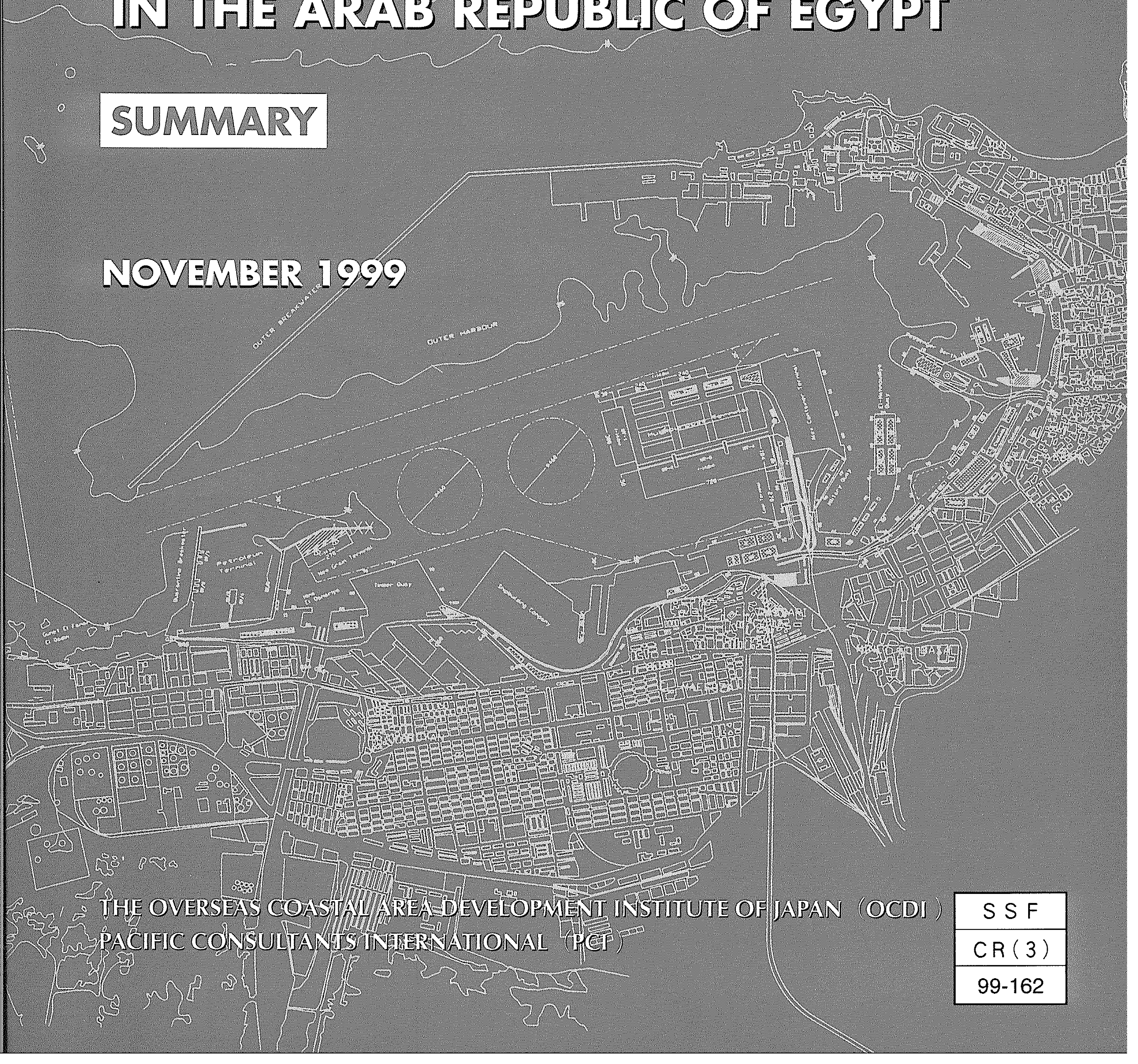
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF MARITIME TRANSPORT (MOMT)

No.

FINAL REPORT

THE STUDY ON MASTER PLAN AND REHABILITATION SCHEME OF THE GREATER ALEXANDRIA PORT IN THE ARAB REPUBLIC OF EGYPT

SUMMARY



NOVEMBER 1999

THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN (OCDI)
PACIFIC CONSULTANTS INTERNATIONAL (PCI)

The following foreign exchange rates are applied in this study:

US$ 1.00 = LE (Egyptian Pound) 3.40 = ¥ 136.00, as of May, 1998

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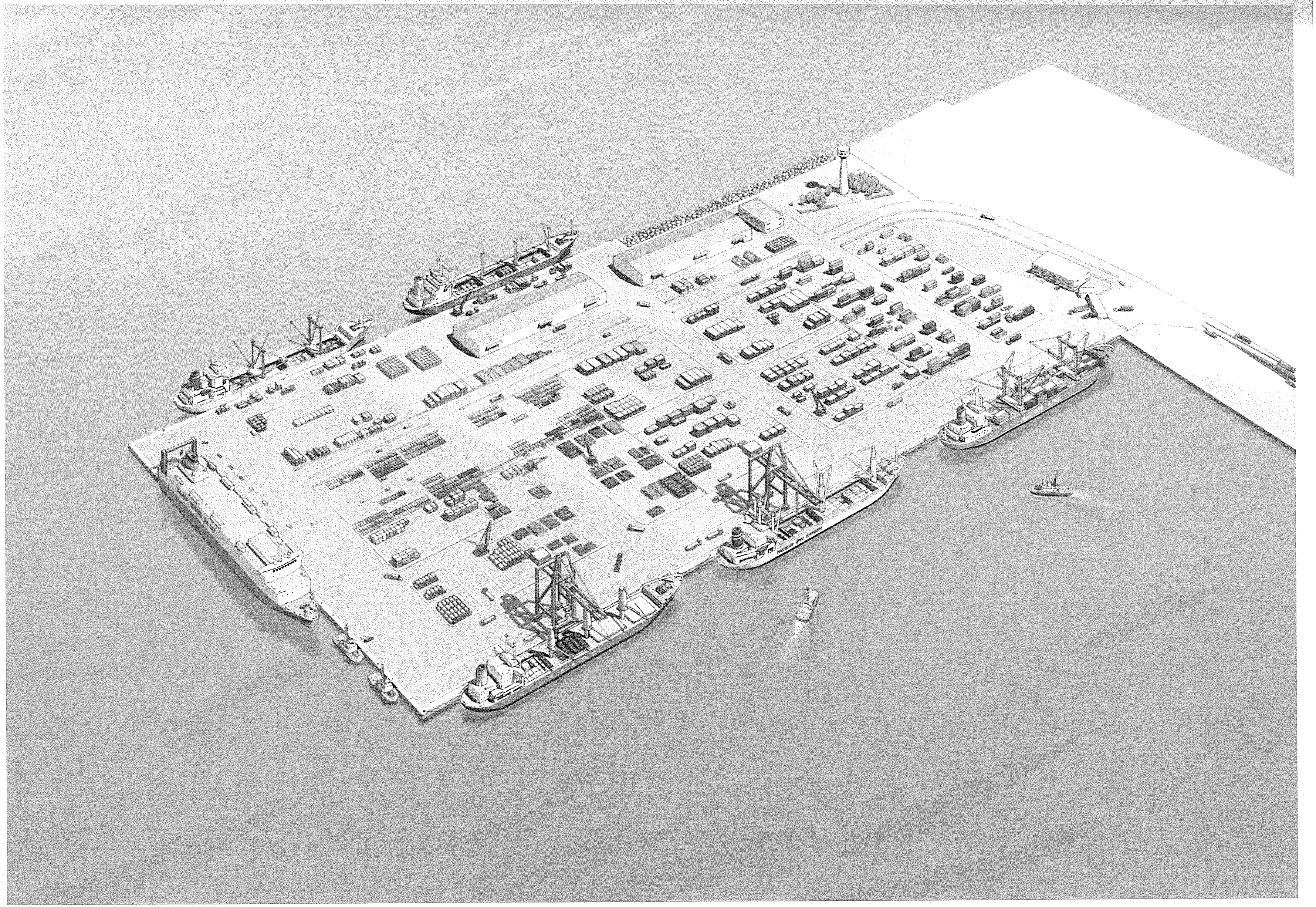


PREFACE

In response to a request from the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a study on the master plan and rehabilitation scheme of the Greater Alexandria Port in the Arab Republic of Egypt and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team, headed by Mr. Yugo Otsuki of the Overseas Coastal Area Development Institute of Japan (OCDI), consisting of OCDI and Pacific Consultants International (PCI) to Egypt, four times between March 1998 and September 1999.

The team held discussions with the officials concerned of the Government of Egypt and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between out two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Egypt for their close cooperation extended to the Team.

November, 1999

Kimio Fujita

President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

November, 1999

Mr. Kimio Fujita
President
Japan International Cooperation Agency

Dear Mr. Fujita:

It is my great pleasure to submit herewith the final report for the Study on the Master Plan and Rehabilitation Scheme of the Greater Alexandria Port in the Arab Republic of Egypt.

The study team which consists of the Overseas Coastal Area Development Institute of Japan (OCDI) and Pacific Consultants International (PCI), and headed by myself, conducted surveys in Egypt four times from March 1998 to September 1999 as per the contract with the Japan International Cooperation Agency.

The findings of these surveys were fully discussed with the officials of the Ministry of Maritime Transport (MOMT) and other authorities concerned to formulate the Master Plan and Rehabilitation Scheme for the period up to the year 2017 and to formulate and examine the feasibility of the Short-term Plan for the period up to the year 2007, and were then compiled into this report.

On behalf of the study team, I would like to express my deepest appreciation to the Government of Egypt, Alexandria Port Authority and other authorities concerned for their brilliant cooperation and assistance and for the heartfelt hospitality which they extended to the study team during our stay in Egypt.

I am also greatly indebted to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport and the Embassy of Japan in Egypt for giving us valuable suggestions and assistance during the preparation of this report.

Respectfully,

Yugo Otsuki
Leader of the Study Team for the Study on Master Plan and Rehabilitation Scheme of the Greater Alexandria Port in the Arab Republic of Egypt

ABBREVIATION LIST

A	AGOSD	Alexandria General Organization for Sanitary Drainage
	ANSDAK	Alexandria National Iron and Steel Co.
	APA	Alexandria Port Authority
	APC	Alexandria Petroleum Company
	AWSA	Alexandria Water Supply Authority
B	BOD	Biochemical Oxygen Demand
	BOR	Berth Occupancy Ratio
C	CD	Chart Datum
	CEE	Corporate Environmental Ethics
	CFS	Container Freight Station
	CIS	Commonwealth of Independent States
	COD	Chemical Oxygen Demand
	CY	Container Yard
D	DPA	Damietta Port Authority
	DWT	Dead Weight Tonnage
E	EDI	Electronic Data Interchange
	EEAA	Egyptian Environmental Affairs Agency
	EIA	Environmental Impact Assessment
	EIRR	Economic Internal Rate of Return
F	FIRR	Financial Internal Rate of Return
G	GDP	Gross Domestic Product
	GRDP	Gross Regional Domestic Product
	GRT	Gross Tonnage

I	IEE	Initial Environmental Examination
L	LOA	Length Overall
M	MOMT	Ministry of Maritime Transport
O	OECD	Organization for Economic Cooperation and Development
P	PSPA	Port Said Port Authority
Q	QGC	Quay-side Gantry Crane
R	RTG	Rubber-Tired Gantry
S	SCA	Suez Canal Authority
T	TEU	Twenty-foot Equivalent Unit
U	UNCTAD	United Nations Conference on Trade and Development
	USAID	United States Agency for International Development
V	VTMS	Vessel Traffic Management System

CONTENTS

Executive Summary

1. Background of the Study

Mediterranean ports in Egypt, viz. the Greater Alexandria (including El Dekheila Port), Damietta and Port Said Ports, play a role in handling Egyptian sea-borne trades to a large extent. The Greater Alexandria Port handles approximately 20 million tons, which accounts for a little more than 60% of the Egyptian sea-borne trade cargo. However, the future cargo demand for the Greater Alexandria Port is expected to exceed its overall capacity, mainly due to geographical constraint, un-modernized cargo handling and transportation systems, and aged facilities of the port. Additionally, port related traffic such as cargo trucks coming in/out the port causes heavy traffic jam at the downtown area right behind Alexandria Port.

On the other hand, El Dekheila Port was developed as a modern port and started its operations in 1986, located only 6 km west of Alexandria Port. This port is expected to complement and ease congested Alexandria Port. Roles of Damietta Port and Port Said Port have been enhancing their importance as a container port taking the geographical advantages of proximity to Suez Canal. Functions of Alexandria Port and El Dekheila Port are requested to be integrated as the Greater Alexandria Port so as to promote national and regional development by maximizing its potential, taking account of increasing cargo demand and structural change of commodity flows through those ports.

2. Objectives of the Study

The objectives of the study are i) to formulate development guidelines of the Mediterranean ports in Egypt (target year: 2017), ii) to formulate the Master Plan for the Greater Alexandria Port (including El Dekheila Port) (target year: 2017), iii) to formulate the Short-term Plan (target year: 2007), and iv) to propose measures to improve port management and operations.

3. Outline of the Study

3.1 Development Guidelines of the Mediterranean Ports in Egypt

Development guidelines are formulated for three ports viz. the Greater Alexandria Port, Damietta Port and Port Said Port for the target year of 2017. The following matters are proposed.

(1) Handling Local Containers

It is proposed to allocate local containers first to the existing container terminals at the Greater Alexandria Port and Port Said Port up to their potential capacity of 2.2 million TEUs per annum (1.5 million TEUs in the Greater Alexandria and 700,000 TEUs in Port Said). Then, it is also proposed to allocate excess containers of 700,000 TEUs to the existing terminal at Damietta Port and the new terminal at Port Said East Port.

(2) Handling of Transshipped Containers

It is proposed to increase the capacity of container-handling in Damietta Port up to 1.7 million TEUs per annum. Thus, in the target year 2017, the Egyptian hub ports containing Port Said East Port and

Damietta Port are expected to take demand for handling transshipped containers of 5.2 million TEUs per annum which accounts for 44.1 % of the total demand of 11.7 million TEUs in the East Mediterranean and the Black Sea.

(3) Handling of Conventional General Cargo

It is proposed to allocate a great portion of the total conventional general cargo (12.8 million tons, 73.6% of the total in 2017, almost the same percentage as at present) to the Greater Alexandria Port. At Damietta Port, it is also proposed to implement the second phase development by the year 2017 so as to meet the increasing demand (3.2 million tons in 2017) for handling conventional general cargo and to compensate for the conversion of the existing conventional berths into container berths.

(4) Handling Dry Bulk Cargo

1) Grain

Although the incremental volume of grain up to the target year is moderate as a whole, there will be shortage of grain handling capacity at the Greater Alexandria Port compared with the regional demand. To meet the increasing demand economically, it is proposed to redevelop the existing obsolete grain-handling facilities at the West Zone of Alexandria Port.

2) Coal and Coke

Since the volume of coal/coke will be stable up to the target year, it is proposed to redevelop the existing obsolete facilities for handling coal/coke in the harbor area of Alexandria Port by additional investment rather than concentrating coal/coke handling in El Dekheila Port. This will save ocean coal transport costs.

(5) Handling of Liquid Bulk Cargo

To meet the increasing demand of liquid bulk cargo in the future, it is proposed to renovate the existing obsolete facilities for handling petroleum and edible oil at the Petroleum Basin in the Alexandria Port in addition to a new oil jetty to be constructed at El Dekheila Port by MEDOR.

(6) Common Port Facilities

Together with the development, redevelopment or renovation of marine terminals at each port as mentioned above, it is proposed to prepare required common port facilities such as breakwaters, port roads and vessel traffic management system (VTMS).

(7) Management, Operations and Institutional Matters

The following matters are proposed.

- To promote private participation and privatization of the state-owned companies so as to improve the level of services to port users,
- To promote the establishment of integrated private terminal operators with enough capital and

ability to perform comprehensive port terminal operations including stevedoring, warehousing and trucking, and

- To make MOMT set the maximum level of the port charges and allow each port authority to decide the charges freely below the maximum level.

3.2 Master Plan and Short-term Plan for the Greater Alexandria Port

3.2.1 Facility Plan

The Master Plan and the Short-term Plan for the Greater Alexandria Port are formulated in the framework of "the Development Guidelines of the Mediterranean Ports in Egypt" mentioned above. The followings are the major items of the plans.

Items of the Plans	1st Phase Project (Short-term Plan)		2nd Phase Project		Completion (Master Plan)	
1.Project Period	Up to 2007		2007-2017		Up to 2017	
2.Projected cargo volume of final year (thousand tons)	35,722		44,327		44,327	
3.Multi-purpose Terminal		million LE: 443		million LE: 51		million LE: 494
3.1 Infrastructure						
(1) Deep water berth (14 m below C.D.)	960 m		480 m		1,440 m	
(2) Open yard	13 ha		4 ha		17 ha	
(3) Dedicated access road (700 m long) with a fly-over bridge connected to the existing fly-over bridge	Development		—			
3.2 Superstructure						
(1) Warehouses	6,000 sq.m.		6,000 sq.m.		12,000 sq.m.	
(2) Gate house	Development		—			
(3) Truck scale	Development		—			
3.3 Two (2) units of multi-purpose quay-side gantry cranes	Development		—			
4. Redevelopment of the existing Grain Terminal at the West Zone		118		—		118
4.1 New berth with a length of 270 m (14m below C.D.)	Development		—			
4.2 Grain-handling equipment						
(1) Two (2) units of rail-mounted ship unloaders	Development		—			
(2) Belt conveyors connecting ship unloaders and the existing silos	Development		—			
5. New Coal Berth with a length of 270 m (14m below C.D.) at the existing Coal/Coke Terminal	Development	23	—	—		23

6. Redevelopment of El Mahmudiya Quay		—		—		—
(1) Demolishing warehouses no.44 and no.45	Development		—			
(2) Preparation of open yards behind berths no.39 and no.40	Development		—			
7. Deepening of the Inner Harbor Basins to water depth of 14 m below C.D. between the West and Central Zones of Alexandria Port (The cost is allocated to 3,4 & 5)	Development	—	—	—		—
8.A new port road bridge connecting the East and Central zones	Development	10	—	—		10
9.Commoon port facilities	Development	4	—	—		4
(1) Introduction of the latest vessel traffic management system (VTMS)						
(2) Installation of a waste oil receiving facility at El Dekheila Port	Development		—			
Grand Total		598		51		649

* CD : Chart Datum

3.2.2 Management, Operations and Institutional Matters

(1) It is recommended that APA set the targeted productivity/throughput and monitor the performance of operators.

(2) It is proposed that APA divide the new multi-purpose terminal into two or three portions and lease them or give concession to existing state-owned or private companies. To choose competent terminal operators, it is recommended to have a tender on concession or lease fee.

4. Appraisal of the Short-term Plan

4.1 Economic Appraisal

A comparison between the "Without" case and the "With" case was carried out to evaluate the economic feasibility of the project for construction of 1) Multipurpose Terminal including common port facilities such as VTMS and waste oil receiving facilities, 2) Grain Terminal Modernization, 3) Deep Water Coal Berth, and 4) New Port Road Bridge proposed in the Short-term Plan from the viewpoint of the national economy of Egypt.

The resulting economic internal rate of return (EIRR), benefit cost ratio (B/C), and net present value (NPV) for the above-mentioned projects proposed in the Short-term Plan are presented in Table 4.1, Table 4.2 and Table 4.3. Consequently, all the projects are considered to be economically feasible from the viewpoint of the national economy of Egypt.

Table 4.1 Resulting EIRR for each Project

(unit: %)

Project	Multi-purpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Overall Projects
EIRR	23.0	18.2	39.1	19.8	22.7

Table 4.2 Resulting B/C for each Project

Project	Multi-purpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Overall Projects
B/C	1.70	1.74	4.34	1.74	1.80

Table 4.3 Resulting NPV for each Project

(unit: 1,000LE)

Project	Multi-purpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Overall Projects
NPV	265,295	82,331	56,772	4,539	408,937

4.2 Financial Appraisal

The financial revenues are generated from the port dues and charges based on the tariff proposed to cover capital investment and operational costs by referring to the current tariff level and those of the neighboring ports.

The resulting financial rates of return (FIRR) for the projects of 1) Multipurpose Terminal including common port facilities such as VTMS, waste oil receiving facilities and New Port Road Bridge, 2) Grain Terminal Modernization, 3) Deep Water Coal Berth, and 4) the overall projects are 10.2%, 16.6%, 36.4% and 12.6% respectively, exceeding the weighted average interest rate (5.3%) of assumed fund raising plans and hence each project is considered to be financially feasible.

Table 4.4 Resulting FIRR for each Project

(unit: %)

Project	Multi-purpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	Overall Projects
FIRR	10.2	16.6	36.4	12.6

5. Proposed Measures together with Project Implementation

Prior to constructing a new multi-purpose terminal, sawn timber landing operations from barges at quays Nos. 57-61 need to be relocated to appropriate places in the harbor.

For achieving gradual conversion of barge operation into quayside operation smoothly, it is proposed that the Government take the initiative in conducting measures to give barge operators licenses to perform quayside operation. In addition, it is recommended to provide retraining programs to obtain necessary knowledge, techniques or skills for quayside operation.

Suez Canal

	Km	Min. depth	Min. width
Port Said – Suez	161·6	19·5m	300m

Examples of largest vessel

Draught	Beam
16·1m	42·7m
11·6m	56·1m
10·1m	64·0m

loa .... N/A Air draught .... N/A
Laden .... 150,000 dwt In ballast .... 370,000 dwt

24 hour lock-free transit. Passage by convoy system, 2 southbound and 1 northbound daily. Maximum of 40 vessels per convoy.

Gibraltar								
Marseilles	690	**Marseilles**						
Naples	979	457	Naples					
Trieste	1648	1204	800	Trieste				
Piraeus	1481	1065	661	839	**Piraeus**			
Istanbul	1800	1378	974	1152	352	Istanbul		
Beirut	2004	1595	1189	1367	643	810	Beirut	
Port Said	1913	1512	1108	1294	593	786	228	**Port Said**
Tunis	794	472	309	921	729	1042	1252	1160

Figure 1 Map of the Mediterranean

Figure 2 Land Use Map of the Greater Alexandria Port

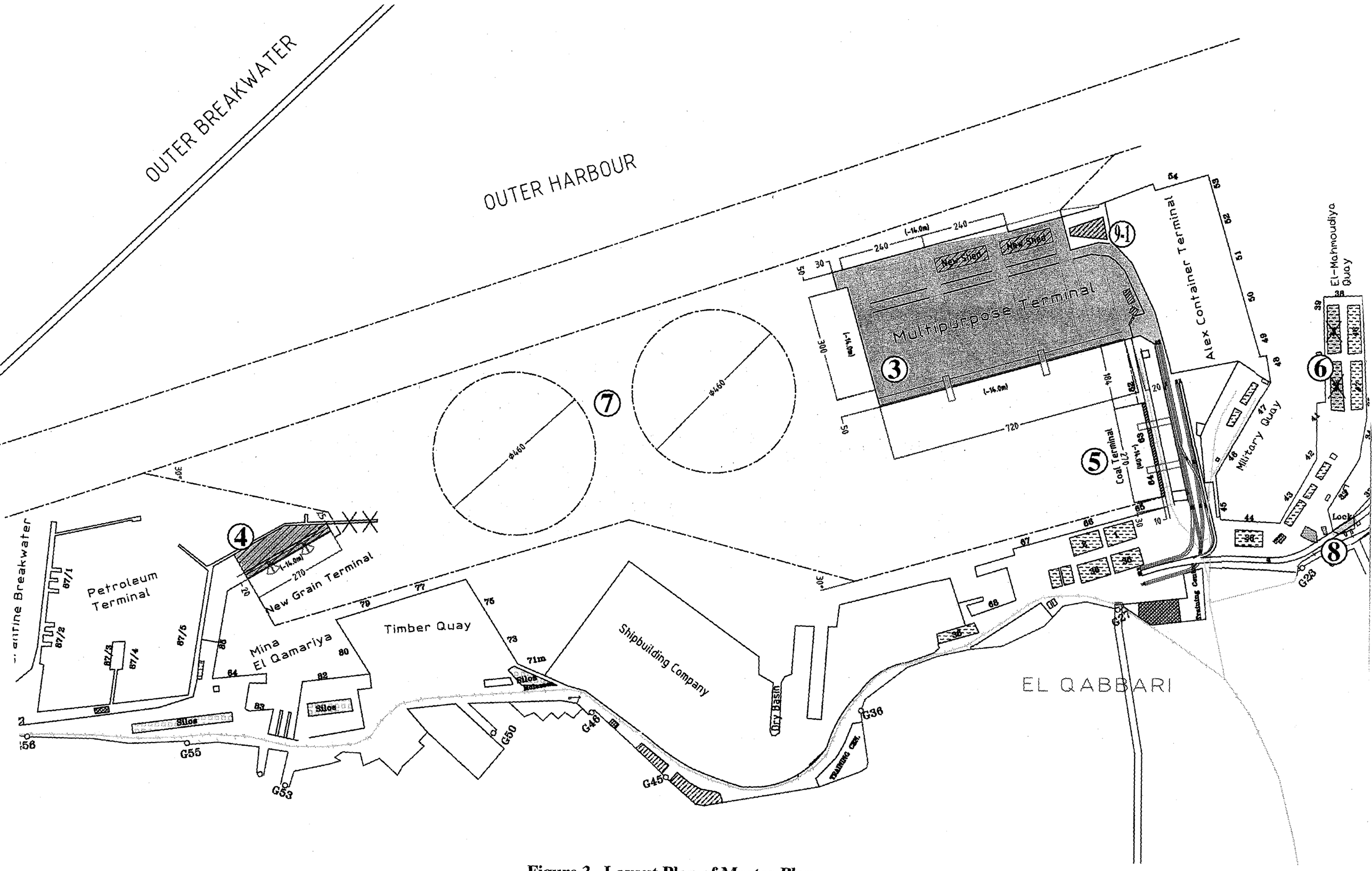


Figure 3 Layout Plan of Master Plan

ORGANIZATION OF THE STUDY TEAM

The study team is comprised of the following specialists. This name and responsibilities are listed below;

Name	Responsibilities
Yugo Otsuki	Team Leader, Overall management (OCDI)
Toshihiko Kamemura	Demand Forecast (1)
Tadahiko Kawada	Demand Forecast (2)
Masahiko Furuichi	Sub-Leader, Port Planning (1)
Shinichi Tezuka	Port Planning (2)
Shinobu Yamamoto	Port Management and Operation
Toshihiro Okura	Port Management and Operation
Toru Yano	Economic and Financial Analyses
Nobuo Ide	Port Facility Design
Masahiro Yokogawa	Construction and Cost Estimation
Abdelaziz Rabie	Natural Conditions
Jayamohan Somasundaram	Environmental Conditions
Tsuyoshi Oki	Coordinator
Toru Yano	Coordinator

CONCLUSIONS

1. Necessity of Coordinated Development of the Mediterranean Ports in Egypt

1. Egypt has enjoyed stable economic growth, with Gross Domestic Product from 1991/92 to 1996/97 growing at an annual average rate of 4.2%. On the Mediterranean coast, the three major ports, viz. the Greater Alexandria Port (containing Alexandria and El Dekheila), Damietta Port and Port Said Port, are handling the great majority of overseas trade cargo passing through the Egyptian ports (hereinafter referred to as "the local cargo"). The volume of the local cargo which passed through the three major ports recorded average annual increase rates of 12.2% in imports and 6.9% in exports, with 30 million tons in imports and 6 million tons in exports in 1996/97. In the same year, the Greater Alexandria Port ranked first in terms of local cargo volume, accounting for 67.1% of the total of the three ports, followed by Damietta (21.3%) and Port Said (11.6%).

2. The volume of the local cargo through the three ports is expected to continuously increase in the future; projected volumes in the years of 2017 are 16.6 million tons in conventional cargo (1.7 times as much as the volume in 1997) and 2.9 million TEUs in local containers (5.2 times as much as the volume in 1997) including the volume to be allocated to the new port, viz. Port Said East Port, respectively.

3. There is a shortage of the required infrastructures or cargo-handling machines and no leader giving proper instructions, resulting in inefficient, costly and time-consuming cargo-handling operations and consequent long berth-waiting time at the three major ports.

4. On the other hand, along with the economic growth in the countries facing the East Mediterranean Sea (the average annual growth rate of GDP from 1990 to 1995 is 3.7%), the progress of globalization in overseas trade involving those countries and the ever-increasing size of main-line container vessels, container transshipment at the East Mediterranean hub ports has been emerging in the last decade as a promising business. The volume of containers which were transshipped at the East Mediterranean hub ports and transported to/from feeder ports facing the East Mediterranean Sea or the Black Sea in 1997 is estimated as 2.6 million TEUs with an average annual increase rate in the last five years of 25.7%.The volume of containers transshipped at the Egyptian ports in 1997 accounted for 33.0% (38.2% in 1996) of the total in the East Mediterranean hub ports. In the same year, Gioia Tauro Port ranked first in terms of the volume of containers with the same catchment areas, with an estimated value of one million TEUs, followed by Damietta (542,000 TEUs), Marsaxlokk (417,000 TEUs), and Port Said (311,000 TEUs).

5. The potential demand for transshipment containers which will originate from or be destined to the above catchment areas and will be transshipped at the East Mediterranean hub ports in 2017 is estimated as 11.7 million TEUs in total with an average annual increase rate of 7.3% towards the year 2017. On the other hand, the existing capacity available for handling the above-mentioned transshipped containers at the hub ports is estimated as approximately 4.7 million TEUs per annum,

indicating that container-handling capacity of approximately 7 million TEUs in total is additionally required for transshipment services at hub ports towards the year 2017. In other words, incremental demand for handling 7-million-TEU containers is expected to be generated in the transshipment business at container hub ports in the future.

6. The ports of Port Said and Damietta, thanks to their geographical advantage of zero or little deviation from the international trunk route via the Suez Canal, have almost one third of the transshipment market share in the East Mediterranean and the Black Sea. And a promising new hub port, viz. Port Said East Port, which is on the verge of being constructed, could take a considerable market share in the future together with Damietta Port, if required port facilities are prepared and efficient operations are provided with competitive tariff. They would make a positive contribution to the Egyptian economy through earning foreign currency.

7. Thus to resolve the present problems and meet increasing demand for handling conventional cargo and local and transshipped containers in the future, it is necessary to develop, re-develop or rehabilitate the Egyptian Mediterranean ports, the Greater Alexandria Port, Damietta Port and Port Said Port, in a comprehensive manner to effective use of the limited resources. Main issues are outlined by type of cargo-handling as follows:

(1) Handling of Local Containers

8. Local containers imported or exported through the three Mediterranean ports in Egypt increased at a high growth rate of 13.8% per annum in the past five years, recording 571,000 TEUs in total in 1996/97. In the same year, 68.2% of the total local containers were received by the Greater Alexandria Port.

9. It is essential to meet future demand for handling local containers at those ports so as to support the national and regional economic growth. In this view, the Greater Alexandria Port whose hinterland extends over the Nile Delta including the second largest city, viz. Alexandria as its own back area and Cairo Metropolis, is expected to continue playing a major role in handling local containers.

10. The Greater Alexandria Port has a natural harbor with deep waters which is maintained without heavy maintenance dredging. The water depths of the existing container terminals are 14 m in the Alexandria harbor and 14m and 12 m (under construction) in El Dekheila, and their water depths seem to be sufficient to serve local container handling. In addition, the El Dekheila terminal has spacious land areas for future expansion. Thus, the Greater Alexandria Port has a large potential capacity for handling local containers (estimated as 1.5 million TEUs in total). The container-handling capacity, however, is insufficient to meet the large potential demand of 2.5 million TEUs in 2017.

11. Hence, to meet the potential demand, it is necessary to increase container handling capacity of Alexandria Port as much as possible by investing additionally for super-structures and container-handling machines and make the most of the already existing infrastructures including berths. Excess

containers would then be allocated to other Mediterranean ports including Port Said East Port.

12. Port Said Port is also required to serve local containers as well as Alexandria Port, because the port has its own hinterland, Port Said City, which accounted for 48.1% of its local container market in 1996/97. Also, the available navigational time to the port is limited due to interference with a convoy passing through the Suez Canal which presumably makes it difficult for the port to function as an international hub port for container transshipment in the next century.

13. In this regard, it is advisable that Port Said Port be used principally for local containers, and thereby the port will have room to receive a considerable amount of excess local containers from Alexandria Port in addition to the containers from/to its present hinterland in the future. Its capacity, however, is insufficient to receive all of the excess local containers.

14. While Damietta Port as well as Port Said East Port is expected to function as an international hub port for serving container transshipment in future, some amount of local containers is necessary for the sake of stable port management, since customer royalty at a hub port is prone to shift in the fiercely competitive transshipment business. Thus, a portion of the excess local containers from Alexandria will be required to be allocated to both Damietta Port and Port Said East Port in the future as well as Port Said Port.

(2) Handling of Transshipped Containers

15. The Egyptian hub ports are expected to take a considerable portion of the incremental demand for container-handling in the transshipment business which is anticipated to be 7 million TEUs towards the year 2017 in the East Mediterranean and the Black Sea. This will be an important source of foreign currency.

16. Damietta Port could increase the container handling up to 1.7 million TEUs in total by converting the existing conventional berths to additional container berths and preparing additional required super-structures and container-handling machines. This is much more economical than constructing a new terminal on virgin land. Thereby, in addition to local containers, Damietta Port could take a some portion of incremental demand for handling transshipped containers towards the year 2017 in the East Mediterranean and the Black Sea. Needless to say, much more demand is expected to be taken by Port Said East Port.

17. Although Damietta Port has several problems in container-handling, viz. insufficient specifications of container gantry cranes to accommodate the gigantic main-line container vessels, lack of efficient terminal operation system using computers, the resulting low container-handling productivity, etc., they could be overcome by moderate investment.

18. The present tips of the existing breakwaters are placed in the wave-breaking zones, and consequently the Damietta Port Authority is struggling to maintain its guaranteed water depths in the access channel

by continuous maintenance dredging throughout the year. To support the above expansion project, it is required to receive container vessels at the port on time by taking adequate countermeasures against siltation in the access channel. An effective countermeasures would be to extend the existing breakwaters. The port authority is studying the optimum extension lengths of the existing breakwaters.

(3) Handling of Conventional General Cargo

19. A great portion of the total conventional general cargo is being handled at Alexandria Port. Due to the lack of wharves specialized for handling long, bulky and/or heavy cargo such as iron billets, steel bars, scraps and plant components which are equipped with deeper berths with spacious aprons and open storage yards just behind them, these cargoes are handled at the existing berths in the harbor mostly with narrow aprons and aged sheds behind them together with other conventional cargoes which need to be stored in sheds. Thus, on-dock cargo-handling operations are conducted in chaotic conditions at these berths which are already close to being saturated, resulting in intricate cargo-hauling within the port. In addition, barge operations at anchorage within the harbor basins are done for handling goods such as sawn timbers and dust cargoes including sulfur and clay for the same reason mentioned above. Such cargo-handling results in a lot of wastage and inefficient, costly and time-consuming operations.

20. In the future, the volume of the above-mentioned long, bulky and/or heavy conventional general cargoes required to be handled at Alexandria Port is expected to increase to a considerable extent, (in the year 2017, 2.4 times as much as at present in Alexandria) whereas the remaining conventional cargoes are expected to remain at a moderate level (1.2 times as much as at present) reflecting the inverse effect of the anticipated further progress of containerization.

21. Hence, to meet the increasing demand for handling long, bulky and/or heavy cargoes, it is necessary to construct a new multi-purpose terminal with deep berths and spacious open yards aiming at handling principally long, bulky and/or heavy cargoes in Alexandria Port. Such a terminal could be constructed by re-developing the existing aged wharf. The preparation of the new terminal will reduce the congestion in handling the remaining conventional cargoes in the existing berths, thereby reducing berth waiting costs of vessels in off-shore anchorage

(4) Handling of Dry Bulk Cargo

1) Grain

22. In the Greater Alexandria Port, due to the shallow berth at the harbor grain terminal, a great portion of grains is discharged at El Dekheila Port. At El Dekheila Port, however, there are only two units of rail-mounted grain unloaders, and considerable grains are discharged onto truck wagons alongside directly by using portable pneumatic unloaders temporally placed on upper decks. This results in low grain-handling productivity of less than 300 tons per hour per vessel and consequently, all general cargo berths at El Dekheila are occupied by grain carriers.

23. Hence, to resolve present problems and meet the increasing demand for handling grains at the Greater Alexandria Port, it is necessary to construct a new deep water berth that will be connected with the existing silos through conveyors to receive Panamax type grain carriers in the Alexandria harbor.

2) Coal and Coke

24. At the coal/coke terminal in the Alexandria harbor, the berths are obsolete and shallow (10 m in design water depth). Nevertheless, a Panamax-type coal carrier of around 69,000 DWT with a full draft of 13.3 m and a length of 215 m once called the terminal in partly-loaded draft condition. To receive larger coal carriers in fully-loaded conditions, coal/cokes handling could be concentrated on the mineral jetty at El Dekheila by shifting the current handling at Alexandria to El Dekheila through investment for procuring coal/cokes handling machines on the jetty and yards and constructing storage yards and inland barge basins. The required resources for the investment, however, are gigantic and far outweigh the benefits to be obtained by such a concentration plan. Taking into account that demand for handling coal/cokes is predicted to increase slightly for the future, it is more economical to prepare deeper berths in front of the existing berth line with moderate investment so as to receive larger coal carriers at the existing coal/coke terminal in the Alexandria harbor.

(5) Handling of Liquid Bulk Cargo

25. The five marine oil berths of the Alexandria Petroleum Company in the Petroleum Basin within the Alexandria harbor have sufficient capacity for the refinery of the above company located behind the basin and another refinery of a company located within the free zone at Al Amriya south of Alexandria for the time of being, if the existing broken-down loading/unloading arms are replaced together with the installation of new connecting pipelines.

26. The Mediterranean Oil Refinery (MEDOR) is planning to construct a new refinery at Al Amriya. The company is also planning to construct a marine oil jetty to the west of the mineral jetty at El Dekheila Port.

(6) Common Port Facilities

27. To support cargo handling operations in the marine terminals, it is necessary to prepare required common port facilities such as breakwaters, port roads and vessel traffic management system (VTMS).

(7) Management, Operations and Institutional Matters

28. In Egypt, port authorities function as the Government's landlords over water, land and infrastructure of the ports. Port authorities are in charge of planning, constructing and maintaining port facilities, securing navigation safety and marine service in the ports. Port authorities lease land and facilities in the ports to both state-owned and private companies and collect fees from them.

29. State-owned companies have been allowed to perform cargo handling operations, warehouse operations and act as shipping agents. They are under the control of the Holding Companies supervised by the Ministry of Public Enterprise. Inefficient cargo handling and high costs, which are major problems in Egyptian Ports, are mainly derived from the monopolistic situation of the state-owned companies. To solve these problems, Egyptian Government has begun to implement new policies: privatization of state-owned companies and private participation in the port sector.

2. The Development Guidelines of the Mediterranean Ports in Egypt

(1) Handling of Local Containers

30. The Development Guidelines is formulated with a target year of 2017. In that year, the number of local containers to be handled at the Mediterranean Ports in Egypt is estimated as 2.9 million TEUs. To receive the forecast traffic, it is proposed to allocate local containers first to the existing container terminals at Greater Alexandria Port and Port Said Port up to their potential capacity of 2.2 million TEUs per annum (1.5 million TEUs in the Greater Alexandria and 700,000 TEUs in Port Said). This entails investing in super-structures and container-handling machines to make the most of the already existing infrastructures.

31. It is also proposed to allocate excess containers of 700,000 TEUs to the existing terminal at Damietta Port and the new terminal at Port Said East Port which is expected to contribute to stabilizing terminal management.

(2) Handling of Transshipped Containers

32. To take a portion of demand for handling transshipped containers, the volume of which is anticipated to reach 11.7 million TEUs per annum towards the year 2017 in the East Mediterranean and the Black Sea, it is proposed to increase the capacity of container-handling in Damietta Port up to 1.7 million TEUs per annum. This could be accomplished at the least cost by using the existing infrastructures including the conversion of the existing conventional berths to container berths.

33. Thus, in the target year, the Egyptian hub ports containing Port Said East Port and Damietta Port are expected to take demand for handling transshipped containers of 5.2 million TEUs per annum of 44.1 % of the total demand of 11.7 million TEUs in the East Mediterranean and the Black Sea.

(3) Handling of Conventional General Cargo

34. In the year 2017, the volume of conventional general cargo to be handled at the Mediterranean Ports in Egypt is estimated as 17.4 million tons. To receive the forecast traffic, it is proposed to allocate a great portion of the total conventional general cargo (12.8 million tons, 73.6% of the total in 2017, almost the same percentage as at present) to the Greater Alexandria Port whose cargo-handling

capacity could be economically increased by re-developing some existing obsolete wharves through constructing a new terminal with deeper berths and spacious open yards just behind them or demolishing some existing warehouses to widen apron areas and prepare required open yards within the harbor area. This will reduce the congestion at the remaining existing wharves.

35. At Damietta Port, it is proposed to implement the second phase development by the year 2017 so as to meet the increasing demand (3.2 million tons in 2017) for handling conventional cargo and to compensate for the conversion of the existing conventional berths into container berths.

(4) Handling of Dry Bulk Cargo

1) Grain

36. In the year 2017, the volume of grains to be handled at the Mediterranean Ports in Egypt is estimated as 13.4 million tons or 1.4 times as much as the volume in 1997. Although the incremental volume up to the target year is moderate as a whole, there will be shortage of grain handling capacity at the Great Alexandria Port compared with the regional demand. To meet the increasing demand economically, it is proposed to redevelop the existing obsolete grain-handling facilities in the harbor area of Alexandria Port.

2) Coal and Coke

37. In the year 2017, the volume of coal and coke to be handled at the Greater Alexandria Port is estimated as 2 million tons almost the same as in 1997. Since the volume will be stable up to the target year, it is proposed to redevelop the existing obsolete facilities for handling coal and coke in the harbor area of Alexandria Port by additional investment rather than concentrating coal/coke handling in El Dekheila Port. This will save ocean coal transport costs.

(5) Handling of Liquid Bulk Cargo

38. In the year 2017, the volume of liquid bulk cargo containing petroleum and edible oil to be handled at the Greater Alexandria Port is estimated as 6.5 million tons including the assumed volume from/to the new refinery plant to be installed at Al Amriya or 1.5 times as much as the volume in 1997. To meet the increasing demand in the future, it is proposed to renovate the existing obsolete facilities for handling petroleum and edible oil at the Petroleum Basin in the Alexandria harbor in addition to a new oil jetty to be constructed at El Dekheila Port by MEDOR.

(6) Common Port Facilities

39. Together with the development, redevelopment or renovation of marine terminals at each port as mentioned above, it is proposed to prepare required common facilities such as breakwaters, port roads and vessel traffic management system (VTMS).

(7) Management, Operations and Institutional Matters

1) General

40. The current key issue facing the Egyptian ports is how to effectively implement the new policies, private participation and privatization of the state-owned companies, to improve the service level to port users. Since these are closely related, it is advisable to introduce the following coordinated plans.

