Ministry of Infrastructure Development
Solomon Islands

THE SECOND PREPARATORY SURVEY REPORT FOR OUTLINE DESIGN ON THE PROJECT FOR IMPROVEMENT OF HONIARA PORT FACILITIES IN SOLOMON ISLANDS

NOVEMBER 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

ECOH CORPORATION

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to ECOH CORPORATION.

The survey team held a series of discussions with the officials concerned of the Government of Solomon Islands, and conducted a field investigation. As a result of further studies in Japan, the present report was finalized.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Solomon Islands for their close cooperation extended to the survey team.

November, 2013

Mr. Kazunori Miura
Director General
Economic Infrastructure Department
Japan International Cooperation Agency

Summary

SUMMARY

(1) Background and Summary of the Project

Solomon Islands is an island country consisting of 6 main islands and about 1,000 small islands. The import and export of international cargoes and the most of the domestic cargoes are depending on sea transportation. Although there are 6 major ports in the country, the international cargoes are mainly handled in Honiara Port located at the capital city in Guadalcanal Island. The major commodities imported to the country comprise food, industrial material and equipment, apparel, fuel and others that are essential for the life of people. The major products exported are palm oil, cacao, lumber, fisheries products and others that are important to support the country's economy.

A tribal conflict has occurred from the latter part of 1990's and the cargo handling volume in Honiara Port has greatly decreased once, but it has sharply increased by the economic recovery after conflict in 2003. As the result, the existing port facilities are in the situation to exceed the cargo handling capacity at this moment and many container ships are obliged to wait for berthing in offshore for a long time. In addition, although Honiara Port has an international berth with the extension of 120m, berth extension does not meet to cater for large sized calling ships and a portion of the berth has less capacity of structural strength to handle heavy cargoes. Therefore, safety and efficiency of cargo handling operation are the problems to be settled urgently.

The major export products such as palm oil and mineral resources are expected to increase in future. Therefore, the improvement of cargo handling efficiency and safety of this port are urgently required for the future economic development of this country. Under such circumstances, the Governmrnt of Solomon Islands has requested "The Project for Improvement of Honiara Port Facilities in the Solomon Islands" to construct the Second International Wharf under the grant aid cooperation to the Government of Japan.

However, after this request was made, PIAC (Pacific Infrastructure Advisory Centre) that is coordination institution for the development of infrastructures of Pacific Ocean has released the report on scoping study of Honiara Port. According to this report, the Second International Wharf has been analyzed not to be necessary until around the year of 2020, in case that a new copra wharf is constructed. JICA was in need to verify the urgency and necessity of this project, considering that analyzed results and etc. Therefore, the Preparatory Study (No.1) was conducted in September 2012 and confirmed the followings.

i) Offshore waiting time of calling ships have been increased due to the congestion of rapid increase of container ships,
ii) Cargo handling operation has been inefficient due to the shorter berth length against the size of calling ships and
iii) Due to the narrow water area adjacent to the international wharf, a risk is growing for both of large sized international ship and small sized domestic ships.

As the results, the conclusion was reached that the execution of this project is necessary to implement earlier than the year of 2020 described in the PIAC report for the capacity improvement and the safety of Honiara Port.

Based on the results and relevant information obtained through preparatory study (No.1), this study aims to confirm the necessity and urgency of the requested project components. And proper preliminary design and project implementation plan including cost estimation of the project are carried out as the project under grant aid scheme.

Furthermore, PIAC has reported the necessity to make and improve a business plan from the view of organizational operation of related authorities. The organizational operation system is necessary to review more since the great impact is considered due to the double operations of the existing wharf and the new international wharf when the project is implemented. Therefore, the alternative plan is proposed in this study by studying practical organizational operation focusing on the out-sourcing of stevedoring works to cater for multiplied operations of the existing berth and the new international wharf.

(2) Summary of Study and Components of Project

The Government of Japan decided to conduct the preparatory study (No.2) at the request of Solomon Islands and dispatched the study team as follows,

Field Survey	: March 7 to April 28, 2013
Outline Design Explanation	: October 1 to October 11, 2013

The international wharf of Honiara Port has been constructed essentially as a general cargo wharf. However, it is used as wharf for container handling in order to cope with container cargoes which increased rapidly by recent introduction of larger sized container ships. With the gap between the existing condition of port facilities and utilization situation, various problems presently become obvious in its vessel congestion, the efficiency and safety of cargo handling operation and the counter measures become urgent issues. In order to solve the issues, the new international wharf in addition to the existing international wharf is considered to be absolutely imperative.

Following necessary and very urgent components are selected out of the project components of the request letter in August, 2011. These components are necessary for the construction of the new international wharf.

* International Wharf	: Berth, End Revetment, Dredging and Filling, Mooring Dolphins
* Container Yard	: Yard Pavement
* Accessories	: Water Supply to Wharf, Lighting Facility

In view of safety navigation of vessels, beacons to show the berth location during night to be included as navigation aids facility.

1) New International Wharf

The new international wharf is planned in a comprehensive manner according to the results of sizes of calling ships, arrival draft of calling ships and ship maneuvering operation at the berthing and deberthing, water depth distribution with sounding survey, direction of prevailing wind, normal wave characteristics and etc.

Target ships for berth planning are selected from the calling liner container ships to Honiara Port. According to their ship particulars such as overall length and draft of the representative ships, berth dimensions such as berth extension and water depth are determined. The berth extension is set as 150m by examining the coverage of ship geared crane to the wharf and location of mooring dolphins. The water depth of the berth is set as 11.0 m below low water leverl by arrival draft and full draft of calling container ships. Structural type of the quay are examined by three alternative type, namely steel pipe sheet pile structure, sheet pipe pile open jetty and caisson type structure. Steel pipe sheet pile structure is selected through comparison of emviromental aspects, construction cost, construction period and construction condition.

Due to steep bathymetry of the adjacent water area, breakwater to protect the wharf from intruding wave can not constructed in the project area, so that the facility planning and design are carried out by considering the wave condition. Based on the forecasted wave condition of surrounding water area, rate of effective workable days of the berth is predicted in allowable range without breakwater protection. To facilitate wave overtopping to the wharf, the crown height of the berth is set as highest within the height stipulated in the criteria. And parapet is intalled on the top of the north and south revetment to reduce wave overtopping, as well. As to the land area of the wharf, access roads with 2 lanes are included in the north and the south end for smooth container transportation to the container yard.

2) Container Yard

Container yard plan is established based on the container handling volume of the year of 2020. Container yard allocation is examined by efficient operation jointly with the new container yard of the new international wharf and the existing container yard.

Container stacking plan is set by reviewing container traffic movement during most congested period of container ship operation. Paving area of the container yard is installed to the all area of the new whalf, as well as the some urgently required area of the existing container yard. Remaining area of the existing container yard will be carried out by SIPA, because SIPA is capable to construct by itself. Pavement structure of the container yard and access road are determined according the heavy traffic of container handling equipment.

3) Accessories

Regarding the water supply facility, SIPA is to extend the water supply pipe up to back of the new wharf and pipe laying from the back to inside of yard is executed by this project.

Night cargo handling works are made in the new international wharf of Honiara Port. Therefore, proper lighting pursuant to lighting standard is adopted in the berth apron portion and the container yard portion.

Beacon that indicate the position of berth location when the visibility is poor at the time of bad weather and night time, rainy weather, heavy fog and etc. is included in the project. Each one beacon at the both ends of the berth is installed to indicate the position of the new international wharf.

Following table is the comparison with the requested components and the project components.

Contents of Planned Project Facilities

Components		Requested	Project
1) International Wharf	Berth Extension	150m	150m
	Revetment Extension	125m	155m
	Water Depth	11m	11m
	Dredging and Filling	17,000m^3	6,680m^3 (Dredging) 58,900m^3 (Filling)
	Mooring Dolphin	2 units	2 units
2) Container Yard	Yard Pavement	10,500 m^2	19,222m^2 in total 6,700m^2 (Yard) 10,600m^2 (Apron) 1,922m^2 (Access)
3) Accessories	Water Supply Facility	L/S	L/S
	Lighting Facility	L/S	L/S
	Beacon	Additional Request	2 units

(4) Estimated Project Cost and Implementation Schedule

The project cost born by Solomon Islands side is estimated as approximately 13 million yen in case the implementation by Grant Aid Cooperation of Japanese Government. The implementation period takes 32 months in total, comprising 8 months for detailed design and tender, and 24 months for construction and procurement.

(5) Project Evaluation

1) Relevance

Solomon Islands is comprised of 6 major islands such as Guadalcanal Island where Honiara, capital city is located, Malaita Island, New Georgia Island, Santa Isabel Island, Choiseul Island and San Cristobal Island and other about 1,000 of small islands where inter-inland sea transportation has substantially developed. Port and small scale landing facility are available in each island and the domestic feeder net-work is formed centering Honiara Port. Sea transportation becomes the life line

for the isolated islands where the road condition is not well implemented. The international ports in Solomon Islands are Honiara Port and Noro Port. 90% of international cargoes are handled at Honiara Port.

Honiara Port is composed of international wharf and domestic wharves, both of which are managed and operated by Solomon Islands Port Authority (SIPA). International wharf in Honiara Port is consisted of one berthing facility with the extension of 120m and land facilities like container yard with about 3.0ha located at the back. International wharf has been constructed as a general cargo wharf, therefore it is in the situation that cannot correspond to recent containerization as well as increasing size and number of calling vessels. As a result, various problems and issues, such as congestion of calling ships, low efficiency of cargo handling operation and safety of ship operation, become obvious and it is considered to be necessary to construct the second international wharf.

In order to settle the above problems, it is considered to be necessary to construct the new international wharf in addition to the existing international wharf. And the necessity and the urgency of the project port facility construction are fully recognized.

In the national development strategy (2011 to 2022) made by the Government of Solomon Islands, a poverty and discrepancy reduction in the course of economic growth was aimed as one of the target. To facilitate the current situation, the economic activity and industrial promotion, the construction of economic and social infrastructures such as in the transportation, water supply, electricity and communications become urgent requirements. Particularly, the maritime transportation is the life line to support the economic activities of this country. And the ports and harbors are absolutely imperative as the base for import and export as well as domestic cargoes, of which facilities become economic and social infrastructures to be closely connected with people's life. Therefore, in view of the ensuring social services to people and the access to the market, the improvement of the port facility and maritime transportation services become inevitable for the economic growth of this country.

As the aid policy of the Government of Japan to Solomon Islands, achievement of sustainable economic growth and upgrading people's life standard through the enhancement of social economic infrastructures are stated. Upgrading and enhancement of the international wharf by this project are to contribute to the achievement of sustainable economic growth and promotion of people's life standard by enhancing social and economic infrastructures. Additionally, this project is for transportation and traffic that is strategic field and the consistency with the aid policies of the Government of Japan is ensured.

The construction of the new international wharf in Honiara Port is beneficial to the port staff and port users directly. Honiara Port handles the most of import and export cargoes of Solomon Islands which are distributed throughout the country, therefore all the people in Solomon Islands become beneficiary in an indirect sense.

Direct Beneficiary : Port staff relevant to Honiara Port and port users
Indirect Beneficiary : All 540 thousand people in Solomon Islands

With the above, as this project widely contributes to the promotion of Basic Human Needs (BHN) and the poverty reduction, the relevancy of the implementation under the scheme of Grant Aid Cooperation by the Government of Japan can be confirmed for the part of this cooperation.

2) Effectiveness

The outcome of quantitative effects by this project is as below.

i) Elimination of Berth Waiting by Container Ships

With the implementation of the new international wharf in addition to the existing international wharf, Honiara Port equips two berths which facilitate the congestion of calling ships vessels and reduce basically a berth waiting time of liner container ships to alomost zero.

ii) Improvement in Efficiency of Container Handling Operation

As the new international wharf implemented will enable the container handling operation through all the extension of berth, geared cranes on container ship can be effectively operated and the efficiency of container cargo handling operation will be improved. Container handling operation beside the berth will be imporved from current 15 TEU/hour to 20 TEU/hour.

iii) Upgrading Efficiency of Vehicles Handling Operation

Container ships equipped with Ro-Ro ramp can be berthed to the new international wharf and the vehicles handling operation will be upgraded due to the direct discharge to the wharf by using Ro-Ro ramp. Vehicle handling operation at the berth will be imporved from current 10 vehicles /hour to 30 vehicles /hour.

iv) Increase of Stacking Capacity of Containers

Since the increase of container stacking capacity from current 22,035 TEU/year to 33,341 TEU/year by implementation of the new container yard and the expansion of the existing container yard by the project, congestion mitigation of the container yard and the correspondence to forthcoming increase of container handling volume become possible.

The outcomes of qualitative effects by this project are as shown below.

i) Promotion of Logistics

The function as international port is enhanced and the logistics are promoted by inputting the new international wharf.

ii) Reduction of Transportation Cost

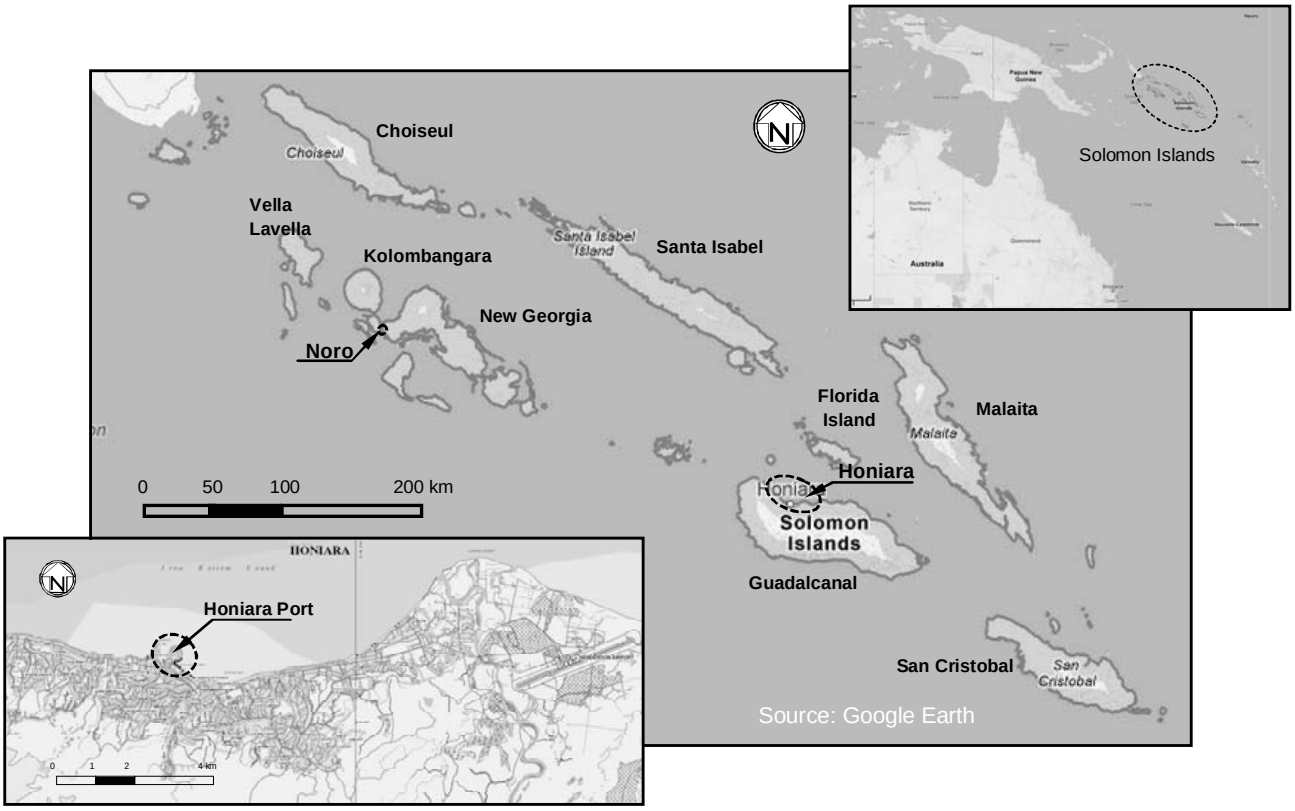
Reduction of transportation cost can be expected by upgrading the safety and efficiency of container handling operation in Honiara Port.

iii) Shortening of Port Time and Elimination of Berth Waiting Time

As a benefit for shipping companies, shortening of port time and elimination of berth waiting time of calling container ships are expected by implementation of the project.

With the above contents, the relevancy of this project is sufficient and the efficiency is considered to be significant.

The Second Preparatory Survey for Outline Design on
the Project for Improvement of Honiara Port Facilities in Solomon Islands



Location Map of Honiara, Solomon Islands

Aerial View of Honiara Port

The Second Preparatory Survey for Outline Design on
the Project for Improvement of Honiara Port Facilities

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Abbreviations

A	ADB	Asian Development Bank
	A/P	Authorization to Pay
B	B/A	Banking Arrangement
	BOT	Build, Operate and Transfer
D	D.L.	Datum Level
E	EAC	Environmental Advisory Committee
	ECD	Environment and Conservation Division
	EIA	Environmental Impact Assessment
	EIS	Environmental Impact Statement
	E/N	Exchange of Notes
F	FCL	Full Container Load
G	G/A	Grant Agreement
	GDP	Gross Domestic Product
I	ICD	Inland Container Depot
	IMO	International Maritime Organization
	IMF	International Monetary Fund
	ISPS	International Code for the Security of Ships and Port Facilities
J	J/V	Joint Venture
L	LCL	Less than Container Load
M	MECDM	Min. of Environment, Climate Change, Disaster Management and Meteorology
	MID	Ministry of Infrastructure Development
N	NIIP	National Infrastructure Investment Plan
P	PER	Public Environmental Report
	PIAC	Pacific Infrastructure Advisory Centre
	P/Q	Prequalification
R	RAMSI	Regional Assistance Mission to Solomon Islands
S	SIPA	Solomon Islands Ports Authority
	SOE	State Owned Enterprise
	SOLAS	International Convention for the Safety of Life at Sea
T	TEU	Twenty-foot Equivalent Unit
	TEU-Gs	Twenty-foot Equivalent Unit Ground Slot

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Project

(1) Background

Solomon Islands (Population: 523,000, Area: 28,900 km^2) is an island country consisted of 6 main islands and about 1,000 small islands spread in the water area of 1,632,964 km^2 lying east and west of 1,666.8 km long. The import and export of international cargoes and most of the domestic cargoes are depending on sea transportation. Although there are 6 major ports in the country, the international cargoes are mainly handled in Honiara Port located at the capital city. The major commodities imported to the country comprise food, industrial material and equipment, apparel, fuel and etc. that are essential for the life of people. The major products exported are palm oil, cacao, lumber, fisheries product and etc. that are important to support the country's economy.

A tribal conflict has occurred from the latter part of 1990's and the cargo handling volume in Honiara Port has greatly decreased once, but it has sharply increased by the economic recovery after conflict in 2003. As the result, the existing port facilities are in the situation to exceed the cargo handling capacity at this moment and many container ships are obliged to wait in offshore for a long time. In addition, although Honiara Port has an international berth with the length of 120m, berth extension does not meet to cater for large sized calling vessels and some portion of the berth has less capacity of strength to handle heavy cargoes. Therefore, safety and efficiency of cargo handling operation are the problems to be settled urgently.

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Furthermore, PIAC has reported the necessity to make and improve a business plan from the view of organizational operation of related authorities. The organizational operation system is necessary to review more since the great impact is considered due to the double operations of the existing wharf and the Second International Wharf when the project is implemented. Therefore, the alternative plan is proposed in this study by studying practical organizational operation focusing on the out-sourcing of stevedoring works to cater for multiplied operations of the existing berth and the Second International Wharf.

(2) Summary of Project

The summary and requested components of this project are as per shown below.

1) Upper Goal

The project contributes to economic development of Solomon Islands by the promotion of smooth import and export cargo transportation.

2) Project Goal

Safe and effective operation of Honiara Port becomes possible.

3) Prospective Outcome

Second International Wharf and the related facilities are newly constructed in Honiara Port.

4) Project Components

Requested component related with this project is as follows.

[Facility]

i) International Wharf : Berth (150m), Revetment (125m),
Dredging of Berth Front (Water Depth 11m) and
Filling (17,000m^3), Mooring Dolphin (2 nos.)

ii) Container Yard : Yard Pavement (10,500m^2)

iii) Accessories : Water Supply and Fire Fighting, Lighting Facility

Fire fighting facility is excluded according to the Minutes of Meeting dated March 2013.

5) Project Site

Honiara Port in Point Cruz, Honiara City

6) Responsible and Implementing organizations

Responsible Agency : Ministry of Infrastructure and Development (MID)
Implementing Agency : Solomon Islands Ports Authority (SIPA)

7) Beneficial Effect of Project

The implementation of the Second International Wharf to Honiara Port will contribute to enhancements of international port functions which affect the logistics in Solomon Islands. In addition, reduction of transportation cost is expected by improved efficiency and safety of container handling operation. For this reason, beneficial effect on the price of imported goods which includes transportation cost is received. Vitalization of the economy is together expected by promotion of the import and export related industries in the country. Regarding the shipping companies, elimination of berth waiting time and shortening the port time of ships in Honiara Port will contribute to efficient operation of container ships. Therefore, improvement of sea transportation services is expected by frequent allocation of vessels.

Construction of the Second International Wharf in Honiara Port is beneficial directly to the employers of SIPA and users of Honiara Port. Indirectly, as Honiara Port handles most of import and export cargoes of Solomon Islands, the project is beneficial to all the people of Solomon Islands.

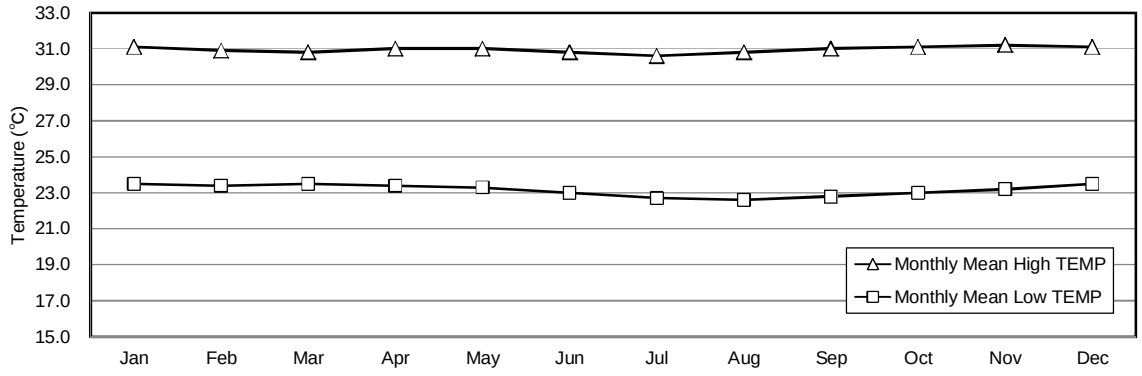
Direct Beneficiary : Employers of all port facilities in Honiara Port and Port users
Indirect Beneficiary : 540 thousand people of Solomon Islands

1-2 Natural Conditions

(1) Temperature and Humidity

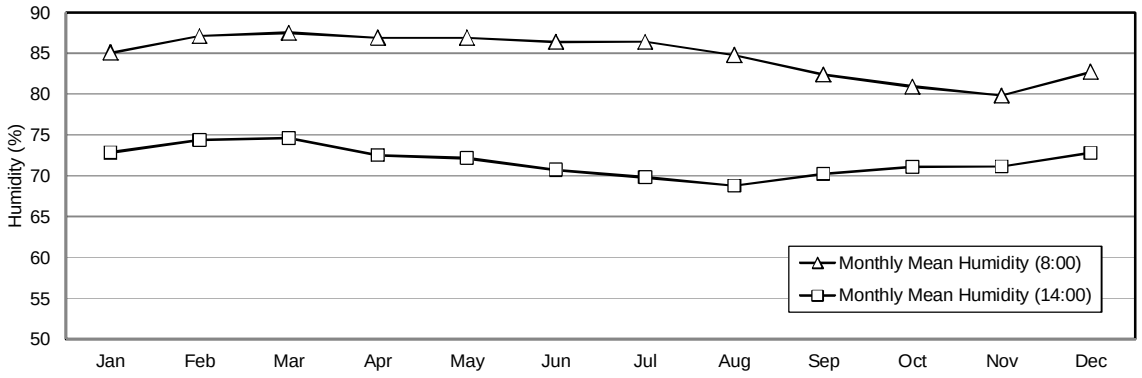
Monthly mean temperature is as shown in Figure 1.2-1. In addition, monthly average humidity is shown in Figure 1.2-2. These data are collected for the period from 1951 to 2012 (missing from 1975 to 1986) at the Honiara Meteorological Office.

The mean high temperature is approximately 31 degree and the mean high humidity at morning time is over 80 percent throughout a year. The mean low temperature is approximately 23 degree.



Source: Honiara Meteorological Office

Figure 1.2-1 Monthly Mean Temperature

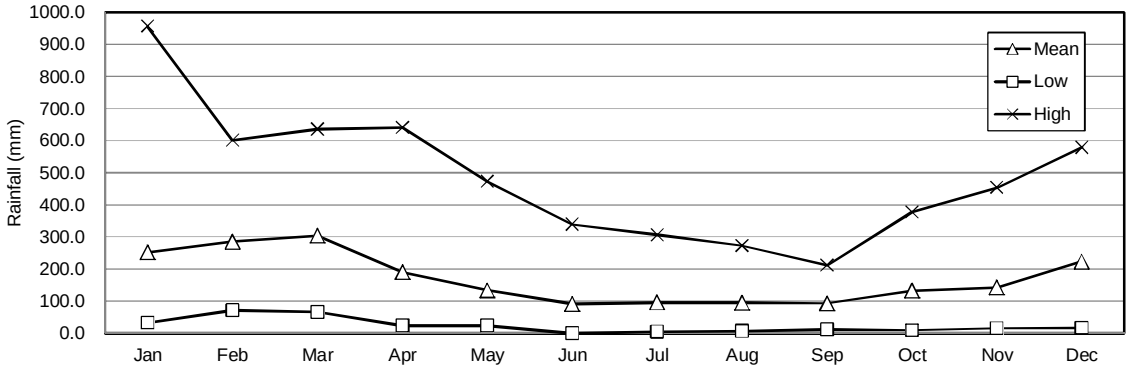


Source: Honiara Meteorological Office

Figure 1.2-2 Monthly Mean Humidity

(2) Rainfall

Monthly rainfall is shown in Figure 1.2-3. These data are collected for the period from 1955 to 2012 (missing from 1975 to 1979) at the Honiara Meteorological Office. The dry season is from June to September and the rainy season is from October to April. Cyclone season is said to be from November to January.

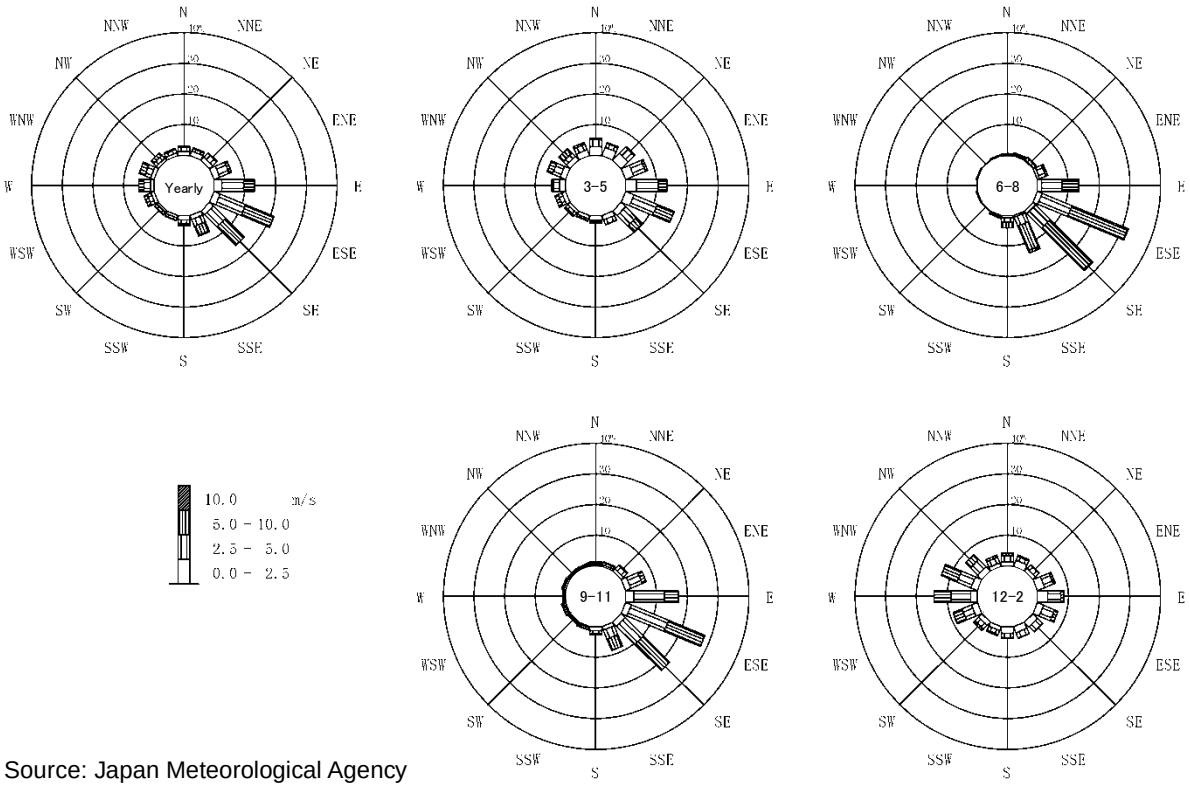


Source: Honiara Meteorological Office

Figure 1.2-3 Monthly Rainfall

(3) Wind

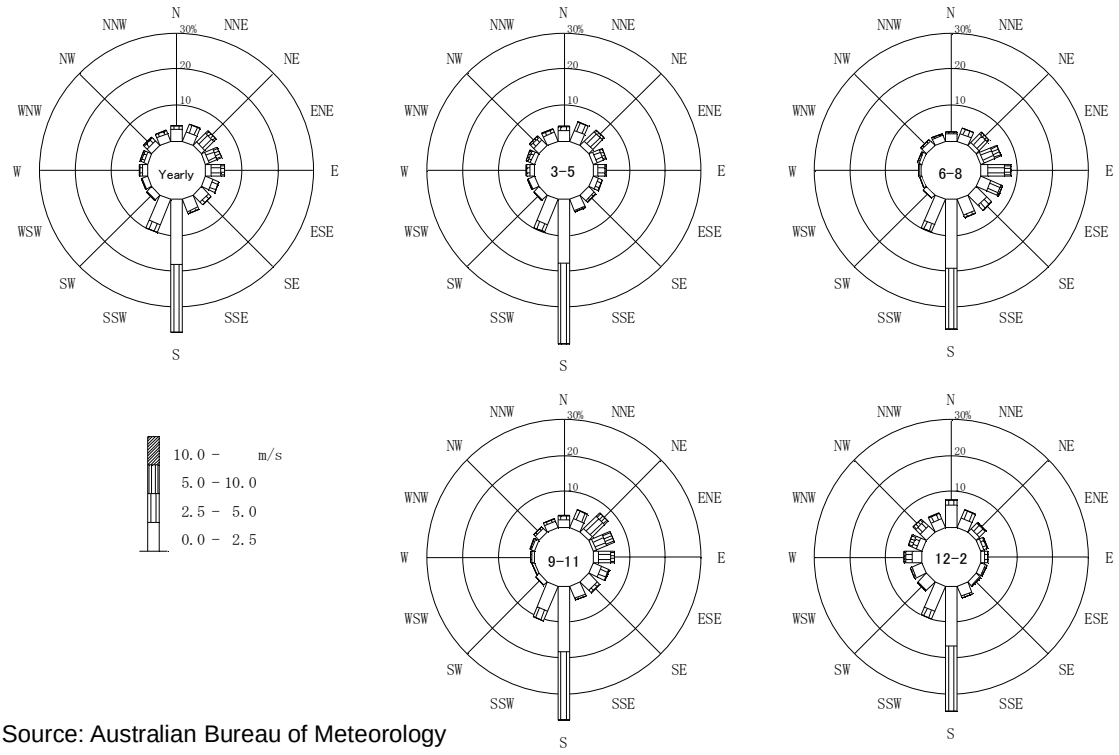
Wind rose (according to the data base of Japan Meteorological Agency) in offshore of north side of Guadalcanal is shown in Figure 1.2-4. Frequency of occurrence of SE and ESE winds which seems to be the influence of trade winds is high through a year. From December to February, the frequency of occurrence of WNW winds which seem to be the influence by monsoon becomes high.



Source: Japan Meteorological Agency

Figure 1.2-4 Wind Rose in the Offshore of North Side of Guadalcanal
(2002 to 2006, 4 times prediction per day)

Wind rose that was analyzed the wind direction and wind speed obtained in the observatory located near Honiara port for the period from 2002 to 2012 by Australian Bureau of Meteorology is shown in Figure 1.2-5. S winds of 5.0 m/s or less is outstanding through a year. From December to February, N winds are increased as compared with other period. These winds are considered that SE or WNW winds to be in the data base of Japan Meteorological Agency have changed by geographical effects.



Source: Australian Bureau of Meteorology

Figure 1.2-5 Wind Rose in Observatory Located Near Honiara Port (2002 to 2012)

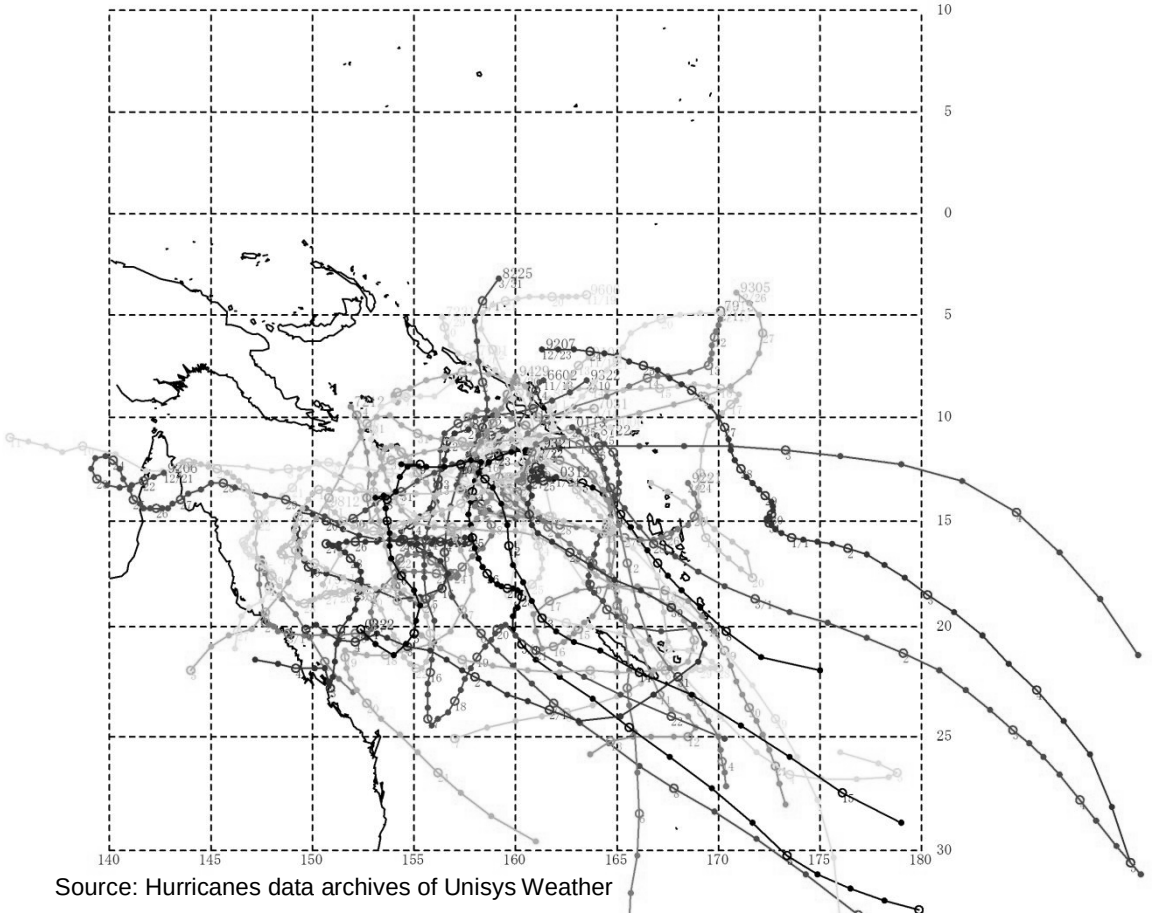
From the viewpoint that the wind conditions with large scale in the areas where waves are generated is important than the local winds that affected by geographical elements, wave condition is forecasted by using the wind data by Japan Meteorological Agency in the wave analysis of this study.

(4) Cyclone

Figure 1.2-6 shows the route map of cyclone passed near Solomon Islands from 1945 to 2011 and selected out of which considered to have a significant impact to the project site.

Cyclones is generated and developed within southern area of latitude 5 degrees south, and propagates toward mainly to the south side.

Solomon Islands is located near the 8 to 10 degree south latitude, which is the area cyclones and waves are considered to be in developing process. Further, the propagating path has many variations in general as the feature of this area.



Source: Hurricanes data archives of Unisys Weather

Figure 1.2-6 Routes of Cyclones (1945 to 2011)

(5) Tide

Tide gauges are installed by Australian Bureau of Meteorology near the Honiara Port for the South Pacific Sea Level in the Climate Monitoring Project. The datum level (D.L.) for this project is set based on the observations in this tide gauge. The tide condition at Honiara Port is shown in Figure 1.2-7.

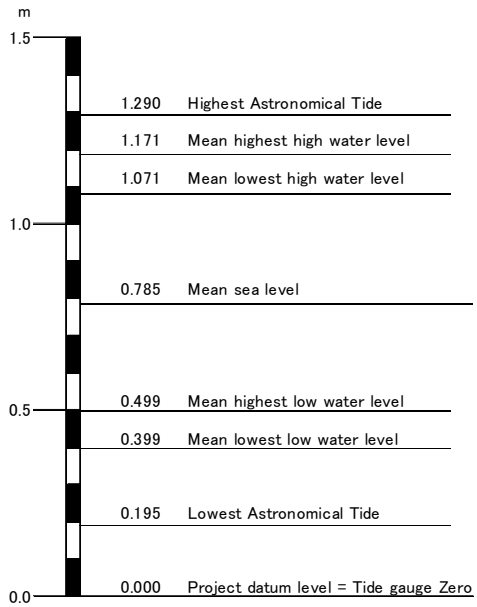


Figure 1.2-7 Tide Condition at Honiara Port

(6) Wave

For wave conditions adjacent to Honiara Port, the forecasting method and results of wave analysis are shown below. (for more information, refer to Appendix 6.2)

1) Methodology of Wave Analysis

Waves intruding to the objective site can be classified as Figure 1.2-8 shows, i) waves generated in South Pacific Ocean and ii) waves generated in New Georgia Sound. Waves generated in South Pacific are incoming from Indispensable Strait located between Santa Isabel Island and Malaita Island and arrive to the site (off Honiara Port) being affected by the shelter consisted of Florida Islands. While, the waves generated in New Georgia Sound propagate to the site directly. The waves to intrude to the offshore of Honiara Port were obtained by combining above two waves. In this report, each normal waves and stormy waves (design wave) were analyzed by this methodology. The forecasting flow is shown in Figure 1.2-9.

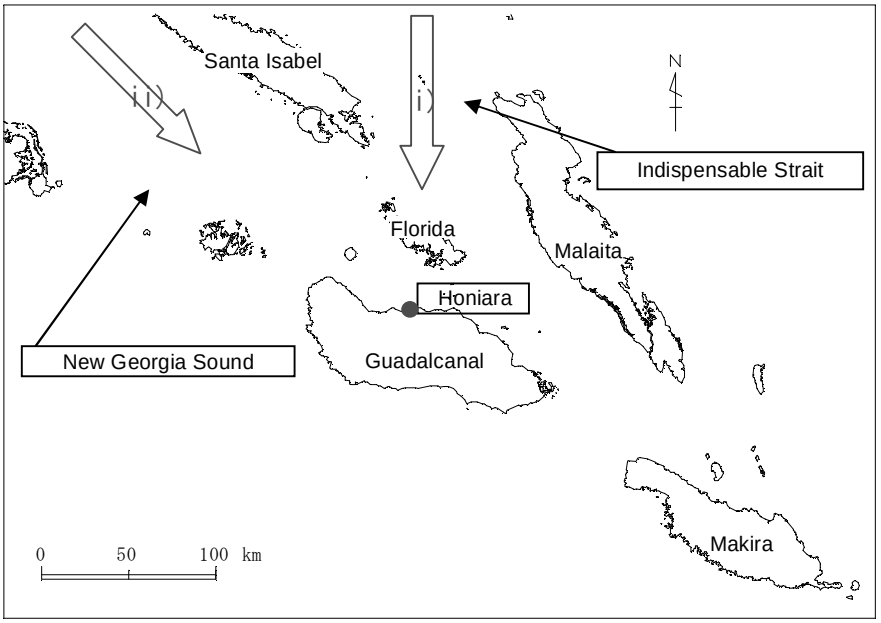


Figure 1.2-8 Waves Generating Area

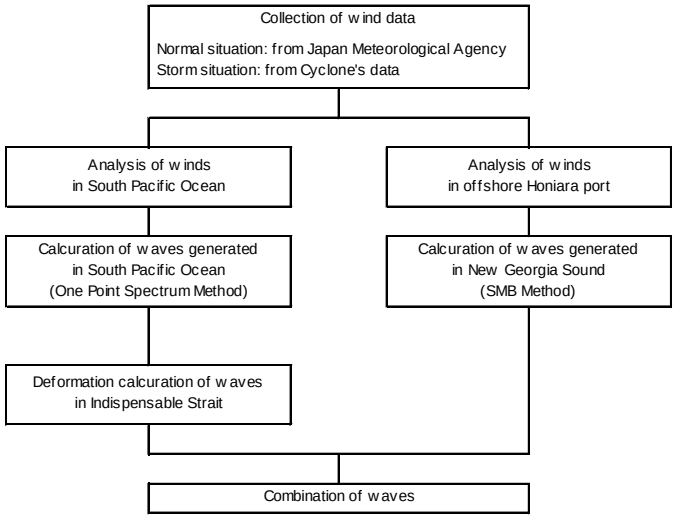


Figure 1.2-9 Wave Analysis Flow

2) Normal Wave Forecast (off Honiara Port)

Wave direction distribution of normal waves in offshore Honiara Port is shown in Figure 1.2-10. Frequency of occurrence of ENE and NNE waves is high throughout a year and occupies about 76%. These are relatively calm waves with 1.0m wave height or less. Less often, NW or WNW waves with 1.5m wave height or more arrive from December to February.

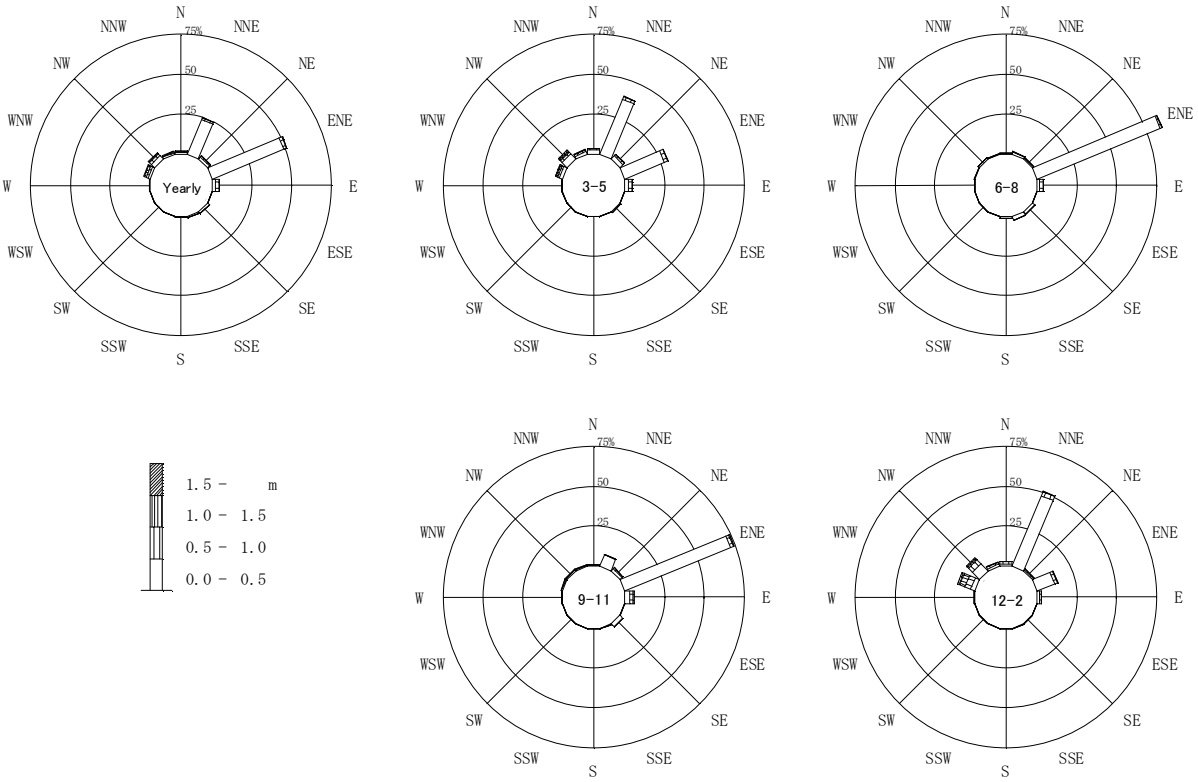


Figure 1.2-10 Wave Rose (off Honiara Port, 2002 to 2006)

3) Stormy Wave Forecast (Design Wave)

The project site is affected by cyclone waves generated in South Pacific Ocean. Here, wave at the time of cyclone was studied using the same method with wave analysis of normal wave. The design wave forecasted in the offshore of Honiara Port is shown in Table 1.2-1.

