17.13 Financial Analysis

17.13.1 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.

17.13.2 Methodology of the Financial Analysis

Figure 17.13.2-1 shows a 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 and costs during the project 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
Ri : Revenue in the i-th year
Ci : 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
Cost	(1) Initial and renewal investments for the project
	(2) Increase of maintenance, repair, personnel and administrative costs by the project

Following revenue and expenditures are excluded from calculation of FIRR.

Revenue	Fund management income
Cost	Depreciation 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.

(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

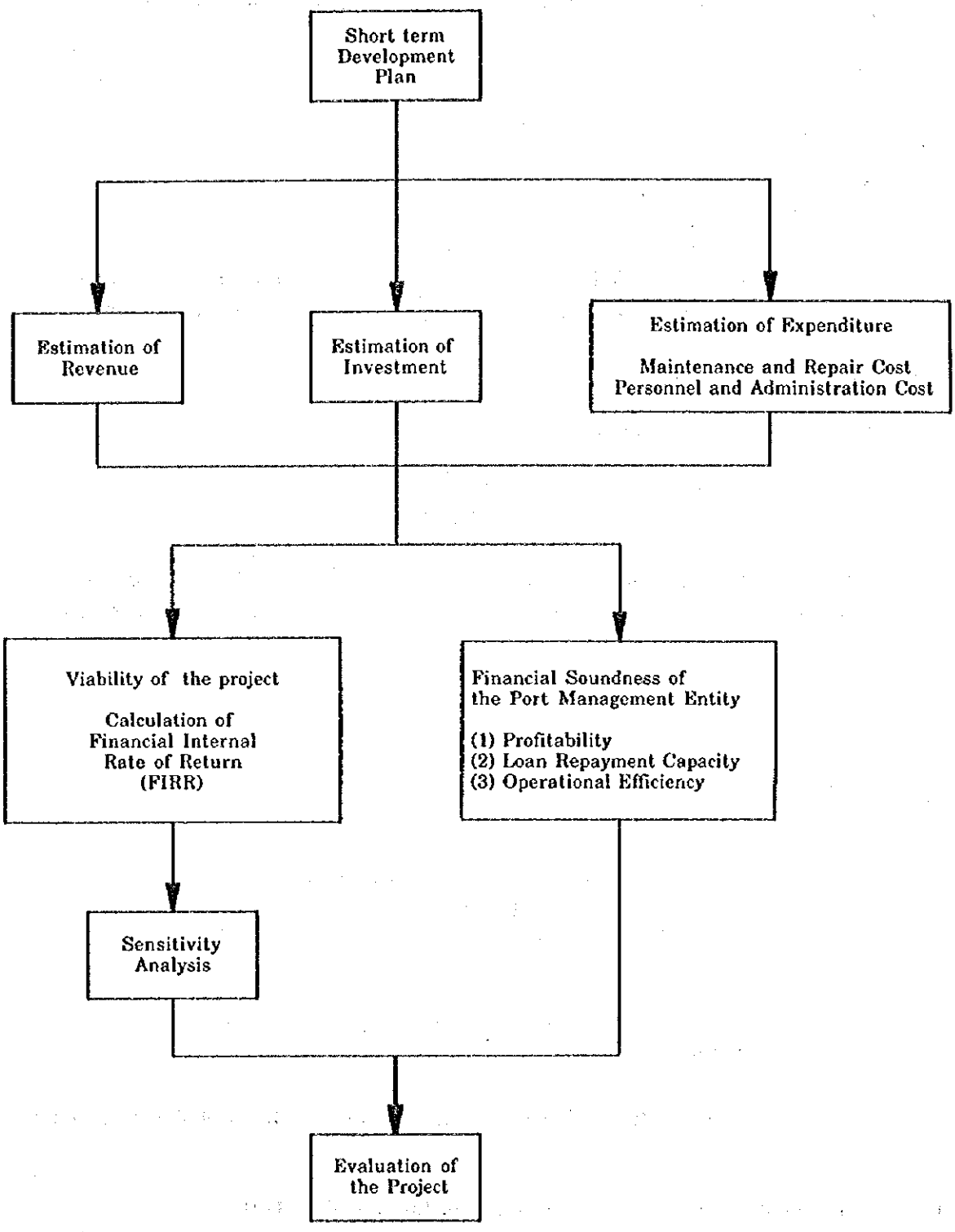


Figure 17.13.2-1 Flowchart of the Financial Analysis

repayment capacity and operational efficiency, using the following ratios:

1) Profitability

Rate of Return on Net Fixed Assets

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

Rate of 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

$$\frac{Net\ Operating\ Income\ before\ Depreciation}{Repaymentof\ Principal\ and\ Intereston\ Longterm\ Loan} \times 100\%$$

Debt Service Coverage Ratio shows whether the operating income can cover the repayment and the interest on long-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%.

17.13.3 Prerequisites of the Financial Analysis for the New Port

(1) Scope of the Financial Analysis

Scope of the financial analysis is all the construction work of the New Port.

(2) Prerequisites of the Financial Analysis for the New Port

1) Project life

Project life is 35 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 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 domestic procurement costs are assumed to be raised by domestic funds in principle. The required money for domestic funds is financed by the General Monetary Fund. Conditions of loans are as follows:

(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)
4.28%

4) Cargo Handling Volume

See chapter 17.2.1 - 17.2.7

(3) Expenditure

1) Investment

Initial investment cost is shown in chapter 17.12. The depreciable facilities will be replaced after their service lives. This replacement cost is included in the investment cost of this financial analysis.

Table 17.13.3-1 Summary of Investment (Unit : Thousand S.P.)

	Civil Works	Buildings	Utilities	Port Service	Equip-ment	Others	Total	
Foreign	3,792,150	0	0	130,000	3,200,000	360,000	7,482,150	38.2%
Domestic	10,382,351	1,198,500	272,011	20,000	0	240,000	12,112,862	61.8%
Sub-Total	14,174,501	1,198,500	272,011	150,000	3,200,000	600,000	19,595,012	100.0%

Table 17.13.3-2 Scheduled Investment of Machines and Equipment

(Unit:1000 S.P.)

		Phosphate	Cement	Fertilizer	Pellet	Scrap	Sulphur	Common Eq.	Port Service	Total
1	1999									0
2	2000									0
3	2001	357,000	130,400							487,400
4	2002	357,000	130,400	63,000	277,200			178,290		1,005,890
5	2003	247,800	83,180		540,166	573,300	84,000	178,290	150,000	1,856,736
6	2004									0
7	2005									0
8	2006									0
9	2007									0
10	2008	247,800	80,000							327,800
11	2009	247,800	80,000	63,000				178,290		569,090
12	2010	247,800	83,180		120,166	220,500	84,000	178,290		933,936
13	2011									0
14	2012									0
15	2013									0
16	2014									0
17	2015	247,800	80,000							327,800
18	2016	247,800	80,000	63,000				178,290		569,090
19	2017	247,800	83,180		120,166	220,500	84,000	178,290		933,936
20	2018	109,200	50,400							159,600
21	2019	109,200	50,400		277,200					436,800
22	2020				420,000	352,800				772,800
23	2021								150,000	150,000
24	2022	247,800	80,000							327,800
25	2023	247,800	80,000	63,000				178,290		569,090
26	2024	247,800	83,180		120,166	220,500	84,000	178,290		933,936
27	2025									0
28	2026									0
29	2027									0
30	2028									0
31	2029	247,800	80,000							327,800
32	2030	247,800	80,000	63,000				178,290		569,090
33	2031	247,800	83,180		120,166	220,500	84,000	178,290		933,936
34	2032									0
35	2033	-456,918	-154,238	-252,000	-233,574	-240,512	-60,000	-229,230	-44,118	-1,670,589

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 in 2004.

Table 17.13.3-3 Maintenance and Repair Cost (Unit: 1000S.P.)

Facilities	Procurement Cost	Ratio	Maintenance Cost(2001-)
Breakwater	3,125,950	1%	31,260
Wharf	2,783,560	1%	27,836
Revetment	1,236,400	1%	12,364
Apron/Yard/Open Space	1,614,788	1%	16,148
Railway	20,883	1%	209
Road	4,920	1%	49
Building	1,198,500	1%	11,985
Utilities	272,011	1%	2,720
Cargo Handling Equipment	3,200,000	4%	128,000
Port Service Facilities	150,000	4%	6,000
Total			236,570

Table 17.13.3-4 Maintenance and Repair Cost by year (Unit: 1000S.P)

Facilities	2001	2002	2003	2004-
Breakwater				31,260
Wharf				27,836
Revetment				12,364
Apron/Yard/Open Space				16,148
Raiway				209
Road				49
Building				11,985
Utilities				2,720
Cargo Handling Equipment	19,496	59,731	128,000	128,000
Port Service Facilities			6,000	6,000
Total	19,496	59,731	134,000	236,571

3) Personnel and Administration Cost

Estimation of annual personnel cost is based on the required number of workers and Tartous Port's pay scales. Administration cost (material cost) is assumed as 25% of total personnel cost considering 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 Administrative Body

General Manager	1
Budgeting & Financial Department	15
Administration Department	165
Sea Machinery Department	60
Operating Department (Public Berths)	250
Civil Maintenance Department	150
Total	641

Number of Personnel of Each Terminals

Phosphate	210
Pellet	105
Sulphur	120
Scrap	105
Fertilizer	120
Cement Clinker	110
Total	770

Average Personnel Cost of Tartous Port

Personnel cost per capita	88,268 S.P. / year (including social benefit)
Material cost per capita	22,072 S.P. / year
Total	110,358 S.P. / year

Table 17.13.3-5 Personnel and Administration Cost

Section	Number	Wage/Year	2004
Administrative Body (New Port Authority)*	391	110,358	43,149,978
Public General Berths (3 berths)	250	110,358	27,589,500
Sulphur Terminal	120	110,358	13,242,960
Phosphate Terminal	210	110,358	23,175,180
Steel Terminal(Pellet, Scrap)	210	110,358	23,175,180
Export Fertilizer Terminal	120	110,358	13,242,960
Cement Clinker Terminal	110	110,358	12,139,380
Total	1,411		155,715,138

* Excluding public berths

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 (Table 17.13.3-6)

1st category	106.55 S.P. / ton
4th category	94.3 S.P. / ton
6th category	240.8 S.P. / ton

Storage Fee

Storage period	Not exceeding 15 days	1.15 S.P. / ton
	Exceeding 15 days and up to 30 days	1.75 S.P. / ton

Charges from Vessels

- Anchorage Fee	0.5344 S.P. / NRT
- Berthing Fee	0.7125 S.P. / NRT
- Pilotage & Towage Fee	2.316 S.P. / NRT*2times

Table 17.13.3-6 Loading / Unloading and Cargo Handling Fee

Year	2004	2005	2006	2007	2008	2009	2010
Total ton ('000ton)	7,243	7,366	7,496	7,634	7,778	7,933	8,090
Total Handling Fees ('000 S.P.)	1,283,887	1,315,226	1,348,263	1,383,080	1,419,488	1,458,398	1,497,937
1st category Stowage							
Pellet	1,250	1,250	1,250	1,250	1,250	1,250	1,250
Scrap	200	200	200	200	200	200	200
Materials for Iron Making	150	150	150	150	150	150	150
Clinker	1,085	1,070	1,056	1,042	1,028	1,014	1,000
Sub-total ('000ton)	2,685	2,670	2,656	2,642	2,628	2,614	2,600
Handling Fees ('000 S.P.)	286,087	284,489	282,997	281,505	280,013	278,522	277,030
4th category Stowage							
Fertilizer	681	683	684	686	687	689	690
(Export)	510	492	492	494	495	496	480
(Import)	171	191	192	192	192	193	210
Sub-total ('000ton)	681	683	684	686	687	689	690
Handling Fees ('000 S.P.)	64,218	64,407	64,501	64,690	64,784	64,973	65,067
6th category Stowage							
Phosphate	3,267	3,391	3,521	3,657	3,799	3,949	4,100
Oil Coke	110	122	135	149	164	181	200
Sulphur	500	500	500	500	500	500	500
Sub-total ('000ton)	3,877	4,013	4,156	4,305	4,463	4,630	4,800
Handling Fees ('000 S.P.)	933,582	966,330	1,000,765	1,036,885	1,074,690	1,114,904	1,155,849

Table 17.13.3-7 Storage Fee

Year	2004	2005	2006	2007	2008	2009	2010
Total Storage Fee ('000 S.P.)	1,079,625	1,081,190	1,082,589	1,084,101	1,085,670	1,087,395	1,089,353
Fertilizer (Import) 26 days	6,242	6,980	6,980	7,011	7,021	7,012	7,665
Materials for Iron Making 24 days	4,950	4,950	4,950	4,950	4,950	4,950	4,950
Pellet 23 days	39,063	39,063	39,063	39,063	39,063	39,063	39,063
Scrap 19 days	10,100	10,100	10,100	10,100	10,100	10,100	10,100
Fertilizer (Export) 19 days	12,368	11,925	11,943	11,978	11,995	12,030	11,640
Oil Coke 18 days	2,475	2,745	3,038	3,353	3,690	4,073	4,500
Clinkers 16 days	20,615	20,330	20,064	19,798	19,532	19,266	19,000
Sulpher 16 days	950,000	950,000	950,000	950,000	950,000	950,000	950,000
Phosphate 9 days	33,813	35,097	36,442	37,850	39,320	40,872	42,435

Table 17.13.3-8 Charges from Vessels

Year	2004	2005	2006	2007	2008	2009	2010
Total (000 S.P.)	61,058	61,905	62,787	63,732	64,718	65,794	66,907
Phosphate 30000ton/vsl. No.of Vsl.	109	113	117	122	127	132	137
NRT=30000/0.9(Loaded)x3/4=25000NRT							
365days x Occupancy Rate÷Berthing days (%)	31.9	33.1	34.4	35.7	37.1	38.6	40.0
Anchorage Fee 0.5344SP/NRT*25000*days*2berths	3,111	3,229	3,353	3,483	3,618	3,761	3,904
Berthing Fee 0.7125SP/NRT*25000*days*2Berths	4,148	4,305	4,470	4,643	4,823	5,014	5,206
Pilotage & Towage Fee	12,611	13,089	13,591	14,116	14,664	15,243	15,826
Sub-total	19,870	20,624	21,415	22,242	23,105	24,018	24,936
Pellet 63000ton/vsl. No.of Vsl.	20	20	20	20	20	20	20
NRT=63000/0.9(Loaded)x3/4=52500NRT							
365days x Occupancy Rate34.5%=126days							
Anchorage Fee 0.5344SP/NRT*52500*126days	3,535	3,535	3,535	3,535	3,535	3,535	3,535
Berthing Fee 0.7125SP/NRT*52500*126days	4,713	4,713	4,713	4,713	4,713	4,713	4,713
Pilotage & Towage Fee	4,825	4,825	4,825	4,825	4,825	4,825	4,825
Sub-total	13,073	13,073	13,073	13,073	13,073	13,073	13,073
Clinker 40000ton/vsl. No.of Vsl.	27	27	26	26	26	25	25
NRT=40000/0.9(Loaded)x3/4=33333NRT							
365days x Occupancy Rate÷Berthing days (%)	32.1	31.7	31.2	30.8	30.4	30.0	29.6
Anchorage Fee 0.5344SP/NRT*33333*days	2,087	2,058	2,031	2,004	1,977	1,951	1,924
Berthing Fee 0.7125SP/NRT*33333*days	2,783	2,744	2,708	2,672	2,636	2,601	2,565
Pilotage & Towage Fee	4,188	4,130	4,076	4,022	3,968	3,914	3,860
Sub-total	9,058	8,933	8,816	8,699	8,582	8,465	8,348
Scrap 9000ton/vsl. No.of Vsl.	22	22	22	22	22	22	22
NRT=9000/0.9(Loaded)x3/4=7500NRT							
365days x Occupancy Rate38.8%=142days							
Anchorage Fee 0.5344SP/NRT*7500*142days	569	569	569	569	569	569	569
Berthing Fee 0.7125SP/NRT*7500*142days	759	759	759	759	759	759	759
Pilotage & Towage Fee	772	772	772	772	772	772	772
Sub-total	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Fertilizer (Export) 23000ton/vsl. No.of Vsl.	22	21	21	21	22	22	21
NRT=23000/0.9(Loaded)x3/4=19167NRT							
365days x Occupancy Rate÷Berthing days (%)	38.9	37.5	37.6	37.7	37.7	37.8	36.6
Anchorage Fee 0.5344SP/NRT*19167*days	1,454	1,402	1,404	1,408	1,411	1,415	1,369
Berthing Fee 0.7125SP/NRT*19167*days	1,939	1,870	1,872	1,878	1,881	1,886	1,825
Pilotage & Towage Fee	1,969	1,898	1,901	1,907	1,909	1,915	1,853
Sub-total	5,362	5,170	5,178	5,193	5,200	5,216	5,047
Sulphur 30000ton/vsl. No.of Vsl.	17	17	17	17	17	17	17
NRT=30000/0.9(Loaded)x3/4=25000NRT							
365days x Occupancy Rate38.5%=141days							
Anchorage Fee 0.5344SP/NRT*25000*141days	1,884	1,884	1,884	1,884	1,884	1,884	1,884
Berthing Fee 0.7125SP/NRT*25000*141days	2,512	2,512	2,512	2,512	2,512	2,512	2,512
Pilotage & Towage Fee	1,930	1,930	1,930	1,930	1,930	1,930	1,930
Sub-total	6,325	6,325	6,325	6,325	6,325	6,325	6,325
Materials for Steel 9000ton/vsl. No.of Vsl	17	17	17	17	17	17	17
NRT=9000/0.9(Loaded)x3/4=7500NRT							
365days x Occupancy Rate32.1%=118days							
Anchorage Fee 0.5344SP/NRT*7500*118days	473	473	473	473	473	473	473
Berthing Fee 0.7125SP/NRT*7500*118days	631	631	631	631	631	631	631
Pilotage & Towage Fee	579	579	579	579	579	579	579
Sub-total	1,683	1,683	1,683	1,683	1,683	1,683	1,683
Oil Cake 12000ton/vsl. No.of Vsl	9	10	11	12	14	15	17
NRT=12000/0.9(Loaded)x3/4=10000NRT							
365days x Occupancy Rate÷Berthing days (%)	27.5	30.5	33.8	37.3	41.0	45.3	50.0
Anchorage Fee 0.5344SP/NRT*10000*days	536	595	658	727	800	883	975
Berthing Fee 0.7125SP/NRT*10000*days	715	793	878	969	1,066	1,177	1,300
Pilotage & Towage Fee	425	471	521	575	633	699	772
Sub-total	1,676	1,859	2,057	2,270	2,499	2,758	3,048
Fertilizer(Import) 12000ton/vsl. No.of Vsl	14	16	16	16	16	16	18
NRT=12000/0.9(Loaded)x3/4=10000NRT							
365days x Occupancy Rate÷Berthing days (%)	28	31	31	31	31	31	34
Anchorage Fee 0.5344SP/NRT*10000*days	536	600	601	603	603	605	659
Berthing Fee 0.7125SP/NRT*10000*days	715	800	801	803	805	807	878
Pilotage & Towage Fee	660	738	739	741	743	745	811
Sub-total	1,912	2,138	2,141	2,147	2,150	2,157	2,348

(5) Tax

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

17.13.4 Appraisal of Project

17.13.4.1 Viability of Project

(1) Financial Internal Rate of Return (FIRR)

The calculation result of FIRR is 7.69%

This exceeds 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 decreases by 10%
Case 3 : Case 1 and 2

The results of sensitivity analysis are as follows:

	FIRR	Table
Base Case	7.69%	17.13.4-1
Case 1	6.77%	17.13.4-2
Case 2	6.48%	17.13.4-3
Case 3	5.61%	17.13.4-4

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

(3) Evaluation

Judging from the above results of analysis, this project is regarded as financially feasible on the conditions of proposed tariff.

