ABBREVIATIONS

AMTA	Arab Maritime Training Academy
APL	American President Line
BOO	Build-Own-Operate
BOT	Build-Operate-Transfer
CEO	Chief Executive Officer
CMA	Capital Market Authority
DGPMA	Directorate General of Ports and Maritime Affairs
DPA	Dubai Port Authority
DPI	Dubai Port International
DPS	Detailed Plan of Study
DWT	Dead Weight Ton
EDI	Electronic Data Interchange
EIA	Environmental Impact Assessment
EPZ	Export Processing Zone
FTZ	Free Trade Zone
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GNVQ	General National Vocational Qualification
GRT	Gross Registered Ton
GSO	the Government of the Sultanate of Oman
GWT	Gross Weight Ton
IBRD	International Bank of Reconstruction and Development
IMO	International Maritime Organization
IRR	Internal Rate of Return
ISPS	International Ship and Port Facility Security
IT	Information Technology
JICA	Japan International Cooperation Agency
LNG	Liquefied Natural Gas
MOAF	Ministry of Agriculture and Fisheries
MOCI	Ministry of Commerce and Industry
MOF	Ministry of Finance
MONE	Ministry of National Economy
MOOG	Ministry of Oil and Gas
MOTC	Ministry of Transport and Communications
MOU	Minute of Understanding
MRMEWR	Ministry of Regional Municipality, Environment and Water Resource
NVQ	National Vocational Qualification
OR.	Omani Rial

PEIE	Public Establishment for Industrial Estates
PPC	Port Planning Committee
PPRC	Port Planning and Regulatory Committee
PSA	Port of Singapore Authority
PSC	Port Services Corporation
R.O.	Rial Omani
RO/RO	Roll-on Roll-off
RPA	Port of Rotterdam Authority
RTG	Rubber Tired Gantry
SAOC	Societe Anonyme Omani Closed
SAOG	Societe Anonyme Omani General
SIPC	Sohar Industrial Port Company
SOLAS	Safety of Life at Sea
SPS	Salalah Port Services Company
SW	Scope of Work
TEU	Twenty feet Equivalent Unit
TOR	Terms of Reference
UAE	United Arab Emirates
UK	United Kingdom
WB	World Bank
WTO	World Trade Organization

MAIN REPORT

Preface

Letter of Transmittal

Location of the Study Ports

Photographs on the Study

Contents

List of Tables

List of Figures

List of Photos

CHAPTER 1

INTRODUCTION

1 INTRODUCTION

1.1 Introduction

In response to the request of the Government of the Sultanate of Oman (hereinafter referred to as "GSO"), the Government of Japan (hereinafter referred to as "GOJ") had decided to conduct National Ports Development Strategy Study in the Sultanate of Oman (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of GOJ, dispatched a Preparatory Study Team to the Sultanate of Oman in December 2003, and reached an agreement with GSO on the Scope of the Study.

Further, based on the Minutes of Meetings on the said agreement, JICA dispatched another team for the Preparatory Study (Phase 2) to conduct a study on the outline of the national ports development strategy in the Sultanate of Oman during February and April 2004.

After that, JICA dispatched the full scale study team (hereafter referred to as "JICA Study Team") to conduct the Study in full scale. This report shows the results of the Study implemented by JICA Study Team, which visited the Sultanate of Oman three times during the course of the Study. The first visit was made from July through October 2004, the second from January through February 2005, and the third during March 2005. During the stay in the Sultanate, JICA Study Team made site visits to every study port, had a series of discussions with officials of Ministries concerned, and interviewed with executives of private circles.

Further JICA Study Team held a Workshop and a Seminar in cooperation with Directorate General of Ports and Maritime Affairs (hereafter referred to as "DGPMA") of Ministry of Transportation and Communications (hereafter referred to as "MOTC") to exchange views and opinions among people concerned. Regarding environment and social aspects associated with port development, stakeholders meetings were arranged, and information disclosure at early stage was realized.

It is hoped that this Report will enhance the discussion among people in the port circles as well as those who are engaged in economic and administrative matters in both national and regional level.

1.2 Background

The government's current long-term strategy aims to double per capita income in real terms by 2020. The plan set "continued economic diversification" as one of the most important policy targets. Almost 95% of the oil produced in Oman is exported, bringing in US$8.7 billion in 2000. The Omani economy has been heavily relied on oil sector, which accounts for some 75% of government revenue.

Another important policy target for the government is to reduce the inequality among regions and among various income groups in ensuring that the fruits of development are shared by all citizens. Currently the

population concentrates in the northern regions of Batinah, Muscat, and Sharaqiyah which collectively account for 68% of the total population.

Bearing in mind the underlying need for Oman to diversify its economy and decrease dependence on oil exports, port development is expected to act as an impetus for the development of new industries and to promote private sector development. For example, Sohar was selected as the construction site of a new port to serve as a base for diversified industries. Construction works for new industries are underway.

There are six major commercial ports in the Sultanate; namely Sultan Qaboos Port, Salalah Port, Sohar Port, Khasab Port, Duqm Port, and Shinas Port. Since its opening in 1974 Sultan Qaboos Port has been playing a significant role in supporting Omani economy as the gateway port, and Salalah Port commissioned in 1998 as an international container hub-port, and has been managed and operated by a quasi-private company with more than two million TEUs. The other three major commercial ports have been developing or under planning.

Although increased importance of the port sector has been recognized for achieving the long-term economic goals of Oman, clear vision on the roles and functions among these ports has not been established. Effective coordination system of these developments as well as integrated and efficient management and operation system of national ports has not been formulated yet, while the competition among the ports in the region is becoming severe and necessity of diversification of Oman's industries and creation of job opportunity are urgent.

1.3 Objectives of the Study

The objectives of the Study are:

(1) To formulate the master plan for the strategic development of the national port system to the target year 2025

Long-term strategy of development of ports
Long-term strategy of administration, management and operation of ports

(2) To formulate the guideline for the Seventh Five-Year Development Plan (2006-2010) of the port sector

(3) To pursue technology transfer to the counterpart personnel in the course of the Study

1.4 Study Team

The JICA Study Team is made up of the following experts with the respective assignments as shown below.

Expert	Assignment
Mr. Yukio NISHIDA	Team Leader
Mr. Takao HIROTA	Port Administration 1
Mr. Hiroshi KATO	Port Planning 1

Mr. Takaaki KURODA	Port Administration 2
Mr. Hideaki SAGARA	Port Management・Operation
Mr. Nobuyuki IINUMA	Port Facility Design・Cost Estimation
Mr. Mitsuo SATO	Regional Development Planning
Mr. Tomoo AMANO	Demand Forecast /Port Planning 2
Mr. Toshiaki NAGAYA	Economic Analysis・Financial Analysis
Mr. Takashi SATO	Environmental and Social Consideration
Mr. Nobuhide MIYAWAKI	Coordination

CHAPTER 2

PRESENT SITUATION OF ADMINISTRATION, MANAGEMENT AND OPERATION

2 PRESENT SITUATION ON ADMINISTRATION, MANAGEMENT AND OPERATION

2.1 National Port System

2.1.1 General

Oman's ports and harbors system comprises of common-user ports which are catering to various industries and commercial shipping under one management, industry-specific ports which are constructed for a specific industrial use, fisheries harbors (about 12 harbors handling approximately 110,000 tons to 120,000 tons of fish landed annually), which are small public-owned harbors catering to small fishing boats, two recreational marinas which are either as stand alone facilities or part of hotel and resort ventures, and naval bases which are developed and looked after by the military departments. Coastal engineering, navigation and maritime safety are coordinated between commercial and military vessels.

The Ministry of Transport and Communications (MOTC) has a jurisdiction of six common-user ports, Sultan Qaboos Port, Salalah Port, Khasab Port, Sohar Port, Shinas Ports and Port Ad Duqm. There are two industry-specific ports, Sur (Qalhat) and Al Fahal. Port Qalhat is a LNG terminal and Port Al Fahal is an oil terminal. These ports are managed and operated by joint venture companies under the administration of the Ministry of Oil and Gas ("MOOG"). Fishery ports are under the Ministry of Agriculture & Fisheries ("MOAF"). There is no clear jurisdiction in the administration of two private marinas. Royal Oman Navy, Royal Yacht Squadron and Royal Oman Police (ROP) Coast Guard have their own base ports (See Table 2.1-1).

Table 2.1-1 Ports and Jurisdictional Organizations

Name of port	Management & Operation	Administration
Common-user port		
Sultan Qaboos	PSC	MOTC
Salalah	SPS	Ditto
Sohar	SIPC	Ditto
Khasab	MOTC	Ditto
Shinas	MOTC	Ditto
Industry-specific port		
Sur LNG Terminal	Oman LNG. LLC	MOOG
Al Fahal	Petroleum Development Oman LLC	Ditto
Fisheries port (12 ports)	MOAF	MOAF
Marina		
Bandar Elrodha	Private Company	
Muscat Yacht Club	Ditto	
Navy Port		
Widam Navy Base	Royal Oman Navy	Royal Oman Navy
Royal Yacht Squadron		
Marsa Elmakala	Royal Yacht Squadron	Diwan of Royal Court Affairs
R.O.P. Coast Guard		
Sidab	ROP Coast Guard	ROP Coast Guard

Source: The Preparatory Study Team I

2.1.2 Administration of Ports Affairs

Five ministries and one agency are main concerned organization of the common-user port administration and management. They are MOTC, the Ministry of Finance (MOF) (budget), the Ministry of National Economy (MONE) (Five Year Plans), MOAF (fishing activities and quarantine), the Ministry of Commerce and Industry (MOCI) (industrial estate, privatization) and ROP (Customs and Immigration).

Administration of port affairs is under, that has 5 General Directorate, namely Finance and Administrative Affairs, Transport Dhofar Governorate, Roads, Civil Aviation and Meteorology and Port and Maritime Affairs (DGPMA), other than a number of cross-sectional departments, offices and so on (see Figure 2.1-1).

Royal Decrees stipulate the objectives and responsibilities of Ministries and their branches. The General Directorate of Ports and Maritime Affairs is one of the five General Directorates, and it has clearly distinct two functions; Ports Affairs and Maritime Affairs. The objective of DGPMA outlines as follows:

"To execute laws and regulations and submit proposals for developing and improving the maritime activities, improving the performance of utilization of marine resources as well as to provide plans to develop the commercial sea ports."

Functions of DGPMA with respect to port matters are as follows;

- Executing laws and regulations, convention and treaties with respect to the safety of human life and ship at sea, ensuring sovereignty within Omani territorial waters, and taking all precautionary measures to prevent marine pollution,
- Continuous evaluation of the port projects with a view to modernizing, expanding or creating port, and supervising the study of aforementioned projects,
- Preparing the drafts and studies concerning expansion, development and modernization of port abilities, and reviewing and examining technical studies and designs for establishing the approved ports, and following up the execution with keeping the consistency of the works to the technical conditions and executions,
- Evaluation of port operation by the entrusted companies and organizations, examining the agreement made in this regards, and submitting the findings to the authorities concerned,
- Operation of ports and observing the efficiency of performance, and raise the performance level where necessary,
- Establishing plans and policies regarding to the development of goods and vessel movements using Omani ports, following up and preparing the detailed statistics on ships and goods in Omani ports, analyzing and studying these statistics and extracting the results and indicators of port performances,

- Conducting site survey to compare fees, tariff and wages with designated performances or operation cost,
- Representing the Sultanate to conferences, seminars and the maritime organizations and fo0llowing up the implementation of the resolution and recommendations.

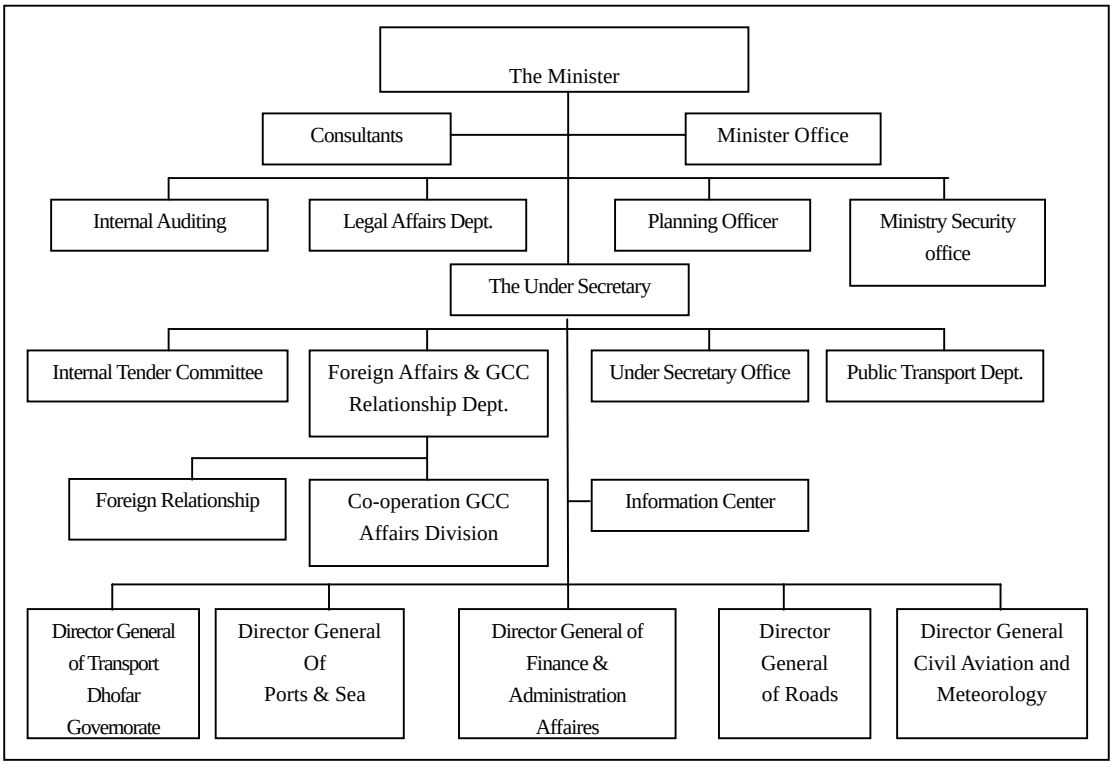
Within the Directorate, the following departments are attached;

- Maritime Affairs Department,
- Department of Development and Marketing,
- Port Affairs Department, and
- Sohar Port Department.

Organization Chart of MOTC and DGPMA is shown in Figure 2.1-1 and 2.1-2.

Staff number of DGPMA is nearly 60. Professionals of port affairs are less than 20, but qualified expert may be much less. It is observed that such a few number of personnel may not cover the functions shown in above, and cannot deploy to all the department and divisions in DGPMA port sector (Figure 2.1-2).

