社会開発調査部報告書

NO. 52

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SUBIC BAY METROPOLITAN AUTHORITY (SBMA)

THE STUDY ON THE SUBIC BAY PORT MASTER PLAN IN THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT
VOL.3 FEASIBILITY STUDY

AUGUST 1999

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

FINAL REPORT
THE STUDY ON THE SUBIC BAY PORT MASTER PLAN IN THE REPUBLIC OF THE PHILIPPINES
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AUG

Exchange Rate

1 US Dollar = 40.4458 Peso = 127.75 Yen

(As of February 1998)

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct THE STUDY ON THE SUBIC BAY PORT MASTER PLAN IN THE REPUBLIC OF THE PHILIPPINES and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Republic of the Philippines a study team four times between January 1998 and June 1999, which was headed by Dr. Koji Kobune of the Overseas Coastal Area Development Institute of Japan (OCDI) and composed of members from OCDI and the Pacific Consultants International (PCI).

The team held discussion with the officials concerned of the Government of the Republic of the Philippines, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.

August, 1999

Kimio Fujita
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

August, 1999

Mr. Kimio FUJITA
President
Japan International Cooperation Agency

Dear Mr. Fujita,

It is my great pleasure to submit herewith the Final Report of the Study on the Subic Bay Port Master Plan in the Republic of the Philippines.

The study team which consists of the Overseas Coastal Area Development Institute of Japan (OCDI) and the Pacific Consultants International (PCI) conducted surveys in the Republic of the Philippines over the period between January 1998 and June 1999 as per the contract with the Japan International Cooperation Agency.

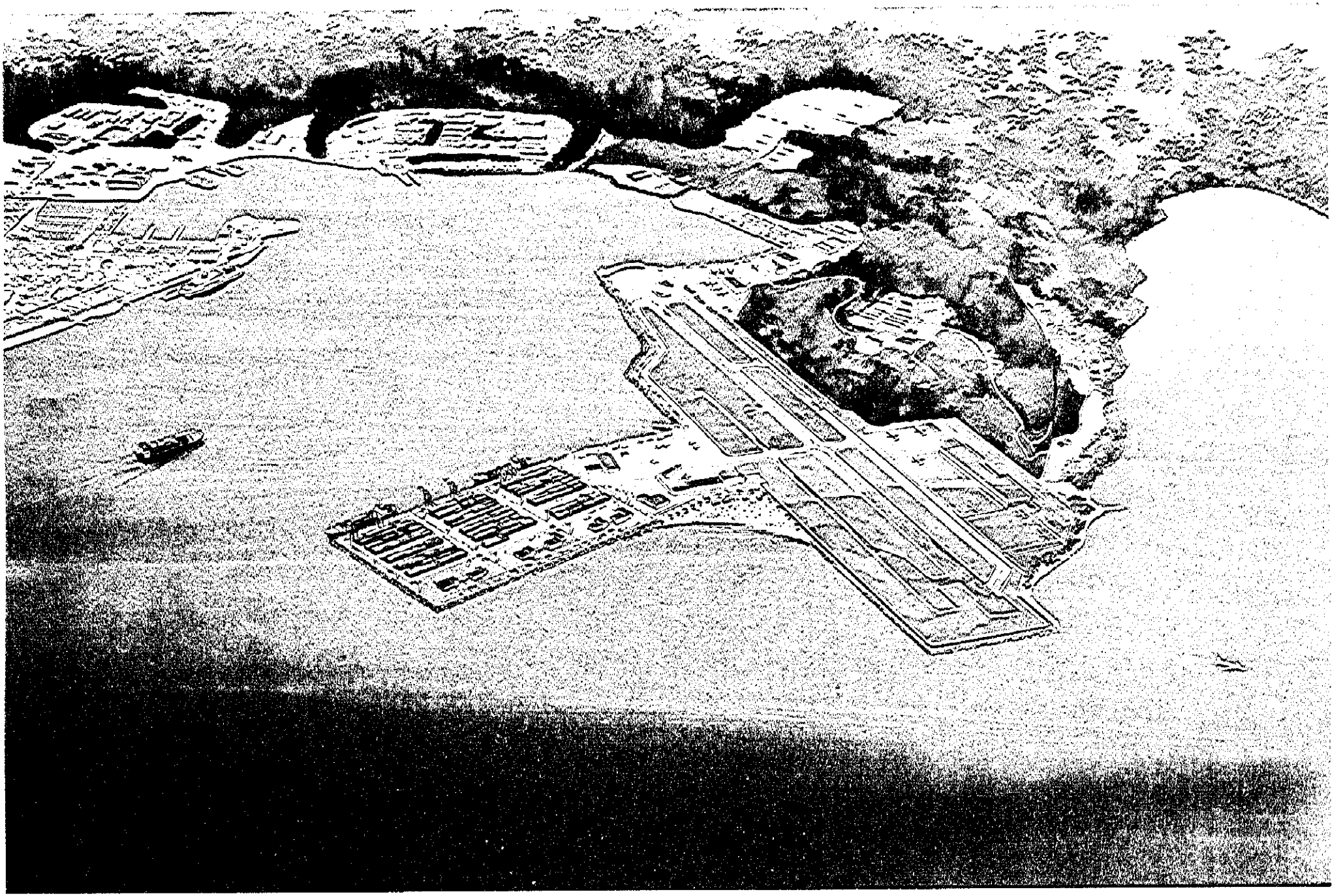
The findings of this study, which are compiled in this report, were fully discussed with the officials of the Subic Bay Metropolitan Authority and other authorities concerned to formulate the Master Plan which is the Long Term Plan of Subic Bay Freeport for the period up to the year 2020, and formulate and examine the feasibility of the Short Term Plan of the same port for the period up to the year 2007.

On behalf of the study team, I would like to express my heart felt appreciation to the Government of the Republic of the Philippines, the Subic Bay Metropolitan Authority and other authorities concerned for their diligent cooperation and assistance in the course of the study.

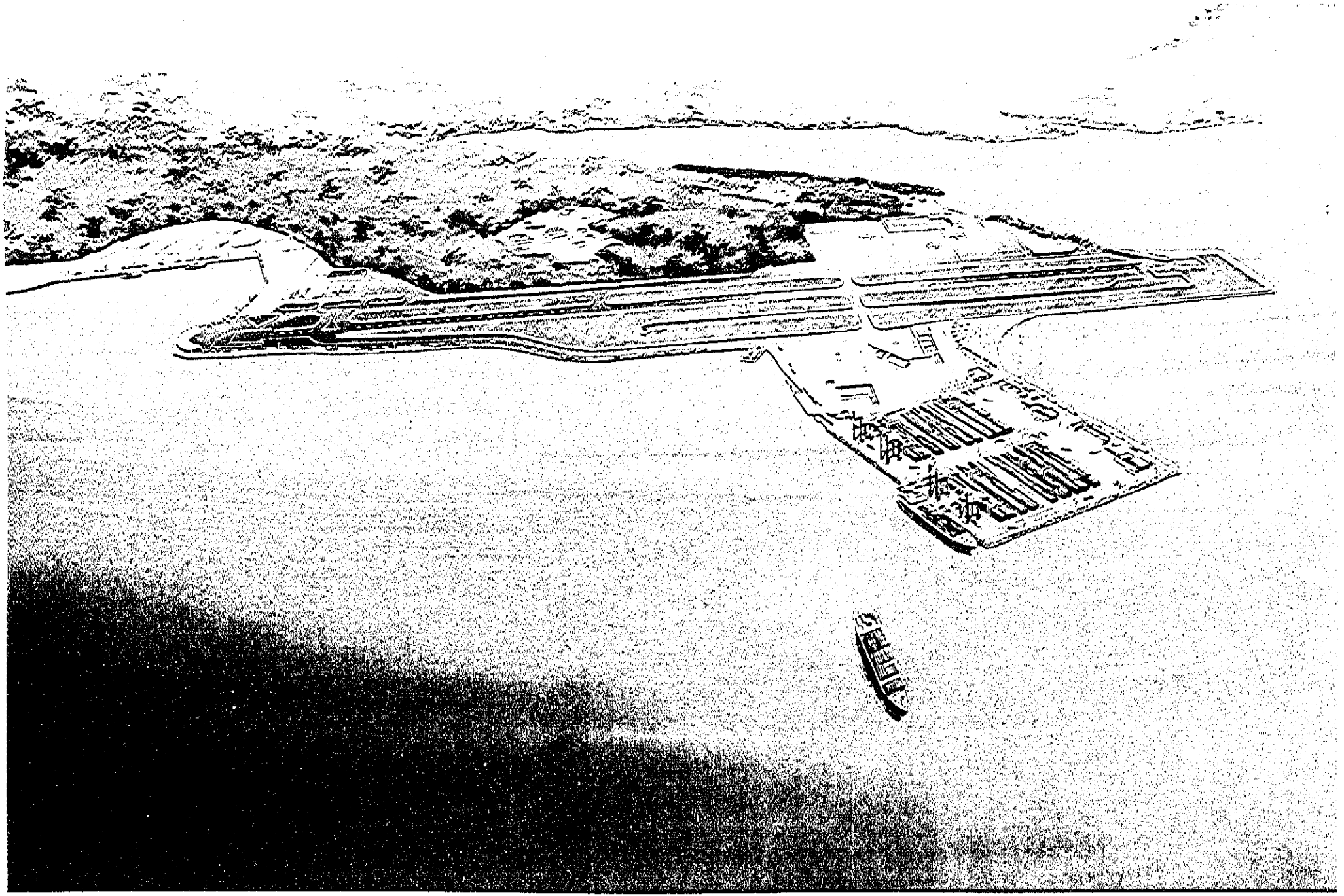
Yours faithfully,

Koji Kobune

Koji Kobune
Leader of the study team
for the Study on the Subic Bay Port Master Plan in the Republic of the Philippines



Long-term Development Plan (up to 2020)



Short-term Development Plan (up to 2007)

LIST OF ABBREVIATIONS

A	ADB	: Asian Development Bank
	AFP	: Armed Forces of the Philippines
	ANERA	: Asia/North America Eastbound Rate Agreement
	AO	: Administrative Order
	APL	: American President Lines
	APT	: Asset Privatization Trust
	AT&T	: American Telephone and Telegraph Co.
	ATI	: Asian Terminals Incorporated
	ATO	: Air Transportation Office
B	BCDA	: Bases Conversion Development Authority
	BI	: Bureau of Immigration
	BIR	: Bureau of Internal Revenue
	BOC	: Bureau of Customs
	BOR	: Berth Occupancy Ratio
	BOT	: Build, Operate and Transfer
C	CAB	: Civil Aeronautics Board
	CB	: Central Bank of the Philippines
	CBA	: Cost/Benefit Analysis
	CCA	: Custom Clearance Area
	CDC	: Clark Development Corporation
	CFS	: Container Freight Station
	CIQ	: Custom, Immigration and Quarantine
	CLDP	: Central Luzon Development Program
	COA	: Commission on Audit
	COP	: Committee on Privatization
D	DBEL	: Deep Berth Equivalent Length
	DENR	: Department Environmental and Natural Resources
	DF / R	: Draft Final Report
	DOF	: Department of Finance
	DOH	: Department of Health
	DOJ	: Department of Justice
	DOTC	: Department of Transportation and Communications
	DPWH	: Department of Public Works and Highways
E	EDI	: Electronic Data Interchange
	EDP	: Electronic Data Processing

	EIA	: Environmental Impact Assessment
	EL	: Elevation Line
	EO	: Executive Order
	EPZ	: Export Processing Zone
F	FCL	: Full Container Load
	F / R	: Final Report
	F / S	: Feasibility Study
	FSC	: Freeport Service Corporation
G	GOCC	: Government Owned and Controlled Company
	GOP	: Government of the Philippines
H	HHW	: Highest High Water Level
	HPPL	: Hutchison Port Philippines Ltd.
I	IC / R	: Inception Report
	ICTSI	: International Container Terminal Services, Inc.
	IEE	: Initial Environmental Examination
	ISO	: International Standardization Organization
	IT	: Information Technology
J	JAIDO	: Japan International Development Organization
	JICA	: Japan International Cooperation Agency
L	L/C	: Letter of Credit
	LCL	: Less than Container Load
	LCT	: Loading Craft Transport
	LGU	: Local Government Unit
	LLW	: Lowest Low Water Level
	LO-LO	: Lift on Lift off
M	MEPZ	: Mactan Export Processing Zone
	M/ P	: Master Plan
	MICT	: Manila International Container Terminal
	MOT	: Ministry of Transport
	MSL	: Mean Sea-Water Level
	MTPDP	: Medium-Term Philippine Development Plan
	M/V	: Motor Vessel
N	NAIA	: Ninoy Aquino International Airport
	NAVMAG	: Naval Magazine

	NEDA	: National Economic and Development Authority
	NOAA	: U.S. National Oceanic and Atmospheric Administration
	NOL	: Neptune Orient Lines
	NSCB	: National Statistical Coordination Board
	NSD	: Naval Supply Depot
	NVOCC	: Non Vessel Operating Common Carrier
O	OCS	: Obstacle Clearance Surface
	OJT	: On the Job Training
	OSIR	: Out of Service in Reserve
P	PAL	: Philippine Air Lines
	PBAC	: Pre-qualifications, Bids & Awards Committee
	PD	: Presidential Decree
	PEA	: Public Estate Authority
	PEZA	: Philippine Economic Zone Authority
	PHRI	: Port and Harbor Research Institute
	PLDT	: Philippine Long Distance Telephone Company
	PNR	: Philippine National Railways
	POD	: Pocket Oxford Dictionary
	POL	: Petroleum, Oil and Lubricant
	PPA	: Philippine Ports Authority
	PPATC	: Philippine Ports Authority Training Center
	PR / R	: Progress Report
	PSE	: Philippine Stock Exchange
	PTA	: Philippine Tourism Authority
	PTSS	: Philippine Transport Strategy Study
R	RA	: Republic Act
	R/W	: Runway
	RO-RO	: Roll on Roll off
	RTGC	: Rubber Tired Gantry Crane
S	S/W	: Scope of Work
	SBC	: Sensitive Biological Community
	SBDMC	: Subic Bay Development and Management Corporation
	SBF	: Subic Bay Freeport
	SBFSA	: Subic Bay Freeport Secured Area
	SBFZ	: Subic Bay Freeport Zone
	SBIA	: Subic Bay International Airport
	SBMA	: Subic Bay Metropolitan Authority
	SBSSI	: Subic Bay Satellite Systems, Inc.

	SBWD	: Subic Bay Waterfront Development Corporation
	SBYC	: Subic Bay Yacht Club
	SEC	: Securities and Exchange Commission
	SEZ	: Special Economic Zone
	SIACI	: Subic International Air Charter Inc.
	SPC	: Enron Subic Power Corporation
	SS	: Suspended Solid
	SSEFZ	: Subic Special Economic and Freeport Zone
	STEP	: Subic Technopark Corporation
T	TCC	: Training through Curriculum Course
	TEU	: Twenty- Foot Equivalent Unit
	TOR	: Terms of Reference
	TSP	: Total Suspended Particulates

CONTENTS

1. Introduction 1-1

2. Cargo Traffic Forecast 2-1

2.1 Methodology 2-1

2.2 Cargo Forecast 2-1

2.2.1 Premise of Forecast 2-1

2.2.2 Demand Forecast 2-4

3. Phasing of Long Term Plan 3-1

3.1 Formulation of Phasing Plan 3-1

3.1.1 Policy for the Phasing of Long Term Plan 3-1

3.1.2 Phasing Plan for Port Facilities 3-3

3.1.3 Phasing Plan for Cargo Handling Equipment 3-23

3.2 Short Term Development Plan 3-25

3.2.1 Policy for the Short Term Plan and Urgent Development Plan 3-25

3.2.2 Requirement and Port Layout Plan for Short Term Plan 3-26

3.2.3 Restriction of Airspace Caused by the Airport 3-29

3.2.4 Requirement for Cargo Handling Equipment in short Term Plan 3-39

3.3 Preliminary Design of the Facilities for Short Term Plan 3-43

3.3.1 Design Criteria 3-43

3.3.2 Codes and Standards 3-46

3.3.3 Design of New Container Terminal at Cubi Pt. 3-47

3.3.4 Design of Access Road to the New Container Terminal at Cubi Pt. 3-56

3.3.5 Design of Rehabilitation/Reinforcement for the Existing Wharves 3-59

3.3.6 Upgrading Existing Navigation Aids in Subic Bay 3-59

3.4 Cost Estimate for Short Term Plan 3-63

3.4.1 General Conditions for the Estimate 3-63

3.4.2 Estimate of the Project Cost 3-64

3.5 Construction and Implementation Program for Short Term Plan 3-69

3.5.1 Construction Program for Short Term Plan 3-69

3.5.2 Implementation Program 3-72

4. Port Development, Management and Operation 4-1

4.1 Introduction of Private Sector and Responsibility of SBMA 4-1

4.1.1 Institutional Background of Privatization of the Philippines 4-1

4.1.2 Responsibility of SBMA 4-5

4.2 Recommendable Institutional and Regulatory Framework ····· 4-9
4.2.1 Reinforcement of the Privatization ····· 4-9
4.2.2 Health Check Items of Port Privatization ····· 4-11
4.2.3 The Outline of The Privatization of SBMA ····· 4-16
4.2.4 Recommendable Institutional Framework ····· 4-22
4.3 Technology Transfer Method and Training System ····· 4-30
4.3.1 Technology Transfer Method ····· 4-30
4.3.2 Training System ····· 4-36
4.4 Marketing Strategy for Port Promotion ····· 4-41
4.4.1 Sales Point of Port of Subic ····· 4-41
4.4.2 Marketing Strategy for Port Promotion ····· 4-45
4.4.3 Port Promotion and Sales ····· 4-49
4.5 Action Program for Improvement of Management and Operation System ····· 4-53
4.5.1 Necessary Improvement ····· 4-53
4.5.2 Action Program for Improvement of Management and Operation Systems 4-60
4.6 Improvement Plan and Schedule for Short Term Development Plan ····· 4-67
4.6.1 Urgent Development Plan ····· 4-67
4.6.2 The Short Term Development Plan ····· 4-67
4.7 Organization and Tariff for Short Term Development Plan ····· 4-71
4.7.1 Organization for Short Term Development Plan ····· 4-71
4.7.2 Port Tariff ····· 4-75
4.8 Implementation and Financial Programs for Short Term Plan ····· 4-80
4.8.1 Outline of the Investment ····· 4-80
4.8.2 Financial Program for Short Term Plan ····· 4-85