Table 1.2-1 Dimension of Design Offshore Wave at Honiara Port

Wave Height (H)	3.66m
Period (T)	6.7s
Wave Direction	NW to N

(7) Topographic and Bathymetric Survey

The results of topographic and bathymetric surveys around Honiara Port is shown in Figure 1.2-11. As the result of cross-section survey in berth planning area, the survey lines are shown in Figure 1.2-12, and the results are shown in Figure 1.2-13. These data are indicated on the basis of the Project Datum Level (D.L.).

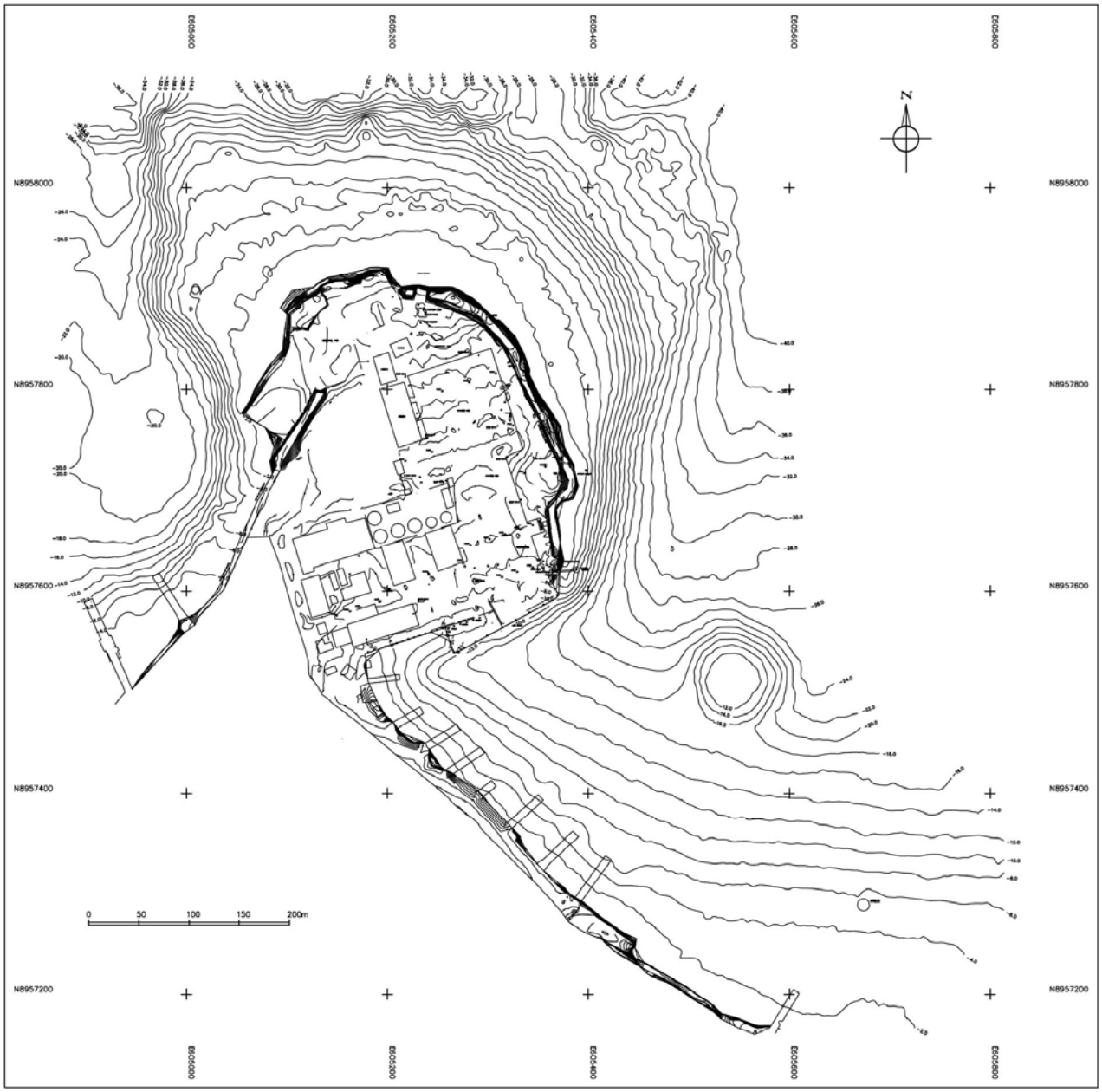


Figure 1.2-11 Topographic and Bathymetric Map

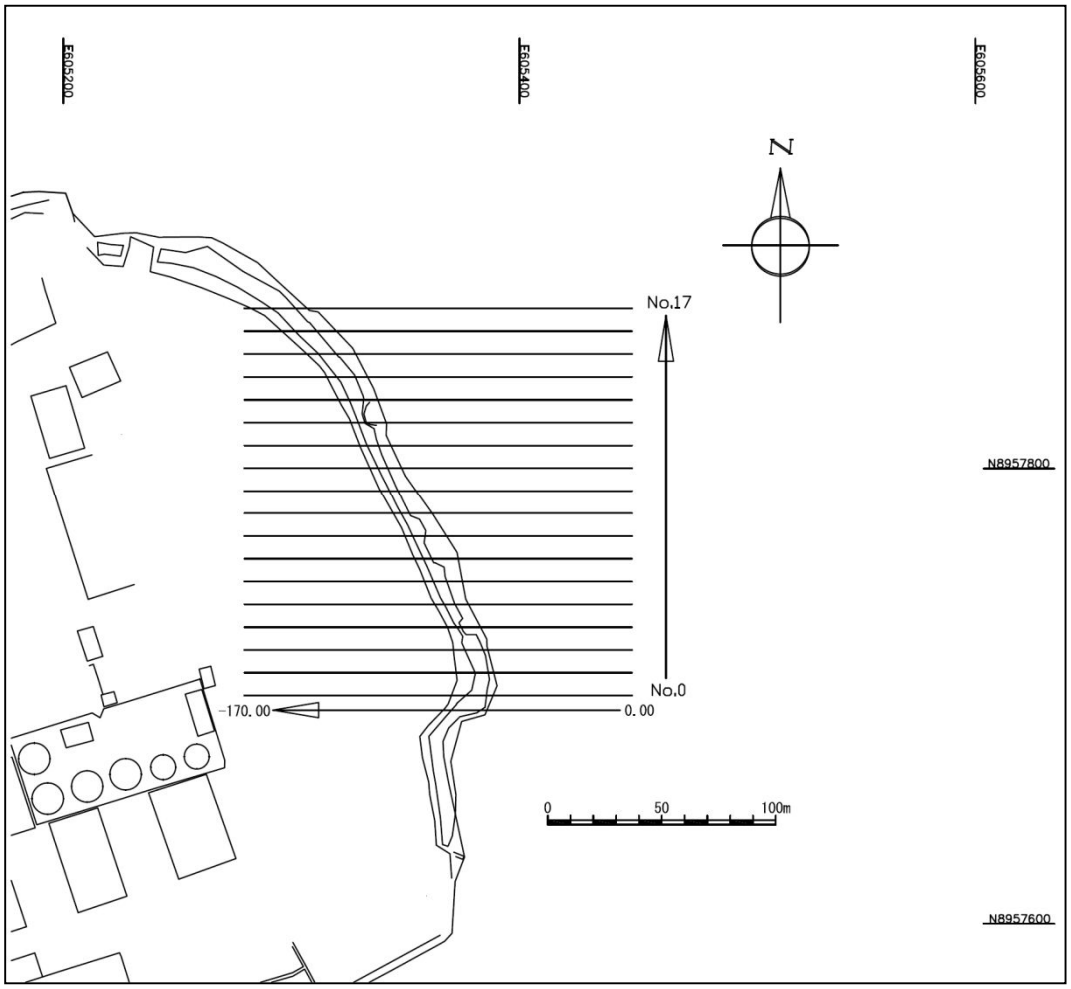


Figure 1.2-12　Survey Line for Cross Section

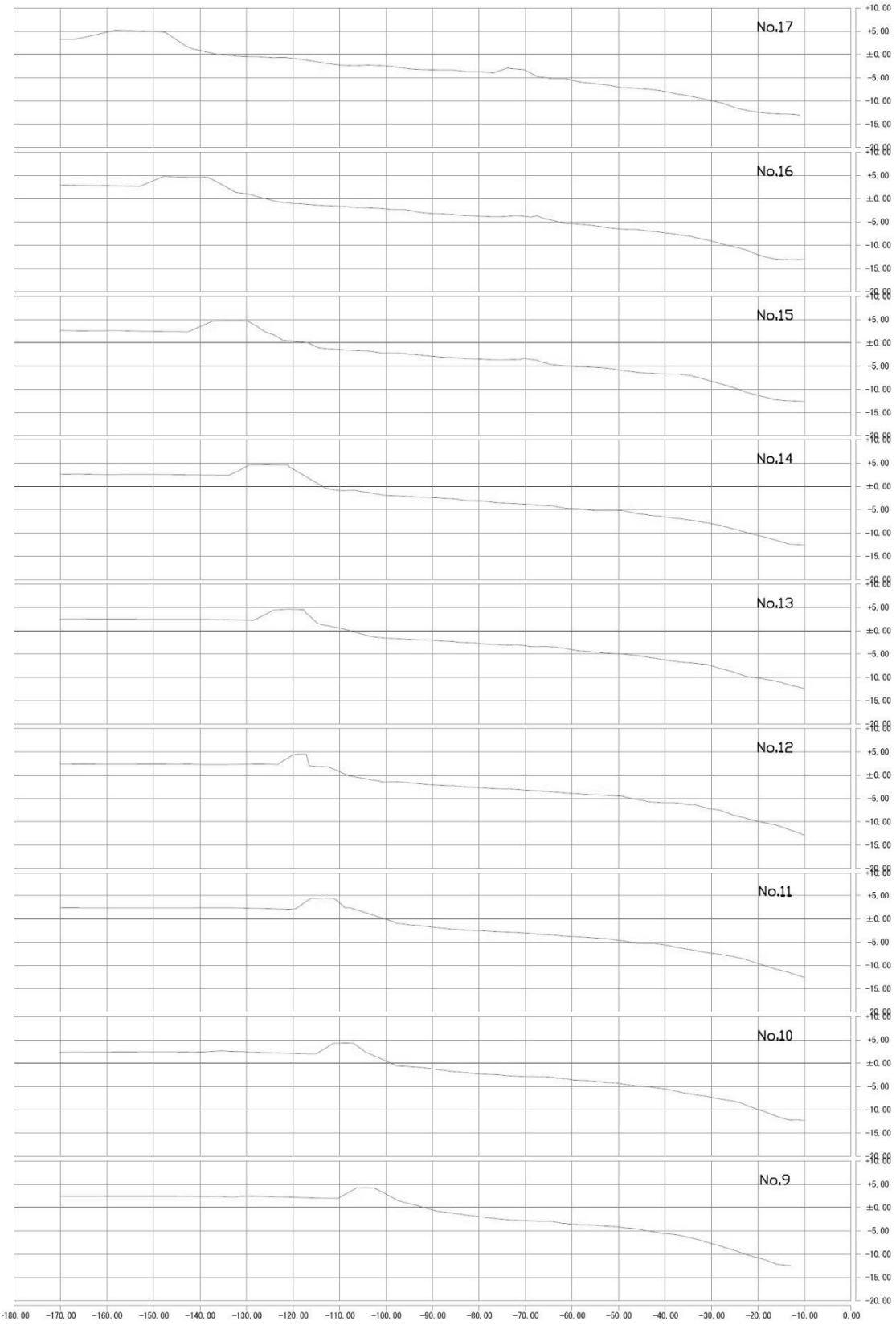


Figure 1.2-13(1)　Cross Section (No.17 - 9)

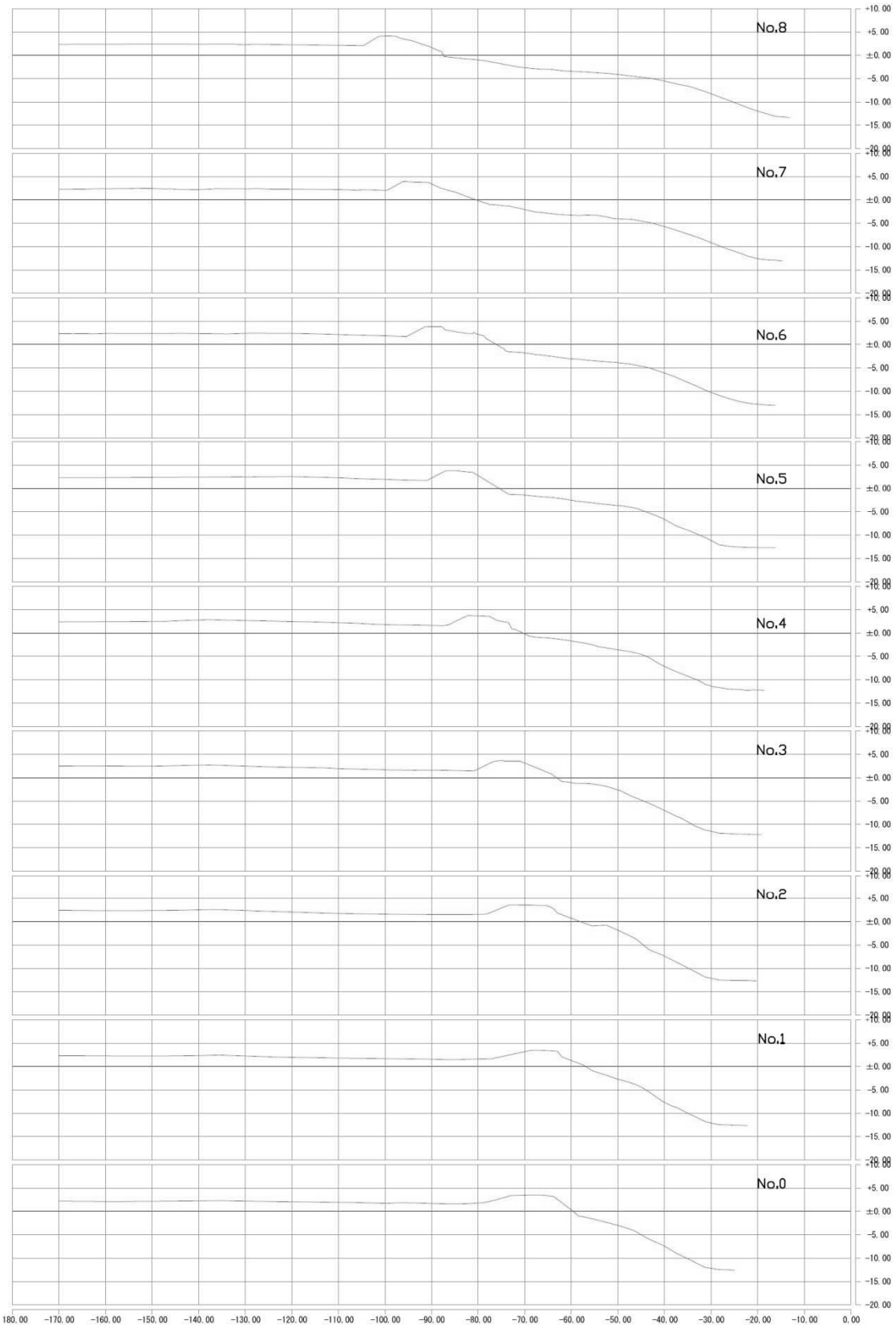


Figure 1.2-13(2)　Cross Section (No.8 - 0)

(8) Magnetic Survey

The area for the magnetic survey is shown in Figure 1.2-14. The unexploded ordnance (UXO) is scanned by a research vessel equipped with a proton magnetometer and side-scan sonar in the north-south direction of the east side of Point Cruz peninsula, including the berth planning site. The suspicious objects that have been discovered by these surveys were directly checked by divers.

As the result, UXO was not discovered in this area.

Figure 1.2-14 Magnetic Survey Area

(9) Soil Investigations

Boring investigations were carried out at 8 points of marine boring (BH-1 to BH-8) and 2 points of land boring (BH-9 to BH-10). Boring location map is shown in Figure 1.2-15. BH-1 to BH-4 correspond to be the berth face line positions and BH-5 to BH-8 correspond to be anchor pile positions. The boring log is shown in Figure 1.2-16.

For two locations of land boring, the soil up to a depth of about 5m from the current surface is composed of landfilled soil. There is no clear relevance to the properties of each point. Some clay layer in BH-3 and BH-2 is found but, as a whole, coral sand and silt mixed gravel has become the trend. Depending on the situation of the gravel and tightness of sandy soil, there exist the layers that banked up like sandwich with a soft layer of 10 or less and a solid layer of 50 N value or more.

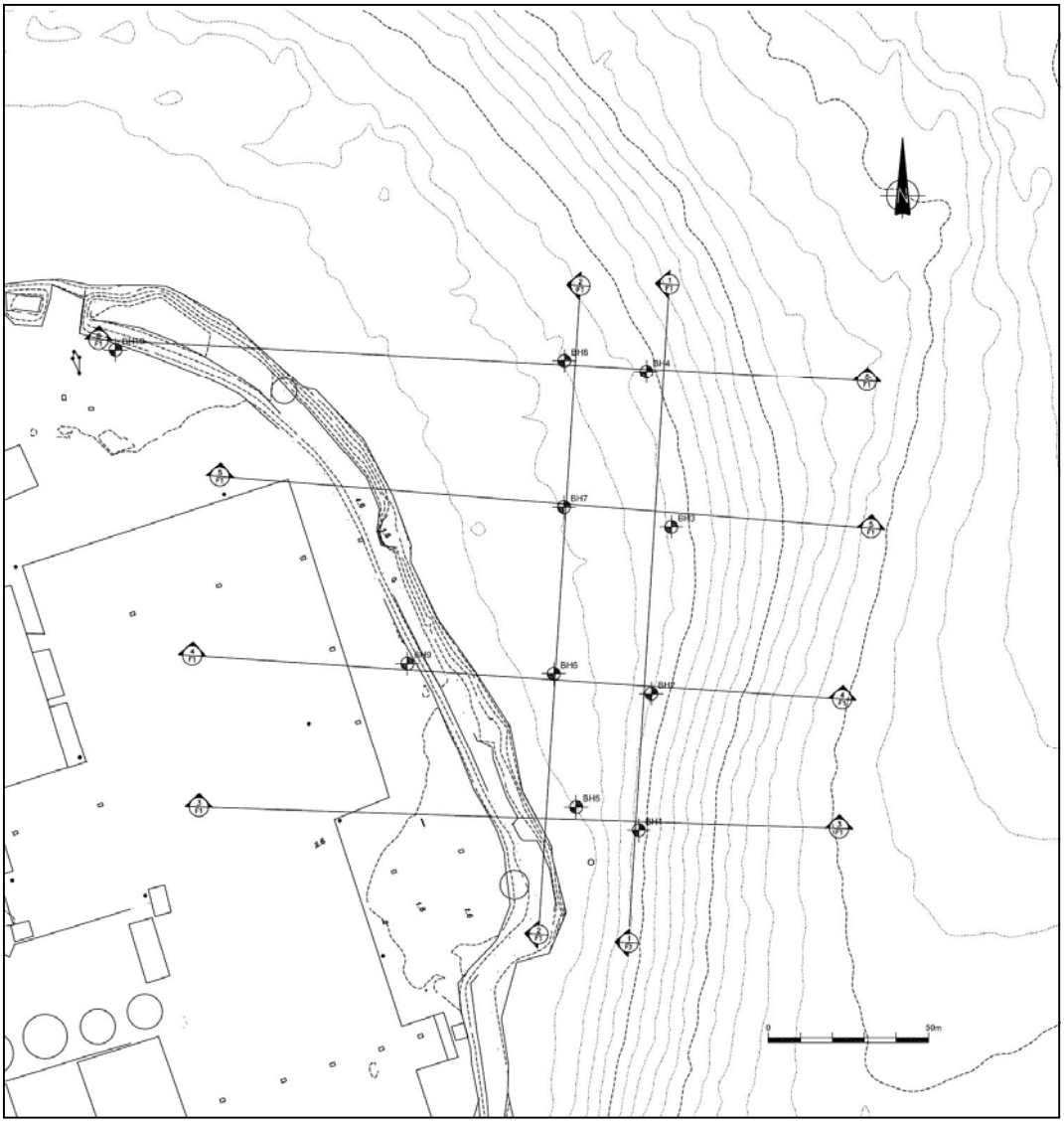


Figure 1.2-15 Location of Boreholes

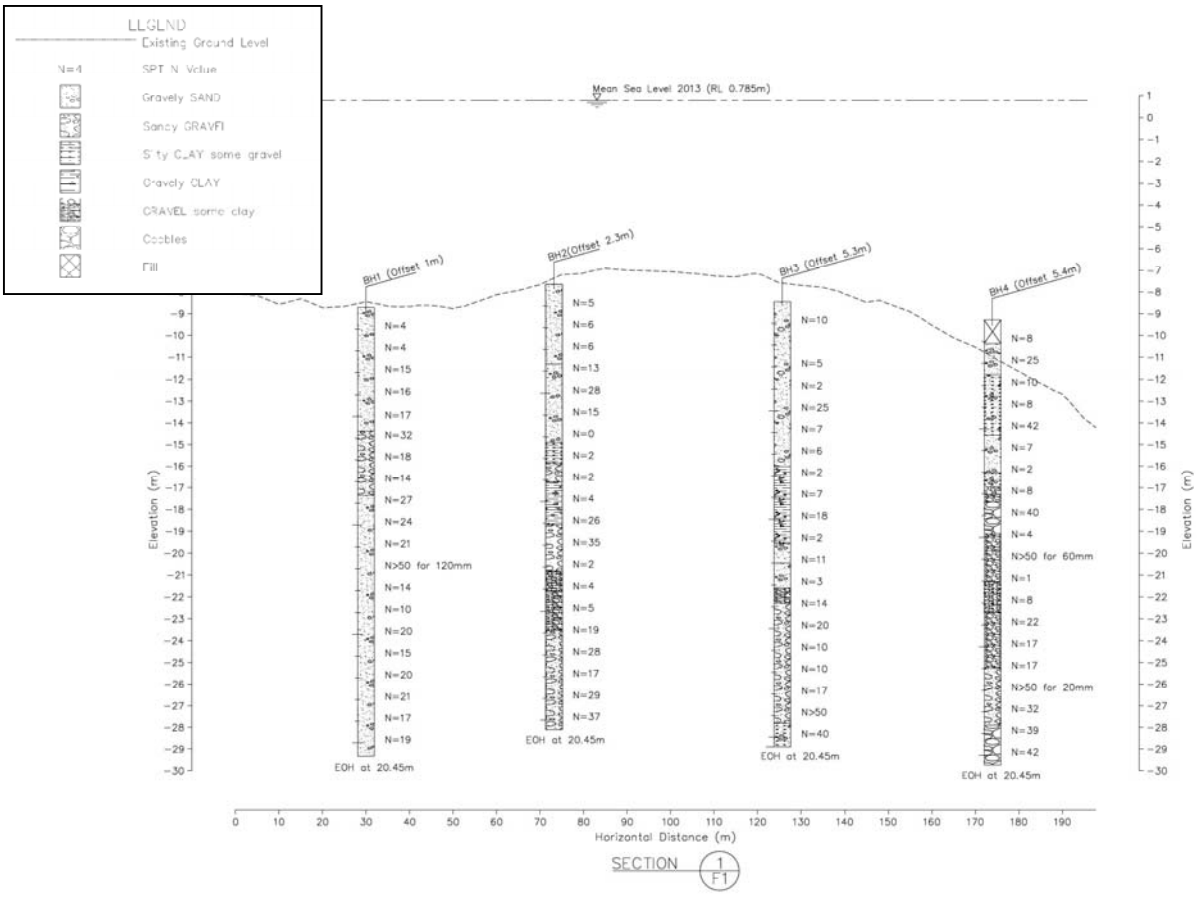


Figure 1.2-16(1)　Results of Soil Investigations (BH-1 to BH-4)

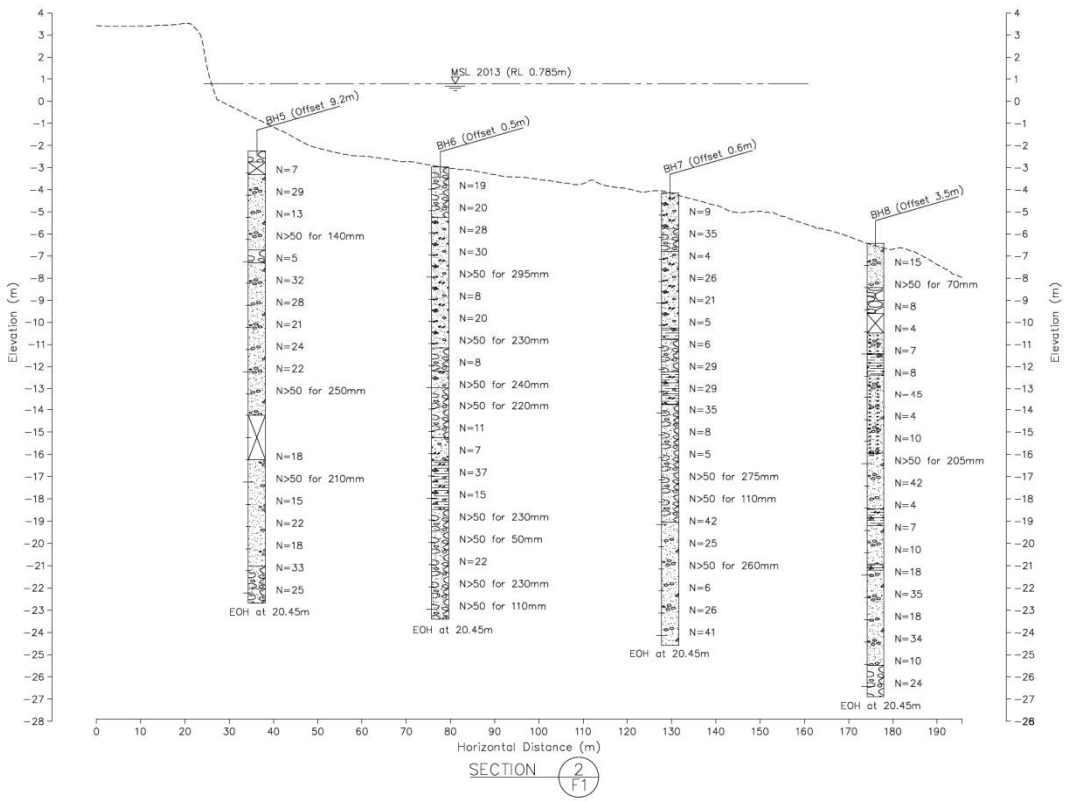


Figure 1.2-16(2)　Results of Soil Investigations (BH-5 to BH-8)

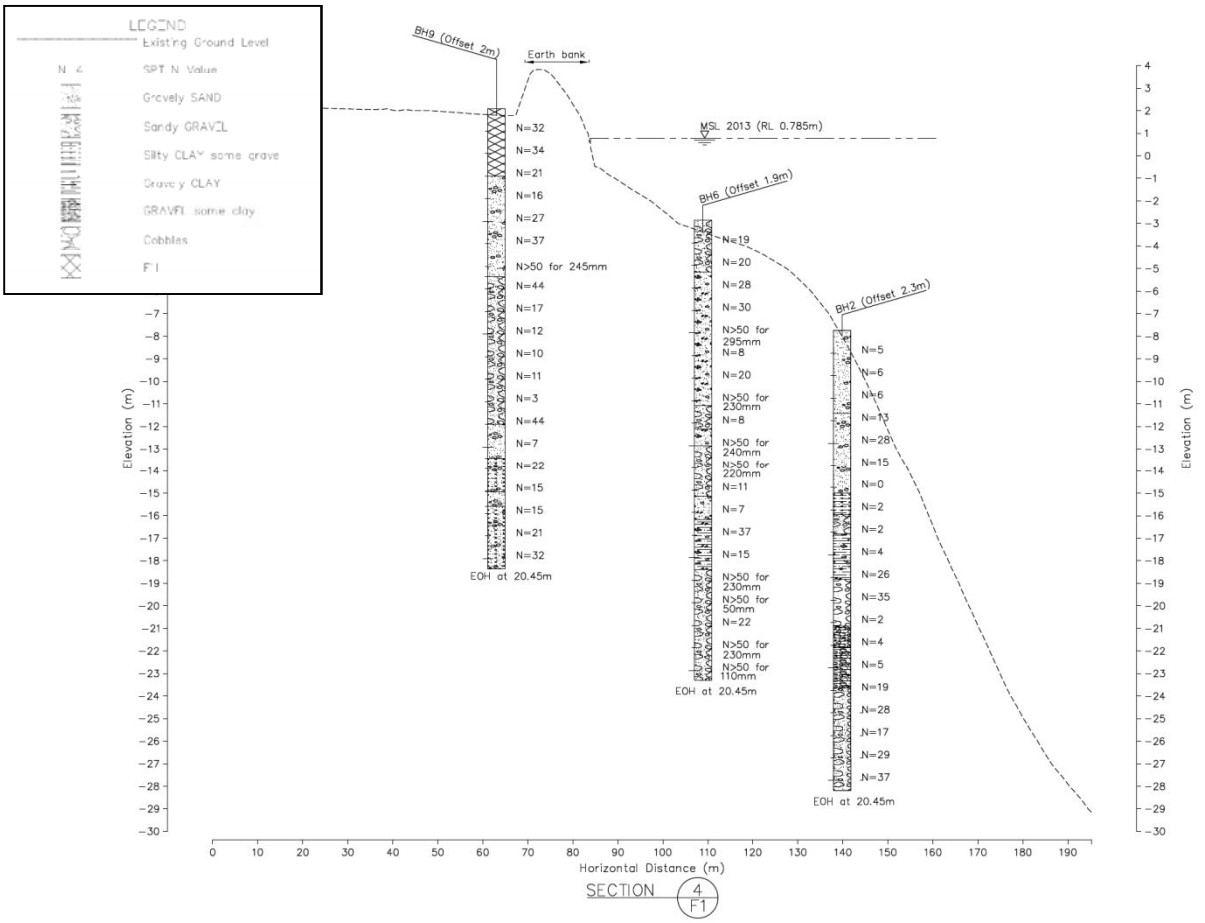


Figure 1.2-16(3) Results of Soil Investigations (BH-9)

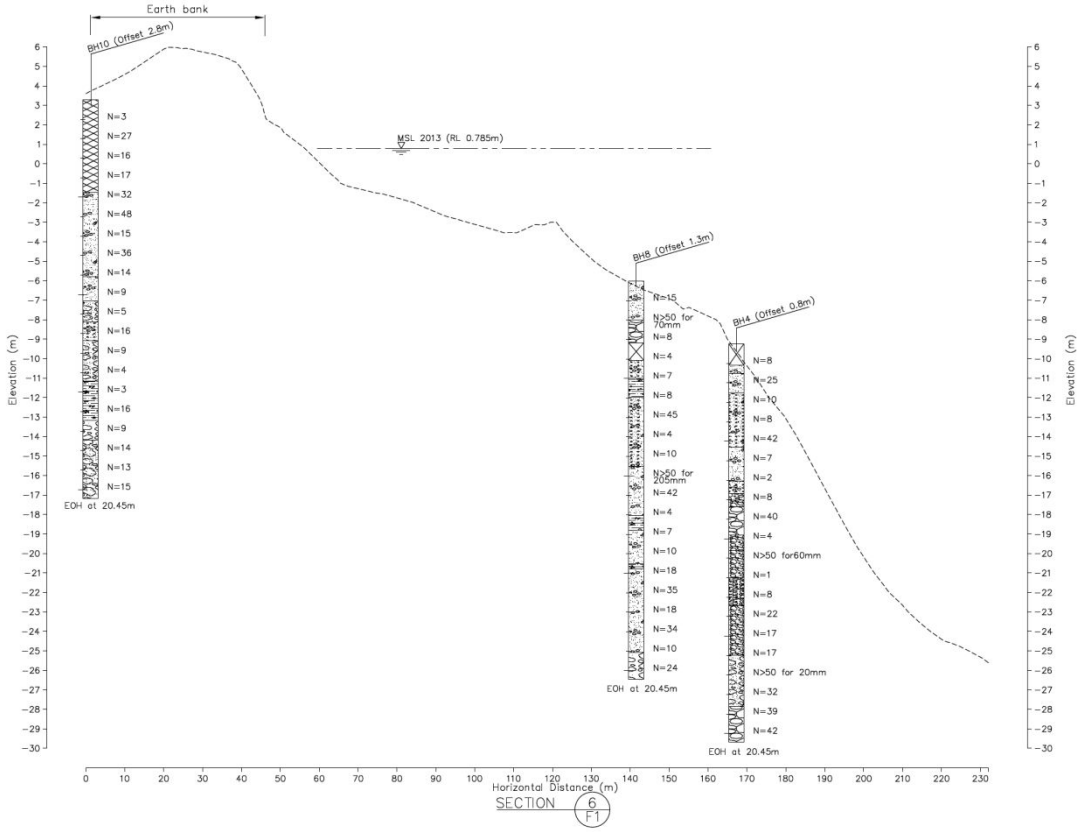


Figure 1.2-16(4) Results of Soil Investigations (BH-10)

(10) Seabed Material (Sediment Survey)

For the project area to be dredged, bottom sampling at the two points was taken out and the grain size analysis was conducted. Sampling points are shown in Figure 1.2-17, and the result of grain size distribution analysis is shown in Figure 1.2-18.

According to this analysis, since grain size distribution of SD1 is uniform, it is less suitable by itself as landfill material. SD2 is varied and can be used as landfill material. From the view point of liquefaction measures by the earthquake, it is necessary to pay attention to the quality control.

Figure 1.2-17 Sampling Points of Seabed Material

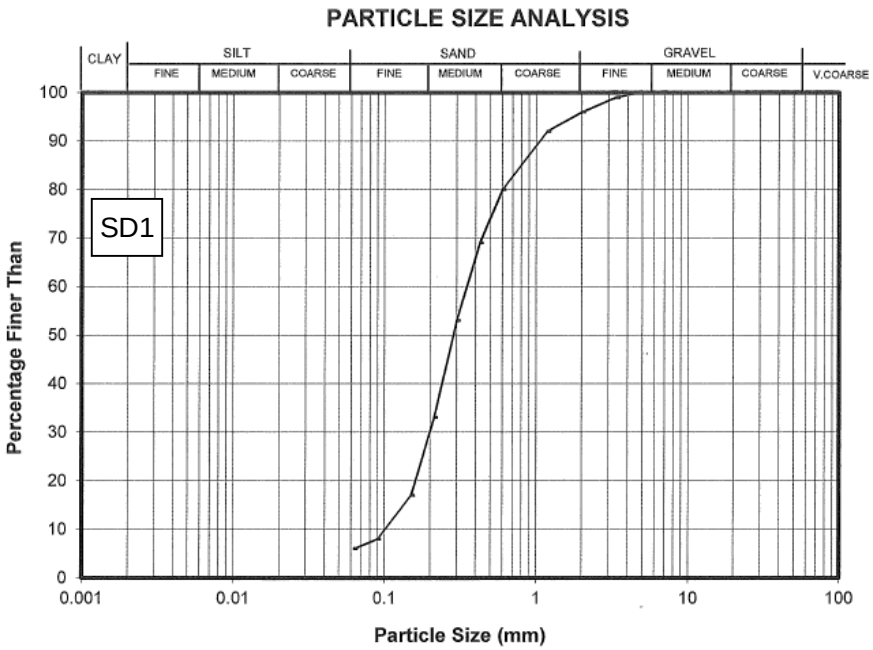


Figure 1.2-18(1) Grain Size Distribution (SD1)

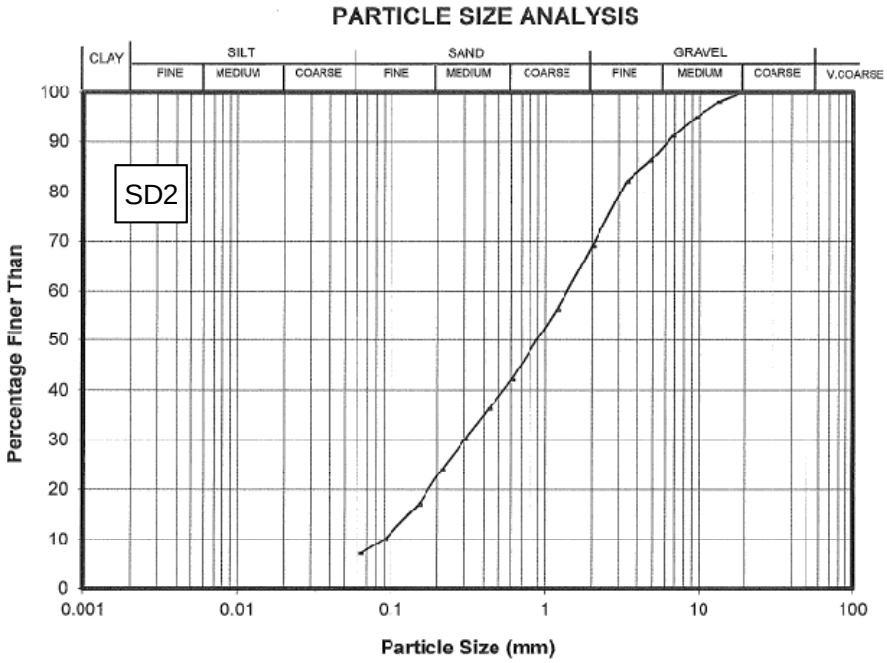


Figure 1.2-18(2) Grain Size Distribution (SD2)

(11) Construction Material (Material Survey)

Landfill material was collected in the stockpile of SIPA. This materials are procured from the basin of Lunga River. The test results are shown in Figure 1.2-19. This material is considered to be suitable as landfill material for the project.

Items	Unit	
Particle size distribution		Sandy GRAVEL mixed with trace coral/shell fragments, a trace of silt
Specific Gravity	t/m3	2.7
Unit Mass	kg/m3	1,850

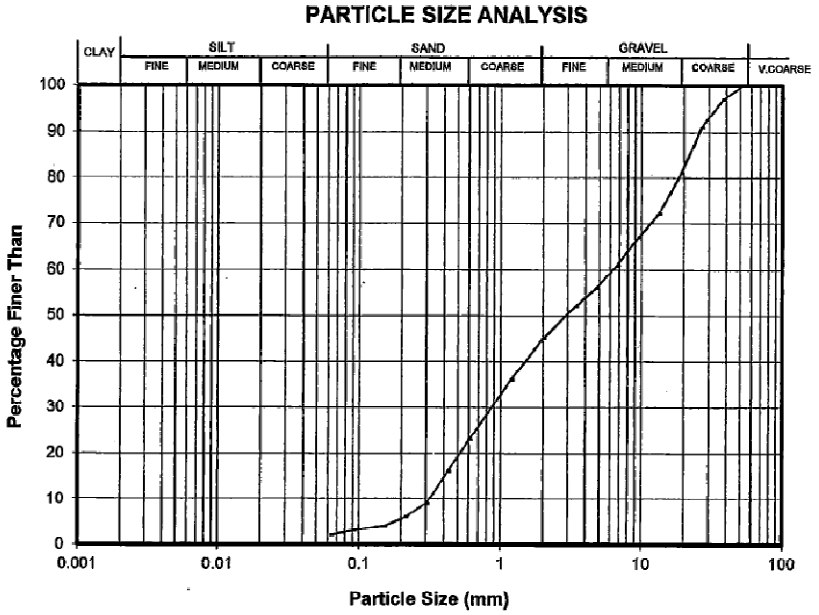


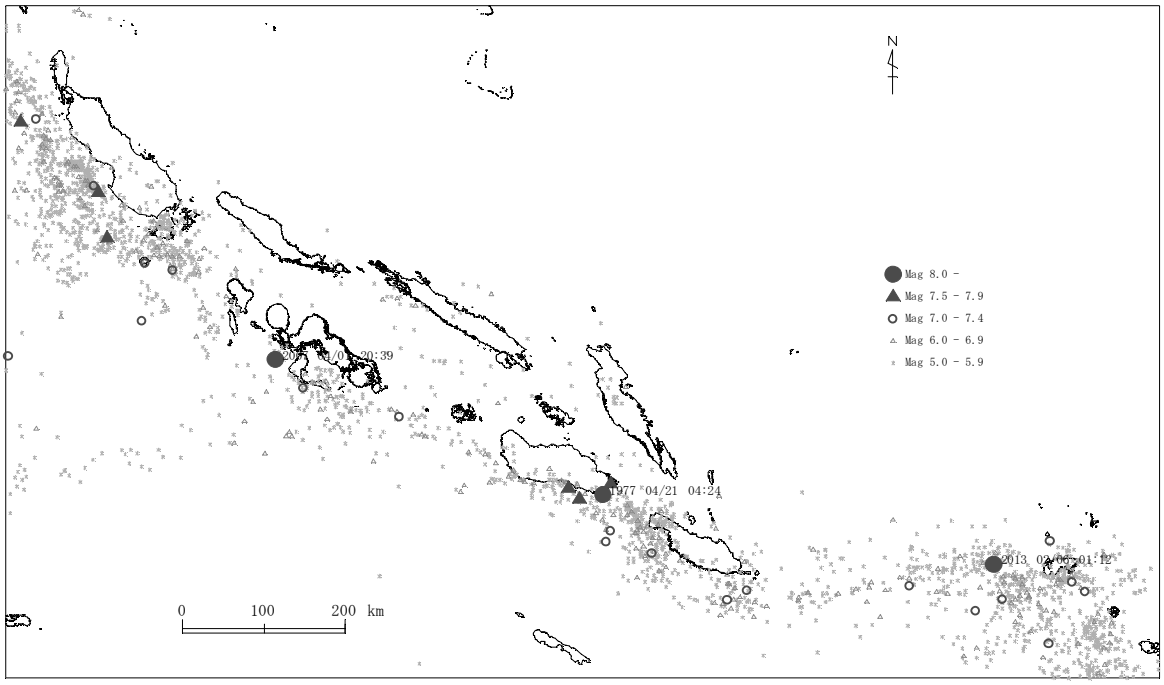
Figure 1.2-19 Result of Material Survey

(12) Earthquake

Distribution of earthquake center occurring around Solomon Islands is shown in Figure 1.2-20. Solomon Islands is located at the boundary of the Australian Plate and Pacific Ocean Plate, corresponding to the same earthquake country as Japan. According to the U.S. Geological Survey (USGS), earthquakes with the magnitude 7.5 or greater have occurred 22 times in the north, south, east and west within 1,000 km around Honiara, since 1973.

Earthquake with the magnitude 8.0 occurred in the vicinity of Nendo Island in February 2013 and the earthquake with the magnitude 8.1 occurred in the vicinity of Gizo Island in April 2007, which killed many people by the Tsunami. In addition, between April 20 and 21 1977, earthquake with the magnitude 7.5 occurred three times continuously in the vicinity of Guadalcanal, the damages caused by landslides have been reported in northwestern islands.

The damage to the structure by the recent earthquake has not been reported in Honiara and adjacent area, but the countermeasure for earthquake is considered at the design stage.



Source: U.S. Geological Survey

Figure 1.2-20 Earthquake Distribution around Honiara (January, 1973 to May, 2013)

1-3 Environmental and Social Considerations

The EIA study was carried out based on JICA Guidelines for Environmental and Social Considerations (April, 2010) (hereinafter referred to as "JICA Guidelines") in the Preparatory Study (No. 1) on the Project for Improvement of Honiara Port Facilities in Solomon Islands between August and September in 2012 (hereinafter referred to as "Preparatory Study (No. 1)".

The Preparatory Study (No. 1) report had indicated that the project might cause serious impact on the coral reef, which led to the coral survey on Preparatory Study (No. 2). The results were considered to be unnecessary to change Category B. Therefore, in this Study, the studies were conducted according to the procedure of Category B.

Category: B

Reason of Categorization:

The project is not considered to be a large-scaled port project, is not located in a sensitive area, and has none of the sensitive characteristics under the JICA Guidelines. It is not likely to have a significant adverse impact on the environment.

(1) Project Components

The project is to construct new international wharf and upgrading facilities at the existing Honiara Port. The project components which may affect environment are shown as below.

* Construction of Berth (150m)
* Construction of Revetment (125m)
* Dredging in front of Berth (11m water depth) and Filling (17,000 m^3)
* Installation of Mooring Dolphin (2 units)
* Pavement of Container Yard (Area: 10,500m^2)
* Auxiliary Facilities: Water Supply Facility, Lighting Facility and Beacons

(2) Environmental and Social Conditions as Baseline

The baseline of the project is shown in Table 1.3-1, information required for scoping works about social environment, natural environment and pollution in and around Honiara Port.