Figure 2.1-1 Organization Chart of MOTC

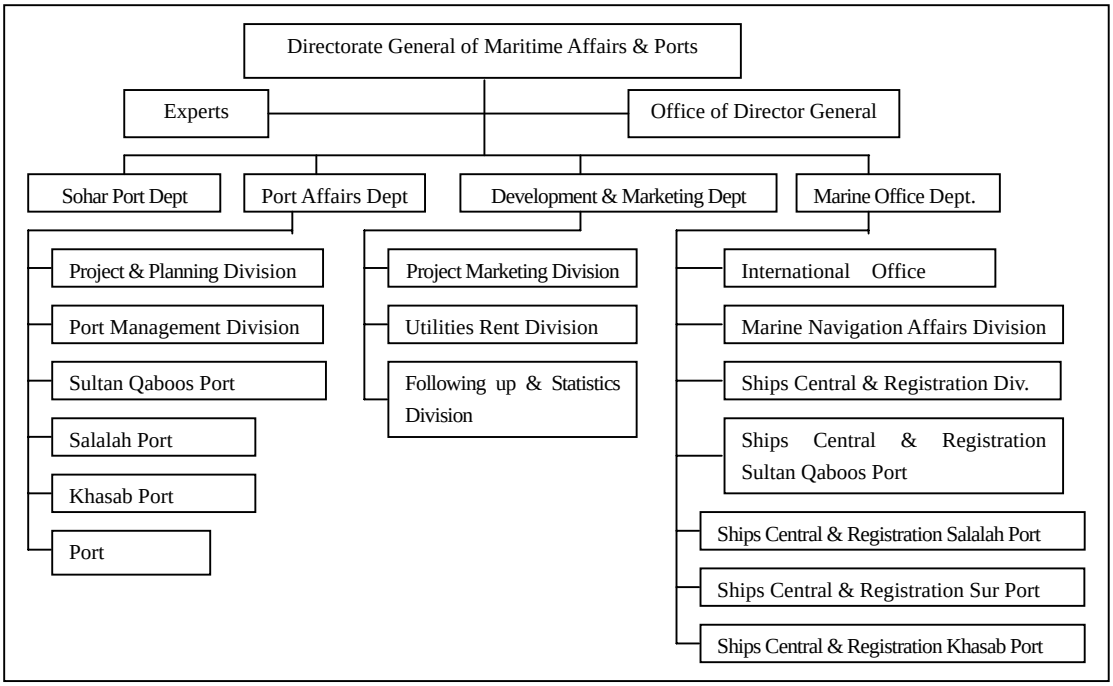


Source: DGPMA

These personnel have inevitably to work for affairs or project basis, supported by DG of Finance and Administration Affairs and Legal Department. This working arrangement may be sensible for keeping flexible activity, bearing in mind that numbers of ports are very limited and demand for work of port by port may occur in different timing.

However, shortage of professional staff may cause some harm to carry out some routine activity such as inspection of assets and collation of data transmitted from each port, since these works may not suitable for outsourcing.

Figure 2.1-2 Organization Chart of DGPMA in 2004



Source: DGPMA

2.2 Sultan Qaboos Port

2.2.1 General

As a priority project, GSO developed the infrastructures of Sultan Qaboos Port and the initial stage completed in 1974 with a capacity to handle 2 million tons annually. Since then many improvements have been made including dredging the harbor entrance to a depth of 13 meters. The spoil from this and other operations has been used for land reclamation in Shutaifi Bay where a 150,000 sq meter container storage area has been created. The MOTC installed two quay side gantry cranes in 1981 and two quay cranes were added in 1992 with the outreach of 36m. In 1993, PSC purchased another quay side gantry crane with the same specification of cranes installed in the previous year by MOTC. In 2002, MSC started to operate transshipment service for containers.

2.2.2 Management and Organization

The PSC（SAOG）is registered as an Public Joint Stock Company, in accordance with Royal Decree 46/76 issued on 17 November 1976. The Corporation operates and maintains Sultan Qaboos Port at Muscat. On 29 November 1977, the Corporation signed the agreement with GSO to operate the Government Port facilities for 30 years.

When PSC was established, the government held 58.56% of the shares. The government portion has been reduced to 35.49% in 31 December 2003, resulting the number of government officials among the 12 Board of Directors decreased from 7 to 3.

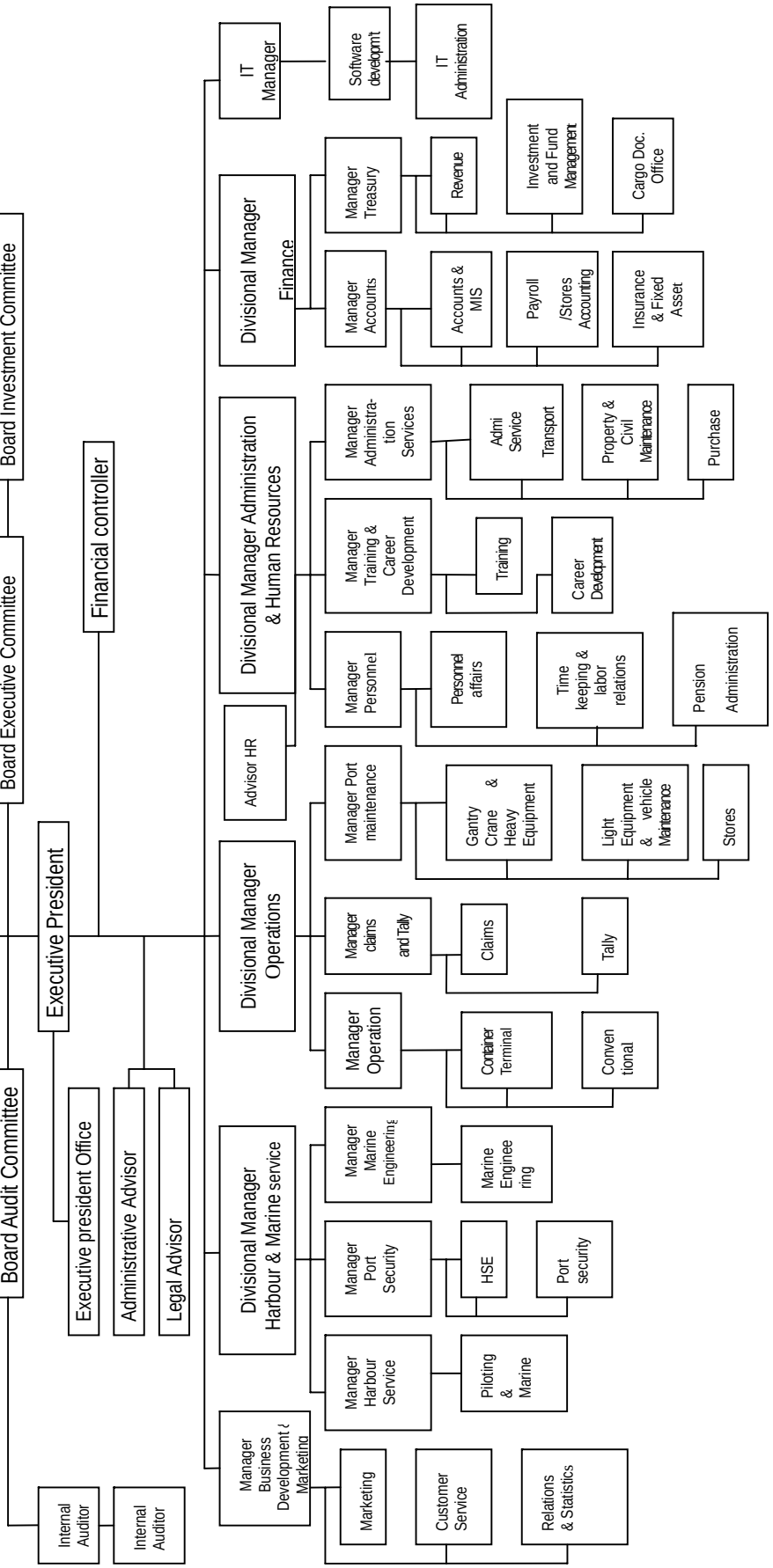
Current Board consists of 7 members of the Board of Directors among which 3 members are from the Government, Ministry of Finance (Chairman of the Board), the Director General of Customs (Royal Oman Police), and the Ministry of Transport & Communications. Other members are from industry and financial sectors including, Representative of Middle East investment Co.

There are three Committees in the Board, namely, Executive Committee, Investment Committee and Audit Committee. Number of the Audit Committee members is 3, Investment Committee 3 (one of the members also assigned in the Audit Committee), and Executive Committee 3 (one of which is the Chairman). No representatives from private port users including shipping and traders are included.

The Corporation's current concession agreement with the Government is due to expire in November 2006. The present management is hoping to renew the contract after expiration. The organization chart of PSC is shown in the Figure 2.2-1.

At the establishment of PSC, non-fixed properties in the port area which were owned by MQA (Mina Qaboos Authority) and OPSC (Oman Port Services Company) were transferred to PSC, but the GSO retains the fixed properties. While MOTC is responsible to provide infrastructures (fixed properties), PSC is responsible for the management, procurement of terminal facilities (non-fixed) and maintenance. PSC provides all port services including navigation aids and vessel control.

Figure 2.2-1 Organization Chart of PSC



Source: JICA Study Team

Table 2.2-1 Management Scheme of Sultan Qaboos Port

Land, Infrastructure	Government
Cargo Handling Equipment	PSC
Infrastructure	
Dredging	Government
Breakwater	Government
Berthing Facilities	Government
Superstructure	
Buildings (Sheds, Workshop, Store etc.)	Government
Gate and fence	
Gantry Cranes (Initia3 sets)	Government
(Later sets)	PSC
Cargo Handling equipment	PSC
Terminal Operation	PSC
Navigation Control	PSC

Source: JICA Study Team

Collecting port dues is PSC's competency. Infrastructure development is conducted by the government with its funds.

The tariff was initially fixed in 1981 amended in 1992 and May 2003 by MOTC. The 2003 amendment adjusted the tariff structures to simplify from previous one and resulted approximately 10 to 15% increase in average. As per Ministerial Resolution No. 166/97 of 6.10.97 by MOTC, PSC is authorized to grant concessions in individual cases in the interest of PSC up to a maximum limit of 40% of the fixed tariff. This is in line with the government policy to advance privatization.

Day to day management is conducted by the Executive President & Secretary to the Board of Directors. The major departments include Operations, Harbor & Marine Service, Business Development & Marketing, Administration & Human Resources, Finance and IT. September 2004 was 661.

2.2.3 Financial Condition

(1) Franchise Fee and Rental Fee

In accordance with the Agreement; the Royal Decree 46/76, as amended by Royal Decree 24/84 dated 11 March 1984; and the Ministerial Decision 2/44/84 dated 2 April 1984, as amended by Ministerial Decision 180/98 dated 25 October 1998 and Ministerial Decision 215/T/ 2001 dated 13 August 2001, PSC is subject to pay franchise fees and rent to the Government to operate, maintain and use of the operating facilities at the Port.

Rental fee is a basic yearly fee. Franchise fee is a profit share for the government in return for the use of the utilities and facilities provided by the government and for the exclusive right given to the PSC to act as the operator of Sultan Qaboos Port. PSC pays rental fee of R.O.160,000 which was raised from R.O. 100,000 in 2000.

Franchise fee was set in 1994 with a calculation of 50 % of after tax less 15% share capital of the same

year. Payment is made in quarterly basis first and adjusted at the end of the year after the dividend was determined. In 2003 PSC paid franchise fee of R.O.189,617. The franchise fee varies according to the profit level. Franchise fee is not paid in 1999 because PSC operated in deficit. In 2000 the deduction of share capital was much more than now and there was no due payment.

(2) Financial Statements

PSC's consolidated balance sheet, income statement and cashflow statement from 1999 to 2003 are shown as following tables. Operating revenue is increasing according to the increase of cargo throughput.

Table 2.2-2 Balance Sheet (Digest) Unit: R.O.

	1999	2000	2001	2002	2003
Non-current assets	13,090,369	11,670,518	10,928,269	11,588,968	12,758,101
Current assets	5,509,769	5,250,292	5,548,746	6,230,899	7,599,683
Total assets	18,600,138	16,920,810	16,477,015	17,819,867	20,357,784
Shareholders' equity	12,185,293	12,341,151	13,539,246	14,576,181	16,382,263
Non-current liabilities	2,645,417	1,591,145	0	1,287,471	1,476,493
Current liabilities	3,769,428	2,988,514	2,937,769	1,956,215	2,499,028
Total liabilities	6,414,845	4,579,659	2,937,769	3,243,686	3,975,521
Shareholders' funds and liabilities	18,600,138	16,920,810	16,477,015	17,819,867	20,357,784

Source: PSC Annual Report 2003, 2002, 2001, and 2000

Table 2.2-3 Income Statement (Digest) Unit: R.O.

	1999	2000	2001	2002	2003
Revenue	7,328,206	7,557,127	8,404,971	9,457,053	11,716,029
Expenses	6,060,479	6,142,892	6,640,339	7,107,815	8,910,252
Profit from operations	1,267,727	1,414,236	1,764,632	2,349,238	2,805,777
Net investment income/(loss)				-46840	526,295
Profit before tax	1,066,242	1,039,288	1,887,477	2,302,398	3,332,072
Taxation	0	116,367	156,166	203,053	359,455
Extraordinary item, Payment to PASI	2,937,500	-	-	-	-
Net profit for the year	-1,871,258	922,921	1,731,311	2,099,345	2,972,617

Note: The extraordinary item is integration of the pension fund with Public Authority Social Insurance "PASI"

Source: PSC Annual Report 2002, 2001, and 2000

Table 2.2-4 Cashflow Statement (Digest) Unit: R.O.

	1999	2000	2001	2002	2003
Cash from Operating Activities	837,217	456,984	3,022,027	2,921,022	3,369,699
Cash from Investing Activities	313,358	447,396	326,800	-1,674,727	-1,232,569
Cash used in financing activities	-1,097,500	-917,500	-2,998,228	-1,296,000	-1,800,000
Net increase/(decrease) in cash	53,075	-13,120	350,599	-49,705	337,130
Cash at year-end (incl. S.T. Deposits)	4,437,837	4,424,717	4,775,316	4,725,611	5,062,741

Note: Policy changes in 2003 for the cash balance excluding fixed deposits 4.25mil (2002) & 4.5 mil (2003)
In this table, these deposits are included for comparative purposes.

Source: PSC Annual Report 2003, 2002, 2001, and 2000

Table 2.2-5 Financial Ratios

	1999	2000	2001	2002	2003
Operating Profit ratio	31%	31%	41%	46%	49%
Net Profit Margin (bef. Tax & Extra)	15%	14%	22%	24%	28%
Return on Asset	-10%	5%	11%	12%	15%
Return on Equity	-15%	7%	13%	14%	18%
Debt Equity Ratio	53%	37%	22%	22%	24%

Source: JICA Study Team calculated based on SC Annual Report 2003, 2002, 2001, and 2000

Table 2.2-6 Information on the Performance and Value of Shares

	1999	2000	2001	2002	2003
Basic earnings per share (R.O./Share)	-0.26	0.13	0.24	0.29	0.41
Net assets per share (R.O)	1.69	1.71	1.88	2.02	2.28
Dividend per share	0.10	0.10	0.18	0.25	0.30

Source: PSC Annual Report 2003, 2002, 2001 and 2000

PSC raised loan (interest 6%) from supplier creditors when it installed a new one quay side gantry crane. PSC has no loan now.

PSC is operating without any long-term loan. Judging from financial ratios, operating profit ratio is increasing and 49% now, and return on asset is also increasing and now 15%. These are high and profit from operation is managed it at the same time it should be noted that employee cost is also high, being almost 53% of total cost.

Average wages including salaries and bonus are around R.O. 6,600 per year per person (Table 2.2-7). It is higher than rate at SPS.

Table 2.2-7 Average Wage Unit: R.O.

	1999	2000	2001	2002	2003	2004(est)
Salaries and employee related costs (R.O)	3,502,762	3,361,561	3,574,291	3,828,563	4,487,620	4,435,543
Rate of salaries to total cost	58%	55%	54%	54%	50%	NA
No. of Personnel	746	730	727	703	679	663
Average salaries	4,695	4,605	4,916	5,446	6,609	6,690

Note: Data for 2004 is estimated by PSC accounting section.

Source: PSC Annual Report 2002, 2001, and 2000

(3) Notes to the Financial Statements

As for the revenues and expenditures, there were several revisions on both tariff and salaries in 2003.

- On May 1, the structure of tariff was revised and the unit charges were increased by approximately 12 to 15 %.
- October 1, organizational structure was changed and salary level was increased. PSC is reducing the number of personnel and raise salary level in order to attract skilled staff. It was necessary to make structural changes in order to avoid duplication of reporting. The new system is expected to continue to the future.

- In 2000 and 2001extra payment was made because of the repair of major structural defects of the headquarter building.

As for investment activities, the amount is controlled not to exceed the level of total cash on hand.

