15.6 Access Channel and Basins

The dimension of the largest vessel that uses the Grain Terminal(1) is as follows:

- Capacity : 30,000 DWT
- Draft : 10.9 m
- LOA(Length Over All) : 180 m
- Breadth : 26 m

Since the water depth in the Old Port area is around 9 m, dredging is necessary. Turning basin is planned in front of the Berth No.1 where the dredging volume is smaller. Since the distance between breakwater and the Berth No.4 is limited, the diameter of the basin is planned to be 270 m = 1.5 LOA under assistance of tug boats. The width of the access channel is planned to be 180 m = 1 LOA.

Total dredging volume for these basins is 300,000 m^3, while total reclamation volume is estimated to be 330,000 m^3. Both volume are almost balanced.

15.7 Access Roads and Railways

The traffic volume of vehicles originating from or destined to the port in the year 2003 is estimated to be 14,226 vehicles per day each way in total. The hourly traffic is estimated to be 1778 each way.

As hourly capacity of traffic volume per road lane is estimated as 600 vehicles, three lanes each way need to be shared for the entire traffic above. Since the port has two entrances, two access roads with three lanes each way are planned.

As for railway wagons, daily traffic is estimated to be 66. Since the present railway has enough capacity, the plan does not include new railways.

15.8 Alternative Layout Plans

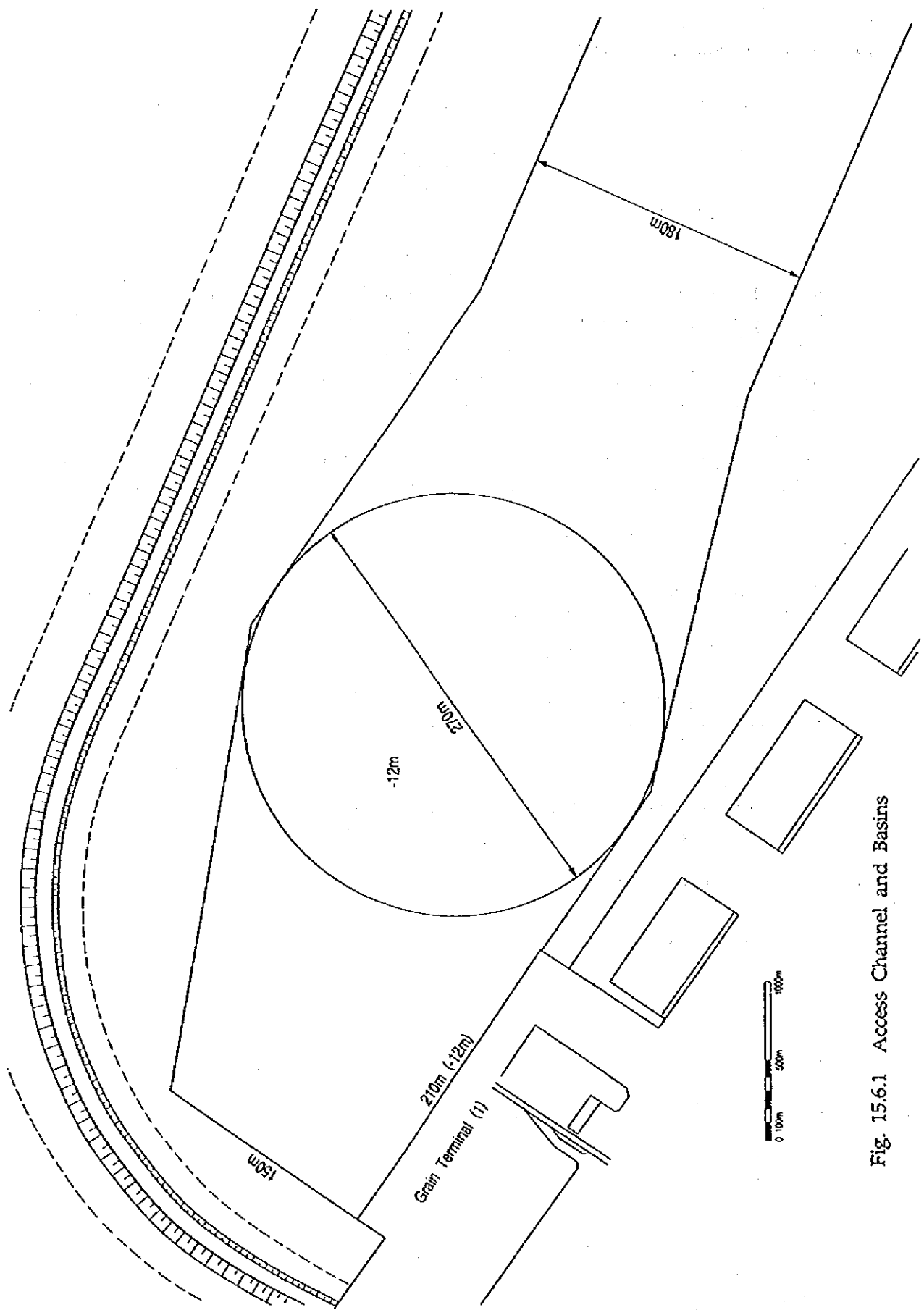The layout of the major facilities is described in Fig. 15.8-1.

Fig. 15.6.1 Access Channel and Basins

270m

-12m

180m

150m

210m (-12m)

Grain Terminal (1)

0 100m   500m   1000m
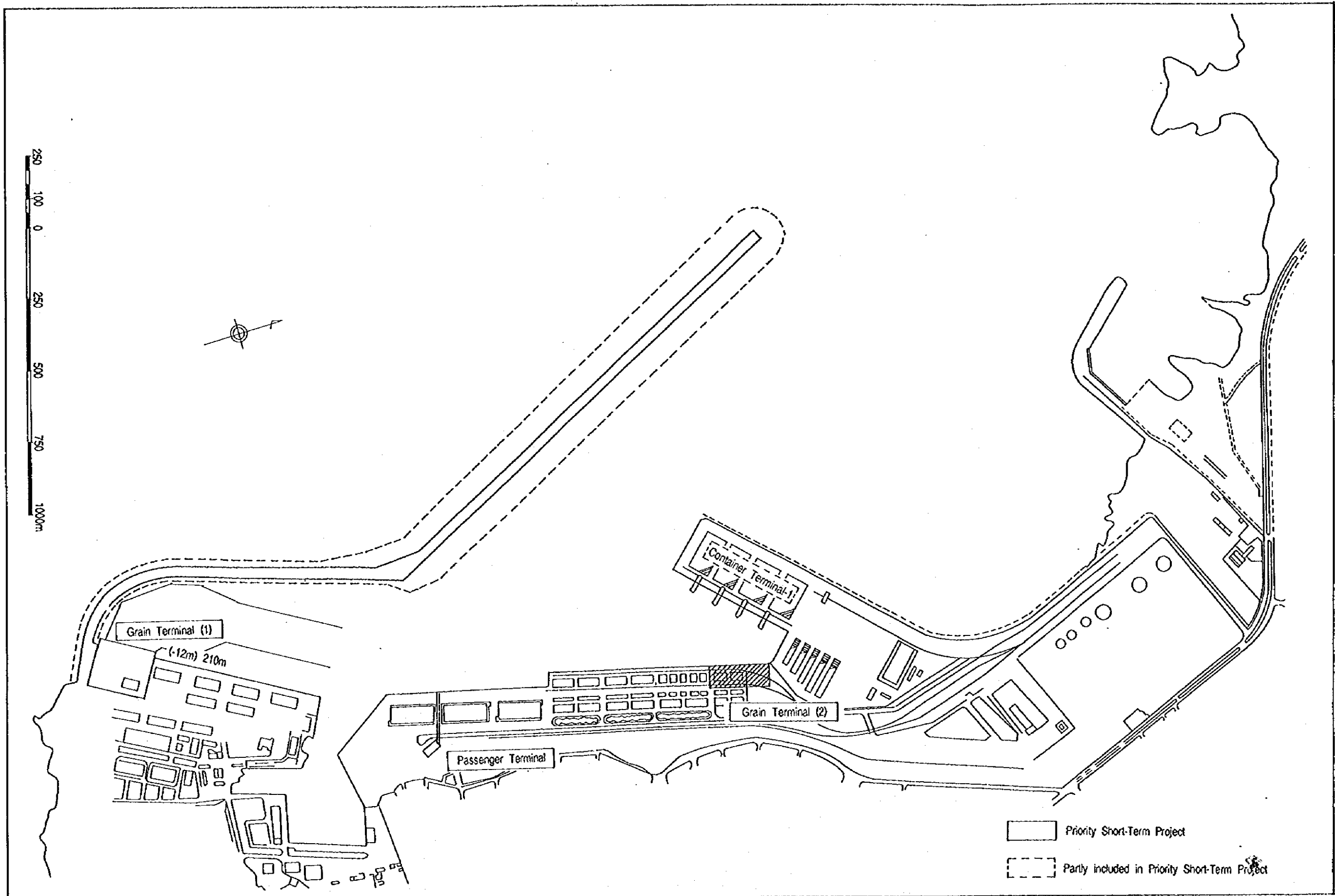
Figure 15.8.1 LAKAKIA PORT Short-Term Plan

Legend labels (on map):
- Grain Terminal (1)
- (-12m) 210m
- Container Terminal-1
- Grain Terminal (2)
- Passenger Terminal
- Priority Short-Term Project
- Partly included in Priority Short-Term Project

Scale bar: 250 100 0 250 500 750 1000m
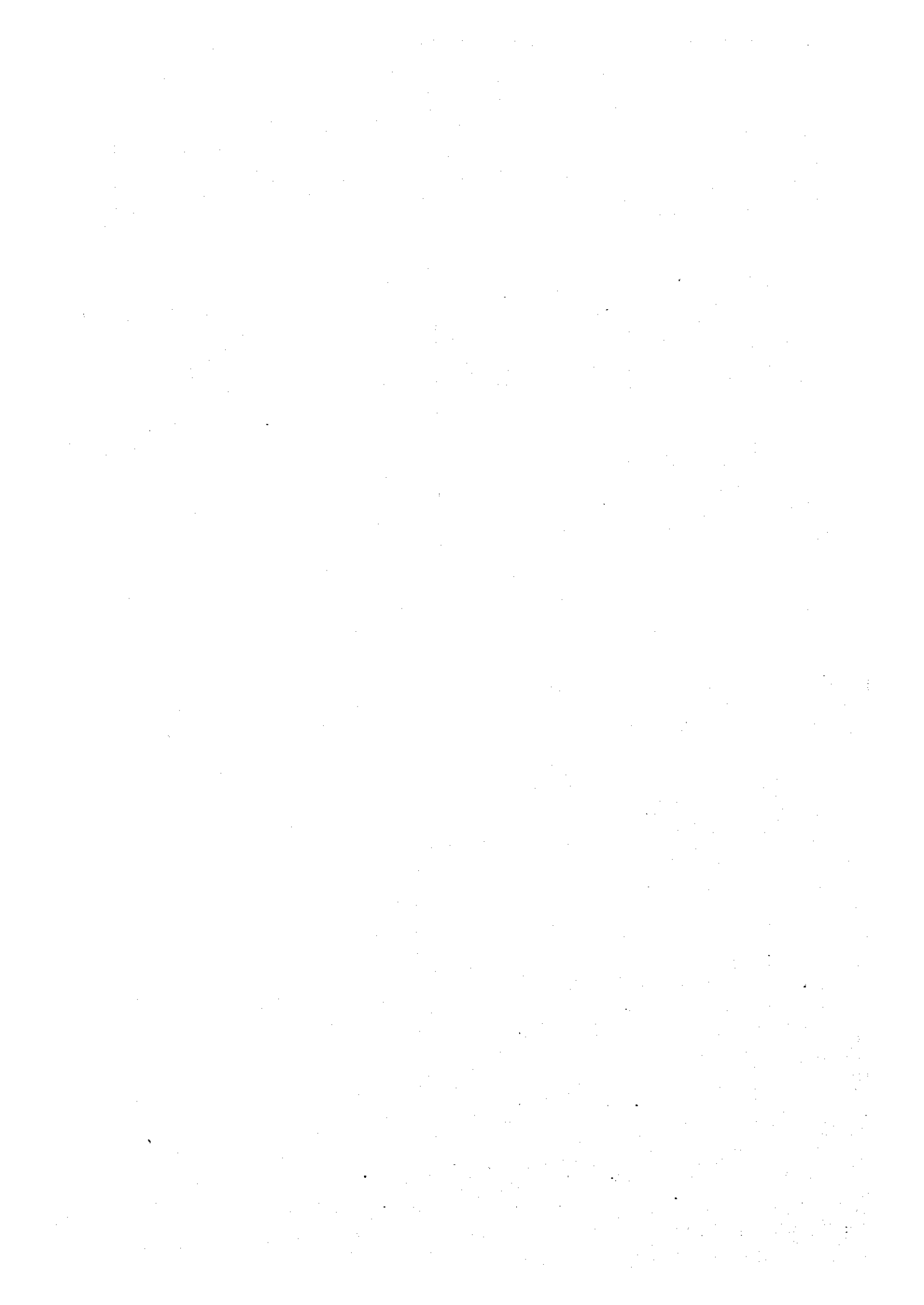
15.9 Design of the Major Structure

In the short-term plan of Latakia Port, the following facilities, building and equipments are planned by the year 2003. Among these, designs of grain terminal berth, open yard and road are described in this section.

Table 15.9-1 Planned Facilities in the Short-Term Plan of Latakia Port

Facilities	Unit	Master Plan	Short-Term Plan
Main Breakwater	m	600	
Sub Breakwater	m	900	
Grain Terminal(1):			
Wharf(-12m)	m	210	210
Water Basin(-12m)	m3	579,400	579,400
Reclamation		22,770	22,770
Pavement		3,970	3,970
Grain Terminal(2):			
Silo	L.S.	1	1
Railway	L.S.	1	1
Container Terminal(2):			
Wharf(-14m)	m	700	
Water Basin(-14m)	m3	1,643,000	
Backup Area	m2	245,000	
General Cargo Terminal:			
Wharf(-10m)	m	555	
Passenger Terminal:			
Terminal Building	m2	2,400	2,400
Boarding Bridge	m	150	150

15.9.1 Design Conditions

(1) Grain Terminal Berth

Design conditions for the grain terminal berth are set as follows.

Table 15.9.1-1 Design Conditions for Grain Berth

Facilitiy	Existing Berth	Improvement Plan
Planned Ship (DWT)	10,000	40,000
Water Depth of Berth (m)	-8.5	-12.0
Berth Length (m)	180	210
Crown Height (m)	+2.8	+2.8
Planned Surcharge (t/m2) Ordinary Extra-ordinary	not clear not clear	2.0 1.0
H.W.L. (m)	0.5	0.5
Geological Condition	silty sand	silty sand
Seismicity	0.03	0.03

(2)   Open Yard, Apron, Road

The design load are set as follows.

Truck   T-14
Tractor trailer   20 ft, 40 ft

15.9.2 Structural Design

(1)   Grain Terminal Berth

The design of gravity type quaywall is preferably made according to the
following sequence.

| Determination of Design Conditions |
| Assumption of Wall Dimensions |
| Calculation of External Forces |
| Examination of Sliding of Wall |
| Examination of Overturning of Wall |
| Examination of Bearing Capacity of Foundation |
| Determination of Wall Dimensions |
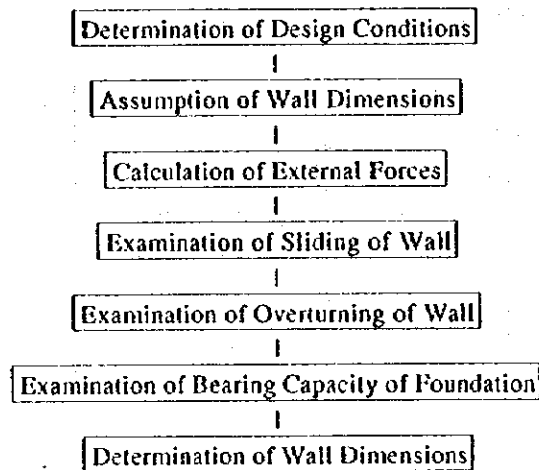
Fig. 15.9.2-1 Design Flow of Gravity Type Quaywall

1)   External Forces and Loads Acting on Walls

As the external forces and loads acting on the wall of a gravity type quaywall,
the followings are considered.

(a)   Surcharge
(b)   Dead weight of wall
(c)   Earth pressure
(d)   Buoyancy
(e)   Seismic force
(f)   Tractive forces of ships

2)   Examination Concerning Sliding of Wall

The safety factor against sliding of a gravity type quaywall shall satisfy the
following formula.

$$F \leq \frac{fW}{P}$$

where;
        W   :The resultant of vertical forces acting on the wall (tons)

P   :The resultant of horizontal forces acting on the wall (tons)
f   :Coefficient of friction between the bottom of the wall and the foundation
F   :Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.0 or more in special condition.

3)   Examination Concerning Overturning of Wall

The safety factor against overturning of a gravity type quaywall shall satisfy the following formula.

$$F \leq \frac{Wt}{Ph}$$

where;

W   :The resultant of vertical forces acting on the wall (tons)
P   :The resultant of horizontal forces acting on the wall (tons)
t   :Distance from the application line of the resultant force of the vertical forces acting on the wall, to the front toe of the wall(m)
h   :Height from the application line of the resultant force of the horizontal forces acting on the wall, to the bottom of the wall (m)
F   :Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.1 or more in special condition.

4)   Result of Stability Calculation

According to the standard cross section shown in Fig.15.9.2-2, the safety factors for sliding (S.F.$_1$) and the safety factors for overturning (S.F.$_2$) result in the Table 15.9.2-1. These figures show the sufficient stability against sliding and overturning.

Table 15.9.2-1 Safety Factors of Grain Terminal Berth

Case	S.F.$_1$ for Sliding	S.F.$_2$ for Overturning
Ordinary Condition	1.31	1.30
Special Condition	1.25	1.19

(2)   Open Yard, Apron, Road

Open Yard, apron and road are planned to be paved by asphalt concrete. The composition of the bituminous pavement is shown below.

(Unit:cm)

Dense Graded Asphalt Conc.   5
Open Graded Asphalt Conc.   5

Graded Crusher Run   20

Crusher Run   25

Design CBR=6 (assumed)
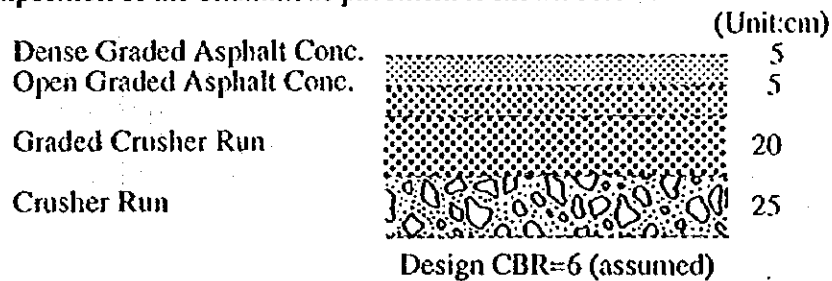
Fig. 15.9.2-3 Standard Cross Section of Yard, Apron, Road

CONCRETE BLOCK QUAY (-12.0m)

S 1:200

SAND FILLING

CRUSHED STONE

15~100 kg STONE

1050

275

190

500

1300

15

90

190 100

290

290

260

260

260

1200

210

40

+2.80

±0.00

-12.00

-14.00
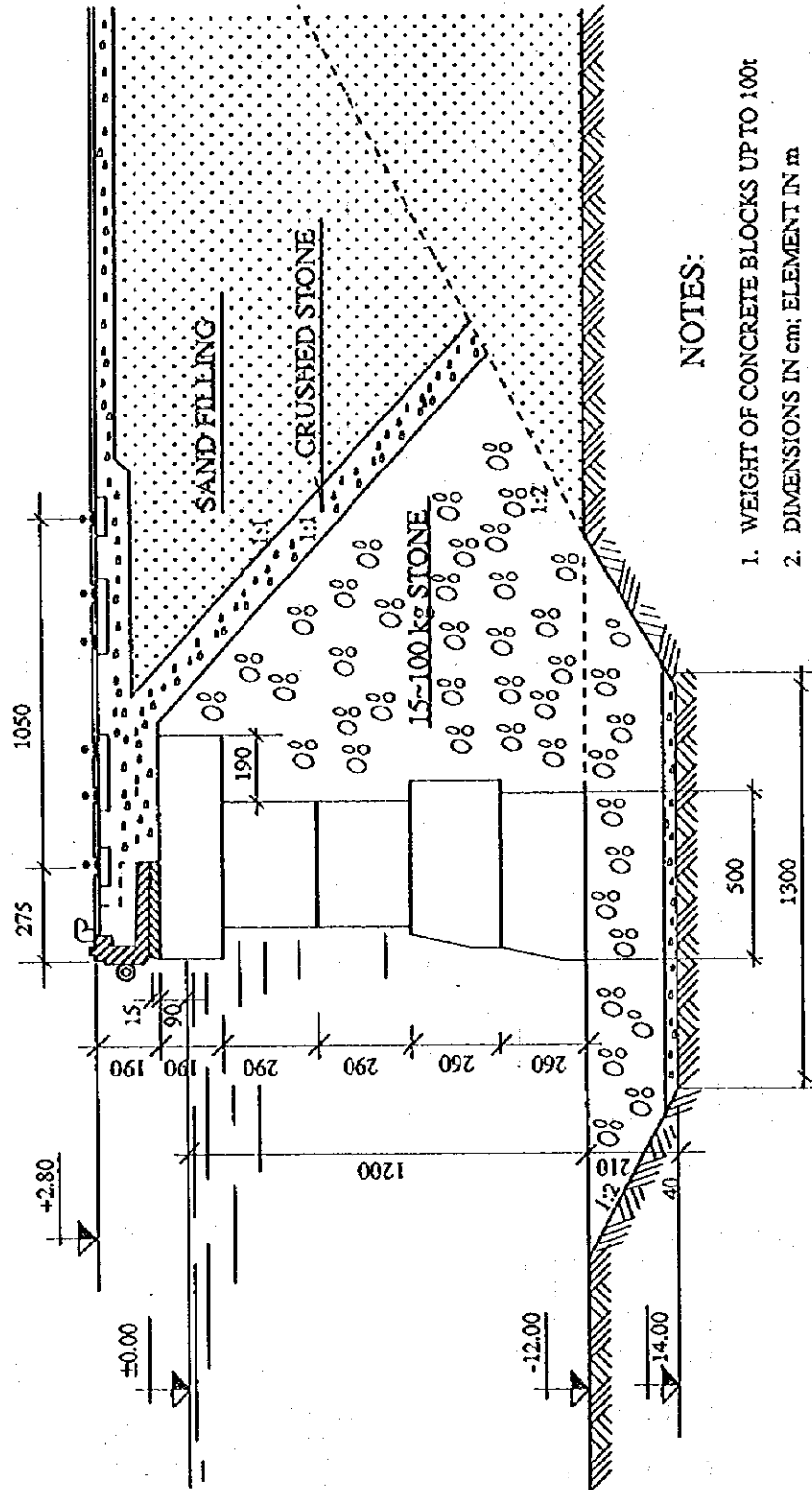
NOTES:

1. WEIGHT OF CONCRETE BLOCKS UP TO 100t

2. DIMENSIONS IN cm; ELEMENT IN m

Fig. 15.9.2-2 Standard Cross Section of Quay
Block Type (-12.0m)

1:1

1:1

1:2

1:2

15.10 Design of Cargo Handling Equipment

15.10.1 Handling Equipment For Container Handling

(1) Handling from/to ship

At present,the container handling from/to ships which are berthed at the existing container berth is performed by ship gear because the berth is not equipped with a container crane.

All of modernized container berths have container cranes. Therefore, container cranes should be installed to get high productivity at the existing container berths in the stage of the Sort-Term Plan.

However the containers which are transported by conventional ship and handled at conventional berth can be handled by ship gears or mobile cranes even in the future in the same manner as at present.

Container Cranes

The maximum ship size which can be handled at the berth is decided as panama type.

The number of container cranes to be installed at the container berth is decided by the number of container berths and number of containers to be handled. Most modernized container berths have two or three container cranes per berth. Judging from the number of container berths and number of containers to be handled, two container cranes are installed at each berth, totalling four cranes in the target year.

Remarks: The procured numbers of equipment is shown in parenthesis.

Number of Container Cranes	4(4) Units
Basic Dimensions	
Hoist Capacity(under spreader) for hatch cover	35.6 t
Hoist Capacity(under spreader) for container	30.5 t
Outreach from seaside rail center	37.6m(include 4.25 + 0.3)
Span (gauge of rail)	16.8m
Back reach from land side rail center	11m
Lift Total	42.0m
Lift(above rail)	31.1m(ch-2.8,tr+0.8)
Lift(below rail)	10.9m(+ch2.8)
Length	About 28m
Portal clearance(under horizontal stays)	at least 14.0m
Portal clearance(between sea side leg and sea side leg) at least 16.0m	
Travelling distance	About 130 m

(2) Handling at Apron, Yard and in C.F.S

Two container handling systems(Straddle Carrier System and Transfer Crane System) were compared and it is proposed to adopt to Straddle Carrier System, as at

present to utilize the existing straddle carriers, resulting the save of investment costs.

1) Straddle Carriers

The required number of straddle carriers is generally estimated by number of container cranes to be installed at quay side as follow:

$Qs = 3N + 2$

Qs : Number of required straddle carrier

N : Number of quay side container crane

$Qs = 3 \times 4 + 2 = 14$

Number of Straddle Carriers	14(11) Units

Basic Dimensions

Rated load	30.5 t
Max. lifting height at upper face of container	more than 11.85m
Travel speed(same speed for forward and reverse travel)	
Same speed for empty and with rated load,30.5t	0-25 km or more
Turning radius, outside	Max. 13.4 m
Overall length	Max. 18.2 m
Overall width	Max. 4.9 m
Overall height	Max. 13.75 m
Inner width of frame	Min. 3.05 m

2) Forklift Trucks

a. For general services	with spreader		1(0) Unit
lifting capacity(under spreader)		30.5 t	
b-1. For empty container	with spreader		4(0) Units
lifting capacity(under spreader)		7.5 t	
b-2. For empty (5t)			4(0) Units

3) For CFS	3t		9(9) Units
	2t		9(9) Units

4) Tractor	2(2) Units

5) Trailer	9(9) Units

15.10.2 Handling Equipment at Grain Terminal (Case-3)

(1) Grain Silo

1) Capacity

The grain silo capacity is estimated using two methods. One is based on turnover and the other on ship size. The method which yields the larger capacity is adopted. Detailed of each method is described as follows.

a. Turnover

The actual turnover is studied at the existing terminal. The total volume to be handled per year divided by turnover makes required capacity on view of turnover.

Base on the result of interviews ,the dwelling days for export are from 7days to 10 days and for import,it is assumed to be 20 days.

Then the turnover for export at the port is assumed as36 and required silo capacity for export is 39,000 t. The turnover for import is assumed as 18 and required silo capacity for import is 24,000 t. Then total required capacity is 63,000 t.

b. Ship size

The maximum cargo volume to be handled per ship times coefficient is required capacity on view of ship size.

b-1 For export

The maximum cargo volume to be unloaded per ship is 30,000 t. The coefficient to be used is assumed as 1.3. Then the required capacity for export is 39,000 t.

b-2 For import

The maximum cargo volume to be handled per ship is 50,000 t. The coefficient to be used is assumed as 1.3. Then the required capacity for import is 65,000 t.

c. Conclusion

Assuming that the peak conditions of handling export and import grains do not occur simultaneously and the existing silo is used, the required new silo(this silo is used for export and import) capacity is determined as 65,000 t.