41. It is advisable to promote the establishment of integrated private terminal operators with enough capital and ability to perform comprehensive port terminal operations including stevedoring, warehousing and trucking. The port authorities should divide port areas into several zones and designate some zones as port terminals, each of which must have the appropriate size for such operations and include berths for preferential use and warehouses and open storage yards for exclusive use. Port authorities should give port terminal operators the concessions to use the terminals on an auction basis and allow both existing state-owned and private companies to apply for this tender.

42. To assure competition in the port sector, private companies should be entitled to decide the charges freely based on the negotiations with their customers. Concerning fees charged by a port authority, MOMT should set the upper level of the charges and allow a port authority to decide the charge freely below the maximum level considering those of the ports in the neighboring countries.

2) Alexandria Port

43. Unloading of sawn timber and dust cargo such as phosphate and clay, is currently conducted by barge. To improve the operational efficiency and to prevent cargo damage and environmental pollution, it is proposed that the unloading operation be conducted at the quay. To avoid social unrest that could result from an abrupt loss of jobs, the conversion of barge operators must be done gradually and prudently by increasing the job opportunities in the port.

44. To eliminate exchange of documents and speed up the clearance, a terminal computer linked to the computer system of container terminal should be installed at a gate office. Through this computer system, information on containers to pass through the port gate will be exchanged in real time between the port gate office and the gate at the container terminal.

3) Damietta Port

45. The port authority is suffering from a deficit due to large depreciation costs and repayment of loans. This situation prevents the port authority from investing in new facilities with internal funds. It is necessary to lighten the financial burden of the port authority without relying on the subsidy from the Central Government by increasing revenues from cargoes.

46. It is necessary to grasp the basic information on transshipment containers using loading/unloading container lists from shipping lines. To survive the severe competition among transshipment ports in the Mediterranean Sea, it is advisable to make the future strategy of the port based on this information and the future prospect of container traffic in neighboring countries.

4) Port Said Port

47. Port Said Port Authority does not have its own pilots or tugboats. Suez Canal Authority carries out pilotage and tug assistance in the Port Said Port. While the convoy is passing the Suez Canal, Suez Canal Authority's pilots and tugboats are engaged in service for vessels navigating through the canal. If vessels joining the convoy increase, no pilots or tugboats are available for berthing/unberthing vessels after the convoy passes through the port. Port Authority should have its own pilots and tugboats.

48. Although the Suez Canal gives Port Said Port certain advantages, the navigable time for vessels entering or departing the port is limited due to the interference with the convoy passing through the north entrance of the canal. The convoy has the priority to navigate the canal. During the convoy's passage from midnight to 8:00 AM, vessels to call at the port must stay at the outer anchorage area and vessels at berth can not leave the port. This prevents quick dispatch of vessels and discourages shipping lines to call at the port and consequently limits the number of calling vessels. Port Said Port Authority should have meetings with Suez Canal Authority to extend the time available for entering and departing the port as much as possible.

3. Master Plan for the Greater Alexandria Port (Target Year: 2017)

(1) Handling of Local Containers

49. The Master Plan for the Greater Alexandria Port is formulated with a target year of 2017 in the framework of "the Development Guidelines of the Mediterranean Ports in Egypt" mentioned previously. In that year, the number of local containers to be allocated at the Greater Alexandria Port is 1.5 million TEUs per annum (500,000 TEUs in Alexandria Port and one (1) million TEUs in El Dekheila Port). To receive the allocated volume of containers, it is proposed to invest in additional super-structures and container-handling machines at the existing container terminals of Alexandria and El Dekheila.

(2) Handling of Conventional General Cargo

50. In the year 2017, the volume of conventional general cargoes that will need to be received at the Greater Alexandria Port is estimated as 13.0 million tons. Among those cargoes, the volume of long, bulky and/or heavy cargoes is forecast to be 8.6 million tons, 2.1 times as much as at present in Alexandria. To meet the increasing demand for handling long, bulky and/or heavy cargoes, it is proposed to construct a new multipurpose terminal which will principally handle those cargoes in the

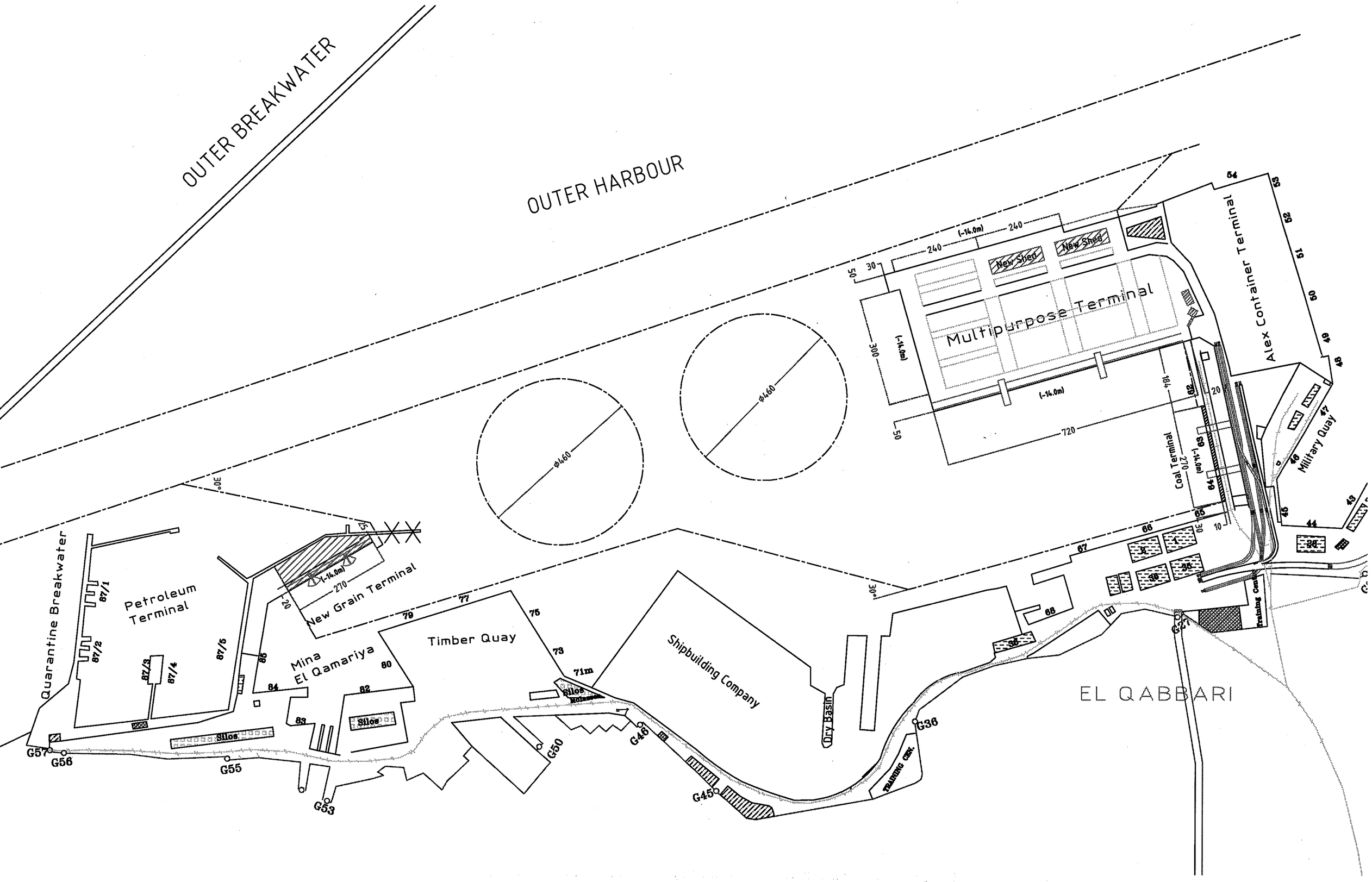


Figure 1 Layout Plan of Multi-purpose Terminal Master Plan

Alexandria harbor.

51. To reduce the current congestion at the existing wharves, it is proposed to redevelop the existing obsolete wharf through demolishing some existing warehouses.

(3) Handling of Dry Bulk Cargo

1) Grain

52. In the year 2017, the volume of grains that need to be received at the Greater Alexandria Port is estimated as 6.1 million tons or 1.4 times as much as the volume in 1997. To meet the increasing demand and save grain-handling costs at the port, it is proposed to construct a new deep water berth equipped with rail-mounted unloaders connected with the existing silos at the grain terminal in the Alexandria harbor

2) Coal and Coke

53. In the year 2017, the volume of coal and coke to be handled at the Greater Alexandria Port is estimated as 2 million tons. To save ocean transport costs for coal, it is proposed to construct a deep water berth in front of the existing coal/coke terminal in Alexandria harbor.

(3) Handling of Liquid Bulk Cargo

54. In the year 2017, the volume of liquid bulk cargo containing petroleum and edible oil to be handled at the Greater Alexandria Port is estimated as 6.5 million tons. To meet the increasing demand in the future, it is proposed to replace the existing obsolete loading/unloading arms and pipelines for handling petroleum and edible oil at the Petroleum Basin in the Alexandria harbor in addition to a new oil jetty to be constructed at El Dekheila Port by MEDOR.

(4) Common Port Facilities

55. Together with the development, redevelopment or renovation of marine terminals, it is proposed to prepare required common facilities including a new bridge connecting the east and central zones, a garbage collecting ship based on the International Convention for the Prevention of Marine Pollution from Ships and a waste oil receiving facility. It is also proposed to introduce the latest vessel traffic management system (VTMS).

(5) Project Cost

56. The total project cost of the Master Plan is roughly estimated as L.E.649 million.

(6) Initial Environmental Examination

57. It is concluded that the proposed master plan targeting principally the enhancement of operational efficiency and safety of the Greater Alexandria Port will lead to overall long-term environmental improvement of the port as well in tandem, in comparison to the baseline (present) environmental condition of the port.

(7) Management, Operations and Institutional Matters

58. It is recommended that APA set the targeted productivity/throughput and monitor the performance of operators. APA should recommend that productivity be improved if the performance is poor and reject the renewal of lease contract if improvement is not expected.

59. To upgrade the port services, it is proposed to enhance the privatization of state-owned companies. If some private investors in Egypt were to hold enough stakes to participate in management of the company, they would seek to increase the dividend by improving management and operation. Consequently, the service level to customers would be upgraded. Such participation in management of the company is a key element for the success of the privatization.

4. Short-term Plan for the Greater Alexandria Port (Target Year: 2007)

(1) Handling of Local Containers

60. The Short-term Plan is prepared as a first-phase plan for the development, redevelopment or rehabilitation of the Greater Alexandria Port with a target year of 2007 in the framework of "the Master Plan" mentioned previously. In that year, the number of local containers that will need to be handled at the Greater Alexandria Port is estimated as 1.2 million TEUs per annum. To meet the demand in the stage of the Short-term Plan, it is proposed to invest in required super-structures and container-handling machines for the existing container terminals of Alexandria and El Dekheila.

(2) Handling of Conventional General Cargo

61. In the year 2007, the volume of conventional general cargoes that will need to be received at the Greater Alexandria Port is estimated as 11.1 million tons. Among those cargoes, the volume of long, bulky and/or heavy cargoes is forecast to be 6.9 million tons, 1.7 times as much as at present in Alexandria. To meet the demand for handling long, bulky and/or heavy cargoes in the stage of the Short-term Plan, it is proposed to implement a first-phase project for the construction of a new multipurpose terminal in Alexandria harbor.

62. To reduce the current congestion at the existing wharves, it is proposed to demolish some existing warehouses.

(3) Handling of Dry Bulk Cargo

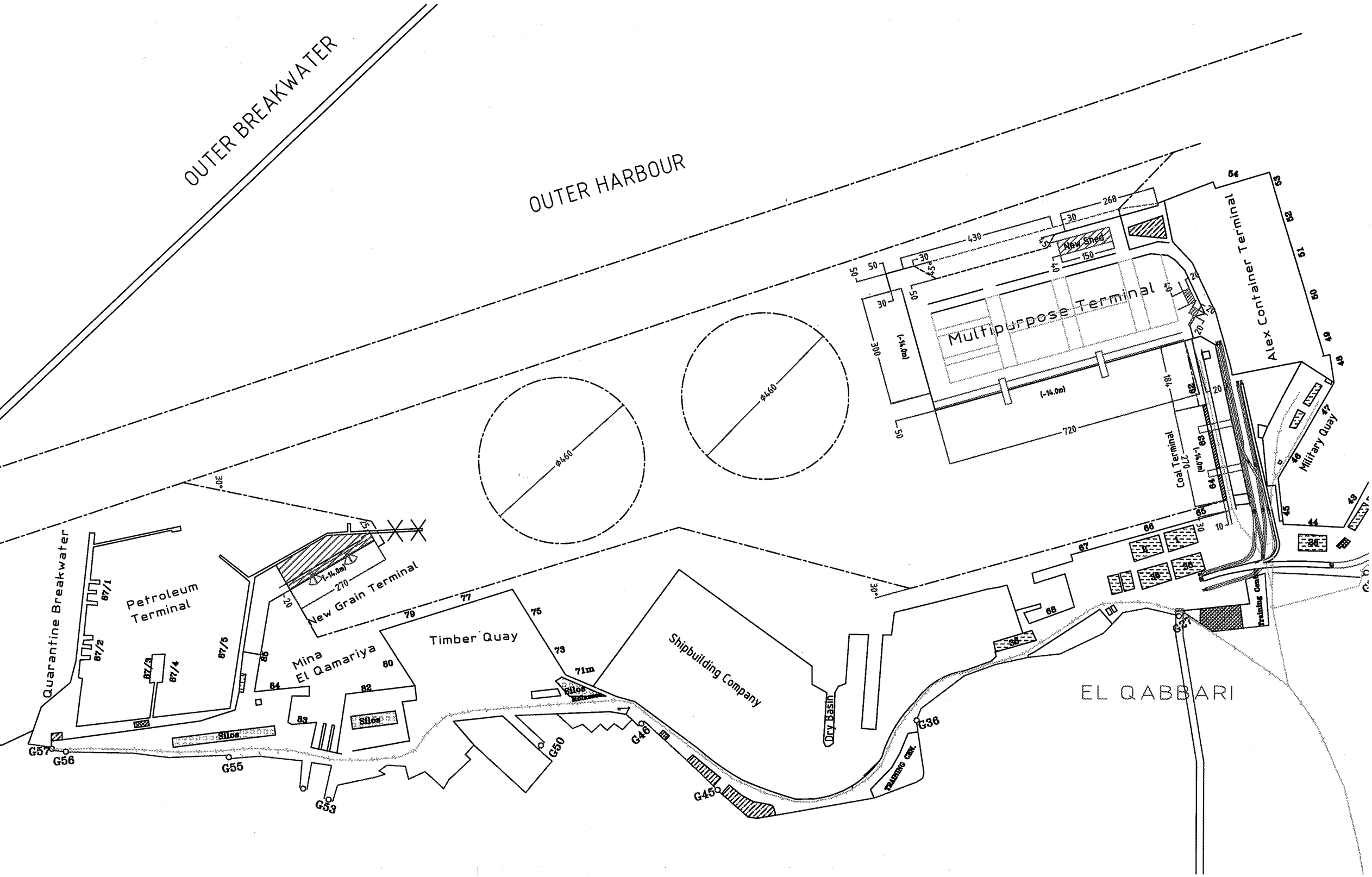


Figure 2 Layout Plan of Multi-purpose Terminal Short-term Plan

1) Grain

63. In the year 2007, the volume of grains that will need to be received at the Greater Alexandria Port is estimated as 5.4 million tons or 1.2 times as much as the volume in 1997. To meet the increasing demand and save grain-handling costs at the port, it is proposed to construct a new deep water berth equipped with rail-mounted unloaders connected with the existing silos at the grain terminal in Alexandria harbor.

2) Coal and Coke

64. In the year 2007, the volume of coal and coke to be handled at the Greater Alexandria Port is estimated as 1.7 million tons. To save ocean transport costs, it is proposed to construct a deep water berth in front of the existing coal/coke terminal in the Alexandria harbor.

(3) Handling of Liquid Bulk Cargo

65. In the year 2007, the volume of liquid bulk cargo containing petroleum and edible oil to be handled at the Great Alexandria Port is estimated as 4.8 million tons. To save costs for handling petroleum/edible oil, it is proposed to replace the existing obsolete loading/unloading arms and pipelines at the Petroleum Basin in the Alexandria harbor in addition to a new oil jetty to be constructed at El Dekheila Port by MEDOR.

(4) Common Port Facilities

66. It is proposed to prepare required common facilities including a new bridge connecting the east and central zones, a garbage collecting ship based on the International Convention for the Prevention of Marine Pollution from Ships and a waste oil receiving facility. It is also proposed to introduce the latest vessel traffic management system (VTMS).

(5) Project Cost

67. The total cost of the Short-term Plan is estimated as L.E. 598 million.

(6) Economic Analysis

68. A comparison between the "Without" case and the "With" case was carried out to evaluate the economic feasibility of the project for construction of 1) Multipurpose Terminal including common port facilities such as VTMS and waste oil receiving facilities, 2) Grain Terminal Modernization, 3) Deep Water Coal Berth, and 4) New Port Road Bridge proposed in the Short-term Plan from the view point of the national economy of Egypt.

69. The main economic benefits of Multipurpose Terminal project are saving in ship staying and off-shore waiting costs and construction costs of new berths for handling the excess cargoes in another port. The resulting economic rate of return (EIRR) of the projects is estimated as 23.0%, exceeding the general criterion to assess the economic justifiability.

70. The main economic benefits of Grain Terminal Modernization project are saving in ship staying and off-shore waiting costs. The resulting economic rate of return (EIRR) of the projects is estimated as 18.2%, exceeding the general criterion to assess the economic justifiability.

71. The main economic benefits of Deep Water Coal Berth project are saving in sea transportation costs. The resulting economic rate of return (EIRR) of the projects is estimated as 39.1%, exceeding the general criterion to assess the economic justifiability.

72. The main economic benefits of New Port Road Bridge project are saving in land transportation costs. The resulting economic rate of return (EIRR) of the projects is estimated as 19.8%, exceeding the general criterion to assess the economic justifiability.

73. The resulting economic rate of return (EIRR) of the overall projects proposed in the Short-term Plan is estimated as 22.7%.

(7) Financial Analysis

74. The financial revenues are generated from the port dues and charges based on the tariff proposed to cover capital investment and operational costs by referring to the current tariff level and those of the neighboring ports. The resulting financial rates of return (FIRR) for the projects of 1) the Multipurpose Terminal project including common port facilities such as VTMS, waste oil receiving facilities and New Port Road Bridge, 2) the Grain Terminal project, 3) Deep Water Coal Terminal project, and 4) the overall projects are 10.2%, 16.6%, 36.4% and 12.6% respectively, exceeding the weighted average interest rate (5.3%) of assumed fund raising plans and hence each project is considered to be financially feasible.

(8) Environmental Consideration

75. Implementation of the proposed short-term development plan is strongly recommended to enhance the port water quality improvement by diminishing barge operations and the air quality improvement by diminishing port-related detour traffic on Alexandria city area, and hence the long-term improvement of the environmental condition of the port. As a long-term environmental monitoring program of the Greater Alexandria Port, establishment of an ambient air quality monitoring station and a set of port water quality monitoring stations is recommended. In order to ensure not only the long-term sustainability of the offshore projects facilities of the short term development plan but also the improvement of port water environment, the elimination of untreated waste water from sewage out-falls into the port waters is strongly recommended.

(9) Management, Operations and Institutional Matters

1) Improvement of Conventional Cargo Handling

76. It is proposed that APA divide the new multi-purpose terminal, Timber Quay and Mamoudiya Quay into some portions and lease them or give concession to existing state-owned or private companies. As a terminal operator, each company will manage the allocated areas efficiently for comprehensive cargo handling from quayside operation, storage to trucking. To choose competent terminal operators, it is recommended to have a tender on concession or lease fee and to encourage private companies to join the tenders.

2) Measures to mitigate the Impact on Barge Operators

77. Prior to constructing a new multi-purpose terminal, sawn timber landing operations from barges at quays Nos. 57-61 need to be relocated elsewhere in the harbor.

78. For achieving gradual conversion of barge operation into quayside operation smoothly, it is proposed that the Government take the initiative in conducting measures to give barge operators licenses to perform quayside operation. In addition, it is recommended to provide retraining programs to obtain necessary knowledge, techniques or skills for quayside operation.

3) Improvement of Container Handling Operation

79. It is proposed to introduce the most advanced equipment or technologies and operational know-how of a private company with sufficient experience.

80. The following measures are proposed to enhance container handling productivity.

    1) To achieve the targeted container handling productivity (24 boxes/hour per crane) by improving crane operators' skill/technique.

    2) To introduce computer system such as container inventory system, delivering/receiving control system and loading/unloading control system.

    3) To exchange information and communicate effectively between crane operators and the supervisor at the control center in the container terminal by introducing advanced technology.

    4) To conduct regular maintenance of container handling equipment for minimizing the breakdown time to avoid lowering service level at sudden breakdowns.

4) Others

81. It is proposed to introduce a computer system concerning documentation inside the port authority at first. As a next step, it is necessary to upgrade functions and expand the area covered by the computer system.

RECOMMENDATIONS

In accordance with the results of the study, it is recommended that the Government of Egypt implement the development project of the Greater Alexandria Port to contribute to the Egyptian economy. The project is divided into two phases: the first phase project is that proposed in the Short-term Plan with the target year 2007 and the second phase project is that to be completed by the target year 2017 of the Master Plan.

1. The First Phase Project

The main components of the first phase project are summarized as follows:

1.1 Establishment of a new Multi-purpose Terminal (740 m x 400 m) at the Central Zone of Alexandria Port

(1) Construction of infra-structures
   1) Berths with a total length of 960 m and water depth of 14m below C.D.
   2) Open storage yard with area of 13 ha
   3) Dedicated access road with a fly-over bridge connected to the existing fly-over bridge: length of 700 m

(2) Construction of supper-structures
   1) One (1) warehouse with a total floor space of 6,000 sq. m
   2) Gate house
   3) Truck scale

(3) Procurement of two (2) units of multi-purpose quay-side gantry cranes

1.2 Redevelopment of the existing Grain Terminal at the West Zone of Alexandria Port

(1) Construction of a new berth with length of 270 m and water depth of 14m below C.D.
(2) Procurement of Grain-handling equipment
   1) Two (2) units of rail-mounted ship unloaders
   2) Belt conveyors connecting ship unloaders and the existing silos

1.3 Construction of a New Coal Berth with length of 270 m and water depth of 14m below C.D. at the existing Coal/Coke Terminal in Alexandria Port

1.4 Redevelopment of El Mahmudiya Quay of Alexandria Port

(1) Demolishing warehouses no.44 and no.45
(2) Preparation of open yards behind berths no.39 and no.40

1.5 Deepening of the Inner Harbor Basins by water depth of 14 m below C.D. at the West and Central Zones of Alexandria Port

1.6 Preparation of common facilities

(1) Construction of a new bridge connecting the East and Central Zones of Alexandria Port
(2) Introduction of the latest vessel traffic management system (VTMS)
(3) Installation of a waste oil receiving facility at El Dekheila Port

1.7 Management, operations and institutional matters

(1) Setting the target productivity/throughput and monitoring the performance of terminal operators
(2) Dividing the new multi-purpose terminal into some portions and allocating them to terminal operators performing conventional cargo handling comprehensively on an auction basis
(3) Implementing the measures to mitigate the impact on barge operators
    1) Preparing substitutive quays for barge operations prior to constructing a multi-purpose terminal
    2) Giving barge operators licenses to perform quayside operation and providing retraining program to obtain necessary knowledge
(4) Encouraging private investors to obtain enough stakes to exert their influence on the management of the privatized state-owned companies
(5) Introducing computer system concerning documentation inside APA

2. The Second Phase Project

The main components of the second phase project are summarized as follows:

2.1 Construction of a new Multi-purpose Terminal at the Central Zone of Alexandria Port

(1) Construction of infra-structures
    1) Berths with a total length of 480 m and water depth of 14m below C.D.
    2) Open storage yard with area of four (4) ha

(2) Construction of supper-structures
    1) One (1) warehouse with a total floor space of 6,000 sq. m

SUMMARY

PART I

PRESENT CONDITIONS

1 Socio-economic Conditions of the Greater Alexandria Port and Egypt

1.1 Population

Egypt had a population of 30.08 million in 1966, 36.63 million in 1976 and 48.25 million in 1986. The preliminary result of the 1996 Census indicated that the total population inside Egypt reached 59.27 million people. The average annual growth rate decreased from 2.8% for the period from 1976-1986 to 2.1% for the period from 1986-1996.

According to the Mid-year Census, it had 54.44 million people in 1991 and 61.40 million in 1997. The average annual growth rate is 2.0% for the period 1991-1997.

1.2 Gross Domestic Products (GDP)

1.2.1 GDP

The Egyptian GDP amounted to 161.5 billion Egyptian Pound (LE) in the fiscal year of 1996/97 at constant price of the year 1991/92. GDP growth rates (at factor cost) rose to 5.3% in 1996/97 from 5.0% in 1995/96. Nevertheless, there was a decline of 5% in the output of the oil sector and of 4.2% in Suez Canal's revenue compared with the previous year.

1.2.2 GDP by Sector

As for commodity sectors of Egyptian GDP, Industry and Mining sector reached 29,228 million LE in 1996/97, followed by Agriculture sector(25,310million LE), Petroleum sector (13,650 million LE), Construction sector(8,571million LE) and Electricity sector(2,830million LE).

1.3 Foreign Trade

1.3.1 Trade Value of Import and Export

The foreign trade value of export and import in 1996 reached 12.3 billion Egyptian Pound (LE) and 44.2 billion LE respectively. Import value has exceeded export value in the last six years. Consequently, there has been a deficit in the balance of payments. Annual growth rate of export was 2.7% in 1996 compared with the previous year and that of import was 10.8%.

1.3.2 Trade Value of Import and Export by Commodity

As for trading value of import by principal commodity, trade in wheat amounts to 3.7 billion LE, followed by organic and inorganic chemical (1.5 billion LE) and maize (1.5 billion LE). As to value of export, crude oil amounts to 2.8 billion LE, followed cotton goods (1.3 billion LE), Refined Petroleum Products (0.8 billion LE) and clothing manufactured (0.8 billion LE).

1.3.3 Trading Partners of Egypt

In imports, Western Europe led with 17.1 billion LE in trade. North America was ranked second with 9.2 billion LE, and Asian Countries was third with 6.0 billion LE in 1996. On

the other hand, in exports, trade with Western Europe amounted to 5.2 billion LE, followed by Asian Countries (2.0 billion LE) and Arab Countries (1.8 billion LE) in 1996.

1.4 Agriculture

1.4.1 Agriculture Production

Agricultural production achieved a continuous increase during the last six years. The production of Wheat increased to 5.7 million tons in 1996 with an average annual growth rate of 5.0% during 1991-1996. In the same way, production of Maize (5.8 million tons, 5.5%), Rice (4.9 million tons, 7.3%), Sugar-cane (14.1 million tons, 4.9%) and Vegetable (11.9 million tons, 7.2%) also increased.

1.4.2 Chemical Fertilizer Production

Consumption volume of Azote and Ammonia fertilizer reached 4.5 million tons in 1995/96 and that of Phosphate fertilizer and Potassium fertilizer reached 18 thousand tons and one thousand tons respectively.

1.5 Industry

Egypt has made great progress in the field of traditional industries, namely, spinning, weaving and food industries. Significant progress has also been made in modern industries such as engineering, metallurgical and chemical. Coordination between heavy and consuming industries has been considered in such a way to secure self-sufficiency and reduce imports.

Production of Cotton Yarn reached 250 thousand tons in 1995/96 and that of Wool Yarn reached 16 thousand tons. Value of Cotton Textiles and Wool textiles amounted to 1,561 million LE and 16 million LE respectively.

Production of White Sugar Crystal and Refined Sugar reached 282 thousand tons and 745 thousand tons in 1995/96 respectively. Production of Molasses reached 259 thousand tons in 1995/96.

Production of Steel Billet and Steel Section reached 473 thousand tons in 1995/96 and that of Steel Sheet reached 280 thousand tons in 1995/96.

Production of Cement, which belongs to the category of construction material, reached 15.6 million tons in 1995/96 with an annual growth rate of 9.4%.

1.6. Energy and Mining

1.6.1 Electricity

The production of generated power in 1995/96 reached around 54.5 billion KWH with a growth rate estimated at 6.2%.

1.6.2 Petroleum

Newly discovered oil and gas deposits in Lower Egypt and the Western Desert, especially at Alamain, El-Fayoum, and the Red-Sea area are considered to be a turning point in the petroleum industry in Egypt, likely elevating it to one of the major oil exporting countries.

Production of Crude Petroleum reached 44.0 million tons in 1995/96, and that of Iron ore reached 2.1 million tons in 1995/96. Production of Fuel oil, Butane Gas and Natural Gas reached 12.6 million tons, 0.5 million tons, 10.2 million tons in 1995/96 respectively.

1.7 Fourth Five-Year Plan (1997/98- 2001/02)

The fourth five-year plan envisages a rise in the overall resource of the economy by 35.7% against 1996/97 with an average annual growth rate of 6.3%. GDP of Industry is expected to rise from 8.7% in 1996/97 to 10.8% in 2001/02. Agriculture sector's GDP is expected to reach 15.5% by the end of the plan. As for the population growth rate, it is forecast to drop to 1.66% in 2001/02,the end of fourth five-year plan, from 1.94% in 1996/97.

The fourth five-year plan aims at adding more arable land to the cultivated area, so as to increase the agricultural production. The most significant aspects of the crop structure targeted are cultivating 2,850 thousand feddans with wheat, cultivating 430,000 feddans with barley and cultivating 2,320 thousand feddans with maize.

The industrial production is expected to grow at an annual average rate of 9.5%.

1.8 Egypt in the 21st Century

According to the most conservative estimates, population is projected to reach 80 million with the growth rate around 1.3% in 2017.

Agriculture development strategy is primarily based on preserving and improving the productivity of cultivated land, and protecting it from urban expansion. It is also targeted to increase agricultural production at a real growth rate of around 4% per annum.

Industrial development is the mainstay for establishing a production base and maximizing the export capabilities of the national economy. A growth rate of not less than 9% in the fourth five-year plan is targeted which would progressively rise to an average of 11% until 2017.

The development strategy of petroleum sector is based on the following integrated policies:

- Maximizing the pivotal role of the petroleum sector as a key source of national income, foreign exchange , and job opportunity.
- Preserve and protect the environment against pollution.
- Boost development efforts north of the Valley by increasing available refinery capacity at Wadi Firan refinery, and so on.

The development strategy of petroleum sector is based on the following integrated policies:

- Maximizing the pivotal role of the petroleum sector as a key source of national income, foreign exchange , and job opportunity.
- Preserve and protect the environmental against pollution.
- Boost development efforts north of the Valley by increasing available refinery capacity at Wadi Firan refinery. and so on

2 Natural Conditions in and around the Greater Alexandria Port

2.1 General

During the Field Surveys in Egypt, data and project-related information on the natural conditions at the Greater Alexandria Port were collected from both governmental and non-governmental sources of agencies. In addition, a series of site surveys such as topographic survey in port area, bathymetric survey along the port access channel and/ at inner port basin and subsoil investigation was executed during the field survey (I) and (II) in Egypt. The results of these field surveys for natural conditions are presented in this chapter.

2.2 Outline of Natural Conditions

The city of Alexandria is situated upon the western end of the Nile Delta at the distance of around sixty kilometers to the west from the river Nile. Along this coastal line of the Nile Delta, there exists a succession of peaks or rocky points separated the coastal zones by bays. The city of Alexandria developed along the coastal area is geographically sandwiched between the Mediterranean Sea to the northwest and the lake of Maryut to the southeast and extends as a narrow coastal strip along northeast-south west direction.

The Greater Alexandria Port faces to the sea area limited by the two peaks of Ras El Tin and El Agami of which distance is about 10 km between them. Along the alignment of these two peaks, there exists a succession of shoals or rocks, which forms underwater shelf with water depth less than 10 meters. At present, the manmade breakwaters protect the port extending between the two peaks to the west from Ras El Tin and to the east from El Agami covering more than half distance between the two peaks.

The weather regime of Alexandria belongs to the Mediterranean climate and generally mild and highly seasonal with a few rainfalls experienced only in winter and therefore oceanographic environment is relatively calm and moderate in nature as well.

2.3 Meteorological Conditions

(1) Climate

The area in the city of Alexandria belongs to the weather regime of Mediterranean Climate. Unlike dry desert climate in Cairo with little raining, the weather in Alexandria is highly seasonal in nature. The temperature is mild and humidity is relatively high having a little rainfall in winter season. The cool winter season in Alexandria is the period from November to April while the hot summer season covers from July to September. The months of May-June and October are considered as a transitional period of the weather climate.

(2) Temperature and Humidity

The temperature in Alexandria is mild and moderate. The maximum temperature records 29.1 °C (in August) and the minimum temperature is 11.6 °C (in February). The difference of temperature between the maximum in the summer season and the minimum in the

winter season is 17.5 °C. The minimum humidity is 57% in January while the maximum 75% in July and varies little throughout the year. Unlike those changes recorded in Cairo, the monthly humidity is very high and the mean humidity throughout the year is about 68%.

(3) Rainfall
Although the weather in Alexandria has a little rainfall, the rainfall concentrates in the cool season from November to February and records the maximum rainfall of 41.4 mm/month in December. The warm season from June to September has no rainfall. The annual mean rainfall is 146.7 mm.

(4) Wind
The climate in Alexandria and the adjacent area facing the Mediterranean is relatively calm throughout the year. But, in winter season, the masses of cold air associated with the North Atlantic depressions entering the Eastern Mediterranean area causes vertical instability along the meteorological fronts with the warm and moist air of the Mediterranean. The westerly strong wind occasionally occurs due to the depression moving to east in the south region of Europe but the speed of the winds are usually not more than 20 m/s.

The wind data observed in the Alexandria Port observation station show that the predominant wind direction in Alexandria ranges from north to west and the 88% of the whole wind is less than 10 knots (5.14 m/s) in speed. The strong wind having more than 10 m/s in speed predominates from southwest to northwest directions and the 96% of whole strong wind are 10 to 15 m/s in speed. The wind having more than 25 m/s in speed has been observed only one time for 10 years period from 1985 to 1994.

2.4 Oceanographic Conditions

(1) Tides
The tide observation is gauged inside port area by the survey department of the Alexandria Port Authority. The data obtained for the past 5 years period from January 1994 to May1998 show a notable pattern of semi-diurnal tide variations with about 0.3 meters range in difference between mean high and mean low water levels as being generally the most case in the Mediterranean Sea.

(2) Current
Owing to the weakness of the tide variations in the Mediterranean Sea, currents along the coastal area of the Greater Alexandria port are basically very small. General movement of current is to the east and weak although the movement is generally accelerated by the winds blowing from the northwest.

(3) Waves
The JICA study on Maadia Fishing Port provides ordinary and extraordinary offshore waves by frequency of occurrence by wave heights and directions, which were hind-cast by means of the SMB method. The study indicates that the predominant waves range from north to west directions as for ordinary waves and, for extreme waves, offshore waves

derived through wind data over the 30 years period are summarized in Table 2.4.1. According to this study, extreme offshore waves are 6.9 meter in height, 9.9 seconds in wave period from west direction.

Table 2.4.1. Dimensions of Extreme Offshore Waves

Direction		W	NW	NNW	NE
Wave Height	Ho (m)	6.9	6.2	5.7	3.7
Wave Period	To (sec)	9.9	9.5	9.1	7.7
Wave Length	Lo (m)	153	141	129	92

Source: described as above

2.5 Previous Observation on Subsoil Conditions and Bathymetry of the Port

The subsoil around Alexandria areas is composed of quaternary deposits, which are mainly recent accumulation. The subsoil profile of the Greater Alexandria Port is characterized by the existence of parallel sand bar deposits. These bars were formed during various periods when the sea water levels were subject to changes. The bars are composed of cemented sands with some finely divided or broken shells. Sandwiched by these bars, lagoon deposits are found in the form of fine sands or silts and in most cases weak clays. Large amount of silty or clayey deposit exists in the subsoil under the seabed, which would be formed when Nile alluvium was transported by an old tributary of the river. The lagoon deposits also include layers of fibrous peaty materials mixed with sands and clay or clayey soils, which are extensively ranged into the bay.

The particular profile of bathymetry of the area provides a preferable advantage against sedimentation and siltation. Actually, the presence of the two peaks, Ras El Tin and El Agami, and the alignment of shelf between them result in a considerable reduce of littoral drifts so that the littoral transit of sediments across the shelf becomes very weak pattern and therefor is quite limited to a small amount of volume of finer materials. It is reported that the siltation along navigational channel together with approach channel is minor concern for the Greater Alexandria Port and substantial siltation problems is deemed to be minimal.

2.6 Field Survey (I) for Natural Conditions

Topographic survey within the inner ports area of the Greater Alexandria Port (the ports of Alexandria and Dikheila) was carried out to supplement the lack of indication provided on the existing available map of 1: 10,000 scale. A topographic survey map to cover the survey area was prepared at scale of 1:10,000 based on and referred to the existing available map.

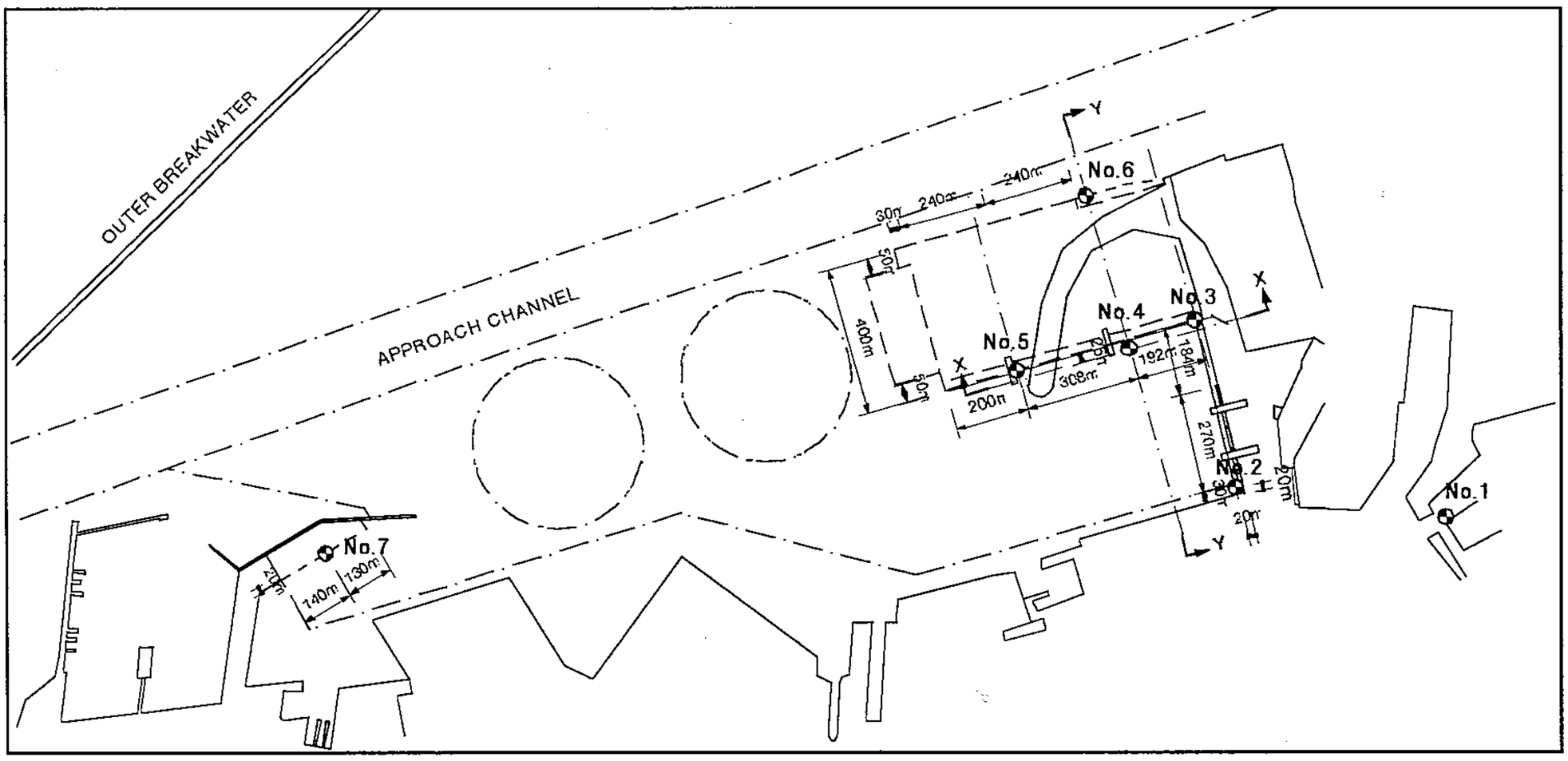
Sounding by means of hydrographic recording echo sounder was conducted on each specified sounding survey line in the greater Alexandria port. The sounding was carried out for total length of 25.2 km along survey lines at the specified interval of 100 meters. The reduced water depth data for each section were indicated on maps at scale of 1:10,000.