Table 1.3-1 Description of Project Site

Present Situation		Description
	Affected People/ Related People/ Group: (Livelihood/ People/ Gender/ Residents / Informal Settlers/ NGOs/ Poor People/ Indigenous	・Solomon Islands consists of more than 300 islands (only islands where people live), including Guadalcanal Island where the capital, Honiara, is located. According to the 2009 census, Solomon Islands have a population of 515,870, which is gradually growing. The population of Guadalcanal Province and Honiara City are respectively 93,613 and 64,609.

Social Environment	People, Ethnic Minority and Socially Vulnerable Groups/ People's Awareness to the Project, etc.)	・The urban population is 101,798 (19.7%) in the whole country. The population growth rate in the whole country and urban area is 4.7% and 2.3% respectively. The male-to-female ratio of population is almost fifty-fifty, and the ratio of people who enroll in school is also almost fifty-fifty (male: 82.8%, female: 83.9%). ・As a whole, the status of women is inferior to that of men. According to a speech for national development policy in 2008, elimination of gender disparity in education and employment is addressed as one of the major goals and indicators. ・While the official language is English, there are more than 80 original languages in the whole country and Pidgin is the common language among tribes. ・Melanesian people comprise 94.5% of the population, with the rest including Polynesian, Micronesian, and Chinese. About 97.5% of the people are Christians. ・The residential area is isolated from the Project Site.
	Land Use and Local Resource Utilization: (Urban Area/ Rural Area/ Industrial and Commercial Area/ Historical Area/ Scenic Spot/ Fishing Ground/ Seaside Industrial Zone/ Historical Legacy, etc.)	・An ownership pattern of land and surrounding sea area in Solomon Islands is either national land (Crown Land) owned by the Government or Customary Land owned by individuals or tribes. Crown land can be freely used by paying money for the government agency (Commissioner of Lands) and registering. ・Solomon Islands Port Authority (SIPA) acquires the rights to use the Project Site and surrounding land and sea areas, all of which are currently crown land, with an apply to the government agency. SIPA also leases a part of land within Point Cruz, of which SIPA has a right of use, to a private company, Bowman's Hardware. ・According to interview surveys with Department of Fisheries and Marine Resources (DFMR), SIPA and Honiara Market, there are no fishing activities around the Project Site. In Guadalcanal Island, fishing ports are located in Tenaru and Doma area.
	Local Infrastructure/ Social Organization: (Decision-making Organization of the Area/ Education/ Transportation Network/ Drinking Water/ Well, Reservoir, Water Supply/ Electricity/ Sewage System/ Wastes, Bus and Ferry Terminal, etc.)	・Solomon Islands is located between latitude 5 and 12 south and longitude 154 and 172 east, composed of major six islands and others of various sizes. Total land area is 28,400km^2 (about twice as large as Iwate Prefecture, Japan). ・The capital city is Honiara, located at Guadalcanal Island (5,400km^2). ・Solomon Islands has suffered from an enormous economic shock caused by a situation under which government agencies have not functioned normally and basic social service has not been provided due to an ethnic conflict originated from a boycott of off-islanders from Malaita Island by Guadalcanal islanders. While it has currently almost pulled out of its direct impacts, maintenance of basic infrastructures such as roads, electricity are still in delay and various services provided by the government remain on a low level. ・While urban water supply and sewerage systems are managed by Solomon Water, water supply rate is low and poorly runs in Solomon Islands. The water supply rate in the capital, Honiara City, remained at 72% in 2011. The city cannot supply stable water due to old pumps, and also almost two-thirds of contractant is supplied water only for a few hours in a day.

		・While Solomon Water supplies water to 4 cities, namely Honiara, Noro, Auki, and Tulagi. Honiara City accounts for nearly 90% of total population with water supply. ・The south side of Honiara Port faces downtown Honiara City. In the downtown, a row of shops and offices stand along the main road (Mendana Avenue) running in parallel with the coastline. In the interior, there is a residential area for local people surrounded by green spaces. Also, there are the National Referral Hospital and the University of the South Pacific (Honiara Campus) on the east side of the Mataniko River. The closest school is Bokonabera primary and secondary schools, which is about 1.2 km distant from the site. ・SIPA has its own clinic in the site, which is used by the port workers. There are not any other social services in the site.
	Economy: (Agriculture/ Fishing/ Industry/ Commerce/ Tourism, etc.)	・The GNI per capita in Solomon Islands is US$ 1,030 (2010), which makes the country belong to the least developed countries. ・While Solomon Islands is abundant in domestic resources compared with other island countries in the Pacific Ocean, the country has fallen behind in the progress of development. ・Since the export of gold has been stopped since 2000 due to the tribal conflict, the major exports are limited to agricultural and fishery products such as timber, fish, copra, and cocoa. The percentage of GDP accounted for by primary, secondary, and tertiary industries are 36.1%, 9.2%, and 54.7 %, respectively. ・Only 23% of the population with over 14 years of age are employed laborers. 85% of the population is engaged in a food production for self-sufficiency, which is the main economic activity in villages of Solomon Islands. ・Timber exports have increased since the end of the tribal conflict (mentioned above), and Solomon Islands deeply relies on forestry for its current economic well-being. ・While there is no statistical data on the fish catch for domestic consumption, there is a record of the catch for export since 2002 in Solomon Islands. According to it, the export volume of fish had been increasing since 2008 in spite of substantial fluctuations every year, and in 2011 it reached a record high of 1,027,339 kg, SI$ 17,632,134 (Solomon Islands Government, 2011).
	Nation's Health and Hygiene: (Infectious Disease such as Disease/ HIV/ AIDS, Hospital, Sanitary Custom, etc.)	・In Solomon Islands, the malaria infection rate is high and especially the rate of falciparum malaria, which usually gets patients become severe, accounting for 60 - 70% of the total. The mortality rate from malaria is higher than that of other diseases, accounting for 11.7% of cause of death in Solomon Islands, in second place after cancer. In addition, it led to an increase in malaria morbidity that the country had been forced to suspend a struggle with malaria by the outbreak of the ethnic conflict in late 1998. ・In the clinic in the port, malaria patients are sometimes transferred. However, it is difficult to see that the construction of the wharf and business activities in the port increase the risk of malaria infection because malaria is not an uncommon disease in Solomon Islands as mentioned above.
	Geographical Feature and Geology: (Steep Slope/ Soft Ground/	・Most of major islands belonging to Solomon Islands are the origin of volcano. The country has the highest Mt. Popomanaseu (2,440 m) on Guadalcanal Island as well as

Natural Environment	Wetland/ Fault, etc.)	some lowlands which are covered by seawater at the time of high tide, which make the land rough. ・Annual rainfall is more than 3,000 mm. Because of subtropical climate and the soil of volcanic origin, the forests are developed with abundant timber resources. Because of the steep terrain, cultivable land area composes about 12% of the national land. On the other hand, for the vast economic zone of 163 million km^2 fisheries resources, especially bonito and tuna are abundant. ・ Point Cruz, where the Honiara Port is located, was constructed by reclaiming the shallow water area of coral reef, and its ground elevation is about the same height as the container yard. ・In the eastern areas where the new wharf has been expected, a coast, sub-linear with 150 m in length, is formed. In this coastal area, a sea wall is installed for prevention of overtopping waves, the crown height of which is about +2.0 m from the container yard behind.
	Fauna, Flora and Habitat: (Protected Area/ National Park/ Rare Species/ Mangrove/ Coral Reef/ Aquatic Life, etc.)	・The Honiara Port is located in Point Cruz jutting into the north side of Honiara City, of which the coastal terrain forms a coral reef. A patch of rocks on the sand area is seen in the coral reef of the planned construction site for the new wharf, a part of which is covered with reef-building corals. In addition, near the planned construction site for the new wharf, there are two 5-meter-high trees and herbaceous species of coastal vegetation growing on. ・A mangrove ecosystem is diverse and 13 families, 15 genera, 26 species of mangroves' growth are observed in the coastal areas of Solomon Islands, which accounts for 43 % of the world's mangrove species. In addition, mangrove forests occupy about 62,200 hectares on the total five islands, Isabel, Rennell, Short Land, Malaita, and New Georgia. ・76 genus and 485 species of reef-building corals grow on the same coastal area where coral diversity is the second highest in the world. While damages caused by bleaching have been small since 2000, acanthasters' feedings are seen at several points, which lead to severe damages to the coral reef. The Rapid Ecological Assessment (REA) on coverage of the coral reef was conducted in 2004 and was surveyed bottom sediments with about 5,000 m^2 at each point of 59 fringing reefs (including reef slope, reef ridge and reef flat) in the surrounding sea areas of Solomon Islands, which showed that about 32% of the study site is covered with over reef-building corals. ・Near the coast area there are not paved roads, and annual herbaceous species grow on the soil. ・The trees with height of about 5 meters grow one by one each of the eastern and western ends of the planned construction site for the wharf. ・On the wave armor blocks (Dolos) adjacent to the planned construction site, several young colonies of staghorn coral with a width of about 10 cm are observed. ・There are no national parks, World Heritage sites, and marine protected areas around Honiara Port. As protected areas supported by the government, there are three types as below.

		1.East Rennell Lake Ferano (World Heritage site) 2.Arnavons Conservation Area (marine protected areas on Isabel and Choiseul Islands) 3.Tetepare Islands (marine and terrestrial protected areas rooted in the community) While there are 130 locally-owned small sanctuaries called as Locally Managed Marine Area (LMMA) other than those mentioned above, there is no this type of areas around Honiara.
	Coast and Sea: (Erosion/ Sedimentation/ Flow / Tide/ Water Depth/ Ocean Current, etc.)	・As water depth increases sharply at the offshore of the second wharf of the Honiara Port, it is difficult to install a breakwater to prevent sea waves. As a result, an appropriate use of the wharf against the waves occurring in the front ocean is required. ・Two rivers on the east side of Point Cruz, Mataniko River and Lunga River, affect Honiara Port (there is no such rivers found at the periphery of the west side). However, as a result of the observation survey of the coastline on the east side, an area where wave armor blocks were installed due to coastal erosion is observed. Therefore, it is expected that sediments which are discharged from the two rivers do not reach the periphery of Honiara Port. In addition, as a result of measuring the water depth along the International Wharf, any area where the depth is especially shallower is not observed, and it can be seen that the sediments do not reach the wharf. ・It can be thought that littoral drift from the west are deposited around the for the patrol boat base which is topographically located in the inner part of the Port. Sandy beach is formed in these waters. It is assumed that the sediments of this sandy beach are not transferred to Point Cruz, jutting in the shape of a peninsula, and deposited there. ・In addition, because water depth increases sharply at the offshore and the transfer of sediment from the offshore cannot be considered, it is expected that water depth change by the sediments deposited in the waters in front of the wharf which has been proposed shall not occur. ・There is neither underwater obstacles which may hinder sailing of container ships nor restrictions related to the access channel and water basin in the offshore areas of Point Cruz.
	Lake, River System, Seashore/ Climate: (Water Quality, Flow, Precipitation, etc.)	・Average annual precipitation in Solomon Islands belonging to tropical maritime climate is 2,500 - 4,000 mm, which make the country hot with heavy rain. The average amount of rainfall decreases during July to October, with the fewest in September. The amount of rainfall increases during December to April, with the most in January. The average annual rainfall is 2,035 mm. ・The temperature in Honiara is almost 31°C throughout a year. Fog is not observed so often at the coast of Honiara. ・As for ocean waves at Honiara Port, easterly Trade Winds prevail from April to November. Ocean waves generated by Trade Winds are about 50 cm at the highest. On the other hand, while Solomon Islands has a high risk of occurrence of cyclones from November to March, surrounding areas of Honiara are not struck by cyclones so often (about once to twice a year, passing near the areas). Swells generated by cyclones in the waters around Palau affects Honiara as

		westerly waves (about twice a month). As a result, a seawall was constructed and covered with wave armor blocks (Dolos) at the western waters which suffered from rough waves. Although there is no impact on large container ships, they affect small ferries travelling between islands. They also affect the coastal areas. In fact, the high waves of 2 - 3 meters in September, 2008, caused damages such as overtopping waves to the domestic berth and the coastal areas. ・According to a report by the National Disaster Office, 10 deaths in the northwestern part of Guadalcanal Island have been reported which were caused by a landslide at the time of the earthquake in 1977. Therefore, there is a need to respond to an earthquake.
Pollution	Present Pollution: (Atmosphere, Water, Sewer, Noise, Vibration, etc.)	・At Honiara Port, garbage is floating in the gap between the containership hull and the quay wall. In addition, drums are scattered and oil puddle near the Dolphin. Garbage is accumulated at the planned construction site of the new wharf. Sanitary condition is terribly bad in the toilet (only one) at the Port. ・A lot of household and industrial wastes are scattered especially at the planned construction site of the new wharf. It is said that a part of the wastes has drifted from the Mataniko River about 1 km east of the site. In addition, the waste disposal site near the airport is filled with bad odor and smoke. ・Scattering of wastes and wastewater and the unsanitary toilet cause bad odor at one part of the site. ・Near the existing international wharf, contamination of surface water caused by oil leaking from ships can be observed at some places. ・Even though noises from heavy machinery are constantly heard in the Port, any worker has not fallen sick with the noise and vibration so far (from an interview with the SIPA clinic). ・Monitoring survey of noise and vibration has not been conducted very much and there are no standards and past data on them in Solomon Islands (from an interview with the Ministry of the Environment).
	Complaint which People Make the Biggest Concern	No information
	Countermeasures against Pollution: (Measure on Systems such as Rules/ Compensations)	・There are some environmental Acts and by-laws adopted in Solomon Islands and Honiara City as shown below. 1. Environment Act 1998 2. Environmental Health Act 1980 3. The Honiara (Refuse Disposal) By-law 1995 4. The Honiara Litter By-law 1994 5. National Solid Waste Management Strategy and Action Plan 2009 - 2014
Others	---	---

Notes: The table was compiled based on the information which JICA Study Team collected.

(3) Institutional Framework and Organizations in Solomon Islands

1) Laws on EIA

a) Overview of Laws

In Solomon Islands, as a law related to EIA, Environment Act was established in 1998. In Environment Act 1998, a development project which possibly affects environment is defined as "a prescribed project" and any corresponding project requires implementation of EIA. In the procedure of EIA, a developer of the prescribed project requires submission of Environmental Impact Statement (EIS) or Public Environmental Report (PER) as a simplified environmental report to the Minister of Environment. Furthermore, Environment Act 1998 stipulates establishment of Environment and Conservation Division (ECD) and Environmental Advisory Committee (EAC) as the organizations for operation of the Act, and enactment of Environmental Regulations as the regulations for implementation of the Act. Following it, Environmental Regulations was enforced in 2008. Environmental Regulations defines an application format needed for the EIA procedure and fees and duration for the procedure, and also stipulates the development of the guideline by which developers can easily understand the procedure. Environmental Impact Assessment Guidelines was published in 2010. Environmental Impact Assessment Guidelines sums up the EIA procedure by using figures and tables, and makes it clear what and how developers need to prepare at each stage of the procedure.

In Solomon Islands, their own environmental standards have not been established.

b) EIA Procedures in Solomon Islands

The procedure for applying to EIA project and obtaining an authorization is shown below, according to the Environmental Impact Assessment Guidelines 2010. EIA procedure is shown in Figure 1.3-1.

i) The entrepreneur submits Proposal Application to Environment and Conservation Division (ECD).

ii) ECD checks it and then conducts a screening.

iii) ECD notifies the entrepreneur of the screening results within 15 days of the submission of the Proposal Application. In case that EIA (EIS or PER level) is needed, ECD provides advice concerning a scoping and a PER survey.

iv) The entrepreneur conducts EIA (EIS or PER level) survey.

v) The entrepreneur develops EIA (EIS or PER) report and submits it with Development Application to the Ministry of Environment.

vi) The Director of ECD reviews the contents and makes the first decision within 10 days of the submission of the EIA report.

vii) The EIA report is printed out and public consultation is advertised for people within 5 days of the submission of the first decision-making by the Director of ECD.

viii) The EIA report is kept released to people for 30 days and meanwhile the public consultation is convened.

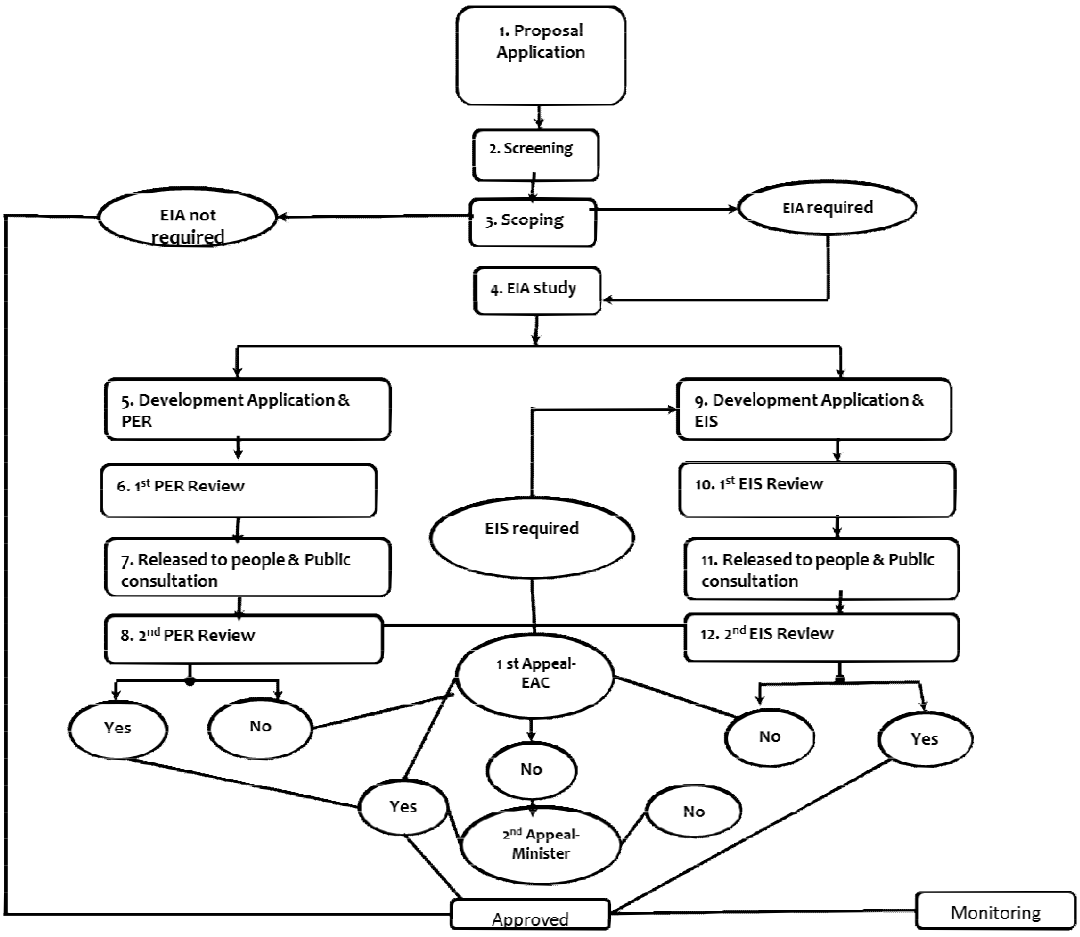
ix) Any resident who is disgruntled about the decision-making by the director of ECD can file a complaint with Environmental Advisory Committee (EAC) within 30 days.

x) EAC approves or rejects the Project Proposal after hearing the opinions of local residents.

xi) Any resident who is disgruntled about the decision-making by EAC can file a complaint with the Minister of Environment within 30 days.

xii) The Minister of Environment makes the final decision after hearing the opinions of local residents.

Any project defined in the Environment Act 1998 is subject to EIA regardless of the scale. This Project falls under the category of "(k) development of ports" in a public project among the projects subject to EIA, and thus it is a prescribed project subject to EIA. While, in this Project, the new port facility is constructed not from scratch but in the existing port of Honiara, ECD will decide whether it needs to submit an EIA report (EIS or PER).



Source: MECDM

Figure 1.3-1 EIA Procedures

2) Supervisory Agencies and Environmental Related Organizations

a) Ministry of Environment

The current official name is the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM). According to inverview surveys with the Ministry, it was called as the Ministry of Environment Conservation and Meteorology before 2010, and had been called as Ministry of Forestry, Environment and Conservation before 2007. The Minister

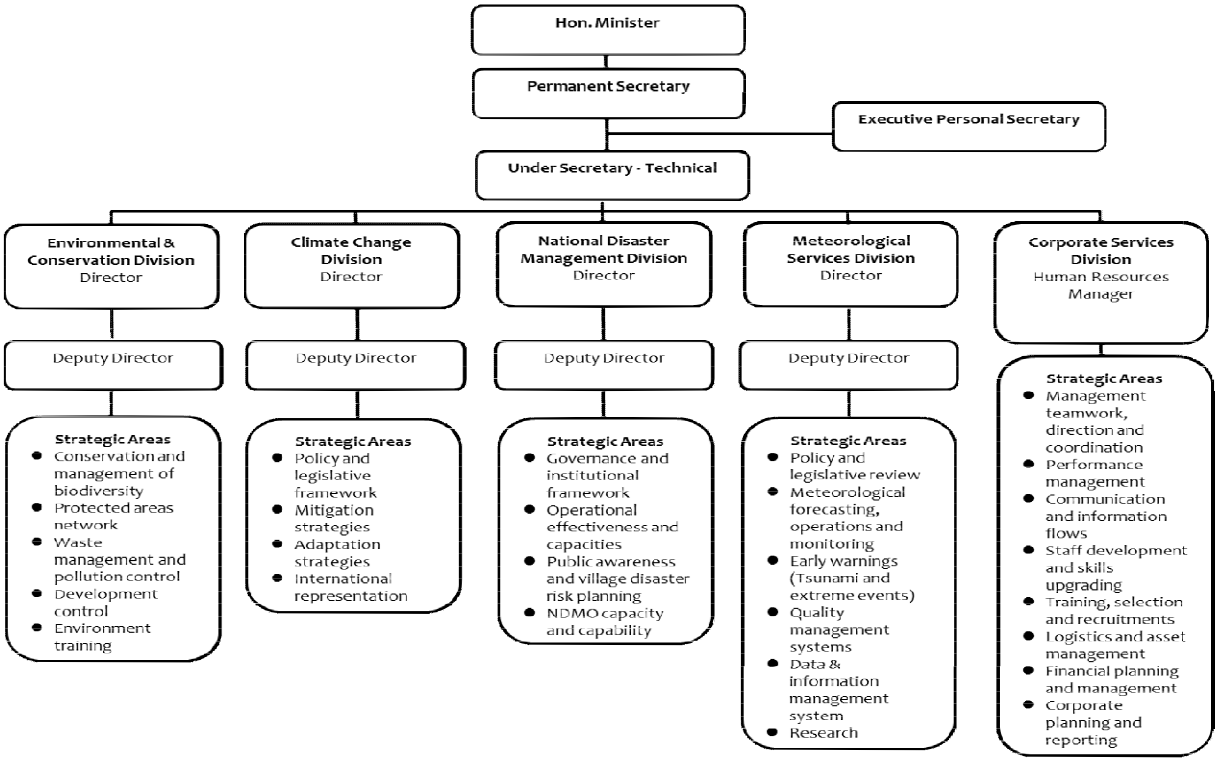
of Environment makes the final decision on relevant projects of EIA. The Environment and Conservation Division (ECD) in the Ministry is responsible for other processes except for the final decisions. The organization chart of MECDM is shown in Figure 1.3-2.

b) Environment and Conservation Division (ECD)

It is one of the subordinate bodies of the Ministry of Environment. There are 11 permanent staffs and the office is located in the building of the Ministry of Environment. An entrepreneur submits an application of the construction to ECD and then ECD conducts a screening. Furthermore, ECD performs some procedures such as notification of screening results, provision of advice to scoping and an EIA study, review of reports, and the first decision-making.

c) Environmental Advisory Committee (EAC)

It is a board of advisers established in 2009 following the Environment Act 1998. EAC provides advice concerning the operation of the EIA system in Solomon Islands. There are 10 members listed. It does not have an office and is convened by ECD on the date of the committee. Any resident who is disgruntled about the first decision-making by ECD can submit a written statement to EAC, which makes the second decision based on the statement.



Source: MECDM

Figure 1.3-2 Organization Chart of MECDM

3) Conformity with JICA Guidelines

Environmental laws of Solomon Islands do not stipulate that for projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage. However, "Category A and B" project requires a one-off public consultation. Table 1.3-2 shows Conformity of EIA System of Solomon Islands with JICA Guidelines.

Table 1.3-2 Conformity of EIA System of Solomon Islands with JICA Guidelines

Main Considerations	JICA Guidelines	EIA System of Solomon Islands
Impacts to be Assessed	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety.	Environment Regulations 2008 Additional matters to EIS 5. In addition to the requirements of section 23 of the Act, the EIS shall (a) include the social impact on the surrounding communities where the prescribed development is to be located; (b) ensure public participation in the prescribed development; (c) spell out employment opportunities for Solomon Islanders and in the case where the prescribed development is to undertaken is a rural area, employment opportunities for members of the surrounding communities; (d) provide demographic impact assessment; (f) provide a health impact assessment; (g) provide a gender impact assessment; (h) provide a noise impact assessment; and (i) state whether any of the above would have short term or long term harmful effects on the environment.
Alternatives	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	The Environment Act 1998 (No. 8 of 1998) Contents of public environmental report 20. Any public environmental report in respect of proposed and existing prescribed development shall (a) describe the prescribed development in summary form, including its objectives and any reasonable alternatives to it; (b) describe the environment likely to be affected by the prescribed development and any reasonable alternatives to it; (c) indicate the potential or actual impact of the prescribed development on the environment and of any reasonable alternatives to the prescribed development, including any enhancement of the environment;

		Contents of environmental impact statement. 23. An environmental impact statement in respect of proposed and existing prescribed development shall (d) examine any reasonable alternatives to the prescribed development, including alternative sites for it; (e) describe the environment that is or is likely to be affected by the prescribed development and by any reasonable alternatives to it; (f) assess the actual or potential impact on the environment of the prescribed development and of any reasonable alternatives to it, including the primary, secondary, short-term, long-term, adverse and beneficial impacts on the environment;
Information Disclosure and Consultations with Stakeholders	JICA itself discloses information on environmental and social considerations in collaboration with project proponents etc., in order to ensure accountability and to promote the participation of various stakeholders. JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus accordingly. For Category A studies, after the disclosure of the scoping drafts, project proponents etc. conduct consultations with local stakeholders based on stakeholder analyses. For Category B studies, project proponents etc. consult with local stakeholders after the disclosure of scoping drafts when necessary.	The Environment Act 1998 (No. 8 of 1998) Publication of public environmental report (environmental impact statement) and procedure in respect of objections and appeal. 22. and 24. (2) Any public authority or person whose interests are likely to be affected by the proposed development may within thirty days from the date of publication of the notice referred to in subsection (1) make written objections to the Director in respect of the proposed development. (3) On receipt of the written objections referred to in subsection (2), the Director shall examine the grounds of objections, and where he deems it necessary after hearing the affected parties.
Categorization	Category A: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Category B: Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Category C: Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.	Screening is undertaken using the information provided in the proposal application. The Consent Authority (ECD) is responsible for screening of development proposal application. (1) Environment Impact Assessment is required where the proposed development is likely to have significant adverse environmental impacts. (2) Environmental Impact Assessment is not required where the proposed Development is unlikely to cause significant environmental impacts. (EIA Guidelines, April 2010, Ministry of Environment, Conservation and Meteorology)

Source: Study Team

(4) Alternatives

The alternate plans, which are "the new wharf is constructed on the east or north of Point Cruz" and also include zero-option (do nothing), had been evaluated from the environmental and social viewpoints in the Preparatory Study (No.1). In this survey, they were evaluated from the viewpoint of development effect and cost as well as shown in Table 1.3-3. As a result, it was evaluated that Alternative 1, "the new wharf is constructed on the east of Point Cruz", was reasonable.

Table 1.3-3 Alternatives

Scenario	Alternative (1) The second international wharf is constructed on the east of Point Cruz	Alternative (2) The existing facility is utilized	Alternative (3) The second international wharf is constructed on the north of Point Cruz
Option	Requirement	Zero-option	Alternative
Effect	・Required berth extension of 150 m or more is possible. ・It is installed in the Container Yard behind. Therefore, operation with the container for cargo handling in the existing international wharf is possible and thus there is not much change in land utilization. ・It is relatively close to the planned water depth contour line of -11.0 m and it is advantageous for dimension of the quay reclamation area. ・It is unlikely to be affected by a north-westerly high wave.	・In recent years, cargo handling volume has increased rapidly and in the existing facility it is over the cargo handling capacity and many cargo ships are forced to wait for loading outside the Port for a long time. ・Furthermore, although Honiara Port has an international wharf with length of 120 m, there are some problems in terms of safety and efficiency of cargo handling. Among the problems, it does not correspond to growth in size of ships calling the Port and some part of the wharf can handle only light cargo due to lack of strength.	・Required quay extension of 150 m or more is possible. ・Is location is far from the container yard. Therefore, operation is not effective due to the distance from the existing wharf. ・The planned water depth contour line of -11.0 m is located relatively offshore and thus the distance of the quay stretched offshore gets longer and dimension of the quay reclamation area becomes larger. ・It is likely to be affected by a north-westerly rough wave.
Cost	Medium	Nil	High
Environmental and Social Impacts (Negative)	・The coverage of coral reefs in the site is under 10 %. The dimension of coral colony distributed in the construction area (20 m×150 m) is about 300 m^2 at the outside. ・About 300 m^2 coral reefs are possibly destroyed due to land reclamation in this Project.	It cannot meet the growing demand for use of the Port.	・The coverage of coral reefs in the site is about 35 %. The dimension of coral colony distributed in the construction area (20 m×150 m) is about 1,050 m^2. ・About 1,050 m^2 coral reefs (about 3.5 times larger than the requirement) are

			possibly destroyed due to land reclamation in this Project.
Environmental and S0ocial Impacts (Positive)	Economically beneficial for a corresponding increase in demand for use of the Port	No impact on ecosystem	Economically beneficial for a corresponding increase in demand for use of the Port
Evaluation	Excellent	Bad	Good

Source: Study Team

Regarding other alternatives, " the new wharf is constructed on the west of Point Cruz" and "the existing wharf is extended", are unrealistic in terms of sea bottom topography and relationship to the existing facility, and thus are excluded from the alternative plans (see Chapter 2-1-1(3) "Selection of Project Site" for further details). Furthermore, in this survey, three alternatives in the structure of the new wharf, steel pipe sheet pile type, steel pipe pile open jetty type and caisson type, were considered. As a result, it is concluded that the structure of steel pipe sheet pile type structure is better for some reasons below.

* Steel Pipe Sheet Pile Type:

It is advantageous compared to steel pipe pile jetty type, because the construction method is simple and the easiest and thus the construction period is shorter and quality control is easy. The existing international quay wall is constructed by steel pipe sheet piles (installed in 1980) and steel pipe sheet-piles (installed in 1990), the latter of which are used without any problem in terms of strength.

* Steel Pipe Pile Open Jetty Type:

While most of the coral reefs can escape from land reclamation, their habitat will be disappeared after the construction since they need sunlight for living. SIPA imposes load restrictions on the existing quay of steel pipe piles.

* Caisson Type:

It is unrealistic since an installment of a floating dock is difficult in this construction scale.

(5) Scoping

Impacts of the project on the environment (society, nature and pollution) were evaluated during pre-construction, construction and operation stages. As a result, no major negative impacts (A-) were expected. Scoping results are shown in Table 1.3-4.

Table 1.3-4 Scoping Results

No.	Item	Project Stage	Rating	Remarks
Social Environment				
1	Involuntary Resettlement	P, C, O	D	There will be no resettlement.
2	Local Economy such as Employment and Livelihood, etc.	P	D	No impacts expected.
		C	B+	Generation of construction related employment.
		O	B+	Generation of operation related employment.
3	Land Use and Utilization of Local Resources	P	D	No impacts expected.
		C, O	D	There is no change of utilization form of a land. Although the water resources of the area are used by the project, no impacts are expected because of consumption of little water.
4	Social Institutions such as Social Infrastructure and Local Decision - making Institutions	P, C, O	D	This plan is to utilize unused ocean space effectively, and to build a new wharf. No impacts are expected on such an item.
5	Existing Social Infrastructures and Services	P, C, O	D	No impacts are expected since there is no public facility such as schools and hospitals in the surroundings of the Port.
6	The Poor, Indigenous and Ethnic People	P, C, O	D	No impacts are expected since the area in which people reside is distant from the project site.
7	Misdistribution of Benefit and Damage	P	D	No impacts expected.
		C	B+	Possible benefits in regards to local employment, economy and so on.
		O	B+	Possible benefits in regards to local employment, economy and so on.
8	Cultural Heritage	P, C, O	D	There are no cultural heritages in the project site.
9	Local Conflicts of Interest	P, C, O	D	No impacts expected.
10	Water Usage or Water Rights and Communal Rights	P, C, O	D	No impacts are expected since that SIPA owns a right to use the water area and that fishing activity is not performed around the site. Although SIPA uses the water resources of the area, the amount is low.
11	Sanitation	P	D	No impacts expected.
		C	D	Since construction workers increase very little, there is neither excretion action on the outdoors nor the possibility of the increase in garbage.
		O	D	No impacts expected.
12	Hazards (Risk) Infectious Diseases such as HIV/AIDS	P	D	No impacts expected.
		C	D	The project consists of civil engineering facilities, and is mainly-mechanically constructed. Therefore, the spread of infectious diseases including malaria cannot be considered.
		O	D	No impacts expected.
Natural Environment				
13	Topography and Geographical Features	P	D	No impacts expected.
		C, O	B-	The shore of the site partially changes geographical feature by dredging and reclamation.
14	Soil Erosion	P, C, O	D	No impacts are expected since the plan is to construct the revetment.
15	Groundwater	P, C, O	D	No impacts are expected since the plan is not to use groundwater.
16	Hydrological Situation	P, C, O	D	No impacts expected.

17	Coastal Zone (Mangrove, Coral Reef, Tidal Flat, etc.)	P	D	No impacts expected.
		C, O	B-	The coral reefs are disrupted due to dredging and reclamation of the site.
18	Flora, Fauna and Biodiversity	P	D	No impacts expected.
		C, O	B-	Some impacts are expected on the ecosystem of the coral reefs in the surroundings.
19	Meteorology	P, C, O	D	No impacts expected.
20	Landscape	P, C, O	D	No impacts are expected since the site does not catch the attention of the local people.
21	Global Warming	P, C, O	D	No impacts expected.
Pollution				
22	Air Pollution	P	D	No impacts expected.
		C	B-	Deterioration of air quality due to fugitive dust and exhaust emissions from construction activities and construction vehicles.
		O	B-	Deterioration of air quality due to exhaust emissions from cargo trucks.
23	Water Pollution	P	D	No impacts expected.
		C	B-	The dredging and reclamation works may cause impact of turbidity on the environment. Risk of oil leakage from heavy machines increases.
		O	D	New port facilities are civil engineering ones including revetment and sea walls. Therefore, no waste water discharges from those facilities.
24	Soil Contamination	P	D	No impacts expected.
		C	B-	Risk of oil leak from heavy machines increases.
		O	C-	Since dredged soil is to be diverted to the reclamation material on the backland, contamination of the material by harmful substances should be examined.
25	Waste	P	D	No impacts expected.
		C	B-	Dredged soil is generated.
		O	D	Generation of wastes is not expected to affect the surroundings.
26	Noise and Vibration	P	D	No impacts expected.
		C	B-	Noise from construction trucks and heavy machines could have adverse impacts on the local residents.
		O	B-	Noise from cargo trucks could have adverse impacts on the local residents.
27	Ground Subsidence	P, C, O	D	No impacts expected.
28	Offensive Odor	P, C, O	D	No impacts expected.
29	Bottom Sediment	P	D	No impacts expected.
		C	B-	Diffusion of dredged soil may affect environment of bottom sediment.
		O	D	The activity which may affect environment of bottom sediment is not expected.
30	Accidents	P	D	No impacts expected.
		C	B-	Higher risk of construction and road accidents due to construction works and traffic of construction trucks.
		O	B-	Higher risk of road accidents due to an increase in cargo-truck traffic.

Legend of project stage

P: Pre-construction Stage

C: Construction Stage

O: Operation Stage

Rating criteria

A-: Major negative impact
A+: Major positive impact
B-: Moderate negative impact
B+: Moderate positive impact
C-: Impact uncertain
D: No impact expected. No need for further assessment

Source: Study Team

(6) TOR for EIA Study

1) Basic Policy for EIA Study

Environmental and social considerations studies were conducted based on JICA Guidelines for Environmental and Social Considerations (April, 2010) (hereinafter referred to as “JICA Guidelines”) in the Preparatory Survey (No.1) on the Project for Improvement of Honiara Port Facilities in Solomon Islands (hereinafter referred to as “the Preparatory Survey (No.1)”), August - September 2012. Now, this project was classified as environmental Category B based on JICA Guidelines. Therefore, in this preparatory survey, were conducted the studies tailored to the environmental Category B.

Basic policies for EIA Study are considered as shown below and the study is conducted following them.

i) In EIA Study, the contents of the environment-related laws and regulations of Solomon Islands are understood and full consultations with environmental agencies are conducted.

ii) In EIA Study, opinions and requests of SIPA, the proponent, are sufficiently grasped, and besides both what Solomon Islands should implement and what JICA Study Team supports are understood.

iii) Based on JICA Guidelines, after alternate plans (including zero-option) for facility planning of outline design and position and structure of the construction are evaluated, environmental impacts are predicted and mitigation measures are examined as concretely as possible.

iv) Recommendations and formulation of mitigation measures should be realistic and give due consideration to present situations in Solomon Islands (land use, natural environment, water and electric resources and energy available, technology and public awareness and skill).

v) The most important issue for EIA Study in this preparatory survey is considered as "support for business related to EIA procedures by SIPA and support for issue of the Environment License by the Ministry of Environment", and problems for these supports are clearly solved.

vi) Survey results are analyzed and a draft of the “Environmental Checklist: Ports and Harbors” in the form shown in JICA Guidelines is developed. In this process, full consultations with Solomon Islands are conducted.

2) TOR for EIA Study

TOR for EIA Study is shown in Table 1.3-5.

Table 1.3-5 Terms of Reference for Environmental Impact Study

No.	Task	TOR
1	Review of TORs for EIA Study at each Stage	-TORs for EIA Study at each stage : the Preparatory Survey on the Project for Construction of Market and Jetty in Auki (2006), the Road Improvement (Sector) Project (ADB) (2008), the Honiara Port Scoping Study (PIAC) (2012), the Preparatory Survey on the Project for Improvement of Honiara Port Facilities (No.1) (2012)） are confirmed with SIPA, the proponent, and the Ministry of Environment, and tasks are identified.
2	Confirmation of SIPA's Intention Regarding EIA Procedure	-SIPA's intention is confirmed with person in charge of this Project and grasped as concretely as possible. The main points are as below. ・To what extent main problems with environmental impacts expected by this project are understood ・To what extent (in terms of items and depth) collection of natural environmental baseline data is needed ・It is explained that prediction of environmental impacts are conducted based on outline design, and then scoping is discussed in detail. ・Regarding mitigation measures, items requiring measures and their possibility are discussed and confirmed.
3	Implementation of Scoping (Clarifying Environmental and Social Items Necessary for Decision-making and Assessment Method）	-According to the Preparatory Survey (No.1), JICA Study Team discussed scoping with SIPA. As a result, ・In this Project, there are no environmental items in which major negative impacts (A-) are expected. ・Moderate negative impacts (B-) are expected in some environmental items below: Sanitation, Topography and Geographical Features, Coastal Zone, Flora, Fauna and Biodiversity, Water Pollution, Soil Pollution, Wastes, Noise and Vibration, Odor and Accidents -In this preparatory survey, missing information is reviewed and scoping is conducted again in case of any change in the plan. Scoping is mainly based on subjects required in Environmental Regulations 2008 and Environmental Impact Assessment Guidelines 2010 (overview of the project, natural and social environmental baseline, items targeted for EIA, methods of survey, prediction and evaluation, implementation structure, overview of comments obtained at stakeholder meetings etc.) and also includes subjects required in JICA Guidelines and considered in other projects. JICA Study Team supports scoping. -In the process of finalization of a scoping draft, results of SIPA's review, comments at a stakeholder meeting and advice from JICA Environmental and Social Considerations Review Division are reflected.
4	Review of Environmental Baseline (Land Use, Natural Environment, Indigenous People, Economic and Social Environment, etc.）	-Existing reports are reviewed to confirm whether there is any missing or updated information, and existing materials (other EIA reports, annual environmental reports, statistics and land use) are mainly collected. -Regarding any missing information through the process above, inerview surveys with international organizations and universities are conducted for cooperation in provision of information. -According to the Preparatory Survey (No.1), surveys by snorkeling were conducted at the planned construction site of the new wharf (east side) and alternative waters (north side). As a result, ・Coverage of living reef-building corals was 10 % at east side and 35 % at north side. As dominant corals, porites australiensis, staghorn coral and submassive coral were identified. ・Among living things identified (except for corals), there were about ten kinds of invertebrate species and fishes respectively and about five kinds of plants. -Surveys of water quality, sediment quality and corals are conducted by subcontracting to local consultants. Survey results of water quality and sediment quality are compared and assessed with environmental standards (international standards, standards in Solomon Islands and other countries). A coral list and coral community are evaluated from the viewpoint of rarity requiring protection in laws of Solomon Islands and international treaties.

5	Review of Institutional Framework and Organizations in Solomon Islands	-Laws, regulations and standards related to environment (EIA, information disclosure etc.) identified at present are below. Any revised or newly established one will be obtained. ・Environment Act 1998 ・Environmental Regulations 2008 ・Environmental Impact Assessment Guidelines 2010 ・Laws and regulations about environmental standards (no environmental standards established in Solomon Islands at present)
		-Unconformity with JICA Guidelines identified at present is below. ・EIA framework includes a concrete study, EIS level and a simplified study, PER level. ・Any project categorized as a prescribed project (including development of ports) requires EIA regardless of the project scale. ・There is no stipulation regarding information disclosure and consultations with local stakeholders at the early stage of projects. ・Any EIA at EIS level requires a public consultation at least once.
		-The roles of related organizations expected at present are shown below. ・Ministry of Environment, Climate Change, Disaster Management and Meteorology: policy decision about environment and natural resources, authorization right of EIA and administrative order such as corrective action about implementation of EIA ・Environment and Conservation Division/ECD: one of the subordinate bodies of the Ministry of Environment described above, implementation of screening, advice on scoping and EIA Study and review of reports ・Environmental Advisory Committee/EAC: a board of advisers established in 2009 following the Environment Act 1998, advice on EIA procedure, receipt of written statements from residents and support
6	Prediction of Impacts	-Prediction of impacts is based on Environmental Regulations 2008, and Environmental Impact Assessment Guidelines 2010 of Solomon Islands and JICA Guidelines and follows some points below. ・The results of prediction are shown at each stage of the Project. ・Characteristics, extent, continuity, targets and uncertainty of impacts are analyzed. ・Impacts are predicted as quantitatively as possible.
7	Impact Assessment and Evaluation of Alternative Plans (Plural Projects Including Zero-option)	-Because there are no environmental standards defined in Solomon Islands at present, predicted impacts are assessed by setting targets based on WHO guidelines and standards defined in developed countries (Japan, Australia, New Zealand, United States and European countries) and surrounding countries to set targets. -In the Preparatory Study (No.1), three alternate plans below were compared and it was evaluated that Alternative 1 was reasonable. 1.Construction of the second international wharf on the northeast of the Honiara Port 2.Utilization of the existing facility 3.Construction of the second international wharf on the northwest of the Honiara Port In this survey, they are evaluated from the viewpoint of cost, environment and development effect as well in accordance with changes in the construction plan of the international wharf. The alternate plans include zero-option.
8	Support for Stakeholder Meeting (Objectives, Participants, Agenda and etc.)	-According to Environmental Regulations 2008 and Environmental Impact Assessment Guidelines 2010 of Solomon Islands, this Project is categorized as a prescribed project ("(k) development of ports") and therefore EIA Study is required. There are two kinds of EIA Studies, simplified and full-scale and the latter requires stakeholder meetings. -According to JICA Guidelines, "Project proponents etc. disclose scoping drafts" and "also consult with local stakeholders reflecting stakeholder analysis, if necessary for Category B projects". -JICA Study Team helps SIPA actively organize a stakeholder meeting. ・Objectives: to obtain consent by appropriate explanation as to contents and impacts of the Project and to reflect comments from participants in the Project

		・Participants: people involved in the Port, fishermen, local residents (including illegal residents), NGOs, Ministry of Infrastructure and Development (MID), SIPA, Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), Honiara City Council (HCC), educators, research institutions, international organizations and etc. ・Agenda: necessity of the Project, presentation of scoping draft, Q&A ・Preparation: setting of date and venue, arrangement of the invitation letters, audio and projection equipment and preparation of the minutes
9	Review of Mitigation Measures (Avoidance, Minimization or Compensation)	-According to the Preparatory Survey (No.1), mitigation measures were developed after considering avoidance, minimization or compensation against each negative impact identified during the construction and operation stage. In this preparatory survey, mitigation measures are similarly developed in case of any change in the plan. The mitigation measures include the possibility of coral transplantation.
10	Environmental Management Plan and Environmental Monitoring Plan (Implementation Structure, Method, Cost)	-Environmental Management Plan According to the Preparatory Survey (No.1), mitigation measures were developed against each negative impact. In this preparatory survey (No.2), responsible entity is set and also an environmental management plan is developed in case of any change in the plan. -Environmental Monitoring Plan According to the Preparatory Survey (No.1), an environmental monitoring plan including frequency and timing of implementation was developed against each negative impact. In this preparatory survey, a concrete monitoring plan is developed after considering implementation structure, method, and cost.