Grain conveying lines

Grain conveying lines at the new grain terminal is shown in appendix 19 and that of the existing grain silo will be basically the same system.

2) Type

Most silo bins can be classified into reinforced concrete type and steel structure type.

Both of them have some merits and demerits.

In this case, steel structure is recommended to be built, because of the special conditions for this project(the short completion term, high air-tightness due to fumigation and light weight of the silo to reduce foundation works are required).

Furthermore steel structure type can be classified steel type and corrugate plate type.

Corrugate plate type is cheaper than steel type.

Considering the life of silo and the necessity of the air-tights for fumigation, steel type is selected.

3) Main Dimensions

a. Type   Steel type
b. Capacity   65,000 t
c. Number of silo bins   32 bins

d. Silo inner diameter   11.5m

Remarks: It is possible to enlarge the silo capacity from 65,000 t to 100,000 t in future.

(2) Loader cum Unloader

1) Capacity

The planed loading and unloading capacity are as follows;

Case-1   for loading 800 t/h x 2 units   Total 1,600 t/h/berth
            for unloading 800 t/h(400+400) x 2 units   Total 1,600 t/h/berth
Case-2   for loading 800 t/h x 2 units   Total 1,600 t/h/berth
            for unloading 400 t/h(200+200)x 2units   Total 800 t/h/berth
Case-3
        New Terminal   for loading 400 t/h x 2 units   Total 800 t/h/berth
                   for unloading 400 t/h(200+200) x 2 units Total 800 t/h/berth
        Existing Terminal for loading 400 t/h x 2 unts   Total 800 t/h/berth
                   for unloading 200 t/h(100+100) x 2units Total 400 t/h/berth

Details are shown on 11.3.1

2) Type of loader cum unloader

For unloading device

Pneumatic unloader was popular as a grain unloader in the past. Recently continuous mechanical type has been developed and is excellent in performance; it is especially energy efficient though its procurement cost is higher than that of pneumatic.

The power cost in syria is comparatively low. Therefore, a pneumatic type is recommended to be installed for this project.

(3) Related Handling Equipment

1) Loading and unloading to/from truck and wagon

The required equipment shall be equipped with loading and unloading to/from truck and wagon.

2) Belt conveyors, chain conveyors and bucket elevators

The required handling equipment for transportation and lifting up at the terminal shall be introduced.

Further more recycle line and direct transportation lines(no through silo) shall be installed.

(4) Related Equipment

Removal system (It is possible to by-pass) of foreign materials in the cargo (magnetic separator and net screen), weighing equipment(hopper scales and truck and wagon scales), fumigation equipment, dust collection equipment, drier and fire fighting and safety equipment shall be introduced.

15.10.3 Handling Equipment at Conventional Berth

(1) Handling from/to ship

Handling of conventional cargoes between a ship and a quay has generally been done by quay cranes or ship's cranes and this handling system shall be continued in future.

a. Replacement
Total of twelve(12) quay cranes have been installed on berth 1st-4th. However they are very old(procured in1957) and two(2) cranes have already been scrapped and four cranes have some troubles at present.
Therefore all of them have to be replaced. And their productivity and capacity shall be improved. The detailed specifications are as follows

    a-1 4 t Portal Jib Cranes

Number of units	9 Units
Capacity	4t x 27m
Rail Gauge	5.5m
Height of hook	40 m
Travelling distance	100m

    a-2 6t Portal Jib Cranes

Number of units	3 Units
Capacity	6t x 27m
Rail Gauge	5.5m
Height of hook	40m
Travelling distance	100m

(2) Handling at apron,yard and in shed

In due consideration of the procured year of the existing equipment and the cargo handling system which shall be introduced in future, the following equipment should be introduced.

a. Mobile cranes	65 t	4 Units
b. Forklift truck 5 t special type		5 Units
	5 t	15 Units
	3 t	30 Units

15.11 Implementation Program

15.11.1 General

The construction quantities for main facilities in this project up to the year 2,003 are shown in Table 15.11.1-1, and the main construction materials which have been estimated based on the foregoing facility design (15.9) are listed in Table 15.11.1-2.

The meteorological and marine conditions at the port are sometimes hard during winter season. However, construction works within the port area where is sheltered by the breakwaters can be performed continuously almost throughout the year, and the project will be smoothly implemented.

To complete the project within four years, the implementation of the construction work and the supply of construction equipment and materials should be carefully planned.

Construction equipment, particularly construction crafts, are difficult to obtain in Syria, so they will be procured outside the country. An economic construction plan shall be made considering full use of local materials.

Table 15.11.1-1 Construction Quantities

Description	Unit	Quantities
Grain Terminal(1):		
Wharf(-12m)	m	210
Water Basin(-12m)	m3	579,400
Reclamation		22,770
Pavement		3,970
Grain Terminal(2):		
Silo	L.S.	1
Railway	L.S.	1
Passenger Terminal:		
Terminal Building	m2	2,400
Boarding Bridge	m	150

Table 15.11.1-2 Main Construction Materials for Wharf(-12m)

Material	Unit	Quantities
Concrete Block(72-94ton)	Nos.	384
(Concrete)	(m3)	13,690
(Steel Bar)	(ton)	1,369
Rubble Stone(15-100kg)	m3	54,050
Concrete	m3	3,146
Steel Bar	ton	315
Asphalt Concrete	m3	294
Crusher Run	m3	1,325

15.11.2 Preliminary Study on Construction Procedure

For storage of these materials, stock yards with an estimated size of 4,000m2 will be necessary. The existing land area neighboring the container yard will be used as the temporary yard for the construction materials and equipment.

The construction method of major works is briefly described below.

(1)   Water Basin (-12m)

The required dredging volume is estimated to be 579,400 m3 in water basin in
front of the grain terminal (1). From the existing borehole data, it is difficult
to classify the types of soils at the planned site.
Detailed soil characteristics should depend on the sub-soil surveys, but, in
this study, the following conditions are used by assuming the uniform
geological conditions at the site.

In water basin and at the grain terminal: Sandy silt
                                                 N=20-30*
                                                 Ø=30°

* N means N-value. (Standard Penetration Test)

Dredging work will be carried out by using 8 m3 grab bucket dredger and the
dredged material will be dumped in the future extension area.
The dredging work in the water basin should be completed in accordance with
the completion of the wharf (-12m).

(2)   Wharf (-12m)