2.7 Field Survey (II) for Natural Conditions

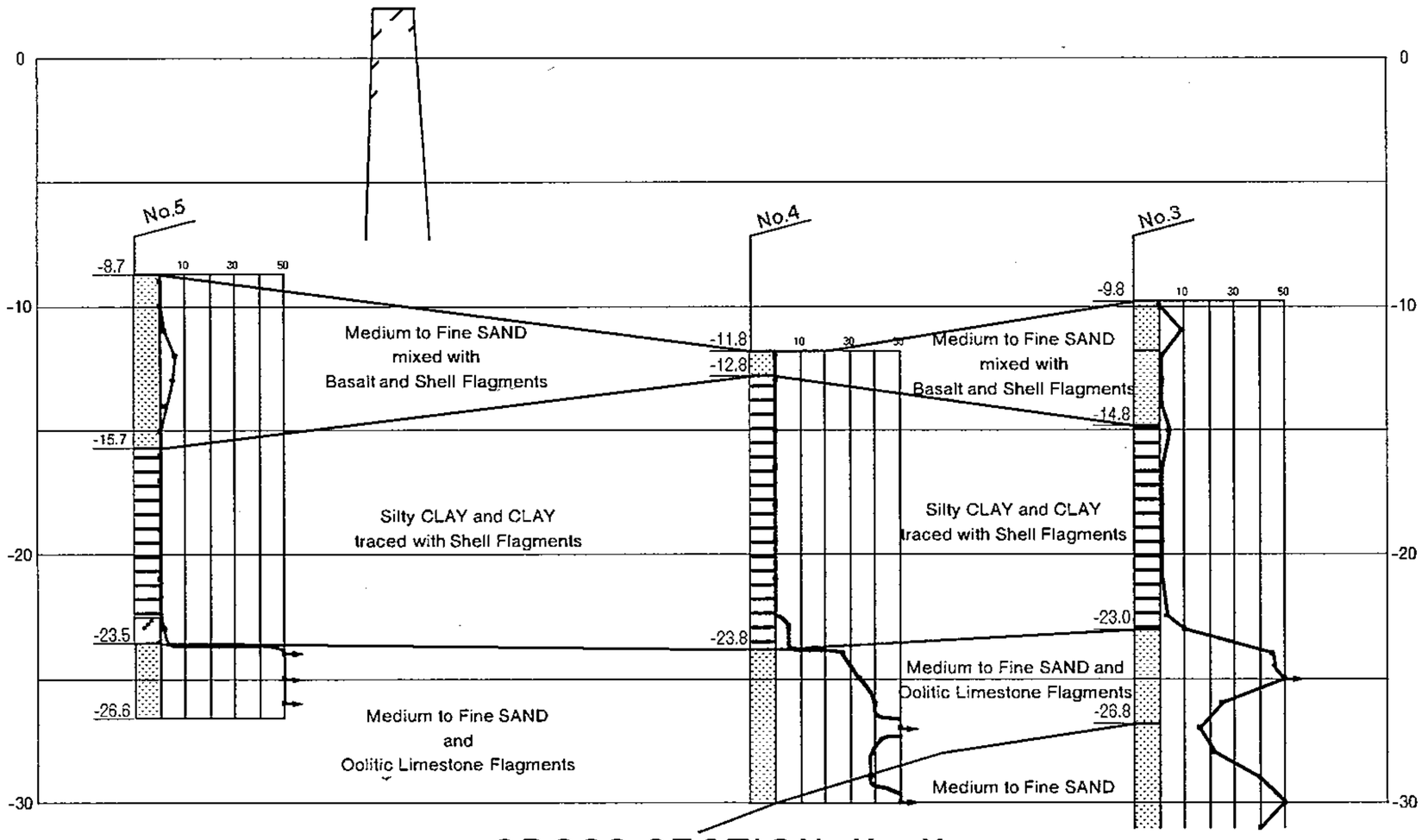
During the fields survey (II) in Egypt from April to May 1999, subsoil investigation and water depth sounding were carried out at the area where the short-term development plan were envisaged.

In order to supplement available subsoil information, seven (7) borings composed of one (1) onshore boring and other six (6) offshore borings were conducted. The objectives of the subsoil investigation are to characterize the site subsoil, define their geotechnical conditions and to evaluate soil strength and compressibility parameters relevant to foundation design and construction. The subsoil investigation includes the execution of boring, in-situ testing, laboratory testing, analysis of field and laboratory test results, evaluation of design subsoil parameters and preparation of final report.

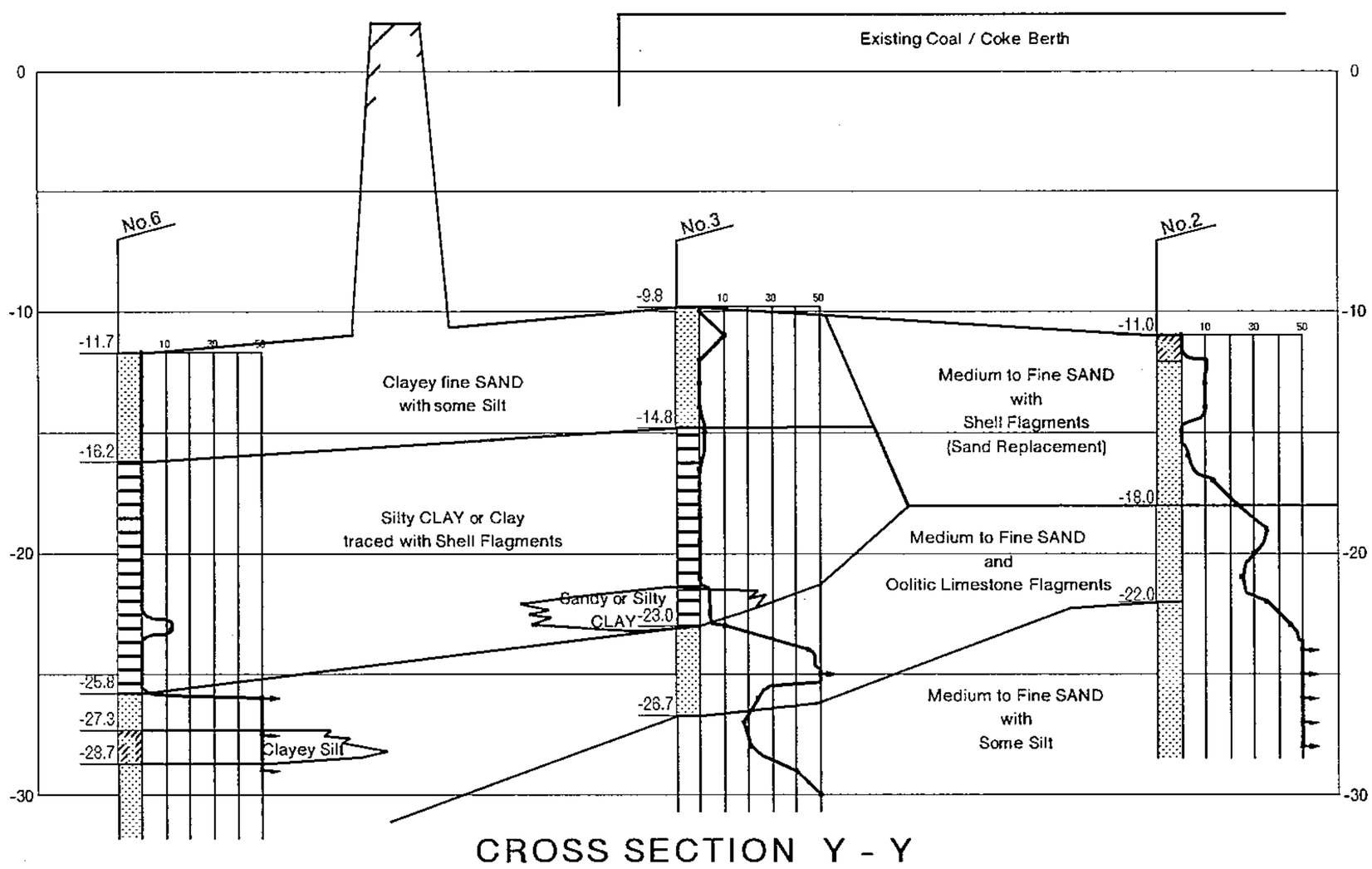
The sectional subsoil profiles with boring logs at the area from new multipurpose terminal to deep water coal berth are shown in the Figure 2.7.1. It is evaluated that cohesion of very soft clay deposit is more or less 0.3 kg/cm2 showing an increase with depth despite of its very low N-value.
Water depth sounding was carried out at fifty (50) off shore points in order to obtain the present water depths within the area where the greater Alexandria port development are envisaged in the short term development. The water depth soundings were taken by casting a suspended weight from survey boat to the seabed to measure the present water depth within the specified area by using a calibrated precise total station based on points of coordinates. Final hydrographic sounding map in a scale of 1:5,000 was prepared to indicate the correlated water depths to the Port Datum.



BORING LOCATIONS



CROSS SECTION X - X



CROSS SECTION Y - Y

Fig. 2.7.1 Subsoil Condition at the Port of Alexandria

3 Environmental Condition of the Greater Alexandria Port

3.1 Overview

The port city of Alexandria, having more than 2000 years of rich history and culture, extends as a narrow coastal strip along East-West direction being boxed between the Mediterranean sea to the north and Lake Maryut to the south. Nevertheless, at present, very few of the ancient archeological treasures remain intact in Alexandria.

The population of Alexandria is estimated at about 4 million. The city is a popular summer time beach recreation area due to its favorable Mediterranean climate and white sand beaches. Its harbors, the Western Harbor and Dekheila Port of Alexandria Port Authority (APA), known as Greater Alexandria Port for international trade, and the Eastern Fishing Harbor are integral parts of the landscape of the city.

Almost the entire population of the city is served with piped water supply, while about 50 % is connected to the city sewerage system.

3.2 Environmental Issues of the Port

The port water is visibly polluted with floating oil and other debris including garbage. This severe port water quality deterioration was confirmed by the results of port sea water and seabed material quality survey conducted by the Study Team and illustrated in Section 3.4. The causative elements for this severe water pollution problem of the port are very complex due to the very long history of port operation as well as a variety of potential pollution sources involved. The pollution sources are both due to direct port operational activity as well as indirect non-port related land based activities as briefed below.

(1) Issues directly related to Port Operational Activities
Oil pollution in port water is attributed to inadequate management measures to deal with ship-borne oily wastes such as ballast and bilge waste by APA. Moreover, inefficient handling of non-containerized cargo and the resultant loss of product should also be a significant source of pollution in port waters. It is noted that the port has no independent reception and treatment facility to receive and treat ship-borne oily waste. It is noted that the National Environmental Law of Egypt, known as **Law No. 4/1994,** not only forbids disposal of wastes by ships in marine waters of Egypt but also mandates major national ports of to have waste oil reception facilities.

There is no single responsible environmental section in the organizational structure of the Alexandria Port Authority (APA), an important institutional deficiency. The port environmental aspects are handled by more than one section with overlapping and unclear responsibility. This complicates implementation of effective mitigation measures against pollution due to direct port operational activity.

(2) Issues concerned to Non-port related Activities

The port water environment is very significantly affected by the discharge of polluted effluents of land based industrial, agricultural and domestic activity. The two polluted canals of Mahmoudeya and Nubariya discharge directly into the western harbor waters, within the hub of port activity. The El Umum canal, which is integrated with the Lake Maryut since it is mostly submerged within the lake, serves as the conduit to pump the polluted water of Lake Maryut near the entrance of the western harbor into the Max Bay.

Moreover, there are some sewage out-falls discharging directly into the port waters. It is presumed that some of these out-falls carry untreated wastewater discharged from the port administrative buildings and other port facilities, though external sources would be dominant. It is noted that untreated wastewater discharge from port facilities is in fact pollution due to direct port operational activity.

3.3 Environmental Improvement Programs of the Port

In the proposed port water environmental improvement program highest priority is assigned to the control of pollution due to direct port operational activity. This is identified as the first step in realizing long-term port water environmental improvement. However, simultaneously APA is recommended to take the required action to control non-port pollution sources in coordination with agencies having direct responsibility, specifically the local municipality and the sewerage management authority of Alexandria, AGOSD (Alexandria General Organization for Sanitary Drainage). It is further noted that with the progressing sewerage development of the Alexandria City by AGOSD, discharge of untreated wastewater into the port water environment, the major external pollution source, has been steadily declining. The important programs identified for the environmental improvement of the port are summarized below.

(1) Waste Oil (ballast and bilge waste) Treatment System

Waste treatment system is provided by the short-term development plan (2007) of this master plan to treat the waste oil generated in the port except the petroleum basin. It is noted that the waste oil generated at the petroleum basin is directly collected and conveyed for independent treatment by the Alexandria Petroleum Corporation (APC). It is presumed that APC would continue to provide this independent treatment throughout the planning frame of this master plan (2017).

(2) Sewerage Management Improvement in Port Area

Reception facility and its temporary storage to accept sewage from ships need to be provided by the port (APA). Since the collected sewage will be disposed into the city sewerage system no specific sewage treatment plant for the port is required. Moreover all wastewater outlets from administrative and other operational facilities of the port shall be connected to the city sewerage system.

(3) Solid Waste Management of Port Facilities and Ships

Solid waste transfer stations, one each in Alexandria port and Dekheila port, to temporarily store the solid waste generated both from the administrative buildings and

shipping activity is recommended to be provided. APA will be responsible for the transportation of stored solid waste to the final disposal site.

(4) Institutional and port surveillance and management aspects
It is recommended that a new general management section be established in the APA administrative structure solely being responsible for "Port Safety and Environment". The section will be responsible for the management dangerous cargo and the entire waste management of the port. Also it would be responsible for the surveillance of ships to ensure their compliance with designated means of waste disposal.

3.4 Field Survey on Environmental Condition

In order to define the baseline port environment the Study Team carried out the following field surveys in the Alexandria Port area. They are sea-water and seabed material quality sampling survey in the entire port water area, land utilization survey both in and around the vicinity of the entire port area and traffic condition survey inside the entire port area. Of these surveys the results of environmentally most significant port water and seabed material quality surveys are summarized below.

3.4.1 Port Sea Water Quality Survey

The port sea water quality survey was conducted two times in May and October 1998 at 5 locations spanning the entire Greater Alexandria Port area. The water quality analysis results clearly indicated the highly polluted nature of the port waters. In particular high suspended solid level in the range of about 1000-4000 mg/l was measured. Also high oil and grease level mostly exceeding 5mg/l, in fact mostly exceeding 10 mg/l during the October 1998 sampling, was measured. Moreover high metallic pollution level, in particular with respect to the heavy metal elements of cadmium and chromium was measured.
It is noted that high oil pollution level in the port waters could be attributed to indiscriminate and illegal disposal of oily waste by ships and vessels into the port waters.

3.4.2 Port Seabed Material Quality Survey

The port seabed material sampling survey was also conducted two times. The first survey was conducted in May 1998, simultaneously with sea water sampling survey, spanning 10 locations of the surface layer of the entire Greater Alexandria Port seabed area. The second survey was conducted as a supplementary survey in May 1999 to identify the depth of potential heavy metal contamination in the seabed area planned for deepening with dredging by the short-term port development plan (2007) of this master plan (2017).

Since the objectives of the first and the second surveys of the seabed sampling differ significantly they are illustrated separately below.

(1) First seabed material sampling survey

The analysis results of the first survey conducted at 10 locations of the entire port seabed area indicated that the surface layer of seabed material throughout is contaminated with heavy metals. In particular contamination level of copper (Cu) and cadmium (Cd) was found to be high as per the Dredged Materials Quality Standards of Netherlands (1987) as published in the World Bank Technical Paper on Environmental Considerations for Port and Harbor Developments (1990). In particular, the heavy metal contamination level was found to be very high in the eastern most inner port area of the Alexandria Port.

The measured ranges of copper (Cu) and cadmium (Cd) in all of the 10 sampling locations of the port were, respectively, 167-1313 mg/l and 12-54 mg/l. Both of these exceeded the permissible limit for unconstrained open water disposal of dredged material of 90 mg/l for Cu and 7.5 mg/l for Cd, designated as the Testing Values, as per the above Netherlands Standards. Accordingly at-least the top layer of the dredged material derived from the port consequent to the implementation of this master would require controlled disposal.

Hence the determination of the vertical depth profile variation in the subsoil seabed material quality in an area designated for dredging would assist to delineate the potentially contaminated top layer of seabed from that of uncontaminated bottom layer, there-by limiting the quantity of contaminated dredged material requiring controlled disposal.

Accordingly, vertical depth profile variation in seabed material quality in those areas designated for dredging as per the short-term development plan of this master plan was conducted as supplemental environmental survey (second seabed material sampling survey) and illustrated below.

(2) Second seabed material sampling (supplemental) survey

The target areas for the second survey were two (2) areas, the coal basin area and its vicinity and the area near the petroleum basin of the Alexandria Port. These are the off-shore areas planned for port deepening with dredging by the short-term development plan (2007).

The work included seabed material sampling to obtain all-core samples and subsequent laboratory analysis. The total number of sampling locations were three (3), two (2) being located at the coal basin area and its vicinity and remaining one (1) being located near the petroleum basin. The depth of all-core sampling for all three (3) locations was so as to obtain a minimum of 3.2m length of all-core soil samples.

Samples for analysis of soil contamination level were extracted at the following vertical depth layers of the seabed. The initial layer just below the surface, the layer at 0.5m depth, the layer at 1.0m depth, the layer at 2.0m depth and the final layer at 3.0m depth. The heavy metal parameters analyzed for the determination of seabed contamination

level were Cr (total chromium), Ni (nickel), Cu (copper), Zn (zinc), Cd (cadmium), Hg (total mercury), Pb (lead) and As (arsenic).

The analysis results clearly indicated overall decrease in heavy metal content with increasing depth of seabed. The potential heavy metal contamination level and its vertical depth profile variation were evaluated using the Standards of Netherlands, same as the first seabed material sampling survey.

The results of evaluation indicated that the maximum depth of unallowable contamination level exceeding the Testing Value as per the Netherlands Standards was one (1) meter for the heavy metal constituent of copper. The corresponding depth for the heavy metal constituent of mercury was 0.5 meter. The contamination level of all the remaining heavy metals was not significant.

Accordingly, it is concluded that dredged material derived from a depth up to one (1) meter in the objective deepening area of the port with dredging as per the short-term port development plan is contaminated and hence not amenable for simple unconstrained deep sea disposal. This 1meter top layer of the seabed requires controlled disposal in a designated confined area.

4 Port Facilities of the Greater Alexandria Port

4.1 Port Facilities

(1) Quay Walls

The port of Alexandria has been developed over many years in the past and in consequence the features of series of berths and basins varies by district of the port in lengths, water depths and shapes. But, the most of quay wall structures are the gravity type of concrete blocks placed upon the rubble mound base on the sea bottom or on the replaced sandy soils for excavated loose sands or soft silty soils. This standard type of construction by means of concrete block wall structure are typically adopted by the APA to recent construction for expansion of existing berth at the Alexandria port as well as new construction at the Dikheila port.

Unlike those newly constructed quay wall structures at Dikheila district, the port facilities of Alexandria are constituted of an old complicated alignment with water depth full of variety. Due to the long history of construction, existing quay walls has narrow space of apron and back-up port area which are not considered wide enough and not suitable for modern cargo handling operation.

At present, the APA is implementing the modernization of quay wall structures. Among others, the quay walls from berth nos. 71 to 82 at west zone are rehabilitated to form new pier with wide back-port area. The most of newly constructed quay wall except for those of old structures are set out at the height of quay wall face line of 2.4 meters above lowest low water level (L. W. L.) which is equal to the Port Datum Level (D.L.)

(2) Utilities Facilities

The Electrical Distribution Company provides electric power supply to the port of Alexandria through the electric substations. There is 8 number of stations inside port to supply electrical power to the port of Alexandria. Each station has 2 electrical sources of supply by electrical cable of 300 KVA for power supply and by generator of 500 KVA power supply for the use of emergency in case of shortage in electrical current. The electric cable network is buried in culvert or laid directly under the ground. The lightening of the port area is provided by lighting tower with sodium lamps along with the main internal roads, at quay wall apron and cargo handling yards.

The water supply to the port of Alexandria is provided by Alexandria Water Supply Authority through water pipelines to various berths and on-land facilities supplemented with supply by tanker barges. The water pipelines of 3 to 12 inches are connected at various points to the main supply pipes in the city area. The water pipeline network provides water outlets and hazardous hydrants installed at quay walls and yard apron along the water pipelines.

Bunkering to ships is done by a fleet of bunker barges, which are operated by a company selected from the lowest bidder among the competitive companies.

(3) Onshore Facilities

All the warehouses inside the port of Alexandria are managed by the General Egyptian Warehouse Company (G.E.W.C.). But the ownership of warehouses had been transferred to the APA in 1965 by declaration by the relevant law. Besides, the open storage areas are still owned by the APA. The open storage areas inside the port are utilized by a number of private cargo handling or stevedoring companies.

The existing warehouses in the East and Middle East zones were constructed before 1920 and therefor a number of the above warehouses in the said area are old fashioned and generally in bad conditions. Some of the existing warehouses are ineffectively utilized or being subject to rehabilitation. But, the berths from 25 to 27 at the middle-east zone are provided a number of sheds in relatively good conditions, although these sheds are very old and constructed too close to the quay wall face line. There are very old fashioned warehouses at berths nos. 35-40, of which heavy construction by bearing walls and pillars hamper the cargo handling operation. Berths 42-44 are provided with very old warehouses in critical structural conditions. At berths 65-67, there are several warehouses located behind the berth apron in suitable shape and neatly arranged.

The port of Alexandria is equipped with two grain silos of 100,000 tons capacity for export and 48,000 thousand tons capacity for import. These are provided behind berths 84 and 85 together with unloading facilities. A 100,000 tons capacity silo was built in 1984 while 48,000 tons capacity silo in 1965.

The railway lines serving for hammer shaped pier at west zone is actively utilized for handling coal cargoes in particular. But, in many places inside port area, the railway lines are interrupted or buried by the overlaying asphalt paving of roads. It seems that the maintenance of the railway lines is not effectively carried out. In addition, railway lines would rather hamper the road traffic at some places, resulting in the unnecessary road traffic congestion due to unavoidable exaction of low-speed traffic.

4.2 Cargo Handling Equipment

Most of all cargo handling equipment utilized in the port belongs to the private sectors except for such equipment necessary for port supporting service and maintenance. Among others, United Arab Stevedoring Company holds the biggest share of the ownership of these cargo handling equipment to carried out cargo handling operation in the port. Such specialized cargoes as container, grain bulk or coal, etc. are handled by their own equipment owned by the terminal operators who are specialized

for these cargoes.

A number of cargo handling equipment are owned by the Alexandria Port Authority for maintenance or clearance service and supplemental cargo handling which will be carried out based on the requests by the private operation company.

4.3 Facility Design and Cost Estimate

In this study, preliminary design for the port facilities envisaged in the master plan and the short term development will be done on the basis of the Japanese design. The project cost for constructing infrastructures may include such cost components as construction cost (direct cost and indirect cost), procurement of equipment and machinery, engineering services and contingencies. The cost of construction, which constitutes large portion of the project cost, will be obtained through combining such major direct cost components for construction as materials cost, depreciation of construction equipment and machinery, labor wages and indirect cost components. The indirect cost components will be estimated as a sum of overhead expenses required to providing temporary works for the site, mobilization cost, managing and operational overheads for site and in common needs and overhead profits.

The project cost will be basically divided into the foreign and local currency components of the cost in consideration of possible sources of procurement of necessary input materials and work forces. The project cost estimate will be broken down into the following cost components.

1) Direct Cost
2) Indirect Cost
3) Procurement Cost for Equipment and Machinery
4) Engineering Service Cost
5) Contingencies

5 Maritime Transportation Trends through Egypt and in the Mediterranean Sea

5.1 Cargo Movement to/from Egypt

5.1.1 Cargo Traffic

There are five major ports in Egypt, namely the Greater Alexandria Port, Damietta Port, Port Said Port, Suez Port and Safaga Port. More than 90% of maritime traffic involves the five major ports.

The volume of cargo handled in the five major ports dropped to 31.6 million tons in 1992 but then increased steadily for five years reaching 51.1million tons in 1997. Among the five major ports, the Greater Alexandria Port has a cargo volume of 24.8 million tons accounting for 48.5% of the total Egyptian cargo volume, followed by Damietta Port (14.1 million tons), Port Said Port (6.8 million tons), Suez Port (4.1 million tons) and Safaga Port (1.5 million tons)

The volume of import cargo has been greater than that of export cargo, while export cargo has steadily increased for the past ten years import cargo has rapidly increase in the last 5 years.

Principle import commodities in 1997 are wheat(6.9 million tons), maize(3.3 million tons), aluminum(3.1 million tons) and cement(2.7 million tons). On the other hand, the major export commodity is Petroleum which registered 4.4 million tons in 1997.

5.1.2 Container Cargo Traffic

Transshipment container cargo volume has rapidly increased from 114 thousand TEUs in 1990 to 861 thousand TEUs in1997 though the local container cargo volume has only gradually increased from 237 thousand TEUs in 1990 to 571 thousand TEUs in 1997.

5.2 Transshipment Containers through Egyptian Major Ports

The Study Team surveyed origin ports and destination ports of transshipment containers with the discharging container list. The Study Team surveyed 39 vessels that called at Damietta Port and 11 vessels that called at Port Said Port in 1997.

Movement of transshipment containers is characterized by four types, which are combinations of westbound/eastbound and outbound/inbound. For example, container traffic from Southeast Asia to Turkey via an Egyptian port is categorized as westbound-outbound and that from Syria to United States is categorized as inbound-westbound.

The volume of full transshipment container loaded/discharged at origin/destination ports is summarized by region. Proportions of East Mediterranean countries are 86% and 84% in destination, and 68% and 78% in origin to/from Westbound and Eastbound respectively. Those of Black Sea countries are24% and 13% in origin from Westbound and Eastbound respectively. This indicates that Damietta Port and Port Said Port function as regional hub ports for East Mediterranean and Black Sea countries.

5.3 Socio-economic Conditions and International Trades of the Mediterranean and Black Sea Region

5.3.1 Socio-economic Conditions of the Regions

Six sub-regions can be identified in examining the Mediterranean and Black Sea region; namely, West-Europe, East-Europe, Black Sea, Middle East, East-Africa and West-Africa.

The population of the Black Sea sub-region exceeds 240 million persons in 2010 due to the large Russian population. In the case of Middle East sub-region, the total population of Iran, Turkey and Iraq is estimated at 230 million persons in 2010. But in spite of the huge population, only a portion shall be recognized as having a relation with Mediterranean maritime transport.

5.3.2 International Trade of the Region

Trade value per capita of West Europe Sub-region is about 5 to 10 times of other Sub-regions. And trade balances of Sub-regions show a surplus only in West Europe and Black Sea in 1996.

Among the Regions, trade by West Europe accounts for 73% of the total in case of export and 68% in import. Black Sea and Middle East follow between 13% and 8%. East Europe has a share of 3% in Export and 5% in Import. West and East Africa have shares between 3% and 1%. Trading partners of Europe are mainly European countries.

5.3.3 Future growth of the Region

OECD forecasts future world GDP growth at 3.1-3.5% annually in the Low Case up to 20 10 and 4.3 to 5.0% in the High Case. On the contrary, the World Bank predicts 3.4% ann ual growth up to 2006. The projection of OECD seems a little bit higher than that of the World Bank.

5.4 Cargo Movement through the Mediterranean Sea

5.4.1 Maritime Routes

Container vessels moving on the Mediterranean Sea are classified by maritime route such as Europe-Far East, East Mediterranean-Far East, West Mediterranean-Far East, etc.

(1) Europe-Far East Route

West bound cargo volume(1,676,000TEU) was larger than east bound(1,244,000TEU) in 1996.

Major commodities are electric goods/ motorcycles/ autoparts on the west bound route and machinery/ daily products/ beverages on the east bound route.

(2) East Mediterranean and Black Sea-Far East Route

According to cargo statistics, east bound container volume was less than 50,000 TEU in 1996 while that for west bound was 47,710 TEUs.

Major commodities are machinery/ tires/ chemicals on the west bound route and leaf tobacco/ asbestos/ food products on the east bound route.

(3) West Mediterranean-Far East Route
West bound cargo volume was also larger than east bound up to 1995, but in 1996 balance changed as follows:(westbound)1996-208,000TEU (eastbound)1996-212,000TEU.
Major west bound commodities are electric goods/ motorcycles/ autoparts while those on the east bound route are machinery/ reefer cargo/ wine & spirits on east bound respectively.

5.4.2 Typical Loading Plan of Container Vessel

From typical loading plan of container vessel between Europe and Far East, loading volumes at last port of Europe is smaller than the discharging volume. Also, total loading volume at Mediterranean ports is smaller than the discharging volume. This means European trade with Far East is negative by volume. And total volume of the Mediterranean Region, 6,400 TEU, is 23 % of that of Europe, 27,500 TEU.

5.4.3 Container Volume through Suez Canal

Container vessel is most common carrier at Suez Canal, accounting for 28% of the total vessels and 38% of total cargo volume at Suez Canal in 1997. Tanker and bulk carriers follow container vessels.

Container traffic through Suez Canal includes not only vessels of the Mediterranean - Asia route but also North Europe – Asia and Europe – Middle East/ East Africa routes. Cargo of Mediterranean - Asia is around 20% of that of North Europe - Asia. Cargo volume to/from Southeast Asia and Far East reached 40.6 % and Red Sea 26.3 % of the total Suez southern traffic in 1997. Concerning Suez northern traffic, north Europe occupied 30.2 % and whole Mediterranean 53.4 % of the total.

5.4.4 Container Volume to/from Gioia Tauro port

According to statistics, 33.4% of the total container volume at Gioia Tauro Port(593,000 TEU) was distributed to the Far East. Other destinations were the Middle East(24.5%), America(23.4%), North Europe(15.3%) and Africa(3.4%). As for intra Mediterranean container traffic, 28.7% of the total(856,000 TEUs) was distributed to Aegean Sea. Other destinations were Italy(20.0%), North Africa(12.5%), the Adriatic Sea(11.7%), the West Mediterranean(11.3%), the Black Sea(8.3%) and the East Mediterranean(7.5%).

5.4.5 Future Demand Forecast by Ocean Shipping Consultants

Ocean Shipping Consultants (O.S.C) forecast international container movement by region. World container market in 2010 is estimated at 465 million TEUs in the High Case and 391 million TEUs in the Low Case. West and East Mediterranean markets are computed at 14.1 and 9.6 million TEUs in the High Case and 13.0 and 8.9 million TEUs in the Low Case respectively.
Mediterranean Projection by O.S.C provides detailed information on current container movement in the Mediterranean Sea. Total future container demand of West-, Central- and East-Mediterranean are estimated at 9.6, 12.8 and 13.1 million TEUs respectively in 2010.

5.5 Rapidly Growing Overseas Container Hub-Port in the Mediterranean Sea

While the geographic location of particular of International container handling Hub-Port be of some importance, the relatively short haul lengths involved in the East Mediterranean sea and black-sea area feeder container transports, and the broadly based by nature of distribution, will result in a highly competitive major shipping lines and shipping space charter consortium (Shipping Alliance) in International and Mediterranean sea container trade markets.

5.5.1 Major International Hub-Port in the Mediterranean Sea

(1) Port of Algeciras (Spain)

1) Location of port : Lat 36 ° -08'N / Long 05 ° - 26'W
Diversion distance between the main shipping route and the entrance of port of Algeciras or calling on 1 mile.
2) Main client : Maersk Line / Sea-Land Service
3) Container Berth : 1,910 meters (Draft –13.00m / 16.00m)
4) Container Handling Equipment : Quay side Gantry Crane 11 Units
: Yard Equipment(Transfer Crane) 23 Units
5) Container Handling Productivity: Ships Operation Av 25 Boxes/Hr
: Yard Operation Av 27 Boxes/Hr
6) Present Computerization : Function are well control of container movement and handling equipment with the IBM AS-400, soft-ware was designed by self developed
7) Number of Calling Vessels and Container Traffic on 1997
:40,152 Vessels / 1,582,100 TEUs
: (1998 1,825,614 TEUs)
8) Transshipment Ratio : 83 %

(2) Port of Gioia Tauro (Italy)

1) Location of port : Lat 38 ° - 26' N / 15 ° - 53'E
Diversion distance between the main shipping route and the entrance of Port of Gioia Tauro is 66 miles.
2) Main Client : Cont-Ship Italy, Mediterranean Container Line, Lloyd- Triestino, and Ever-Green Marine corporation
3) Container Berth : 3,012 meters (Draft 13.50m – 18.00 m)
4) Container Handling Equipment : Quay side Gantry Crane 14 Units
: Yard Equipment (Straddle Carriers) 60 Units
5) Container Handling Productivity: Ships Operation Av 26 Boxes/Hr
6) Present Computerization : Most of the terminal function are well controlled through computers, soft-ware was designed by COSMOS . N.V.
7) Number of Calling Vessels and Container Traffic
: 2,729 Vessels / 1,448,500 TEUs
: (1998 2,125,6490TEUs)
8) Transshipment Ratio : 96 %

(3) Port of Marsaxlokk (Malta)

1) Location of port : Lat 35 ° - 49' N / Long 14 ° - 34'E

Diversion distance between the main shipping route and the entrance of port of Marsaxlokk is 6 miles.

2) Main Client : Grand Alliance (Hapag-Lloyd, MISC, NYK Line, OOCL and P&O Nedlloyed), Compagnis Maritime D' Affretement, Mediterranean Shipping Lines

3) Container Berth : 1,480 meters (Draft – 14.50m / 15.50m)

4) Container Handling Equipment: Quay side Gantry Crane 11 Units
Yard Equipment (Transfer Crane) 17 Units
Top-Lift / Reach Stacker 18 Units

5) Container Handling Productivity : Ships Operation Av 23 Boxes/Hr

6) Present Computerization : NAVIS XPRESS SYSTEM integrated real-time control of container movement and handling equipment with the NAVIS SPARCS.

7) Number of Calling Vessels and Container Traffic on 1997
: 1,378 Vessels / 662,648 TEUs
: (1998 Estimate 720,000 TEUs)

8) Transshipment Ratio : 90 %

5.6 Maritime Networking strategy in the East Mediterranean Sea

The outlook for container handling port demand in the East Mediterranean and the Black-Sea and associated markets is seen to be very positive. This littoral area the current congestion problems will be marginally eased by planned investments, but in general the position will remain very tight.

Relatively strong underlying economic growth, continued increases in transshipment operations and further scope for the increased penetration of containerization into the general cargo base will all see total volumes expand very rapidly.

In East Mediterranean and black-Sea area sustained expansion is anticipated and there is to be very strong potential in the this area countries.

6 Present Condition of the Greater Alexandria Port

6.1 Outline of the Existing Port Facility

6.1.1 Alexandria Port

The port area is divided into six Customs Zones stipulated by the resolution No.618/1997. The first Customs Zone is a district between the floating berths and berth no.15, including marine service berths, dry docks, spillways and workshop. The second Customs Zone is a district between berth no.16 and no.31, including passenger terminal, general cargo berths, Ro-Ro berths and storage yard for empty containers. The third Customs Zone is a district between berths no.33 and no.47, including general cargo berths, Ro-Ro berths and storage yard for empty containers. The fourth Customs Zone is a district between berths no.49 and no.68, including container terminal, and timber barges, coal, fertilizer and cement berths. The fifth Customs Zone is a district between berth no.71 and berth no.85, including grain terminal and timber barge and molasses berths. The sixth Customs Zone is a district between berths no.87/1, 87/2, 87/3, 87/4 and 87/5 and berth no.86, including petroleum and vegetable oil berths.

(1) Container Terminal

The container terminal is operated by Alexandria Container Handling Company. There are three container berths (no.49, 51 and 53) of which total length is 560 m and one Ro-Ro berth (no.54) of which length is 160 m. Berth depth is practically maintained at 12.0 m though design depth is 14.0 m.

There are three Quay-side Gantry Cranes (QGCs), six Rubber Tyred Gantries (RTGs) in the terminal. Stacking capacity of laden container in the terminal is said to be 9,600 TEUs (ground slots of approximately 3,000 TEUs) with the terminal area of 163,000 sq.m. Empty container yard with stacking capacity of 2,400 TEUs is prepared outside the terminal but in the port area.

Potential handling capacity of Alexandria Container Terminal is expected to be 400 thousand to 450 thousand TEUs by introducing additional container handling equipment, while the terminal throughput in 1997 is 188 thousand TEUs.

(2) Grain Terminal

The grain terminal is operated by Alexandria General Company for Silos and Storage. There are three grain berths (no.82, 84 and 85) whose length and depth are 485 m and 10.0 m respectively. There are also two silos with their storage capacities of 100,000 tons and 50,000 tons respectively. Three un-loaders with discharging rate of 150 (tons/hour/un-loader) and two un-loders with discharging rate of 250 (tons/hour/un-loader) are also equipped at berth no.84 and no.85 respectively. One mobile un-loader with discharging rate of 150 (tons/hour/un-loader) is available at berth no.82.

(3) Coal Terminal

There are three coal berths (no.62, 63 and 64) is 480 m in length and 10.0 m deep. An open yard is located right behind the berths with stacking capacity of 80,000 tons for coal and

30,000 tons for cokes. There are three cranes whose discharging rates are 150 to 200 (tons/hour/crane) for coal, and 100 (tons/hour/crane) for cokes respectively.

(4) Petroleum Terminal
Berth no.87/1 is mainly used for butane, lubricant oil, petrol gas, vegetable oil with a length of 236 m and a depth of 10.0 m. Berth no.87/2 is mainly used for LPG and vegetable oil with a length of 136 m and a depth of 10.0 m. Berths no.87/3 and 87/4 are mainly used for fuel oil, jet oil and naphtha with a total length of 296 m and a depth of 12.0 m. Berth no.87/5 is used for fuel oil with a length of 94 m and a depth of 12.0 m.

(5) General Cargo Berth
There are 31 general cargo berths of 3,804 m in length and 5.5 m to 12.0 m in depth. The extension of timber berths (berths no.71 to no.81) is under construction and has almost been completed.

(6) Approach Channel
Alexandria Port is protected by marine rocks and two breakwaters. A width of entrance to the inner harbor is approximately 400 m. The western strait (main channel) is used for the entry and exit of the ships to and from the port, and its dimensions are 2,000 m in length, 220 m in width and 14.0 m in depth. The eastern strait (secondary channel) is used for the entry and exit of the ships to and from the port, and its dimensions are 1,600 m in length, 100 m in width and 9.0 m in depth.

Outer harbor channel from the harbor entrance to the inner harbor is maintained to be 220 m in width and 14.0 m in depth.

6.1.2 El Dekheila Port

(1) Container Terminal
El Dekheila Container Terminal is operated by Alexandria Container Handling Company. There are two container berths (no.96/1 and 96/2) of which total length is 480 m and of which depth is 14.0 m. There are three QGCs but no RTGs in the terminal. Stacking capacity of the terminal is said to be 9,400 TEUs for laden containers and 5,000 TEUs for empty containers with the terminal area of 280,000 sq.m. One hundred and eighty (180) reefer points are provided in the terminal.

The extension of the container berths (new berths no.97/1 and no.97/2) is under construction. When the extension is completed, the existing container berths (berth no.96/1 and no.96/2) will reach to 620 m in total length and 14.0 m in depth, having new berths of 420 m in total length and 12.0 m in depth.

Potential handling capacity of El Dekheila Container Terminal is expected to be 1.0 million TEUs when the extension of container berths is completed, while the terminal throughput in 1997 is 152 thousand TEUs.

(2) General Cargo Berth
Berth no.92 is prepared as general cargo berth whose length and depth are 307 m and 15.0 m respectively. However, this berth is often used by bulk carrier carrying maize.

The extension of the general cargo berths (new berths no.95/1 and no.95/2) is under construction. The new general cargo berths of 570 m in total length and 12.0 m in depth are expected to handle one to 4.5 million tons of general cargo.

(3) Grain Terminal
There are two grain berths (no.94/1 and 94/2) whose total length and depth are 490 m and 14.0 m respectively. There are also five silos with a total storage capacity of 440,000 tons. Two un-loaders with discharging rate of 500 (tons/hour/un-loader) and six mobile un-loaders with discharging rate of 100 (tons/hour/un-loader) are equipped at the berths.

(4) Iron ore / Coal Terminal
There are two berths (no.90/1 and 90/2). Berth length and depth of berth no.90/1 are 375 m and 20.0 m respectively. Berth length and depth of berth no.90/2 are 255 m and 14.0 m respectively. An open yard is located right behind the berths with stacking capacity of 300,000 tons for iron pellet and 150,000 tons for coal. There are two un-loaders whose discharging rates are 1,000 (tons/hour/un-loader).

(5) Approach Channel
Dimensions of the main channel in El Dekheila Harbour are 2,800 m in length, 250 m in width and 24.0 m in depth.

6.2 Cargo Movement

6.2.1 Cargo Traffic
Port cargo is divided into four cargo types, namely conventional cargo, container cargo, dry bulk cargo and liquid bulk cargo. Cargo volume of conventional, container, dry bulk and liquid bulk in 1997 account for 7,087 thousand tons (28.7% of total cargo volume), 2,707 thousand tons (10.9%), 10,635 thousand tons (43.0%) and 4,297 thousand tons (17.4%) respectively. Total volume of cargo handled in Greater Alexandria Port amount to 24,725 thousand tons, average annual growth rate is 2.3% in the period of 1988-1997. Major cargoes among import commodities are grains (4,425 thousand tons in 1997), iron pellets (1,988 thousand tons) and coal (1,659 thousand tons) as dry bulk, timber (1,629 thousand tons) and iron/steel products (3,142 thousand tons) as conventional. Major cargoes among export commodities are petroleum oil (2,956 thousand tons in 1997) as liquid bulk

6.2.2 Outline of Container Cargo
Conventional cargo divided into three categories. One is “Containerizable” cargo which is already containerized or has the potential to be containerized as containerization progress. The other is “Non-containerizable” cargo which has no possibility to be containerized even in the future; such as long, heavy and bulk cargo (some type of steel

products), livestock (goat, sheep and so on) and vehicles. In general, containerization ratio of the Greater Alexandria Port remains relatively low range.

6.3 Port Activities

6.3.1 Alexandria Port

A total of 3,886 vessels (3,263 vessels at Alexandria Port / 623 vessels at El Dekheila Port) called the Greater Alexandria Port in 1996. General cargo, container and dry bulk vessels account for approximately 50%, 16% and 14% respectively of the total number of vessels calling at Alexandria Port. Average ship waiting time on anchorage is estimated as 3.14 (days/ship).

Table 6.3.1 Number of Vessels calling at Alexandria and El Dekheila Ports in 1996

Vessel Type	Alexandria Port (vessels/year)	El Dekheila Port (vessels/year)	Grand Total (vessels/year)
1. Container	519 (15.9%)	426 (68.4%)	945 (24.3%)
2. General Cargo	1,653 (50.7%)	59 (9.5%)	1,712 (44.1%)
3. Dry Bulk	450 (13.8%)	130 (20.9%)	580 (14.9%)
4. Liquid Bulk	297 (9.1%)	0 (0%)	297 (7.6%)
5. Passenger	82 (2.5%)	0 (0%)	82 (2.1%)
6. Supply	121 (3.7%)	0 (0%)	121 (3.1%)
7. Others	141 (4.3%)	8 (1.3%)	149 (3.8%)
Grand Total	3,263 (100%)	623 (100%)	3,886 (100%)

Source) “Annual Statistics Report 1997”, Alexandria Port Authority

6.3.2 El Dekheila Port

Container and dry bulk vessels account for 68% and 21% respectively of the total number of vessels which called at El Dekheila Port in 1996.

6.4 Hinterland and Trading Partners

6.4.1 Hinterland of Container Cargoes through the Greater Alexandria Port

Hinterland of import container cargoes have been analyzed by the Study Team based on cargo handling records provided from Alexandria Port Authority. Import container cargoes discharged at the Greater Alexandria Port have been distributed toward inner Egypt. In terms of destination of import container cargoes, the suburbs of Cairo account for 68.3%, the suburbs of Alexandria accounts for 28.3% and middle delta accounts for 0.6%.

6.4.2 Direct/Feeder Service Ratio of Container Cargoes through Alexandria Port by Trading Partner

The Study Team sets up trading partner areas such as “West Mediterranean” (consist of South Europe and North Africa), “West and North Europe”, “East Mediterranean and Black Sea”, “East Asia”, “North America East Coast”, “South-East Asia” and “South Asia”. “West Mediterranean” accounts for 39%, “West and North Europe” accounts for 25.8% and “East Asia” accounts for 14.2%. In terms of percentage by service type, “West Mediterranean” accounts for 99.8% as direct services and 0.2% as feeder services, “West

and North Europe" accounts for 95.1% as direct services and 4.9% as feeder services and "East Asia" accounts for 64.2% as direct services and 35.8% as feeder services.