5. Economic Analysis ····· 5-1
5.1 Methodology of the Economic Analysis ····· 5-1
5.1.1 Objective ····· 5-1
5.1.2 Methodology ····· 5-1
5.2 Economic Analysis ····· 5-2
5.2.1 "With" case and "Without" Case ····· 5-2
5.2.2 Prerequisites of the Economic Analysis ····· 5-3
5.2.3 Economic Prices ····· 5-4
5.2.4 Cost of the Projects ····· 5-6
5.2.5 Benefits of the Projects ····· 5-9
5.2.6 Economic Internal Rate of Return (EIRR) ····· 5-16
5.3 Evaluation ····· 5-17

6. Financial Analysis 6-1
6.1 Objective and Methodology of the Financial Analysis 6-1
6.1.1 Objective 6-1
6.1.2 Methodology 6-1
6.2 General Prerequisites of Financial Analysis 6-3
6.2.1 Scope of the Analysis 6-3
6.2.2 Project Life and Base Year 6-4
6.2.3 Revenue and Expenditure 6-4
6.2.4 Fund Raising 6-8
6.3 Financial Analysis 6-9
6.3.1 Analyzed Pattern 6-9
6.3.2 Sensitivity Analysis 6-10
6.4 Evaluation 6-10
6.4.1 Viability of the Project 6-10
6.4.2 Financial Soundness of SBMA 6-10
6.4.3 Conclusion 6-11

7. Environmental Impact Assessment (EIA) 7-1
7.1 Objective of the Environmental Impact Assessment 7-2
7.2 EIA for Change in Coastal Currents 7-2
7.2.1 Methodology 7-2
7.2.2 Results of the Calculation 7-11
7.3 EIA for Dispersal of Dredging and Reclamation Material 7-19
7.3.1 Suspended Solid 7-19
7.3.2 Sea Bottom Quality (Chromium) 7-28
7.4 EIA for Natural Resources Utilization 7-29
7.4.1 Impact on Marine Biological Resources 7-29
7.4.2 Impact on Fishery Resources and Activities 7-31
7.5 EIA for Socioeconomic Environment 7-49
7.5.1 Target Group of EIA for Socioeconomic Environment 7-49
7.5.2 Questionnaires and General Information 7-50
7.5.3 Impact to Recreational Beach 7-62
7.5.4 Impact to the Socioeconomic Activities in Redondo Peninsula 7-68
7.5.5 Impact on Port Labor 7-72
7.6 Environmental Monitoring 7-75
7.6.1 Monitoring Area and Monitoring Items 7-75
7.6.2 Monitoring Frequency and the Countermeasures 7-76
7.7 Evaluation 7-78

8. Overall Evaluation 8-1

9. Conclusions and Recommendations 9-1
9.1 Conclusions 9-1
9.1.1 Cargo Forecast 9-1
9.1.2 Phasing of Long Term Plan 9-1
9.1.3 Port Development, Management and Operation 9-3
9.1.4 Economic Analysis 9-5
9.1.5 Financial Analysis 9-6
9.1.6 Environmental Impact Assessment 9-7
9.1.7 Overall Evaluation 9-9
9.2 Recommendations 9-10
9.2.1 Matters with Regard to Airport 9-10
9.2.2 Matters with Regard to Environment 9-11
9.2.3 Port Development, Management and Operation 9-12
9.2.4 Function and Role of the Ecology Center as a Constituent of SBMA 9-13

APPENDICES

Appendix A: Results of Demand Forecast A-1
Appendix B: (1) Land Land Transportation Cost A-7
(2) Calculation of Benefits A-7

LIST OF TABLES

Table 2.2.1-1	Comparison of Demand and Handling Capacity	2-2
Table 2.2.1-2	Cargo Handling Volume in the "With" and "Without" case	2-4
Table 2.2.2-1	Container Cargo Volume in SBFZ	2-6
Table 2.2.2-2	Other Container Cargo through SBF	2-9
Table 2.2.2-3	Container Cargo Volume at other EPZs and SEZs	2-9
Table 2.2.2-4	Container Cargo through SBF	2-11
Table 2.2.2-5	Import Cargo Volume by Commodity	2-14
Table 2.2.2-6	Non-containerized Cargo through SBF	2-15
Table 3.1.2-1	Calculation Result of Container Handling Capacity	3-4
Table 3.1.2-2	Container Volume by Phasing Plan	3-6
Table 3.1.2-3	Necessary Number of Ground Slots by Phasing Plan	3-7
Table 3.1.2-4	Planned Container Terminal Facilities by Phasing Plan	3-9
Table 3.1.2-5	Required Number of Berth for Foreign Trade in 2005, 2010, 2015 and 2020	3-16
Table 3.1.2-6	Required Number of Berth for Domestic Trade in 2005, 2010, 2015 and 2020	3-18
Table 3.1.2-7	Required Area for Cargo Storage Facilities	3-19
Table 3.1.3-1	Phasing Plan for Required Container Handling Equipment	3-23
Table 3.1.3-2	Required Non-container Handling Equipment (2005-2020)	3-24
Table 3.2.2-1	Container Ship Size of 2,000 TEU Carrier in TSK Lines	3-26
Table 3.2.4-1	Required Number of Container Handling Equipment	3-39
Table 3.3.1-1	General Design Criteria for Basic Design in the Master Plans	3-44
Table 3.3.3-1	Comparison of Quay Wall Structures	3-48
Table 3.3.3-2	Calculation Sheet for Stability of Caisson Type Quay Wall	3-50
Table 3.3.3-3	Volume of the Dredging and Reclamation for the Short Term Development	3-52
Table 3.3.3-4	Selection of Pavement Type and Preliminary Design of the Section	3-54
Table 3.3.3-5	Outline of Buildings in the New Container Terminal	3-55
Table 3.3.6-1	Outline of the Navigational Aids Upgrade in Subic Bay	3-61
Table 3.4.2-1	Overall Project Cost for Short Term Development Plan (Phase 1 & 2)	3-64
Table 3.4.2-2	Project Cost for Short Term Development (Phase 1 & 2)	3-66
Table 3.4.2-3	Cost Estimate for Phase 1 Development	3-67
Table 3.4.2-4	Cost Estimate for Phase 2 Development	3-68
Table 3.5.1-1	Construction Schedule for Short Term Development (Phase 1 & 2)	3-70
Table 3.5.2-1	Overall Implementation Schedule of the Short Term Development (Phase 1 & 2)	3-73

Table 4.2.1-1	The Three Companies Comparison	4-13
Table 4.2.3-1	The Subic Bay Investors	4-16
Table 4.2.3-2	SBMA Related Companies	4-20
Table 4.2.4-1	Japanese Laws Related to the Water-front Industry	4-28
Table 4.3.2-1	PPA Training Courses (Part I) --- Organic Courses ---	4-37
Table 4.4.1-1	Nautical Miles between Subic/Various Asian Ports	4-43
Table 4.6.2-1	Ship Calls by Shipping Lines (1998)	4-68
Table 4.7.2-1	Revenue of the Seaport Department Year-End Report	4-78
Table 5.2.3-1	Estimation of Standard Conversion Factor in 1997	5-5
Table 5.2.4-1	Estimation of Construction Cost (Initial Investment)	5-7
Table 5.2.4-2	Cost in Economic Prices by Year	5-8
Table 5.2.5-1	Forecasted Containerized Cargo Volume through Manila Port	5-10
Table 5.2.5-2	Comparison of Land Transportation Cost	5-11
Table 5.2.5-3	Difference of Transportation Rate (per TEU)	5-11
Table 5.2.5-4	Difference of Transportation Cost	5-12
Table 5.2.5-5	Benefits of the Project	5-15
Table 5.2.6-1	Results of Sensitivity Analysis	5-16
Table 5.2.6-2 (a)	Cost/Benefit Analysis of Short-term Plan (Base Case)	5-18
Table 5.2.6-2 (b)	Cost/Benefit Analysis of Short-term Plan (Case A)	5-19
Table 5.2.6-2 (c)	Cost/Benefit Analysis of Short-term Plan (Case B)	5-20
Table 5.2.6-2 (d)	Cost/Benefit Analysis of Short-term Plan (Case C)	5-21
Table 6.1.2-1	The Revenue and Cost Elements Employed in the FIRR Calculation	6-1
Table 6.1.2-2	The Revenue and Cost Exempted from the FIRR Calculation	6-2
Table 6.2.3-1	Revenue in With Case	6-5
Table 6.2.3-2	Revenue in Without Case	6-6
Table 6.2.3-3	Handling Volume Share of Operators	6-7
Table 6.2.3-4	Cost and Revenue Items Allocated to SBMA and Operators	6-4
Table 6.2.3-5	Project Cost of SBMA and Operators	6-7
Table 6.2.3-6	Personnel Cost	6-8
Table 6.4.1-1	Results of the FIRR	6-10
Table 6.4.2-1	Financial Statements (SBMA)	6-12
Table 7.2.1-1	Fresh Water Discharge from Four Rivers	7-5
Table 7.3.1-1	Characteristics of Each Suspended Solid	7-22
Table 7.3.1-2	The Standard Values of SS for Each Classification in Subic Bay	7-23
Table 7.4.1-1	Population Density and Biomass of Soft Bottom Benthic Fauna in the Vicinity of the Project Site (February 1998)	7-30
Table 7.4.2-2	Perceived Impacts and Respondents' Opinions related to the Planned Port Development	7-40
Table 7.4.2-3	Demographic Profile of Respondents	7-41
Table 7.4.2-4	Employment Status, Number of Years as Fishers and Family	

	Involvement	7-42
Table 7.4.2-5	Respondents' Status of Boat Ownership and Engine Types of Boats	7-43
Table 7.4.2-6	Types of Fishing Gear and Preferred Fishing Ground	7-44
Table 7.4.2-7	Respondents' Number of Encounters with Ships	7-44
Table 7.4.2-8	Disturbances Created by Ships	7-45
Table 7.4.2-9	Respondents' Opinion on Pollution and Recommendations	7-46
Table 7.4.2-10	Respondent's Acceptability of the Project and Perceived Impacts	7-47
Table 7.5.2-1	Age Group Distribution by Target Group and by Sex (%)	7-51
Table 7.5.2-2	Place of Residence by Target Group and by Sex (%)	7-52
Table 7.5.2-3	Occupation by Target Group (%)	7-52
Table 7.5.2-4	Employment by Target Group (%)	7-53
Table 7.5.2-5	Working Place by Target Group (%)	7-54
Table 7.5.2-6	Income Level by Target Group (%)	7-55
Table 7.5.2-7	Perception on "Development" in General	7-56
Table 7.5.2-8	Ideal Type of Development (%)	7-57
Table 7.5.2-9	Will to Participate into "Development" (%)	7-58
Table 7.5.2-10	Perception on the Present Project within the SBMA Area	7-59
Table 7.5.2-11	Participation to the Present Project (%)	7-60
Table 7.5.2-12	Environmental Considerations	7-61
Table 7.5.3-1	Purpose of Visit of Tourists (%)	7-63
Table 7.5.3-2	Reason Why the Tourists Choose the Beach (%)	7-64
Table 7.5.3-3	Opinion on the Closure of the Beach (%)	7-65
Table 7.5.3-4	Opinion on the Creation of Equivalent Beach (%)	7-65
Table 7.5.3-5	Status of Employers/Employees	7-66
Table 7.5.3-6	Request against the Job Reduction and /or Closure (Employees)	7-68
Table 7.5.4-1	Opinion on the Activities of Quarrying and Filling Material Collection (Actual Numbers)	7-71
Table 7.5.4-2	Willingness to Participate into Developmental Activities (Actual Numbers)	7-71
Table 7.5.5-1	Opinion on the Development Activities at Cubi point (%)	7-74
Table 7.5.5-2	Opinion against Change/Increase of Work Shift (%)	7-74
Table 9.1.1-1	Demand Forecast of Container and Non-container Cargo	9-1
Table 9.1.2-1	Planned Container Terminal Facilities by Phasing Plan	9-1
Table 9.1.2-2	Project Cost for Short Term Plan	9-3
Table 9.1.5-1	Cost and Revenue of SBMA and Container Terminal Operators	9-6
Table A-2.2.1-1	Demand Forecast of Containerized Cargo	A-2
Table A-2.2.1-2	Demand Forecast of Non-containerized Cargo	A-2
Table A-2.2.2-1	Containerized Cargo from Factories at SBFZ	A-3
Table A-2.2.2-2	Other Containerized Cargo through SBFZ	A-3
Table A-2.2.2-3	Containerized Cargo at Other EPZs and SEZs	A-4

Table A-2.2.2-4	Containerized Cargo through SBF	A-4
Table A-2.2.2-5 (a)	Import Cargo by Commodity	A-5
Table A-2.2.2-5 (b)	Import Cargo by Commodity	A-5
Table A-2.2.2-6 (a)	Non-containerized Cargo through SBF	A-6
Table A-2.2.2-6 (b)	Non-containerized Cargo through SBF	A-6
Table A-5.2.5-2	Land Transportation Costs from Subic/Manila to Each EPZ and SEZ	A-8
Table A-5.2.5-2 (a)	Distance and Transportation Cost for Container	A-9
Table A-5.2.5-2 (b)	Transportation Cost from Subic to Each EPZ and SEZ	A-9
Table A-5.2.5-4	Transportation Cost for Non-containerized Cargo from Subic/Manila to Each Province	A-10
Table A-5.2.5-5 (a)	Benefit from Factory Development	A-11
Table A-5.2.5-5 (b)	Saving in Land Transportation Costs for Containerized Cargo of SBFZ	A-12
Table A-5.2.5-5 (c)	Saving in Land Transportation Costs for Containerized Cargo of Outside SBFZ	A-13
Table A-5.2.5-5 (d)	Saving in Land Transportation Costs for Non-containerized Cargo through SBF	A-14
Table A-5.2.5-5 (e)	Saving of Costs of Cargo Handling (Arbitrary Charge)	A-15

LIST OF FIGURES

Figure 2.2.1-1	Demand & Capacity of Container Cargo	2-3
Figure 2.2.1-2	Demand & Capacity of Non-containerized Cargo	2-3
Figure 2.2.1-3	Demand Forecast of Container Cargo	2-5
Figure 2.2.1-4	Demand Forecast of Non-containerized Cargo	2-5
Figure 2.2.2-1 (a)	Containerized Cargo from Factories at SBFZ	2-7
Figure 2.2.2-1 (b)	Containerized Cargo from Factories at SBFZ	2-7
Figure 2.2.2-2 (a)	Other Containerized Cargo through SBF	2-8
Figure 2.2.2-2 (b)	Other Containerized Cargo through SBF	2-8
Figure 2.2.2-3 (a)	Containerized Cargo at Other EPZs and SEZs	2-10
Figure 2.2.2-3 (b)	Containerized Cargo at Other EPZs and SEZs	2-10
Figure 2.2.2-4 (a)	Containerized Cargo through SBF	2-12
Figure 2.2.2-4 (b)	Containerized Cargo through SBF	2-12
Figure 2.2.2-5 (a)	Import Cargo by Commodity	2-13
Figure 2.2.2-5 (b)	Import Cargo by Commodity	2-13
Figure 2.2.2-6 (a)	Non-containerized Cargo through SBF	2-16
Figure 2.2.2-6 (b)	Non-containerized Cargo through SBF	2-16
Figure 3.1.2-1	Container Traffic Demand and Capacity	3-5
Figure 3.1.2-2	Container Terminal Development (Phase 1)	3-10
Figure 3.1.2-3	Container Terminal Development (Phase 2)	3-11
Figure 3.1.2-4	Container Terminal Development (Phase 3)	3-12
Figure 3.2.2-1	Port Layout for Short term Plan (New Container Terminal)	3-28
Figure 3.2.3-1	Obstacle Limitation Surfaces (The Subic International Airport)	3-31
Figure 3.2.3-2	Final Approach OCS (CAT-I, R/W 25)	3-32
Figure 3.2.3-3	R/W 25 Missed Approach OCS	3-33
Figure 3.2.3-4	R/W 07 Missed Approach OCS	3-34
Figure 3.2.3-5	Departure OCS	3-35
Figure 3.2.3-6	Height Limitation at Cubi point	3-36
Figure 3.2.3-7	Height of OCS on the Access Road	3-37
Figure 3.2.3-8	Detailed Height Limitation in Boton Area	3-38
Figure 3.2.4-1	Outline of Gantry Crane	3-41
Figure 3.2.4-2	Outline of Transfer Crane	3-42
Figure 3.3.1-1	Soil Conditions at Cubi Pt. for Preliminary Design	3-45
Figure 3.3.3-1	Typical Section of the Caisson Quay Wall for the New Container Terminal at Cubi pt.	3-49
Figure 3.3.3-2	Dredging Area	3-51
Figure 3.3.3-3	Typical Sections of Revetment for the New Container Terminal	3-53
Figure 3.3.4-1	General Alignment and Longitudinal Profile of New Access Road	3-57