Existing detached pier which is used for grain loading is located 45m
offshore. This pier is made of pillars with pre-packed concrete foundation
having a total length of 180m and a water depth of -8.5m. As a new deep-
water wharf (-12m) is planned along the shore line, existing pier as well as
conveyor bridge connecting the silo tower with the pier should be demolished
in advance of the construction of the new wharf.
The structure of the wharf is concrete block type and its construction process
is shown below.

```
              ┌──────────────┐
              │ Preparation  │
              └──────────────┘
                     │
       ┌──────────────────────────────┐
       │ Demolition of Existing Pier  │
       └──────────────────────────────┘
                     │
              ┌──────────────┐
              │   Dredging   │
              └──────────────┘
                     │
          ┌────────────────────┐
          │ Base Rubble Stone  │
          └────────────────────┘
                     │
            ┌──────────────────┐
            │ Concrete Blocks  │
            └──────────────────┘
                     │
             ┌─────────────┐
             │ Buckfilling │
             └─────────────┘
                     │
            ┌──────────────┐
            │ Reclamation  │
            └──────────────┘
                     │
               ┌─────────┐
               │ Coping  │
               └─────────┘
                     │
                ┌────────┐
                │ Apron  │
                └────────┘
                     │
          ┌─────────────────────┐
          │ Auxiliary Facilities│
          └─────────────────────┘
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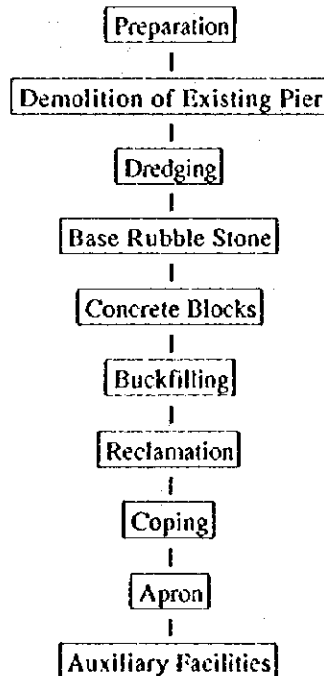
Fig. 15.11.2-1 Construction Flow of Wharf(-12m)

(a)   The dredging work between ground level and the bottom of foundation should be conducted before the structural works.

(b)   On completion of the dredging work, the installation of base rubble stone and concrete blocks should be implemented.

(c)   Since 5 concrete blocks (Ave. weight 82 ton each) will be placed on the basement, the bases should be tightly formed on the dredged seabed.

(d)   After that, backfilling and reclamation behind the concrete block wall should be done.

(e)   And placing of coping concrete and apron pavement should be continued.

(f)   Lastly, a concrete beam will be constructed as the base of the grain loading equipment.

(g)   Given a construction period of about two years, construction materials should be procured and concrete blocks should be manufactured in advance.

15.11.3 Construction Schedule

(1)   Workable Days

An average wind speed over 10 m/sec and significant wave height over 1.0 m are experimentally assessed as critical for the marine construction works.
According to the data on the frequency of stormy winds over the eastern part of the Mediterranean Sea, the stormy days over 10 m/sec are recorded to be 4.19 % per year. Consequently, non-workable days caused by wind condition are approximately 15 days per year. Rough wave days are included in above stormy days. (Ref. Extension of the Port of Latakia, 1980, USSR State Design and Research Institute of Sea Transport)
As for holidays, there are 70 holidays totally, that is, 48 Fridays and 22 national holidays. So, the net workable days per year are assumed to be 280 days or 23 days per month.

Fridays	48
National Holidays	22
Stormy Days	15
Total	85

(2)   Working Capacity

Working efficiency of main works is assumed as follows.

Table 15.11.3-1 Working Efficiency

Works	Equipment	Working Efficiency*
Dredging	Grab dredger: 4m3x1 Tug boat: 150psx1 Barge:200m2x2	744 m3/day
Dredging	Grab dredger: 8m3x1 Tug boat: 350psx1 Barge: 400m3x2	1,408 m3/day
Core Stone	Self-propelled barge with crane, Clamshell	343 m3/day
Armor Stone	Self-propelled barge with crane, Clamshell	242 m3/day
Leveling	Diver's boat	19.3 m2/day
Concrete Block (Ave.80ton)	Blockyard	1.8 Nos/day
Pavement	Motor grader: 3.1m, Macadam roller: 10-12t, Tire roller: 8-20t, Finisher: 2.4-5m	150 m2/day

* Working volume per workable day

3)   Working Schedule

After the completion of the detailed design in 1998, the construction of the port facilities is to start in 1999 and be completed by the end of 2002.

At first, the new grain terminal (2) will be constructed based on the Short-Term Plan. The existing wharf (-12m) is to be used for grain unloading, and the new silos will be constructed behind the wharf.

After the completion of the new grain terminal, the existing grain terminal (1) will be improved. Improvement works include the construction of new wharf (-12m) ,the increasement of the water depth in front of the new wharf and the installation of loader/unloader.

Installation of the cargo handling equipment at container terminal (1) and the construction of passenger terminal will be conducted separately.

The construction schedule is shown in Fig.15.11.3-1.

Fig. 15.11.3-1 Construction Schedule for Latakia Port

Work	Unit	Q'ty
Grain T (2):		
1. Silo	L.S.	1
2. Railway	L.S.	1
3. Equipment	L.S.	1
Grain T (1):		
1. Wharf (-12 m)	m	210
Demobilization	L.S.	1
Dredging	m3	44,730
Foundation	m3	13,440
Concrete Block	Nos	386
Backfilling	m3	35,910
Coping	m3	690
2. Reclamation	m3	330,000
3. Pavement	m2	2,970
4. Dredging (-12 m)	m3	232,000
5. Equipment	L.S.	1
Passenger T:		
1. Building	m2	2,400
2. Boarding Bridge	m	150
Container T:		
1. Gantry Crane	Nos.	2
Utility	L.S.	1
Engineering Service	L.S.	1
Supervision	L.S.	1

15.12 Cost Estimate

15.12.1 Scheme of Short-Term

The scheme of Short-Term Plan is mentioned in Chapter 15.8, and major items to be completed in Short-Term are as follows:

1) Grain Terminal (1)
   - Wharf (-12m) and dredging the channel and the basin
   - Machinery tower (exist)

2) Grain Terminal (2)
   - Grain silo (Capacity: 65,000 t, Metallic)
   - Machinery tower (new)

3) Passenger Terminal
   - Passenger terminal building and access bridge

Table 15.12.1-1 shows the comparison of quantity of each facility in master-Plan, in Short-Term and in Second-Behalf.

Table 15.12.1-1   Comparison of Master Plan and Short-Term

No.	Facilities	Unit	Master-Plan	Short-Term	Second-Half
A	Civil Works				
1	Breakwater				
	Main Breakwater	m	600	0	600
	Sub-Breakwater	m	900	0	900
	Sub-Total				
2	Grain Terminal(1)				
	Dredging(-12m)	m3	300,000	300,000	0
	Wharf(-12m)	m	210	210	0
	Revetment	m	20	20	0
	Reclamation	m3	330,000	330,000	0
	Sub-Total				
3	Container Terminal				
	Wharf(-14m)	m	700	0	700
	Transition	m	50	0	50
	Revetment	m	370	0	370
	Dredging(-14m)	m3	1,643,000	0	1,643,000
	Reclamation	m3	1,886,000	0	1,886,000
	Marsheling/Back Yard etc	m2	315,000	0	315,000
	Stuffing Yard etc	m2	44,000	0	44,000
	Sub-Total				
4	General Cargo Terminal				
	Wharf(-10m)	m	555	0	555
	Revetment	m	140	0	140
	Dredging(-10m)	m3	370,500	0	370,500
	Reclamation	m3	92,500	0	92,500
	Open Space etc	m2	230,000	0	230,000
	Sub-Total				
5	Mobilization	LS	1	1	0
	Total of Civil Works				
B	Building				
1	Grain Silo(Metalic)	LS	1	1	0
2	Machinery Tower(new)	Nos	1	1	0
3	Machinery Tower(exist)	Nos	1	1	0
4	C.F.S	m2	2,400	0	2,400
5	Terminal Office	m2	3,000	0	3,000
6	Work Shop/Cleanning	m2	3,000	0	3,000
7	Passenger Terminals	m2	2,300	2,300	0
	Total of Building				
C	Utilities	LS	1	1	1
D	Cargo Handling Equipment				
	Total of Equipment	LS	1	1	1
E	Physical Conti/Engineering Fee	LS	1	1	1
F	Grand Total				

15.12.2 Unit Price of Main Facilities

The cost estimate is carried out, and the unit price of main facilities are shown as follows:

Table 15.12.2-1   Unit Price of Main Facilities

Facilities		Unit	Unit Price		
			F.C	L.C	Total
Grain Terminal (1)					
	Wharf (-12m)	S.P/m	235,000	800,000	1,035,000
	Dredging (-12m)	S.P/m³	600	0	600
Grain Terminal (2)					
	Grain Silo (65,000t)	1,000 S.P/Unit	117,600	50,400	168,000
	Machinery Tower (New)	1,000 S.P/Unit	0	105,000	105,000
	Loader / Unloader	1,000 S.P/Unit	126,000	0	126,000
Container Terminal					
	Container Crane	1,000 S.P/Unit	239,400	0	239,400
	Stradle Carrier	1,000 S.P/Unit	39,860	0	39,860

15.12.3 Total Cost

The total cost of Short-Term Plan is estimated at around 4,910 Millions S.P, and is tabulated in Table 15.12.3-1.

The detail cost of the cargo handling equipment is shown in Table 15.12.3-2.

Table 15.12.3-1 Total Cost of Short-Term

No.	Facilities	Unit	Q'ty	Unit Cost (Unit:$.P) F.C	L.C	Total	Cost (Unit:1,000 S.P) F.C	L.C	Total
A	Civil Works								
1	Grain Terminal(1)	m3	300,000	600	0	600	180,000	0	180,000
	Dredging(-12m)		210	235,000	800,000	1,035,000	49,350	168,000	217,350
	Wharf(-12m)	m	20	0	490,200	490,000	0	9,800	9,800
	Revetment	m		0	300	300	0	93,000	93,000
	Reclamation	m3	300,000						
2	Mobilization	LS	1	2,500,000	0	2,500,000	2,500	0	2,500
	Total of Civil Works						231,850	270,000	500,650
B	Building								
1	Grain Silo(Metallic)	LS	1	117,000,000	50,400,000	160,000,000	117,000	50,400	160,000
2	Machinery Tower(new)	Nos	1	0	105,000,000	105,000,000	0	105,000	105,000
3	Machinery Tower(exist)	Nos	1	0	94,500,000	94,500,000	0	94,500	94,500
4	Passenger Terminals	m2	2,320	0	9,130	9,130	0	21,000	21,000
	Total of Building						117,000	272,900	389,520
C	Utilities	LS	1				0	40,174	40,174
D	Cargo Handling Equipment						3,815,200	0	3,815,200
	Total of Equipment	LS	1				130,000	20,000	150,200
E	Physical Cont./Engineering Fee	LS	1				4,294,050	615,874	4,910,524
F	Grand Total								

Table 15.12.3-2 Cargo Handling Equipment
Latakia Port

Unit Cost:1,000Sp

Items	Capacity	Unit Price	Master Plan Q'ty	Short Term Plan Q'ty	Cost
1. Grain Silo(Exclude Silo & M.T)					1,915,200
1-1 Grain Terminal at New Port					1,050,000
Loader/Unloader	400/400t/h	126,000	2	2	252,000
Handling Equipment		798,000	1	1	798,000
1-2 Existing Grain Silo(Exclude M.T)					865,200
Loader/Unloader	400/200t/h	96,600	2	2	193,200
Handling Equipment		672,000	1	1	672,000
2. Container Terminal					1,444,150
Container Cranes	(Panamax)	239,400	8	4	957,600
Straddle Carriers		39,860	24	11	438,460
Forklift Trucks	3t	1,680	18	9	15,120
Forklift Trucks	2t	1,050	18	9	9,450
Tractors		4,200	4	2	8,400
Trailers		1,680	18	9	15,120
3. Conventional Berths					455,850
Portal Jib Cranes	16tx32m	35,320	3	0	0
Portal Jib Cranes	6.3tx27m	26,040	6	0	0
Portal Jib Cranes	6tx27m	25,230	3	3	75,690
Portal Jib Cranes	4tx27m	20,960	9	9	188,640
Mobil Cranes	65t	31,500	4	4	126,000
Forklift Trucks	5t(Special)	2,520	8	5	12,600
Forklift Trucks	5t	2,100	31	10	21,000
Forklift Trucks	3t	1,680	57	19	31,920
Total					3,815,200

15.12.4 Yearly Investment

The yearly investment based on the implementation program in Chapter 15.11 is shown in Table 15.12.4-1.

Table 15.12.4-1 Yearly Investment Schedule

(Unit : 1,000 S.P)

Items	1998 F.C	1998 L.C	1999 F.C	1999 L.C	2000 F.C	2000 L.C	2001 F.C	2001 L.C	2002 F.C	2002 L.C
Civil Works	-	-	-	-	12,370	33,600	96,740	110,000	122,740	133,200
Buildings	-	-	67,200	133,800	50,400	21,600	0	12,600	0	102,900
utilities	-	-	-	-	0	20,600	-	-	0	27,574
Cargo Handling Equipment	-	-	1,349,860	0	959,490	0	752,925	0	752,925	0
Physical Contingency and engineering Fee	26,000	0	26,000	5,000	26,000	5,000	26,000	5,000	26,000	5,000
Grand Total	26,000	0	1,443,060	138,800	1,048,260	80,800	875,665	127,600	901,665	268,674

15-36

15.13 Economic Analysis

15.13.1 Methodology

(1) Purpose

The purpose of economic analysis is to appraise the economic feasibility of the short-term plan for the study ports in the target year (2003) from the viewpoint of the national economy.

Therefore, the purpose of this section is to investigate the economic benefits as well as the economic costs that will arise from this project, and to evaluate whether the net benefits of the project exceed those that could be obtained from other investment opportunities in Syria.

(2) Methodology

Economic analysis will be carried out according to the following method. Short-term plan will be defined and it will be compared to the "Without" case. All benefits and costs of it in market price for the difference from "With" case will be calculated and it will be converted to economic price. All benefits and costs are evaluated using economic prices in the economic analysis based on the border price concept.

. There are various methods to evaluate the feasibility of this type of development project. Here, the economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of the project. The EIRR is a discount rate which makes the costs and the benefits of the project during the project life equal. The procedure used for this economic analysis is shown in Figure 15.13.1-1.

15.13.2 Prerequisites of Analysis

In order to estimate the costs and benefits, the following requisites are assumed for the analysis.

(1) Base Year

The "Base Year" here means the standard year in the estimation of costs and benefits. Taking into consideration the base year in cost estimation of construction, 1995 is set as the "Base Year" for this study.

(2) Project Life

Taking into consideration the depreciation period of the main facilities of 30 years and the construction period of 4 years, the period of calculation (project life) in the economic analysis is assumed to be 34 years from the beginning of construction.

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                    ┌─────────────────┐
                    │   Short-term    │
                    │  Development    │
                    │     Plan        │
                    └─────────────────┘
         ┌──────────────────┼──────────────────────────────┐
┌──────────────────┐  ┌──────────────────┐  ┌──────────────────┐
│ Cargo Throughput │  │ Construction Costs│  │ Operation Costs  │
│  in "With" and   │  │ of the Short-term │  │ and Maintenance  │
│ "Without" Cases  │  │ Development Plan  │  │     Costs        │
└──────────────────┘  └──────────────────┘  └──────────────────┘
┌──────────────────┐
│  Identification  │          ┌──────────────────┐
│   of Benefits    │          │  Calculation of  │
└──────────────────┘          │ Additional Costs │
┌──────────────────┐          │  at Market Prices│
│  Calculation of  │          └──────────────────┘
│   Benefits at    │
│  Market Prices   │
└──────────────────┘
              ┌──────────────────┐
              │ Conversion Factor│
              │  into Economic   │
              │     Prices       │
              └──────────────────┘
┌──────────────────┐        ┌──────────────────┐
│   Benefits at    │        │    Cost at       │
│ Economic Prices  │        │ Economic Prices  │
└──────────────────┘        └──────────────────┘
              ┌──────────────────────┐
              │ Calculation of EIRR  │
              └──────────────────────┘
              ┌──────────────────────┐
              │ Sensitivity Analysis │
              └──────────────────────┘
        ┌──────────────────────────────┐
        │ Comparison with the Opportunity│
        │     Cost of Capital          │
        └──────────────────────────────┘
              ┌──────────────────────┐
              │     Evaluation       │
              └──────────────────────┘
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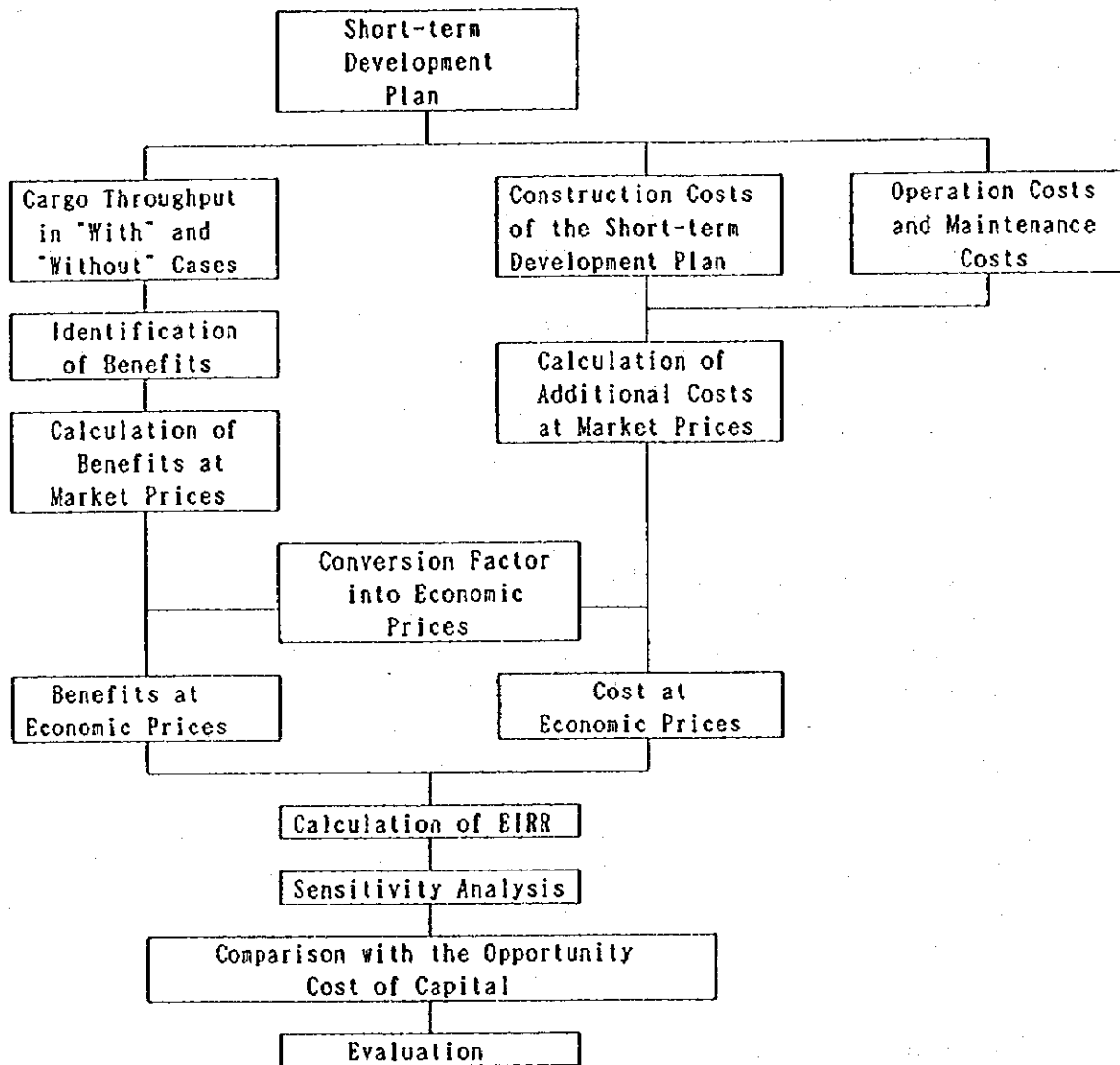
Figure 15.13.1-1 Procedure of the Economic Analysis

(3) Foreign Exchange Rate

The exchange rate adopted for this analysis is US$ 1.00 = 42 S.P., the same rate as used in the cost estimation.

(4) "With"case and "Without"case

In the cost-benefit analysis, the benefits and the costs of the project are defined as the difference between the "Without"case and "With"case of the Project. Therefore, it is very important to define the difference between "Without" case and "With"case in the economic analysis in order to evaluate the feasibility of the development project. The following conditions are assumed for this study.

1) "With"case

In an economic analysis, benefits are mainly brought about by improvements and expansions in handling capacity. Therefore, the "With"case scenario includes all improvements in productivity and all expansions of port facilities for the short-term plan. In this study, the following conditions are assumed for the capacity of cargo handling and the ship size.

i)   Handling capacity of the container terminal planned in the short-term plan is estimated to be about 316,000 TEUs (handled in 2003). The excess container cargo will be dealt with in the next phase project.

ii)   Handling capacity of the existing general cargo berth is estimated to be about 3.3 million tons (handled in 2009). The excess general cargo will be dealt with in the next phase project.

iii)   The enlargements of ship size for the container and grain cargoes are assumed.

2) "Without"case

In this study, the following conditions are adopted as the "Without" case.

i)   No investment is made for the port

ii)   As for the container and grain terminal project, the size of vessels and the working efficiency of cargo handling are not the same as "With" case.

iii)   Handling capacity of the existing grain terminal is estimated to be about 800,00 tons. The overflowed grain is assumed to be handled at the general cargo berth. Therefore, the cargoes handled at the general cargo berth in 2007 will fill the maximum handling capacity.

The results of forecast on the handling volume by categories of berth are shown in Table 15.13.2-1.
As for the container and grain terminal project, the size of ships and the working efficiency of cargo handling in the "With" and "Without" cases are shown in Table

15.13.2-2.

Table 15.13.2-1 Handling Cargo Volume by Categories of Berth in Latakia Port

(Unit: thousand ton)

Classification of Berth		1994	2003	2004	2005	2006	2007	2008	2009
Container Terminal		--	2,601	2,061	2,061	2,061	2,061	2,061	2,061
Grain Terminal: Export		113	800	800	800	800	800	800	800
: Import		0	0	0	0	0	0	0	0
Grain	Export	0	600	600	600	600	600	600	600
	Import	288	260	280	302	326	351	378	408
General			961	987	1,013	1,040	1,067	1,096	1,125
Food			394	402	410	418	426	435	443
Steel		--	246	281	320	365	416	474	541
Wood			264	289	317	347	380	416	456
Machine			221	228	236	244	253	262	271
Chemical			120	133	148	164	182	203	225
Ro/Ro			129	142	156	172	189	208	229
General Berth Total		--	3,195	3,342	3,502	3,676	3,865	4,072	4,298
Total		2,864	6,596	6,203	6,363	6,537	6,726	6,933	7,159

Table 15.13.2-2 Size of Ship and Working Efficiency of Cargo
Handling in both Cases

			"Without"	"With"
Ship Size (DWT)	Container		6500-22000	6500-50000
	Grain	Terminal: Export	10000	20000-30000
		: Import	--	30000-50000
		General : Export	15000	--
		Berth : Import		
Working Efficiency (ton/hr)	Container (TEU/hr)		27	48
	Grain	Terminal: Export	120	320
		: Import	--	236
		General : Export	115	--
		Berth : Import	60	--
	General	General	33.3	
		Foodstuff	35.4	
		Steel	80.0	
		Wood	22.2	
		Machine	15.4	
		Chemical	36.8	
		Ro/Ro	36.4	

15.13.3 Economic Prices

(1) Method for Converting to Economic Prices from Market Prices

For the economic analysis, prices are expressed in economic prices rather than prices based on the border price concept. There are various methods to convert the market prices into border prices. Here, the border prices (economic prices) are calculated by eliminating transfer items, such as taxes, subsidies, etc.

In general, all the costs and benefits are divided into three categories : labor, tradable goods and non-tradable goods. And labor is further classified into skilled labor and unskilled labor. As for skilled labor, the economic price is determined by multiplying the market wage by the conversion factor for consumption. On the other hand, the economic price of unskilled labor is determined by multiplying the nominal wage by the shadow wage rate and the conversion factor for consumption.The prices of tradable goods are expressed in CIF and FOB value for import goods and export goods respectively.

These value show the actual border prices. However, as the border price of non-tradeable goods cannot be converted directly, the border price of the inputs needed to produce the non-tradable goods is considered. After some classification of the non- tradable goods, the economic price of a small amount of the non-tradable goods is calculated by multiplying the market prices by the standard conversion factor directly.

(2) Transfer items

Import / export duties, other taxes and subsidies are merely transfer items which do not actually reflect any consumption of national resources. Therefore, these transfer items should be excluded in the calculation of the costs and benefits of the project for the economic analysis.

(3) Conversion factors

Conversion factors for goods and labor are determined as follows:

1) Standard Conversion Factor (SCF)

The standard conversion factor is used to determine the economic prices of certain goods which cannot be directly revalued at border prices. These goods include most non- tradable goods and services. The standard conversion factor is expressed by the following equation:

$$SCF = \frac{(X + M)}{((X - Tx) + (M + Tm))}$$

Where, X : Value of exports
       M : Value of imports
       Tx : Value of taxes on export
       Tm : Value of taxes on import

In this study, the SCF of 0.983 in 1992 is adopted according to the past records of trade and customs as shown in Table 15.13.3-1.

2) Conversion Factor for Consumption (CFC)

This conversion factor is used to convert the market prices of consumption goods into the border prices. The conversion factor for consumption is usually calculated in the same manner as the SCF, replacing total imports and exports by those of consumption goods only.In this study, the CFC of 0.964 in 1992 is adopted according to the past records of trade and customs as shown in table 15.13.3-1.

Table 15.13.3-1   Estimation of Conversion Factor in 1992

Items	SCF	CFC
Value of Import(CIF)	146,265	48,111
Value of Export(FOB)	130,200	35,884
Taxes on Import	4,937	3,109
Taxes on Export	264	264
Conversion Factor	0.983	0.964

Note: 1. Exchange rate in this table is 1$=42SP
      2. Taxes are estimated based on the data of customs

3) Conversion Factor for Skilled Labor

The cost of skilled labor is calculated based on actual market wages, assuming that the market mechanism is functioning properly. However, as these are domestic costs or market costs, they are converted into border prices by multiplying the market wages by the CFC.

The Conversion Factor for Skilled Labor
$$= \text{(Market wage rate)} \times \text{(CFC)}$$
$$= 1 \times 0.964$$
$$= 0.964$$

4) Conversion Factor for Unskilled Labor

As the wages paid to unskilled labors by a project are usually far the above opportunity cost, these market wages should not be used for calculation of the economic value of the unskilled labors. Considering GDP and the number of labor by sector, the marginal wage rate is assumed to be calculated based on the labor market in the construction sector. Therefore, in this study, it is assumed in a simplified manner that the economic cost of unskilled labor is equal to the per capita income of the construction sector.
The conversion factor for unskilled labor is calculated by the following formula.

$$\text{Conversion Factor for Unskilled Labor} = \frac{\text{GDP per capita of construction sector}}{\text{Worker's Cost of Construction}} \times \text{CFC}$$

$$= (4,081 \ / \ 5,400) \times 0.964$$
$$= 0.729$$

15.13.4 Costs of the Projects

The items that should be considered as costs of the projects are construction costs and maintenance costs. The project costs must be converted from market prices into economic prices for the economic analysis.

(1) Construction Costs

Construction costs are divided into such categories as foreign currency portion, local currency portion, skilled labor, unskilled labor and others.
The costs of local currency portion and others at market prices are converted to economic prices by multiplying by the standard conversion factor(SCF).
The costs of skilled labor and unskilled labor at market prices are converted to economic prices by multiplying by the conversion factor for skilled labor and the conversion factor for unskilled labor respectively.
Table 15.13.4-1 shows the economic prices of the construction costs including

investment schedule.

(2) Maintenance and Operation Costs

1) Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1 % for structures, 4 % for handling equipment) of the original construction costs excluding the costs of dredging and reclamation costs.

2) Operation Costs

Operation costs consist of personnel costs and material costs. Based on the estimation of operation costs in the following Chapter 15.14, operation costs are converted to economic prices by multiplying by the conversion factor for skilled labor and the conversion factor for unskilled labor respectively.

(3) Renewal Investment Costs

The renewal investment costs for facilities and equipment after their useful lifetimes are considered.

Table 15.13.4-1 Construction Cost in Economic Prices by Year

(Unit: Million SP)

	1999	2000	2001	2002	Total
Container Terminal	939.7	549.3	0.0	0.0	1,489.0
Grain Terminal	662.1	576.9	750.3	913.8	2,903.1
Others	0.0	0.0	249.9	247.8	497.7
Total	1,601.8	1,126.3	1,000.2	1,161.6	4,889.9

Table 15.13.4-2 Maintenance Costs in Economic Prices

(Unit: Million SP)

Items	Projects	Container Terminal	Grain terminal	Others	Total
Maintenance Costs		57.8	82.8	18.5	159.1
Operation Costs	Personnel Costs	17.5	5.1	0.0	22.6
	Material Costs	4.4	1.3	0.0	5.7
Sub Total		79.7	89.2	18.5	187.4
Renewal Investment	Every 7 Years	486.6	0.0	191.5	678.1
	Every 17 Years	957.6	445.2	264.3	1,667.1

Note: Renewal Investment
   7 Years: Stradle Carrier, Forklift, Tractor, Trailer, Mobil Crane
   17 Years: Loader/Unloader, Container Crane, Portal Jib Crane

15.13.5 Benefits of the Projects

(1) Benefit Items

As benefits brought about by the short-term plan of study port, the following items are identified.

1) Savings in waiting costs of ships
2) Savings in water transportation cost by enlargement of ship size
3) Savings in land transportation costs
4) Savings of cost in cargo handling
5) Savings in interest of cargo costs
6) Reduction of cargo damage and accidents at the port
7) Promotion of regional economic development
8) Increase in employment opportunities and incomes

Items 1), 2), 3), 4) and 5) are considered countable and in this study the monetary benefits of item 1) are calculated.

(2) Calculation of Benefits

1) Savings in waiting costs of ships

In accordance with the implementation of the projects, the total ship staying time, namely ship waiting time for berthing and ship mooring time for unloading/loading in the port, will be greatly decreased. The reduction of the ship staying time under the "With" case is one of the major benefits of the projects. The benefits that will accrue to Syria from the projects can be calculated by the following formula.

Savings in ships' waiting costs
= Difference in waiting time between "With" and "Without" cases
x Ship's staying cost (unit cost)
x Share of benefits accruing to Syria (= 0.5)

Table 15.13.5-1   Benefits of the Projects

(Unit: Million SP)

Items		2001	2002	2003	2004	2005	2006	2007 & over
Container Terminal	Staying Cost	525.8	590.5	663.2	663.2	663.2	663.2	663.2
Grain Terminal	Staying Cost	–	–	482.5	499.6	518.4	538.9	560.3
	Waiting Cost	–	–	199.2	209.0	215.7	292.6	407.4
	Sub Total	–	–	681.7	708.6	734.1	831.5	967.7