17.13.4.2 Financial Soundness of the Port Management Entity

Table 17.13.4-5 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 New 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.

17.13.4.3 Conclusion

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

Table 17.13.4-1 FIRR Calculation of New 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		3,002,430		3,002,430	-3,002,430	0	3,002,430	-3,002,430
2000		2,942,430		2,942,430	-2,942,430	0	2,732,212	-2,732,212
2001		3,836,530	19,496	3,856,026	-3,856,026	0	3,324,730	-3,324,730
2002		4,478,830	59,731	4,538,561	-4,538,561	0	3,633,648	-3,633,648
2003		5,334,792	134,000	5,468,792	-5,468,792	0	4,065,596	-4,065,596
2004	2,424,570		392,285	392,285	2,032,285	1,673,693	270,796	1,402,897
2005	2,458,320		392,285	392,285	2,066,035	1,575,751	251,450	1,324,302
2006	2,493,639		392,285	392,285	2,101,354	1,484,195	233,485	1,250,710
2007	2,530,913		392,285	392,285	2,138,628	1,398,759	216,804	1,181,955
2008	2,569,879	327,800	392,285	720,085	1,849,794	1,318,823	369,537	949,287
2009	2,611,587	569,090	392,285	961,375	1,650,212	1,244,476	458,116	786,361
2010	2,654,197	933,936	392,285	1,326,221	1,327,976	1,174,420	586,822	587,598
2011	2,654,197		392,285	392,285	2,261,912	1,090,515	161,176	929,339
2012	2,654,197		392,285	392,285	2,261,912	1,012,605	149,661	862,944
2013	2,654,197	327,800	392,285	720,085	1,934,112	940,260	255,093	685,167
2014	2,654,197	569,090	392,285	961,375	1,692,822	873,085	316,239	556,845
2015	2,654,197	933,936	392,285	1,326,221	1,327,976	810,708	405,086	405,622
2016	2,654,197	159,600	392,285	551,885	2,102,312	752,788	156,527	596,262
2017	2,654,197	436,800	392,285	829,085	1,825,112	699,006	218,347	480,659
2018	2,654,197	772,800	392,285	1,165,085	1,489,112	649,067	284,914	364,153
2019	2,654,197	150,000	392,285	542,285	2,111,912	602,695	123,138	479,557
2020	2,654,197	327,800	392,285	720,085	1,934,112	559,636	151,830	407,807
2021	2,654,197	569,090	392,285	961,375	1,692,822	519,654	188,223	331,430
2022	2,654,197	933,936	392,285	1,326,221	1,327,976	482,528	241,104	241,423
2023	2,654,197		392,285	392,285	2,261,912	448,054	66,221	381,833
2024	2,654,197		392,285	392,285	2,261,912	416,043	61,490	354,553
2025	2,654,197		392,285	392,285	2,261,912	386,320	57,097	329,222
2026	2,654,197		392,285	392,285	2,261,912	358,720	53,018	305,701
2027	2,654,197		392,285	392,285	2,261,912	333,091	49,230	283,861
2028	2,654,197		392,285	392,285	2,261,912	309,294	45,713	263,581
2029	2,654,197	327,800	392,285	720,085	1,934,112	287,197	77,917	209,280
2030	2,654,197	569,090	392,285	961,375	1,692,822	266,678	96,593	170,085
2031	2,654,197	933,936	392,285	1,326,221	1,327,976	247,626	123,731	123,895
2032	2,654,197		392,285	392,285	2,261,912	229,935	33,984	195,951
2033	2,654,197	-1,670,589	392,285	-1,278,304	3,932,501	213,507	-102,829	316,336
Total	78,789,636	26,766,927	11,981,777	38,748,704	40,040,932	22,359,131	22,359,131	-0

FIRR= 0.076941

Table 17.13.4-2 FIRR Calculation of New Port

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

Year	Revenue (1)	Cost(2)			(1)-(2)	Discount Value		
		Investment	Expense	Total		Revenue	Cost	Difference
1999		3,302,673		3,302,673	-3,302,673	0	3,302,673	-3,302,673
2000		3,236,673		3,236,673	-3,236,673	0	3,031,308	-3,031,308
2001		4,220,183	19,496	4,239,679	-4,239,679	0	3,718,737	-3,718,737
2002		4,926,713	59,731	4,986,444	-4,986,444	0	4,096,232	-4,096,232
2003		5,868,271	134,000	6,002,271	-6,002,271	0	4,617,857	-4,617,857
2004	2,424,570	0	392,285	392,285	2,032,285	1,746,992	282,656	1,464,336
2005	2,458,320	0	392,285	392,285	2,066,035	1,658,921	264,721	1,394,200
2006	2,493,639	0	392,285	392,285	2,101,354	1,575,985	247,925	1,328,060
2007	2,530,913	0	392,285	392,285	2,138,628	1,498,052	232,194	1,265,858
2008	2,569,879	360,580	392,285	752,865	1,817,014	1,424,602	417,348	1,007,255
2009	2,611,587	625,999	392,285	1,018,284	1,593,303	1,355,866	528,666	827,200
2010	2,654,197	1,027,330	392,285	1,419,615	1,234,582	1,290,555	690,262	600,293
2011	2,654,197	0	392,285	392,285	2,261,912	1,208,670	178,639	1,030,031
2012	2,654,197	0	392,285	392,285	2,261,912	1,131,981	167,304	964,676
2013	2,654,197	360,580	392,285	752,865	1,901,332	1,060,157	300,714	759,443
2014	2,654,197	625,999	392,285	1,018,284	1,635,913	992,891	380,923	611,968
2015	2,654,197	1,027,330	392,285	1,419,615	1,234,582	929,892	497,359	432,533
2016	2,654,197	175,560	392,285	567,845	2,086,352	870,891	186,320	684,571
2017	2,654,197	480,480	392,285	872,765	1,781,432	815,633	268,200	547,433
2018	2,654,197	850,080	392,285	1,242,365	1,411,832	763,882	357,555	406,327
2019	2,654,197	165,000	392,285	557,285	2,096,912	715,414	150,211	565,203
2020	2,654,197	360,580	392,285	752,865	1,901,332	670,021	190,052	479,969
2021	2,654,197	625,999	392,285	1,018,284	1,635,913	627,509	240,744	386,765
2022	2,654,197	1,027,330	392,285	1,419,615	1,234,582	587,694	314,332	273,362
2023	2,654,197	0	392,285	392,285	2,261,912	550,405	81,349	469,056
2024	2,654,197	0	392,285	392,285	2,261,912	515,482	76,187	439,295
2025	2,654,197	0	392,285	392,285	2,261,912	482,775	71,353	411,422
2026	2,654,197	0	392,285	392,285	2,261,912	452,143	66,826	385,317
2027	2,654,197	0	392,285	392,285	2,261,912	423,455	62,586	360,869
2028	2,654,197	0	392,285	392,285	2,261,912	396,587	58,615	337,972
2029	2,654,197	360,580	392,285	752,865	1,901,332	371,424	105,355	266,069
2030	2,654,197	625,999	392,285	1,018,284	1,635,913	347,857	133,456	214,402
2031	2,654,197	1,027,330	392,285	1,419,615	1,234,582	325,786	174,249	151,537
2032	2,654,197	0	392,285	392,285	2,261,912	305,115	45,095	260,019
2033	2,654,197	-1,837,648	392,285	-1,445,363	4,099,560	285,755	-155,610	441,366
Total	78,789,636	29,443,620	11,981,777	41,425,397	37,364,239	25,382,392	25,382,392	-0

FIRR= 0.067748

Table 17.13.4-3 FIRR Calculation of New 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		3,002,430		3,002,430	-3,002,430	0	3,002,430	-3,002,430
2000		2,942,430		2,942,430	-2,942,430	0	2,763,288	-2,763,288
2001		3,836,530	19,496	3,856,026	-3,856,026	0	3,400,791	-3,400,791
2002		4,478,830	59,731	4,538,561	-4,538,561	0	3,759,051	-3,759,051
2003		5,334,792	134,000	5,468,792	-5,468,792	0	4,253,745	-4,253,745
2004	2,182,113	0	392,285	392,285	1,789,828	1,593,959	286,551	1,307,409
2005	2,212,488	0	392,285	392,285	1,820,203	1,517,752	269,105	1,248,648
2006	2,244,275	0	392,285	392,285	1,851,990	1,445,826	252,721	1,193,105
2007	2,277,822	0	392,285	392,285	1,885,537	1,378,097	237,335	1,140,762
2008	2,312,891	327,800	392,285	720,085	1,592,806	1,314,121	409,132	904,988
2009	2,350,428	569,090	392,285	961,375	1,389,053	1,254,143	512,971	741,172
2010	2,388,777	933,936	392,285	1,326,221	1,062,556	1,197,004	664,563	532,442
2011	2,388,777	0	392,285	392,285	1,996,492	1,124,128	184,604	939,524
2012	2,388,777	0	392,285	392,285	1,996,492	1,055,688	173,365	882,323
2013	2,388,777	327,800	392,285	720,085	1,668,692	991,416	298,857	692,558
2014	2,388,777	569,090	392,285	961,375	1,427,402	931,056	374,708	556,348
2015	2,388,777	933,936	392,285	1,326,221	1,062,556	874,371	485,440	388,931
2016	2,388,777	159,600	392,285	551,885	1,836,892	821,137	189,709	631,428
2017	2,388,777	436,800	392,285	829,085	1,559,692	771,144	267,645	503,499
2018	2,388,777	772,800	392,285	1,165,085	1,223,692	724,195	353,214	370,982
2019	2,388,777	150,000	392,285	542,285	1,846,492	680,105	154,393	525,712
2020	2,388,777	327,800	392,285	720,085	1,668,692	638,698	192,532	446,166
2021	2,388,777	569,090	392,285	961,375	1,427,402	599,813	241,398	358,415
2022	2,388,777	933,936	392,285	1,326,221	1,062,556	563,295	312,735	250,560
2023	2,388,777	0	392,285	392,285	1,996,492	529,000	86,872	442,128
2024	2,388,777	0	392,285	392,285	1,996,492	496,793	81,583	415,210
2025	2,388,777	0	392,285	392,285	1,996,492	466,547	76,616	389,931
2026	2,388,777	0	392,285	392,285	1,996,492	438,143	71,952	366,191
2027	2,388,777	0	392,285	392,285	1,996,492	411,468	67,571	343,897
2028	2,388,777	0	392,285	392,285	1,996,492	386,417	63,457	322,959
2029	2,388,777	327,800	392,285	720,085	1,668,692	362,891	109,392	253,499
2030	2,388,777	569,090	392,285	961,375	1,427,402	340,797	137,155	203,642
2031	2,388,777	933,936	392,285	1,326,221	1,062,556	320,049	177,687	142,361
2032	2,388,777	0	392,285	392,285	1,996,492	300,563	49,358	251,205
2033	2,388,777	-1,670,589	392,285	-1,278,304	3,667,081	282,264	-151,048	433,312
Total	70,910,672	26,766,927	11,981,777	38,748,704	32,161,968	23,810,881	23,810,881	-0

FIRR= 0.064829

Table 17.13.4-4 FIRR Calculation of New Port

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

Year	Revenue (1)	Cost(2)			(1)-(2)	Discount Value		
		Investment	Expense	Total		Revenue	Cost	Difference
1999		3,302,673		3,302,673	-3,302,673	0	3,302,673	-3,302,673
2000		3,236,673		3,236,673	-3,236,673	0	3,064,794	-3,064,794
2001		4,220,183	19,496	4,239,679	-4,239,679	0	3,801,351	-3,801,351
2002		4,926,713	59,731	4,986,444	-4,986,444	0	4,233,490	-4,233,490
2003		5,868,271	134,000	6,002,271	-6,002,271	0	4,825,315	-4,825,315
2004	2,182,113	0	392,285	392,285	1,789,828	1,661,077	298,617	1,362,460
2005	2,212,488	0	392,285	392,285	1,820,203	1,594,763	282,759	1,312,003
2006	2,244,275	0	392,285	392,285	1,851,990	1,531,771	267,744	1,264,027
2007	2,277,822	0	392,285	392,285	1,885,537	1,472,109	253,526	1,218,583
2008	2,312,891	360,580	392,285	752,865	1,560,026	1,415,396	460,723	954,673
2009	2,350,428	625,999	392,285	1,018,284	1,332,144	1,361,985	590,057	771,927
2010	2,388,777	1,027,330	392,285	1,419,615	969,163	1,310,700	778,930	531,771
2011	2,388,777	0	392,285	392,285	1,996,492	1,241,097	203,813	1,037,284
2012	2,388,777	0	392,285	392,285	1,996,492	1,175,191	192,990	982,201
2013	2,388,777	360,580	392,285	752,865	1,635,912	1,112,784	350,713	762,071
2014	2,388,777	625,999	392,285	1,018,284	1,370,493	1,053,691	449,166	604,526
2015	2,388,777	1,027,330	392,285	1,419,615	969,163	997,737	592,940	404,797
2016	2,388,777	175,560	392,285	567,845	1,820,932	944,753	224,581	720,173
2017	2,388,777	480,480	392,285	872,765	1,516,012	894,584	326,846	567,738
2018	2,388,777	850,080	392,285	1,242,365	1,146,412	847,078	440,552	406,526
2019	2,388,777	165,000	392,285	557,285	1,831,492	802,095	187,123	614,972
2020	2,388,777	360,580	392,285	752,865	1,635,912	759,501	239,370	520,131
2021	2,388,777	625,999	392,285	1,018,284	1,370,493	719,169	306,566	412,603
2022	2,388,777	1,027,330	392,285	1,419,615	969,163	680,979	404,696	276,283
2023	2,388,777	0	392,285	392,285	1,996,492	644,816	105,892	538,925
2024	2,388,777	0	392,285	392,285	1,996,492	610,574	100,269	510,306
2025	2,388,777	0	392,285	392,285	1,996,492	578,151	94,944	483,207
2026	2,388,777	0	392,285	392,285	1,996,492	547,449	89,902	457,547
2027	2,388,777	0	392,285	392,285	1,996,492	518,378	85,128	433,250
2028	2,388,777	0	392,285	392,285	1,996,492	490,850	80,607	410,243
2029	2,388,777	360,580	392,285	752,865	1,635,912	464,784	146,485	318,299
2030	2,388,777	625,999	392,285	1,018,284	1,370,493	440,102	187,606	252,496
2031	2,388,777	1,027,330	392,285	1,419,615	969,163	416,731	247,657	169,074
2032	2,388,777	0	392,285	392,285	1,996,492	394,602	64,801	329,800
2033	2,388,777	-1,837,648	392,285	-1,445,363	3,834,140	373,647	-226,080	599,727
Total	70,910,672	29,443,620	11,981,777	41,425,397	29,485,276	27,056,546	27,056,546	-0

FIRR= 0.056082

Table 17.13.4-5 Financial Statement

Income Statement

	1	2	3	4
Year	1999	2000	2001	2002
Operating Revenue	0	0	0	0
Operating Expenditure	0	0	19,496	59,731
Personnel & Administration	0	0	0	0
Maintenance	0	0	19,496	59,731
Depreciation	0	0	0	0
Net Operating Income	0	0	-19,496	-59,731
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	124,976	244,077	397,085	572,512
Interest on Long-term Loans	124,976	244,077	397,085	572,512
Others				
Net Income	-124,976	-244,077	-416,581	-632,243
Accumulated Earnings	-124,976	-369,053	-785,634	-1,417,877

Cash Flow

Year	1999	2000	2001	2002
Cash Beginning	0	-162,507	-480,894	-1,019,742
Cash Inflow	3,002,430	2,942,430	3,817,034	4,419,099
Net Operating Income	0	0	-19,496	-59,731
Depreciation	0	0	0	0
Long-term Loans	3,002,430	2,942,430	3,836,530	4,478,830
Interest Income	-	-	-	-
Cash Outflow	3,164,937	3,260,818	4,355,882	5,229,595
Investment	3,002,430	2,942,430	3,836,530	4,478,830
Payment for Long-term Loans	37,530	74,311	122,267	178,253
Interest on Long-term Loans	124,976	244,077	397,085	572,512
Other Non-operating Expenditure	0	0	0	0
Cash Inflow - Outflow	-162,507	-318,388	-538,848	-810,496
Cash Ending	-162,507	-480,894	-1,019,742	-1,830,238
Cash Excess	0	0	0	0
Cash Shortage	-162,507	-480,894	-1,019,742	-1,830,238

Balance Sheet

Year	1999	2000	2001	2002
Current Assets	0	0	0	0
Cash & Deposit	0	0	0	0
Other Current Assets				
Fixed Assets	3,002,430	5,944,860	9,781,390	14,260,220
Depreciable Assets	3,002,430	5,944,860	9,781,390	14,260,220
Accumulated Depreciation	0	0	0	0
Total Assets	3,002,430	5,944,860	9,781,390	14,260,220
Liabilities	3,127,406	6,313,913	10,567,024	15,678,097
Current Liabilities	162,507	480,894	1,019,742	1,830,238
Fixed Liabilities(Long-term Loans)	2,964,900	5,833,019	9,547,282	13,847,859
Capital				
Accumulated Earnings	-124,976	-369,053	-785,634	-1,417,877
Total Liabilities & Capital	3,002,430	5,944,860	9,781,390	14,260,220
	0	0	-0	-0

Financial Indicators

Year	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
0	2,424,570	2,458,320	2,493,639	2,530,913	2,569,879	2,611,587	2,654,197
134,000	983,211	983,211	983,211	983,211	983,211	983,211	983,211
0	155,715	155,715	155,715	155,715	155,715	155,715	155,715
134,000	236,570	236,570	236,570	236,570	236,570	236,570	236,570
0	590,926	590,926	590,926	590,926	590,926	590,926	590,926
-134,000	1,441,359	1,475,109	1,510,428	1,547,702	1,586,668	1,628,376	1,670,986
0	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-
778,530	756,485	734,441	712,397	690,352	668,308	643,224	615,160
778,530	756,485	734,441	712,397	690,352	668,308	643,224	615,160
-912,530	684,874	740,668	798,031	857,350	918,360	985,152	1,055,826
-2,330,407	-1,645,533	-904,865	-106,834	750,516	1,668,876	2,654,029	3,709,855