Source: Study Team

(7) Results of EIA Study

1) Results of Water Quality Survey

The JICA Study Team conducted a current water quality survey for monitoring before and after the construction of the facilities. Three sampling points were near the Project Site (WQ-1, 2, 3) and the other two points are in the water area without any effect of Honiara Port as shown in Figure 1.3-3. The results of water quality survey are shown in Table 1.3-6. It seems that WQ-1 and WQ-2 are affected by municipal effluent because as a whole they are higher in COD, coliform bacilli and total phosphorus, and lower in transparency compared with the other three points.

Table 1.3-6(1) Results of Water Quality Survey

Sampling Date：March 14, 2013

Parameter	Unit	WQ-1	WQ-2	WQ-3	WQ-4	WQ-5	Criteria / Guidelines	Verification
Hydrogen-ion Exponent (pH)	-	7.8	7.9	8.1	7.9	7.9	7.8 - 8.3	1)
Suspended Solids (SS)	g/m^3	<3	<3	<3	<3	<3	5mg/l or less	1)
Chemical Oxygen Demand (COD)	mg/l	1.4	1.3	1.2	1.2	1.2	2mg/l or less	1)
Dissolved Oxygen (DO)	mg/l	7.18	7.20	7.69	7.32	7.34	7.5mg/l or more	1)
Coliform Bacilli	cfu/100 ml	2,900	2,500	130	630	300	1,000/100ml or less 500/100ml	2) 4)
n-Hexane Extraction Substance	mg/l	< 4	5	5	4	<4	Not to be detected	1)
Total Nitrogen	mg/l	<0.3	<0.3	<0.3	<0.3	<0.3	0.2mg/l or less 0.3mg/l	1) 3)
Total Phosphorus	mg/l	0.015	0.027	0.018	0.014	0.017	0.02mg/l or less 0.025mg/l	1) 3)
Salinity	‰	33	33	35	34	34		
Transparency	Secchi Depth(m)	4.2	5.0	10.0	5.0	11.0		
Temperature	℃	28.8	28.9	29.1	29.1	29.0		

1) Japan – Environmental quality standards for conservation of the living environment, Coastal Waters, class A, class I（Total nitrogen, Total phosphorus）or Lakes, class A (SS)
2) Japan - Water Quality Criteria for Bathing Beaches, Satisfactory for bathing, Category C
3) Australian and New Zealand Environment and Conservation Council (ANZECC) - Guidelines for Fresh and Marine Water Quality and Sediment Quality Guidelines
4) European Union Bathing Water Directive 1976

Source: Study Team

To obtain baseline data to be used during the construction stage, turbidity survey was conducted by using a portable turbidity meter. The result is shown in Table 1.3-6(2). While environmental standards regarding turbidity are not stipulated internationally, these values are comparable to portable water quality standards (about 1NTU).

Table 1.3-6(2) Results of Water Quality Survey - Turbidity

Date	Unit	WQ-1	WQ-2	WQ-3	WQ-4	WQ-5
13/03/2013	NTU	1	1	1	1	0
20/03/2013	NTU	3	1	2	1	1
27/03/2013	NTU	1	0	0	0	3
03/04/2013	NTU	0	0	0	0	1

Source: Study Team

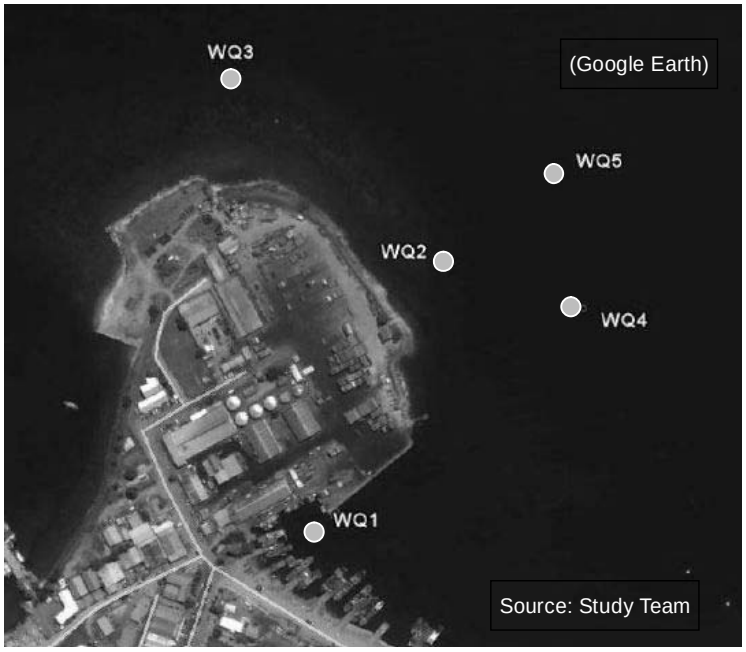


Figure 1.3-3 Sampling Points for Water Quality

2) Results of Sediment Quality Survey

The sea area of the quay normal front will be dredged in order to ensure the water depth corresponding to port call of ships, and the dredged soil will be used as material for landfill behind. Therefore, the survey was conducted in order to check whether the landfill material includes hazardous materials such as heavy metals or not and it is appropriate as landfill material or not. The sampling points were two in the quay normal front as shown in Figure 1.3-4. The results of sediment quality survey are shown in Table 1.3-7. According to it, both SD-1 and SD-2 were below the criteria and guidelines or under the detection limit.

Table 1.3-7 Results of Sediment Quality Survey

Sampling Date：March 14, 2013

Parameter	Unit (Dry Weight)	SD-1	S-2	Criteria / Guidelines	Verification
Arsenic (As)	mg/kg	3.9	4	20 20-70	1) 2)
Cadmium (Cd)	mg/kg	0.04	0.04	1.5 1.5-10	1) 2)
Chromium (Cr)	mg/kg	10.9	14	80	1)
Copper (Cu)	mg/kg	13.1	23	65 65-270	1) 2)
Lead (Pb)	mg/kg	8.4	7.7	50 50-220	1) 2)
Mercury (Hg)	mg/kg	< 0.10	< 0.10	0.15 0.15-1.00 25	1) 2) 3)
Nickel (Ni)	mg/kg	10	12.8	21	1)
Zinc (Zn)	mg/kg	52	43	200	1)
Total DDT	mg/kg	< 0.03	< 0.03	0.0016	1)
Total PCB	mg/kg	< 0.04	< 0.04	0.023 25 10	1) 2) 3)
Tributyltin (TBT)	mg/kg	< 0.004	< 0.004	0.005	1)

1) Australian and New Zealand Environment and Conservation Council (ANZECC) - Guidelines for Fresh and Marine Water Quality and Sediment Quality Guidelines
2) Australia - National Ocean Disposal Guidelines for Dredged Material
3) Japan - Interim Standards for Sediment Removal

Source: Study Team

Figure 1.3-4 Sampling Points for Sediment Quality

3) Coral Reefs

In order to understand the current status of coral, a survey for coral reefs was conducted for six days from March 13 to 18, 2013 in the adjacent sea area of the Project Site.

a) Purpose

The survey purpose is as follows.

i) Coral species, colony size, and coral life form are to be understood.

ii) Existence of living or bleaching coral is to be confirmed. Information on their disease and predation and effect by silt are to be obtained.

iii) Species of marine organisms are to be listed.

b) Method

The survey method is as follows.

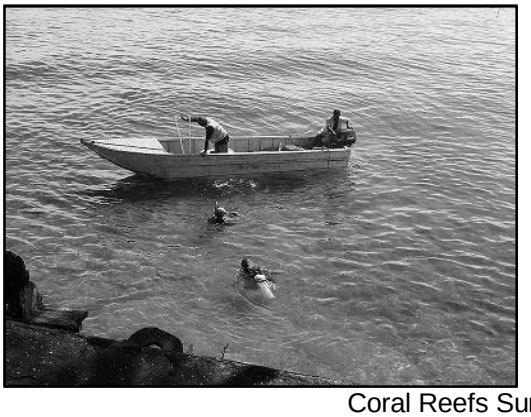
i) Substrate survey was conducted with visual observation and measuring by scuba diving.

ii) In diving survey on the first day, visual observation was conducted along depth contour lines of 20, 10 and 5 meters in targeted waters in order to understand overall ecological situation. After that, for detailed surveys, 9 dives were done over 5 linear transects from shore heading to the 25 meters depth contour（see Figure 1.3-6）.

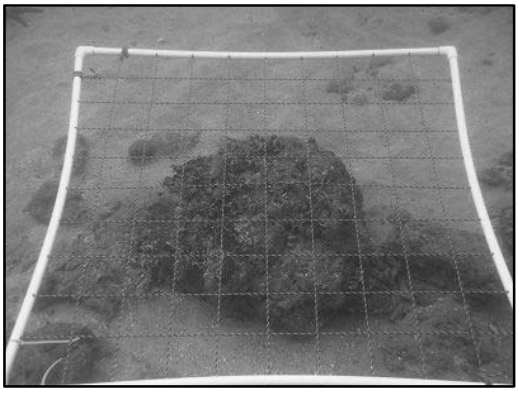
iii) 1m x 1m Quadrat was set right and left at 10 meters intervals along each transect, and characteristics of coral life form and substrate in the Quadrats were recorded.

iv) Start points were marked by a GPS, sea bed distances were measured along a 100m tape, and depths were recorded using a dive computer.

v) Photographic and video records were made for each transect.



Coral Reefs Surveys (March15 2013)



Quadrat T3 point

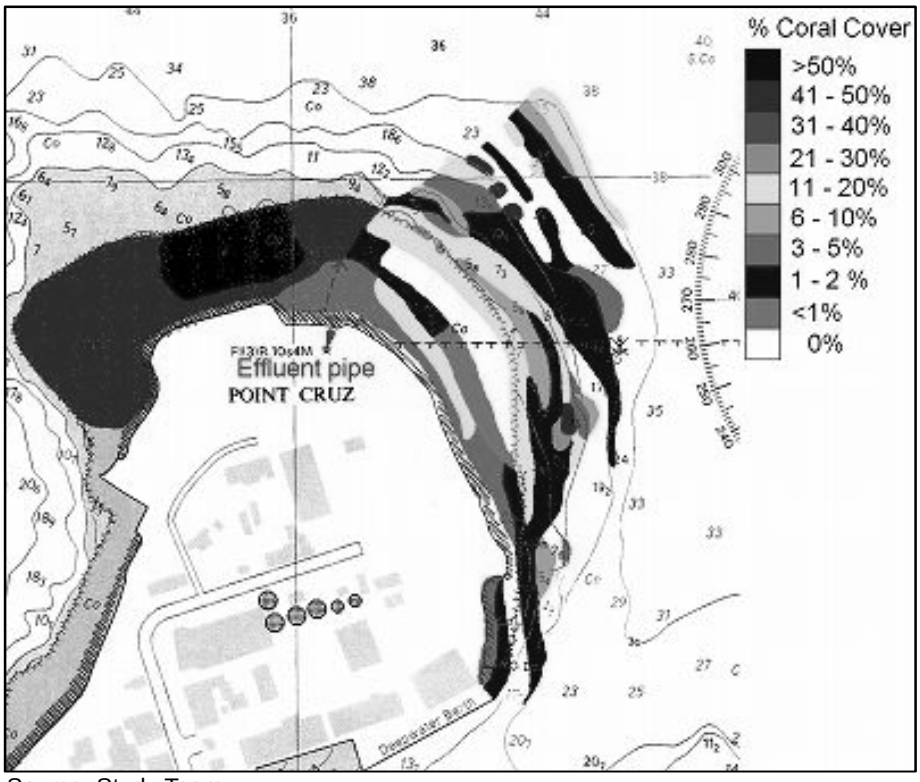
Photo by Study Team

Photo 1.3-1 Coral Reefs Survey

c) Results

Coral species, colony size and coral life form were confirmed.

A habitat map is shown in Figure 1.3-5. According to it, it is considered that overall coral coverage is low, most of which is less than 6 % including 0 % in all areas. As the areas where coral coverage is relatively high, the very limited areas, the northeastern waters at 11 m depth where coral coverage is 41 - 50 % and 21 - 30 % around there, can be found. Furthermore, among coral species surveyed, neither specifically endangered nor threatened species were seen.

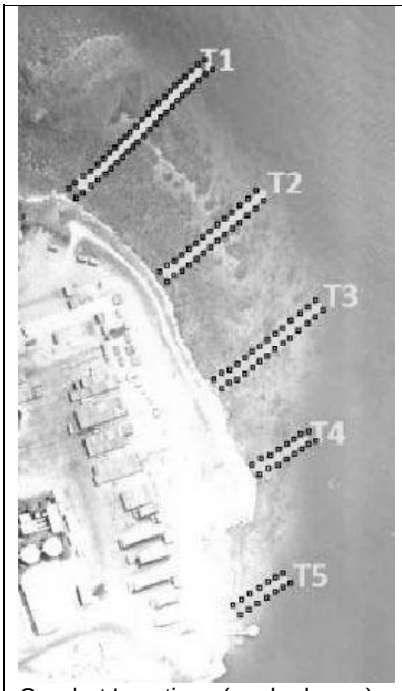


Source: Study Team

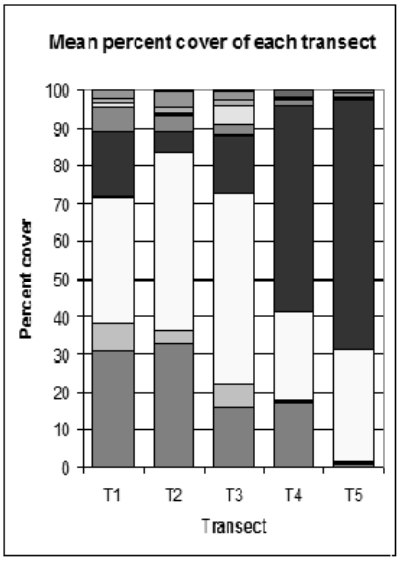
Figure 1.3-5 Habitat Map

The survey results for coral substrate and life form were summarized in accordance with categories developed by Australian Institute of Marine Science (AIMS).

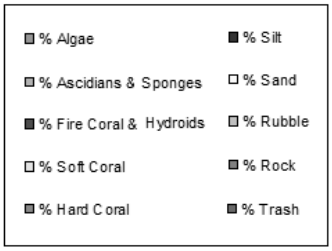
Coral substrate and life form are shown in Figure 1.3-6. The left illustrates Quadrat locations, the central graph shows mean percent substrate coverage of each transect (T1 - T5), and the right shows substrate categories. Most living biotic cover was seen along T1, T 2 and T3 with the highest level of hard coral at T1, Halimedes algae at T2 and soft coral at T3. Overall coral coverage was less than 10% and most were sand, rubble, and silt in all areas. T4 and T5 had higher levels of rubbish and trash, mostly drink cans and plastic sheeting and bags.



Quadrat Locations (marked as ・)



Mean Percentage of Substrate Coverage over T1-T5



Substrate Categories

Source: Study Team

Figure 1.3-6 Coral Substrate and Life Form

Less than 1% of corals exhibited any disease or predation. No temperature-related coral bleaching was seen. White band disease or predation may be the causes of bleaching. No Crown of Thorns coral-eating starfish was seen, but on some corals there were aggregations of corallivorous "Drupe" snails. The largest adverse impact on coral health in the area appears to be heavy sedimentation (silt) in turbid water.

A list of sessile invertebrates and macro algae seen during the surveys is shown in Table 1.3-8. According to the list, 47 species of coelenterate represented by coral, 3 species of algae and 7 species of porifera were found. As stated by the marine biologist who conducted the surveys, Hibiscus Coral, Pectinia lactuca, a common coral, was frequently encountered in waters surveyed and this coral has a tolerance for turbid waters.

Table 1.3-8 Sessile Invertebrates and Macro Algae Observed during Surveys

Taxonomic Group		Common Name	Scientific Name
Porifera	Calcarea	Barrel sponge	*Xestospongia testudinaria*
	Sponges	Fan sponge	*Phyllospongia lamellose or foliascens*
			Stylissa spp
		Volcano sponge	*Spirastrella vagabunda*
		Paddle sponge	*Niphates callista*
		Encrusting sponges	*Callyspongia spp*
			Dysidea spp
Coelenterata	Hydroida	Hydroids	
	Millipora	Encrusting Fire coral	*Millipora spp*
	Octocorallia	Ridged Leather coral	*Lobophyton spp*
	Soft corals	Leather coral	*Sarcophyton spp*

		Slimy Leather coral	*Sinularia flexibilis*
		Knobby Leather coral	*Sinularia spp*
		Tree coral	*Dendronepthea spp*
		Cauliflower coral	*Paralemnalia cf clavata*
		Gorgonian fan	*Melitharea spp*
			Acabria spp
			Rumphella spp
		Gorgonian rod	*Ctenocella spp*
		Gorgonian whip	*Junceela spp*
	Corallimorpharia	Large corallimorph	*Amplidexidiscus fenestrafer*
	Scleractinia	Massive (boulder) coral	*Porites spp, poss P. solida or lobata*
	Hard corals		*Goniastrea spp*
			Favia spp, poss F. maritima
			Montastrea spp
			Favities stylifera
		Star boulder coral	*Diploastrea heliopora*
		Brain coral	*Platygyra spp, poss P. sinensis*
		Lobed coral	*Physogyra lichenseini*
			Lobophyllia spp, poss L corymbosa
		Submassive coral	*Pocillopora damicornis*
			Stylophora pistillata
		Encrusting coral	*Montipora verrucosa*
			Montipora spumosa
			Turbinaria stelluata
			Pachyseris speciosa
			Favites spp
			Galaxea fascularis
			Leptoseris spp
		Foliose coral	*Turbinaria spp, poss T. peltata*
			Montipora spp, poss M.foliosa
			Merulina spp, poss M. ampliata
			Echinophyllia spp
			Mycedium spp. poss elephantotus
		Hibiscus coral	*Pectinia lactuca*
		Table coral	*Acropora hyacinthus*
		Branching staghorn	*Acropora formosa*
			Acropora loripes
			Acropora cerealis
		Digitate coral	*Acropora humilis*
		Mushroom coral	*Sandalolitha dentata*
			Heliofungia spp, poss H. actiniformis
			Fungia spp, poss F.corona
		Solitary corals	*Cynaria lacrymalis*
Algae	Chlorophyta	Turtle weed	*Chlorodesmis fastigata*
		Halimeda	*Halimeda gracilis*
	Rhodophyta	Red algae	*Rhodymenia spp, poss R. intricata*

Source: Study Team

A list of macro invertebrate species observed during the surveys is shown in Table 1.3-9. According to the list, 20 macro invertebrate species, which include 5 species of molluscs, 4 species of sea stars and 3 species of worms were found.

Table 1.3-9 Macro Invertebrate Species Observed during Surveys

Phylla	Group		Species	
	Common name	Scientific name	Common name	Scientific name
Annelida	Segmented worms	Polychaeta	Spaghetti worm	*Loimia medusa*
	Fan worms	Sabellidae	ChristmasTree worm	*Spirobranchus giganteus*
			Fan worm	*Sabellastarte sanctijosephi*
Mollusca	Snails	Gastropoda	Corallivorous Drupe snail	*Drupella conus*
			Trochus	*Trochus pyramidis*
			Scorpion Spider shell	*Lambis scorpius*
	Nudibranchs	Nudibranchia	Chromodoris	*Chromodoris coi*
	Bivalves	Bivalvia	Coral clam	*Pedum sponyloideum*
Crustacea	Crustaceans	Palinuridae	Spiny lobster	*Panulirus spp*
Echinodermata	Crinoids	Crinoidea	Feather star	*Comanthina schlegeli Probably Comaster gracilis*
	Sea stars	Asteroidea	Blue Linckia	*Linckia laevigata*
			Granular star	*Choriaster granulatus*
	Sea urchins	Echinoidea	Black sea urchin	*Echinothrix diadema*
	Sea cucumbers	Holothuridea	Pinkfish	*Holothuria edulia*
			Amberfish	*Thelenota anax*
			Blackspotted	*Bohadschia graeffei*
Urochordata	Ascidians	Ascidiacea	Colonial tunicate	*Didemnid spp*
			Bluebell tunicate	*Clavelina moluccensis*
			Giant tunicate	*Polycarpa aurata*

Source: Study Team

116 species of fish were recorded and neither specifically endangered nor threatened species were seen. Most were small species of no commercial or fisheries value.

4) Location Environment of Coral Reef in Honiara Port

Based on the coral reef survey of this survey, analysis of existing documents and hearing surveys with the Ministry of Environment in Solomon Islands and NGOs, it is concluded that “Honiara Port is not the area which especially needs environment and social considerations”. The reasons are shown below.

a) Results of Coral Reef Survey

- Among marine species surveyed, neither species in danger of extinction nor endangered species were found.
- The Project site is consisted of sands (70 %), rocks (30 %) and living reef-building corals (10 %) which is not dominant. In the adjacent north side of the Point Cruz, coverage of living reef-building corals is 35 %, which is shown to be much larger than the Project sites.
- There is nothing which prevents the implementation of the Project, because there are no coral reefs to be protected and the distribution is very small, seen from the ecology and distribution of the coral reefs in the planned site (comments from the marine biologist who conducted the survey).

b) Analysis of Existing Documents

Although survey results concerning marine ecology in the coastal areas of Solomon Islands are described in detail in "Solomon Islands Marine Assessment" (2006), "Solomon Islands State of Environment Report" (2008) and "State of the Coral Reefs of Solomon Islands" (2012), there are no description of it around Honiara Port because the area is not important. The overview of the descriptions is shown below.

- A mangrove ecosystem is diverse in the coastal areas of Solomon Islands and accounts for 43 % of the world's mangrove species.
- 76 genus and 485 species of reef-building corals grow on in the same coastal area where coral diversity is the second highest in the world. While damages caused by bleaching have been small since 2000, acanthasters' feedings are seen at several points, which lead to severe damages to the coral reefs.
- The study showed that about 32% of the same coastal area were covered with reef-building corals.
- Although the map which marks the location of important coral reefs in Solomon Islands shows the coastal areas of the eastern and western parts of Guadalcanal Island as important coral reef areas, it does not mark the coastal areas of Honiara (see "State of the Coral Reefs of the Solomon Islands" (2012)).

c) Ministry of Environment in Solomon Islands

There are no national parks, World Heritage sites, and marine protected areas around the Honiara Port. As protected areas supported by the national government, there are three types as below.

- East Rennell Lake Ferano (World Heritage site in Rennell island)
- Arnavons Conservation Area (located in the Manning Strait between Isabel and Choiseul Province)

・ Tetepare Islands (community based marine and land protected area)

While there are 130 locally-owned small sanctuaries called as Locally Managed Marine Area (LMMA) other than those mentioned above, there is not this type of areas around Honiara.

d) NGOs

・ According to Dr. Anne-Maree Schwarz (a marine biologist) of World Fish Center (WFC),
  - A biological researcher has no interest in the coral reefs around Honiara.
  - The coral reef around the Project Site is not in a good habitat environment, since there is an urban area behind it and it is affected by turbidity of water flowing from rivers and domestic wastewater.
・ Mr. Duddley Marau of WWF (Honiara Office),
  - There is only one staff (Mr. Duddley Marau) just doing clerical duties in the Honiara Office of WWF.
  - In Giza office around which there are some protected areas such as Isabel Island, 6 resident staffs conduct survey research for coral reefs using the office as a base. There are much survey data on coral reefs in Solomon Islands but around Honiara where is not important.

e) Others (see Table 1.3-1 Description of Project Site)

・ The site is designated as the Port Area and fishery rights are extinct there.
・ According to hearing surveys with fishermen, there are no fishing activities around the site.

5) Sewer

Human waste in Honiara City is treated at every door except for some households with pipe and drain. Not only human waste but also wastewater from kitchen is collected in sewage system and discharged into river and ocean without any treatment since there is no purification device, which causes water pollution.

Toilet sewage in the Honiara Port is treated in a septic tank and not directly discharged into the sea. A septic tank is a sewage treatment unit which makes sewer underground seepage through an impregnation vessel after a certain period of anaerobic digestion, whose method is used for treatment of wastewater from flush toilets.

On the other hand, at the north side of the Port, a sewer pipe of Honiara City is embedded and sewer is directly discharged into the sea through it. According to the Solomon Water (former SIWA), sewer is collected from the central area of the city (on the north side of Mendana Avenue between the eastern and western roundabouts) and discharged about 5 meters away from the Port since pipe and drain are being broken. It is needed to repair the pipe and drain and extend it far offshore in order to preserve water quality and coral reef on the coast.

6) Wastes

Wastes in Honiara City are collected every day in commercial areas and three times a week in residential areas and transported to the Ranadi final disposal site. 8 staffs of the City Environmental Health Division, about 20 workers and 2 refuse tracks (compactors) (other three are being repaired) are responsible for it. The person in charge of the City pointed out lack of refuse collection equipment, full wastes at the disposal sites and deterioration of environmental conditions around the site as examples of some problems. Currently, some private companies collect only metals in the disposal site and there are no activities of so-called "waste pickers".

A lot of household and industrial wastes are scattered in the Honiara Port. It is said that a part of the wastes have been flowed from Mataniko River about 1 km east of the Port. Wastes in Honiara Port are not collected sufficiently by the city and currently SIPA consigns the collection to the private waste disposal services.

According to SIPA, dust emissions caused by this construction will be transported directly to the disposal site by dump trucks.

(8) Impact Evaluation

Negative impact evaluation and its reason are shown in Table 1.3-10.

Table 1.3-10 Impact Evaluation

No.	Item	Evaluation	Reason
13	Topography and Geographical Features	C: B- O: B-	C, O: Topographical features in the coastal area of the Site are changed partially by dredging, which ensures the water depth -11m and land reclamation (an area of 3,000 m^2 (20 m × 150 m)).
17	Coastal zone (mangrove, coral reef, tidal flat, etc.)	C: B- O: B-	C, O: The coral reef in the dredging and land reclamation areas will be disrupted (an area of reef is a maximum of 300 m^2 since coverage of the coral reef is a maximum of 10 % at the Site according to the field study).
18	Flora, Fauna and Biodiversity	C: B- O: B-	C, O: It can be expected that there is an impact on the coral reef ecosystem around the Site, especially the sea area with high coverage of the coral reef in the northeast.
22	Air Pollution	C: B- O: B-	C: There are some impacts on air quality caused by exhaust gas from construction vehicles and heavy equipment (backhoe and bulldozer) associated with construction. O：There are some impacts on air quality caused by exhaust gas associated with increase of traffic after construction.
23	Water Pollution	C: B-	C: There is a possibility of an increase in turbidity associated with dredging and land reclamation, and water pollution by oil leakage from heavy machinery.
24	Soil Contamination	C: B- O: D (C- at scoping)	C: There is a possibility of soil pollution by oil leakage from heavy machinery. O: Since it is planned that dredged soil is to be diverted to the land reclamation material on the backland, it was tested whether there are any hazardous heavy metals included in the soil. As a result, the analysis values were below standards (guidelines).
25	Waste	C: D (B- at scoping)	C: Since dredged soil is used as reclaimed material, wastes are not generated.

26	Noise and Vibration	C: B- O: B-	C：Negative impacts on residents are caused by noise from construction trucks and heavy machinery. O：Negative impacts on residents are caused by noise from trucks.
29	Bottom Sediment	C: B-	C：There is a possibility that the bottom sediment is affected by diffusion of dredged soil.
30	Accidents	C: B- O: B-	C：There is a risk of accident due to operation of heavy equipment and traffic of construction trucks. O：There is a risk of accident due to an increase in traffic of cargo trucks.

C: Construction Stage
O: Operation Stage
B-: Moderate negative impact
C-: Impact uncertain
Source: Study Team

(9) Environmental Management Plan

It can be considered that, among the expected impacts on environmental and social items, most of negative impacts can be avoided by complying with environmental regulations of Solomon Islands by properly disclosing information and by providing a sufficient explanation to the parties concerned. Furthermore, it is expected that impacts during the construction stage can be minimized by considering environmental measures in advance and by implementing the construction based on it. Mitigation measures against negative environmental and social impacts are shown in Table 1.3-11.

Table 1.3-11 Mitigation Measures

No.	Item	Evaluation	Mitigation Measures
13	Topography and Geographical Features	C: B- O: B-	C, O：A picture of state of the terrain is taken at a fixed-point in order to refer in the future.
17	Coastal zone (mangrove, coral reef, tidal flat, etc.)	C: B- O: B-	C, O：All of the records including list of appearance species obtained by coral reef survey are to be preserved. A picture of state of the terrain is taken at a fixed-point in order to refer in the future, same as “Topography and Geographical Features” above.
18	Flora, Fauna and Biodiversity	C: B- O: B-	C: A silt fence is installed to avoid impact of turbidity on the environment during dredging and land reclamation, same as “Water Pollution” and “Bottom sediment” below. O：A strategy is created in order to control maintenance of a sewage pipe line managed by Solomon Water and oil leakage.
22	Air Pollution	C: B- O: B-	C: Appropriate use of construction vehicles and maintenance of machinery and vehicles. O: Enlightenment for avoiding unnecessary idling.
23	Water Pollution	C: B-	C: A silt fence is installed to avoid impact of turbidity on the environment during dredging and land reclamation. Maintenance of machinery and vehicles for avoiding water pollution by oil leakage.
24	Soil pollution	C: B-	C: Maintenance of machinery and vehicles for avoiding soil pollution by oil leakage.
26	Noise and Vibration	C: B- O: B-	C: Strict abidance of speed limit and avoidance of unnecessary idling. Avoidance of night-time construction. O: Strict abidance of speed limit and avoidance of unnecessary idling. Avoidance of night-time driving of trucks wherever possible.
29	Bottom Sediment	C: B-	C: A silt fence is installed to avoid impact of turbidity on the environment during dredging and land reclamation.

30	Accidents	C: B- O: B-	C: Strict abidance of speed limit. Placement of lollipop person in the Port for avoiding traffic accidents. O: Strict abidance of speed limit. A new employment of a pilot during the operation stage of the new wharf.

C: Construction Stage
O: Operation Stage
B-: Moderate negative impact
Source: Study Team

(10) Environmental Monitoring Plan

In order to confirm the effects of the mitigation measures against possible negative impacts during construction and operation stages, environmental monitoring plan was developed as shown in Table 1.3-12.

Table 1.3-12(1) Environmental Monitoring Plan - Construction Stage

No.	Item	Purpose	Environmental Monitoring	Implementing Entity	Responsible Entity
13	Topography and Geographical Features	To confirm modification of the terrain caused by the construction.	Method : ・Shooting of the modified terrain at a fixed-point Frequency : ・1/month	Construction Contractor	SIPA
17	Coastal Zone (Mangrove, Coral Reef, Tidal Flat, etc.)	To confirm modification of the coral reef caused by the construction.	Method : ・Shooting of the modified terrain at a fixed-point Frequency : ・1/month	Construction Contractor	SIPA
18	Flora, Fauna and Biodiversity	To confirm an effect of a silt fence installed to avoid impact of turbidity on the environment during dredging and land reclamation.	Method : ・Measurement by using a portable turbidity meter Frequency : ・1/week	Construction Contractor	SIPA
22	Air Pollution	To confirm appropriate use of construction vehicles and regular maintenance of heavy machinery and vehicles.	Method : ・Checking of the maintenance and inspection records Frequency : ・1/month	Construction Contractor	SIPA
23	Water Pollution	To confirm an effect of a silt fence installed to avoid impact of turbidity on the environment during dredging works.	Method : ・Measurement by using a portable turbidity meter Frequency : ・1/week	Construction Contractor	SIPA
24	Soil Pollution	To confirm regular maintenance of machinery and vehicles.	Method : ・Checking of the maintenance and inspection records Frequency : ・1/month	Construction Contractor	SIPA

26	Noise and Vibration	To confirm no implementation of night-time construction.	Method： ・Checking of heavy equipment and vehicles driving records Frequency： ・1/month	Construction Contractor	SIPA
29	Bottom Sediment	To confirm an effect of a silt fence installed to avoid impact of turbidity on the environment during dredging works.	Method： ・Measurement by using a portable turbidity meter Frequency： ・1/week	Construction Contractor	SIPA
30	Accidents	To confirm placement of lollipop person in the Port.	Method： ・Regular meetings with the Port officials Frequency： ・2/year	Construction Contractor	SIPA

Source: Study Team

Table 1.3-12(2) Environmental Monitoring Plan - Operation Stage

No.	Item	Purpose	Environmental Monitoring	Implementing Entity	Responsible Entity
13	Topography and Geographical Features	To confirm modification of the surrounding terrain.	Method： ・Shooting of the surrounding terrain at a fixed-point Frequency： ・2/year	SIPA	SIPA
17	Coastal zone (mangrove, coral reef, tidal flat, etc.)	To confirm modification of the surrounding coral reef.	Method： ・Shooting of the surrounding coral reef at a fixed-point Frequency： ・2/year	SIPA	SIPA
18	Flora, Fauna and Biodiversity	To confirm impacts on the surrounding coral reef.	Method： ・Checking of coverage of the coral reef ・Maintenance of a sewage pipe line ・Monitoring of oil leakage Frequency： ・1/year（as needed in monitoring of oil leakage）	SIPA	SIPA
22	Air Pollution	It is supposed that vehicle traffic increases during the operation stage of the new wharf. To confirm health damage caused by an increase in the exhaust gas.	Method： ・An interview with the SIPA clinic (number of patients with respiratory disease) Frequency： ・2/year	SIPA	SIPA

26	Noise and Vibration	To confirm avoidance of night-time driving of trucks.	Method： ・Checking of vehicles driving records Frequency： ・4/year	SIPA	SIPA
30	Accidents	To confirm employment of a pilot in the Port.	Method： ・Regular meetings with the Port officials Frequency： ・2/year	SIPA	SIPA

Source: Study Team

(11) Stakeholder Workshop

SIPA selected stakeholders including relevant ministries and agencies, city government, donors, NGOs, fishermen association, maritime transport association, chamber of commerce, etc. as shown in Table 1.3-13. An invitation letter, which notes the necessity of the Second International Wharf, background of cooperation by JICA, and the necessity of the EIA study for obtaining an environmental license, is dispatched to these stakeholders.

Table 1.3-13 List of Stakeholder

1	Ministry of Infrastructure and Development (MID)	12	Republic of China (ROC)
2	Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)	13	World Bank (WB)
3	Ministry of Mines, Energy and Rural Electrification (MMERE)	14	Asian Development Bank (ADB)
4	Ministry of Fisheries and Marine Resources (MFMR)	15	World Fish Center (WFC)
5	Ministry of Development Planning and Aid Coordination (MDPAC)	16	The Nature Conservancy (TNC)
6	Ministry of Foreign Affairs and Trade (MoF)	17	World Wide Fund for Nature (WWF)
7	Honiara City Council (HCC)	18	Solomon Islands Port Authority (SIPA)
8	Japan International Cooperation Agency (JICA)	19	Solomon Islands Maritime Transport Association (SIMTA)
9	European Union (EU)	20	Fishermen Association
10	AusAID	21	Chamber of Commerce (C.C.)
11	NZAID		

Source: SIPA

Meeting memo of the stakeholder workshop is shown in Table 1.3-14. Following an opening remarks by SIPA, some slide presentations were made. SIPA explained the necessity of the project, the problem of space of yard associated with increase in cargo volume, the urgency of the construction of the second international wharf, and expectation for JICA survey results. Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) explained the importance of the Legal Framework and Legislations of the Ministry, the EIA procedure, and the duration which needs to obtain an environmental license. Furthermore, local environmental consultants as SIPA's counterpart assured that there is an obligation to obtain the environmental license and that an EIA report will be submitted to ECD by June 2014 in addition

to the progress of environmental survey so far. These presentations were followed by a question and answer session. As a result, it can be said that this project has been well-understood by the stakeholders and sufficient consensus has been achieved. There was no counter opinion. Moreover, it can be stated that this workshop fulfilled to some extent a few points regulated in the Legal Framework and Legislations of the Ministry such as "a business operator (SIPA in this project) clarifies any survey result at a public hearing" and "date and venue of a public hearing are notified to stakeholders to promote public participation".

Table 1.3-14 Meeting Memo

Date	March 28, 2013 (10:30 - 13:00)
Place	Heritage Park Hotel
Participants	・Ministry of Infrastructure and Development (MID), Ministry of Development Planning and Aid Coordination (MDPAC), Asian Development Bank (ADB), Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), Solomon Islands Maritime Transport Association (SIMTA), Chamber of Commerce (C.C.), Board Chairman – SIPA, Board Member – SIPA, Local environmental consultant: 9 ・SIPA Counterpart: 3 ・JICA Honiara Office: 1 ・JICA Study Team: 5
Agenda	1.Introduction of participants 2.Opening remarks by SIPA 3.Necessity of the Project 4.Environmental policy and procedure of Environmental Impact Assessment (EIA) 5.Environmental and social survey in this project 6.Discussion
Summary of Opinion	Director of Solomon Office, ADB： ・What is soil test? Is it physical or chemical? (It is a test to analyze the quality of dredged soil chemically. Furthermore, it includes boring exploration and physical soil test for the construction. (local environmental consultant)) (In order to minimize the impact on coral reef, we are developing carefully a dredging plan. (JICA survey team)) Representative of Chamber of Commerce (C.C.)： ・We welcome the assistance for Japanese port project and give our blessing. As a user, we would like to ask SIPA to consider both public security and traffic congestion. (Currently progressing projects such as Master Plan project for the Port must tackle with these problems. (SIPA counterpart)) (While JICA and MID have been dealing with the problem of traffic congestion together, it takes two or three years for implementation. Since this problem is related to restriction of car import, we ask relevant ministries and agencies to have an understanding of it. (JICA Honiara Office)) (These problems are considered in ADB scoping report. (SIPA counterpart)) EIA officer, MECDM： ・In order to determine the naturalness, in addition to the coral reef survey, marine life survey is also important. (The coral reef survey was focused in the preparatory report. Not only coral reef but also plant and animal species are surveyed and the preciousness is evaluated in this survey. Environmental category will be decided based on these data. (JICA survey team)) Officer, MDPAC： ・What are effects of the new and old international wharf? (Containerships and vessels will be docked at the new international wharf. (JICA survey team)) (Two wharfs will enable an intermediate stop of cruise ships and contribute to economic development in Solomon Islands. (SIPA counterpart))

Source: compilation of the Minutes by SIPA


Photo 1.3-2 Stakeholder Workshop

(12) Others

1) Environmental Monitoring Form

Environmental Monitoring Form is as below.

SIPA undertakes monitoring for necessary items that are decided by scoping results and submits the report regularly to JICA (4 times- January, April, July, November per year during the construction stage and twice-January, July per year or once-July per year during the operation stage). When necessary, SIPA should refer to the following monitoring form for submitting reports.

a) Permits and Public Consultation

Monitoring Item	Monitoring Results during Report Period
【Preparatory Survey】 TOR Approval for EIA Minutes of Stakeholder Meeting Publication of EIA Report Minutes of Public Consultation EIA Permit and Imposed Conditions (Other observations of instructions from the authorities)	(Report: submission in each item)

b) Pollution Control

* Air Quality

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Method: ・Checking of the maintenance and inspection records of heavy machinery and vehicles Frequency: ・Once a month	(Report: 4 times per year (January, April, July, November))
【Operation stage】 Method: ・An interview with the SIPA clinic (number of patients with respiratory disease) Frequency: ・Every 6 month	(Report: twice per year (January, July))

* Water Quality

Monitoring Item	Monitoring Results during Report Period (Report: 4 times per year) (January, April, July, November)		
【Construction Stage】 Method: ・Measurement by using a portable turbidity meter Frequency: ・Once a week Sampling point: ・2 points at dredged site, 3 points around the Port	Measured Value(NTU)（Average）	Measured Value(NTU)（Maximum）	Referred International Standards
			・Turbidity limits in the surface water resulting from any discharge may not exceed 150 NTUs at any time, or 50 NTUs as a monthly average *1 ・Change from background of 5 NTU when background is <50 NTU, or Change from background of 10% when background >50 NTU *2

*1：The Maryland water quality regulations, USA

*2: Recreation and aesthetics, Ambient Water Quality Guidelines, The Government of British Columbia, Canada

* Soil Pollution

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Method: ・Checking of the maintenance and inspection records of heavy machinery and vehicles Frequency: ・Once a month	(Report: 4 times per year (January, April, July, November))

* Noise and Vibration

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Method: ・Checking of heavy equipment and vehicles driving records Frequency: ・Once a month	(Report: 4 times per year (January, April, July, November))
【Operation Stage】 Method: ・Checking of vehicles driving records Frequency: ・Every 3 month	(Report: 4 times per year (January, April, July, November))

* Bottom sediment

Same as the above Water Quality

c) Natural Environment

* Topography and Geographical Features

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Method: ・Shooting of the modified terrain at a fixed-point Frequency: ・Once a month	(Report: 4 times per year (January, April, July, November))
【Operation Stage】 Method: ・Shooting of the surrounding terrain at a fixed-point Frequency: ・Every 6 month	(Report: twice per year (January, July))

* Coastal Zone (Coral Reef)

Same as the above Topography and Geographical Features

* Ecosystem of corals

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Same as the above Water Quality	(Report: 4 times per year (January, April, July, November))
【Operation Stage】 Method: ・Checking of coverage of the coral reef ・Maintenance of a sewage pipe line ・Monitoring of oil leakage Frequency: ・Once a year（as needed in monitoring of oil leakage）	(Report: once per year (July))

d) Others

* Accident

Monitoring Item	Monitoring Results during Report Period
【Construction Stage】 Method: ・Regular meetings with the Port officials Frequency: ・Every 6 month	(Report: twice per year (January, July))
【Operation Stage】 Method: ・Regular meetings with the Port officials Frequency: ・Every 6 month	(Report: twice per year (January, July))

2) Environmental Checklist

Environmental Checklist is as below.