Figure 3.3.4-2	Typical Sections of the Access Road (Scale: 1/400)	3-58
Figure 3.3.5-1	Rehabilitation and Reinforcement of Marine Terminal	3-60
Figure 3.3.6-1	Navigation Aids (Light House, Buoys and Beacons) Planned	3-62
Figure 4.2.1-1	Inter-relation of Privatization and Nationalization	4-10
Figure 4.5.1-1	SBMA Organization Chart	4-57
Figure 4.5.2-1	Seaport Department Organizational Chart	4-62
Figure 5.1.2-1	Procedure of the Economic Analysis	5-2
Figure 6.2.3-1	Handling Volume Share of Operators	6-7
Figure 7.2.1-1	Simulation Domains of Grid Size	7-4
Figure 7.2.1-2	Location of Fresh Water Discharge from Four Rivers	7-5
Figure 7.2.1-3	Observation Points for Calibration of the Model	7-6
Figure 7.2.1-4	Tidal Current Ellipse	7-7
Figure 7.2.1-5	Tidal Current Pattern (falling tide, present topography)	7-8
Figure 7.2.1-6	Tidal Current Pattern (rising tide, present topography)	7-9
Figure 7.2.1-7	Tidal Current Pattern (residual current, present topography)	7-10
Figure 7.2.2-1	Tidal Current Pattern (falling tide, long term plan)	7-12
Figure 7.2.2-2	Tidal Current Pattern (rising tide, long term plan)	7-13
Figure 7.2.2-3	Tidal Current Pattern (residual current, long term plan)	7-14
Figure 7.2.2-4	Tidal Current Pattern (falling tide, short term plan)	7-15
Figure 7.2.2-5	Tidal Current Pattern (rising tide, short term plan)	7-16
Figure 7.2.2-6	Tidal Current Pattern (residual current, short term plan)	7-17
Figure 7.2.2-7	Difference of Current Velocity (residual current, long term plan)	7-18
Figure 7.2.2-8	Difference of Current Velocity (residual current, short term plan)	7-18
Figure 7.3.1-1	Topographic Features and SS Loads in Construction Stage 1	7-21
Figure 7.3.1-2	Topographic Features and SS Loads in Construction Stage 2	7-21
Figure 7.3.1-3	Daily Average of SS Concentration in Construction Stage 1	7-24
Figure 7.3.1-4	Daily Maximum of SS Concentration in Construction Stage 1	7-25
Figure 7.3.1-5	Daily Average of SS Concentration in Construction Stage 2	7-26
Figure 7.3.1-6	Daily Maximum of SS Concentration in Construction Stage 2	7-27
Figure 7.4.2-1	Location of Study Barangays	7-34
Figure 7.4.2-2	Locations of Fishing Grounds and Area Restricted for Municipal Fishing in Subic Bay	7-35
Figure 7.4.2-3	Approximate Routes Taken by Fisherman to Fishing Grounds from their Respective Communities	7-37
Figure 7.6.1-1	Monitoring Lines and Stations	7-75
Figure 7.6.2-1	Schematic Image of Environmental Monitoring	7-77
Figure 2 (a)	Correlation between Distance and Transportation Cost	A-9
Figure 5 (a)	Development of Industrial Estate at SBFZ	A-11

1. Introduction

This report proposes the Phasing Plan and the Short Term Plan up to 2007 of Subic Bay Freeport within the framework of the Port Master Plan, which, as discussed in the Volume two of this Report, was identified to be most recommendable.

The feasibility of the proposed Short Term Plan was evaluated from various viewpoints. The feasibility study covered the following work items:

(1) Formulation of suitable phasing plan and the Short Term Plan in line with the Long Term Plan
(2) Review of the cargo volume forecast which was carried out for the Economic and the Financial analyses in the Short Term Plan
(3) Careful examinations of the construction schedule, engineering soundness of the structural design, the construction plan and the construction cost for the Short Term Plan
(4) Proposals of adequate systems of port development, management and operation
(5) Evaluation of both the Economic and the Financial feasibility
(6) The Environmental Impact Assessment for those elements which, in the course of the preparation of the Long Term Plan, were identified to be the potential impacts caused by the project

2. Cargo Traffic Forecast

2.1 Methodology

Demand forecast of the Master plan was already conducted in Chapter 7.3.4, Volume 2. Three cases, the high case, medium case and low case, are assumed up to 2020 by the projection of socio-economic indices of GDP.

Demand forecast of the Short-term plan for target year 2005 and after is based on the assumption that the GDP growth rate will be the same as medium case.

Cargo handling capacity of port facilities at each year in the Short-term plan (see Chapter 3, Volume 3) will be considered for the demand forecast. After comparing cargo demand and cargo handling capacity of port at each year of the Short-term plan the smaller figure will be adopted as the cargo demand at each year in the feasibility study of Short-term plan.

2.2 Cargo Forecast

2.2.1 Premise of Forecast

The volume of container and non-containerized cargo in the Short-term plan will be the same as the medium economic growth case of the Philippines economy in the Master plan.

Cargo handling capacity of SBF is given in Chapter 3.1.2, Volume 3.

(1) Cargo handling capacity of SBF

1) Container cargo

According to SBMA, one gantry crane is planned to be installed at Sattler Pier in 2000. In the year 2001, cargo handling capacity will reach 110,000 TEU from the present capacity of 88,000 TEU. In the target year 2005 of the first phase of the Short-term plan, one container berth (L=280m) equipped with two gantry cranes will have a container handling capacity of 297,000 TEU. At the end of the second stage of the Short-term plan in 2007, another berth (L=280m) equipped with two gantry cranes will be in operation.

Finally, container handling capacity of the new container terminal will reach a maximum 594,000 TEU.

In the year 2016, cargo demand will exceed the container cargo handling capacity, thus the cargo volume will maintain a constant level of 594,000 TEU beyond that year.

2) Non-containerized cargo

Considering that the non-containerized cargo handling capacity of SBF, after 2005 year, cargo handling is mainly used at NSD area (Marine Terminal and Sattler Pier) and Boton berth for foreign trade and local trade, respectively.

Cargo handling capacity of these berth will be calculated by cargo handling capacity rate per berth / year. The rate of cargo handling capacity at NSD area is assumed 220,000 tons /berth/year based on the world standard. The rate of capacity at Boton berth is assumed 160,000 tons /berth/year considering the height restriction of this area.

Accordingly, cargo handling capacity at NSD area composed of three berth is assumed 660,000 tons and Boton berth composed of one berth is assumed 160,000 tons.

Therefore, total cargo handling capacity is estimated at about 820,000 tons.

Demand of container and non-containerized cargo above mentioned and capacity of port are shown in the following Table 2.2.1-1, Figure 2.2.1-1 and Figure 2.2.1-2.

Table 2.2.1-1 Comparison of Demand and Handling Capacity

	2000	2005	2010	2015	2020
Container Cargo (1000 TEU)					
Cargo Demand	126	277	423	588	726
Capacity of Port	88	297	594	594	594
Non-container Cargo (1000 tons)					
Cargo Demand	527	631	742	863	995
Capacity of Port	820	820	820	820	820

(2) Cargo Volume in the "With" and "Without" Case

1) Container cargo

In the "With" case, after comparing demand and capacity at each year, the smaller figure will be applied as the cargo demand. When cargo demand reaches the maximum capacity of port facilities, surplus cargoes will be handled at adjacent ports.

Cargoes for the located factories in SBFZ will be given priority followed by other container cargoes in SBFZ. Cargo from EPZs and SEZs in Region III will also be handled, but the volume of this cargo is expected to decrease as the volume of the former cargoes increases from 2016 and after.

As soon as the first phase construction of the short-term plan is completed in 2005, container cargo handling capacity will increase to 297,000 TEU. And then cargo demand will be assumed as 277,300 TEU in 2005.

However, although the container cargo demand is 277,300 TEU, the actual cargo handling volume at the new container terminal will not increase so rapidly. Therefore, actual container volume will be determined based on the following assumption.

Actual container cargo volume at the new container terminal will gradually catch up to the demand, rising from 110,000 TEU in 2004 year to 364,600 TEU in 2008.

In the "Without" case, port capacity is always below the demand. Therefore container cargo is maintained as 110,000 TEU from 2001 and after. Also, investment activities for the industrial park located in SBFZ might be delayed or canceled.

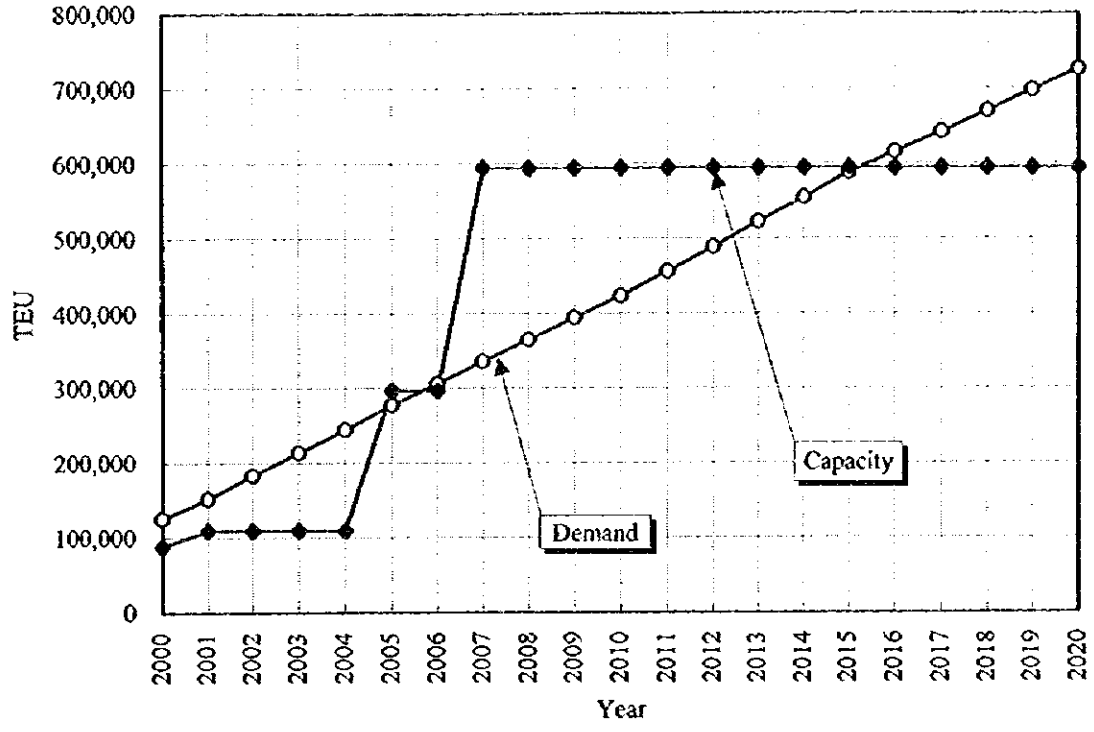


Figure 2.2.1-1 Demand & Capacity of Container Cargo

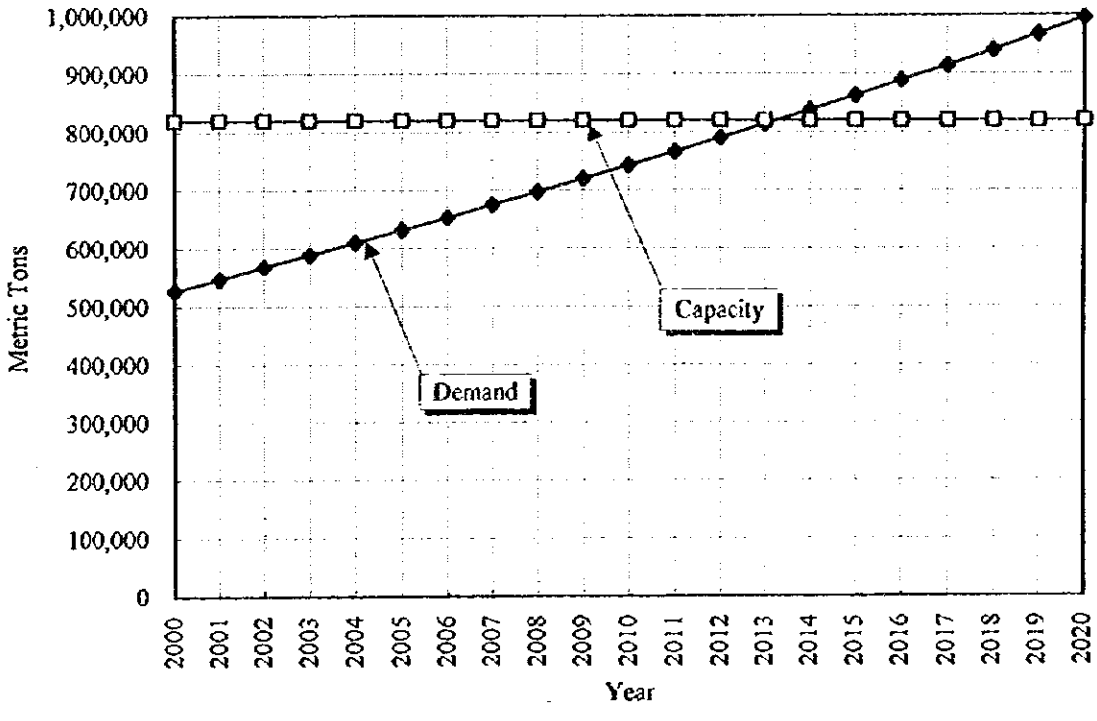


Figure 2.2.1-2 Demand & Capacity of Non-containerized Cargo

In this study, only the on-going projects of Industrial Park phase I & II and Technopark phase I will be developed. Other projects such as Industrial Park phase III and Technopark phase II will not be developed.

2) Non-containerized cargo

An important assumption concerns the soya bean which is imported and outbound to the domestic market as bulk cargo. In the demand forecast of soya bean in Chapter 7.3.4, Volume 2, import volume of soya bean is 210,000 tons in 2020. At present, it is planned that soya bean handling works will be wholly turned over to a private company by BOT scheme in 2001. Therefore, from 2002, soya bean is no longer handled at aforesaid facilities (NSD area and Botom area).

In the "With" and "Without" case, only soya bean cargo will be applied to aforesaid plan. The volume of other cargo handled at SBF corresponds to the demand forecast.

In the "Without" case, Sattler Pier as above mentioned is converted to container berth. Therefore, non-containerized cargo is not handled any more. And also, there will be no investment in existing facilities at all. Therefore, handling capacity of Marine Terminal will be decreased gradually every year from 2000 to 2010 due to deterioration of existing facilities. In 2010, available berth number at Marine Terminal is considered as only one berth and Boton berth is maintained as same as present capacity. Total cargo handling capacity will be assumed 380,000 tons(Marine Terminal: 220,000 tons and Boton berth:160,000 tons) in 2010, that is, about 46% of volume of the year 2000 level.

After the year 2010, port capacity will be maintained at a constant level.

Cargo handling volume in the "With" and "Without" cases based on above premise are shown in Table 2.2.1-2, Figure 2.2.1-3 and Figure 2.2.1-4.

Table 2.2.1-2 Cargo handling volume in the "With" and "Without" case

	2000	2005	2010	2015	2020
Containerized Cargo (1000 TEU)					
"With" case	88	173	423	588	594
"Without" case	88	110	110	110	110
Non-containerized Cargo(1000 tons)					
"With" case	527	424	504	594	698
"Without" case	527	424	380	380	380

2.2.2 Demand Forecast

(1) Container Cargo

Containerized cargoes handled at SBF which are determined hereinafter are composed of three categories: container cargoes of located factories in SBFZ, other container cargoes in

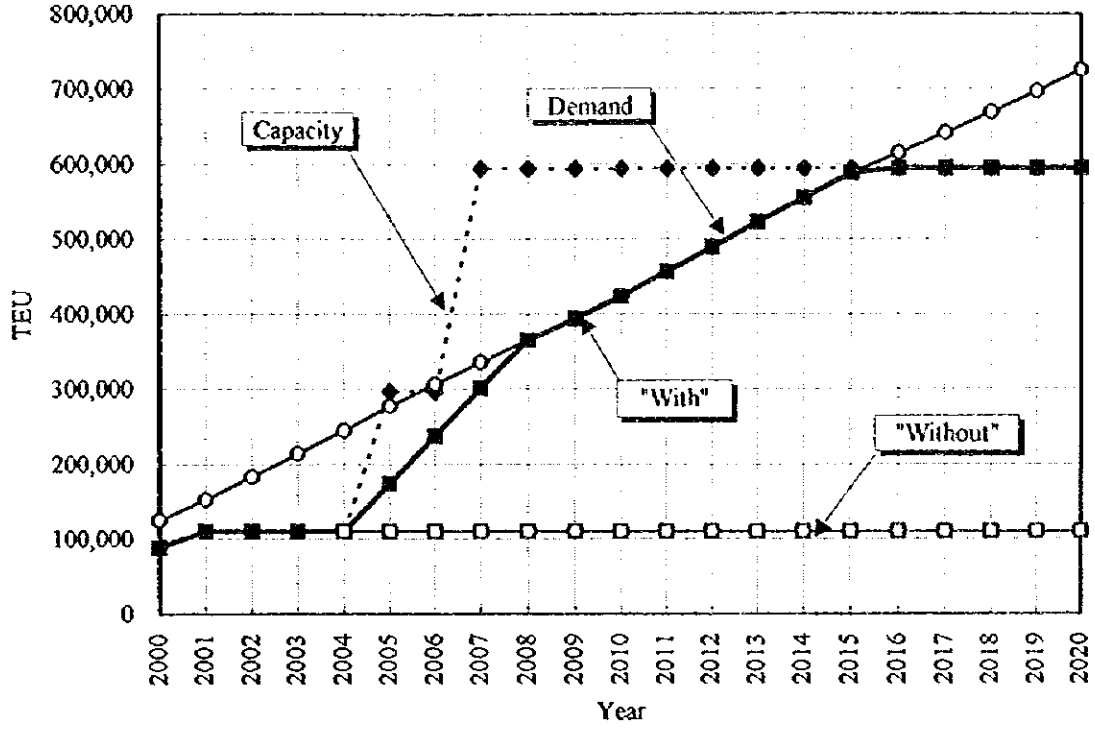


Figure 2.2.1-3 Demand Forecast of Container Cargo

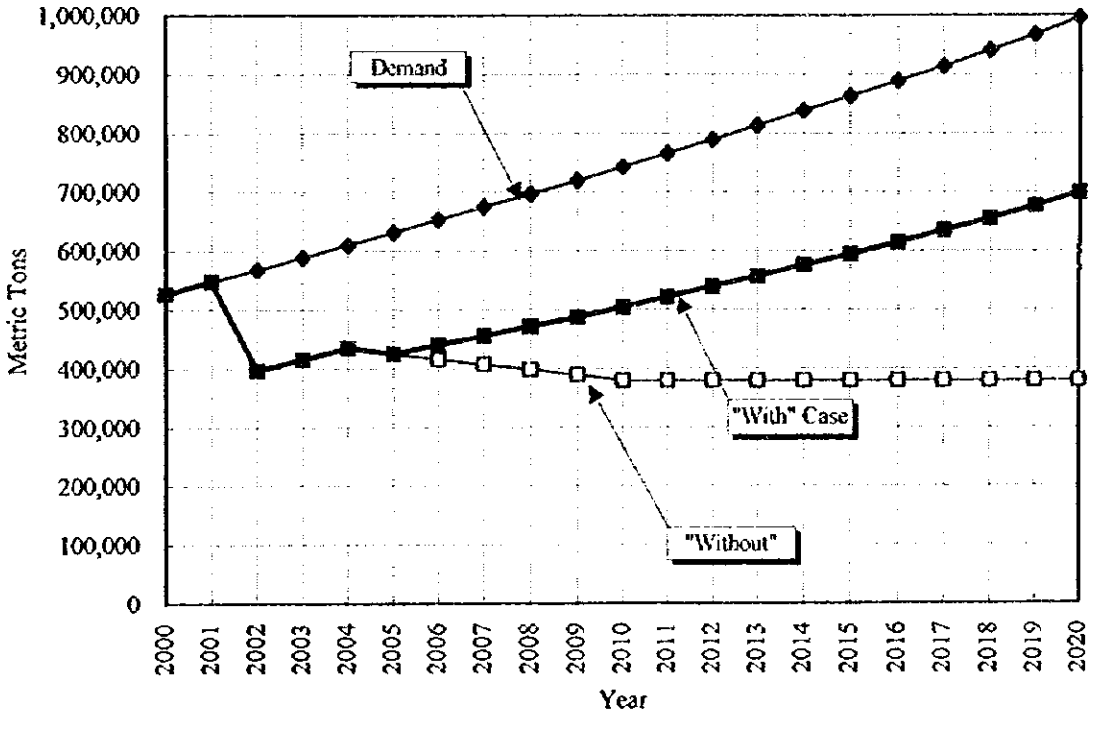


Figure 2.2.1-4 Demand Forecast of Non-containerized Cargo

SBFZ and container cargoes of located factories in EPZs and SEZs in Region III.

