The Project will be completed by following three steps:

- Preparation of design documents,
- Tender and construction contract,
- Execution of the construction work.

The implementation time frame in the Phase I is 4 months for designing, 12 months for construction works, and in the Phase II, 4 months for designing, 12 months for construction works as shown in Table 6-3.

Table 6-3 Project Implementation Time Frame

		1	2	3	4	5	6	7	8	9	10	11	12	Remarks
PHASE (I)	D	******(Site)												Site Survey
			**********		**** (Home)									Design, Tender Documents
					** (Site)									Approval of Tender Documents
	C	**********	**********			(Mobilization)								
			**********	**********		(Preparation)								
				**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	Dock-B Extension Works
PHASE (II)	D	*** (Site)												Site Survey
		**********			*** (Home)									Design, Tender Documents
				****** (Site)										Approval of Tender Documents
	C	**********	(Mobilization)											
		**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	Dock-A Extension Works etc.

Note : D = Detailed Design, C = Construction

CHAPTER 7

PROJECT EVALUATION AND CONCLUSION

CHAPTER 7: PROJECT EVALUATION AND CONCLUSION

7.1 Project Evaluation

Weno Port is one of the most important fundamental infrastructures of Chuuk State, performing real lifeline roles in marine transportation and fishery business, maintaining daily life of Chuuk people and supporting social economy of Chuuk State.

The project plan for the Weno Harbor Extension Project in this report places emphasis on enhancement of commercial port function of Weno Port by expansion and improvement of port facilities in commercial dock area corresponding to 10,000 DWT class international cargo vessels.

The commercial port function of Weno Port consists of the following two components:

1) International trade and transport activity
2) Domestic marine transport and traffic activity

Present status of port facilities in commercial dock area in this port are in rather inferior condition due to insufficient capacity and deterioration of facilities, being compelled to intermingle above two activities together in a same area causing disorders in port operation.

The proposed project plan aims to improved inconvenient conditions in the commercial port function, and the main constituents of the project works are:

1) Dock-A Reformation Works
2) Dock-B Extension Works
3) Container Handling Improvement Works
4) Navigation Aids Improvement Works

Detail plan for each work and expected effects and benefits are summarized below.

(1) Dock-A Reformation Works

The purpose of Dock-A reformation works is to provide mother port berths for three intra-state shipping vessels stationed in Weno Port being operated by Chuuk State, as well as providing an alternate berth of Dock-B for accommodation of 10,000 DWT class international cargo vessel in case of adverse sea condition at Dock-B, and the works consist of three sub-works:

* Dock-A rehabilitation work
* Dock-A extension work
* Small dock works at return wall portion with ramp

1) Dock-A Rehabilitation Works

a) Current Situation

The existing Dock-A which was constructed in 1962 is 91 m long, and since this dock is almost 30 years old, and since the steel sheet-pile in use for this quaywall is rather thinner section, due to rust corrosion developed in long time on the wall, structural stability has been already lowered to a point where failure of entire wall structure is feared for this existing Dock-A.

b) Proposed plan

Reinforce work is proposed to the deteriorated present dock structure by installation of a new sheetpile wall in front of the existing wall for entire wall length.

c) Effects

By the rehabilitation works, the existing degraded Dock-A structure recovers stability and brings forth safety and efficiency for ships in mooring operation and for cargoes in handling works.

2) Dock-A Extension Works

a) Current Situation

The existing Dock-A with 97 m long is suffering from absolute insufficiency of berth length to accommodate vessels stationed in Weno Port. The existing length of Dock-A is good only for accommodation of one of the intra-state boats of Chuuk State, and extension is necessary for simultaneous berthing of two or three boats. Furthermore, for accommodation of a large size international cargo vessel as the alternate berth of Dock-B in case when sea condition is rough at Dock-B taking advantage of existing water depth of Dock-A, extension of Dock-A is required.

b) Proposed plan

Extension of Dock-A toward east by 60 m to make total berth length of Dock-A 157 m is proposed. Also - 9 m dredging of the mooring basin in front of Dock-A is included.

c) Effects

Two of the three intra-state service boats can be accommodated at Dock-A simultaneously in ordinary case, eliminating offshore waiting for berth mooring, and thus leading to decrease of loss of operation costs as well as to improvement of domestic shipping service keeping schedules on time. Cargo handling of international large vessel can be secured at this berth even in most of rough sea days at Dock-B during the months; August through November, contributing for stabilization of import goods supply to Chuuk.

3) Small Dock Works at the Return Wall

a) Current situation

Weno Port have no ramp for landing-craft type vessels, though some of intra-state boats of Chuuk State are LST type to serve for outer islands. Therefore, small boat dock with ramp is required.

b) Proposed plan

The return wall portion at the east end of the extended Dock-A can be used as small boat dock taking advantage of existing water depth in front. At landside end of the small boat dock ramp for landing craft is provided.

c) Effects

Traffic of vehicles to outer islands of Chuuk State can be facilitated through this ramp, benefiting for motorization in outer islands.

(2) Dock-B Extension Works

The purpose of Dock-B Extension Work is to furnish a complete 10,000 DWT class quaywall with -9.0 m water depth and 183 m long berth, and the works consist of following sub-works:

* Dock-B Extension Works

* Small Dock Works at the Return Wall portion

1) Dock-B Extension Works

a) Current situation

Existing Dock-B is only 91 m long, being almost one half berth length of a standard 10,000 DWT class berth, despite that this dock was designed to be a - 9 m quaywall. Furthermore, since actual water depth of the existing Dock-B is only -8 to -5 m deep, main international shipping boat is not able to moor on this berth. For this reason at present, most of main vessels for international transport is accommodated at the existing Dock-A of only 97 m long. As the length of this berth is also only one half of a standard berth length, and since the mooring water basin in front of the present Dock-A is very narrow, a lot of danger accompany in mooring mameuverment of a main boat onto this berth. Furthermore

Dock-A and present container yard is separated requiring long distance haul of each container.

b) Proposed plan

With extension of new quaywall of 92 m length, Dock-B will be expanded up to 183 m long dock, satisfying length requirement of 170 m for standard 10,000 DWT berth. The mooring and turning basin area in front of the extended Dock-B will be dredged to - 9 m depth to accommodate 10,000 DWT class boat.

c) Effects

By installation of the main international berth close to the container yard to be expanded in this project, large extent improvement can be achieved in cargo handling efficiency as well as in mooring maneuverment of international trade vessel.

By improvement of this dock, near future introduction of a larger size vessel than the one in service at present for international transport will be accelerated, and the resulted contribution for cost down of import and export cargoes not only for Chuuk State but also for the whole FSM can be expected.

2) Dock-C Replacement Works along New Return Wall

a) Current situation

By extension of Dock-B toward north, the existing Dock-C along present return wall portion which is in use for local shipping will be buried down into proposed yard expansion area. However, a new return wall is to be provided from the north end of the extended Dock-B, and present Dock-C is to be replaced to the new location along the new return wall.

b) Proposed plan

Taking advantage of large water depth along the new return wall for Dock-B extension work, small boat dock of 50 m long is planned here. Water depth along this dock varies from - 9m at west end to - 5 m at east end.

c) Effects

This is a replacement of Dock-C from old location to a new location without significant increase of investment cost, maintaining function of existing Dock-C.

(3) Container Handling Improvement Works

The purpose of the container related works is to improve cargo handling facility corresponding to recent trend of containerization of most of international cargoes in Weno Port, and the works consist of:

* Expansion of Container Yard

1) Expansion of Container Yard

a) Current situation

Present yard area for container operation in Weno Port is extremely narrow with available container stack area of only 3,500 m^2 wide, and thus container handling operation in Weno Port suffer from congestion and inefficiency and hazard.

b) Proposed plan

Expansion of Container yard is proposed over newly reclaimed land area of 5,700 m^2 which can be acquired in behind the extended Dock-B by damping of disposal soil dredged from the mooring basin dredging works.

c) Effects

Expanded container yard becomes 9,200 m^2 wide and very close to the expanded Dock-B for international container boat, and the container handling operation is expected to be improved to a large extent in view of safety and efficiency.

(4) Navigation Aids Works

The purpose of Navigation Aids Works is to make possible for commercial boats in and out to this port to navigate even at night along with other improvement works in this projects.

1) Current situation

Navigational aids along entrance channel from the North-east Pass to Weno Port are in damaged condition requiring repair works with imported apparatus. Also new markers and lighted aids become necessary along with Dock-A and Dock-B works.

2) Proposed plan

Improvement works on the 6 existing navigation aids along the entrance channel is proposed. Also 2 new markers to indicate boundary limits of the turning basin for Dock-B and 1 lighted aids for approaching Dock-A and Dock-B are included in the plan.

3) Effects

Effects of the whole project can be further magnified by securing safer and more efficient navigation even at night in and around Truck Lagoon and Weno Port.

7.2 Conclusion

As discussed above, sufficient benefits are expected by implementation of the Weno Harbor Extension Project, and its effects are in good concordance with the objectives of the National Development Plan of the Federated States of Micronesia such as reinforcing the economic basis and achieving economic self-relience. The Project is therefore believed to make contribution toward improvement of living standards of people of Chuuk State by promoting more employment opportunities in Chuuk State. Therefore, it is evaluated appropriate to implement the present Project under a grant aid program.

It is also confirmed that the organization of the Chuuk State Government is satisfactory in terms of personal and financial resources for operation/ administration of the Project.

In this connection, it is recommended that training of port managing experts be promoted for enhancement of efficiency of port management and port operation through technical assistance associated with this project.

APPENDICES

APPENDICES

LIST OF FIGURES

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APPENDIX-1 (1) Basic Design Study Team Members and Site Study Schedule

Name	Assignment	Position
Mr. Masaki Shiomi	Team Leader	Chief of Design Standard Section, Port and Harbor Research Institute, Ministry of Transport, Government of Japan
Mr. Naota Ikeda	Environmental Assessment Specialist	Senior Engineering Officer, Yokohama Investigation and Design Office, 2nd District Port Construction Bureau, Ministry of Transport, Government of Japan
Mr. Kenji Maekawa	Project Coordinator	Second Basic Design Study Division, Grant Aid Study & design Department Japan International cooperation Agency (JICA)
Mr. Ken Ishiguro	Port Facilities Planner	Nippon Tetrapod Co., Ltd.
Mr. Hitoshi Takemoto	Port Civil Engineer	-ditto-
Mr. Kiyotaka Sasao	Natural Condition Survey	-ditto-
Mr. Masafumi Ito	Construction and Cost Estimation	-ditto-
Mr. Fuminori Nishime	Environmental Survey	-ditto-

Site Study Schedule for Basic Design

Site Study Schedule for Basic Design

Day	Date		Itinerary and Work Items							
			Team Leader	Environmental Assessment Specialist	Project Coordinator	Port Facilities Planner	Port Civil Engineer	Environmental Survey	Natural Condition	Construction and Cost Estimation
			Masaki Shiomi	Naota Ikeda	Kenji Maekawa	Ken Ishiguro	Hitoshi Takemoto	Fuminori Nishime	Kiyotaka Sasao	Masafumi Ito
1	Mar.30	Tue							NRT(CO962)- Guam	
2	31	Wed							Guam(CO956)- Chuuk	
3	Apr. 1	Thu							Survey Preparation	
4	2	Fri								
5	3	Sat								
6	4	Sun								
7	5	Mon								
8	6	Tue	NRT(CO962)- Guam							
9	7	Wed	Guam(CO956)- Pohnpei, Courtesy Call to External Affairs, Resources and Development				Guam(CO956)- Chuuk			
10	8	Thu	Pohnpei(CO957)- Chuuk				Preparation for Investigation	Survey Preparation	Topographical Survey	
11	9	Fri	Courtesy Call to State Government, Explanation of Inception Report and Discussion on Contents of the Study					- ditto -		
12	10	Sat	Site Study at Weno Port and Channel				Site Study	- ditto -		
13	11	Sun	Team Meeting							
14	12	Mon	Discussion on Questionaire with the Officials Concerned				Site Study	Site Survey	Soil Investigation	
15	13	Tue	- ditto -				- ditto -	- ditto -		
16	14	Wed	- ditto -				- ditto -	- ditto -		
17	15	Thu	Discussion on Memorandum of Understanding and Site Study					Sea Water Analysis	Sounding Survey	
18	16	Fri	Team Meeting					- ditto -		
19	17	Sat	Site Survey at Chuuk Lagoon and Dublon Port							
20	18	Sun	Chuuk(CO956)- Pohnpei, Site Survey at Pohnpei Port				Data Analysis			

Day	Date		Itinerary and Work Items							
			Team Leader	Environmental Assessment Specialist	Project Coordinator	Port Facilities Planner	Port Civil Engineer	Environmental Survey	Natural Condition	Construction and Cost Estimation
			Masaki Shioui	Naota Ikeda	Kenji Maekawa	Ken Ishiguro	Hitoshi Takemoto	Fuminori Nishime	Kiyotaka Sasao	Masafumi Ito
21	19	Mon	Discussion on Minutes of Discussions				Site Study	Site Study	↑ ↑	
22	20	Tue	Signing of Minutes of Discussions, Pohnpei(C0957)→ Guam, Farewell Call to Consulate General of Japan in Agana				- ditto -	- ditto -	Sounding Survey ↓ Soil Investigation ↓	
23	21	Wed	Guam(C0967)→ NRT		Guam(C0958)→ Chuuk		Data Collection	- ditto -	↓ ↓	
24	22	Thu				Site Study	- ditto -	Sea Water Analysis	↓ ↓	
25	23	Fri				- ditto -	- ditto -	Site Study	↓ ↓	
26	24	Sat				- ditto -	- ditto -	- ditto -	↓	NRT(C0962)→ Guam
27	25	Sun				Team Meeting				Guam(C0956)→ Chuuk
28	26	Mon				Data Collection	Site Study	Sea Water Analysis	↑	Site Study
29	27	Tue				- ditto -	- ditto -	Site Study	Topographical Survey	- ditto -
30	28	Wed				- ditto -	- ditto -	- ditto -	↓	- ditto -
31	29	Thu				- ditto -	Study for Commuter Boat	- ditto -	Data Collection	- ditto -
32	30	Fri				- ditto -	- ditto -	- ditto -	- ditto -	- ditto -
33	May 1	Sat				- ditto -	Data Analysis	- ditto -	- ditto -	- ditto -
34	2	Sun				Team Meeting and Data Analysis				
35	3	Mon				Data Collection	Data Collection	Data Collection	Data Collection	Site Study
36	4	Tue				- ditto -	- ditto -	- ditto -	- ditto -	- ditto -
37	5	Wed				- ditto -	- ditto -	- ditto -	- ditto -	Data Analysis
38	6	Thu				Chuuk(C0957)→ Guam		- ditto -	- ditto -	Chuuk→ Guam
39	7	Fri				Guam(C0976)→ NRT		- ditto -	- ditto -	Guam→ NRT
40	8	Sat						Chuuk(C0957)→ Guam		
41	9	Sun						Guam(C0967)→ NRT		

APPENDIX-1 (2) Draft Report Explanation Team Members and Schedule

Name	Assignment	Position
Mr. Masaki SHIOMI	Team Leader	Chief of Design Standard Section, Port and Harbor Research Institute, Ministry of Transport, Government of Japan
Mr. Kenji TOYAMA	Environmental Assessment Specialist	International Affairs Office, Port and Harbours Bureau, Ministry of Transport, Government of Japan
Mr. Eiichiro CHO	Project Coordinator	First Project Management Division, Grant Aid Project Management Dept., Japan International cooperation Agency (JICA)
Mr. Ken ISHIGURO	Port Facilities Planner	Nippon Tetrapod Co., Ltd.
Mr. Hitoshi TAKEMOTO	Port Civil Engineer	-ditto-
Mr. Fuminori NISHIME	Environmental Survey	-ditto-

Draft Report Explanation Schedule

Day	Date		Itinerary	
	1993			
1	Sept. 4	Sat.	NRT (Tokyo) (CO-962) -> Guam	
2	5	Sun.	Guam (CO-956) -> Pohnpei	
3	6	Mon.		Courtesy call to Department of External Affairs of FSM Govt. and explanation of draft report
4	7	Tue.	Pohnpei (CO-957) -> Chuuk	
5	8	Wed.		Courtesy call to Chuuk State Government and explanation of draft report
6	9	Thu.		Discussion with Chuuk State Government, Preparation of Memorandum
7	10	Fri.	Chuuk (CO-958) -> Pohnpei	Signing of Memorandum
8	11	Sat.		Investigation of Pohnpei Port
9	12	Sun.		Team meeting
10	13	Mon.		Discussion with Department of External Affairs of FSM Government Preparation of Minutes of Discussion Mr. Cho departed to Marshall Island
11	14	Tue.		Signing of Minutes of Discussion
12	15	Wed.	Pohnpei (CO-957) -> Guam	
13	16	Thu.	Guam (CO-967) -> NRT (Tokyo)	Courtesy call to Consulate-General of Japan in Agana

MEMORANDUM OF UNDERSTANDING ON BASIC DESIGN STUDY OF THE WENO HABOUR EXTENSION PROJECT IN CHUUK STATE THE FEDERATED STATES OF MICRONESIA

IN WENO, CHUUK STATE, MEETINGS WERE HELD ON THE WENO HARBOUR EXTENSION PROJECT, BETWEEN THE BASIC DESIGN TEAM AND THE CONCERNED OFFICIALS OF THE STATE OF CHUUK, FROM 8TH THROUGH 15TH OF APRIL 1993.

IN THE COURSE OF DISCUSSION AND FIELD SURVEY, BOTH PARTIES HAVE CONFIRMED THAT THE FOLLOWING ITEMS WERE PROPOSED BY THE GOVERNMENT OF THE STATE OF CHUUK IN PRIORITY ORDER:

1. Repair of Dock A (-30' deep, 300' long)
   (Dredging of Mooring Basin)

2. Expansion of Container Yard (with Revetment)

3. Extension of Dock B (-30' deep, 300' long)
   (Return Wall 150' long, Slop for landing craft)

4. Extension of Dock A (-30' deep, 200' long)
   (Freight Station, Tugboat)

5. Commuter Boat Terminal
   A. Inner Northern Basin
   - Eastern Apron
   - Mooring Jettys
   - Revetment in Western Side

   B. Primary Marina

6. Miscellaneous
   - Navigation Aids
   - Forklift
   - Revetment in Southern Basin

However, the final components of the Project will be decided after further studies.

Weno Chuuk, April 15, 1993

Mr. Masaki Shiomi
Team Leader
Basic Design Study Team
JICA

Hon. Sasao H. Gouland
Governor
State of Chuuk
Federated States of Micronesia

MINUTES OF DISCUSSIONS
ON
BASIC DESIGN STUDY
OF
THE WENO HARBOR EXTENSION PROJECT
IN
CHUUK STATE
THE FEDERATED STATES OF MICRONESIA

In response to a request from the Government of the Federated States of Micronesia (hereinafter referred to as "FSM"), the Government of Japan decided to conduct a Basic Design Study on the Weno Harbor Extension Project in Chuuk State (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to FSM a study team headed by Mr. Masaki Shiomi, Chief of Design Standard Laboratory, Port and Harbor Research Institute, Ministry of Transport, and is scheduled to stay in the country from March 31 to May 8, 1993.

The team held discussions with the officials concerned of the Government of FSM and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study Report.

Palikir, Pohnpei, April 20, 1993

塩見 雅樹

Mr. Masaki Shiomi
Team Leader
Basic Design Study Team
JICA

John A. Mangefel

Mr. John A. Mangefel
Deputy Secretary
Department of External Affairs
Government of the Federated States of Micronesia

ATTACHMENT

1. Objective

The objective of the Project is to improve and expand port facilities and contribute toward development of economy in Chuuk State and FSM by extension of the Weno Harbor

2. Project Site

The Project site is located in the Weno Harbor, in Weno Island, Chuuk State, FSM as shown in Annex I.

3. Executing Agency

The Department of Transportation and Communications of the Government of FSM is responsible for coordination of the Project. The Department of Transportation and the Department of Planning and Statistics, Chuuk State Government are responsible proponents for the administration and execution of the Project.

4. Items requested by the Government of FSM

After discussions with the Basic Design Study Team, the project items which were finally requested by the FSM side are shown in Annex II. However, the final components of the Project will be decided after further studies.

5. Japan's Grant Aid System

(1) The Government of FSM has understood the system of Japan's Grant Aid explained by the team.

(2) The Government of FSM will undertake necessary measures, described in Annex III for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

(1) The team will proceed to further site studies in Chuuk State until May 8, 1993.

(2) JICA will prepare the draft report and dispatch a mission in order to explain its contents in September, 1993.

(3) In case that the contents of the report is accepted in principle by the Government of FSM, JICA will complete the final report and send it to the Government of FSM in November, 1993.

7. Environmental Protection Consideration

(1) Implementation of the Project requires authorization of FSM for laws on environmental control.