- "Investment property" is a block of building purchased in 1988 from government auction and rent out to private companies such as shipping agents and Bank Muscat. There is only one vacancy and the revenue is much better than the interest from bank deposit.
- Investment available-for-sale includes marketable securities.

(4) Procurement Procedure

PSC has its own Internal Tender Committee, and examine based on the budget.

- For the purchase of item over R.O.150,000; Management Board will give procurement policy.
- Purchase of goods and services of value up to R.O. 100; Concerned Head of Department
- Purchase of spares, lubricants and other urgent requirements up to R.O.1.000; Divisional Manager (Operations)
- Purchase of goods and services and contracts up to R.O.5,000; Internal Tender Committee
- Purchase of goods and services and contracts up to R.O.40,000; Executive President
- Purchase of goods, services and contracts up to R.O.150,000; Board Audit Committee (BAC)
- Purchase of goods, services and contracts above R.O.150,000; Board of Directors based on recommendation of BAC.

(5) Accountability and Compliance

The Corporation encloses in the 2003 Annual Report the Management Discussions and Analysis Report on Adherence to the Code of Corporate Governance (issued by the Capital Market Authority-CMA) including specific area of non-compliance (not holding of some of Board Meetings).

The Corporation enacted the Board Audit Committee in compliance with the requirement of the CMA Resolution issued on 25th December 2002. The Committee monitors the effectiveness of internal controls to ensure that they are commensurate with the size of the Corporation and the nature of its business.

A world famed auditing firm examines the financial statements as well as the corporate governance practice in accordance with the International Standards on Auditing and CMA Code of Corporate Governance. During the 2003 period, the Corporation confirmed its compliance with all applicable statutory requirements.

2.2.4 Present Operation at Sultan Qaboos Port

(1) Operation Efficiency

Sultan Qaboos port provides all the port service directly by the port. Operations Division is in charge of cargo handling and has three sub-divisions namely, Operation, Security and Maintenance.

Presently efficiency of cargo handling at Qaboos port is not satisfactory compared with international port operation standard.

Productivity for container handling is 10 to 12TEU/hr/crane in average, which is far below the international standard.

Productivity for bulk grain discharge is 5000 tons/day/ship operated by a ship gear and a pneumatic suction conveyor installed at the berth No. 2. The discharge rate is considered to be normal when considering the scale of operation. With this rate, a bulk carrier of 35000DWT can finish discharge in 7days. However, the same berth is also used for container vessels which require quick dispatch and in some case; priority is given to the container vessel and operation of the bulk carrier has to be interrupted.

Frequent discharge of vehicles causes shortage of storage space in the port as well as interference of terminal traffic flow between cars and other cargo handling. Discharge rate is generally poor because the port has insufficient number of workers to unload vehicles. And the vehicle storage yard is not located at the berth but some distance away.

Discharge of live stocks, often 5000 to 7000 sheep, at the berth No. 5, which occurs at two week intervals, also disturbs other cargo operation. Break-bulk cargo contains a significant volume of plants and equipment related to the oil and gas industries. Steel pipes for gas and oil pipe lines have been sitting in the storage yard for long period which reducing workable space of other conventional cargo.

(2) Insufficient Terminal Space and Facilities

Poor cargo handling efficiency is mainly attributable to shortage of space relative to the nature of cargo types and layout of the terminal. Several transit sheds still remain on the pier without much utilization due to containerization of general cargo. The shed space occupies limited waterfront space and obstructs cargo movement. Insufficient deep water berth makes conflict use of container vessels and grain ships at the berths No, 1 and 2.

Shortage of cargo handling equipment is another factor of poor productivity. Many machines including quay side gantry cranes are old and not sufficient in numbers and capacities to meet the demand. The ratio of equipments under repair is high due to the age of equipments, lack of spare parts and lack of adequate repair facilities and insufficient number of skilled mechanics in the port.

The total available number of RTG is 8 against 5 quay-side gantry cranes. Because of insufficient number of RTG, many containers are placed quay side without RTG. Number of tractors/trailers is not

enough for relatively long distance between container berth and the yard.

Table 2.2-8 shows condition of equipment in PSC as on 6 September 2004. The ratio of equipment under repair or maintenance in average is 15%. However, if tractors are excluded, the average equipment in repair or maintenance ratio becomes much larger. In a normal condition, this ratio must not be more than 5%.

Table 2.2-9 shows age of equipment in SPC. Much equipment exceeds 10 years of age and some are nearly 30 years old. Usual age limit of this equipment is 15 to 17 years. Older equipment becomes inefficient or difficult for repair due to lack of spare parts.

For the container operation, the port is not operated by computerized yard system. All the containers in the port are located manually causing delay in operation.

Number of reefer points is 120 at the Shutaifi yard and 192 more at the quay side yard. Some times the number is insufficient particularly when main line vessels come to the port for transshipment.

Table 2.2-8 Daily Equipment Report at PSC

Date: 6/9/2004 Time:10:00Hrs

Type of Equipment	Total Equipment	Available Equipment	Equipment not Available due to				Equipment Available %
			Routine Service	Under Repair	Awaiting Parts	Other Reason	
Quqyside Cranes	5	3	2				60.0
RTG Cranes	8	7		1			87.5
Terminal Tractors	30	27	1	2			90.0
Top Loaders	5	4			1		80.0
Empty Loaders	6	3		2	1		50.0
Mobile Cranes	6	5			1		83.3
Forklifts	40	35	1	1	3		87.5
Ro Ro Tractors	9	9					100.0
Total	109	93	4	6	6	0	85.3

Source: PSC

Table 2.2-9 Cargo Handling Equipment in PSC

Type of equipment	Number	Capacity	Year purchased
Container gantry crane	3	40T	1994x2 1996x1
Container gantry crane	2	35T	1981
RTG CRANE	8	40T	1993
Mobile crane	6	7~54T	1975~1993
Top loader	4	35T	1983~1990
Empty container handler	4	6.6~7.5T	1982~1990
Reach stacker	2	8~10T	1998
Reach stacker	3	45T	2003
Terminal tractor	30	60T	
Terminal tractor(45')	32	60T	
RO/RO tractor	8	60T	
RO/RO tractor	1	100T	
Heavy forklift	2	25T	1983~1990
Forklift	38	2~10T	1975~1993

Source: PSC

The Board of Directors is aware of these facts and has prepared remedial actions and allocated necessary budget. The annual report of PSC 2003 states that:-

- "At the end of the year, the management has confirmed an order for 2 Reach Stackers, 8 Tractors/Trailers and 2 RO/RO Tractors at a total cost of R.O. 769,195. Additional equipment is in the process of being ordered to ensure that productivity and service standards are on par with international standards."
- "The Ministry of Transport & Communications has already awarded the contracts for the construction of a well equipped workshop with all the related facilities to help maintain all the equipment and marine crafts within the port and construction of gates at the main entrance and Shutaifi area and providing for security fencing."
- "With a view to take advantage of the latest trends in information technology, the Corporation has drawn up an ambitious computerization strategy covering various areas of port operations, including berth and yard planning, cargo stacking, documentation and EDI facility with vessels' agents and other authorities. At present, the process of selecting an appropriate vendor for hardware and software for the project is in progress and the implementation of the project is planned during the period 2004-05."

On 24 August 2004, introduction of IT system into the port operation and management contract was signed. It is scheduled to start operation at the end of 2005. Introduction of IT system should have been completed years before. Consequently the performance of the port has been less efficient than international standard level. This is one of the important reasons to the lost customers, which diverted cargoes to Dubai and other UAE ports.

There is no sign of construction activities regarding workshop and construction of the gate at the new entrance for the container yard.

Because temperature in summer seasons in Muscat area exceeds 40 degrees centigrade, working condition at day time is extremely bad without any shade area or old equipment without air conditioning. This is one of the reasons that the operation efficiency in Sultan Qaboos Port is less than that of Salalah Port, where summer temperature seldom exceeds 30 degrees.

(3) Customs and Quarantine

Customs office opens at 7:30 a.m. to 1 a.m. daily. Due to increase of traffic, PSC has requested to extend Customs' office hours to 6 p.m.

Custom inspection for a FCL container is made at the customs inspection yard. After inspection is made, the document is cleared but the gate-pass is not issued on the spot. The inspected container has to be sent back to the yard until the pass is issued. For the LCL container cargo, inspection is made at the freight station in the terminal. After inspection, consignees collect cargo with own trucks.

For the export in LCL cargo are consolidated at the freight forwarders yard without using the freight

station in the port.

Customs procedures still uses documents in papers. No electronics data documents in any form, including floppy disks or CD ROM, are acceptable. More over, all the document must be written in Arabic. These procedures require additional time and costs to the port users.

Plant and animal quarantine are applied to all the imported animals and food stuff.

(4) Access road to the Port and Highway Restriction

Only one access road connecting the port to the national highway runs through the town of Mutrah and is connected to the Qurm road or Al Nadah Street. Both roads are well paved and have four lanes, but heavily loaded trucks must observe weight and time restrictions. Due to congestion in the morning and afternoon rash hour, trucks are restricted to run on the main road during that period.

The major fly-over on the trunk road and national highway has load limit of 3 tons so that trucks to and from the port have to use level road which has over-head clearance limit of 5.5 meters. According to the informal information, the design load of the fly-over portion of the highway must be 30 ton in stead of 3 ton.

Because of such restriction at the access road, creation of a new access road has been proposed. The proposed road will be constructed along the sea side of the coastal hills and will be connected to the planned national highway which is planned paralleled to the existing national highway.

The highway department of MOTC is responsible to develop the national highway and the said new highway is planned to be built to the vicinity of Al Fahal oil refinery. Beyond that point to Sultan Qaboos Port area, responsibility of planning and construction of the road is considered to be under jurisdiction of the municipality.

The Supreme Committee for Town planning is already coordinating the matter and a consultant report to build the access road from the port to the vicinity of Al Fahal oil refinery has been made to divert port traffic to the newly proposed highway without passing existing road through Mattra.

(5) Inland Container Depot (ICD)

PSC is contemplating to create an inland container depot at the vicinity of Seeb airport area. The ICD will serve as a freight station for LCL containers for both export and import. With this system, total number of trucks will be reduced and ease congestion of road traffic near the port.

The ICD will be managed by a new JV organization between PSC and Seeb Airport. The plan is not yet officially recognized in the Supreme Committee for town planning.

2.3 Salalah Port

2.3.1 General

Salalah port is located on the southern coast of Dhofar Governorate in Oman and about 20km southwest of Salalah municipality. It is the second largest city in Oman. The distance from Muscat, the capital city of Oman, to Salalah municipality is about 1,050km by road and about 660 nautical miles (about 1,200km) by sea. The port is situated about 100km east from the border of the Republic of Yemen and face the Arabian Sea.

The present port, which consists of conventional port and container terminal, is situated immediately to the north of the natural peninsula formed by a limestone ridge. A 1,400m long breakwater is extended to the northeast from the end of the peninsula and protects the port from the SW monsoon.

Until the beginning of the 1970's there was no port in the southern region of Oman and cargo to/from Dhofar was rowed ashore in small boats. During the monsoon season (form June to September), however, such small boats could not operate. The initial development of the port (Raysut Port) was executed from 1971 to 1974 and provided accommodations for small vessels with drafts up to 4m. As economic activities in the southern region began to increase, in 1976 an expansion program to enlarge the harbor to accommodate ships with drafts up to 10m was initiated. The expanded port, which was designed to handle annual cargo throughput of 1,000,000 tons, was opened in 1980. Under the Second Five Development Plan, in 1982 a container terminal was developed in the existing conventional terminal area, including one container crane, four luffing cranes and other yard facilities to improve container handling efficiency.

In May 1996 a Memorandum of Understanding was signed between the Ministry of Communication and Sea-Land Inc. and its Omani partners for the transformation of the Raysut port into a modern container terminal to attract transshipment, and the first stage of the new container terminal construction project was started. Salalah Port Services Company (SPS)(SAOG), which is responsible for management. SPS was established with a 30 year concession contract with the Omani Government holding a 20% share of SPS. Operation commenced on 1st November 1998 when the first vessel called the new container terminal.

In the mean time, the conventional port (Raysut port), remained under direct control of MOTC and the old container terminal was converted into multi-purpose berth, the existing container crane was relocated to the SPS container terminal, and a new bulk terminal was constructed.

In 2000, management of entire conventional port (Raysut port) was transferred to SPS under the revised contract between SPS and GSO.

2.3.2 Management and Organization

SPS was established in 1997 for the management & operation of the container terminal of Salalah Port and concession agreement for 30 years between the GSO and SPS was made in 1998.

Board of Directors consists of 6 members (2 from MOTC and MOF, 2 from Maersk-Sea Land, 2 from Omani private sector). Total employee of SPS is 935 as of Dec. 2003 and Omani participation rate is 61%.

Based on this Agreement, the GSO developed the infrastructure for a container terminal with an investment of 130 million US dollars, which was subsequently leased to SPS, and granted to SPS an exclusive license to operate and manage the container terminal facility. SPS executed procurement, installation and commissioning of the equipment and started to operate and maintain the facilities as a world-class container transshipment terminal at its sole cost and expense except for the infrastructure development.

SPS is obliged to ensure that an open and competitive commercial environment exists and not to discourage competition. SPS is also required to undertake marketing and related activities in order to encourage usage of the facilities by any shipping company. In addition, SPS is required to conduct training and promote employment of Omani nationals.

The revenues of the GSO from SPS consist of land lease fee, royalty fee for granting the concession, share of profit and dividend. Whether the initial investment can be recovered depends on the financial performance of SPS.

In May 2000, an Memorandum of Understanding was made between the Government and SPS to define their relationship with respect to (i) the development, management and operation of the Port by SPS (excluding the container terminal), and (ii) grant to SPS of a Right to Benefit in the Port Area.

SPS has appointed AP Moler Finance SA as the manager of the container terminal and conventional port facilities. The agreements provide for compensation to be paid to the manager by the company during the concession period comprising fees which vary dependant on the number of container handled by the company.

This management covers buildings, quays, wharves, cranes, equipment and machinery in the conventional terminal. At the same time SPS takes over tugs, pilot vessels, vessel tracking systems, harbor master functions and navigation aids. This means that SPS manages and operates all facilities in Salalah Port.

The number of shareholders is 1,851 in December 31, 2003. Percentage of the SPS's share is shown in Table 2.3-1.

Table 2.3-1 Share-Holders of SPS

SHARE-HOLDERS	SHARE(%)
The Government	20.08
Ministry of Defense Pension Funds	10.00
Dhofar International Development & Investment CO. SAOG	10.89
Others	19.00
AP Moler Finance SA	30.13
Total	100

Source: SPS Annual Report 2003

SPS provides all port services, which include tug services, fire brigade, bunkering, pilotage, and navigational services. SPS employs a total of 866 workers and its organization is basically divided into two sections; the container terminal and the conventional terminal. The container terminal employs 75 % of all employees.

Table 2.3-2 Number of Employees of SPS as of 1st July of 2000

Department	Number of Employees
Container Terminal	
Finance & Administration Department	7
Human Resources Department	17
Information Technology Department	14
Marketing & Sales Department	5
Operations Department	430
Engineering & Maintenance Department	156
Harbor Master Department	10
Sub Total	646
Conventional Terminal	
Administration	9
Facilities & Development	33
Property Department	2
Security Department	37
Operations Department	117
Engineering Department	17
Club	6
Sub Total	220
Total	866

Source: SPS

Pilot, pilot boat, tugs and lineman services are provided by a contracted company. Three pilots, 18 line handlers and 23 boat crews belong to the company.

SPS is the sole management and operation body of Salalah Port and covers not only the land area but also the inner harbor area. Navigation control is a duty of the harbor master of SPS. As a joint venture company, SPS puts priority on profit to provide shareholders with a reasonable return. In this sense potentially profitable container terminals are the main concern of SPS. SPS's basic policies are to compete with neighboring ports through providing efficient, effective, competitive and reliable services to customers.