2003	2004	2005	2006	2007	2008	2009	2010
-1,830,238	-2,987,706	-1,956,844	-870,187	273,832	1,477,170	2,213,664	2,663,069
5,200,792	2,032,285	2,066,035	2,101,354	2,138,628	2,177,594	2,219,302	2,261,912
-134,000	1,441,359	1,475,109	1,510,428	1,547,702	1,586,668	1,628,376	1,670,986
0	590,926	590,926	590,926	590,926	590,926	590,926	590,926
5,334,792	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-
6,358,260	1,001,423	979,379	957,334	935,290	1,441,100	1,769,897	2,214,753
5,334,792				0	327,800	569,090	931,668
244,938	244,938	244,938	244,938	244,938	444,992	557,583	667,925
778,530	756,485	734,441	712,397	690,352	668,308	643,224	615,160
0	0	0	0	0	0	0	0
-1,157,468	1,030,862	1,086,656	1,144,020	1,203,338	736,494	449,405	47,159
-2,987,706	-1,956,844	-870,187	273,832	1,477,170	2,213,664	2,663,069	2,710,228
0	0	0	0	0	0	0	0
-2,987,706	-1,956,844	-870,187	273,832	1,477,170	2,213,664	2,663,069	2,710,228

2003	2004	2005	2006	2007	2008	2009	2010
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
19,595,012	19,004,086	18,413,160	17,822,234	17,231,308	16,968,182	16,946,346	17,287,088
19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012
0	590,926	1,181,852	1,772,778	2,363,704	2,626,830	2,648,666	2,307,924
19,595,012	19,004,086	18,413,160	17,822,234	17,231,308	16,968,182	16,946,346	17,287,088
21,925,419	20,649,619	19,318,025	17,929,068	16,480,792	15,299,306	14,292,318	13,577,234
2,987,706	1,956,844	870,187	-273,832	-1,477,170	-2,213,664	-2,663,069	-2,710,228
18,937,713	18,692,775	18,447,838	18,202,900	17,957,963	17,712,970	16,955,387	16,287,462
-2,330,407	-1,645,533	-904,865	-106,834	750,516	1,668,876	2,654,029	3,709,855
19,595,012	19,004,086	18,413,160	17,822,234	17,231,308	16,968,182	16,946,346	17,287,088
-0	-0	0	-0	-0	0	0	-0

2003	2004	2005	2006	2007	2008	2009	2010
	7.58	8.01	8.47	8.98	9.35	9.61	9.67
	2.03	2.11	2.20	2.29	1.96	1.85	1.76
	40.55	40.00	39.43	38.85	38.26	37.65	37.04
	16.18	15.96	15.73	15.50	15.26	15.02	14.78

Table 17.13.4-5 Financial Statement

Income Statement

	13	14	15	16
Year	2011	2012	2013	2014
Operating Revenue	2,654,197	2,654,197	2,654,197	2,654,197
Operating Expenditure	983,211	983,211	983,211	983,211
Personnel & Administration	155,715	155,715	155,715	155,715
Maintenance	236,570	236,570	236,570	236,570
Depreciation	590,926	590,926	590,926	590,926
Net Operating Income	1,670,986	1,670,986	1,670,986	1,670,986
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	583,212	546,729	504,845	462,960
Interest on Long-term Loans	583,212	546,729	504,845	462,960
Others				
Net Income	1,087,774	1,124,257	1,166,141	1,208,026
Accumulated Earnings	4,797,629	5,921,886	7,088,027	8,296,053

Cash Flow

Year	2011	2012	2013	2014
Cash Beginning	2,710,228	3,577,134	4,312,566	5,089,883
Cash Inflow	2,261,912	2,261,912	2,261,912	2,261,912
Net Operating Income	1,670,986	1,670,986	1,670,986	1,670,986
Depreciation	590,926	590,926	590,926	590,926
Long-term Loans	0	0	0	0
Interest Income	-	-	-	-
Cash Outflow	1,395,006	1,526,480	1,484,595	1,442,711
Investment		0	0	0
Payment for Long-term Loans	811,794	979,751	979,751	979,751
Interest on Long-term Loans	583,212	546,729	504,845	462,960
Other Non-operating Expenditure	0			0
Cash Inflow - Outflow	866,906	735,432	777,317	819,201
Cash Ending	3,577,134	4,312,566	5,089,883	5,909,084
Cash Excess	0	0	0	5,909,084
Cash Shortage	3,577,134	4,312,566	5,089,883	0

Balance Sheet

Year	2011	2012	2013	2014
Current Assets	0	0	0	5,909,084
Cash & Deposit	0	0	0	5,909,084
Other Current Assets				
Fixed Assets	16,696,162	16,105,236	15,514,310	14,923,384
Depreciable Assets	19,595,012	19,595,012	19,595,012	19,595,012
Accumulated Depreciation	2,898,850	3,489,776	4,080,702	4,671,628
Total Assets	16,696,162	16,105,236	15,514,310	20,832,468
Liabilities	11,898,534	10,183,351	8,426,284	12,536,416
Current Liabilities	-3,577,134	-4,312,566	-5,089,883	0
Fixed Liabilities(Long-term Loans)	15,475,668	14,495,917	13,516,166	12,536,416
Capital				
Accumulated Earnings	4,797,629	5,921,886	7,088,027	8,296,053
Total Liabilities & Capital	16,696,162	16,105,236	15,514,310	20,832,468
	-0	-0	0	0

Financial Indicators

Year	2011	2012	2013	2014
Rate of Return on Net Fixed Assets (%)	10.01	10.38	10.77	11.20
Debt Service Coverage Ratio	1.62	1.48	1.52	1.57
Operating Ratio (%)	37.04	37.04	37.04	37.04
Working Ratio (%)	14.78	14.78	14.78	14.78

17	18	19	20	21	22	23	24
2015	2016	2017	2018	2019	2020	2021	2022
2,654,197	2,654,197	2,654,197	2,654,197	2,654,197	2,654,197	2,654,197	2,654,197
983,211	983,211	983,211	983,211	983,211	983,211	983,211	983,211
155,715	155,715	155,715	155,715	155,715	155,715	155,715	155,715
236,570	236,570	236,570	236,570	236,570	236,570	236,570	236,570
590,926	590,926	590,926	590,926	590,926	590,926	590,926	590,926
1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986
0	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-
421,076	379,192	337,307	295,423	256,916	221,720	190,840	164,998
421,076	379,192	337,307	295,423	256,916	221,720	190,840	164,998
1,249,910	1,291,794	1,333,679	1,375,563	1,414,070	1,449,266	1,480,146	1,505,988
9,545,962	10,837,757	12,171,435	13,546,998	14,961,068	16,410,334	17,890,480	19,396,468

2015	2016	2017	2018	2019	2020	2021	2022
5,909,084	6,442,369	6,776,249	6,789,435	7,616,573	8,242,548	8,604,500	9,668,089
2,261,912	2,261,912	2,261,912	2,261,912	2,261,912	2,261,912	2,261,912	2,261,912
1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986
590,926	590,926	590,926	590,926	590,926	590,926	590,926	590,926
0	0	0	0	0	0	0	0
-	-	-	-	-	-	-	-
1,728,627	1,928,032	2,248,726	1,434,774	1,635,937	1,899,960	1,198,323	1,294,296
327,800	569,090	931,668	159,600	436,800	772,800	150,000	327,800
979,751	979,751	979,751	979,751	942,220	905,440	857,483	801,498
421,076	379,192	337,307	295,423	256,916	221,720	190,840	164,998
0	0	0	0	0	0	0	0
533,285	333,880	13,186	827,138	625,975	361,952	1,063,589	967,616
6,442,369	6,776,249	6,789,435	7,616,573	8,242,548	8,604,500	9,668,089	10,635,705
6,442,369	6,776,249	6,789,435	7,616,573	8,242,548	8,604,500	9,668,089	10,635,705
0	0	0	0	0	0	0	0

2015	2016	2017	2018	2019	2020	2021	2022
6,442,369	6,776,249	6,789,435	7,616,573	8,242,548	8,604,500	9,668,089	10,635,705
6,442,369	6,776,249	6,789,435	7,616,573	8,242,548	8,604,500	9,668,089	10,635,705
14,660,259	14,638,423	14,979,165	14,547,839	14,393,713	14,575,587	14,134,661	13,871,535
19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012
4,934,753	4,956,589	4,615,847	5,047,173	5,201,299	5,019,425	5,460,351	5,723,477
21,102,628	21,414,671	21,768,599	22,164,412	22,636,261	23,180,087	23,802,750	24,507,240
11,556,665	10,576,915	9,597,164	8,617,413	7,675,193	6,769,753	5,912,270	5,110,772
0	0	0	0	0	0	0	0
11,556,665	10,576,915	9,597,164	8,617,413	7,675,193	6,769,753	5,912,270	5,110,772
9,545,962	10,837,757	12,171,435	13,546,998	14,961,068	16,410,334	17,890,480	19,396,468
21,102,628	21,414,671	21,768,599	22,164,412	22,636,261	23,180,087	23,802,750	24,507,240
0	0	0	0	0	0	0	0

2015	2016	2017	2018	2019	2020	2021	2022
11.40	11.42	11.16	11.49	11.61	11.46	11.82	12.05
1.61	1.66	1.72	1.77	1.89	2.01	2.16	2.34
37.04	37.04	37.04	37.04	37.04	37.04	37.04	37.04
14.78	14.78	14.78	14.78	14.78	14.78	14.78	14.78

Table 17.13.4-5 Financial Statement

Income Statement

	25	26	27	28
Year	2023	2024	2025	2026
Operating Revenue	2,654,197	2,654,197	2,654,197	2,654,197
Operating Expenditure	983,211	983,211	983,211	983,211
Personnel & Administration	155,715	155,715	155,715	155,715
Maintenance	236,570	236,570	236,570	236,570
Depreciation	590,926	590,926	590,926	590,926
Net Operating Income	1,670,986	1,670,986	1,670,986	1,670,986
Non-operating Revenue	0	0	0	0
Interest Income	-	-	-	-
Others				
Non-operating Expenditure	145,158	125,318	105,478	85,638
Interest on Long-term Loans	145,158	125,318	105,478	85,638
Others				
Net Income	1,525,828	1,545,668	1,565,508	1,585,348
Accumulated Earnings	20,922,296	22,467,963	24,033,471	25,618,819

Cash Flow

Year	2023	2024	2025	2026
Cash Beginning	10,635,705	11,448,556	11,918,669	13,340,289
Cash Inflow	2,261,912	2,261,912	2,261,912	2,261,912
Net Operating Income	1,670,986	1,670,986	1,670,986	1,670,986
Depreciation	590,926	590,926	590,926	590,926
Long-term Loans	0	0	0	0
Interest Income	-	-	-	-
Cash Outflow	1,449,061	1,791,799	840,291	820,451
Investment	569,090	931,668	0	0
Payment for Long-term Loans	734,813	734,813	734,813	734,813
Interest on Long-term Loans	145,158	125,318	105,478	85,638
Other Non-operating Expenditure	0	0	0	0
Cash Inflow - Outflow	812,851	470,113	1,421,621	1,441,461
Cash Ending	11,448,556	11,918,669	13,340,289	14,781,750
Cash Excess	11,448,556	11,918,669	13,340,289	14,781,750
Cash Shortage	0	0	0	0

Balance Sheet

Year	2023	2024	2025	2026
Current Assets	11,448,556	11,918,669	13,340,289	14,781,750
Cash & Deposit	11,448,556	11,918,669	13,340,289	14,781,750
Other Current Assets				
Fixed Assets	13,849,699	14,190,441	13,599,515	13,008,589
Depreciable Assets	19,595,012	19,595,012	19,595,012	19,595,012
Accumulated Depreciation	5,745,313	5,404,571	5,995,497	6,586,423
Total Assets	25,298,255	26,109,110	26,939,804	27,790,339
Liabilities	4,375,959	3,641,146	2,906,333	2,171,520
Current Liabilities	0	0	0	0
Fixed Liabilities(Long-term Loans)	4,375,959	3,641,146	2,906,333	2,171,520
Capital				
Accumulated Earnings	20,922,296	22,467,963	24,033,471	25,618,819
Total Liabilities & Capital	25,298,255	26,109,110	26,939,804	27,790,339
	-0	-0	0	-0

Financial Indicators

Year	2023	2024	2025	2026
Rate of Return on Net Fixed Assets (%)	12.07	11.78	12.29	12.85
Debt Service Coverage Ratio	2.57	2.63	2.69	2.76
Operating Ratio (%)	37.04	37.04	37.04	37.04
Working Ratio (%)	14.78	14.78	14.78	14.78

29	30	31	32	33	34	35
2027	2028	2029	2030	2031	2032	2033
2,654,197	2,654,197	2,654,197	2,654,197	2,654,197	2,654,197	2,654,197
983,211	983,211	983,211	983,211	983,211	983,211	983,211
155,715	155,715	155,715	155,715	155,715	155,715	155,715
236,570	236,570	236,570	236,570	236,570	236,570	236,570
590,926	590,926	590,926	590,926	590,926	590,926	590,926
1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986
0	0	0	0	0	0	0
-	-	-				
65,798	45,959	29,159	15,338	5,401	0	0
65,798	45,959	29,159	15,338	5,401	0	0
1,605,188	1,625,028	1,641,827	1,655,648	1,665,585	1,670,986	1,670,986
27,224,006	28,849,034	30,490,861	32,146,510	33,812,094	35,483,080	37,154,066

2027	2028	2029	2030	2031	2032	2033
14,781,750	16,243,051	17,724,191	19,006,923	20,172,526	21,129,358	23,191,215
2,261,912	2,261,912	2,261,912	2,261,912	2,261,912	2,261,912	2,261,912
1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986	1,670,986
590,926	590,926	590,926	590,926	590,926	590,926	590,926
0	0	0	0	0	0	0
-	-	-	0	0	0	0
800,611	780,771	979,180	1,096,308	1,305,080	200,055	0
0	0	327,800	569,090	931,668	0	0
734,813	734,813	622,222	511,881	368,011	200,055	0
65,798	45,959	29,159	15,338	5,401	0	0
0	0	0	0	0	0	0
1,461,301	1,481,141	1,282,732	1,165,604	956,832	2,061,857	2,261,912
16,243,051	17,724,191	19,006,923	20,172,526	21,129,358	23,191,215	25,453,127
16,243,051	17,724,191	19,006,923	20,172,526	21,129,358	23,191,215	25,453,127
0	0	0	0	0	0	0

2027	2028	2029	2030	2031	2032	2033
16,243,051	17,724,191	19,006,923	20,172,526	21,129,358	23,191,215	25,453,127
16,243,051	17,724,191	19,006,923	20,172,526	21,129,358	23,191,215	25,453,127
12,417,663	11,826,737	11,563,611	11,541,775	11,882,517	11,291,591	10,700,665
19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012	19,595,012
7,177,349	7,768,275	8,031,401	8,053,237	7,712,495	8,303,421	8,894,347
28,660,714	29,550,928	30,570,534	31,714,302	33,011,875	34,482,807	36,153,793
1,436,707	701,895	79,673	-432,208	-800,219	-1,000,274	-1,000,274
0	0	0	0	0	0	0
1,436,707	701,895	79,673	-432,208	-800,219	-1,000,274	-1,000,274
27,224,006	28,849,034	30,490,861	32,146,510	33,812,094	35,483,080	37,154,066
28,660,714	29,550,928	30,570,534	31,714,302	33,011,875	34,482,807	36,153,793
-0	0	-0	-0	-0	-0	-0

2027	2028	2029	2030	2031	2032	2033
13.46	14.13	14.45	14.48	14.06	14.80	15.62
2.83	2.90	3.47	4.29	6.06	11.31	-
37.04	37.04	37.04	37.04	37.04	37.04	37.04
14.78	14.78	14.78	14.78	14.78	14.78	14.78

17.14 Environmental Impact Assessment

17.14.1 Institutional Situation

International Environmental Situation

Under the UN Regional Seas Program the Mediterranean Sea was designated a critical area in 1975 due to high levels of pollution. To tackle the pollution problems the "Medpol" strategy was formulated and implemented by common agreement by the 17 countries bordering the Mediterranean, including Syria. This strategy requires a Coastal Area Management Plan (CAMP) for all countries. The main planning document is "Development/Environment:Systemic and Prospective Approach for the Syrian Coastal Region; Mediterranean Action Plan, UNEP/GCEA, Draft 1994. This is known as the Blue Plan, and represents a fundamental economic planning strategy for the coastal zone.

EIA Capability and Procedures

In the past responsibility for environmental matters has been fragmented among several government organisations. The current intention is to establish and strengthen an EIA unit in the Ministry of Environment. The project is supported by the World Bank and the European Investment Bank under the Mediterranean Technical Action Plan. EIAs are carried out in Syria if deemed necessary but no standard format yet applies. It is intended that procedures will be developed by a new EIA unit located within the Engineering Department of the Ministry of State for the Environment.

Environmental Standards and Environmental Law

Industrial pollution discharges are required to comply with the Guidelines of the Arab League and UNEP. There are draft National Standards for Ambient Air Quality and Waste Water Discharge. Standards for Drinking Water apply and are basically the same as WHO standards. The Ministry of Irrigation enforces the law "Controlling of Public Water", Law 16 of 1983.

17.14.2 Coastal Environmental Setting

General

The coastal region of Syria covers 145 kms from the border with Turkey in the north to Hamidie on the border with Lebanon in the south. The region is a fertile coastal plain experiencing Mediterranean climate, mild winters and abundant rainfall. This contrasts with the rest of Syria which has extremes of climate and in places is extremely arid.

The low areas of the coastal region are characterised by Mediterranean oaks. The

higher altitudes north of Latakia are dominated by pines. There are no areas of high or unique ecological value along the coast as most natural flora have been replaced by plants having high commercial value and endemic species of fauna have retreated to the interior. No significant fauna remain other than domesticated animals. Nevertheless several areas have been designated as Sites of Special Ecological Importance.

The coastal zone has a rich cultural heritage and many historical sites. Several places have been proposed as sites of special historical interest. Wetlands are not common along the coastal zone due to the high infiltration capacity of the chalky soils. Two exist, located at Buhairat Al Laha and Buhairat Laraba. Farming represents a major source of income for many families supplemented by income from other jobs. Farming takes place on natural soils, on terraces, under greenhouse cover and is assisted by chemical fertilisers and pesticides. Domestic animals and hens are reared

The Government are promoting tourism, both on an international and regional basis. At the moment tourism has not realised its full potential, although certain large planned developments have been constructed. The natural attractions of the coastal area include beaches (although in town areas these are heavily polluted by garbage), natural rock outcrops, long areas of sand dunes, and visually striking white cliffs.

The main industrial concentration occurs around Banias. These include an oil refinery, the oil fired power station, and a large cement plant. There is some small manufacturing industry along the eastern edge of Latakia.

Choice of New Port Site

The coastal area is intensively developed. This includes residential development, tourist hotels and holiday homes, oil loading facilities, and intensive cultivation both in fields and under greenhouses. Also there are many areas which have been designated as restricted areas under the Blue Plan for historical, cultural and ecological reasons and so the sites remaining for location of a new port are restricted. A series of sites were examined from Hamide in the south to Latakia in the north. The coastline between Latakia and the southern border with Lebanon contains many sites of outstanding natural value, historical value, ecological value, and high amenity value to the local residents as well as tourists potential. Also many stretches of this coastline are already under environmental stress. The only area which is considered suitable for development of the new port is south of Hamidie.