Total		–	–	1,344.9	1,371.8	1,397.3	1,494.7	1,630.9

15.13.6 Evaluation of the Projects

(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. It is calculated by using the following formula.

$$\sum_{i=1}^{n} \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

where, n : Period of economic calculation (project life)
 Bi : Benefits in i-th year
 Ci : Costs in i-th year
 r : Discount rate

(2) Sensitivity Analysis

In order to determine whether the project is feasible when certain conditions change, a sensitivity analysis is made for three alternatives.

 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%

The sensitivity analysis for three alternatives is calculated by using above formula as the base case and the results are shown in Table 15.13.6-1 (Refer to Table 15.13.6-2 - 15.13.6-4).

Table 15.13.6-1   Results of Sensitivity Analysis

Case	EIRR(%)		
	Project Total	Container Terminal	Grain Terminal
Base Case	18.9	29.2	19.8
Case A	17.3	26.3	18.2
Case B	17.1	26.1	18.1
Case C	15.5	23.4	16.6

Table 15.13.6-2   Cost/Benefit Analysis of All Projects

[Total-Base Case]   (Unit: million S.P.)

| | Year | Cost | | | Benefit | | Net Present Value (NPV) | | |
		Construc-tion	Maintenance	Total	Total	Benefit - Cost	Benefit	Cost	Benefit - Cost
1	1999	1602	0	1602	0	-1602	0	1602	-1602
2	2000	1126	0	1126	0	-1126	0	947	-947
3	2001	1000	0	1000	0	-1000	0	707	-707
4	2002	1162	0	1162	0	-1162	0	690	-690
5	2003	0	187	187	1345	1158	672	94	579
6	2004	0	187	187	1372	1184	576	79	498
7	2005	0	187	187	1397	1210	494	66	427
8	2006	0	187	187	1495	1307	444	56	388
9	2007	0	187	187	1631	1444	407	47	361
10	2008	0	187	187	1631	1444	343	39	303
11	2009	0	187	187	1631	1444	288	33	255
12	2010	0	865	865	1631	765	242	129	114
13	2011	0	187	187	1631	1444	204	23	180
14	2012	0	187	187	1631	1444	171	20	152
15	2013	0	187	187	1631	1444	144	17	127
16	2014	0	187	187	1631	1444	121	14	107
17	2015	0	187	187	1631	1444	102	12	90
18	2016	0	187	187	1631	1444	86	10	76
19	2017	0	865	865	1631	765	72	38	34
20	2018	0	187	187	1631	1444	60	7	54
21	2019	0	187	187	1631	1444	51	6	45
22	2020	0	1855	1855	1631	-224	43	49	-6
23	2021	0	187	187	1631	1444	36	4	32
24	2022	0	187	187	1631	1444	30	3	27
25	2023	0	187	187	1631	1444	25	3	22
26	2024	0	865	865	1631	765	21	11	10
27	2025	0	187	187	1631	1444	18	2	16
28	2026	0	187	187	1631	1444	15	2	13
29	2027	0	187	187	1631	1444	13	1	11
30	2028	0	187	187	1631	1444	11	1	9
31	2029	0	187	187	1631	1444	9	1	8
32	2030	0	187	187	1631	1444	8	1	7
33	2031	0	865	865	1631	765	6	3	3
34	2032	0	187	187	1631	1444	5	1	5
	Total	4890	10002	14891	48012	33121	4717	4717	0

EIRR=   0.18933

Table 15.13.6-3 Cost/Benefit Analysis of Container Terminal Project

[Container - Base Case]   (Unit: million S.P.)

	Year	Cost Construc-tion	Cost Maintenance	Cost Total	Benefit Total	Benefit - Cost	NPV Benefit	NPV Cost	NPV Benefit - Cost
1	1999	940	0	940	0	-940	0	940	-940
2	2000	549	0	549	0	-549	0	425	-425
3	2001	0	80	80	526	446	315	48	267
4	2002	0	80	80	591	511	274	37	237
5	2003	0	80	80	663	584	238	29	209
6	2004	0	80	80	663	584	184	22	162
7	2005	0	80	80	663	584	143	17	125
8	2006	0	80	80	663	584	110	13	97
9	2007	0	80	80	663	584	85	10	75
10	2008	0	566	566	663	97	66	56	10
11	2009	0	80	80	663	584	51	6	45
12	2010	0	80	80	663	584	40	5	35
13	2011	0	80	80	663	584	31	4	27
14	2012	0	80	80	663	584	24	3	21
15	2013	0	80	80	663	584	18	2	16
16	2014	0	80	80	663	584	14	2	13
17	2015	0	566	566	663	97	11	9	2
18	2016	0	80	80	663	584	9	1	7
19	2017	0	80	80	663	584	7	1	6
20	2018	0	1037	1037	663	-374	5	8	-3
21	2019	0	80	80	663	584	4	0	3
22	2020	0	80	80	663	584	3	0	3
23	2021	0	80	80	663	584	2	0	2
24	2022	0	566	566	663	97	2	2	0
25	2023	0	80	80	663	584	1	0	1
26	2024	0	80	80	663	584	1	0	1
27	2025	0	80	80	663	584	1	0	1
28	2026	0	80	80	663	584	1	0	1
29	2027	0	80	80	663	584	1	0	0
30	2028	0	80	80	663	584	0	0	0
31	2029	0	566	566	663	97	0	0	0
32	2030	0	80	80	663	584	0	0	0
	Total	1489	5295	6784	19686	12902	1642	1642	0

EIRR=   0.29192

Table 15.13.6-4 Cost/Benefit Analysis of Grain Terminal Project

[Grain - Base Case]   (Unit: million S.P.)

	Year	Cost Construction	Maintenance	Total	Benefit Total	Benefit - Cost	Net Present Value (NPV) Benefit	Cost	Benefit - Cost
1	1999	662	0	662	0	-662	0	662	-662
2	2000	577	0	577	0	-577	0	482	-482
3	2001	750	0	750	0	-750	0	523	-523
4	2002	914	0	914	0	-914	0	531	-531
5	2003	0	89	89	682	593	331	43	288
6	2004	0	89	89	709	619	287	36	251
7	2005	0	89	89	734	645	248	30	218
8	2006	0	89	89	832	742	235	25	210
9	2007	0	89	89	968	879	228	21	207
10	2008	0	89	89	968	879	190	18	173
11	2009	0	89	89	968	879	159	15	144
12	2010	0	89	89	968	879	133	12	120
13	2011	0	89	89	968	879	111	10	101
14	2012	0	89	89	968	879	92	9	84
15	2013	0	89	89	968	879	77	7	70
16	2014	0	89	89	968	879	64	6	58
17	2015	0	89	89	968	879	54	5	49
18	2016	0	89	89	968	879	45	4	41
19	2017	0	89	89	968	879	37	3	34
20	2018	0	89	89	968	879	31	3	28
21	2019	0	89	89	968	879	26	2	24
22	2020	0	534	534	968	433	22	12	10
23	2021	0	89	89	968	879	18	2	17
24	2022	0	89	89	968	879	15	1	14
25	2023	0	89	89	968	879	13	1	12
26	2024	0	89	89	968	879	11	1	10
27	2025	0	89	89	968	879	9	1	8
28	2026	0	89	89	968	879	7	1	7
29	2027	0	89	89	968	879	6	1	6
30	2028	0	89	89	968	879	5	0	5
31	2029	0	89	89	968	879	4	0	4
32	2030	0	89	89	968	879	4	0	3
33	2031	0	89	89	968	879	3	0	3
34	2032	0	89	89	968	879	2	0	2
	Total	2903	3121	6024	28116	22092	2469	2469	0

EIRR=   0.19799

(2) Evaluation

There are various views concerning the critical percentage of EIRR to judge whether a project is feasible or not. The leading view is that the project is feasible if the EIRR exceeds the opportunity cost of capital. In general, the opportunity cost of capital is considered to range from 8 % to 10 % according to the degree of development in each country. It is generally considered that a project with an EIRR of more than 10 % is economically feasible for infrastructure or social service projects.

As for this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR(18.9 %) exceeds 10 %. Therefore, this short-term plan development project is feasible from the viewpoint of the national economy.

15.14 Financial Analysis

15.14.1 Purpose of the Financial Analysis

Purpose of the financial analysis is to examine the viability of the project in the short-term plan and the financial soundness of the port management entity during the project life.

15.14.2 Methodology of the Financial Analysis

Figure 15.14.2-1 shows flowchart of the financial analysis.

(1) Viability of the Project

The viability of the project is evaluated by the Financial Internal Rate of Return (FIRR). The FIRR is a discount rate in which revenue during costs during the proect life are considered equal. It is obtained from the following formula:

$$\sum_{i=1}^{n} \frac{R_i - C_i}{(1+r)^{i-1}} = 0$$

n : Project Life
R_i : Revenue in the i-th year
C_i : Cost in the i-th year
r : Discount Rate

Here, the revenue and the cost in this analysis consist of the following items:
Revenue - Increase of operating revenues by the project
(Crane usage fee -- in case of conventional terminal)
Cost - (1) Initial and renewal investments for the project
- (2) Increase of maintenance, repair, personnel and administrative costs by the project
(Increase of maintenance and repair cost -- in case of conventional terminal)

Following revenue and expenditures are excluded from calculation of FIRR.
Revenue - Fund management income
Cost - Depriciation cost
- Repayment of the principal loan
- Interest on loan

When FIRR exceeds the weighted average interest rate of the total funds for investments of the project, the project is regarded as financially feasible.
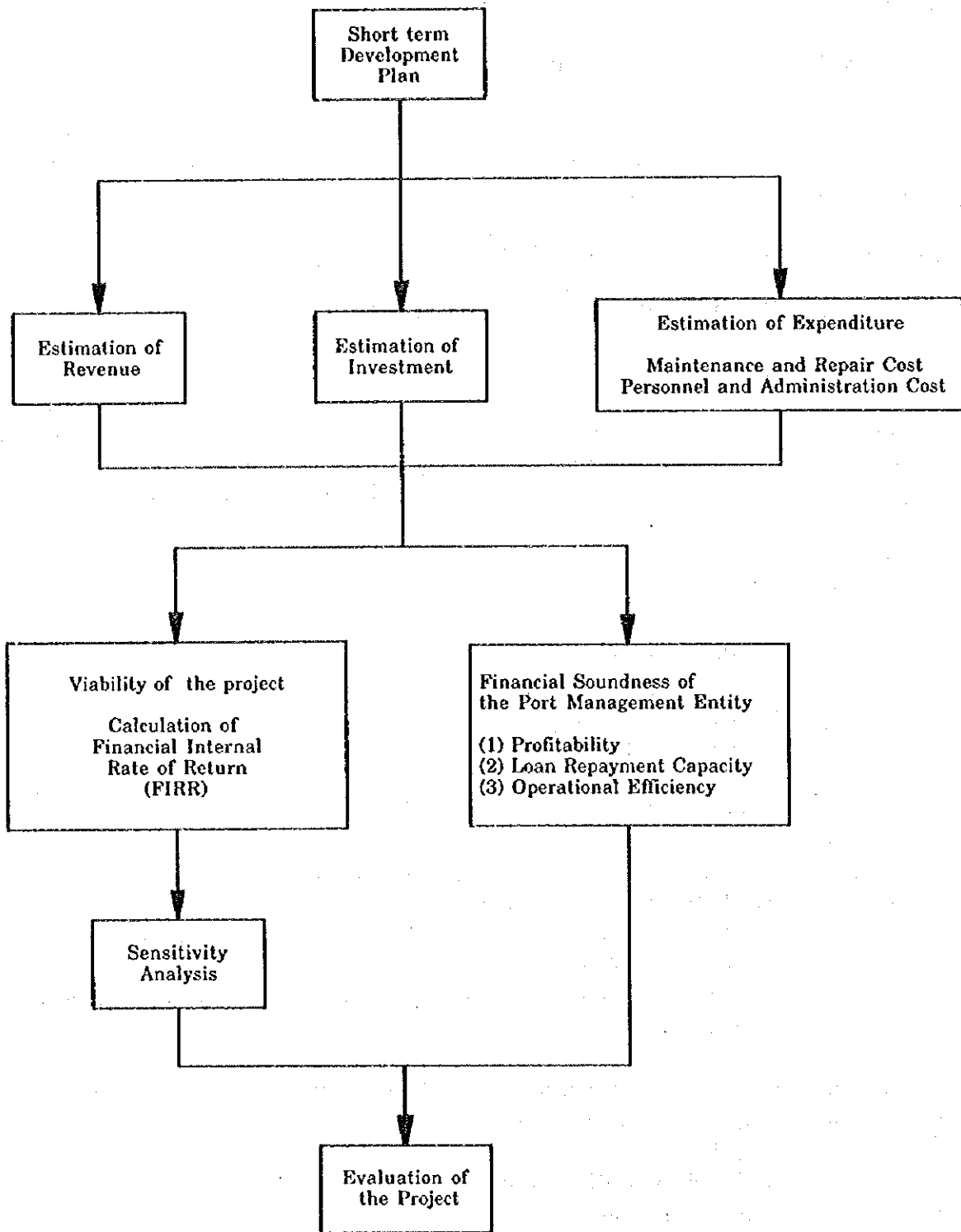
Figure 15.14.2-1 Flowchart of the Financial Analysis

(2) Financial Soundness of the Port Management Entity

Financial soundness of the port management entity is appraised based on its projected financial statements (Profit and Loss Statement, Cash Flow Statement and Balance Sheet). The appraisal is made from the viewpoint of profitability, loan repayment capacity and operational efficiency, using the following ratios:

1) Profitability

Rate of Return on Net Fixed Assets

$$\frac{Net\ Operation\ Income}{Total\ Fixed\ Assets} \times 100\%$$

Rateof Return on Net Fixed assets relates operating fixed assets. It is necessary to keep the rate above the average interest rate of the funds for investment.

2) Loan Repayment Capacity

Debt Service Coverage ratio

$$\frac{Net\ operating\ income\ before\ depreciation}{Repayment\ of\ principal\ and\ interest\ on\ long-term\ loan} \times 100\%$$

Debt Service Coverage Ratio shows whether the operating income can cover the repayment and the interest onlong-term loans. The ratio must be higher than 1.0.

3) Operational Efficiency

Operating Ratio

$$\frac{Operating\ expenses}{Operating\ revenue} \times 100\%$$

Operating Ratio shows the percentage of port revenue that is consumed by operating expenditure. It must be less than 75%.

Working Ratio

$$\frac{Operating\ expenses - Depreciation\ expenses}{Operating\ revenue} \times 100\%$$

Working Ratio shows the efficiency of the routine operations of the port. It must be less than 60%.

15.14.3 Prerequisites of the Financial Analysis

(1) Scope of the Financial Analysis

All the projects except the passenger terminal building are included in this financial analysis.

(2) Prerequisites of the Financial Analysis for the Container Terminal and the Grain Terminals

1) Project life

Project life is 34 years from the beginning of the project. It includes four years of detailed design and construction work of the port facilities.

2) Base Year

All costs, expenditures and revenues are indicated in prices as of 1995, when the price survey was conducted. Neither inflation nor an increase in nominal wages are considered during the project life.

3) Fund Raising

Fund raising is mainly divided into two kinds, foreign and domestic funds. In the projects, all the costs of foreign procurement are assumed to be raised by foreign funds (soft loan) and the remaining initial investment costs are assumed to be raised by domestic funds in principle. The required money for domestic funds is procured out of the General Monetary Fund.

(Foreign Funds)
Loan period   : 30 years
Grace period : 10 years
Interest rate : 2.7%
Repayment   : Fixed amount repayment of principal

These conditions are OECF's in 1995. Its upper limit of finance is 75% of the total project or foreign procurement, whichever is higher.

(Domestic Funds)
Loan period : 40 years
Interest Rate : 9%
Repayment   : Fixed amount repayment of principal

(Weighted Average Interest Rate)
  3.47%

4) Cargo Handling Volume

Cargo handling volume reaches limit of capacity of the current container terminal in 2000. In the grain terminal, in 1996.

(3) Expenditure

1) Investment

Initial investment cost is shown in chapter 15.12. The depreciable facilities will be replaced after their service lives, this replacement cost is included in the investment cost of this financial analysis.

Summary of Investment

(Unit : Thousand S.P.)

	Civil Works	Buildings	Utilities	Equipment	Others	Total	
Foreign	231,850	117,600	0	3,815,200	112,000	4,276,650	87.9%
Domestic	276,800	249,900	46,000	0	18,500	591,200	12.1%
Sub-Total	508,650	367,500	46,000	3,815,200	130,500	4,867,850	100.0%

Table 15.14.3-1 Scheduled Investment of Container Terminal

(Machines and Equipment)

Year	Container Crane	Straddle Carrier	Other Equipment	Total
1999	478,800	438,460		917,260
2000	478,800		48,090	526,890
2001				0
2002				0
2003				0
2004				0
2005				0
2006		438,460		438,460
2007			48,090	48,090
2008				0
2009				0
2010				0
2011				0
2012				0
2013		438,460		438,460
2014			48,090	48,090
2015				0
2016	478,800			478,800
2017	478,800			478,800
2018				0
2019				0
2020		438,460		438,460
2021			48,090	48,090
2022				0
2023				0
2024				0
2025				0
2026				0
2027		438,460		438,460
2028			48,090	48,090
2029				0
2030				0
2031				0
2032	-84,495	-125,274	-27,480	-237,249

Table 15.14.3-2 Scheduled Investment of Grain Terminal

(Machines and Equipment)

Year	Loader / Unloader	Cargo Equipment	Total
1999	96, 600	336, 000	432, 600
2000	96, 600	336, 000	432, 600
2001	126, 000	399, 000	525, 000
2002	126, 000	399, 000	525, 000
2003			0
2004			0
2005			0
2006		336, 000	336, 000
2007		336, 000	336, 000
2008		399, 000	399, 000
2009		399, 000	399, 000
2010			0
2011			0
2012			0
2013		336, 000	336, 000
2014		336, 000	336, 000
2015		399, 000	399, 000
2016	96, 600	399, 000	495, 600
2017	96, 600		96, 600
2018	126, 000		126, 000
2019	126, 000		126, 000
2020		336, 000	336, 000
2021		336, 000	336, 000
2022		399, 000	399, 000
2023		399, 000	399, 000
2024			0
2025			0
2026			0
2027		336, 000	336, 000
2028		336, 000	336, 000
2029		399, 000	399, 000
2030		399, 000	399, 000
2031			0
2032	-68, 930	-753, 000	-821, 930

Table 15.14.3-3   Scheduled Investment of Conventional Terminal (Cranes and Equipment)

Year	Cranes	Cargo Equipment	Total
1999			0
2000			0
2001	195, 165	32, 760	227, 925
2002	195, 165	32, 760	227, 925
2003			0
2004			0
2005			0
2006			0
2007			0
2008		32, 760	32, 760
2009		32, 760	32, 760
2010			0
2011			0
2012			0
2013			0
2014			0
2015		32, 760	32, 760
2016		32, 760	32, 760
2017			0
2018	195, 165		195, 165
2019	195, 165		195, 165
2020			0
2021			0
2022		32, 760	32, 760
2023		32, 760	32, 760
2024			0
2025			0
2026			0
2027			0
2028			0
2029		32, 760	32, 760
2030		32, 760	32, 760
2031			0
2032	-80, 363	-42, 120	-122, 483

2) Maintenance and Repair Cost

The annual maintenance cost for the port facilities are calculated as follows:

Infrastructure : 1% of the construction cost
Equipment : 4% of the procurement cost

Operation of the planned facilities will start as follows:

Grain Terminal A : from the year 2001
Grain Terminal B : from the year 2003
Gantry Crane : from the year 2001

Table 15.14.3-4   Maintenance and Repair Cost of Container Terminal

(Unit: 1,000S.P.)

	Procurement Cost	Ratio	Maintenance Cost(2001-)
Cargo Handling Equipment	1,444,150	4%	57,766

Table 15.14.3-5   Maintenance and Repair Cost of Grain Terminal

(Unit:1,000S.P.)

Facilities	Procure-Cost	Ratio	Mainte-Cost	1999	2000	2001	2002	2003
Wharf	217,350	1%	2,174		435	1,304	2,174	2,174
Revetment	9,800	1%	98			98	98	98
Silo	168,000	1%	1,680	960	1,680	1,680	1,680	1,680
Machinery Tower	199,500	1%	1,995	1,050	1,050	1,050	1,995	1,995
Handling	1,470,000	4%	58,800	13,440	26,880	42,840	58,800	58,800
Loader /	445,200	1%	4,452	966	1,932	3,192	4,452	4,452
Utilities	46,000	1%	460		206	206	460	460
Total	2,555,850		69,659	16,416	32,183	50,370	69,659	69,659

Table 15.14.3-6   Maintenance and Repair Cost of Conventional Terminal

(Unit : 1000 S.P.)

	Procurement Cost	Ratio	Maintenance Cost	2002	2003-
Cargo Handling Equipment	227,925	4%	9,117	9,117	18,234

3) Personnel and Administration Cost

The annual personnel cost is estimated based on the required number of workers and existing pay scales. Administration cost (material cost) is assumed as 25% of total personnel cost cosidering increase of administrative cost and modernized management system in the target year. The number of operation personnel of terminals is assumed as follows:

Number of Personnel of Container Terminal

Division manager	1
Administration Department	10
Operation Department	168
Maintenance Department	12
CFS Department	16
Total	207

Number of Personnel of Grain Terminals

Division manager	1
Administration Department	5 (1 shift)
Operation Department	54 (2 shifts)
Total	60

Average Personnel Cost of Latakia Port

Personnel cost per capita	87,610 S.P. / year (including social benefit)
Material cost per capita	21,903 S.P. / year
Total	109,513 S.P. / year

Table 15.14.3-7 Personnel and Administration Cost

Terminal	Number	Wage/Year	Total	2001	2002	2003	Unit
Container	207	109,513	22,669	11,335	11,335	22,669	1,000S.P.
Grain	60	109,513	6,571	3,285	3,285	6,571	1,000S.P.
Total			29,240	14,620	14,620	29,240	1,000S.P.

4) Depreciation

Annual depreciation costs are calculated by the straight line method. The annual depreciation costs are not retained inside the administrative body. The administrative body repays the amount of annual depreciation expenses with 9% interest to the General Monetary Fund as a rule.

Standard service lives are as follows:

Depreciable assets except cargo handling equipment : 40 years Container
Crane, Mobile Tower Crane, Grain Loader / Unloader : 17 years
Other cargo handling equipment : 7 years

(4) Revenue

Calculation of revenues from port activities is based on the tariff system (issued on 24th Oct. 1995) and future cargo handling volume. Charges obtained from the operation of each terminal are as follows:

Loading / Unloading and Cargo Handling Fee
Storage Fee
  -Container Teminal   US$38.16 / Box
  -Grain Terminal   270   S.P. / t (US$6.4)
Charges from Vessels
  - Anchorage Fee   0.5344 S.P. / NRT (per day)
  - Berthing Fee   0.7125 S.P. / NRT (per day)
  - Pilotage & Towage Fee 2.316   S.P. / NRT*2 times

The above proposed container handling fee is lower than those of neighboring container ports facing the east Mediterranean Sea. Consequently Latakia Port has sufficient competitiveness.

Table 15.14.3-8 Charges from Renewed Container Terminal

Year	2001	2002	2003
With case (TEU)	251,000	277,000	316,000
(Box)	175,524	193,706	220,979
(Ton)	2,100,000	2,278,000	2,601,000
Without case (TEU)	251,000	251,000	251,000
(Box)	175,524	175,524	175,524
(Ton)	2,100,000	2,100,000	2,100,000
Balance(Ton)	0	178,000	501,000
Increased Charges from Cargo Volume Direct Delivery (44%) 106.55SP/t Entering & Withdrawing(56%) 131.4SP/t		8,344,996 13,097,952	23,487,882 36,865,584
Sub-Total		21,442,948	60,353,466
Increased Charges from Gantry Crane $31.8/Box*1.2*42	281,315,825	310,456,480	354,167,463
Total (Unit:1000S.P.)	281,316	331,899	414,521

Table 15.14.3-9 Charges from Container Vessels

Year	2002	2003
Overflow containers (TEU)	26,000	65,000
Average number of vessels (830TEU/Vessel)	31	78
NRT=Average DWT26000/Vessel*0.75=19500 Volume of NRT	610,843	1,527,108
Anchorage Fee (0.5344S.P.*NRT)	326,435	816,087
Berthing Fee (0.7125S.P,*NRT)	435,226	1,088,065
Pilotage & Towage Fee (2.316S.P.*NRT*2)	2,829,427	7,073,566
Total(Unit:1000S.P.)	3,591	8,978

Table 15.14.3-10 Charges from Grain Terminals and Vessels

Year	2001	2002	2003	2004
Cargo Volume (Ton)	1,542,000	1,600,000	1,660,000	1,680,000
Export(72%)	1,110,240	1,152,000	1,195,200	1,209,600
Import(28%)	431,760	448,000	464,800	470,400
Handling Charge (1000S.P.)	416,340	432,000	448,200	453,600
Average Number of Vessels Export(19500Ton/Vessel)	57	59	61	62
Import(27000Ton/Vessel)	16	17	17	17
a) Average NRT*No. of Export	925,200	960,000	996,000	1,008,000
b) Average NRT*No. of Import	359,800	373,333	387,333	392,000
Sub-Total	1,285,000	1,333,333	1,383,333	1,400,000
c) Anchorage Fee	6,867,040	7,125,333	7,392,533	7,481,600
d) Berthing Fee	9,155,625	9,500,000	9,856,250	9,975,000
e) Pilotage & Towage Fee	5,952,120	6,176,000	6,407,600	6,484,800
Total(1000S.P.)	21,975	22,801	23,656	23,941

a) Average NRT (Export Vessel)=19500/0.9(90%Loaded)*0.75=16250
b) Average NRT (Import Vessel)=27000/0.9(90%Loaded)*0.75=22500
c) Anchorage Fee = 0.5344 S.P.*NRT*10days
d) Berthing Fee = 0.7125 S.P.*NRT*10days
e) Pilotage & Towage Fee = 2.316 S.P.*NRT*2

Year	2005	2006	2007	2008	2009
Cargo Volume	1,702,000	1,726,000	1,751,000	1,779,000	1,808,000
Export(72%)	1,225,440	1,242,720	1,260,720	1,280,880	1,301,760
Import(28%)	476,560	483,280	490,280	498,120	506,240
Handling Charge	459,540	466,020	472,770	480,330	488,160
Average No. Export	63	64	65	66	67
Import	18	18	18	18	19
Export NRT=16250	1,021,200	1,035,600	1,050,600	1,067,400	1,084,800
Import NRT=22500	397,133	402,733	408,567	415,100	421,867
Sub-Total	1,418,333	1,438,333	1,459,167	1,482,500	1,506,667
Anchorage Fee	7,579,573	7,686,453	7,797,787	7,922,480	8,051,627
Berthing Fee	10,105,625	10,248,125	10,396,563	10,562,813	10,735,000
Pilotage & Towage	6,569,720	6,662,360	6,758,860	6,866,940	6,978,880
Total(1000S.P.)	24,255	24,597	24,953	25,352	25,766

Table 15.14.3-10 shows Charges from the renewed conventional berth. Calculation of crane usage fee is based on following formulas

Crane usage fee = Operation time of crane X Crane usage fee per hour (US$39)
Operation time of crane = Forecast Cargo volume by commodity
                          / Cargo handling productivity by commodity
                          (Chapter 15.2)

(5) Tax
The administration body pays 45% of the annual net income as income tax to the government.

Table 15.14.3-11   Charges from the Renewed Conventional Berth

(Forecast Cargo Volume by Commodity by Year)

(Unit : 1000ton)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cargo Volume	2,062	2,335	2,462	2,600	2,751	2,915	3,095	3,291	3,507
General	840	961	987	1,013	1,040	1,067	1,096	1,125	1,155
Food	362	394	402	410	418	426	434	443	451
Steel	223	246	281	320	365	416	474	541	617
Wood	229	264	289	317	347	380	416	456	500
Machine	193	221	228	236	245	253	262	271	281
Chemical	103	120	133	148	164	183	203	225	250
Ro/Ro	113	129	142	156	172	189	208	229	252
Total	2,063	2,335	2,462	2,600	2,751	2,914	3,093	3,290	3,506

(Operation Time of Crane and Crane Usage Fee)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
General	25,455	29,121	29,909	30,697	31,515	32,333	33,212	34,091	35,000
Food	10,226	11,130	11,356	11,582	11,808	12,034	12,260	12,514	12,740
Steel	2,788	3,075	3,513	4,000	4,563	5,200	5,925	6,763	7,713
Wood	10,315	11,892	13,018	14,279	15,631	17,117	18,739	20,541	22,523
Machine	12,532	14,351	14,805	15,325	15,909	16,429	17,013	17,597	18,247
Chemical	2,799	3,261	3,614	4,022	4,457	4,973	5,516	6,114	6,793
Total(Hours)	64,115	72,830	76,215	79,905	83,882	88,086	92,665	97,620	103,015
Fee (US$)	2,500,474	2,840,353	2,972,380	3,116,279	3,271,390	3,435,344	3,613,936	3,807,165	4,017,599
(1,000 SP)	105,020	119,295	124,840	130,884	137,398	144,284	151,785	159,901	168,739

15.14.4 Appraisal of Project

15.14.4.1 Viability of Project

(1) Financial Internal Rate of Return (FIRR)

The calculation results of FIRR are as follows:

Container Terminal	15.20 %
Grain Terminal	8.33 %
Conventional Terminal(*)	27.06 %
Total	14.07 %

(*) Replacement of cargo handling equipment.

All of them exceed the weighted average interest rate of the funds.

(2) Sensitivity Analysis

Sensitivity analysis is conducted to examine the impacts of unexpected future changes. (For example, cargo volume or construction cost) Following cases are assumed.

Case 1 : Investment cost increases by 10%
Case 2 : Revenue cost decreases by 10%
Case 3 : Case 1 and 2

The results of sensitivity analysis are as follows:

	Container Terminal	Grain Terminal	Conventional Terminal(*)	Total
Base Case	15.20%	8.33%	27.06%	14.07%
Table	15.14.4-1	15.14.4-5	15.14.4-9	15.14.4-13
Case 1	13.43%	6.47%	24.39%	12.10%
Table	15.14.4-2	15.14.4-6	15.14.4-10	15.14.4-14
Case 2	12.73%	5.88%	23.70%	11.60%
Table	15.14.4-3	15.14.4-7	15.14.4-11	15.14.4-15
Case 3	11.06%	4.13%	21.30%	9.76%
Table	15.14.4-4	15.14.4-8	15.14.4-12	15.14.4-16

(*) Replacement of cargo handling equipment.

In all cases, FIRR exceeds the weighted average interest rate of the funds.

(3) Evaluation

Judging from the above results of analysis, all the projects are regarded as financially feasible on the conditions of proposed tariff.

15.14.4.2 Financial Soundness of the Port Management Entity

Table 15.14.4-17 shows the projected financial statements and financial indicators (the rate of return on net fixed assets, debt service coverage ratio, operating ratio and working ratio of the port management body) with regard to Short-term plan in Latakia Port.

(1) Profitability

The rate of return on net fixed assets exceeds the weighted average interest rate of funds from 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 ratios and working ratios maintain favorable levels. It shows that the operation will be efficient.

15.14.4.3 Conclusion

Judging from the above analysis, the base case projects are regarded as financially feasible. However, it is advisable that the Latakia Port Company make continuous efforts to secure forecast cargo volume, to improve cargo handling efficiency and to reduce operating expenses.

Table 15.14.4-1 FIRR Calculation of Container Terminal (Latakia Port)

Base Case (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Discount Value Revenue	Cost	Difference
1999		939,760	0	939,760	-939,760	0	939,760	-939,760
2000		549,390	0	549,390	-549,390	0	476,906	-476,906
2001	281,317		80,435	80,435	200,882	211,982	60,611	151,372
2002	335,491		80,435	80,435	255,056	219,451	52,614	166,837
2003	423,499		80,435	80,435	343,064	240,470	45,672	194,798
2004	423,499		80,435	80,435	343,064	208,743	39,647	169,097
2005	423,499		80,435	80,435	343,064	181,203	34,416	146,787
2006	423,499	438,460	80,435	518,895	-95,396	157,296	192,728	-35,432
2007	423,499	48,090	80,435	128,525	294,974	136,543	41,439	95,104
2008	423,499		80,435	80,435	343,064	118,528	22,512	96,016
2009	423,499		80,435	80,435	343,064	102,890	19,542	83,348
2010	423,499		80,435	80,435	343,064	89,315	16,964	72,352
2011	423,499		80,435	80,435	343,064	77,531	14,726	62,806
2012	423,499		80,435	80,435	343,064	67,302	12,783	54,520
2013	423,499	438,460	80,435	518,895	-95,396	58,423	71,583	-13,160
2014	423,499	48,090	80,435	128,525	294,974	50,715	15,391	35,324
2015	423,499		80,435	80,435	343,064	44,024	8,361	35,662
2016	423,499	478,800	80,435	559,235	-135,736	38,215	50,464	-12,248
2017	423,499	478,800	80,435	559,235	-135,736	33,173	43,806	-10,632
2018	423,499		80,435	80,435	343,064	28,797	5,469	23,327
2019	423,499		80,435	80,435	343,064	24,997	4,748	20,250
2020	423,499	438,460	80,435	518,895	-95,396	21,699	26,587	-4,888
2021	423,499	48,090	80,435	128,525	294,974	18,836	5,717	13,120
2022	423,499		80,435	80,435	343,064	16,351	3,106	13,246
2023	423,499		80,435	80,435	343,064	14,194	2,696	11,498
2024	423,499		80,435	80,435	343,064	12,321	2,340	9,981
2025	423,499		80,435	80,435	343,064	10,696	2,031	8,664
2026	423,499		80,435	80,435	343,064	9,285	1,763	7,521
2027	423,499	438,460	80,435	518,895	-95,396	8,060	9,875	-1,815
2028	423,499	48,090	80,435	128,525	294,974	6,996	2,123	4,873
2029	423,499		80,435	80,435	343,064	6,073	1,153	4,920
2030	423,499		80,435	80,435	343,064	5,272	1,001	4,271
2031	423,499		80,435	80,435	343,064	4,576	869	3,707
2032	423,499	-237,249	80,435	-156,814	580,313	3,973	-1,471	5,444
	13,321,776	4,155,701	2,573,920	6,729,621	6,592,155	2,227,931	2,227,931	-0

FIRR= 0.151988

Table 15.14.4-2 FIRR Calculation of Container Terminal (Latakia Port)

Case 1 <Investment +10%>

(Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999	0	1,033,736	0	1,033,736	-1,033,736	0	1,033,736	-1,033,736
2000	0	604,329	0	604,329	-604,329	0	532,780	-532,780
2001	281,317	0	80,435	80,435	200,882	218,648	62,516	156,131
2002	335,491	0	80,435	80,435	255,056	229,882	55,115	174,767
2003	423,499	0	80,435	80,435	343,064	255,830	48,590	207,240
2004	423,499	0	80,435	80,435	343,064	225,541	42,837	182,704
2005	423,499	0	80,435	80,435	343,064	198,838	37,765	161,073
2006	423,499	482,306	80,435	562,741	-139,242	175,297	232,933	-57,636
2007	423,499	52,899	80,435	133,334	290,165	154,543	48,656	105,887
2008	423,499	0	80,435	80,435	343,064	136,246	25,877	110,369
2009	423,499	0	80,435	80,435	343,064	120,115	22,813	97,302
2010	423,499	0	80,435	80,435	343,064	105,894	20,112	85,782
2011	423,499	0	80,435	80,435	343,064	93,357	17,731	75,626
2012	423,499	0	80,435	80,435	343,064	82,304	15,632	66,672