2.3.3 MOTC in Salalah Port

Raysut port had been managed and operated in all aspects by MOTC until September of 1998. By amalgamation of Raysut with newly build Salalah container terminal, all the work previously under MOTC was transferred to SPS except for ship registration function which is run by 10 officers.

However, recent enforcement on port security control in relation to ISPS Code of SOLAS convention would need review for MOTC function at the port.

2.3.4 Financial Condition

SPS has entered into a lease agreement with the GSO in November 1998, which grants a lease of the land and infrastructure required for the container terminal facility to the company, for a term consistent with its 30 year concession period.

The company has been granted a 30 year concession by the Government to lease, equip, operate and manage the Salalah port container terminal facility, effective 29 November 1998.

SPS directly manages and operates the port both on the container terminal as well as general cargo terminal. AP Moler, under the management contract agreement, took the helm of port management. Several key managers in SPS including CEO are assigned to SPS.

(1) Financial Statements

SPS's consolidated income statement cash flow and balance sheet from 1998 to 2003 are shown as follow. Operating revenue is increasing according to the increase of cargo throughput.

Table 2.3-3 Balance Sheet Unit: R.O.

	1998	1999	2000	2001	2002	2003
Non-current assets	20,657,608	27,472,534	32,845,706	39,565,747	37,436,751	37,044,551
Current assets	3,343,471	7,858,448	8,604,048	14,420,776	12,420,244	16,177,379
Total Assets	**24,001,079**	**35,330,982**	**41,449,754**	**53,986,523**	**49,856,995**	**53,221,930**
Total Equity	12,313,216	8,563,099	10,446,412	20,298,941	21,919,496	25,889,207
Non Current Liabilities	8,856,040	18,205,712	21,012,578	24,609,837	21,961,763	18,984,228
Current Liabilities	2,831,823	8,562,171	9,990,764	9,077,745	5,975,736	8,348,495
Total Liabilities	11,687,863	26,767,883	31,003,342	33,687,582	27,937,499	27,332,723
Total Equity and Liabilities	**24,001,079**	**35,330,982**	**41,449,754**	**53,986,523**	**49,856,995**	**53,221,930**

Source: SPS Annual Reports

Table 2.3-4 Income Statements Unit: R.O.

	1998	1999	2000	2001	2002	2003
Revenue	253,757	7,140,716	14,230,894	15,636,361	16,504,902	22,018,842
Operating costs	408,949	5,751,931	8,825,813	8,486,061	8,156,607	10,494,309
Gross Profit	-155,192	1,388,785	5,405,081	7,150,300	8,348,295	11,524,533
Net profit for the year before royalty fees	-586,784	-3,750,117	1,883,313	1,820,220	2,653,413	5,017,393
Royalty fees to the Government					246,002	935,351
Net Profit/Loss for the year	-586,784	-3,750,117	1,883,313	1,820,220	2,407,411	4,082,042

Source: SPS Annual Reports

Table 2.3-5 Statement of Cashflow Unit: R.O.

	1998	1999	2000	2001	2002	2003
Cash from operations	-780,540	-538,165	6,390,762	6,414,194	7,065,655	10,237,766
Cash from investing activities	-17,964,397	-13,799,120	-8,010,503	-14,734,808	5,976,798	-7,100,807
Cash used in financing activities	14,443,777	12,471,963	1,068,088	10,105,847	-8,853,152	-4,294,997
Cash and cash equivalents at the end of the year	2,344,617	476,239	-84,235	1,680,257	5,847,113	4,649,245

Source: SPS Annual Report

Basic financial indicators are calculated in the following table. Operating profit ratio is Gross profit over operating revenue, and used as an indicator to understand the profitability of operation. The ratio of more than 50% means that the gross profit by operation is very efficiently done and direct cost is less than half.

Net profit margin is also an indicator to know the profitability in detail, and the value of more than 5% is regarded as good performance. Here in the performance of SPS shows 19% which is very good. Return on asset, Return on Equity and Debt Equity ratio, all of these ratios show very good high performance.

For investors it is good to announce the earnings per share and net assets per share. For the share distributed by 1.000 R.O./share is now earns 0.23 R.O. every year which is higher than the interest rate. Net asset becomes more than 1 Rial in 2001 and valued 1.44 in 2003.

Table 2.3-6 Financial Ratios

	1998	1999	2000	2001	2002	2003
Operating Profit ratio	-61%	19%	38%	46%	51%	52%
Net Profit Margin	-231%	-53%	13%	12%	15%	19%
Return on Asset	-2%	-11%	5%	3%	5%	8%
Return on Equity	-5%	-44%	18%	9%	11%	16%
Debt Equity Ratio	95%	313%	297%	166%	127%	106%

Source: SPS Annual Report calculated by the Study Team

Average wages around R.O. 4,400 per year per person (Table 2.3-7). It is lower than that of SPC shown in Table 2.2-7.

Table 2.3-7 Average Wage Unit: R.O.

	2000	2001	2002
Stuff Cost	4,226,651	3,848,804	3,462,846
No. of Stuff	839	829	785
Average Cost	5,038	4,643	4,411

Source: The Preparatory Study Team II

(2) Expenditure Commitment

Operating lease commitment- The company has entered into a lease agreement with the GSO in November 1998, which grants a lease of the land and infrastructure required for the container terminal facility, to the company, for a term consistent with its 30 year concession period.

Table 2.3-8 Expenditure Commitment

Future minimum lease payments (R.O.)	2001	2002	2003
Not later than one year	312,672	322,052	331,714
Later than one year and not later than five years	1,347,348	1,387,768	1,429,401
Lather than five years	11,068,757	10,706,285	10,332,935
Aggregate operating lease expenditure contracted for the balance sheet data	12,728,777	12,416,105	12,094,035

Source: SPS Annual Reports

Finance lease commitment- The Company has entered into a five year bareboat charter agreement with a company for two tugs, effective from the date of their delivery in 1999. The company has the option to purchase either of the tugs at any time during the lease period.

In consideration for granting the concession, the company pays royalty fee to the Government. In aggregate, the fees are calculated as follows;

- A fixed royalty fee of US$ 255,814 per annual, increasing at 3% per annual
- A variable royalty fee calculated in accordance with the terms set out in the agreement

During the year ended 31 December 2000, SPS was granted a further concession by the Government to equip, operate, market and manage Salalah Port conventional facility for the period co-terminus with the container terminal facility agreement. The concession term commenced on 1 October 1998. In consideration for granting the concession, the SPS shall pay the royalty fees to the Government. In aggregate, the fees are calculated as follows;

- A fixed royalty fee of R.O. 49,900 per annual, payable from 2005 onwards and increasing at 3% per annual
- A variable royalty fee calculated in accordance with the terms set out in the agreement

The concession which is co-terminus with the container terminal facility allows the company to acquire the assets and liabilities of the conventional port facility. Following the signing of the concession agreements, the company has included in the current year's financial statements, the assets, liabilities and operating result of the Salalah conventional port facility with effect from the agreements' commencement data, 1 October 1998. The fair value of assets acquires and liabilities assumed were as follows:

Assets	
Equipment	R.O. 391,209
Inventories	18,791
Accounts receivable	72,083
	482,083
Liabilities	
Amount payable to the Government	482,083

Under the terms of the concession agreements, AP Moler Finance SA (Sealand Freight Service and Partners L.L.C.) was appointed as the manager of the container terminal and conventional port facilities. The agreements provide for compensation to be paid to the manager by the company during the concession period comprising fees which vary dependant on the number of container handled by the company.

Fee paid for management services to AP Moler Terminals and Company C.L.C. amounts R.O. 1,371,692 in 2003. A cash dividend is R.O. 0.050 per share totaling R.O. 899,187.

(3) Accountability and Compliance

The Company encloses in the 2003 Annual Report the management discussions and corporate governance in accordance with the Code of Corporate Governance. The Corporate Governance Report includes the specific area of non-compliance (lack of some Board Meetings).

During the last three years time, the company does not pay any penalty and no strictures was not imposed on the Company by Muscat Security Market/CMA or any statutory authority on any matters related to the capital markets.

A world's leading auditing firm examines the financial statements as well as corporate governance practice in accordance with the International Standards on Auditing and CMA Code of Corporate Governance.

The GSO sets the Omanization Policy on the employment of Omani workers and 60% and more is the target set for the transport sector. According with this policy, SPS employed Omani workers about 62% in July 1999 and eventually fell to 54% in July 2000 caused by lack of enough number of capable Omani workers.

Training of workers is conducted by National Training Institute together with the management of SPS. Sending trainees abroad for on-the-job training at modernized container terminals and inviting experts to train workers at home are common practices.

For management purposes the company is organized into two major operating divisions-container terminal and general cargo terminal. The container terminal division is engaged in leasing, equipping, operating and managing a container terminal. The general cargo terminal division is engaged in providing stevedoring and other cargo related services to vessel and cargo operators. These divisions are the basis on which the company reports following primary segment information.

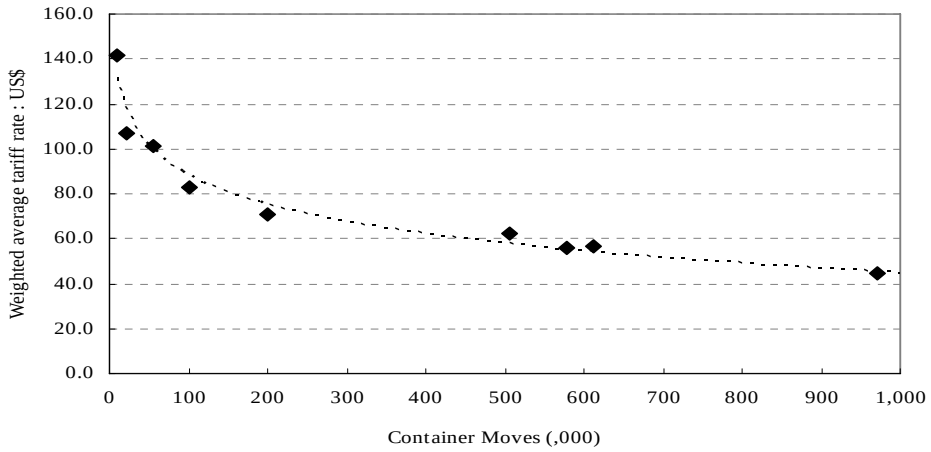
Study team estimated that more than 72 percent of total containers handled in Salalah Port were for Maersk-Sealand Line. Average of SPS's revenue from container handling charge is estimated around 13 R.O./TEU (US$ 34), and hence, Maersk-Sealand Line may have enjoyed very low level of charge. Discounted tariff is applied for excess of 200,000 moves on negotiation base according to tariff table saying that 40 footer is more favorable than 20 footer and hence Maersk-Sealand Line is enjoying more favorable situation by carrying majority of 40 footers. Tariff applied for container is shown in Table 2.3-9.

Table 2.3-9 Handling Charge Unit: US$

	Less 10,000	10,000 Move	22,000 move	55,000 Moves	100,000 Moves	200,000 Moves
Transhipment						
20' laden	140	118	89.5	87.1	81.7	70.4
20' Empty	98	88	72	71.5	71	62.4
40' laden	200	170	124	116.2	89.8	75.5
40' Empty	140	126	109	100.7	75	66.4
Import/Export						
20' laden	109	93	68	66	64	56
20' Empty	63	56	47	46.5	45.5	44
40' laden	165	136	97	90.5	88	63
40' Empty	85	78	65	60	58	53

Source: SPS

Figure 2.3-1 Handling Charge Estimated



Source: JICA Study Team

2.3.5 Present Port Operation at Salalah

(1) Container Terminal

The container terminal at Salalah was a purpose built for exclusive use for over-Panamax container ship operation. Consequently, efficiency of loading and unloading containers is sufficiently high in the normal situation. On the four container berths, 12 over-Panamax gantry cranes and one smaller gantry crane are installed. A ship is served more than three cranes when she is at the berth.

Table 2.3-10 Container Yard and Storage in Salalah Port

Area	Dimension and Equipment
Storage (Conventional Terminal)	Total Area 200,000 m2 Transit shed 4Nos.*3,000 m2 Mobile Crane (150t) 1 Unit Mobile Crane (30t) 1 Unit
Container Yard (Container Terminal)	Total Terminal Area 54 Ha Rubber Tired Gantry 24 Units Reach Stacker 6 Units Yard Tractor 66 Units Yard Chassis 81 Units Crane Maintenance Repair Two Hour Container Repair Facility Reefer Wash Facility Hazardous Containment Bays Fuel Station Emergency Power Plant 2.8MW Sewage Treatment Plant Container Freight Station Recreation Facilities

Source: SPS

The berth occupancy rate is more than 70% in terms of hourly bases. Which means, sometimes, more than two vessels are served at a berth in one day. According to the annual report of SPS, it recorded average productivity on container handling in 2002 was 32 box/hr/crane and in 2003 was 30 box/hr/crane. Even though 99% of the operation is for transshipment, the handling rate is higher than international average of 25 box/hr/crane. Reasons of reduced efficiency in 2003 were, according to the annual report, due to sharp increase in the traffic so that the entire terminal experienced a stage of congestion.

Presently the container volume is growing more than the level of previous year and the terminal is almost saturated with containers. Considerable numbers of containers are placed outside of the normal slots. Temporally stacking area has been created in the terminal mainly for empty boxes and some of the feeder operation has to be intruded to the break-bulk terminal area.

Container yard is managed by the computer yard planning system. All the boxes are placed according to the hatch plan of incoming vessel. All the same, the computer system is not the latest model and also not completely covering temporary stacking area outside of the normal slots.

Because of sharp increase of transshipment containers, the container volume has reaching to its maximum capacity. As stated in the previous paragraph, normal container yard with 28 sets of RTG is

insufficient to handle all the containers. Four container berths are receiving more than four vessels a day so that some of the feeder vessels have to be berthed at the general cargo berth where no quay side gantry crane is installed. Moreover, because of this situation, some conventional vessels with bulk or break-bulk cargo find difficulty for berthing.

SPS is under the management of AP Molar, which is also the operator of Maersk-Sealand Line. Although SPS is supposed to be opened for common users without discrimination, in reality berthing schedule is always fully booked for Maersk-Sealand and APL vessels. As the transshipment business grow sharply, almost no other lines can reserve berth at Salalah except for APL.

According to the berthing record at Salalah container terminal during August through September, percentage of lines serving or connecting to Main Line, India/Pakistan, Africa and Gulf are 35, 35, 20 and 16 respectively. For the same period, approximately 74 percent of vessels were handled through Maersk agent and 22 percent by GAC (agent for APL) and only 4 percent were handled by other agents.

During the same period, draft of the calling vessels were, 16% for over 13m, 44% for 10 to 13m, and 40% were less than 10m.

In 2002, Mediterranean Shipping Company gave up calling to Salalah and shifted its hub operation to Sultan Qaboos. In 2003, SPS negotiated with China Shipping for new service and China Shipping started calling Salalah from July 2003. China Shipping, however, canceled calling Salalah from January 2004.

(2) Conventional Terminal

The conventional cargo terminal, most part was built since the opening of Raysut Port. Besides small craft berths and oil berth, it has 4 multi-purpose/general cargo berth with 8 to 10 m water and a new bulk terminal with 16m water.

The new bulk terminal is generally used for export of cement and mineral in bulk. Export of cement increased since last year and main destinations are Aden, Djibouti and other African ports. Export of lime stone to an India steel mill has started as trial base and expected become regular trade. Gypsum shipment to Gulf area was observed. Although it was a spot contract, it will be a potential commodity for export from Salalah.

There are several requests from mining industries for the use of the bulk berth but because of insufficient space available, some of the mineral export is not materialized. However, due to increased container operation, the multipurpose berth and the bulk berth are increasingly used for container feeder operation.