The area under consideration for the location of the new port was shown in Figure 13-9-1. The area is composed of a sand and rock foreshore with extensive low sand dunes. The hinterland is mainly agricultural land under intensive farming for

vegetables and cereals. The main north south road to Lebanon forms a distinct delineation of the coastal strip and the agricultural area. The main area of residential occupation is Hamidie to the north of the selected area. To the south is the village of Al Kharabeh. The population density is low. To the south of the area is the small river which forms the boundary with Lebanon. To the east is a small wetlands area. The main highway and railway line are located some 5km from the site and run in a north south direction.

17.14.3 New Port Construction

The new port will have two breakwaters enclosing a frontage of 1.8 km. In order to secure the necessary depth for vessels berthing reclamation will be constructed out to a distance of 450 metres. Some dredging will also be necessary. In addition there will be areas for storage of bulk materials and handling facilities. These will be located on the western side of the main road. Access roads and the railway line connection will be located on the eastern side of the main road.

17.14.4 Initial Environmental Examination

The Initial Environmental Examination(IEE) was assessed in a tabular form and is shown in Table 13-9-1. This showed the need for an EIA. The EIA requires the establishing of the baseline conditions, identifying the impacts, assessing the degree of those impacts and stating whether the situation is acceptable or if mitigation measures are required. This is described below. At this stage of a Feasibility Report many technical details are not available as final decisions have not been made. Where this is the case qualitative assessments have been made. Where possible quantitative assessments have been made based on available data, previous similar case studies and professional judgement. The significance of impacts is given and overall conclusions given on the feasibility of the project.

17.14.5 Environmental Baseline Conditions

Existing environmental data compiled by the Ministry of Environment and Ministry of Irrigation, Coastal Department Centre of Water Pollution Control was reviewed in the IEE and indicated that the water quality was good although suffering high biological contamination from sewage. No other data on other water quality parameters or sediments was available and so the existing seawater quality, seabed sediment quality, freshwater quality and air quality were assessed by means of a site survey. Also an ecological survey was conducted to ascertain the existing flora and fauna.

Water Quality

The existing water quality and sediment quality were assessed by the site survey at the positions shown in Figure 17.14.1 Not all of these parameters are covered

by standards but those which are subject to water quality guidelines are discussed below. The results obtained at Hamidie are given in Table 17.14.1 and are compared with the relevant standards.

Direct Readings

Temperature varied between 14.4 and 15.2 °C. The temperature of seawater should not be raised by more than 2°C although a mixing zone where temperature can be higher is usually allowed. Thermal discharges arise from power stations or large industry that have cooling water requirements. These do not presently exist at Hamidie and none are planned in the future. Therefore this parameter is acceptable. Values for **pH** varied between 8.0 and 8.7. An acceptable range is 7.0-8.3 This parameter is slightly high for the ocean but is acceptable.

Salinity was consistent at 39.2 ppt which is slightly higher than expected. The consistency shows good mixing of the water body. Salinity should not be allowed to change by more than 5% on the background level. The level in the Mediterranean Sea is consistently high due to the high evaporation and high total dissolved salts load from rivers. Therefore this parameter is acceptable.

Dissolved Oxygen (DO) varied from 9.03 mg/l to 9.8 mg/l. The Japanese standard is 7.5 mg/l although fish may survive at 4 mg/l and anaerobic conditions generally may not arise until the DO drops below 2 mg/l. The figures recorded show good water quality with no organic loads. **Transparency** (or secchi depth) varied from 4 metres to 5 metres. This is high and indicates clean water.

Laboratory Analysis

Chemical Oxygen Demand (COD) varied between 6.4 mg/l and 9.1 mg/l. The standard is 8 mg/l. One site was slightly above this. In general there is not an excessive organic or inorganic pollution load in the vicinity and this parameter is considered acceptable.

Sulphide was not detected which indicates an absence of pollution. **Total Nitrogen** varied between 0.0009 mg/l to 0.0025 mg/l. The standard for avoidance of eutrophication is 0.06 mg/l. This area of ocean is known to be low in naturally occurring available nutrients and the situation is considered acceptable. **Free Chlorine** was not detected.

Total Phosphorus varied from 0.001 mg/l to 0.006 mg/l. This is within the standard of 0.01 mg/l. **Phosphates** varied between 0.0016 mg/l and 0.0036 mg/l which is within the standard of 0.015 mg/l.

Suspended Solids varied between 206 mg/l and 372 mg/l. The standard is 25 mg/l. This corresponds to a range of clear to moderately turbid water. Although these levels are rather high the monitoring took place following a period of stormy

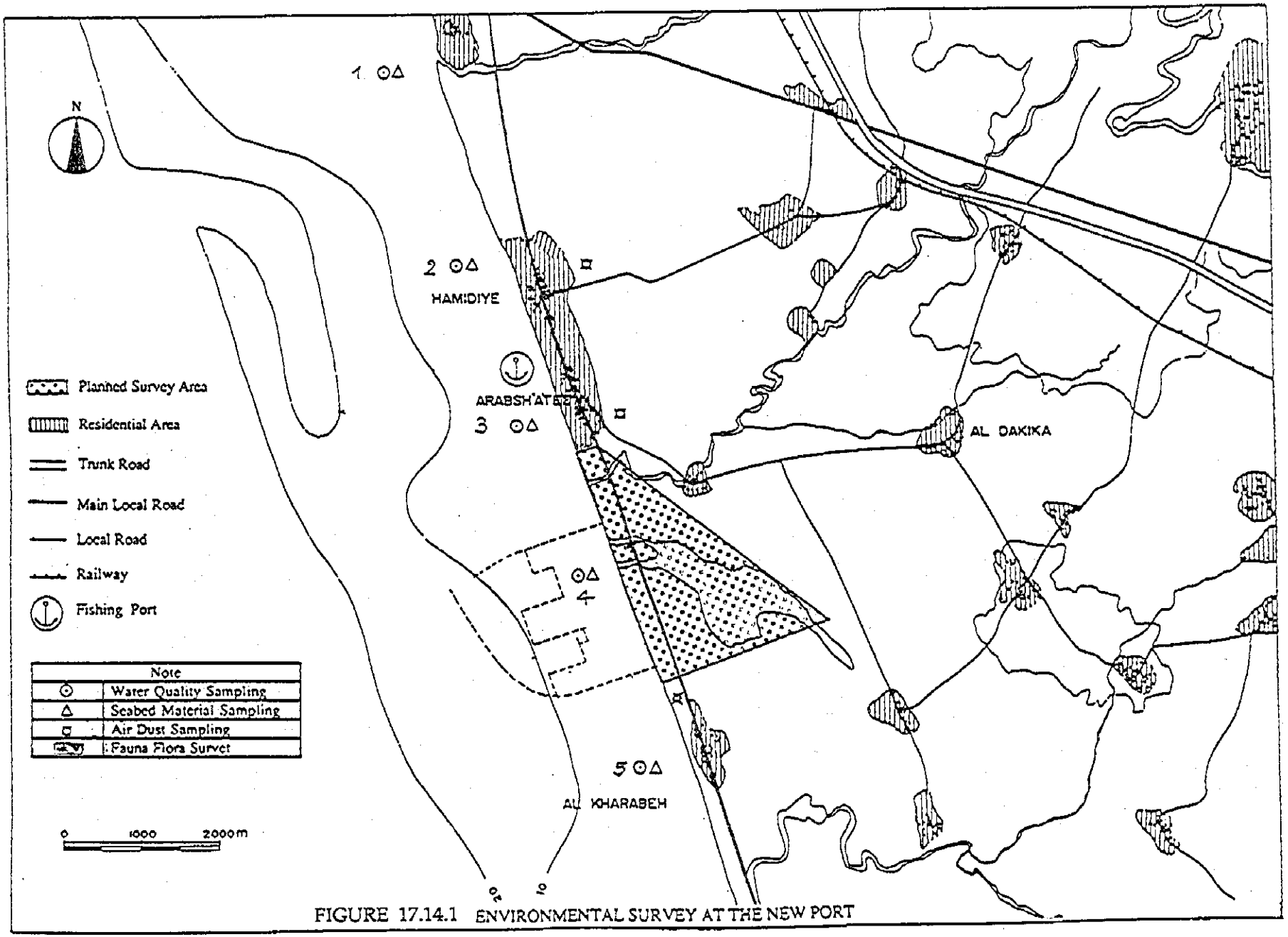


FIGURE 17.14.1 ENVIRONMENTAL SURVEY AT THE NEW PORT

TABLE 17.14.1 COMPARISON OF SITE DATA WITH STANDARDS - NEW PORT

ENVIRONMENTAL PARAMETERS FOR WHICH STANDARDS APPLY															
PORT:	NEW PORT														
			SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	STANDARD	SOURCE	SITES WHICH MEET OR EXCEED STANDARD				
PARAMETER	SAMPLE TYPE	UNITS								1	2	3	4	5
TEMPERATURE	WATER	° C	14.7	15.1	15.2	14.4	15.0	<+2°C increase	AUS	-	-	-	-	-
pH	WATER	pH	8.0	8.5	8.4	8.7	8.4	7.0-8.3	JAPAN	O	X	X	X	X
SALINITY	WATER	PPTHOUSAND	39.2	39.2	39.2	39.2	39.2	<5% change	AUS	-	-	-	-	-
DISSOLVED OXYGEN	WATER	mg/l	9.3	9.0	9.4	9.5	9.8	7.5	JAPAN	O	O	O	O	O
TRANSPARENCY	WATER	metres M	>5M	>5M	>5M	>5M	>5M	0.250	JAPAN	O	O	O	O	O
COD	WATER	mg/l	9.1	6.6	7.6	6.5	6.4	8	JAPAN	X	O	O	O	O
SULPHIDE	WATER	ppm	0.0	0.0	0.0	0.0	0.0	0.002	USEPA	O	O	O	O	O
TOTAL NITROGEN	WATER	ug/l	0.90	0.90	1.20	1.20	2.50	60	AUS	O	O	O	O	O
TOTAL PHOSPHORUS	WATER	mg/l	0.004	0.006	0.001	0.006	0.003	0.01	AUS	O	O	O	O	O
PHOSPHATE	WATER	mg/l	0.001	0.002	0.002	0.003	0.003	0.015	JAPAN	O	O	O	O	O
SUSPENDED SOLIDS	WATER	mg/l	372	348	206	349	237	25	USEPA	X	X	X	X	X
OIL GREASE	WATER	mg/l	1.3	1.3	1.3	1.3	1.3	0.5	JAPAN	X	X	X	X	X
CHLORINE	WATER	mg/l	0.0	0.0	0.0	0.0	0.0	2	MALAYSIA	O	O	O	O	O
COLIFORMS	WATER	N/100ml	2	2	4	28	8	1000	JAPAN	O	O	O	O	O
ARSENIC	SEDIMENTS	ppm(dry weight)	ND	ND	ND	ND	ND	12.5	USA	O	O	O	O	O
COPPER	SEDIMENTS	ppm(dry weight)	5	18	20	415	24	45	CANADA	O	O	O	X	O
MERCURY	SEDIMENTS	ppm(dry weight)	ND	ND	ND	ND	ND	0.15	USA	O	O	O	O	O
ZINC	SEDIMENTS	ppm(dry weight)	2	40	26	125	106	105	USA	O	O	O	X	X
			ND=NOT DETECTED							O	MEETS STANDARD			
			DETECTION LIMIT = 2PPM							X	EXCEEDS STANDARD			
										-	NOT APPLICABLE			
ENVIRONMENTAL PARAMETERS FOR WHICH STANDARDS DONOT APPLY														
COLOR	WATER	NONE	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR							
ODOR	WATER	NONE	NONE	NONE	NONE	NONE	NONE							
SULPHATE	WATER	mg/l	3.0	3.1	3.0	3.0	2.9							
COLOR	SEDIMENTS	NONE	BROWN	BROWN	GREY	GREY	GREY							
ODOR	SEDIMENTS	NONE	NONE	NONE	NONE	NONE	NONE							
COD	SEDIMENTS	mg/g	0.5	1.7	0.3	0.4	0.4							
OIL GREASE	SEDIMENTS	mg/g	4.0	4.5	1.2	1.2	4.8							
IGNITION LOSS	SEDIMENTS	%	43.0	43.0	19.0	22.0	21.0							
SULPHIDE	SEDIMENTS	µg/gm ppm	4.0	4.8	7.6	6.0	5.6							
TOTAL PHOSPHORUS	SEDIMENTS	µg/gm ppm	0.5	0.4	1.1	0.9	1.1							
PHOSPHATE	SEDIMENTS	µg/gm ppm	12.0	4.0	12.0	14.0	13.0							
PARTICLE SIZE %	SEDIMENTS	>425 µM	100	100	0	0	0							
	SEDIMENTS	300-425	0	0	0	0	0							
	SEDIMENTS	220-300	0	0	19	20	20							
	SEDIMENTS	106-220	0	0	11	12	11							
	SEDIMENTS	<106	0	0	70	68	69							

weather and disturbance of the seabed must be anticipated. Also the measurement of clarity showed a visible depth of 5 metres and so the water is clear. The levels of solids should not impede primary productivity and the water quality is considered acceptable.

Oil and Grease was consistent and varied from 1.25 mg/l to 1.3 mg/l. Ambient standards for oil and grease in receiving waters are not common but when they do exist they are low. For example Malaysia requires 0.5 mg/l although some countries stipulate none at all. The levels measured are low and are to be expected as small fishing boats use the area. The situation is acceptable.

Coliform counts varied from 2 to 28 organisms per 100ml of sample water. The standard is 1000/100ml and so there is little evidence of bacterial contamination in the waters. These standards are generally associated with bathing waters and so indicate that the waters do not pose a health threat to recreational bathers.

Sediments

There are no generally accepted standards for sediments as their ability to affect the surrounding waters varies with local conditions. A major concern is heavy metals which can pass into the water and result in biomagnification and bioaccumulation in the various trophic layers of the food chain. These are discussed below. Standards which can be applied relate to dumping of sludge and are drawn from USEPA, Canada and Japan. This would be a similar situation to dredging, or dumping of dredged material.(See references)

Arsenic was not detected and so is below the limit of detection which is 2ppm. The standard is 12.5ppm.

Copper was highly variable. It ranged from 5ppm to 415ppm against a standard of 45ppm. The standard was exceeded at one location only. **Zinc** varied from 2ppm to 125ppm. The standard is 105ppm. The standard was exceeded at two locations. These exceedences are thought to be due to the boats which use the area as copper and zinc are used in antifouling agents for boats.

Total Mercury was not detected and so is below the limit of detection which is 2ppm. The standard is 0.15ppm. Although it is not possible to say that mercury is totally absent it is not present in significant concentrations.

Air Quality

Air quality was assessed at three locations as shown in Figure 17.14.1 The locations were taken as being typical of the conditions around the area in general. High volume samplers were installed and left to run for 24 hours. The instruments sampled at a height of 5 metres above the ground and a rate of 1 m^3 / minute. The results were then assessed by gravimetric analysis in the laboratory and

interpreted in terms of particulate and dust content in the atmosphere. During previous analysis at Tartous the dust sampling identified the phosphate component of the dust. In this case this was not done as there was no reason to expect phosphate to be present. The results obtained in terms of Total Suspended Particulates were :

o	Site 1	Hamidie	2,401 mg/m^3
o	Site 2	Arabshatte	2,280 mg/m^3
o	Site 3	Al Kharabeh	2,653 mg/m^3

The standard for dust according to the USEPA, which are the standards adopted in Syria, is 260mg/m^3 for a 24 hour period. The WHO standard is 150mg/m^3 for a 24 hour period. The results are very high and were due to the fact that during the monitoring strong winds were blowing up to 40 km per hour. However these winds are typical of this area at this time of year. According to the meteorological office at Tartous winds of 80-100 km/hour occur perhaps five times a year in Hamidie and result in the destruction of plastic greenhouses. Therefore such levels may be expected to occur naturally. Previous measurements carried out in this area have given background dust levels during calm periods of typically 40-70mg/m^3.

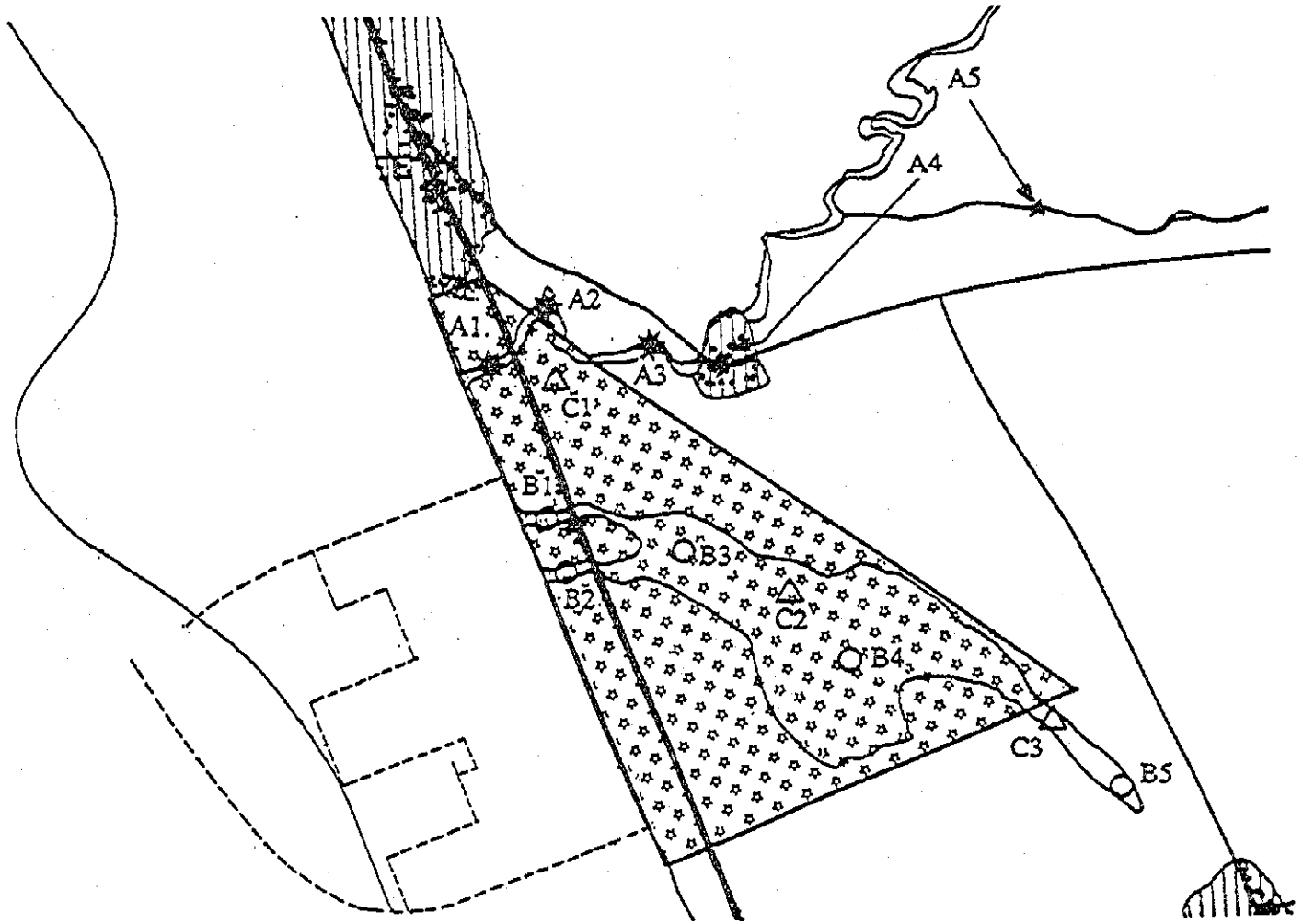
Fresh Water Salinity

In order to assess the presence of salt on the farmland the salt content of the soil and the two streams which flow across the farmland was measured. The locations were A1 to A5 on the northern stream, B1 to B5 on the central stream and C1 to C3 for the soil samples. (See Figure 17.14.2) The survey time coincided with a period of heavy rain.