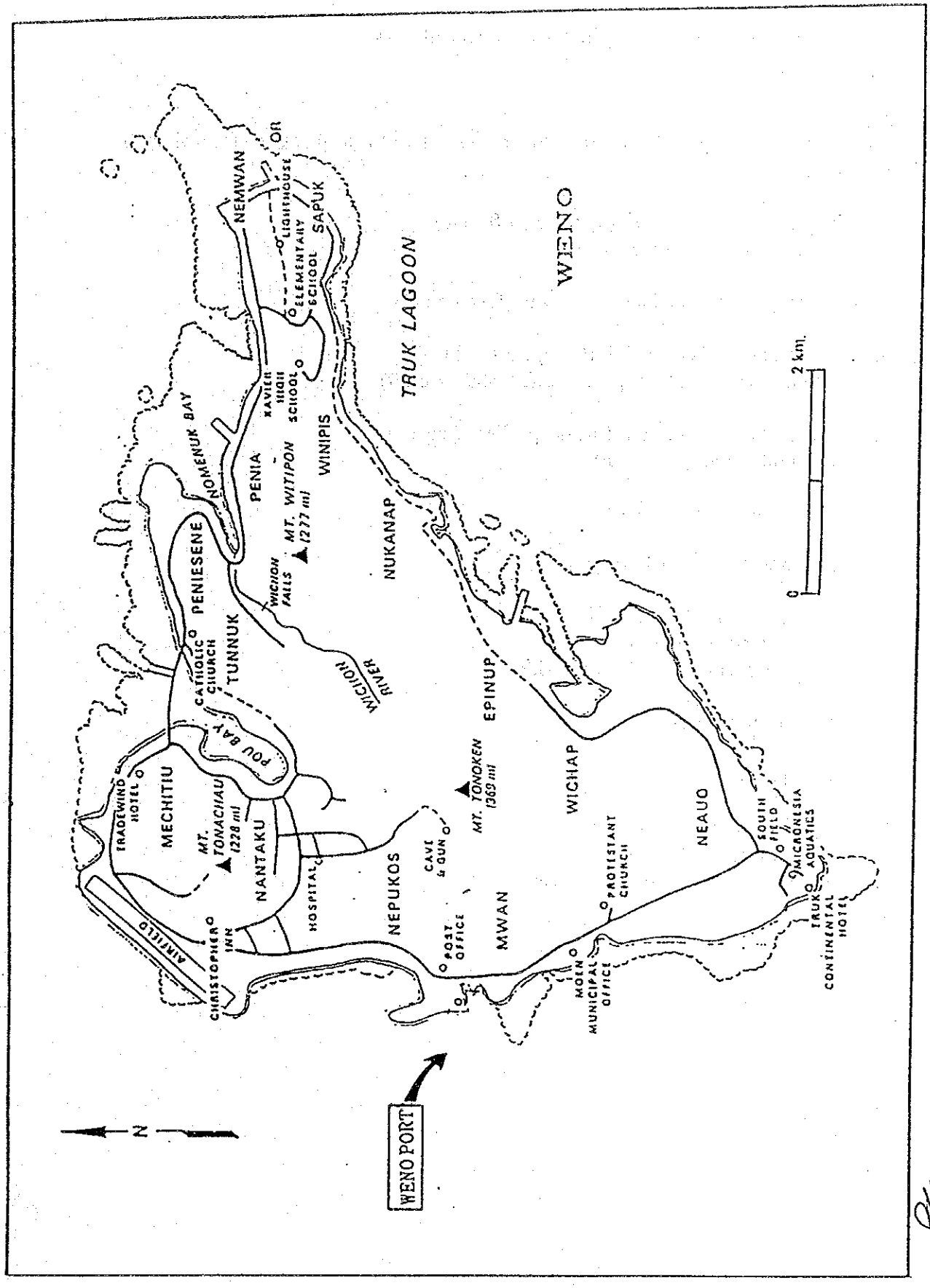
(2) The Department of Health Services is responsible for environmental assessment for the Project by laws of FSM.

Also Chuuk State Department of Health Services, Division of Environmental Health of Chuuk State is project proponent in respect to environmental control.

(3) The Project is required to be executed in compliance with the Earth Moving Regulation of FSM.

(4) The Basic Design Study Report will include one chapter on environmental precaution on the basis of site study by the team.

Annex I. Project site



Annex II. Items requested by the Government of FSM

The project items requested by the Government of FSM are listed as followings in priority order;

1. Repair of Dock A (-30ft deep, 300 ft long)
   (Dredging of Mooring Basin)

2. Extension of Container Yard (with Revetment)

3. Extension of Dock B (-30ft deep, 300ft long)
   (Return Wall 150ft long, Slope for landing craft)

4. Extension of Dock A (-30ft deep, 200ft long)
   (Freight Station, Tugboat)

5. Commuter Boat Terminal

   A. Inner Northern Basin

      - Eastern Apron
      - Mooring Jetties
      - Revetment in Western Side

   B. Primary Marina

6. Miscellaneous

   - Navigation Aids
   - Forklift
   - Revetment in Southern Basin

Annex III. Undertakings of the Government of FSM for Japan's Grant Aids

1. To secure the site for the Project.

2. To clear the site prior to commencement of the construction.

3. To provide outlets for electricity, water supply, telephone, drainage, sewage and other incidental utilities to the Project site.

4. To ensure prompt unloading and custom clearance at port of disembarkation in FSM and internal transportation of the materials and equipment for the Project.

5. To exempt any equipment, materials and supplies brought into FSM in connection with the performance of the Project from any tax, duties and levies which are imposed in FSM.

6. To exempt Japanese nationals concerned with the Project from custom duties, internal taxes and other fiscal levies which may be imposed in FSM with respect to the supply of the products and services under verified contracts.

7. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into FSM and stay therein for the performance of their work.

8. To ensure that facilities under the Grant be maintained and used properly and effectively for FSM.

9. To bear all the expenses, other than those to be borne by the Grant, necessary for execution of the Project.

10. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

11. To coordinate and solve any related matters which may arise with third party in the Project area during implementation of the Project.

APPENDIX-2 (2) Minutes of Discussions (Explanation of Draft Report)

<Chuuk State Government>

MEMORANDUM OF DISCUSSIONS ON BASIC DESIGN STUDY OF THE WENO HARBOR EXTENSION PROJECT IN CHUUK THE FEDERATED STATES OF MICRONESIA

(CONSULTATION ON DRAFT REPORT)

In April 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Weno Harbor Extension Project (hereinafter referred to as "the Project") to the Federated States of Micronesia (hereinafter referred to as "FSM"), and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Chuuk State side on the components of the draft report, JICA sent to the Chuuk State a study team, which is headed by Mr. Masaki Shiomi, Chief of Design Standard Section, the Port and Harbor Research Institute, Ministry of Transport, and is scheduled to stay in the State from September 7 to 10, 1993.

As a result of discussions the team and the Government of the State of Chuuk have agreed to and accepted in principle the components of the Draft Report by the team.

Weno, Chuuk State, September 10, 1993

Mr. Masaki Shiomi
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
(JICA)

Honorable Sasao H.Gouland
Governor
State of Chuuk, FSM

MINUTES OF DISCUSSIONS ON BASIC DESIGN STUDY OF THE WENO HARBOR EXTENSION PROJECT IN CHUUK STATE THE FEDERATED STATES OF MICRONESIA

(CONSULTATION ON DRAFT REPORT)

In April 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Weno Harbor Extension Project (hereinafter referred to as "the Project") to the Federated States of Micronesia (hereinafter referred to as "FSM"), and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the FSM side on the components of the draft report, JICA sent to FSM a study team, which is headed by Mr. Masaki Shiomi, Chief of Design Standard Section, The Port and Harbor Research Institute, Ministry of Transport, and is scheduled to stay in the country from September 5 to 14, 1993.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Palikir, Pohnpei, September 14, 1993

Mr. Masaki Shiomi
Leader
Draft Report Explanation
JICA Team

Mr. John A. Mangefel
Deputy Secretary
Department of External Affairs

Witness:

The Honorable Marcelino Umwech
Lieutenant Governor
Chuuk State

ATTACHMENT

1. Components of Draft Report

The Government of FSM has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid System

(1) The Government of FSM has understood the system of Japanese Grant Aid explained by the team.

(2) The Government of FSM will take the necessary measures, described in Annex, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. The team will make the Final report in accordance with the confirmed items, and send it to Government of FSM in November, 1993.

Annex: Necessary measures to be taken by the Government of FSM in case Japan's Grant Aid is executed.

1. To provide EIA Approval of the Project before the Exchange of Notes.

2. To provide Permit for Earth Moving Works before the Construction Contract.

3. To secure the site for the Project.

4. To clear the site prior to commencement of the construction.

5. To provide outlets for electricity, water supply, telephone, drainage, sewage and other incidental utilities to the Project site.

6. To ensure prompt unloading and custom clearance at port of disembarkation in FSM and internal transportation of the materials and equipment for the Project.

7. To exempt any equipment, materials and supplies brought into FSM in connection with the performance of the Project from any tax, duties and levies which are imposed in FSM.

8. To exempt Japanese nationals concerned with the Project from custom duties, internal taxes and other fiscal levies which may be imposed in FSM with respect to the supply of the products and services under verified contracts.

9. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into FSM and stay therein for the performance of their work.

10. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.

11. To bear all the expenses other than those to be borne by the Grant, necessary for execution of the Project.

12. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.

13. To coordinate and solve any related matters which may arise with third party in the Project area during implementation of the Project.

APPENDIX-3 List of Interviewees

Organization	Name	Position
Consulate-General of Japan	Renzo Izawa	Consulate-General
	Yoshio Koshio	Consul & First Secretary
	Masashi Higuchi	Vice-Consul
<FSM Government>		
Department of External Affairs	Resio Moses	Secretary
	John Mangfel	Deputy Secretary
	Epel Ilon	Chief of US Relations
	Tadao Sigrah	Deputy Secretary
	Gabriel Aiyn	Deputy Secretary
	Lorin Robert	Deputy Assistant Secretary
	Jeem Lippwe	Deputy Assistant Secretary
	Ossia Santos	Foreign Service Officer
	Samson Pretrick	Foreign Service Officer
Department of Health Service	Nachsa Siren	EPA Officer
Office of Planning and Statistics	James Mordad	Chief of Planning
Department of Resources and Development	Asterio Takesy	Secretary
Department of Transportation	Robert Weilbacher	Secretary

Organization	Name	Position
<Chuuk State Government>		
Governor	Sasao Gouland	Governor
Lieutenant Governor	Marcellino Umwech	Lieutenant Governor
Office of Budget	Frank Cholomy	Director
Department of Education	Kangichy Welle	Director
Department of Transportation	Thomas Narruhn Leo Lokopwe	Director Deputy Director
Department of Public Works	Joakin Kaminanga	Director
Office of Planning and Statistics	Krescio Billy	Director
Department of Commerce and Industry	Marion Henry	Director
Department of Health Service	Joseph Konno	Environmental Quality Control Officer
<Others>		
PM&O Line	Shuji Hori	Micro Commerce Captain
Kyowa Line	Yukinobu Seno	Kyowa Rose Captain
Overseas Fishery Cooperation Foundation	Susumu Kawakami	Fisheries Expart
Truk Continental Hotel	Takayuki Suenaga	Marine Instructor

APPENDIX-4 Statistical and Technical Data

Table A-2-1 Expenditure on the Gross Domestic Product, 1989

(US$ Million)

	Chuuk	Kosrae	Pohnpei	Yap	FSM
CONSUMPTION EXPENDITURES BY HOUSEHOLDS					
Marketed	28.2	8.8	33.0	10.0	80.1
Nonmarketed	16.0	4.8	14.7	7.1	42.7
CONSUMPTION EXPENDITURES BY GOVERNMENT	25.5	6.5	34.4	12.8	79.1
GROSS DOMESTIC FIXED CAPITAL FORMATION					
Private sector	6.7	1.0	4.0	1.7	13.5
Government	10.2	3.2	13.7	3.5	30.7
EXPORTS	2.3	0.5	3.0	1.2	7.0
LESS IMPORTS					
Visible imports FOB	26.3	6.9	30.4	9.1	72.7
CIF	9.2	2.4	10.6	3.2	25.4
Invisible imports	3.7	1.0	4.3	1.3	10.2
GROSS DOMESTIC PRODUCT	49.8	14.6	57.6	22.7	144.8

Table A-2-2 Federated States of Micronesia, National Government Operations, 1985/86-1990/91 /a

(US$ Thousand)

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Total revenue and grants	19,558	38,921	48,053	39,503	49,093	42,039
Total revenue	10,960	10,688	15,363	20,509	24,077	25,988
Tax	3,617	3,824	4,630	4,987	5,112	6,148
Income	1,397	1,555	1,831	1,938	1,915	2,254
Import duties (excl. fuel tax)	748	775	1,039	1,089	988	1,165
Gross receipts	1,398	1,415	1,675	1,868	2,105	2,602
Fuel import duties	74	79	85	92	104	127
Nontax	7,343	6,864	10,733	15,522	18,965	19,840
Fishing rights fees	4,856	3,845	7,733	10,252	12,660	12,841
Postal revenue, net	429	346	394	485	560	467
Fees and charges	335	155	177	645	208	244
Investment and interest income	788	1,592	1,422	2,729	3,543	4,073
Other	935	926	1,007	1,411	1,994	2,215
Grants	8,598	28,233	32,690	18,994	25,016	16,051
Compact	0	20,718	25,142	13,391	21,639	13,972
Other	8,598	7,515	7,548	5,603	3,377	2,079
Total Expenditure	16,832	25,492	35,054	44,853	34,015	49,150
Current Expenditure	14,791	16,206	19,867	21,666	23,317	27,598
Wages and salaries	5,946	7,073	6,554	7,581	7,785	8,343
Other purchases of goods and services	8,131	8,983	9,549	11,292	13,024	13,646
Interest payments	0	0	0	0	0	0
Subsidies and other current transfers	714	150	3,764	2,793	2,508	5,609
Public enterprises	696	150	1,108	993	1,137	1,750
FSM Development Bank	18	0	264	270	230	236
Scholarships	0	0	2,392	1,530	1,141	3,623
Capital expenditure	2,041	9,286	15,187	23,187	10,698	15,441
Development expenditure	547	5,221	6,124	5,463	2,026	1,246
Capital Transfers	1,494	4,065	9,063	17,724	8,672	14,195
Public enterprises	0	924	4,192	1,009	4,537	0
FSM Development Bank	0	0	3,000	13,510	1,000	11,029
CFSM transfers to states	1,494	3,141	1,871	3,205	3,135	3,166
Other	0	0	0	0	0	0
Net lending	0	0	0	0	0	6,111
Overall balance	2,726	13,429	12,999	-5,350	15,078	-7,111
Change in deferred payments (net)	2,538	556	-2,336	868	-1,498	-702
Cash balance	5,264	13,985	10,663	-4,482	13,580	-7,813
Financing	-5,264	-13,985	-10,663	4,482	-13,580	7,813
Change in cash, CDs, and equivalents	-5,245	6,653	-2,133	-6,843	-6,608	8,036
Change in investment	0	-20,453	-8,209	11,327	-6,584	-4,675
Loan and bank overdraft	-25	-188	-501	0	0	1,992
Notes and bonds	0	0	0	0	0	2,460
Other ((-) means increase in assets)	6	3	180	-2	-388	0

Source: FSM, Trade Bulletin, November 1992

/a Includes the general fund, special revenue fund, capital projects funds, and expenditure trust funds.

Table A-2-3 Federated States of Micronesia, Chuuk State Government Operations

(US$ Thousand)

	1986	1987	1988	1989	1990	1991
REVENUE AND GRANT						
Tax Revenue	2,011	1,691	2,754	3,124	2,814	4,072
Nontax revenue	906	1,790	1,303	5,062	2,770	3,990
External grants	23,301	37,871	44,743	39,841	39,034	44,950
TOTAL REVENUE	26,218	41,352	48,800	48,027	44,618	53,012
EXPENDITURES						
General fund	15,344	19,399	20,348	24,776	22,529	25,437
Special revenue funds	7,925	8,658	16,668	10,707	9,319	14,340
Capital Projects funds	2,949	13,295	11,784	12,544	12,770	13,235
TOTAL EXPENDITURES	26,218	41,352	48,800	48,027	44,618	53,012

Source : FSM, Chuuk State Government

Table A-2-4 Type of Goods and Services Exported in US$, FSM, 1987-1991

Type / Year	1987	1988	1989	1990	1991
Agriculture Produce:					
Copra	135,800	587,200	589,836	345,742	1,041,418
Bananas	44,042	57,420	88,349	117,254	136,123
Citrus	10,126	9,729	9,688	10,334	4,503
Root Crops	4,816	8,337	6,979	12,205	1,662
Black Pepper	51,300	31,600	483,400	2,967	23,951
Betel Nuts	0	28	90	8,090	8,795
Other Farm Produce	9,409	67,402	33,603	10,127	26,693
Total Agriculture Produce	255,493	761,716	1,211,945	506,719	1,243,145
Marine Products:					
Fish	126,767	416,511	500,637	1,836,259	8,627,680
Trochus Shell/Meat	25,000	764,267	0	627,712	427,603
Crab/Lobsters	7,911	39,727	30,897	109,052	97,761
Other Marine Products	0	8,404	12,482	18,920	5,928
Total Marine Products	159,678	1,228,909	544,016	2,591,943	9,158,972
Others					
Coconut oil/Soap Products	29,000	50,086	29,443	20,921	43,472
Handicrafts, souvenirs, gifts					
-Purchases reported by sales outlets	218,640	299,376	74,660	105,201	76,176
-Est. purchases where data not available*	275,560	403,580	426,100	462,900	505,060
Other tourist expenditure:					
-accommodation, food & beverages and transport.	3,086,700	4,428,120	4,625,955	5,169,120	5,612,220
Total Others	3,609,900	5,181,162	5,156,158	5,758,142	6,236,928
Total Exports	4,025,071	7,171,787	6,912,119	8,856,804	16,639,045

Source : FSM, Trade Bulletin, November 1992

* 1989 and 1990 figures are changed due to updated Tourist/Visitor data received

Table A-2-5 Imports by Major SITC Section in US$ and Percentage (%), FSM, 1987-1991.

Year	Total	0 Food	1 Beverages & Tobacco	2 Crude Materials	3 Petroleum Products	4 Animal & Veg. Oil	5 Chemical	6 Manufac. Goods	7 Machinery & Vehicle Manu.	8 Misc. Goods	9 Items N.E.C
1987 $	41,889,621	13,116,474	5,201,189	61,128	5,042	41,278	2,976,257	6,680,265	6,640,593	6,090,866	1,076,529
%	100	31.31	12.42	0.15	0.01	0.10	7.10	15.95	15.85	14.54	2.57
1988 $	67,701,424	16,389,816	11,658,995	338,048	4,062,895	44,766	3,543,859	9,868,033	9,162,728	9,995,832	2,636,452
%	100	24.21	17.22	0.50	6.00	0.07	5.23	14.58	13.53	14.76	3.89
1989 $	72,724,789	17,318,665	7,394,289	182,193	7,182,327	25,148	3,307,827	12,236,979	11,691,422	6,848,175	6,537,764
%	100	23.81	10.17	0.25	9.88	0.03	4.55	16.83	16.08	9.42	8.99
1990 $	83,880,020	20,309,196	8,873,560	225,178	14,485,269	60,966	3,797,652	11,500,142	12,542,759	7,925,160	4,160,138
%	100	24.21	10.58	0.27	17.27	0.07	4.53	13.71	14.95	9.45	4.96
1991 $	88,630,630	23,794,687	8,549,492	133,714	11,691,644	103	3,661,363	12,757,481	12,508,805	8,218,441	7,314,900
%	100	26.85	9.65	0.15	13.19	0.00	4.13	14.39	14.11	9.27	8.25

Table A-2-6 (1) Imports by Last Port of Shipment in US$, FSM, 1987-1991

Year	Total	USA Main land	USA Hawaii	USA Guam	AUSTRALIA	JAPAN	OTHERS
1991	88,630,630	34,357,413	1,475,647	26,355,393	3,315,546	17,077,850	6,048,781

Source : Office of Planning and Statistics, Government of the FSM

Note: 1. Petroleum Products imported through Mobil Oil Micronesia, 1987, are not included.