1) Container cargo generated at industrial estate in SBFZ

Based on aforesaid premise, Table 2.2.2-1 and Figure 2.2.2-1(a) & (b) show the demand forecast of containerized cargo generated in SBFZ in the "With" and "Without" case.

Table 2.2.2-1 Container Cargo Volume in SBFZ

"With" Case Unit: TEU

	2000	2005	2010	2015	2020
Import	16,100	30,100	43,200	57,900	57,900
Export	19,600	29,600	42,400	56,800	56,800
Total	35,700	59,700	85,600	114,700	114,700

"Without" Case Unit: TEU

	2000	2005	2010	2015	2020
Import	16,100	24,600	24,600	24,600	24,600
Export	19,600	29,900	29,900	29,900	29,900
Total	35,700	54,500	54,500	54,500	54,500

2) Other containerized cargo in SBFZ

Other containerized cargoes through SBF (non-related industrial cargo) consist of the items listed below.

a) Import of containerized general cargo
b) Import / export of containerized heavy equipment
c) Re-export (transshipment) of containerized cargo
d) Domestic outbound containerized cargo
e) Empty container

Table 2.2.2-2 and Figure 2.2.2-2 (a) & (b) show the demand forecast of other container cargo through SBF to prorate the demand forecasted in Chapter 7.3.4, Volume 2 at each year.

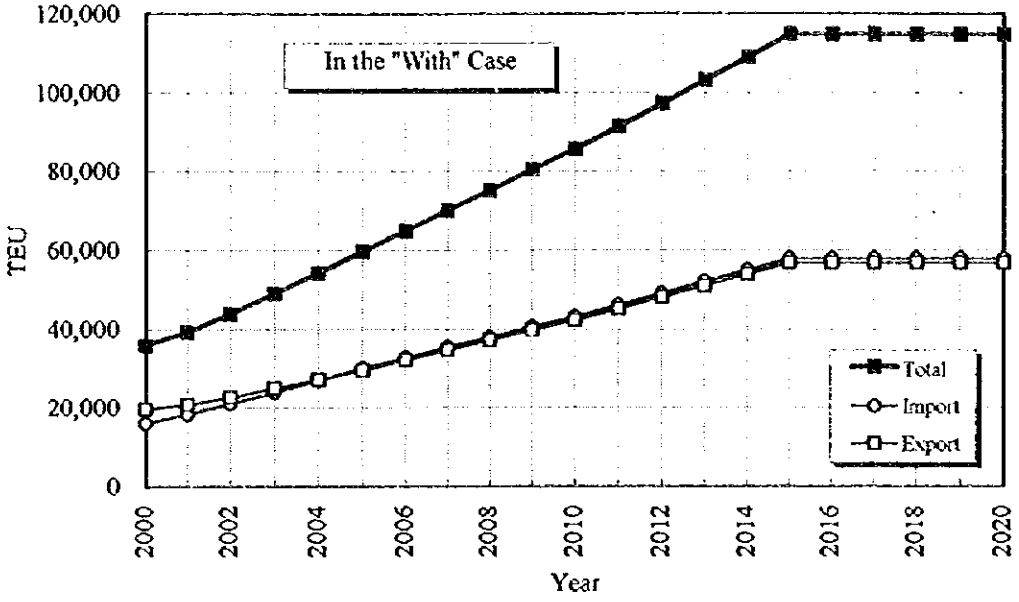
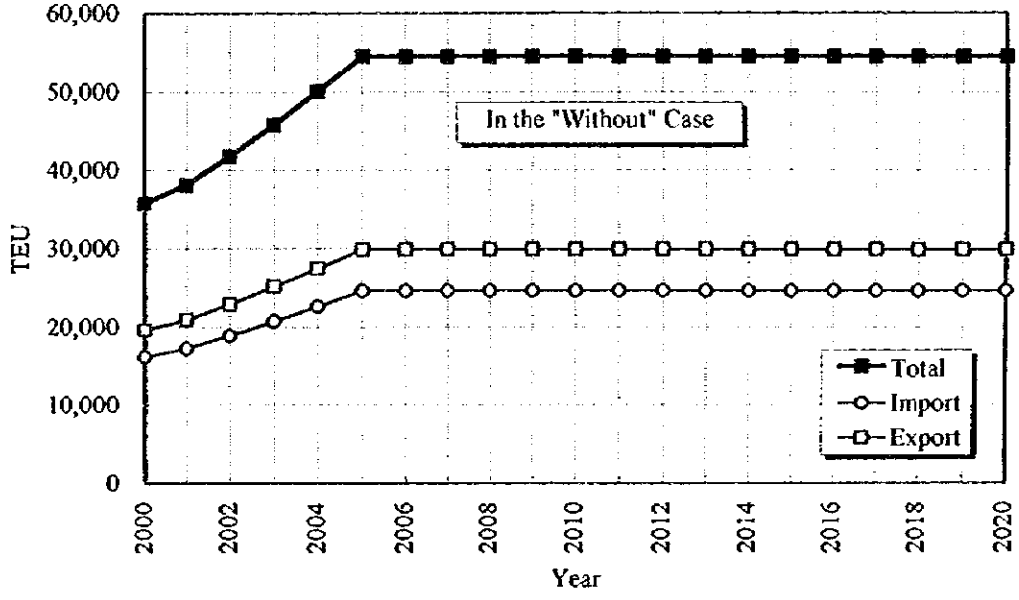


Figure 2.2.2-1(a) Containerized Cargo from Factories at SBFZ



Figue 2.2.2-1(b) Containerized Cargo from Factories at SBFZ

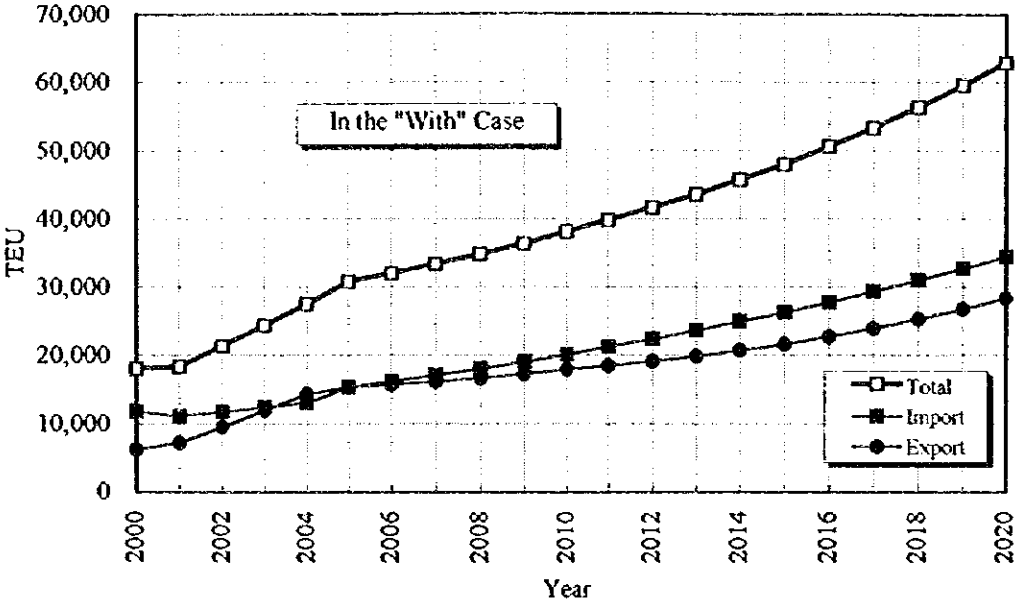


Figure 2.2.2-2(a) Other Containerized Cargo through SBF

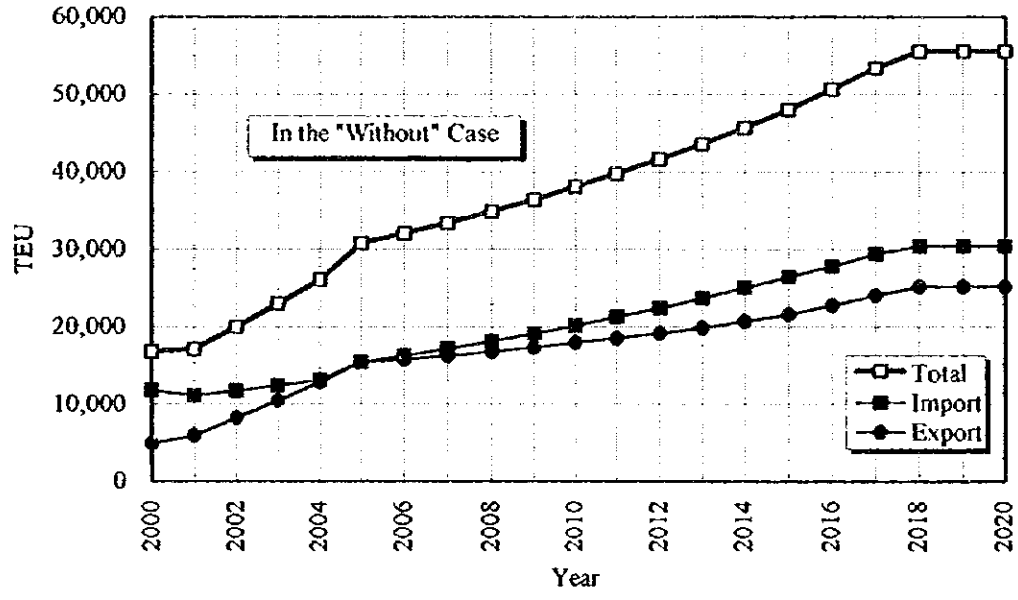


Figure 2.2.2-2(b) Other Containerized Cargo through SBF

Table 2.2.2-2 Other Container Cargo Through SBF

"With" Case Unit: TEU

	2000	2005	2010	2015	2020
a) Import of G. Cargo	7,440	11,270	14,800	19,400	25,500
b) Import of Heavy Equip.	220	390	460	530	610
Export of Heavy Equip.	20	130	150	180	200
c) Re-export (Import)	2,810	3,720	4,880	6,410	8,410
(Export)	2,830	3,720	4,880	6,410	8,410
d) Domestic Outbound	2,100	2,760	3,630	4,800	6,300
e) Empty Container (IN)	1,300	0	0	0	0
Empty Container (OUT)	0	8,780	9,280	10,270	13,540
Total	16,750	30,840	38,050	48,000	62,980

"Without" Case Unit: TEU

	2000	2005	2010	2015	2020
a) Import of G. Cargo	7,400	11,300	14,800	19,400	22,500
b) Import of Heavy Equip.	220	390	460	530	530
Export of Heavy Equip.	20	130	150	180	180
c) Re-export (Import)	2,800	3,700	4,900	6,400	7,400
(Export)	2,800	3,700	4,900	6,400	8,400
d) Domestic Outbound	2,100	2,800	3,600	4,800	5,500
e) Empty Container (IN)	1,250	0	0	0	0
Empty Container (OUT)	0	8,800	9,300	10,300	12,000
Total	16,700	30,800	38,100	48,000	55,300

3) Container cargo volume at EPZ and SEZ in Region III

Table 2.2.2-3 and Figure 2.2.2-3(a) & (b) show the container cargo volume through SBF which is related industrial cargoes located at other EPZs and SEZs based on aforesaid premise.

Table 2.2.2-3 Container Cargo Volume at other EPZs and SEZs

"With" Case Unit: TEU

	2000	2005	2010	2015	2020
Import	16,000	41,300	148,400	209,800	204,600
Export	18,200	41,900	151,400	215,600	211,700
Total	34,200	83,200	299,800	425,400	416,300

"Without" Case Unit: TEU

	2000	2005	2010	2015	2020
Import	16,100	15,000	10,300	4,000	0
Export	19,500	9,800	7,200	3,500	0
Total	35,600	24,800	17,500	7,500	0

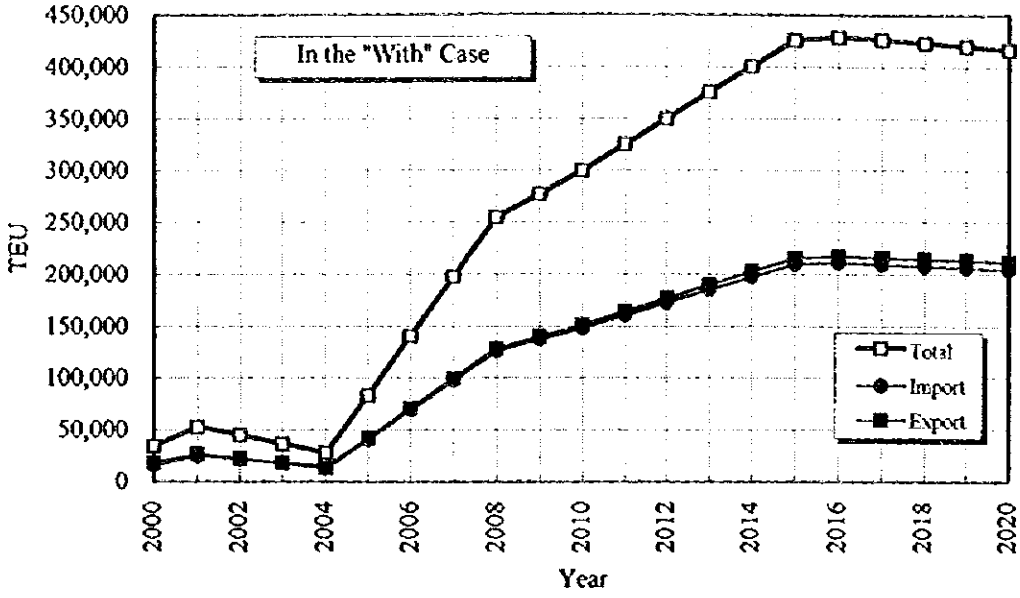


Figure 2.2.2-3(a) Containerized Cargo at Other EPZs and SEZs

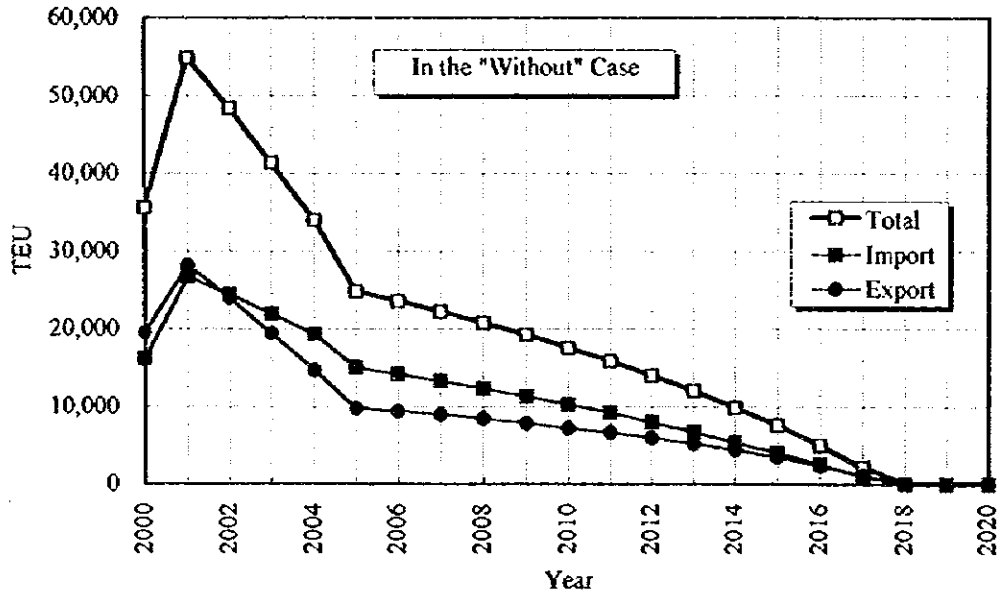


Figure 2.2.2-3(b) Containerized Cargo at Other EPZs and SEZs

4) Result of demand forecast for container cargo

Table 2.2.2-4 and Figure 2.2.2-4 (a) & (b) show the demand forecast of containerized cargo handled at SBF based on medium economic growth case in the Philippines.