The rain fall for the 14 day period immediately preceding the survey was as given below. All figures are in millimeters over a 24 hour period. If no day is recorded that day was dry. The survey corresponded to Day 15.

Day	1	4	5	8	9	10	11	12	14
Rainfall mm	4	1	2	1	22	15	6	1	4

At the time of the survey stream A was flowing at approximately 0.5 metres/second and carrying a large flow of freshwater. Stream B was flowing but much more slowly. The soil water collected was mainly due to fallen rain which was collected in ponds on the surface of the ground. The results in electrical conductivity units of mS/cm at 25°C were:



Note		
✸	A1-A5	Stream A salt measuring points
○	B1-B5	Stream B salt measuring points
△	C1-C3	Soil water measuring points

FIGURE 17.14.2 Location Map of Salt Measuring Points

Location	Conductivity	Location	Conductivity	Location	Conductivity
A1	545	B1	1915	C1	109
A2	542	B2	613	C2	153
A3	511	B3	1968	C3	140
A4	475	B4	8500		
A5	588	B5	635		

The results show that stream A is not tidal but is influenced by the runoff rainfall from upstream which flows from the nearby mountains. Stream B drains the lagoon in the centre of the site. The actual flow in the stream was mainly freshwater but the centre of the lagoon, which would be well mixed due to the strong winds blowing, was saline. The soil water was not very saline but this is as expected due to the surface standing rainwater. However a major artificial drainage scheme is being implemented by the government to pump out the groundwater which is reported to be salty. This scheme does not appear to be effective, according to the local farmers.

Ecology

The area under survey is shown in Figure 17.14.1 and covers the land to the east and the west of the main highway. The area to the west of the road will be used for the new port construction. The area to the east will not be used for the new port construction but was surveyed to establish the ecological value in case the land may be affected by the new port construction.

In general the survey was conducted using the winding survey method as shown in Figure 17.14.3 This follows a series of winding paths 50 metres apart and observations are made as the survey progressed. The centre of the area was under water and so observations were made by binoculars from all sides. The survey took one week in February 1996. This was mainly during the day. On two occasions the survey started at 4.00 am in order to record any nocturnal animals during the dawn. The land uses are shown in Figure 17.14.4

Botanical samples were taken and identified in the laboratory. In all cases Genus was identified and where possible Species. It was possible to identify the upper classes of animals such as mammals and birds. Lower classes such as molluscs and worms were identified to the species level if possible. If not the order and family were given. In total there were 40 botanical species identified and 37 species of animal.

Observations on Flora

Grasses

As shown in Table 17.14.2 there were 18 genera in 14 families. The genera *poa, verbascum* and *arundo* dominate the grass areas, with the other species scattered

throughout the area. The area west of the road is mainly pastoral that is used for animals to graze on. The area to the east of the road is mainly agricultural, being used for crops and vegetables grown in plastic covered hothouses. Most of the grass species are pastoral such as *poa, secala,* and *trifolium.* There are three edible species which are rich in vitamins and minerals; these are *pelargonium, rumex* and *aloe.* There are three species which have medical value. *Ecbalium sp* is used in treatment of jaundice; *Ammi sp* can be used for treatment of blood diseases as can *Urtica sp.*

Agricultural Plants

Winter Plants.
These are mostly found on the eastern side with little cultivation on the western side. Seven families containing 13 species were identified. Winter agriculture occurs in two ways. Firstly there are 247 hothouses owned by the local farmers and used during winter. (Figure17.14.5) The production is 95% tomatoes. The remaining 5% is eggplant, cucumber and green pepper. Secondly there is open land farming of which 95% is wheat, barley and grass peas. The remaining 5% is broad beans, onions, peas, and radish.(See Table 17.14.3)

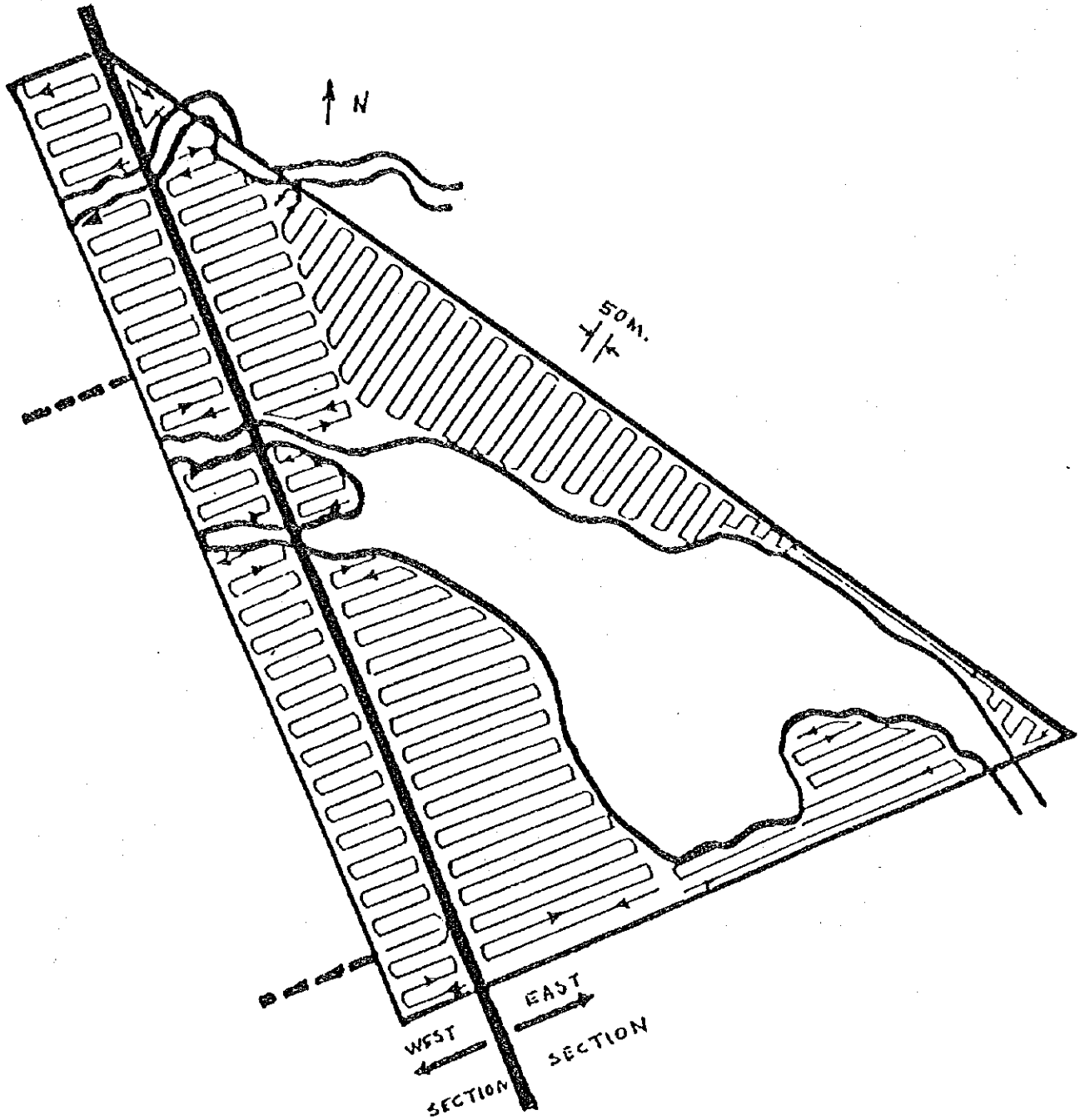
Summer plants.
Based on enquiries made of the farmers there are 9 species cultivated in summer of which tomatoes and eggplants are the main species. (See Table 17.14.4)

Trees
Trees cover less than 1% of the area. (Figure17.14.6) There are 7 families and 8 species. Lines of trees are often used as wind shelters for the hothouses. *Salix* and *Cupersssus* are often used for this and so dominate the area. *Eucalypts* are the next most dominant. Only one *ficus* tree, two *melia* and four *phoenix* trees were seen. These species are all cultivated by man but the Plane trees are naturally occurring. Over 50 of these were seen around the rivers. The wood is used in the furniture industry.(See Table 17.14.5)

Fauna

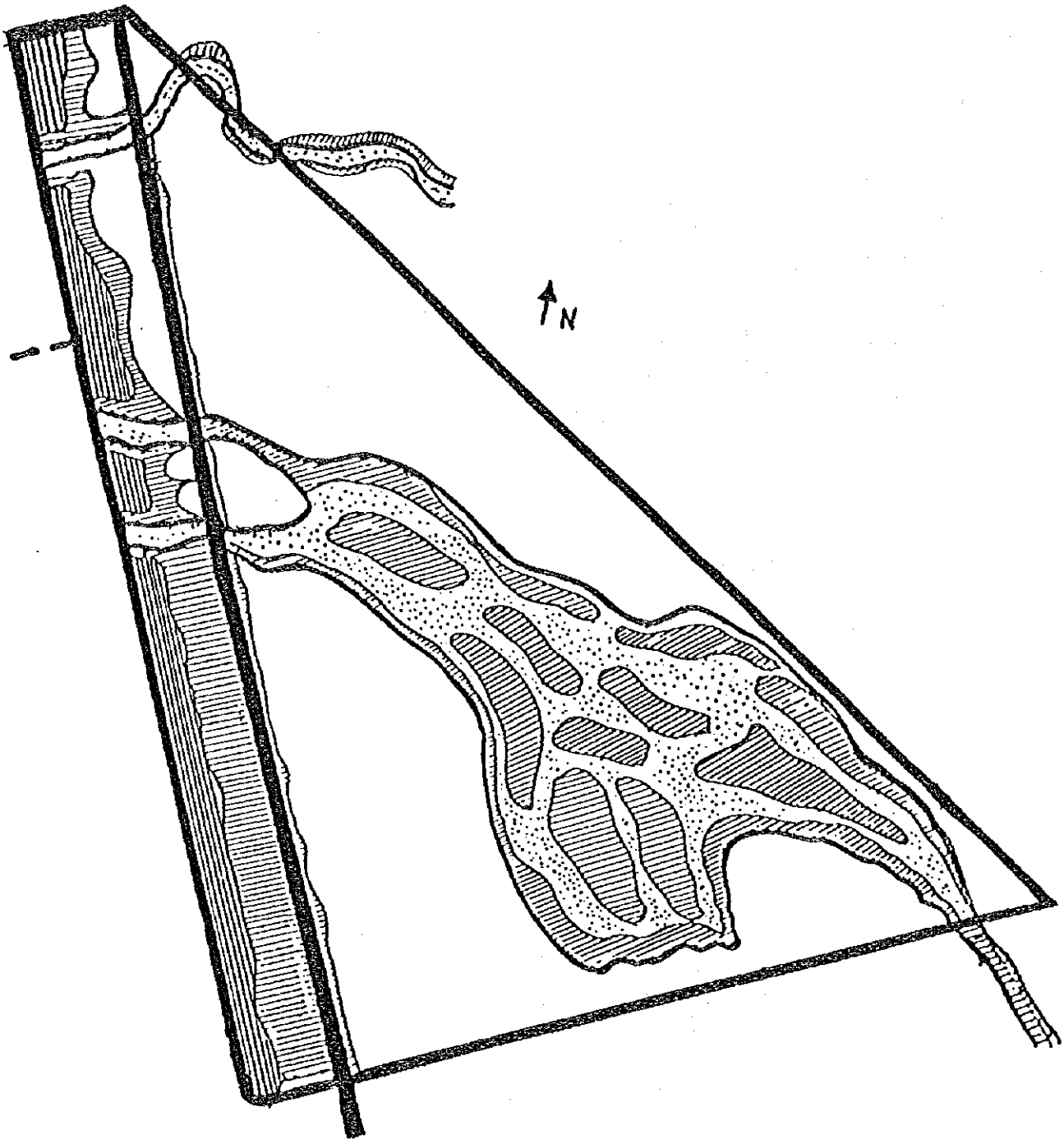
Wild Animals.
Observations recorded 9 orders and 14 species.(Figure17.14.7) Most of these occurred in small numbers except the *Helix* (snake) which occurred in large numbers on the western side but was rarely seen on the eastern side. Moderate numbers of mice were seen and one turtle. Other species were in low numbers.(See Table 17.14.6)

Domestic Animals.
There 6 orders and 9 species. *Ovis* (sheep) and *bison* (cows) were dominant. Other species present in moderate numbers were *capra* (goat) and *equus* (horse). Present in small numbers were dogs, ducks, hens and pigeons. See (See Table 17.14.7)