2. Others include: New Zealand, Taiwan, China, Hong Kong, Philippines, India, Thailand, Malaysia, Singapore, France, Switzerland, Indonesia, CNMI, Korea, Belau, Poland and Marshall Island

Table A-2-6 (2) Merchandise Exports by Type and Destinations in US$, FSM, 1991

Descriptions & Destinations	GUAM	SAIPAN	MARSHALL	HAWAII	USA	JAPAN	OTHERS	TOTAL
Total Exports	810,562	187,499	38,223	117,772	0	9,279,566	98,143	10,531,765

Source : Office of Planning and Statistics, Government of the FSM

Note: 1. Other Destinations include: Belau, Korea, Singapore, Australia, Italy and New Zealand

Table A-3-1 Climatic Data

NORMALS, MEANS, AND EXTREMES

CHUUK, EASTERN CAROLINE IS., PACIFIC

LATITUDE: 7°27'N LONGITUDE: 151°50' E ELEVATION: FT. GRND 5 BARO 8 TIME ZONE: 150E MER WBAN: 40505

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		85.4	85.5	85.8	86.2	86.6	86.9	86.7	87.0	87.1	87.0	86.8	86.0	86.4
-Daily Minimum		76.9	76.9	77.0	76.8	76.4	76.0	75.2	75.1	75.3	75.5	76.1	76.8	76.2
-Monthly		81.2	81.2	81.4	81.5	81.5	81.5	81.0	81.1	81.2	81.3	81.5	81.4	81.3
Extremes														
-Record Highest	41	91	91	94	92	94	93	92	92	93	92	91	91	94
-Year		1969	1946	1946	1982	1946	1957	1984	1981	1981	1981	1990	1981	MAR 1946
-Record Lowest	41	69	70	71	71	70	70	70	70	68	66	70	70	66
-Year		1990	1986	1968	1967	1980	1965	1974	1968	1973	1980	1990	1980	OCT 1980
NORMAL DEGREE DAYS:														
Heating (base 65°F)		0	0	0	0	0	0	0	0	0	0	0	0	0
Cooling (base 65°F)		502	454	508	495	512	495	496	499	486	505	495	508	5955
% OF POSSIBLE SUNSHINE	31	52	56	57	52	48	47	49	50	47	43	46	46	49
MEAN SKY COVER (tenths)														
Sunrise - Sunset	40	9.1	9.3	9.2	9.1	9.1	9.2	9.1	9.1	9.1	9.1	9.1	9.3	9.2
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	40	0.3	0.2	0.3	0.2	0.4	0.2	0.2	0.1	0.3	0.3	0.2	0.1	2.6
-Partly Cloudy	40	3.7	2.9	3.2	3.8	4.1	3.7	4.2	4.5	4.0	4.1	3.8	3.3	45.2
-Cloudy	40	27.1	25.2	27.5	25.9	26.5	26.1	26.6	26.5	25.8	26.6	26.0	27.6	317.4
Precipitation .01 inches or more	40	19.3	16.2	18.7	20.5	24.6	24.0	24.3	24.5	22.4	23.5	23.8	23.0	264.7
Snow, Ice pellets, hail 1.0 inches or more	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thunderstorms	40	0.9	0.3	1.0	1.3	1.7	1.6	1.7	1.3	1.7	2.1	2.3	1.6	17.3
Heavy Fog Visibility 1/4 mile or less	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature °F														
-Maximum														
90° and above	40	0.1	0.1	0.2	0.6	2.1	2.0	2.5	2.8	3.0	2.7	1.7	0.4	18.1
32° and below	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Minimum														
32° and below	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0° and below	40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVG. STATION PRESS. (mb)	13	1008.7	1009.5	1009.4	1009.1	1009.2	1009.4	1009.1	1009.3	1009.3	1008.8	1008.2	1008.6	1009.1
RELATIVE HUMIDITY (%)														
Hour 04	21	82	81	82	85	86	87	89	89	89	88	87	84	86
Hour 10 (Local Time)	40	76	76	76	79	80	80	80	80	80	80	79	79	79
Hour 16	40	76	75	75	77	79	78	78	77	77	78	78	79	77
Hour 22	40	81	80	81	83	85	85	87	87	86	86	85	83	84
PRECIPITATION (inches):														
Water Equivalent														
-Normal		8.36	6.67	9.11	12.76	15.64	12.37	14.32	14.04	13.23	14.68	12.07	12.59	145.84
-Maximum Monthly	42	19.19	15.95	24.02	23.38	28.39	21.72	32.99	25.96	21.17	24.71	26.12	34.89	34.89
-Year		1981	1991	1967	1956	1976	1950	1962	1979	1955	1979	1962	1959	DEC 1959
-Minimum Monthly	42	0.96	0.56	1.95	3.28	3.80	6.10	2.65	5.37	5.24	4.17	1.88	3.12	0.56
-Year		1959	1983	1983	1983	1983	1966	1984	1949	1989	1972	1982	1990	FEB 1983
-Maximum in 24 hrs	42	6.78	6.59	8.21	7.16	11.13	7.61	10.07	4.91	6.24	6.55	10.41	14.92	14.92
-Year		1985	1970	1972	1989	1976	1972	1962	1963	1978	1968	1962	1959	DEC 1959
Snow, Ice pellets, hail														
-Maximum Monthly		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-Year														
-Maximum in 24 hrs	42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-Year														
WIND:														
Mean Speed (mph)	26	10.8	11.3	10.7	9.6	8.6	7.2	7.3	7.2	7.6	7.7	8.0	9.6	8.8
Prevailing Direction through 1963		NNE	NNE	NNE	NNE	NNE	NNE	SE	S	SW	S	NNE	NNE	NNE
Fastest Mile														
-Direction (!!!)	27	NW	S	NE	NE	S	SW	NW	W	SW	NW	N	W	S
-Speed (MPH)	27	37	31	34	40	78	40	41	38	50	41	45	39	78
-Year		1985	1962	1978	1971	1971	1972	1962	1979	1972	1979	1962	1979	MAY 1971
Peak Gust														
-Direction (!!!)	8	SE	NE	NE	NE	E	SE	SE	NW	SW	E	S	SW	S
-Speed (mph)	8	53	48	54	55	52	49	46	44	43	59	94	47	94
-Date		1987	1990	1991	1990	1985	1986	1989	1986	1986	1985	1987	1986	NOV 1987

Table A-3-2 Average Temperature

AVERAGE TEMPERATURE (deg. F) CHUUK, EASTERN CAROLINE IS., PACIFIC

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1962	81.3	81.1	81.5	82.0	81.4	80.9	80.2	80.5	80.8	81.3	80.7	81.1	81.1
1963	80.0	80.5	80.7	81.2	81.1	81.4	80.8	80.9	80.8	80.9	81.0	81.5	80.9
1964	81.8	80.7	81.7	81.4	81.1	81.2	80.5	80.2	80.2	80.8	81.4	80.2	80.9
1965	80.2	80.3	80.0	80.4	80.8	80.1	79.0	80.7	80.5	80.6	80.9	81.3	80.4
1966	80.1	81.3	81.4	82.0	81.3	81.1	81.1	81.3	81.2	81.4	81.5	80.8	81.2
1967	81.3	81.3	80.7	80.5	81.5	80.8	80.4	80.1	80.8	81.0	81.2	81.6	80.9
1968	81.0	81.0	80.8	80.7	81.4	81.5	80.2	81.1	80.9	81.2	80.8	80.8	80.9
1969	80.7	80.2	81.4	81.0	81.7	81.6	80.7	81.0	81.0	81.4	81.9	81.8	81.2
1970	81.5	81.9	82.6	82.4	81.8	81.8	81.8	81.6	81.7	81.1	82.1	81.9	81.8
1971	81.5	81.3	81.5	81.6	81.2	81.0	80.4	81.5	81.1	81.3	82.1	81.7	81.3
1972	80.9	80.5	81.1	81.0	81.5	81.4	80.7	80.7	81.3	81.6	82.1	81.4	81.2
1973	81.6	81.2	82.2	81.8	82.2	82.4	81.6	81.8	81.7	81.0	82.2	81.8	81.8
1974	81.2	81.2	81.6	81.8	82.0	81.4	81.2	81.3	81.5	81.4	81.8	81.7	81.5
1975	81.6	81.7	81.7	82.2	81.4	81.2	81.0	81.1	81.1	81.0	80.5	81.2	81.3
1976	81.2	80.8	81.3	80.9	80.9	80.9	81.3	80.7	80.5	81.7	81.6	81.7	81.1
1977	81.3	81.6	81.4	82.1	82.0	82.5	81.7	81.9	81.7	82.1	81.2	82.2	81.8
1978	81.3	81.7	82.4	82.1	82.1	82.0	82.4	82.1	81.9	81.8	81.9	82.0	82.0
1979	81.9	82.2	81.8	81.8	81.9	82.3	81.8	81.3	82.4	81.3	81.6	81.5	81.8
1980	81.2	81.5	81.8	82.5	82.0	81.8	80.8	81.1	81.5	80.4	81.3	81.2	81.4
1981	81.0	82.0	82.2	82.6	83.0	82.0	82.7	82.5	82.4	82.3	82.4	82.4	82.3
1982	82.7	82.2	81.8	82.7	82.4	82.3	82.1	81.9	82.2	82.0	82.6	82.1	82.2
1983	80.8	81.5	81.8	82.8	84.0	83.4	81.8	82.5	82.6	82.5	82.7	82.4	82.4
1984	81.4	81.7	82.5	83.3	83.6	81.5	83.8	81.6	82.6	81.9	82.7	83.1	82.5
1985	81.5	82.6	82.9	82.1	82.8	82.7	81.7	81.9	81.6	82.4	82.9	82.7	82.3
1986	81.9	81.0	81.7	82.9	83.0	82.6	82.0	82.6	81.6	82.1	82.0	81.8	82.1
1987	81.8	82.9	81.8	81.8	83.9	82.7	81.2	81.3	82.6	83.0	82.8	82.7	82.4
1988	82.3	81.9	83.9	83.7	82.5	82.8	82.7	82.8	82.5	82.1	83.0	81.9	82.7
1989	82.7	82.9	82.1	81.5	82.0	81.8	81.5	81.5	82.2	82.0	82.1	81.9	82.0
1990	82.0	82.2	81.9	82.3	82.3	82.1	81.4	80.8	81.9	82.0	82.1	82.2	81.9
1991	81.4	80.8	81.6	82.2	82.4	82.3	81.9	82.0	81.0	82.0	81.7	82.2	81.8
Record Mean	81.3	81.4	81.7	81.8	81.9	81.7	81.3	81.3	81.4	81.4	81.7	81.6	81.5
Max	85.6	85.8	86.2	86.5	86.9	87.0	87.0	87.1	87.2	87.2	87.0	86.2	86.6
Min	76.9	76.9	77.1	77.0	76.7	76.3	75.5	75.4	75.6	75.7	76.3	77.0	76.4

Table A-3-3 Precipitation

PRECIPITATION (inches) CHUUK, EASTERN CAROLINE IS., PACIFIC

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1962	7.91	9.85	12.77	6.98	18.33	12.27	32.99	16.51	14.64	9.77	26.12	11.04	179.18
1963	11.27	7.35	5.44	7.41	8.54	7.64	14.01	18.35	16.88	16.61	7.08	9.48	130.06
1964	2.00	10.80	2.44	12.29	18.45	9.99	13.55	12.47	16.88	15.80	7.85	17.73	140.25
1965	13.86	6.70	15.30	8.17	10.79	12.17	25.19	9.13	16.97	9.53	5.54	4.26	137.61
1966	4.61	1.70	7.57	7.53	13.62	6.10	20.11	12.39	12.49	8.88	8.44	18.21	121.65
1967	8.04	6.38	24.02	17.21	15.17	14.13	19.90	17.36	7.82	15.80	15.56	14.17	175.55
1968	8.67	9.23	13.91	20.50	10.00	14.20	15.75	7.77	12.37	11.78	6.91	24.51	155.60
1969	1.22	1.44	3.82	11.28	19.26	14.91	16.38	14.29	12.26	10.38	16.00	10.39	131.63
1970	14.80	11.80	2.40	10.43	18.60	13.99	7.49	12.98	10.75	19.04	8.43	13.57	144.28
1971	8.25	8.63	9.85	10.20	15.33	13.92	13.18	10.63	14.54	16.40	5.20	8.04	134.17
1972	9.83	10.65	18.49	15.79	16.68	14.73	16.68	11.58	13.60	4.17	7.49	9.26	148.95
1973	1.36	2.30	4.59	8.83	8.95	10.31	13.78	13.18	11.34	21.16	8.59	17.60	122.00
1974	10.23	13.44	19.75	11.59	13.47	14.83	12.49	10.72	14.33	20.14	14.91	8.84	164.74
1975	3.71	3.86	11.17	4.25	17.91	16.12	7.35	13.72	12.02	12.24	17.44	9.99	129.78
1976	10.57	9.37	5.70	17.80	28.39	12.26	11.55	14.74	15.14	15.22	16.09	6.41	163.24
1977	6.44	1.98	8.31	11.47	11.67	7.07	9.11	14.20	13.94	16.21	12.45	3.24	116.09
1978	5.73	2.29	4.85	8.17	13.25	10.10	8.40	14.37	14.98	21.21	12.99	12.47	128.81
1979	7.69	4.39	7.83	20.32	13.91	19.02	9.02	25.96	10.44	24.71	20.97	7.36	171.62
1980	13.91	5.96	8.14	6.55	18.26	12.88	17.26	12.78	8.50	18.91	2.98	18.44	144.57
1981	19.19	4.41	7.24	12.54	6.04	14.46	8.44	10.76	11.35	14.48	9.62	18.20	136.73
1982	7.04	5.92	11.21	8.67	14.68	11.99	11.55	10.70	9.38	6.76	1.88	4.61	104.39
1983	5.16	0.56	1.95	3.28	3.80	9.28	23.09	12.84	9.75	15.32	12.08	15.17	112.28
1984	12.92	10.10	8.27	7.03	11.06	7.47	2.65	14.88	5.35	18.06	14.58	6.84	119.21
1985	16.99	7.85	3.64	16.39	11.67	10.21	12.24	9.73	15.81	7.47	8.70	12.91	133.61
1986	14.40	14.82	18.35	9.45	10.86	8.81	14.92	8.31	10.74	5.60	12.67	11.45	140.38
1987	9.51	0.58	7.69	19.80	5.89	13.34	14.68	15.70	5.36	7.12	14.14	10.89	124.70
1988	3.46	6.65	2.94	3.49	16.18	8.45	11.41	10.44	11.21	21.17	8.84	11.86	116.10
1989	9.32	3.85	7.13	22.51	13.47	10.50	18.20	14.43	5.24	15.72	8.94	11.27	140.58
1990	12.16	2.02	10.72	12.65	11.54	11.22	10.57	24.39	10.89	9.25	12.59	3.12	131.12
1991	11.42	15.95	15.67	18.92	16.81	11.25	9.91	9.60	18.57	6.14	10.21	4.45	148.90
Record Mean	8.83	6.39	8.73	12.36	14.55	12.20	13.90	13.58	12.67	13.67	11.55	12.43	140.86

(1) : RESULTS OF TIDE OBSERVATION AND ANALYSIS

The study team made tide observation at Weno Harbor for 28 days from April 10 to May 8 using pressure type tide-meter (WLR-7). Tide data were taken every 10 minutes at the position next to Tide Gauge House of Chuuk Weather Station located at the east end of Dock-A. The results of observation and analysis are shown as a tide curve and a tide harmonic analysis result in Fig. A-3-1 and Table A-3-4 respectively.

The tide curve in this region shows a specific pattern of diurnal type with some semi-diurnal variation tide.

According to the results of harmonic analysis for 15 day's observed records, the tide amplitude (Zo) consisting of the sum of main four tide components of M2, S2, K1 and O1 can be obtained to be 0.457 m. And, tide type index "T" that is expressed in (K1+O1)/(m2+S2) as a ratio of diurnal tide components against semi-diurnal tide components is 1.753, which shows a typical characteristics of diurnal tide. Classification of tide type index is as follows:

$1.50 \leqq T$	--------- Diurnal Tide
$0.25 \leqq T < 1.50$	--------- Mixed Tide
$T < 0.25$	--------- Semi-diurnal

Table A-3-5 shows comparison of tide harmonic constants of main four components between this study and Admiralty Tide Table by British Navy. A very good accord of data from both sources can be seen.

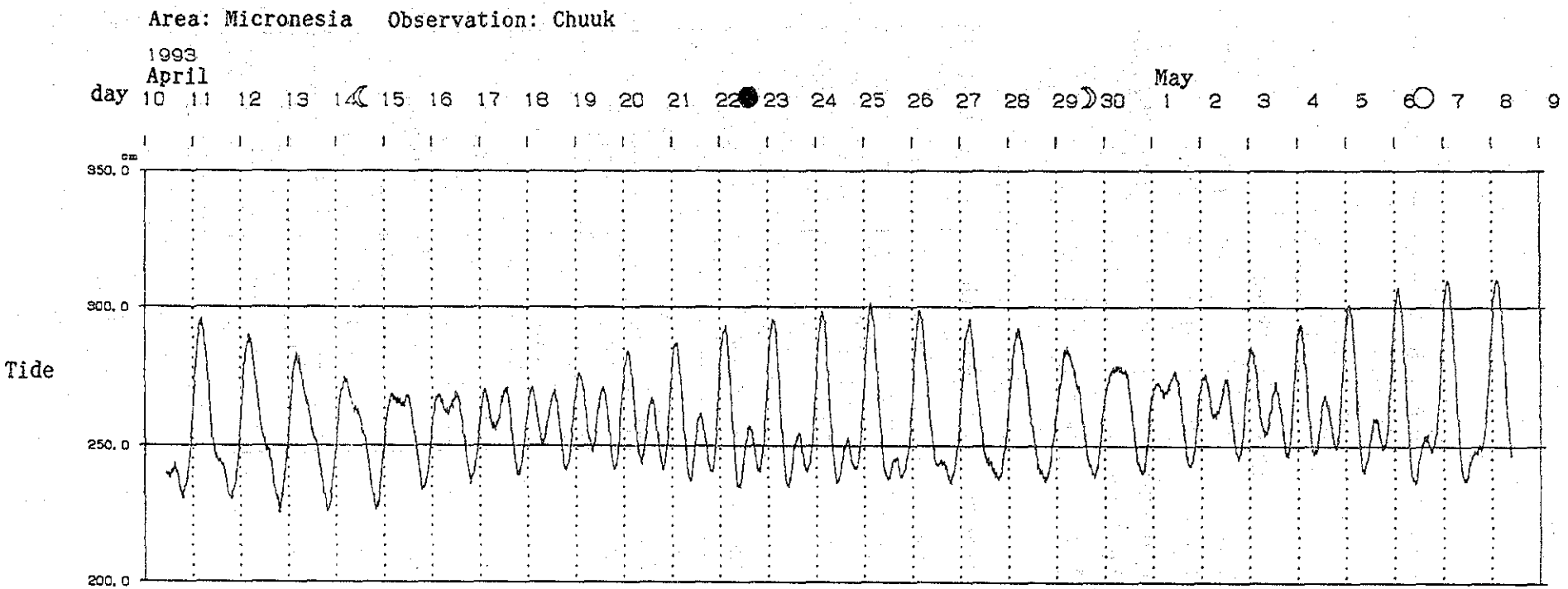


Fig. A-3-1 Tide Curve

Table A-3-4 Result of Tide Harmonic Analysis

Area : Micronesia
Observation point : Chuuk
Latitude : 7° 26' 35"N
Longitude : 151° 50' 15"E
Observation period : April 11 - April 25, 1993
Standard time : -10.0
Standard water level: M. S. L.

Component Tide	Amplitude (cm)	Lag Angle (°)
M2	6.8	84.9
S2	9.8	89.7
K2	2.7	89.7
N2	1.5	134.9
K1	16.5	215.7
O1	12.6	193.7
P1	5.5	215.7
Q1	3.0	181.9
M4	0.4	11.5
MS4	0.3	99.4
A0	-6.4	

Table A-3-5 Comparison of Tide Harmonic Constants

		M2	S2	K1	O1	Zo= M2+S2+K1+O1
Observation	Amplitude H (m) Angle K (°)	0.068 84.9	0.098 89.7	0.165 215.7	0.126 193.7	0.457 ---
Admiralty Tide Table	Amplitude H (m) Angle K (°)	0.06 84.9	0.10 89.7	0.18 215.7	0.11 193.7	0.46 ---

Tide chart drawn by use of the amplitude of main four components is shown in Fig. A-3-2 in which the following two conditions have been considered to set up the datum line.

(a) Each tidal level is arranged from the mean sea level set by Chuuk Weather Station.

(b) Since the chart datum line of Weno Islands has been set at 2 ft (0.6096 m) below the mean sea level, levels of all kind tide are determined on the basis that chart datum line level is 0.00 m.

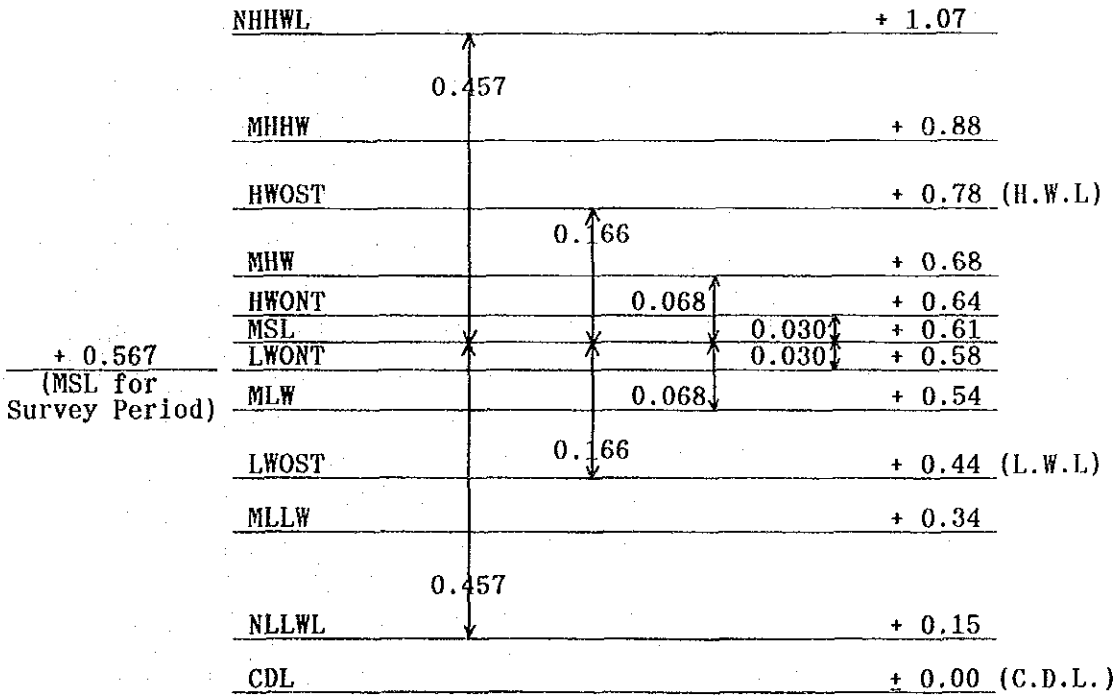


Fig. A-3-2 Tide Level Chart

The above-mentioned 2 ft below mean sea level seems to have been applied from the reason that the mean sea level has seasonal change of 0.126 m due to annual tide period, (Sa + Ssa = 0.126 m at Dublon: source by Hydrographic Department of Japan). When the seasonal change of 0.126 m is added to the summed up amplitude Zo (= 0.457 m), obtained is 0.583 m, which seems to have been rounded to 2 ft (= 0.6096 m).