Environmental Checklist

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) Y (d) N/A	(a) EIA for "the Project for Improvement of Honiara Port Facilities" is being performed by the entrepreneur (SIPA). (b) EIA reports will be approved by the Ministry of Environment of Solomon Islands around January, 2014. (c) If conditions are imposed on the approval of EIA reports, implementing entities are responsible for dealing with it. (d) There is no other required environmental permit from the regulatory authorities except for the Ministry of Environment.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) Stakeholder meetings were held to collect comments/suggestions on the development plan during the Preparatory Survey (No.2). There was no counter opinion raised and the sufficient consensus formation in the project has been achieved. A stakeholder meeting in accordance with the EIA Regulations of Solomon Islands will be held in December, 2013. (b) At the stakeholder meetings as described above, the comment from the stakeholders (such as local residents, fishermen, and the Port workers) has been reflected to the project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The Project includes improvement of the wharf and seawall, dredging and land reclamation of the sea bed in front of the wharf and container yard pavement. Therefore, the alternatives to arrangement of these facilities were evaluated from the viewpoint of development effect, cost and environment.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipment comply with the country's emission standards? Are any	(a) Y	(a) While there are neither emission standards of air pollutants nor air quality standards in Solomon Islands, international standards such as the EHS Guidelines of IFC are fulfilled. Regarding deterioration of air quality due

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		mitigating measures taken?		to operation of heavy machinery and construction vehicles during the construction stage, international emission standards are planned to be fulfilled by appropriate use of construction vehicles and maintenance of machinery and vehicles.
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipment comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) Y (b) Y (c) Y (d) Y (e) Y	(a) There is no effluent from the Port. (b) All ships are required to comply with regulations and standards under MARPOL. (c) Leakages of oils and toxicants from the port facilities are not expected since newly constructed facilities are civil engineering ones such as a wharf, seawall and container yard. (d) Although it is limited, the project affects topography of the seabed in land reclamation and dredging areas certainly and irreversibly. Therefore, land reclamation and dredging areas are kept to a minimum so that changes in water temperature and quality are not caused. (e) Soil without hazardous substances is used for land reclamation.
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) Y (b) Y (c) Y	(a) All wastes generated from activity at the Port are properly treated and disposed of in accordance with the related regulations. (b) After confirming that dredged soil does not include hazardous substances, it is used for land reclamation. (c) Most of the incoming and outgoing ships are containerships and their cargoes are mainly industrial products and commodities without hazardous substances. Moreover, ocean dumping of waste oil from ships into surrounding waters is prohibited.
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) There are no noise and vibration standards set in Solomon Islands. Regarding noise from heavy machinery and construction vehicles, the standards specified in the EHS Guidelines of IFC are planned to be fulfilled by avoidance of night-time

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				construction and strict abidance of speed limit.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Groundwater is not extracted.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) N	(a) There are no odor sources.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) There is a risk of contamination of bottom sediment through leaching of pollutants from ship anti-corrosion paint. Therefore, SIPA takes measures such as recall of stock on prohibited anti-corrosion paint and tight monitoring of carry-on of the paints into the Port.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected area around the project site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) Y (b) N (c) Y (d) N (e) N	(a) The Honiara Port is located in the Point Cruz jutting into the north side of Honiara City, whose coastal terrain forms a coral reef. (b) In a coral reef survey at the project site, precious coral species to be protected were not identified. (c) When selecting a project site, the north side of the Honiara Port where sound coral reef grew was avoided. (d) There may be no possibility that the project will adversely affect aquatic organisms since a silt fence is installed to avoid impact of turbidity on the environment during dredging works. (e) It is expected that there is no possibility that the project will adversely affect vegetation or wildlife of coastal zones.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc. if the project facilities are constructed on/by the seas?	(a) N	(a) It is expected that the project facilities do not affect tides so much since they are constructed along the oceanfront.
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) It is expected that large scale changes of topographic/geographic features or disappearance of the natural seashore are not caused by installation of the port facilities.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	(a) Any involuntary resettlement is not caused by project implementation. (b) Not applicable (c) Not applicable (d) Not applicable (e) Not applicable (f) Not applicable (g) Not applicable (h) Not applicable (i) Not applicable (j) Not applicable

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that changes in water uses (including fisheries and recreational uses) in the surrounding areas due to project will adversely affect the livelihoods of inhabitants? (c) Is there a possibility that port and harbor facilities will adversely affect the existing water traffic and road traffic in the surrounding areas? (d) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are considerations given to public health, if necessary?	(a) N (b) N (c) N (d) N	(a) The living conditions of inhabitants will be improved by the project. (b) Water uses in the surrounding areas will not be changed since the project is implemented within the port area. (c) The port and harbor facilities will not adversely affect the existing water traffic and road traffic. (d) There is very low risk of such a possibility since the port facilities are constructed mainly by machinery. Adequate considerations are given to public health, if necessary.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There are no heritage sites around the project site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is no area which requires attention for the local landscape since the project is located in the port area.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a) There is no residence of ethnic minorities and indigenous peoples around the project site. (b) v.s.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for	(a) N (b) Y (c) Y (d) Y	(a) The project proponent complies with any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project. (b) Tangible safety considerations are in place for individuals

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?		involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials. (c) Intangible measures are being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, safety training (including traffic safety and public health) for workers, etc. (d) Appropriate measures are taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents.
5 Others	(1) Impacts During Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Following mitigation measures against pollution during construction are developed. [Countermeasures against air pollution] - Use of well-maintained trucks and implementation of regular vehicle maintenance - Covering of loading space with sheet cover to minimize dust spills - Loading and unloading bulk cargo should be in areas protected from the wind in calm conditions. - Vehicles carrying dusty materials should be washed before leaving the site (washing facilities should be available). - Speed limit for construction vehicles - Speed limit for all the vehicles on the construction site - Spray bare ground and roads with water [Countermeasures against water pollution] - A silt fence is installed to avoid impact of turbidity on the environment during dredging and land reclamation. [Countermeasures against noise] - Use of well-maintained trucks and implementation of regular vehicle maintenance

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				- Strict abidance of speed limit and avoidance of unnecessary revving - Avoidance of night-time travelling of trucks whenever possible [Countermeasures against wastes] - Construction wastes (wastes of concrete and asphalt) are properly disposed to the damping site in the city. (b) Construction activities do not adversely affect the coral reef ecosystem.（See (C) and (D), "(2) Ecosystem" in "3: Natural Environment"） Mitigation measures against any negative impacts identified such as water pollution are developed as described above. (c) Various countermeasures against pollution are developed for local residents and fishermen. See (a) above.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) - (c) Y (d) Y	(a) The proponent develops and implements monitoring program for the environmental items that are considered to have potential impacts. (b) The monitoring program is proposed as stated below. - Air pollution (1/month during construction, 2/year during operation) - Water and sediment pollution (1/week during construction) - Soil pollution (1/month during construction) - Noise and Vibration (1/month during construction, 4/year during operation) - Topography・Geographical Features and Coastal zone (coral reef) (1/month during construction, 2/year during operation) - Flora, Fauna and Biodiversity (1/week during construction, 2/year during operation) - Accident (2/year during construction, 2/year during operation) (c) 1) The implementing entities of monitoring during construction stage are construction contractors and SIPA.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				2) The implementing entity of monitoring during operation stage is SIPA. 3) SIPA will establish an adequate monitoring framework. (d) Methodology and frequency of a report to the Ministry of Environment will be listed in EIA reports.
6 Note	Note on Using Environmental Checklist	(a) Where necessary, impacts on groundwater hydrology (groundwater level drawdown and salinization) that may be caused by alteration of topography, such as land reclamation and canal excavation should be considered, and impacts, such as land subsidence that may be caused by groundwater uses should be considered. If significant impacts are anticipated, adequate mitigation measures should be taken. (b) If necessary, the impacts to trans-boundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N/A (b) N/A	(a) Not applicable (b) Not applicable

1) Regarding the term “Country's Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

1-4 Port Demand Forecast

1-4-1 Trend of Social Economic Index

(1) Trend of Population

The population of past 10 years in Solomon Islands shown on Table 1.4.1-1, in which the population increases 2.8 to 2.3%/year and the population of 2011 becomes 540,000. According to the trend forecast, it is projected to be 640,000 in 2020.

Table 1.4.1-1 Population Change of Solomon Islands

(as of July 1)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total population ('000)	439	449	459	470	481	492	504	516	528	540
Population density (persons/km^2)	15.4	15.8	16.2	16.7	16.9	17.3	17.7	18.2	18.6	19.0
Annual change (%)	2.8	2.8	2.8	2.8	2.3	2.3	2.3	2.3	2.3	2.3

Source: Asian Development Bank

The population of urban area in Solomon Islands shown on Table 1.4.1-2 indicates that 101,798 persons and about 20% of all the population live in urban area like Honiara City and the vicinity. Area wise, there are much population in States of Malaita, Guadalcanal, Western and Honiara City. The population of Guadalcanal Island comprising Honiara City and State of Guadalcanal is 158,222 persons, occupying 30% of total population.

Table 1.4.1-2 Population of Solomon Islands (year of 2009)

Indicator	Population			Ave. Annual Growth Rate
	Males	Females	Total	
Solomon Islands	264,455	251,415	515,870	2.3%
Urban	53,478	48,320	101,798	4.7%
Rural	210,977	203,095	414,072	1.8%
Province				
Choiseul	13,532	12,840	26,372	2.8%
Western	39,926	36,723	76,649	2.0%
Santa Izabel	13,328	12,830	26,158	2.5%
Central Islands	13,261	12,790	26,051	1.9%
Rennel-Bellona	1,549	1,492	3,041	2.5%
Guadalcanal	48,283	45,330	93,613	4.4%
Malaita	69,232	68,364	137,596	1.2%
Makira/Ulawa	20,789	19,630	40,419	2.6%
Temotu	10,466	10,896	21,362	1.2%
Honiara	34,089	30,520	64,609	2.7%

(Source: National Bank of Solomon Islands)

(2) Trend of GDP

Table 1.4.1-3 shows the trend of actual GDP by industry of Solomon Islands (1985 as basic year) and shows an increasing trend although there seen a temporary backset by Lehman Shock in 2009 and the GDP in 2011 becomes SI$463.9 million. By industry, agriculture field occupies 50% of total.

Table 1.4.1-3 Actual GDP by Industry in Solomon Islands (Basic Year: 1985)

(SI$ '000,000)

Industry / Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	124.5	148.3	164.8	173.5	183.4	205.4	219.1	203.1	224.8	252.0
Mining	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.8	0.8	...
Manufacturing	10.6	9.5	9.6	9.7	10.0	10.2	10.4	10.0	10.0	...
Electricity, gas, and water	4.6	4.6	4.6	5.4	5.5	6.2	6.3	6.1	6.4	...
Construction	6.2	7.4	8.1	8.7	9.9	11.9	12.6	13.0	13.1	...
Trade	27.2	28.3	29.2	29.7	29.7	31.6	34.2	34.2	34.9	...
Transport and communications	11.2	11.9	12.3	12.5	16.0	19.3	21.4	25.8	28.3	...
Finance	15.2	14.9	15.2	15.4	15.7	17.1	17.4	17.8	18.1	...
Others	60.9	52.6	55.9	59.9	63.7	68.0	75.3	81.1	87.5	...
GDP Total	260.5	277.4	299.7	314.8	333.9	369.7	396.8	391.9	419.1	463.9

Source: Asian Development Bank

(3) Trade Balance

The trend of trade balance in Solomon Islands is as per shown in Table 1.4.1-4. Main export goods are lumbers, minerals, fisheries products, palm oils and etc. The export sum of 2011 becomes SI$ 3,156 million increasing rapidly than previous year and it contributes to the improvement of trade balance. Rapid increase of lumbers, minerals and palm oil/ kernel contributes the balance. The import has shown the increasing trend although there seen a temporary stagnation by Lehman Shock in 2009, the import sum becomes SI$3,179 million in 2011. By items, machineries, vehicles, foods, farm animals, fuels and the basic products are getting remarkable. Although, the trade balance shows the minus, but the minus sum decreased to a large extent in 2011.

Main trade partners and the trade sum are as per shown in Table 1.4.1-5. China is the most export partner in 2011, occupying about 51% out of total export sum of US$ 618.1 million. Australia, Thailand, Italy and Spain are following. While, the total of Singapore and Australia occupies about 53% of the total import sum of US$523.3 million. The import from Japan is US$16.3 million and takes 8th place of the total.

Table 1.4.1-4 Trend of Trade Balance in Solomon Islands

(SI$ '000)

Goods	2006	2007	2008	2009	2010	2011
Export (f.o.b)						
Copra & Coconut	21,802	53,513	177,422	53,446	98,164	215,854
Fish	129,847	157,755	176,052	134,013	196,805	341,074
Logs	600,179	766,814	854,873	710,042	1,005,692	1,457,399
Cocoa	30,827	45,532	69,142	116,750	118,234	119,378
Timber	24,452	40,413	50,596	51,672	47	74,294
Palm Oil & Kernels	16,195	110,141	164,151	134,604	256,246	326,250
Minerals	6,236	6,424	20,500	29,545	25,729	518,002
Other Exports	16,049	37,586	38,648	45,645	25,912	35,666
Re-exports & unrecorded	22,061	40,882	76,176	52,834	30,758	68,138
Total Export (f.o.b)	867,648	1,259,600	1,627,560	1,328,551	1,804,387	3,156,055
Imports (c.i.f)						
Food and live animals	269,781	386,335	497,900	486,225	633,270	643,209
Beverages and tobacco	29,360	40,371	38,463	31,285	40,516	56,959
Crude materials, excl fuels	8,155	9,381	7,107	18,070	16,947	42,818
Mineral fuels	427,225	544,451	622,313	417,593	457,015	732,561
Animal, veg and oil fats	6,666	9,574	12,470	7,149	15,502	22,681
Chemicals	98,442	122,587	171,087	77,551	180,805	326,170
Basic manufactures	181,730	276,377	326,278	301,025	464,693	574,263
Machiney and transport equipment	471,767	622,049	547,624	605,831	1,156,325	860,245
Miscellaneous	150,600	167,391	149,403	162,642	260,896	257,259
Goods not specified elsewhere	6,419	11,682	9,646	7,473	1,104	4
Re-export & unrecorded imports	18,768	49,242	36,985	43,121	33,793	49,792
Total Imports (c.i.f)	1,668,913	2,239,440	2,419,276	2,157,965	3,260,866	3,565,961
Frieght and Insurance	181,516	240,922	262,052	354,978	354,978	386,779
Total Imports (f.o.b)	1,487,396	1,998,519	2,157,225	1,925,333	2,905,890	3,179,183
Trade in Goods Balance (f.o.b.)	△ 619,748	△ 739,459	△ 529,665	△ 1,101,502	△ 1,101,502	△ 23,128

* Imports(f.o.b) = Imports(c.i.f) - Freights & Insurance

Source: Central Bank of Solomon Island, Amnnual Report 2011

Table 1.4.1-5 Main Trade Partners of Solomon Islands

(US$ '000,000)

Year (calendar year)	2007	2008	2009	2010	2011
Exports, total	351.4	403.7	305.7	438.5	618.1
1. China	165.7	195.3	161.9	260.9	316.7
2. Thailand	21.2	27.0	10.8	14.8	27.1
3. Australia	5.6	5.4	4.0	5.0	73.2
4. Korea	22.9	21.1	11.5	14.3	11.4
5. Italy	12.0	13.7	11.2	14.2	21.6
6. Spain	3.9	22.0	14.5	9.1	20.7
7. Philippines	13.9	19.0	8.1	9.2	15.6
8. Japan	18.6	11.1	6.1	8.5	5.6
9. Malaysia	8.8	6.1	4.9	6.0	5.8
10. Indonesia	1.0	3.6	6.8	10.3	9.7
Imports, total	352.6	354.5	307.9	407.1	523.3
1. Singapore	94.2	93.2	74.4	86.1	136.6
2. Australia	85.0	63.1	69.5	115.3	141.4
3. China	11.2	13.0	18.6	31.3	33.7
4. New Zealand	14.9	14.0	15.7	24.2	26.2
5. Malaysia	8.8	15.4	13.0	22.1	26.5
6. Fiji	13.5	15.4	13.5	17.1	19.2
7. Papua New Guinea	13.1	15.0	13.1	16.6	18.6
8. Japan	15.4	11.3	9.8	13.2	16.3
9. India	23.1	31.9	1.2	0.7	1.2
10. Indonesia	6.3	6.7	4.9	6.2	14.2

Source： Asian Development Bank

1-4-2 Trend of International Cargoes in Honiara Port

(1) Handling Volume of International Cargoes

The handling volume of international cargoes in Honiara Port is as shown in Table 1.4.2-1and Figure 1.4.2-1. There is a berth for tankers and a jetty for fishing boats other than the international wharf that mainly handles container cargoes and each handling volume is sorted out separately. The handling cargo volume in the international wharf shows an increasing trend in the export and import cargoes. The handling volume in 2012 becomes 85,241RT (Revenue Ton) in the export and 346,481 RT in the import totaling 472,903 RT in handling volume. And, the annual international cargoes handling volume including 218,933 RT of other facilities than the international wharf is 650,655RT.

Table 1.4.2-1 Handling Volume of International Cargoes in Honiara Port

Cargo (RT)

Year (to Sept.)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1. Cargo handled by SIPA at Main Wharf										(Revenue Ton)
Export	17,068	36,689	45,391	47,450	56,851	80,269	59,190	56,355	77,829	85,241
Import	123,350	145,313	169,372	189,557	258,632	265,294	265,896	309,497	329,135	346,481
Sub-total	140,418	182,002	214,763	237,007	315,483	345,563	325,086	365,852	406,964	472,903
2. Cargo not handled by SIPA (Fuel, Gas and Fish)										(Revenue Ton)
Export	0	0	0	1,000	14,694	20,846	25,730	25,675	29,915	41,566
Import	39,448	55,890	27,239	50,228	65,308	75,020	82,631	84,707	102,011	95,284
Transhipment (Fish)	0	69,785	2,680	85,030	118,695	180,457	199,019	122,741	205,600	82,083
Sub-total	39,448	125,675	29,919	136,258	198,697	276,323	307,381	233,123	337,526	218,933
3. All Cargoes										(Revenue Ton)
Export	17,068	36,689	45,391	48,450	71,545	101,115	84,920	82,030	107,744	126,807
Import	162,798	201,203	196,611	239,785	323,940	340,314	348,527	394,204	431,146	441,765
Transhipment (Fish)	0	69,785	2,680	85,030	118,695	180,457	199,019	122,741	205,600	82,083
Total	179,866	237,892	242,002	288,235	395,485	621,886	632,467	598,975	744,490	650,655

Source: SIPA Statistics

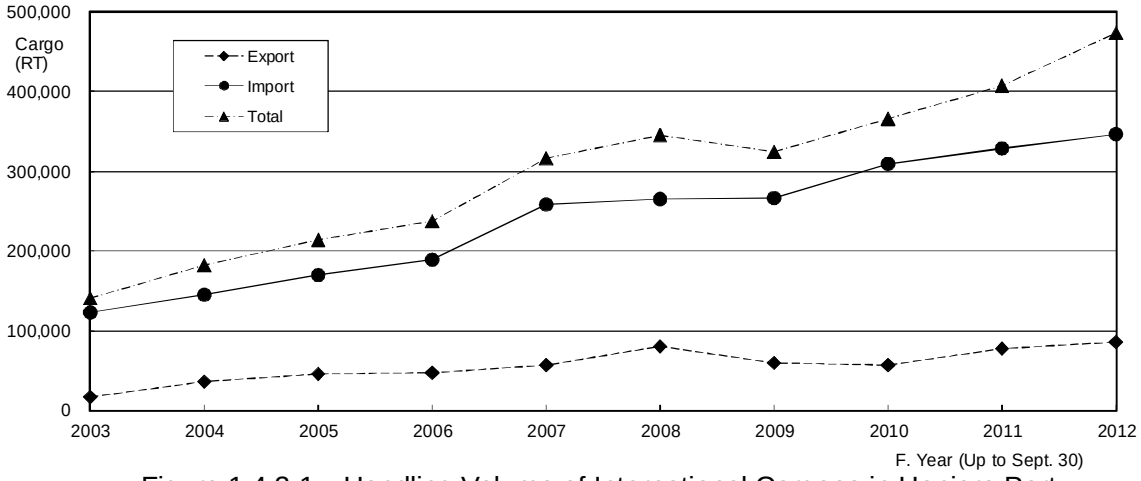


Figure 1.4.2-1 Handling Volume of International Cargoes in Honiara Port

(2) Handling Volume of International Containers

The handling volume of international containers in the existing international wharf of Honiara Port is as shown in Table 1.4.2-2. The number of handling containers shows an increasing trend every year although the temporary stagnation is seen in 2009 by Lehman Shock.

The container handling volume in 2012 becomes 10,519 TEU (Twenty Foot Equivalent Unit) in the export and 11,045 TEU in the import and 21,564 TEU in the total. The most of import containers are full containers judging from the trade structure of Solomon Islands, but 80% of handling containers for export are empty.

Table 1.4.2-2 Handling Volume of Container in Honiara Port

Container(TEU)

Year (to Sept.)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1. Export										(TEU)
Full	931	1,223	935	997	1,438	1,705	1,506	1,472	1,787	2,165
Empty	3,337	3,717	4,662	4,730	6,471	5,921	6,171	4,807	8,074	7,867
Transhipment	16	0	801	310	500	751	138	74	170	487
Sub-total	4,284	4,940	6,398	6,037	8,409	8,377	7,815	6,353	10,031	10,519
2. Import										(TEU)
Full	4,268	5,279	5,804	6,520	8,179	7,740	7,011	8,542	8,722	10,604
Empty	28	77	61	45	53	55	28	51	109	69
Transhipment	0	248	613	354	184	761	147	98	137	372
Sub-total	4,296	5,604	6,478	6,919	8,416	8,556	7,186	8,691	8,968	11,045
3. All Containers										(TEU)
Full	5,199	6,502	6,739	7,517	9,617	9,445	8,517	10,014	10,509	12,769
Empty	3,365	3,794	4,723	4,775	6,524	5,976	6,199	4,858	8,183	7,936
Transhipment	16	248	1,414	664	684	1,512	285	172	307	859
Total	8,580	10,544	12,876	12,956	16,825	16,933	15,001	15,044	18,999	21,564

Source: SIPA Statistics

(3) Handling Volume of International Cargoes by Items

Table 1.4.2-3 shows the trend of handling volume of international cargoes by commodity in Honiara Port. In the export cargoes, main items consist of palm oil, copra, timber and general cargoes. As lumber that is main export item is handled in the exclusive port, it is not handled in Honiara Port. Main import cargoes are general cargoes, fuel, bagged food, vehicles and cement. Out of these, fuel is handled not in the international wharf but in the tanker berth.

Table 1.4.2-3 Handling Volume of International Cargoes by Items

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Exports										
Copra	5,150	11,867	20,923	19,812	16,401	31,925	22,971	17,820	33,233	24,822
Rice	130	43	1,048	1,200	1,046	100	97	142	202	0
Cocoa	4,780	7,323	6,881	6,987	8,077	7,472	7,207	9,682	11,423	8,241
Timber	280	164	5,421	10,085	456	21,397	14,987	14,896	17,703	22,290
Palm Oil	4,240	6,976	0	1,000	14,695	20,846	25,730	25,675	29,915	42,089
Palm Kernel	0	0	0	254	3,589	3,950	3,319	3,042	3,047	9,155
Mill Run (Stock Feed)	0	0	169	0	0	527	0	0	0	0
Fish	0	0	1,765	739	0	0	517	304	330	533
Shells	0	0	272	296	355	214	314	163	208	197
Beche- De-Mar	120	122	0	0	189	0	0	0	0	0
Motor Vehicle	10	2,751	41	24	334	433	158	6	51	456
General Cargoes	2,360	7,442	8,871	8,053	12,231	14,253	9,630	10,299	11,634	19,025
SubTotal	17,070	36,688	45,391	48,450	57,373	101,117	84,930	82,030	107,746	126,808
Transhipments										
Frozen fish										
Fish in Bulk	0	69,790	2,680	85,030	118,695	180,457	199,009	122,741	205,600	82,083
Others										
SubTotal	0	69,790	2,680	85,030	118,695	180,457	199,009	122,741	205,600	82,083
Imports										
Cement	5,450	7,307	9,470	10,005	20,831	16,278	16,417	16,129	20,525	19,333
Fertilizer	0	24	361	217	3,314	4,246	5,526	4,640	7,524	6,748
Bagged Food	25,080	27,740	37,664	24,481	36,346	31,756	27,724	22,437	36,229	43,130
Grain	700	2,409	7,315	6,604	12,224	11,140	10,916	11,790	14,030	12,140
Vehicles	7,900	10,490	13,414	18,419	21,795	20,750	18,407	22,990	26,986	31,480
Drums Fuel	0	1,367	1,958	4,044	2,651	2,266	2,578	1,470	1,534	3,620
Fuel(Bulk)	38,750	55,260	26,284	49,152	64,519	72,800	75,704	78,217	94,850	87,104
Gas(Bulk)	700	629	955	1,076	789	2,220	6,198	6,490	7,161	8,180
General Cargoes	84,210	95,980	96,509	125,787	161,471	178,858	185,058	230,041	222,307	230,030
Total Import	162,790	201,206	193,930	239,785	323,940	340,314	348,528	394,204	431,145	441,765
Grand Total	179,860	307,684	242,001	373,265	500,008	621,888	632,467	598,975	744,491	650,656

Source: SIPA Statistics (Year: 12 Months up to Sept. 30)

(4) Trend of Cargoes by Type of Vessels

Table 1.4.2-4 shows the handling volume of international cargoes by type of vessel. The almost all export cargoes are handled by containers with the exception of copra and palm oil. Although a part of copra is exported by container, most of them are transported by copra exclusive vessel. And also, most palm oil is exported by palm oil tanker.

Import cargoes handled in the international wharf are container cargoes and vehicles. Most of vehicles are unloaded and devanning on berth after transported by container. There is another case to import as the break bulk cargo.

Table 1.4.2-4 Handling Volume of International Cargoes by Type of Vessels

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Export										
Export Containers (TEU)	931	1,123	935	997	1438	1,705	1,506	1,472	1,787	2,165
Export Bulk Copra (RT)	5,153	11,867	20,923	19,812	16,401	31,925	22,971	17,820	33,233	21,212
Export Bulk CPO (RT)	0	0	0	1,000	14,695	20,846	25,729	25,675	29,915	41,425
Import										
Import Containers (TEU)	4,268	5,279	5,804	6,520	8,179	7,740	7,011	8,542	8,722	10,604
Import Vehicles (Units)	395	525	671	921	1,090	1,038	920	1,150	1,349	1,574
Import Buld Fuel (RT)	697	629	26,284	49,152	64,519	72,800	75,704	78,216	78,000	81,900
Import Bulk Gas (RT)	700	629	955	1,076	789	2,220	6,198	6,490	7,161	8,180

Source: SIPA Statistics (Year: 12 Months up to Sept. 30)

(5) Handling Volume of Copra and Palm Oil

The handling volume of copra and palm oil that are main export items handled in Honiara Port is as shown in Table 1.4.2-5. The handling volume of copra is varied intensively by year since copra is very much depended on international price i.e. the handling volume is increased when the price is high but it is decreased when the price is low. Palm oil is increased significantly, its production and the handling volume is getting increased year by year. And the handling volume becomes more than the handling volume of copra in 2012.

Table 1.4.2-5 Handling Volume of Copra and Palm Oil in Honiara Port

Cargo(RT)

Year (to Sept.)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Copra	5,150	11,867	20,923	19,812	16,401	31,925	22,971	17,820	33,233	24,822
Palm Oil	4,240	6,976	0	1,000	14,695	20,846	25,730	25,675	29,915	42,089

Source: SIPA Statistics

1-4-3 Forecast of Container Volume and Calling Container Ships

(1) Forecast of Container Handling Volume

Most of the international cargoes in Honiara Port, as it is clarified by the cargo statistic with type are handled as container cargoes. As the feature of handling containers, full containers that occupy the most of imported containers are the main and empty containers that occupy the most of export are gone hand in hand. And, as most of palm oil and copra that are main export items are transported by exclusive tanker or copra exclusive boat, this does not contribute to the container handling volume. Future forecast of container handling volume is made considering of these features. The container handling volume in Honiara Port is as shown in Table 1.4.2-2, although in the year of 2009 that became world recession by Lehman Shock there was a temporary stagnation, the cargo volume has been steadily increased after that. The similar tendency can be understood by the GDP trend described previously that shows the scales of economic activities and the changes of growing rate of GDP that is shown in Table 1.4.3-1. And Figure 1.4.3-1 shows the relationship between the trend of GDP that is obtainable from the Table 1.4.3-1 and the handling volume of imported containers shown in Table 1.4.2-2. Both are highly correlated each other and the container handling volume also shows an increasing trend according to the growth of GDP.

Table 1.4.3-1 Trend of GDP Growing Rate in Solomon Islands

Year	2006	2007	2008	2009	2010	2011	2012	Average
GDP Growth Rate (%)	3.5	8.5	7.6	-1.9	7.9	10.6	3.2	5.6

Source: Central Bank of Solomon Islands

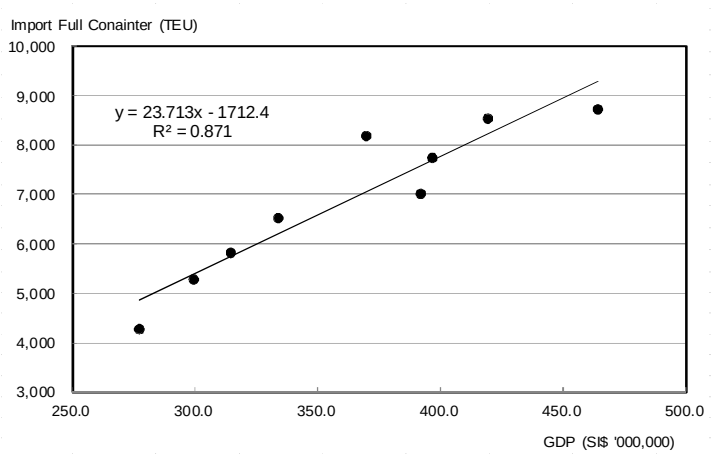


Figure 1.4.3-1 Relationship between Import Container Handling Volume and GDP

In case that there is no big change in future on social economic structure of the hinterland and the average growing rate of GDP trends is maintained about 5% as shown in Table 1.4.3-1, it is considered that the increasing trend of container handling volume stays almost constant for the time being, which signify that the future demand is forecasted with the trend base. Meanwhile, imported empty containers and transshipped containers are excluded from the forecasting, since they are not relatively significant.

Figure 1.4.3-2 shows the forecasted volume based on the actual figures of 10 years from 2003 to 2012 for import full containers, export full containers and import vehicles. The volume of import full containers will be increased with the rate of 581 TEU per year and the handling volume in the year of 2020 is forecasted as 14,518 TEU. This results 1.37 times increase comparing with 10.604 TEU that is the handling volume of 2012 and the simple average increasing rate becomes 5.8% per year.

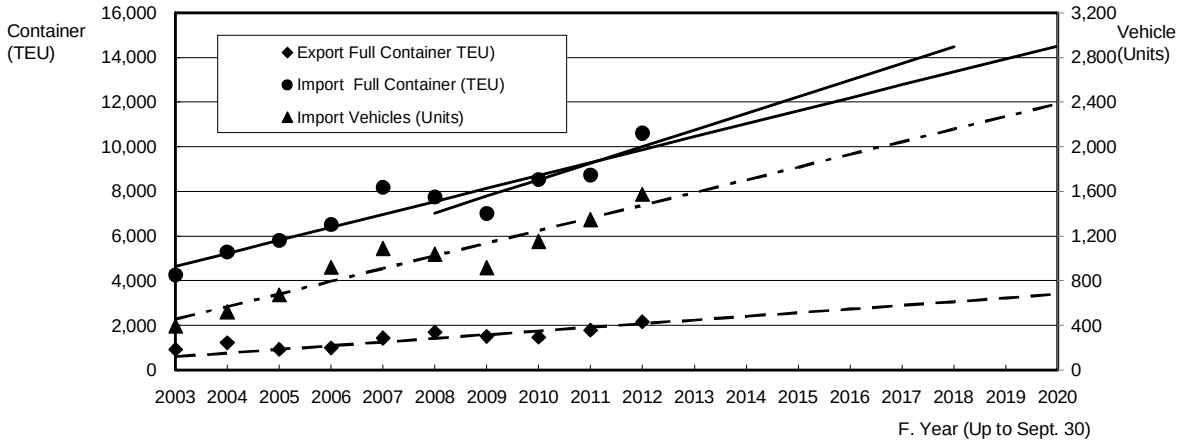


Figure 1.4.3-2 Forecast of Container Handling Volume in International Wharf

Therefore, the total container cargo volume in the international wharf of Honiara Port is forecasted as about 29,000 TEU in the year of 2020 as shown in Table 1.4.3-2. Meanwhile, in case that import full containers are based on the actual figures of past 5 years from recent 2008 to 2012, the increasing rate becomes higher and it may be possible that the achieving year to 14,000 TEU written above could be accelerated about 2 years than the year of 2020. For a reference, the forecasted figure of import container in the year of 2020 by PIAC Scoping Report shows 14,097 TEU that is slightly below the forecasted figure by this survey.

Table 1.4.3-2 Forecast of Container Handling Volume in International Wharf

Container (TEU)		2012 (Actual)	2020 (Forecast)
Export Container	Full	2,165	3,393
	Empty	7,867	11,125**
Import Container	Full	10,604	14,518
	Total	20,636	29,036*

*) Total container volume in 2020 is estimated by export container volume equivalent to import container volume

**) Export empty container volume is estimated to be difference between total container volume and export full container volume

Furthermore, the imported vehicles is expected to increase from 1,600 vehicles in the year of 2012 to 2,400 vehicles in the year of 2020 as shown in Figure 1.4.3-2. Although, the imported vehicles are sensitively varied by taxation system and etc., it is expected to increase continuously. The vehicles is transported by Ro-Ro vessel and discharged though the ramp of Ro-Ro- vessel that cannot be used at present. As the direct unloading using Ro-Ro ramp enabled by the construction of the Second International Wharf, the vehicle's handling becomes drastically effective.

(2) Future Forecast of Number of Calling Container Ships

Ship calling to Honiara Port in case of Greater Bali Hai are sequentially operated by sister ships with Islander type having with the facilities restrictions of surrounding ports. And, regarding Swire Shipping, although it is trying to convert from the sister ships of Kwansi to the sister ships of Shansi, the sizes of ship's body are almost the same. Therefore, as calling ships will not be grown in size significantly in the near future, the future increase of port cargo volume is considered to be converted by the increase of number of calling ships.

The future forecast of the number of calling container ships shown in Table 1.4.3-3 is made based on the actual figures in 10 years from 2003 to 2012. The number of calling container ships is forecasted as 172 ships in the year of 2020 based on the last 10 years actual figures referring to Figure1.4.3-3. And, the recent increase of number of calling vessels as shown in the figure is shown a rapid rise in comparison with the past and it is expected to be 161 ships in the year of 2014 with the recent forecasted result based on the actual figures from recent 2008 to 2012. It indicates the possibility to exceed the forecasted result of past 10 years.

The number of calling ships in the year of 2020 is 158 ships/year according to the Scoping Study of PIAC. This is the result to be 14 ships less than the number of calling ships in the year of 2020 by this study.

Table 1.4.3-3 Number of Calling Vessels to International Wharf

Year (upto Sept. 30)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Number of Ship Calls	177	399	330	423	437	577	617	503	598	496
Ships Berthing at International Wharf	139	207	170	166	155	210	233	212	189	241
Container Ship	73	82	62	74	85	88	83	98	123	137
Copura Ship	1	8	13	13	10	19	20	10	20	14
Palm Oil Tanker	0	0	1	10	11	8	7	8	8	13
Cruise Boat	1	3	2	0	2	7	6	6	2	5
Fishing Boat	10	43	14	17	20	30	35	34	9	22
War Ship	2	7	2	2	5	2	7	1	4	3
Flat Logging Berge										10
Others	52	64	76	50	22	56	75	55	23	37
Fuel Tanker Berthing at Oil Berth	20	26	34	23	26	35	30	30	34	35

Source: SIPA Statistics (Year: 12 Months up to Sept. 30)

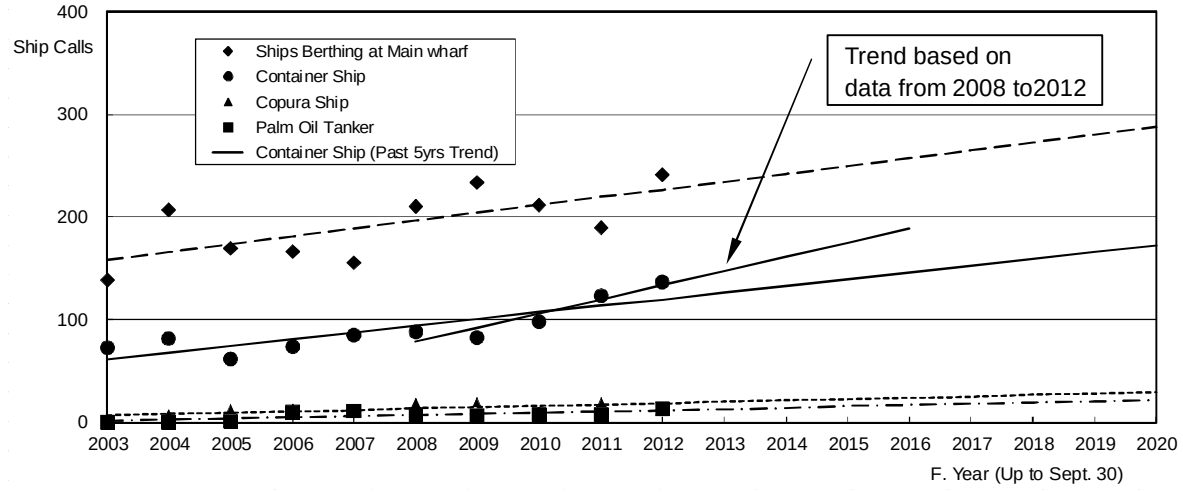


Figure 1.4.3-3 Forecast of Number of Calling Vessels to International Wharf

1-5 Organization and Management Improvement Plan

1-5-1 Institutional Framework

Solomon Islands Port Authority (SIPA) was established as a statutory company under the authorization of Port Act of Solomon Islands, and was initially under the control of the Ministry of Finance and Treasury. The Port Act stipulated the objectives, functions and responsibility of SIPA, and even hereto SIPA's basic functions are substantially subjected to the stipulation.

By State Owned Enterprise Act which came into force in 2007, SIPA was granted status as a State Owned Enterprise (SOE) managing both Honiara and Noro Port, and became under the control of Ministry of Infrastructure Development (MID).

At present, functions of SIPA cover a wide range of port activities including port development, maintenance, administration and operations. These functions are categorized into three main functions.

[Development and Maintenance of the Port Facilities]

i) Expansion/rehabilitation planning, development and construction supervision of port facilities in Honiara and Noro to facilitate trade expansion and cargo growth

ii) Maintenance and keeping good condition of port facilities (maintenance and repair, cleaning, water depth keeping, renovation, etc.)

[Administration and Control of Port Facility Utilization]

i) Permit approval of port facility usage

ii) Vessel traffic control in the channel and port area (Harbor Master)

[Providing Port related Services and Port Facility Management]

i) Pilotage and navigation aids to the calling vessels

ii) Providing berthing, stevedoring, cargo handling, warehousing services to the customers, i.e. shipping lines, cargo owners, etc.

iii) Leasing land, building, warehouse and other port facilities

1-5-2 Existing Organization

Under the control of Board of Directors, SIPA manages both Honiara and Noro Port. However, organization and management center is Honiara Port, while a small number of staff members is dispatched to Noro Port. According to interviews with SIPA's managers, SIPA has a total of 224 employees (196 personnel in Honiara Port, 28 personnel in Noro Port) at the time of April 2013. Organization of Honiara Port consists of four (4) departments; Operation Department, Engineering Department, Financial Department and Corporate Service Department.

Table 1.5.2-1 Number of Employees of SIPA (Honiara Port) (April 2013)

Department	Number of Employees	%	Remarks
Operation Department*	110	56%	*Navigation:15 (8%)
Engineering Department	29	15%	*Stevedoring:95 (48%)
Finance Department	19	10%	
Corporative Services Department	37	19%	
Total (additional: +1 (CEO))	196	100%	

(1) Operation Department has 110 (56% of total employees of Honiara Port). It has two category of functions, i) Navigation and Port Operations, and ii) Stevedoring and Cargo Operations.

i) Navigation and Port Operations section has fifteen (15) employees including Operational Director who covers Harbor Master of the Port. This section is responsible for pilotage, navigation aid, berth allocation in both international and domestic berths, berthing and un-berthing aid, water supply and refueling to the calling vessels (See Figure 1.5.2-1).

ii) Stevedoring and Cargo Operations section has ninety-five (95) employees. This section is responsible for stevedoring, cargo and container handling, storage and delivery services, cargo handling equipment operation and warehouse services (See Figure 1.5.2-1). Besides the direct employees of the Port, more than twenty-four (24) casual workers take part in vessel operations at peak time.

(2) Engineering Department has twenty nine (29) employees under the supervision of Director of Engineering (15% of total employees of Honiara Port). This department is responsible for planning, project management (construction), engineering and maintenance of the facilities of SIPA, as well as workshop operations (maintenance and management of equipment). Among them workshop (maintenance shop) has twenty-six (26) employees making it the biggest organization of the Engineering Department (See Figure 1.5.2-1). Besides the direct employees of the Port, SIPA has a Project Team (hired on a yearly contract basis) which consists of more than twenty (20) workers who participate in maintenance of the civil facilities of the Port. Sometimes, the Team undertakes reclamation and construction works.

(3) Finance Department has nineteen (19) employees under the supervision of the Director of Finance (10% of total employees of Honiara Port). This department is responsible for whole financial and accounting works of SIPA, i.e. financial planning, budgeting, accounting, control of receivables and payables, casher and payroll administration. This department also undertakes a wide range of managerial works such as ledger control of fixed asset leasing contract, manifest control and cash collection of port dues, compiling port statistics, and management of IT system of the Port (See Figure 1.5.2-1).

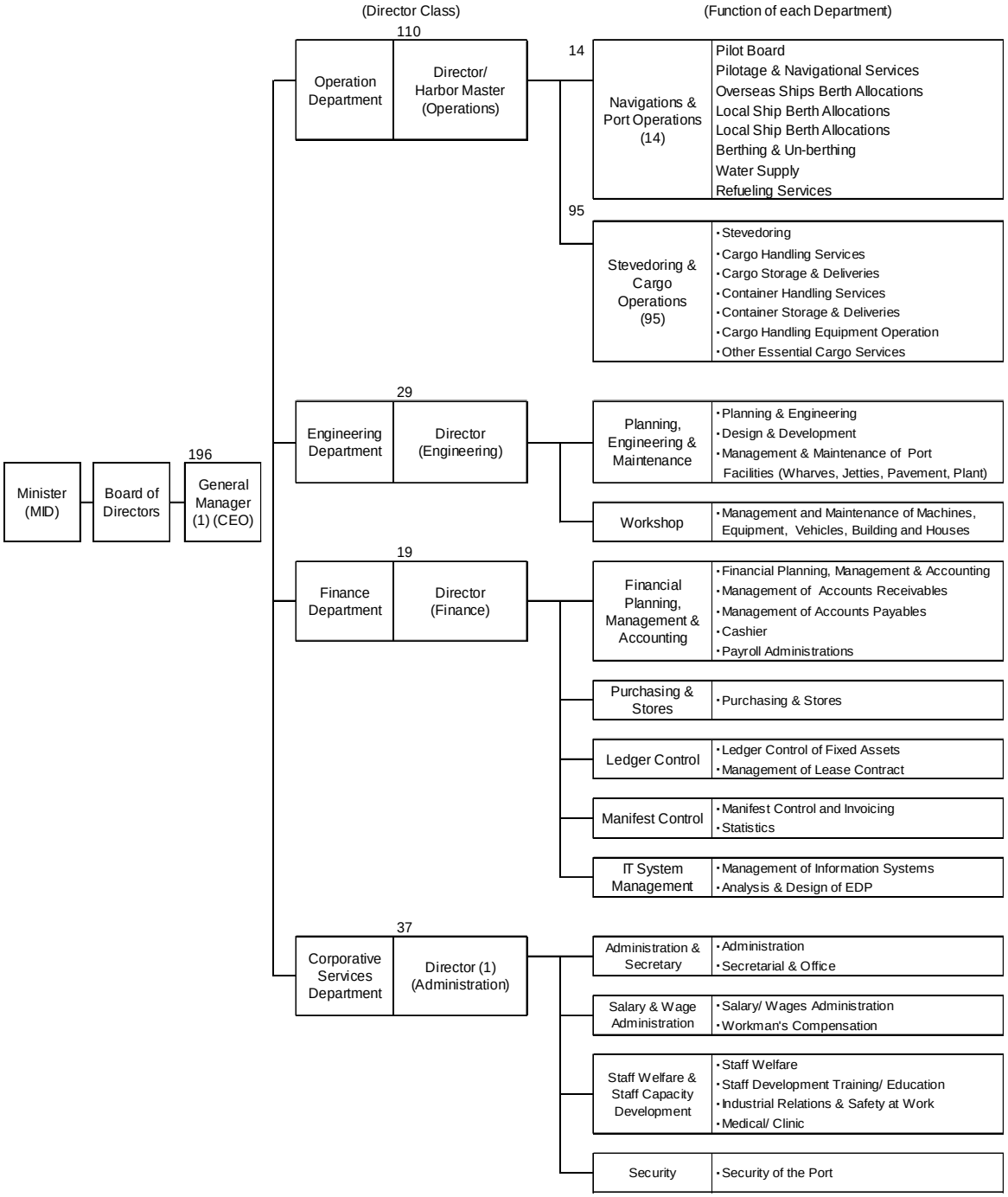


Figure 1.5.2-1 Organization of SIPA (Honiara Port), April 2013

(4) Corporate Service Department has thirty seven (37) employees under the management of the Director of Administration (37% of total employees of Honiara Port). This department is responsible for all the administrative works of SIPA, i.e. human resource management, salary and wage administration, staff welfare and capacity development and security control of the Port (See Figure 1.5.2-1). The security control section, which is the largest organization of this department, has twenty six (26) employees under the supervision of the chief security officer, and executes its duties on a three shift (with four groups) basis.

In order to perform their responsibility four (4) departments have their own workforce and organizational structures. Workforce and organizational structure of each department is shown in Figure 1.5.2-2.