6.4.3 Hinterland of General Cargoes through Alexandria Port

Major commodity of general cargoes through Alexandria Port are agricultural products, sawn timber and light industry products. As to destination of Agricultural Products, the suburbs of Cairo accounts for 65.4%, the suburbs of Alexandria accounts for 24.5% and Middle Delta accounts for 2.5% and so on. Sawn Timber have been distributed mainly Alexandria (66.1%), the suburbs of Cairo (26.1%) and Damietta (0.2%). Light industry products have been distributed mainly to the suburbs of Cairo (86.6%) and to the suburbs of Alexandria (13.4%).

7 Present Condition of Damietta Port

7.1 Outline of the Existing Port Facility and the Future Development Plan

Damietta Port is located 8.5 km west of Ras El Bar, Damietta branch of River Nile to the Mediterranean Sea and also 70 km west of Port Said Port. Damietta Port started its operations June 26, 1986. Dimension of the entrance channel is 11.3 km long, 300 m wide and 15 m deep. The entrance channel is protected by two breakwaters of about 1,500 m in length. The western breakwater is 1,640 m long and the eastern breakwater is 738 m long.

7.1.1 General Information

a) Area: 6.2 sq.km (Land area) / 3.1 sq.km (Water area)
b) Tide: Two feet up above the constant level of the map
c) Maximum permissible vessel draft: 12.8 m (42 feet)

Table 7.1.1 Berth Dimension of Damietta Port

Berth No.	Berth Type	Berth Length (m)	Berth Depth (m)
1	Container	250	14.5
2	Container	250	14.5
3	Container	250	14.5
4	Container	250	14.5
5	General Cargo	200	12.0
6	General Cargo	200	12.0
7	General Cargo	200	12.0
8	General Cargo	200	12.0
9	General Cargo	225	12.0
10	General Cargo	225	12.0
11	General Cargo	225	12.0
12	General Cargo	225	12.0
13	Grains	300	14.5
14	Grains	300	14.5

Source) “Egyptian Ports Information” Egyptian Ports Bulletin April 1998, MOMT

7.1.2 Container Terminal

The container terminal is operated by Damietta Container Handling Company. There are four container berths (no.1, 2, 3 and 4) of which total length is 1,000 m. Berth depth is maintained at 14.5 m while the entrance channel is facing siltation problems. There are six QGCs and 21 top-lifters but no RTGs in the terminal. Accordingly, container marshaling is done not by RTGs but top-lifters. Ground slots of the stacking yard is said to be 3,400 TEUs with the yard area of 163,000 sq.m. Potential handling capacity of Damietta Container Terminal is expected to be 900 thousand TEUs, while the terminal throughput in 1997 is 607 thousand TEUs. Potential capacity is also said to be 1.7 million TEUs when converting the existing four general cargo berths (berths no.5, 6, 7 and 8) into container berths with additional seven QGCs and 21 RTGs in the future.

7.1.3 Grain Terminal

The grain terminal is operated by Damietta General Company for Silos and Storage. There are two grain berths (no.13 and 14) whose length and depth are 300 m and 14.5 m respectively. There are also two silos with their storage capacities of 100,000 tons and 50,000 tons. There are also two pneumatic un-loaders with discharging rate of 700 (tons/hour/un-loader) and one mechanical un-loader with discharging rate of 1,000 (tons/hour/un-loader).

7.2 Cargo Movement

Total volumes of import and export cargoes handled through Damietta Port amount to 9,371 thousand tons and 3,077 thousand tons respectively. Major cargoes among import commodities are “wheat” (2,544 thousand tons in 1997), “maize” (1,147 thousand tons) and “cement” (1,686 thousand tons). Major cargoes among export commodities are “fertilizer” (130 thousand tons in 1997).

7.3 Port Activities

7.3.1 Ship Movement

A total of 1,493 vessels called at Damietta Port in 1997. Container vessel accounts for approximately 65% of the total number of vessels which called at Damietta Port.

Table 7.3.1 Number of Vessels calling at Damietta Port in 1997

Vessel Type	Number of Vessels (vessels)
1. Container	979 (65.6%)
2. General Cargo	93 (6.2%)
3. Dry Bulk	244 (16.3%)
4. Liquid Bulk	0 (0.0%)
5. Passenger	0 (0.0%)
6. Supply	0 (0.0%)
7. Others	177 (11.9%)
Grand Total	1,493(100%)

Source) “10 Years Statistical Report (1998)”, Egyptian Maritime Data Bank

7.3.2 Container Terminal

Average BOR of container terminal (berths no.1, 2, 3 and 4) is calculated as 67.3%. Total containers of 337,494 boxes were handled through berths no.1, 2, 3 and 4 with a total berthing time at the berths of 23,593 hours in 1997. Container handling productivity is calculated as 14.8 (boxes/hour/vessel). Average dwelling time of laden transshipment container in the yard is 8 days. Average dwelling time of empty transshipment container in the yard is 20 days.

7.3.3 Grain Terminal

“Wheat” was transported by 50,000 DWT-size bulk carriers and discharged at berths no.13 and 14 from the six existing berthing records. Average handling productivity of “wheat” is estimated as 270 (tons/hour/vessel) from the six berthing records.

7.3.4 Cement Berths

Average handling productivity of “cement” is estimated as 271 (tons/hour/vessel) from the seven berthing records.

7.3.5 General Cargo Berths

Average handling productivity of “frozen fish” is estimated as 18.8 (tons/hour/vessel) from the three berthing records. Average handling productivity of “rice/lentil” is estimated as 7.4 (tons/hour/vessel) from the three berthing records. Average handling productivity of “steel products” is estimated as 42.6 (tons/hour/vessel) from the nine berthing records. Average handling productivity of “timber” is estimated as 10.8 (tons/hour/vessel) from the ten berthing records. Average handling productivity for “rice ” and “timber” seems to be comparatively low, supposedly because those bags and bundles are discharged directly onto trucks along the quay.

7.4 Hinterland and Trading Partner

7.4.1 Hinterland of Container Cargoes through Damietta Port

Hinterland of import container cargoes have been analyzed by the Study Team based on cargo handling records provided by Damietta Port Authority. In terms of destination of import container cargoes, the suburbs of Cairo account for 77.1%, the suburbs of Alexandria account for 12.7% and the suburbs of Damietta account for 4.7% and middle delta accounts for 3.8%.

7.4.Trading Partners of Container Cargoes through Damietta

Origin of container cargoes through Damietta Port are analyzed. Concerning origin of containers through Damietta Port, “West and North Europe ” accounts for 64.2%, “East Mediterranean and Black Sea” accounts for 12.2% and “South Asia” accounts for 8.3%.

7.4.3 Hinterland of Conventional Cargoes through Damietta Port

Major commodity of conventional cargoes through Damietta Port are “agricultural products”, “sawn timber and plywood” and “steel”. As to destination of “agricultural products”, the suburbs of Cairo account for 82.2%, the suburbs of Damietta account for 0.8% and Middle Delta accounts for 1.4% and so on. “Sawn timber and plywood” have been distributed mainly to Damietta (56.3%), the suburbs of Cairo (27.4%) and Port Said (3.5%). “Steel” have been distributed mainly to the suburbs of Cairo (71.4%) and Alexandria (7.2%).

8 Present Condition of Port Said Port

8.1 Outline of the Existing Port Facility

Port Said Port is located at the northern entrance of the Suez Canal. The canal entrance leading to the port is protected by two breakwaters. The eastern breakwater is approximately 6.5 km long while the western is approximately 2.8 km long.

8.1.1 General Information

a) Approach Channel: 140 m wide, 12.5 to 13.0 m deep
b) Tide: 70 cm
c) Maximum permissible vessel draft: 12.8 m (42 feet)

Table 8.1.1 Berth Dimension of Port Said Port

Berth No.	Berth Type	Berth Length (m)	Berth Depth (m)
1	Lighters Discharge	175	3.66
2	Lighters Discharge	198.75	3.66
3	Lighters Discharge	136.3	3.66
4	Lighters Discharge	243	3.66
5	General Cargo	281.8	3.66
6	General Cargo	295.38	8.23
7	Grains	264.6	11.59
8	Grains	262.6	13.0
9	General Cargo	364.8	8.23
10	Petroleum	410	3.66
11	Containers	341	13.7
12	Multi-purpose	248.15	13.7
13	Lighter Discharge	163	1.83

Source) “Egyptian Ports Information” Egyptian Ports Bulletin April 1998, MOMT

8.1.2 Container Terminal

The container terminal is operated by Port Said Port Container Handling Company. There is one container berth (no.11) and one multipurpose berth (no.12) mainly used by large mother vessels of which total length is 590 m. Berth depth is maintained at 13.7 m. There is also general cargo berth (no.6) whose length and depth are 295 m and 8.2 m, mainly used by small feeder vessels. A new multipurpose berth whose length and depth are 300 m and 13.7 m respectively is under construction. Four additional post panamax QGCs are planned to be introduced at the terminal.

There are six QGCs and four RTGs in the terminal. Ground slots of the stacking yard is said to be 2,300 TEUs with the yard area of 300,000 sq.m. Potential handling capacity of Port Said Port Container Terminal is expected to be 800 thousand TEUs, while the terminal throughput in 1997 is 415 thousand TEUs.

8.1.3 Grain Terminal

There are two grain berths (no.7 and 8) whose length and depth are 263 m and 13.0 m respectively. There are also two silos with total storage capacity of 43,000 tons. There are also two floating un-loaders with discharging rate of 16,000 (tons/day/un-loader).

8.2 Cargo Movement

Total volumes of import and export cargo handled through Port Said Port amount to 4,385 thousand tons and 2,216 thousand tons respectively. Major cargoes among import commodities are “wheat” (1,678 thousand tons in 1997), “sugar” (308 thousand tons) and “iron products” (118 thousand tons). Major cargoes among export commodities are “salt” (139 thousand tons in 1997) and “fertilizer” (139 thousand tons).

8.3 Port Activities

8.3.1 Ship Movement

A total of 1,823 vessels called at Port Said Port in 1997. Container and general cargo vessels account for approximately 58% and 11.5% respectively of the total number of vessels which called at Port Said Port.

Table 8.3.1 Number of Vessels calling at Port Said Port in 1997

Vessel Type	Number of Vessels (vessels)
1. Container	1,069 (58.4%)
2. General Cargo	209 (11.5%)
3. Dry Bulk	64 (3.5%)
4. Liquid Bulk	0 (0.0%)
5. Passenger	435 (23.9%)
6. Supply	0 (0.0%)
7. Others	46 (2.5%)
Grand Total	1,823 (100%)

Source) “10 Years Statistical Report (1998)”, Egyptian Maritime Data Bank

8.3.2 Container Terminal

Average BOR of container terminal (berth no.11), multipurpose berth (no.12) and general cargo berth (no.6) is calculated as 72.3%.

Total containers of 312,454 boxes were handled through berths no.11, 12, and 6 with a total berthing time of 19,009 hours in 1997. Since original berthing and cargo handling records obtained from Port Said Container Handling Company include only operating hours, preparation time of four hours for each vessel are added to analyze cargo handling productivity. Container handling productivity is calculated as 16.4 (boxes/hour/vessel). Average dwelling time of laden transshipment container in the yard is 8 days. Dwelling time of import and export container in the yard is 10 and three (3) days respectively.

8.4 Hinterland of Container Cargoes through Port Said Port

Hinterland of import container cargoes has been analyzed by the Study Team based on the cargo handling records provided from Port Said Port Authority. In terms of destination of import container cargoes, Port Said 48.1%, the suburbs of Cairo accounts for 38.7% and Ismailia account for 6.6% and Alexandria accounts for 6.6%. Port Said play a role as the free zone and many importers have been conducting economic activities. Hence, some of import cargoes through Port Said Port have been stock in warehouse, and then, cargoes are distributed to all of Egypt.

9 Port Management and Operation in the Egyptian Major Ports

9.1 General

Ministry of Maritime Transport (MOMT) supervises overall administration of port management and controls port authorities. Port authorities are in charge of planning, construction of port facilities, securing navigation safety and marine services in the Port. Alexandria Port Authority (APA) controls Alexandria and El Dekheila Port. Damietta Port Authority (DPA) controls Damietta Port. Port Said Port Authority (PSPA) controls Port Said Port. Port Authorities own land and facilities in their port area and lease them to State-owned companies and private companies and collect fees from them.

State-owned companies perform cargo handling operation. United Arab Stevedoring Company is in charge of loading/unloading break bulk cargo. Alexandria Container Handling Company is in charge of container handling operation at the Container Terminal in Alexandria port and Dekheila port. General Warehouse Company is in charge of storing cargoes at warehouses in Alexandria Port. Concerning shipping agent, there are three state-owned companies, Thebe and Abu Simbel Shipping Agencies, Amon Shipping Agencies and Memphis Shipping Agencies. These state-owned companies are under the control of the Holding Company for Maritime Transport.

In Damietta port, Damietta Container & Cargo Handling Company is in charge of container handling operation and break bulk cargo handling operation. In Port Said Port, Port Said Container & Cargo Handling Company is in charge of container handling and dry bulk and general cargo operation. Concerning passing through the Suez Canal, Canal Shipping Agency is forwarding the necessary procedures for joining the convoy passing through the Suez Canal on behalf of shipping lines or ship owners. These state-owned companies are under the control of the Holding Company of Inland Transport. The Holding Company for Maritime Transport and the Holding Company of Inland Transport are under the control of Ministry of Public Enterprises of Egyptian Government.

9.2 Port Authority

9.2.1 Alexandria Port Authority

Board of directors was established according to the Law No.6/1967 and reorganized in 1997 in accordance with the Resolution 736/1997 and its revision under the Authorization of the President of Egypt. The main tasks of the Board are to prepare plans and policies for the port. Chairman of the Port Authority presides over the Board. Board of directors is comprised of first under secretary of MOMT and other related ministries, vice chairman of the Port Authority and other members representing public institution concerning port activities, state-owned or private companies working in the port, university scholars and consultants of the Transport Minister.

9.2.2 Damietta Port Authority

Ministry of Construction, New Civilized Communities and Land Reclamation planned and constructed Damietta port. The port was taken over by the Ministry of Transport and Communication after the construction was completed. In 1986, under the control of Ministry of Transport and Communication, the Damietta Port Authority was established to administrate and operate the port.

9.3 Private Participation and Privatization in Maritime Transport Sector

State owned companies have provided maritime transport services. Resolution 30/1998 allows the private sector to participate in the following maritime transport services.

- Stevedoring work for grains and general cargo
- Shipping agent
- Ship chandler and marine supplies
- Ship repair, maintenance and marine works
- Warehouse
- Container handling

Required amount of company's capital and permission period are shown in the following table.

Table 9.3.1 Required Capital and Permission Period

	Required capital	Permission period
Stevedoring works for grains and general cargo	Not less than 25 million L.E.	15 years
Shipping agent	Not less than 250,000 L.E.	3 years
Ship chandler and marine supplies	Not less than 50,000 L.E.	2 years
Ship repair, maintenance and marine works	Not less than 50,000 L.E.	2 years
Warehouse	Not less than 10 million L.E.	10 years
Container handling	Not less than 25 million L.E.	15 years

In case of shipping agent, a company needs a bank guarantee of 250,000 L.E. After the permission period expires, permission can be renewed. The National Assembly approved the privatization of maritime transport companies last November. The Holding Company for Maritime Transport offered 25% share of the equity of the Unite Arab Stevedoring Company for public subscription in April. This is the first case of privatization in the maritime transport sector. After the sale of the stock, the ownership structure of the United Arab Stevedoring Company changed as follows.

Government Share	41%
The company's employee shareholding association	8%
Private owners	51%

9.4 Port Operations

9.4.1 Alexandria port

(1) Pilotage, tug, security, fire fighting and telephone services are rendered 24 hours a day
Pilotage is compulsory for vessels coming into or going out the port and vessels moving from one berth to another berth.
The Port Authority decides the required number of tugs for each movement of vessels. It depends on LOA (the length of overall) of vessels as follows.

1) less than 275 feet	subject to maneuver and ship master's request
2) from 275 feet to 400 feet	one tug
3) more than 400 feet	two tugs

Passenger vessels are exempted from above rules. Usage of tug is subject to shipmaster's request.

(2) Berth assignment is conducted on "first come, first served" basis. However, some of vessels have priority of berthing. The berthing priority is given in accordance with the following order.

Passenger ship→Container ship→Ship carrying livestock→General cargo ship
→Bulk cargo (coal, iron ore, fertilizer, timber, and provisions) ship
→Liquid bulk cargo (oil, tallow, chemicals and molasses) ship
→Ship entering the dry dock or the floating crane

Some berths are spared for a specific cargo or vessel.

Berths of passenger maritime station passenger ship
These berths can receive Ro/Ro ships and general cargo ships if berths are available. But the ship must shift to another berth if a passenger ship comes.

Berth 14/16, 17/18, 40/41, 67/68	Ro/Ro ship
Berth 62, 63, 64	Coal
Berth 65, 66, 67	Fertilizer
Berth 71, 73	Timber
Berth 75-85	Grain
Berth at the petroleum terminal	Petrol material
Berth 87/2, 87/6	Liquid chemical
Berth 87/1, 87/2	Oil, tallow
Berth 71/back	Molasses

Port Authority and concerned parties form the committee to decide the berth. A meeting is held every morning to decide the next day's berth allocation based on the dimensions and types of ships and cargo types.

(3) Container terminal operates 24 hours a day and 360 days a year. Container operation is performed on a three-shift basis. The starting and ending times of each shift are as follows:
1st shift: 8:00-16:00 2nd shift: 16:00-24:00 3rd shift: 24:00-8:00

(4) Dry and liquid bulk cargo handling are operated in two shifts (day/night).
(5) Agricultural quarantine and water supply are conducted in two shifts (day/night).

9.4.2 El Dekheila port

Pilotage, tug assistance, berth assignment and container terminal operation are the same as Port of Alexandria. Cargo handling operation is performed 24 hours a day regardless of the kind of cargo.

9.4.3 Damietta Port

(1) Pilotage is compulsory for vessels having 200 GRT or more.
(2) Tug assistance is compulsory for vessels having 400 GRT or more.
(3) Container terminal operates 24 hours a day and 363 days a year. Container operation is performed on a three-shift basis. The starting and ending times of each shift are as follows:
1st shift: 8:00-16:00 2nd shift: 16:00-24:00 3rd shift: 24:00-8:00

9.4.4 Port Said Port

(1) Pilotage and tug assistance
Pilotage is compulsory for vessels coming into or going out the port and passing through the Suez Canal. Suez Canal Authority carries out pilotage and tug assistance.

Port Said Port is situated at the north entrance of the Suez Canal. This gives the port potential to become a hub port in East Mediterranean Sea because of its geographical advantage. On the other hand, it restricts navigation time of vessels to call at the port. It is required for vessels passing the canal to join the convoy. The convoy has the priority to navigate the canal. While the convoy is passing in front of the port, vessels to call at the port can not enter the port or vessels at berth can not leave the port.

(2) Container terminal operates 24 hours a day and 363 days a year. Container operation is performed on a three-shift basis. The starting and ending times of each shift are as follows:
1st shift: 8:00-16:00 2nd shift: 16:00-24:00 3rd shift: 24:00-8:00

9.5 Tariff

9.5.1 The Greater Alexandria Port

	Unit	Egyptian ships (L.E.)	Foreign ships (US$)
(1) Port dues	Per GRT	0.25	0.30
(2) Berth hire	per GRT per day	0.1	0.01
(3) Stay due *	per GRT per day	0.1	0.01
(4) Light house due	per GRT	0.5	0.05

* This charge is collected from the 16th day after berthing date or the next day of completion of cargo loading/unloading, whichever comes earlier.

(5) Pilotage

1) From outside port to berth/anchorage or vice versa

	Egyptian ships (L.E.)	Foreign ships (US$)
GRT 300 - 999	70	83.1
1,000 - 4,999	115	136.5
5,000 - 9,999	160	190.25
10,000 - 19,999	225	267.5
20,000 - 29,999	485	351.5
30,000 - 39,999	645	467.4
40,000 - 49,999	725	525.4
50,000 - 59,999	765	554.35
60,000 or more	900	652.2

2) Harbor zones

GRT 20,000 - 29,999	340	346.4
30,000 - 39,999	430	311.6
40,000 - 49,999	455	329.75
50,000 - 59,999	470	340.6
60,000 or more	550	398.55

Pilotage increases by 50 % from sunset to sunrise

In case of container ships and ferries transporting transit containers, pilotage, lighthouse due, berthing and staying due are discounted as follows:

Number of transit containers	Discount rate
80-120 boxes	20%
121-160 boxes	35%
161-2000 boxes	45%
More than 200 boxes	50%
Ships carrying transit containers between Egyptian ports	75%

(6) Tug assistance

1) Inside the port	US$500/movement
2) Outside the port	US$1,000/movement

Movement starts from the time of arrival beside the ship till the time of completing the maneuver.

(7) Container loading/unloading charge

(8) Container storage charge (unit: L.E. , Per day)

	20’		40’	
	Full	Empty	Full	empty
First three days	3	1.5	6	3
Next 10 days	6	3	12	6
Additional days	10	5	30	15

(9) General cargo storage charge (unit: L.E., Per ton per day)

First three days	0.5
Next four days	1
Next seven days	4
From the next day	5

(10) Bulk cargo storage charge (unit: L.E., Per ton per day

First three days	0.2
Next four days	0.4
From the next day	1

9.6 Financial Situation

9.6.1 Alexandria Port Authority

The main revenues are lease fees of real estate, port dues and towage charge. Operating ratio clears the required level, less than 75%, from the fiscal year 92/93 through 96/97. Although the port authority had less revenues in 96/97, the fixed assets increased. Return on net fixed assets is exceeding the required level, more than 7%. Debt equity ratio is 38:62 in 96/97, which also clears the required level, 50:50.

9.6.2 Damietta Port Authority

While operating ratio is more than 100% (Net operating income is negative.), working ratio shows the favorable level, less than 60%. The port authority is suffering from a deficit due to the large amount of depreciation cost and repayment of long-term loan. Debt service coverage ratio is less than 1.0, which means that the port authority can not repay the loan with its internal funds. So far the port authority has no shortage of cash flow because of the central government's subsidy. However the amount of the subsidy has been decreasing for three years. It is very difficult for the port authority to make further investment under this financial situation. Debt equity ratio is 67:33, which is under the required level. The port authority must reduce the deficit and increase its capital.

9.6.3 Damietta Container and Cargo Handling Company

Both operating ratio and working ratio, which have been increasing for these three years, are within the required level. Therefore operation is regarded as efficient according to the income statement. Cash balance impaired in the fiscal year 96/97 as cash outflow increased. Return on net fixed assets exceeds the required level. Debt equity ratio improved from 57:43 in 94/95 to 49:51 in 96/97, which clears in the required level.

10 Port Said East Port Project

10.1 Outline of the Project

Studies concerning a new hub port project, namely "Port Said East Port Project" have been or will be conducted by Sir William Halcrow and Partners (UK), Netherlands Engineering Consultants (Nedeco) and Arab Academy. Although the detailed information of the project has not been so far available, an outline of the project is summarized materializing information of newspapers, magazines[1)2)] and interviews.

A new company to be in charge of the port development and its operations is expected to capitalize at LE 1,500 million. The new company is being established by the Port Said Container and Cargo Handling Company, Damietta Container Handling Company, the Suez Canal Authority and Egyptian General Petroleum Corporation at the beginning stage. This company is also expected to be funded 25% by above-mentioned Egyptian authorities, 15% by other Egyptian investors and 60% by foreign investors.

A whole project area of about 12,000 acres (4,850 hectares) is planned for warehouses, storage space and an industrial zone. A container terminal with area of 2,000 acres (810 hectares) is planned to have one-kilometer-long container berths and ten (10) quay-side gantry cranes (QGCs) with a capacity to handle 1.0 million TEUs. Future capacity of the whole project is expected to be 6.0 million TEUs.

An alternative project site is proposed on the east of the eastern Suez Canal Bypass along with a development of Sinai, even though this bypass is being used to a certain extent by all the north-bound convoy and south-bound larger vessels convoy. The other alternative site is considered to be out the Mediterranean Sea.

It is said that the studies concluded the project is feasible only if the government takes a full responsibility of the infrastructure. One study concluded that an internal rte of return (IRR) of this project is 24% to investors.

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1) MEED, 24 April, 1998, pp.2 - 3
2) MEED, 6 February, 1998, p.16

PART II

DEVELOPMENT GUIDELINES

11 Maritime Transport Network and Future Transshipment Container of the East Mediterranean Sea

11.1 Container Traffic of the East Mediterranean

11.1.1 The Number of Containers Handled at Ports

The number of containers handled at the Mediterranean ports has increased at an annual growth of 12.7% from 1986 to 1995. Growth was especially pronounced in the East Mediterranean ports registering 15.3%. To put this figure into perspective, average container traffic growth of the world was only 9.2%.

11.1.2 The Number of Containers by Country

Although world container cargo traffic has been increasing on average, container traffic in some countries, for example, CIS countries and countries of the Balkan peninsula, showed a recent tendency to decline. This is a reflection of the unstable economic situation caused by the collapse of communism in the early 90's.

11.1.3 Transshipment Container of the East Mediterranean

Damietta, Port Said, Larnaca, Limassol, Piraeus and Marsaxlokk are major hub ports for transshipped containers originating from or destined to countries facing to the East Mediterranean or Black Sea. Share of transshipment containers ranges from 4% at Alexandria to 95% at Damietta. Annual transshipment traffic is estimated by transshipment rate in 1994.

11.1.4 The Number of Local Containers Handled at Ports of the East Mediterranean

The historical trend of the number of local containers originating from or destined to the hinterland of each port is 1.1 million TEUs in 1986, 2.0 million TEUs in 1990 and 3.8 million TEUs in 1995 respectively.

11.2 Socio-economic Condition of the East Mediterranean Countries GDPs of the East Mediterranean

The East Mediterranean countries are divided into two groups. In case of East Med Group which consists of Cyprus, Egypt, Greece, Israel, Lebanon, Malta, Syria and Turkey, GDP has a strong correlation with container traffic in the historical trend. On the contrary, GDP of the Balkan and Black Sea Group which consists of Bulgaria, Croatia, Romania, Slovenia, Yugoslavia and Ukraine, is characterized by a stagnant trend and has no clear correlation with container traffic presumably reflecting the economic and political turmoil in the first half of 90's.

11.2.1 GDPs of the Target Years

Growth rates of GDPs for target years of this study follow the OECD report. The GDPs of two groups are computed as in the following Table.

Table 11.2.1 Futute GDPs of the Mediterranean, Balkan and Black Sea Region

(unit:million USD in 1990 constant price)

Group	Y1995	Y2007	Y2017
East Med Group	421,780	719,552	1,131,595
Balkan and Black Sea Group	216,220	358,979	577,744

11.3 Transshipment Container Transport Networking Scenario through the East Mediterranean

11.3.1 Key Factors of Transshipment Container Network through the East Mediterranean

Carriers need a significant local market which makes the call worthwhile while transshipment is a bonus function. However, there are some ports in the Mediterranean, which receive mainly transshipped containers rather than local containers due to their geographical advantages near the main shipping lanes.

Argeciras, Damietta, Port Said, Marsaxlokk and Gioia Tauro are dominated by transshipment container traffic supposedly due to the less deviation distance. Alexandria is mainly serving main-line vessels for local container rather than transshipment.

Distance between a hub-port and feeder ports is a second important factor. Marsaxlokk and Gioia Tauro are centrally located and serve the feeder service markets in the Mediterranean. Generally speaking, the Mediterranean is too wide to be covered from the east and west ends by a single hub-port economically.

A third condition necessary for a successful transshipment port is reasonable costs in the port. A successful transshipment port is supposed to at least perform at a productivity in the range of 25 to 30 boxes/hour/crane.

11.1.2 Transshipment Container Transport Networking Scenario through the East Mediterranean

Damietta and Port Said have been functioning as transshipment ports where feeder vessels are extending their services to mainly the East Mediterranean.

The newly-participating competitors, Marsaxlokk and Gioia Tauro, located at the center of the Mediterranean, have a geographical advantage for serving both the Central and East Mediterranean ports in transshipment.

On the other hand, the recently proposed Port Said East Port is expected to serve the East Mediterranean and Black Sea ports as well as Damietta.

11.1.3 Another Implications of Container Movement to and from Alexandria Port

Alexandria serves mainly local containers, though it's geographical advantage makes it a potential transshipment hub-port. Direct service ratio in local container transport by route seems to be closely related to both route distance and transport volume on routes between Alexandria and trading partners' ports.

There seem to be two inverse relations at the same time. The longer the route distance, the less direct shipping services. The more volume on a route, the more direct shipping services.

Furthermore, Alexandria is located only 32 NM away from the main shipping lane. THerefore, many main line vessels tend to make multiple calls at the ports. Consequently,

Alexandria has also been playing a role of major container port in Egypt, serving the local container market generated from Nile Delta including Metropolitan Cairo.

11.4 Future Transshipment Container Traffic

Co-relation between the Number of Local Containers and GDP

Co-relation between the total number of local containers and GDP of the East Med Group is analyzed as follows;

Y=A*X+B Where, Y: Local Containers(TEU)
X:GDP (million US$ in 1990 constant price)
A:19.81 B:-5,068,000 R^2:0.97

11.4.1 The Number of Local Containers Handled at Ports

On the assumption that container traffic of the Balkan and Black Sea Group has the same growth rate as the East Med Group towards the target years, future local containers are forecast as in the following Table:

Table 11.4.1 Future Local Container Traffic of the East Mediterranean

Group	Item	Year 1995	Year 2007	Year 2017
East Med Group	Containers (TEU)	3,459,000	9,186,000	17,348,000
			8.5 %	6.6 %
	GDP (million USD)	422,000	720,000	1,132,000
			4.6 %	4.6 %
Balkan and Black Sea Group	Containers (TEU)	297,000	789,000	1,490,000
			8.5 %	6.6 %
	GDP (million USD)	216,000	359,000	578,000
			4.3 %	4.9 %
East Mediterranean	Containers (TEU)	3,757,000	9,975,000	18,839,000
			8.5 %	6.6 %
	GDP (million USD)	638,000	1,079,000	1,709,000
			4.5 %	4.7 %

Note: USD in 1990 constant price

11.4.2 The Number of Containers Handled at Hub Ports in the Target Years

Local containers are carried partly by direct shipping service and partly by feeder shipping service. The share of containers by feeder shipping service in the future is projected at 26% in 2007 and 31% in 2017 respectively.

The number of containers handled at transshipment ports is estimated as 5.1 million TEUs in 2007 and 11.7 million TEUs in 2017 respectively.

Table 11.4.2 The Number of Containers of the East Mediterranean (unit: TEUs)

Year		1995	2007	2017	Remarks
Local Containers	Direct Shipping Service	2,991,000	7,421,000	12,999,000	A
	Feeder Shipping Service	766,000	2,554,000	5,840,000	B
	Sub Total	3,757,000	9,975,000	18,839,000	A+B
Containers Handled at Transshipment Port		1,532,000	5,108,000	11,680,000	2*B
Total Port Container		5,289,000	15,083,000	30,519,000	A+3*B

12 Demand Forecast

12.1 Socio-economic Framework for the Target Year

12.1.1 Population

The population of Egypt reached 59.272 million in 1996 based on the "World Development Indicators 1998" issued by the World Bank. The average annual growth rate from 1996 to 2007 is set as 1.7% which is expressed in the "The Fourth Five-Year Plan for Economic and Social Development (1997/98-2001/02) and the Plan of It's First Year"(hereinafter referred to as "The Fourth Five-Year Plan") by the Ministry of Planning, and that from 2007 to 2017 is set as 1.2% based on "The National Strategy of Economic and Social Development of the Twenty First Century(1997/98-2016/17)"(hereinafter referred to as "The National Strategy") also by the Ministry of Planning.

12.1.2 Gross Domestic Product (GDP)

The average growth rate of GDP is set as 6.9 % in the period from 1997 to 2007 and as 7.6 % in the period from 2007 to 2017 in this study referring to the average annual growth rate expressed in the "The Fourth Five-Year Plan" and the "The National Strategy". The sectoral GDP of agriculture is estimated as 4.2% in the "The Fourth Five-Year Plan", and this figure is used up to 2017 in this study.

12.2 Methodology of Demand Forecast

There are two different methods of forecasting future port traffic in the target year. One is the so-called macro forecast method which estimates the cargo volume as a group including entire commodities regardless of the volume of each commodity. The other is the so-called micro forecast method which estimates the cargo volume of each commodity individually.

In the first step of the port traffic projection in Egypt, the total volume through five major ports (the Greater Alexandria, Damietta, Port Said, Suez and Safaga) is forecast taking account of the overlap of their hinterlands to a great extent. Next, cargo volume is allocated to the Greater Alexandria, Damietta and Port Said Port (hereinafter referred to as "the Mediterranean Ports") referring to the share of cargo volume in 1997.

12.3 Macro Forecast of Local Cargo through the Mediterranean Ports in Egypt

Time series is used as an index in the correlation analysis of the macro forecast in this study. The estimation volumes of import are 36,872 thousand tons in 2007 and 45,729 thousand tons in 2017. In case of export, the estimation volumes are 11,747 thousand tons in 2007 and 16,139 thousand tons in 2017.

12.4 Micro Forecast of Local Cargo through the Mediterranean Ports in Egypt

12.4.1 Classification of the Major Commodity Groups

The cargo handled at the Mediterranean Ports is classified into major commodity groups, conventional cargo, dry bulk cargo and liquid bulk cargo for the micro forecast. In

addition, conventional cargo is divided into three categories, viz. containerizable cargo, statistically mixed cargo in containerization and non-containerizable cargo.

12.4.2 Result of Micro Forecast at the Mediterranean Ports

According to the micro forecast, cargo volume will reach 52,221 thousand tons in 2007 and 69,174 thousand tons in 2017.

12.4.3 Cross Check with the Result of Macro Forecast

In case of import cargo, the result of the micro forecast method is larger than that of the macro forecast, while export cargo by the macro forecast method is larger than that of the micro forecast. However, the total cargo volume forecast by the micro forecast method is larger than that of the macro forecast method. Herein, the cargo volume handled at the Mediterranean Ports for the target years will be forecasted by the micro forecast method.

12.5 Forecast of Local Cargo Volume through the Mediterranean Ports in Egypt

12.5.1 Forecast of Container Cargo Volume

Cargo forecast is conducted according to three categories, viz. containerizable cargo, non-containerizable cargo and statistically mixed cargo in containerization. Containerizable cargo volume is computed by percentage of containerization multiplied by cargo volume which is estimated by the micro forecast. Containerizable cargo items are selected and are checked by the actual percentage of containerization using the past traffic records. The percentage of containerization of the group of containerizable cargoes for the target year is forecast by using the logistic curve, and that of statistically mixed cargo in containerization is forecast by considering the past trend of percentage of containerization. Then, number of containers is forecast considering the average cargo weight per TEU in laden container and ratio of empty container. The resulting numbers of containers in the target year are 1,528 thousand TEUs at 2007 and 2,944 thousand TEUs at 2017 through the Mediterranean Ports.

Total containers through the Mediterranean Ports at the target year of 2007 and 2017 are allocated considering functional allotment of the Mediterranean ports. The result of allocation of total container to the ports is shown in Table 12.5.1.

Table 12.5.1 Allocation of Local Container Volume

(Unit: thousand TEUs)

Port	1997	2007	2017
Greater Alexandria	389	1,234	1,500
Damietta	65	98	372
Port Said	104	98	700
East Port Said	-	98	372
Total	558	1,528	2,944

Source: JICA Study Team

12.5.2 Forecast of Conventional Cargo Volume at the Mediterranean Ports

The forecast volume of conventional cargo for the target year is computed by deducting containerized cargo volume from the total cargo volume. Conventional cargo volume through the Mediterranean ports at the target year is forecast as 14,593 thousand tons in

2007 and 18,162 thousand tons in 2017, which is 1.55 times and 1.93 times as large as the cargo volume in 1997 respectively.

12.5.3 Forecast of Dry Bulk Cargo Volume at the Mediterranean Ports

The forecast volume of Dry Bulk cargo handled at the Mediterranean Ports at the target year is forecasted as 23,002 thousand tons in 2007 and 27,136 thousand tons in 2017, which is 1.25 times and 1.47 times as large as the cargo volume in 1997 respectively.

12.5.4 Forecast of Liquid Bulk Cargo Volume at the Mediterranean Ports

Liquid bulk cargo is handled at the Greater Alexandria Port and Port Said Port. Liquid bulk cargo handled at Alexandria Port consists of Petroleum products, Edible oil, Grease and Molasses, and that of Port Said Port consists of petroleum products. The forecast volume of liquid bulk cargo to be handled at the two ports at the target year is 5,723 thousand tons in 2007 and 7,630 thousand tons in 2017, which is 1.14 times and 1.53 times as large as the cargo volume in 1997 respectively

12.6 Forecast Passenger Volume through the Mediterranean Ports in Egypt

Passenger volume was 97,000 persons through Greater Alexandria Port and 544,000 persons through Port Said Port in 1997. Most passengers through those ports were tourists using large passenger vessels cruising around the Mediterranean Sea and Suez Canal. The forecast passenger volume is shown in Table 12.6.1.

Table 12.6.1 Forecast Passenger Volume at Greater Alexandria and Port Said Port

(Unit: thousand persons)

Port	1997	2007	2017
Greater Alexandria	97	182	342
Port Said	544	1,021	1,917
Total	641	1,203	2,259

Source: JICA Study Team

12.7 Summary of Demand Forecast

Demand forecast by commodity of the Mediterranean ports in the target year is summarized in Table 12.7.1, Table 12.7.2, Table 12.7.3 and Table 12.7.4.

Table 12.7.1 Summary of Forecast Containers Handled at the Mediterranean Ports

Package Style	Port	Unit	Cargo Volume			Forecast Cargo Volume					
			1997			2007			2017		
			Import	Export	Total	Import	Export	Total	Import	Export	Total
Local Container	The Greater Alexandria	('000 tons)	2,055	651	2,707	5,270	1,943	7,213	6,715	1,689	8,404
		('000 TEUs)	204	185	389	617	617	1,234	750	750	1,500
	Damietta	('000 tons)	271	317	588	419	154	573	1,665	419	2,084
		('000 TEUs)	27	38	65	49	49	98	186	186	372
	Port Said	('000 tons)	537	209	746	419	154	573	3,134	788	3,922
		('000 TEUs)	52	52	104	49	49	98	350	350	700
	East Port Said	('000 tons)	0	0	0	419	154	573	1,665	418	2,083
		('000 TEUs)	0	0	0	49	49	98	186	186	372
	Total	('000 tons)	2,863	1,177	4,041	6,526	2,406	8,932	13,179	3,314	16,493
		('000 TEUs)	283	275	558	764	764	1,528	1,472	1,472	2,944
Transship-ment Container	The Greater Alexandria	('000 TEUs)	4	4	8	0	0	0	0	0	0
	Damietta	('000 TEUs)	273	269	542	-	-	974	-	-	1,328
	Port Said	('000 TEUs)	157	154	311	-	-	524	-	-	0
	East Port Said	('000 TEUs)	0	0	0	-	-	1,995	-	-	3,828
	Total	('000 TEUs)	435	427	862			3,493			5,156
Grand Total		('000 tons)	2,863	1,177	4,041	6,526	2,406	8,932	13,179	3,314	16,493
		('000 TEUs)	718	702	1,420	-	-	5,021	-	-	8,100

Table 12.7.2 Summary of Forecast Volume Handled at Greater Alexandria Port by Commodity in the Target Year

Package Style	Containeriza-bility	Commodity	Cargo Volume ('000tons)			Forecast Cargo Volume ('000tons)					
			1997			2007			2017		
			Import	Export	Total	Import	Export	Total	Import	Export	Total
Conventional Cargo	Containerizable	Miscellaneous	2,889	55	2,943	3,827	12	3,839	3,312	1	3,313
		Frozen Food	164	0	164	25	0	25	7	0	7
		Lash Cargo	122	0	122	0	0	0	0	0	0
		Citrus	0	12	12	0	441	441	0	632	632
		Cotton	0	0	0	0	0	0	0	0	0
		Fiber	0	0	0	0	0	0	0	0	0
		Sub-total	3,175	67	3,241	3,852	453	4,305	3,319	633	3,952
	Statistically Mixed	Timber	1,629	3	1,633	3,634	0	3,634	4,783	0	4,783
		Ro-Ro Cargo	625	133	758	0	0	0	0	0	0
		Sugar	661	0	661	276	0	276	531	0	531
		Paper	172	1	173	826	0	826	659	0	659
		Rice	1	49	50	0	297	297	0	537	537
		Flour	53	0	53	238	0	238	268	0	268
		Sub-total	3,142	187	3,329	4,974	297	5,271	6,241	537	6,778
	Non-Containerizable	Iron/Steel Products	293	192	485	712	500	1,212	1,325	630	1,955
		Scrap	16	0	16	201	0	201	201	0	201
		Car	10	0	10	36	0	36	36	0	36
		Livestock	6	0	6	70	0	70	79	0	79
		Sub-total	325	192	517	1,019	500	1,519	1,641	630	2,271
	Total		6,641	446	7,087	9,845	1,250	11,095	11,201	1,800	13,001
Local Containers		'000 tons	2,055	651	2,707	4,578	1,688	6,266	6,715	1,689	8,404
		('000 TEUs)	204	185	389	536	536	1,071	750	750	1,500
Dry Bulk		Wheat	2,161	18	2,179	3,897	0	3,897	3,846	0	3,846
		Maize	2,264	0	2,264	1,524	0	1,524	2,210	0	2,210
		Iron Pellets	1,988	7	1,995	3,750	0	3,750	5,000	0	5,000
		Coal	1,659	0	1,659	1,300	0	1,300	1,500	0	1,500
		Coke	0	306	306	0	399	399	0	520	520
		Cement	976	0	976	1,137	0	1,137	1,215	0	1,215
		Sulpher	349	1	351	349	0	349	349	0	349
		Fertilizer	239	19	258	195	0	195	416	0	416
		Salt	0	235	235	0	573	573	0	972	972
		Others	413	1	414	413	0	413	413	0	413
		Total	10,048	588	10,636	12,565	972	13,537	14,949	1,492	16,441
Liquid Bulk		Petroleum Oil	614	2,956	3,570	488	3,777	4,265	906	4,825	5,731
		Edible Oil	480	3	483	124	0	124	135	0	135
		Grease	58	0	58	86	0	86	86	0	86
		Molasses	0	186	186	0	349	349	0	529	529
		Total	1,151	3,145	4,297	698	4,126	4,824	1,127	5,354	6,481
Grand Total			19,896	4,830	24,726	27,686	8,036	35,722	33,992	10,335	44,327

Table 12.7.3 Summary of Forecast Volume Handled at Damietta Port by Commodity in the Target Year

Package Style	Containeriz a-bility	Commodity	Cargo Volume ('000tons)			Forecast Cargo Volume ('000tons)					
			1997			2007			2017		
			Import	Export	Total	Import	Export	Total	Import	Export	Total
Conventional Cargo	Containeri-zable	Fish and Meat	138	0	138	21	0	21	6	0	6
		General cargo	0	378	378	0	16	16	0	1	1
		Others	71	0	71	309	0	309	268	0	268
		Sub-total	209	378	587	330	16	346	273	1	274
	Statistically Mixed	Timber	197	0	197	392	0	392	516	0	516
		Flour	0	0	0	0	0	0	0	0	0
		Sub-total	197	0	197	392	0	392	516	0	516
	Non-Containeri-zable	Iron products	622	0	622	1,287	0	1,287	2,363	0	2,363
		Special Cargo	31	9	40	37	9	46	37	9	46
		Sub-total	653	9	662	1,324	9	1,333	2,400	9	2,409
	Total		1,059	387	1,446	2,047	25	2,072	3,190	10	3,200
Local Containers		('000tons)	271	317	588	752	277	1,029	1,665	419	2,084
		('000TEUs)	27	38	65	88	88	176	186	186	372
Dry Bulk		Wheat	2,544	0	2,544	3,250	0	3,250	3,208	0	3,208
		Maize	1,147	0	1,147	1,272	0	1,272	1,844	0	1,844
		Soybean	243	0	243	32	0	32	21	0	21
		Cement	1,686	0	1,686	1,964	0	1,964	2,099	0	2,099
		Fertilizer	7	130	137	6	166	172	12	212	224
		Others	3	62	65	167	27	194	167	27	194
		Total	5,630	192	5,822	6,691	193	6,884	7,351	239	7,590
Grand total			6,960	896	7,856	9,490	495	9,985	12,206	668	12,874

Table 12.7.4 Summary of Forecast Volume Handled at Port Said Port by Commodity in the Target Year

Package Style	Containeriz a-bility	Commodity	Cargo Volume ('000tons)			Forecast Cargo Volume ('000tons)					
			1997			2007			2017		
			Import	Export	Total	Import	Export	Total	Import	Export	Total
Conventional Cargo	Containeri-zable	Frozen	45	0	45	7	0	7	1	0	1
		Agricultural Products	0	56	56	0	14	14	0	2	2
		General Cargo	0	32	32	0	5	5	0	0	0
		Others	243	0	243	594	0	594	514	0	514
		Sub-total	288	88	376	601	19	620	515	2	517
	Statistically Mixed	Sugar	308	0	308	128	0	128	237	0	237
		Flour	24	0	24	108	0	108	122	0	122
		Sub-total	332	0	332	236	0	236	359	0	359
	Non-Containeri-zable	Iron products	118	0	118	244	0	244	448	0	448
		Special cargo	57	0	57	101	2	103	101	2	103
		Sub-total	175	0	175	345	2	347	549	2	551
	Total		795	88	883	1,182	21	1,203	1,424	4	1,428
Local Containers		('000tons)	537	209	746	753	277	1,030	3,134	788	3,922
		('000TEUs)	52	52	104	88	88	176	350	350	700
Dry Bulk		Wheat	1,678	0	1,678	1,478	0	1,478	1,458	0	1,458
		Maize	0	0	0	578	0	578	838	0	838
		Cement	6	0	6	7	0	7	7	0	7
		Coke	0	0	0	0	0	0	0	0	0
		Fertilizer	0	139	139	0	179	179	0	227	227
		Salt	0	139	139	0	339	339	0	575	575
		Others	0	0	0	0	0	0	0	0	0
		Total	1,684	278	1,962	2,063	518	2,581	2,303	802	3,105
Liquid Bulk		Petrol	0	704	704	0	899	899	0	1,149	1,149
		Total	0	704	704	0	899	899	0	1,149	1,149
Grand total			3,016	1,279	4,295	3,998	1,715	5,713	6,861	2,743	9,604

Note: All figures under column 2007 and 2017 in preceding tables are calculated by the JICA Study Team based on the data from Egyptian Maritime Data Bank, the Greater Alexandria Port Authority, Damietta Port Authority and Port Said Port Authority.