(2) DETAIL OF WAVE COMPUTATION FOR THE CASE OF ORDINARY WIND CONDITION

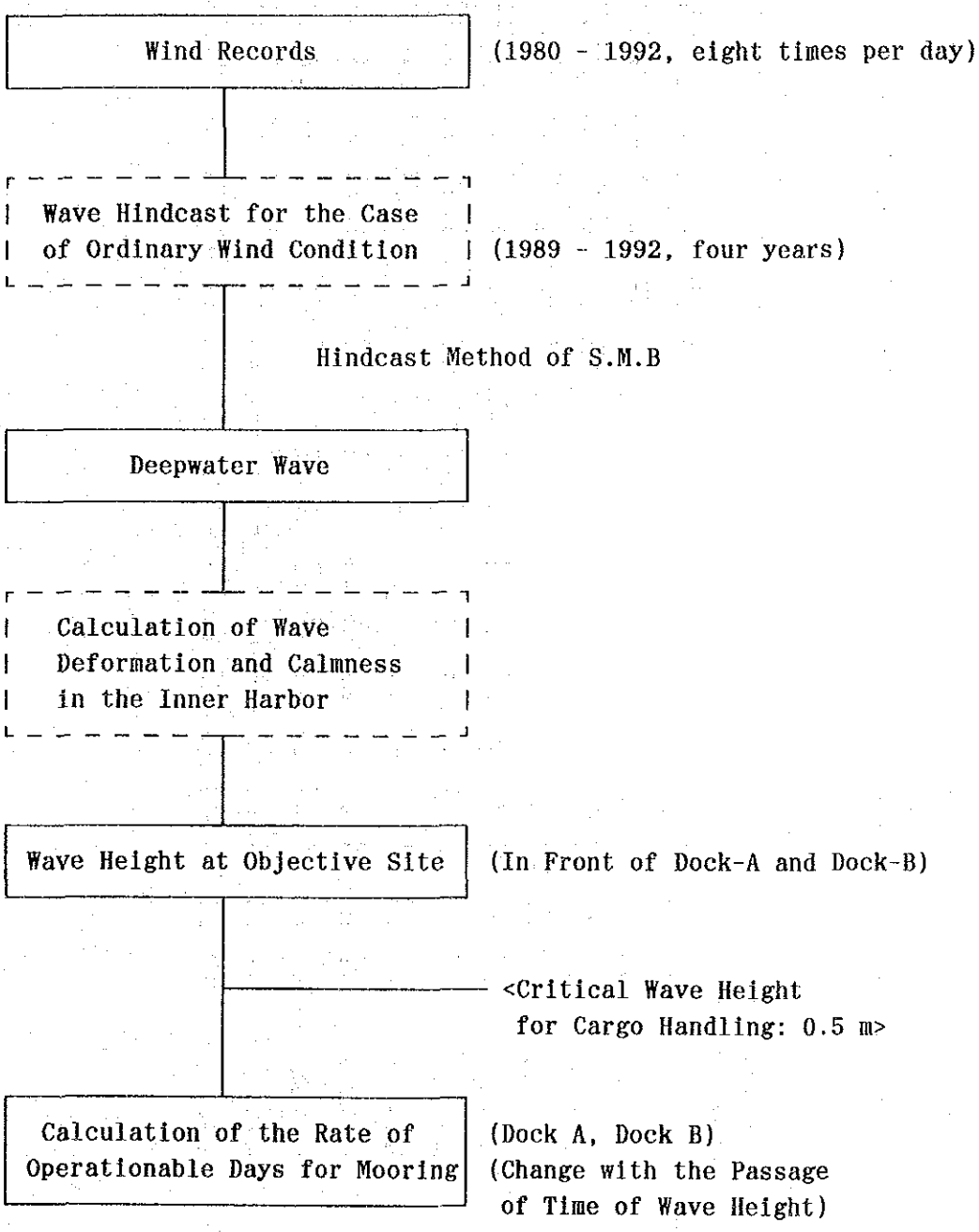


Fig. A-3-3 Calculation Flow of the Rate of Operationable Days for Mooring

Table A-3-6 Frequencies of Wind Occurrence by Direction and Speed (1980-1992)

WIND DIRECTION	U.K.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
WIND SPEED(M/S)																		
CALM	2044 5.9	0 0.0	1 0.0	2 0.0	3 0.0	4 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0	2 0.0	3 0.0	4 0.0	1 0.0	0 0.0	0 0.0	2065 5.9
0.0 - 2.5	3 0.0	115 0.3	120 0.3	351 1.0	538 1.5	1106 3.2	768 2.2	541 1.6	239 0.7	211 0.6	72 0.2	83 0.2	96 0.3	127 0.4	89 0.3	74 0.2	64 0.2	4597 13.2
2.5 - 5.0	15 0.0	576 1.7	962 2.8	3733 10.7	3500 10.0	2863 8.2	981 2.8	662 1.9	290 0.8	653 1.9	353 1.0	493 1.4	492 1.4	684 2.0	321 0.9	306 0.9	243 0.7	17127 49.2
5.0 - 7.5	3 0.0	175 0.5	594 1.7	3619 10.4	1949 5.6	956 2.7	290 0.8	189 0.5	66 0.2	288 0.8	291 0.8	385 1.1	317 0.9	361 1.0	115 0.3	84 0.2	52 0.1	9734 28.0
7.5 - 10.0	0 0.0	17 0.0	81 0.2	366 1.1	128 0.4	51 0.1	24 0.1	14 0.0	4 0.0	48 0.1	92 0.3	139 0.4	72 0.2	71 0.2	15 0.0	9 0.0	14 0.0	1145 3.3
10.0 - 15.0	0 0.0	1 0.0	4 0.0	5 0.0	6 0.0	2 0.0	1 0.0	2 0.0	0 0.0	10 0.0	46 0.1	38 0.1	10 0.0	10 0.0	6 0.0	5 0.0	4 0.0	150 0.4
15.0 - 20.0	0 0.0	0 0.0	1 0.0	0 0.0	0 0.0	1 0.0	0 0.0	1 0.0	0 0.0	0 0.0	0 0.0	2 0.0	1 0.0	1 0.0	0 0.0	0 0.0	0 0.0	7 0.0
20.0 - 25.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
25.0 - 30.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0
30.0 -	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	2065 5.9	884 2.5	1763 5.1	8076 23.2	6124 17.6	4983 14.3	2064 5.9	1409 4.0	600 1.7	1210 3.5	855 2.5	1142 3.3	991 2.8	1258 3.6	547 1.6	478 1.4	377 1.1	34826 100.0

Fetch Length

Wind Direction	S	SSW	SW	WSW	W	WNW	NW	NNW	N
Fetch Length (km)	9.1	14.8	20.2	22.9	23.0	24.0	22.8	20.1	14.2

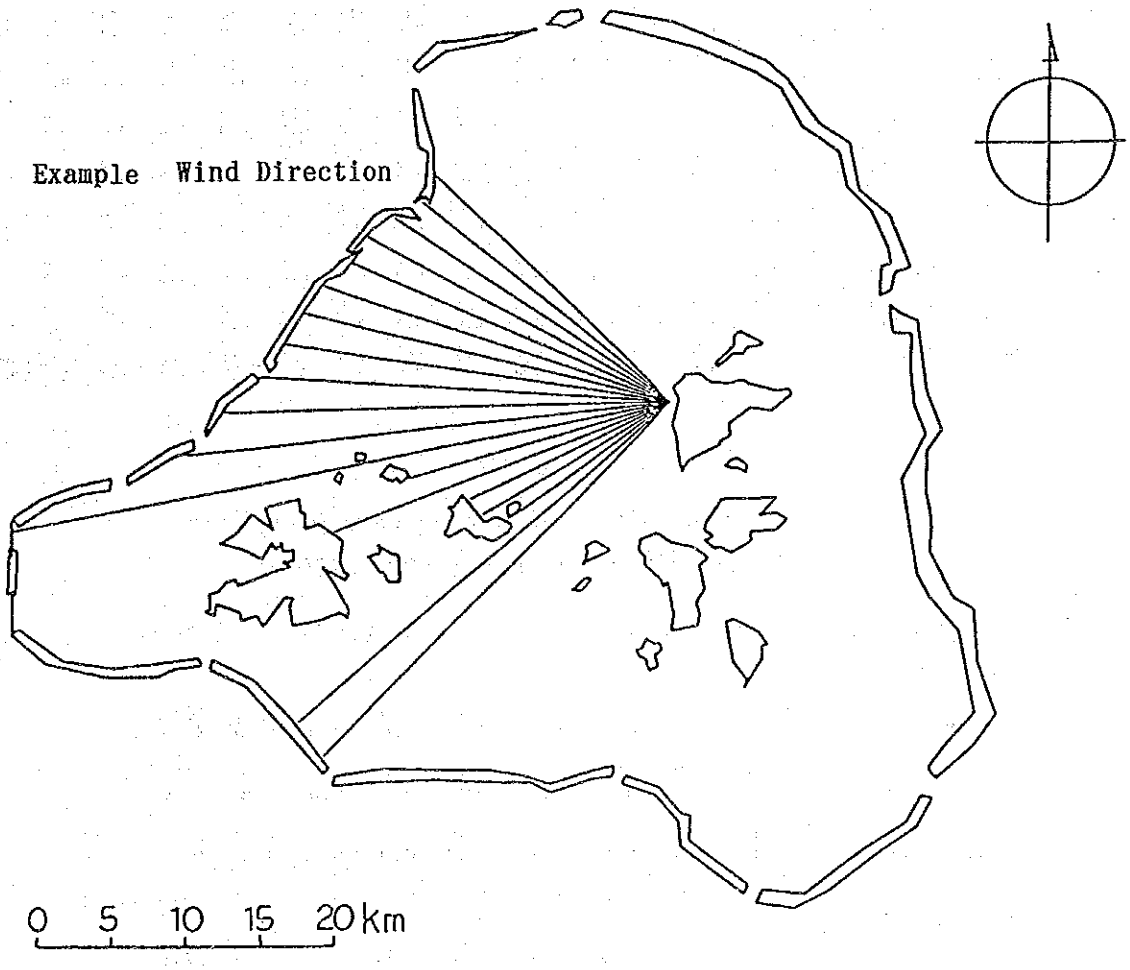


Fig. A-3-4 Fetch Length

Table A-3-7 Frequencies of Deepwater wave Occurrence by Direction and Height (1989 - 1992)

WAVE DIRECTION / WAVE HEIGHT(m)	U.K.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM	8661 74.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	8661 74.1
0.00 - 0.25	0 0.0	133 1.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	232 2.0	80 0.7	99 0.8	88 0.8	103 0.9	57 0.5	79 0.7	63 0.5	934 8.0
0.25 - 0.50	0 0.0	164 1.4	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	290 2.5	129 1.1	152 1.3	136 1.2	144 1.2	80 0.7	75 0.6	61 0.5	1233 10.5
0.50 - 0.75	0 0.0	31 0.3	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	45 0.4	47 0.4	116 1.0	112 1.0	106 0.9	41 0.4	26 0.2	24 0.2	548 4.7
0.75 - 1.00	0 0.0	11 0.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	8 0.1	22 0.2	51 0.4	43 0.4	51 0.4	15 0.1	9 0.1	6 0.1	216 1.8
1.00 - 1.25	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.0	18 0.2	22 0.2	14 0.1	3 0.0	2 0.0	1 0.0	6 0.1	68 0.6
1.25 - 1.50	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	3 0.0	4 0.0	5 0.0	2 0.0	1 0.0	2 0.0	0 0.0	17 0.1
1.50 - 2.00	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	6 0.1	1 0.0	1 0.0	0 0.0	0 0.0	1 0.0	9 0.1
2.00 - 2.50	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	1 0.0	1 0.0	0 0.0	0 0.0	0 0.0	2 0.0
2.50 -	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	8661 74.1	339 2.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	577 4.9	299 2.6	450 3.9	402 3.4	411 3.5	196 1.7	192 1.6	161 1.4	11688 100.0

Table A-3-8 Frequencies of Deepwater wave Occurrence by Period and Height (1989 - 1992)

WAVE PERIOD(s) / WAVE HEIGHT(m)	CALM	0- 1	1- 2	2- 3	3- 4	4- 5	5- 6	6-	TOTAL
CALM	8661 74.1	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	8661 74.1
0.00 - 0.25	0 0.0	2 0.0	932 8.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	934 8.0
0.25 - 0.50	0 0.0	0 0.0	73 0.6	1160 9.9	0 0.0	0 0.0	0 0.0	0 0.0	1233 10.5
0.50 - 0.75	0 0.0	0 0.0	0 0.0	439 3.8	109 0.9	0 0.0	0 0.0	0 0.0	548 4.7
0.75 - 1.00	0 0.0	0 0.0	0 0.0	2 0.0	214 1.8	0 0.0	0 0.0	0 0.0	216 1.8
1.00 - 1.25	0 0.0	0 0.0	0 0.0	0 0.0	68 0.6	0 0.0	0 0.0	0 0.0	68 0.6
1.25 - 1.50	0 0.0	0 0.0	0 0.0	0 0.0	10 0.1	7 0.1	0 0.0	0 0.0	17 0.1
1.50 - 2.00	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	9 0.1	0 0.0	0 0.0	9 0.1
2.00 - 2.50	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2 0.0	0 0.0	0 0.0	2 0.0
2.50 -	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
TOTAL	8661 74.1	2 0.0	1005 8.6	1601 13.7	401 3.4	18 0.2	0 0.0	0 0.0	11688 100.0

Table A-3-9 Wave Height Ratio

Incident Wave Direction	Point A	Point B
N	0.08	0.58
N N W	0.13	0.72
N W	0.26	0.84
W N W	0.37	0.89
W	0.46	0.90
W S W	0.52	0.87
S W	0.53	0.80
S S W	0.33	0.49
S	0.26	0.37

Note: Wave Period 4.0 sec
Wave Height Ratio 1.0 is deep sea water height

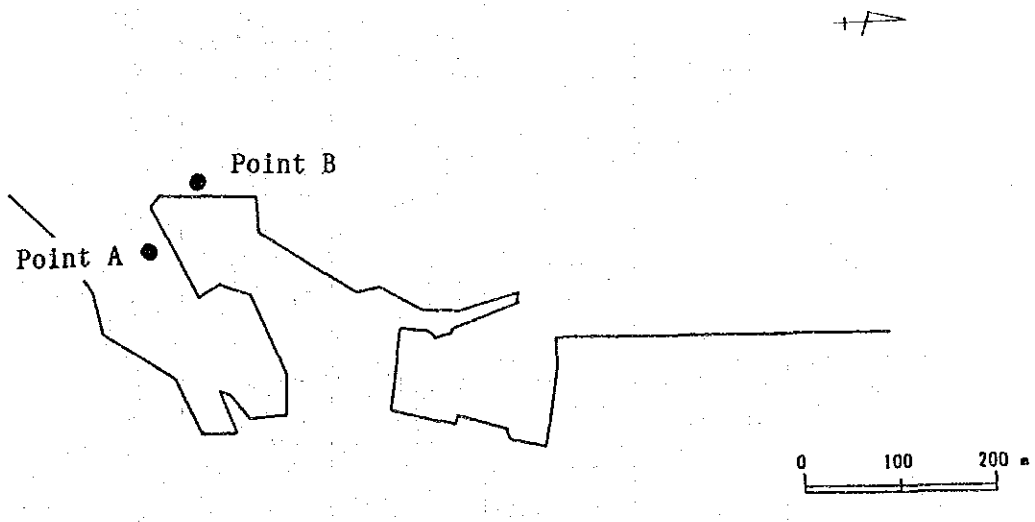


Fig. A-3-5 Calculation Point of the Rate of Operationable Days For Mooring

Table A-3-10 Rate of Operationable Days at Dock-A and Dock-B

(Unit : %)

	Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
1989	Dock A	100	100	100	100	100	100	100	96.77	100	93.55	100	100	99.18
	Dock B	100	100	100	90	100	100	100	83.87	90	83.87	93.33	96.77	94.79
	Relief rate	0	0	0	10	0	0	0	12.9	10	9.68	6.67	3.23	4.38
1990	Dock A	96.77	100	100	100	100	100	100	90.32	96.67	100	96.67	96.77	98.08
	Dock B	93.55	100	100	96.67	96.77	93.33	83.87	77.42	77.33	87.10	70	93.55	88.77
	Relief rate	3.23	0	0	3.33	3.23	6.67	16.13	12.90	23.33	12.90	26.67	3.23	9.32
1991	Dock A	100	100	100	100	100	100	100	93.55	93.33	100	96.67	100	98.63
	Dock B	100	100	93.55	100	96.77	96.67	93.55	54.84	66.67	80.65	80	100	88.49
	Relief rate	0	0	6.45	0	3.23	3.33	6.45	38.71	26.67	19.35	16.67	0	10.14
1992	Dock A	100	100	100	100	100	100	100	87.10	90	93.55	83.33	100	96.17
	Dock B	93.55	100	100	100	100	100	87.10	41.94	70	67.74	66.67	100	85.52
	Relief rate	6.45	0	0	0	0	0	12.90	45.16	20	25.81	16.67	0	10.66
Total	Dock A	99.19	100	100	100	100	100	100	91.94	95	96.77	94.17	99.19	98.02
	Dock B	96.77	100	98.39	96.67	98.39	97.50	91.13	64.52	75	79.84	77.50	97.58	89.39
	Relief rate	2.42	0	1.61	3.33	1.61	2.50	8.87	27.42	20	16.94	16.67	1.16	8.62

Note: Relief rate means the difference of rate when Dock A operationable while Dock B is not operationable