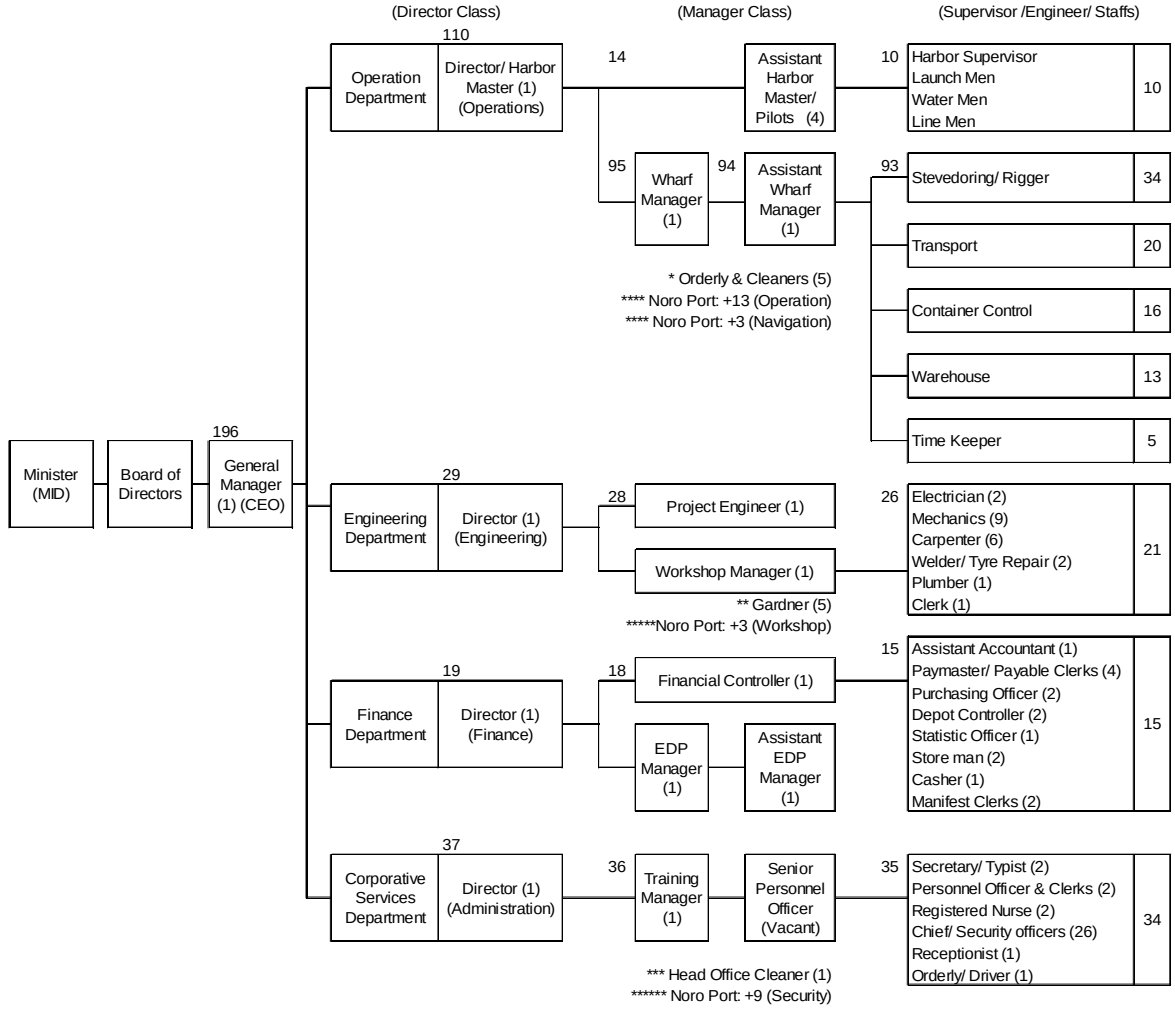


Figure 1.5.2-2 Organizational Structure and Workforce of SIPA (Honiara Port), April 2013

Among the four departments described above, organization and work force deployment related to Stevedoring and Cargo Operation section in Operation Department, which is directly involved in this Project (the development and operation of No.2 international berth), is analyzed from the viewpoint of container operation in the following section.

1-5-3 Present Workforce Allocation in Stevedoring and Cargo Operation

Workforce dedicated Stevedoring and Cargo Operation in the Port amounts to 112 persons. Among them, SIPA has eighty eight (88) employees while there are twenty four (24) casual workers who are pulled into vessel operations as supplementary workers. These workforces also undertake Copra vessel stevedoring and general cargo operation, in which less workforce is required than container operation (See Table 1.5.3-1).

Table 1.5.3-1 Workforce Allocation for Container Operation (Honiara Port), April 2013

Designation	Working Place	Position	A-Shift Workers		B-Shift Workers		Skeleton Workers	Total
			1st. Gang	2nd. Gang	1st. Gang	2nd. Gang		
Stevedoring	Wharf	Shift Supervisor	1		1			42
	Onboard	Foreman	1	1	1	1		
		Crane Operator	1	1	1	1		
		Signal Man	1	1	1	1		
		Stevedore	3	3	3	3		
		Casual Workers	3	3	3	3		
		Total	9	9	9	9		
		Ship Tally Clerk	1	1	1	1		
Rigger	Berth	Rigger	1		1		2	16
		Casual Workers	3		3		6	
		Total	4		4		8	
Transport	Terminal	Transport Supervisor					1	20
		Heavy Machine Operator	2		2		2	
		Top Lifter/ Fork Lift Operator	2		2		2	
		Tractor Operator	2		2		2	
		Total	6		6		7	
		Transport Clerk					1	
Container Control	Terminal	Container Controller					1	16
	Berth	Quay Tally Clerk	1	1	1	1		
	Container Yard	Yard Traffic Clerk					2	
	FCL Delivery Office	Container Receipt/ Delivery Clerk					3	
	Container Service Office	Container Service Clerk					4	
	Back-loading Office	Back-loading Clerk					2	
Warehouse	No.3 & No.4 Warehouse (LCL Container, General Cargo, Break Bulk Cargo)	Warehouse Supervisor					1	13
		Shift Operation Clerk	3		3			
		No.3 Warehouse Control Clerk					3	
		No.4 Warehouse Control Clerk					1	
		Break Bulk Control Clerk					1	
		Storage A/C Office Clerk					1	
Time Keeper	Wharf	Time Keeper					5	5
Total			36		36		40	112

Workforce of container operation consists of three groups, (1) Vessel operation workers, (2) Yard operation workers and (3) Warehouse and general cargo operation workers, and they are conducted by Wharf Supervisor in each shift. Working hours in each shift and skeleton workers is shown in Table 1.5.3-2.

Table 1.5.3-2 Operation Hours of SIPA

	Skelton Working Hours		Day-shift Working Hours		Night-shift Working Hours	
Total Working Hours	07:30-16:00	8.5	07:30-19:30	12.0	19:30-07:30	12.0
Details	07:30-11:30	4.0	07:30-11:30	4.0	19:30-24:00	4.5
	M/B 11:30-13:00	1.5	M/B 11:30-13:00	1.5	M/B 24:00-01:00	1.0
	13:00-16:00	3.0	13:00-16:00	3.0	01:00-04:00	3.0
			T/B 16:00-16:30	0.5	T/B 04:00-04:30	0.5
			16:30-19:30	3.0	04:30-07:30	3.0
Overtime			16:30-19:30	3.0		

Note： M/B: Meal Break, T/B: Time Break

(1) Vessel Operation Workers

Vessel operation workers' group includes Stevedores (42 persons), Riggers (16 persons), and Transport workers (20 persons) who operate container handling equipment and tractors. Stevedores and Riggers are deployed into two (2) shifts and two (2) gangs per shift (See Table 1.5.3-1). Totally, this Port has four (4) gangs for 24 hour vessel operation.

Transport workers' group consists of two (2) groups and one (1) group is allocated to each shift. Therefore, two (2) gangs' of Stevedores and Riggers are covered by one transport group. Each transport group usually has six (6) workers for vessel operation including two (2) heavy duty machine operators at the quayside, two (2) tractor operators, and two (2) heavy duty machine operators at the yard. In addition to vessel operation, two or three skeleton workers are allocated for container receiving and delivery operations (See Table 1.5.3-1).

(2) Yard Operation Workers

Yard operation workers designated as Container Control (16 persons) are responsible for i) Talley work at the quay, ii) Stacking location assignment for discharging and receiving containers, iii) Container receiving, delivery and inventory control and iv) container document control (See Table 1.5.3-1). Except tally clerk at the quay, they are skeleton workers. As all the information processing related to the container operation in the Port is done on a manual basis or by standalone PC, information updates fail to keep pace with the actual container movement. When container traffic increases in near future, container terminal of the Port will soon become uncontrollable.

(3) Warehouse and General Cargo Operation Workers

Warehouse and general cargo operation workers (13 persons) are clerks responsible for receiving, delivery and inventory control of such cargoes as LCL container cargo, break bulk and general cargoes, which are stored in No.3 and No.4 warehouse area. General cargo includes import cars, import machinery, import steel product and other cargoes (See Table 1.5.3-1). Basically they are skeleton workers.

Besides the above three groups of workers, this Port has a group of clerks (5 persons) designated as "Time Keeper". They keep all the precise time records on vessel operation including rest and detention time at the quayside, and report to the management.

1-5-4 Organization Plan after No.2 International Berth Development

In this project, there are two issues for "improving organization and management of SIPA". The first one is to study and propose an effective organization and work force deployment plan which can efficiently operate two international berths, existing No.1 berth and new No.2 berth, as an integrated unit. Considering that the existing international berth cannot cope with the increasing containerization of the South Pacific Region in terms of both capacity and capability, which has necessitated the development of No.2 international berth, the first issue is the most

important for the improvement plan.

The second issue is to study the possibility of outsourcing the cargo handling operation of SIPA. However, this issue is not directly related to the first one. The first is a technical issue related to the operation efficiency, while the second one is a long term issue related to SIPA's management policy. The second issue will be addressed in Section 1-5-5.

(1) Work Force Deployment after No.2 International Berth Development

The primary objective of No.2 international berth development is to take counter- measures against longer waiting time of calling vessels for berthing due to the capacity shortage of No.1 international berth when calling vessels are concentrated, and remedy the obstacles which hinder economic growth of the state. Hence, after No.2 international berth is developed, it is assumed that the two berths will often be occupied and in operation at the same time.

The most critical situation is when both No.1 and No.2 international berths are occupied by container vessels and require loading or discharging operations simultaneously. Therefore, workforce deployment plan has to accommodate this situation, which requires that two gangs (for No.2 berth operation) be added to the existing workforce (No.1 berth operation) in each shift.

Additional workforce for No.2 international berth is summarized in Table 1.5.4-1. As shown in the table, additional workforce is fifty-four (54) employees including thirty-four (34) stevedoring & riggers, fourteen (14) transportation equipment operators, and six (6) quayside and yard clerks. Other skeleton workers and administration staff will come from the existing workforce assuming that container volume is 30,000 TEUs in 2020, and management capability of staffs of the Port is enhanced by introduction of appropriate management procedures (standardization) and IT Systems.

Table 1.5.4-1 Workforce Allocation for Container Operation (Honiara Port)
(After No.2 International Berth Developed)

Designation	Working Place	Position	Existing Workers (April 2013)		Additional Workers (after No.2 International Berth is constructed)		Total Number of Workers (No.1 & 2 International Berth are in Operation)	
				Total		Total		Total
Stevedoring	Wharf	Shift Supervisor	2	30	2	30	4	60
	Onboard	Foreman	4		4		8	
		Crane Operator	4		4		8	
		Signal Man	4		4		8	
		Stevedore	12		12		24	
		Ship Tally Clerk	4		4		8	
Rigger	Berth	Rigger	4	4	4	4	8	8
Transport	Terminal	Transport Supervisor	1	20	1	14	2	34
		Heavy Machine Operator	6		4		10	
		Top Lifter/ Fork Lift Operator	6		4		10	
		Tractor Operator	6		4		10	
		Transport Clerk	1		1		2	
Container Control	Terminal	Container Controller	1	16		6	1	22
	Berth	Quay Tally Clerk	4		4		8	
	Container Yard	Yard Traffic Clerk	2		2		4	
	FCL Delivery Office	Container Receipt/ Delivery Clerk	3				3	
	Container Service Office	Container Service Clerk	4				4	
	Back-loading Office	Back-loading Clerk	2				2	
Warehouse	No.3 & No.4 Warehouse	Warehouse Supervisor	1	13		0	1	13
		Shift Operation Clerk	6				6	
		No.3 Warehouse Control Clerk	3				3	
		No.4 Warehouse Control Clerk	1				1	
		Break Bulk Control Clerk	1				1	
		Storage A/C Office Clerk	1				1	
Time Keeper	Wharf	Time Keeper	5	5		0	5	5
Total			88	88	54	54	142	142

As a result, by adding fifty four (54) container handling workers, workforce of the Port will increase from 196 to 250 persons in order to operate No.1 and No.2 international berth at the same time (See Table 1.5.4-2). As shown in this table, workforce of Operation Department becomes 66% of total workforce. In particular, that of Cargo Operation Section becomes 60%, making it the biggest organization of the Port.

Scope of works of Cargo Operation Section extends to two berths. In order to perform smoothly the operation for both berths and fulfill the objective of the Project, comprehensive management of the whole cargo operation is essential, i.e. 1) to enhance operation planning function such as effective resource (equipment, workforce, yard space) allocation planning following daily or shift wise traffic demand, 2) to enhance operation control function such as to supervise terminal operation in real time basis integrating on-board, at berth and in yard operation for both berths, and 3) to enhance operation analysis function such as to set up performance indicator of terminal operation, record, analyze, find performance gap and find solutions and improvement. For this purpose, as the existing manual based information processing is insufficient, establishment of a sophisticated IT System in the Port is crucial.

Table 1.5.4-2 Number of Employees of SIPA (Honiara Port)
(After No.2 International Berth Developed)

Department		Number of Employees	%	Remarks
Operation Department		164	66%	
	Port Operation Section	15	6%	
	Cargo Operation Section	149	60%	
Engineering Department		29	12%	
Finance Department		19	8%	
Corporative Services Department		37	15%	
Total (additional: +1 (CEO))		250	100%	

(2) Workforce Allocation Model at the Early Stage of No.2 International Berth Operation

Additional workforce (2 gangs per shift) in Table 1.5.4-1 is not expected to be fully allocated from the beginning of No.2 international berth operation. Cargo volume will increase gradually, rather than jump to 30,000TEUs forecasted in 2020. Therefore, workforce will also be increased according to the cargo volume. To identify the timing of additional workforce deployment, the following three aspects should be considered; 1) Berth capacity and gang allocation model, 2) Training of workers for stevedoring and cargo handling operation, and 3) Timing of outsourcing (privatization) of cargo operations.

1) Berth Capacity and Gang Allocation Model

For the purpose of identifying the timing of additional workforce deployment, berth capacity and gang allocation model should be clarified.

a) Berth Capacity

According to the actual performance data of the Port during three months (July to September, 2012) vessel productivity of the container vessels is 7.7 boxes per hour (See Table 1.5.4-3). This figure is relatively lower than standard norm of ship gear system. Main reasons are long non-operational time and influences of general cargo handling. Container vessels calling the Port are often involved in general cargo discharging operations, i.e. machines, steel products and sometimes automobiles.

Based on the productivity and standard BOR (Berth Occupancy Rate), standard capacity for container operation of the existing berth is estimated at about 19,000TEUs per year (See Table 1.5.4-3). In the existing international berth, non-container vessels, such as copra vessels, palm oil tankers, cruise ships etc., occupy twenty-five percent (25%) of the total capacity in hourly basis (8,760 hours per year). As container throughput of the berth in 2012 is 21,564TEUs, container throughput in this year has already exceeded the estimated standard capacity.

The standard capacity of No.2 International Berth is estimated at about 38,000TEUs, because this berth is to be allocated mainly for container vessels (See Table 1.5.4-3). In the case of two container vessels called on the Port at a close timing, No.1 and No.2 International Berth will be allocated to each calling vessel to provide the maximum services (the minimum TRT

(Turn Round Time)).

Table 1.5.4-3 Berth Capacity Model in Honiara Port
(Based on the Actual Performance Data from July to September 2012)

Items			Calculus	Unit	Indicator
Number of Container Calling Vessels				Ships	37
Average Handling Volume*1			a	Box/Call	180
			ateu	TEU/Call*2	203.4
Average Time of Vessel at Berth (TB)			b	Hour/Call	23.3
Time not in Operation during Vessel at Berth		Non Operation Time*3	c	Hour/Call	6.6
		Idle Time*4	d	Hour/Call	1.1
		Delay Time*5	e	Hour/Call	3.6
Operation Hours after deducting Not Operation Time		Operation Time (1)	b-c	Hour/Call	16.8
		Operation Time (2)	b-c-d	Hour/Call	15.6
		Operation Time (3)	b-c-d-e	Hour/Call	12.1
Container Handling Productivity		Vessel Productivity	f = a/b	Box/Hour	7.7
		Net Productivity (1)	a/(b-c)	Box/Hour	10.7
		Net Productivity (2)	a/(b-c-d)	Box/Hour	11.5
		Net Productivity (3)	a/(b-c-d-e)	Box/Hour	14.9
Estimated Standard Berth Capacity	No.1 International. Berth	Total Available Berth Time *6	g	Hour/Year	4,380
		Berth Time for Other Vessels*7	h	Hour/Year	2,190
		Berth Time for Container Vessels	I = g - h	Hour/Year	2,190
		Number of Container Vessels to be called	j = I / b	Call/Year	93.9
		Berth Capacity	Cap1 = j x (ateu)	TEU/Year	**19,095**
	No.2 International. Berth	Total Available Berth Time *6	k	Hour/Year	4,380
		Berth Time for Other Vessels*7	l	Hour/Year	0
		Berth Time for Container Vessels	m = k - l	Hour/Year	4,380
		Number of Container Vessels to be called	n = m/ b	Call/Year	187.8
		Berth Capacity	Cap 2 = n x (ateu)	TEU/Year	**38,189**

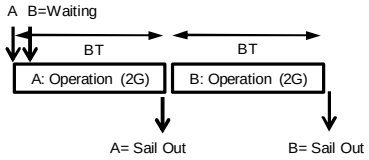
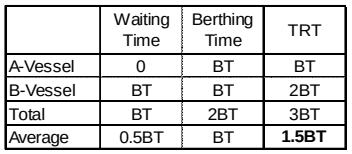
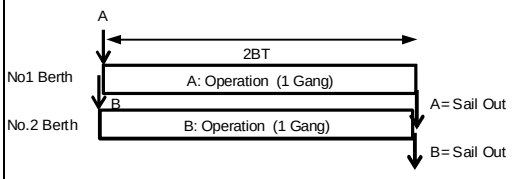
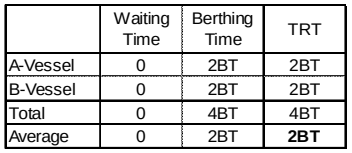
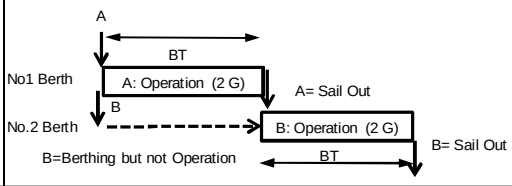
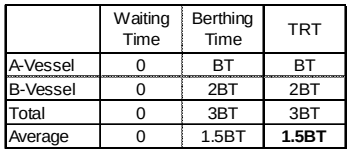
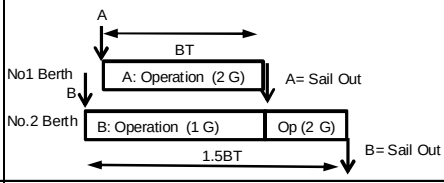
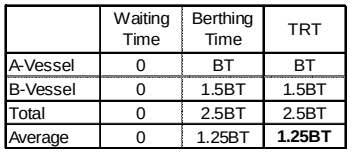
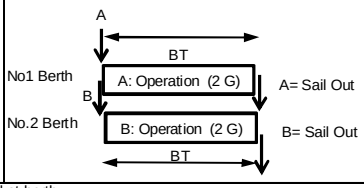
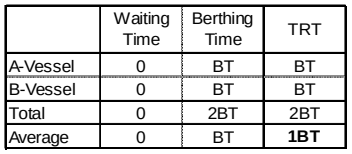
Note:
(*1) Including Re-stow Container (Restow container ratio : 4% to 5% of loading & discharging containers)
(*2) TEU Ratio : 1.13
(*3) Non operation time (Meal break, Tea break, Custom clearance time, lashing time, etc.)
(*4) Idle time (Rain detention, loading container waiting time, etc.)
(*5) Delay time (Stevedore embankment/ dismemberment time, hatch cover open/ close time, etc.)
(*6) Standard BOR : 50%
(*7) BOR to be used for vessels other than container (i.e., copra vessel, palm oil tanker, cruise ship) : 25%

b) Gang Allocation Model

When two vessels arrive at the same time, after No.2 international berth development, existing workforce (Two Gang System) would be insufficient. In this case, due to the insufficient workforce, even though berth waiting time is reduced, advantage effect of No.2 berth development will not be materialized (See Table 1.5.4-4).

In the event of a Three Gang System (existing two gangs and additional one gang), TRT will be slightly improved compared to the present No.1 berth operation. However workforce is still a bottleneck of the capacity. In the event of a Four Gang System (existing two gangs and additional two gangs), TRT will become minimum and the workforce will not be a problem. However, this Four Gang System entails higher labor costs. Hence, time to introduce Four Gang System should be decided considering the cargo volume and other factors described in the following sections.

Table 1.5.4-4 Gang Allocation Model

Vessel Calling		A-Vessel and B-Vessel Called at the Same Time		Evaluation
Existing No.1 Berth	Total: 2 Gang System (per shift)			Base Case
After No.2 International Berth Developed	Total: 2 Gang System (per shift)			1. Service Down (Longer TRT) 2. No2 Berth advantage is not materialized. ×
	Total: 2 Gang System (per shift)			1. No2 Berth advantage is not materialized. ×
	Total: 3 Gang System (per shift)			1. TRT is slightly improved. 2. Workforce is still bottleneck of the capacity. ○
	Total: 4 Gang System (per shift)			1. TRT is improved. 2. Workforce bottleneck is cleared. ◎

Note: BT=Time of vessel at berth

2) Training of Workers for Stevedoring and Cargo Handling Operation

For training of stevedoring and cargo handling operation workers, considerable period will be necessary. Therefore, additional workers should be recruited as soon as possible when cargo volume is expected to reach the capacity of one berth.

3) Timing of Outsourcing (Privatization) of Cargo Operations

For the Privatization of cargo operation, consensus with labor union is one of the biggest and unavoidable issues. Unions are usually of the opinion that “Privatization equals Job Losses”. Increasing the workforce due to No.2 international berth development is a good opportunity to introduce Privatization.

(3) Organization after No.2 International Berth Development

In order to respond to the requirements of the container operation described above, Honiara Port should reorganize the Operation Department into two departments. That is, to make the stevedore and cargo operation section into an independent department so that the Operation

Department can enhance its capability, concentrate its expertize more autonomously, become conscious of the importance of their responsibility, and have power of influence in the Port. The organization scheme of the new operation departments is illustrated in Figure 1.5.4-1.

This improved organization scheme has also been proposed in the Scoping Study Report by PIAC. In the report the necessity of establishing Cargo Operation Department and assignment of Director Cargo Operations is summarized as follows;

i) Existing Director Operations covers Harbor Master/ Navigational Operations and Stevedoring & Cargo Handling Operations. This coverage is over capacity for one Director.

ii) Expertize related to Vessel operations and Cargo operation is completely different. Hence, each group should concentrate its own job enhancing respective expertize.

iii) Office and working site of Harbor Master/ Navigational Operations and Stevedoring & Cargo Handling Operations is completely different.

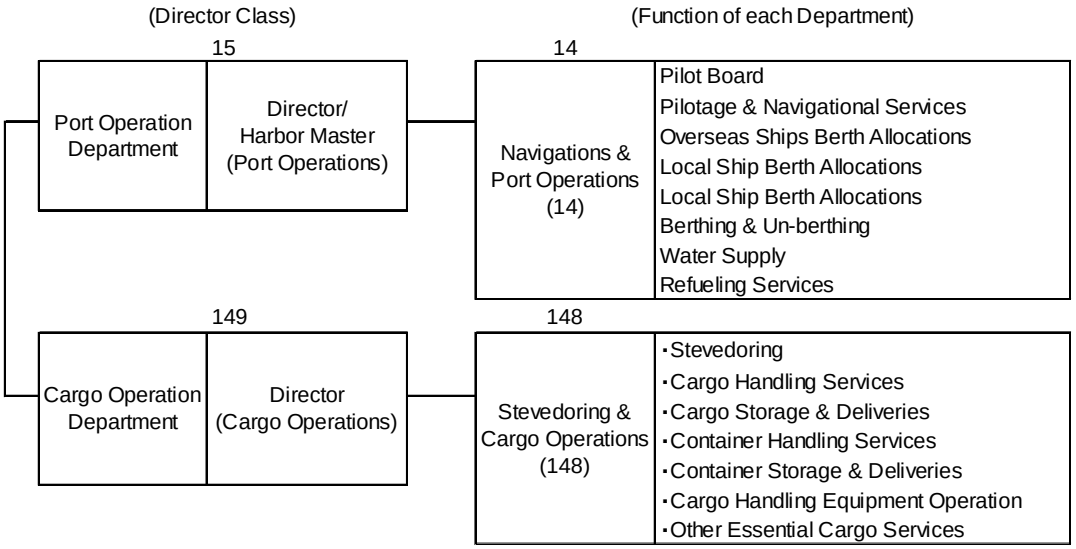


Figure 1.5.4-1 Proposed Organization of Operation Department (Honiara Port)
(After No.2 International Berth Developed)

Based on the proposed organization scheme, whole organization structure and workforce allocation of Honiara Port after No.2 Berth development is shown in Figure 1.5.4-2.

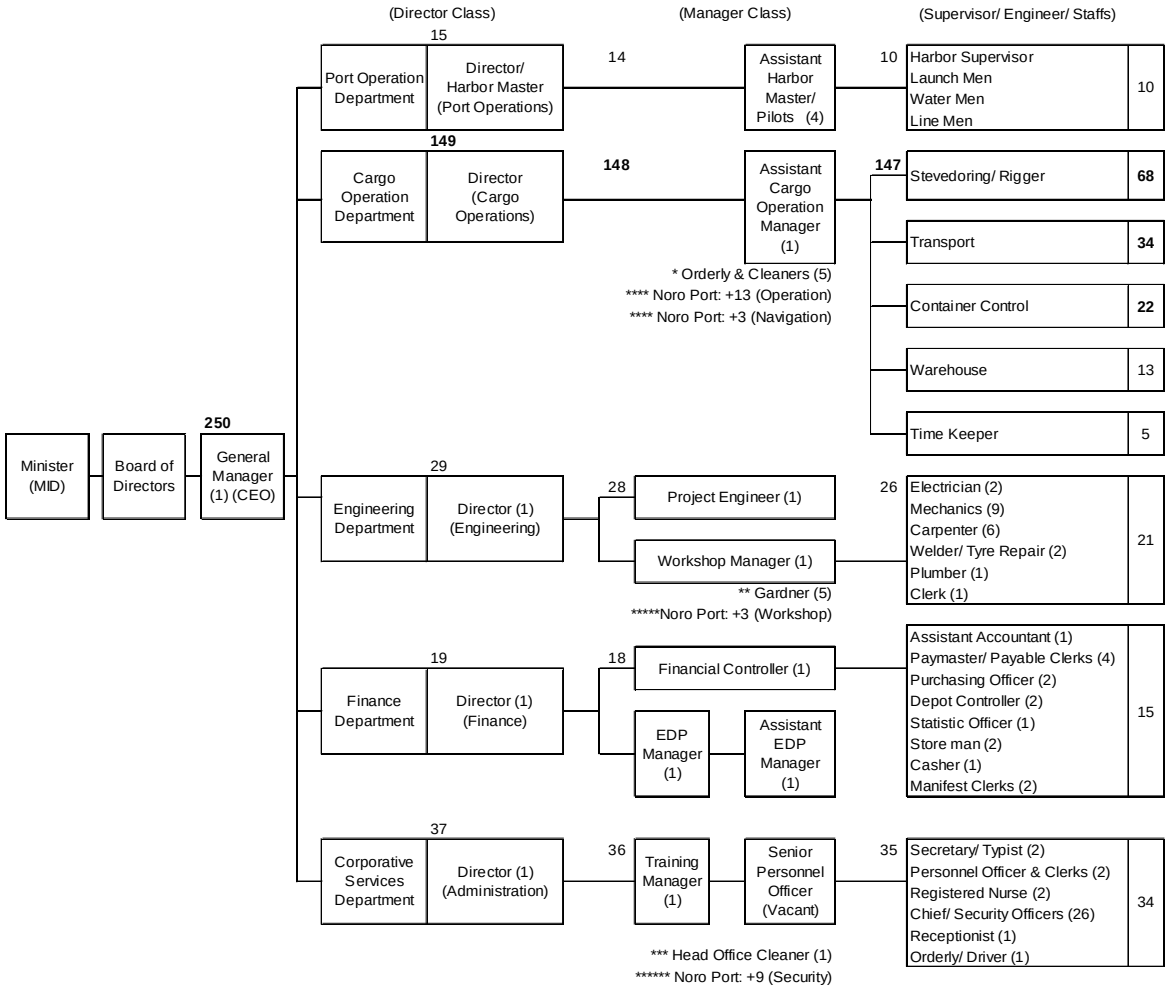


Figure 1.5.4-2 Organization and Workforce Allocation of SIPA (Honiara Port)
(After No.2 International Berth Developed)

1-5-5 Outsourcing of Cargo Handling Operation

In this project, there are two issues for improving the organization and management of SIPA. The first is to study and propose an effective work force deployment and organization plan which can operate two international berths as an integrated unit. As for this issue, the study result and the proposed plan are addressed in the previous sections (from Sections 1-5-1 to 1-5-4).

The second issue is to study the possibility of outsourcing the cargo handling operation of SIPA. However, this issue is not directly related to the first one (to operate two berths effectively as an integrated unit and to implement rational work force deployment and organization plan). The first is a technical issue related to the operation efficiency, while the second is a long term issue related to SIPA's management policy. In this section, the second issue is studied from the viewpoint of privatization of port operation.

(1) Objectives of Outsourcing (Privatization) of Cargo Related Operations

Objective of the outsourcing is to improve SIPA's potential, capability and performance by introducing private sector's resource, management capability and technology. To successfully implement the privatization of targeted functions, authority and assets owned by the public sector

are essential.

Among many various objectives, there are at least three main objectives supporting the port privatization;

i) Improvement of management capability of port entity (efficiency, productivity, transparency, etc.)
ii) Reduction of the financial demands on the public sector (financial burden of central government, etc.)
iii) Enhancement of the service quality to users (reduction of the payment for the port services, etc.)

Additionally, other objectives are targeted by privatization scheme.[1)]

Privatization of port management is often introduced to reduce the government's financial burden, which in this case was the result of long-term inefficient management and operation by the public sector. To alleviate financial burden and catch up with the growing market demand on port development by introducing private investment is also a common reason for port privatization. In both cases, the most common incentives of port privatization is "reduction of the financial demands on the public sector in port development (ii) above)".

As the development of No.2 international berth which is the most important and costly facility in the port is assumed to be done on a grant basis, there might not be an urgent incentive for privatization from the viewpoint of reduction of financial burden of the central government. However, from a medium or long-term perspective, outsourcing or privatization of the port operations especially cargo handling operation is necessary for the following reasons.

1) Enhancement of Container Terminal Operation Capability

As described above, to execute effective terminal operations for two berths as an integrated unit, enhancement of the terminal operation and management capability become essential. Some important points are listed below;

i) Operation Planning Function: to set up effective resource (equipment, workforce, yard space) allocation planning following daily or shift wise traffic demand
ii) Operation Control Function: to supervise terminal operation in real time basis integrating on-board, at berth and in yard operation for both berths.
iii) Operation Analysis Function: to set up performance indicator of terminal operation, record, analysis, find performance gap and find solutions and improvement.

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1)
(1) redistributing wealth or other social objectives (i.e. restraining trade unions power)
(2) attracting new or additional trade and business for the country and the port
(3) sharing commercial, economic, technological or management risks between public and private sector
(4) stimulating private entrepreneurs and investment in the economy
(5) transferring technology in the form of advanced equipment deployment or the introduction of advanced management system. (Source: Guideline for Port Authorities and Government on the privatization of port facilities UNCTAD 1998)

Up to now, due to its small quantity of cargo, SIPA is at a very primitive stage regarding the basic functions necessary for effective terminal operation, such as yard management, gate operation, terminal operation IT system. In the near future when container volume increases, SIPA has to establish a container terminal in Honiara Port that meets international standards. For this purpose introducing technology, resources, business capability and furthermore business channels, etc. of experienced foreign private terminal operator and/ or shipping line (there is no experienced company in Solomon Islands) will be very effective.

2) Reduction of the Financial Demands

In this project, development of No.2 international berth is being considered. After development of this No.2 berth and considering the increasing container volume in the Port, SIPA has to establish a container terminal. For this purpose, substantial amount of investment is necessary for acquisition of additional cargo handling equipment, expansion of yard pavement area, establishing gate facilities, expansion and renewal of maintenance shop, establishing terminal operation and management IT system, etc. For this purpose, introduction of private investment to reduce the financial burden of the public sector should be considered.

(2) Outsourcing (Privatization) Model of Cargo Handling Operation

In the discussion of outsourcing of cargo handling operation, to what extent functions, authorities and assets, which SIPA owns, are transferred to the entity in which private company participates, that is, the scope of outsourcing, should be clarified. Then the nature of the special purpose company (new company) which undertakes the outsourced or privatized scope of operation will be clarified. For this purpose, some alternatives of outsourcing (privatization) model are organized in the whole map of port activities. The result of the organization is shown in Table 1.5.5-1.

1) Existing SIPA's Management Scheme

As a public entity (SOE), SIPA undertakes port planning, port development, possessing and maintenance of port facilities, and provides services using port facilities, so called port operations (See Table 1.5.5-1). Therefore, port management scheme of Honiara Port is deemed as a "**Public Service Port**". For reference, whole land of the Port is owned by Solomon Islands Government and leased to SIPA for fifty (50) years terms as a SOE.

There are several alternatives which can be considered as outsourcing (privatization) models. The first alternative is outsourcing of cargo handling operations by leasing facilities (Case A).

Table 1.5.5-1 Port Outsourcing (Privatization) Model

Category of Port Activities	Port Management Scheme	Port Development	Maintenance of Port Facilities & Equipment			Port Operations (To provide services using port facilities)		
			Water Infrastructure & Basic Infrastructures	Superstructures	Equipment & IT System	Stevedore, Warehouse and Cargo Handling	Equipment Maintenance (Work Shop)	Pilotage & Navigation Services
Main Facilities & Port Activities		Port Development Planning Land Utilization Planning New Port Development Planning New Wharf Development Planning	Anchorage Facilities Access Channel Berth Facilities Landfill/ Reclamation Primary Electricity Source Water Supply/ Sewage	Yard Pavement Lighting Facility Warehouse/ Shed Maintenance Shop Office Building Gate Facility Weighing Facility Container Washing Facility	Maintenance & Purchasing of Cargo Handling Equipment EDI & IT System	・Stevedoring ・Cargo Handling ・Warehouse/ Cargo Delivery ・Container Yard Operation ・Gate Check and Operation	・Cargo Handling Equipment Maintenance ・Transport Equipment Maintenance	・Pilot Board ・Pilotage & Navigational Services ・Berth Allocation ・Berthing/ Un-berthing ・Water Supply ・Refueling Services
Existing Management Scheme (SIPA)	Public Service Port	MID / SIPA	SIPA	SIPA	SIPA	SIPA	SIPA	SIPA
Case A: Outsourcing of Cargo Handling Operations by Leasing Facilities i) Ownership of Facilities belongs to Public Entity. ii) Facilities are maintained by SIPA. iii) Facilities are leased to the New Company. Iv)Cargo handling equipment is transferred to New Company, or Invested by SIPA. V)Cargo handling equipment is maintained by New Company.	Tool Port	MID / SIPA	SIPA	SIPA (Leased to New Company)	New Company (Lease Term: ex 10～20 years) (Ex. Privatized or Joint Venture between SIPA and Private Entity)			SIPA
Case B: Concession of Superstructure (Ex. BOT) i) Ownership of Infrastructure belongs to Public Entity. ii) Infrastructure is maintained by SIPA. iii) Infrastructure is leased to the New Company. Iv)Superstructure is conceded to the New Company, or invested by SIPA. v)Superstructture is maintained / redeveloped by the New Company.	Landlord Port (1)	MID / SIPA	SIPA	SIPA (Leased to New Company)	New Company (Concession Term: ex.. 20～30 years) (Ex. Privatized or J/V between SIPA and Private Entity)			SIPA
Case C: Concession of Infrastructure (ex.BOT) i) Facilities are conceded to the New Company except Water Facilities. ii)Conceded facilities are maintained/ redeveloped by the New Company.	Landlord Port (2)	MID / SIPA	SIPA	New Company (Concession Term: ex.. 30～50 years) (Ex. Privatized or J/V between SIPA and Private Entity)				SIPA

Note1 : Land is owned by the Government and Leased to SIPA (Leased Term: 50 Years) Note2: Facility include Infrastructure and Superstructure in this Table .

2) Outsourcing of Cargo Handling Operations by Leasing Facilities (Case A)

This alternative is so called "**Tool Port**" model and has been adopted at Japanese container terminals for many years. In this model, ownership of facilities, including infrastructure and superstructure, belong to the public entity, and are maintained by SIPA. Among them, facilities required for cargo handling operation, i.e. berths, yard, warehouse and gates, are leased to the new company. Leasing term is usually from ten (10) to twenty (20) years, and renewal of term is possible by mutual agreement. Existing cargo handling equipment is transferred to the New Company, and additional one will be procured by the new company itself. Cargo handling equipment is maintained by the new company.

The new company will be established by the private company(s) (Case A1) or by joint venture between SIPA and company(s) (Case A2). Regardless of Case A1 or A2, the new company recruits required staff (employees shifting from SIPA and newly recruited staff) and manage and operate cargo handling business in the Port using leased facilities and its own equipment.

Harbor master functions in the Port, berth assignment and other services to the calling vessels, i.e. navigation safety aid, pilotage, berthing and un-berthing support, water supply and refueling, are to be remained as the SIPA' functions. These functions are basically public in nature.

3) Concession of Superstructure (Case B)

The second alternative is outsourcing of cargo handling operations by Concession of Superstructure (Case B).

This alternative may be called a kind of "**Landlord Port**" model and has also been adopted in Japanese container terminals. In this model, ownership of infrastructure belongs to the public entity, and is maintained by SIPA. Among them, basic infrastructures required for cargo handling operation, i.e. berths, yard ground, primary electricity source and water supply/sewage, are leased to the new company. Leasing term is usually from twenty (20) to thirty (30) years, and renewal of term is possible by mutual agreement.

Superstructures which are required for cargo handling operation, i.e. yard pavement, lighting facility, warehouses and sheds, maintenance shop, office buildings, gate facility and weighing facility, are conceded to the New Company. Expansion and redevelopment of the superstructures will be the financial responsibility of the new company. Super structures are maintained by the new company. Transferring, investment and maintenance of cargo handling equipment is the same as Case A. In the case of BOT, the conceded facilities will be back-transferred to SIPA at the end of concession term at a mutually agreed price.

The new company will be established by the private company(s) (Case B1) or by joint venture between SIPA and company(s) (Case B2). Regardless of Case B1 or B2, the new company recruits required staff (employees shifting from SIPA and newly recruited staff) and manage and operate cargo handling business in the Port using leased and conceded facilities and its own equipment.

4) Concession of Infrastructure (Case C)

The third alternative is outsourcing of cargo handling operations by Concession of Infrastructure (Case C).

This alternative is so called "**Landlord Port**" model and has also been adopted in concession terminals throughout the world. In this model, ownership of land and water facilities of port area belongs to the public entity and leased to the private sector. Among them, except water facilities, basic infrastructures and superstructures required for cargo handling operation are conceded to the New Company. Concession term is usually from thirty (30) to fifty (50) years, and renewal of term is possible by mutual agreement. Expansion and redevelopment of the infrastructures and superstructures are the responsibility of the new company. Conceded facilities are maintained by the new company. Transferring, investment and maintenance of cargo handling equipment is the same as Case A and Case B. In the case of BOT (Build, Operate and Transfer), the conceded facilities will be back-transferred to SIPA at the end of concession term at a mutually agreed price.

In this project, No.2 international berth which is the most important and costly facility in the Port is assumed to be developed on a Japanese Government grant basis. If that is in fact the case, this third alternative will not be considered, for grant aid scheme does not allow the granted facility to be conceded to a private company for such a long time.

Table 1.5.5-2 Alternatives on Outsourcing of Cargo Handling Operation

Ownership of the New Company	Private Company or Consortium (Investor)	Joint Venture between SIPA and Private Company or Consortium
Outsourcing of Cargo Handling Operations by Leasing Facilities	Case A1	Case A2
Concession of Superstructure	Base B1	Base B2

As a result of the above discussion, alternatives which can be considered for outsourcing of cargo handling operation are summarized in the Table1.5.5-2.

In each alternative, relationship among three concerned entities, such as SIPA, investor (private company) and the New Operation Company (Special Purpose Company: SPC), are illustrated in Figure 1.5.5-1, 2. The relationship includes 1) rights and responsibilities, 2) flow of capital and profit, and 3) flow of lease fee and royalty.

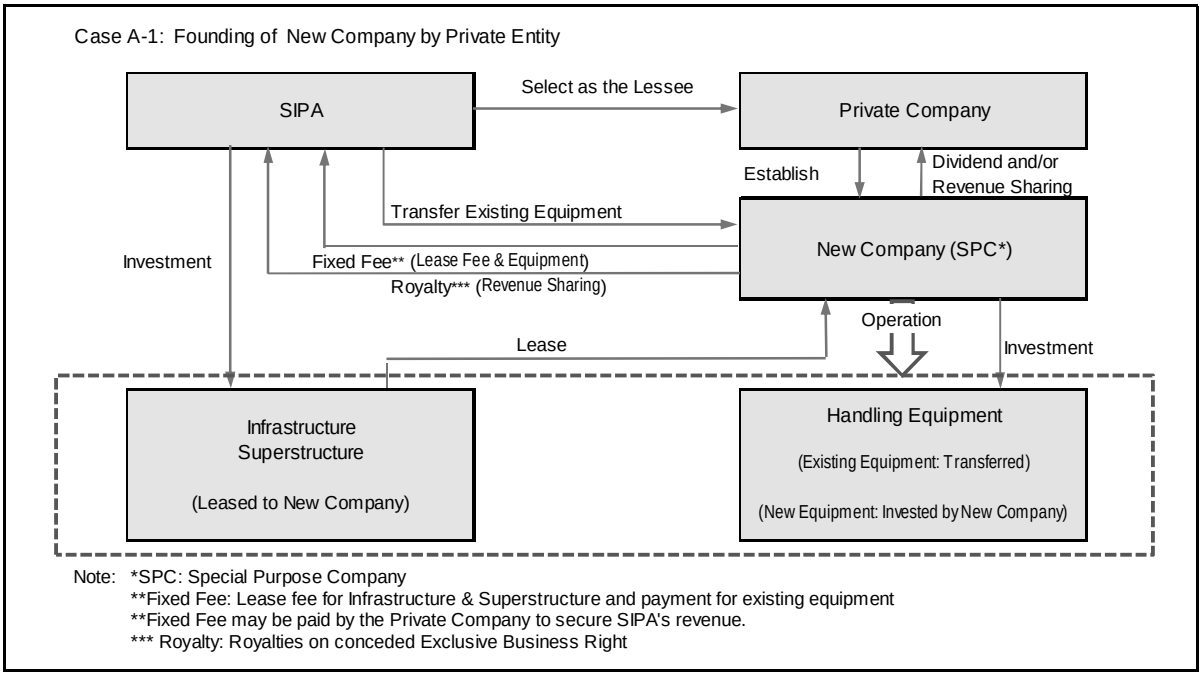
In the case of lease of infrastructure and superstructure (Case A1 and A2), SIPA's main revenues from the New Company are lease fee and royalty on Exclusive Business Rights (M & O Rights) conceded to the New Company. In the case of concession of superstructure (Case B1), concession fee for superstructure will be included instead of lease fee for superstructure. In the case that investment in existing superstructure and equipment is made by SIPA to the New Company (Case B2), SIPA's main revenues are lease fee for infrastructure, royalty for Exclusive Business Rights and return on investment (existing superstructure and equipment).

Summary of each alternatives of outsourcing (privatization) scheme is shown in Table 1.5.5-3.