2013	423,499	482,306	80,435	562,741	-139,242	72,560	96,417	-23,857
2014	423,499	52,899	80,435	133,334	290,165	63,969	20,140	43,829
2015	423,499	0	80,435	80,435	343,064	56,396	10,711	45,684
2016	423,499	526,680	80,435	607,115	-183,616	49,719	71,275	-21,557
2017	423,499	526,680	80,435	607,115	-183,616	43,832	62,837	-19,004
2018	423,499	0	80,435	80,435	343,064	38,643	7,339	31,303
2019	423,499	0	80,435	80,435	343,064	34,068	6,470	27,597
2020	423,499	482,306	80,435	562,741	-139,242	30,034	39,909	-9,875
2021	423,499	52,899	80,435	133,334	290,165	26,479	8,336	18,142
2022	423,499	0	80,435	80,435	343,064	23,344	4,434	18,910
2023	423,499	0	80,435	80,435	343,064	20,580	3,909	16,671
2024	423,499	0	80,435	80,435	343,064	18,143	3,446	14,697
2025	423,499	0	80,435	80,435	343,064	15,995	3,038	12,957
2026	423,499	0	80,435	80,435	343,064	14,102	2,678	11,423
2027	423,499	482,306	80,435	562,741	-139,242	12,432	16,520	-4,088
2028	423,499	52,899	80,435	133,334	290,165	10,960	3,451	7,509
2029	423,499	0	80,435	80,435	343,064	9,663	1,835	7,827
2030	423,499	0	80,435	80,435	343,064	8,519	1,618	6,901
2031	423,499	0	80,435	80,435	343,064	7,510	1,426	6,084
2032	423,499	-260,974	80,435	-180,539	604,038	6,621	-2,822	9,443
	13,321,776	4,571,271	2,573,920	7,145,191	6,176,585	2,560,062	2,560,062	-0

FIRR= 0.134293

Table 15.14.4-3 FIRR Calculation of Container Terminal (Latakia Port)

Case 2 <Revenue -10%>   (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999	0	939,760	0	939,760	-939,760	0	939,760	-939,760
2000	0	549,390	0	549,390	-549,390	0	487,337	-487,337
2001	253,185	0	80,435	80,435	172,750	199,221	63,291	135,930
2002	301,942	0	80,435	80,435	221,507	210,751	56,142	154,608
2003	381,149	0	80,435	80,435	300,714	235,988	49,801	186,187
2004	381,149	0	80,435	80,435	300,714	209,333	44,176	165,157
2005	381,149	0	80,435	80,435	300,714	185,689	39,187	146,503
2006	381,149	438,460	80,435	518,895	-137,746	164,716	224,244	-59,528
2007	381,149	48,090	80,435	128,525	252,624	146,111	49,269	96,842
2008	381,149	0	80,435	80,435	300,714	129,608	27,352	102,257
2009	381,149	0	80,435	80,435	300,714	114,969	24,262	90,707
2010	381,149	0	80,435	80,435	300,714	101,984	21,522	80,462
2011	381,149	0	80,435	80,435	300,714	90,465	19,091	71,374
2012	381,149	0	80,435	80,435	300,714	80,247	16,935	63,312
2013	381,149	438,460	80,435	518,895	-137,746	71,183	96,908	-25,725
2014	381,149	48,090	80,435	128,525	252,624	63,143	21,292	41,851
2015	381,149	0	80,435	80,435	300,714	56,011	11,820	44,191
2016	381,149	478,800	80,435	559,235	-178,086	49,685	72,899	-23,214
2017	381,149	478,800	80,435	559,235	-178,086	44,073	64,665	-20,592
2018	381,149	0	80,435	80,435	300,714	39,095	8,250	30,845
2019	381,149	0	80,435	80,435	300,714	34,679	7,318	27,361
2020	381,149	438,460	80,435	518,895	-137,746	30,762	41,880	-11,117
2021	381,149	48,090	80,435	128,525	252,624	27,288	9,201	18,086
2022	381,149	0	80,435	80,435	300,714	24,206	5,108	19,097
2023	381,149	0	80,435	80,435	300,714	21,472	4,531	16,940
2024	381,149	0	80,435	80,435	300,714	19,046	4,019	15,027
2025	381,149	0	80,435	80,435	300,714	16,895	3,565	13,330
2026	381,149	0	80,435	80,435	300,714	14,987	3,163	11,824
2027	381,149	438,460	80,435	518,895	-137,746	13,294	18,098	-4,804
2028	381,149	48,090	80,435	128,525	252,624	11,793	3,976	7,816
2029	381,149	0	80,435	80,435	300,714	10,461	2,208	8,253
2030	381,149	0	80,435	80,435	300,714	9,279	1,958	7,321
2031	381,149	0	80,435	80,435	300,714	8,231	1,737	6,494
2032	381,149	-237,249	80,435	-156,814	537,963	7,301	-3,004	10,305
	11,989,599	4,155,701	2,573,920	6,729,621	5,259,978	2,441,964	2,441,964	-0

FIRR= 0.127331

Table 15.14.4-4   FIRR Calculation of Container Terminal (Latakia Port)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999	0	1,033,736	0	1,033,736	-1,033,736	0	1,033,736	-1,033,736
2000	0	604,329	0	604,329	-604,329	0	544,130	-544,130
2001	253,185	0	80,435	80,435	172,750	205,257	65,208	140,048
2002	301,942	0	80,435	80,435	221,507	220,400	58,713	161,687
2003	381,149	0	80,435	80,435	300,714	250,503	52,864	197,639
2004	381,149	0	80,435	80,435	300,714	225,550	47,598	177,951
2005	381,149	0	80,435	80,435	300,714	203,082	42,857	160,225
2006	381,149	482,306	80,435	562,741	-181,592	182,853	269,970	-87,117
2007	381,149	52,899	80,435	133,334	247,815	164,638	57,594	107,044
2008	381,149	0	80,435	80,435	300,714	148,238	31,283	116,955
2009	381,149	0	80,435	80,435	300,714	133,472	28,167	105,305
2010	381,149	0	80,435	80,435	300,714	120,177	25,361	94,815
2011	381,149	0	80,435	80,435	300,714	108,206	22,835	85,371
2012	381,149	0	80,435	80,435	300,714	97,427	20,560	76,867
2013	381,149	482,306	80,435	562,741	-181,592	87,722	129,516	-41,794
2014	381,149	52,899	80,435	133,334	247,815	78,984	27,630	51,354
2015	381,149	0	80,435	80,435	300,714	71,116	15,008	56,108
2016	381,149	526,680	80,435	607,115	-225,966	64,032	101,994	-37,962
2017	381,149	526,680	80,435	607,115	-225,966	57,654	91,834	-34,180
2018	381,149	0	80,435	80,435	300,714	51,911	10,955	40,956
2019	381,149	0	80,435	80,435	300,714	46,740	9,864	36,876
2020	381,149	482,306	80,435	562,741	-181,592	42,084	62,134	-20,050
2021	381,149	52,899	80,435	133,334	247,815	37,892	13,255	24,636
2022	381,149	0	80,435	80,435	300,714	34,117	7,200	26,917
2023	381,149	0	80,435	80,435	300,714	30,719	6,483	24,236
2024	381,149	0	80,435	80,435	300,714	27,659	5,837	21,822
2025	381,149	0	80,435	80,435	300,714	24,904	5,255	19,648
2026	381,149	0	80,435	80,435	300,714	22,423	4,732	17,691
2027	381,149	482,306	80,435	562,741	-181,592	20,189	29,808	-9,619
2028	381,149	52,899	80,435	133,334	247,815	18,178	6,359	11,819
2029	381,149	0	80,435	80,435	300,714	16,367	3,454	12,913
2030	381,149	0	80,435	80,435	300,714	14,737	3,110	11,627
2031	381,149	0	80,435	80,435	300,714	13,269	2,800	10,469
2032	381,149	-260,974	80,435	-180,539	561,688	11,947	-5,659	17,606
	11,989,599	4,571,271	2,573,920	7,145,191	4,844,408	2,832,447	2,832,447	-0

FIRR=   0.110633

Table 15.14.4-5 FIRR Calculation of Grain Terminal (Latakia Port)

Year	Revenue (1)	Cost (2) Investment	Cost (2) Expense	Cost (2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999		668,100	16,416	684,516	-684,516	0	684,516	-684,516
2000		579,670	32,183	611,853	-611,853	0	564,808	-564,808
2001	438,315	752,240	53,655	805,895	-367,580	373,503	686,731	-313,228
2002	454,801	922,840	72,914	995,784	-540,983	357,753	783,299	-425,545
2003	463,438		76,230	76,230	387,208	336,518	55,353	281,165
2004	468,918		76,230	76,230	392,688	314,317	51,097	263,219
2005	474,946		76,230	76,230	398,716	293,879	47,168	246,711
2006	481,522	336,000	76,230	412,230	69,292	275,039	235,461	39,579
2007	488,372	336,000	76,230	412,230	76,142	257,504	217,356	40,147
2008	496,043	399,000	76,230	475,230	20,813	241,438	231,308	10,130
2009	503,989	399,000	76,230	475,230	28,759	226,445	213,523	12,922
2010	503,989		76,230	76,230	427,759	209,034	31,617	177,417
2011	503,989		76,230	76,230	427,759	192,961	29,186	163,775
2012	503,989		76,230	76,230	427,759	178,125	26,942	151,183
2013	503,989	336,000	76,230	412,230	91,759	164,429	134,492	29,937
2014	503,989	336,000	76,230	412,230	91,759	151,786	124,151	27,635
2015	503,989	399,000	76,230	475,230	28,759	140,116	132,120	7,995
2016	503,989	495,600	76,230	571,830	-67,841	129,342	146,753	-17,411
2017	503,989	96,600	76,230	172,830	331,159	119,397	40,944	78,453
2018	503,989	126,000	76,230	202,230	301,759	110,217	44,226	65,991
2019	503,989	126,000	76,230	202,230	301,759	101,743	40,825	60,917
2020	503,989	336,000	76,230	412,230	91,759	93,920	76,820	17,100
2021	503,989	336,000	76,230	412,230	91,759	86,698	70,914	15,785
2022	503,989	399,000	76,230	475,230	28,759	80,032	75,465	4,567
2023	503,989	399,000	76,230	475,230	28,759	73,879	69,663	4,216
2024	503,989		76,230	76,230	427,759	68,198	10,315	57,883
2025	503,989		76,230	76,230	427,759	62,955	9,522	53,432
2026	503,989		76,230	76,230	427,759	58,114	8,790	49,324
2027	503,989	336,000	76,230	412,230	91,759	53,616	43,879	9,767
2028	503,989	336,000	76,230	412,230	91,759	49,521	40,505	9,016
2029	503,989	399,000	76,230	475,230	28,759	45,713	43,105	2,609
2030	503,989	399,000	76,230	475,230	28,759	42,199	39,791	2,408
2031	503,989		76,230	76,230	427,759	38,954	5,892	33,062
2032	503,989	-821,930	76,230	-745,700	1,249,689	35,959	-53,205	89,163
Total	15,862,091	8,426,120	2,462,098	10,888,218	4,973,873	4,963,332	4,963,332	0

FIRR=   0.083293

Table 15.14.4-6 FIRR Calculation of Grain Terminal (Latakia Port)

Case 1 <Investment +10%>   (Unit : Thousand S.P.)

Year	Revenue (1)	Cost (2) Investment	Cost (2) Expense	Cost (2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999		734,910	16,416	751,326	-751,326	0	751,326	-751,326
2000		637,637	32,183	669,820	-669,820	0	629,128	-629,128
2001	438,315	827,464	53,655	881,119	-442,804	386,676	777,313	-390,637
2002	454,801	1,015,124	72,944	1,088,068	-633,267	376,846	901,567	-524,722
2003	463,438		76,230	76,230	387,208	360,674	59,326	301,347
2004	468,918		76,230	76,230	392,688	342,768	55,722	287,046
2005	474,946		76,230	76,230	398,716	326,083	52,337	273,746
2006	481,522	369,600	76,230	445,830	35,692	310,514	287,497	23,016
2007	488,372	369,600	76,230	445,830	42,542	295,799	270,032	25,767
2008	496,043	438,900	76,230	515,130	-19,087	282,192	293,051	-10,858
2009	503,989	438,900	76,230	515,130	-11,141	269,295	275,248	-5,953
2010	503,989		76,230	76,230	427,759	252,935	38,257	214,678
2011	503,989		76,230	76,230	427,759	237,569	35,933	201,636
2012	503,989		76,230	76,230	427,759	223,136	33,750	189,386
2013	503,989	369,600	76,230	445,830	58,159	209,580	185,395	24,185
2014	503,989	369,600	76,230	445,830	58,159	196,848	174,132	22,716
2015	503,989	438,900	76,230	515,130	-11,141	184,889	188,976	-4,087
2016	503,989	545,160	76,230	621,390	-117,401	173,657	214,109	-40,452
2017	503,989	106,260	76,230	182,490	321,499	163,107	59,060	104,048
2018	503,989	138,600	76,230	214,830	289,159	153,198	65,302	87,896
2019	503,989	138,600	76,230	214,830	289,159	143,891	61,335	82,556
2020	503,989	369,600	76,230	445,830	58,159	135,150	119,554	15,596
2021	503,989	369,600	76,230	445,830	58,159	126,939	112,291	14,648
2022	503,989	438,900	76,230	515,130	-11,141	119,228	121,863	-2,636
2023	503,989	438,900	76,230	515,130	-11,141	111,984	114,460	-2,475
2024	503,989		76,230	76,230	427,759	105,181	15,909	89,272
2025	503,989		76,230	76,230	427,759	98,791	14,943	83,849
2026	503,989		76,230	76,230	427,759	92,790	14,035	78,755
2027	503,989	369,600	76,230	445,830	58,159	87,153	77,095	10,057
2028	503,989	369,600	76,230	445,830	58,159	81,858	72,412	9,446
2029	503,989	438,900	76,230	515,130	-11,141	76,885	78,585	-1,700
2030	503,989	438,900	76,230	515,130	-11,141	72,214	73,810	-1,596
2031	503,989		76,230	76,230	427,759	67,827	10,259	57,568
2032	503,989	-904,123	76,230	-827,893	1,331,882	63,706	-104,649	168,356
Total	15,862,091	9,268,732	2,462,098	11,730,830	4,131,261	6,129,364	6,129,364	-0

FIRR=   0.0646805

Table 15.14.4-7 FIRR Calculation of Grain Terminal (Latakia Port)

Year	Revenue (1)	Cost (2) Investment	Cost (2) Expense	Cost (2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999		668,100	16,416	684,516	-684,516	0	684,516	-684,516
2000		579,670	32,183	611,853	-611,853	0	577,899	-577,899
2001	394,484	752,240	53,655	805,895	-411,412	351,916	718,934	-367,017
2002	409,321	922,840	72,944	995,784	-586,463	344,889	839,036	-494,147
2003	417,094		76,230	76,230	340,864	331,936	60,666	271,270
2004	422,026		76,230	76,230	345,796	317,223	57,300	259,924
2005	427,451		76,230	76,230	351,221	303,471	54,120	249,351
2006	433,370	336,000	76,230	412,230	21,140	290,599	276,424	14,175
2007	439,535	336,000	76,230	412,230	27,305	278,378	261,084	17,293
2008	446,439	399,000	76,230	475,230	-28,791	267,060	284,283	-17,223
2009	453,590	399,000	76,230	475,230	-21,640	256,280	268,507	-12,227
2010	453,590		76,230	76,230	377,360	242,059	40,680	201,378
2011	453,590		76,230	76,230	377,360	228,626	38,423	190,203
2012	453,590		76,230	76,230	377,360	215,939	36,291	179,648
2013	453,590	336,000	76,230	412,230	41,360	203,956	185,358	18,597
2014	453,590	336,000	76,230	412,230	41,360	192,638	175,072	17,565
2015	453,590	399,000	76,230	475,230	-21,640	181,948	190,628	-8,680
2016	453,590	495,600	76,230	571,830	-118,240	171,851	216,648	-44,797
2017	453,590	96,600	76,230	172,830	280,760	162,314	61,846	100,468
2018	453,590	126,000	76,230	202,230	251,360	153,307	68,351	84,956
2019	453,590	126,000	76,230	202,230	251,360	144,799	64,558	80,242
2020	453,590	336,000	76,230	412,230	41,360	136,764	124,293	12,471
2021	453,590	336,000	76,230	412,230	41,360	129,175	117,396	11,779
2022	453,590	399,000	76,230	475,230	-21,640	122,006	127,827	-5,821
2023	453,590	399,000	76,230	475,230	-21,640	115,236	120,734	-5,498
2024	453,590		76,230	76,230	377,360	108,841	18,292	90,549
2025	453,590		76,230	76,230	377,360	102,801	17,277	85,524
2026	453,590		76,230	76,230	377,360	97,096	16,318	80,778
2027	453,590	336,000	76,230	412,230	41,360	91,708	83,346	8,362
2028	453,590	336,000	76,230	412,230	41,360	86,619	78,721	7,898
2029	453,590	399,000	76,230	475,230	-21,640	81,812	85,715	-3,903
2030	453,590	399,000	76,230	475,230	-21,640	77,272	80,959	-3,687
2031	453,590		76,230	76,230	377,360	72,984	12,266	60,719
2032	453,590	-821,930	76,230	-745,700	1,199,290	68,934	-113,327	182,261
Total	14,275,882	8,426,120	2,462,098	10,888,218	3,387,664	5,930,439	5,930,439	-0

FIRR=　　0.0587534

Table 15.14.4-8   FIRR Calculation of Grain Terminal (Latakia Port)

Case 3 <Revenue -10% Investment +10%> (Unit : Thousand S.P.)

Year	Revenue (1)	Cost (2) Investment	Cost (2) Expense	Cost (2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999		734,910	16,416	751,326	-751,326	0	751,326	-751,326
2000		637,637	32,183	669,820	-669,820	0	643,229	-643,229
2001	394,484	827,464	53,655	881,119	-486,636	363,784	812,548	-448,764
2002	409,321	1,015,124	72,944	1,088,068	-678,747	362,481	963,558	-601,077
2003	417,094		76,230	76,230	340,864	354,702	64,827	289,875
2004	422,026		76,230	76,230	345,796	344,648	62,253	282,395
2005	427,451		76,230	76,230	351,221	335,220	59,782	275,438
2006	433,370	369,600	76,230	445,830	-12,460	326,369	335,753	-9,384
2007	439,535	369,600	76,230	445,830	-6,295	317,871	322,424	-4,553
2008	446,439	438,900	76,230	515,130	-68,691	310,047	357,752	-47,705
2009	453,590	438,900	76,230	515,130	-61,540	302,508	343,550	-41,042
2010	453,590		76,230	76,230	377,360	290,498	48,821	241,677
2011	453,590		76,230	76,230	377,360	278,966	46,883	232,083
2012	453,590		76,230	76,230	377,360	267,891	45,022	222,869
2013	453,590	369,600	76,230	445,830	7,760	257,256	252,855	4,401
2014	453,590	369,600	76,230	445,830	7,760	247,043	242,817	4,226
2015	453,590	438,900	76,230	515,130	-61,540	237,236	269,422	-32,186
2016	453,590	545,160	76,230	621,390	-167,800	227,817	312,096	-84,278
2017	453,590	106,260	76,230	182,490	271,100	218,773	88,018	130,756
2018	453,590	138,600	76,230	214,830	238,760	210,088	99,502	110,586
2019	453,590	138,600	76,230	214,830	238,760	201,748	95,552	106,196
2020	453,590	369,600	76,230	445,830	7,760	193,739	190,424	3,315
2021	453,590	369,600	76,230	445,830	7,760	186,047	182,864	3,183
2022	453,590	438,900	76,230	515,130	-61,540	178,661	202,901	-24,240
2023	453,590	438,900	76,230	515,130	-61,540	171,569	194,846	-23,277
2024	453,590		76,230	76,230	377,360	164,757	27,689	137,068
2025	453,590		76,230	76,230	377,360	158,217	26,590	131,627
2026	453,590		76,230	76,230	377,360	151,936	25,534	126,401
2027	453,590	369,600	76,230	445,830	7,760	145,904	143,408	2,496
2028	453,590	369,600	76,230	445,830	7,760	140,112	137,715	2,397
2029	453,590	438,900	76,230	515,130	-61,540	134,549	152,804	-18,255
2030	453,590	438,900	76,230	515,130	-61,540	129,208	146,738	-17,530
2031	453,590		76,230	76,230	377,360	124,078	20,853	103,226
2032	453,590	-904,123	76,230	-827,893	1,281,483	119,153	-217,477	336,630
Total	14,275,882	9,268,732	2,462,098	11,730,830	2,545,052	7,452,875	7,452,875	-0

FIRR=   0.0413405

Table 15.14.4-9　FIRR Calculation of Conventional Berth (Latakia Port)

Base Case　　　　　　　　　　　　　　　　　　　　　　　　　　(Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Discount Value Revenue	Cost	Difference
2001	0	227,925		227,925	-227,925	0	179,389	-179,389
2002	105,020	227,925	9,117	237,042	-132,022	65,055	146,836	-81,781
2003	119,295		18,234	18,234	101,061	58,161	8,890	49,271
2004	124,840		18,234	18,234	106,606	47,903	6,997	40,907
2005	130,884		18,234	18,234	112,650	39,528	5,507	34,021
2006	137,398		18,234	18,234	119,164	32,659	4,334	28,325
2007	144,284		18,234	18,234	126,050	26,992	3,411	23,581
2008	151,785	32,760	18,234	50,994	100,791	22,349	7,508	14,840
2009	159,901	32,760	18,234	50,994	108,907	18,530	5,909	12,621
2010	168,739		18,234	18,234	150,505	15,390	1,663	13,727
2011	168,739		18,234	18,234	150,505	12,113	1,309	10,804
2012	168,739		18,234	18,234	150,505	9,533	1,030	8,503
2013	168,739		18,234	18,234	150,505	7,503	811	6,693
2014	168,739		18,234	18,234	150,505	5,906	638	5,267
2015	168,739	32,760	18,234	50,994	117,745	4,648	1,405	3,243
2016	168,739	32,760	18,234	50,994	117,745	3,658	1,106	2,553
2017	168,739		18,234	18,234	150,505	2,879	311	2,568
2018	168,739	195,165	18,234	213,399	-44,660	2,266	2,866	-600
2019	168,739	195,165	18,234	213,399	-44,660	1,784	2,256	-472
2020	168,739		18,234	18,234	150,505	1,404	152	1,252
2021	168,739		18,234	18,234	150,505	1,105	119	985
2022	168,739	32,760	18,234	50,994	117,745	870	263	607
2023	168,739	32,760	18,234	50,994	117,745	684	207	478
2024	168,739		18,234	18,234	150,505	539	58	480
2025	168,739		18,234	18,234	150,505	424	46	378
2026	168,739		18,234	18,234	150,505	334	36	298
2027	168,739		18,234	18,234	150,505	263	28	234
2028	168,739		18,234	18,234	150,505	207	22	184
2029	168,739	32,760	18,234	50,994	117,745	163	49	114
2030	168,739	32,760	18,234	50,994	117,745	128	39	89
2031	168,739		18,234	18,234	150,505	101	11	90
2032	168,739	-122,483	18,234	-104,249	272,988	79	-49	128
Total	4,954,404	985,777	556,137	1,541,914	3,412,490	383,156	383,156	0

FIRR=　0.2706

Table 15.14.4-10 FIRR Calculation of Conventional Berth (Latakia Port)

Case 1 <Investment +10%> (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2)			(1)-(2)	Discount Value		
		Investment	Expense	Total		Revenue	Cost	Difference
2001	0	250,718		250,718	-250,718	0	201,560	-201,560
2002	105,020	250,718	9,117	259,835	-154,815	67,875	167,933	-100,058
2003	119,295	0	18,234	18,234	101,061	61,984	9,474	52,510
2004	124,840	0	18,234	18,234	106,606	52,148	7,617	44,531
2005	130,884	0	18,234	18,234	112,650	43,953	6,123	37,830
2006	137,398	0	18,234	18,234	119,164	37,094	4,923	32,171
2007	144,284	0	18,234	18,234	126,050	31,315	3,958	27,358
2008	151,785	36,036	18,234	54,270	97,515	26,484	9,469	17,015
2009	159,901	36,036	18,234	54,270	105,631	22,430	7,613	14,817
2010	168,739	0	18,234	18,234	150,505	19,029	2,056	16,973
2011	168,739	0	18,234	18,234	150,505	15,298	1,653	13,645
2012	168,739	0	18,234	18,234	150,505	12,299	1,329	10,970
2013	168,739	0	18,234	18,234	150,505	9,887	1,068	8,819
2014	168,739	0	18,234	18,234	150,505	7,949	859	7,090
2015	168,739	36,036	18,234	54,270	114,469	6,390	2,055	4,335
2016	168,739	36,036	18,234	54,270	114,469	5,137	1,652	3,485
2017	168,739	0	18,234	18,234	150,505	4,130	446	3,684
2018	168,739	214,682	18,234	232,916	-64,177	3,320	4,583	-1,263
2019	168,739	214,682	18,234	232,916	-64,177	2,669	3,684	-1,015
2020	168,739	0	18,234	18,234	150,505	2,146	232	1,914
2021	168,739	0	18,234	18,234	150,505	1,725	186	1,539
2022	168,739	36,036	18,234	54,270	114,469	1,387	446	941
2023	168,739	36,036	18,234	54,270	114,469	1,115	359	756
2024	168,739	0	18,234	18,234	150,505	896	97	800
2025	168,739	0	18,234	18,234	150,505	721	78	643
2026	168,739	0	18,234	18,234	150,505	579	63	517
2027	168,739	0	18,234	18,234	150,505	466	50	415
2028	168,739	0	18,234	18,234	150,505	374	40	334
2029	168,739	36,036	18,234	54,270	114,469	301	97	204
2030	168,739	36,036	18,234	54,270	114,469	242	78	164
2031	168,739	0	18,234	18,234	150,505	195	21	174
2032	168,739	-134,731	18,234	-116,497	285,236	156	-108	264
Total	4,954,404	1,084,355	556,137	1,640,492	3,313,912	439,696	439,696	0

FIRR= 0.2439

Table 15.14.4-11 FIRR Calculation of Conventional Berth (Latakia Port)

Case 2 <Revenue -10%> (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
2001	0	227,925		227,925	-227,925	0	184,249	-184,249
2002	94,518	227,925	9,117	237,042	-142,524	61,765	154,901	-93,136
2003	107,366		18,234	18,234	89,132	56,716	9,632	47,084
2004	112,356		18,234	18,234	94,122	47,979	7,786	40,193
2005	117,796		18,234	18,234	99,562	40,663	6,294	34,369
2006	123,658		18,234	18,234	105,424	34,507	5,088	29,419
2007	129,856		18,234	18,234	111,622	29,293	4,113	25,180
2008	136,607	32,760	18,234	50,994	85,613	24,911	9,299	15,612
2009	143,911	32,760	18,234	50,994	92,917	21,214	7,517	13,697
2010	151,865		18,234	18,234	133,631	18,097	2,173	15,924
2011	151,865		18,234	18,234	133,631	14,629	1,756	12,873
2012	151,865		18,234	18,234	133,631	11,826	1,420	10,406
2013	151,865		18,234	18,234	133,631	9,560	1,148	8,412
2014	151,865		18,234	18,234	133,631	7,728	928	6,800
2015	151,865	32,760	18,234	50,994	100,871	6,247	2,098	4,149
2016	151,865	32,760	18,234	50,994	100,871	5,050	1,696	3,354
2017	151,865		18,234	18,234	133,631	4,082	490	3,592
2018	151,865	195,165	18,234	213,399	-61,534	3,300	4,637	-1,337
2019	151,865	195,165	18,234	213,399	-61,534	2,668	3,749	-1,081
2020	151,865		18,234	18,234	133,631	2,156	259	1,898
2021	151,865		18,234	18,234	133,631	1,743	209	1,534
2022	151,865	32,760	18,234	50,994	100,871	1,409	473	936
2023	151,865	32,760	18,234	50,994	100,871	1,139	383	757
2024	151,865		18,234	18,234	133,631	921	111	810
2025	151,865		18,234	18,234	133,631	744	89	655
2026	151,865		18,234	18,234	133,631	602	72	530
2027	151,865		18,234	18,234	133,631	486	58	428
2028	151,865		18,234	18,234	133,631	393	47	346
2029	151,865	32,760	18,234	50,994	100,871	318	107	211
2030	151,865	32,760	18,234	50,994	100,871	257	86	171
2031	151,865		18,234	18,234	133,631	208	25	183
2032	151,865	-122,483	18,234	-104,249	256,114	168	-115	283
Total	4,458,964	985,777	556,137	1,541,914	2,917,050	410,779	410,779	0

FIRR= 0.2370

15-75

Table 15.14.4-12   FIRR Calculation of Conventional Berth (Latakia Port)

Case 3 <Investment +10%, Revenue -10%>   (Unit : Thousand S. P.)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
2001	0	250, 718		250, 718	-250, 718	0	206, 692	-206, 692
2002	94, 518	250, 718	9, 117	259, 835	-165, 317	64, 238	176, 594	-112, 355
2003	107, 366	0	18, 234	18, 234	89, 132	60, 156	10, 216	49, 940
2004	112, 356	0	18, 234	18, 234	94, 122	51, 898	8, 422	43, 476
2005	117, 796	0	18, 234	18, 234	99, 562	44, 856	6, 943	37, 913
2006	123, 658	0	18, 234	18, 234	105, 424	38, 820	5, 724	33, 096
2007	129, 856	0	18, 234	18, 234	111, 622	33, 607	4, 719	28, 888
2008	136, 607	36, 036	18, 234	54, 270	82, 337	29, 146	11, 579	17, 567
2009	143, 911	36, 036	18, 234	54, 270	89, 641	25, 313	9, 546	15, 767
2010	151, 865	0	18, 234	18, 234	133, 631	22, 022	2, 644	19, 378
2011	151, 865	0	18, 234	18, 234	133, 631	18, 155	2, 180	15, 975
2012	151, 865	0	18, 234	18, 234	133, 631	14, 967	1, 797	13, 170
2013	151, 865	0	18, 234	18, 234	133, 631	12, 339	1, 481	10, 857
2014	151, 865	0	18, 234	18, 234	133, 631	10, 172	1, 221	8, 951
2015	151, 865	36, 036	18, 234	54, 270	97, 595	8, 386	2, 997	5, 389
2016	151, 865	36, 036	18, 234	54, 270	97, 595	6, 913	2, 470	4, 443
2017	151, 865	0	18, 234	18, 234	133, 631	5, 699	684	5, 015
2018	151, 865	214, 682	18, 234	232, 916	-81, 050	4, 699	7, 206	-2, 508
2019	151, 865	214, 682	18, 234	232, 916	-81, 050	3, 873	5, 941	-2, 067
2020	151, 865	0	18, 234	18, 234	133, 631	3, 193	383	2, 810
2021	151, 865	0	18, 234	18, 234	133, 631	2, 633	316	2, 316
2022	151, 865	36, 036	18, 234	54, 270	97, 595	2, 170	776	1, 395
2023	151, 865	36, 036	18, 234	54, 270	97, 595	1, 789	639	1, 150
2024	151, 865	0	18, 234	18, 234	133, 631	1, 475	177	1, 298
2025	151, 865	0	18, 234	18, 234	133, 631	1, 216	146	1, 070
2026	151, 865	0	18, 234	18, 234	133, 631	1, 002	120	882
2027	151, 865	0	18, 234	18, 234	133, 631	826	99	727
2028	151, 865	0	18, 234	18, 234	133, 631	681	82	600
2029	151, 865	36, 036	18, 234	54, 270	97, 595	562	201	361
2030	151, 865	36, 036	18, 234	54, 270	97, 595	463	165	298
2031	151, 865	0	18, 234	18, 234	133, 631	382	46	336
2032	151, 865	-134, 731	18, 234	-116, 497	268, 362	315	-241	556
Total	4, 458, 964	1, 084, 355	556, 137	1, 640, 492	2, 818, 472	471, 968	471, 968	-0

FIRR=   0. 2130

Table 15.14.4-13 FIRR Calculation of Latakia Port

Base Case   (Unit : Thousand S. P.)

Year	Revenue (1)	Cost(2) Investment	Cost(2) Expense	Cost(2) Total	(1)-(2)	Discount Value Revenue	Discount Value Cost	Discount Value Difference
1999		1,607,860	16,416	1,624,276	-1,624,276	0	1,624,276	-1,624,276
2000		1,129,060	32,183	1,161,243	-1,161,243	0	1,018,051	-1,018,051
2001	719,632	980,165	70,756	1,050,921	-331,289	553,099	807,724	-254,624
2002	895,312	1,150,765	99,162	1,249,927	-354,615	603,272	842,217	-238,944
2003	1,006,232		122,899	122,899	883,333	594,407	72,600	521,807
2004	1,017,257		122,899	122,899	894,358	526,820	63,647	463,173
2005	1,029,329		122,899	122,899	906,430	467,339	55,799	411,540
2006	1,042,419	774,460	122,899	897,359	145,060	414,922	357,183	57,739
2007	1,056,155	384,090	122,899	506,989	549,166	368,552	176,917	191,635
2008	1,071,327	431,760	122,899	554,659	516,668	327,747	169,685	158,063
2009	1,087,389	431,760	122,899	554,659	532,730	291,641	148,761	142,880
2010	1,096,227		122,899	122,899	973,328	257,757	28,897	228,860
2011	1,096,227		122,899	122,899	973,328	225,973	25,334	200,639
2012	1,096,227		122,899	122,899	973,328	198,109	22,210	175,898
2013	1,096,227	774,460	122,899	897,359	198,868	173,680	142,172	31,508
2014	1,096,227	384,090	122,899	506,989	589,238	152,264	70,420	81,844
2015	1,096,227	431,760	122,899	554,659	541,568	133,488	67,541	65,947
2016	1,096,227	1,007,160	122,899	1,130,059	-33,832	117,028	120,639	-3,612
2017	1,096,227	575,400	122,899	698,299	397,928	102,597	65,355	37,243
2018	1,096,227	321,165	122,899	444,064	652,163	89,946	36,436	53,510
2019	1,096,227	321,165	122,899	444,064	652,163	78,855	31,943	46,912
2020	1,096,227	774,460	122,899	897,359	198,868	69,131	56,590	12,541
2021	1,096,227	384,090	122,899	506,989	589,238	60,607	28,030	32,577
2022	1,096,227	431,760	122,899	554,659	541,568	53,133	26,884	26,249
2023	1,096,227	431,760	122,899	554,659	541,568	46,581	23,569	23,013
2024	1,096,227		122,899	122,899	973,328	40,838	4,578	36,259
2025	1,096,227		122,899	122,899	973,328	35,802	4,014	31,788
2026	1,096,227		122,899	122,899	973,328	31,387	3,519	27,868
2027	1,096,227	774,460	122,899	897,359	198,868	27,517	22,525	4,992
2028	1,096,227	384,090	122,899	506,989	589,238	24,124	11,157	12,967
2029	1,096,227	431,760	122,899	554,659	541,568	21,149	10,701	10,448
2030	1,096,227	431,760	122,899	554,659	541,568	18,541	9,381	9,160
2031	1,096,227		122,899	122,899	973,328	16,255	1,822	14,433
2032	1,096,227	-1,181,662	122,899	-1,058,763	2,154,990	14,251	-13,764	28,014
Total	34,138,273	13,567,598	3,905,487	17,473,085	16,665,188	6,136,813	6,136,813	-0

FIRR=   0.140653

Table 15.14.4-14　FIRR Calculation of Latakia Port

Case 1 <Investment +10%>　　　　　　　　　　　　　　　　　　(Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Discount Value Revenue	Cost	Difference
1999		1,768,646	16,416	1,785,062	-1,785,062	0	1,785,062	-1,785,062
2000		1,241,966	32,183	1,274,149	-1,274,149	0	1,136,620	-1,136,620
2001	719,632	1,078,182	70,756	1,148,938	-429,306	572,665	914,295	-341,630
2002	895,312	1,265,842	99,162	1,365,004	-469,692	635,564	968,989	-333,425
2003	1,006,232	0	122,899	122,899	883,333	637,204	77,827	559,377