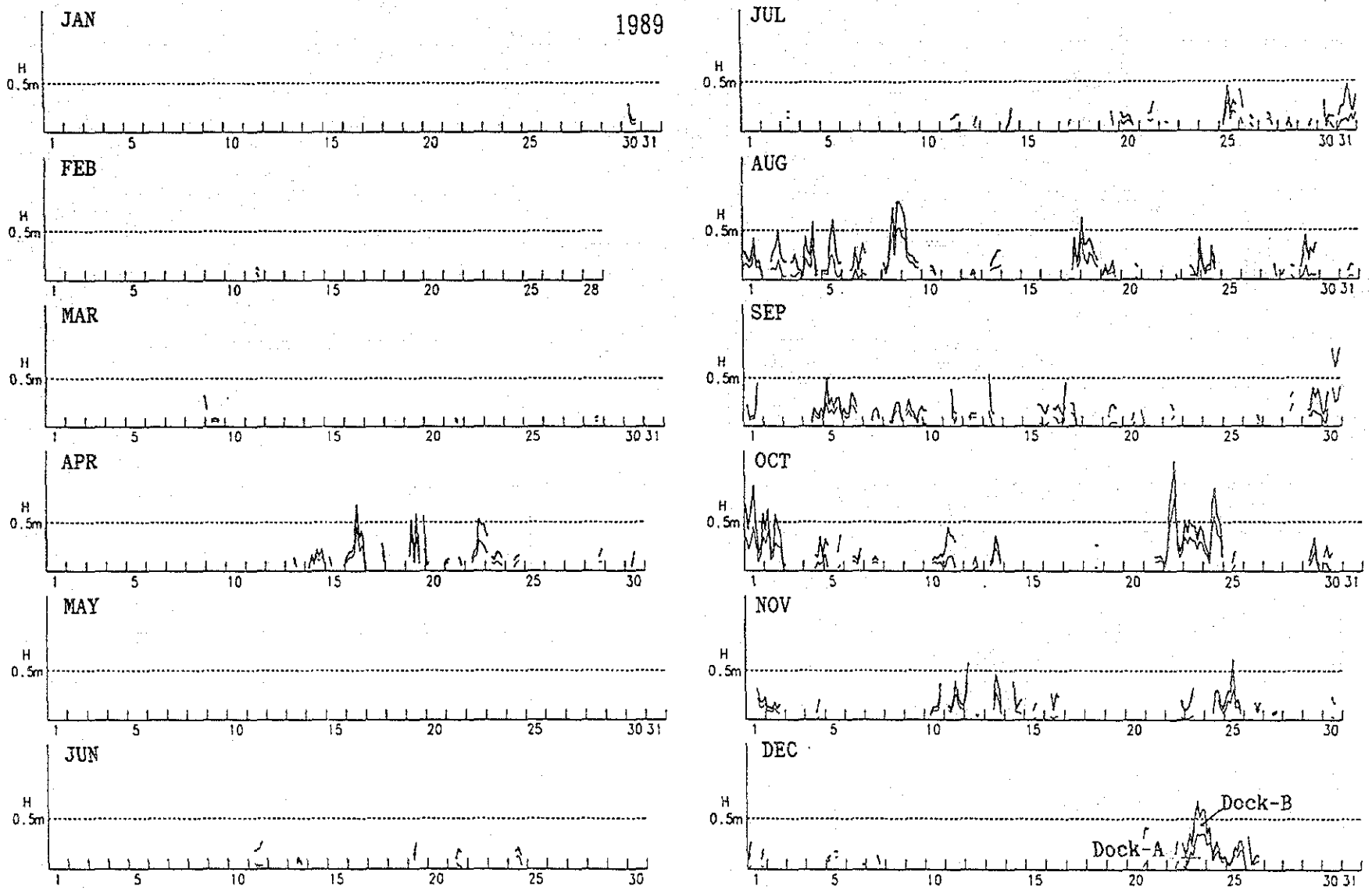


Fig. A-3-6 (1) Chronological Graph of Wave Height 1989

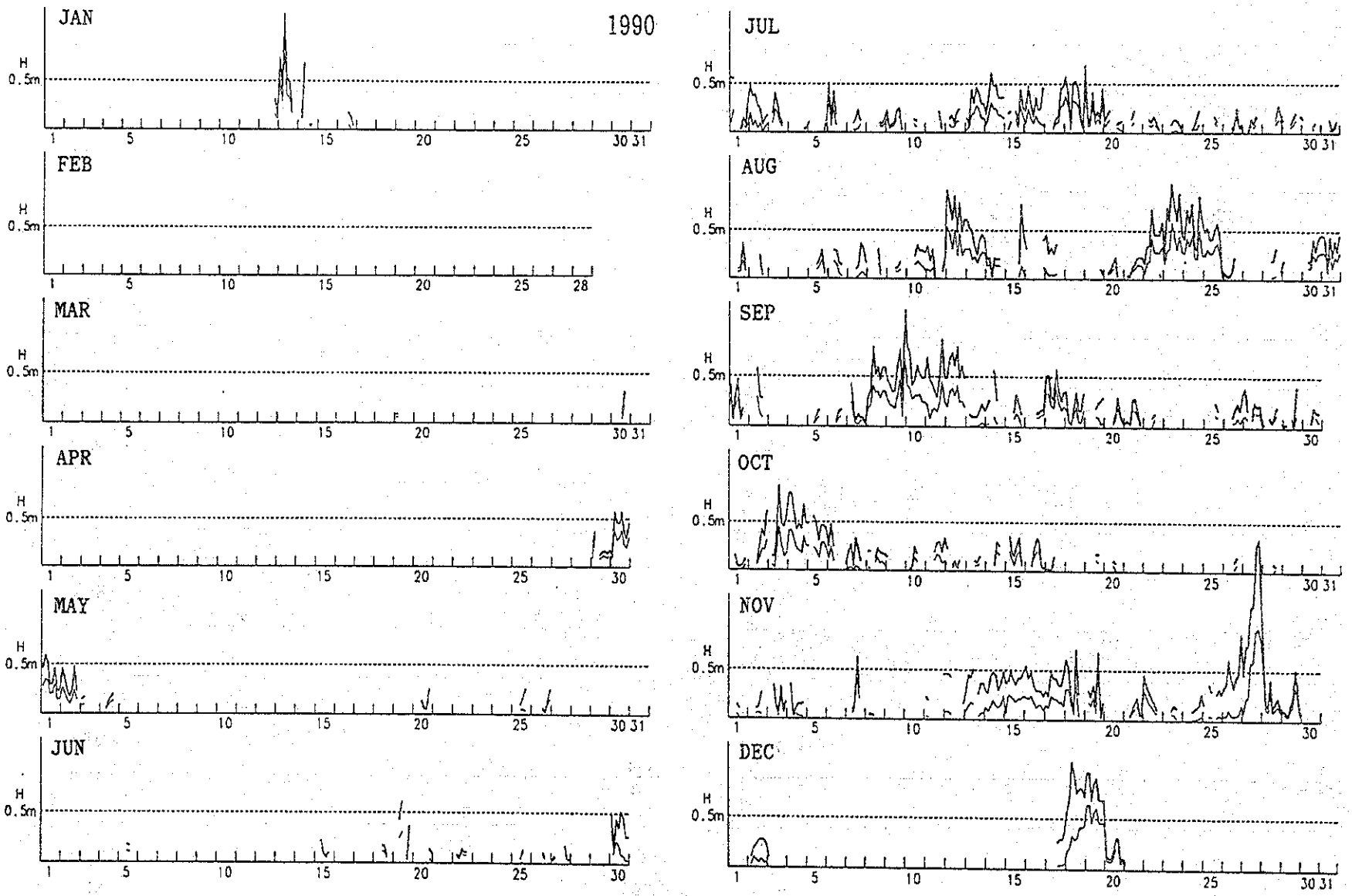


Fig. A-3-6 (2) Chronological Graph of Wave Height 1990

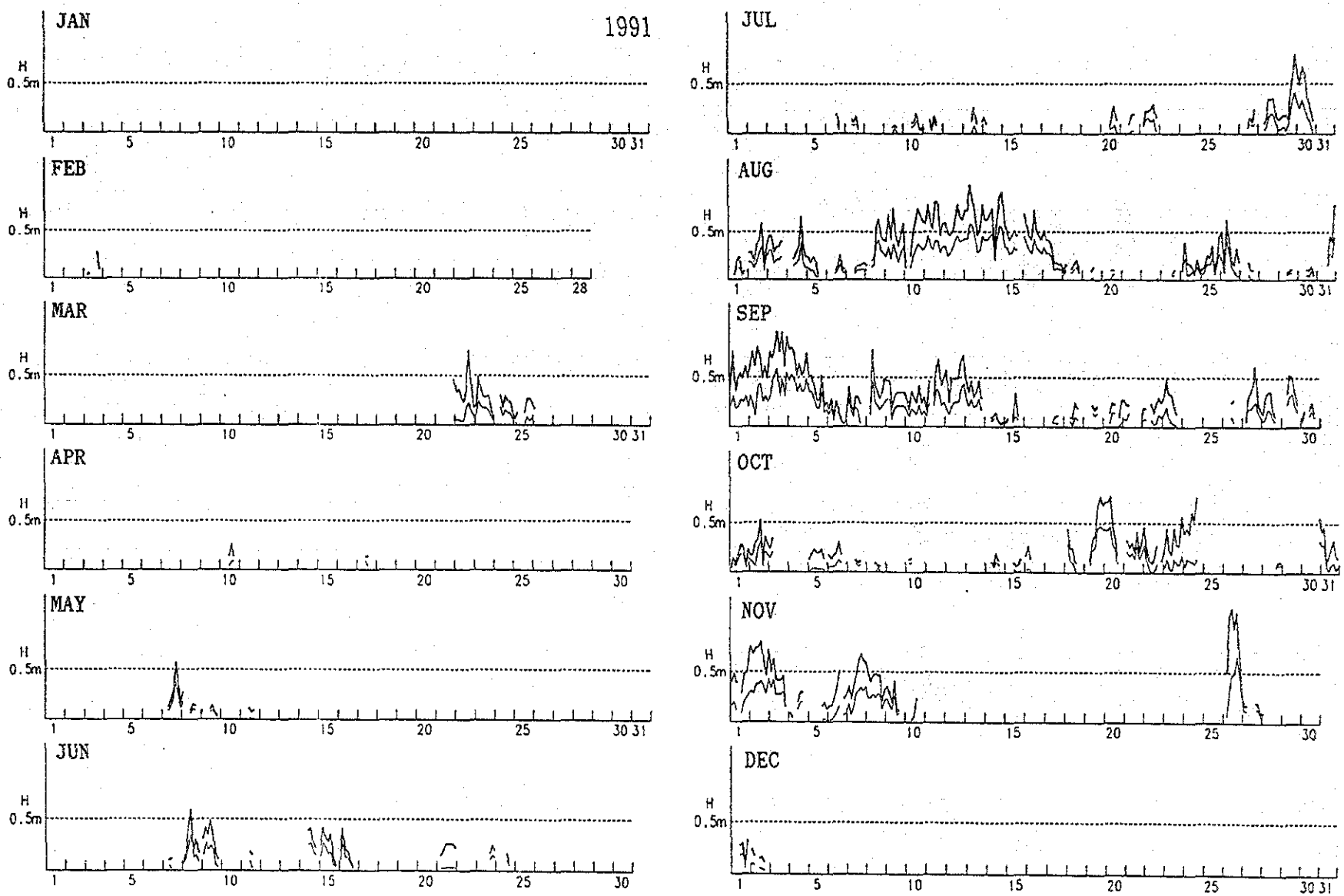


Fig. A-3-6 (3) Chronological Graph of Wave Height 1991

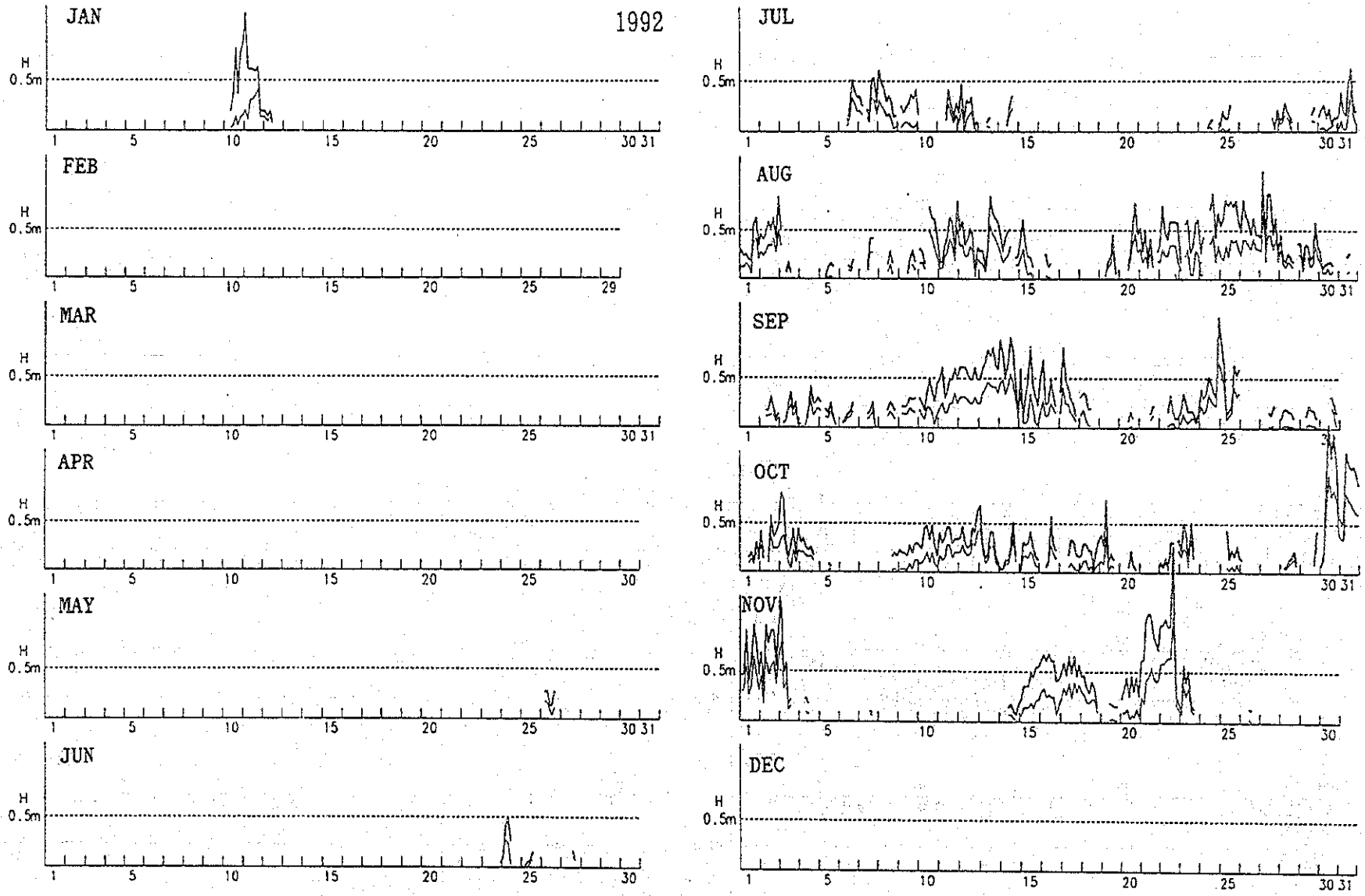


Fig. A-3-6 (4) Chronological Graph of Wave Height 1992

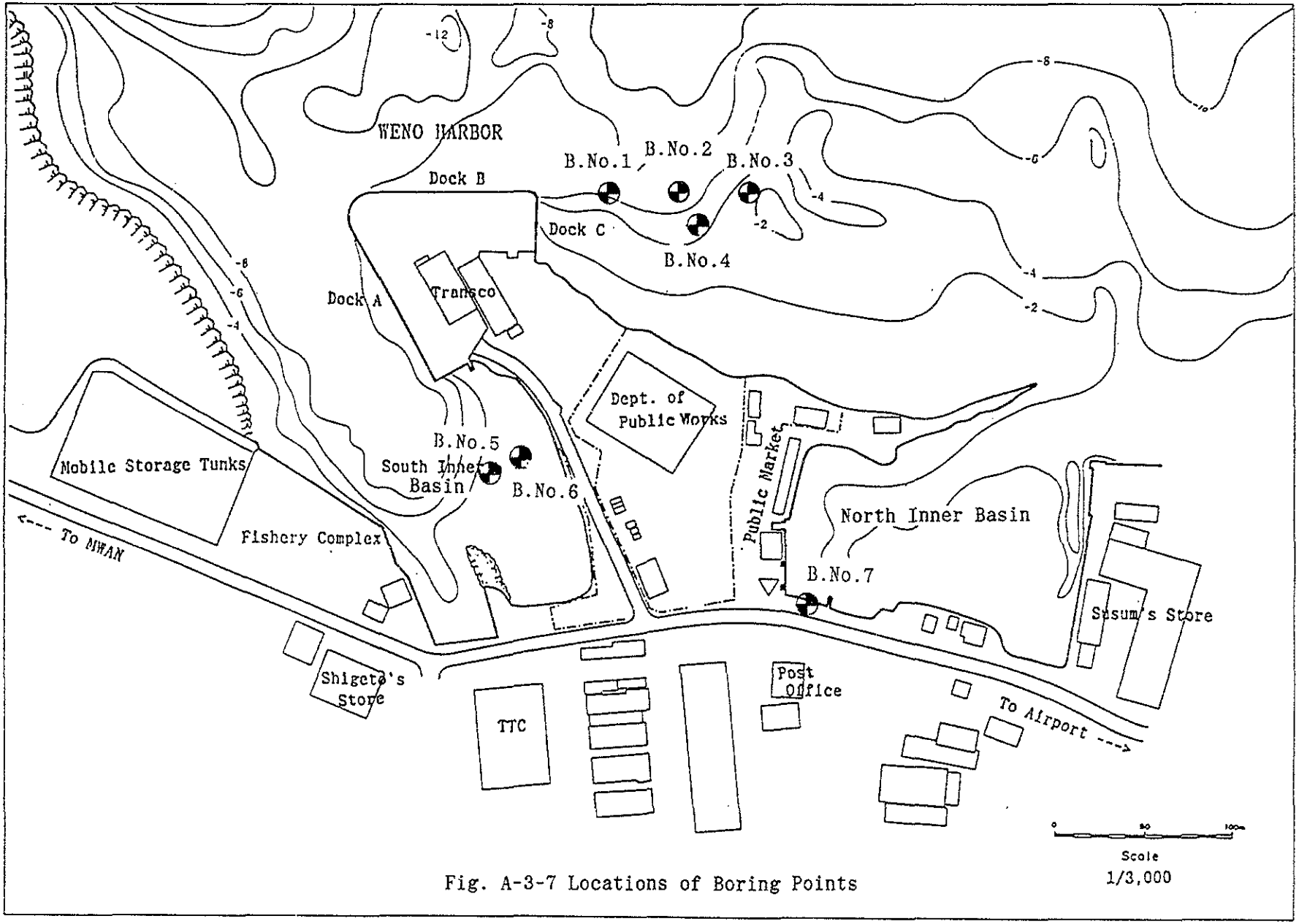


Fig. A-3-7 Locations of Boring Points

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/08/93

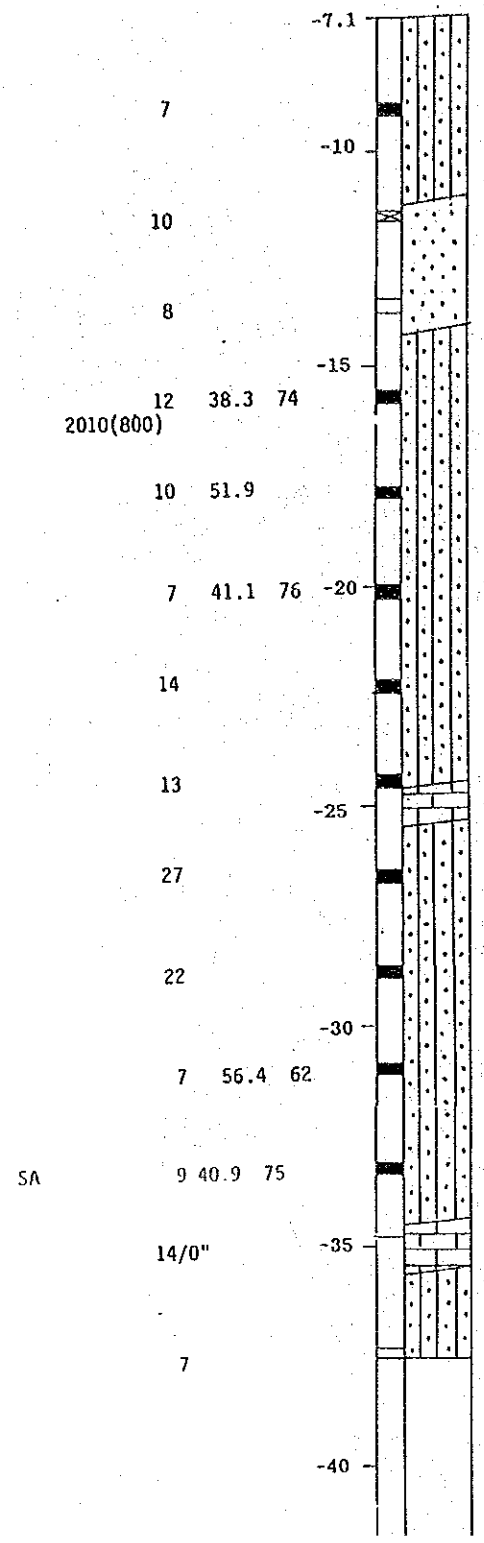


Fig. A-3-8 (1) Boring Log. No.1

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/12/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)	SAMPLE SYMBOL	
				-7.3		LIGHT GREY-BROWN SAND (SP) - loose, saturated, with some coral fingers and shell fragments
SA Tx 1100(300)	13	45.6	71	-10		LIGHT GREY-BROWN SILTY SAND (SM) - medium dense, saturated, with some coral fingers and shell fragments
SA Tx 1890(500)	15	45.7	72			
	11	36.9	80	-15		loose at 25'-32'
SA	5	42.7	78			
G_S	11					
SA Tx 2100(1200)	12	35.1	77	-20		loose at 48'-52'
	9					
	16	29.9	88	-25		LIGHT GREY-WHITE CORALLINE LIMESTONE - hard
	14/0"					possible cavity at 64.5'-66'
	14/0"					LIGHT GREY-BROWN SILTY SAND (SM) - medium dense, saturated, with traces of coral gravel and shell fragments
	10			-30		
SA	14					
						LIGHT GREY-BROWN SILTY SANDY CORAL GRAVEL (GM) - medium dense, saturated
SA G_S	27	24.2	93	-35		LIGHT GREY-WHITE CORALLINE LIMESTONE - hard
	14/0"					(Water depth 26' above sea floor, 7:30 AM, 04/11/93)
				-40		

Fig. A-3-8 (2) Boring Log. No.2

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/13/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)	SAMPLE SYMBOL	
				-3.7		LIGHT GREY-BROWN GRAVELLY SAND (SP) - very loose, saturated, with some coral fingers and shell fragments
				-5		coral boulders at 5'-7'
SA Tx 430(300)	3	35.4	71			
SA Consol	3	43.8	70			LIGHT GREY-BROWN SILTY SAND (SM) - very loose, saturated, with some coral fingers and shell fragments
				-10		loose from 20'
SA	7	37.4	71			
						medium dense at 28'-32'
SA Tx 1310(800)	26	39.6	89			
						coral boulders at 32'-35'
SA	3	37.4	78	-15		very loose from 35'
SA Tx 2460(1200)	5	32.5	86			
						medium dense at 48'-54'
G_S	11					
				-20		
	7					loose from 58'
						(Water depth 14' above sea floor, 10:15 AM, 04/13/93)
				-25		

Fig. A-3-8 (3) Boring Log. No.3

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/15/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)	SAMPLE SYMBOL
				-4.2	
				-5	
Gs	9				
	7				
				-10	
SA	8	56.8	75		
SA	5	42.8	75		
SA	9	47.7	70	-15	
SA	6	38.2	77		
	10	41.1	73		
				-20	
SA Tx 1470(1500)	22	36.5	77		
SA	22	40.9	73		
				-25	
	16				
SA	18	45.5	78		
	22	50.2	73	-30	
SA	29				
SA Tx 1930(3000)	20	34.5	88		
				-35	

LIGHT GREY-BROWN SILTY SAND (SM) - loose, saturated, with some coral gravel and shell fragments

LIGHT GREY-BROWN SANDY SILT (MH) - stiff to very stiff, saturated, with some coral gravel and shell fragments