13 Functional Allotment of the Mediterranean Ports in Egypt

13.1 Transshipment Container Port Capacity in the East Mediterranean

There are eight major transshipment container ports in the East Mediterranean mainly handling the transshipment containers. Transshipment container shares to the total container throughput for those ports in 1994 are reported as 90% (Marsaxlokk), 36% (Limassol), 78% (Larnaca), 20% (Piraeus), 9% (Haifa), 89% (Damietta) and 75% (Port Said)[1)2)].

In addition, the Port Said East Port is currently proposed as a hub-port targeting transshipment containers at the area of Shark Al-Tafriaa, east of Port Said. According to the report[3)], 2.5 million TEUs of containers are planned to be handled at the Port Said East Port in 2011. In this study, it is assumed that at the Port Said East Port, the second stage project (total berth length of 4,800m, twelve (12) 400m-equivalent berths) will be completed by the year 2017 with the estimated annual capacity of 4.2 million TEUs.

Future container-handling capacities of Gioia Tauro, Marsaxlokk, Piraeus and Haifa are announced by the port authorities together with the future expansion plans. The future capacities of the other foreign hub-ports are estimated considering their future expansion plans if any. As to container-handling capacities of the Egyptian ports are calculated using the computer simulation method. Thus, the resulting container-handling capacities of the East Mediterranean hub-ports in the future are shown in Table 13.1.1. Unit berth capacities are in the range of 225,000 - 369,000 TEUs.

Out of total capacities of approximately 18.3 million TEUs, the capacity of 10.9 million TEUs in total is estimated to be available for container transshipment in the East Mediterranean in 2017.

13.2 Origin and Destination Distribution of the Transshipment Container through the Mediterranean Ports in Egypt

Origin and destination of containers which were transshipped at Damietta or Port Said Ports in 1997 are revealed through the survey by the Study Team. According to the results of the survey, the East Mediterranean, the Black Sea and the West Mediterranean accounts for 81.8%, 7.1% and 4.4% respectively in the volume of containers transshipped by the feeder vessels on short-sea routes. On the other hand, East Asia, West Europe, North America, Southeast Asia, South Asia and the Middle East accounts for 33.9%, 22.4%, 22.1%, 13.6%, 3.8% and 3.5% respectively by main-line vessels on long-sea routes. This reveals that the East Mediterranean and Black Sea account for approximately 90% of the total volume of containers transported by feeder vessels on short-sea routes.

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1) "The battle for Med hub role", Containerization International (July 1995), pp. 95-99
2) Percentages of Damietta and Port Said Ports in 1997 are obtained through Maritime Databank by the Study Team.
3) "Feasibility Study on Establishment of Sharq Al-Tafriaa Port and Free Zone at Greater Area of Port Said" (Research and Consultation Center of Maritime Transport Sector)

Table 13.1.1 Transshipment Container Port Capacity in the East Mediterranean in 2017

Port Name	Status	Berth Length	Berth Depth	Berth No.	Stacking Area	Total Port Capacity	Transship Share	East Med Share	Transship Port Capacity
		(m)	(m)	(Berths)	(Sq.m)	(TEUs)	(%)	(%)	(TEUs)
Gioia Tauro	Present	3,012	13.5	9	950,000				
	Additional	1,250	- 18.0	4	-----				
	Total	1,262		13		4,800,000	100	70	3,360,000
Marsaxlokk	Present	1,480	14.5	4	274,000				
	Additional	1,000	- 15.5	3	-----				
	Total			7		2,450,000	90	70	1,543,500
Limassol	Present	1,000	11.0	3	400,000				
	Additional	-----	- 14.0	-----	-----				
	Total			3		840,000	36	100	302,400
Larnaca	Present	340	12.0	1	100,000				
	Additional	-----	-----	-----	-----				
	Total			1		280,000	78	100	218,400
Piraeus	Present	1,500	12.0	4	-----				
	Additional	-----	- 16.5	-----	-----				
	Total			4		1,000,000	20	100	200,000
Haifa	Present	400	10.5	1	-----	200,000			
	Additional	700		2	700,000	700,000			
	Total			3		900,000	9	100	81,000
Alexandria	Present	560	14.0	2		450,000			
	Additional	-----		-----		-----			
	Total			2	163,000	450,000	0	-----	0
El Dekheila	Present	480	14.0	1	280,000				
	Additional	560	12.0	2	100,000				
	Total			3	380,000	1,000,000	0	-----	0
Damietta	Present	1,000	14.5	3	256,000				
	Additional	800	12.0	2	-----				
	Total			5		1,700,000	78	100	1,328,000
Port Said	Present	600	13.7	2	300,000				
	Additional	350	13.7	1	150,000				
	Total			3	450,000	700,000	0	-----	0
East Port Said Project	Present	-----		-----		-----			
	Additional	4,800	16.5	12		4,200,000			
	Total			12		4,200,000	91	100	3,828,000
The East Mediterranean Grand Total						18,320,000	-----		10,860,800

Table 13.2.1 Regional Share of Origin and Destination of the Transshipment Container through the Mediterranean Ports in Egypt

On Short-sea Route (Feeder Vessels)	Regional Share (%)	On Long-sea Routes (Main-line Vessels)	Regional Share (%)
East Mediterranean	81.8%	West Europe	22.4%
Black Sea	7.1%	North America	22.1%
West Mediterranean	4.4%	The Middle East	3.5%
-----	-----	East Asia	33.9%
-----	-----	Southeast Asia	13.6%
-----	-----	South Asia	3.8%
Other region	6.7%	Other region	0.7%
Grand Total	100%	Grand Total	100%

13.3 Container Port Capacity of the Mediterranean Ports in Egypt

Container-handling capacities of the three ports, the Greater Alexandria Port (Alexandria and El Dekheila), Damietta and Port Said are separately estimated using computer simulation on the operational conditions which could be achieved in the future.

(1) Alexandria Container Terminal
Taking account of the maximum available ground slots of 3,000 TEUs in the terminal, the container-handling capacity is estimated as 450,000 TEUs per annum though the resulting berth occupancy shows some room.

(2) El Dekheila Container Terminal
Taking account of the maximum available ground slots of 5,430 TEUs in the terminal in the future, the container-handling capacity is estimated as one million TEUs per annum though berth occupancy shows some room.

(3) Damietta Container Terminal
Taking account of the maximum available ground slots of 11,935 TEUs in the terminal in the future, the container-handling capacity is estimated as 1.7 million TEUs per annum though the resulting berth occupancy shows some room.

(4) Port Said Container Terminal
Container-handling capacity is estimated as 700,000 TEUs keeping ship-waiting time less than 24 hours/vessel at the anchorage of the entrance of the port. Ship-waiting time or delay of more than 24 hours are not usually accepted for the container transport services. Because the container transport services generally require a regular schedule.

13.4 Functional Allotment of Container Handling and Container Traffic Assignment among the Mediterranean Ports in Egypt

(1) Local Container Hinterland through the Mediterranean Ports in Egypt
According to the overall average hinterland share, Cairo takes the first place (63.8%) followed by Alexandria area (22.5%) and Port Said area (9.1%). In addition to Cairo area, the Greater Alexandria Port and Port Said Port have their own hinterlands (28.3% and 48.1% respectively) right behind those ports to a certain extent.

(2) Functional Allotment of Container Handling among the Mediterranean Ports in Egypt
Both the Greater Alexandria Port and Port Said Port are expected to handle local containers with priority considering the present role and their own hinterland. Port Said Port will handle transshipment containers supplementarily at the beginning stage of Port Said East Port, only if its port capacity is left available.

On the other hand, both Damietta Port and Port Said East Port are expected to attract transshipment containers with the geographical advantages and superior infrastructures existing or to be prepared, so as to contribute to the national economy through earning foreign currencies. Thus these two ports are supposed to mainly handle transshipment

containers as regional hub-port, while approximately 20% of their capacity to local containers are assigned as a base cargo to stabilize terminal management.

(3) Future Container Traffic Assignment to the Mediterranean Ports in Egypt
Local containers are assigned to the Greater Alexandria Port and Port Said Port with priority. The excess local containers from Alexandria is assigned first to Port Said, then to Damietta Port and Port Said East Port. After the assignment of excess containers to the two ports, the marginal capacities are expected to be used to attract transshipment containers as much as possible. The resulting assignment among the Mediterranean ports is shown in Table13.4.2.

Table 13.4.2 Local and Transshipment Container Assignment to the Mediterranean Ports in Egypt in 2007 and 2017

(Unit: thousand TEUs)

Port Name	1997			2007			2017		
	Local	Transship	Total	Local	Transship	Total	Local	Transship	Total
Greater Alexandria	389	8	397	1,234	0	1,071	1,500	0	1,500
Damietta	65	542	607	98	974	1,150	372	1,328	1,700
Port Said	104	311	415	98	524	700	700	0	700
Port Said East	----	----	----	98	1,995	2,100	372	3,828	4,200
Egypt Total	558	861	1,419	1,528	3,493	5,021	2,944	5,156	8,100

13.5 Economical Size of Container Vessels calling at the Mediterranean Ports in Egypt by Shipping Route

(1) The Most Economical Size for Local Container Traffic
The amount of local container traffic on the long distance routes connecting Alexandria Port with trading partners such as West and North Europe, North America, East Asia, Southeast Asia and South Asia accounts for 51.5% of the total local container traffic handled in 1997. On the above-mentioned long distance routes, large container vessels of 3,000 TEUs in loading capacity are revealed as the most economical.

On the other hand, the amount of local container traffic on the short distance routes connecting Egypt with the West Mediterranean, the East Mediterranean and Black Sea accounts for the remaining 48.5% of the total local container traffic for the same year. Container vessels of 1,200 TEUs and 2,000 TEUs in loading capacity are revealed as the most economical sizes for the routes between Egypt and the West Mediterranean and between Egypt and the East Mediterranean and Black Sea.

(2) The Most Economical Size for Transshipment Container Traffic
The amount of transshipment container traffic on the long-sea routes connecting the ports of Damietta or Port Said with the one end of origin and destination accounts for 95.8% of a half of transshipment container traffic handled in 1997. On the above-mentioned long-sea routes, large container vessels of 3,000 TEUs in loading capacity are also revealed as the most economical size.

On the other hand, the amount of transshipment container traffic on the short-sea routes connecting the ports of Damietta or Port Said with the other end of origin and destination accounts for the remaining 93.3% of the other half of the transshipment container traffic for the same year. Container vessels of 1,200 TEUs and 2,000 TEUs in loading capacity are also revealed as the most economical sizes for these routes between Egypt and the East Mediterranean and between Egypt and the West Mediterranean and Black Sea.

13.6 Functional Allotment of Conventional Cargo Handling among the Mediterranean Ports in Egypt

In principle, conventional cargo should be handled at each port as long as the demand does not exceed the port capacity which could increase economically through additional investment in improvement of port facilities, procurement of cargo handling equipment and improvement of operational productivity.

13.7 Functional Allotment of Dry Bulk Cargo Handling among the Mediterranean Ports in Egypt

In principle, dry bulk cargo should be handled at each port as long as the demand does not exceed the port capacity which could increase economically through additional investment in improvement of port facilities, procurement of cargo handling equipment and improvement of operational productivity.

13.8 Functional Allotment of Liquid Bulk Cargo Handling among the Mediterranean Ports in Egypt

In principle, liquid bulk cargo should be handled at each port as long as the demand does not exceed the port capacity which could increase economically through additional investment in improvement of port facilities, procurement of cargo handling equipment and improvement of operational productivity.

14 Development Guidelines of the Mediterranean Ports in Egypt

14.1 General Development Guidelines of the Mediterranean Ports in Egypt

14.1.1 General Principles of Development

The volume of the local cargo through the three ports is expected to continuously increase in the future; projected total volume of cargo in the year of 2017 are 69.2 million tons (1.9 times as much as the volume in 1997) and 2.9 million TEUs (5.2 times as much as the volume in 1997) in local containers. At the same time, the potential demand of transshipment containers to be transshipped at the East Mediterranean hub-ports is forecast as 11.7 million TEUs per annum in 2017.

There is a shortage of the required infrastructure or cargo-handling machines, resulting in inefficient, costly and time-consuming cargo-handling operations and consequent long berth-waiting time at the three major ports.

Thus to resolve the present problems and meet increasing demand for handling conventional cargo and local and transshipment containers in the future, it is necessary to develop, re-develop or rehabilitate the Mediterranean Ports in Egypt, the Greater Alexandria, Damietta and Port Said Ports through coordinated development in view of effective use of the limited resources.

14.1.2 Alexandria Port

(1) General

Alexandria Port is handling a great portion of the conventional cargo in the country. Long, bulky and/or heavy cargo such as iron billets, steel bars, scraps and plant components need deeper berths with spacious aprons and open storage yards right behind them in order to achieve efficient cargo-handling operations. However, these cargoes are currently handled at the existing berths in the harbor mostly with narrow aprons and aged sheds behind them together with other conventional cargoes to be stored in sheds. Thus, on-dock cargo-handling operations are conducted in chaotic condition at these berths which are already close to be saturated, resulting in intricate cargo-handling within the port. In addition, barge operations at anchorage within the harbor basin are done for handling goods such as sawn timbers and dust. Such cargo-handling results in inefficient, costly and time-consuming operations.

To resolve the present problems in conventional cargo-handling and meet the increasing demand for handling long, heavy and/or bulky conventional cargoes, it is necessary to construct a new multi-purpose terminal with deep berths and spacious open yards in Alexandria Port by re-developing the existing aged wharf. Consequently, the preparation of the new terminal will reduce the congestion in the existing berths and generate benefits mainly from savings of berth-waiting costs of vessels at the off-shore anchorage.

(2) Local Container Handling

In order to meet the potential demand of handling local containers, it is essential to increase the capacity of Alexandria Port as much as possible by investing additional

super-structure and container-handling machines through making the most of the most of the existing infrastructure including berths, and then assign the excess containers to other Mediterranean ports including the Port Said East Port.

(3) Transshipment Container Handling
No transshipment containers will be assigned to Alexandria Port, considering its role of supporting the local container handling.

(4) Dry Bulk Cargo Handling
(Grain)
In the Greater Alexandria Port a large portion of grains are discharged at El Dekheila Port rather than Alexandria Port, due to the shallow berth at the Alexandria Harbor Grain Terminal. Since there are only two units of rail-mounted un-loaders at El Dekheila, however, a considerable volume of grains are discharged by using portable un-loaders in direct unloading onto truck wagons. This results in low grain-handling productivity less than 300 tons/hour/vessel, consequently all genera cargo berths except for container berths at El Dekheila are occupied by grain carriers.

In order to resolve the present problems and meet the increasing demand for handling grains, it is necessary to construct a new grain berth of 14m deep connected with the existing silos through conveyors to receive the Panamax-type grain carriers in the Alexandria harbors.

(Coal and Cokes)
The berth at the coal/cokes terminal are obsolete and shallow in the Alexandria Harbor. Nevertheless, Panamax-type coal carriers of around 69,000 DWT with a full draft of 13.3m and a length of 215 m once called the terminal in partly-loaded draft condition.

Coal/cokes could be transported inland by barges from/to El Dekheila by constructing new barge basin together with creation of new canals or breakwater between El Dekheila in the Alexandria Harbor. The plan, however, requires too gigantic resources compared with benefit to be justified. It is advisable to prepare deeper berths in front the existing berth line with moderate investment so as to receive larger coal cokes carriers at the existing coal/cokes terminal in the Alexandria Port.

(5) Liquid Bulk Cargo Handling
The five marine oil berths in the Petroleum Basin within the Alexandria harbor have sufficient capacity for Alexandria Petroleum Company for time of being, if the existing broken-down loading/un-loading arms will be replaced together with installation of required new pipelines connecting the berths and back-side refinery plants as planned by the company.

Within the free zone at Al Amariya, south of Alexandria where another refinery using the petroleum terminal of Alexandria Petroleum Company in the Alexandria Harbor is in operation, a new refinery is planned to be operated by MEDOR (Mediterranean Oil

Refinery) which is under establishment. The company also needs an outlet to export or import refined oil within the Greater Alexandria Port.

(6) Common Port Facility
To support quay-side cargo handling operations, it is necessary to rehabilitate, renew or construct common facilities such as port roads, open yards and vessel traffic management system (VTMS).

14.1.3 Damietta Port

(1) General
Damietta Port has several problems in container-handling , viz. Insufficient specifications of container gantry cranes to accommodate the gigantic main-line container vessels, lack of efficient operation system using computers, resulting in low container-handling productivity, etc. However, they will be able to be solved by moderate investment.

Damietta Port Authority is also struggling to keep the depth by continuous maintenance dredging by contract dredging through the year, and hence studying the feasibility on the optimum extension lengths of the existing breakwaters. The present lengths of the existing breakwaters placed in the wave-breaking zones seem likely to be short to avoid continuous dredging. The adequate countermeasure is essential to support the above-mentioned expansion project by enabling container vessels operated on regular schedule to receive at the port on time.

(2) Local Container Handling
While Damietta Port is expected to function as an international hub-port for serving container transshipment as it does at present, it needs some amount of local containers to stabilize the port management with other hub-ports. Thus, a portion of the excess local containers from Alexandria Port will be required to assign to Damietta in the future as well as Port Said Port.

(3) Transshipment Container Handling
Damietta Port is expected to increase the capacity of container-handling by less investment costs through using the existing infrastructure so as to attract a some portion of the potential demand for handling transshipment containers towards the year 2017 in the East Mediterranean and the Black Sea. Needless to say, much more transshipment container demand is expected to be attracted by Port Said East Port.

14.1.4 Port Said Port

(1) Local Container Handling
Port Said Port is also requires to serve local containers with priority as well as Alexandria Port, because the port has it own hinterland, Port Said Port city, amounting to 48.1% in 1997 in its local container market and has some constraint in available navigational time causing from interference with south-bound convoy passing through Suez Canal in functioning as an international hub-port for container transshipment in the next century.

(2) Transshipment Container Handling
Port Said Port is expected to handle transshipment containers up to its container-handling capacity, only if there remains room except for handling local containers.

14.2 General Improvement Guidelines of Port Management and Operations

14.2.1 General Principles of Port Management and Operations

Port authorities should focus on the following three points for port management and operation to attract port users, especially foreign shipping lines.

(1) Efficient services
High productivity of cargo handling, seamless smooth operation and speedy procedure for cargo clearance are necessary. These encourage port users to minimize the cost of transport through a port.

(2) Reliability and availability of port facilities
Port facilities and cargo handling equipment must be well maintained so that port users can make full use of facilities and equipment. Breakdown time must be minimized. Storage facilities should be properly designed to prevent cargo damages. Security measures for cargoes or countermeasures against pilferage must be taken effectively. Cargo handling operation must be precise, careful and safe.

(3) Reasonable tariff
Port charges should be competitive but must cover the cost of construction, management and maintenance of port facilities. Furthermore, tariff structure should encourage port users to use port facilities efficiently.

14.2.2 Promotion of Private Participation and Implementation of Privatization of the State-owned Companies in the Port Sector

Above mentioned problems are mainly derived from the monopoly of the state-owned companies. So far only one company has been allowed to perform the port service in each port sector. There is no competition with other private companies. No competition results in high port charges and low cargo handling productivity. Port users can not help using the Egyptian Ports even if they are not satisfied with the services. On the other hand, state-owned companies are enjoying profits and there is no incentive or motivation for them to improve the quality of the services. If a competitor emerges, port users are likely to receive an improved quality of services at lower costs. Recent decrees (including Decree no.30, May 1998) on private participation in the maritime sector could dramatically change the monopolistic operations by the state-owned companies. Together with the promulgation of the decrees, the Government announced its intention to privatize the state-owned companies in the maritime sector.

14.2.3 Establishing of Integrated Terminal Operator for Stevedoring

As for handling conventional general cargoes, it is essential to promote the establishment of integrated private terminal operators with enough capital and ability to perform comprehensive port terminal operations including stevedoring, warehousing and trucking.

The port authorities should divide port areas into several zones and designate some zones as port terminals. Each terminal should have the appropriate size for such operations and include berths for preferential use and warehouses and open storage yards for exclusive use. Port authorities should give port terminal operators the concessions to use the terminals on an auction basis. They are expected to provide smooth and seamless operation with reduced costs for port users. If several port terminal operators emerge besides the existing state-owned stevedoring and warehouse companies to be privatized, competition among all of the port terminal operators will be activated and their service levels will be upgraded.

14.2.4 Setting the Tariff Level Freely

To assure competition in the port sector, private companies should be entitled to decide the charges of their services freely based on negotiations with their customers, especially concerning the shipping agent fee/commission and other charges paid by a shipping line. Concerning the fees charged by a port authority, e.g. port dues, berthing dues, pilotage and towage, it is necessary for MOMT to set the upper limit of the charges. MOMT should allow port authorities to decide the charges freely below this maximum level considering those of the ports in the neighboring countries. It is also necessary to compete among Egyptian ports concerning the tariff level.

PART III

MASTER PLAN

15 Master Plan of the Greater Alexandria Port

15.1 The Basic Concept for Master Plan of the Greater Alexandria Port

The purpose of the Master Plan (target year 2017) is to serve as a target and guidelines for phase plans including the Short-term Plan (target year 2007). The Master Plan shall be an integrated plan covering the layout plans for a multi-purpose terminal, a deep water coal berth, a grain terminal modernization, a new port road bridge and effective management and operation systems. In making the Master Plan of the Greater Alexandria Port, the following various aspects are recognized.

15.1.1 Local Container Handling

To meet the large potential demand, it is necessary to increase the capacity of the Greater Alexandria Port as much as possible by investing additional super-structures and additional container-handling machines through making the most of the currently existing infrastructures including berths, and to allocate the excess containers to other Mediterranean ports including Port Said East Port.

15.1.2 Conventional General Cargo Handling

To resolve present problems in conventional-cargo handling and meet the increasing demand for handling long, heavy and/or bulky conventional general cargoes, it is necessary to construct a new multi-purpose terminal with deep berths and spacious open yards aiming at handling mainly long, heavy and/or bulky conventional cargoes in the Greater Alexandria Port by re-developing the existing berths, thereby reducing berth waiting costs of vessels in the off-shore anchorage.

15.1.3 Dry Bulk Cargo Handling

(1) Grain

To resolve present problems and meet the increasing demand for handling grains at the Greater Alexandria Port, it is necessary to construct a new 14m-deep-berth that will be connected with the existing silos through conveyors to receive panamax-type grain carriers in Alexandria Harbour.

(2) Coal and Coke

The berths at the coal/coke terminal in Alexandria Harbour are obsolete and shallow. Nevertheless, panamax-type coal carrier of around 69,000 DWT with a full draft of 13.3m and a length of 215m once called at the terminal on partially-loaded condition. It is advisable to prepare a deeper berth in front of the existing berth line with moderate investment so as to receive larger coal carriers at the existing coal/coke terminal in Alexandria Harbour.

15.1.4 Liquid Bulk Cargo Handling

The five marine oil terminals in the Petroleum Basin within Alexandria Harbour have sufficient capacity for the Alexandria Petroleum Company for the time being, if the existing broken-down loading/unloading arms are replaced together with the installation of new pipelines connecting the berths and back-side refinery plants of the company.

15.2 Zoning of Port Activities in Alexandria and El Dekheila Harbour

Each part of the port districts should be characterized by the future port activities and separately marked with zoning. This zoning will determine each port district characteristics. Seven types of zones: i) conventional cargo zone, ii) conventional cargo (long, heavy and bulky) zone, iii) container zone, iv) dry bulk cargo zone, v) liquid bulk cargo zone, vi) dangerous cargo zone, and vii) service boat zone are assumed so as to formulate Master Plan of the Greater Alexandria Port.

15.2.1 Alexandria Harbour

A basic concept for zoning of Alexandria Harbour is to separate conventional (long, heavy and bulky) cargo handling activities from the remaining conventional cargo handling activities. Because all conventional cargoes are mixed up and presently handled at the same general cargo berths with narrow aprons, which results in significantly low cargo handling productivity. Additionally, specialized cargoes such as dry bulk cargo and liquid bulk cargo should be handled separately from conventional cargo and containers as they are presently handled at the petroleum terminals, the grain terminals, and the mineral (iron pellet, coal and cokes) terminals.

15.2.2 El Dekheila Harbour

A basic concept for zoning of El Dekheila Harbour is to continuously handle dry bulk cargo (iron pellet, coal and grain) and containers as they are handled at present. Since the berths (berth nos.92-1, 92-2 and 95-1 through 95-3) are to be available in the future, those berths are grouped and identified as “conventional cargo zone” to separately handle conventional (long, heavy and bulky) cargo from Alexandria Harbour. “Dangerous cargo zone” (sulfur, fertilizer, other liquid) is placed at the north end (berth nos.98, 99-1 and 99-2) of El Dekheila Harbour apart from the other cargo handling activities.

15.3 Container Handling

15.3.1 Target Volume of Containers to be handled at the Greater Alexandria Port in 2017

Total volume of containers to be handled at the Greater Alexandria Port is estimated at 1.5 million TEUs in 2017. Concerning detailed assignment of containers among the container terminals and Ro-Ro berths within the Greater Alexandria Port in 2017, 0.45 million TEUs and 0.05 million TEUs of containers are expected to be handled at Alexandria Container Terminal and Ro-Ro berths respectively in Alexandria Harbour. The remaining one (1.0) million TEUs of containers are expected to be handled at El Dekheila Container Terminal.

15.3.2 Requirement of Additional Container Handling Facilities

(1) Alexandria Container Terminal

There is no space to expand the existing container terminal at the same place. However, cargo handling equipment would be in short supply for efficient operations in 2017, even though no additional infrastructure is expected. It is recommended that one (1) additional

QGC, eight (8) additional RTGs and 20 units of tractor-trailers should be installed so as to efficiently handle 450,000 TEUs of containers in 2017.

(2) El Dekheila Container Terminal

It is recommended that three (3) additional QGCs, 21 additional RTGs and 30 units of tractor-trailers should be installed so as to efficiently handle 1.0 million TEUs of containers in 2017. Consequently, a relatively-small amount of investment on container handling equipment is essential for the future utilization and development of El Dekheila Container Terminal.

15.4 Conventional Cargo Handling

15.4.1 Target Volume of Conventional Cargo to be handled at the Greater Alexandria Port in 2017

Total volume of conventional cargo to be handled at the Greater Alexandria Port is estimated at 13.0 million tons in 2017. Bagged cargo (sugar, rice, flour , etc.) and bundled cargo (sawn timber and steel products) are expected to increase steadily up to the year 2017. Rolled paper and miscellaneous conventional cargo are expected to increase steadily up to the year 2007, then to start decreasing moderately due to the further progress of containerization.

15.4.2 Requirement of Additional Conventional Cargo Handling Facilities

In order to achieve efficient conventional cargo handling operations and meet the future conventional cargo demand, it is essential to build six (6) 14 m-deep berths with spacious open yards of approximately 170,000 sq.m. Two (2) units of multi-purpose QGCs of which under-spreader lifting capacity is 40 tons are required to be installed to secure an efficient operation for handling extremely heavy cargoes and/or heavy bulky bare cargoes such as plant components, heavy vehicles, etc. While the requirement and the existing amount of covered area of sheds and warehouses nearly balances out, a covered area of approximately 12,000 sq.m is additionally required. One hundred twenty six (126) units of forklifts are also required to be introduced for an efficient cargo handling operation.

15.5 Dry Bulk Cargo Handling

15.5.1 Target Volume of Dry Bulk Cargo to be handled at the Greater Alexandria Port in 2017

Dry bulk cargo to be handled at the Greater Alexandria Port is expected to increase to 16.5 million tons (annual growth rate of 2.0% for the next ten years) in 2017.

15.5.2 Requirement of Additional Dry Bulk Cargo Handling Facilities

(1) Grain Handling

There exists available silos behind the existing grain terminals in Alexandria Harbour. Accordingly, it is recommended that an additional 14.0 m-deep grain berth with two (2) units of highly efficient grain un-loaders (nominal productivity of 1,000 tons/hour/un-loader) should be built connecting to the usable existing silos.

(2) Mineral (Iron Pellets, Coal and Coke) Handling
Partially-loaded 65,000 DWT-class bulk carriers transporting “coal” could be fully loaded and save their transport costs, if the coal berth (no.63/64) were to be deepened to 14.0 meters. It is recommended that the existing coal berth (no.63/64) should be deepened and utilize the existing structure with less investment.

(3) Dangerous Cargo (Sulfur and Fertilizer) Handling
Sulfur is presently handled together with fertilizer at the berths (nos. 65 and 66). These berths are located nearly at the center of the Alexandria Harbour and in front of the densely-populated city area. Dangerous cargo should be handled separately from flammable cargoes and located apart from the densely-populated area. Accordingly, it is recommended that those dangerous cargoes be assigned to the berths (nos.98 and 99-1) in the El Dekheila Harbour.

15.6 Liquid Bulk Cargo Handling

15.6.1 Target Volume of Liquid Bulk Cargo to be handled at the Greater Alexandria Port in 2017

Total volume of liquid bulk cargo to be handled at the Greater Alexandria Port is estimated at 6.5 million tons in 2017. Petroleum oil and grease are expected to increase moderately up to 2017. Molasses are expected to increase relatively rapid, while edible oil seems to decrease in the future.

15.6.2 Requirement of Additional Liquid Bulk Cargo Handling Facilities

It is examined whether the existing berthing facilities for liquid bulk cargo would be sufficient to handle the future volume, assuming that the reasonable rate of future productivity in case that loading arms and pipelines are to be modernized. Consequently, no additional berthing facility (infrastructure) is needed besides modernization of the existing aged loading arms and pipelines (superstructure).

15.7 Common Port Facilities

15.7.1 Port Road Networking

Port-related cargo traffic to/from the Greater Alexandria Port is suffering from heavy traffic congestion which is caused by together with heavy city traffic through downtown area in Alexandria city. Port-dedicated fly-over road behind the port from the gate no.27 to evacuate port-related cargo traffic apart from the heavy city traffic is now under construction so as to release both port-related and city traffic congestion. This road leads to Cairo through either “the Agricultural Road” or “the Desert Road”, and is expected to smoothly evacuate port traffic to/from the Alexandria Harbour. However, if heavy weight trucks should be still prohibited to ran across the aged port road bridge, the expected benefit of this road would be lost to a considerable extent. Therefore, this aged port road bridge is required to be re-constructed.

15.7.2 Waste Oil Receiving Facility

The Greater Alexandria Port has no independent treatment facilities either to treat the bilge waste or the ballast waste from the ships and oil tankers. Consequently, the port waters is visibly polluted with floating oil and others. It is also required to introduce a waste oil processing plant at the Greater Alexandria Port in order to properly prevent the sea water pollution by processing the ship waste oil.

15.7.3 VTMS (Vessel Traffic Management System)

VTMS which covers all the area of the Greater Alexandria Port including El Dekheila Port was installed and used at the port control tower. However, the system is out of order now. It has also become old-fashioned so there is no point in repairing it. Navigation control is currently conducted through VHF between the control center and each ship. It is possible to monitor the movement of vessels after vessels come into sight. But there is no visual aid while vessels are out of sight. Furthermore, it is very difficult to monitor the vessels' traffic during night time and bad weather. It is necessary to introduce an advanced VTMS to accommodate the increasing vessel traffic in the near future.

15.8 Multipurpose Terminal Project

15.8.1 Proposed Plan

(1) Dimensions of the Proposed Plan

Major components of the proposed plan are i) six (6) multipurpose berths of which water depth is 14.0 m and total length is 1,440 m, ii) spacious open yards whose total area is 170,000 sq.m, iii) two units of sheds whose total covered area is 12,000 sq.m, iv) two (2) units of multipurpose QGCs, v) dedicated road merging to the existing fly-over, vi) dredging of ship-maneuvering area of which total volume is approximately 70,000 cu.m, and vii) 36 units of forklifts (24 units for lifting capacity of 5 tons and 12 units for 3 tons).

Table 15.8.1 Major Components of the Proposed Multipurpose Terminal Project

Project Component	unit	Infrastructure	Superstructure	Equipment
1. Multipurpose Berths (-14.0m*240m)	(berth)	6	---	---
2. Open Yards	(sq.m)	170,000	---	---
3. Sheds	(sq.m)	12,000	---	---
4. Multipurpose QGC	(unit)	---	2	---
5. Dedicated fly-over road	(m)	360	---	---
6. Dredging of Ship Maneuvering Area	(cu.m)	70,000	---	---
7. Forklifts	(unit)	---	---	36

(2) Open Yards and Sheds

The spacious open yards of which total area is 170,000 sq.m are located behind the berth. Also, two units of the sheds of which total covered area is 12,000 sq.m are located behind the northern end of the reclaimed area.

(3) Dedicated Fly-over Road merging to the Existing Fly-over

The new multipurpose terminal needs good road connection through the existing fly-over between the new terminal and the port gate (no.27). The existing road along the eastern fence of the coal/coke terminal is presently being expanded to four-lane-road. However,

one (1) outbound lane by fly-over structure is required to exclusively merge with the existing fly-over so as to smoothly evacuate port traffic to/from the new terminal.

(4) Dredging the Ship-Maneuvering Area up to 14.0 meter below CD.
Two (2) ship-maneuvering basins are planned at the water area between the coal/coke terminal and the grain terminal in Alexandria Harbour. These basins are to be designed for the fully-loaded 65,000 DWT-class dry bulk carriers transporting “coal” and “grain”. Since LOA of this dry bulk carrier is 230 meters, diameter of ship-maneuvering circle is to be determined as 460 meters (twice as long as 230 meter). One of the ship-maneuvering basins, which is expected to be commonly used by both general cargo vessels and dry bulk carriers, is located off the eastern end of the new terminal area.

(5) Forklifts
Thirty six (36) units of forklifts (24 units for lifting capacity of 5 tons / 12 units for lifting capacity of 3 tons) are required to be introduced to ensure an efficient conventional cargo handling operations. Stevedoring companies are responsible to introduce these forklifts at each terminal.

15.8.2 Conventional Cargo Handling System

(1) Quay-side Loading/Unloading Operations
Concerning the berth assignment for the new multi-purpose terminal, two berths are assigned to sawn timber, another two berths to steel products, and the remaining two berths to miscellaneous cargoes to be stored either in the shed or at the open yard. In case of conventional cargo handling, quay-side loading/unloading operations are generally performed with ship’s cranes/derricks or mobile shore cranes. However, two units of multi-purpose QGCs of which under-spreader capacity is 40 tons are planned to be installed to secure an efficient operation for handling extremely heavy cargoes and/or heavy bulky bare cargoes such as plant components, heavy vehicles, etc. Additionally some kinds of attachments are required to enable to lift various kinds and shapes of above-mentioned heavy bulky cargoes.

(2) Open Yard Operations between the Quay and the Open Yard.
In handling heavy bulky conventional cargo such as sawn timber, steel products, etc., large apron and sorting/storing yards are needed for smooth operation. It is also necessary to use pallets for landing cargoes on the quay so that forklifts could pick up, carry and sort the landed cargoes and store them in the sheds and/or at the spacious open yard behind the quay. In particular, bagged cargo such as fertilizer and sugar, must be handled with pallets to increase the throughput. Therefore, it is recommended that the sufficient number (36 units) of the forklifts should be introduced for this terminal.

15.9 El Mahmudiya Quay Re-development Project

There are presently hundreds of damaged containers behind the warehouses (nos.44, 45, 46 and 47) within the El Mahmudiya Quay area. Consequently precious land space is not utilized in this area to a full extent. On the other hand, the berths (nos.39 and 40 with water depth of 10.0 meters) next to the Ro-Ro berth (no.41) would be suitable for

handling “long, heavy and/or bulky conventional cargoes”, if the warehouses (no.44 and 45) were to be demolished.

Miscellaneous cargoes to be stored at the open yard are assigned to the berths (nos. 39 and 40). Those cargoes are expected to be handled by forklifts at the apron as well as the open yard where the warehouses (nos. 44 and 45) are to be removed. 12 units of the forklifts are essential to secure an efficient cargo handling at the El Mahmudiya Quay.

15.10 New Port Road Bridge Project

Since the port road bridge on the lock between the berth no.32 and no.33 is aged and poorly-maintained as mentioned, heavy weight trucks are presently prohibited to ran across the bridge resulting in detour traffic through downtown and consequent heavy traffic congestion in the Alexandria city area. In order to fully utilize the port-dedicated road now under construction behind the port gate no.27, reinforcement of this bridge or a new bridge construction are essential.

The hourly maximum one-directional traffic is estimated at 399 (vehicles/hour/direction), which implies that one (1) lane is required compared with the standard maximum hourly traffic volume per lane of 600 (vehicles/hour/lane). However, two (2) lanes for each direction should be planned taking into account of the case of emergency.

15.11 Deep Water Coal Berth Project

The new deep water coal berth is expected to accommodate fully-loaded 65,000 DWT-class dry bulk carriers (LOA is 230 (m) and moulded breadth is 32.2 (m)). Therefore, the required berth length and depth are 270 meters and 14.0 meters respectively. Additionally, it is recommended to utilize the existing infrastructure and handling and storing facilities so as to minimize the investment costs. The maximum additional extendable width of the berth without replacing the existing rail-mounted unloaders is examined and estimated at 10.0 meters, keeping the grabs reach approximately two thirds of the ship width.

15.12 Grain Terminal Modernization Project

The new grain terminal is expected to accommodate fully-loaded 65,000 DWT-class dry bulk carriers (LOA is 230 (m) and moulded breadth is 32.2 (m)). Therefore, the required berth length and depth are 270 meters and 14.0 meters respectively. A jetty-type structure of about 20 meters in width may be sufficient for a fully-automated grain terminal. However, the terminal will be used more flexibly with spacious back-up yards in case of maintenance and/or emergency. Therefore, the enclosed area by the existing breakwater and the new grain berth is recommended to be reclaimed and used as back-up yards.

Two (2) units of the efficient mechanical un-loaders of which nominal productivity is 1,000 (tons/hour/un-loader) are required to simultaneously be assigned to one ship so as to ensure an efficient grain cargo handling. Mechanical un-loaders of which nominal

productivity is 1,000 (tons/hour/un-loader) are also required to ensure the same productivity of the un-loaders installed at berth (no.94-2). Conveyor of 750 meters in length connecting the new grain berth and the existing silos is required so as to utilize the existing silos to a full extent.