SPIRAL RANDOM SURVEY SYSTEM

FIGURE 17.14.3



DISTRIBUTION OF LAND USES

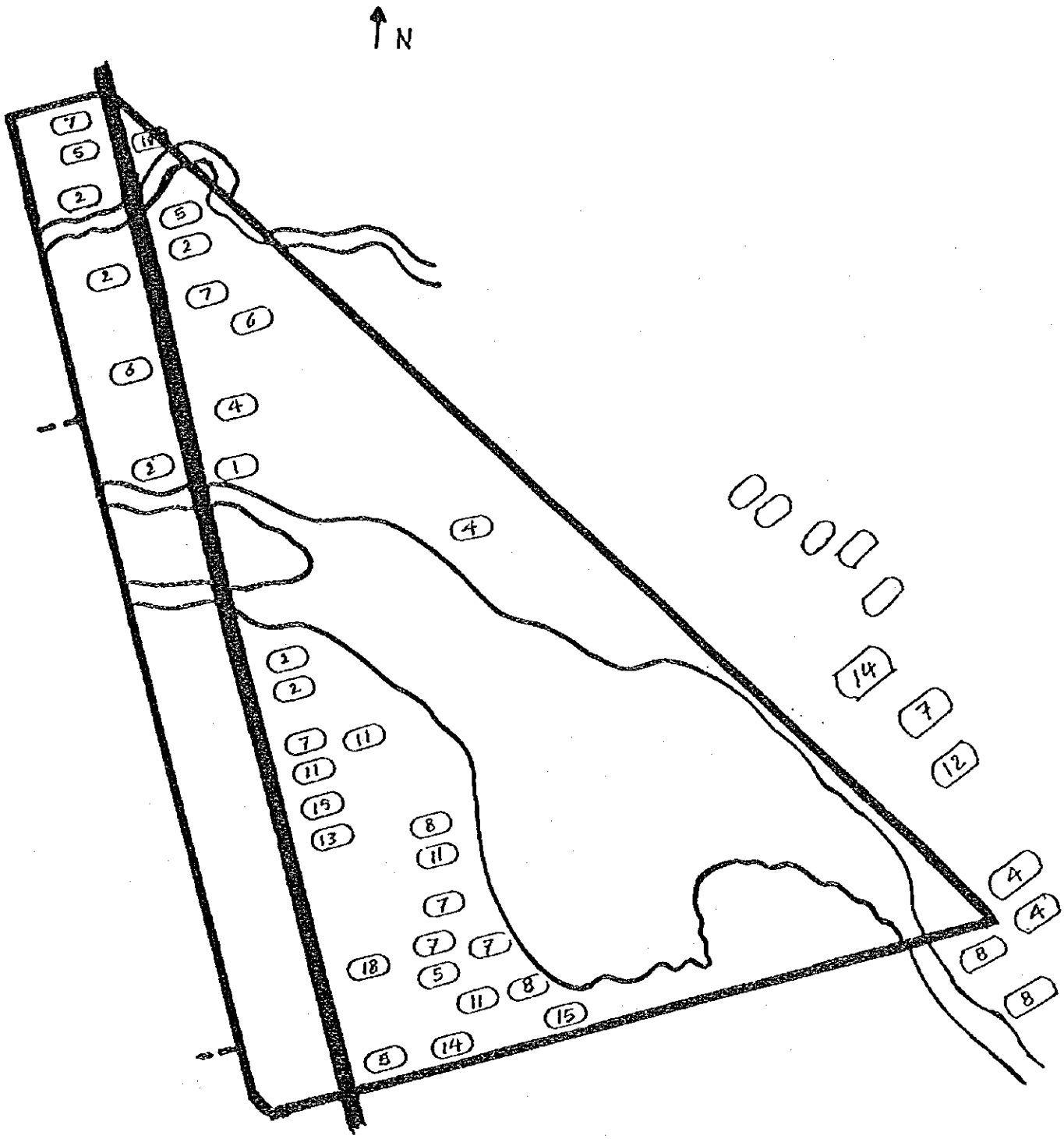
GRASS

MARSHY LAND

UNUSED LAND

SEASONAL AGRICULTURAL LAND

FIGURE 17.14.4



LOCATION OF GREEN HOUSES
and its numbres

GREEN HOUSE

FIGURE 17.14.5

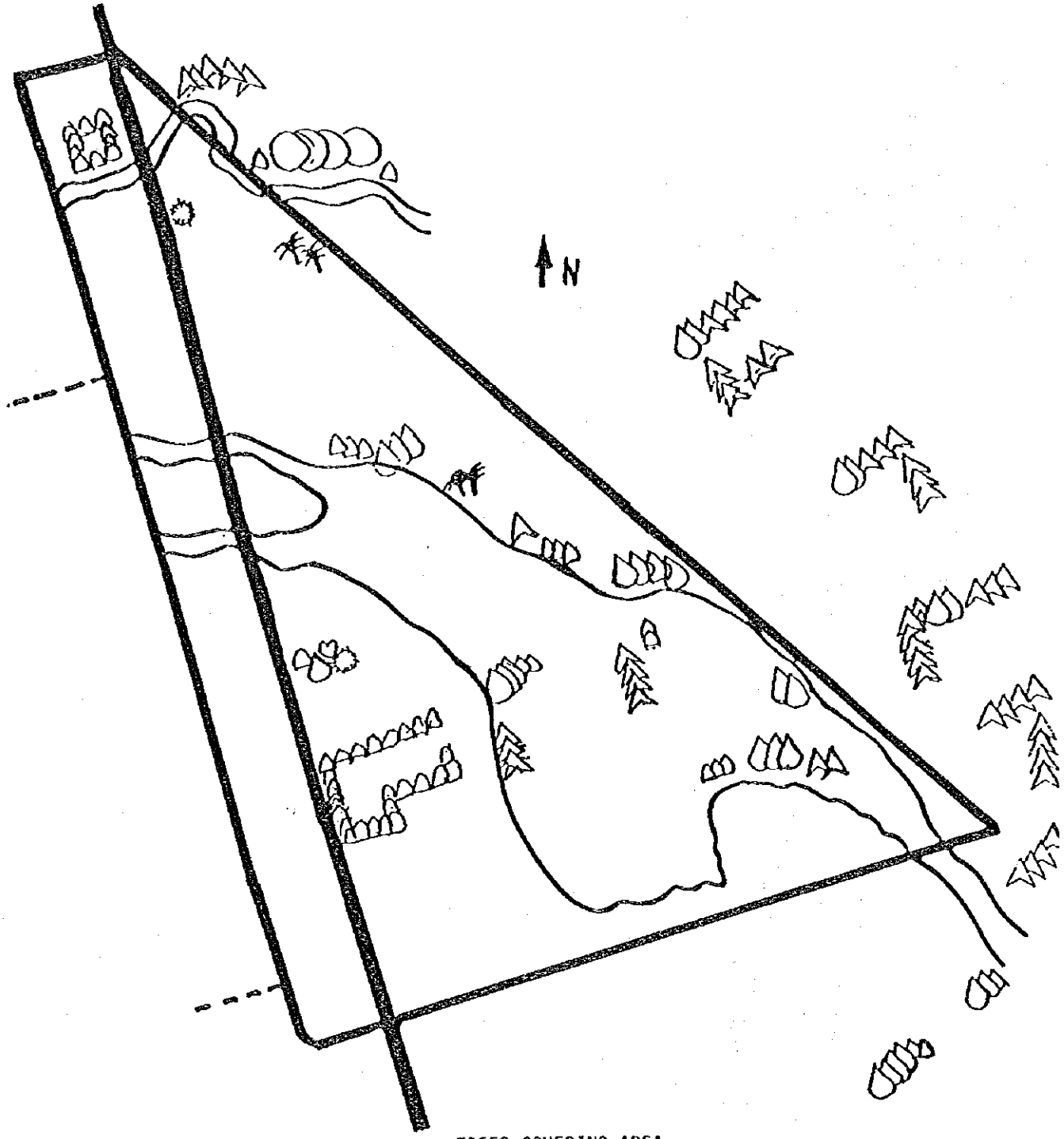
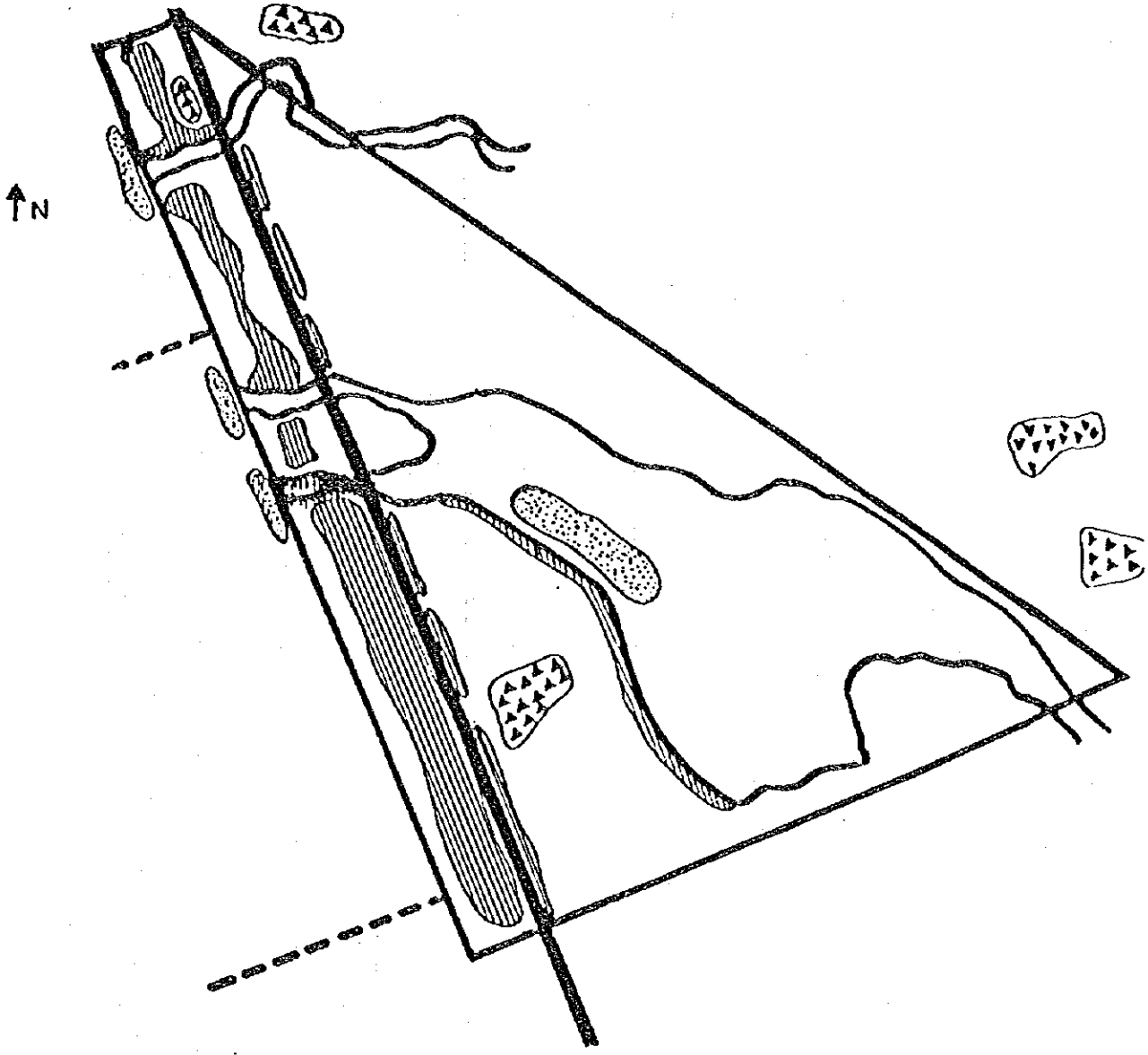


FIGURE 17.14.6



LOCATION OF ENDEMIC ANIMALS

BREEDING AREA

SEA-GULLS (nawras birds)

SPARROWS (douri birds)

FIGURE 17.14.7

TABLE 17.14.2 TAXONOMY, ABUNDANCE AND UTILITY OF GRASSES

COMMON NAME	LOCAL NAME	TAXONOMY		DENSITY			UTILITY				
		FAMILY	GENUS	LOW	MEDIUM	HIGH	TOXIC	EDIBLE	GRAZING	FOOD	MEDICAL
GRASSES	HACHIAHCH	POACEAE	POA PRATENSIS			ΦΦΦ	O		O		
DARNEL	CHILEM	POACEAE	SECALE CEREALE	Φ					O		
BERSEEM	BARSEEM	PAPILIONACEAE	TRIFOLIUM PRATENSE	Φ					O		
DONKEY CUCUMBEI	KITHA HUMAR	CUCURBITACEA	ECBALLIUM ELATERIUM		ΦΦ						O
MALLOW	KUBEZE	GERANIACEAE	PELARGONIUM		ΦΦ				O	O	
KITTEH	KALLE	APIACEAE	AMMI VISNAGA LAM		ΦΦ						O
CITRUS GRASS	HAMDIE	POLYGONACEA	RUMEX SP		ΦΦ				O	O	
STINGING NETTLE	KURRAS	URTICACEAE	URTICA SP	Φ						O	
POPPY	KICHKACH	PAPAVERACEAE	PAPAVERA RHOEAS			ΦΦΦ					O
BEAR EAR	EZN ELDUB	SCROPULARIACEAE	VERBASCUM SPECIES			ΦΦΦ		O			
AYEK	ALAYEK	EUPHORBIACEAE	DELPHINIUM SP	Φ				O			
ANDALO	OUS AJWAJ	ARACEAE	ACORUS CALAMUS		ΦΦ						O
DEER HORN	KURNALGASAL	LILIACEAE	ALOE ARBORESCENS	Φ					O		
LION TEETH	ASNASAJASAD	ASTERACAEA	TARAXACUM SP		ΦΦ				O		
ONION	BASLALONSOL	LILIACEAE	SCILLA MARTIMA		ΦΦ		O				
CANE	KASAB	POACEAE	ARONDO DAONAX			ΦΦΦ		O			
DRESS CANE	KAAB THOB	POACEAE	CYNODON SP		ΦΦ				O		
THORN BEET	ALCHABIT CHOKI	ASTERACAEA	XANTHIUM SP		ΦΦ			O			

TABLE 17.14.3 TAXONOMY AND PERCENTAGE OF WINTER FARMING

COMMON NAME	LOCAL NAME	TAXONOMY		LOCATION		PERCENTAGE
		FAMILY	GENUS	HOTHOUSES	OPEN LAND	
TOMATOES	BANDOURA	SOLANACEAE	LYCOPERSICONESCULENTUN	Φ		95%
EGGPLANT	BAZENJAN	SOLANACEAE	SOLANUM MELONGENA	Φ		2%
GREEN PEPPER	FLEFLE	SOLANACEAE	CAPSIUM ANNUM	Φ		1%
CUCUMBER	KHIAR	CUCURBITACEAE	CUCUMIS ATIVIS	Φ		1%
ZUCCHINI	KOUSSA	CUCURBITACEAE	CUCURBITA PEPO	Φ		1%
BARLEY	CHAIR	POACEAE	HORDEUM VULGARIS		Φ	10%
WHEAT	KAMEH	POACEAE	TRITICUM VULGARIS		Φ	80%
GRASS PEA	JILBAN	PAPILIONACEAE	LATHYRUS SATIVUS		Φ	5%
BROAD BEANS	FOUL	PAPILIONACEAE	VICIA FABA		Φ	2%
ONION	BACAL	AMARYLLIDACEAE	ALLIUM CEPA		Φ	2%
PEAS	BAZELA	PAPILIONACEAE	PISIUM SATIVUM		Φ	1%
RADISH	FIJIL	BRASSICACEAE	RAPHANUS VULGARIS		Φ	LOW
PARSLEY	BACDOUNES	APIACEAE	PETROSELINUM SATIVUM		Φ	LOW

TABLE 17.14.4 TAXONOMY AND PERCENTAGE OF SUMMER FARMING

COMMON NAME	LOCAL NAME	TAXONOMY		PERCENTAGE
		FAMILY	GENUS	
TOMATOES	BANDOURA	SOLANACEAE	LYCOPERSICONESCULENTUM	30%
EGGPLANT	BAZENJAN	SOLANACEAE	SOLANUM MELONGENA	20%
GREEN PEPPER	FLEFLE	SOLANACEAE	CAPSIUM ANNUM	10%
ZUCCHINI	KOUSSA	CUCURBITACEAE	CUCURBITA PEPO	10%
OKRA	BAMIA	MALVACEAE	HIBISCUS	5%
BEANS	FASSOULIA	PAPILIONACEAE	PHASEOLUS VULGARIS	10%
PEAS	BAZELA	PAPILIONACEAE	PISIUM SATIVUM	10%
COW PEAS	LOUBIA	PAPILIONACEAE	VIGNA SINENSIS	5%

TABLE 17.14.5 TAXONOMY AND ABUNDANCE OF TREES

COMMON NAME	LOCAL NAME	TAXONOMY		DENSITY		
		FAMILY	GENUS	LOW	MEDIUM	HIGH
QUININE TREE	KINA	MYRTACEAE	EUCALYPYTUS CAMALDULENSIS	Φ		
WILLOW TREE	SAFSAF	SALICACEAE	SALIX SAFSAF			ΦΦΦ
HORIZONTAL EVERGREEN CYPRESS	SAROU	CUPERSALES	CUPERSUS SEMPERVIRENS			ΦΦΦ
PYRAMID EVERGREEN CYPRESS	SAROU PYRAMID	CUPERSALES	CUPERSUS ARIZONICA			ΦΦΦ
FIG TREE	TIN	MORACEAE	FICUS CARICA		ΦΦ	
CHINA TREE	ZANZALAKT	MELIACEAE	MELIA AZE DARACH	Φ		
FAN PALM TREE	NAKIL MARWAHI	PALMACEAE	PHOENIX DACTYLIFERA		ΦΦ	
PLANE TREE	DELB	NOT CLASSIFIED	NOT CLASSIFIED		ΦΦ	

TABLE 17.14.6 TAXONOMY AND ABUNDANCE OF WILD ANIMALS

COMMON NAME	LOCAL NAME	TAXONOMY			DENSITY		
		ORDER	FAMILY	GENUS	LOW	MEDIUM	HIGH
BROWN MOUSE	FARBOUNI	RODENTIA		RATTUS SP		ΦΦ	
FIELD MOUSE	FARHOUKOUL	RODENTIA		RHIZOMYS SP		ΦΦ	
TURTLE	SULHUFAT	CHELONIA		TESTUDO SP	Φ		
CHAMELEON	AZIA	SQUAMATA	CHAMELEONTIDAE	CHAMELEON SP	Φ		
LIZARD	HARDON	SQUAMATA	GEKKONIDEA	TARENTOLA SP	Φ		
RAT	HARDON	SQUAMATA	LACERTIDAE	LACERTA SP		ΦΦ	
SPOTTED SNAKE	AFAABARCHA	SQUAMATA	ELAPIDAE	DENDROASPIS SP	Φ		
GREEN FROG	DAFDAAKDAR	ANURA		RANA ESCULANTA	Φ		
CROAKING FROG	DAFDANAKAK	ANURA		ASTYLOSTERNUS SP		ΦΦ	
WATER FLEA	BARGOUSALMAA	CLADOCERA		DAPHNIA SP	Φ		
BLACK COCKROACH	SARSOURASWAD	COLEOPTERA		BLAHA ORIENTALIS		ΦΦ	
SHIVERER	ALRAACH	ODONATA		CARDULEGASTER SP	Φ		
SNAKE	HALAZON	STYLOMMATOPHORA		HELIX SP			ΦΦΦ
SOIL WORM	DOUDEALARD	OPISTHOPORA		LUMBRICUS SP		ΦΦ	

TABLE 17.14.7 TAXONOMY AND DISTRIBUTION OF DOMESTIC ANIMALS

COMMON NAME	LOCAL NAME	TAXONOMY		NUMBER	PERCENT IN VILLAGE	
		ORDER	GENUS	(APPROXIMATE)	ARAB'SHATE	AL'KHARABE
SHEEP	GANAM	ARIODACTYLA	OVIS SP	1,000	80%	20%
COW	BAKAR	ARIODACTYLA	BISON SP	300	70%	30%
GOAT	MAEZ	ARIODACTYLA	CAPRA SP	75	60%	40%
HORSE	HUSAN	PERISSODACTYLA	EQUUS SP	50	70%	30%
MULE	BAGEL	PERISSODACTYLA				
DOG	KALB	CARNIVORA	CANIS SP	LOW		
DUCK	BATT	ANSERIFORMES	ANAS PLATYRHNCHUS	LOW		
FOWL/HEN	DAGAJE	GALLIFORMES		LOW		
PIGEON	HAMAME	COLUMBIFORMES	COLUMBA SP	LOW		

Birds

The area is inhabited by both local (endemic) and migratory (transient) birds.(Figure17.14.7) Observations showed 6 orders with 11 species, of which 7 are migratory and 4 endemic. The seagulls and sparrow are dominant in very high numbers (both are endemic) and the swallow was the only migratory species observed in high numbers. Other species were seen in small numbers. The *Upupa* and *Eudocimus* (stork) are rare migratory species in Syria. (See Table 17.14.8)

Marine Creatures

Mollusca dominate the offshore sea creatures. They are represented by the bivalve *Glycimeriss sp* which occurs in large numbers. Other gastropods occurred in lesser numbers. Mosses occurred in one species in high numbers. (See Table 17.14.9)

Ecological Value

The western area has little natural shelter from trees and bushes and the soil is not fertile. The species diversity and number of creatures is low. The ecological value is low. The eastern area has a more diverse population of flora and fauna. However this is mainly domestic animals with few naturally occurring species. The area is almost completely changed from its natural state due to the activities of man for farming.

Within 5 km of the site there are no shellfish beds, fish spawning grounds, fish breeding grounds or coral reefs. The marine area is not considered to be ecologically sensitive.

Economic Value

The western area is of little value for agriculture as it is often covered by seawater during storms, the land is rocky, and few plants will adapt to these conditions. It is mainly used for grazing and as a dumping area. The eastern area is of high economic value with the exception of the lagoon area in the centre. The area is used during both summer and winter. The hothouses provide the only income for some of the local inhabitants. The total income from the area used for hothouses is approximately 250,000 US dollars per year.

Consultation With Local Population

A considerable amount of time was spent on the site surveys, both on land and on the sea. During these periods the opportunity was taken to talk to local villagers and gain their opinions on any areas of concern. Also local officials such as the senior police officers were consulted to gain the general impression on the proposed plans. Dust was a common topic as most persons were aware of the problems over handling of phosphate dust at Tartous. However on balance the local populations where in favor of the port as they saw it as boosting the economy of the area which they feel is low relative to other parts of Syria. Without exception

TABLE 17.14.8 TAXONOMY AND ABUNDANCE OF BIRDS

COMMON NAME	LOCAL NAME	TAXONOMY		HABITAT		DENSITY			
		ORDER	GENUS	MIGRATORY	ENDEMIC	RARE	LOW	MEDIUM	HIGH
SEAGULL	NAWRAS	CHARADRIIFORMES	LARUS MINUTUR		Φ				ΦΦΦ
STORK	LOKLOK	CICONIIFORMES	EUDOCIMUS SP	Φ		Φ			
SWALLOW	SNOUNOU	PASSERIFORMES		Φ					ΦΦΦ
WILD PIGEON	HAMAMBARI	COLUMBIFORMES	DOVE SP	Φ					
WILD DUCK	BATBARI	ANSERIFORMES	ANAC CRECCA	Φ		Φ			
KHURSHANNEH	KURCHANI	CHARADRIIFORMES	TERNS SP		Φ		Φ		
WATER COCK	DWAIKALMAA	CHARADRIIFORMES	SANDPIPER SP	Φ	Φ		Φ		
SPARROW	DOURI	PASSERIFORMES	SYLVIA SP	Φ	Φ	Φ			
BLACKBIRD	CHAHROUR	PASSERIFORMES		Φ			Φ		
STARLING	ZARZOUR	PASSERIFORMES		Φ			Φ		
HOOPOE	HUDHUD	CORACIIFORMES	UPUPA SP	Φ		Φ			

TABLE 17.14.9 TAXONOMY AND ABUNDANCE OF MARINE ANIMALS

COMMON NAME	LOCAL NAME	TAXONOMY			DENSITY		
		MOLLUSCA		ALGAE	LOW	MEDIUM	HIGH
		GASTROPODA	BIVALVE				
SEA LETTUCE	KASALBAHR			ULVA SP			ΦΦΦ
NOT KNOWN	NOT KNOWN		GLYCIMRRIS SP				ΦΦΦ
PEARL SHELL	SADAF LOULOU		PINCTADA SP		Φ		
NOT KNOWN	NOT KNOWN	THAIS HAEMASTOMA				ΦΦ	
NOT KNOWN	NOT KNOWN	MONODONTA SP				ΦΦ	
PTOLEMIE	BATLYOUS	PATELLA SP			Φ		
NOT KNOWN	NOT KNOWN	VASUM SP			Φ		
NOT KNOWN	NOT KNOWN	NATICARIUS SP			Φ		

all persons contacted were most helpful and cooperative.