Until 2002, vehicle carriers used to call Salalah to discharge import cars and trucks. Some of which were sold to the local market and some were sent to Yemen by land or transshipped to African ports. However, this trade stopped from 2003 because of difficulty for securing berth and yard space in

Salalah port. This trade is now entirely shifted to Sultan Qaboos Port.

Table 2.3-11 Conventional Terminal

Berth Number	Usage	Dimension (m)		Handling Equipment and Facilities
		Length	Draft	
1,2&3	Multi-Purpose	546	10.0	Rail Mounted Quay Side Crane (15t) 2 Units Rail Mounted Quay Side Crane (6t) 2 Units, Shed 3,000m2)*2
4	General	200	8.0	
5,6&7	(Dhow) & Government Use	345	4.0	Shed (3,000m2)*2
8		115	4.0	
9	Launch(Dhow)	260	3.0	for Launch Repair
10	Oil Pier		12.0	Oil Boom (300-350m3/hour) Oil Tanker up to 35,000DWT
NewBerth	Bulk Terminal	650	16.0	Back yard is not completed

Source: SPS

(3) Customs and Other Government Offices

Similar to Sultan Qaboos port, Custom office under Royal Oman Police opens from 7:30 to 14:00. Immigration office is also under Royal Oman Police provides 24 hour service at the container terminal with 2 officials under a 3 shift system since1999.

2.4 Sohar Port

2.4.1 General

Sohar city is one of the regional centers in Al Batinah Region and located some 230km northwest from Muscat and about 90km to the UAE boundary. Al Batinah Region is the next densely populated area after Muscat in Oman. The town was also the capital of Oman before Islam and is famous for its production and export of copper since long time ago and Majees Jetty was used for copper import/export.

The Study on The Port Development for Northern Oman by JICA in 1990 recommended a new port at Sohar and MOTC of Oman decided to develop new port, considering location, population, existing infrastructure distance from the neighboring market and construction cost. In June 1998 an agreement was signed between Japan Export & Import Bank and the Government of Oman, and construction project was commenced in July 1999.

The Phase I of the construction work was completed in July 2003 which consists of breakwater contract and dredging & reclamation contract. Currently Phase II constructions of quay-walls are implemented and will complete in 4th quarter of 2004.

Power plant of 500MW and desalination plant are under process by the Ministry of National Economy.

Within the 2400 ha waterfront industrial area, already several industries have started building their factories including aluminum smelter oil refinery, petro-chemical factories and other heavy industries besides power plant and water de-salinization plant. Besides this waterfront area, there exists 334 ha Sohar industrial estate which is already in operation mainly by light industries. For future development site, a large land space of approximately 8000ha is available at the south side of the main highway.

2.4.2 Management and Organization

The port is under the management of SIPC (Sohar Industrial Port Company) which is established by the GSO jointly with the Rotterdam Port Authority sharing 50% each. The chairman of the board is the Minister of Transport and Communication and board members will consist of the representatives from the Ministry of Finance and PEIE (Public Establishment for Industrial Estates) and MOTC.

SIPC is responsible for management of the port as well as the industrial estates of the port which is leased from the GSO and rent to the industries. Stevedoring of the cargoes specialized to major industries located in the port will be conducted by each firm and that of other cargoes and containers will be conducted by the Dutch stevedoring company Steinweg Oman under subcontract with SIPC. Towage and pilotage will also be subcontracted with other company.

Detailed formation and operation system is under discussion within SIPC.

2.4.3 Financial Condition

The report on the feasibility study is not provided to the preparatory study team II and detailed financial condition is unknown. SIPC's function is to lease the infrastructure and land from the government and rent them to private companies and such profit as is enjoyed in Salalah Port from concession is not expected by the explanation of SIPC. It may expect other fringe benefit.

2.5 Khasab Port

2.5.1 General

Khasab Port locates in Musandam Governorate facing to Hormuz strait and was opened in March 1983. 60m Berth for coast guard and 90m berth for Ministry of Housing with -4.5m was constructed in 1991.

The Jazirat Al Ghanim Naval Base was sited on an island with little or no fresh water supply and it was necessary to deliver water and other consumables to it and villages such as Kumzar from the reserves at Khasab, Bukha and Lima. Up to the early 1980's water was delivered by trucks transported on landing craft using concrete ramps located at Bukha and Khasab. These ramps were providing unsatisfactory and in need of repair, in the case of Bukha littoral drift was beginning to prohibit marine

access to the ramp.

The need to supply water to the Naval Base and the outlying villages provided one of the reasons for initiating the development of a new port at Khasab. Consequently the Ministry of Defense was identified as the main user of the Port. The Port was constructed between 1981 and 1983.

Since 1988/89 regulations in Iran have altered so that high duties are levies on the import of American cigarettes and some other goods. This has given rise to the development of the unregulated trade in these commodities using high speed craft capable of outmaneuvering the Iranian Coastguard vessels.

2.5.2 Management and Organization

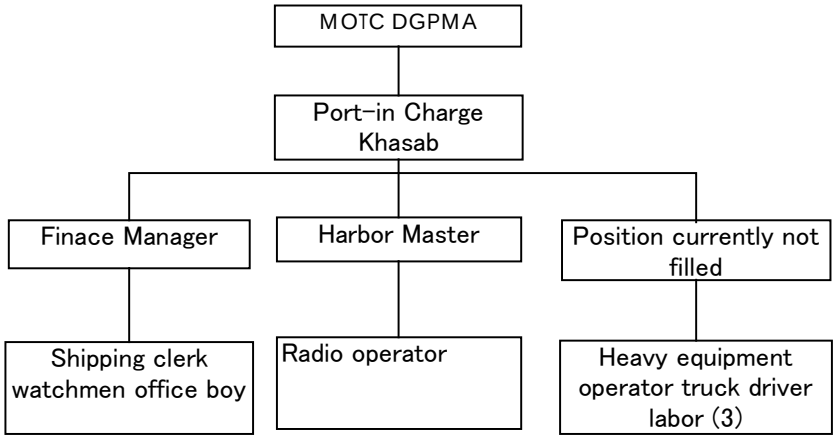
Currently the Port management and staffs are limited to a few personnel as shown in the report; WS Atkins "Khasab Port Technical and Economic Feasibility Study"

Figure 2.5-1 was prepared as part of the Weidleplan study in 1991 and quoted in Atkins study in 2002, it is believed that there has been little change since that time.

The management and administrative staff includes the port in charge, harbor master and a finance manager supported by a small office staff, and occasional labor, largely hired on an as and when basis.

Significantly, there is no marketing function in the organization, which together with operational expertise is necessary for the port to examine, create and prepare for the implementation of a strategy to attract customers to use its facilities.

Figure 2.5-1 Existing Organization of Khasab Port



Source: WS Atkins "Khasab Port Technical and Economic Feasibility Study"

2.5.3 Financial Condition

The port has been run as a department of MOTC for the last several years. During this period the traffic passing through the port has been very low giving rise to low revenues and there has been little, if any, generated from other sources. The principal users of the port have been the Police and the

Ministry of Housing, Electricity and Water (MHEW) which, as far as is known, have not contributed to the running costs presumably leading to MOTC having to subsidize the operations at Khasab on a continuous basis. Small revenue has been secured from the Iranian Speed Boat activities amounting to approximately R.O. 70,000 per year.

2.6 Duqm Port

2.6.1 General

The Wilayat of Duqm is the largest in the Al Wusta Region on the South East coast of Oman but is sparsely populated with some 3,200 people. The small town of Duqm is situated near the coast 540 km by road from Muscat. A new port and drydock complex is considered to be constructed at Ras Duqm, situated some 7km from the town of Duqm. Transport links to the town are being improved and tarmacing the road to Muscat via Sinaw has been completed. Tarmacing of the road link to Hayma, situated on the Nizwa Salalah road has been commenced.

Some investment in fisheries has been made by the Government with the construction of a fish processing factory at Ras Duqm where shelter exists for small fishing boats in the lee of the Ras Duqm headland.

The GSO intends to build a new port including drydock facility and fisheries harbor at Duqm. This is considered to help stimulate development of the Region and bring employment opportunities to the area. The new port will also be used for the benefit of the Royal Navy of Oman, the Royal Yacht Squadron and the Royal Oman Police, including the Coastguard.

In order to materialize aforementioned plan, the GSO entrusted consulting firm, Posford Haskoning, the study on design, supervision and operation and management for a new port and drydock complex at Duqm in 2002.

2.6.2 Management and Organization (Planned)

In the said report, management scheme is proposed to form a land lord port authority rather than a service port concept. There is no deep consideration on this matter considering the resulting fragile commercial viability of the project itself.

2.6.3 Financial Condition (Planned)

According to the report, net benefit due to various services is estimated as in Table 2.6-1.

Table 2.6-1 Net Benefit Due to Various Services Unit: 1,000R.O.

Source	2007	2010	2015	2020	IRR on P.I
port authority	-1418	-1387	-1393	-2122	
marine services	-350	-294	-259	-224	
commercial quay	-909	-183	307	797	8.2%
large ship yard	-4619	192	405	244	-2.6%
small ship yard	-355	235	185	163	9.6%

Source: Posford Haskoning "Draft Final Report Consultancy Service for Design , Supervision and Operation & Management Studies for A New Port and Drydock Complex at Duqm"

2.7 Shinas Port

2.7.1 General

Shinas Port locates 50Km north of Sohar and was constructed as a fishery port by the Ministry of Agriculture and Fishery in 1995 and inaugurated in December 1996. By the Royal Decree, it was converted to commercial port in January 2001.

Development of Shinas Port as a commercial port is aimed to provide necessary infrastructure for marine fisheries sector in the region, to provide an opportunity for economic development of the region forming the necessary industries for fisheries such as ice factories, fish processing, canning and packing, to provide job opportunities for citizens of Shinas who are mainly engaged in fishing and to stabilize the region by the provision of profitable job opportunities.

2.7.2 Management and Organization

The port is managed by 5 MOTC officials, 3 MOAF (Ministry of Agriculture and Fishery) officials and 5 coast guard (Royal Oman Police) officials. MOTC is responsible for overall port management, MOAF for guidance of fisheries and ROP for passport and custom control.

CHAPTER 3

PRESENT SITUATION OF PORT INFRASTRUCTURE AND PREVIOUS STUDIES

3 PRESENT SITUATION ON PORT INFRASTRUCTURE AND PREVIOUS STUDIES

3.1 Sultan Qaboos Port

An early development priority was on the construction of Sultan Qaboos Port, as a maritime gateway to the Sultanate, which was completed in 1974 with a total number of 13 berths and a capacity to handle 2 million tons of cargo annually.

Since then many improvements have been made including dredging the harbor entrance to a depth of 13m. The spoil from this and other operations was used for land reclamation in Shutaifi Bay where a 150,000m^2 container storage area was created.

Main facilities at Sultan Qaboos Port are shown in Photo 3.1-1and Table 3.1-1 below.

Photo 3.1-1 Sultan Qaboos Port

- Two multi-purpose berths with a length of 458m equipped with 3 quayside gantry cranes each of 42-ton capacity and 13m depth alongside at chart datum.
- Two container berths with a length of 366m equipped with RTG on 1,236 slots and 10.9m alongside water depth. The container yard has an area of 18,600sq.m.
- Berth No.3 between container berths and multipurpose berths is for bulk grain and rice unloading with a length of 228m and 11m alongside depth at chart datum.
- Berth No.7 and No.8 are used for conventional cargo and naval vessel with a length of 183m each and alongside depth of 9.6m.

Table 3.1-1 Berths in Sultan Qaboos Port

Berth Number	Usage	Dimension (m)		Handling Equipment and Facilities
		Length	Draft	
1&2	Multi-Purpose	458	13	3 Nos. Quay Side Container Crane (41t, 36m outreach, 27m height, 14m Backreach) Grain Conveyor (250t/h)
3	General/Bulk	228	10.2	
4&5	Container/General	366	10.9	2 Nos. Quay Gantry Crane (35t, 36m outreach, 22m height) Container yard
6	Multi-Purpose	183	9.6	RORO, WOWO, Break Bulk
7&8	General/Liquid	366	9.6	Launch and Bitumen, Transit Shed 2
9	Tugboats Parking	122	4	Marine workshop
10	Government	183	4	
11	and	223	9	
12	Coast Guard	160	8	12A(40), 12B(84)
13		152	4	

Source: PSC

Until 1997 total cargo volume handled in Sultan Qaboos Port increased steadily year by year, the volume in 1990 was over 1,000,000ton and in 1997 over 1,700,000ton, and the average annual growth rate was more than 8%. In 1998 and 1999, however, the volume decreased about 5% per year and increased again in 2001. The major factor was reduction of project cargo. (See Table 3.1-2)

Container handling volume in Sultan Qaboos Port is shown in Table 3.1-3. In 1990 transshipment container volume was about 100,000TEUs and import/export volume was about 70,000TEUs. From 1993 to 2001 the volume of transshipment container has been minimal (less than 500TEUs in 1993 and about 3,700TEUs in 2001) because Sultan Qaboos Port lacked the infrastructure facilities to handle the increased volumes of CMA. The transshipment traffic resumed in 2002 when MSC commenced their operation at Sultan Qaboos Port.

Table 3.1-2 Cargo Throughput in Sultan Qaboos Port Unit: 1,000 tons

Year / Commodities	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Unloaded														
1. Food Stuff	**357.5**	**438.9**	**415.5**	**410.9**	**450.9**	**523.8**	**536.6**	**480.1**	**669.1**	**644.4**	**652.7**	**663.2**	**710.3**	**763.7**
1.1 Rice	42.9	62.4	55.4	47.1	65.0	51.0	72.9	80.7	87.4	90.2	99.1	103.3	82.2	105.6
1.2 Wheat & Flour	134.6	171.8	129.3	151.5	135.4	204.3	163.6	138.5	315.6	286.9	229.1	223.3	237.8	262.9
1.3 Maize	8.4	21.8	21.9	12.0	34.2	34.9	34.3	4.5	30.2	28.9	52.8	37	43.5	48.9
1.4 Barley	27.3	28.8	36.8	38.7	35.1	38.3	68.7	67.0	43.7	48.3	36.1	38.1	65.5	20.4
1.5 Sugar	10.5	22.7	14.4	13.8	15.5	18.2	10.1	16.9	15.2	8.7	6.7	10.9	5.4	9.9
1.6 Frozen Food	47.1	38.7	43.5	34.8	36.0	39.1	45.7	46.3	46.3	50.7	67.2	86.3	97.9	104.2
1.7 Others	86.7	92.7	114.2	113.0	129.7	138.0	141.3	126.2	130.7	130.7	161.7	164.3	178	211.8
2. Construction	**116.7**	**134.8**	**151.3**	**159.4**	**191.1**	**141.0**	**111.8**	**153.1**	**312.1**	**287.8**	**140.3**	**175.2**	**395**	**331.8**
2.1 Timber	31.6	44.3	51.5	38.3	37.5	28.9	30.7	23.3	22.1	31.5	31.8	27.1	35	46.6
2.2 Cement-bagged	13.1	7.0	-	-	2.5	0.2	-	-	16.8	4.6	0.1	0	0	0
2,2'Cement-bulk												52.1	109.9	132.9
2.3 Steel	56.0	70.2	86.7	105.6	129.3	92.2	56.7	106.4	237.8	211.2	74.3	62.8	215.5	112.9
2.4 Others	16.0	13.3	13.1	15.5	21.8	19.7	24.2	23.45	35.4	40.5	34.1	33.2	34.6	39.4
3. Vehicles (No.)	19,122	26,254	34,353	48,354	48,810	41,598	33,024	39,711	46,291	50,399	35,742	46,977	55,045	48,099
4. Others	**340.2**	**372.2**	**436.6**	**480.8**	**503.8**	**527.6**	**660.7**	**864.4**	**741.1**	**706.4**	**730.2**	**649.7**	**739.9**	**788.3**
4.1 Livestock	18.0	19.5	23.2	24.2	26.7	32.4	30.7	39.6	27.6	23.3	25.3	25.5	26	20
4.2 General Cargo	315.5	347.2	405.2	447.5	466.6	484.8	617.4	811.6	698.8	662.3	684.7	606.7	695.0	748.2
4.3 Spareparts	6.7	5.5	8.2	9.1	10.5	10.4	12.6	13.2	14.7	20.8	20.2	17.5	18.9	20.1
Total	**814.4**	**945.9**	**1,003.4**	**1,051.1**	**1,145.8**	**1,192.4**	**1,309.1**	**1,497.6**	**1,722.3**	**1,638.6**	**1,523.2**	**1,488.1**	**1,845.2**	**1,883.8**
Loaded														
1. Dates	0.4	0.8	0.9	7.7	5.3	4.3	4.2	4.2	3.0	7.6	4.1	9	9.1	5
2. Others	80.1	66.3	77.5	57.1	81.7	103.5	124.8	130.4	142.8	135.8	161.5	212.5	307.1	428.3
Total	80.5	67.1	78.4	64.8	87.0	107.8	129.0	134.6	145.8	143.4	165.6	221.5	316.2	433.3