Table 2.2.2-4 Container Cargo through SBF

"With" Case Unit: 1000 TEU

	2000	2005	2010	2015	2020
1) Cargo of Industrial Estate at SBFZ	35.7	59.7	85.6	114.8	114.8
2) Other Container Cargo at SBFZ	18.1	30.8	38.1	48.0	62.9
3) Cargo of Other EPZ & SEZ	34.2	83.2	299.8	425.4	416.3
Total	88.0	173.7	423.5	588.2	594.0

"Without" Case Unit: 1000 TEU

	2000	2005	2010	2015	2020
1) Cargo of Industrial Estate at SBFZ	35.8	54.4	54.4	54.5	54.5
2) Other Container Cargo at SBFZ	16.7	30.8	38.1	48.0	55.5
3) Cargo of Other EPZ & SEZ	35.5	24.8	17.5	7.5	0
Total	88.0	110.0	110.0	110.0	110.0

(2) Non-containerized Cargo

Demand of non-containerized cargoes handled at SBF in Short-term plan which is determined herein after based on aforesaid premise.

Non-containerized cargoes are composed of the following five categories (forecast was conducted in Chapter 7.3.4, Volume 2).

1) Import non-containerized cargo

Import non-containerized cargoes through SBF (non-related industrial cargo) consist of the items listed below

a) Rice
b) Cement
c) Fertilizer
d) Soya bean (will no longer be handled at Marine Terminal and Boton wharf from the year 2002)
e) Heavy Equipment
f) Construction Materials
g) Other

Table 2.2.2-5 and Figure 2.2.2-5(a) & (b) show the import non-containerized cargo through SBF based on the prorated demand forecast in Chapter 7.3.4, Volume 2.

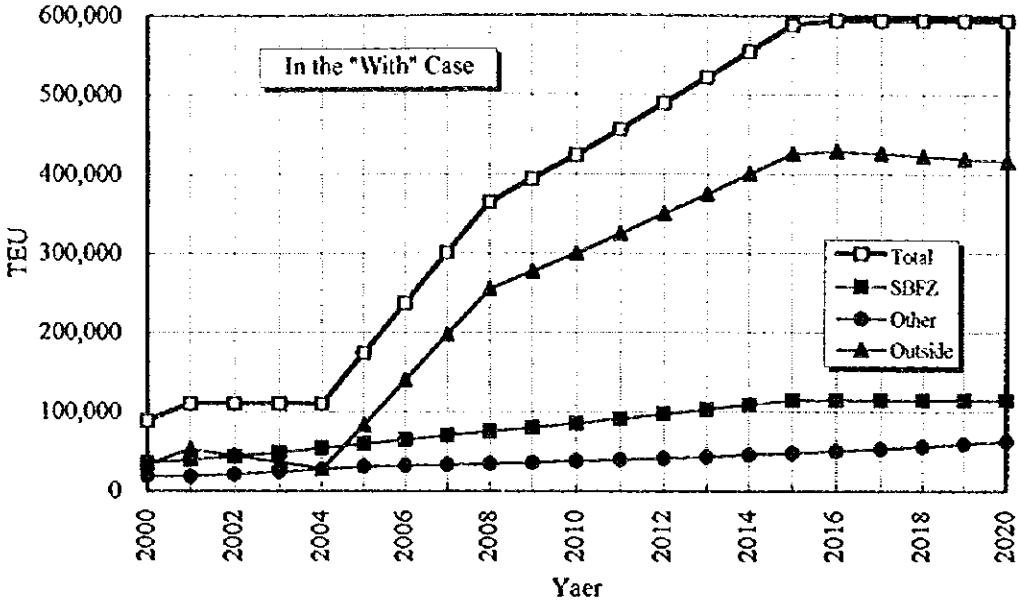


Figure 2.2.2-4(a) Containerized Cargo through SBF

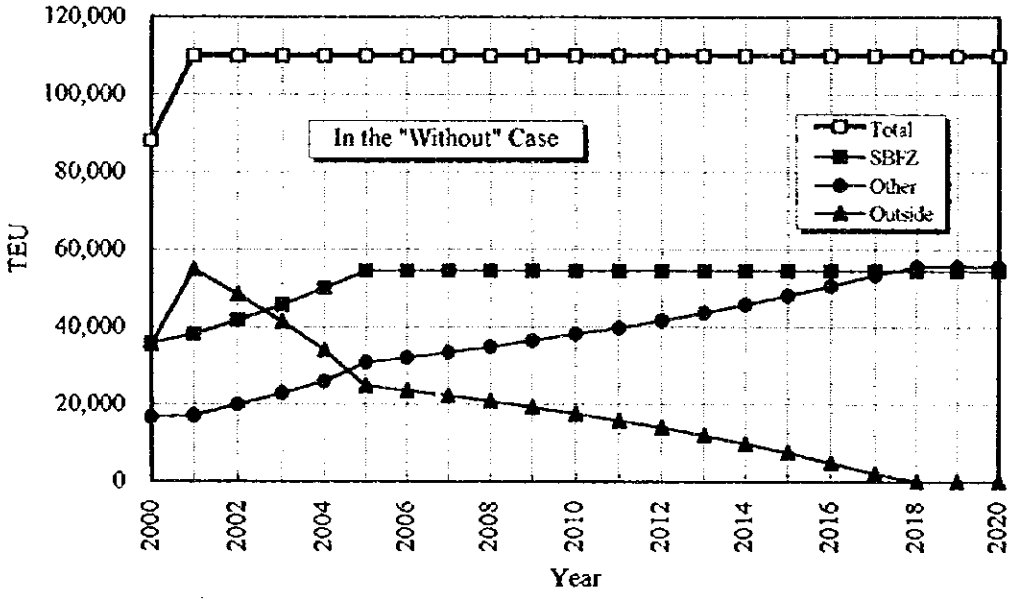


Figure 2.2.2-4(b) Containerized Cargo through SBF

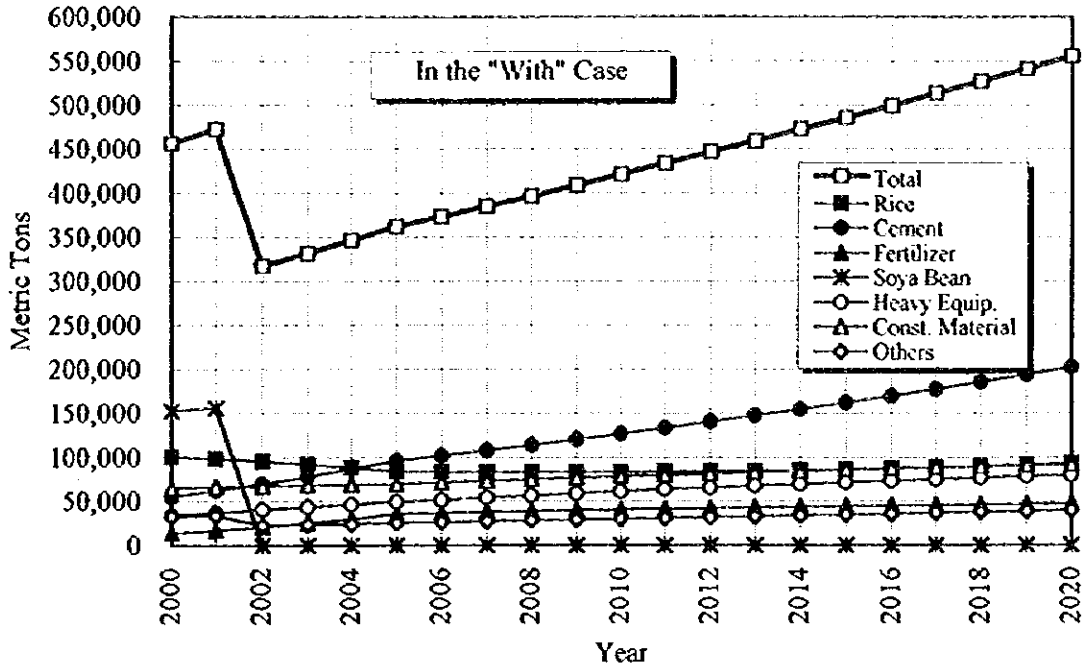


Figure 2.2.2-5(a) Import Cargo by Commodity

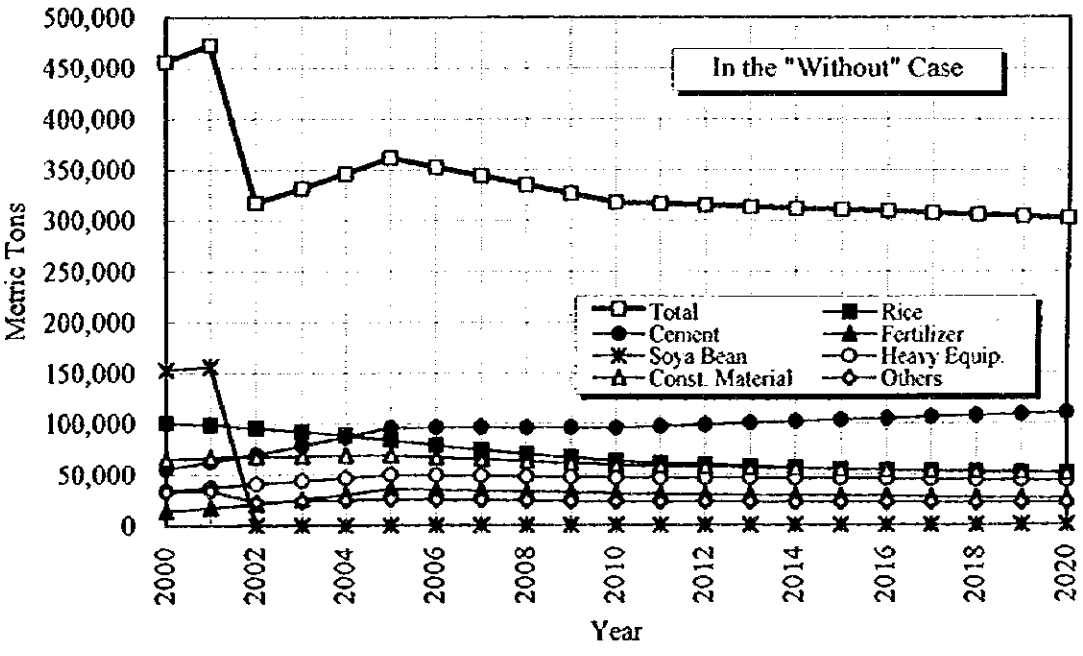


Figure 2.2.2-5(b) Import Cargo by Commodity

Table 2.2.2-5 Import Cargo Volume by Commodity

"With" Case Unit: tons

	2000	2005	2010	2015	2020
Rice	100,900	83,800	83,400	86,300	93,200
Cement	55,400	96,400	126,700	162,000	202,400
Fertilizer	14,300	36,000	41,000	45,000	47,800
Soya bean	153,100	-	-	-	-
Heavy equipment	34,200	49,800	61,300	71,400	79,800
Construction material	65,200	69,300	78,300	86,000	92,200
Others	33,000	26,200	30,500	35,100	40,200
Total	456,100	361,500	421,200	485,800	555,600

"Without" Case Unit: tons

	2000	2005	2010	2015	2020
Rice	100,900	83,800	62,900	55,200	50,700
Cement	55,400	96,400	95,600	103,500	110,100
Fertilizer	14,300	36,000	30,900	28,700	26,000
Soya bean	153,100	0	0	0	0
Heavy equipment	34,200	49,800	46,200	45,700	43,400
Construction material	65,200	69,300	59,100	55,000	50,200
Others	33,000	26,200	23,000	22,500	21,900
Total	456,100	361,400	317,600	310,600	302,400

2) Export non-containerized cargo

The main commodity of export cargo is heavy equipment.

3) Re-export (transshipment) cargo

The main commodity of re-export cargo is heavy equipment and cigarettes.

4) Domestic inbound cargo

The main commodity of domestic inbound cargo is fertilizer.

5) Domestic outbound cargo

The main commodity of domestic outbound cargo is soya bean and heavy equipment.

6) Result of demand forecast for non-containerized cargo

Above mentioned cargo from item 2) to 5) which is estimated in Chapter 7.3.4, Volume 2.

Table 2.2.2-6 and Figure 2.2.2-6(a) & (b) show the demand forecast of non-containerized cargo through SBF in the "With" and "Without" case.

Table 2.2.2-6 Non-containerized Cargo through SBF

"With" Case Unit: 1000 tons

	2000	2005	2010	2015	2020
1) Import of Non-containerized Cargo	456.1	361.4	421.1	485.7	555.6
2) Export	1.4	1.8	2.4	3.1	4.1
3) Re-export	17.1	22.5	29.6	38.8	51.0
Foreign Trade Total	474.6	385.7	453.1	527.6	610.7
4) Domestic Inbound	14.3	18.8	24.7	32.4	42.5
5) Domestic Outbound	37.9	19.9	26.1	34.3	45.1
Domestic Trade Total	52.2	38.7	50.8	66.7	87.6
Total	526.8	424.4	503.9	594.3	698.3

"Without" Case Unit: 1000 tons

	2000	2005	2010	2015	2020
1) Import of Non-containerized Cargo	456.1	361.4	317.6	310.6	302.4
2) Export	1.4	1.8	1.8	2.0	2.2
3) Re-export	17.1	22.5	22.3	24.8	27.8
Foreign Trade Total	474.6	385.7	341.7	337.4	332.4
4) Domestic Inbound	14.3	18.8	18.6	20.7	23.1
5) Domestic Outbound	37.9	19.9	19.7	21.9	24.5
Domestic Trade Total	52.2	38.7	38.3	42.6	47.6
Total	526.8	424.4	380.0	380.0	380.0

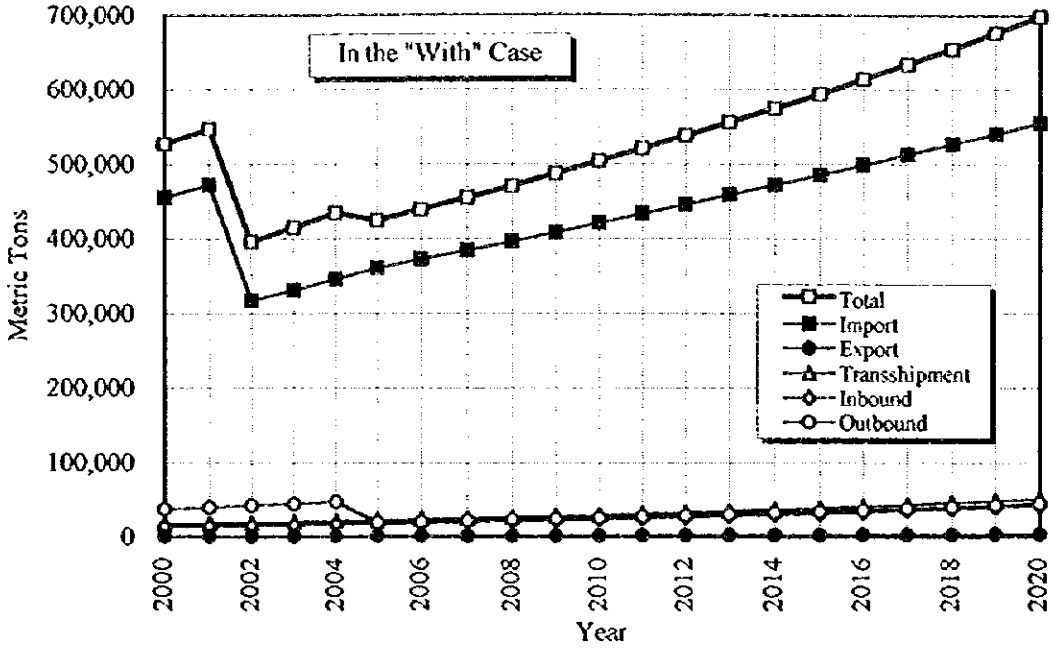


Table 2.2.2-6(a) Non-containerized Cargo through SBF

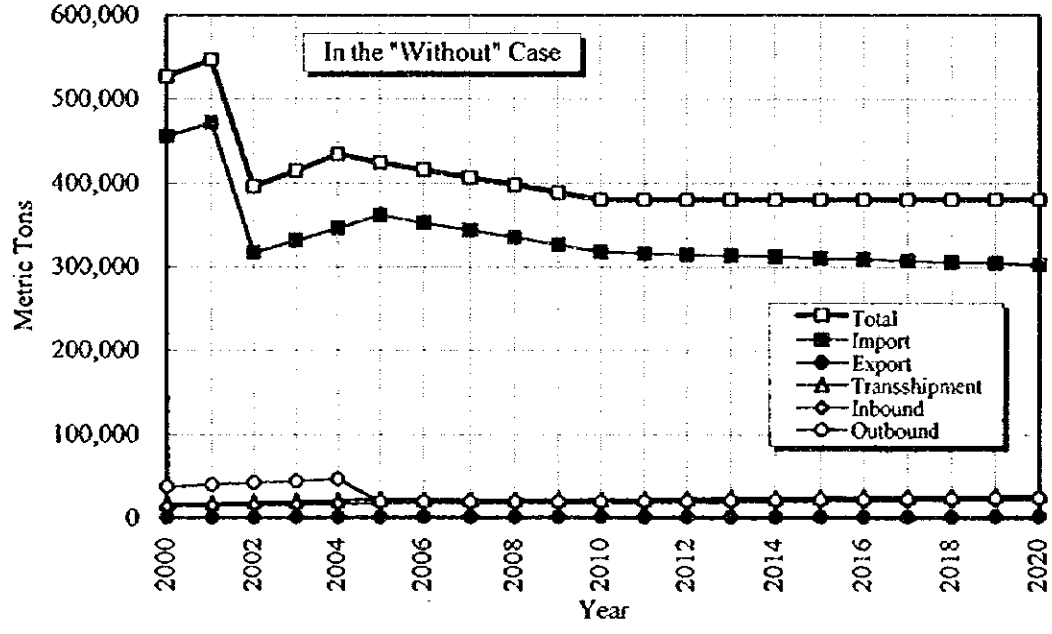


Figure 2.2.2-6(b) Non-containerized Cargo through SBF

3. Phasing of Long Term Plan

3.1 Formulation of Phasing Plan

3.1.1 Policy for the Phasing of Long Term Plan

(1) General

The Long Term Plan is defined as the SBMA's Port Plan having the target year 2020, which includes neither SBMA's other coastal development plans nor private investment plans. Initially the formulation of Phasing Plan was intended to phase construction plans in 2005, 2010 and 2015. However, considering the traffic demand and the capacity of the future port facilities, the Phasing Plan is defined in accordance with port capacity and traffic demand, not every five years. For example one container berth can normally handle 250,000~300,000 TEUs, therefore the next phase development plan is required when the traffic demand exceeds this amount.