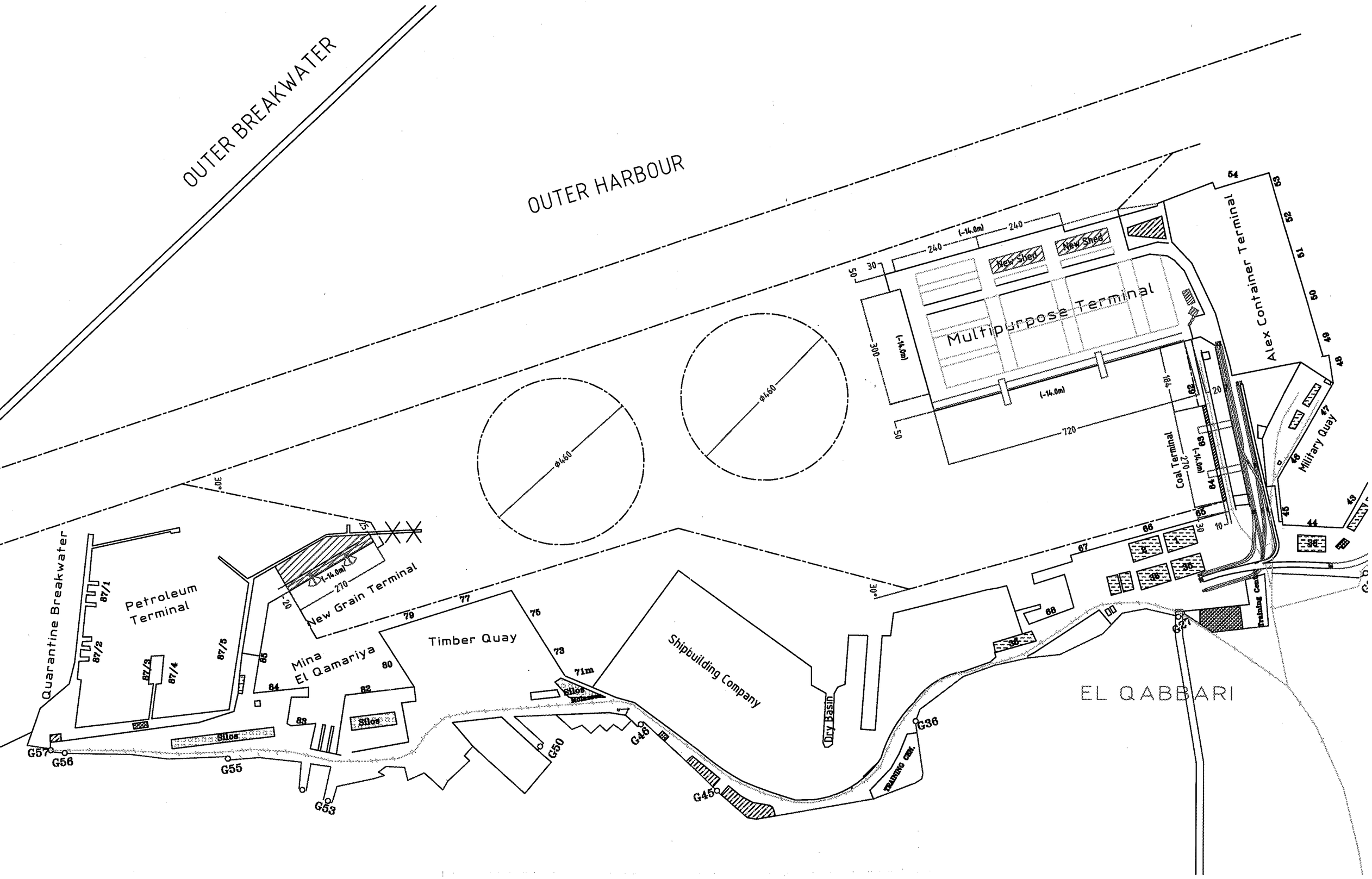


Figure 15.8.1 Layout Plan of Multi-purpose Terminal Master Plan

16 Preliminary Cost Estimation

16.1 Preliminary Structural Design

The port facilities comprise of various port structures. It is necessary to clearly set forth the design conditions in determining suitable type of structures, their structural dimensions and construction materials. Among others, the subsoil conditions at the designated project area for facilities are one of the major factors for executing preliminary design of port facilities.

The subsoil condition within the center zone of Alexandria port area is composed of very soft clayey layers up to the depth of the bearing stratum which would exist at an elevation between -23 to 28 meters. Although the consistency of these very soft layer deposits is uncertain, it would be assumed to be soft or organic clayey soils having a very low N-value, probably 0-2. In this design study for the master plan, therefore, an assumption that those soft deposits at the center zone of Alexandria Port would uniformly exist at each respective project area is made to the subsoil conditions to be used for designing port facilities

(1) Multi-purpose Terminal
Prior to the construction of berth line substructure, the existing soft subsoil deposit along the berth line of the terminal at this zone must be artificially improved by such soil improvement as subsoil replacement, pre-loading or hardening treatment mixed by cement material or others. In this study, sand replacement method for subsoil improvement is applied along the proposed berth line. This subsoil replacement by sandy materials is implemented to obtain the sufficient stability of circular sliding of subsoil slopes and/or the bearing capacity of base mound to receive the gravity type of structures.

Considering typically adopted method of construction by APA and other types of structures, the following three types of construction have been selected as alternatives of berth line structure at multi-purpose terminal.

Alternative-1: Concrete Block Gravity Type of Quay Wall
Alternative-2: Concrete Caisson Gravity Type of Quay Wall
Alternative-3: Open Deck Type Steel Pipe Piles Pier

As a result of comparing the alternatives, it is recommended that the traditional type of concrete block gravity wall would be the most suitable to be used for construction.

New access bridge from the terminal will be constructed from the point behind the berth no. 62 and by flying over the existing railway installation to be connected to the existing

elevated inner main port road. This access bridge will be constructed by superstructure of reinforced concrete slab and girder spanning 15 meter. The total length of fly-over is estimated 360 meters.

(2) Deep Water Coal Berth

Considering the structural stability of existing quay wall during deepening the water depth by dredging, the following 3 type of open deck pier structures are selected as alternatives of quay front structures.

Alternative-1: Detached Pier Type provided at a certain intervals
Alternative-2: Open Deck Type Continuous Pier with Underwater Steel Pipe Piles Retaining Walls
Alternative-3: Batter Pile Open Deck Type Continuous Pier

As a result of comparing the alternatives, it is recommended that batter pile open type continuous pier would be the most suitable to be used for construction of deep water coal terminal project.

(3) Grain Terminal

It is assumed that the soft subsoil having the same properties as those at the center zone exist upon the bearing stratum which would be located at an elevation of DL - 25 meters approximately. In this area, the subsoil replacement by sandy materials is also considered and the following three types of structure have been selected as alternatives of grain terminal wharf structure.

Alternative-1: Concrete Block Gravity Type of Quay wall
Alternative-2: Concrete Caisson Gravity Type of Quay Wall
Alternative-3: Steel Pipe Pile Open Deck Pier Type

Among others, each optional type of berth line structure has various advantages and disadvantages. And, as a result of comparing the alternatives, it is recommended that the traditional type of concrete block gravity wall would be the most suitable to be used for construction.

(4) New Port Road Bridge

New bridge to be constructed will be 90m length of spanning so that the bridge foundation structure could be built besides the existing facilities without any disturbance to the retaining wall and canal gate structure. Therefore, considering long spanning of bridge, a steel truss superstructure will be considered one of the most applicable type of bridge supersturcture.

16.2 Preliminary Cost Estimation

16.2.1 Basic assumption for Cost Estimation

(1) Unit Price and Exchange Rate

The project costs are estimated based on the unit prices as of May, 1998 and the foreign currency exchange rate 1 US$ = 3.4 L.E. (Egyptian Pound) is applied.

(2) Dredging and Pre-dredging Works

The seabed quality survey at the port of Alexandria shows that the seabed material around this proposed dredging area is heavily contaminated with high level of heavy metals. Therefore, subsurface materials to be dredged must be dumped into such specially confined area as contaminated material dumping area. In this study, it is assumed that high level of heavy metals exist in the sea bottom surface of 1 meter depth and therefore the dredged materials only from 1 meter depth of the sea bed surface are considered to be disposed into the contaminated material dumping area . The other dredged materials will be planned to dispose to an offshore open sea area.

In order to dispose the dredged materials of about 0.8 million cubic meters contaminated with high level of heavy metals, a confined water area of about 300 meters squared area will be prepared in the inner port beside of the existing breakwater of Alexandria port. Along the periphery of this water area, an embankment by means of double sheet pile walls will be planned to construct to confine the contaminated dredged subsoil.

16.2.2 Construction Cost

Each project cost including alternative layout plans for multipurpose terminal and alternative types of berth structures is broken down into cost item of civil works and the procurement costs of cargo handling equipment as presented in Tables of 16.2.1 to 16.2.4. In costing construction costs, the engineering fee for the detailed design and construction supervision amounting of 10% for civil works and 3% for procurement and, in addition, the physical contingency by 10% for civil works and 3% for procurement are included in the cost estimates by this study.

Table 16.2.1 Cost Summary of Multipurpose Terminal

Layout Plan		Structural Type		Cost		F/C Portion	
				L.E	Cost Ratio		L.E
1	Altnative-1 (400X720m)	Alt. 1	Concrete Block	494,159,000	1.00	32%	158,049,000
		Alt. 2	Concrete Caisson	537,083,000	1.09	37%	198,208,000
		Alt. 3	Open Type	599,200,000	1.21	45%	267,211,000
2	Alt. 2 (320X960m)	Alt. 1	Concrete Block	586,120,000	1.19	31%	182,317,000
		Alt. 2	Concrete Caisson	646,253,000	1.31	37%	237,940,000
		Alt. 3	Open Type	744,319,000	1.51	44%	330,482,000
3	Alt. 3 (250X1200m)	Alt. 1	Concrete Block	638,405,000	1.29	31%	198,244,000
		Alt. 2	Concrete Caisson	676,013,000	1.37	38%	259,067,000
		Alt. 3	Open Type	812,268,000	1.64	45%	363,102,000

Table 16.2.2 Construction Cost of Coal & Coke Berth

Alternative	Structural Type	Cost		F/C Portion	
		L.E	Cost Ratio		L.E
1	Detached Pier	34,514,000	1.27	53%	18,312,000
2	Open Pier with S.P.P.Slope Protectio	27,956,000	1.03	63%	17,582,000
3	Open Pier	27,087,000	1.00	64%	17,438,000

Table 16.2.3 Construction Cost of New Grain Berth

Alternative	Structural Type	Cost		F/C Portion	
		L.E	Cost Ratio		L.E
1	Concrete Block Gravity Wall	134,841,000	1.00	53%	76,177,000
2	Concrete Caisson Gravity Wall	152,548,000	1.13	63%	86,308,000
3	Open Pier	152,548,000	1.13	64%	17,438,000

Table 16.2.4 Construction Cost of Other Facilities

Facility		Structural Type	Cost		F/C Portion	
			L.E	Cost Ratio		L.E
1	New Bridge	Steel Truss (span length of 90 m)	9,752,000		33%	3,184,000
2	Vessel Traffic Management System (VTMS)		2,862,000		64%	2,479,000
3	Waste Oil Receiving Facility		1,060,000		87%	918,000

17 Preliminary Economic Analysis

17.1 Purpose and Methodology

A preliminary economic analysis is conducted to appraise the economic feasibility of the Master Plan for the Greater Alexandria Port before conducting a feasibility study of the Short-term Development Plan. The preliminary economic evaluation of a project should show whether the project is justifiable from the viewpoint of the national economy by assessing its contribution to the national economy.

Preliminary economic analysis will be carried out according to the following method. Master Plan will be defined and it will be compared to the “Without the project” case (hereinafter referred to as the “Without” case). All benefits and costs in market price of the difference between “With the project” case (hereinafter referred to as the “With” case) and “Without” case will be calculated and evaluated. In this study, the economic internal rate of return (EIRR) and the benefit/cost ratio (B/C ratio) based on a cost-benefit analysis are used to appraise the feasibility of the project.

17.2 Prerequisites for Economic Analysis

(1) Base Year
The “Base Year” here means the standard year in the estimation of costs and benefits. In this study, 1998 is set as the “Base Year”.

(2) Project Life
The period of calculation (project life) in the economic analysis is assumed to be 30 years from starting year of construction, taking into consideration the depreciation period of the main facilities.

(3) Foreign Exchange Rate
The exchange rate adopted for this analysis is US$ 1.00 = LE 3.40 = ¥ 136.00 (as of May 1998), the same rate as used in the cost estimation.

(4) “With” Case and “Without” Case
In the preliminary economic analysis, the four projects, Multipurpose Terminal Project, Grain Terminal Modernization Project ,Deep Water Coal Berth Project and New Port Road Bridge Project are assessed individually.

A cost-benefit analysis is conducted on the difference between the “With” case where investment is made and the “Without” case where no investment is made. In other word, incremental benefits and costs arising from the proposed investment are compared.

Following conditions are adopted as the "Without" case for each project.

1) Multipurpose Terminal Project
   a) No investment is made for the port. (Multipurpose terminal is not constructed.)

b) The working efficiency of cargo handling is not the same as the “With” case.

2) Grain Terminal Modernization Project
   a) No investment is made for the port. (A new grain terminal is not constructed.)
   b) The working efficiency of cargo handling is not the same as the “With” case.

3) Deep Water Coal Berth Project
   a) No investment is made for the port. (The coal terminal is not improved.)
   b) Coal berth is not deepened from present level.
   c) The size of vessels is the same as the "With" case, but the unit load per vessel is not the same.

4) New Port Road Bridge Project
   a) No investment is made for the port. (A new port road bridge is not constructed.)
   b) The time and distance required for the land transportation is not the same as the “With” case.

17.3 Costs of the Projects

The following items are identified as costs of the Master Plan.
(1) Construction and dredging costs
(2) Maintenance costs
Above costs are shown in Table 17.3.1.

Table 17.3.1 Result of Cost Calculation (Unit: thousand LE)

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
Construction costs	494,159	134,841	27,087	9,752	665,839 (669,761)
Maintenance costs	200,778	159,655	7,585	2,730	370,748 (375,140)
Total	694,937	294,496	34,672	12,482	1,036,587 (1,044,901)

Note: ( ) *is calculated based on the total costs including VTMS and Waste Oil Receiving Facility.*

17.4 Benefits of the Projects

As benefits brought about by the master plan of the study port, the following items are identified. And benefits are shown in Table 17.4.1.
(1) Savings in ship staying costs at a berth
(2) Savings in ship waiting costs at an offshore anchorage
(3) Savings in sea transportation costs
(4) Savings in land transportation costs

Table 17.4.1 Result of Benefits Calculation (Unit: thousand LE)

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
Savings in ship staying costs	46,803	73,305	0	0	120,108
Savings in ship waiting costs	3,150,769	856,041	0	0	4,006,810
Savings in sea transportation costs	0	0	333,090	0	333,090
Savings in land transportation costs	0	0	0	50,290	50,290
Total	3,197,572	929,346	333,090	50,290	4,510,298

17.5 Results of Preliminary Economic Analysis

(1) Calculation of the EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project. The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. The results of the EIRR calculation are shown in Table 17.5.1.

Table 17.5.1 Result of EIRR Calculation (Unit: %)

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
EIRR	19.8	20.3	36.3	15.9	20.6 (20.5)

Note: ( ) *is calculated based on the total costs including VTMS and Waste Oil Receiving Facility.*

(2) Calculation of the Benefit/Cost Ratio

The benefit/cost ratio is obtained by dividing the benefit by the cost. The results of the B/C are shown in Table 17.5.2. The discount rate adopted for calculation of B/C is 10% in this study.

Table 17.5.2 Result of B/C Calculation

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
B/C	1.83	1.67	3.58	1.50	1.86 (1.84)

Note: ( ) *is calculated based on the total costs including VTMS and Waste Oil Receiving Facility.*

(3) Calculation of the Net Present Value (NPV)
The results of the NPV calculation are shown in Table 17.5.3.

Table 17.5.3 Result of NPV Calculation (Unit: thousand LE)

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
NPV	438,227	112,471	72,499	5,062	628,259 (623,188)

Note: ( ) *is calculated based on the total costs including VTMS and Waste Oil Receiving Facility.*

17.6 Evaluation of the Projects

The resulting EIRRs of the four projects and whole project are in the range of 15.9% - 36.3%, exceeding the general criterion used to assess economic justifiability, and all B/C ratios are greater than one. All of the NPVs also show plus value.

Therefore, all projects proposed in the master plan are considered to be feasible from the viewpoint of the national economy.

18 Improvement Plan of the Port Management and Operation

18.1 Alexandria Port Authority

18.1.1 Background on Management, Operations and Institutional Matters of Alexandria Port

Although Alexandria Port is a landlord port, cargo-handling operations have not necessarily been efficient. This has presumably resulted from monopolistic operations by the state-owned companies. Private companies had been allowed to conduct only limited operations. However, recent decrees (including Decree No.30, May 1998) on private participation have dramatically changed this situation. Private companies are now able to participate in various maritime works including loading/discharging works, storage/warehouses activities, container activities and shipping agency services if they satisfy the conditions stipulated by the decrees.

18.1.2 Monitoring the Performance of Operators

Based on the new policy, law and regulations, private companies are allowed to perform cargo-handling operation. APA should monitor the performance of operators and recommend the improvement of productivity if the performance is poor and reject the renewal of lease contract if improvement is not expected.

18.1.3 Financial Independence of Port Authority

Currently revenues derived from port activities are transferred to the central government and spent for other sectors' development. Concerning operational expenses, APA receives a budget from the central government. Every year APA has to negotiate with the central government to decide the budget for APA. Therefore APA can not spend its budget flexibly, timely or effectively in accordance with requirements. It is necessary to ensure that APA is independent or self-sustainable financially. APA should have the freedom to borrow money from commercial banks or issue bonds when funds for investment are required.

18.2 Reorganization to Encourage Competition in the Port Sector

18.2.1 Private Participation and Privatization of State-Owned Companies

To improve cargo handling efficiency, it is necessary to introduce competition in the field of cargo handling operation. According to the new law, private companies can perform stevedoring operation using mechanical equipment at quay.

As a method of privatization of state-owned companies, Egyptian Government opted to sell their shares to the public. If capital gain or dividend is not expected due to the poor performance of the company, nobody might be interested in subscribing for the shares. Therefore, the performance of the company must first be improved to attract potential investors.

To improve the service level, even after the majority of shares is handed over to the public, the Government should not remain the largest shareholder. If investors were to hold enough stakes to participate in management of the company, they would demand that a customer-oriented approach be adopted from the top management to the lowest level of employees to earn profit.

18.3 Improvement of Container Handling Operation

18.3.1 Necessary Measures to Achieve the Targeted Productivity

It is required to achieve the targeted productivity (24 boxes/hour per crane) of container loading/unloading operation to handle the future container traffic in the existing facilities. In order to do so, following measures shall be promoted.

1) In case of unloading, a crane operator has to know in advance the location of containers to be lifted in a hold or on deck.
2) An operator of quayside crane should not stop a spreader to find a container to be lifted.
3) The operator has to put a spreader on a container exactly and should not hit a spreader or container against other containers.
4) A crane operator should move a spreader at the appropriate and constant speed to prevent the sway of containers.
5) Drivers of yard tractors should cooperate with a crane operator to minimize delay at the interface between a quayside crane and stacking area to achieve the targeted productivity.
6) In case of loading operation, before arrival of a vessel, it is necessary to get together and stack containers to be loaded in accordance with the stowage bay plan of vessels.
7) In case of delivering containers to consignees, it is required to retrieve nominated containers from stack quickly. Information system in chapter 18.3.3 should be adopted for precise and efficient operation.
8) A signalman on shore must instruct a tractor/trailer driver properly to adjust the halt position so that an operator of quayside crane/RTG can load containers onto tractor/trailers smoothly.

18.3.2 Introduction of Advanced Technology

To improve the efficiency of container handling operation, it is essential to exchange information and communicate effectively between crane operators and the supervisor at the control center. The following systems for transmitting information are currently used at container terminals.

(1) Radiotelephone (handy talkies) system
(2) Mobile radio terminal on vehicle system
(3) Mobile telephone system (PHS = Personal Handy phone System)
(4) Global Positioning System (GPS)

18.3.3 Introduction of Computer Systems

(1) Documentation

If a computer system is introduced for other fields, for example, documentation, berth assignment, accounting, administration work and personnel management as well as statistics, the documentation will be streamlined and the required time for port users to finish necessary procedures will be shortened. Consequently, the dwelling time of cargoes will be shortened and capacity of the port will increase.

(2) Container Inventory Control

1) Inventory control of containers stored in CY is the most important task in container

terminal operation. It is essential to grasp the location and kind of containers stored in CY to operate a container terminal efficiently.

2) Gate offices, yard control center and container handling equipment should be linked with each other to exchange information effectively and assure the accuracy of information on containers. The above information is entered into the terminal computer at the gatehouse and transmitted to the control center in real time. The yard control center instructs operators of container handling equipment to pick up/stack the designated containers.

(3) Container delivering/receiving control system

1) Gate offices of container terminal play important roles in receiving/delivering containers from/to shippers/consignees. Delivering containers is one of the most important functions of a container terminal.
2) In receiving an export container, it is important to decide its optimum location in CY based on the container's information for efficient operation.
3) In delivering an import container, it is important to instruct the tractor/trailer driver to go to the location of the containers quickly and to inform the operator of container handling equipment of the tractor/trailer's arrival.
4) It is possible to grasp the storing location and exact information on container by inputting and renewing it into a terminal computer in real time after verifying the driver's documents and the container.

(4) Loading/unloading operation control system

1) It is important to prepare an operation plan so that one crane does not interfere with the operation of another crane. In loading export containers, it is very important to load containers based on the yard planning system by weight, port of discharge and container size for stability and safe navigation of vessels.
2) Necessary information on containers should be obtained from shipping lines or agents as early as possible. Obtaining the information in advance enables a terminal operator to prepare the working schedule indicating the order of unloading/loading containers and to minimize the operation time.
3) After loading containers, the terminal operator prepares the stowage bay plan, which indicates the result of the operation, and passes it to a captain or shipping agent. Making the stowage bay plan is an important task of a terminal operator.

18.3.4 Minimizing the Breakdown Time of Container Handling Equipment

To achieve the targeted productivity, it is essential to minimize the breakdown time of container handling equipment. Competent personnel should be appointed as a yard operator. This yard operator should always stand by in the terminal office to monitor both loading/unloading and yard operation. To minimize the breakdown time of quayside gantry crane or RTG, backup spreaders must be procured.

18.4 Improvement of Conventional Cargo Handling

18.4.1 Establishment of Terminal Operators

It is necessary to establish terminal operators that perform general cargo handling operation comprehensively. These areas are divided into some portions and they are allocated to the terminal operators. Each terminal should have the appropriate size for conventional cargo handling and have open storage yards and warehouses for exclusive use. To choose competent terminal operators, it is necessary to have tender on concession or lease fee. APA should allow both existing state-owned and private companies to apply for this tender.

18.4.2 Avoiding Direct Loading/Delivery

In case of conventional general cargoes, loading/unloading operations are generally performed with ship's cranes/derricks or mobile shore cranes. Currently, unloaded cargoes from a vessel are directly loaded onto trucks/trailers. Although this method reduces cargo damage during operation, productivity is lower than when landing on the quay. The throughput of cargoes depends on the arrival of trucks and the turn-around on the apron. It is advised that this method should be adopted only for handling specific cargoes, such as hazardous cargoes, frozen cargoes, perishable cargoes and special heavy cargoes.

18.4.3 Proper Use of Cargo Handling Equipment

It is necessary to use pallets for landing cargoes on the quay so that forklifts could pick up, carry and sort the landed cargoes and store them in the sheds/warehouse behind the quay.
Currently raw sugar is transported with a bulk carrier. Although many people are involved in unloading operation, productivity is not high. It is necessary to use a grab and a hopper equipped with a bagging machine and belt conveyer to raise the productivity of unloading and reduce wastage.
Cargo damage is likely to happen during the loading/unloading operation rather than the sea transportation. The lack of adequate cargo handling equipment, such as rope/wire slings spreaders and attachment for forklifts is a main factor.

18.4.4 Targeted Productivity by Cargoes

Concerning the unloading operation, the targeted productivity by cargoes is summarized as below.

Kinds of cargo		Unloading Machine	Cycle time	Productivity
(1) Bagged Cargo		Forklifts	3 minutes (20 moves/hour)	20 moves/hr*2t = 40t/hour
(2) Steel bar, angle and beam		Ship's gear & flat bed trucks	3.5 minutes (17 move/hour)	17 moves * 5t = 85t/hour
(3) Steel sheet		Forklifts	2.5 minutes (24 moves/hour)	24 moves * 5t = 120t/hour
(4) Steel coil		Steel ram forklifts	2.5 minutes (24 moves/hour)	24 moves * 4t =96t/hours
(5) Steel wire		Steel ram forklifts.	3.25 minutes (18 moves/hour)	18 moves * 3.5t = 63t/hour
(6) Timber (Length 3', 6', 9' and 12')	Unloading on quay	Forklifts	3 minutes (20 moves/hour)	20 moves * 5t = 100t/hour
	Unloading into barges	Truck cranes & forklifts	4 minutes (15 moves/hour)	15 moves * 5t = 75t/hour
(7) Paper Products (kraft paper, newsprint paper)		Roll clamp forklifts	3.5 minutes (by belt sling) (17 moves/hour)	17 moves * 3t = 51t/hour
(8) Paper pulp		Bale clamp forklifts	3 minutes (by rope sling with hooks) 20 moves/hour	20 moves * 3t = 60t/hour

The above figures can be achieved under the ideal conditions. However, it is necessary to raise the productivity and the throughput to the target level in the long run.

The overall throughput depends on not only the productivity at the quayside but also the productivity of transfer from quayside to storage area (open yards or warehouse/sheds). From this point of view, it is advisable to promote the establishment of the integrated terminal operators mentioned earlier.

18.5 Measures to Mitigate the Impact on Barge Operators

(1) In the stage of the Master Plan, some cargoes such as sawn timbers and dust cargo are planned to be discharged/loaded at a berth from/onto an ocean-going vessel so as to enable economical, swift and safe operations with less risk of cargo damage for shippers/consignees and less environmental impact on the water areas in the harbor. To meet the increasing demand for handling long/heavy cargoes and simultaneously enable the replacement of the barge operations by quayside operations, the construction of a new multi-purpose terminal is proposed by this study.

(2) The mostly small-sized barge operators will have to acquire new licenses to conduct quayside stevedoring and barge skippers will have to be retrained for land work. To avoid social unrest that could result from an abrupt loss of jobs, the conversion of barge

operators must be done gradually and prudently.

(3) Prior to constructing a new multi-purpose terminal, sawn timber landing operations from barges at quays Nos. 57-61 need to be relocated elsewhere in the harbor.

19 Initial Environmental Examination (IEE)

19.1 Overview of the Master Plan

The target year of this rehabilitation master plan of the Greater Alexandria Port is 2017. The master plan is aimed at enhancing the overall operational efficiency and safety of the port facilities including the provision of waste oil (ballast and bilge waste) treatment plant as an important environmental infrastructure component of the master plan.

The port rehabilitation master plan basically relies in increasing the productivity and safety of ship movement and cargo handling, with not very significant provision of new cargo handling civil infrastructure such as new port terminals. This is in consideration to the low cargo handling efficiency at present that could be increased essentially with the provision of appropriate additional cargo handling machinery and equipment.

The significant civil infrastructure development and rehabilitation project components of the master plan are mostly confined to the Alexandria Port area only since the new Dekheila Port has adequate civil infrastructure facilities to meet the future demand. The significant new civil infrastructure development and rehabilitation projects planned in the Alexandria Port area are Multipurpose Terminal Project, New Port Road Bridge Project, Deep Water Coal Berth Project and Grain Terminal Modernization Project. It is noted that the projected increase in containerized cargo until the year 2017 will be met with the provision of additional cargo handling equipment and machinery only so as to utilize effectively the existing container terminals in Alexandria port and Dekheila port

19.2 Initial Environmental Examination

(1) Introduction

The proposed port facility improvement of the master plan is basically aimed at increasing the efficiency and safety of the port operation. This increased efficiency of the port operation in combination with increased containerization of the cargo would lead to decrease in cargo damage and the subsequent reduced loss of product (cargo) in cargo handling operation. This in itself would lead to overall long-term environmental improvement of the port.

(2) Baseline Environment of the Port

The port water environment is visibly deteriorated which is confirmed by the sampling results of sea water and seabed material quality survey conducted by the Study Team. The causative elements for this severe water pollution problem of the port are very complex due to the very long port operational history and a variety of potential pollution sources involved. The variety of pollution sources is both due to direct port operational activity and indirect non-port activity as illustrated in Chapter 3.

The potential long-term environmental impact consequent to the implementation of this master plan is evaluated as beneficial in an overall sense as illustrated below. The impacts are illustrated distinguished between social impacts and other impacts.

(3) Social Impacts

All the facilities of the proposed master plan are confined within the present administrative boundary of the Greater Alexandria Port. Moreover, all land and the offshore areas of the port facility expansion and rehabilitation by this master plan belong to the Alexandria Port Authority (APA). Accordingly, no land acquisition or resettlement of population for the implementation of the facilities proposed by the master plan is required.

Based on the above aspects, potential adverse social effect by the implementation of this master plan is evaluated as insignificant.

(4) Other Impacts

It is emphasized that a very long time existence of the Alexandria Port has resulted in irreversible long-term change in the environmental condition of the port. With due consideration to this baseline environmental condition as a functional port, it could be visualized that the improved port navigational and operational safety as well as port operational efficiency by this master plan, would lead to improved overall long term environmental condition of the port.

The most significant port operational and safety improvement realized consequent to the implementation of this master plan and the resultant environmental improvement, with due consideration to potential adverse environmental effects, is illustrated hereunder for each significant planned component of the master plan.

1) Increased containerized cargo handling

Containerized cargo handling is estimated to increase by about 4 times in 2017. This increase will be accommodated with the provision of additional cargo handling machinery only. The additional machinery to be provided are Quay-side Gantry Cranes (QGCs), Rubber Tired Gantry cranes (RTGs) and tractor-trailers.

Increased containerized cargo will lead to safer cargo handling with negligible cargo damage and hence reduced port water pollution due to loss of product (cargo), a significant environmental benefit. Still increased cargo handling machinery will lead to increased exhaust gas emission due to the operation of machinery at the terminals and hence potential increase in air pollutants. However, the potential air quality deterioration due to increased emission of air pollutants is evaluated as insignificant in consideration to the favorable topographic condition of the terminal areas having open-air environment with active exchange of air between land and sea.

2) Rationalized conventional cargo handling

The rationalization proposed by this master plan principally delineates the conventional cargo into two groups by separating long, heavy and bulky conventional cargo from the rest. The Multipurpose Terminal Project is intended specifically at handling long, heavy and bulky conventional cargo. It is noted that conventional cargo is handled in a haphazard and inefficient manner at present resulting in significant loss of product (cargo). This invariably leads to pollution of port water as well.

Hence rationalized conventional cargo handling would result in long term safety and environmental improvement of the port.

3) Improved dry bulk cargo handling

The improvement proposed by the master plan concerning the dry bulk cargo handling targets the handling of grain and coal.

Establishment of the modernized grain terminal to facilitate effective utilization of the existing grain silos located near the petroleum basin of the Alexandria port is proposed as the improvement plan for handling of grain. Two units of highly efficient mechanical unloaders will be provided to ensure efficient handling of grain cargo. Moreover, the modernized grain terminal will be deepened to have a water depth of 14m to provide sufficient draft for direct access of dry bulk grain carriers. Also the deepening of the existing coal basin in the Alexandria port to 14m water depth to have sufficient draft for direct access of dry bulk carriers is contemplated as the improvement plan for the coal basin.

The environmental benefit realized due to the improved and efficient handling of dry bulk cargo of grain and coal would encompass the mitigation of both the port water and air pollution. This is due to the fact that any loss of dry bulk material during cargo handling has the potential to generate dust emission, an air pollutant, in addition to causing potential port water pollution due to ultimate deposition of product (lost cargo) into port water.

The direct access of dry bulk carriers to terminals of both the grain terminal and coal terminal would help reduction of loss of product in cargo handling and hence the mitigation of potential port water and air pollution. Moreover, the highly mechanized unloading of grain in the proposed modernized grain terminal would further ensure the mitigation of product loss and the resultant air pollution due to dust emission.

4) Improved and safe handling of dangerous cargo at new terminal

A new terminal exclusive for the handling of dangerous cargo will be established, by this master plan, at the most remote and spacious location in the Dekheila port area. This new terminal will also replace the fertilizer and sulfur handling wharf located at present in the very center of the congested Alexandria port area near the coal basin. These cargoes also fall into the category of dangerous cargo.

The enhanced safety and security of dangerous cargo handling, and the resultant mitigation of potential handling damage and leakage of dangerous cargo having high environmental hazard, is evaluated as a very significant port safety and environmental benefit.

5) Improved port transportation network

The improvement in port transportation network by this master plan basically targets the congested internal road network of the Alexandria port. The planned replacement of the old bridge located near birth no.32 of the Alexandria port with the New Port Road Bridge is also an important integral component of the port transportation network improvement plan.

The improved transportation network within the port would lead to efficient transportation of cargo and less traffic congestion, an aesthetic improvement. Moreover, in general, reduced traffic congestion would lead to reduction in noxious gaseous exhaust emission from vehicles as well, resulting in improved ambient air quality, an environmental benefit.

6) Rehabilitated and improved ship navigation system

The ship navigation system for the Greater Alexandria Port instituted in the port control tower located in the container terminal of the Alexandria port is not functional at present, posing very significant threat to ship navigational safety.

In order to rectify this very important ship navigational safety and efficiency issue of the port, a modern VTMS (Vessel Traffic Management System) type navigation system will be instituted by this master plan. The environmental benefit of ship navigational safety is obvious and requires no further elaboration.

7) Waste oil (ballast and bilge waste) treatment system

The proposed waste oil treatment plant by this master plan in itself is solely a port environmental improvement (pollution control) measure aimed at mitigating potential ship-borne oil pollution. It is noted that the port water is visibly polluted with floating oil, which is an aesthetic nuisance in addition to be a water pollutant. This is in-fact the first step in mitigating port water pollution due to direct port operational activity, an important environmental improvement contribution of this master plan.

19.3 Conclusion

It is concluded that the proposed master plan targeting principally the enhancement of operational efficiency and safety of the Greater Alexandria Port will lead to overall long-term environmental improvement of the port as well in tandem, in comparison to the baseline environmental condition of the port.

Still, the most crucial constraint in achieving these multiple benefits of port operational safety, efficiency as well as environmental improvement, even if the required financial resource allocation is met, is the effective enhancement of the port operational management, including the human resources development. This would ensure proper operational management of the facilities provided by the master plan and hence the realization of multiple benefits including effective long-term environmental improvement of the port.

PART IV

SHORT-TERM PLAN

20 Short-term Plan of the Greater Alexandria Port

20.1 The Basic Concept for Short-term Plan of the Greater Alexandria Port

The Short-term Plan is prepared as a first-phase plan for the development, re-development or rehabilitation of the Greater Alexandria Port for the target year 2007 in the framework of the Master Plan. The basic concept of the Short-term Plan is based on the following various aspects.

20.1.1 Local Container Handling

To meet the large potential demand, it is necessary to increase the capacity of the Greater Alexandria Port as much as possible by investing additional super-structures and additional container-handling machines through making the most of the currently existing infrastructures including berths, and to allocate the excess containers to other Mediterranean ports including Port Said East Port.

20.1.2 Conventional General Cargo Handling

To resolve present problems in conventional-cargo handling and meet the increasing demand for handling long, heavy and/or bulky conventional general cargoes, it is necessary to construct a new multi-purpose terminal with deep berths and spacious open yards aiming at handling mainly long, heavy and/or bulky conventional cargoes in the Greater Alexandria Port by re-developing the existing berths, thereby reducing berth waiting costs of vessels in the off-shore anchorage.

20.1.3 Dry Bulk Cargo Handling

(1) Grain

To resolve present problems and meet the increasing demand for handling grains at the Greater Alexandria Port, it is necessary to construct a new 14m-deep-berth that will be connected with the existing silos through conveyors to receive panamax-type grain carriers in Alexandria Harbour.

(2) Coal and Coke

The berths at the coal/coke terminal in Alexandria Harbour are obsolete and shallow. Nevertheless, panamax-type coal carrier of around 69,000 DWT with a full draft of 13.3m and a length of 215m once called at the terminal on partially-loaded condition. It is advisable to prepare a deeper berth in front of the existing berth line with moderate investment so as to receive larger coal carriers at the existing coal/coke terminal in Alexandria Harbour.

20.1.4 Liquid Bulk Cargo Handling

The five marine oil terminals in the Petroleum Basin within Alexandria Harbour have sufficient capacity for the Alexandria Petroleum Company for the time being, if the existing broken-down loading/unloading arms are replaced together with the installation of new pipelines connecting the berths and back-side refinery plants of the company.

20.2 Container Handling

20.2.1 Target Volume of Containers to be Handled at the Greater Alexandria Port in 2007

Total volume of containers to be handled at the Greater Alexandria Port is estimated at 1.2 million TEUs in 2007. Concerning detailed assignment of containers among the container terminals and Ro-Ro berths within the Greater Alexandria Port in 2007, 0.45 million TEUs and 0.05 million TEUs of containers are expected to be handled at Alexandria Container Terminal and Ro-Ro berths respectively in Alexandria Harbour. The remaining 0.7 million TEUs of containers are expected to be handled at El Dekheila Container Terminal.

20.2.2 Requirement of Additional Container Handling Facilities

(1) Alexandria Container Terminal

There is no space to expand the existing container terminal at the same place. However, cargo handling equipment would be in short supply for efficient operations in 2007, even though no additional infrastructure is expected. It is recommended that one (1) additional QGC, eight (8) additional RTGs and 20 units of tractor-trailers should be installed so as to efficiently handle 450,000 TEUs of containers in 2007.

(2) El Dekheila Container Terminal

It is recommended that two (2) additional QGCs, 18 additional RTGs and 25 units of tractor-trailers should be installed so as to efficiently handle 730,000 TEUs of containers in 2007. A large amount of investment on container handling equipment is essential for the future utilization and development of El Dekheila Container Terminal.

20.3 Conventional Cargo Handling

20.3.1 Target Volume of Conventional Cargo to be Handled at the Greater Alexandria Port in 2007

Total volume of conventional cargo to be handled at the Greater Alexandria Port is estimated at 11.1 million tons in 2007. Bagged cargo (sugar, rice, flour , etc.) and bundled cargo (sawn timber and steel products) are expected to increase steadily up to the year 2007. Rolled paper and miscellaneous conventional cargo are also expected to increase steadily up to the year 2007.

20.3.2 Requirement of Additional Conventional Cargo Handling Facilities

In order to achieve efficient conventional cargo handling operations and meet the future conventional cargo demand, it is essential to build four (4) 14 m-deep berths with spacious open yards of approximately 130,000 sq.m. Two (2) units of multi-purpose QGCs of which under-spreader lifting capacity is 40 tons are required to be installed to secure an efficient operation for handling extremely heavy cargoes and/or heavy bulky bare cargoes such as plant components, heavy vehicles, etc. While the requirement and the existing amount of covered area of sheds and warehouses nearly balances out, a covered area of approximately 6,000 sq.m is additionally required. One hundred fourteen

(114) units of forklifts are also required to be introduced for an efficient cargo handling operation.

20.4 Dry Bulk Cargo Handling

20.4.1 Target Volume of Dry Bulk Cargo to be Handled at the Greater Alexandria Port in 2007

Total volume of dry bulk cargo to be handled at the Greater Alexandria Port is expected to increase to 13.3 million tons (annual growth rate of 2.7% for the first ten years) in 2007.

20.4.4 Requirement of Additional Dry Bulk Cargo Handling Facilities

(1) Grain Handling

There exists available silos behind the existing grain terminals in Alexandria Harbour. Accordingly, it is recommended that an additional 14.0 m-deep grain berth with two (2) units of highly efficient grain un-loaders (nominal productivity of 1,000 tons/hour/un-loader) should be built connecting to the usable existing silos.

(2) Mineral (Iron Pellets, Coal and Coke) Handling

Partially-loaded 65,000 DWT-class bulk carriers transporting “coal” could be fully loaded and save their transport costs, if the coal berth (no.63/64) were to be deepened to 14.0 meters. It is recommended that the existing coal berth (no.63/64) should be deepened and utilize the existing structure with less investment.

(3) Dangerous Cargo (Sulfur and Fertilizer) Handling

Sulfur is presently handled together with fertilizer at the berths (nos. 65 and 66). These berths are located nearly at the center of the Alexandria Harbour and in front of the densely-populated city area. Dangerous cargo should be handled separately from flammable cargoes and located apart from the densely-populated area. Accordingly, it is recommended that those dangerous cargoes be assigned to the berths (nos.98 and 99-1) in the El Dekheila Harbour.

20.5 Liquid Bulk Cargo Handling

20.5.1 Target Volume of Liquid Bulk Cargo to be handled at the Greater Alexandria Port in 2007

Total volume of liquid bulk cargo to be handled at the Greater Alexandria Port is estimated at 4.8 million tons in 2007. Petroleum oil and grease are expected to increase moderately up to 2017. Molasses are expected to increase relatively rapid, while edible oil seems to decrease in the future.

20.5.2 Requirement of Additional Liquid Bulk Cargo Handling Facilities

It is examined whether the existing berthing facilities for liquid bulk cargo would be sufficient to handle the future volume, assuming that the reasonable rate of future productivity in case that loading arms and pipelines are to be modernized. It is recommended that the existing aged loading arms and pipelines should be modernized without any additional berthing facilities.

20.6 Common Port Facilities

20.6.1 Port Road Networking

Port-related cargo traffic to/from the Greater Alexandria Port is suffering from heavy traffic congestion which is caused by together with heavy city traffic through downtown area in Alexandria city. Port-dedicated fly-over road behind the port from the gate no.27 to evacuate port-related cargo traffic apart from the heavy city traffic is now under construction so as to release both port-related and city traffic congestion. This road leads to Cairo through either "the Agriculture Road" or "the Desert Road", and is expected to smoothly evacuate port traffic to/from the Alexandria Harbour. However, if heavy weight trucks should be still prohibited to ran across the aged port road bridge, the expected benefit of this road would be lost to a considerable extent. Therefore, this aged port road bridge is required to be re-constructed.

20.6.2 Waste Oil Receiving Facility

The Greater Alexandria Port has no independent treatment facilities either to treat the bilge waste or the ballast waste from the ships and oil tankers. Consequently, the port waters is visibly polluted with floating oil and others. It is also required to introduce a waste oil processing plant at the Greater Alexandria Port in order to properly prevent the sea water pollution by processing the ship waste oil.

20.6.3 VTMS (Vessel Traffic Management System)

VTMS which covers all the area of the Greater Alexandria Port including El Dekheila Port was installed and used at the port control tower. However, the system is out of order now. It has also become old-fashioned so there is no point in repairing it. Navigation control is currently conducted through VHF between the control center and each ship. It is possible to monitor the movement of vessels after vessels come into sight. But there is no visual aid while vessels are out of sight. Furthermore, it is very difficult to monitor the vessels' traffic during night time and bad weather. It is necessary to introduce an advanced VTMS to accommodate the increasing vessel traffic in the near future.

20.7 Multipurpose Terminal Project

20.7.1 Project Components

(1) Dimensions of the Project

Major components of the proposed plan are i) four (4) multipurpose berths of which water depth is 14.0 m and total length is 960 m, ii) spacious open yards whose total area is 130,000 sq.m, iii) one (1) unit of shed whose total covered area is 6,000 sq.m, iv) two (2) units of multipurpose QGCs, v) dedicated road merging to the existing fly-over, vi) dredging of ship-maneuvering area of which total volume is approximately 70,000 cu.m, and vii) 24 units of forklifts.