17.14.6 Assessment of Potential Major Impacts

The potential major impacts are discussed below.

Water Quality
Dredging of sediments.
In the event of dredging, two factors are of concern with respect to heavy metals. Firstly stirring up the bottom sediments may generate heavy metals into the water. These can then adversely effect sealife, in particular shell fish. Secondly, if the dredged material has to be dumped at sea, again sealife may be adversely affected. The field survey has determined the heavy metal concentrations of the sediments on the seabed around the intended site. They are low in heavy metals, unlike the sediments at Latakia and Tartous. In fact the two main chemicals of concern, arsenic and mercury, were not detected in the analysis. Handling of dredged materials does not pose a potential impact from heavy metals.

Dredging can also stir up fine particles which can affect the clarity of the water. If suction dredging is used then the solids are collected and the excess water discharged over the side of the vessel. This water usually contains the fine components of the sediments and can leave a visible plume of "muddy" water on the surface. The direction of this will depend on the combination of the tides and current. The length of the plume will depend on the strength of the currents. The tidal range in the area is very low and the long shore current is thought to be low, less than 1-2 knots. Therefore the dispersion of the plume will not be great which is disadvantageous. However the extent of the plume will not be great which is advantageous. At the moment the water quality is moderate having a secchi depth of 5 metres, which is surprisingly clear as the suspended solids is 200-300 mg/l which would be considered high. Dredging discharges can typically be several thousand mg/l but will rapidly mix within several hundred metres of the boat to the order 100-200 mg/l. Therefore the levels generated would quickly reduce to the same order as those currently existing. In would be unusual for the plume to extend more than one kilometre from the dredging vessel.

The effect of increased turbidity can generally be thought of in two ways. Sediments falling to the bottom can smother benthic (bottom living) organisms causing death and corals are usually the main species of concern. Or increased turbidity can reduce sunlight penetration, cutdown on photosynthesis, and reduce the primary productivity of the seawater column on which the rest of the ecological food pyramid rely for food supply. This can cause the food chain to collapse. In this case there are no coral reefs in the vicinity which would be at risk. Also the existing turbidity is quite high and the marine ecosystem must have adapted to this. The analysis of the bottom sediments shows that the particle size distribution varies from north to south. In the north of the site the sediments are coarse and

completely larger than 425 microns. To the south the sediments are silty with a large component of particles less than 106 microns. Less turbidity can be expected from dredging in the north of the site than in the south. As the prevailing current is from the south to the north the higher turbidity will have chance to disperse before reaching the beaches of Hamidie. There are no shellfish or fish spawning or feeding grounds in the area. Therefore the impacts of dredging discharges are not considered to be significant.
There could be some disturbance due to construction of the breakwaters which could lead to increased turbidity of water. However it should be noted that these will be temporary effects, as will be dredging, and no long term adverse effects are anticipated.

Hydrological Effects.

The construction may form a restriction of the seaway to coastal vessels. The only regular passenger services in the area are to Arwad Island which is well removed to the north. Any obstructions will not significantly affect local transportation and is considered to be a minor effect.

Interruption to Free Flowing Coastal Current.

Concerns have been expressed by the local authorities over effects on littoral drift. The construction of breakwaters can cause erosion and deposition if coasts experience a strong longshore current and if rivers flowing into the sea carry a heavy sediment load. There is no evidence of this occurring and no physical signs of erosion or littoral accretion were seen during site inspections. Therefore this is not considered to be a significant effect.

Air Quality

A major reason for building the new port and relocating "dirty" cargoes to this site is to remove a source of air pollution from a residential area. It is accepted that some dust may arise from the new port due to the nature of the operation, but efforts will be made to minimise this. Bulk cargo handling will be by means of enclosed conveyors, unlike at Tartous where there are many openings in the handling system through which dust can escape. There is currently insufficient technical detail on the handling system to carry out a full air pollution prediction exercise but initial calculations are given below to assess the potential impacts.

Ambient Air Quality

The existing air quality was assessed by measurement. This was for Total Suspended Particulates (TSP) or dust. The recorded levels were high being over 2,000mg/m^3. The standard is 260mg/m^3. This was due to the high winds which occur at that time of year. Other research has shown that TSP levels in the area

are typically below 70mg/m^3. Nevertheless this shows that the area experiences naturally occurring high levels of dust.

Dust From Loading / Unloading Operations.

The materials handling operations will be onshore within the port but due to the intended reclamation the actual loading point into the ship will be several hundred metres from the boundary fence. Also the nearest residential properties are about 1000 metres from the operation and so a distance of 1 km has been taken for assessment purposes.

According to previous studies (Reference 1) based on operational experience, phosphate handling operations can expect a loss of 1kg per tonne of handled material. This equates to 0.1% loss, or dust control handling equipment efficiency of 99.9%. This is a typical performance figure for a well maintained fabric bag filter plant. This would lead to an expected emission of 0.1% of throughput.

In order to predict dispersion patterns of TSPs one needs detailed meteorological results as input data to computer simulations. However one can examine worst case conditions over short time periods. If one assumes the wind speed and direction is constant, which is correct for short time intervals, the total emission will pass into unit volume of air which is passing over the point of emission. At the lower wind speeds, say 1m/second, this represents one cubic metre of air. Phosphate dust has a specific gravity of 2.6gm and will tend to fall rapidly to earth under gravity. Measurements carried out at Tartous during handling operations showed that under 1% of measured dust was phosphate at a distance of 1000 metres. Therefore a loss factor of 0.01 has been assumed due to gravity. Dispersion due to wind induced atmospheric mixing varies with weather, temperature, wind speed and from night to day. A loss of 1:10,000 is typical at distances of greater than 1km and could be higher as the atmospheric conditions at Hamidie are unstable due to high wind velocities. Inversions can "trap" air pollution below the inversion layer and lead to high pollution levels but there is no evidence of this occurring at Hamidie. Therefore a total loss factor due to gravity and atmospheric dispersion of 1:10^{-6} has been assumed.

The assumption above have been used to give the table below. A handling rate for phosphate of 3,000,000 tonnes per year has been taken.

This screening calculation shows dust levels of 116mg/m^3 anticipated under the assumptions made. This compares favourably with the standard of 260mg/m^3. This would be the worst 2case as phosphate dust is probably the lightest of the dusty materials being handled. Sulphur may be similar and clinker is believed to be heavier. Also not all operations would be working at the same time and the wind direction will vary so any emitted dust would be dispersed rather than all sources add together.

These calculations indicate that it is possible to keep emitted dust levels within acceptable standards if efficient dust collection devices are installed on bulk cargo handling equipment. From an operational viewpoint this desirable as the materials are products of value and their loss represents a waste of a valuable resource. Also excessive dust levels within the port will lead to increased wear and tear on equipment and increased maintenance costs.

An increase in dust levels in the vicinity may be expected with the operation of the new port. Due to the high existing dust levels this is not likely to cause nuisance. If efficient dust suppression equipment is incorporated in the design then emitted levels may be kept within acceptable standards. No other forms of air pollution such as smoke or odours are expected.

Transportation Impacts

Traffic Flows

The site is currently bounded by the road from Hamidie to Al Kharabeh. Although this is the main connecting highway to Lebanon the road is of low capacity and comprises a single carriageway of two lanes. The hard shoulder is crushed stone and there is no drainage. Although the road was probably designed for light vehicles, that is cars, it carries heavy vehicles. These are trucks carrying farm produce, buses carrying passengers to Lebanon, light passenger vehicles and farm vehicles which use the road to move around their fields. In places the surface is good, being bitumen blacktop. In other places the road surface is poor and is breaking up, which is probably due to the heavy vehicles exceeding the design specification. Passenger vehicles, especially taxis, tend to travel at high speeds. Farm vehicles travel very slowly. As a result there is a mixture of vehicle speeds and, with no lane separation, overtaking is at times dangerous. A short traffic count was made which showed the traffic flow to be approximately as follows:

Capacity	Vehicle Type	Vehicles per hour
Light	Cars, taxis	88
Medium	Buses	24
Heavy	Fuel tankers, trucks	4
Heavy	Agricultural, farm	4

This would suggest a traffic flow of around 1,000 vehicles per day. The new port operation may introduce several hundred vehicles per day. Also the construction phase may require a similar number of heavy vehicles during the reclamation phase. The road currently passes through the centre of the village of Hamidie / Arabshate. This stretch of road is very congested, the road is of poor quality, and the width of the carriageway is narrow due to encroachment by shops and pedestrians. Also there is a large school in the village and several hundred school children need to cross the road twice a day which is done in an uncontrolled fashion. There are no pedestrian crossings, traffic lights or supervised crossing.

Severance and Safety

Severance is the splitting of a community by a new road (or railway) which makes it difficult for the two halves of the community to visit each other. This may be due to heavy traffic on a road and even if footbridges are provided persons may prefer not to use them if it is easier to run across the road. This can lead to fatalities particularly with children and elderly people. The construction traffic would have an adverse effect on the road surface if they pass through the village of Hamidie as the road surface in the village is already deteriorating. Regular traffic would cause considerable congestion in the village and severance. It is recommended that a new access route be developed both for construction traffic and operational traffic. A direct connection across the farm land to the east of the site would connect to the existing road which then leads to the main highway. The land is poorly drained but this could be overcome by correct design. During the construction phase a one way circulatory system is recommended to separate trucks entering and leaving the site. This would prevent them turning across the flow of traffic and reduce the chances of accidents. It is not considered acceptable to introduce a large number of vehicles into the village due to the large numbers of pedestrians.

Railway Access and Trains.

Access by rail for bulk cargo trains will be necessary. The existing railway connects Tartous to Homs and passes about 5km from the site. It will be necessary to construct a link to the existing line and this will probably pass across the existing farm land. This will require purchase of the land from the farmers and in view of the high productivity of the land some compensation may be appropriate. Other than this train movements are not considered likely to be intrusive.

Noise and Vibration

Noise From Access Traffic.
As the site is relatively remote from residential dwellings this is not considered to be significant. It is recommended that new access roads be built and this would ensure that construction traffic does not cause increased noise levels to existing

villages.

Noise From Port Traffic.
If new access roads are constructed then noise from regular traffic is not considered likely to be intrusive.

Trains.
Access by rail for bulk cargo trains will be necessary. If a connection is made to the existing railway then the link is not likely to pass close to housing or other sensitive areas. In terms of noise and vibration people tend to be more tolerant of train noise than road traffic and no intrusion is expected.

Port Operations.
No noise intrusion from port operations is anticipated.

Vibration.
Vibration from road surfaces is primarily a function of the road surface and the axle weight of the road vehicles. If road surfaces are smooth then vibration levels are usually acceptable. Road surfaces rapidly deteriorate if excessive vehicle weights use the road as vibration from road vehicle axles increases exponentially as the fifth power of the axle weight. Therefore heavy vehicles should be restricted from poor quality roads and new access roads of suitable design load provided.

Solid Waste

There will be some solid waste generated by the port operation although at this stage the actual quantities are not known. The types of waste will include domestic garbage, office type waste such as paper, food wastes from canteen facilities, sanitary waste from toilets and washrooms, and industrial wastes such as used oil, engine replacement and maintenance parts. At the moment there is no strategy for solid waste disposal in Tartous other than removing the material outside the town and surface dumping. The result of this can be seen on many beaches which are covered in garbage, particularly plastic bags. It is recommended that a policy for waste disposal be included in the detailed design of the port facilities and this could be in collaboration with the local municipal authorities. Oil disposal is always problematical in ports as large quantities are needed before treatment facilities become cost effective. Contractors currently operate in Tartous and Latakia ports and they remove waste oils on a commercial basis. It is recommended that this practice continue but also some bulk facilities for storage of larger quantities of waste oils be provided such as bulk storage tanks. These should then be emptied by private contractors.

Hazardous Materials

In addition to low level wastes, hazardous wastes may be a concern in ports. There

are no plans to handle hazardous cargoes in the new port and no special facilities are considered necessary.

Construction Effects

Construction camp of workers.
Adverse effects from this are heavily dependent on the management and supervision of the camp. However large building works are expected over a long period of time and proper facilities should be provided. If temporary accommodation is needed for workers they must have adequate water supply and sanitary facilities.

Raw Materials.
The construction site should include areas for storage of raw materials so they do not interfere with the nearby farming activities. All bulk materials such as sand, cement etc should be stored under temporary cover such as tarpaulins or plastic sheets to prevent dust problems as the area is subject to high winds.

Site Completion
After completion of the construction it should be a contractual obligation on the contractor to make good the site. All waste should be removed and any site disturbance returned to its natural state. Waste materials such as plastic sheeting, wire or empty drums should be removed as they can be a health hazard to grazing animals, of which there are large numbers on the nearby fields.

Quarrying Areas.
The reclamation may require more infill material than will be available from dredging. Extra material will be required and this must come from local quarries. The location of these will probably be existing quarries at Homs. If new material is required from new locations then the sites should be reinstated after use to avoid spoiling the appearance of the area.

Socio-economic Effects

Social Aspects
The area selected is not close to large urban centres. The incursion of workers is not likely to place a burden on local facilities or cause undue disruption.

Cultural aspects.
There are no historical, religious or cultural artefacts in the immediate vicinity which may be affected. The nearest is the historical site at Amrit to the north. No adverse effects are anticipated.

Visual Impact.
There may be some visual impact from the final construction due to elevated cranes and lights at night. As there is no major residential centre nearby, and the

area is not intended for tourist development, this is not considered significant.

Economic Aspects.

The land along the coastal plain is valuable to Syria as there is a shortage of good agricultural land. The avoidance of farmland acquisition is a high priority and reclamation which avoids using fertile land is intended. There may be some loss of farmland to provide access to the port. On balance the port should boost the economy of the area by new job creation and the growth of secondary commercial activities around the port.

17.14.7 Mitigation Measures

Mitigation measures are those extra actions necessary to reduce environmental impacts to an acceptable level. The following are recommended:

- Provision of dust control equipment on all bulk cargo handling facilities where dust generation may occur to an efficiency of 99.9%. This should be achievable by fabric bag filter plants.
- Implementation of a solid waste management plan in collaboration with the local authorities.
- Provision of bulk storage facilities for waste oil from ships and port equipment.
- During construction, storage of all raw materials under cover to prevent loss during high winds and dust nuisance to neighbours.
- Provision of new access roads for construction traffic and port operations traffic to prevent congestion in the nearby villages.

Subject to the above the conceptual design is considered environmentally acceptable.

17.14.8 Conclusions

The existing environmental conditions were established by means of site surveys and analysis.

The existing ambient air quality is highly variable due to the high winds which can occur. Dust levels can naturally be very high. Dust control measures are recommended on all dusty cargo handling plant. If this is implemented to a standard of 99.9% efficiency then dust nuisance is not expected to occur.

Existing water quality is moderate to good although not extremely high. Biological contamination and high levels of suspended solids occur. Dredging will cause some increase in turbidity. This is not considered significant as the marine environment is not considered ecologically sensitive.

If additional material is required for reclamation this must be obtained from a local

source. The effect of this can be similar to quarrying and can be disruptive. The location of borrow pits should be approved by the port authority at the time of construction.

The flora and fauna that may be affected by the development has been assessed. The western area has little natural shelter from trees and bushes and the soil is not fertile. The species diversity and number of creatures is low. The ecological value is low. The eastern area has a more diverse population of flora and fauna. However this is mainly domestic animals with few naturally occurring species. The area is almost completely changed from its natural state due to the activities of man for farming.

The land is productive with the exception of the central area which is flooded in wintertime. This flooded area provides a lagoon for several thousand seagulls and some migratory birds. It is of significant economic importance but moderate ecological value.

In general the soil is of good quality but the poor drainage and salt water intrusion limits the crops which can be grown. The main crops are salt tolerant and can survive the salty soil conditions. The productive areas rely on artificial help such as hothouses, fertilisers and attention by man.

Economically, the western area is of little value for agriculture. The eastern area is of high value with the exception of the lagoon area in the centre. The area is used during both summer and winter. The total income from the area used for hothouses is approximately 250,000 US dollars per year.

The planned activities at the new port that may have significant impacts are dust generation, dredging, quarrying of material for reclamation, acquisition of agricultural land for the storage facilities and the transportation infrastructure, and the construction activities. The degree of these impacts has been examined and where appropriate mitigation measures have been recommended.

The site is considered suitable for the site of the new port. There are no environmental reasons why the project should not proceed and the proposal is considered feasible.

References

Reference 1. "Study on the Improvement Plan of the Port of Aqaba in the Hashemite Kingdom of Jordan", OCDI, OCJ, PCI, for JICA, November 1995.

Reference 2. "Environmental Guidelines for Infrastructure Projects ; Ports and Harbours", September 1992, JICA.

Reference 3. "Environmental Assessment Handbook for Port Development

Projects", December 1993, OCDI.
Reference 4. "Quality Criteria for Water", USEPA, 1986.

Chapter 18 Port Management and Operation in the Short-term Plan

18.1 Personal-arrangement of the Proposed Components

18.1.1 Latakia Port

A) Basic Concept on Organization of Cargo Handling in the Short-term Plan

a) Conventional Break Bulk Berths and Grain Terminal

The basic concept on organization of cargo handling at break bulk berth and grain terminal in Latakia Port in the Short-term Plan is the same as that in the Master Plan. The contents are as follows:

For break bulk berth:

- Present Organization for cargo handling of conventional break bulk cargo is not drastically revised in the Master Plan Stage.

- Number of cargo handling workers including drivers of cargo handling equipment at present should be adjusted to the Master Plan.

For grain terminal:

- Management and operation system at present is not drastically changed in the Master Plan stage.

- Present organization and number of employees at the grain terminal should be adjusted to the Master Plan.

b) Container Terminal

- In the Short-term Plan, the operator and system of the container terminal is the same as in the Master Plan.

- The only difference in Major functions between the Master Plan and the Short-term Plan is the repairing of containers. Because there is no repair shop in the Short-term Plan, the container can't be repaired at the container terminal.

B) Number of Cargo Handling Workers(including Drivers of Cargo Handling Equipment) for Conventional General Cargo.

The procedure and method to calculate the number of cargo handling workers and drivers of cargo handling equipment for conventional general cargo in the Short term Plan are the same as in the Master Plan.

The number of cargo handling workers and drivers of cargo handling equipment for conventional general cargo in the Short-term Plan are about 1,400 workers and 850 drivers, respectively.

C) Number of Employees at Grain Terminal in the Short-term Plan

Organization of Grain Terminal at Latakia Port in the Short-term Plan is the same

as that in the Master Plan. Therefore, the number of employees at grain terminal in the Short-term Plan is the same as in the Master Plan.

D) Number of Employees at Container Terminal in the Short-term Plan
The number of employees at the container terminal in the Short-term Plan is decided considering the difference of the organization and the number of cargo handling equipment.

Table 18.1.1 shows the number of employees at container terminal in Latakia Port in The Short-term Plan.

Table 18.1.1 Required Number of Employees at Container Terminal in the Short-term Plan

unit:persons

Section	Employees
Maneger of Container Terminal Division	1
Administration Department	10
Operation Department	168
Maintenance Department	12
C. F. S. Department	16
Total	207

18.1.2 Tartous Port

A) Basic Concept on Organization of Cargo Handling

a) Conventional Break Bulk Berths and Grain Terminal
The basic concept on organization of cargo handling at break bulk berth and grain terminal in Tartous Port in the Short-term Plan is the same as that in the Master Plan.

b) Multi-purpose Terminal
In the Short-term Plan, the operator and system of the container handling is the same as in the Master Plan.