The Middle Case of the traffic demand is selected as the most realistic in formulating the phasing plan.

Maintenance, repair and minor improvement of the existing facilities are considered to fall under the normal management and operation of the port, and thus those items are not covered by the Phasing Development Plan.

(2) Policy for the Phasing of the Long Term Plan

The phasing of the Long Term Plan is in accordance with the following policy:

1) To develop the port facilities in order to accommodate the traffic demand appropriately

The larger the scale of the project, the longer the construction period. To ensure that the project is economically and financially feasible, all efforts to shorten the time span between the investment and the start of the operation of the facilities need to be made. The phasing plan must guard against over-investment by making sure that the development of port facilities can be justified by the traffic demand.

2) To phase the long term plan in accordance with the suitable port development, management and operation systems

The recommendable systems of port development, management and operation are mentioned in "Chapter 4 Port Development, Management and Operation" of this report. According to these systems, each container terminal should be leased to a different terminal operator (see Chapter 4.6.2). Since the phasing plan should be consistent with this policy, the

same berth condition (the berth length, the number of the gantry cranes etc.) is required in the phasing plan.

3) To make maximum use of the existing port facilities

SBMA has plenty of port facilities, namely wharves, transit sheds and warehouses in SBF, and utilizing the existing port facilities is a useful measure to minimize investment.

4) To develop the container terminal at the earliest possible time

Container terminal development is the most urgent and essential point to realize the SBMA's strategy. Therefore, the phasing plan must include provisions for development of the container terminal. The SBMA must take necessary measures and play a leading role in securing the container terminal development in the Phasing Plan.

5) To harmonize with other master plans

The SBMA has other master plans, such as the World Bank's Land Use Plan, Kenzo Tange's Master Plan and Subic International Airport Master Plan. The Phasing Plan must be in harmony with these plans especially when the Phasing Plan calls for the temporary utilization of an area which is earmarked for future development in another plan.

3.1.2 Phasing Plan for Port Facilities

(1) Container Cargo

1) Requirement for Facilities and Berth Construction Plan

a) Capacity of Container Terminal and Future Traffic Demand

The container handling capacity is calculated by the following formula :

(Container handling capacity)=(Number of calling ships) × (Average number of loading/unloading containers per ship)

(Number of calling ships)=(Actual working days per year) × (Berth occupancy rate) ÷ {(Container handling time per ship)+(Idle time at ship berthing)}

(Container handling time per ship)=(Average number of loading/unloading containers per ship) ÷ (Container handling productivity per day)

Actual working days per year=300 days
Berth occupancy rate=0.7 (existing berth without gantry crane)
=0.7 (existing berth with gantry crane)
=0.8 (new container terminal with gantry crane)
Average number of loading/unloading containers per ship=450 boxes
=765 TEUs
Container handling productivity per day
=270 boxes(existing berth without gantry crane)
=472.5 boxes(existing berth with one gantry crane)
=540 boxes(one berth of new container terminal with one gantry crane)
=960 boxes(one berth of new container terminal with two gantry cranes)

Idle time at ship berthing=0.15 days

The result of calculation is shown in Table 3.1.2-1.

However, since the existing container stacking yard located in NSD area is about 10 ha., the container handling capacity in the yard is limited to 110,000 TEUs based on the following calculation:

(Yard handling capacity)=(Ground slots in the yard) × {365/(Dwelling time)} × (Average container stacking height) × (Handling efficiency)

(Ground slots in the yard)=10 ha /(Yard scale per one ground slot)

Yard scale per one ground slot: 85 m^2 (Forklift and reachstacker operation including road area)

Dwelling time: 7 days

Average container stacking height: 2.0

Handling efficiency: 0.9

Table 3.1.2-1 Calculation Result of Container Handling Capacity

	Number of berth and gantry crane	Handling capacity (TEUs/Year)
Existing berth	One berth without gantry crane	88,000
	One berth with one gantry crane	110,000
New container terminal	One berth with one gantry crane	186,000
	One berth with two gantry cranes	297,000

Note) Existing berth handling capacity with one gantry crane is calculated as 145,000 TEUs, but the yard operating capacity is limited to 110,000 TEUs.

Considering the container handling capacity mentioned above, the future container traffic demand and capacity (phasing plan) is shown in Figure 3.1.2-1.

The container terminals will be leased to plural operators according to the Chapter 4 "Port Development, Management and Operation" in the Volume 3 of this report.

In the phasing plan, container terminal development is uniformly defined as "One berth with two gantry cranes", because it is appropriate for the different terminal operators to lease the terminal under the same lease conditions. And under this competitive situation, either the SBMA or the customers will be able to obtain the greatest benefit.

b) Access Road

According to the long term development plan (Alternative-3), access road from Boton area to the new container terminal is required. Two lanes will be sufficient until 2020 based on the planned traffic volume and standard design traffic volume.

Since this access road crosses the flight path of airplanes in the Subic International Airport, the elevation of the road located in the adjacent area to the runway will be planned as four (4) m from LLW. This would leave at least 10 m between the elevation of the road and the elevation of the runway. However, if the traffic of container trucks on the access road affects the transponder landing system (TLS) installed on the runway 25, a countermeasure to resolve this problem will be required, for example; to install a traffic signal for the container trucks crossing the flight path. Therefore, four (4) lanes are planned for the access road to avoid traffic congestion at the traffic signal point.

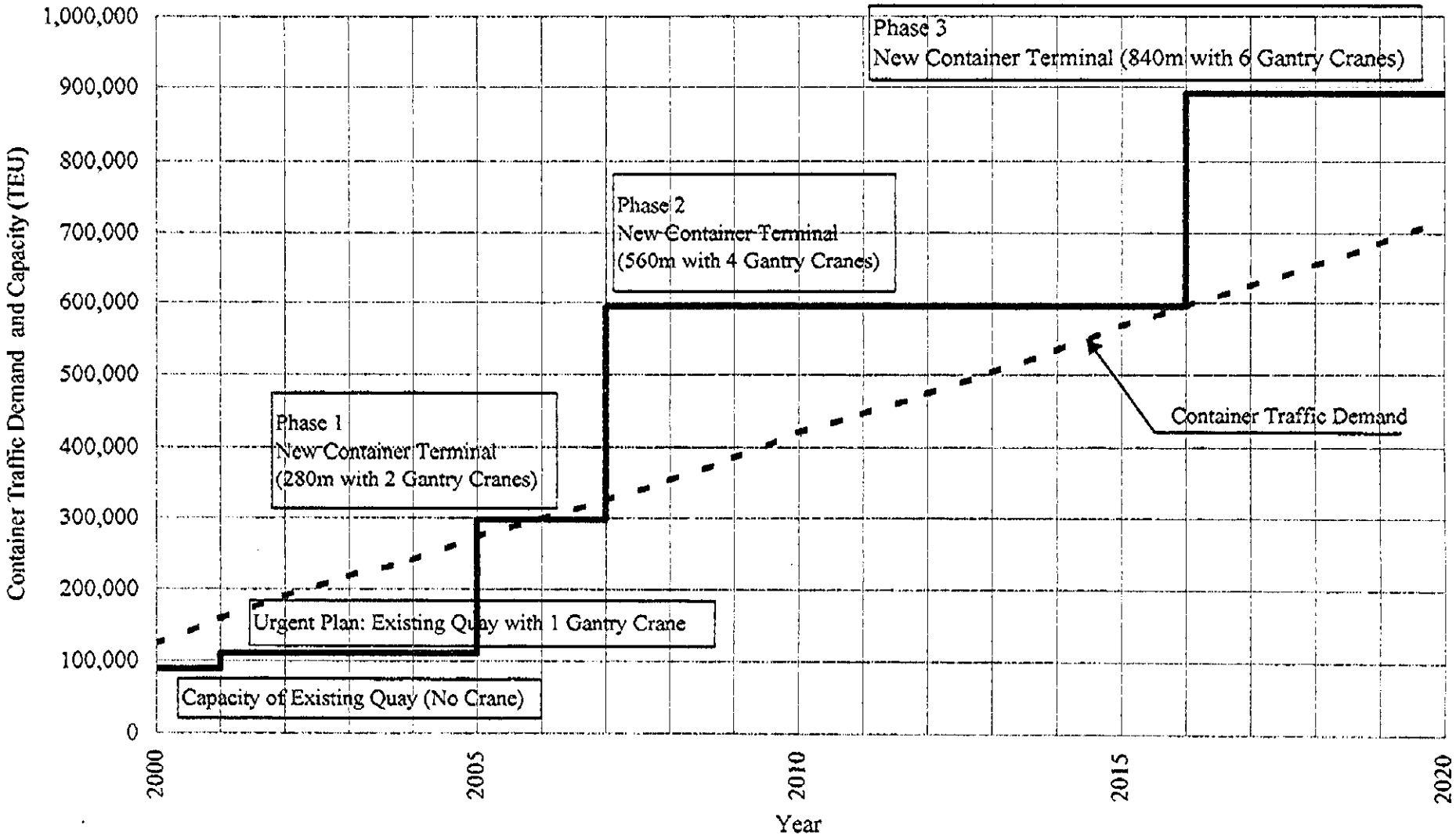


Figure 3.1.2-1 Container Traffic Demand and Capacity

c) Container Marshalling Yard (Container Storage Yard)

According to the capacity of the new container terminal, a certain scale of container marshalling yard is necessary. The required scale of the container marshalling yard is defined by container ground slots, and the required number of ground slots is calculated by the following formula:

(Ground slots)= Σ {(Container volume in each item) × (Dwelling time) × (Peak ratio)/365/(Container stacking height)}

Dwelling time: 7 days (import loaded)
4 days (export loaded)
3 days (import and export empty)

Peak ratio: 1.3

Container stacking height: 3.0 (import loaded)
3.2 (export loaded)
2.0 (import reefer)
4.0 (import and export empty)

Container volume by container types is shown in Table 3.1.2-2.

Table 3.1.2-2 Container Volume by Phasing Plan

	Total Container Volume (TEU/Year)		
	Phase 1	Phase 2	Phase 3
Import	148,500	297,000	445,500
Loaded	148,100	296,400	444,500
Empty	0	0	0
Reefer	400	600	1,000
Export	148,500	297,000	445,500
Loaded	144,300	288,700	428,700
Empty	4,200	8,300	16,800
Total	297,000	594,000	891,000
Loaded	292,400	585,100	873,200
Empty	4,200	8,300	16,800
Reefer	400	600	1,000

The result of calculation (necessary number of ground slots) is shown in Table3.1.2-3.

Table 3.1.2-3 Necessary Number of Ground Slots by Phasing Plan

	Total Ground Slots (TEU)		
	Phase 1	Phase 2	Phase 3
Import	1,236	2,472	3,708
Loaded	1,231	2,464	3,695
Empty	0	0	0
Reefer	5	8	13
Export	655	1,309	1,954
Loaded	643	1,286	1,909
Empty	12	23	45
Total	1,891	3,781	5,662
Loaded	1,874	3,750	5,604
Empty	12	23	45
Reefer	5	8	13

d) Container Freight Station (CFS)

The required area for the CFS is calculated by the following formula:

$A=(Hc \times Wc \times R \times Dw \times P)/(w \times r \times Dy)$

A: Required floor area of CFS (m^2)

Hc: Annual handling volume of loaded container (TEU)

Wc: Cargo volume per one loaded container (ton/TEU)

7.9 ton/TEU (import loaded)

6.1 ton/TEU (export loaded)

R: Ratio of LCL cargo of total loaded container (5%)

Dw: Dwelling time at CFS (3 days)

P: Peak ratio (1.3)

w: Volume of cargo per unit area in CFS (1.3 ton/m^2)

r: Utilization rate of CFS floor (0.5)

Dy: Operating days of CFS (365 days)

The required capacity of CFS is calculated as follows:

Phase 1: 1,920 m^2 (40 m × 8 m/bay × 6 bays=40 m × 48 m)

Phase 2: 3,840 m^2 (40 m × 8 m/bay × 12 bays=40 m × 96 m)

Phase 3: 5,760 m^2 (40 m × 8 m/bay × 18 bays=40 m × 144 m)

e) Other Facilities

① Gate

The required number of truck lanes is calculated by the following formula.

$N=(Hc / Tb)\times p/(Dy\times H)\times(S/60)$

N: Required number of truck lanes

Hc: Annual handling volume of containers (TEU)

Tb: Average number of TEU per one box (1.7 TEU/box)

p: Peak ratio (1.3)

Dy: Annual operation days (365 days)

H: Operating hours per day (24 hrs)

S: Necessary procedure time per truck (3 minutes)

According to the calculation, the required number of truck lane is 2 lanes for 297,000 TEU (capacity of one berth with two gantry cranes), but 6 lanes is standard for a container terminal with one berth.

② Administration Building and Terminal Office

The scale of the new administration building of the Sea Port Department in SBMA is determined as 2,000 m^2 (200 persons $\times$ 10 m^2=2,000 m^2). This building will be constructed in Phase 1 stage.

The required floor scale for the terminal office will depend on the method of operation and other factors. An area of 1,200 m^2 (floor area) and 1,000 m^2 (land area) is generally planned for the terminal office of a one-berth container terminal.

③ Maintenance Shop

The container terminal will need space to repair damaged containers and to maintain handling equipment. An area of 875 m^2 is planned for the maintenance shop.

④ Washing and Cleaning Containers

For washing and cleaning of empty containers at the container terminal, an area of 400 m^2 is allocated.

⑤ Gas Station

An area of 250 m^2 is planned as a gas station for refilling the equipment in the container terminal.

⑥ Substation

An area of 600 m^2 is planned as a substation. Emergency power generators (500 KVA $\times$2 units) will be installed in the substation.

f) Conclusions

Planned container terminal facilities mentioned above are shown in Table 3.1.2-4.

Table 3.1.2-4 Planned Container Terminal Facilities by Phasing Plan

	Phase 1	Phase 2	Phase 3
Total Handling Capacity (TEU)	297,000	594,000	891,000
Total Berth Length (m)	280	560	840
Total Ground Slots (TEU)	2,112	4,224	6,336
Total CFS (m^2)	1,920	3,840	5,760
Total Gate (unit)	6	12	18
Total Administration Building (m^2)	2,000	2,000	2,000
Total Terminal Office (m^2)	1,200	2,400	3,600
Total Maintenance Shop (m^2)	875	1,750	2,625
Total Washing & Cleaning Space (m^2)	400	800	1,200
Total Gas Station (m^2)	250	500	750
Total Substation (m^2)	600	1,200	1,800
Total Emergency Generator	500KVA×2	500KVA×4	500KVA×6

2) Layout Plan of Phasing Plan

The development of the new container terminal is divided into three phases. Layout plan of each phase is shown in Figures 3.1.2-2, 3.1.2-3 and 3.1.2-4.