Source: PSC

Table 3.1-3 Container Handling Volume in Sultan Qaboos Port

(TEU)

	Unloading (Loaded)	Unloading (Empty)	Loading (Loaded)	Loading (Empty)	Transship ment (Unloading)	Transship ment (Loading)	Total	Laden Loading / Unloading
1989	33,001	938	5,349	28,511	49,415	48,118	165,332	38,350
1990	34,271	1,153	5,148	29,737	48,718	48,846	167,873	39,419
1991	39,121	905	5,761	33,346	38,381	38,090	155,604	44,882
1992	42,198	1,350	9,774	33,530	13,898	15,041	115,791	51,972
1993	44,808	829	12,397	31,902	185	231	90,352	57,205
1994	43,480	836	17,456	26,106	109	161	88,148	60,936
1995	47,797	1,306	12,149	34,353	162	183	95,950	59,946
1996	50,152	978	12,670	36,206	437	410	100,853	62,822
1997	53,274	1,455	13,876	37,948	1,386	1,248	109,187	67,150
1998	61,103	1,088	12,006	46,475	644	949	122,265	73,109
1999	61,204	844	13,135	46,284	1,664	1,672	124,803	74,339
2000	63,735	621	17,037	45,574	944	946	128,857	80,772
2001	70,492	1,381	18,954	49,417	1,845	1,844	143,933	89,446
2002	73,688	1,615	21,545	50,400	29,325	27,291	203,864	95,233
2003	74,169	1,616	26,336	48,582	57,843	56,280	264,826	100,505

Source: PSC

To find a way to resolve the problems that the conventional terminal is gradually coming close to its maximum capacity and on the other hand the container terminal will be unable to receive a large volume of transshipment containers with the existing berthing facilities and its back up facilities, PSC entrusted a serious of the study to Halcrow Group Ltd.

Halcrow is provisionally proposing phased development options including the first phase of enhancing the port's equipment inventory followed by the 2nd phase of a new deep-sea container terminal to the east of the existing terminal in the area of the new breakwater and convert again the existing container berths to conventional berths to handle increasing general cargo and receive cruising vessels. As the Phase 3, deepening and improvement of the existing berth 1 to 5 basins is proposed subject to demand. There is an additional phase 4 of further expansion, in case of traffic growth.

3.2 Salalah Port

Photo 3.2-1 Salalah Port at the Early Stage

Source: SPS

Salalah port is located on the southern coast of Dhofar Governorate in Oman and about 20km southwest of Salalah municipality. It is the second largest city in Oman. The distance from Muscat, the capital city of Oman, to Salalah municipality is about 1,050km by road and about 660 miles (about 1,200km) by sea. The port is situated about 100km east from the border of the Republic of Yemen and faces the Arabian Sea.

The present port, which consists of conventional port and container terminal, is situated immediately to the north of the natural peninsula formed by a limestone ridge. A 1,400m long breakwater is extended to the northeast from the end of the peninsula and protects the port from the SW monsoon.

Until the beginning of the 1970s there was no port in the southern region of Oman and cargo to/from Dhofar was rowed ashore in small boats. The initial development of the port (Raysut Port) was executed from 1971 to 1974 and provided accommodations for small vessels with drafts up to 4m. In 1976 an expansion program to enlarge the harbor to accommodate ships with drafts up to 10m was initiated. The expanded port, which was designed to handle annual cargo throughput of 1,000,000 tons, was opened in 1980. Under the Second Five Development Plan, in 1982 a container terminal was developed in the existing conventional terminal area.

Based on 1996 MOU for the transformation of the Raysut port into a modern container terminal to attract transshipment, the first stage of the new container terminal construction project was started. Operation commenced on 1st November 1998 when the first vessel called the new container terminal.

In the conventional port, the old container terminal was converted into multi-purpose berth, the existing container crane was relocated to the new container terminal, and a new bulk terminal was constructed.

The length of the east breakwater is 1,400m, the depth of the approach channel is 16.5m, and the diameter and depth of the turning basin is 500m and 16.0m, respectively.

The port consists of conventional port and container terminal at present. In the conventional port, there are specialized berthing facilities to accommodate bulk carriers, conventional cargo vessels and oil tankers. There are six deep water berths, five berths for coastal vessels and launches, and one oil pier. The total length of berths is 2,116 m. (The back yard for the new bulk terminal has not yet been prepared.) the Ministry of Oil and Gas uses the oil pier.

The total area of the container terminal is 54 ha including a total berth length of 1,260 m. The terminal is designed for container transshipment operation and is equipped with twelve (12) post panamax quayside gantry cranes.

Table 3.2-1 Berths in Salalah Port

Berth Number	Length (m)	Depth at LAT (m)	Type of Use
No.1 ~ No.4	1,260	16	Container
21	173	9.5	Multi-Purpose
22	173	9.5	Multi-Purpose
23	173	9.5	Multi-Purpose
24	200	7.8	General Cargo
25	115	4.8	Dhow and Govt
26	115	4.0	Dhow and Govt
27	115	4.0	Dhow and Govt
28	115	4.0	Dhow and Govt
29	260	3.0	Dhow and Govt
30	300	15.0	Bulk Cargo
31	300	16.0	Bulk Cargo
Oil Jetty	130	16.0	Oil
Ramp Lct	45	3.0	

Source: SPS

In 2003, the container terminal in Salalah port handled 2,001,259 TEUs. Transshipment container share is around 99 %. The container volume handled at the old container terminal (although no detailed data exists) in the conventional port was less than 500TEUs for the past several years. After the new container terminal started service in November 1998, container volume rapidly increased.

In 2003, the conventional port in Salalah handled about 1,347,100 tons; 586,100tons of unloaded cargo and 761,000 tons of loaded cargo. The annual unloaded volume was included around 300,000 tons of Fuel cargo and annual loaded volume was included around 600,000 tons of cement cargo. Cargo throughput in 2003 decreased 20% compared with that in 2002. (See Table 3.2-2).

Table 3.2-2 Cargo Handling Volume in Salalah Port unit 1,000t

Year / Commodities	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Unloaded															
1. Food Stuff	**6.6**	**12.6**	**7.5**	**4.2**	**16.9**	**14.2**	**9.1**	**15.5**	**24.3**	**50.7**	**94.0**	**92.0**	**127.5**	**132.8**	**151.3**
1.1 Rice	3.0	10.0	4.9	2.5	3.3	2.0	0.5	1.5	1.1	-	0.6				
1.2 Suger	2.0	-	-	-	3.1	-	-	-	-	-	-				
1.3 Frozen Food	1.1	2.2	2.3	1.2	1.1	1.5	1.0	0.7	1.5	0.7	0.1	0.1	4.2	4.0	7.3
1.4 Wheat	-	-	-	-	-	-	-	-	11.9	-	85.6	88.3	118.9	123.7	141.3
1.5 Others	0.5	0.4	0.3	0.5	9.4	10.7	7.6	13.4	9.8	50.0	7.7	3.6	4.5	5.1	2.7
2. Construction	**22.7**	**64.5**	**47.9**	**22.2**	**12.3**	**20.5**	**37.2**	**32.4**	**34.5**	**41.4**	**18.6**	**56.7**	**135.0**	**141.9**	**65.0**
2.1 Timber	0.8													1.9	1.4
2.2 Cement	-	-	-	-	-	-	-	-	-	-	-		0.0		0.2
2.3 Steel & Pipes	21.9	26.7	47.9	22.2	12.3	13.2	8.4	23.8	20.0	24.7	17.9	10.9	110.3	103.1	24.7
2.4 Others	-	37.8	-	-	-	7.3	28.8	8.6	14.5	16.7	0.7	45.8	24.7	36.8	38.8
3. Vehicles [No. (1989-1999)& Weight(2000-2003)]	224	251	57	560	375	223	1,226	315	349	497	1.6	0.1	37.4	1.3	1.7
4. Others	**287.9**	**381.4**	**376.9**	**350.4**	**433.9**	**399.1**	**378.8**	**411.5**	**429.9**	**450.2**	**468.2**	**394.6**	**537.7**	**707.6**	**368.2**
4.1 General Cargo	43.1	19.1	27.4	14.8	9.8	7.1	7.3	7.2	12.9	12.3	6.4	0.0	2.2	9.0	1.8
4.2 Iron Ore	-	-	-	-	58.8	14.9	-	22.8	58.5	33.8	14.3			11.7	4.0
4.3 Fuel	207.9	296.1	265.9	265.0	293.3	293.6	309.5	323.8	346.8	375.1	398.2	358.8	495.1	648.2	310.7
4.4 Cattle Feed	36.7	66.2	83.6	70.6	72.0	83.2	61.0	56.6	8.9	24.3	35.4	27.0	26.2	33.3	46.0
4.5 Live Stock	0.2	-	-	-	-	0.3	1.0	1.1	2.8	4.7	3.7	1.9	1.2	4.5	5.8
4.6 Palm Oil											10.2	6.8	13.0	1.0	
Total (Unloaded)	**318.1**	**460.4**	**432.7**	**382.3**	**466.1**	**435.7**	**428.7**	**461.5**	**490.2**	**544.0**	**582.5**	**543.4**	**837.7**	**983.7**	**586.1**
Loaded															
1. Cement	88.0	42.0	79.0	47.0	15.0	69.0	78.0	72.0	49.0	84.7	430.0	447.3	477.8	501.1	572.9
2. Flour	-	-	-	-	-	-	-	-	-		36.2	49.7	50.8	53.6	56.2
2. Others	2.0	10.0	9.0	9.0	8.0	5.0	7.0	7.0	14.0	162.3	64.9	9.2	35.2	190.4	131.9
Total (Loaded)	**90.0**	**50.0**	**88.0**	**56.0**	**23.0**	**74.0**	**85.0**	**79.0**	**63.0**	**247.0**	**531.1**	**506.2**	**563.9**	**745.1**	**761.0**

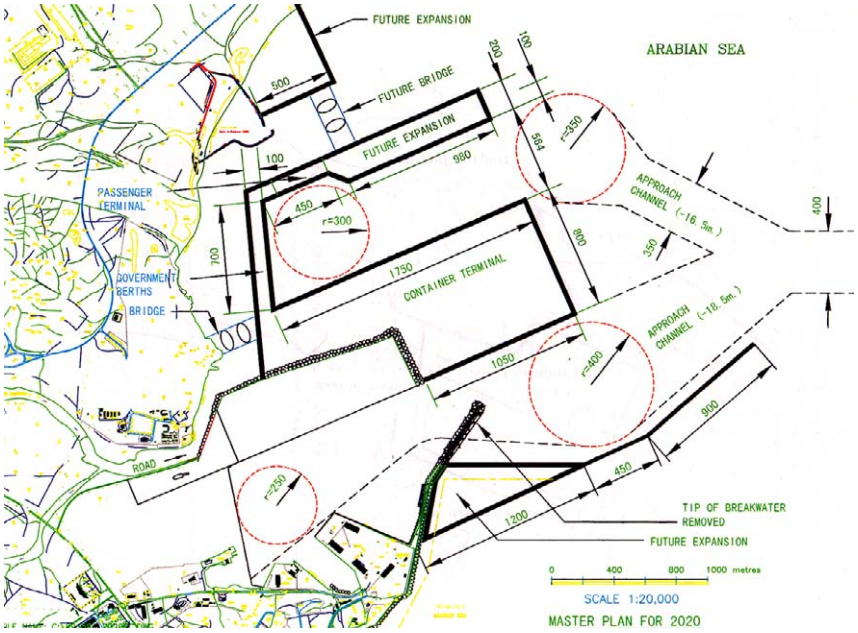
Source: SPS

In 1980, Hochtief A. G. of Germany designed and constructed the initial expansion phase of the port. Hochtief's works included the construction of the east breakwater and the 1,000m long North Breakwater, which no longer exist.

In 1998, Han-Padron associates (HPA) completed the Phase 1 Expansion of Mina Raysut, which included the construction of an international container terminal equipped with four 330m long container ship berths with an annual capacity capable of handling two (2) million TEUs, and reclamation of a 405,000 m2 area. In line with the expansion of the container ship berths, the volume of transshipment of containers at Salalah Port increased tremendously from a trifle amount of 17,500 TEUs in 1998 to about 2,000,000 TEUs in 2003.

In 2000, upon the request of the GSO, JICA Study Team conducted a study on the port development in the future, as a part of the technical cooperation programs of the government of Japan, and formulated a master plan of Salalah Port with the target year of 2020, which is shown in Figure 3.2-1.

Figure 3.2-1 Master Plan of Salalah Port (JICA Study Team 2000)



Source: JICA "The Master Plan Study of Salalah Port and Its Hinterland in the Sultanate of Oman"

To cope with the aforementioned steep increase in the volume of container transshipment, SPS, port's administration and management body, is promoting a series of necessary procedures to implement a plan to expand the port facilities for handling container transshipment.

The plan, which is consistent with the master plan formulated by JICA study team (2000), includes an extension of the existing container berths by 900 (two berths) with a depth of 18m, the dredging of the navigation channel to the depth of 18.5m and the extension of the breakwaters by 2,400m. The plan has already been approved by the GSO, and the construction works are scheduled to complete by 2007.

3.3 Sohar Port

Photo 3.3-1 Artist Impression of Sohar Industrial Port

Source: SIPC

Sohar city is one of the regional centers in Al Batinah Region and located some 230km northwest from Muscat and about 90km to the UAE boundary. Al Batinah Region is the next densely populated area after Muscat in Oman. The town was also the capital of Oman before Islam and is famous for its production and export of copper since long time ago and Majees Jetty was used for copper import/export.

The Study on The Port Development for Northern Oman by JICA in 1990 recommended a new port at Sohar and MOTC of Oman decided to develop new port, considering location, population, existing infrastructure distance from the neighboring market and construction cost. In June 1998 an agreement was signed between Japan Export & Import Bank and the Government of Oman, and construction project was commenced in July 1999.