Table 20.7.1 Major Components of the Proposed Multipurpose Terminal Project

Project Component	unit	Infrastructure	Superstructure	Equipment
1. Multipurpose Berths (-14.0m*240m)	(berth)	4	---	---
2. Open Yards	(sq.m)	130,000	---	---
3. Sheds	(sq.m)	6,000	---	---
4. Multipurpose QGC	(unit)	---	2	---
5. Dedicated fly-over road	(m)	360	---	---
6. Dredging of Ship Maneuvering Area	(cu.m)	70,000	---	---
7. Forklifts	(unit)	---	---	24

(2) Open Yards and Sheds

The spacious open yards of which total area is 130,000 sq.m are located behind the berth. Also, two units of the sheds of which total covered area is 6,000 sq.m are located behind the northern end of the reclaimed area.

(3) Dedicated Fly-over Road merging to the Existing Fly-over

The new multipurpose terminal needs good road connection through the existing fly-over between the new terminal and the port gate (no.27). The existing road along the eastern fence of the coal/coke terminal is presently being expanded to four-lane-road. However, one (1) outbound lane by fly-over structure is required to exclusively merge with the existing fly-over so as to smoothly evacuate port traffic to/from the new terminal.

(4) Dredging the Ship-Maneuvering Area up to 14.0 meter below CD.

Two (2) ship-maneuvering basins are planned at water area between the coal/coke terminal and the grain terminal in Alexandria Harbour. These basins are to be designed for the fully-loaded 65,000 DWT-class dry bulk carriers transporting “coal” and “grain”. Since LOA of this dry bulk carrier is 230 meters, diameter of ship-maneuvering circle is to be determined as 460 meters (twice as long as 230 meter). One of the ship-maneuvering basins, which is expected to be commonly used by both general cargo vessels and dry bulk carriers, is located off the eastern end of the new terminal area.

(5) Forklifts

Twenty four (24) units of forklifts (16 units for lifting capacity of 5 tons / 8 units for lifting capacity of 3 tons) are required to be introduced to ensure an efficient conventional cargo handling operations. Stevedoring companies are responsible to introduce these forklifts at each terminal.

20.7.2 Conventional Cargo Handling System

(1) Quay-side Loading/Unloading Operations

Concerning the berth assignment for the new multi-purpose terminal, two berths are assigned to sawn timber, another two berths to steel products, and the remaining two berths to miscellaneous cargoes to be stored either in the shed or at the open yard. In case of conventional cargo handling, quay-side loading/unloading operations are generally performed with ship’s cranes/derricks or mobile shore cranes. However, two units of multi-purpose QGCs of which under-spreader capacity is 40 tons are planned to be installed to secure an efficient operation for handling extremely heavy cargoes and/or

heavy bulky bare cargoes such as plant components, heavy vehicles, etc. Additionally some kinds of attachments are required to enable to lift various kinds and shapes of above-mentioned heavy bulky cargoes.

(2) Open Yard Operation between the Quay and the Open Yard.
In handling heavy bulky conventional cargo such as sawn timber, steel products, etc., large apron and sorting/storing yards are needed for smooth operation. It is also necessary to use pallets for landing cargoes on the quay so that forklifts could pick up, carry and sort the landed cargoes and store them in the sheds and/or at the spacious open yard behind the quay. In particular, bagged cargo such as fertilizer and sugar, must be handled with pallets to increase the throughput. Therefore, it is recommended that the sufficient number (24 units) of the forklifts should be introduced for this terminal.

20.8 El Mahmudiya Quay Re-development Project

There are presently hundreds of damaged containers behind the warehouses (nos.44, 45, 46 and 47) within the El Mahmudiya Quay area. Consequently precious land space is not utilized in this area to a full extent. On the other hand, the berths (nos.39 and 40 with water depth of 10.0 meters) next to the Ro-Ro berth (no.41) would be suitable for handling “long, heavy and/or bulky conventional cargoes”, if the warehouses (no.44 and 45) were to be demolished.

Miscellaneous cargoes to be stored at the open yard are assigned to the berths (nos. 39 and 40). Those cargoes are expected to be handled by forklifts at the apron as well as the open yard where the warehouses (nos. 44 and 45) are to be removed. 12 units of the forklifts are essential to secure an efficient cargo handling at the El Mahmudiya Quay.

20.9 New Port Road Bridge Project

Since the port road bridge on the lock between the berth no.32 and no.33 is aged and poorly-maintained as mentioned, heavy weight trucks are presently prohibited to ran across the bridge resulting in detour traffic through downtown and consequent heavy traffic congestion in the Alexandria city area. In order to fully utilize the port-dedicated road now under construction behind the port gate no.27, reinforcement of this bridge or a new bridge construction are essential.

The hourly maximum one-directional traffic is estimated at 404 (vehicles/hour/direction), which implies that one (1) lane is required compared with the standard maximum hourly traffic volume per lane of 600 (vehicles/hour/lane). However, two (2) lanes for each direction should be planned taking into account of the case of emergency.

20.10 Deep Water Coal Berth Project

The new deep water coal berth is expected to accommodate fully-loaded 65,000 DWT-class dry bulk carriers (LOA is 230 (m) and moulded breadth is 32.2 (m)). Therefore, the required berth length and depth are 270 meters and 14.0 meters respectively.

Additionally, it is recommended to utilize the existing infrastructure and handling and storing facilities so as to minimize the investment costs. The maximum additional extendable width of the berth without replacing the existing rail-mounted un-loaders is examined and estimated at 10.0 meters, keeping the grabs reach approximately two thirds of the ship width.

20.11 Grain Terminal Modernization Project

The new grain terminal is expected to accommodate fully-loaded 65,000 DWT-class dry bulk carriers (LOA is 230 (m) and moulded breadth is 32.2 (m)). Therefore, the required berth length and depth are 270 meters and 14.0 meters respectively. A jetty-type structure of about 20 meters in width may be sufficient for a fully-automated grain terminal. However, the terminal will be used more flexibly with spacious back-up yards in case f maintenance and/or emergency. Therefore, the enclosed area by the existing breakwater and the new grain berth is recommended to be reclaimed and used as back-up yards.

Two (2) units of the efficient mechanical un-loaders of which nominal productivity is 1,000 (tons/hour/un-loader) are required to simultaneously be assigned to one ship so as to ensure an efficient grain cargo handling. Mechanical un-loaders of which nominal productivity is 1,000 (tons/hour/un-loader) are also required to ensure the same productivity of the un-loaders installed at berth (no.94-2). Conveyor of 750 meters in length connecting the new grain berth and the existing silos is required so as to utilize the existing silos to a full extent.

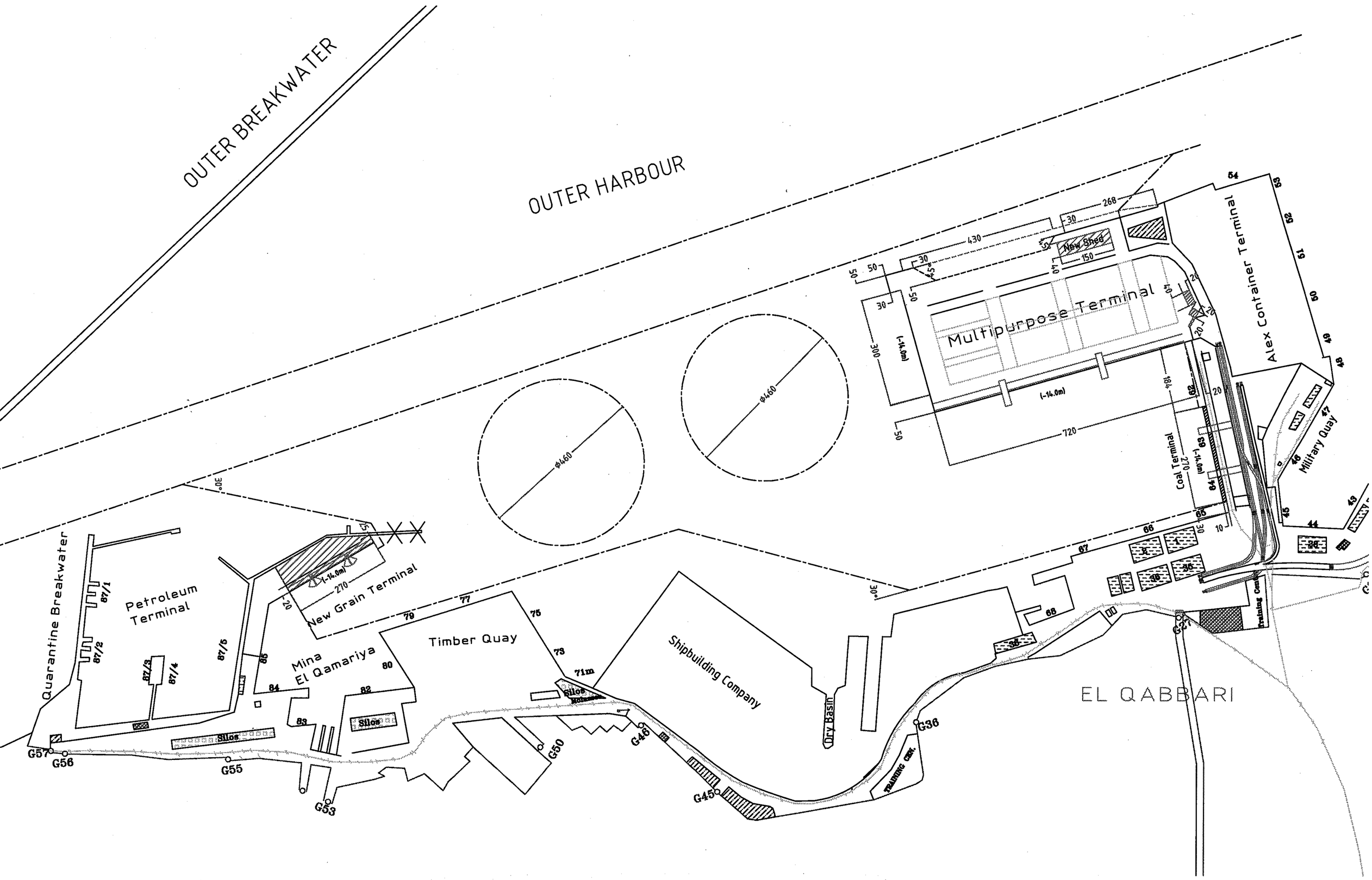


Figure 20.7.1 Layout Plan of Multi-purpose Terminal Short-term Plan

21 Preliminary Design

21.1 Design Conditions

Based on the results of the supplemental natural condition surveys, the design criteria for each Project proposed in the short term development were carefully studied. In particular, each boring log of bored hole and the result of laboratory tests were carefully reviewed for determination of design criteria and reflecting the construction program on the short term development plan.

21.2 Preliminary Design

(1) General Considerations

According to the subsoil investigation, a subsoil profile in the proposed site for the multi-purpose terminal, coal & coke berth and new grain berth shows uniformly developed middle layer of clayey subsoil in general. This clay deposit is sandwiched by the subsurface soft sand and dense lower sand layer except for the area at coal & coke berth where possibly original clayey deposits had already replaced by sand material.

But, the present subsoil in front of the south portion of the existing coal berth is composed mostly of sandy soils having 10-30 N-value in SPT, which would be the replaced sands in the construction of the existing coal berth construction. In contrary, the subsoil at the area where the new multipurpose terminal and the new grain berth are planned is basically composed of very soft clayey soils of 0-1 N-value. Since uni-axial compression strength (Qu) of these very soft clayey deposits are more or less 0.6 kg/cm2 and therefore the adoption of the subsoil improvement technique will be mandatory to construct the new terminal.

The above subsoil data obtained through the soil investigation will be reflected to the work for the selection of most suitable type of quay front structures envisaged in the short term development scheme. The height of quay wall along face-line is set forth to be +2.4 m above datum, which would be suitable level for quay wall for receiving objective vessels under the tide levels of the Greater Alexandria Port. Utmost utilization of locally available materials is considered in easier maintenance of view. In addition, reviewing laboratory test results on the subsoil samples such as uni-axial compression strength, consolidation test and other subsoil properties, the study on the applicable method of subsoil improvement is carefully carried out.

(2) Comparative Study of Quay Wall Structure

By judging from the subsoil condition at the proposed site, a comparative study of structure is made for the following three types of structure which are selected among applicable construction method of structure.

[Multi-purpose Terminal] & [New Grain Terminal]
Alternative A: Gravity Type of Wall by Concrete Blocks
Alternative B: Gravity Type of Wall by Concrete Caissons
Alternative C: Open Type Deck supported by Piles

[Deep Water Coal Berth]
Alternative A: Detached Pier provided at a certain interval
Alternative B: Open Type Continuous Deck with Underwater Retaining Sheet Pile Wall
Alternative C: Open Type Continuous Deck supported by Batter Piles

Most suitable type of structure is selected for each Project in view of technical and economical points. Tables 21.2.1 and 21.2.2 show a comparative study of the above described three type of structures. As the result of study, gravity type quay wall by concrete blocks is recommended for the multi-purpose terminal and new grain berth while open type continuous deck supported by batter piles for coal berth with deeper water depth. Standard cross section of recommended quay wall structure is presented in Fig. 21.2.1.

(3) Consolidation and Reclamation

Subsoil properties for consolidation are also evaluated based on the test data of consolidation test. Based on these consolidation properties of the subsoil, the estimation on possible consolidation process of existing clayey subsoil is carried out and the following measure will be implemented in construction of reclamation fill.

a. In multi-purpose terminal area, the consolidation of clayey deposit is estimated 1.4 to 1.9m height due to newly reclaimed earth pressure and surcharge load. Therefore, soft clayey deposits along the face-line of quay wall will be pre-dredged for replacement of clayey soil by sandy materials. In addition, in order to complete the process of consolidation in shorter construction period, soft clayey deposits within multi-purpose terminal reclamation area will be preloaded, adopting sand drain soil improvement technique will possibly accelerate consolidation process.

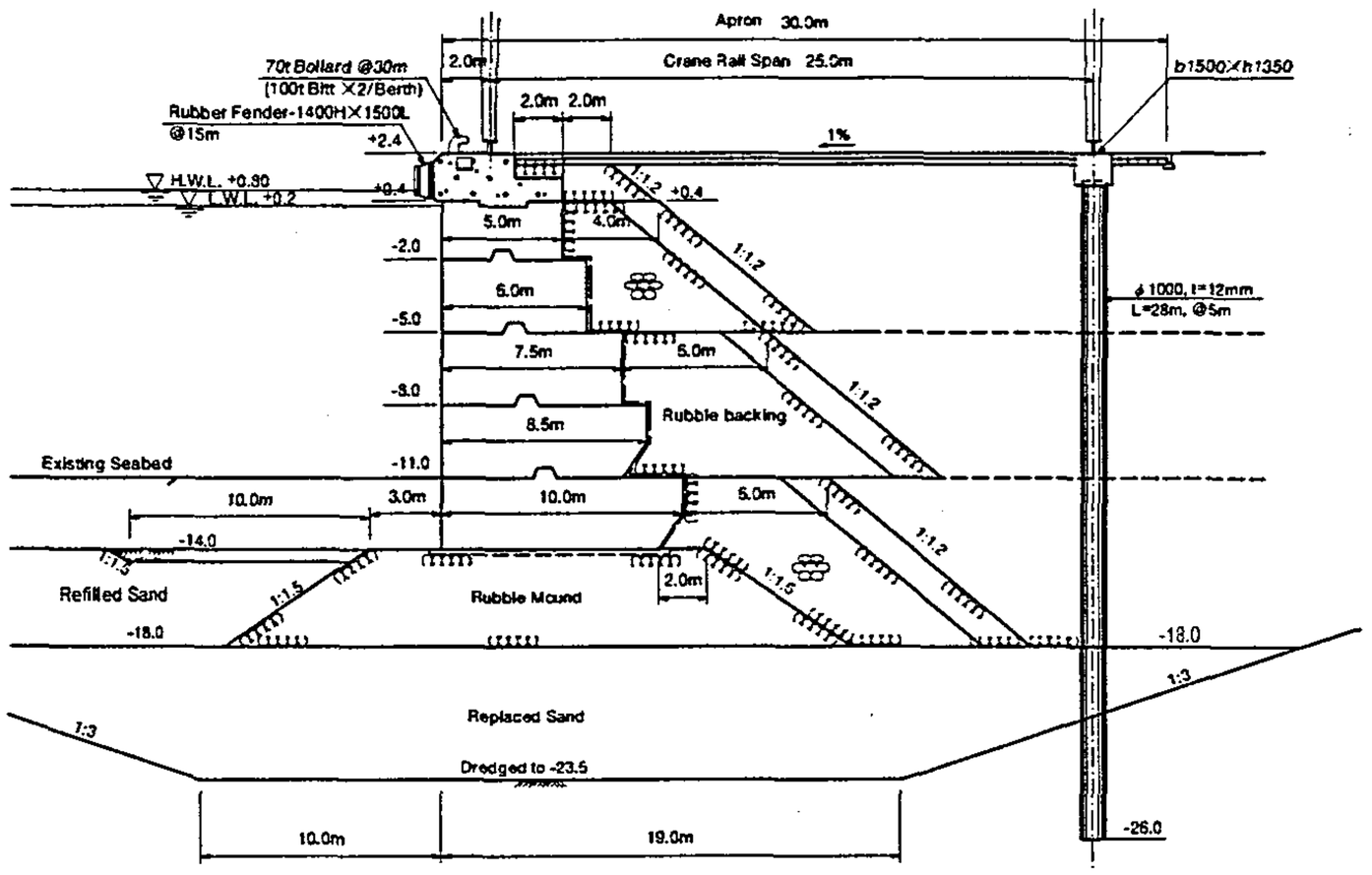
b. Since no onshore facilities is planned to be constructed at the back of new grain berth, this area will not be needed to subject to any subsoil improvement technique. Therefore, pre-dredging along the faceline of berth will be carried out for replacing soft clay subsoil by sandy soil

Table 21.2.1 Comparison of Type of Quay Wall for Multi-purpose Terminal & Grain Berth

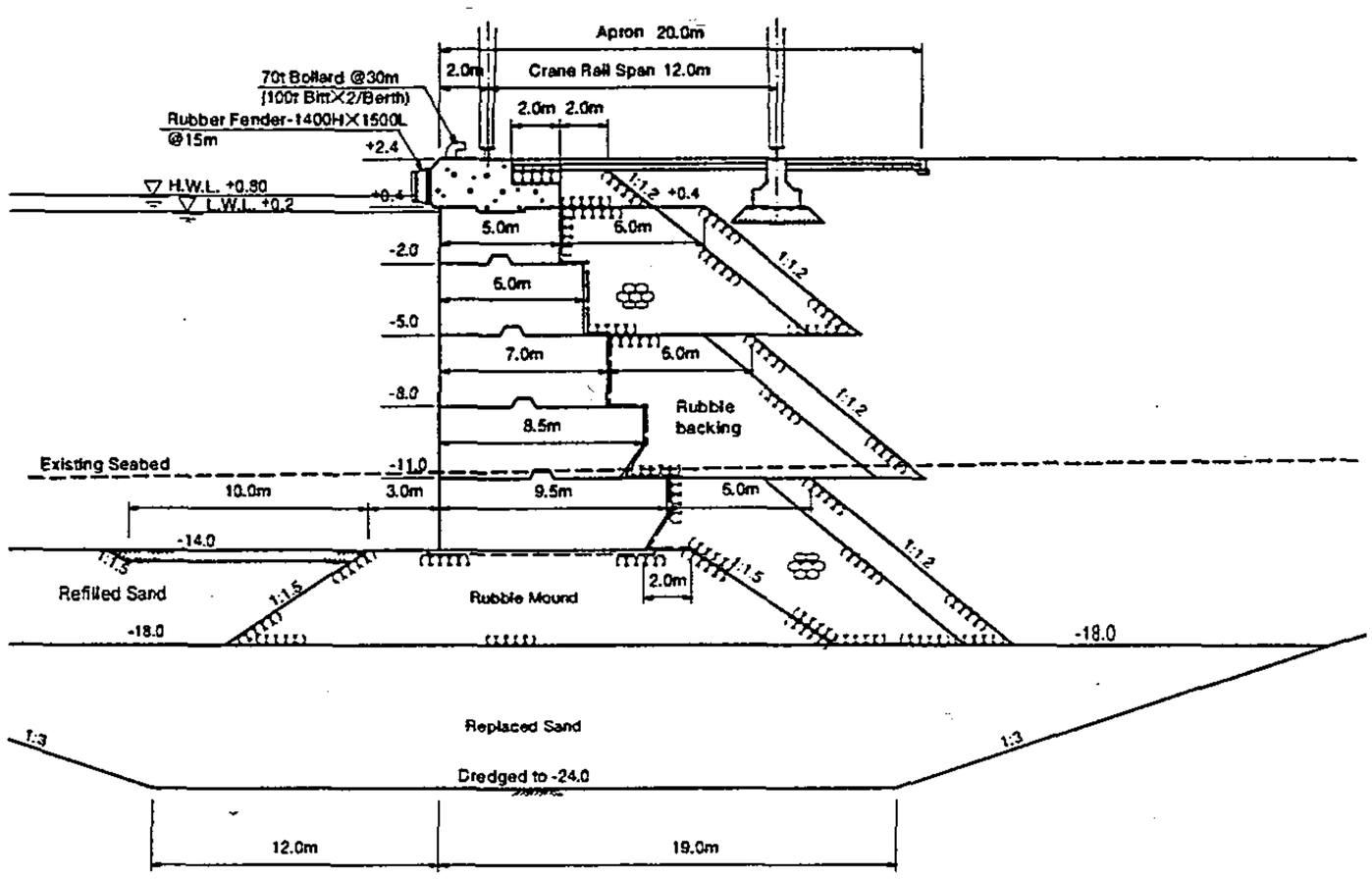
Alternative	Alternative-A		Alternative-B		Alternative-C	
	Gravity Type Wall by Concrete Blocks		Gravity type Wall by Concrete Caisson		Open Deck supported by Steel Pipe Pile	
Structural Concept	Before placing concrete blocks, original weak clay subsoil must be replaced by sandy soil along quay wall alignment so as to eliminate settlement by own weight of blocks. Layers of concrete blocks are installed on the rubble mound base and in-site coping concrete is provided at the top of quay wall.		Before placing concrete caisson, original weak clay subsoil must be replaced by sandy soil along quay wall alignment so as to eliminate settlement by own weight of caissons. Concrete caisson are installed on the rubble mound base and in-site coping concrete is provided at the top of quay wall.		The gravity type wall is provided on the top of underwater slope protection for retaining reclamation fill at the terminal yard. Beam and deck superstructure is supported by pile foundation. The original clay subsoil under the open deck must be replaced by sandy soil in order for the under-the-deck slope to be stable for circular sliding.	
Particulars	△	Clayey subsoil are replaced by sandy soils to sustain vertical weight of gravity wall	△	Clayey subsoil are replaced by sandy soils to sustain vertical weight of gravity wall	△	Clayey subsoil are replaced by sandy soils for under-the deck slope stability
	○	High stability by relying on own weight of concrete blocks	○	High stability by relying on own weight of concrete caisson	△	Structure is in combination with R.C. superstructure and Steel Pipe Pile foundations
	△	Full precaution needed in formation of base mound and possible settlement in particular.	△	Full precaution needed in formation of base mound and possible settlement in particular.	△	Steel pipe piles are materials to be imported
	△	Accuracy in installing concrete blocks is required to maintain structural stability.	△	Accuracy in installing concrete caissons is required to maintain structural stability.	△	A series of offshore works must be systematically carried out
	△	Unity of block structure is less than the case of caisson type	○	Unity of caisson structure is excellent	△	Anti-corrosion measure in absolutely need for steel pipe pile protection.
Structural Stability	△	Full precaution needed for possible vertical settlement in particular.	△	Full precaution needed for possible vertical settlement in particular.	○	High structural flexibility for vertical and lateral loads
	△	Flow away of backfill materials must be precluded by effective measures	△	Flow away of backfill materials must be precluded by effective measures	△	Horizontal displacement of deck occurs due to its flexibility
Construction	○	Easiness in onshore fabrication of concrete block and block fabrication yard is needed	△	Floating dock or wide onshore area is required for caisson fabrication.	○	Easiness in construction except for piling work which is required heavy pile driving hammer
	△	Large scale subsoil replacement by sands is required along berth alignment.	△	Large scale subsoil replacement by sand is required along berth alignment.	△	Large scale subsoil replacement by sand is also required along berth alignment
	△	Relatively large crane is needed for block installation.	○	Such large size crane as required for Alternative A is not needed for installation caisson at site	△	Piling and deck & beam concrete works upon temporary stage are carried out at offshore work
Cost for Multi-purpose Terminal (ratio of cost)	lowest		medium		costly	
	1.00		1.15		1.71	
Cost for New Grain Berth (ratio of cost)	lowest		medium		costly	
	1.00		1.32		1.53	
Assessment	◎		○		△	

Table 21.2.2 Comparison of Type of Quay Wall for Coal Berth

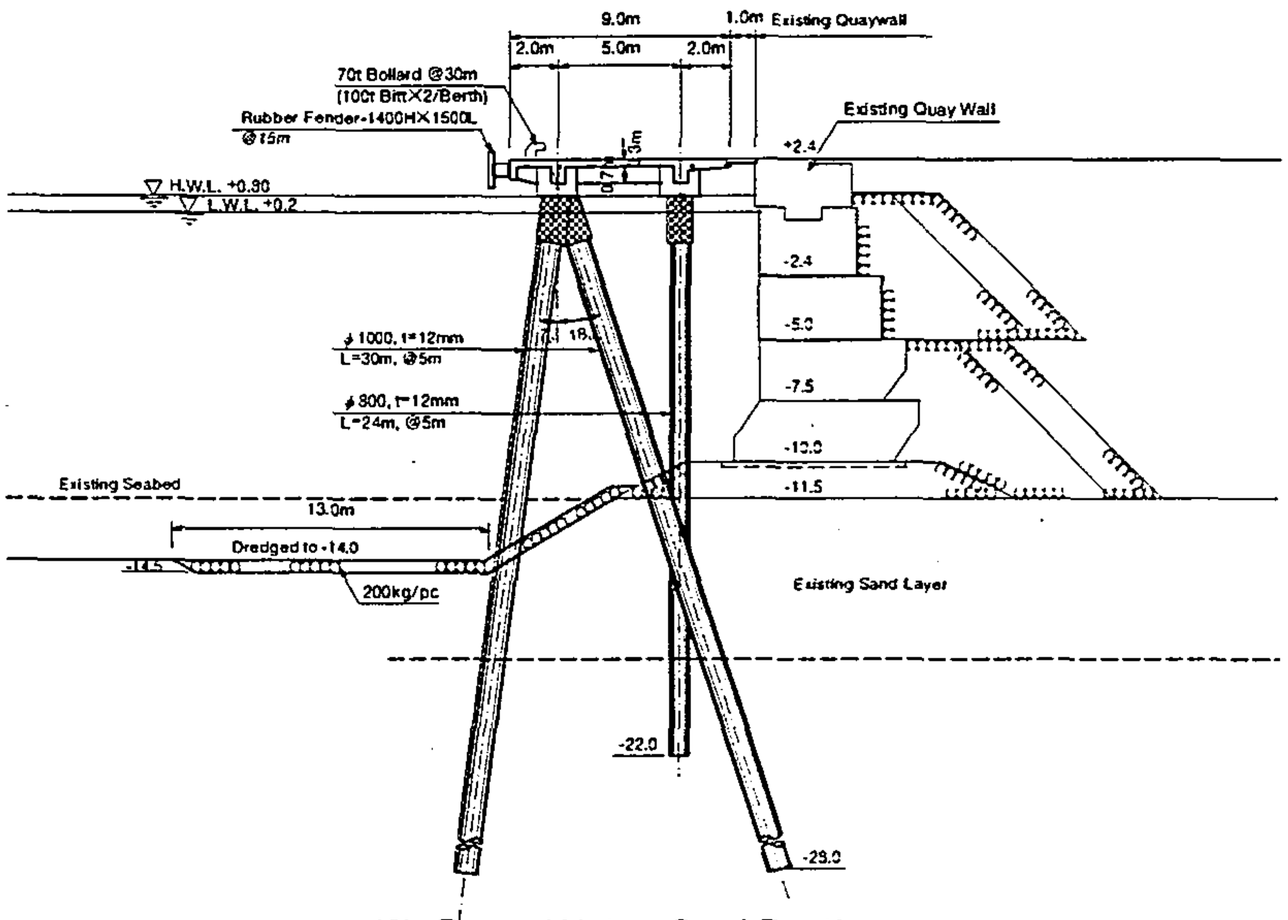
Alternative	Alternative-A		Alternative-B		Alternative-C	
	Detached Pier supported by Batter Pile Foundatic		Open Pier with Underwater Sheet Pile		Continuous Open type Pier supported by Piles	
Structural Concept	Open type detached dolphin structure is adopted in order to receive lateral impact load at vessel berthing. Deepening of water depth can be made by providing underwater slope in front of the existing quay wall		Open type piled deck is provided in front of the existing quay wall. Coupled pile foundation system is adopted in order to minimize bending moment on the piles and displacement of wharf block. Deepening of water depth can be made by dredging sea bed in front of sheet piled underwater wall		Open type piled deck is provided in front of the existing quay wall. Coupled pile foundation system is adopted in order to minimize bending moment on the piles and displacement of wharf block. Deepening of water depth can be made by providing underwater slope in front of the existing quay wall	
Particulars	△	Detached piers are installed at a certain interval	○	Continuous deck pier is installed	○	Continuous deck pier is installed
	△	Large size of coupled batter piles is needed	△	Foundation piles in combination of vertical and batter piles	△	Foundation piles in combination of vertical and batter piles
	△	Approach walkway will be necessary for mooring operation and maintenance	○	Pier deck is additionally provided in front of existing quay wall	○	Pier deck is additionally provided in front of existing quay wall
	△	Full precaution in dredging and slope protection work in view of stability of existing quay wall	○	Easiness in dredging work control	△	Full precaution in dredging and slope protection work in view of stability of existing quay wall
	△	Anti-corrosion measure in absolutely need.	△	Anti-corrosion measure in absolutely need.	△	Anti-corrosion measure in absolutely need.
Structural Stability	△	Each detached pier structure is subjected to large magnitude of bending moment and horizontal displacement of pier.	○	One block of deck pier (=25 m length) unitedly resists to lateral impact load at vessel berthing	○	One block of deck pier (=25 m length) unity resists to lateral impact load at vessel berthing
Construction	△	Piling work must be operational for plus & minus batter directions	○	Piling work must be operational for vertical and plus batter directions	△	Piling work must be operational for plus & minus batter directions
	△	Large size foundation pile driving is required	○	Piles to be driven are relatively smaller size than Alternative- A.	○	Piles to be driven are relatively smaller size than Alternative- A.
Cost (ratio of cost)	costly		costly		medium	
	1.19		1.39		1.00	
Assessment	△		○		◎	



(1) Multi -purpose Terminal



(2) New Grain Berth



(3) Deep Water Coal Berth

Fig. 21.2.1 Recommended Quay Wall Structure

22 Implementation Program

22.1 Construction Works

(1) Construction Materials

The quantities of major materials to be used for the construction works are roughly estimated as follows.

Sand, Fill material, Fine Aggregates,	4,800,000 m^3
Stone, Gravel, Coarse Aggregates, Crusher-run	700,000 m^3
Concrete, Asphalt Concrete	265,000 m^3
Steel bar, Structural Steel,	5,500 tons
Steel Pipe Pile	1,800 tons

Such soil and stone materials as sands, fill materials, stones, gravel, base coarse and crusher-run will be used for structural foundation and earth works and will be transported by 20 tons (12 m^3 load) dump trucks from the borrow pits to the project sites.

There are many wadi (dry up river) located at around southern west direction on the Sahara desert from the Alexandria Port at a distance of about 40 – 60 km from the site. Since these wadi produce a large amount of natural sands and gravel suitable for the use of aggregates for concrete and asphalt concrete, these will be possible sources of sand and gravel materials for the projects. The natural gravel obtained from these sites will be a better quality of consistency to be used for concrete mixing than crushed stones. The round trip of dump truck for transportation to the project site will take 3 hours and 4 hours for sands and stones respectively.

A considerable large amount of sand materials is required for the projects. Most of the materials will be used in underwater as sand replacement for pre-dredging, sand piles for pre-consolidation of subsoil, refilled sand and reclamation material. These sandy materials will be obtained from borrow pits locating at coastal areas or possible offshore sources. The sandy materials will be transported by self-propelled sand barges of 500 to 1000 cubic meters capacity.

Most of steel-products for civil and building construction are locally available in Egypt. Steel bars and structural steels will be also locally obtainable in the Egyptian market. But steel pipe piles will be imported from the outside countries due to non-availability in Egypt.

(2) Dredging and Pre-dredging Works

The quality survey of the continuous seabed soil from subsurface to 3 meter depth shows that high contaminated level of heavy metals exist at the seabed surface within 1 meter depth. Therefore, a offshore dumping area for disposing dredged materials including the contaminated dredged materials is proposed to constructed at inside of the existing outer breakwater of Alexandria port. The structure of embankment of the offshore dumping area will be the gravity type of concrete blocks placed on

stone bedding.

Space under water : 400,000 m2 x 6.5m+ 100,000 m2 x 2.5m=2,850,000m3
Space above water (up to +3.0m) : 500,000 m2 x 3 m= 1,500,000m3
Length of Embankment (-8.0m depth) : 1,000m
Length of Embankment (-6.5m depth) : 800m
Length of Embankment (-2.5m depth) : 200m

The quantity of subsoil to be dredged from the project is roughly estimated as follows.

Table 22.1.1 Quantity of Dredging required by the Project Unit:m3

Project	Multi-purpose	Coal berth	Grain berth	TOTAL
Dredging of Subsurface Soil	475,000	25,000	75,000	575,000
Pre-dredging at surface soil	75,000	0	28,000	103,000
Total of surface bed soil	550,000	25,000	103,000	678,000
Dredging at the other parts	334,000	45,000	25,000	404,000
Pre-dredging at the other parts	854,000	0	189,000	1,043,000
Total of the other parts	1,188,000	45,000	214,000	1,447,000
Grand Total	1,738,000	70,000	317,000	2,125,000

The distance from the dredging site to the disposed area will be 3 to 5 km and therefore a cutter suction pump dredger of 6,000 to 8,000 hp capacity would be the most recommendable.

(3) Quay Construction by Concrete Block

Quay walls structures for multi-purpose terminal and grain berth will be constructed by gravity type of concrete blocks. Concrete blocks to be used is estimated to be 90 tons weight in average and 2.67 units per linear meter of berth length. Pre-cast concrete blocks of about 4,200 units will be required to manufacture within 1.5 years (450 working days). Temporary yard space for stacking 100 units of block will be necessary for producing and curing pre-cast concrete blocks. This will be a space equivalent to an area of 2,000 sq. meters. The temporary yard must be located in front of waterfront line of 150 meter in minimum length.

At present, there is not available such yard inside the Alexandria port, adequate survey must be conducted before initiating detailed design and construction. Such existing facilities as jetty, breakwater, fishery boat yard, etc. in the eastern harbor may be alternative site suitable for such temporary yard for the project.

22.2 Construction Schedule

(1) Preconditions

Preliminary planning for the implementation of the civil work construction and equipment procurement is carried out under the following assumptions:

1) The financial arrangement for the project will be completed before the year 2001 and a engineering consulting for detailed design and supervision of construction will be procured in

middle of 2001.

2) Actual detailed design is to be commenced in early 2002 so that the 1st year in the coming tables or figures may be replaced by the year of 2002.
3) Civil and building works of the projects including dredging works are to be executed under the one package contract.
4) The cargo handling operation at the new berth terminal is assumed to start from the 6th year. Therefore all construction works and installation of equipment are scheduled to complete within the 5th year.

(2) Dredging works

Prior to the commencement of dredging work, embankment at the inner water basin behind the existing breakwater must be constructed so that dredged subsoil could be discharged into the dumping area. Thereafter, permanent construction works will be initiated by dredging works. Construction period for dredging works will be given only 1 year among overall construction period of 3 years.

(3) Construction Schedule of the Project

The Project will take 5 years after the commencement of the engineering services for detailed design to the completion of construction excluding maintenance period. Overall actual construction works will take 3 years and 1 year for maintenance period. Figure 22.2.1 shows construction time schedule of the short-term development plan.

	Works Item			year	1st	2nd	3rd	4th	5th	6th
1	Detailed Design of Civil Works									
2	Tendering and Selection of Contractor									
3	Construction Supervision									
4	Dredging of all projects	dredging	m3	979,000						
5	Pre-dredging and Replacement	pre-dredging	m3	1,146,000						
	include Consolidation	replacement	m3	3,009,400						
6	Quaywall Construction	Multi-purpos	Lm	1,650						
	include revetment	Grain Berth	Lm	280						
		Coal and Cok	Lm	270						
7	Reclamation	Multi-purpos	m3	3,431,000						
		Grain Berth	m3	265,000						
8	Building, Pavement, Utilities	Multi-purpos	LS	1						
9	Detailed Design of Equipment	Training								
10	Tendering and Selection of Supplier									
	Procurement and Installation of Equipment									
11	2 Gantry Crane	Multi-purpose								
12	2 Mechanical Unloaders	Grain Berth								
13	2 lane Grain Conveyor Line	Grain Berth								
14	3 units of Truck Scale Instru	Multi-purpose								
15	Equipment of Vessel Traffic Management System									
16	Equipment of Waste Oil Receiving Facility									

Figure 22.2.1 Construction Schedule of the Short-term Development Plan

23 Cost Estimation of the Project

23.1 Major Facilities of the Project

Table 23.1.1 summarizes major facilities involved in each project for the short term development plan.

Table 23.1.1 Major Facilities of the Project

Project: Facility Item To be Improved	Location	Construction Item	
		Construction Facility	Quantity
1. Multi-purpose Berth	Around coal		
New Berth	Quay No.55-61	3 Berths for Conventional Ships	720 l.m
		1 Berth of Heavy Cargo	400 l.m
		Rubber Fender (h=1.4m,L=1.5m)	75 units
		70 tf bollard	39 units
		100 tf bitt	6 units
		Revetment	280 l.m
		Temporary Revetment	350 l.m
		Crane Foundation	700 l.m
Land Reclamation		Filling Sand with Pre-consolidation	17.5 ha
Yard Area		Open Storage & Concrete Pavement yard	7.8 ha
		AsphaltConcrete Pavement Yard	8 ha
		Transit Shed	6,000 sq.m
Road Area		Road Pavement	22,000 sq.m
		Gate House with Truck Scale	1,200 sq.m
New Fly-over Bridge		Fly-over PC Bridge (2 lanes)	360 l.m
2. Deep Water Coal Berth	Behind of		
Front Extension of Berth	Military quay	1 Berth for Coal & Coke Ships	270 l.m
		Rubber Fender (h=1.4m,L=1.5m)	18 units
		70 tf bollard	9 units
		100 tf bitt	2 units
3.New Port Bridge			
Steel Truss Superstructure		91 m x 17.35 m; 545 tons	1 unit
Abutment		RC base concrete 20x4x6.3h	2 units
Road & Walkway		W=15.85m; 2.10x2 lane	91 L.m
4.New Grain Terminal	Mina Qamariya		
New Berth		-14.0 m grain berth	270 l.m
		Rubber Fender (h=1.4m ,L=1.5m)	18 units
		70 tf bollard	9 units
		100 tf bitt	2 units
		Revetment	10 l.m
		Crane Foundation	250 l.m
Land reclamation		Back-of-berth yard	2.2 ha

23.2 Cost Estimation

The cost of the construction and equipment procurement for the short-term development plan is estimated based on the following considerations:

A) Quantities of main civil works are based on the preliminary designs of facilities. In estimating construction costs, the physical contingency of 10% for civil works and 3% for equipment procurement are included in the cost estimates by this study.
B) Unit rates of the onshore works collected during the site surveys are adopted in the cost estimate. Unit rates of the offshore works such as beams and slab concrete of the pier are obtained by

multiplying those of onshore concrete works by certain factors.

C) Unit prices of equipment are based on the currently prevailing costs by potential suppliers
D) In costing construction costs, engineering service cost for the detailed design, assistance in construction tendering and construction supervision amounting of 10% for civil works and 3% for procurement are included in the cost estimates by this study.
E) The exchange rate of 1.0 US$ against to 3.4 L.E. and 136 Japanese Yen as of May, 1998 is adopted.

Total project cost for short-term development plan is estimated to be about 596 million Egyptian Pound (L.E.). The foreign currency portion is about 242 million L.E. (71 million US$) which is equivalent to 41% for the total cost of the project. Total project cost and each project cost are presented in Table 23.2.1.

In addition, annual fund requirement for construction and equipment procurement is prepared based on study results of construction cost estimate and implementation program as presented in Figure 23.2.1.