2004	1,017,257	0	122,899	122,899	894,358	574,653	69,426	505,227
2005	1,029,329	0	122,899	122,899	906,430	518,710	61,932	456,777
2006	1,042,419	851,906	122,899	974,805	67,614	468,606	438,211	30,395
2007	1,056,155	422,499	122,899	545,398	510,757	423,534	218,713	204,821
2008	1,071,327	474,936	122,899	597,835	473,492	383,246	213,863	169,382
2009	1,087,389	474,936	122,899	597,835	489,554	347,005	190,779	156,225
2010	1,096,227	0	122,899	122,899	973,328	312,066	34,986	277,080
2011	1,096,227	0	122,899	122,899	973,328	278,382	31,210	247,172
2012	1,096,227	0	122,899	122,899	973,328	248,334	27,841	220,493
2013	1,096,227	851,906	122,899	974,805	121,422	221,529	196,992	24,537
2014	1,096,227	422,499	122,899	545,398	550,829	197,618	98,319	99,298
2015	1,096,227	474,936	122,899	597,835	498,392	176,287	96,139	80,148
2016	1,096,227	1,107,876	122,899	1,230,775	-134,548	157,259	176,561	-19,302
2017	1,096,227	632,940	122,899	755,839	340,388	140,285	96,725	43,560
2018	1,096,227	353,282	122,899	476,181	620,047	125,143	54,360	70,783
2019	1,096,227	353,282	122,899	476,181	620,047	111,635	48,492	63,143
2020	1,096,227	851,906	122,899	974,805	121,422	99,585	88,555	11,030
2021	1,096,227	422,499	122,899	545,398	550,829	88,836	44,198	44,638
2022	1,096,227	474,936	122,899	597,835	498,392	79,248	43,218	36,029
2023	1,096,227	474,936	122,899	597,835	498,392	70,694	38,553	32,140
2024	1,096,227	0	122,899	122,899	973,328	63,063	7,070	55,993
2025	1,096,227	0	122,899	122,899	973,328	56,256	6,307	49,949
2026	1,096,227	0	122,899	122,899	973,328	50,184	5,626	44,558
2027	1,096,227	851,906	122,899	974,805	121,422	44,767	39,809	4,959
2028	1,096,227	422,499	122,899	545,398	550,829	39,935	19,869	20,067
2029	1,096,227	474,936	122,899	597,835	498,392	35,625	19,428	16,197
2030	1,096,227	474,936	122,899	597,835	498,392	31,779	17,331	14,448
2031	1,096,227	0	122,899	122,899	973,328	28,349	3,178	25,171
2032	1,096,227	-1,299,828	122,899	-1,176,929	2,273,156	25,289	-27,151	52,440
Total	34,138,273	14,924,358	3,905,487	18,829,845	15,308,428	7,243,335	7,243,335	-0

FIRR=　　0.120998

15-78

Table 15.14.4-15 FIRR Calculation of Latakia Port

Case 2 <Revenue -10%>   (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Discount Value Revenue	Cost	Difference
1999		1,607,860	16,416	1,624,276	-1,624,276	0	1,624,276	-1,624,276
2000		1,129,060	32,183	1,161,243	-1,161,243	0	1,040,580	-1,040,580
2001	647,669	980,165	70,756	1,050,921	-403,252	520,066	843,869	-323,804
2002	805,781	1,150,765	99,162	1,249,927	-444,146	579,795	899,378	-319,583
2003	905,609		122,899	122,899	782,710	583,917	79,243	504,674
2004	915,531	0	122,899	122,899	792,632	528,976	71,009	457,967
2005	926,396	0	122,899	122,899	803,497	479,636	63,630	416,006
2006	938,177	774,460	122,899	897,359	40,818	435,264	416,327	18,937
2007	950,540	384,090	122,899	506,989	443,551	395,176	210,775	184,401
2008	964,194	431,760	122,899	554,659	409,535	359,201	206,633	152,568
2009	978,650	431,760	122,899	554,659	423,991	326,703	185,162	141,541
2010	986,604	0	122,899	122,899	863,705	295,135	36,764	258,371
2011	986,604	0	122,899	122,899	863,705	264,468	32,944	231,524
2012	986,604	0	122,899	122,899	863,705	236,988	29,521	207,467
2013	986,604	774,460	122,899	897,359	89,245	212,363	193,153	19,210
2014	986,604	384,090	122,899	506,989	479,615	190,297	97,788	92,508
2015	986,604	431,760	122,899	554,659	431,945	170,523	95,867	74,657
2016	986,604	1,007,160	122,899	1,130,059	-143,455	152,805	175,023	-22,218
2017	986,604	575,400	122,899	698,299	288,305	136,927	96,914	40,013
2018	986,604	321,165	122,899	444,064	542,540	122,699	55,226	67,473
2019	986,604	321,165	122,899	444,064	542,540	109,950	49,488	60,462
2020	986,604	774,460	122,899	897,359	89,245	98,525	89,613	8,912
2021	986,604	384,090	122,899	506,989	479,615	88,287	45,369	42,919
2022	986,604	431,760	122,899	554,659	431,945	79,114	44,477	34,637
2023	986,604	431,760	122,899	554,659	431,945	70,893	39,855	31,038
2024	986,604	0	122,899	122,899	863,705	63,527	7,913	55,613
2025	986,604	0	122,899	122,899	863,705	56,926	7,091	49,835
2026	986,604	0	122,899	122,899	863,705	51,011	6,354	44,656
2027	986,604	774,460	122,899	897,359	89,245	45,710	41,576	4,135
2028	986,604	384,090	122,899	506,989	479,615	40,961	21,049	19,912
2029	986,604	431,760	122,899	554,659	431,945	36,705	20,635	16,070
2030	986,604	431,760	122,899	554,659	431,945	32,891	18,491	14,400
2031	986,604	0	122,899	122,899	863,705	29,473	3,671	25,802
2032	986,604	-1,181,662	122,899	-1,058,763	2,045,367	26,411	-28,342	54,753
Total	30,724,446	13,567,598	3,905,487	17,473,085	13,251,361	6,821,321	6,821,321	-0

FIRR=   0.115957

15-79

Table 15.14.4-16 FIRR Calculation of Latakia Port

Case 3 <Investment+10%, Revenue -10%>   (Unit : Thousand S.P.)

Year	Revenue (1)	Cost(2) Investment	Expense	Total	(1)-(2)	Discount Value Revenue	Cost	Difference
1999		1,768,646	16,416	1,785,062	-1,785,062	0	1,785,062	-1,785,062
2000		1,241,966	32,183	1,274,149	-1,274,149	0	1,160,878	-1,160,878
2001	647,669	1,078,182	70,756	1,148,938	-501,269	537,633	953,739	-416,106
2002	805,781	1,265,842	99,162	1,365,004	-559,223	609,419	1,032,365	-422,945
2003	905,609	0	122,899	122,899	782,710	624,031	84,687	539,345
2004	915,531	0	122,899	122,899	792,632	574,785	77,158	497,627
2005	926,396	0	122,899	122,899	803,497	529,902	70,299	459,603
2006	938,177	851,906	122,899	974,805	-36,628	488,934	508,023	-19,089
2007	950,540	422,499	122,899	545,398	405,142	451,338	258,968	192,370
2008	964,194	474,936	122,899	597,835	366,359	417,122	258,630	158,491
2009	978,650	474,936	122,899	597,835	380,815	385,738	235,638	150,099
2010	986,604	0	122,899	122,899	863,705	354,302	44,135	310,168
2011	986,604	0	122,899	122,899	863,705	322,805	40,211	282,594
2012	986,604	0	122,899	122,899	863,705	294,108	36,636	257,472
2013	986,604	851,906	122,899	974,805	11,799	267,962	264,758	3,205
2014	986,604	422,499	122,899	545,398	441,206	244,141	134,962	109,179
2015	986,604	474,936	122,899	597,835	388,769	222,437	134,786	87,651
2016	986,604	1,107,876	122,899	1,230,775	-244,171	202,662	252,818	-50,156
2017	986,604	632,940	122,899	755,839	230,765	184,646	141,457	43,188
2018	986,604	353,282	122,899	476,181	510,424	168,231	81,196	87,035
2019	986,604	353,282	122,899	476,181	510,424	153,275	73,978	79,298
2020	986,604	851,906	122,899	974,805	11,799	139,649	137,979	1,670
2021	986,604	422,499	122,899	545,398	441,206	127,235	70,336	56,899
2022	986,604	474,936	122,899	597,835	388,769	115,924	70,244	45,679
2023	986,604	474,936	122,899	597,835	388,769	105,618	63,999	41,619
2024	986,604	0	122,899	122,899	863,705	96,229	11,987	84,242
2025	986,604	0	122,899	122,899	863,705	87,674	10,921	76,753
2026	986,604	0	122,899	122,899	863,705	79,880	9,950	69,929
2027	986,604	851,906	122,899	974,805	11,799	72,779	71,908	870
2028	986,604	422,499	122,899	545,398	441,206	66,309	36,656	29,653
2029	986,604	474,936	122,899	597,835	388,769	60,414	36,608	23,806
2030	986,604	474,936	122,899	597,835	388,769	55,043	33,354	21,690
2031	986,604	0	122,899	122,899	863,705	50,150	6,247	43,903
2032	986,604	-1,299,828	122,899	-1,176,929	2,163,534	45,692	-54,506	100,198
Total	30,724,446	14,924,358	3,905,487	18,829,845	11,894,601	8,136,066	8,136,066	-0

FIRR=   0.097573

Table 15.14.4-17 Financial Statement

Income Statement

	1	2	3	4
Year	1999	2000	2001	2002
Operating Revenue	0	0	719,632	895,312
Operating Expenditure	16,416	122,985	367,291	411,858
Personnel & Administration	0	0	25,954	25,954
Maintenance	16,416	32,183	108,136	· 136,542
Depreciation	0	90,802	233,201	249,362
Net Operating Income	-16,416	-122,985	352,341	483,454
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	51,532	86,119	119,683	161,789
Interest on Long-term Loans	51,532	86,119	119,683	161,789
Others				
Net Income	-67,948	-209,104	232,657	321,665
Accumulated Earnings	-67,948	-277,052	-44,394	277,271

Cash Flow

Year	1999	2000	2001	2002
Cash Beginning	0	-74,888	-204,170	244,329
Cash Inflow	1,591,444	1,096,877	1,565,707	1,883,581
Net Operating Income	-16,416	-122,985	352,341	483,454
Depreciation	0	90,802	233,201	249,362
Long-term Loans	1,607,860	1,129,060	980,165	1,150,765
Interest Income	-	-	-	-
Cash Outflow	1,666,332	1,226,159	1,117,208	1,341,214
Investment	1,607,860	1,129,060	980,165	1,150,765
Payment for Long-term Loans	6,940	10,980	17,360	28,660
Interest on Long-term Loans	51,532	86,119	119,683	161,789
Other Non-operating Expenditure	0	0	0	0
Cash Inflow - Outflow	-74,888	-129,282	448,499	542,367
Cash Ending	-74,888	-204,170	244,329	786,696
Cash Excess	0	0	244,329	786,696
Cash Shortage	-74,888	-204,170	0	0

Balance Sheet

Year	1999	2000	2001	2002
Current Assets	0	0	244,329	786,696
Cash & Deposit	0	0	244,329	786,696
Other Current Assets				
Fixed Assets	1,607,860	2,646,118	3,393,082	4,294,485
Depreciable Assets	1,607,860	2,736,920	3,717,085	4,867,850
Accumulated Depreciation	0	90,802	324,003	573,365
Total Assets	1,607,860	2,646,118	3,637,411	5,081,181
Liabilities	1,675,808	2,923,170	3,681,805	4,803,910
Current Liabilities	74,888	204,170	0	0
Fixed Liabilities(Long-term Loans)	1,600,920	2,719,000	3,681,805	4,803,910
Capital				
Accumulated Earnings	-67,948	-277,052	-44,394	277,271
Total Liabilities & Capital	1,607,860	2,646,118	3,637,411	5,081,181
	0	-0	-0	0

Financial Indicators	1999	2000	2001	2002
Rate of Return on Net Fixed Assets (%)				
Debt Service Coverage Ratio				
Operating Ratio (%)				
Working Ratio (%)				

5	6	7	8	9	10	11	12
2003	2004	2005	2006	2007	2008	2009	2010
1,006,232	1,017,257	1,029,329	1,042,419	1,056,155	1,071,327	1,087,389	1,096,227
584,111	584,111	584,111	584,111	584,111	584,111	584,111	584,111
29,240	29,240	29,240	29,240	29,240	29,240	29,240	29,240
145,659	145,659	145,659	145,659	145,659	145,659	145,659	145,659
409,212	409,212	409,212	409,212	409,212	409,212	409,212	409,212
422,121	433,146	445,218	458,308	472,044	487,216	503,278	512,116
0	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-
159,210	156,630	154,051	151,471	148,892	146,313	141,750	135,772
159,210	156,630	154,051	151,471	148,892	146,313	141,750	135,772
262,912	276,516	291,168	306,837	323,152	340,904	361,528	376,344
540,183	816,699	1,107,867	1,414,704	1,737,856	2,078,760	2,440,289	2,816,633

2003	2004	2005	2006	2007	2008	2009	2010
786,696	1,430,159	2,087,227	2,758,946	2,671,875	2,991,489	3,281,184	3,518,052
831,333	842,358	854,430	867,520	881,256	896,428	912,490	921,328
422,121	433,146	445,218	458,308	472,044	487,216	503,278	512,116
409,212	409,212	409,212	409,212	409,212	409,212	409,212	409,212
0	0	0	0	0	0	0	0
-		-	-				
187,870	185,290	182,711	954,591	561,642	606,733	675,623	290,298
			774,460	384,090	431,760	431,760	
28,660	28,660	28,660	28,660	28,660	28,660	102,113	154,526
159,210	156,630	154,051	151,471	148,892	146,313	141,750	135,772
0	0	0	0	0	0	0	0
643,463	657,068	671,719	-87,071	319,614	289,695	236,867	631,030
1,430,159	2,087,227	2,758,946	2,671,875	2,991,489	3,281,184	3,518,052	4,149,081
1,430,159	2,087,227	2,758,946	2,671,875	2,991,489	3,281,184	3,518,052	4,149,081
0	0	0	0	0	0	0	0

2003	2004	2005	2006	2007	2008	2009	2010
1,430,159	2,087,227	2,758,946	2,671,875	2,991,489	3,281,184	3,518,052	4,149,081
1,430,159	2,087,227	2,758,946	2,671,875	2,991,489	3,281,184	3,518,052	4,149,081
3,885,274	3,476,062	3,066,850	3,432,099	3,406,977	3,429,526	3,452,074	3,042,862
4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850
982,576	1,391,788	1,801,000	1,435,751	1,460,873	1,438,324	1,415,776	1,824,988
5,315,433	5,563,289	5,825,797	6,103,974	6,398,466	6,710,710	6,970,126	7,191,944
4,775,250	4,746,590	4,717,930	4,689,270	4,660,610	4,631,950	4,529,837	4,375,311
-	-	-	-	-	-	-	-
4,775,250	4,746,590	4,717,930	4,689,270	4,660,610	4,631,950	4,529,837	4,375,311
540,183	816,699	1,107,867	1,414,704	1,737,856	2,078,760	2,440,289	2,816,633
5,315,433	5,563,289	5,825,797	6,103,974	6,398,466	6,710,710	6,970,126	7,191,944
0	0	0	0	-0	0	0	0

2003	2004	2005	2006	2007	2008	2009	2010
10.86	12.46	14.52	13.35	13.86	14.21	14.58	16.83
4.43	4.55	4.68	4.82	4.96	5.12	3.74	3.17
58.05	57.42	56.75	56.03	55.31	54.52	53.72	53.28
17.38	17.19	16.99	16.78	16.56	16.33	16.08	15.95

Table 15.14.4-17 Financial Statement

Income Statement	13	14	15	16
Year	2011	2012	2013	2014
Operating Revenue	1, 096, 227	1, 096, 227	1, 096, 227	1, 096, 227
Operating Expenditure	584, 111	584, 111	584, 111	584, 111
Personnel & Administration	29, 240	29, 240	29, 240	29, 240
Maintenance	145, 659	145, 659	145, 659	145, 659
Depreciation	409, 212	409, 212	409, 212	409, 212
Net Operating Income	512, 116	512, 116	512, 116	512, 116
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	128, 612	120, 235	111, 858	103, 481
Interest on Long-term Loans	128, 612	120, 235	111, 858	103, 481
Others				
Net Income	383, 504	391, 881	400, 259	408, 636
Accumulated Earnings	3, 200, 137	3, 592, 018	3, 992, 277	4, 400, 912

Cash Flow

Year	2011	2012	2013	2014
Cash Beginning	4, 149, 081	4, 743, 488	5, 301, 188	5, 092, 806
Cash Inflow	921, 328	921, 328	921, 328	921, 328
Net Operating Income	512, 116	512, 116	512, 116	512, 116
Depreciation	409, 212	409, 212	409, 212	409, 212
Long-term Loans	0	0	0	0
Interest Income	-	-	-	-
Cash Outflow	326, 921	363, 628	1, 129, 710	730, 963
Investment	0	0	774, 460	384, 090
Payment for Long-term Loans	198, 309	243, 393	243, 393	243, 393
Interest on Long-term Loans	128, 612	120, 235	111, 858	103, 481
Other Non-operating Expenditure			0	0
Cash Inflow - Outflow	594, 407	557, 700	-208, 382	190, 365
Cash Ending	4, 743, 488	5, 301, 188	5, 092, 806	5, 283, 171
Cash Excess	4, 743, 488	5, 301, 188	5, 092, 806	5, 283, 171
Cash Shortage	0	0	0	0

Balance Sheet

Year	2011	2012	2013	2014
Current Assets	4, 743, 488	5, 301, 188	5, 092, 806	5, 283, 171
Cash & Deposit	4, 743, 488	5, 301, 188	5, 092, 806	5, 283, 171
Other Current Assets				
Fixed Assets	2, 633, 651	2, 224, 439	2, 589, 687	2, 564, 566
Depreciable Assets	4, 867, 850	4, 867, 850	4, 867, 850	4, 867, 850
Accumulated Depreciation	2, 234, 199	2, 643, 411	2, 278, 163	2, 303, 284
Total Assets	7, 377, 139	7, 525, 628	7, 682, 494	7, 847, 737
Liabilities	4, 177, 002	3, 933, 609	3, 690, 217	3, 446, 824
Current Liabilities	-	-	-	-
Fixed Liabilities(Long-term Loans)	4, 177, 002	3, 933, 609	3, 690, 217	3, 446, 824
Capital				
Accumulated Earnings	3, 200, 137	3, 592, 018	3, 992, 277	4, 400, 912
Total Liabilities & Capital	7, 377, 139	7, 525, 628	7, 682, 494	7, 847, 737
	-0	-0	-0	-0

Financial Indicators	2011	2012	2013	2014
Rate of Return on Net Fixed Assets (%)	19. 45	23. 02	19. 78	19. 97
Debt Service Coverage Ratio	2. 82	2. 53	2. 59	2. 66
Operating Ratio (%)	53. 28	53. 28	53. 28	53. 28
Working Ratio (%)	15. 95	15. 95	15. 95	15. 95

17	18	19	20	21	22	23	24
2015	2016	2017	2018	2019	2020	2021	2022
1,096,227	1,096,227	1,096,227	1,096,227	1,096,227	1,096,227	1,096,227	1,096,227
584,111	584,111	584,111	584,111	584,111	584,111	584,111	584,111
29,240	29,240	29,240	29,240	29,240	29,240	29,240	29,240
145,659	145,659	145,659	145,659	145,659	145,659	145,659	145,659
409,212	409,212	409,212	409,212	409,212	409,212	409,212	409,212
512,116	512,116	512,116	512,116	512,116	512,116	512,116	512,116
0	0	0	0	0	0	0	0
95,103	86,726	78,349	69,972	62,219	54,830	48,016	42,218
95,103	86,726	78,349	69,972	62,219	54,830	48,016	42,218
417,013	425,390	433,767	442,144	449,897	457,286	464,101	469,899
4,817,925	5,243,315	5,677,083	6,119,227	6,569,124	7,026,410	7,490,511	7,960,409

2015	2016	2017	2018	2019	2020	2021	2022
5,283,171	5,434,243	5,018,292	5,042,478	5,329,277	5,630,768	5,490,393	5,753,583
921,328	921,328	921,328	921,328	921,328	921,328	921,328	921,328
512,116	512,116	512,116	512,116	512,116	512,116	512,116	512,116
409,212	409,212	409,212	409,212	409,212	409,212	409,212	409,212
0	0	0	0	0	0	0	0
770,256	1,337,279	897,142	634,529	619,837	1,061,703	658,138	688,710
431,760	1,007,160	575,400	321,165	321,165	774,460	384,090	431,760
243,393	243,393	243,393	243,393	236,453	232,413	226,033	214,733
95,103	86,726	78,349	69,972	62,219	54,830	48,016	42,218
0	0	0	0	0	0	0	0
151,072	-415,951	24,186	286,799	301,491	-140,375	263,190	232,618
5,434,243	5,018,292	5,042,478	5,329,277	5,630,768	5,490,393	5,753,583	5,986,201
5,434,243	5,018,292	5,042,478	5,329,277	5,630,768	5,490,393	5,753,583	5,986,201
0	0	0	0	0	0	0	0

2015	2016	2017	2018	2019	2020	2021	2022
5,434,243	5,018,292	5,042,478	5,329,277	5,630,768	5,490,393	5,753,583	5,986,201
5,434,243	5,018,292	5,042,478	5,329,277	5,630,768	5,490,393	5,753,583	5,986,201
2,587,114	3,185,063	3,351,251	3,263,204	3,175,158	3,540,406	3,515,284	3,537,833
4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850
2,280,736	1,682,787	1,516,599	1,604,646	1,692,692	1,327,444	1,352,566	1,330,017
8,021,357	8,203,355	8,393,729	8,592,481	8,805,926	9,030,799	9,268,867	9,524,033
3,203,432	2,960,039	2,716,647	2,473,254	2,236,802	2,004,389	1,778,357	1,563,624
3,203,432	2,960,039	2,716,647	2,473,254	2,236,802	2,004,389	1,778,357	1,563,624
4,817,925	5,243,315	5,677,083	6,119,227	6,569,124	7,026,410	7,490,511	7,960,409
8,021,357	8,203,355	8,393,729	8,592,481	8,805,926	9,030,799	9,268,867	9,524,033
-0	-0	0	-0	0	0	0	0

2015	2016	2017	2018	2019	2020	2021	2022
19.79	16.08	15.28	15.69	16.13	14.46	14.57	14.48
2.72	2.79	2.86	2.94	3.08	3.21	3.36	3.59
53.28	53.28	53.28	53.28	53.28	53.28	53.28	53.28
15.95	15.95	15.95	15.95	15.95	15.95	15.95	15.95

Table 15.14.4-17 Financial Statement

Income Statement

Year	25	26	27	28
	2023	2024	2025	2026
Operating Revenue	1,096,227	1,096,227	1,096,227	1,096,227
Operating Expenditure	584,111	584,111	584,111	584,111
Personnel & Administration	29,240	29,240	29,240	29,240
Maintenance	145,659	145,659	145,659	145,659
Depreciation	409,212	409,212	409,212	409,212
Net Operating Income	512,116	512,116	512,116	512,116
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	36,420	30,622	24,825	19,027
Interest on Long-term Loans	36,420	30,622	24,825	19,027
Others				
Net Income	475,696	481,494	487,292	493,090
Accumulated Earnings	8,436,106	8,917,600	9,404,891	9,897,981

Cash Flow

Year	2023	2024	2025	2026
Cash Beginning	5,986,201	6,224,616	6,900,589	7,582,360
Cash Inflow	921,328	921,328	921,328	921,328
Net Operating Income	512,116	512,116	512,116	512,116
Depreciation	409,212	409,212	409,212	409,212
Long-term Loans	0	0	0	0
Interest Income	-	-	-	-
Cash Outflow	682,913	245,355	239,557	233,759
Investment	431,760			
Payment for Long-term Loans	214,733	214,733	214,733	214,733
Interest on Long-term Loans	36,420	30,622	24,825	19,027
Other Non-operating Expenditure	0	0	0	0
Cash Inflow - Outflow	238,415	675,973	681,771	687,569
Cash Ending	6,224,616	6,900,589	7,582,360	8,269,929
Cash Excess	6,224,616	6,900,589	7,582,360	8,269,929
Cash Shortage	0	0	0	0

Balance Sheet

Year	2023	2024	2025	2026
Current Assets	6,224,616	6,900,589	7,582,360	8,269,929
Cash & Deposit	6,224,616	6,900,589	7,582,360	8,269,929
Other Current Assets				
Fixed Assets	3,560,381	3,151,170	2,741,958	2,332,746
Depreciable Assets	4,867,850	4,867,850	4,867,850	4,867,850
Accumulated Depreciation	1,307,469	1,716,680	2,125,892	2,535,104
Total Assets	9,784,997	10,051,759	10,324,318	10,602,675
Liabilities	1,348,892	1,134,159	919,427	704,694
Current Liabilities	-	-	-	-
Fixed Liabilities(Long-term Loans)	1,348,892	1,134,159	919,427	704,694
Capital				
Accumulated Earnings	8,436,106	8,917,600	9,404,891	9,897,981
Total Liabilities & Capital	9,784,997	10,051,759	10,324,318	10,602,675
	0	0	-0	-0

Financial Indicators	2023	2024	2025	2026
Rate of Return on Net Fixed Assets (%)	14.38	16.25	18.68	21.95
Debt Service Coverage Ratio	3.67	3.76	3.85	3.94
Operating Ratio (%)	53.28	53.28	53.28	53.28
Working Ratio (%)	15.95	15.95	15.95	15.95

29	30	31	32	33	34
2027	2028	2029	2030	2031	2032
1,096,227	1,096,227	1,096,227	1,096,227	1,096,227	1,096,227
584,111	584,111	584,111	584,111	584,111	584,111
29,240	29,240	29,240	29,240	29,240	29,240
145,659	145,659	145,659	145,659	145,659	145,659
409,212	409,212	409,212	409,212	409,212	409,212
512,116	512,116	512,116	512,116	512,116	512,116
0	0	0	0	0	0
13,229	7,431	3,617	1,217	0	0
13,229	7,431	3,617	1,217	0	0
498,887	504,685	508,500	510,899	512,116	512,116
10,396,868	10,901,554	11,410,053	11,920,953	12,433,069	12,945,185

2027	2028	2029	2030	2031	2032
8,269,929	8,188,836	8,503,910	8,848,582	9,248,066	10,124,311
921,328	921,328	921,328	921,328	921,328	921,328
512,116	512,116	512,116	512,116	512,116	512,116
409,212	409,212	409,212	409,212	409,212	409,212
0	0	0	0	0	0
		0	0	0	0
1,002,421	606,254	576,656	521,844	45,083	0
774,460	384,090	431760	431760		
214,733	214,733	141,280	88,867	45,083	0
13,229	7,431	3,617	1,217	0	0
0	0	0	0	0	0
-81,093	315,074	344,672	399,484	876,245	921,328
8,188,836	8,503,910	8,848,582	9,248,066	10,124,311	11,045,639
8,188,836	8,503,910	8,848,582	9,248,066	10,124,311	11,045,639
0	0	0	0	0	0

2027	2028	2029	2030	2031	2032
8,188,836	8,503,910	8,848,582	9,248,066	10,124,311	11,045,639
8,188,836	8,503,910	8,848,582	9,248,066	10,124,311	11,045,639
2,697,995	2,672,873	2,695,421	2,717,970	2,308,758	1,899,546
4,867,850	4,867,850	4,867,850	4,867,850	4,867,850	4,867,850
2,169,855	2,194,977	2,172,429	2,149,880	2,559,092	2,968,304
10,886,830	11,176,783	11,544,003	11,966,036	12,433,069	12,945,185
489,962	275,229	133,950	45,083	0	0
489,962	275,229	133,950	45,083	0	0
10,396,868	10,901,554	11,410,053	11,920,953	12,433,069	12,945,185
10,886,830	11,176,783	11,544,003	11,966,036	12,433,069	12,945,185
0	-0	-0	-0	-0	-0

2027	2028	2029	2030	2031	2032
18.98	19.16	19.00	18.84	22.18	26.96
4.04	4.15	6.36	10.23	20.44	-
53.28	53.28	53.28	53.28	53.28	53.28
15.95	15.95	15.95	15.95	15.95	15.95

15.15 Environmental Impact Analysis

a) Existing situation

The existing water quality and sediment quality were assessed by the site survey. The baseline data from the environmental survey has been reviewed. In general the water quality is acceptable and is classed as good for a port where are not so high. areas of discharges are inevitable, and the beneficial used of the water are not so high. Area of concern are the high sulphides and low dissolved oxygen (at one location) which together with the marginally high COD indicate that a substantial pollution load is entering the harbour.

In the most restricted part of the port, where the natural flushing action of the harbour is lowest, the harbour receives the flows from three sewage outfalls. This imposes a heavy organic load. Latakia is implementing a major sewage treatment scheme with the assistance of World Bank and this should ensure that the organic loads decrease in the future.

The existing oil storage tank farm represents a potential environmental hazard and no contingency plans or emergency response vessels are available.

Large concentration of mercury are present in the harbour bottom sediments. if dredging were to take place these sediments could be disturbed, reentrained into the water, and the mercury could then pose a potential environmental threat.

b) Change to Port Construction

The fundamental changes to the existing port construction will involve facilities for the export of grain and wheat, and the import of maize. These could include movement of silos, dredging and new berths. It is intended that all dredged material will be used for reclamation purposes. It is also planned that the existing oil storage tank farm be moved to anew location.

c) Environmental Impacts

The planned activities at Latakia will have no major impacts. The majority of the intended construction activities will have minimal or no environmental impact and are of no further concern. The activities that may have an impact are dredging and tipping of the dredged material. The degree of these impacts are classed as large but not major as the dredged material will be used in the reclamation and will not be tipped at sea. Also there are no shellfish breeding grounds in the immediate vicinity which may be affected. Therefore a full EIA is not considered necessary.

d) Conclusions

There are no'environmental reasons why the planned activities should not proceed and a full EIA and remedial measures are not considered necessary. Monitoring for heavy metals during dredging is recommended.

Chapter 16 Short-Term Plan of Tartous Port

16.1 The Basic Concept of the Port Development Plan

The Short-Term Plan is prepared as a first phase plan with a target year of 2003 for the development of Tartous Port. The Short-Term Plan is made within the framework of the Master Plan described in Chapter 12 and whose project components are summarized as follows:

- Modernization of the existing container terminal at the pier B,
- Transfer of the phosphate terminal from Tartous Port to the new port and conversion of it to a grain terminal,
- Preparation of additional general cargo and Ro-Ro berths adjacent to the south breakwater.

According to the results of the rough economic appraisal of the Master Plan of Tartous Port, it is judged that the projects listed above are economically viable as a whole (see Section 12.14). In the process of the above economic appraisal, it was revealed that it is economically viable to implement the following project as the short-term project (first phase) with the target year of 2003:

- Preparation of a Multi-purpose Terminal at the pier B

  In the year 2003, the number of containers handled at Tartous Port is estimated as around 72,000 TEUs. Judging from the number of containers, it seems to be still early to establish a full-scale container terminal at the pier B as proposed in the Master Plan. In a transitional period towards the establishment of the full-scale container terminal at the same pier, it is proposed to prepare a multi-purpose terminal to handle both containers and long and heavy products such as iron and steel.

- Preparation of additional general cargo and Ro-Ro berths adjacent to the south breakwater

  Despite the anticipated progress of containerization, it is forecast that a considerable volume of cargo in break-bulk discharged/loaded from/onto general cargo vessels will pass through the port even in the stage of the Short-Term Plan, over 1.5 times as much as the present volume. In the meantime, Ro-Ro traffic is expected to be encouraged in the foreseeable future as it was until 1981. To cope with the increasing volume of those cargoes, it is proposed to prepare additional berths at the space adjacent to the south breakwater, which seems to be the only space to construct the additional berths within the existing port limits.

The remaining projects are required to be implemented as next phase projects towards the target year of the Master Plan. The project to establish the full-scale

container terminal is required to be started as the second phase plan for container-handling just before the saturation of the multi-purpose terminal; the saturation is forecast to come soon after the year 2003 due to the limited space of container-stacking yard in the first phase project.

On the other hand, the timing of transfer of the phosphate terminal from Tartous Port to the new port and subsequent conversion of it to a grain terminal is determined taking account of progress of the new port construction project to be completed towards the target year of the Master Plan.

16.2 Usage Plan for the Existing Port Facilities

As in Chapter 12, vessels calling at Tartous Port at present are divided into the following eleven categories in 2003. Phosphate carriers are planned to shift into the new port.

- General cargo vessel laden with various kinds of cargoes
- General cargo vessel laden with one kind of commodity
    - Foodstuffs or agricultural products except livestock
    - Livestock (sheep, cattle)