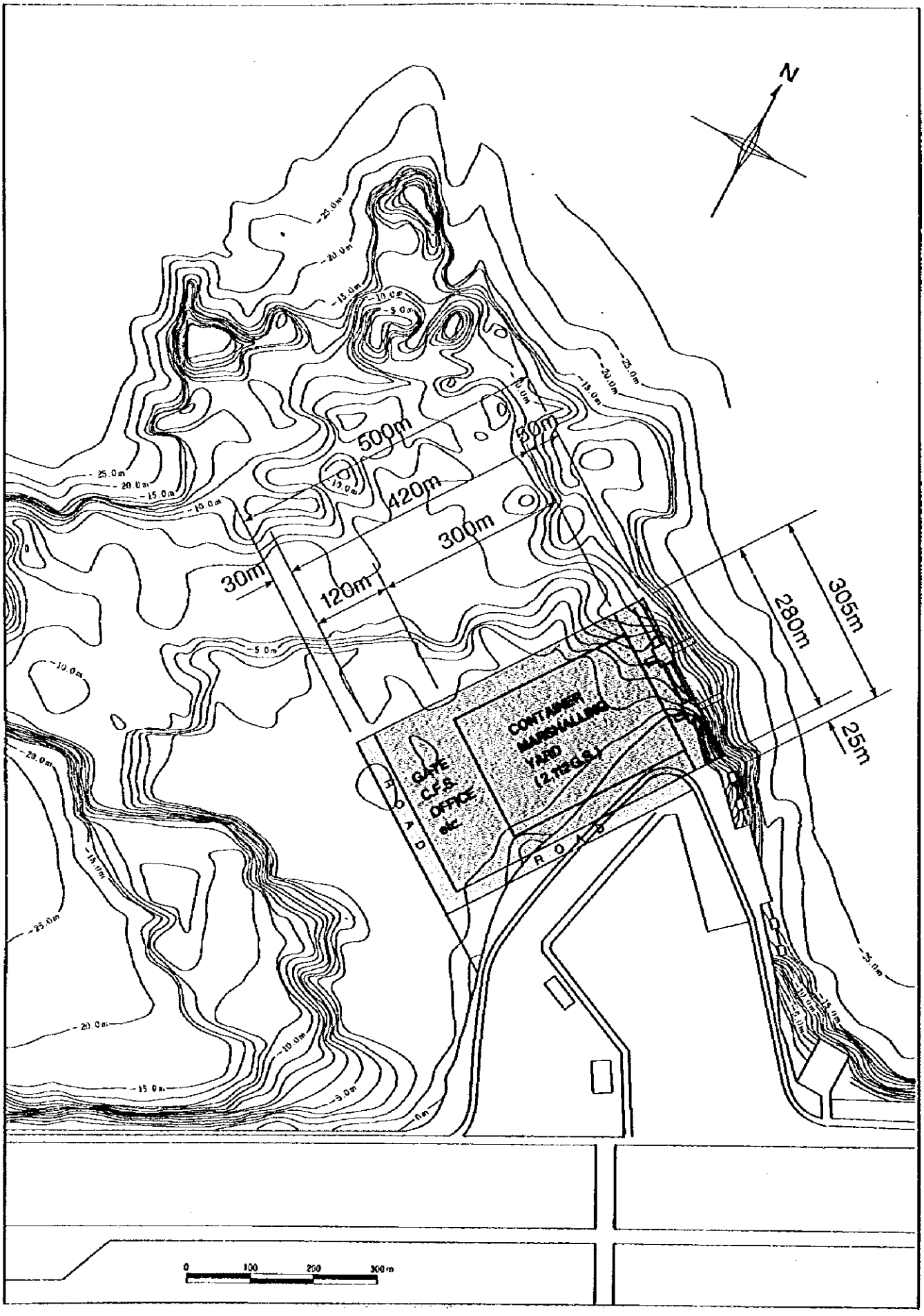


Figure 3.1.2-2 Container Terminal Development (Phase 1)

Figure 3.1.2-2 Container Terminal Development (Phase 1)

Figure 3.1.2-3 Container Terminal Development (Phase 2)

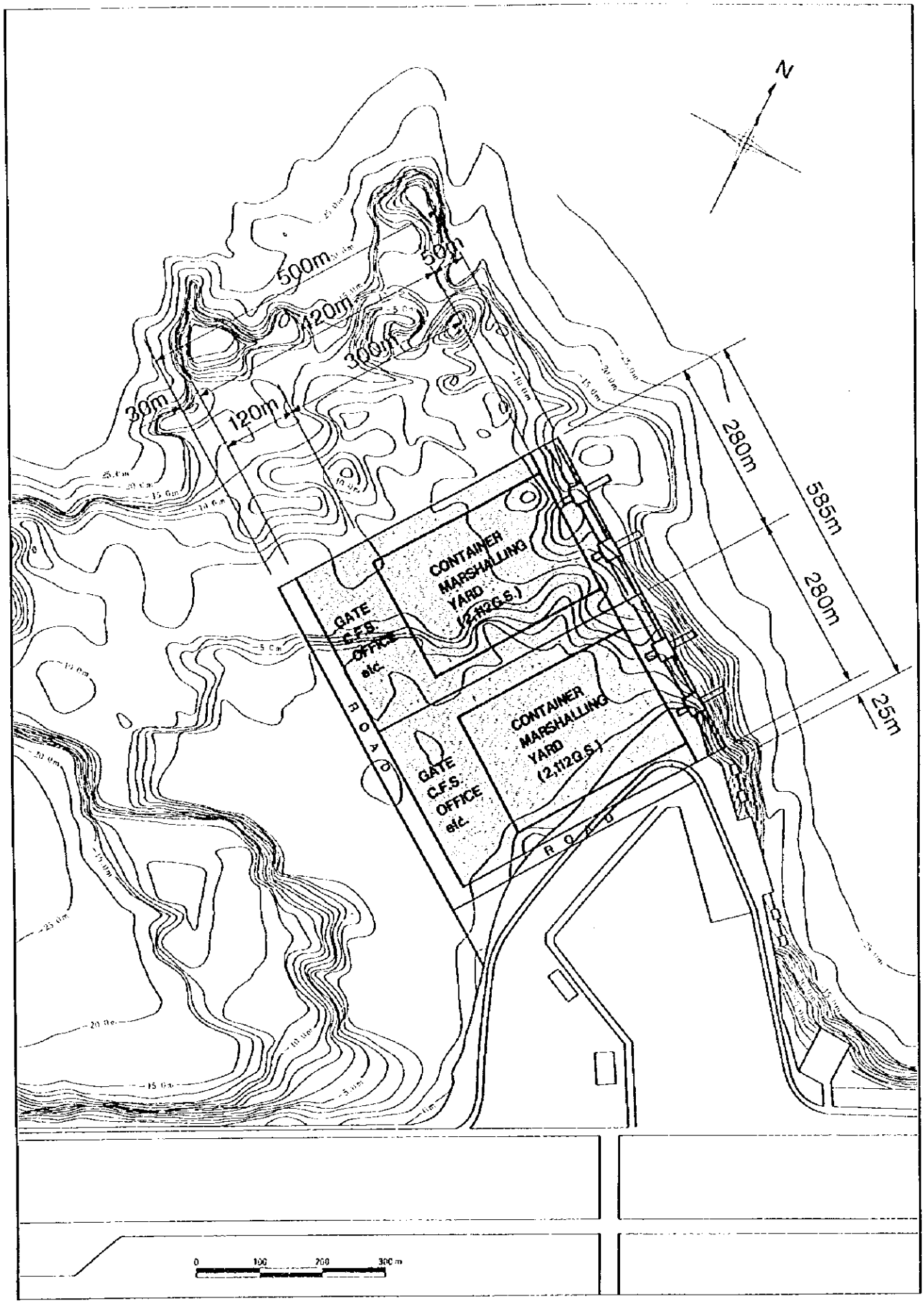


Figure 3.1.2-3 Container Terminal Development (Phase 2)

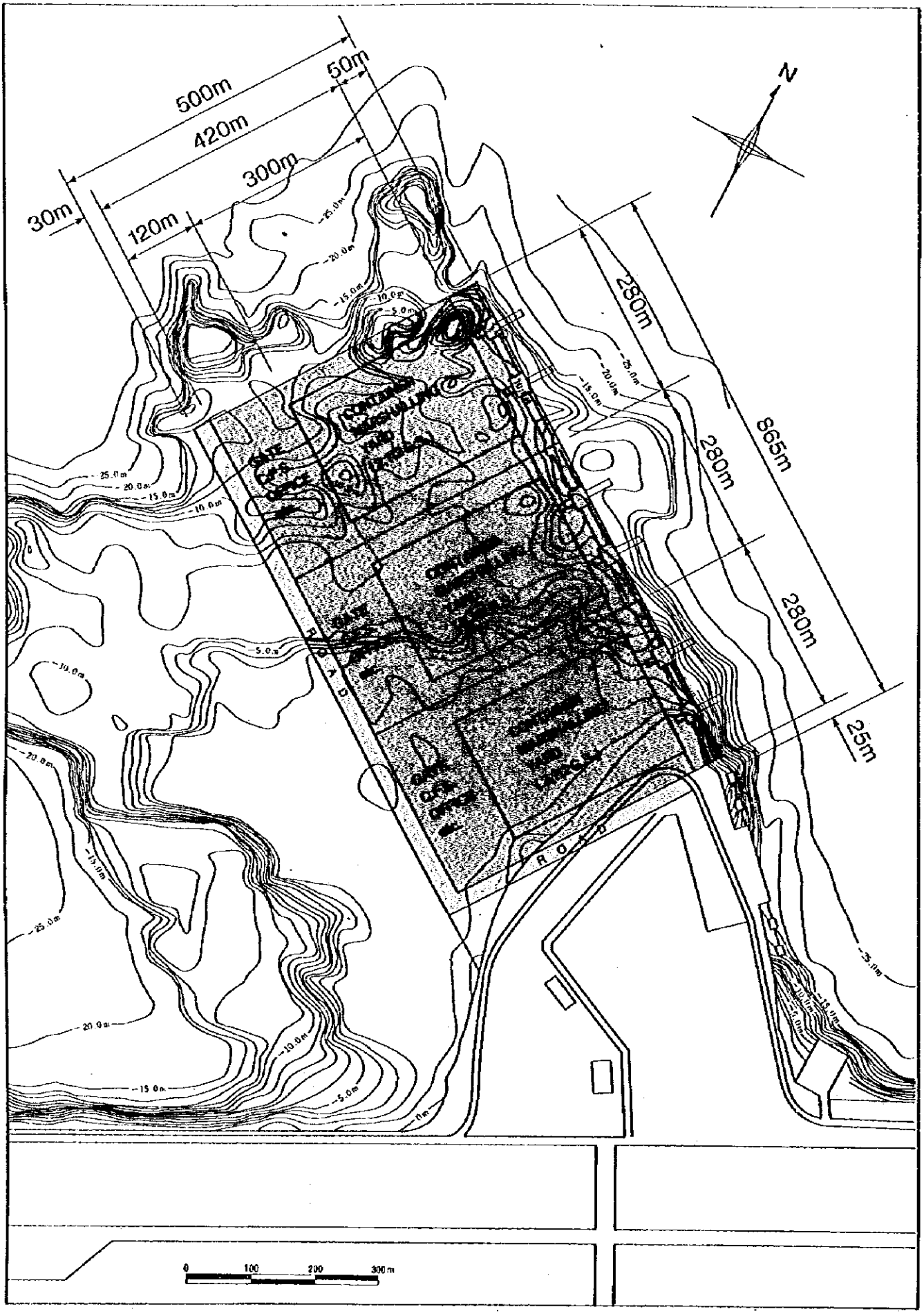


Figure 3.1.2-4 Container Terminal Development (Phase 3)

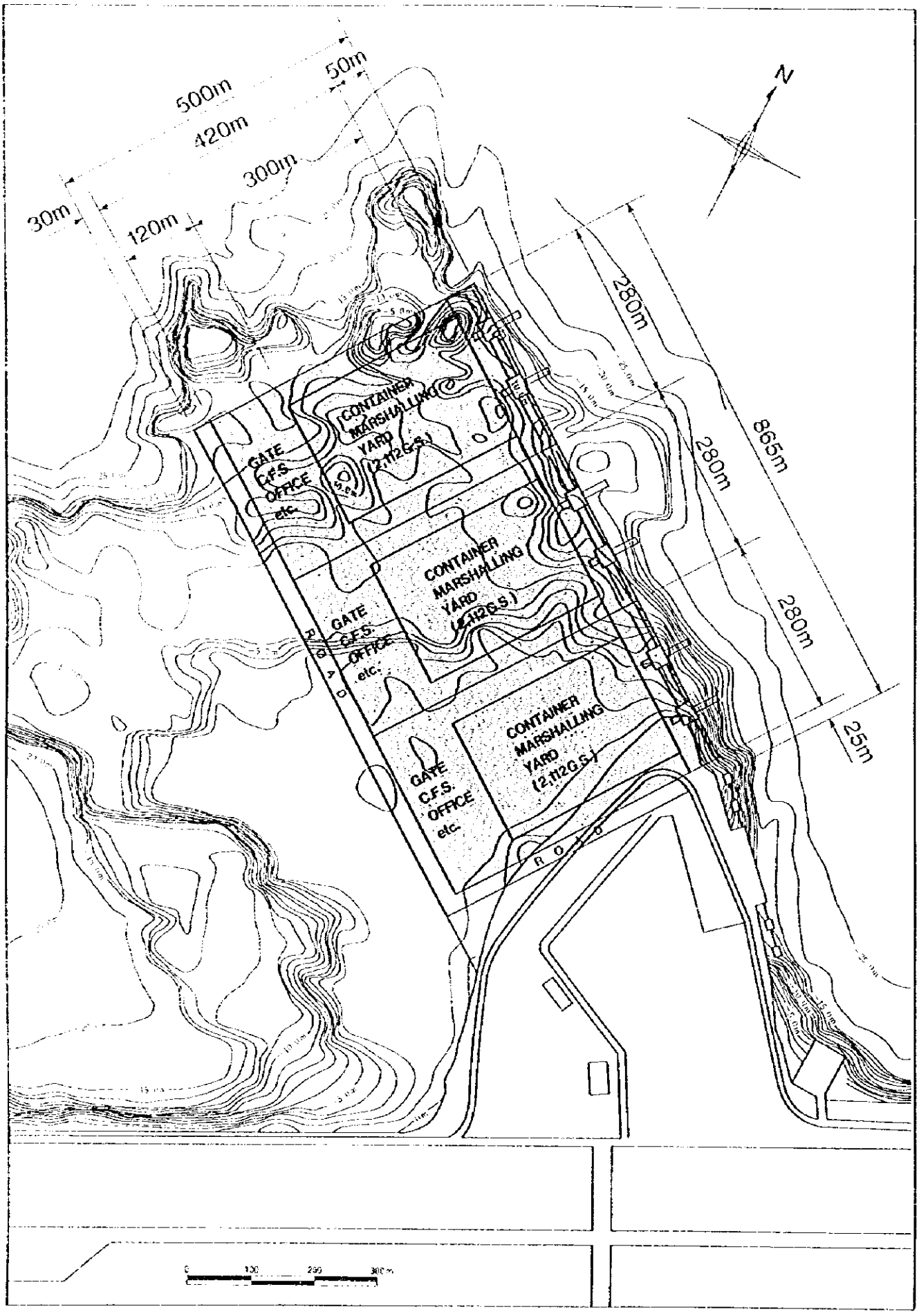


Figure 3.1.2-4 Container Terminal Development (Phase 3)

(2) Non-container Cargo

1) Required Facilities

According to the long term development plan (Alternative-3), NSD area will be utilized for non-container foreign trade cargo and Boton area will be utilized for non-container domestic trade cargo. And existing port facilities in NSD and Boton area should be utilized to the maximum extent.

a) Required Number of Berths

There are four existing berths in NSD area (two in Sattler Pier, two in Marin Terminal), but the number of berths where cargo handling can be conducted at the same time is three, because the width of Sattler Pier is very narrow and only one berth can be used for handling of cargo.

There are two existing berth in Boton area (410 m in length).

Assumptions for calculating required number of non-container cargo berths are as follows:

① The handling of soya bean meal will be privatized in the site except NSD area after 2002 (Cargill Philippines, Inc. is seriously considering a grain silo to handle soya bean meal and other grains at Nabasan Wharf).
② Generally, NSD Terminal will be utilized by foreign trade ships and Boton Wharf will be utilized by domestic trade ships.
③ Since re-export of cigarettes will be carried by small foreign boats at NSD Terminal or Boton Wharf, the berth for these vessels is excluded.
④ Cigarettes for re-export will be stored in warehouses at NSD area.

The required number of berths is calculated by the following formula:

(Number of required berths)=(Total berth time)/{(Actual working days per berth per year)×(Target for berth occupancy rate)}

(Total berth time)={(Cargo volume)/(Average cargo volume per ship)}× [{(Average cargo volume per ship)/(Handling productivity)}+(Idle time at ship berthing)]

(Average cargo volume per ship)=(Average ship size) ×(Average load factor per ship)

Actual working days per berth per year=300 days

Target for berth occupancy rate=70 %

Idle time at ship berthing=0.3 day

The required number of berths in 2005, 2010, 2015 and 2020 are shown in Table 3.1.2-5 for foreign trade and in Table 3.1.2-6 for domestic trade.

The following conclusions can be drawn:

① The existing number of berths at NSD and Boton Wharves is sufficient for the future cargo traffic demand.

② Since the number of required berths is small until 2010, the small foreign boats carrying re-export cigarettes can be accommodated at NSD Wharves. However, it is recommended that these small boats be docked at Boton Wharf in order to utilize the existing berths at Boton area and to ease traffic congestion at NSD Wharves.

b) Required Cargo Storage Facilities

The scale of necessary cargo storage facilities (open storage yard, transit shed, warehouse) at NSD and Boton areas is calculated by the following formula;

$A_1 = N \times a/(R \times K \times W)$

$A_2 = Vs \times L \times a/(K \times W)$

The larger of the above values, A_1 and A_2, is selected.

A_1, A_2: Necessary cargo storage scale (m^2)
N: Required annual handling volume (t/year)
a: Utility rate of cargo storage facilities
R: Cargo turnover (time/year)
K: Occupancy rate
W: Stored cargo volume per unit area (t/m^2)
Vs: Deadweight tonnage of maximum ship
L: Load factor of maximum ship

The gross land area required for cargo storage facilities is determined as follows;
Gross Land Area =(net Land Area)/(0.5～0.6)

The necessary area for cargo storage facilities is shown in Table 3.1.2-7.

The following conclusions can be drwan:

① The scale of existing transit sheds and warehouses at NSD area is about 56,000 m^2 (Bldg. 1010, 1012, 1022, 1026, 1027, 1034, 1035) and this scale is sufficient for required cargo storage facilities (56,000 m^2 for transit sheds and warehouses) up to 2020.

② The existing land area at NSD area (36 ha) is adequate for cargo storage facilities (open storage yard, transit sheds, warehouses) up to 2020.

③ The scale of existing transit sheds and warehouses at Boton area is about 12,762 m^2 (Bldg. 1431, 1432, 1433, 1434, 1455, 1457) and this scale is sufficient for

required cargo storage facilities (2,000 m^2 for transit sheds) up to 2020.

④ The land of Boton area (17 ha) defined as port facility area in Port Master Plan is adequate for cargo storage facilities (open storage yard, transit sheds) up to 2020. And if private companies want to construct their own warehouses for re-export cigarettes at Boton area in order to handle cigarettes more smoothly, Boton area can provide enough land to warehouse the cigarettes (storage area: 42,000 m^2, gross land area: 15.5 ha including road and green).