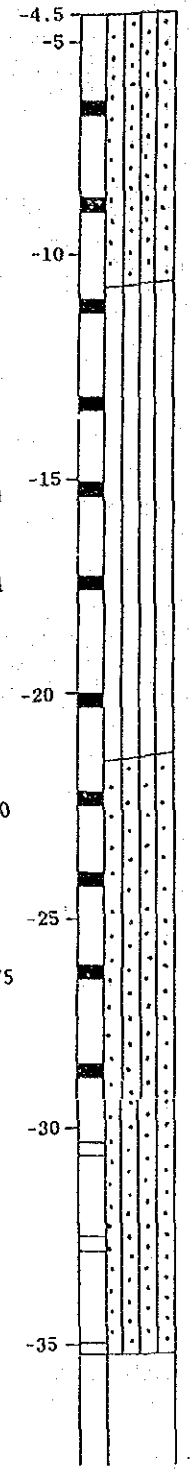
(Water depth 16' above sea floor, 11:00 AM, 04/15/93)

Fig. A-3-8 (4) Boring Log. No.4

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/17/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)
				-4.5
				-5
SA	2	44.1	75	
	3			
				-10
SA	4	47.3	73	
	4			
				-15
Consol	5	43.8	70	
SA	6	45.3	71	
	4			-20
SA	5	41.0	70	
	3			
				-25
SA	5	43.1	75	
	7			
	6			-30
	3			
	5			-35



LIGHT GREY-BROWN SILTY SAND (SM) - very loose, saturated, with some coral fingers and shell fragments

LIGHT GREY-BROWN SANDY SILT (MH) - soft to medium stiff, saturated, with traces of coral fingers and shell fragments

LIGHT GREY-BROWN SILTY SAND (SM) - loose, saturated, with some coral fingers and shell fragments

(Water depth 17' above sea floor, 1:00 PM, 04/17/93

Fig. A-3-8 (5) Boring Log. No.5

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/18/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)	SAMPLE SYMBOL	
				-3.7		LIGHT GREY-BROWN SILTY SAND (SM) - very loose, saturated, with shell fragments
SA Tx 1050(200)	2	64.2	60	-5		
SA	3	37.8	81			
				-10		loose from 20'
G_S	5					
						LIGHT GREY-BROWN SANDY SILT (MH) - medium stiff, saturated, with some coral fingers and shell fragments
SA Consol	6	51.9	71			
SA	5	48.1	68	-15		
						soft at 40'-46'
SA	3	41.7	74			
SA Tx 1740(1500)	6	47.8	67			
				-20		LIGHT GREY-BROWN SILTY SAND (SM) - loose, saturated, with shell fragments
SA	4	48.0	71			
	7					(Water depth 14' above sea floor, 10:30 AM, 04/18/93)
				-25		

Fig. A-3-8 (6) Boring Log. No.6

Equipment: 3-7/8"Dia. Rotary Wash

Date: 04/22/93

LABORATORY TESTS	N-VALUE	MOISTURE CONTENT(%)	DRY DENSITY(%)	DEPTH BELOW CDL (m)	SAMPLE SYMBOL
				+1.3	
				0	
	4				
	3			-5	
SA Tx 1630(800)	11	32.9	82		
SA	5	38.2	82	-10	
SA	4	42.9	70		
SA	7	45.4	73		
SA	9	42.3	78	-15	
SA	3	37.2	81		
				-20	

GREYISH BROWN SANDY COBBLES/BOULDERS (GP) loose, moist to wet

LIGHT GREYISH BROWN SAND (SP) - loose, saturated, with some shell fragments
water level at 7'-3", 3:40 PM, 04/22/93

very loose at 20'

LIGHT GREYISH BROWN SILTY SAND (SM) - loose to medium dense, saturated, with some coral fingers and shell fragments

loose from 35'

very loose from 60'

Fig. A-3-8 (7) Boring Log. No.7

MAJOR DIVISIONS					TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS (MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS, GRAVEL – SAND MIXTURES
			GP		POORLY GRADED GRAVELS, GRAVEL–SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, POORLY GRADED GRAVEL–SAND–SILT MIXTURES
			GC		CLAYEY GRAVELS, POORLY GRADED GRAVEL–SAND–CLAY MIXTURES
	SANDS (MORE THAN HALF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE)	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS, GRAVELLY SANDS
			SP		POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS, POORLY GRADED SAND–SILT MIXTURES
			SC		CLAYEY SANDS, POORLY GRADED SAND–CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL		ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

SA	=	Sieve Analysis
Consol	=	Consolidation
Tx	=	Unconsolidated Undrained Triaxial Compression (psf)
G_S	=	Specific Gravity

■ "UNDISTURBED" SAMPLE ☒ BULK SAMPLE

KEY TO TEST DATA

Fig. A-3-8 (8) Soil Classification Chart and Key to Test Data

Table A-3-11 Records of Vessel Calls and Incoming Cargo in 1991
(In Revenue Tons)

Voyage No. Vessel	Date Arr'd	Date Sailed	Containerized					Break Bulk					All Cargo
			LCL	FCL								VEHI	
				GEN	REEF	HAZ	STEE	GEN	HAZ	STEEL	OTR	CLES	Rev. Tons
4 Marjon	1/10	1/11	47										47
53 Kyowa Rose	1/11	1/12	378	67				81		38		79	643
49 Micro Comm	1/23	1/24	2152	13	46								2211
48 Micro Indep	1/25	1/25	79	11		4							94
54 Kyowa Rose	2/17	2/18	646	196		25	12	80	2	82		62	1105
4 Marjon	2/24	2/25	1633	49	43	43	7						1732
1 Caroline Isl	3/1	2/20						2				6	8
48 Micro Indep	3/6	3/7	1962	23	30	20					69		2104
3 Bunga	3/10	3/11	27					3		109	860		999
1 #5 Kendari	3/16	3/17	113					55			1268		1436
55 Kyowa Rose	3/18	3/19	711	169			21	79	4	97		45	1126
50 Micro Comm	3/26	3/28	1763	12	31			69		16	1	33	1929
56 Kyowa Rose	4/20	4/21	731	215				137	23	64		33	1203
49 Micro Indep	5/2	5/3	3205	71	34							8	3318
7 Marjon	5/5	5/6	270	72									342
21 Sparkle	5/21	5/22	1006	132		17			1		48		1204
51 Micro Comm	5/23	5/24	2106	32	18		39						2191
57 Kyowa Rose	5/23	5/23	199	172		2		22	2	17	115	111	640
4 Cedrus	5/30	5/31	74	35		2		9		95		23	238
52 Micro Indep	6/9	6/10	1764	1018	55							63	2900
22 Sparkle	6/9	6/9	592	107					2		27	3	731
7 Marjon	6/16	6/17	2139	87	21		7	54					2308
4 Sth Clipper	6/21	6/25						601					601
23 Sparkle	6/26	6/27	506	95		3						55	659
50 Micro Indep	7/2	7/3	25	6									31
4 Sea Treas	7/10	7/11	463	265		2		136	4	339	9	145	1363
52 Micro Comm	7/22	7/23	445	25	34					57		2	563
4 #5 Kendari	7/25	7/30						31	1		2979		3011
25 Sparkle	8/3	8/4	1209	118		28		1	2		56	21	1435
2 Blue Comet	8/17	8/18	52	29			1	187					269
8 Marjon	8/22	8/23	1933	84	27								2044
51 Micro Indep	9/8	9/9	1650	65	38							48	1801
5 Sea Treas	9/11	9/12	937	210				2	2	482		14	1647
6 Sea Treas	9/17	9/17	140	21				5		11		6	183
3 Blue Comet	9/18	9/19	99	151			28	131	15		10	145	579
53 Micro Comm	9/29	9/30	2090	76	31								2197
4 Blue Comet	10/17	10/19	813	312		9		144	4	30	20	49	1381
9 Micro Comm	10/30	10/31	1698	49									1741
63 Kyowa Rose	11/20	11/21	781	228				144	20	83	89	198	1513
2 Tropical Ace	11/21	11/24									1450		1450
54 Micro Comm	12/9	12/10	2601	177	27								2805
64 Kyowa Rose	12/16	12/17	663	255				102	7	119		185	1331
8 Sea Treas	12/21	12/24	192	32						224	1367		1815
TOTALS (REVENUE TONS)			37894	4679	435	112	115	2045	89	1863	8368	1334	56934

Source: TRANSCO Inc., 1992
Notes:
a) LCL cargo consists of containerized cargo that is unstuffed by local consignees rather than stevedores.
b) FCL cargo represents incoming containerized cargo which is unstuffed by local stevedors.
c) Break bulk cargo includes non-containerized cargo such as concrete, beer, mail,chassis trailers, copra.

Dimensions of Steel Sheet Pile at Dock A

Type	Dimensions (mm)				Section Modules (cm^3/m)	Remarks
	w	h	t1	t2		
MZ-38	457	305	12.7	9.53	2,520	US Steel

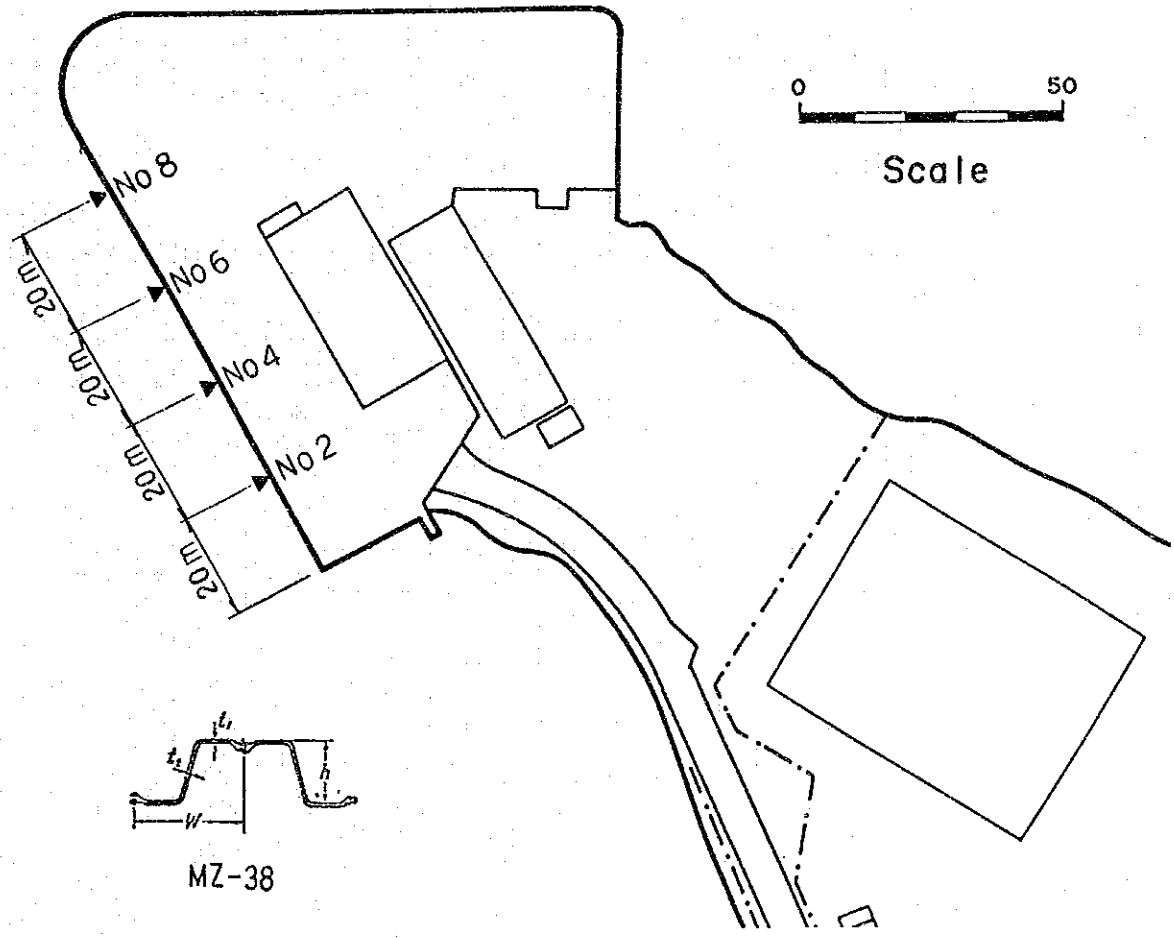


Fig. A-3-9 Dimensions and Locations of the Thickness Measurement of Steel Sheet Piles at Dock-A

Table A-3-12 (1) Results of the Thickness Measurement of Steel Sheet Piles

Site : DOCK A
Location of Selected Sheet Piles : No.2

Measured Location (m)	Original Thickness T1(mm)	Measured No.	Measured Thickness T2(mm) 1st	2nd	3rd	average	Corroded Thickness T1-T2(mm)	Corrosion Rate (mm/year)
-1.0	12.7	1	8.5	8.4	8.0	8.3		
		2	9.4	8.8	8.6	8.9		
		3	8.9	9.0	8.1	8.7		
		4	9.0	8.1	8.6	8.6		
		5	8.0	6.4	8.8	7.7		
		average	—	—	—	8.4	4.3	0.14
-2.5	12.7	1	10.3	8.4	6.4	8.4		
		2	9.5	9.6	9.7	9.6		
		3	9.6	6.9	9.6	8.7		
		4	9.9	9.9	9.8	9.9		
		5	10.0	10.2	9.7	10.0		
		average	—	—	—	9.3	3.4	0.11
-4.5	12.7	1	10.2	10.2	10.1	10.2		
		2	11.2	10.7	11.0	11.0		
		3	10.8	10.7	10.8	10.8		
		4	9.8	10.0	11.6	10.5		
		5	11.9	12.2	11.5	11.9		
		average	—	—	—	10.8	1.9	0.06
-6.0	12.7	1	5.8	9.4	9.6	8.3		
		2	9.7	10.2	9.0	9.6		
		3	11.0	11.0	11.4	11.1		
		4	10.4	4.3	4.4	6.4		
		5	10.3	10.4	10.6	10.4		
		average	—	—	—	9.2	3.5	0.11

Table A-3-12 (2) Results of the Thickness Measurement of Steel Sheet Piles

Site : DOCK A
Location of Selected Sheet Piles : No.4

Measured Location (m)	Original Thickness T1(mm)	Measured No.	Measured Thickness T2(mm)				Corroded Thickness T1-T2(mm)	Corrosion Rate (mm/year)
			1st	2nd	3rd	average		
-1.0	12.7	1	9.8	10.7	10.7	10.4		
		2	10.2	9.8	9.7	9.9		
		3	9.5	9.6	9.8	9.6		
		4	9.5	10.2	9.6	9.8		
		5	9.8	9.7	10.2	9.9		
		average	—	—	—	9.9	2.8	0.09
-2.5	12.7	1	9.5	9.6	7.4	8.8		
		2	8.6	8.1	10.4	9.0		
		3	10.5	10.0	10.5	10.3		
		4	10.8	11.1	11.1	11.0		
		5	10.6	10.6	10.6	10.6		
		average	—	—	—	10.0	2.7	0.09
-4.5	12.7	1	9.2	10.4	10.2	9.9		
		2	10.2	10.6	10.2	10.3		
		3	3.0	3.3	3.5	3.3		
		4	5.7	6.8	11.0	7.8		
		5	9.7	9.6	11.3	10.2		
		average	—	—	—	8.3	4.4	0.14
-6.0	12.7	1	10.7	10.5	9.9	10.4		
		2	9.1	10.6	10.6	10.1		
		3	9.4	9.9	8.6	9.3		
		4	8.9	8.6	9.1	8.9		
		5	8.4	8.7	8.9	8.7		
		average	—	—	—	9.5	3.2	0.10

Table A-3-12 (3) Results of the Thickness Measurement of Steel Sheet Piles

Site : DOCK A
Location of Selected Sheet Piles : No.6

Measured Location (m)	Original Thickness T1(mm)	Measured No.	Measured Thickness T2(mm)				Corroded Thickness T1-T2(mm)	Corrosion Rate (mm/year)
			1st	2nd	3rd	average		
-1.0	12.7	1	10.0	10.1	10.2	10.1		
		2	11.0	10.9	11.3	11.1		
		3	10.1	10.0	10.2	10.1		
		4	7.2	6.8	7.0	7.0		
		5	7.2	7.8	5.7	6.9		
		average	—	—	—	9.0	3.7	0.12
-2.5	12.7	1	6.9	7.0	6.7	6.9		
		2	6.5	6.3	6.2	6.3		
		3	10.3	10.2	10.3	10.3		
		4	9.4	11.0	9.4	9.9		
		5	12.4	11.9	11.4	11.9		
		average	—	—	—	9.1	3.6	0.12
-4.5	12.7	1	10.2	10.3	10.4	10.3		
		2	10.2	10.1	10.2	10.2		
		3	3.8	3.8	3.8	3.8		
		4	6.0	9.9	8.8	8.2		
		5	10.4	10.6	9.4	10.1		
		average	—	—	—	8.5	4.2	0.13
-6.0	12.7	1	9.2	9.3	9.7	9.4		
		2	9.1	9.8	9.7	9.5		
		3	10.1	10.0	10.2	10.1		
		4	9.4	9.1	9.8	9.4		
		5	10.1	9.4	9.6	9.7		
		average	—	—	—	9.6	3.1	0.10

Table A-3-12 (4) Results of the Thickness Measurement of Steel Sheet Piles

Site : DOCK A
Location of Selected Sheet Piles : No.8

Measured Location (m)	Original Thickness T1(mm)	Measured No.	Measured Thickness T2(mm) 1st	2nd	3rd	average	Corroded Thickness T1-T2(mm)	Corrosion Rate (mm/year)
-1.0	12.7	1	9.7	10.6	7.4	9.2		
		2	10.9	11.0	10.8	10.9		
		3	10.4	10.5	10.3	10.4		
		4	10.8	10.2	10.6	10.5		
		5	9.2	10.4	10.3	10.0		
		average	—	—	—	10.2	2.5	0.08
-2.5	12.7	1	10.5	10.3	6.6	9.1		
		2	10.6	10.2	10.6	10.5		
		3	11.1	11.3	11.4	11.3		
		4	10.2	9.9	11.8	10.6		
		5	7.8	8.2	7.4	7.8		
		average	—	—	—	9.9	2.8	0.09
-4.5	12.7	1	10.6	10.0	9.8	10.1		
		2	4.0	4.7	5.0	4.6		
		3	11.0	9.4	7.8	9.4		
		4	11.0	11.2	11.0	11.1		
		5	10.5	8.5	8.2	9.1		
		average	—	—	—	8.8	3.9	0.12
-6.0	12.7	1	7.7	4.9	9.8	7.5		
		2	10.8	10.4	12.4	11.2		
		3	11.7	11.9	12.2	11.9		
		4	10.6	7.5	12.2	10.1		
		5	10.5	10.2	11.0	10.6		
		average	—	—	—	10.3	2.4	0.08

Table A-4-1 Anticipated Incoming Marine Cargo (1991-2003)
(In Revenue Tons)

Year	FCL	LCL	Break Bulk	Total Revenue Tons
1991	37,869	5,335	13,700	56,904
1992	39,081	5,506	14,138	58,725
1993	40,331	5,682	14,591	60,604
1994	41,622	5,864	15,058	62,543
1995	43,037	6,063	15,570	64,670
1996	44,500	6,269	16,099	66,869
1997	46,013	6,482	16,646	69,142
1998	47,578	6,703	17,212	71,493
1999	49,196	6,931	17,798	73,924
2000	50,967	7,180	18,438	76,585
2001	52,801	7,439	19,102	79,342
2002	54,755	7,714	19,809	82,278
2003	56,781	7,999	20,542	85,322

Notes :
1992-1994 annual rate of growth is based on 3.2%/annum.
1995-1999 annual rate of growth is based on 3.4%/annum.
2000-2001 annual rate of growth is based on 3.6%/annum.
2002-2003 annual rate of growth is based on 3.7%/annum.