    - Steel products
    - Wood
    - Car, machine and equipment
    - Chemical products
- Ro/Ro vessel
- Grain carrier(Import)
- Grain carrier(Export)
- Container vessel

The volume of cargoes estimated in the demand forecast(see Chapter 10) is distributed to vessels categorized above. The usage plan for the existing port facilities by vessel type is proposed as follows.

(1) General Cargo Vessel (Various Kinds of Cargoes)

The total volume of cargoes to be transported by the vessel of this type through Latakia Port in 2003 is estimated as 907,000 tons. In making the plan for berth allocation for the vessels, the following premises are adopted considering the actual operations. Average cargo handling volume and hourly cargo handling productivity are the same as that at present.

- Total volume of cargoes: unloaded : 873,000 tons
                            loaded   : 343,000 tons
- Average cargo handling volume   :   1,710 tons per vessel
- Number of calling vessels   :   531 vessels per year

- Cargo handling productivity   :   33 tons per hour
- Average dwelling time   :   7 days
- Storage   : Shed
- Land transport   : 100% by trucks

Since general cargo volume will become nearly double the present cargo volume, most of the existing berths are planned to accommodate general cargoes. The following berths are allocated:

- Quay No.4, No.5, No.9, No.10, No.11, No.12, No.13 No.14, No.15, (11 Berths)
- New Berths(2 Berths)

(2) General Cargo Vessel (Foodstuffs or agricultural products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 497,000 tons
- Average cargo handling volume : 3,560 tons per vessel
- Number of calling vessels   : 140 vessels
- Cargo handling productivity   :   44 tons per hour
- Average dwelling time   :   7 days
- Storage   : Shed
- Land transport by trucks

Foodstuffs and agricultural products show similar cargo handling conditions to general cargo. The following berths are planned to serve the vessels.

- Quay No.9, No.12, No.13, No.14, (7 berths)
- New Berths(2 Berths)

(3) General Cargo Vessels (Livestock)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 191,000 tons
- Average cargo handling volume : 260 tons per vessel
- Number of calling vessels   : 735 vessels
- Cargo handling productivity   :   12 tons per hour
- Average dwelling time   : within 1 day
- Storage   : Open yard
- Land transport by trucks

Since livestock are carried by trucks just after being unloaded from the vessels, area for storage is small. Quay No.4, No.5, No.16 and No.17 (total 4 berths) are allocated for livestock vessels. These vessels have priority to moor these berths.

(4) General Cargo Vessels (Steel products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 546,000 tons
- Average cargo handling volume : 2240 tons per vessel
- Number of calling vessels : 244 vessels
- Cargo handling productivity : 80 tons per hour
- Average dwelling time : 9 days
- Storage : Open yard
- Land transport by trucks

The following berths are allocated for the steel carrying vessels.

- Berth No.4, No.7, No.9 (4 berths), No.21, No.23

(5) General Cargo Vessels (Wood)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 351,000 tons
- Average cargo handling volume : 1,390 tons per vessel
- Number of calling vessels : 253 vessels
- Cargo handling productivity : 22.2 tons per hour
- Average dwelling time : 7 days
- Storage : Open yard
- Land transport by trucks

The following berths are allocated:

- Berth No.4, No.7, No.9, No.21, No.23 (6 berths)

(6) General Cargo Vessels (Car, Machine, Equipment)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 169,000 tons
- Average cargo handling volume : 520 tons per vessel
- Number of calling vessels : 558 vessels
- Cargo handling productivity : 39 tons per hour
- Average dwelling time : 7 days
- Storage : Open yard
- Land transport by trucks

Since car, machine and equipment are handled through the entire area, similar berthing condition should be kept in the year 2003. The following berths are

allocated:

- Quay No.5, No.9, No.12, No.14 (9 berths)

(7) General Cargo Vessels (Chemical products)

The following premises are adopted considering the record of actual operations.

- Total volume of cargoes unloaded from the vessels : 290,000 tons
- Average cargo handling volume : 1,990 tons per vessel
- Number of calling vessels   : 274 vessels
- Cargo handling productivity   : 32.2 tons per hour
- Average dwelling time   : 7 days
- Storage   : Shed
- Land transportation by trucks

The following berths are planned to serve the vessels;

- Quay No.4, Quay No.9, Quay No.12 (7 berths)

(8) Ro/Ro Vessels

Ro/Ro vessels are berthing mainly at three berths with Ro/Ro facilities (Quay No.5, No.6 and No.10). An additional new berth is also allocated to the Ro/Ro cargo.

- Total volume of cargoes: unloaded : 58,000 tons
-                     loaded : 10,000 tons
- Average cargo handling volume : 1,270 tons per vessel
- Number of calling vessels : 54 vessels
- Cargo handling productivity : 34.4 tons per hour
- Average dwelling time : 5 days
- Storage : Open yard
- Land transportation by trucks

(9) Grain Carrier (Import)

The volume of grain (maize and barley) to be unloaded at the port in the year 2003 is estimated as 390,000 tons. The following premises are adopted considering the record of actual operations.

- Average cargo handling volume : 16,640 tons per vessel
- Number of calling vessels   : 24 vessels
- Cargo handling productivity   : 168 tons/hr
- Average dwelling time in silo : 10 days
- Land transport by trucks

Cargo handling productivity is calculated as follows:

240 ton/hr/unit X 2units X 0.7 X 0.5

One berth of Quay No.12 is allocated for Grain Carriers.

(10) Grain Carrier (Export)

Wheat exports are expected to amount to 600,000 tons in the year 2003. The following premises are adopted considering the record of actual operations.

- Average cargo handling volume : 20,000 tons per vessel
- Number of calling vessels   :   31 vessels
- Average dwelling time in silo :   10 days
- Cargo handling productivity   :   192 ton/hr
- Land transport by trucks

The cargo handling productivity is calculated as follows:

240ton/hr/unit X 2units X 0.8 X 0.5

(11) Container Vessel

The number of containers to be discharged/loaded from/onto container vessels at the port is estimated as 72,000 TEUs in 2003. Those container vessel will be received at a multi-purpose terminal at the Pier B.

In the next step, the proposed usage plan for the existing port facilities is determined by using a computer simulation, excluding containers that are planned to be handled at the specified berth of the multi-purpose terminal. In this study, reference to the actual statistical distribution forms for ship arrivals and mooring periods at the Latakia Port is made. Operational conditions at the port are as follows.

- Annual working days : 365 days
- Daily working hours : 24 hours

A result of the simulation is summarized as follows.

- Average ship waiting time:

1 General cargo vessels(Various kinds of cargoes)   : 0.4 hrs
2 General cargo vessels(Foodstuffs/agricultural products) : 0.8 hrs
3 General cargo vessels(Livestock)   : 0.7 hrs
3 General cargo vessels(Steel products)   : 2.0 hrs
4 General cargo vessels(Wood)   : 0.4 hrs

5	General cargo vessels(Car, machine and equipment)	: 0.8 hrs
6	General cargo vessels(Chemical products)	: 4.2 hrs
7	Ro/Ro vessels	: 0.3 hrs
8	Grain carrier(Import)	: 6.6 hrs
9	Grain carrier(Export)	: 9.3 hrs

- Percentage of berth occupancy

Quay No.4+5	: 76.2 [%]
Quay No.7+6	: 78.0
Quay No.9+10	: 68.2
Quay No.12	: 60.4
Quay No.13	: 49.5
Quay No.14	: 55.4
Quay No.16	: 36.8
Quay No.17	: 50.8
Quay No.18	: 24.2
Quay No.24	: 59.5
Quay No.25	: 57.3

Areas of public sheds and open yards occupied by various cargoes fluctuate according to daily arrivals, dwelling time and departures of the cargoes. When estimating the required areas for storing them, a daily maximum occupied area is adopted. The result of the simulation is as follows.

- Area in sheds   : 6.2 ha
- Area in open yards : 4.5 ha
- Total area   : 10.7 ha

Existing sheds and warehouses occupy 7.9 ha and open yards occupy 18.5 ha excluding the container yard, CFS and Ro/Ro marshaling yard. Since the total area of the existing storage facilities exceeds the necessary area, it is possible to accommodate future cargo within the existing port.

Total ship waiting days in 2003 are estimated as 96 days, less than one tenth of the 1534 days in 1994.

16.3.1 Multi-purpose Terminal

It is proposed to prepare a multi-purpose terminal to handle both containers and long and heavy products such as iron and steel. The terminal is planned to be equipped with two units of rail-mounted dock-side gantry cranes which can lift both containers and heavy break-bulk cargoes by using a replaceable attachment of a spreader or a hook, respectively, The yard behind the two berths of the pier B is divided into two parts for container-stacking and conventional cargo storage,

respectively,

It is planned to introduce two units of rail-mounted transfer cranes (4 high stacking and 5 over, 12 rows within the rail span, two tractor-chassis lanes under sea-side reach and two railway lines under land-side outreach) so as to mainly stack laden containers. Empty containers are planned to be stacked by toplifters. The existing straddle carriers could be used at the backyard of the Pier-B without interference with the operations using rail-mounted transfer cranes behind the dockside of the Pier-B.

The layout of terminal facilities is proposed in Fig. 16.3-1. According to the layout plan, the ground slots of rail-mounted transfer cranes are estimated as follows:

- Marshaling yard: 1,480 TEUs for laden containers,
- Backyard: 1,380 TEUs for empty containers.

The required ground slot numbers are estimated as follows:

- Marshaling yard: 490 TEUs for laden containers,
- Backyard: 360 TEUs for empty containers.

From the above, only one third of the planned yards is sufficient to store containers in the year 2003. The remaining yards could be used to store conventional cargo. Beyond the year 2003, handling of conventional cargo there will be gradually replaced by container-handling.

130

Cross section A-A   Scale 1:2,000

Reefer Yard

Parking Space for
Cargo-Handling Machine

Terminal Office

Gate House

Gate

A

540

CFS

Gantry Crane

No.1   No.2

Back Yard

Empty Container Storage Yard

130
15.6
79.4
35
18.5
2.5
37.1
13
26.3
14
13
13
3

A
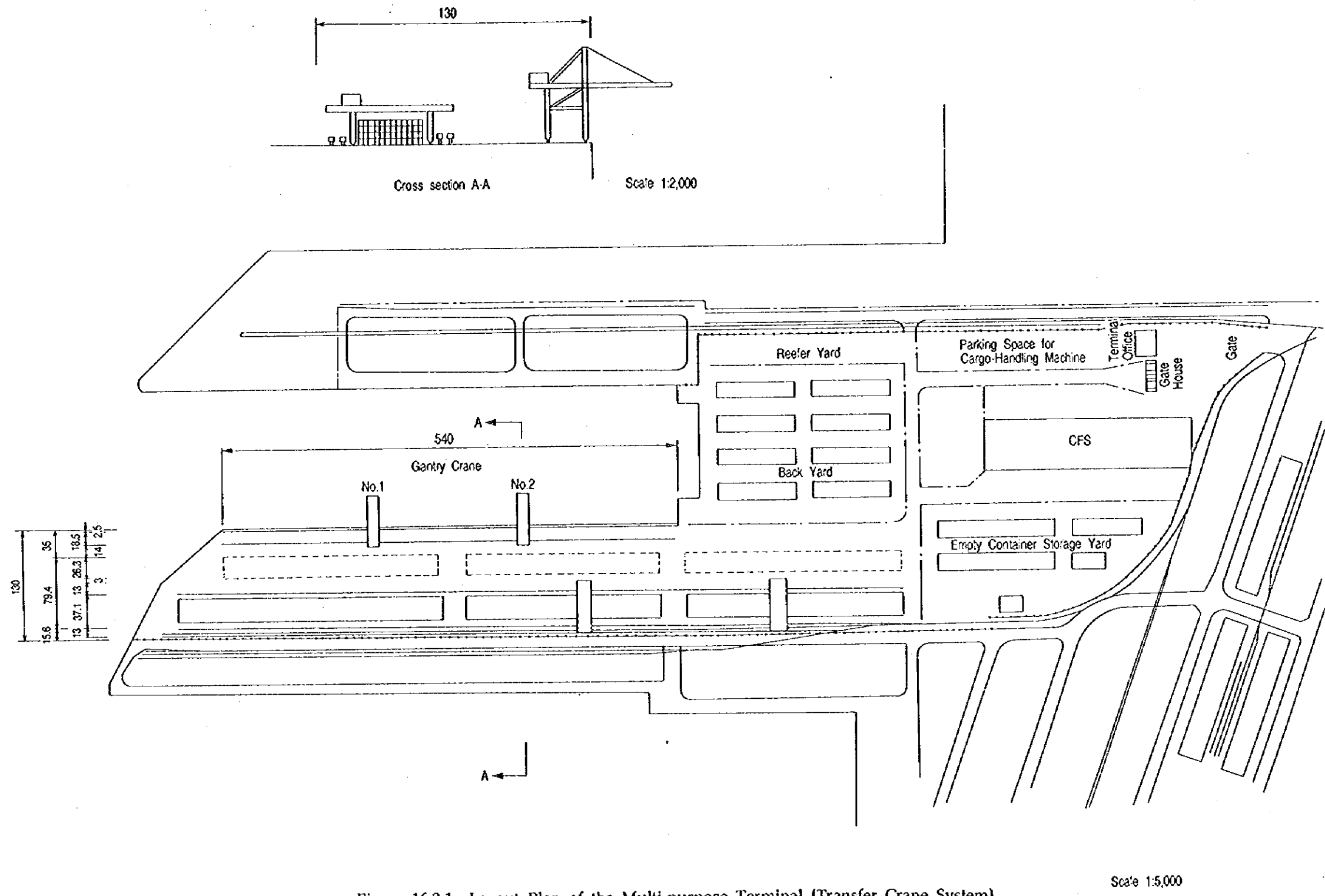
Figure 16.3.1   Layout Plan of the Multi-purpose Terminal (Transfer Crane System)

Scale 1:5,000

16.4 Expansion Plan

16.4.1 Conventional Terminal

Since the phosphate terminal will be converted to the grain/general cargo terminal after the year 2003 when the New Port will be completed, berths adjacent to the phosphate terminal are also used for working craft after the year 2003. In order to avoid congestion due to the lack of these berths, the new berths behind the breakwater (Berth No.24, 25) will start operation by the year 2003.

In order to decide the number of berths for general cargo, the total costs of waiting vessels and construction cost of Case 1(construct 2 berths), Case 2(construct 1 berth) and Case 3(construct 3 berths) are compared.

	Case 1	Case 2	Case 3
Construction	31.8	20.2	42.5
Waiting Cost	5.4	17.3	2.8
Total Cost	37.2	37.5	45.3
INDEX	100	101	122

Note : waiting cost is for 5,000 DWT conventional cargo vessel
unit : $ million   Discount Rate:0.1   Project Life: 30 years

The total cost of Case 1 and Case 2 is almost the same.
Case 1 is the most economical among the alternatives.

16.5 Cargo Handling System

The cargo handling system for container cargoes is mentioned in 12.3 for the Master Plan and 16.3 for the Short Term Plan. The basic trend of cargo handling system for each major commodity in future is already mentioned in 12.5. Therefore, in this chapter, The condition of cargo handling for conventional style break bulk cargo at the Short-Term Plan stage is mainly mentioned.

16.5.1 Cargo Handling System for Break Bulk Cargo in 2003

The improvement of delivery/receiving system should be performed for modernization of Taltouse Port, which is mentioned in Chapter 12.5. Therefore, at Latakia Port, the improvement of delivery/receiving system will not be performed during the Short-Term Plan stage, as mentioned in 15.5.

It is necessary that palletizable cargoes are palletized for improvement of delivery /receiving system because the number of times that cargo must be handled in direct delivery/receiving is much greater than indirect delivery/receiving. If palletizable cargoes are not palletized, losses will be created due to the excessive

time spent in the indirect delivery/receiving system.

Initial investment and repracement of damaged pallets are necessary for palletization. Therefore, if the improvement of delivery/receiving system is not performed, Palletization of palletizable cargo will not be strongly promoted.

About sixty percent of break bulk cargo(including container cargo) for sea trade in Syria is handled at Latakia Port in 2003. Present cargo handling facilities at Latakia Port will be sufficient during the Short-Term Plan stage.

Considering above situation, Palletization of palletizable cargo will not be largely realized during the Short-Term Plan stage.

However, introduction of the three shift system for cargo handling which is mentioned in 12.5 will be sought. As to container cargo handling, additional cargo handling equipment such as rail-mounted transfer cranes at container storage yard and Gantry cranes at quay side will be installed in the Short-Term Plan.

16.6 Access Roads and Railways

The traffic volume of vehicles originating from or destined to the port in the year 2003 is estimated to be 8,290 vehicles per day each way in total. The hourly traffic corresponding to that daily traffic is also estimated to be 1,036 vehicles each way.

The traffic volume of container is estimated to be 228 per day each way. And hourly traffic corresponding to the daily traffic is estimated to be 29 each way. Since the containers require special procedures at the gate of the port, container related vehicles are separated at the north gate of the port.

The remaining hourly traffic volume is 1,007. As hourly capacity of traffic volume per lane is estimated as 600 vehicles, two lanes each way need to be shared for the entire traffic. Two entrances are kept for general and other cargo, main entrance with two lanes and sub entrance with two lanes.

As for railway traffic, daily number of wagons is estimated to be 184 in total. Since the trains for phosphate are shifted to the new port, the tracks for the phosphate are eliminated.

16.7 Layout of the Main Facilities

Two new berths are located behind the south breakwater. Taking account of launch from the shipyard, the distance between the end of the slipway must be at least 150m.
Existing sulphur berth will be used for heavy and long cargo such as steel and wood after the main construction works for Tartous and the new port will be completed. Open yard behind the sulphur berth will be paved to accommodate

heavy and long cargo.

Container yard for containers carried by general cargo vessel will also be paved. The layout of the facilities is described in Fig.16.7.1.
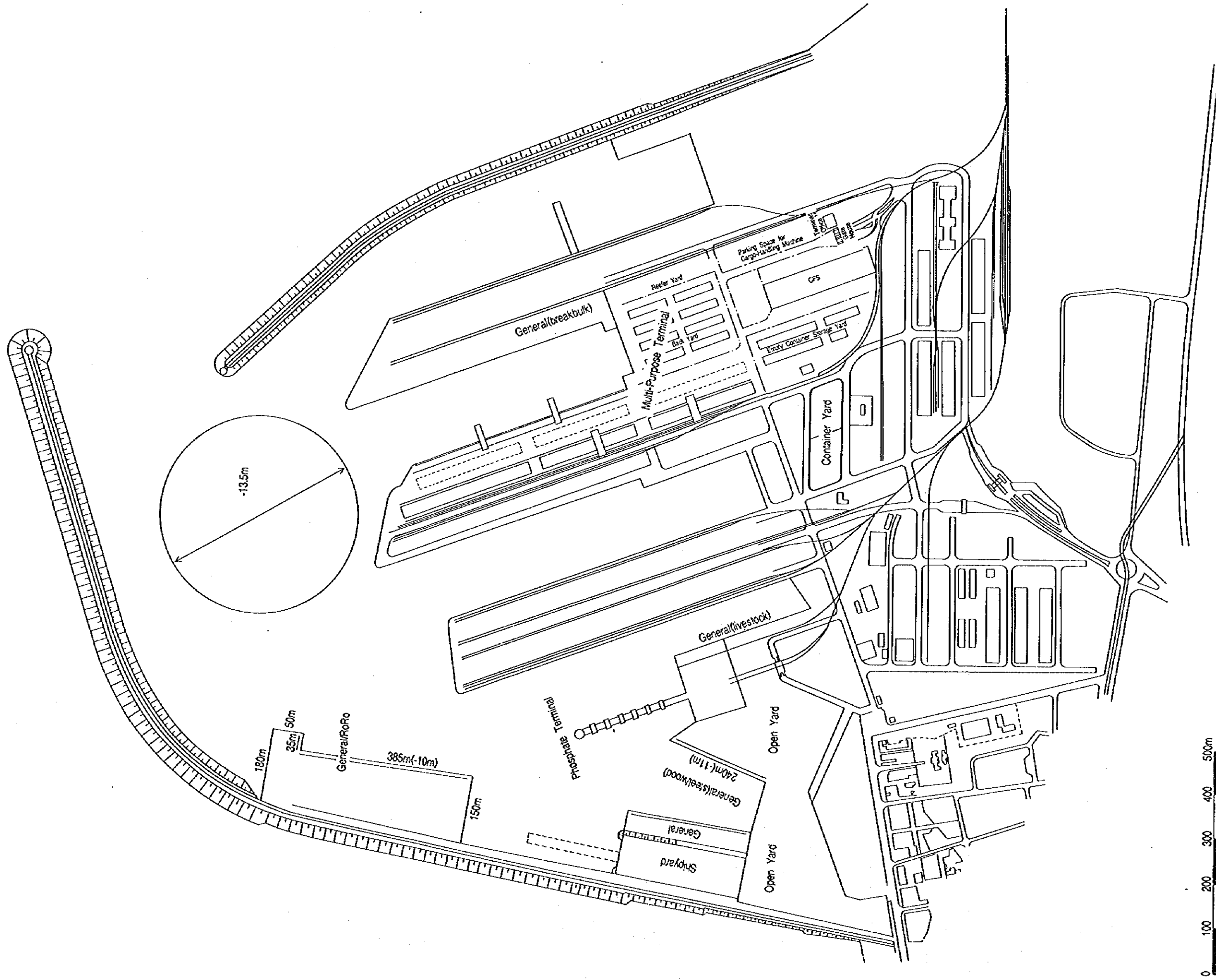
Figure 16.7.1 Tartous Port Short-Term Plan

General(breakbulk)

Parking Space for
Cargo-Handling Machine

Reefer Yard

CFS

Empty Container Storage Yard

Back Yard

Multi-Purpose Terminal

Container Yard

-13.5m

General(livestock)

Phosphate Terminal

50m
35m
General/RoRo
180m

385m(-10m)

150m

General(steel/wood)

240m(-11m)

General

Open Yard

Shipyard

Open Yard

0   100   200   300   400   500m

16-15

16.8 Design of the Major Structure

In the short-term plan of Tartous Port, the following facilities, building and equipment are planned by the year 2003. Among these, designs of general/RoRo terminal berth, revetment, open yard and road are described in this section.

Table 16.8-1 Planned Facilities in the Short-Term Plan of Tartous Port

Facilities	Unit	Short-Term Plan
Grain/RoRo Terminal:		
Wharf(-10m)	m	385
Revetment	m	380
Reclamation	m3	737,330
Pavement	m2	65,250

16.8.1 Design Conditions

(1) General/RoRo Terminal Berth

Design conditions for the general/RoRo berth are set as follows.

Table 16.8.1-1 Design Conditions for General/RoRo Berth (-10m)

Facility	Design Condition
Planned Ship (DWT)	15,000
Planned Water Depth (m)	-10.0
Berth Length	385
Crown Height	+2.8
Planned Surcharge (t/m2) Ordinary	2.0
Extra-ordinary	1.0
H.W.L. (m)	0.5
Geological Condition	Silty sand
Seismicity	0.03

(2) Open Yard, Apron, Road

The design load are set as follows.

Truck	T-14
Tractor trailer	20 ft, 40 ft

16.8.2 Structural Design

(1) General/RoRo Terminal Berth

The sub-soil conditions are very strong and all the wharves in Tartous Port have been constructed by adopting the gravity type quaywall. The planned site is located along the main breakwater and its soil condition is supposedly strong enough. So, the gravity type is chosen for this case.
The design of gravity type quaywall is preferably made according to the following sequence.
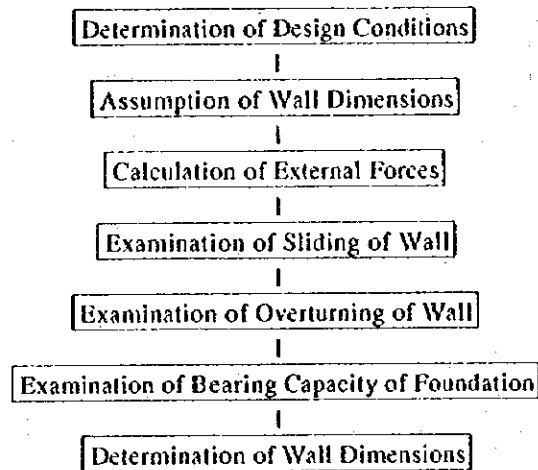
Fig. 16.8.2-1 Design Flow of Gravity Type Quaywall

1) External Forces and Loads Acting on Walls

As the external forces and loads acting on the wall of a gravity type quaywall, the followings are considered.

(a) Surcharge
(b) Dead weight of wall
(c) Earth pressure
(d) Buoyancy
(e) Seismic force
(f) Tractive forces of ships

2) Examination Concerning Sliding of Wall

The safety factor against sliding of a gravity type quaywall shall satisfy the following formula.

$$F \leq \frac{fW}{P}$$

where;
W :The resultant of vertical forces acting on the wall (tons)
P :The resultant of horizontal forces acting on the wall (tons)
f :Coefficient of friction between the bottom of the wall and the foundation
F :Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.0 or more in special condition.

3) Examination Concerning Overturning of Wall

The safety factor against overturning of a gravity type quaywall shall satisfy the following formula.

$$F \leq \frac{Wt}{Ph}$$

where;

W : The resultant of vertical forces acting on the wall (tons)

P : The resultant of horizontal forces acting on the wall (tons)

t : Distance from the application line of the resultant force of the vertical forces acting on the wall, to the front toe of the wall(m)

h : Height from the application line of the resultant force of the horizontal forces acting on the wall, to the bottom of the wall (m)

F : Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.1 or more in special condition.

4) Result of Stability Calculation

According to the standard cross section shown in Fig.16.8.2-2, the safety factors for sliding (S.F.1) and the safety factors for overturning (S.F.2) result in the Table 16.8.2-1. These figures show the sufficient stability against sliding and overturning.

Table 16.8.2-1 Safety Factors of Grain Terminal Berth

Case	S.F.1 for Sliding	S.F.2 for Overturning
Ordinary Condition	1.33	1.52
Special Condition	1.29	1.42

(2) Revetment

Revetment next to the wharf (-10m) should be constructed by the same structure as the wharf considering the ship maneuvering. As for the remaining revetment, the water depths change from -2m to -11m.

The standard cross section of the revetment is shown in Fig.16.8.2-3.

(3) Open Yard, Apron, Road

Open Yard, apron and road are planned to be paved by asphalt concrete. The composition of the bituminous pavement is shown below.
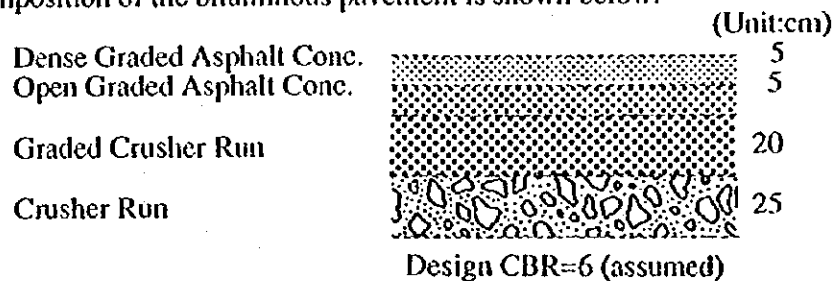
(Unit:cm)

Dense Graded Asphalt Conc.   5

Open Graded Asphalt Conc.   5

Graded Crusher Run   20

Crusher Run   25

Design CBR=6 (assumed)

Fig. 16.8.2-4 Standard Cross Section of Yard, Apron, Road

CONCRETE BLOCK QUAY (-10.0m)

S 1:200

SAND FILLING

CRUSHED STONE

1:1

1:1

1:2

15~100 kg STONE

1:2

1050

275

190

500

1200

15

90

190 180 230 230 230 230

1000

+2.80

±0.00

-10.00

-12.00

NOTES:

1. WEIGHT OF CONCRETE BLOCKS UP TO 100t
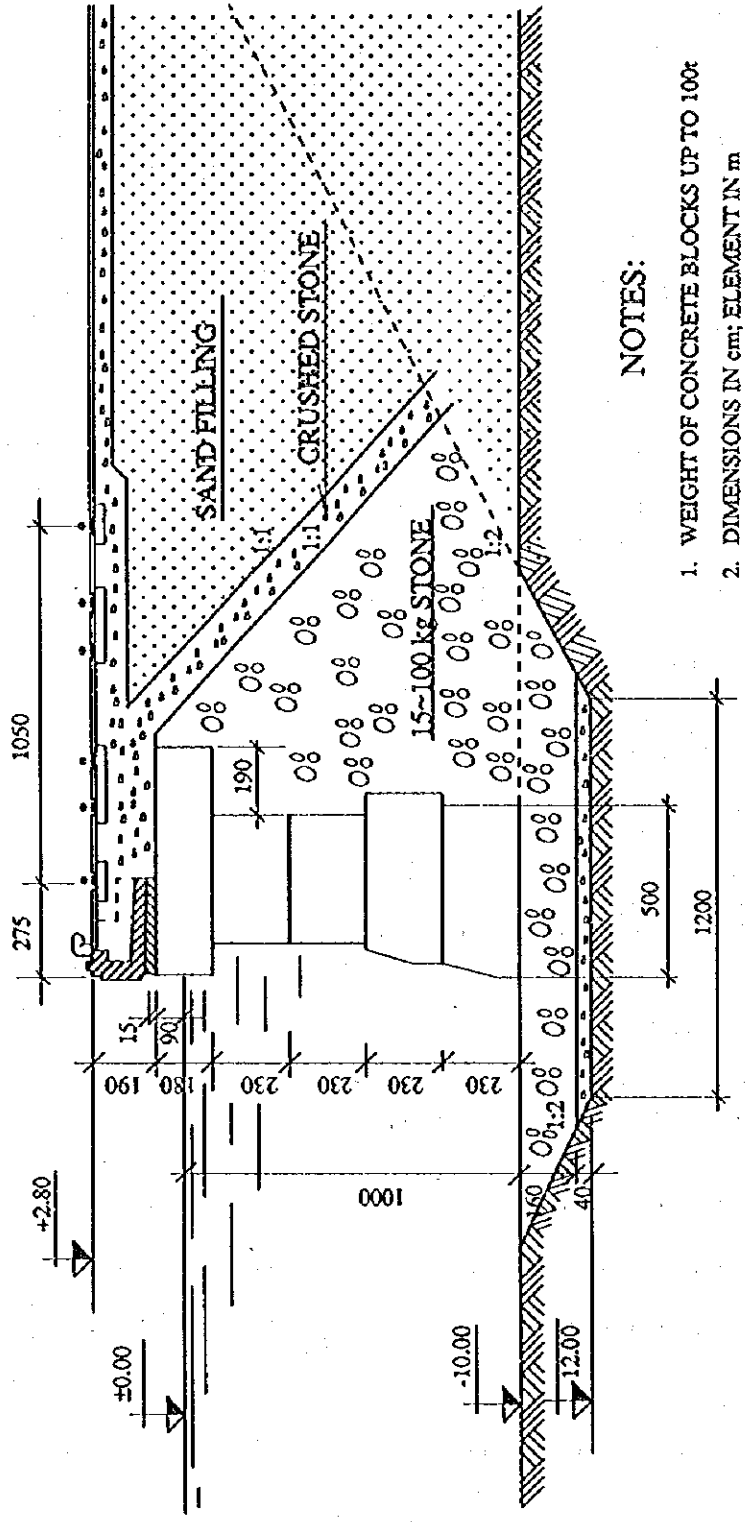
2. DIMENSIONS IN cm; ELEMENT IN m

Fig. 16.8.2-2 Standard Cross Section of Quay
Block Type (-10.0m)

16-20
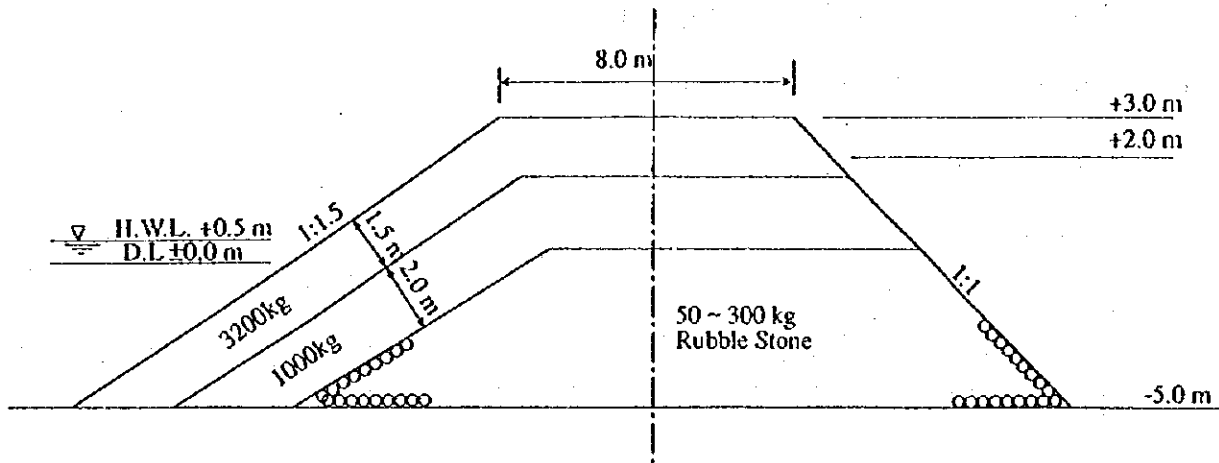
Fig. 16.8.2-3 Standard Cross Section of Revetment

16.9 Design of Cargo Handling Equipment

16.9.1 Handling Equipment for Container

(1) Handling from/to ship

The container handling from/to ship which are berthed at the existing container berth is performed by ship gear because the berth is not equipped with container crane.

All of modernized container berths have container cranes. therefore, container cranes should be installed to get high productivity at the existing container berths.

Container cranes

The maximum ship size which can be handled at the berth will be decided as panamax type.

The number of container cranes to be installed at the container berth is decided by the number of container berths and number of containers to be handled. Most modernized container berths have two or three container cranes. Judging from the container volume to be handled at the berth, two container cranes are installed at the berth.

Remarks: The procured numbers of equipment is shown in parenthesis.

Number of container cranes   2(2) Units

Basic Dimensions

Hoist Capacity (under spreader) for hatch cover	35.6 t
Hoist Capacity (under spreader) for container	30.5 t
Outreach from seaside rail center	36.0m (include 2.5 + 0.5)
Span (gauge of span)	18.5m
Back reach from land side rail center	11m
Lift Total	42m
Lift(above rail)	31.1m(ch-2.8,tr +0.8)
Lift(below rail)	10.9m(ch+2.8)
Length	About 28m
Portal clearance(under horizontal stays)	At least 14m
Portal clearance(between sea side leg and sea side leg)	At least 16m
Travelling distance	200m

(2) Apron, Yard and C.F S Handling Equipment

In due consideration of the transfer crane rail which is under construction and the shape of the yard, the transfer crane system shall be introduced at the container yard which is located behind the container berth.

On the other hand,the existing straddle carriers could be continuously used the back yard of the Pier B. The details of each type of handling equipment are as

follows.

1) Rail-mounted Transfer cranes

Number of rail mounted transfer cranes

Taking travelling distance into consideration, three units shall be installed by the target year and two units shall be installed in 2003. The detailed specifications are as follows.

Number of cranes	2(2) Units
Basic Dimensions	
Hoist capacity(under spreader)	30.5 t
Span(gauge of rail)	37.1m
Cantilever(both sides,from rail center)	10m
Lift	16m
Wheel base	15m
Travelling distance	270m
Power supply	Cable reel system
Spreader	Telescopic(20/40)

2) Other minor handling equipment for container handling.

Some minor handling equipment for container handling including toplifters is also required in the stage of the Short-Term Plan. However they will be used in common with conventional berths.

16.9.2 Handling Equipment at Conventional Berth

(1) Handling from/to ship

Cargo handling of conventional cargoes between a ship and a quay is done by quay cranes or ship's cranes in Pier-A and by mobile tower cranes or ship's gear in Pier-B in general at present and their handling systems shall be continued in the target year.

a. Replacement in Pier-A

Total of seventeen(17) quay cranes have been installed on Pier-A. However some cranes are very old and their conditions are not so good for operation. Therefore some of them shall be replaced by the target year. The details are as follows;

a-1 16 t Portal jib cranes

Number of units	3(3) Units
Capacity	16 t x 25m
Rail gauge	5.6m
Height of hook	20m
Travelling distance	100m

a-2 3t Portal jib cranes

Number of units	3(0) units

These cranes shall be installed after 2003. The detailed specifications are excluded because they are not included in short term plan

b. New additional crane in Pear-B

Nine(9) mobile tower cranes are attended to handle a cargo at quay side because quay crane is not available in Pier B. Considering cargo volume to be handled in Pier B, more six(6) mobile tower cranes are required in 2003 and their capacity is 6t x 20m.

16.10 Implementation Program

16.10.1 General

The construction quantities for main facilities in this project up to the year 2,003 are shown in Table 16.10.1-1, and the main construction materials which have been estimated based on the foregoing facility design (16.8) are listed in Table 16.10.1-2.

The meteorological and marine conditions at the port are sometimes hard during winter season. However, construction works within the port area where is sheltered by the breakwaters can be performed continuously almost throughout the year, and the project will be smoothly implemented.

Construction equipment, particularly construction crafts, are difficult to obtain in Syria, so they will be procured outside the country. An economic construction plan shall be made considering full use of local materials.

Table 16.10.1-1 Construction Quantities

Description	Unit	Quantities
General/RoRo Terminal:		
Wharf(-10m)	m	385
Revetment(-11m)	m	380
Reclamation	m3	737,330
Pavement	m2	65,250

Table 16.10.1-2 Main Construction Materials in Short-Term Plan

Material	Unit	Quantities
Concrete Block(57-75ton)	Nos.	643
(Concrete)	(m3)	18,730
(Steel Bar)	(ton)	1,873
Rubble Stone(15-300kg)	m3	216,830
Armor Stone(1-5ton)	m3	58,140
Concrete	m3	5,080
Steel Bar	ton	508
Asphalt Concrete	m3	6,530
Crusher Run	m3	29,360

16.10.2 Preliminary Study on Construction Procedure

For storage of these materials, stock yards with an estimated size of 3,000m2 will be necessary. The existing land area at the root of main breakwater will be used as the temporary yard for the construction materials and equipment.

The construction method of major works is briefly described below.

(1) Reclamation

The land area is newly developed along the main breakwater to construct the general/RoRo terminal. The planned site has sufficient water depth, say it is deeper than -11m at someplace, so that the dredging for water basin is not necessary. Instead, the reclamation volume is much. The volume is estimated to be more than 700,000 cubic meters. The reclaimed materials can not be supposedly supplied from the water area within the port area, and have to be

transported from the quarry in the hinterland. It takes long time to reclaim the planned site, so it is recommended to start the reclamation work right after filling core stones of the revetment. Filling armor stones and leveling work of armor stones should be done parallel with the reclamation.

The construction schedule of general/RoRo terminal is planned to be around 35 months and it depends on the reclamation work largely. (see, Fig.16.10.3-1 Construction Schedule for Tartous Port)

(2)   Wharf (-10m)

The wharf (-10m) is to be constructed along the main breakwater with total length being 385m. Neighboring the wharf, revetments are also constructed. Within these structures, the water area of around 65,000 square meters will be reclaimed.

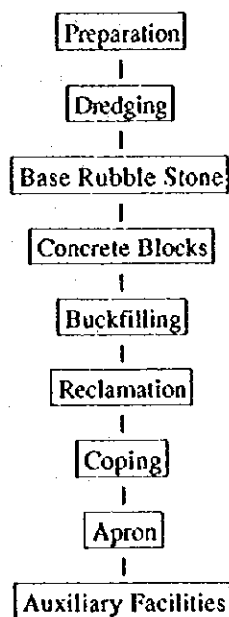The structure of the wharf is concrete block type and its construction process is shown below.