Table 3.1.2-5 Required number of berth for foreign trade in 2005, 2010, 2015 and 2020

2005	Cargo Vol.(ton)	Avg.Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/ berth)	Work Time (day/ ship)	Berth Time (day/ ship)	Total B.T. (day-berth)	No. of Required Berth
(1) Import	374,000							0.3		
1) Break Bulk										
a) Rice	84,000	20,000	0.7	14,000	6.0	1,360	10.29	10.59	63.6	0.30
b) Cement	96,000	10,000	0.7	7,000	13.7	1,360	5.15	5.45	74.7	0.36
2) Bulk										
a) Fertilizer	36,000	10,000	0.7	7,000	5.1	1,950	3.59	3.89	20.0	0.10
3) General Cargo										
a) Heavy Equipment	50,000									
LO/LO	20,000	7,000	0.2	1,400	14.3	870	1.61	1.91	27.3	0.13
RO/RO	30,000	7,000	0.2	1,400	21.4	1,640	0.85	1.15	24.7	0.12
b) Construction Material	69,000	7,000	0.7	4,900	14.1	840	5.83	6.13	86.4	0.41
4) Others	39,000	7,000	0.7	4,900	8.0	840	5.83	6.13	48.8	0.23
(2) Export	2,000									
a) Heavy Equipment	2,000									
LO/LO	800	7,000	0.2	1,400	0.6	860	1.63	1.93	1.1	0.01
RO/RO	1,200	7,000	0.2	1,400	0.9	1,460	0.96	1.26	1.1	0.01
(3) Re-export	23,000									
a) Heavy Equipment	8,000									
LO/LO	3,200	7,000	0.2	1,400	2.3	860	1.63	1.93	4.4	0.02
RO/RO	4,800	7,000	0.2	1,400	3.4	1,460	0.96	1.26	4.3	0.02
b) Cigarette	10,000									
c) Others	5,000	7,000	0.7	4,900	1.0	840	5.83	6.13	6.3	0.03
Total	399,000				90.8				362.6	1.73

2010	Cargo Vol.(ton)	Avg.Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/ berth)	Work Time (day/ ship)	Berth Time (day/ ship)	Total B.T. (day-berth)	No. of Required Berth
(1) Import	435,000							0.3		
1) Break Bulk										
a) Rice	83,000	20,000	0.7	14,000	5.9	1,360	10.29	10.59	62.8	0.30
b) Cement	127,000	10,000	0.7	7,000	18.1	1,360	5.15	5.45	98.8	0.47
2) Bulk										
a) Fertilizer	41,000	10,000	0.7	7,000	5.9	1,950	3.59	3.89	22.8	0.11
3) General Cargo										
a) Heavy Equipment	61,000									
LO/LO	24,400	7,000	0.2	1,400	17.4	870	1.61	1.91	33.3	0.16
RO/RO	36,600	7,000	0.2	1,400	26.1	1,640	0.85	1.15	30.2	0.14
b) Construction Material	78,000	7,000	0.7	4,900	15.9	840	5.83	6.13	97.6	0.46
4) Others	45,000	7,000	0.7	4,900	9.2	840	5.83	6.13	56.3	0.27
(2) Export	2,000									
a) Heavy Equipment	2,000									
LO/LO	800	7,000	0.2	1,400	0.6	860	1.63	1.93	1.1	0.01
RO/RO	1,200	7,000	0.2	1,400	0.9	1,460	0.96	1.26	1.1	0.01
(3) Re-export	30,000									
a) Heavy Equipment	10,000									
LO/LO	4,000	7,000	0.2	1,400	2.9	860	1.63	1.93	5.5	0.03
RO/RO	6,000	7,000	0.2	1,400	4.3	1,460	0.96	1.26	5.4	0.03
b) Cigarette	14,000									
c) Others	6,000	7,000	0.7	4,900	1.2	840	5.83	6.13	7.5	0.04
Total	467,000				108.4				422.4	2.01

2015	Cargo Vol (ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/ berth)	Work Time (day/ ship)	Berth Time (day/ ship)	Total B.T. (day-berth)	No. of Required Berth
(1) Import	502,000							0.3		
1) Break Bulk										
a) Rice	86,000	20,000	0.7	14,000	6.1	1,360	10.29	10.59	65.1	0.31
b) Cement	162,000	10,000	0.7	7,000	23.1	1,360	5.15	5.45	126.1	0.60
2) Bulk										
a) Fertilizer	45,000	10,000	0.7	7,000	6.4	1,950	3.59	3.89	25.0	0.12
3) General Cargo										
a) Heavy Equipment	72,000									
LO/LO	28,800	7,000	0.2	1,400	20.6	870	1.61	1.91	39.3	0.19
RO/RO	43,200	7,000	0.2	1,400	30.9	1,640	0.85	1.15	35.6	0.17
b) Construction Material	86,000	7,000	0.7	4,900	17.6	840	5.83	6.13	107.6	0.51
4) Others	51,000	7,000	0.7	4,900	10.4	840	5.83	6.13	63.8	0.30
(2) Export	3,000									
a) Heavy Equipment	3,000									
LO/LO	1,200	7,000	0.2	1,400	0.9	860	1.63	1.93	1.7	0.01
RO/RO	1,800	7,000	0.2	1,400	1.3	1,460	0.96	1.26	1.6	0.01
(3) Re-export	39,000									
a) Heavy Equipment	13,650									
LO/LO	5,460	7,000	0.2	1,400	3.9	860	1.63	1.93	7.5	0.04
RO/RO	8,190	7,000	0.2	1,400	5.9	1,460	0.96	1.26	7.4	0.04
b) Cigarette	17,550									
c) Others	7,800	7,000	0.7	4,900	1.6	840	5.83	6.13	9.8	0.05
Total	544,000				128.6				490.4	2.34

2020	Cargo Vol (ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/ berth)	Work Time (day/ ship)	Berth Time (day/ ship)	Total B.T. (day-berth)	No. of Required Berth
(1) Import	572,000							0.3		
1) Break Bulk										
a) Rice	93,000	20,000	0.7	14,000	6.6	1,360	10.29	10.59	70.4	0.34
b) Cement	202,000	10,000	0.7	7,000	28.9	1,360	5.15	5.45	157.2	0.75
2) Bulk										
a) Fertilizer	48,000	10,000	0.7	7,000	6.9	1,950	3.59	3.89	26.7	0.13
3) General Cargo										
a) Heavy Equipment	80,000									
LO/LO	32,000	7,000	0.2	1,400	22.9	870	1.61	1.91	43.6	0.21
RO/RO	48,000	7,000	0.2	1,400	34.3	1,640	0.85	1.15	39.6	0.19
b) Construction Material	92,000	7,000	0.7	4,900	18.8	840	5.83	6.13	115.2	0.55
4) Others	57,000	7,000	0.7	4,900	11.6	840	5.83	6.13	71.3	0.34
(2) Export	4,000									
a) Heavy Equipment	4,000									
LO/LO	1,600	7,000	0.2	1,400	1.1	860	1.63	1.93	2.2	0.01
RO/RO	2,400	7,000	0.2	1,400	1.7	1,460	0.96	1.26	2.2	0.01
(3) Re-export	51,000									
a) Heavy Equipment	18,000									
LO/LO	7,200	7,000	0.2	1,400	5.1	860	1.63	1.93	9.9	0.05
RO/RO	10,800	7,000	0.2	1,400	7.7	1,460	0.96	1.26	9.7	0.05
b) Cigarette	23,000									
c) Others	10,000	7,000	0.7	4,900	2.0	840	5.83	6.13	12.5	0.06
Total	627,000				147.7				560.4	2.67

Table 3.1.2-6 Required number of berth for domestic trade in 2005, 2010, 2015 and 2020

2005	Cargo Vol (ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/berth)	Work Time (day/ship)	Berth Time (day/ship)	Total B.T. (day-berth)	No. of Required Berth
								0.3		
(1) Domestic (Inbound)	19,000									
Fertilizer	19,000	3,000	0.7	2,100	9.0	680	3.09	3.39	30.7	0.15
(2) Domestic (Outbound)	20,000									
a) Heavy Equipment	20,000									
LCT	20,000	2,500	0.2	500	40.0	340	1.47	1.77	70.8	0.34
Total	39,000				49.0				101.5	0.48

2010	Cargo Vol.(ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/berth)	Work Time (day/ship)	Berth Time (day/ship)	Total B.T. (day-berth)	No. of Required Berth
								0.3		
(1) Domestic (Inbound)	25,000									
Fertilizer	25,000	3,000	0.7	2,100	11.9	680	3.09	3.39	40.3	0.19
(2) Domestic (Outbound)	26,000									
a) Heavy Equipment	26,000									
LCT	26,000	2,500	0.2	500	52.0	340	1.47	1.77	92.1	0.44
Total	51,000				63.9				132.4	0.63

2015	Cargo Vol (ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/berth)	Work Time (day/ship)	Berth Time (day/ship)	Total B.T. (day-berth)	No. of Required Berth
								0.3		
(1) Domestic (Inbound)	32,000									
Fertilizer	32,000	3,000	0.7	2,100	15.2	680	3.09	3.39	51.6	0.25
(2) Domestic (Outbound)	34,000									
a) Heavy Equipment	34,000									
LCT	34,000	2,500	0.2	500	68.0	340	1.47	1.77	120.4	0.57
Total	66,000				83.2				172.0	0.82

2020	Cargo Vol.(ton)	Avg Ship Size(DWT)	Load Factor	Avg. Loaded	Ship Calls	Handling Prod. (t/day/berth)	Work Time (day/ship)	Berth Time (day/ship)	Total B.T. (day-berth)	No. of Required Berth
								0.3		
(1) Domestic (Inbound)	42,000									
Fertilizer	42,000	3,000	0.7	2,100	20.0	680	3.09	3.39	67.8	0.32
(2) Domestic (Outbound)	45,000									
a) Heavy Equipment	45,000									
LCT	45,000	2,500	0.2	500	90.0	340	1.47	1.77	159.4	0.76
Total	87,000				110.0				227.1	1.08

Table 3.1.2-7 Required Area for Cargo Storage Facilities

2005	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m²)	Necessary Area (m²) (A1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m²) (A2)	Required Storage Area (m²)	Storage Area and Net Land Area (m²)	Gross Land Area (m²)
(1) NSD Wharf													
(Open Storage Yard)													
Heavy Equipment	50,000	1.00	50,000	8	6,250	0.7	1.0	8,929	8,000	11,429	11,429		
Construction Material	69,000	1.00	69,000	8	8,625	0.7	2.0	6,161	33,000	23,571	23,571		
Others	39,000	0.80	31,200	8	3,900	0.7	2.0	2,786	26,400	18,857	18,857		
Subtotal	**158,000**		**150,200**								**53,857**	**55,000**	**91,667**
Subtotal(incl.road,green)													**183,000**
(Transit Shed)													
Rice	84,000	0.40	33,600	20	1,680	0.5	2.0	1,680	10,400	10,400	10,400		
Fertilizer	36,000	0.10	3,600	20	180	0.5	2.0	180	2,600	2,600	2,600		
Subtotal	**120,000**		**37,200**								**13,000**	**13,000**	**21,667**
Subtotal(incl.road,green)													**43,000**
(Warehouse)													
Rice	84,000	0.00	0	8	0	0.7	2.0	0	0	0	0		
Cement	96,000	0.10	9,600	8	1,200	0.7	2.0	857	2,600	1,857	1,857		
Fertilizer	36,000	0.00	0	8	0	0.7	2.0	0	0	0	0		
Construction Material	69,000	0.00	0	8	0	0.7	1.0	0	0	0	0		
Cigarette (Re-export)	10,000	1.00	10,000	4	2,500	0.7	0.2	17,857	5,000	35,714	35,714		
Others	39,000	0.00	0	8	0	0.7	1.0	0	0	0	0		
Subtotal	**334,000**		**19,600**								**37,571**	**38,000**	**63,333**
Subtotal(incl.road,green)													**126,000**
(Total)											**104,429**	**106,000**	**176,667**
(Total incl. road, green)													**352,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	20,000	0.20	4,000	8	500	0.7	1.0	714	800	1,143	**1,143**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	19,000	0.10	1,900	20	95	0.5	2.0	95	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Total)								**809**		**2,143**	**2,143**	**4,000**	**6,667**
(Total incl.road,green)													**15,000**

2010	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1) NSD Wharf													
(Open Storage Yard)													
Heavy Equipment	61,000	1.00	61,000	8	7,625	0.7	1.0	10,893	8,000	11,429	11,429		
Construction Material	78,000	1.00	78,000	8	9,750	0.7	2.0	6,964	33,000	23,571	23,571		
Others	45,000	0.80	36,000	8	4,500	0.7	2.0	3,214	26,400	18,857	18,857		
Subtotal	**184,000**		**175,000**								**53,857**	**57,000**	**95,000**
Subtotal(incl.road,green)													**190,000**
(Transit Shed)													
Rice	83,000	0.40	33,200	20	1,660	0.5	2.0	1,660	10,400	10,400	10,400		
Fertilizer	41,000	0.10	4,100	20	205	0.5	2.0	205	2,600	2,600	2,600		
Subtotal	**124,000**		**37,300**								**13,000**	**13,000**	**21,667**
Subtotal(incl.road,green)													**43,000**
(Warehouse)													
Cement	127,000	0.10	12,700	8	1,588	0.7	2.0	1,134	2,600	1,857	1,857		
Cigarette (Re-export)	14,000	1.00	14,000	4	3,500	0.7	0.2	25,000	5,000	35,714	35,714		
Subtotal	**127,000**		**26,700**								**37,571**	**38,000**	**63,333**
Subtotal(incl.road,green)													**127,000**
(Total)											**104,429**	**108,000**	**180,000**
(Total incl. road, green)													**360,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	26,000	0.20	5,200	8	650	0.7	1.0	929	800	1,143	**1,143**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	25,000	0.10	2,500	20	125	0.5	2.0	125	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Total)								**1,054**		**2,143**	**2,143**	**4,000**	**6,667**
(Total incl.road,green)													**15,000**

2015	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1) NSD Wharf													
(Open Storage Yard)													
Heavy Equipment	72,000	1.00	72,000	8	9,000	0.7	1.0	12,857	8,000	11,429	12,857		
Construction Material	86,000	1.00	86,000	8	10,750	0.7	2.0	7,679	33,000	23,571	23,571		
Others	51,000	0.80	40,800	8	5,100	0.7	2.0	3,643	26,400	18,857	18,857		
Subtotal	**209,000**		**198,800**								**55,286**	**57,000**	**95,000**
Subtotal(incl.road,green)													**190,000**
(Transit Shed)													
Rice	86,000	0.40	34,400	20	1,720	0.5	2.0	1,720	10,400	10,400	10,400		
Fertilizer	45,000	0.10	4,500	20	225	0.5	2.0	225	2,600	2,600	2,600		
Subtotal	**131,000**		**38,900**								**13,000**	**13,000**	**21,667**
Subtotal(incl.road,green)													**43,000**
(Warehouse)													
Cement	162,000	0.10	16,200	8	2,025	0.7	2.0	1,446	2,600	1,857	1,857		
Ciogarette (Re-export)	17,550	1.00	17,550	4	4,388	0.7	0.2	31,339	5,000	35,714	35,714		
Subtotal	**162,000**		**33,750**								**37,571**	**38,000**	**63,333**
Subtotal(incl.road,green)													**127,000**
(Total)											**105,857**	**108,000**	**180,000**
(Total incl. road, green)													**360,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	34,000	0.20	6,800	8	850	0.7	1.0	1,214	800	1,143	**1,214**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	32,000	0.10	3,200	20	160	0.5	2.0	160	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Total)								**1,374**		**2,143**	**2,214**	**4,000**	**6,667**
(Total incl.road,green)													**15,000**

2020	Cargo Handling Volume (tons)	Utility Rate	Required Annual Handling Volume	Cargo Rotation (turnover)	Required Storage Volume (tons)	Occupancy Rate	Storage Cargo Volume per Unit Area (t/m^2)	Necessary Area (m^2) (A_1)	Storage Cargo Volume of Max. Ship (tons)	Necessary Area for Max.Ship (m^2) (A_2)	Required Storage Area (m^2)	Storage Area and Net Land Area (m^2)	Gross Land Area (m^2)
(1) NSD Wharf													
(Open Storage Yard)													
Heavy Equipment	80,000	1.00	80,000	8	10,000	0.7	1.0	14,286	8,000	11,429	14,286		
Construction Material	92,000	1.00	92,000	8	11,500	0.7	2.0	8,214	33,000	23,571	23,571		
Others	57,000	0.80	45,600	8	5,700	0.7	2.0	4,071	26,400	18,857	18,857		
Subtotal	**229,000**		**217,600**								**56,714**	**57,000**	**95,000**
Subtotal(incl.road,green)													**190,000**
(Transit Shed)													
Rice	93,000	0.40	37,200	20	1,860	0.5	2.0	1,860	10,400	10,400	10,400		
Fertilizer	48,000	0.10	4,800	20	240	0.5	2.0	240	2,600	2,600	2,600		
Subtotal	**141,000**		**42,000**								**13,000**	**13,000**	**21,667**
Subtotal(incl.road,green)													**43,000**
(Warehouse)													
Cement	202,000	0.10	20,200	8	2,525	0.7	2.0	1,804	2,600	1,857	1,857		
Cigarette (Re-export)	23,000	1.00	23,000	4	5,750	0.7	0.2	41,071	5,000	35,714	41,071		
Subtotal	**202,000**		**43,200**								**42,929**	**43,000**	**71,667**
Subtotal(incl.road,green)													**127,000**
(Total)											**112,643**	**113,000**	**188,333**
(Total incl. road, green)													**360,000**
(2) Boton Wharf													
(Open Storage Yard)													
Heavy Equipment (Domestic)	45,000	0.20	9,000	8	1,125	0.7	1.0	1,607	800	1,143	**1,607**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Transit Shed)													
Fertilizer(Domestic)	42,000	0.10	4,200	20	210	0.5	2.0	210	1,000	1,000	**1,000**	**2,000**	**3,333**
Subtotal(incl.road,green)													**7,500**
(Total)								**1,817**		**2,143**	**2,607**	**4,000**	**6,667**
(Total incl.road,green)													**15,000**