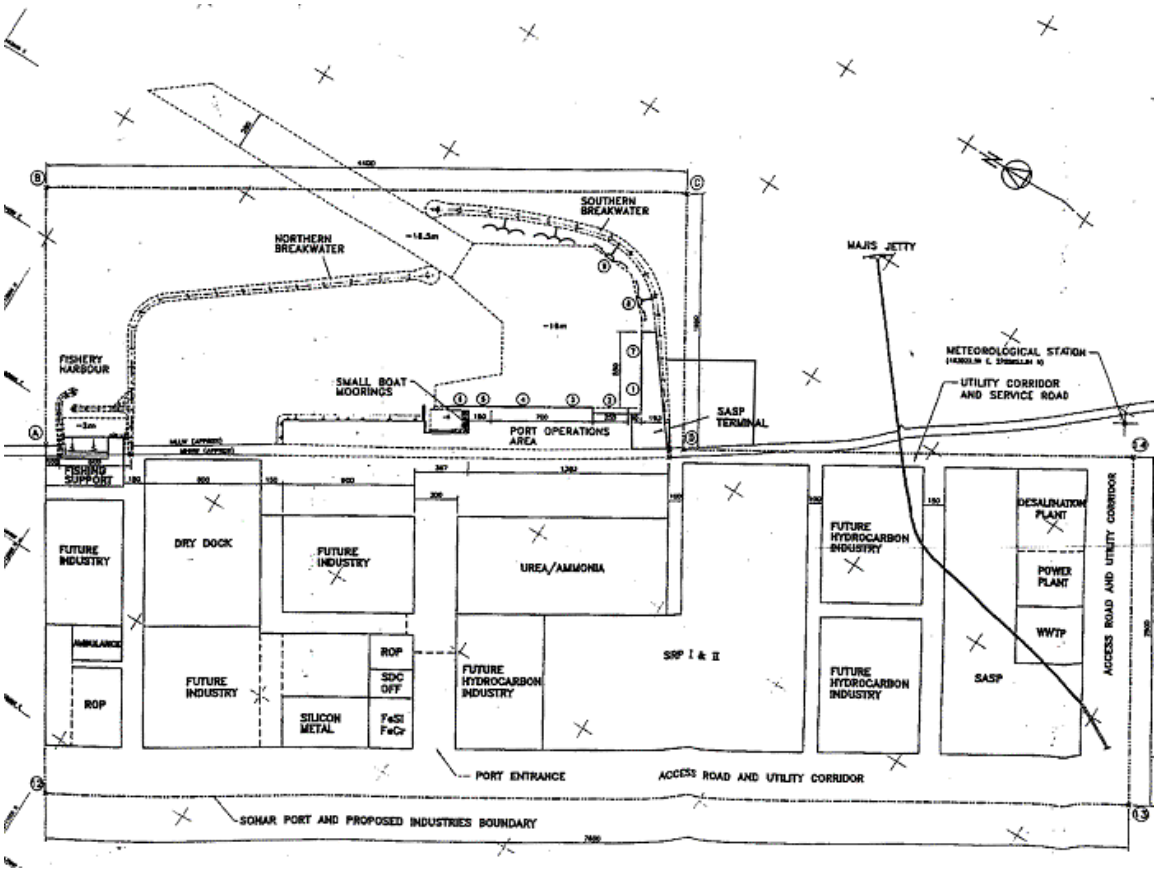
The port is situated north of the town in the area of Marsa Majees (the jetty for the copper smelter import/exports) and close to the Sohar industrial estate and an area set aside for the major industrial projects planned for Sohar.

The Phase I of the construction work was completed in July 2003 which consists of breakwater contract and dredging & reclamation contract. Phase II construction of quay walls was also completed by the end of 2004. Power plant of 500MW and desalination plant are under process by the Ministry of National Economy.

The port development plan comprises a main harbor and a fishery harbor with a 3,600m long north breakwater and a 2,400m long south breakwater. Approach channel and turning basin is dredged to the depth of 16.5m and 16.0m respectively in phase1, resulting a total dredging volume of 14 million m^3.

Construction of a 700m multi-purpose wharf, government wharf (150m), and two liquid berths (detached dolphins) are completed. Two bulk berths with the length of 550m and 260m are also built. Construction of two more liquid bulk berths is planned by SIPC (Figure 3.3-1).

Figure 3.3-1 Layout Plan of Sohar Port



Source: MOTC/DGPMA

3.4 Khasab Port

Khasab Port was constructed in 1981 under the guidance of the Musandam Development Committee (MDC) and opened for operation in March 1983. By 1991, a berth with a length of 60m and a berth with a length of 90m and the water depth of 4.5m were constructed. Since the time of its completion,

it had primarily been used as a base of the Royal Oman Police (ROP) and the vessels of the Ministry of Electricity and Water to supply water and other support requirement to the outlying villages.

Photo 3.4-1 Breakwater at Khasab Port

In 2001, Khasab Port Technical and Economic Feasibility Study was conducted by WS Atkins International & Co. In line with the plan proposed by this feasibility study, port expansion works were initiated in 2002 and the general outline of the new port including two (2) breakwaters and land reclamation have been completed.

The development of Khasab Port has a number of objectives including:

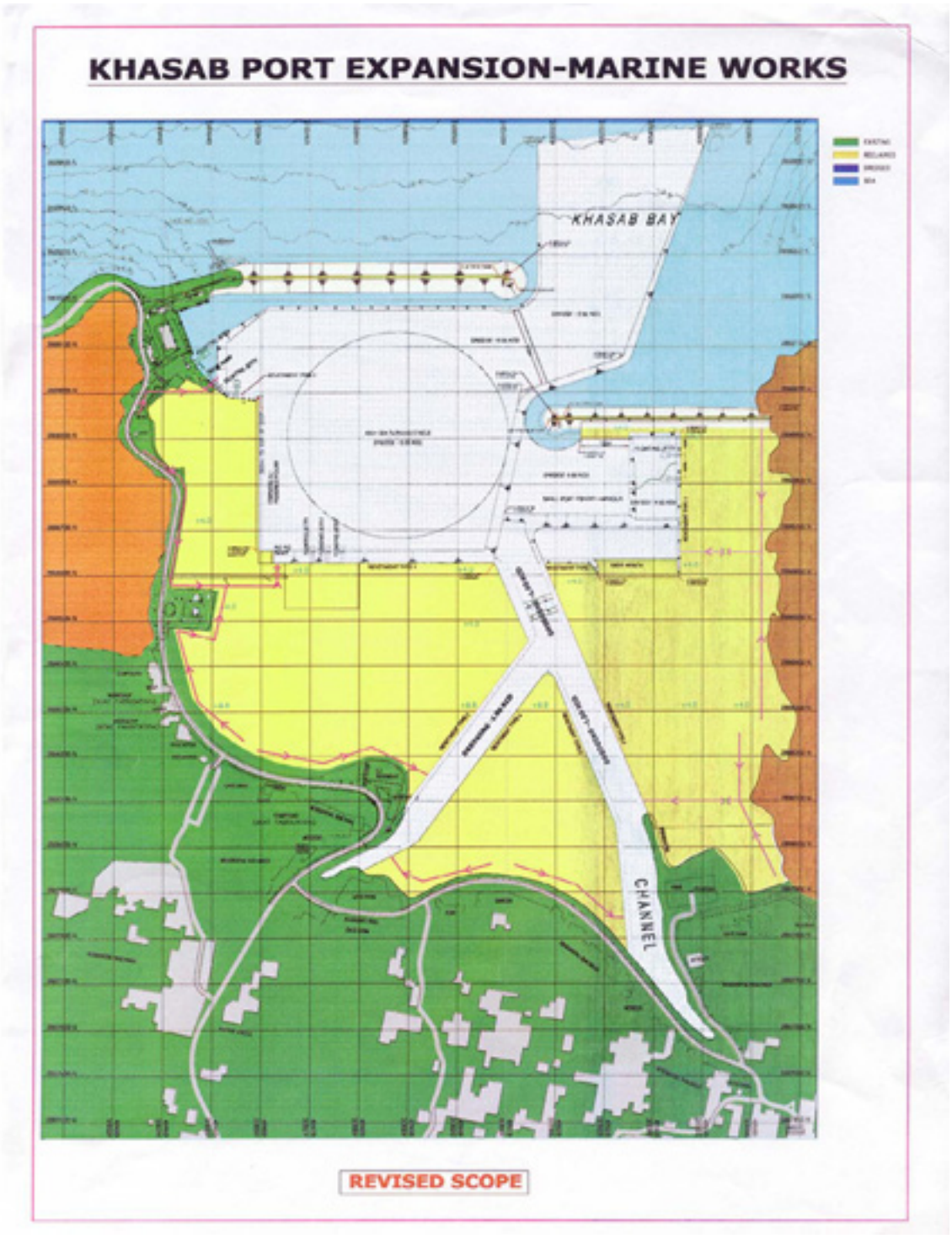
- improvement of the commercial activity in Khasab
- stemming the migration of population to other parts of the Sultanate and UAE
- providing facilities to address the cruise traffic
- provide facilities for the ferry service
- continue to provide a base for ROP activities in the Musandam
- support fishing activities based at Khasab
- encourage commercial operations and management in the Port
- bring operations into line with international practices

The expansion project includes the north breakwater 500m long, a berth with a length of 300m and a water depth of 10m equipped with a landing ramp for RO/RO passenger boats to accommodate general cargo vessels and passenger boats, three (3) floating jetties with a length of 35m and a water depth of 4.5m to accommodate Dhows, two (2) floating jetties with a length of 35m and a water depth of 4.5m to accommodate government vessels.

Other than the above-mentioned, a fishing port is under construction on the opposite side of the commercial/passenger berth (in the eastern part of the bay) to be equipped with the east breakwater 400m long and three (3) floating jetties to accommodate fishing boats.

Dredged materials produced from the turning basin and navigation channel is being used for the reclamation of a land behind the port with an area of 75ha. (Figure 3.4-1)

Figure 3.4-1 Layout Plan of Khasab Port (Nearly Completed)



Source: MOTC/DGPMA

Khasab Port is busy with high speed crafts coming from Iran in the morning and outgoing in the afternoon. Sheep are the most important imports to this port, and cigarettes, electric equipment, and food stuffs are exporting in return. Besides the speed crafts, a small number of wooden ships with a load capacity of 40 to 100 tons are coming to this port.

Table 3.4-1 shows the port traffic of these two vessel types during the period 1999 to 2003. Number of speed craft shows remarkable increase and registered 78,466 boats in 2003. More than 200 boats are coming from and going to Iran everyday. On the other hand Number of wooden vessels are minimal, and 3 or 4 vessels a month.

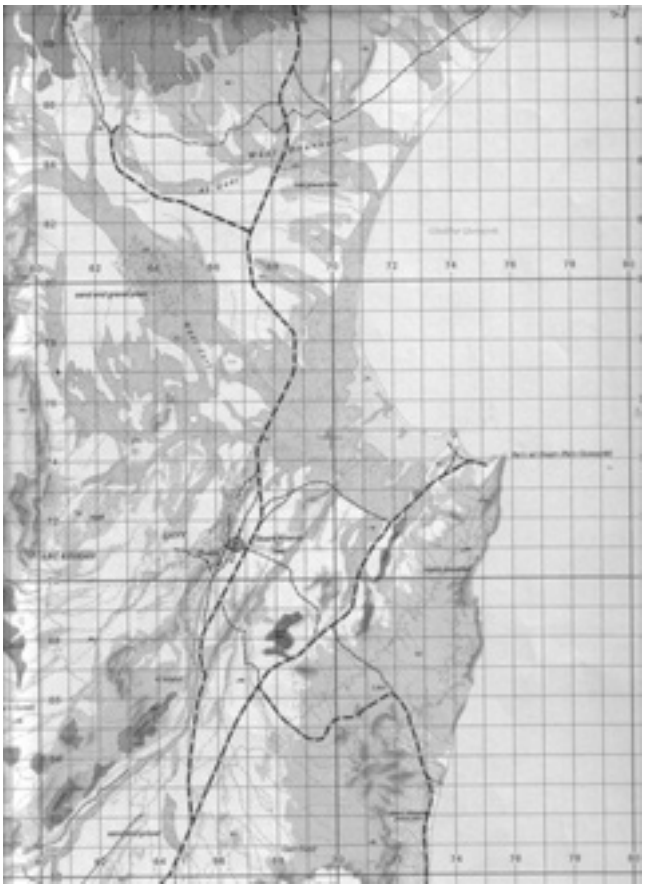
Table 3.4-1 Port Traffic at Khasab Port during 1999-2003

Year	1999	2000	2001	2002	2003
Nos. of commercial boats	58,424	64,622	7,629	75,868	78,466
Nos. of trade wooden ships	42	39	27	33	47

Source: MOTC Annual Report 2002, and Khasab Port Annual Report 2003

3.5 Duqm Port

Figure 3.5-1 Duqm Town and its Vicinity



Duqm is the largest of the Wilayat in the Al Wusta Region on the south-east coast of Oman but sparsely populated with approximately 3,200 people. Duqm town is 540km from Muscat, almost 4km west of Duqm port project site and is halfway between Muscat and Salalah. Duqm is not situated on a major national or international road route – the closest route being some 180km distant from Hajmah on the Mascat to Salalah road.

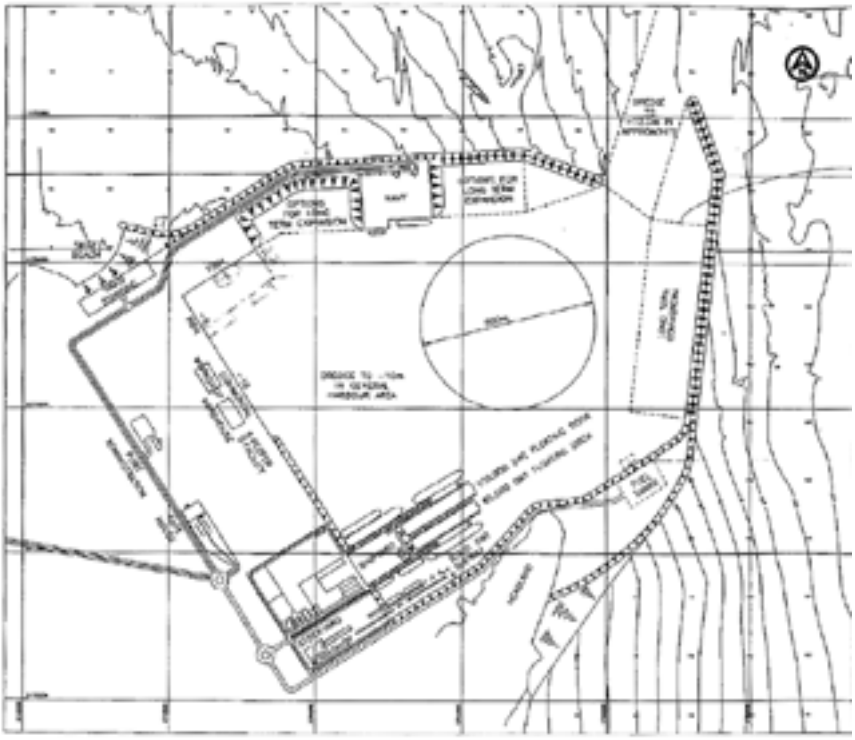
Duqm is used by wooden Dhows as an anchorage on a seasonal basis – up to 30 Dhows have been seen at anchor although only 16 are currently registered in Duqm area. Difficulties are experienced landing catches and loading fuel as there are presently no berthing facilities.

The GSO expects the port to become a development center in Al Wusta Region and to develop it as a national project. POSFORD HASKONING LTD has conducted the feasibility study on the development of the port. The implementation of the project will be discussed on the basis of this report. Major project of the plan is a dry dock for repairing vessels.

Dimensions of the proposed facilities in Duqm Port are as follows:

- Commercial berth with a length of 380m and a depth of 10.0m
- Ship Repair facility with a length of 800m and a depth of 10.0m
- Royal Oman Navy berth with a length of 150m and a depth of 8.0m
- Coast Guard berth with a length of 90m and a depth of 8.0m
- Fisheries 2 berths with the length of 200m, 300m and the depth of 8.0m, 5.0m
- Beaching facilities with the length of 200m

Figure 3.5-2 Proposed Layout Plan of Duqm Port Development



Source: Posford Haskoning "Final Report Consultancy Service for Design, Supervision and Operation & Management Studies for A New Port and Drydock Complex at Duqm"

There is no mention about the necessary size of the quaywall and breakwater except fishery and governmental berths.

Import of general cargo is estimated under the assumption that Duqm Port will handle the general cargo amount proportional to population share of the Al Wusta Region against national population of the national total imported cargo in 2005 plus demand pressure for the construction works in the region. It is also assumed that general cargo will increase at 10%/year for the first 10 years and 7%/year afterward.