Source : Seaport Master Plan, January 1993

Table A-4-2 Container Storage Area by Cargo Handling Methods

Ex. No.	Cargo Handling Method (Mashalling Yard)	Type	Container Storage Area		A_3 [3] (m^2)	A_1 [4]/N (m^2)	A_3/A_1	Remarks	PAC ECO (m^2/piece)
			N [1]	A_2 [2]					
1	Matzon System (1)	20'	1,000	22,750	17,250	40.0	0.431	(10x10)pieces x 10 Block	
2	" (2)	"	1,090	25,112.5	14,887.5	36.7	0.372	Ref.Cont. 1 Block, Dry Cont. 4 Block	41.7 ~
3	" (3)	"	1,290	29,662.5	10,337.5	31.0	0.258	Ref.Cont. 1 Block Dry Cont. 2 Block	54.0
4	" (4)	"	1,200	27,300	12,700	33.3	0.318	Dry Cont. 2 Block	
5	35' Transtainer (1)	"	960	20,280	19,720	41.1	0.493	Pier Head Line v. Parallel arrangement	} 35.5
6	" " (2)	"	1,092	23,400	16,600	36.6	0.415	Perpendicular arrangement	
7	55' " (1)	"	1,200	20,475	19,525	33.3	0.488	Parallel arrangement	
8	" " (2)	"	1,276	22,050	17,950	31.3	0.449	Perpendicular arrangement	
9	62' " (1)	"	1,200	20,280	19,720	33.3	0.493	Parallel arrangement	
10	" " (2)	"	1,710	25,350	14,650	23.4	0.364	Perpendicular arrangement	} 27.0
11	133' "	"	1,170	23,985	16,015	34.2	0.400	Parallel arrangement	25.0
12	Sea Land System (1)	"	630	17,640	22,360	63.5	0.559	Parallel arrangement	
13	" (2)	"	651	18,968	21,032	61.4	0.526	Perpendicular arrangement	} 88.0
14	" (3)	40'	288	17,640	22,360	138.9	0.559	Parallel arrangement	
15	" (4)	"	385	17,787	22,213	103.9	0.555	Perpendicular arrangement	
16	Fork Lift (1)	20'	544	13,260	27,990	75.8	0.679	Parallel arrangement	
17	" (2)	"	550	13,406	27,219	73.9	0.670	Perpendicular arrangement	
18	Side Loader (1)	"	840	17,784	22,216	43.9	0.556	Perpendicular arrangement	
19	" (2)	"	912	16,380	23,620	47.6	0.509	Parallel arrangement	

Source : Introduction for Planning of Port and Harbor,
Japan Construction Technology Association

Note : 1) N: Number of Stock Containers
2) A_2: Storage Area (m^2)
3) A_3: Passage Area
4) A_1: $A_2 + A_3$

Table A-5-1 The Frequency Characteristics of Current

Stations	Rank	Dominant Current Direction	Percentage (%)	Average Velocity (cm/sec)	Range of Most Frequent Velocity	
					Range(cm/sec)	Percentage(%)
C-1	1	NE	42.1	3.5	2 ~ 4	84.2
	2	NNE	17.8	3.2	4 ~ 6	15.8
C-2	1	NNE	15.8	3.3	0 ~ 2	42.1
	2	NE	13.8	2.5	2 ~ 4	36.2
C-3	1	S	25.0	2.4	2 ~ 4	96.7
	2	SSE	24.3	2.7	4 ~ 6	2.0

Table A-5-2 The Tidal Type

$$\text{Tidal Type} = \frac{K1 + O1}{M2 + S2}$$

1.50 < T = Diurnal Tide
0.25 < T < 1.50 = Mixed Tide
T < 0.25 = Semi-Diurnal Tide

K1:Luni-Solar Diurnal Component, O1:Principal Lunar Diurnal Component
M2:Principal Lunar Semidiurnal Component, S2:Principal Solar Semidiurnal Component

Station	(k1+O2)	(M2+S2)	Average Current		VO	Tidal Type
			Direction( )	Velocity(cm/sec)	K1+O1+M2+S2	
C-1	1.4	1.5	51	2.7	0.93	0.93
C-2	2.3	2.7	33	0.6	0.12	0.85
C-3	1.7	1.2	141	2.4	0.83	1.42

Table A-5-3 The Tidal Constants and Tidal Type at Chuuk

Item	K1	O1	M2	S2	Tidal Type
Amplitude	16.5	12.6	6.8	9.8	1.753
Lag ( )	215.7	193.7	84.9	89.7	

N 7° 26' 35" E 151° 50' 15"

Table A-5-4 The Results of Water Quality Survey

Station	Depth (m)	Transparency (m)	Water Temperature (C)	Salinity (-)	pH (-)	*SS (mg/l)	DO (mg/l)	COD (mg/l)	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N (mg/l)	T-P (mg/l)	Turbidity (degree)
St.1	3.9	>3.9	29.0	34.1	8.1	<0.5	6.1	<0.5	<0.002	<0.01	<0.01	0.01	<0.1
St.2	8.0	>8.0	29.0	34.1	8.1	<0.5	6.7	<0.5	<0.002	<0.01	<0.01	<0.01	<0.1
St.3	14.0	10.5	29.2	34.1	8.1	<0.5	6.3	<0.5	<0.002	<0.01	<0.01	0.01	<0.1
St.4	3.4	>3.4	29.3	34.1	8.1	<0.5	6.9	<0.5	<0.002	<0.01	<0.01	<0.01	<0.1
St.5	2.0	>2.0	29.3	34.1	8.1	<0.5	6.4	<0.5	<0.002	<0.01	<0.01	<0.01	<0.1
St.6	9.5	4.1	29.6	34.3	8.1	<0.5	6.6	<0.5	<0.002	<0.01	<0.01	0.01	<0.1

*: less than 0.5 (mg/l) of SS at twenty points around the Planned Area.

Table A-5-5 (1) The Results of Content Tests for Marine Sediments

Station	Sulfied (mg/g dry)	Ignition Loss (wt% dry)	Grain Size Distribution (%)				Composition
			Gravel	Sand	Silt	Clay	
St.1	<0.01	2.9	25.1	74.4	0.5	-	Sand
St.2	<0.01	3.1	26.2	68.6	3.2	-	Sand
St.3	<0.01	2.9	25.8	70.7	3.5	-	Sand
St.4	<0.01	2.6	13.6	86.2	0.2	-	Sand
St.5	0.01	3.2	10.0	71.0	10.5	8.5	Fine Sand
St.6	0.06	6.1	0.4	47.3	34.3	18.0	Silt with Clay

Table A-5-5 (2) The Results of Elute Tests for Marine Sediments

(unit:mg/l)

Station	Cd	Pb	Cr^{6+}	As	Hg	R-Hg	CN	O-P	PCB	Cu	Zn	F
St.7	<0.001	<0.005	<0.02	<0.01	<0.0005	ND*	<0.01	<0.01	<0.0005	<0.01	<0.01	0.5
St.8	<0.001	<0.005	<0.02	<0.01	<0.0005	ND*	<0.01	<0.01	<0.0005	<0.01	<0.01	0.2
Standard**	0.1	1	0.5	0.5	0.005	ND*	1	1	0.003	3	5	15

*: Non-Detection

**: Japanese Standard value for marine sediment

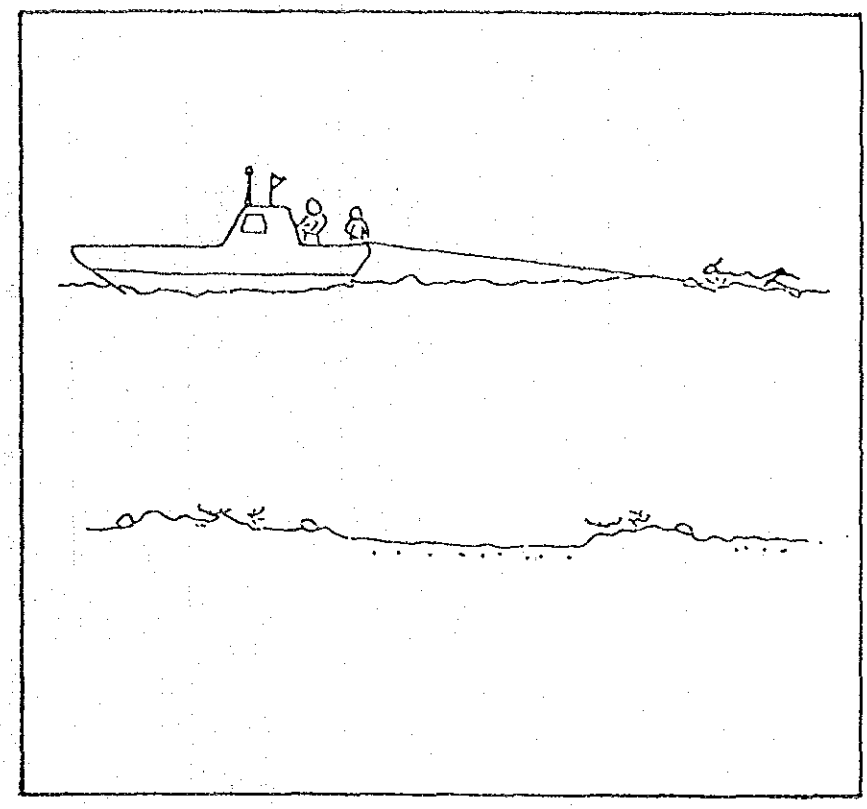


Fig. A-5-1 (1) Survey by means of Manta Method

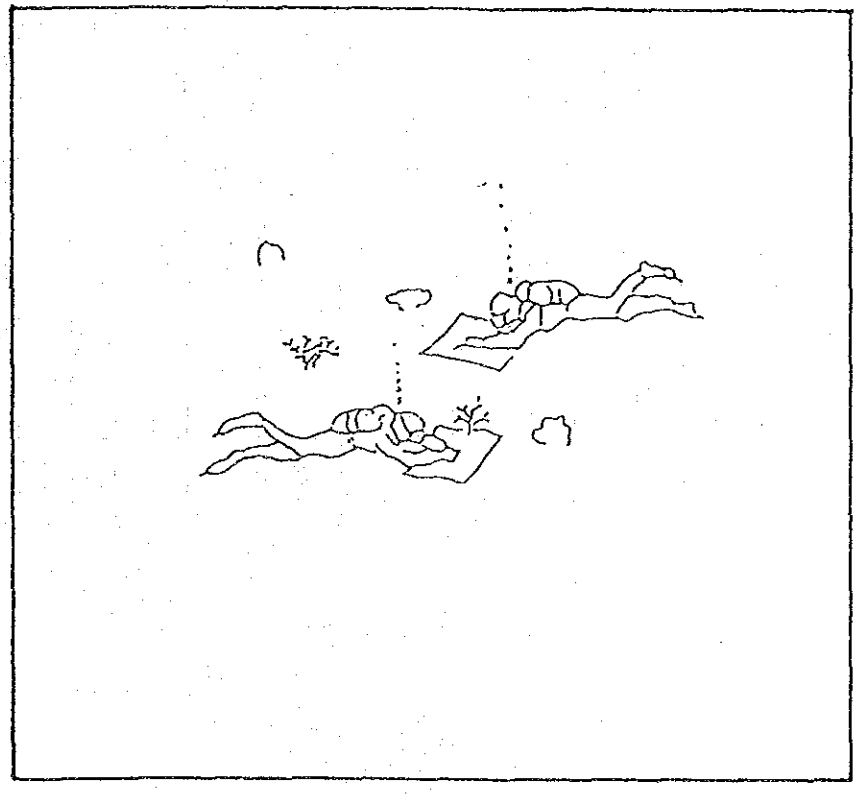


Fig. A-5-1 (2) Survey by means of Quadrat Method

Table A-5-6 The Results of General Survey for Marine Organisms by Means of Manta Method

Line / Organisms	North Inner Harbor - Dock B,C			Airport - North Inner Harbor
	Line I*	Line II*	Line III*	Line IV
Coral Coverage Dominant Sp.	> 5% Massive Porites	> 5% Branch Acropora Massive Porites	> 5% Branch Acropora	> 5% Branch Acropora Massive Porites
Algae Dominant Sp.	Halimeda spp. (on Rocks & Gravels)	Halimeda incrassata on Sandy Bottom)	None	Halimeda incrassata (on Sandy Bottom)
Megarobenthos Dominant Sp.	None	Holothuria atra	Holothuria atra	None

*: Line I located from the center of Dock-C to the mouth of North Inner Harbor (the Beginning Point of Manta Method);
Line II located from the offshore corner of Dock-C to the Beginning Point of Manta Method;
Line III located from the center of Dock-B to the Point 20 m offshore of the Beginning Point of Manta Method.

Table A-5-7 (1) The Results of Detail Survey for Marine Organisms by Means of Quadrat Method

Survey Area	Corals	Algae	Megarobenthos
North Inner Harbor	Coverage: 0 - 5% (<1%) Dominant Sp.: None Occurring Sp.:Porites solida	Coverage: 60 - 70% (>50%) Dominant Sp.:Halimeda sp. Occurring Sp.:Padina minor, Caulerpa racemosa, C.serrulata Neomeris annulata, Dictyopteris sp., Codiacea sp. etc.	Occurring Sp.: Stichopus chloronotus, Holothuria atra
Front Area of Dock-C	Coverage: 0 - 95% (<5%)* Dominant Sp.: Corymbose & Table Acropora, Massive Porites Occurring Sp.: Pocillopora damicornis, Seriatopora hystrix, Symphyllia sp., Pseudosiderastrea tayamai	Coverage: 0 - 95% (<50%)* Dominant Sp.:Halimeda sp. Occurring Sp.:Padina minor, Dictyopteris sp., Liagora sp., Blue-Green Algae, Filamentous Green Algae, etc.	Occurring Sp.: Discosma sp., Stychodactyla gigantea, H. atra, Stichopodidae sp., Polycarpa aurata, Lopha cristagalli, Streptopinna saccata, Lambis lambis, Tripeneustes gratilla, etc.
Front Area of Dock-B (Shore)	Coverage: 0 - 10% (<1%)* Dominant Sp.: None Occurring Sp.:Massive Porites, Favia laxa, Goniastrea pectinata	Coverage: 5 - 80% (80%)* Dominant Sp.:Microscopic Algae Occurring Sp.: Halimeda incrassata, H. macroloba, Udotea sp., P. minor, N. annulata, etc.	Occurring Sp.: Synapta maculata, H. atra, S. chloronotus, Stichopodida sp., Holothuria sp., P. aurata etc.
Front Area of Dock-B (Offshore)	Coverage: 0 -100% (>80%)* Dominant Sp.: Acropora formosa, Porites cylindrica, Massive Porites, Table Acropora, etc. Occurring Sp.: Diploastrea heliopora, Pachyseris rugosa, Hydnophora rigida, Herpolitha weberi etc.	Coverage: 5 - 80% (80%)* Dominant Sp.: Halimeda sp. Occurring Sp.: Halimeda incrassata, H. macroloba, Microscopic Algae	Occurring Sp.: Culucita novaeguineae, Lopha cristagalli, Raspailia hirusta, Polycarpa aurata, Holothuria edulis, H. atra, Linckia sp., etc.

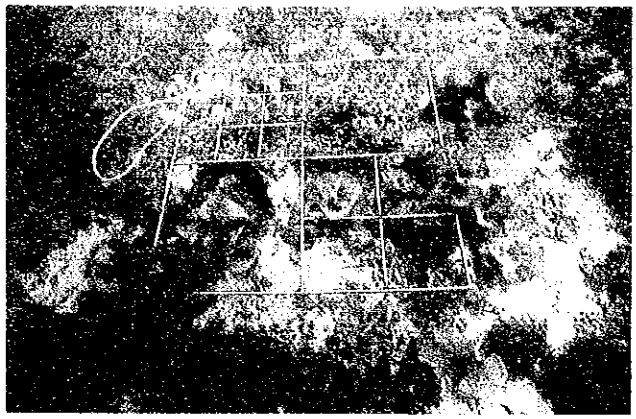
*: The number in parenthesis indicates the coverage at outside of quadrat

Table A-5-7(2) The Individual Numbers of Macrobenthos Species

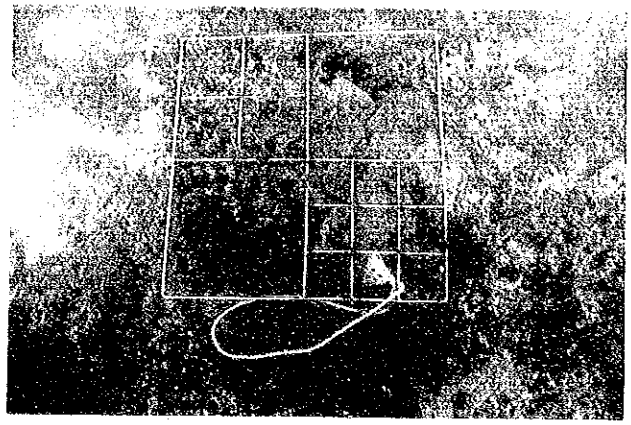
Station / Occurring Species	St.1	St.2	St.3	St.4	St.5	St.6
Foraminifera						
Amphistegina radiata	+	+	+	+	32	0
A. lessonii	0	0	+	0	0	0
A. sp.	0	0	+	+	0	0
Baculogypsina sphaerulata	+	0	0	0	0	+
Calcarina spengleri	0	0	0	+	0	0
Heterostegina depressa	+	0	+	0	0	0
Marginopora vertebralis	+	+	32	+	1	+
Operculina ammonoides	0	0	+	0	0	0
O. venosa	0	0	+	0	0	0
Peneloplis planatas	0	0	+	0	0	0
Polychaeta						
Chrysopetalum sp.	1	0	0	0	0	0
Pisione sp.	0	0	0	0	(1)*	0
Thyposillis sp.	0	1	1	0	0	0
Langerhansia sp.	0	0	1	0	0	0
Sphaerosyllis sp.	0	0	0	0	(6)*	0
Exogone sp.	0	0	1	0	0	0
Spioniidae sp.	0	0	0	0	(1)*	0
Armandia sp.	0	1	0	0	0	0
Archaiannelida						
unknown sp.	0	0	0	0	(13)*	0
Sipunculida						
unknown sp.	0	3	0	0	0	0

+: Only shell appearing

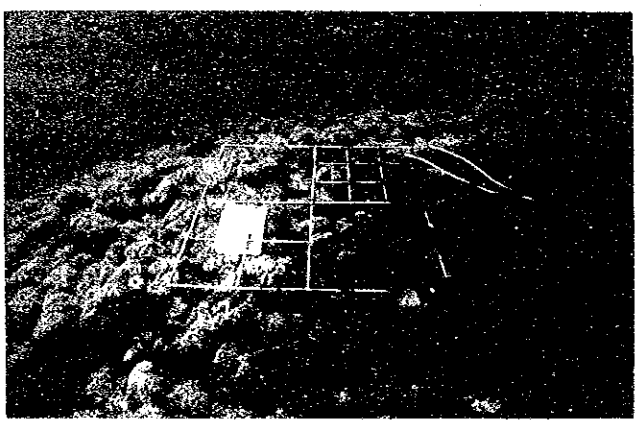
*: The number in parenthesis indicates the numbers of Meiobenthos (smaller than Macrobenthos)



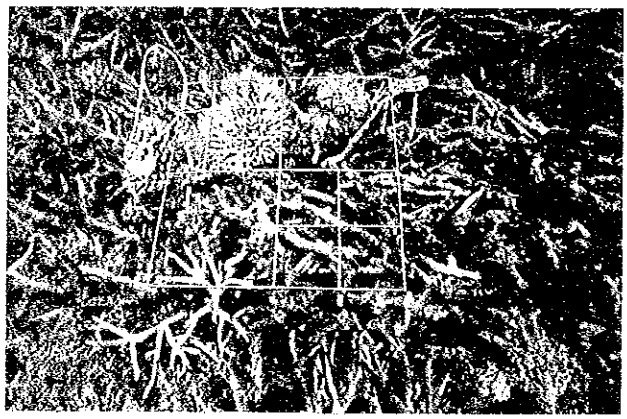
North Inner Basin
(*Stichopus chloronotus, Padina minor*)



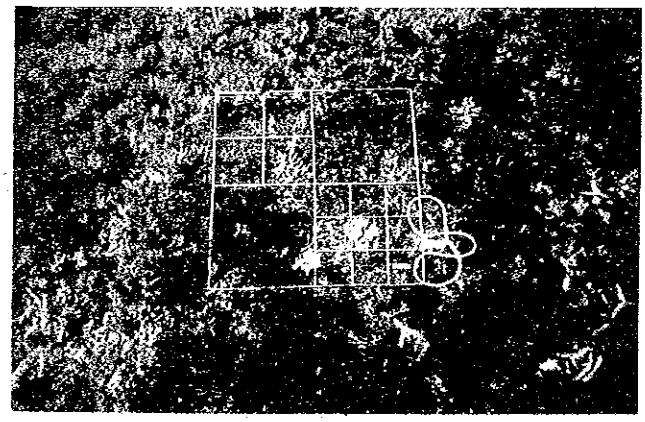
North Inner Basin (*Halimeda spp.*)



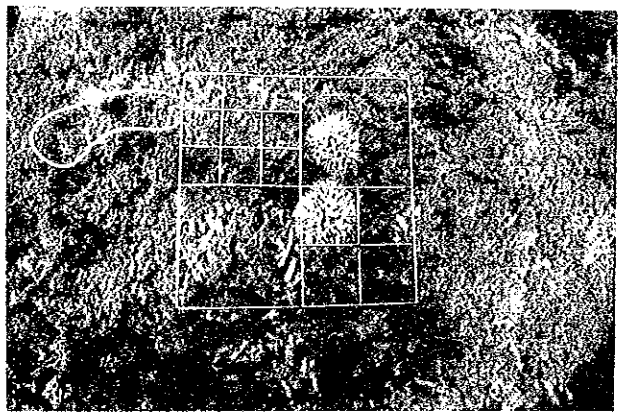
The Front Area of Dock-C (*Discosoma sp.*)



The Front Area of Dock-C
(*Acropora sp., Pocillopora damicornis*)

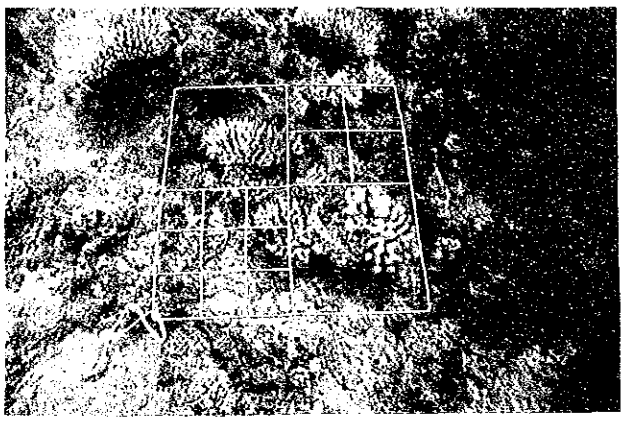


The Front Area of Dock-C
(*Halimeda sp., Acropora sp.*)