```
┌─────────────┐
│ Preparation │
└─────────────┘
       │
  ┌──────────┐
  │ Dredging │
  └──────────┘
       │
┌──────────────────┐
│ Base Rubble Stone│
└──────────────────┘
       │
 ┌────────────────┐
 │ Concrete Blocks│
 └────────────────┘
       │
  ┌────────────┐
  │ Buckfilling│
  └────────────┘
       │
  ┌────────────┐
  │ Reclamation│
  └────────────┘
       │
   ┌────────┐
   │ Coping │
   └────────┘
       │
    ┌───────┐
    │ Apron │
    └───────┘
       │
┌────────────────────┐
│ Auxiliary Facilities│
└────────────────────┘
```

Fig. 16.10.2-1 Construction Flow of Wharf(-10m)

(a)   The dredging work between ground level and the bottom of foundation should be conducted by using the 4 m3 grab dredger before the structural works. Dredged materials should be dumped offshore if these materials are not appropriate for the reclamation.

(b)   On completion of the dredging work, the installation of base rubble stone and concrete blocks should be implemented. Block yard should be prepared at the root of breakwater or some place.

(c)   Since 5 concrete blocks (Ave.. weight 82 ton each) will be placed on the basement, the bases should be tightly formed on the dredged seabed.

(d)   After that, backfilling and reclamation behind the concrete block wall should be done.

(e)   And placing of coping concrete and apron pavement should be continued.

(e) Lastly, Auxiliary facilities relevant to the wharf will be constructed.

16.10.3 Construction Schedule

(1) Workable Days

Assuming the same marine condition as Latakia Port, non-workable days caused by wind condition are approximately 15 days per year. Rough wave days are included in above stormy days. (Ref. Extension of the Port of Latakia, 1980, USSR State Design and Research Institute of Sea Transport) As for holidays, there are 70 holidays totally, that is, 48 Fridays and 22 national holidays. So, the net workable days per year are assumed to be 280 days or 23 days per month.

Fridays	48
National Holidays	22
Stormy Days	15
Total	85

(2) Working Capacity

Working efficiency of main works is assumed as follows.

Table 16.10.3-1 Working Efficiency

Works	Equipment	Working Efficiency*
Dredging	Grab dredger: 4m3x1 Tug boat: 150psx1 Barge:200m2x2	744 m3/day
Dredging	Grab dredger: 8m3x1 Tug boat: 350psx1 Barge: 400m3x2	1,408 m3/day
Core Stone	Self-propelled barge with crane, Clamshell	343 m3/day
Armor Stone	Self-propelled barge with crane, Clamshell	242 m3/day
Leveling	Diver's boat	19.3 m2/day
Concrete Block (Ave.80ton)	Blockyard	1.8 Nos/day
Pavement	Motor grader: 3.1m, Macadam roller: 10-12t, Tire roller: 8-20t, Finisher: 2.4-5m	150 m2/day

* Working volume per workable day

3) Working Schedule

After the completion of the detailed design in 1998, the construction of the port facilities is to start in 1999 and be completed by the end of 2002.

The general/RoRo terminal will be constructed based on the Short-Term Plan. At first, the new wharf (-10m) and revetment are constructed and the reclamation will continue. The general/RoRo terminal needs the construction period of around 41 months.
The construction schedule is shown in Fig.16.10.3-1.

Work	Unit	Qty
General/RoRo T.:		
1. Wharf (-10 m)	m	385
Dredging	m3	82,000
Foundation	m3	24,640
Concrete Block	Nos.	643
Backfilling	m3	65,735
Coping	m3	1,155
2. Revetment (-11 m)	m	415
Core Stone	m3	153,015
Armor Stone	m3	58,640
Levelling	m2	8,360
In Situ Concrete	m3	910
3. Reclamation	m3	1,154,000
4. Pavement	m2	60,000
Utility	L.S.	1
Engineering Service	L.S.	1
Supervision	L.S.	1

Timeline values (months 1998–2002): Dredging 4.8; Foundation 4.4, 15.7; Concrete Block 15.3; Backfilling 41.5; Coping 0.9; Core Stone 8.5, 5.1; Armor Stone 2.8, 1.8; Levelling; In Situ Concrete 28.2; Reclamation 26.6; Pavement 4.0, 6.4, 4.0; Utility 4.0; Engineering Service 12.0; Supervision 48.0.

Fig. 16.10.3-1 Construction Schedule for Tartous Port

16-28

16.11 Cost Estimate

16.11.1 Scheme of Short-Term Plan

The scheme of Short-Term Plan is mentioned in Chapter 16.7, and major items to be completed are as follows:

1) General Berth Terminal (1)
   - Wharf (-10m) and reclamation
   - Machinery Tower (Exist)

2) Container Terminal
   - Container Cranes and Rail-mounted Transfer Cranes etc.

3) Conventional Terminal
   - Portal Jib Cranes and Mobile Tower Cranes etc.

Table 16.11.1-1 shows the comparison of quantity of each facility in Master Plan, in short-Term and in Second-Half.

Table 16.11.1-1 Comparison of Master Plan and Short-Term

TARTOUS(Master-Plan)

No.	Facilities	Unit	Master-Plan	Short-Term	Second-Half
A	Civil Works				
1	General Berth Terminal (1)				
	Wharf(-10m)	m	385	385	0
	Ro/Ro Berth(-10m)	m	35	35	0
	Revetment(1)	m	50	50	0
	Revetment(2)	m	330	330	0
	Road/Open Space	m2	60,000	60,000	0
	Reclamation	m3	1,154,000	1,154,000	0
	Sub-Total				
2	General Cargo Terminal (2)				
	Wharf(-10m)	m	160	0	160
	Revetment	m	70	0	70
	Road/Open Space	m2	14,400	0	14,400
	Reclamation	m3	187,200	0	187,200
	Sub-Total				
	Total of Civil Works				
B	Building				
1	Terminal Office	m2	3,000	2,000	1,000
2	Work Shop/Cleanning	m2	3,000	0	3,000
3	Passenger Terminal &	m2	2,300	0	2,300
	Total of Building				
C	Utilities	LS	1	1	1
D	Cargo Handling Equipment				
	Total fo Handling Eq.	LS	1	1	1
E	Physical Conti/Engineering Fee	LS	1	1	1
F	Grand Total				

16.11.2 Unit Price of Main Facilities

The cost estimate is carried out, and the unit price of main facilities are shown as below:

Facilities		Unit	Unit Price		
			F.C	L.C	Total
Grain Terminal (1)					
	Wharf (-12m)	S.P/m	200,000	700,000	900,000
Container Terminal					
	Container Crane	1,000 S.P/Unit	239,400	0	239,400
	Rail-Mounted T. Crane	1,000 S.P/Unit	91,980	0	91,980

16.11.3 Total Cost

The total cost of Short-Term Plan is estimated at around 2,016 Millions S.P, and is tabulated in Table 16.11.3-1.

The detail cost of the cargo handling equipment is shown in Table 16.11.3-2.

Table 16.11.3-1   Total Cost of Short-Term

TARTOUS PORT(Short-Term)

No.	Facilities	Unit	Q'ty	Unit Cost (S.P)			Cost(Unit:1,000 S.P)		
				F.C	L.C	Total	F.C	L.C	Total
A	Civil Work								
1	General Berth Terminal(1)								
	Wharf(-18m)	m	385	200,000	700,000	900,000	77,000	269,500	346,500
	Ro/Ro berth(-18m)	m	35	200,000	700,000	900,000	7,000	24,500	31,500
	Revetment(1)	m	50	0	250,000	250,000	0	12,500	12,500
	Revetment(2)	m	330	0	210,000	210,000	0	69,300	69,300
	Road/Open Space	m2	60,000	0	720	720	0	43,200	43,200
	Reclamation	m3	1,154,000	0	300	300	0	346,200	346,200
	Total of Civil Work						84,000	765,200	849,200
B	Building								
1	Office etc	m2	2,000	0	12,000	12,000	0	24,000	24,000
	Total of Building						0	24,000	24,000
C	Utilities	LS	1				0	22,937	22,937
D	Cargo Handling Equipment								
	Total fo Handling Eq.	LS	1				1,050,000	0	1,050,000
E	Physical Conti./Engineering Fee	LS	1				46,000	22,800	70,800
F	Grand Total						1,182,000	834,137	2,016,137

16-30

Table 16.11.3-2   Cargo Handling Equipment
Tartous Port

Unit Cost: 1,000Sp

Items	Capacity	Unit Price	Master Plan Q'ty	Short Term Plan Q'ty	Short Term Plan Cost
1. Container Terminal					662,760
Container Cranes		239,400	2	2	478,800
Rail-mounted Transfer Cranes		91,980	3	2	183,960
Tire-mounted Transfer Cranes		52,900	3	0	0
2. Conventional Berths					387,240
Portal Jib Cranes	16tx32m	35,320	3	3	105,960
Portal Jib Cranes	31x25m	17,220	3	0	0
Mobil Tower Cranes	6tx25m	34,000	6	6	204,000
Forklift Trucks	10t	3,360	17	6	20,160
Forklift Trucks	5t(Special)	2,520	17	6	15,120
Forklift Trucks	5t	2,100	25	8	16,800
Forklift Trucks	3t	1,680	13	6	10,080
Trailers		1,680	26	9	15,120
Total					1,050,000

16.11.4 Yearly Investment

The yearly investment based on the implementation program in Chapter 16.7 is shown Table 16.11.4-1.

Table 16.11.4-1 Yearly Investment Schedule

(Unit : 1,000 S.P)

Items	1998		1999		2000		2001		2002	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
Civil Works	-	-	26,000	101,700	26,000	250,000	32,000	291,400	0	122,100
Buildings	-	-	0	24,000	-	-	-	-	-	-
utilities	-	-	-	-	0	11,500	-	-	0	11,437
Cargo Handling Equipment	-	-	331,380	0	331,380	0	193,620	0	193,620	0
Physical Contingency and Engineering Fee	9,600	0	9,600	5,500	9,600	5,500	9,600	5,500	9,600	5,500
Grand Total	9,600	0	366,980	131,200	366,980	267,000	235,220	296,900	203,220	139,037

16-32