Table 1.5.5-3 Summary of Outsourcing (Privatization) Scheme

No.	Items		A1	A2	B1	B2
1	Business Feature		Lease of Infrastructure & Superstructure		Concession of & Superstructure	
2	Founder (Ownership) of the New Company		Private Company	J/V	Private Company	J/V
3	Ownership of the Asset					
	(1)	Land	Solomon Government (Leased to SIPA)			
	(2)	Exclusive Business Right (M & O Right)	SIPA (Conceded to the New Company)			
	(3)	Infrastructure (Necessary for Operation)	SIPA (Leased to the New Company)			
	(4)	Existing Superstructure (Necessary for Operation)	SIPA (Leased to the New Company)		NC (Conceded to NC)	J/V (Invested to J/V)
	(5)	Expansion & Redevelopment of Superstructure	SIPA (Leased to the New Company)		NC (Invested by NC)	J/V (Invested by J/V)
	(6)	Existing Equipment	NC (Transferred to NC)	J/V (Invested to J/V)	NC (Transferred to NC)	J/V (Invested to J/V)
	(7)	Additional Equipment	NC (Invested by NC)	J/V (Invested by J/V)	NC (Invested by NC)	J/V (Invested by J/V)
4	Fixed Fee (from NC or J/V to SIPA on Yearly Basis)					
	(1)	Lease Fee for Infrastructure	○	○	○	○
	(2)	Lease Fee for Superstructure	○	○	×	×
	(3)	Concession Fee for Superstructure	×	×	○	×
	(4)	Payment for Existing Equipment (Transferred)	○	×	○	×
5	Royalty (from NC or J/V to SIPA)					
	(1)	Royalty on Exclusive Business Right (M & O Right)	○	○	○	○
6	Revenue or Profit Sharing (Return for Investment)					
	(1)	Return on invested Equipment	×	○	×	○
	(2)	Return on invested Superstructure	×	×	×	○

Note: NC: the New Company



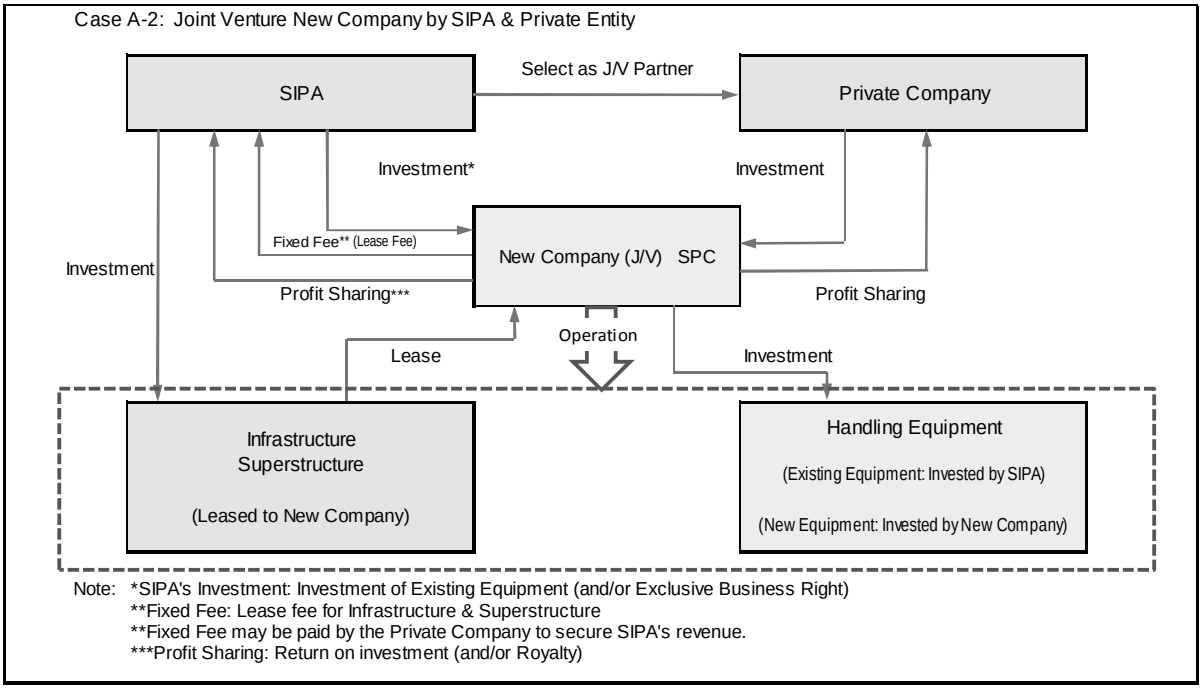
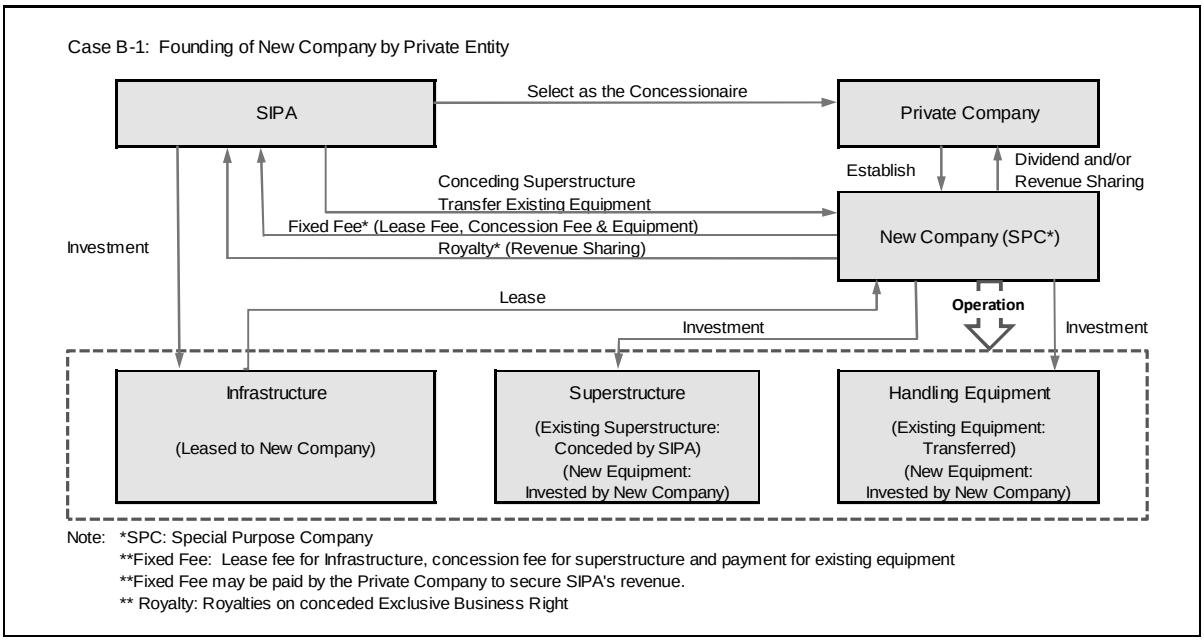


Figure 1.5.5-1 Privatization Scheme of Cargo Operations (Leasing Facilities)



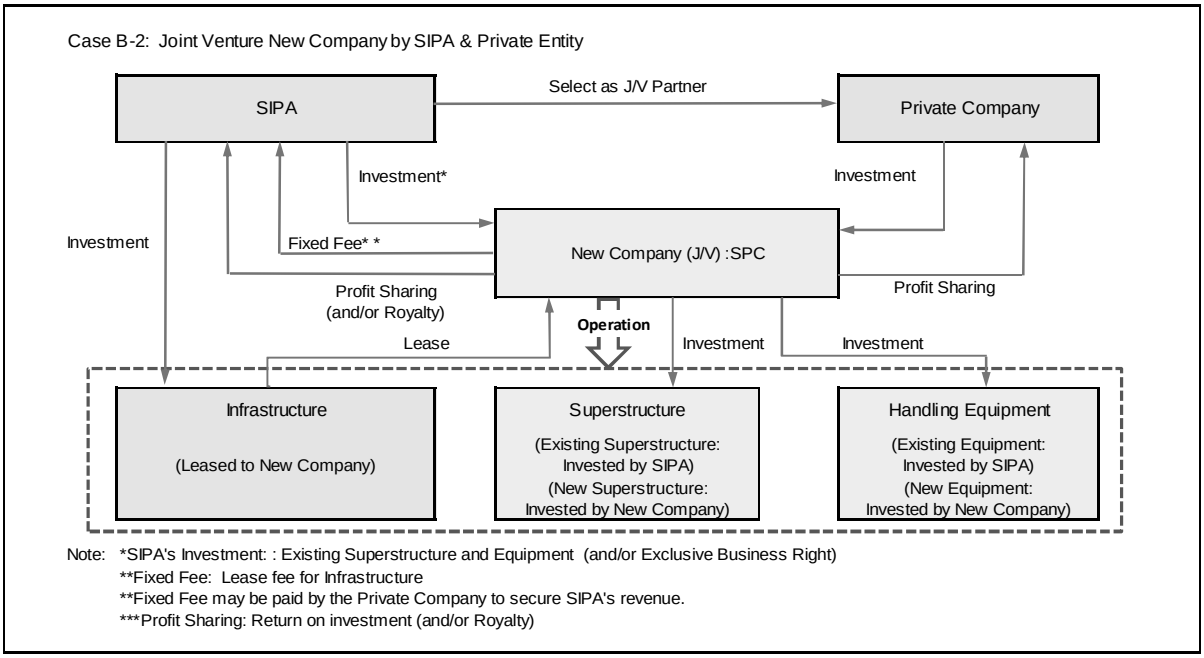


Figure 1.5.5-2 Privatization Scheme of Cargo Operations (Concession of Superstructures)

Which alternative would be selected? This selection needs careful study by the Government of Solomon Islands and SIPA considering the possibility and intention of potential investors. For this purpose, the financial analysis of SIPA and the new company in each case will be required considering 1) future cargo demand, 2) scope of new company's business, 3) scope of leasing or concession facilities, 4) scope of investment done by SIPA (in the case of Joint venture), scope of investment expected by the potential investor, etc.

(3) Milestones toward Outsourcing (Privatization) of Cargo Handling Operation

As a basic road map in the planning stage for promoting of outsourcing of Cargo Handling Operation, the following four steps can be considered;

[Step 1] Reorganize Operation Department

When No.2 international berth enters operation, existing Operation Department is to be divided into Navigation & Port Operation Department (including Harbor Master) and Cargo Operation Department (See Figure 1.5.4-1) so that each department can focus on its respective mission.

[Step 2] Establish Department-wise Management Accounting System

To clarify profit and loss balance, and evaluate the value of activities in each department, especially the two profit centers (Navigation & Port Operation Department and Cargo Operation Department), a Management Accounting System is to be established.

By introducing this Accounting System, basic information for future concession contract can be accumulated, and significant lead for fair concession can also be obtained.

[Step 3] Feasibility Study for Outsourcing (Privatization) and Making Basic Policy

Feasibility study for outsourcing (privatization) is to be done in this stage. In this study, it is necessary to narrow down the alternatives of outsourcing (privatization) scheme. For this purpose, Financial Analysis of SIPA and New Company will become one of the most important criteria.

As for establishing basic policy, consensus building with labor union is also keen issue for the outsourcing (privatization).

[Step 4] Action Plan toward Outsourcing (Privatization)

Based on the Feasibility Study and basic policy made in the previous step, action plan for outsourcing (privatization) is to be studied in this step. Examining the procedures for the selection of the private company (investor) is main theme in this stage.

1-6 Traffic Observation Survey

(1) Present Situation and Issues of the Sector

Point Cruz is the central area in Honiara City and Mendana Avenue is the only main road from there to east and west ward. Port area is connected to Mendana Avenue through Commonwealth Street and the port-related vehicles mostly move to the industry area in the east.

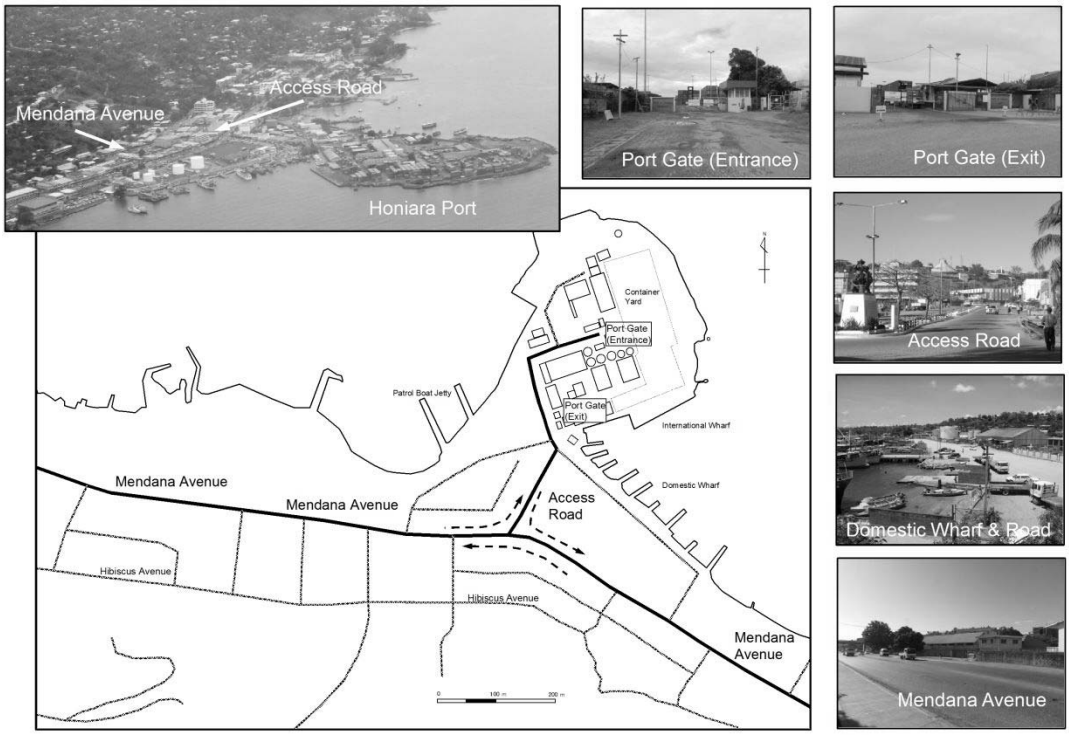


Figure 1.6-1 Road Network around Honiara Port

Traffic congestion in Mendana Avenue has been one of the issues in Honiara City, and the road management agency, Ministry of Infrastructure and Development (MID), is keen to solve the problem. However, the traffic observation survey has not been conducted and therefore it is uncertain that to what extent the port-related vehicles generated from the port area are contributing to the traffic congestion.

Under the above circumstances, the total traffic volume and the share of the truck therein at Mendana Avenue and Port Area are to be observed in this study. The results are as follows.

(2) Outlines of the Observation Survey

Mendana Avenue is of 2 lanes for each way and approx. 16m wide without shoulder, as shown below. In Solomon Islands, driving is on left.

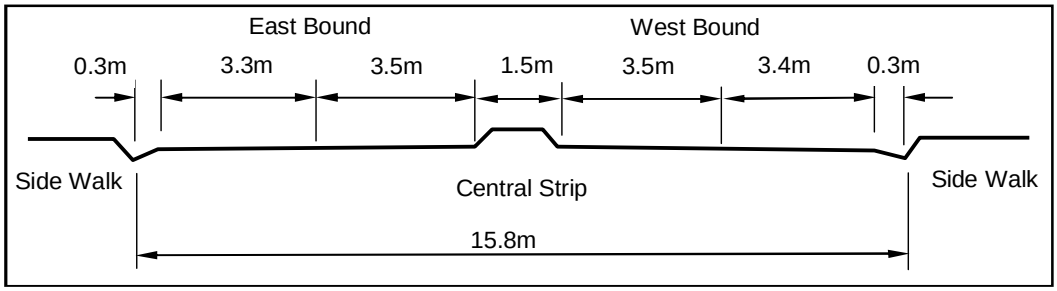


Figure 1.6-2 Typical Road Section of Mendana Avenue

Methods of the observation are enumerated as follows:

* Observation Points : 3 points (A, B and C in Figure 1.6-3) to include the junctions where port-related trucks would merge with the traffic at Mendana Avenue
* Observation Period : 7 days from March 25 (Mon) to 31 (Sun), port operation was carried out in Easter Holidays (4 days from 28 March) with the ship calls in Table 1.6-1.
* Classification of Cars : Truck/Container Carrier and General Car
* Observation Time : 12 hours from 07:00 to 19:00

Figure 1.6-3 Observation Points (A, B and C)

Table 1.6-1 Ship Calls during Observation Period including Easter Holidays

Traffic Observation Period

March	24	25	26	27	28	29	30	31
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Ship Berthed	Island Ch.	Mana	Highland Ch.	Kwangsi		S. Tourville		
Ship Deberthed	Aquarius	Island Ch.	Mana	Highland Ch.	Kwagnsi		S. Tourville	

March 29～April 01: Easter Holiday

(3) Results of Traffic Observation

1) Total Traffic Volume in a Week

Total traffic volumes surveyed in a week (12 hours daily) at each point are shown in Table 1.6-2. Traffic volume of west-bound at Mendana Avenue shows similar to that of east-bound. One of the reasons for that is that there include many busses as public transport in the traffic volume and most of the west-bound busses make a U-turn at the west-end rotary to go east. Figure 1.6-4, 5 show the traffic volume of Truck and General Car and the total traffic volume at each point.

There are some difference between Truck volumes of east-bound and west-bound at B Point, and also between total traffic volumes at B Point and C Point. Although the traffic volume and component have not been scrutinized by Origin and Destination (OD) survey, for instance, it can be inferred through reconnaissance survey that these differences may be caused by traffic through detours such as coastal road connected to the Domestic Wharves and Hibiscus Avenue in the southern area.

Table 1.6-2 Total Traffic Volume in a Week

Point	A		B		C	
Direction	Incoming	Outgoing	East Bnd	West Bnd	East Bnd	West Bnd
Truck	1,092	1,081	10,305	3,125	7,231	7,518
General Vehicle	5,201	5,031	45,267	53,315	66,588	78,405
Total	6,293	6,112	55,572	56,440	73,819	85,923
Truck %	17.4	17.7	18.5	5.5	9.8	8.7

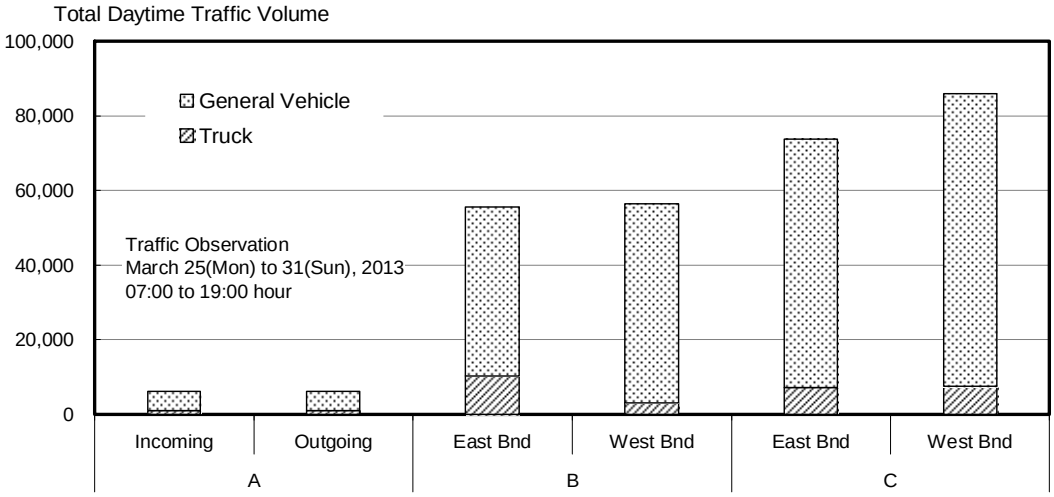


Figure 1.6-4 Total Traffic Volume in a Week

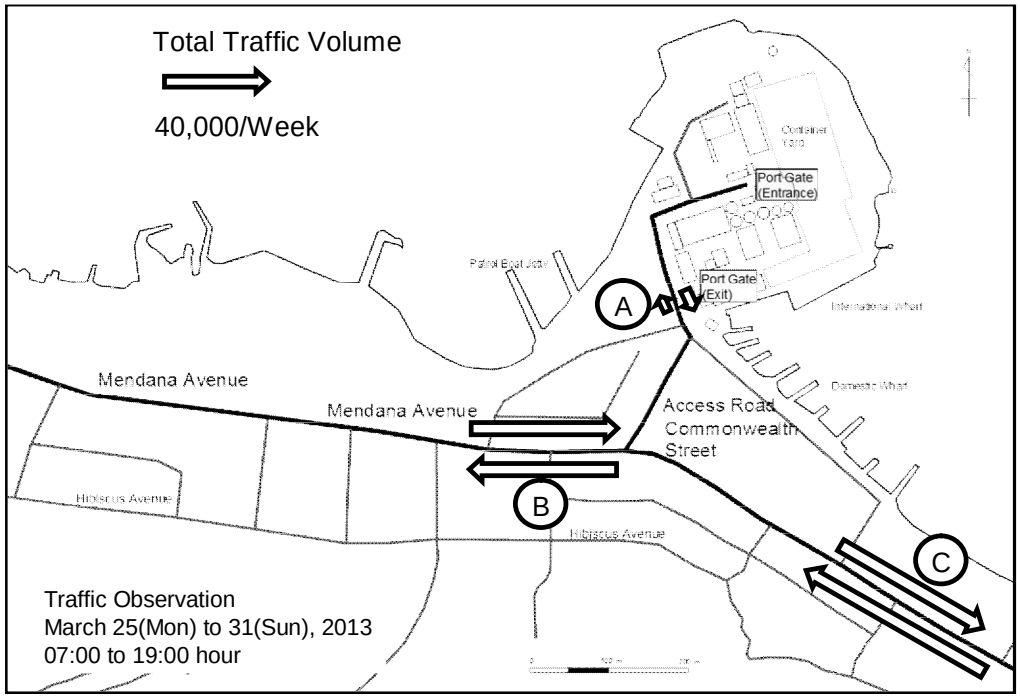


Figure 1.6-5 Pictorial Map of Total Traffic Volume in a Week

From the above observation survey results, the following can be concluded;

* Majority in traffic volume at Mendana Avenue is General Car, and share of Truck is about 10%. This means Mendana Avenue is functional as the urban road and not as port-related road.
* Total traffic volume at A Point, which is mainly related to the international port, is almost 10% of that at B Point and/or Point C.
* Approx. 80% of total traffic volume at A Point is General Car, which are international port-related cars for SIPA and Custom Office.
* Therefore, Truck volume at A Point (international port-related cars) has probably the minimal share of about 2% in total traffic volume at Mendana Avenue (Since the share of

Heavy Cargo Carrier in Truck seems less than 50%, the above share cannot reach even 4% with the equivalent coefficient of 2 for heavy cargo carrier being considered.)

* The average daily traffic volume at Mendana Avenue is about 10,000 (one way for 12 hours). The maximum traffic volume is 13,437 for east-bound and 15,706 for west-bound, and thus 29,143 for both ways. The standard traffic volume for design is generally understood 7,200 per lane as a road capacity, and thus 28,800 in 4 lanes for both ways. This means that the average traffic volume does not reach the road capacity, but the maximum traffic volume occasionally reaches the road capacity.
* Issue of road congestion at Mendana Avenue must consequently be discussed from the different view point other than traffic volume or truck volume, and by the preliminary site observation, causes of the congestion may plausibly be due to existence of roundabout, deterioration of the road pavement, bottle neck at the bridge, insufficient space at bus-stop, right turning at T-junction, street stalls, etc.

2) Daily and Hourly Traffic Volume

Daily traffic volume of east-bound at C Point is shown in Fig. 1.6-6, where it reaches the peak volume on Tuesday and tends to go down on the week-end. The share of trucks is almost constant throughout a week. Traffic volume on Friday is less and similar to that in the week-end, which is because of the first day of Easter Holidays and the traffic congestion. The traffic congestion was also observed on Saturday, due to many cars for purchasing goods for the holiday.

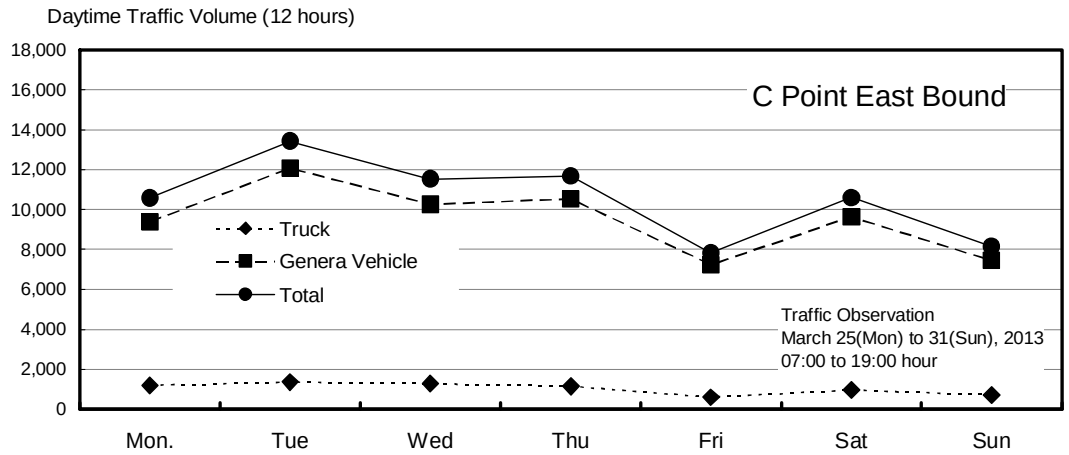


Figure 1.6-6 Daily Traffic Volume

Hourly traffic volume on Wednesday, which generally represents the average daily volume, is shown in Figure 1.6-7, where it reaches the peak volume around 12:00~13:00 and tends to go down in the evening. The share of Truck is almost constant throughout a day. It is learned by through reconnaissance survey that traffic volume in the night is very small.

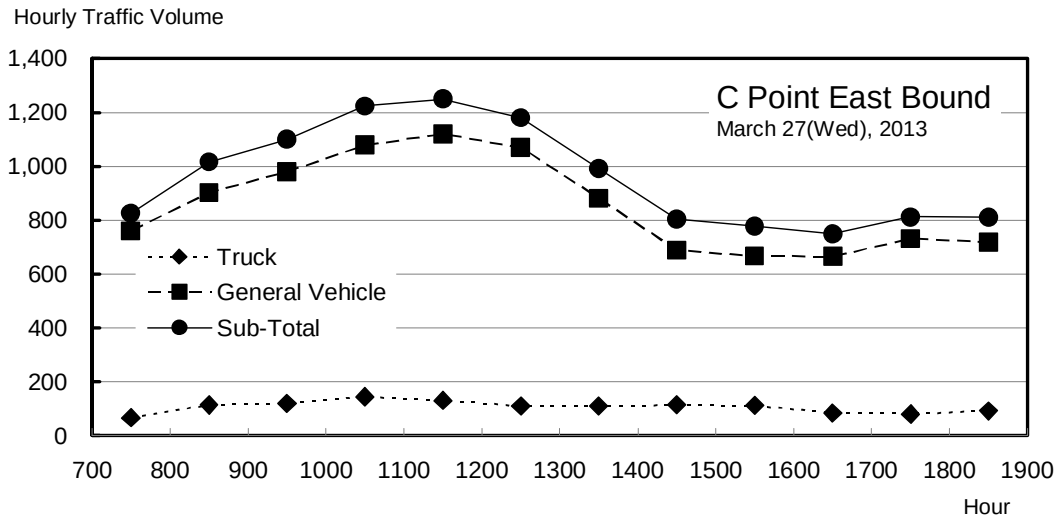


Figure 1.6-7 Hourly Traffic Volume

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Basic Planning Concepts

(1) Scope of the Project

International Wharf of Honiara Port has been constructed essentially as a general cargo wharf. However, it is used as a container wharf in order to cope with recent change of international cargoes with rapid increase of container cargoes and introduction of larger sized vessels. With the gap between the existing condition of port facilities and utilization situation, various problems presently become obvious in its vessel congestion, the efficiency and safety of cargo handling operation, and the counter measures become urgent issues. In order to solve the issues, the Second International Wharf in addition to the existing international wharf is considered to be absolutely imperative.

The plan of the Second International Wharf is planned to be made, considering following points.

* Safe Port
* Effective Port
* Well-organized Port

(2) Basic Contents of Project Facilities

Following necessary and very urgent components are selected out of the project components of the request letter in August, 2011. These components are necessary for the construction of the Second International Wharf.

* International Wharf : Berth, End Revetment, Dredging and Filling, Mooring Dolphin
* Container Yard : Yard Pavement
* Accessories : Water Supply to Wharf, Lighting Facility

In view of safety navigation of vessels, beacons to indicate the port position during night time is included as navigation aids facility.

(3) Selection of Project Site

The project site of the Second International Wharf was selected as following alternate sites in the First Preparatory Survey. 4 alternatives can be considered as the candidate site of the project, judging from the geography of Point Cruz Peninsula as shown in Figure 2.1.1-1.

i) Extension of berth of the existing international wharf
ii) East side sea area
iii) North side sea area
iv) West side sea area

Surrounding bathymetry and topography of Point Cruz Peninsula is conformed of coral reef where the sea bottom slope in reef offshore side is steep toward offshore and the water depth becomes sharply deeper. Constructing a breakwater for wave protection is very difficult as the water depth off berth front for the construction area becomes significantly deep. While waves around Honiara Port are relatively calm through a year and limited by cyclone impact, the project site is affected by wind waves generated by trade wind and swells from outer sea due to the no breakwater.

The outline of each alternative of project site is shown below.

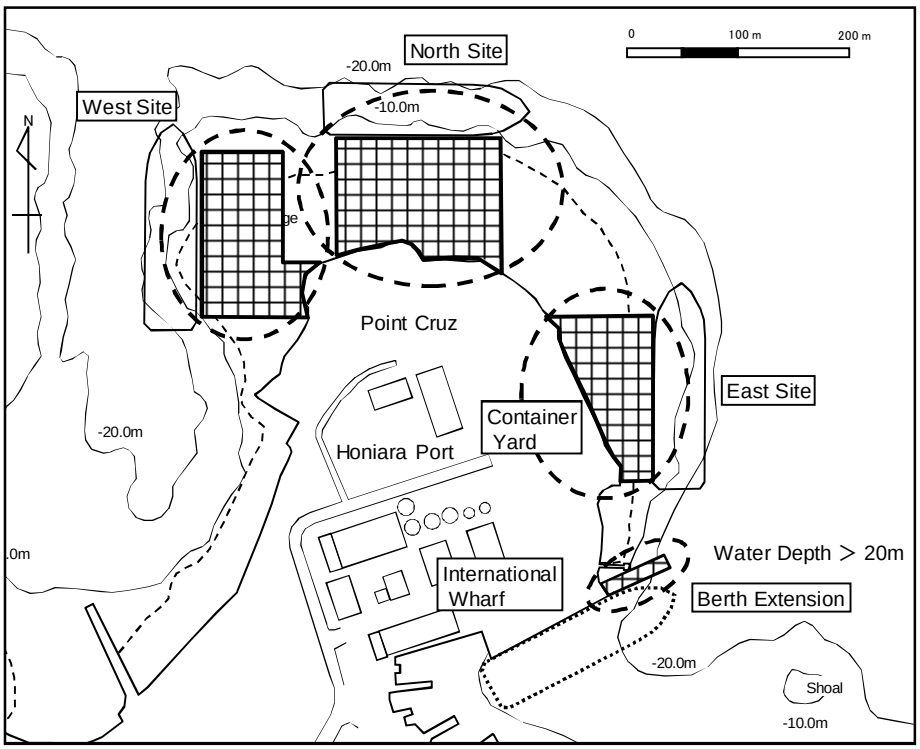


Figure 2.1.1-1 Alternate Project Site for New International Wharf

1) Berth Extension of Existing International Wharf

Regarding the existing international wharf, extension to south side is restricted by the existing domestic wharf and no sufficient space is available for extension of berth. The extension of berth to north side is inappropriate for constructing berth structure, since the bottom slope is very steep and the water depth at the 50m offshore exceeds 20m.

2) East Side Sea Area

The container yard is located at the back of east side sea area of Point Cruz Peninsula and the shared use is possible with the container handling in the existing international wharf and the land utilization is not much changed. And, although the berth extension has the limitation of bottom bathymetry, it is easily possible to secure requested 150m length. Judging from the sea bottom bathymetry, the location of depth contour line of project water depth -11.0m is

comparatively closer to land and it is considered to be an advantage in view of the scale of berth filling.

Although it is influenced by easterly waves by trade wind, it is less affected by northwestward swells that the wave height are high due to the wave sheltered area since the seawall is located east side. It is confirmed by captains of port master and ship masters of calling ships that eastward waves by trade wind is wind waves and large container ships can be berthed without any severe problem

In the natural environmental aspect, the coral coverage is about 10% that is comparatively small, that will not be the bottleneck for the construction of wharf facilities.

East side of the peninsula is in good conditions with its geographical condition, wave condition and environment condition relevant to coral and also has good locational relation with the container yard located backside. Therefore, this sea area is considered to be favorable site for the wharf construction.

3) North Side Sea Area

As copra sheds and navigation aid facilities are located in the back of north side of Point Cruz Peninsula. Linkage with the existing wharf is not good because of slightly being away from the container yard. Concerning the extension of berth, although it is possible to secure the extension of berth more than 150m as requested, the contour line with -11.0m of design water depth is in slightly offshore side and therefore, the length of berth to offshore side becomes longer. As east ward waves by trade wind is not so affected but, northwest ward severe swells is intruded directly and this is the location to be easily influenced by the swells.

In the aspect of natural environmental consideration, it is necessary to consider related with berth construction since the coral coverage is 35% that is comparatively high.

North side water area is slightly inferior in the aspects of utilization condition and wave condition and in addition, the consideration on the natural environmental consideration related with coral seems to be necessary.

4) West Side Sea Area

West side sea area is slightly inferior in its utilization condition and wave condition in addition to the necessity of dredging for securing turning basin concerning geographical condition and the consideration on natural environmental related with corals is considered to be necessary.

This sea area is considered to be poor feasibility of construction of new wharf.

From Table 2.1.1-1 which shows the summary of features of the alternate sites above, the alternate site of east side of Point Cruz Peninsula is considered to be most favorable with its geographical condition, wave condition and natural environmental aspects related with coral reef and what is more, the linkage with the existing international wharf and container yard is better.

This sea area is concluded as the most appropriate project site for the construction of the New International Wharf.

Table 2.1.1-1 Comparison of Alternate Site for New International Wharf

Project Site	Extension of Existing Berth	East Site	North Site	West Site
Bathymetric Condition	×	○	△	×
Wave Condition	○	○	△	×
Natural Environmental Condition	○	○	△	×
Connection of Existing Wharf	○	○	△	×
Evaluation	×	○	△	×

○ : Good △ : Possible × : Impossible

2-1-2 Study of Requested Component

In order to survey the relevancy of the project, the coping policy is mentioned below as well as indicating the necessity and the urgency of each facility on the requested components and additional facilities.

(1) Installation of Second International Wharf

[Necessity・Urgency]

The existing international wharf contains the problems shown below and the installation of the Second International Wharf is considered to be urgent issue.

* As the length of berth in the existing international wharf is 120m which is shorter than the overall length of calling container ships and there is loading restriction on the west side 46m area due to the insufficient structural strength of the berth, which does not meet with recent size growing of calling ships and recent containerization of cargo transportation resulting in low cargo handling efficiency of Honiara Port.
* Area wise, the domestic wharf and the oil (tanker) berth exist neighboring to the international wharf, which increase the risks with the restriction of water basin for the difficulty of ship maneuvering operation at the time of arrival and departure, and the safety consideration on the congestion with vessels to and from the domestic wharf is taken into account.
* Not only increasing the number of large container ships but also various vessels like copra ship and palm oil tanker are berthing. Therefore, berth waiting of calling ships becomes serious due to congested situation of the international wharf.

[Coping Policy]

The implementation of this project by Japanese side can be considered with the following points.

* Recipient country is some difficulty in bearing the high project cost.
* Implementation of this project is somewhat difficult with the capabilities for planning, designing and construction by the recipient country.

* Major portion of the wharf structure such as steel products and other materials are procured from Japan

(2) Container Yard

[Necessity・Urgency]

In conjunction with the construction of the Second International Wharf, the container yard is an essential facility for container handling operation and requisite facility for the International Wharf.

[Coping Policy]

The implementation of this project by Japan side can be considered by following points.

* Yard pavement on container yard inside of the New International Wharf is executed.
* Yard expansion work for the part of the existing container yard to be necessary in conjunction with the implementation of this project is included in the area at the back of the New International Wharf.

(3) Accessory Facilities

[Necessity・Urgency]

In conjunction with the construction of the Second International Wharf, relevant accessory facilities are necessary as port function and for container handling works and requisite as the international wharf.

[Coping Policy]

The implementation of this project by Japanese side can be considered and the following points.

* For the water supply facility to the wharf, piping works up to just back to the Second International Wharf are conducted by SIPA and the piping works to and in the wharf are conducted by Japanese side.
* Lighting facilities are planned based on the necessary lighting intensity for container cargo handling operation in the berthing area and the container yard.
* Beacons are installed both north and south ends of the berth so as to indicate the location of the wharf during night time.

Based on the above study results on necessity and urgency of the requested components and the coping policies, the facilities shown in Table 2.1.2-1 are implemented as the cooperation project. And, the content and quantity of each facility are set in the outline design.

Table 2.1.2-1 Requested Component

Project Facility	Contents	Scale	Content at Planning
International Wharf	Berth	150m	Implementing as the Project
	Revetment	125m	Implementing as the Project
	Dredging and Filling	17,000m^3	Implementing as the Project
	Mooring Dolphin	2 Nos	Implementing as the Project
Container Yard	Yard Pavement	10,500m^2	Implementing as the Project
Accessories	Water Supply Facility	1 Ls	Implementing as the Project
	Lighting Facility	1 Ls	Implementing as the Project
	Beacon	2 sets	Additional Request

2-2 Outline of the Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy of Second International Wharf

The Second International Wharf is planned in a comprehensive manner according to the results of sizes of calling ships, arrival draft of calling ships and ship maneuvering operation at berthing and deberthing, water depth distribution with sounding survey, direction of prevailing wind, normal wave characteristics and etc. Study items and survey flow related with the floor planning of The Second International Wharf is as shown in Figure 2.2.1-1 and set out considering planning conditions including utilization condition and natural condition.

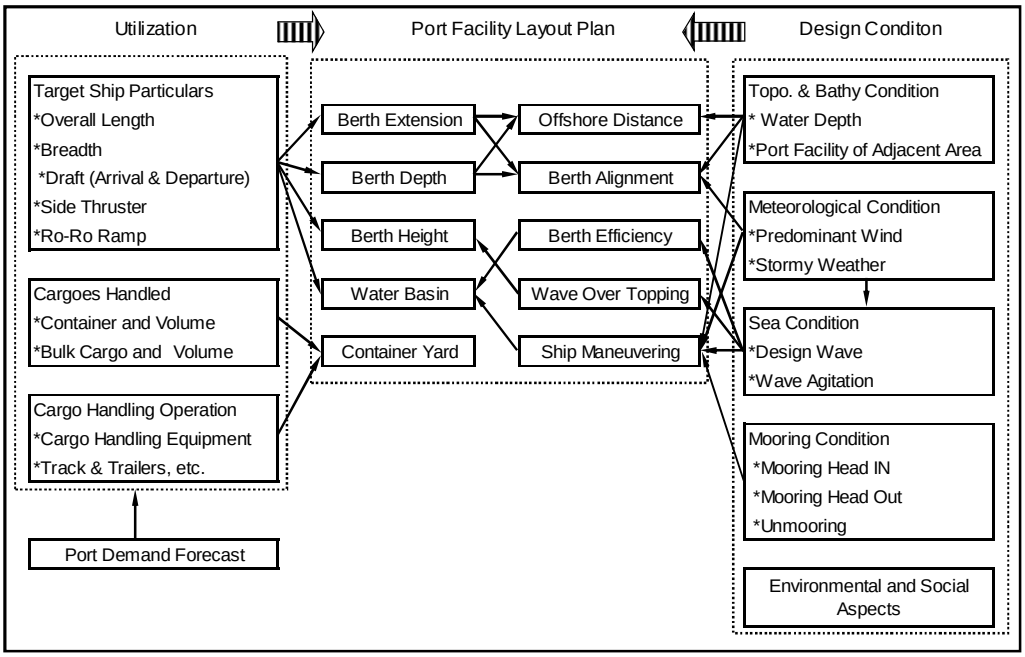


Figure 2.2.1-1 Study Flow Chart of New International Wharf

(2) Basic Policy on Utilization of First International Wharf and Second International Wharf

In conjunction with the construction of the Second International Wharf, the basic policy on the utilization system with the First International Wharf (existing wharf) can be considered as below described.

1) Second International Wharf is made exclusive use of container ships.
2) First International Wharf is made use in manner of following.
   * Utilization by general cargo ships other than container ships (copra boats, palm oil tanker, fishing boats and its mother boats, cruise ships, flat top barge and etc.)
   * Utilization of container ships in case the Second International Wharf is occupied by the first calling container ships
   * Utilization of container ships in case that the Second International Wharf is unable to use with stormy or rough waves

Hereafter, as the increase of container ships calling to the port is forecasted, the Second International Wharf will be fully occupied and as the occupancy of the First International Wharf becomes higher, the simultaneous operation and system of two wharves will be required.

(3) Design Criteria

As the related design criteria for the project facility is not found in Solomon Islands, "Technical Standards for Port and Harbor Facilities in Japan" and the related standards are to be applied.

2-2-2 Basic Plan

In making out the plan of the Second International Wharf, it is to conduct based on the following basic concepts.

2-2-2-1 Basic Plan for Second International Wharf

(1) Target Vessels

Following liner container ships which are in 10 shipping routes in services by 7 shipping companies are calling to Honiara Port.

* Swire Shipping
* New Pacific Line
* Carpenter Shipping
* Matson
* Greater Bali Hai
* Sofrana
* Neptune Pacific Line

Representing container ships out of vessels operated by these shipping companies are as shown below and the facilities design is made based on the sizes of these vessels. Previously, the maximum container ship calling to this port was used to be Kwangsi type in its Loa and full loaded draft operated by Swire Shipping, however this shipping company is going to build Shansi type that the overall length is 199.5m being slightly longer adding to Kwangsi type and already introduced into the route stopping over Honiara Port from January 2013.

Table 2.2.2.1-1 Particulars of Container Ships Considered in Berth Plan

Ship Name (Class)	Shipping Company	DWT (mt)	Length (L_{oa})	Breadth (B)	Draft (D_{max})
Kwangsi	Swire Shipping	25,607	184.90m	27.6m	10.59m
Chief	Swire Shipping	13,387	158.06m	22.0m	7.98m
Shansi	Swire Shipping	31,000	199.50m	28.2m	10.50m
Islander	Greater Bali Hai	17,800	160.70m	25.0m	9.38m

In the "Technical Standards for Port and Harbor Facilities in Japan" (the Ports and Harbors Association of Japan), the typical dimension of berth for container ships and Ro-Ro ships in case that target vessels cannot be identified are defined as follows. The standard dimension catering for the container ship with 30,000DWT is indicated as berth length 250m and water depth 12.0 m, for the Ro-Ro ship with 20,000DWT as berth length 240m. In this project however, as the target vessels can be identified, the berth dimension is set out based on the sizes of target vessels as shown in Table 2.2.2.1-1.

Table 2.2.2.1-2 Standard Size of Berth

[Container Ship]

DWT (mt)	Berth Extension (m)	Berth Depth (m)	(Ref.) Capacity Container (TEU)
10,000	170	9.0	500～890
20,000	220	11.0	1,300～1,600
30,000	250	12.0	2,000～2,400
40,000	300	13.0	2,800～3,200
50,000	330	14.0	3,500～3,900
60,000	350	15.0	4,300～4,700
100,000	400	16.0	7,300～7,700

[Ro-Ro Ship]

DWT (mt)	Berth Extension (m)	Berth Depth (m)
3,000	150	7.0
5,000	180	7.5
10,000	220	9.0
20,000	240	10.0
40,000	250	12.0
60,000	270	12.0

(Source: Technical Standards for Port and Harbor Facilities in Japan, 2007)

(2) Basic Policy Related with Berth Extension

The extension of berth is set including bollard location showing in Figure 2.2.2.1-1 for mooring lines added to Loa of the design ships. Therefore, one berth length becomes 1.15 to 1.20 times of Loa and in case of Shansi Type which Loa is the longest out of plan objective vessels and calculated that its length is over 200m as shown below.

Design Berth Length = 199.50m x (1.15 to1.20) = 229.4 to 239.4m

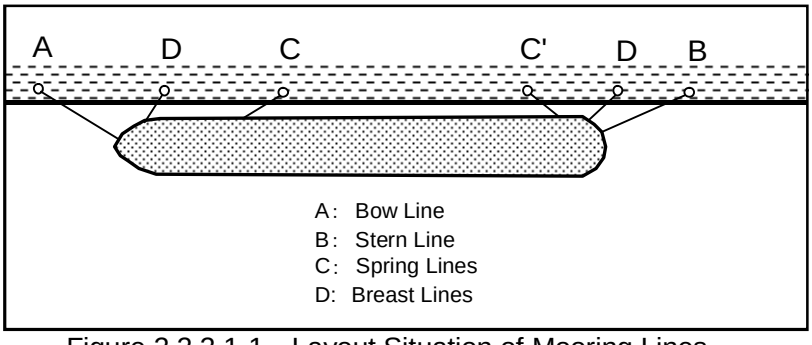


Figure 2.2.2.1-1 Layout Situation of Mooring Lines

However, in case that the berth with the length of 230 to 240m in east sea area of Point Cruz Peninsula is intended, the scales of filling and grading and dredging of berth front become big and costly and it reaches to the sea area where coral coverage is relatively high. In order to avoid like these problems, the plan for 150m berth extension with installing mooring dolphins is studied in view of berthing situation of vessels and the efficiency of berth cargo handling.

As the result, as shown below, the reach of crane equipped with container ships covers the berth area in any target ships and the working area of cargo handling equipment like fork lifts and reach stackers is properly secured, therefore 150 m berth length is possible to accomodate the cargo handling of the target container ships.

1) Berthing Condition of Kwangsi Type (Swire Shipping)

Kwangsi type is the main vessels of Swire Shipping servicing between Australia and PNG, among Asian countries and to connect to China. Figure 2.2.2.1-2 shows the berthing condition in case that objective vessel berths to the 150 m berth. For Kwangsi type equipping 5 geared cranes, the container cargo handling works are in trouble at the existing international wharf due to shorter berth extension of 120m and the wharf load restriction.

In case that the berth length becomes 150m, there is no obstacles observed for the container cargo handling since any geared crane on vessel can be reached to the wharf and the working area for forklifts and reach stackers is secured.