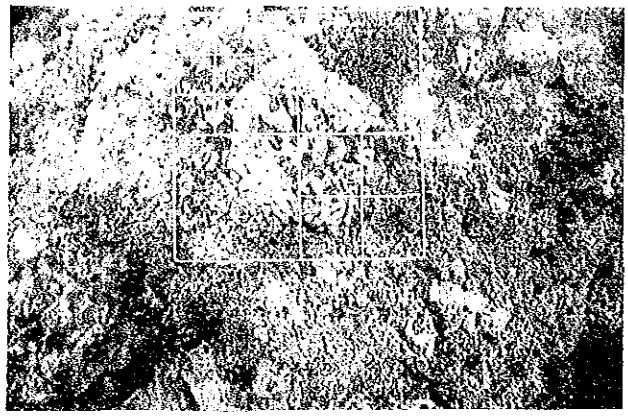


The Front Area of Dock-C
(*Halimeda sp., Seriatopora hystrix*)

Fig. A-5-2(1) Occurring Species (Quadrat Survey)

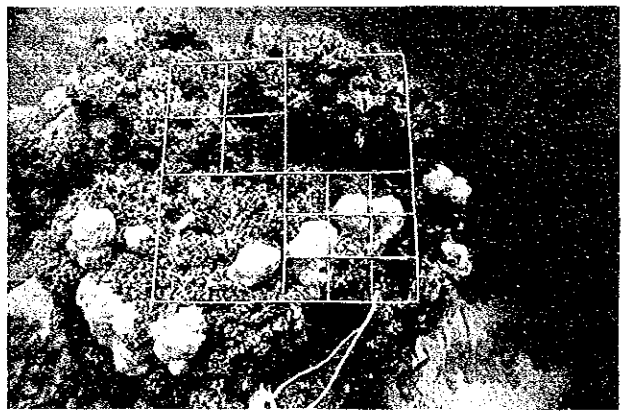


The Front Area of Dock-C
(*Pocillopora eydouxi, Acropora sp.*)

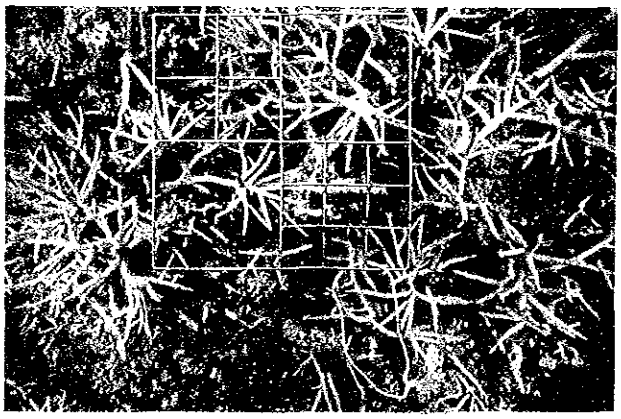


The Front Area of Dock-C (*Symphyllia sp.*)

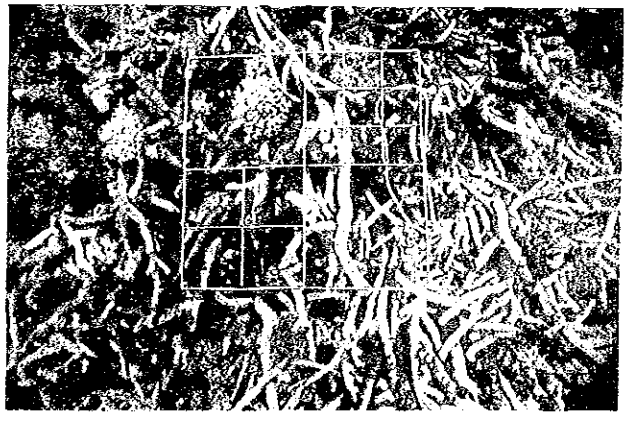
The Front Area of Dock-C
(*Favites abdita, Favia pallioda*)



The Front Area of Dock-C
(*Halimeda sp., Porites sp.*)

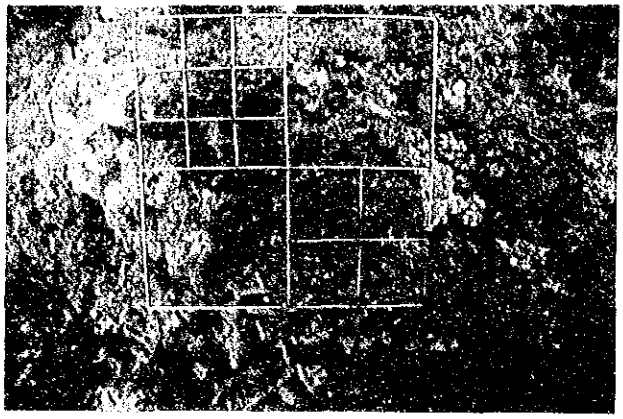


The Front Area of Dock-C
(*Acropora formosa, Halimeda*)

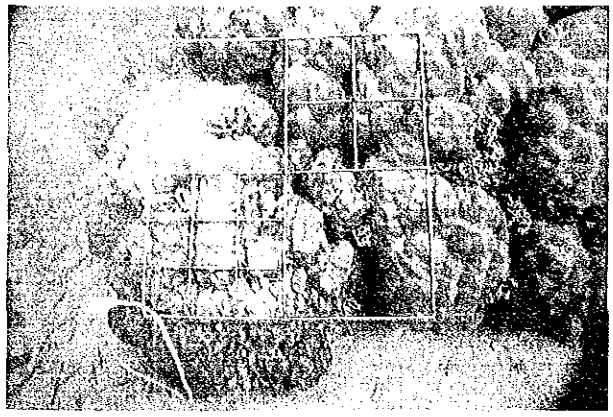


The Front Area of Dock-C
(*Pocillopora damicornis*)

Fig. A-5-2(2) Occurring Species (Quadrat Survey)

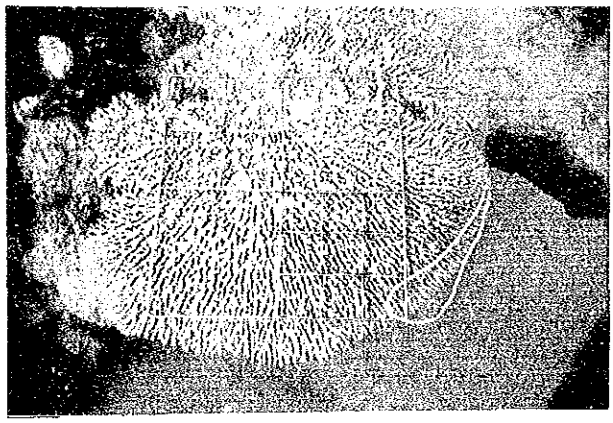


The Front Area of Dock-C
(*Symphyllia sp., Halimeda sp.*)



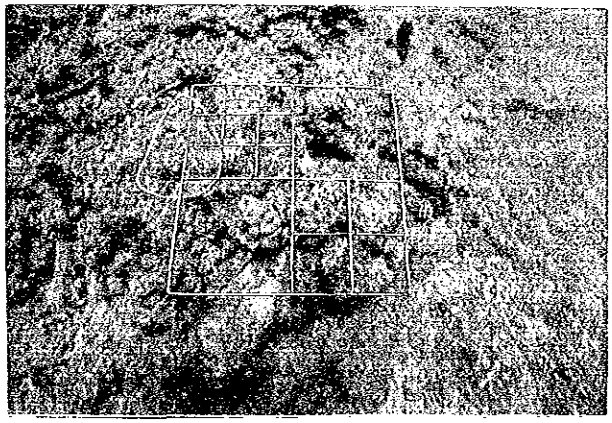
The Front Area of Dock-C
(*Porites sp., Sabellastarte japonica*)

The Front Area of Dock-C
(*Polyphyllia talpina*)



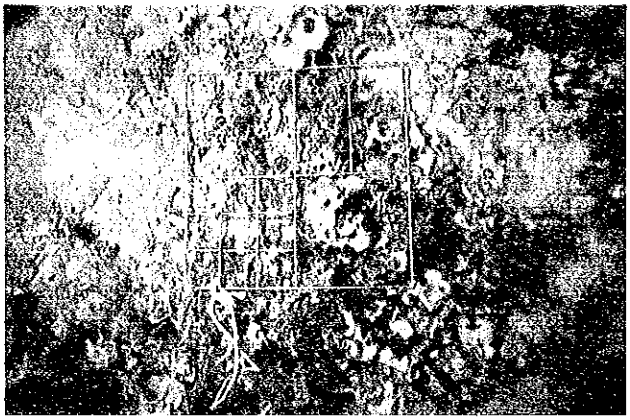
The Front Area of Dock-C (*Acropora sp.*)

Front Area (Shore) of Dock-B
(*Halimeda macroloba, H. incrssata*)

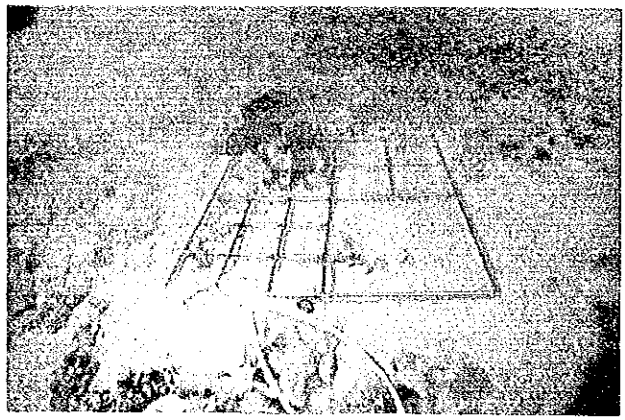


Front Area (Shore) of Dock-B (*Porites sp.*)

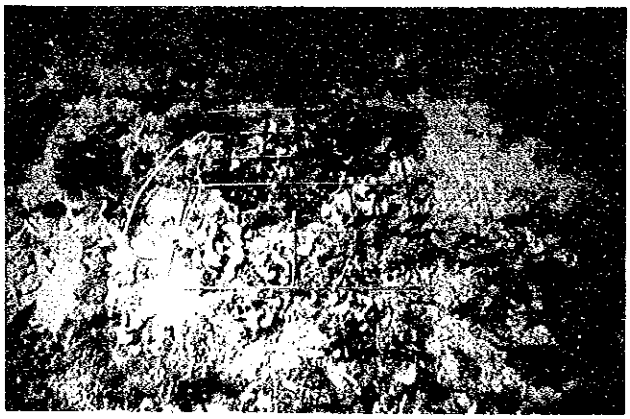
Fig. A-5-2(3) Occurring Species (Quadrat Survey)



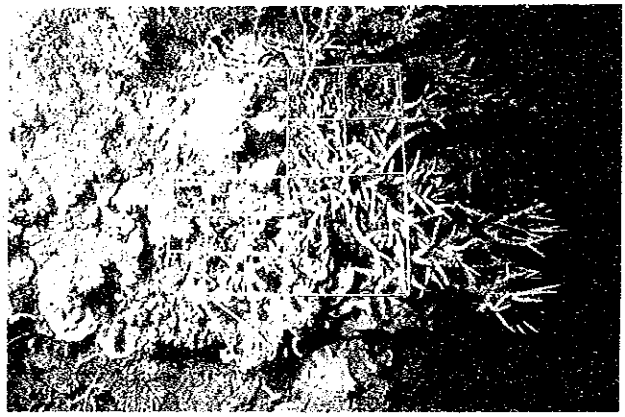
Front Area (Shore) of Dock-B
(*Stichopus chloronotus, padina minor*)



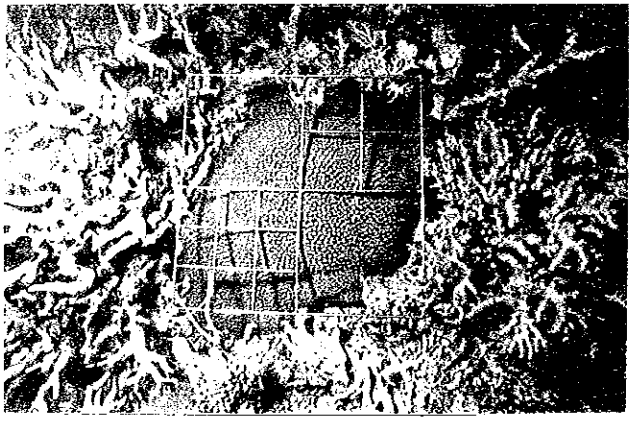
Front Area (Shore) of Dock-B (*Udotea sp.*)



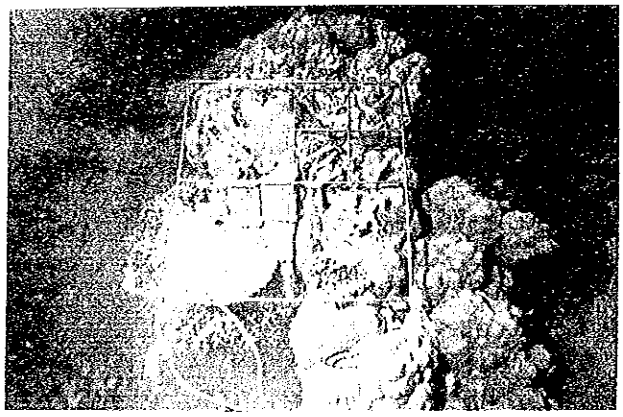
Front Area (Shore) of Dock-B
(*Synapta maculata, Padina minor*)



Front Area (Off Shore) of Dock-B
(*Acropora formasa, Porites sp.*)

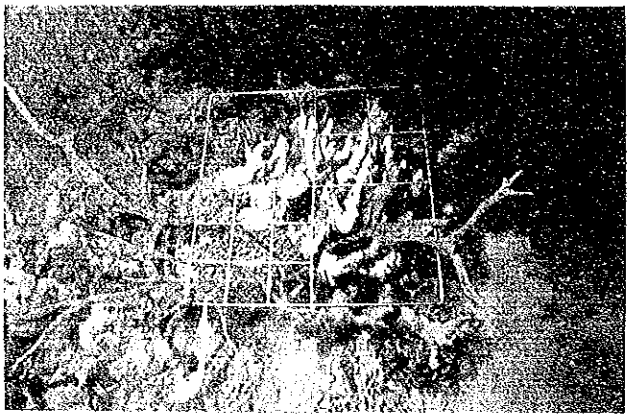


Front Area (Off Shore) of Dock-B
(*Diploastera heliopora*)

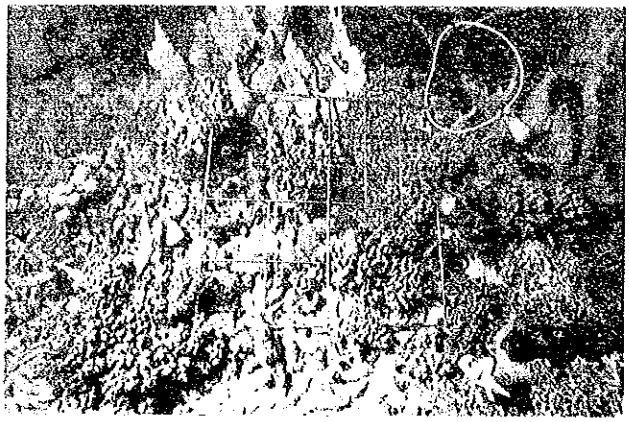


Front Area (Off Shore) of Dock-B
(*Porites sp., Lopha cristagalli*)

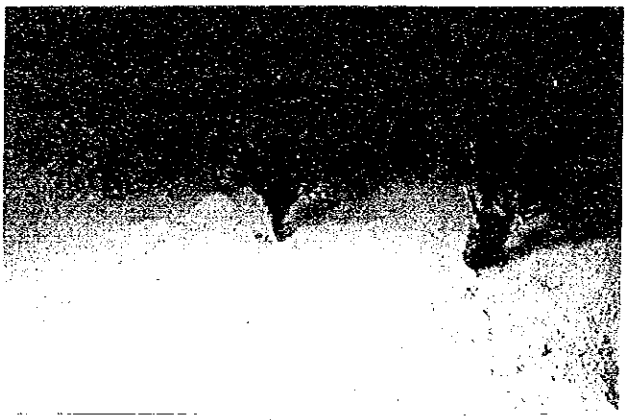
Fig. A-5-2(4) Occurring Species (Quadrat Survey)



Front Area (Off Shore) of Dock-B
(*P. cylindrica, Raspailia hirsuta*)

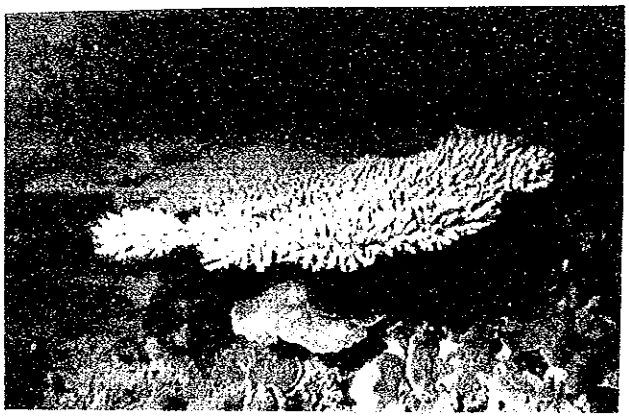


Front Area (Off Shore) of Dock-B
(*Sinularia sp., Pacyseris sp.*)

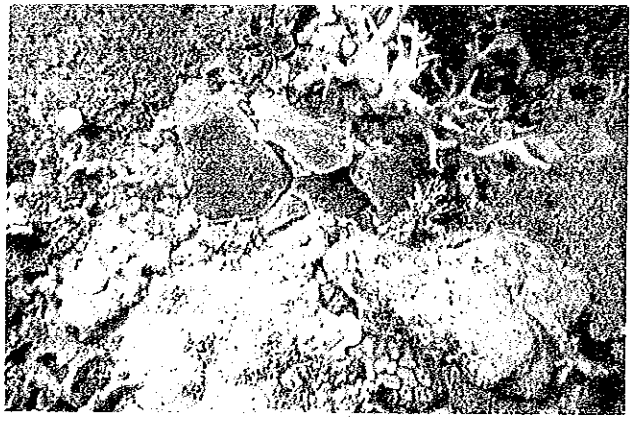


Front Area (Off Shore) of Dock-B
(*Halimeda incrssata*)

Front Area (Off Shore) of Dock-B
(*Polyphyllia talpina, Porites sp.*)



Front Area (Off Shore) of Dock-B (*Acropora sp.*)



Front Area (Off Shore) of Dock-B
(*Zoopilus echinathus*)

Fig. A-5-2(5) Occurring Species (Quadrat Survey)

(3): DESIGN SEISMIC INTENSITY

The Islands of Chuuk State are located over the group of dormant volcanoes of the Caroline Islands in the Central Pacific. Truck Lagoon where Weno Island is located is a large lagoon formed inside the crater of a volcano. The volcano is dormant and no records of volcanic activities have been known.

In the State of Chuuk, no earthquake recording has been conducted, and no regulations are in force for design seismic intensity. As no reference seismic data are locally available on which the design of Weno Harbor Extension Project is to be based, the design seismic intensity for use in basic design are presumed as follows.

The U.S. Uniform Building Codes include some descriptions regarding earthquakes in the Central Pacific area since the area was under U.S. trusteeship and Guam Island is a U.S. territory in nearby.

The table of seismic coefficients in the Uniform Building Codes for these areas gives the following data for the Pacific Region.

Caroline Islands	Grade	Coefficient
Pohnpei	0	z=0
Kwajalei (Marshal Is.)	1	z=0.075
Wake Island	0	z=0
Mariana Islands		
Guam	3	z=0.3
Saipan	3	z=0.3
Tinian	3	z=0.3

Presumption for area other than those mentioned above will be made on the basis of interpolation.

Chuuk State is located at about 900 km southeast of Guam, and Pohnpei is about 700 km further east of Chuuk. Chuuk is therefore slightly to the east of the median point of Guam and Pohnpei. The sites mentioned in the table are over the west portion of the expansive Pacific Plate, the western edge of which moves at the eastern side of the Mariana Trench as if to dive under the Philippine Plate. The activities of the Pacific Plate form the deep Mariana Trench and pushed the islands up to the sea level on its west side to form the Mariana Islands. These plate activities cause earthquakes and volcanic activities in the Mariana Islands and in the region in west of the Islands, assigning high seismic coefficients for the area, particularly for Guam.

The East Caroline Islands including Chuuk and Pohnpei and the Marshall Islands are located over the westerly portion of the Pacific Plate Basin. The seismic coefficient will be lower as the location is away from the western edge of the Pacific Plate as shown in the table above. When the seismic coefficient Z for Chuuk State is interpolated from the above table,

$$z = 0.1 - 0.15$$

According to the U.S. Uniform Building Codes, earthquake force V in static lateral load is given from the following equations:

$$V = W \times (Z \times I \times C) / Rw$$
$$C = 1.25 \times S / (T)^{2/3}$$
$$T = Ct \times (hn)^{3/4}$$

wherein

W : Weight of an object
I : Importance factor, I = 1
Rw: Rw = 4
hn: Height of a structure, (assume 50 ft)
Ct: Structure coefficient, Ct = 0.002
S : Ground coefficient, S = 1.2

After substitution of various values in these equations, following coefficients are obtained.

$T = Ct \times (hn)^{3/4} = 0.002 \times (50)^{3/4} = 0.02 \times 18.8 = 0.376$

$C = 1.25 \times S / T^{2/3} = 1.25 \times 1.2/0.376^{2/3} = 1.5/0.521 = 2.88$

$Z \times I \times C / Rw = (0.1 - 0.15) \times 1 \times 2.88/4 = 0.072 - 0.108$

Therefore, slightly larger than the median value of the two limits of $Z \times I \times C / Rw = 0.1$ is obtained.

As this value is equivalent to seismic coefficient (K) in calculation of soil pressure at the time of earthquake, the design seismic coefficient (K) for this Project is set at 0.1.