Petroleum products are for the use of power generation and desalination plant. Fish export is estimated under the assumption that new fishing boat is introduced based on the trawler resulting 30,000 ton/year from current possible scale of 5,500 ton/year.

Considering the lot size of the consumable goods demand, it is doubtful to import these cargos with large vessels.

3.6 Shinas Port

Photo 3.6-1 Shinas Port and its Vicinity

Shinas Port is located 50 km north of Sohar and was originally constructed as a fishery port by the Ministry of Agriculture and Fishery in 1995. It was then converted to a commercial port in 2001 by the Royal Decree.

The development of Shinas Port has a number of objectives including:

- To provide necessary infrastructure for marine fisheries sector in the region.
- To provide an opportunity for economic development of the region, as the presence of the port will lead to presence of necessary industries such as establishment of ice factories, fish processing, canning and packing, as the region is famous for the availability of huge fisheries resources, and good types of fish suitable for processing and export.
- Providing job opportunities for citizens of Shinas who are engaged in fishing.
- Stability of the region by providing profitable job opportunities.

The port has the following components:

- Breakwater in the north at the length of 370 m and in the south at the length of 517 m.
- Area of the basin of the port is 30,550 m sq., and the length is 160 m.
- Floating bridge to receive vessels and boats and for disembarkation. Length is 98 m and width is 4 m.
- 2 bridges on the floating bridge at the length of 15 m and width of 3 m.
- Asphalt paved disembarkation area is 7,000 m sq.
- Asphalt paved road to link the port with the main road at the length of 182 m, and internal roads at the length of 640 m.
- Sand coast for docking of boats at the length of 500 m.
- A sledge to launch and lift boats [from the main gate directly to the sea].
- Depth of the basin is 3 m, and in the northern part and in front of the floating bridge 4 m while at the entrance of the port 5 m. Length of the entrance is 20 m.
- A hall for delivery of fish [underway]
- Prohibited area is the northern limit, concerning the security fence.

As a part of efforts to enhance the port functions, Government of Sultanate of Oman has a plan to establish both a veterinary quarantine with all facilities and a market for sale and unloading of fish while private sector is encouraged to establish fish processing and packing factory and store for freezing fish.

CHAPTER 4

NATURAL CONDITIONS AND ENGINEERING ASPECTS OF THE STUDY PORTS

4 NATURAL CONDITIONS AND ENGINEERING ASPECTS OF THE STUDY PORTS

4.1 Natural Conditions

Natural conditions in and around the study port areas are described based on the previous study reports as well as the data and information collected. The general information on natural conditions is also referred to Appendix A- I Environmental Section.

4.1.1 Sultan Qaboos Port

A consultant named Halcrow is currently taking care of the feasibility study for the port expansion. However, it is not known yet its completion of the study. Therefore, the assumption of future development of Sultan Qaboos Port is mainly based on the Master Plan Study (JICA, 1990) in this study, and the following design conditions have been set up. It is observed a remarkable contradiction that the wave period in Sultan Qaboos Port is much longer than that in Duqm or Salalah, because long-period waves come not only to Sultan Qaboos Port but also to the coastal areas such as Duqm and Salalah. Thus, the wave condition in this port should be checked with those in other ports.

(1) Wave Condition

The actual wave measurement was carried out throughout the year of 1988 at a buoy 5 km offshore from Sultan Qaboos Port by using a super sonic wave system. The results are shown in Table 4.1-1 and 4.1-2.

Table 4.1-1 Wave Frequency (Height – Period)

T (Sec) / H1/3 (m)	≦4.4	4.5～5.4	5.5～6.4	6.5～7.4	7.5～8.4	8.5～9.4	9.5～10.4	10.5～11.4	11.5～12.4	12.5～13.4	13.5～14.4	14.5～15.4	15.5≦	Total (%)
≦0.4	223													223 (68.4)
0.5～0.6		10	17	12	7	8	5	5	2	1	2		2	71 (21.8)
0.7～0.8		9	6	1	2									18 (5.5)
0.9～1.0		2	5	1										8 (2.5)
1.1～1.2			3											3 (0.9)
1.3～1.4				1										1 (0.3)
1.5～1.6			1	1										2 (0.6)
1.7≦														
Total (%)	223 (68.4)	21 (6.4)	32 (9.8)	16 (4.9)	9 (2.8)	8 (2.5)	5 (1.5)	5 (1.5)	2 (0.6)	1 (0.3)	2 (0.6)		2 (0.6)	326 (100.0)

Note: H1/3 - Daily average wave height, T - Period

Source: Master Plan Study (JICA, 1990)

Table 4.1-2 Wave Frequency (Height – Direction)

W.D / H1/3 (m)	Calm	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total (%)
≦0.4	223																	223 (64.6)
0.5～0.6				2		20	26	6	4					10	16	2	2	88 (25.5)
0.7～0.8		1				1	3	1			1			2	5	3	1	18 (5.2)
0.9～1.0				1			1	1						1	3	1	2	10 (2.9)
1.1～1.2								1							2			3 (0.9)
1.3～1.4								1										1 (0.3)
1.5～1.6														1	1			2 (0.6)
1.7≦																		
Total (%)	223 (64.6)	1 (0.3)		3 (0.9)		21 (6.1)	30 (8.7)	10 (2.9)	4 (1.2)		1 (0.3)			14 (4.1)	27 (7.8)	6 (1.7)	5 (1.4)	345 (100.0)

Note: H1/3 - Daily average wave height, W.D – Wave Direction

Source: Master Plan Study (JICA, 1990)

With regard to the design deep water wave for Sultan Qaboos Port, wave parameters were determined in the Master Plan Study (JICA, 1990) as below based on the above records. As the seabed rises toward SWS at a rate of 1/50, wave direction changes from ENE to NE by the wave refraction. That is the reason why the existing breakwater lies from NW to SE.

Wave Direction; ENE
Wave Height ($H_{1/3}$); 6.4 m (return period: 100 years)
Wave Period ($T_{1/3}$); 12.0 s

According to the port expansion plan prepared by Halcrow, the breakwater is planned to locate at a depth of -40 m. Considering the wave refraction and shoaling, calculated design wave height has been 6.0 m at a depth of -40 m.

(2) Tidal Levels

The parameters of tidal levels set up by JICA Study Team in 1990 were taken from the Admiralty Tide Table. However, as the parameters by Royal Navy of Oman in 2003 are available and they have been applied for this study as shown below. There is no remarkable difference between two information.

MHHW +2.64 m CD
MLHW +2.55 m CD
MHLW +1.67 m CD
MLLW +0.91 m CD
LAT ±0.00 m CD

(3) Tidal Current

The tidal current observation was carried out for 15 days during the Master Plan Study (JICA, 1990). According to the result of the study, the velocity of tidal current was less than 0.10 m/s at about 2m above the seabed with its prevailing direction of NW and SE.

(4) Geological Condition

The soil investigation had been conducted at Berth 1-A (container berth) in 1982. During the Master Plan Study by JICA in 1990, three boreholes were drilled inside the port with the drilling length of 10 m. The results reveal that a gravel layer, gravely sand layer, silty sand layer and sandy silt layer are piled up one after another at a depth between 13 m and 35 m. The N value was found to vary between N=15 and 30 below the seabed down to the level of about -16.5 m and tend to be greater than N=30 at deeper layer. The strength of these strata varies from medium dense to dense depending on the degree of cementation (Master Plan Study, JICA, 1990).

(5) Seismic Condition

The huge earthquake has never experienced in the area around Muscat. K_h, horizontal seismic coefficient, has been calculated at less than 0.02 G with using the earthquake data of National Earthquake Information Center. As this figure is quite small, it has been decided that the seismic condition is not taken into consideration in the structural design of this study for Sultan Qaboos Port.

(6) Sedimentation

There is no record of maintenance dredging in recent years.

4.1.2 Salalah Port

A consultant named Consulting Engineering Service (CES) is performing detailed design for the port expansion based on the Master Plan Study (JICA, 2000). Only Project Definition Study Report prepared by CES is available.

(1) Wave Condition

The wave hindcasting was carried out by JICA in 2000. Based on the result of computed offshore waves, wave deformation was conducted by the Study Team. The design wave height at the port entrance with a return period of 50 years was determined as shown in Table 4.1-3. As the seabed rises toward NNW at a rate of 1/200, wave direction changes from S to SSE by refraction. There is a trouble experienced by the port that the long-period waves used to cause mooring rope to tear off. Therefore, the careful examination of its ships safety in the port should be conducted applying an appropriate simulation at the detailed design stage. The wave condition at Salalah during the SW monsoon season is shown in Photo 4.1-1.

Table 4.1-3 Design Wave Height and Period

	Hs (m)	Ts (s)
ENE	1.24	3.7
E	2.02	5.9
ESE	2.68	5.2
SE	2.82	7.7
SSE	5.79	8.9
S	7.00	8.4
SSW	3.62	5.7

Note: Hs – design wave height, Ts - Period

Source: Master Plan Study (JICA, 2000)

Photo 4.1-1 Wave Condition at Salalah during SW monsoon

(2) Tidal Levels

The parameters of tidal levels set up by JICA Study Team in 2000 were taken from the Tide Table by Royal Navy of Oman as presented below, which are the same as the tide table by Royal Navy of Oman in 2003.

MHHW +1.68 m CD
MLHW +1.64 m CD
MHLW +1.33 m CD
MLLW +0.65 m CD
LAT ±0.00 m CD

(3) Tidal Current

The tidal current observations at a depth of -15 m were carried out for 15 days during the Master Plan Study (JICA, 2000). According to the result, the average velocity of tidal current was 0.13 m/s at about 2 m below the surface with the maximum velocity of 0.38 m/s. Its prevailing directions were NNE and SSW.

(4) Geological Condition

The soil investigation was conducted during the Master Plan Study by JICA Study Team in 2000. The soils around Salalah Port were represented by a sand layer (3m thick beneath the seabed) and limestone or calcareous layer (exist below sand layer). The N value was found to exceed N=50 except for some loose sediments at the seabed (Master Plan Study, JICA, 2000).

(5) Seismic Condition

The significant earthquake has never experienced in the area around Salalah. K_h, horizontal seismic coefficient, has been calculated at 0.02 G with using the earthquake data of National Earthquake Information Center. As this figure is quite small, it has been decided that the seismic condition is not taken into consideration in the structural design of this study for Salalah Port even though 0.10 G was applied in the Master Plan Study (JICA, 2000).

(6) Sedimentation

No maintenance dredging has been carried out since the port operation started in 1998, although the maximum difference in the outer channel between the original and dredged depth has been 3.0m and the port is located near the mouth of Wadi Adownib. A dam is planned to locate in the upper stream of Wadi Adownib in order to prevent flash flood flowing into the sea. Judging from such situation, slight sedimentation can take place in the port area. Photo 4.1-2 shows the river mouth of Wadi Adownib. The mouth of Wadi Adownib is soaked by the sea water.

Photo 4.1-2 River Mouth of Wadi Adownib

4.1.3 Sohar Port

There are several study reports available on Sohar Port such as the Master Plan Study (JICA, 1990), the Mater Plan Study (Brown & Root, 2000), the Geotechnical Investigation Report (Fugro, 2003) and so on.

(1) Wave Condition

No wave data near Sohar Port is available at present. As described above, waves were measured throughout the year of 1988 at a buoy 5 km offshore from Sultan Qaboos Port by using a super sonic wave system. In the Master Plan Study (JICA, 1990), the results were applied not only for Sultan Qaboos Port but also for Sohar Port.

With respect to the design deep water wave for Sohar Port, wave parameters were determined in the Master Plan Study (JICA, 1990) as below. The seabed rises toward SW at a rate of 1/200. Accordingly, wave direction changes from E to NE by refraction.

Wave Direction;	E
Wave Height ($H_{1/3}$);	5.9 m (return period: 100 years)
Wave Period ($T_{1/3}$);	12.0 s

The design wave height for breakwater, which has been already constructed at a depth of 11 m, was also determined to be 5.2 m in the Master Plan Study (JICA, 1990).

(2) Tidal Levels

The parameters set up by JICA Study Team in 1990 were taken from the Admiralty Tide Table. However, as the parameters by Royal Navy of Oman in 2003 are available, they have been applied for

this study as shown below. There is no remarkable difference between two information.

MHHW +2.72 m CD
MLHW +2.61 m CD
MHLW +1.67 m CD
MLLW +0.83 m CD
LAT ±0.00 m CD

(3) Tidal Current

As mentioned above, the tidal current observation was carried out for 15 days during the Master Plan Study (JICA, 1990). According to the result, the velocity of tidal current was less than 0.10 m/s at about 2 m above the seabed with its prevailing direction of NW and SE.

(4) Geological Condition

The soil investigation was conducted around Majis jetty by JICA Study Team in 1990. Six boreholes were drilled inside the port with SPT tests. The results reveal that the soils around Sohar Port (Majis jetty) are represented by loose sediments (4 m thick below the seabed), silty sand layer or sandy silt layer with gravel (15 m thick below loose sediments) and sandstone layer (below a silty sand or a sandy silt layer). The N value of silty sand or sandy silt layer was found to vary between N=15 and N=30 (Master Plan Study, JICA, 1990).

(5) Seismic Condition

The huge earthquake has never experienced in the area around Sohar. K_h, horizontal seismic coefficient, has been calculated at 0.02 G with using the earthquake data of National Earthquake Information Center. As this figure is quite small, it has been decided that the seismic condition is not taken into consideration in the structural design of this study for Sohar Port.

(6) Sedimentation

There is no record of maintenance dredging because capital dredging has been just completed recently. However, it is probable that some sedimentation will occur in the access channel, because there is a big gap between the original and dredged depth with the maximum gap of 6.0 m, and it is reported the net volume of sediment transport from the south to the north is estimated at 50,000-100,000 m^3/year.

4.1.4 Khasab Port

A Feasibility Study was conducted by a consultant named WS Atkins in 2001 based on the British Standard, Technical Standards and Commentaries for Port and Harbour Facilities in Japan and PIANC.

(1) Wave Condition

Khasab Port is located on the northern part of Oman and faces to Arabian Gulf. It is well sheltered by Musandam Peninsula. That is the reason why the wave height is much smaller than that of other ports.

The seabed rises toward S at a rate of 1/100.

Wave Direction; NNE
Wave Height ($H_{1/3}$); 3.6 m (return period: 100 years)
Wave Period ($T_{1/3}$); 6.4 s

(2) Tidal Levels

The parameters of tidal levels set up by WS Atkins were taken from tide tables by Royal Navy of Oman in 2001, which are the same as those in 2003.

MHHW +2.27 m CD
MLHW +2.21 m CD
MHLW +1.12 m CD
MLLW +0.62 m CD
LAT ±0.00 m CD

(3) Tidal Current

According to the Feasibility Study Report (WS Atkins, 2001), the maximum velocity of tidal current was less than 0.40 m/s and most of them were about 0.1 m/s.

(4) Geological Condition

The soil investigation was conducted around Khasab Port. The soils at a depth of 9 – 10 m around Khasab Port are represented by loose sediments (3 m thick below the seabed) and sand layer with gravel (7 – 8 m thick below loose sediments).

(5) Seismic Condition

In the Feasibility Study (WS Atkins, 2001), it was applied that K_h, horizontal seismic coefficient, is 0.05 G. This figure has been confirmed by JICA Study Team with using the earthquake data of National Earthquake Information Center.

(6) Sedimentation

Khasab Port is located at the mouth of Khasab wadi. Monthly and annual flows are as follows. Though flow volume is quite small, it will be inevitable that some sedimentation occurs in the port area in floods.

Table 4.1-4 Monthly and Annual Flows in Khasab Wadi

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
0.05	0.30	0.29	0.10	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.32	1.22

Unit: million m^3

Source: Feasibility Study (WS Atkins, 2001)