Table 23.2.1 Total Project Cost for Short Term Development Plan

Unit : L.E. (Egyptian Pound)

No.	Item	Spec	Unit	Quantity	Prices	Amount	F/c %	F/c Portion
A	Civil Works							
1	Multi-purpose Berth	4berths	sum	1		303,538,515	28%	85,171,500
2	Coal & Coke Berth	1berth	sum	1		17,804,663	67%	11,987,989
3	Grain Berth	1berth	sum	1		36,564,850	21%	7,717,173
4	Aged Bridge Replacement		sum	1		8,044,540	33%	2,084,883
	TOTAL of Civil Works					365,952,568	29%	106,961,545
B	Dredging							
1	Multi-purpose Berth	4berths	sum	1		37,510,000	59%	22,132,000
2	Coal & Coke Berth	1berth	sum	1		1,525,000	69%	880,000
3	Grain Berth	1berth	sum	1		6,855,000	59%	4,026,000
	TOTAL of Dredging					45,890,000	59%	27,038,000
C	Procurement							
1	Multi-purpose Berth	4berths	sum	1		30,000,000	83%	24,900,000
3	Grain Berth	1berth	sum	1		62,500,000	85%	53,125,000
5	Installation of VTMS		sum	1		2,700,000	90%	2,430,000
6	Waste Oil Receiving Facility		sum	1		1,000,000	90%	900,000
	TOTAL of Procurement					96,200,000	85%	81,355,000
D	Engineering services							
	Civil Works & Dredging		%	10%	411,842,568	41,184,257	30%	12,355,277
	Procurement		%	3%	96,200,000	2,886,000	30%	865,800
	TOTAL of Engineering services					44,070,257	30%	13,221,077
E	Physical contingency							
	Civil Works & Dredging		%	10%	411,842,568	41,184,257	30%	12,355,277
	Procurement		%	3%	96,200,000	2,886,000	30%	865,800
	TOTAL of Physical contingency					44,070,257	30%	13,221,077
	GRAND TOTAL					596,183,082	41%	241,796,699

Unit : L.E. (Egyptian Pound)

No	Item	Amount	F/c	F/c Portion	1st year Total	1st year F/C	2nd year Total	2nd year F/C	3rd year Total	3rd year F/C	4th year Total	4th year F/C	5th year Total	5th year F/C	6th year Total	6th year F/C
A	Civil Works		%													
1	Multi-purpose Berth	303,538,515	28%	85,171,500					65,230,882	18,516,004	139,302,658	39,966,259	99,004,955	26,689,237		
2	Coal & Coke Berth	17,804,663	67%	11,987,989							6,797,727	4,407,399	1,006,936	7,580,597		
3	Grain Berth	36,564,850	21%	7,717,173							12,493,130	3,011,524	24,071,720	4,705,651		
4	Aged Bridge Replacement	8,044,540	33%	2,084,883									8,044,540	2,084,883		
	TOTAL of Civil Works	365,952,568	29%	106,961,545					65,230,882	18,516,004	158,593,515	47,385,182	132,128,151	41,060,368		
B	Dredging															
1	Multi-purpose Berth	37,510,000	59%	22,132,000					37,510,000	22,132,000						
2	Coal & Coke Berth	1,525,000	69%	880,000					1,525,000	880,000						
3	Grain Berth	6,855,000	59%	4,026,000					6,855,000	4,026,000						
	TOTAL of Dredging	45,890,000	59%	27,038,000					45,890,000	27,038,000						
C	Procurement															
1	Multi-purpose Berth	30,000,000	83%	24,900,000							9,000,000	7,470,000	18,000,000	14,940,000	3,000,000	2,490,000
3	Grain Berth	62,500,000	85%	53,125,000							18,750,000	15,937,500	37,500,000	31,875,000	6,250,000	5,312,500
5	Installation of VTMS	2,700,000	90%	2,430,000									2,700,000	2,430,000		
6	Waste Oil Receiving Facility	1,000,000	90%	900,000									1,000,000	900,000		
	TOTAL of Procurement	96,200,000	85%	81,355,000							27,750,000	23,407,500	59,200,000	50,145,000	9,250,000	7,802,500
D	Engineering services															
	Civil Works, exclude A-4	35,790,803	30%	10,770,089	16,105,861	4,846,540	1,789,540	538,504	5,368,620	1,615,513	5,368,620	1,615,513	5,368,620	1,615,513	1,789,540	538,504
	Ditto, A-4	804,454	30%	208,488									804,454	208,488		
	Dredging	4,589,000	30%	1,376,700					4,589,000	1,376,700						
	Procurement	2,886,000	30%	865,800							865,800	259,740	1,731,600	519,480	288,600	86,580
	TOTAL of D	44,070,257	30%	13,221,077	16,105,861	4,846,540	1,789,540	538,504	9,957,620	2,992,213	6,234,420	1,875,253	7,904,674	2,343,481	2,078,140	625,084
E	Physical contingency															
	Civil Works, exclude A-4	35,790,803	30%	10,770,089	16,105,861	4,846,540	1,789,540	538,504	5,368,620	1,615,513	5,368,620	1,615,513	5,368,620	1,615,513	1,789,540	538,504
	Ditto, A-4	804,454	30%	208,488									804,454	208,488		
	Dredging	4,589,000	30%	1,376,700					4,589,000	1,376,700						
	Procurement	2,886,000	30%	865,800							865,800	259,740	1,731,600	519,480	288,600	86,580
	TOTAL of E	44,070,257	30%	13,221,077	16,105,861	4,846,540	1,789,540	538,504	9,957,620	2,992,213	6,234,420	1,875,253	7,904,674	2,343,481	2,078,140	625,084
	GRAND TOTAL	596,183,082	41%	241,796,699	32,211,723	9,693,080	3,579,080	1,077,009	131,036,123	51,538,431	198,812,356	74,543,189	207,137,500	95,892,331	13,406,280	9,052,669
					5%		1%		22%		33%		35%		2%	

Figure 23.2.1 Annual Fund Requirement for Construction and Equipment

24 Economic Analysis

24.1 Purpose and Methodology of Economic Analysis

The purpose of the economic analysis is to appraise the economic feasibility of the Short-term Development Plan for the Greater Alexandria Port in the target year (2007) from the viewpoint of the national economy. All benefits and costs are evaluated using economic prices. In this study, the economic internal rate of return (EIRR) and the benefit/cost ratio (B/C ratio) based on a cost-benefit analysis are used to appraise the feasibility of the project.

24.2 Prerequisites for Economic Analysis

(1) Base Year
In this study, 1998 is set as the "Base Year" which means the standard year in the estimation of costs and benefits. Starting year (Year No.1) is assumed 5 years prior to the target year (Year No.6) considering the period of construction.

(2) Project Life
The period of calculation (project life) in the economic analysis is assumed to be 30 years from the starting year, taking into consideration the depreciation period of the main facilities.

(3) Foreign Exchange Rate
The exchange rate adopted for this analysis is US$ 1.00 = LE 3.40 = ¥ 136.00 (as of May 1998), the same rate as used in the cost estimation.

(4) "With" Case
In an economic analysis, benefits are mainly brought about by improvement and expansion in handling capacity. Therefore, the "With" case scenario includes improvements in productivity and expansion of port facilities in the Short-term Development Plan.

(5) "Without" Case
In the "Without" case scenario, no investment is made for the Short-term Development Plan.

1) 4 berths in Multipurpose Terminal are not constructed.
2) New berth in Grain Terminal is not constructed.
3) The coal terminal is not improved.
4) A new port road bridge is not constructed.

24.3 Economic Prices

(1) General
For the economic analysis, all prices must be expressed in economic prices which means the international prices or border prices. The economic prices are calculated by multiplying

the market prices by the conversion factor.

(2) Standard Conversion Factor (SCF)
Customs duties creates a price difference between the domestic market and the international market. The SCF is used to determine the economic prices of non-traded goods that have only market prices, and makes up for this price difference. The average SCF from 1991 to 1996 is calculated as 0.848

(3) Conversion Factor for Consumption (CFC)
This conversion factor is used to convert the market prices of consumer goods into the border prices. The average CFC from 1991 to 1996 is calculated as 0.887.

(4) Conversion Factor for Skilled Labor (CFSL)
The cost of skilled labor is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as the data are domestic prices or market prices, they should be converted to border prices by multiplying by the CFC. The CFSL is calculated as 0.887.

(5) Conversion Factor for Unskilled Labor (CFUL)
The wages paid to unskilled labors by a project are generally above the opportunity cost. Hence, these wages shouldn't be used for calculation of the economic value of the unskilled labors. Assuming that the inflow of unskilled labors to the project is mainly from the agriculture sector, the marginal productivity of an unskilled labor is assumed equal to the per capita GDP of the agriculture sector in Egypt. In this report, the CFUL is calculated as 0.613 using the data in 1996/97.

24.4 Benefits of the Projects

(1) Benefit Items
As benefits brought about by the short-term development plan of the study port, the following items are identified and the monetary benefits of those items are counted.

1) Saving in ship staying costs at a berth
2) Saving in ship waiting costs at an offshore anchorage
3) Saving in sea transportation costs
4) Saving in land transportation costs
5) Saving in construction costs of new berths for handling the excess cargoes in another port

(2) Calculation of Benefits
The benefits above items in the Short-term Development Plan by each project are shown in Table 24.4.1.

Table 24.4.1 Total Benefits in the Short-term Development Plan (Unit: thousand LE)

Project Year No.	Multipurpose Terminal (New berth cost)		Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
1	10,397	0	0	0	0	10,397
2	1,155	0	0	0	0	1,155
3	23,600	0	0	0	0	23,600
4	45,031	0	0	0	0	45,031
5	61,396	0	0	0	0	61,396
6	2,085	88,328	19,557	11,896	1,717	123,583
7	930	87,724	20,483	11,896	1,726	122,759
8	930	87,295	22,032	11,896	1,736	123,888
9	930	87,176	22,995	11,896	1,732	124,729
10	930	86,749	24,036	11,896	1,764	125,375
11	930	86,370	25,476	11,896	1,752	126,423
12	930	86,006	26,759	11,896	1,766	127,357
13	930	86,020	28,246	11,896	1,735	128,826
14	930	85,275	30,030	11,896	1,748	129,879
15	930	85,549	31,743	11,896	1,718	131,835
16	930	84,677	33,191	11,896	1,721	132,414
17	930	84,353	34,817	11,896	1,711	133,707
18	930	84,031	36,729	11,896	1,700	135,285
19	930	83,709	38,959	11,896	1,690	137,184
20	930	83,388	40,434	11,896	1,680	138,328
21	930	83,067	43,620	11,896	1,670	141,183
22	930	82,561	45,985	11,896	1,667	143,039
23	930	82,054	48,580	11,896	1,664	145,124
24	930	81,546	51,495	11,896	1,661	147,527
25	930	81,037	54,858	11,896	1,657	150,378
26	930	80,526	59,192	11,896	1,654	154,199
27	930	80,057	63,961	11,896	1,650	158,493
28	930	79,581	68,813	11,896	1,646	162,866
29	930	79,098	74,880	11,896	1,642	168,446
30	930	78,610	81,713	11,896	1,638	174,787
Total	2,260,764		1,028,584	297,402	42,445	3,629,194

24.5 Costs of the Projects

Following items are identified as costs of the Short-term Development Plan.

1) Construction Costs
2) Maintenance Costs
3) Re-investment Costs
4) Personnel and Administration Costs

Table 24.5.1 shows total costs at economic prices in the Short-term Development Plan by each project.

Table 24.5.1 Total Costs in the Short-term Development Plan (Unit: thousand LE)

Year	Project No.	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
1		23,624	2,846	1,386	0	27,855
2		2,625	316	154	0	3,095
3		103,682	8,315	2,097	0	114,094
4		135,300	30,658	6,748	0	172,707
5		115,693	59,186	10,744	8,214	193,836
6		18,113	10,694	350	82	29,239
7		12,452	4,023	196	82	16,753
8		12,452	4,023	196	82	16,753
9		12,452	4,023	196	82	16,753
10		12,452	4,023	196	82	16,753
11		12,452	4,023	196	82	16,753
12		12,452	4,023	196	82	16,753
13		12,452	4,023	196	82	16,753
14		12,452	4,023	196	82	16,753
15		14,492	4,023	196	82	18,793
16		12,452	4,023	196	82	16,753
17		12,452	4,023	196	82	16,753
18		12,452	4,023	196	82	16,753
19		12,452	4,023	196	82	16,753
20		42,813	67,569	196	82	110,661
21		12,452	4,023	196	82	16,753
22		12,452	4,023	196	82	16,753
23		12,452	4,023	196	82	16,753
24		12,452	4,023	196	82	16,753
25		14,492	4,023	196	82	18,793
26		12,452	4,023	196	82	16,753
27		12,452	4,023	196	82	16,753
28		12,452	4,023	196	82	16,753
29		12,452	4,023	196	82	16,753
30		1,884	-15,960	196	82	-13,798
Total		721,750	252,122	26,194	10,267	1,010,333

24.6 Evaluation of Projects

(1) Calculation of the Economic Internal Rate of Return **(**EIRR)

The EIRR based on a cost-benefit analysis is used to appraise the economic feasibility of the project. The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. The results of the EIRR calculation are shown in Table 24.6.1.

Table 24.6.1 Result of EIRR Calculation

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
EIRR	23.0%	18.2%	39.1%	19.8%	22.7%

(2) Calculation of the Benefit/Cost Ratio

The benefit/cost ratio is obtained by dividing the benefit by the cost. The results of the B/C are shown in Table 24.6.2. The discount rate adopted for calculation of B/C is 10% in this study.

Table 24.6.2 Result of B/C Calculation

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
B/C	1.70	1.74	4.34	1.74	1.80

(3) Calculation of the Net Present Value (NPV)

The results of the NPV calculation are shown in Table 24.6.3.

Table 24.6.3 Result of NPV Calculation (Unit: thousand LE)

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
NPV	265,295	82,331	56,772	4,539	408,937

(4) Sensitivity Analysis

In order to see whether the project is still feasible when some conditions change, a sensitivity analysis is made for the following three alternatives. The results of the sensitivity analysis are shown in Table 24.6.4

- Case A: The costs increase by 10%
- Case B: The benefits decrease by 10%
- Case C: The costs increase by 10% and the benefits decrease by 10%

Table 24.6.4 Sensitivity Analysis for EIRR and B/C Ratio

Project	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	New Port Road Bridge	Whole
Case A	20.1% 1.55	16.6% 1.58	36.4% 3.95	17.8% 1.58	20.1% 1.63
Case B	19.8% 1.53	16.4% 1.56	36.1% 3.91	17.6% 1.57	19.6% 1.60
Case C	17.2% 1.39	15.0% 1.42	33.6% 3.55	15.8% 1.43	17.3% 1.45

Note: The upper figure is EIRR and the lower figure is B/C ratio.

(5) Evaluation

In general, it is said that a project with an EIRR of more than 10% is economically feasible considering the opportunity cost of capital. As for this study, the resulting EIRRs of the four projects and whole project are in the range of 15.0% - 39.1%, exceeding the above criterion, and all B/C ratios are greater than one. Therefore, all projects proposed in the Short-term Development Plan are considered to be feasible from the viewpoint of the national economy.

25 Financial Analysis

25.1 Purpose and Methodology

The purpose of the financial analysis is to appraise the financial feasibility of the Short-term Development Plan. The analysis focuses on the viability of the project itself and the financial soundness of the terminal management entity during the project life.

(1) Viability of the project
The viability of the project is evaluated using the Financial Internal Rate of Return (FIRR). The FIRR is a discount rate which makes the cost and the revenue during the project life equal.

When the calculated FIRR exceeds the weighted average interest rate of the total funds for investments of the project, the project is regarded as financially feasible.

(2) Financial soundness of the terminal management entity
The financial soundness of the terminal management entity is appraised with its projected financial statements (income statement, cash flow statement and balance sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency.

25.2 Prerequisites of the Financial Analysis for the Project

(1) Scope of the Financial Analysis
Scope of this financial analysis is the projects in the Short-term Development Plan. The concrete projects are as follows.
1) Multipurpose Terminal Project including New Port Road Bridge Project
2) Grain Terminal Modernization Project
3) Deep Water Coal Berth Project

(2) “With” case and “Without” case
The viability of the project, namely FIRR is analyzed based on the difference of revenues and costs between “With” case and “Without” case. Here, “With” case is the case which the Short-term Development Plan is executed while “Without” case represents the existing situation. The financial soundness of the terminal management entity is analyzed using “With” case.

(3) Base Year
All costs and revenues are indicated in prices as of 1998, when the price survey was conducted. We call this year the “Base Year”.

(4) Project Life
Considering the long-term loans and the service lives of the port facilities, the project life in the financial analysis is assumed to be 30 years including the period of detailed design

and construction work. Neither inflation nor an increase in nominal wages are considered during the project life.

(5) Fund Raising

Fund raising is divided into foreign fund and domestic fund. In this study, referring to funding conditions of soft loan by international financial institute including OECF, as for foreign fund, its upper limit of finance is assumed to be the total amount of foreign portion or 75% of initial investment costs, whichever is higher. In the proposed projects, seventy-five percent of initial investment costs is assumed to be raised by foreign fund. The remaining initial investment costs (25%) and all of renewal investment are assumed to be raised by domestic fund. Conditions of loans are assumed as follows.

1) Foreign funds
   - Loan period : 30 years, including a grace period of 10 years
   - Interest rate : 2.2 %
   - Repayment : Fixed amount repayment of principal

2) Domestic funds
   - Loan period : 10 years
   - Interest rate : 14.5%
   - Repayment : Fixed amount repayment of principal

3) Weighted average interest rate
   5.275% (= 2.2%×0.75+14.5%×0.25)

(6) Cargo Handling Volume

1) Conventional cargo (Multipurpose Terminal Project)
   In the “With” case, projected volume of conventional cargo increases after year 6 as a result of constructing the Multipurpose Terminal. But in the “Without” case, the cargo volume exceeds the handling capacity in year 6 and remains fixed after that point. The excess cargoes are transferred from the Greater Alexandria Port to another port (Damietta Port).

2) Dry bulk grain cargo (Grain Terminal Modernization Project)
   In the same year, projected volumes of dry bulk grain cargo for “With” case (handling at No.94-1, 94-2, new berth) and “Without” case (handling at No.94-1, 94-2 berth) are the same.
   Therefore, there is no difference in the cargo handling volume between the two cases.
3) Dry bulk coal cargo (Deep Water Coal Berth Project)
   As Projected volumes of dry bulk coal cargo (handling at No.63/64 berth) for “With” case and “Without” case are the same, there is no difference in cargo handling volume between the two cases.

(7) Revenues

1) Multipurpose Terminal Project

Based on the difference of conventional cargo volume for "With" case and "Without" case at the Greater Alexandria Port, revenues for the Multipurpose Terminal Project are calculated using the official tariff (Charges and Services Tariff at Alexandria Port, Storing Services Tariff).

Private stevedoring companies which recently obtained licenses according to Decree No.30 for promoting private participation are offering their own stevedoring charges. The above mentioned official tariff and their charges offered by private companies were cross-checked. There is no decisive difference between them regarding stevedorage. Therefore, the official tariff is used for calculation.

2) Grain Terminal Modernization Project

As projected volumes of dry bulk grain cargo for "With" case and "Without" case are the same, it is assumed that saving in ship staying costs and waiting costs given in the Economic Analysis represents revenue for the Grain Terminal Modernization Project.

3) Deep Water Coal Berth Project

As projected volume of dry bulk coal cargo for "With" case and "Without" case are the same, it is assumed that saving in sea transportation costs given in the Economic Analysis represents revenue for the Deep Water Coal Berth Project

(8) Expenses

1) Investment in capital assets

According to the construction schedule, investment will be made. The equipment will be replaced after service life with internal fund. Service lives are as follows.

- Unloader, conveyor, gantry crane, scale unit : 15 years
- Forklift : 10 years

The annual depreciation of the equipment is calculated by the straight line method. In this analysis, residual values at the end of the project life are not considered.

2) Maintenance costs

The annual maintenance costs for the port facilities are calculated as follows.

- Infrastructure : 1.0% of the original construction cost
- Equipment : 4.0% of the original procurement cost

3) Personnel and administration costs

Estimation of annual personnel costs is based on the required number of employees to manage and operate the future port facilities. Administration costs which include the welfare costs for labor and the general management costs are estimated as 50% of the personnel costs. Assumed numbers of personnel are as follows.

Multipurpose Terminal Project

a) Administration personnel 223

b) Loading/unloading division 252
c) Total - Skilled labor 475
- Unskilled labor 360

Grain Terminal Modernization Project
a) Administration personnel 56
b) Loading/unloading division 24
c) Total - Skilled labor 80
- Unskilled labor 12

25.3 Evaluation of the Project

(1) Viability of the Project

1) Calculation of FIRR

The result of the FIRR calculation is shown in Table 25.3.1. In all the projects, FIRR exceeds the weighted average interest rate of the funds. (5.275%)

Table 25.3.1 Result of FIRR Calculation

	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	Whole
FIRR	10.2%	16.6%	36.4%	12.6%

2) Sensitivity Analysis

Sensitivity analysis is conducted to examine the impact of unexpected future changes such as cargo volume, construction cost, inflation or exchange rate. The following cases are envisioned.

- Case 1 : The investment costs increase by 10%
- Case 2 : The revenues decrease by 10%
- Case 3 : The investment costs increase by 10% and the revenues decrease by 10%

The results of the sensitivity analysis are shown in Table 25.3.6. In all the cases, FIRR exceeds the weighted average interest rate of the funds (5.275%)

Table 25.3.6 Sensitivity Analysis for FIRR

	Multipurpose Terminal	Grain Terminal Modernization	Deep Water Coal Berth	Whole
Case 1	9.0%	15.1%	33.9%	11.4%
Case 2	8.9%	15.0%	33.6%	11.2%
Case 3	7.8%	13.6%	31.2%	10.0%

3) Evaluation

Judging from the above, this project is regarded as financially feasible under the assumptions in chapter 25.2.

(2) Financial Soundness of the Terminal Management Entity

1) Profitability

The rate of return on net fixed assets exceeds the weighted average interest rate of funds from year 6, the beginning of the operation.

2) Loan Repayment Capacity

Throughout the project life, the debt service coverage ratio exceeds 1.0. This means that there will be no difficulty in repaying long-term loans from the annual operating revenues.

3) Operational Efficiency

Both the operating and working ratios maintain favorable levels. It shows that the operation will be efficient.

(3) Conclusion

Judging from the above analysis, all the projects are regarded as financially feasible. However, the terminal management entity should make continuous efforts to secure forecast cargo volume, to improve cargo handling efficiency and to reduce operating expenses.

26 Improvement Plan of the Port Management and Operations

26.1 Principles of Port Management and Operations

26.1.1 Background on Management, Operations and Institutional Matters of Alexandria Port

Although Alexandria Port is a landlord port, cargo-handling operations have not necessarily been efficient owing to monopolistic operations by the state-owned companies. Private companies had been allowed to conduct only limited operations. However, recent decrees (including Decree No.30, May 1998) on private participation have dramatically changed this situation. Private companies are now able to participate in various maritime works including loading/discharging works, storage/warehouses activities, container activities and shipping agency services.

26.1.2 Effective Measures to Promote Privatization and Private Sector Participation

(1) Effective Measures to Promote Private Sector Participation (PSP)

It is essential for the government to induce private companies to participate in terminal operations within the port in order to secure swift and economical port services with high quality for port users. From this viewpoint, it is recommended that the government authorities concerned take the following measures.

1) Basic philosophy of PSP shall be established and reaffirmed among relevant agencies. In this case, the concept of “fairness of opportunity”, “transparency” and “competition” shall be emphasized
2) Legal framework (relevant laws and regulations) shall be arranged transparently so that private sector can participate in terminal operations as freely as possible.
3) In addition, legal framework regarding foreign investment shall be carefully considered. In this case, guarantee of rights of foreign investors shall be emphasized.
4) It is advisable for the government to establish guidelines for PSP based on clear legal frameworks.
5) The guidelines shall clarify working fields of port services that the private sector can participate in. It is advisable for the government to prepare project lists.
6) Competitive bidding needs to be promoted to select the responsive terminal operators beneficial to the national economy.
7) Desirable environment where private sector can easily take part in needs to be created.

(2) Measures to Mitigate the Impact brought by Privatization and Private Sector Participation

On the other hand, for the existing state-owned companies, privatization and subsequent competition among private companies would bring considerable impact on both management and employees due to possible restructuring and downsizing. They may opt to reduce their personnel. In such cases, the following mitigation measures shall be taken

1)To conduct gradual and prudent restructuring so as not to cause social unrest due to unemployment.

2) To retrain the current employees so as to enable them to find new jobs.
3) To provide government assistance for displaced workers looking for new jobs
4) To generate new employment opportunity within the port through the increase in port capacity and promotion of new port business by APA

26.1.3 Reorganization to Encourage Competition in the Port Sector

(1) Principles of Private Participation and Privatization of State-Owned Companies

To improve cargo handling efficiency, it is necessary to introduce competition in the field of cargo handling operation. According to the new law, private companies can perform stevedoring operation using mechanical equipment at quay. In addition, it is necessary to abolish the monopolistic privileges of state-owned companies so that all the companies could compete on equal conditions; encouraging competition between state-owned companies and private companies will improve the service level. As a method of privatization of state-owned companies, Egyptian Government opted to sell their shares to the public. If capital gain or dividend is not expected due to the poor performance of the company, nobody might be interested in subscribing for the shares. Therefore, the performance of the company must first be improved to attract potential investors.

(2) Monitoring the Performance of Operators

APA should monitor the performance of operators and recommend the improvement of productivity if the performance is poor and reject the renewal of lease contract if improvement is not expected. APA needs to put pressure on port operators to improve the productivity of operation.

(3) Financial Independence of Port Authority

Every year APA has to negotiate with the central government to decide the budget for APA. It is necessary to ensure that APA is independent or self-sustainable financially in order to spend its budget flexibly, timely or effectively in accordance with requirement.

26.2 Future Port Management and Operations

26.2.1 Improvement of Conventional Cargo Handling

(1) Establishment of Terminal Operators

It is necessary to establish terminal operators that perform general cargo handling operation comprehensively. APA should designate the new multi-purpose terminal, Timber Quay and Mamoudiya Quay as port terminal for handling conventional cargoes. These areas are divided into some portions and they are allocated to the terminal operators. Each terminal should have the appropriate size for conventional cargo handling and have open storage yards and warehouses for exclusive use.

(2) Avoiding Direct Loading/Delivery

Currently, unloaded cargoes from a vessel are directly loaded onto trucks/trailers. Although this method reduces cargo damage during operation, productivity is lower than when landing on the quay. It is advised that this method should be adopted only for handling specific cargoes such as hazardous cargoes.

26.2.2 Measures to Mitigate the Impact on Barge Operators

For achieving gradual conversion of barge operation into quayside operation smoothly, it is proposed that the government take the initiative in conducting measures to give barge operators licenses to perform quayside operation. In addition, it is recommended to provide retraining programs to obtain necessary knowledge, techniques or skills for quayside operation.

26.2.3 Improvement of Container Handling Operation

(1) The Government must sell some stakes (at least 25%) of the company to private companies interested in the container terminal business on an auction basis.

It is expected that the private investors will introduce the most advanced equipment or technologies and know-how, and they will train personnel for efficient operation.

(2) Necessary Measures to Achieve the Targeted Productivity

It is required to achieve the targeted productivity (24 boxes/hour per crane) of container loading/unloading operation to handle the future container traffic in the existing facilities. In order to do so, the effective measures shall be prompted as explained in Chapter 18.

(3) Introduction of Advanced Technology

To improve the efficiency of container handling operation, it is essential to exchange information and communicate effectively between crane operators and the supervisor at the control center. The following systems for transmitting information are currently used at container terminals.

1) Radiotelephone (handy talkies) system
2) Mobile radio terminal on vehicle system
3) Mobile telephone system (PHS = Personal Handy phone System)
4) Global Positioning System (GPS)

(4) Introduction of Computer Systems

1) Container Inventory Control

   Inventory control of containers stored in CY is the most important task in container terminal operation. It is essential to grasp the location and kind of containers stored in CY to operate a container terminal efficiently. Gate offices, yard control center and container handling equipment should be linked with each other to exchange information effectively and assure the accuracy of information on containers.

2) Container delivering/receiving control system

   Gate offices of container terminal play important roles in receiving/delivering containers from/to shippers/consignees. In receiving an export container, it is important to decide its optimum location in CY based on the container's information for efficient operation. In delivering an import container, it is important to instruct the tractor/trailer driver to go to the location of the containers quickly and to inform the operator of container handling equipment of the tractor/trailer's arrival.

3) Loading/unloading operation control system

In loading export containers, it is very important to load containers based on the yard planning system by weight, port of discharge and container size for stability and safe navigation of vessels.

Necessary information on containers should be obtained from shipping lines or agents as early as possible. Obtaining the information in advance enables a terminal operator to prepare the working schedule indicating the order of unloading/loading containers and to minimize the operation time.

(5) Minimizing the Breakdown Time of Container Handling Equipment

To achieve the targeted productivity, it is essential to minimize the breakdown time of container handling equipment. Competent personnel should be appointed as a yard operator. This yard operator should always stand by in the terminal office to monitor both loading/unloading and yard operation. To minimize the breakdown time of quayside gantry crane or RTG, backup spreaders must be procured. It is also advisable to conduct preventive maintenance at a regular interval.

26.2.4 Others

(1) Introduction of Computer Systems Concerning Documentation

Computerization in many fields such as documentation, berth assignment, accounting, administration work and personnel management as well as statistics will make it unnecessary to enter the same information on other documents and possible to use repeatedly the information once fed into computers.

(2) Preventing Traffic Congestion

At the passenger terminal, where many conventional cargo vessels berth, it is very difficult to secure sufficient space for marshalling area for break bulk cargo handling by forklifts. It is necessary to prepare a waiting area for trucks, where a truck driver stays with a mobile phone or walkie-talkie to communicate with a foreman.

(3) Gate Traffic Control

Truck/trailers carrying timber must pass through Gate No.54. It takes three minutes to finish measuring the volume of timber on one truck. However, more than ten trucks make lines in front of the gate, causing traffic congestion. Furthermore, since Gate No.54 allows two-way traffic, incoming vehicles not related to cargo transport make the congestion around the gate worse. It is necessary to maintain one-way traffic only for outgoing cargo trucks at Gate No.54 as incoming vehicles can pass through another gate, No.46.

(4) Simplifying Physical Inspection of Customs Clearance

The number of samples for physical inspection is approximately 10 % of the whole consignment. To speed up customs clearance, the ratio of sample check should be 5%. At first, customs officers should select and inspect only one container physically regardless of the volume of consignment. If they do not find contraband in this container, they should end the physical inspection.

(5) Reducing Empty Containers in the Port Area

Due to the imbalance between import containers and export containers, there are many empty containers at Alexandria port, which are stacked outside the container terminal in the port area. It is necessary to reduce empty containers in the port area by making the container storing charge greater than that of the yard outside the port.

(6) Removing Wrecked Ships in the Port Area

A lot of wrecked ships are obstacles to developing the new multi-purpose terminal. Before construction of the new multi-purpose terminal, it is required to remove the wrecked ships at the expense of owners. However, in many cases, APA has no choice but to remove the wrecked ships at its own expense. Procedure for removing the ships need to be expedited.

(7) Port Environmental Improvement Action Plan

The Alexandria port water and sea bed material are severely polluted and it would require genuine concerted effort by APA to reserve this seeming trend of ever continuing indiscriminate disposal of wastes. At first pollution control due to the direct ship movement and cargo handling be given the highest priority. APA is legally bound to provide ballast and bilge waste treatment plant. Ballast and Bilge Waste Treatment System is provided by this master plan to treat the ballast and bilge waste generated in the port except the petroleum basin.

27 Environmental Impact Assessment (EIA)

27.1 Introduction

The target year of the master plan is 2017 and that of the Short-term Development Plan (SDP) forming the initial development phase of the master plan is 2007. The environmental impact assessment (EIA) is principally aimed at identification, evaluation of significance and appropriate mitigation measures against potential adverse effects due to the execution of the significant project components of the SDP. In this respect this EIA could also be regarded as a detailed delineation of the IEE of Chapter 19, but targeting only the significant project components of SDP.

Essentially based on the scale of the project, the following four (4) project components are selected as significant projects to be subjected to EIA.

- Multipurpose Terminal Project
- Deep Water Coal Berth Project
- Grain Terminal Modernization Project
- New Port Road Bridge Project

27.2 Baseline Environmental Condition of the Port

The baseline environmental condition and the relevant environmental issues of the port area are summarized in Chapter3. The port water quality is visibly deteriorated. This is confirmed from the sampling results of sea water and seabed material quality conducted by the Study Team.

The causative elements for this severe water pollution problem of the port are very complex due to very long operational history of the port and a variety of potential pollution sources involved. Port waters pollution due to ship-borne oily waste is the significant direct pollution source, while wastewater discharges in port waters due to land based domestic, industrial and other activities are the indirect pollution sources.

The improvement of port water environmental quality would require long-term programs targeting the control of all pollution sources. The required port environmental improvement action program is illustrated in Section 3.3 of Chapter 3.

27.3 Description of the Project

A brief description of the four (4) project components of the SDP targeted for the conduct of EIA is given below. The three (3) projects, namely, Multipurpose Terminal Project, Deep Water Coal Berth Project and Grain Terminal Modernization Project are offshore terminal related projects and hence referred to as “Offshore Projects”. The New Port Road Bridge Project is on-land based and hence referred to as “On-land Project”. Only the offshore projects involve dredging work.

27.3.1 Offshore Projects

The Multipurpose Terminal Project and the Grain Terminal Modernization Project are new terminal development projects, while the Deep Water Coal Berth Project is an improvement project of the existing coal berth. Still the offshore areas of all these three projects, including their common access area, will have a minimum seabed level of 14m below the datum level to ensure sufficient draft for direct access by Panamax type bulk carriers.

The Multipurpose Terminal Project is the largest among the all three offshore terminal related projects, since an entirely new multipurpose terminal (about 740m in length and 400m in width) having a total of six (6) berths will be constructed as per the master plan. However, by this project as per the SDP only four (4) of the six (6) berths will be constructed. This Project will basically provide a spacious open yard to facilitate handling on a priority basis, specialized conventional cargo such as long, heavy and bulky cargo, thereby increasing the overall efficiency of conventional cargo handling. The significant installation work of the project include the provision of two (2) multipurpose QGCs (quayside gantry cranes).

The Deep Water Coal Berth Project is the smallest of the three offshore projects. The existing (concrete block gravity type) coal berth in the Alexandria Port will be extended offshore by about 10m so that the existing rail mounted unloaders in the berth could be continuously used without replacement. The coal berth will be extended using open deck type (non-reclaimed) system. The extended area is about 10m width and 270m length.

The Grain Terminal Modernization Project, the mid-scale offshore project, will provide a modern grain terminal adjacent to the existing underutilized grain terminal of the Alexandria Port. The terminal, having a length of 270m, will be constructed by reclaiming the enclosed inner portion of the offshore area of the existing breakwater. The modernized terminal will lead to effective utilization of the existing grain silos. Significant equipment installation work of the project include the provision of two (2) mechanical grain unloaders and conveyor of 750m length connecting the new grain terminal with the existing silos.

Though all three projects involve dredging work, the quantity of dredging is highest for the Multipurpose Terminal Project (1,740,000 m3). This is followed with Grain Terminal Modernization Project (317,000 m3) and Deep Water Coal Berth Project (70,000 m3). The high dredging quantities of Multipurpose Terminal Project and Grain Terminal Modernization Project are mainly due to the deep excavation work requirements for their basements. The Deep Water Coal Berth Project has no excavation work for basement resulting in the lowest quantity of dredging, since the extension of the existing berth would be accomplished with open deck type structure only.

27.3.2 On-land Project

The New Port Road Bridge is the smallest and the only significant land based project component of SDP until the year 2007. The new bridge will be an effective link between Berth No.32 and Berth No.33 of the Alexandria Port across the water underneath and will

replace the existing old bridge prohibited for passage by heavy weight trucks. The span length of the new bridge is 90m. This new bridge will eliminate unwanted detour of port related heavy trucks through congested Alexandria City center and is also essential to ensure efficient overall operation of the new multipurpose terminal.

27.4 Environmental Impacts and Mitigation

In general environmental impacts by a project are caused due to activities involved in the three significant stages of a project execution (implementation), namely, pre-construction stage, construction stage and post-construction (operation) stage.

The activities involved and the relevant environmental impacts during each of the above three stages of a project execution are distinct. In particular, impacts during construction stage of a project are essentially of short term (temporary) in nature being confined to the duration of the construction activities while those of operation stage are potentially of long term (permanent) in nature. It is noted that most temporary impacts due to construction activities could be managed and minimized, if not entirely eliminated, with careful planning and execution of the construction/installation works. Potential environmental impact during pre-construction stage of a project is principally social aspects in nature, and caused by potential land acquisition issues.All the land areas and the coastal waters of all four (4) project components of this SDP belong to the port authority (APA) and confined within the existing port boundaries. Hence no land acquisition or resettlement is involved and any potential adverse effects during the pre-construction stage are evaluated as insignificant. Consequently the relevant impacts and mitigation measures for the construction and operation (post-construction) stages of the four (4) SDP projects are only briefed in the subsequent sections.

27.4.1 Construction Activity Impacts

The significant total construction activities involved in the execution of all four (4) project components of the SDP are categorized into the following four (4) groups. It is noted that depending on the project some of these activities may not be involved.

- Material and equipment transportation activity (Activity-1)
- Overall construction and installation activity (Activity-2)
- Dredging and dredged material disposal activity (Activity-3)
- Back-filling and terminal reclamation activity (Activity-4)

Relevant project components concerned to each of these four construction activities and the respective potential adverse effects are given below.

(1) Material and equipment transportation activity (Activity-1)

This activity is common to all four (4) project components of SDP. Potential adverse effects are as follows;

- Transportation of construction material and equipment may interfere with regular road traffic and well as traffic within the port area.
- Transportation of fine particulate construction materials such as sand may cause dust nuisance.

(2) Overall construction and installation activity (Activity-2)
This activity is also common to all project components and its potential adverse effects are as follows;

- Construction works may interfere with the regular ship and vessel movement
- Construction and installation works would cause dust, noise and vibration effects

(3) Dredging and dredged material disposal activity (Activity-3)
This activity is also common to all three offshore project components only. Its potential adverse effects are as follows;

- Increased port water turbidity
- Noise nuisance attributed to operation of the dredger
- Probable encounter and potential damage of buried archeological treasure
- Remobilization of contaminants within the sediment to water environment
- Odor nuisance associated with exposure of anoxic sediment to ambient environment
- Disposal issues of contaminated dredged material in an environmentally acceptable manner
- Adverse effect on biota (fauna and flora) inhabiting the concerned seabed areas of dredging and dredged material disposal

(4) Back-filling and terminal reclamation activity (Activity-4)
This activity is common to only two offshore project components of multipurpose terminal project and grain terminal modernization project. Its only significant potential adverse effect is increased port water turbidity.

27.4.2 Construction Impact Mitigation

The significance of impacts and conceivable mitigation measures for each of the four (4) construction related activities of above are delineated below.

(1) Material and equipment transportation activity (Activity-1)
Interference with regular traffic outside the port area, in particular, the city center area of Alexandria, could be mitigated by adopting off-peak and night time hours for the transportation of items in bulk quantity. Interference with road traffic within the port area is somewhat inevitable, but still could be minimized by reserving specific port gates and routes for traffic concerned to construction work. Potential dust nuisance concerned to the transportation of materials like sand could be mitigated using covered transportation trucks. If open truck/trailer transportation is inevitable, vinyl sheet covering shall be the minimum requirement.

(2) Overall construction and installation activity (Activity-2)
Interference to regular ship movement due to this Activity-2 is somewhat inevitable and shall be tolerated, still could be minimized with careful stage-wise planning of the construction work. Still reallocation of affected vessels to alternative berths may be adopted as a last resort.

Potential noise and vibration is inevitable with respect to the miscellaneous construction and installation works. Still, any adverse effect will be mostly confined to the interior and open water environment of the port where a higher noise level is admissible. Nevertheless, activities causing significant noise and vibration could be restricted to day-time only to minimize adverse effects. Potential dust generation due to the construction works is considered as not very significant since under-water works constitute the major portion of construction works. Still water spraying may be used to control acute dust generation.

(3) Dredging and dredged material disposal activity (Activity-3)
Dredging work for these offshore SDP projects is an important environmental issue principally due to the requirement of dredged material disposal. It was determined by field survey that the seabed material up to a maximum depth of 1m is significantly contaminated with heavy metals and hence not amenable for open deep-sea disposal as per the Dredged Material Standards of Netherlands. Hence controlled disposal of the entire dredged material in a confined area adjacent to the outer breakwater is planned. This would result in the formation of an artificial island.

The dredging work will be sequenced so that the contaminated 1m depth initial layer of the seabed will be dredged and disposed first, thereby forming the base layer of the artificial island. This will be followed with the dredging and disposal of deeper layers of the seabed. Hence clean dredged material will form the surface layer of the artificial island. The maximum transportation distance of dredged material up to the confined area is only about 2km. With this mitigation plan to confine the dredged material no significant adverse effects due to dredging work is anticipated as illustrated below.

The water quality deterioration due to increased turbidity by dredging is evaluated as insignificant since the effect will be limited to the already polluted inner port water area.

Potential noise nuisance due to dredger operation is evaluated as insignificant since it will be confined to the open port water environment.

There is no known previous finding of buried archeological treasures (artifacts) in the offshore area of the Alexandria port. Still, the probability of encountering artifacts during dredging has to be anticipated. Accordingly, dredging work need to be proceeded with care so that any buried artifact could be recovered with minimum damage. In case any artifact is encountered dredging work shall be suspended until a professional archeological survey is carried out to retrieve any remaining buried artifacts.

Remobilization of contaminants during dredging is inevitable to some extent since the surface layer of seabed is significantly contaminated. Still, adverse effect is evaluated as insignificant in consideration to the limited exposure time of dredged material to aerobic environment, the principal cause of remobilization of contaminants. This is both due to the short transportation distance and sequential dredging as noted above.

Potential odor nuisance due to the exposure of anoxic dredged material to aerobic environment would be mostly limited to the contaminated seabed surface sediments.

However, the open sea environment and the limited exposure time of contaminated dredged material are expected to mitigate any adverse effect.

The anoxic status of the contaminated sediment in the form of buried base layer of the artificial island as illustrated above would permanently mitigate remobilization of the heavy metal contaminants to the surrounding water environment, thereby preventing their bio-availability. Bio-availability and the subsequent bio-accumulation of heavy metal constituents in higher order marine biota such as fish is the important environmental concern of heavy metal contamination.

The limited inevitable loss of biota inhabiting the affected seabed areas of these offshore SDP projects is evaluated as ecologically insignificant.

(4) Back-filling and terminal reclamation activity (Activity-4)
Similar to that of dredging activity of above (Activity-3), the temporary water quality deterioration due to increased turbidity consequent to this Activity-4 is also considered as insignificant.

27.4.3 Operation Activity Impacts

In an overall sense, no significant long-term adverse effects consequent to the operation of the improved and modernized port facilities provided by the SDP are anticipated. Still conceivable potential adverse effects during the operation of the facilities are as follows;

(1) The new multipurpose terminal may encounter potential ambient air quality deterioration due to increased exhaust gas emission inherent to increased operation of cargo handling machinery and transportation trucks. Moreover, the belt conveyor transfer of grain from the new grain terminal to the silos may result in dust emission.

(2) Periodic maintenance dredging in the offshore areas of the project facilities of SDP may be required, resulting in the generation of potentially contaminated dredged material requiring controlled disposal.

27.4.4 Operation Impact Mitigation

The potential ambient air quality deterioration due to increased emission of air pollutants is evaluated as insignificant in consideration to the favorable topographic condition of the new multipurpose terminal area having open-air environment with active exchange of air between land and sea. The belt conveyor of the modern mechanical unloader is of covered (pipe) type and hence the potential dust emission is considered as insignificant.

The possible cause of siltation leading to maintenance dredging is identified as the external input of particulate materials into the port waters by the existing sewage out-falls. These out-falls also contaminate the port seawater and seabed material quality. Accordingly APA (Alexandria Port Authority) is strongly recommended to eliminate all sewage out-falls as early as possible. Moreover, regular conduct of bathymetric survey is required to confirm the required minimum water depth for safe navigation.

27.5 Conclusion and Recommendation

27.5.1 Conclusions

The proposed project facilities of the SDP are principally aimed at enhancing the operational safety and efficiency of the functional port. This would also lead to overall long-term environmental improvement of the port as well. In particular the enhancement of navigational safety with the provision of modern VTMS (Vessel Traffic Management System) type navigation system and the mitigation of ship and vessel based oil pollution of port waters with the provision of Waste Oil (ballast and bilge waste) Reception Facility by this SDP are emphasized. These two project components, though of small scales and not subjected to the EIA, are specifically targeted at port safety and environmental improvement.

Still, the most crucial constraint in achieving these multiple benefits of port operational safety and efficiency as well as environmental improvement is the effective enhancement of the port operational management, including the human resources development.

27.5.2 Recommendations

(1) The elimination of sewage out-falls into the port waters is strongly recommended to ensure not only the long-term sustainability of the offshore project facilities of this SDP but also to the improvement of port water environment.

(2) As a long-term environmental monitoring program of the Greater Alexandria Port establishment of an ambient air quality monitoring station and a set of port water quality monitoring stations is recommended.

(3) Implementation of the proposed short-term development plan (SDP) is strongly recommended to realize the enhancement of the port operational safety and efficiency and hence the long-term improvement of the environmental condition of the port.