The difference in major functions between the Master Plan and the Short-term Plan is as follows:
- In the Master Plan, the terminal is exclusively used for containers. In the Short-term Plan, the terminal is used for container and conventional break bulk cargoes.
- In the Master Plan, the terminal has a repair shop for containers. However, there is no repair shop in the Short-term Plan, therefore, the containers can't be repaired at the terminal.

B) Number of Cargo Handling Workers(including Drivers of Cargo Handling Equipment) for Conventional General Cargo.

The procedure and method to calculate the number of cargo handling workers and drivers of cargo handling equipment for conventional general cargo in the Short term Plan are the same as in the Master Plan.

The number of cargo handling workers and drivers of cargo handling equipment, for conventional general cargo in the Short-term Plan are about 1,200 workers and 750 drivers, respectively.

C) Number of Employees at Grain Terminal in the Short-term Plan
Organization of grain terminals at Tartous Port in the Short-term Plan is the same as that in the Master Plan. Therefore, the number of employees at grain terminal in the Short-term Plan is the same as in the Master Plan.

D) Number of Employees at Multi-purpose Terminal in the Short-term Plan
The number of employees at the Multi-purpose Terminal in the Short-term Plan is decided considering the difference of the organization and the number of cargo handling equipment at the container terminal in the Master Plan.

Table 18.1.2 shows the number of employees at the multi-purpose terminal in Tartous Port in the Short-term Plan.

Table 18.1.2 Required Number of Employees at Multi-purpose Terminal in Tartous Port in the Short-term Plan

unit:persons

Section	Employees
Manager of Multipurpose Terminal Division	1
Administration Department	9
Operation Department	116
Maintenance Department	10
Shed Department	14
Total	150

18.1.3 New Port

Primary factors of deciding number of employees for cargo handling at port in general are as follows:

1.Packing style of cargo
2.Cargo handling system
3.Cargo handling productivity
4.Number of berths
5.cargo handling volume

In the Short-term Plan, packing style, cargo handling system, cargo handling productivity and number of berths are almost the same as those of the Master Plan. There is not a large difference in the cargo handling volume per commodity between the Master Plan and the Short-term Plan.

Therefore, the number of cargo handling employees in the Short-term Plan is almost the same as that in the Master Plan.

18.2 Human Resources Development in the Short-term Plan

18.2.1 Training Methods and Curriculum for Port Employees

18.2.1.1 Cargo Handling Operation

Training methods for employees of the ports where projects proposed by this study are expected to be materialized are described by category of cargo-handling as follows.

(1) Container-Handling

In the opening of the new container terminals under the closed terminal operation system at the ports of Latakia and Tartous, it will be necessary to train new recruits to acquire the operational know-how and skills to control container boxes within the terminals. Containers are currently controlled according to the container stacking plan and ship stowage plan supported by skilled operations of container-handling machines and adequate documentation using computers.

For the personnel at a control office, it is necessary to invite several foreign experts specializing yard planning, stowage planning and documentation, to assist in on-the-job training.

For the operators of newly introduced machines such as container gantry cranes and transfer cranes, machine manufacturers generally dispatch operational instructors in the beginning of the operations. They will transfer operational skills mainly by on-the-job training using machines newly procured at the actual container yard.

At a modern container terminal, it is necessary to prepare a maintenance shop for container-handling machines within the terminal. It is also expected that manufacturers of newly introduced machines dispatch maintenance engineers to give on- the-job training to ports' engineers/mechanics at the work shops in the beginning of the operations.

Prior to on-the-job training, it is advisable to teach the theory of the newly introduced technology in the various fields for the employees by the respective experts at their offices or special lecture rooms prepared within the ports.

Once personnel of the new terminals obtain the above technology of container-handling operations from foreign experts, some of them could in turn become instructors for new comers who will be recruited or transferred from other sections thereafter.

Training curriculum of container-handling is listed as follows by job classification:

1) Planning of container handling operation
   Theory
   - Port management
   - Handling system
   - Shipping transport
   - Container transport
   - Structure of vessel
   - Customs system
   - Trading system
   - CFS
   - Special container handling

   Practice
   - Vessel's entry / departure
   - Loading / unloading
   - Delivery / receipt
   - Stowage plan
   - Stacking plan

2) Operation of container handling equipment
   Theory
   - Mechanical and electrical engineering
   - Specification of equipment
   - Structure and installation
   - Function of equipment
   - Fuel oil and lubricating oil
   - Cargo handling system
   - Basic dynamics

   Practice
   - Gantry crane
   - Transfer crane
   - Top-loader
   - Fork lift
   - Tractor / chassis

3) Maintenance & repair
   Theory
   - Outline of maintenance & repair
   - Maintenance & repair guidance
   - Fuel oil and lubricating oil

- Management of spare parts
- Mechanical and electrical engineering
- Report

Practice

- Gantry crane
- Transfer crane
- Top-loader
- Forklift
- Tractor / chassis

4) Container handling operation

Theory

- Container handling system
- Kinds and names of container
- Kinds of handling equipment
- Names of container parts
- Weight and measurement
- Kinds of goods
- Outline of vessels

Practice

- Container handling operation

(2) Handling of Break-Bulk Cargo

Since various kinds, types and sizes of conventional break-bulk cargoes are co-stowed in the holds of a general cargo vessel, it is essential to train planners of cargo-handling operations to arrange required gangs, cargo-handling machines including ancillary tools and storage yards for her cargo prior to her arrival at a port. In the ports of Latakia and Tartous, the planners could be trained by senior planners through on-the-job training at the respective operation division offices.

In case of public berths at the New Port, conventional break-bulk cargoes might be handled. Hence, at the start of their operations, skilled planners need to be transferred to the new
company from the existing port company, Latakia or Tartous.

It is advisable to dispatch the Syrian planners to private stevedoring companies abroad which are in operations at leading international ports under severe competition so they can observe first-hand efficient cargo-handling methods. It might be also useful to invite a foreign expert.

Together with the training of the planners of cargo-handling operations, it is necessary to train foremen who instruct gang workers to stow break-bulk cargoes adequately according to the instruction by vessel side, or conversely take out the cargoes from the holds. Stowing of loose cargoes requires a great deal of skill and

experience, which should be emphasized during training. Such training is done by senior foremen through on-the-job training.

It is also necessary to train operators of machines including quay-side cranes, tire-mounted mobile cranes and forklift trucks systematically in accordance with their procurement program. The training can be done by skilled operators through on-the-job training using actual machines at operational sites.

Training items in handling conventional break-bulk cargo are listed as follows by job classification:

1) Planning of General Cargo Handling Operation
   Theory
   - Port management
   - Handling system
   - Shipping transport
   - Structure of vessel
   - Customs system
   - Trading system

   Practice
   - Vessel's entry / departure
   - Loading / unloading
   - Delivery / receipt
   - Stowage plan

2) Operation of cargo handling equipment
   Theory
   - Mechanical and electrical engineering
   - Specification of equipment
   - Structure and installation
   - Function of equipment
   - Fuel oil and lubricating oil
   - Cargo handling system
   - Basic dynamics

   Practice
   - Jib crane (Derrick)
   - Tire-mounted mobile tower crane
   - Forklift

3) Maintenance & repair
   Theory
   - Outline of maintenance & repair
   - Maintenance & repair guidance
   - Fuel oil and lubricating oil
   - Management of spare parts

- Mechanical and electrical engineering
- Reports

Practice

- Jib crane
- Tire-mounted mobile tower crane
- Forklift

4) Cargo handling operation

Theory

- Cargo handling system
- Sling and tools
- Weight and measurement
- Kinds of Goods
- Shoring and lashing

Practice

- Cargo handling operation

(3) Handling of Bulk Cargo

In the opening of the new bulk cargo terminals at the New Port, it will be necessary to train newly recruited personnel to acquire the operational know-how and skills to control bulk cargo movements within the terminals. All movements are controlled by receiving/delivery plan, storage/stacking plan and ship stowage/unloading plan supported by skilled operations of machines for handling bulk cargoes under required quality control such as article-size distribution and moisture.

For the personnel at a control office, it is necessary to invite several foreign experts to assist in on-the-job training through actual operations at the respective control offices of the New Port.

For the operators of newly introduced machines such as shiploaders/unloaders, reclaimers/stackers, magnet-type level luffing cranes, machine manufacturers generally dispatch operational instructors in the beginning of the operations. They will transfer operational skills mainly by on-the-job training using machines newly installed at the actual yards.

At a highly-mechanized bulk cargo terminal equipped with costly machines, it is indispensable to station its own engineers/mechanics for maintenance and repairs for machines within the terminal together with a maintenance shop so as to avoid operational breakdown. In this matter, it is also expected that manufacturers of newly introduced machines dispatch maintenance engineers to give on-the-job training to the terminal' engineers/mechanics at the work shop in the beginning of the operations.

Prior to on-the-job training, it is necessary to teach the theory of the newly started operations in the various fields for the employees by the respective experts at their offices or special
lecture rooms prepared within the terminals.

Once personnel of the new terminals obtains the above technology of cargo handling operations from foreign experts, some of them could in turn become instructors for new comers who will be recruited after then.

In case of the training for the personnel of the new grain terminal at Latakia Port, it is required to adopt a similar procedure.

Generally, bulk cargo terminals are capital-intensive facilities with costly equipment and individual components are connected by belt conveyors with each other. Hence, breakdown of one part can bring down the breakdown of the total system. To avoid total breakdown or enable quick recovery from it, it might be advisable to train multi-skilled personnel. Such personnel are common at private bulk-terminals abroad under severe competition.

Training items of handling of bulk cargo are listed as follows by job classification:

1) Planning of Bulk Cargo Handling Operation
   Theory
   - Port management
   - Handling system
   - Shipping transport
   - Structure of vessel
   - Customs system
   - Trading system

   Practice
   - Vessel's entry / departure
   - Loading / unloading
   - Delivery / receipt
   - Stowage plan

2) Operation of cargo handling equipment
   Theory
   - Mechanical and electrical engineering
   - Specification of equipment
   - Structure and installation
   - Function of equipment
   - Fuel oil and lubricating oil
   - Cargo handling system
   - Basic dynamics

   Practice
   - Shiploader / unloader

- Reclaimer / stacker
- Bulldozer
- Silo equipment
- Level luffing crane

3) Maintenance & repair

Theory
- Outline of maintenance & repair
- Maintenance & repair guidance
- Fuel oil and lubricating oil
- Management of spare parts
- Mechanical and electrical engineering
- Report

Practice
- Shiploader / unloader
- Reclaimer / stacker
- Level luffing crane
- Bulldozer
- Silo equipment

4) Cargo handling operation

Theory
- Cargo handling system
- Weight and measurement
- Kinds of Goods

Practice
- Cargo handling operation
- Silo operation

18.2.1.2 Training of Computer Operation

(1) On-line Operation of Terminal Computer of Port Network System

For the personnel who belong to not only cargo operation sections but administrative sections, it is necessary to participate in training courses about on-line operation of terminal computers.
The company compiling programs and setting up net work systems should dispatch instructors to every section where terminal computers are installed. Participants of training need to operate computers by themselves according to the instruction of instructors. All the employees should join the training course, but if the number of participants or period of training courses would be limited, participants of the course would need to become instructors at their sections for other employees. It is necessary for employees to ask experts questions concerning computer operations and get immediate answers.

Training items of computer operation are listed as follows:

1) How to input data
2) How to retrieve data
3) How to process data
4) How to transmit data
5) How to aggregate data and compile statistics

(Examples of data)
- Applications for vessels' entry/ departure, berthing
- Cargo handling information
  Loading/unloading plan, Stacking plan, Stowage plan, In-yard movement, CFS container control
- Receive / delivery information
  Gate-in or gate-out container, Container inventory control
- Port charge collecting information
- Vessels' information
  Vessels' calling schedule, Allocation of berths
- Statistics

(2) Off-line Operation of Terminal Computer

Personnel who belong to administration section have much opportunity to use computers at the off-line operation. Computers could change manual work at administration section more efficiently.

(Examples)
Personnel management, Salary of employees, Accounting, Documentation

A computer will become an indispensable tool for administrative work. Therefore all the staff members of administrative section have to be able to operate computers. It will be necessary for beginners to participate in basic training course. On-the-job training is the most effective method to learn how to operate a personal computer.

Training items of computer operation are listed as follows:

1) Basic operation of OS
2) Operation of application software
   - Word processor
   - Spread sheet
   - Data base

18.2.1.3 Human Resource Development for Administration Staff

For human resource development for administration staff, it is recommendable to dispatch high level personnel to other advanced foreign ports under highly market-oriented system. At these ports all the operations including administrative work are

very efficient adopting streamlined system using progressive computer systems. If they visit these ports, they would find the different way of administrative work. After returning home, they could inform other staff members of administration section. Important thing is that visiting foreign ports under severe competition internationally would be the motivation to improve work more efficiently, though it might be difficult to introduce the way of administration work in foreign ports into Syrian Ports directly for the time of being.

18.3 Organization of the New Port

(1) The Conception of the Newly Established Port Corporation

The organization of the new port corporation is based on the following premises.

1) The new port corporation reclaims necessary land and prepares the infrastructure including the fundamental facilities.
2) The state-owned companies operate each terminal. They are in charge of the usual maintenance and repairs.
3) In principal, the new port corporation makes the port plan and prepares the fund for the renewal investment and the renewal design.
4) The new port corporation ordinarily adjusts the port activities and the allotments of tugs. It also operates the public berth and maintains and repairs facilities of the port.

The new port corporation will not require a large staff as it will mainly be responsible for maintenance, coordination between the related bodies and collection of the fees charged on the leased objects.

If part of the operating staff of the existing two ports would be shifted to the new port to operate the facilities which are leased by the state-owned companies, their positions should not be retained in the existing two ports but shifted to the state-owned companies. Otherwise, independent management of the companies will be hindered which would make it difficult to achieve the original foal : effective management and operation. In the case of the entrusted operation by the existing two ports, their contract terms should be limited to a certain period and their operations should be transferred to the independent handling system of the companies.

(2) Proposed Organization of the New Port Corporation

Based on the above mentioned conditions, the organization draft of the new port corporation is presented in figure 18.3.1. The administrative section of the new port corporation succeeds in the preparatory organization for the opening. Basic staff members of administration are relatively fixed, whereas the other sections' number of personnel, for instance the section in charge of cargo handling, increases

as the cargo volume increases. However the expected volume of general cargo is not so much and computerized system should be adopted from the beginning. Therefore personnel number of the new port corporation should be kept to a minimum at the first stage.

The organization is divided into four Departments as follows.

1) Budgeting & Financial Department
   /Budget and Accounting
2) Administration Department
   /Administrative services and Security (Fire, Pollution control, Police, First Aid etc.), Training
3) Sea Machinery Department
   /Pilots, Tug handlers, Pilot boat service, Marine communications, Equipment Maintenance (Tugs, Navigational aids etc.) and so on.
4) Operating Department
   /Stevedoring, Terminal Services, etc.
5) Civil Maintenance Department
   /Property Maintenance (Building, Roads, Electorial, Lighting etc.), Equipment

Maintenance (Machinery and cranes, cars etc.) and so on.

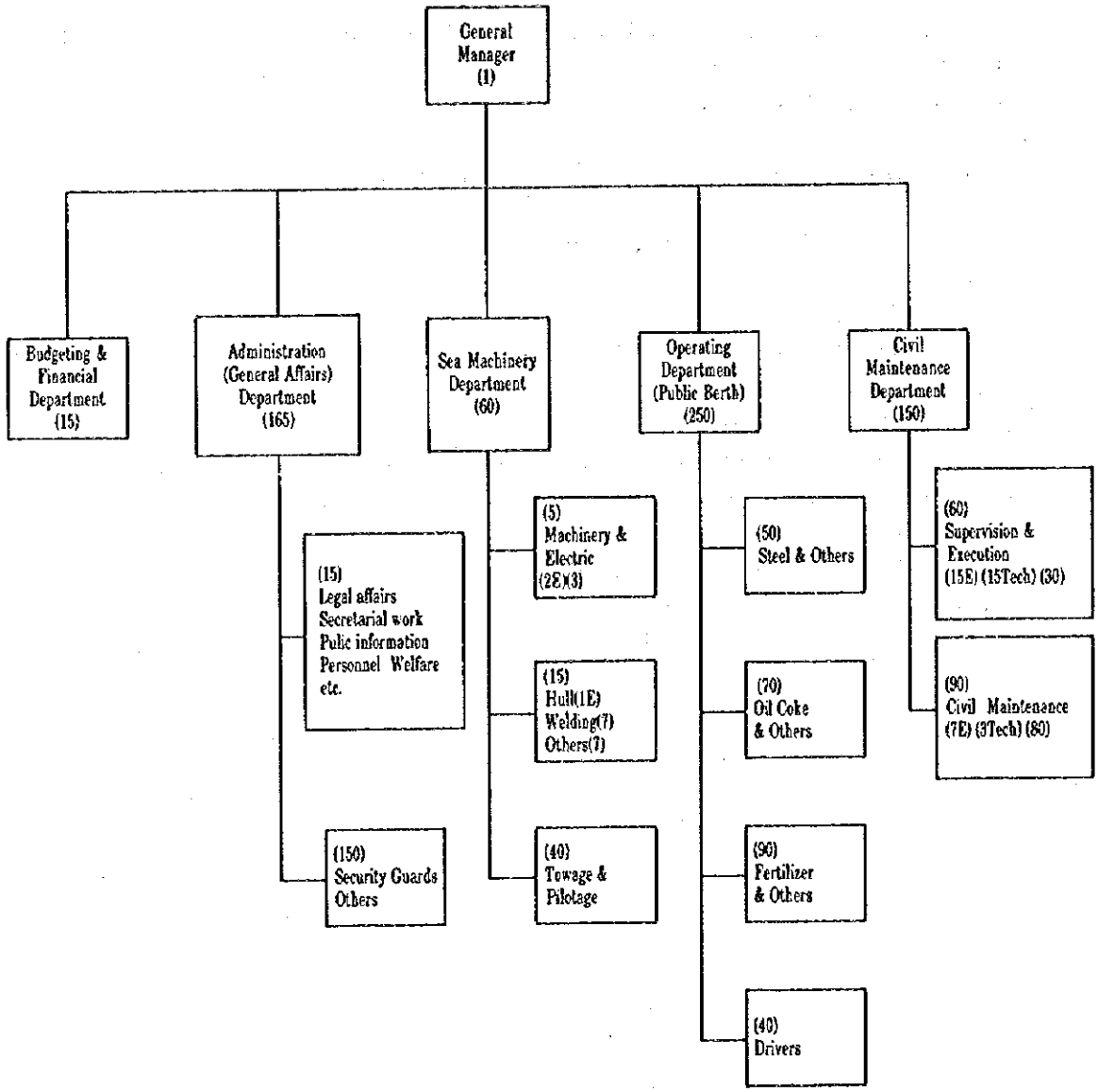


Figure 18.3.2 Proposed Organization of the New Port corporation
( )The Number of Employees / E: Engineer Tech: Technician