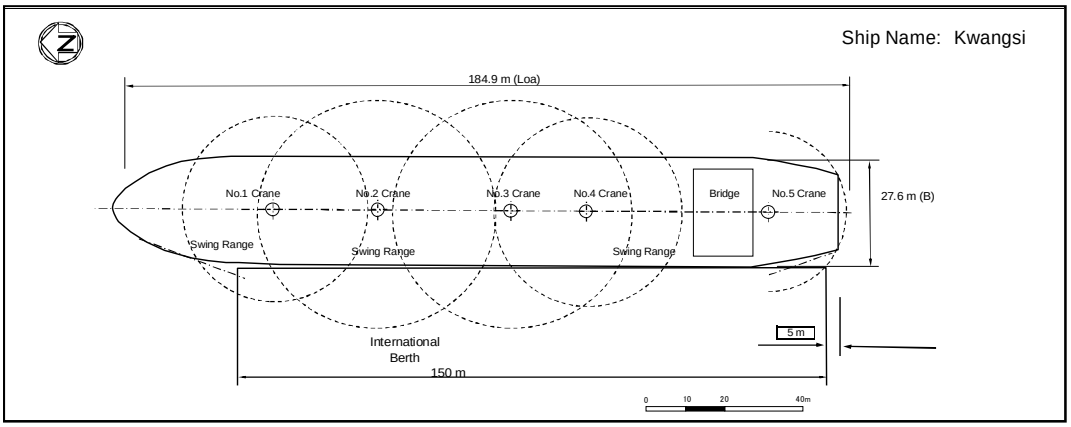


Figure 2.2.2.1-2 Berthing Condition of Kwangsi Type Ships

2) Berthing Condition of Greater Bali Hai (South Islander) Type

Container ships of Islander type operated by Greater Bali Hai equip a Ro-Ro Ramp in the stern for vehicles handling unlike the other container ships. As Ro-Ro Ramp is equipped with starboard side, the ship berths to starboard side. Container ships such as Islander type equip two ship geared cranes shown in Figure 2.2.2.1-3 and the container is handled at usual berthing position. After completing container handling, the vehicles unloading operation is commenced by shifting the ship's body position to bow side about 30m where the Ro-Ro Ramp is possible to berth by mooring line operation as shown in Figure 2.2.2.1-4. It is possible to perform the

vehicle handling and container handling simultaneously although the container handling area is concentrated to the south side of berth even in this berthing position since the ship geared crane reaches to the berth.

At the existing international wharf, as the ship's body cannot be berthed to starboard side since the domestic wharf is located at the west side of berth, Ro-Ro Ramp cannot be used. The new international wharf where is possible to berth to starboard side becomes very favorable in view of the vehicles handling. Meanwhile, most of imported vehicles are the used cars from Japan and more than 100 cars are unloaded by one calling.

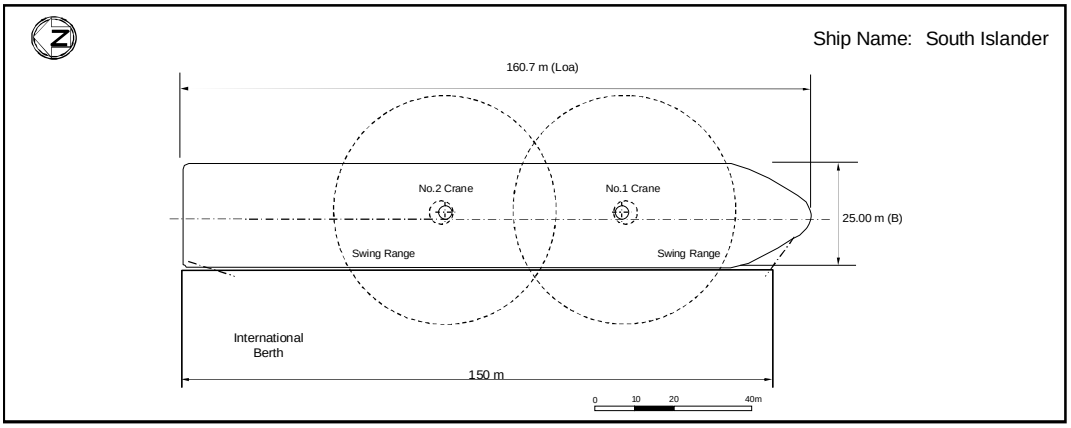


Figure 2.2.2.1-3 Berthing Condition of Islander Type during Container Handling

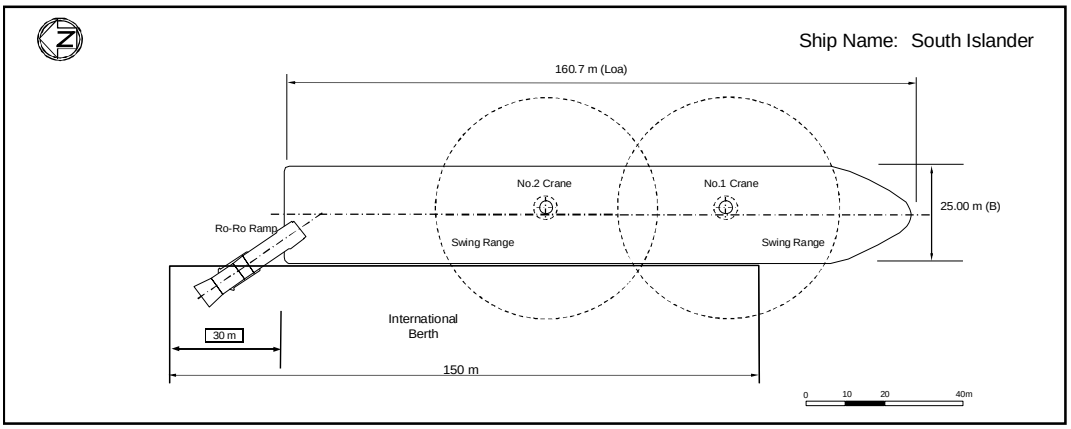


Figure 2.2.2.1-4 Berthing Condition of Islander Type during Vehicle Handling

3) Berthing Condition of Chief Type (Swire Shipping)

Chief type is the container ship to go frequent services among main ports in Australia and Oceania. And as she is calling to small scale international ports in Oceania, the ship size is smaller than the container ships for Asia.

In case of Chief type, as shown in Figure 2.2.2.1-5, 3 ship geared cranes are equipped in starboard side and berth port side one. As the Loa of Chief type is about 158m shorter in comparison with Kwansi type, it is understood that the container handling can be performed effectively since the berth extension covers overall ship hull.

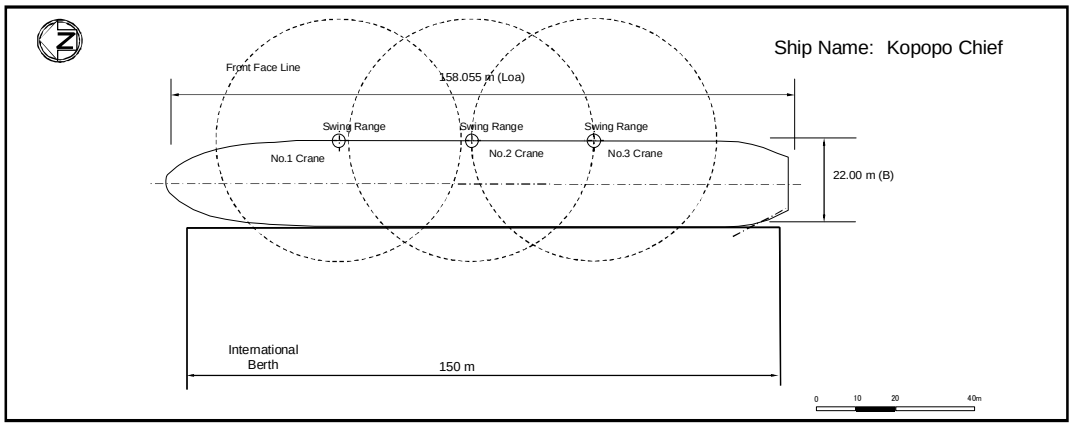


Figure 2.2.2.1-5 Berthing Condition of Chief Type

4) Shansi Type (Swire Shipping)

Shansi Type is a container ship servicing among Australia, PNG and Asian countries commencing her service from January 2013. The same particulars of sister ships have been built and will be introduced to the services in series. Although the Loa is 199.5 m that is 15.0 m longer than Kwangsi previously described, container handling operation can be understood to be performed without any troubles, since the all 4 ship geared cranes reach to the berth area as Figure 2.2.2.1-6 shown.

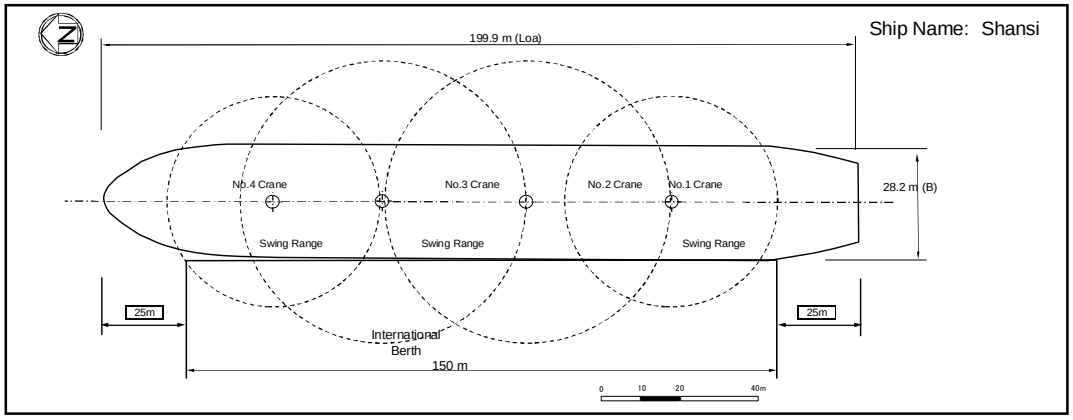


Figure 2.2.2.1-6 Berthing Condition of Shansi Type

(3) Basic Policy of Berth Water Depth

Design water depth of the berth is set adding keel clearance to the maximum draft of target ships and the keel clearance is generally applied that 10% of the maximum draft is preferable. There is Kwangsi type with 10.59m and Shansi type with 10.50m that vessels have deeper full draft out of plan objective vessels. In case that the full draft of these vessels become the objective, the design water depth of berth is calculated as 11.7 m as explained below.

Design Water Depth = Maximum Draft of Target Ship
+ Keel Clearance (about 10% of Maximum Draft)
=10.59m + 1.05 m = 11.64m

While, D.L. -11.0m is described as the planned berth water depth in the request letter. Actually, calling vessels to Honiara Port are unloading and loading cargoes at other ports in each calling route. With the statistics of arrival draft of the vessels calling to Honiara Port, the vessels do not call with full draft and have always an extra depth of about 1.0m. In other word, in case that the full draft 10.59m of Kwangsi is set as the target vessel, she is not considered to call with full draft and it is understood that D.L. -11.0m as the design water depth is enough to be able to berth.

And, taking view of berths water depth of neighboring international ports, -11.0m is the deepest in Suva Port of Fiji and Apia Port of Samoa and other berths water depths become less than -11.0m. As the calling vessels to Honiara Port have chances to call to these international ports, the wharf water depth with -11.0m is considered to be no significant problem for the clearance of container ships.

In case that the design water depth is D.L.-11.0m, vessels having the draft up to 10.00m can be berthed. Therefore, the vessels calling to the Second International Wharf with more than 10.0m full draft is required to make the draft less than 10.0m when she enter in the port and depart out from the port.

Design Water Depth= Maximum Draft of Target Ship
+ Keel Clearance (about 10% of Maximum Draft)
=10.00m + 1.00 m = 11.00m

(4) Basic Policy of Water Basin

Most of container ships berth at port side to the new international wharf. Islander type that equips Ro-Ro Ramp in starboard side is berthed to starboard side. According to the interview survey to ship masters of calling ships, ship maneuvering of arrival and departure are shown in Figure 2.2.2.1-7, 8, namely Kwangsi of the largest container ship and Pacific Islander of Ro-Ro ship. They commented, in case of the Second International Wharf, as it is no need to make ship turn at the basin in front of the berth and there are no obstacles in surrounding water area and it is safe and effective comparing with the existing wharf.

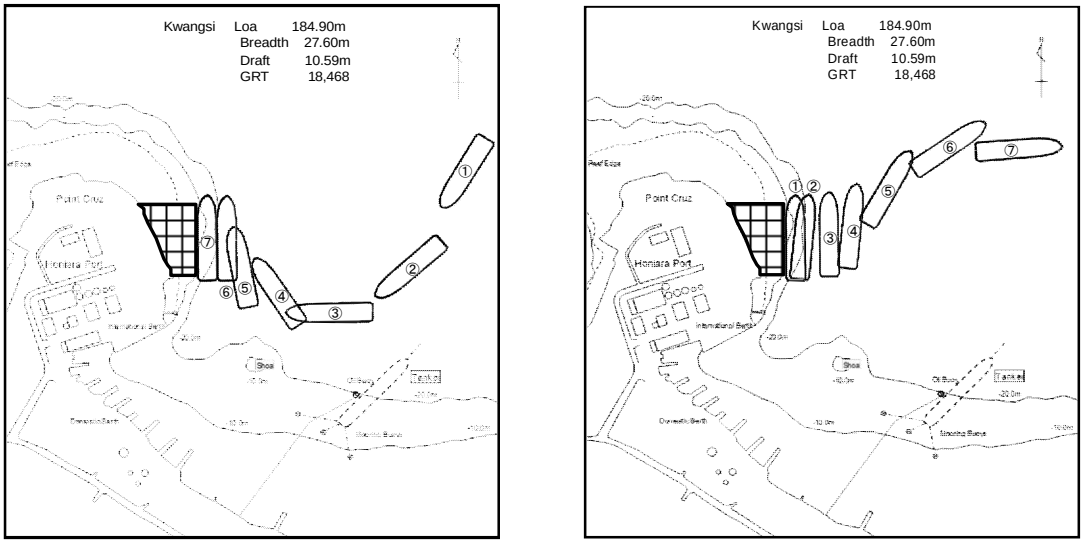


Figure 2.2.2.1-7 Access Route of Container Ships to New International Wharf

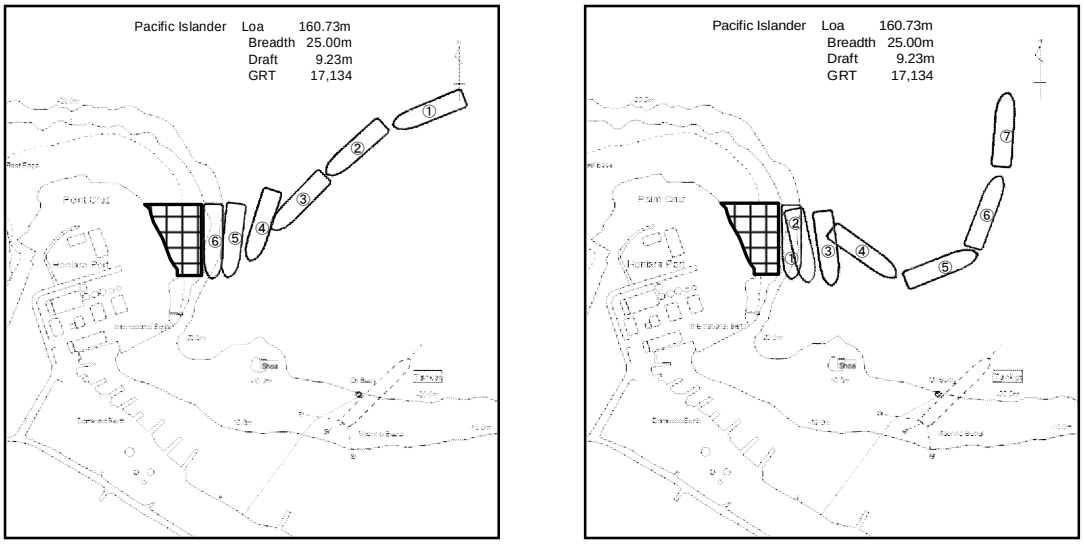


Figure 2.2.2.1-8 Access Route of Ro-Ro Ships to New International Wharf

(5) Basic Policy of Wharf Layout

1) Basic Wharf Layout Plan

Face line layout of the berthing facility is planned, considering basic points shown below.

* The offshore location of the berth face line is determined through deep consideration on economic efficiency since the bottom slope is steep and the scale of necessary structure, filling and dredging volume are very much varied by small differences.
* Necessary wharf cargo handling area equivalent to 30m width and container storage area for export loading are secured at the back of berth so as to make wharf cargo handling works performed smoothly throughout the all berth extension.
* The layout of mooring line from berthing ships is considered and existing dolphin and bollard belonged to the existing international wharf are remained.

* The location of dolphins is installed slightly offshore side than reef edge considering the workability of construction work.
* In view of securing ship's safety, the space between the existing international wharf and the Second International Wharf is kept to certain extent.

The comparative location of the Second International Wharf and other port facilities and the location of berth face are as shown in Figure 2.2.2.1-9. The distance between the Second International Wharf and the existing international wharf becomes about 150m. About 100m distance between vessels is kept even in case that large container ships berth at each wharf. As the bottom slope in front of the Second International Wharf is very steep, there are no obstacles for vessels getting in/out and to/from the port and the location becomes safer comparing with the existing wharf. According to the comments from the port master, there are no obstacles in front of the wharf site and even if there exist some, there will not be the obstacles for the vessels operation since the water depth is deep enough not to touch the draft of vessels.

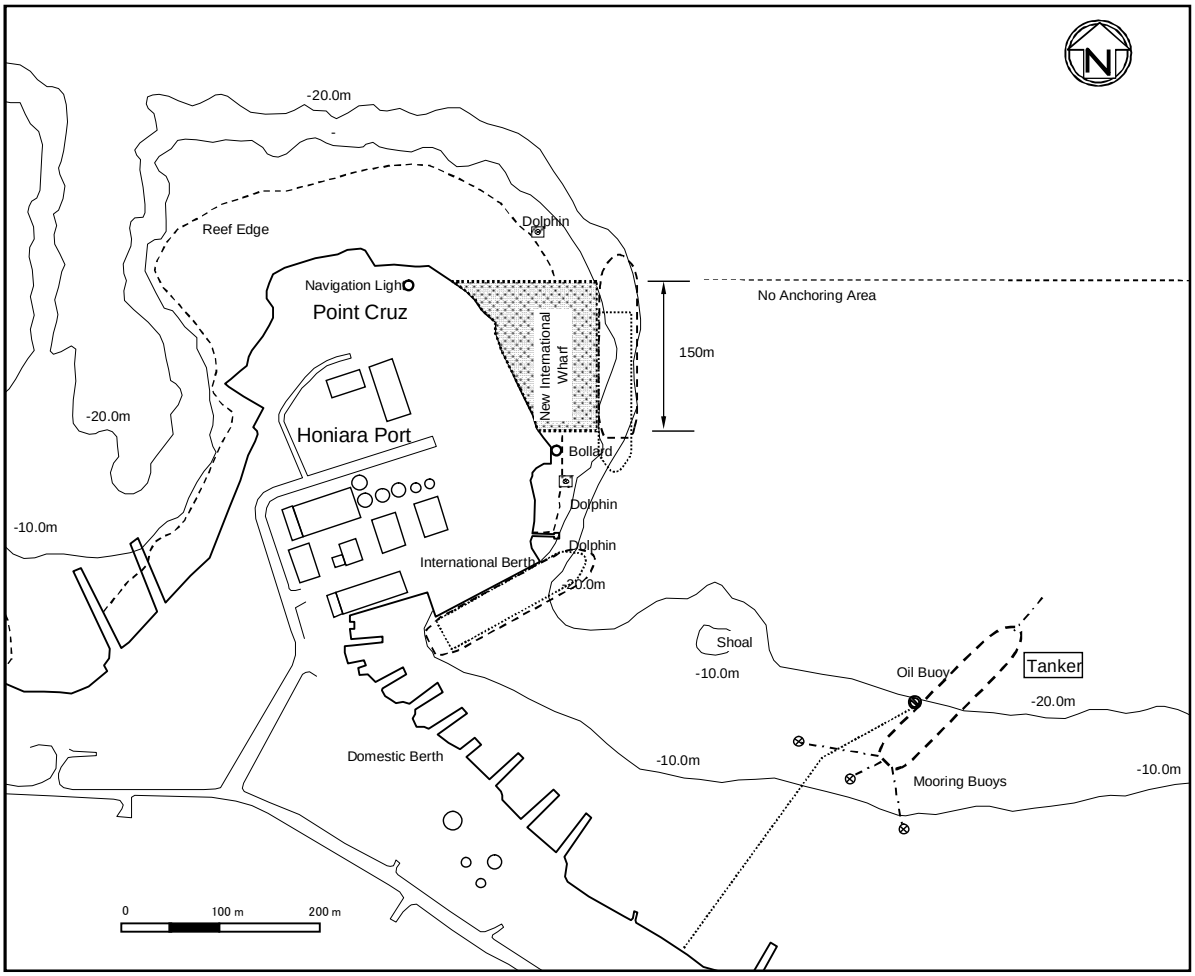


Figure 2.2.2.1- 9 Layout Plan of New International Wharf in Honiara Port

2) Study on Wharf Workable Day Rate

Honiara Port as shown in Figure 2.2.2.1-10 is in water area closed with Malaita Island, Santa Isabel Island and New Georgia Island. And there is Nggela Island being right by the offshore, therefore affecting waves is presumed to be relatively small.

Waves affecting to Honiara Port are consisted of the waves generated in South Pacific Ocean penetrating from Indispensable Strait between Santa Isabel Island and Malaita Island, the waves generated in New Georgia Sound between New Georgia Island and Santa Isabel Island and the wind waves by easterly trade wind generated in the sea area between Malaita Island and Guadalcanal Island.

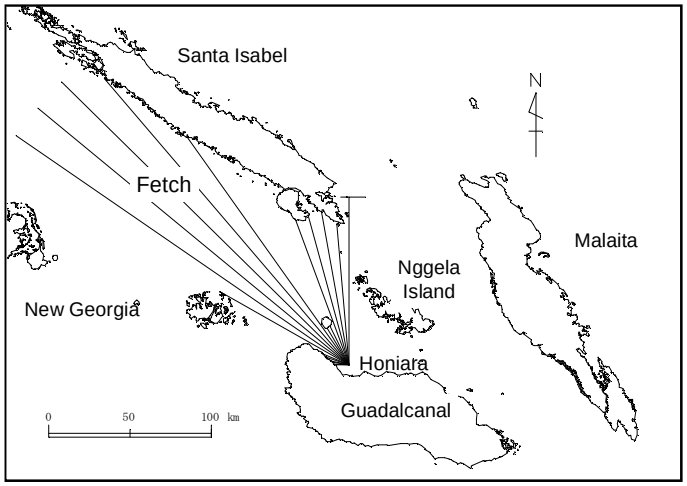


Figure 2.2.2.1-10 Fetch for Wave Forecasting of Honiara Port

Waves affecting Honiara Port was forecasted based on the global wind distribution data (2002 to 2006) published by Japan Meteorological Agency. Waves generated in South Pacific Ocean were forecasted by “One Point Spectrum Method” and the wind waves were adopted by “SMB Method”. Figure 2.2.2.1-11 shows wave generating situation in offshore sea area of Honiara port. Through a year, although the wave to ENE direction generated by trade wind is dominant with the wave height becomes almost below 0.5m. Out of the waves affecting Honiara Port, the wave which the height is relatively higher is the NW or WNW wave generated in December to May and the frequency of the wind is low though, it overlaps waves generated in Indispensable Strait between Santa Isabel Island and Malaita Island that is the waves from outer sea and with long fetch with relatively rough waves.

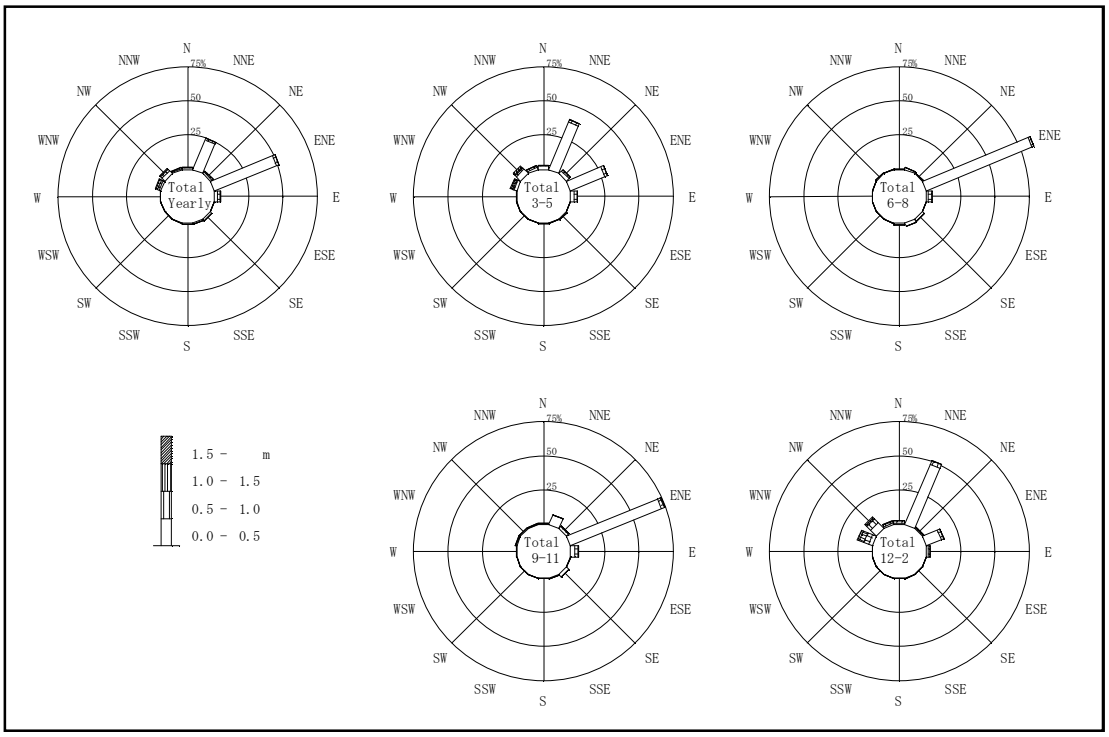


Figure 2.2.2.1-11 Forecasted Wave Distribution in Offshore of Honiara Port

The wave height in front of the berth was simulated with the wave deformation model of wave refraction based on the forecasted waves in the offshore of Honiara Port. The wave deformation calculation is made by the selected design wave as NW to NE wave direction from wave frequency table and intending the period at the time of normal wave and targeted 5 sec. that is relatively longer period in the appearance waves. Wave dimension in front of the berth (wave height ratio, incident wave direction) is able to obtain as shown in Table 2.2.2.1-3 from the result of wave deformation analysis. Waves in front of the berth of the new wharf is obtained multiplying wave appearance frequency in the offshore of Honiara Port by these wave height ratio and the wave appearance frequency table shown in Table 2.2.2.1-4 was made.

Table 2.2.2.1-3 Wave Height Ratio and Wave Direction at Berth Front

Offshore Wave		Wave Dimension at Berth Front	
Direction	Period	Wave Height Ratio	Wave Direction
NW	5.0s	0.51	N17.5° W
NNW	5.0s	0.64	N1.0° E
N	5.0s	0.76	N12.5° E
NNE	5.0s	0.87	N29.0° E
NE	5.0s	0.92	N47.0° E

Table 2.2.2.1-4 Wave Frequency Distribution by Wave Directions in Berth Front

WAVE DIRECTION	U.K.	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
WAVE HEIGHT(M)																		
CALM	0 .0	0 .0	0 .0	0 .0	8 .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	8 .0
0.00 - 0.24	0 .0	316 .7	7398 16.9	337 .8	20591 47.0	323 .7	22 .1	689 1.6	420 1.0	219 .5	61 .1	28 .1	37 .1	58 .1	567 1.3	1299 3.0	295 .7	32660 74.5
0.25 - 0.49	0 .0	274 .6	3107 7.1	400 .9	885 2.0	683 1.6	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	573 1.3	621 1.4	298 .7	6841 15.6
0.50 - 0.74	0 .0	182 .4	341 .8	240 .5	537 1.2	575 1.3	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	537 1.2	244 .6	146 .3	2802 6.4
0.75 - 0.99	0 .0	59 .1	75 .2	65 .1	257 .6	301 .7	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	158 .4	95 .2	42 .1	1052 2.4
1.00 - 1.24	0 .0	20 .0	21 .0	21 .0	63 .1	70 .2	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	90 .2	76 .2	5 .0	366 .8
1.25 - 1.49	0 .0	4 .0	4 .0	0 .0	1 .0	9 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	7 .0	33 .1	7 .0	65 .1
1.50 - 1.74	0 .0	0 .0	0 .0	0 .0	0 .0	7 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	0 .0	4 .0	11 .0	22 .1
1.75 - 1.99	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	1 .0
2.00 - 2.24	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
2.25 - 2.49	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
2.50 - 2.74	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
2.75 - 3.00	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 .0	0 .0
3.00 -	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 .0	0 .0
TOTAL	0 .0	855 2.0	10946 25.0	1063 2.4	22342 51.0	1969 4.5	22 .1	689 1.6	420 1.0	219 .5	61 .1	28 .1	37 .1	58 .1	1932 4.4	2372 5.4	804 1.8	43817 100.0

Table 2.2.2.1-5 shows the estimate of non-exceedance probability ratio from the result of wave calculation in front of the berth of the new international wharf. This table shows the non-exceedance probability ratio in the offshore of Honiara Port as well as the one in berth front, as Table 2.2.2.1-3 shows, in case of NW wave, it is greatly affected by wave refraction and the wave height becomes decreased in front of the berth. As the decrease of wave height is occurred by the NW wise relatively big wave refraction, the wave calmness in front of the berth becomes improved in comparison with the offshore of Honiara Port.

Table 2.2.2.1-5 List of Wave Non-exceedance Appearance in Berth Front

Wave Height (m)	Non-exceedance Wave Appearance in Offshore (%)	Non-exceedance Wave Appearance at Berth Front (%)
0.25	69.0	74.6
0.50	85.8	90.2
0.75	92.5	96.6
1.00	96.0	99.0
1.25	98.1	99.8

Figure 2.2.2.1-12 shows the result of Table 2.2.2.1-5 and it is the result to obtain non-exceedance probability ratio of each wave height for the waves in the wharf front. As Table 2.2.2.1-5 shown, the wave height in the berth front becomes smaller than the offshore and the

non-exceedance probability ratio of 0.5m and 0.75m wave height become 90.2% and 96.6% respectively.

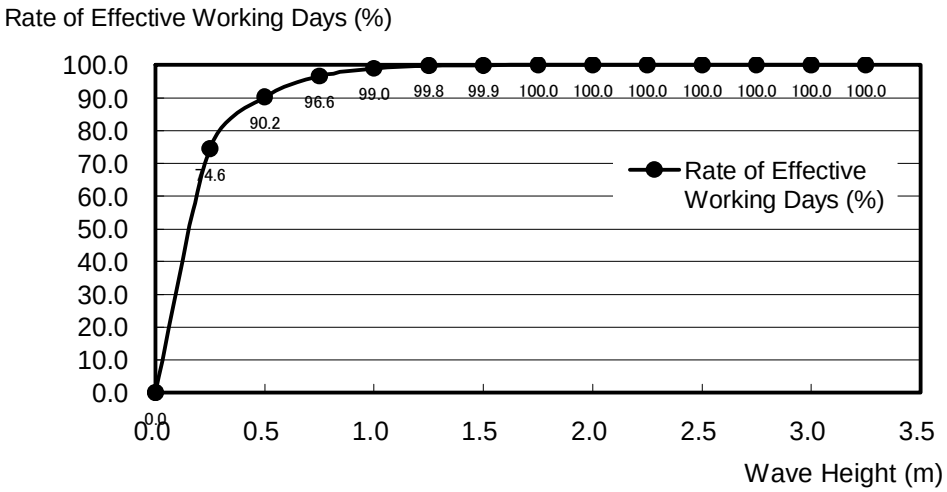


Figure 2.2.2.1-12 Berth Workable Rate of New International Berth

Target figures of wave height as the port tranquility are set out as below in "General Consideration on Ports Plan" (Inoue, Izumi, Ishiwata and Japan Construction Engineers' Association). From the Table 2.2.2-6, in case that the target figure of port calmness is for the vessels more than 5,000GT, the wave height is shown as 0.7m and it is assumed that the abeyance ratio becomes about 3.4% (equivalent to 12 days/year) since the effective work day ratio (non-exceedance probability ratio) of the Second International Wharf where the wave height is 0.75m is shown as 96.6%. Installation of breakwater for a port in Japan is considered under the condition that the berth utilization ratio is to be 95 to 97.5%. Therefore, the new international wharf of Honiara Port has nearly satisfied berth utilization ratio although breakwater cannot be constructed due to the distribution of water depth in surrounding offshore area.

And, the critical wave height of berthing ship for evacuation is set out as the target wave calmness in case of evacuation at the time of stormy weather with the target vessels shown in Table 2.2.2.1-7. In case of Honiara Port, as there is a case that the wave height of berth front exceeds 1.0m, offshore anchoring is required leaving berth in advance according to the rules of SIPA when the wave height is expected to be higher.

Table 2.2.2.1-6 Target Wave Height of Ports Calmness

Target Vessel	Significant Wave Height ($H_{1/3}$)
300～1,000 GT	0.3m
1,000～5,000 GT	0.5m
5,000 GT and More	0.7m
Boat and Small Vessel	0.3m

Table 2.2.2.1-7 Target Wave Height for Evacuation during Stormy Wave Condition

Target Vessel	Berthing	Buoy Mooring	Anchoring
300GT and Less	0.3m	---	---
300～5,000 GT	0.5m	1.0m	1.5m
1,000～5,000 GT	0.7m	1.0m	1.5m
5,000 GT and More	1.0m	1.5m	2.0m

Critical wave height of cargo handling is referred as the wave height at the berth and mooring basin. Critical wave heights are shown with the Table 2.2.2.1-8 extracted from "Technical Standards for Port and Harbor Facilities in Japan". From the Figure2.2.2.1-12, as the probability of wave height in berth front to exceed 0.5m for middle and large vessels is 9.8%, it is necessary to pay attention to what the period being unable to handle cargoes on berth by movement of ship body due to the waves is occurred at a rate of approx.10% per year.

Table 2.2.2.1-8 Critical Wave Height for Cargo Handling

Vessel Size	Critical Wave Height of Cargo Handling ($H_{1/3}$)
Small Vessel	0.3m
Middle & Large Vessel	0.5m
Extra Large Vessel	0.7～1.5m

(Source: Technical Standards for Port and Harbor Facilities in Japan, 2007)

3) Study on Reflected Wave from Berth

As small boats for inter-island transportation and others are navigated offshore of the new international wharf, the aspects of reflected waves to be generated by the quay wall of the berth is studied. Figure 2.2.2.1-13 shows the aspect of reflected waves when representative waves (wind wave with 5.0s wave period) propagate normally to the berth face line, in case of the berth extension of 150m. In the figure, reflected wave height coefficient (left hand side) and combined wave height coefficient (right hand side) by reflected wave and incident wave are indicated.

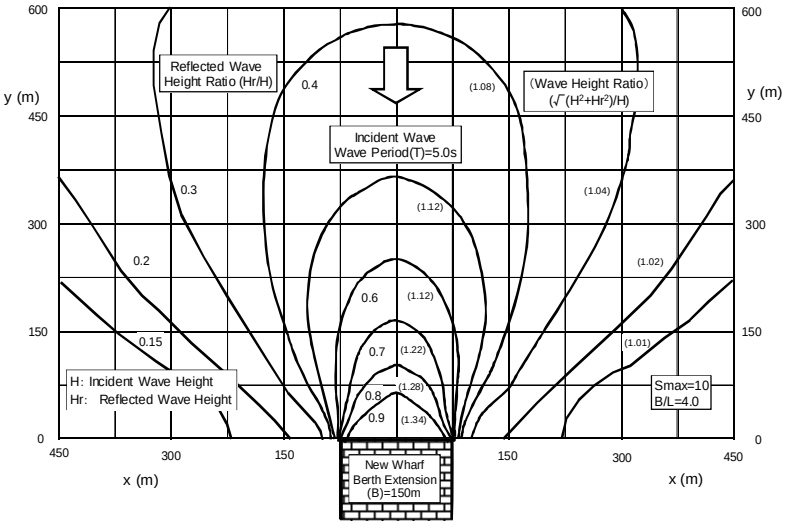
The wave height of reflected wave is sharply decreased along with the distance from the berth and the reflected wave height coefficient at the offshore point of 600m from berth shows 0.4 and the wave height of reflected wave is calculated as 0.2m in case of the normal wave height of 0.5m. The actual wave height can be obtained with the method to combine reflected wave and incident wave. From the wave height distribution shown in right hand side of the figure, the combined wave height coefficient at the offshore point of 600m from wharf becomes 1.08 and the wave height is calculated as 0.54m. As the navigation routes of inter-islands ferries are a few km offshore from the project site of the Second International Wharf, the reflected waves become further decreased and the influence of reflected waves to these vessels is considered to become very minor.

$H=\sqrt{Hi2+Hr2}$ (Formula 2.2.2.1-1)

H：Wave Height

Hi：Incident Wave Height

Hr：Reflected Wave Height



(Source: Technical Standards for Port and Harbor Facilities in Japan)

Figure 2.2.2.1-13 Reflected Wave Distribution from New International Wharf

(6) Basic Policy on Crown Height of Berth

1) Standard Crown Height of Berth

The standard crown height of berth is set as 1.0m to 2.0m above H.W.L. (High Water Level) for large berthing facility from "Technical Standards for Port and Harbor Facilities in Japan" shown in Table 2.2.2.1-9. This standard value is for the berthing facility where is not affected by waves with breakwater. In case of Honiara Port, as wave protection facility like breakwater cannot be constructed in the offshore, it is necessary to consider the wave influence, therefore the highest crown height out of standard crown heights is studied.

Crown Height = Design High Tide Level + (1.0 to 2.0) m

= DL.+1.17m + 2.0m = 3.2m

Table 2.2.2.1-9 Standard Crown Height of Berth

	Tidal Range 3.0m and more	Tidal Range 3.0m or Less
Berth for Large Vessel (Water Depth 4.5m and More)	＋0.5～1.5m	＋1.0～2.0m
Berth for Large Vessel (Water Depth 4.5m or Less)	＋0.3～1.0m	＋0.5～1.5m

(Source: Technical Standards for Port and Harbor Facilities in Japan)

2) Crown Height Considering Wave Condition

Figure 2.2.2.1-14 shows the ground elevation of the existing berth facilities and the container yard. As the existing berth in international wharf is not much influenced by waves, the crown height is set as H.W.L. +1.0m (D.L. +2.2m) and the ground height of backside container yard is almost the same. While, it is necessary to make the crown height of the Second International Wharf higher the one of the existing wharf in order to prevent wave overtopping to the wharf due to the influence of waves from the open sea.

More specifically, the probability that wave height becomes less than 0.75m that is rough indication of port effective workable ratio becomes 96.6% as shown in Table 2.2.2.1-5 judging from the generation frequency of normal waves and the calmness is almost met with requirement. However, 3.4% could be anticipated to be more than 0.75m and the wave with more than 2.0m of wave height is not forecasted. In addition, as the result of design wave forecast at the time of cyclone, the wave height of design wave in Honiara Port becomes 3.66m as shown in Table 2.2.2.1-10. It is anticipated that the equivalent deep water wave in front of the berth considering combined wave refraction-diffraction is influenced by the waves with the wave height of 2.78m. Considering these wave conditions, the crown height is determined by the wave overtopping quantity.

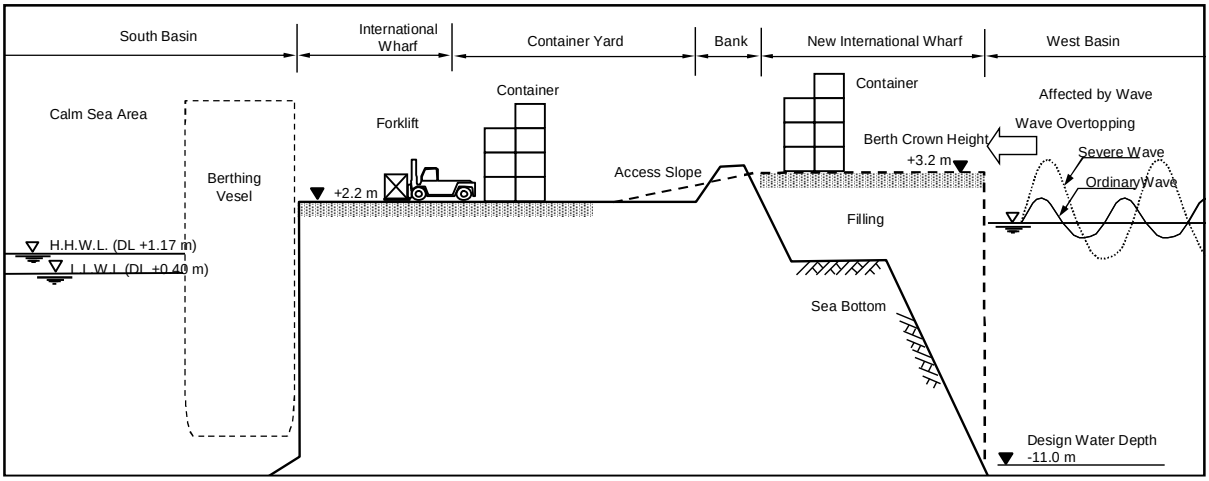


Figure 2.2.2.1-14 Berth Crown Height and Ground Height of Existing Facilities

Table 2.2.2.1-10 Dimensions of Equivalent Deep Water Wave

Offshore Wave			Wave Dimension at Berth Front		
Wave Direction.	Wave Height	Wave Period	Refraction Coefficient	Equivalent Offshore Wave Height (m)	Wave Angle
NW	3.66m	6.7s	0.53	1.94	N3.3°E
NNW			0.67	2.45	N13.3° E
N			0.76	2.78	N25.4° E

In this project, the crown height of the berth is set out from wave overtopping quantity against design waves as the factor to allow wave overtopping to the new international wharf.

The allowable overtopping rate is up to the rate of 0.02m^3/m/s that is set for "other important area" extracting from the Table 2.2.2.1-11 that is allowable overtopping rate for level of importance of backside land utilization, since the backside of berth is used as container yard and it is possible to move containers and others to safe place prior to stormy weather.

Table 2.2.2.1-11 Allowable Overtopping Rate for Importance of Hinter Land (m^3/m/s)

Area where people's houses and public facilities are closing up and major damages are anticipated by the invasion of overtopping, splashes and etc.	Approx. 0.01
Other important area	Approx. 0.02
Other area	0.02～0.06

(Source: Technical Standards for Port and Harbor Facilities in Japan)

From the Table 2.2.2.1-4 of normal wave frequency distribution, about 2.0m wave height is generated as the maximum wave. The result obtained the overtopping quantity at the time of MHHW (D.L.+1.17m) from the calculation chart of overtopping quantity setting study objective wave as wave direction E, wave height 2.0m and period 6s, becomes 0.0048m^3/m/s. Therefore, although at the time of normal, overtopping is observed but it is understood that the overtopping quantity is less than 0.01m^3/m/s within allowable range.

And out of design waves shown in Table 2.2.2.1-10, the result obtained the overtopping quantity at the time of MHHW (D.L.+1.17m) from calculation figure of overtopping quantity in case of upright quay wall using N direction wave becomes 0.02m^3/m/s and that is the same overtopping quantity equivalent to "other important area"

With the result above, although extreme wave is within allowable range, as overtopping is allowed, on the assumption to move container cargoes and others on the wharf to the existing yard at the time of stormy weather, berth crown height is set as D.L.+3.2m. And, the embankment at the backside of the new international wharf is going to be remained as it is except open-cut area for the access road to the existing container yard.

3) Crown Height Considering Ro-Ro Vessel

In case of container ship, the container cargo handling is made by ship geared crane, so that the crown height of the berth does not affect the container handling operation. However, in case of Ro-Ro ship, there is a case that sternward Ro-Ro Ramp cannot be connected to the berth in higher elevation and it is necessary to pay attention to setting up the crown height of the berth. Figure 2.2.2.1-15 shows the berthing situation of Ro-Ro Ramp of South Islander out of Ro-Ro ships operated by Greater Bali Hai. The crown height is less than 4.0m above the water level is possible to connect Ro-Ro Ramp to the berth from the movable range.

In case of berthing at the time of low tide, as the crown height of berth (D.L.+3.2m) is equivalent to 2.8m above L.L.W.L., it is understood that Ro-Ro Ramp is accessible.

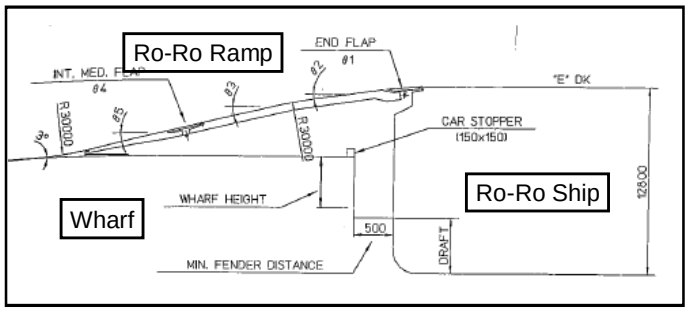


Figure 2.2.2.1-15 Berth Crown Height for Ro-Ro Ramp

(7) Basic Policy of Berth Layout Plan

Regarding the layout plan of the Second International Wharf as shown in Figure2.2.2.1-16, the following points are considered to be paid attention for planning. In addition, the relevancy of plan was checked by interview survey to the ship masters of liner container ships who are the users on important factors of port facility layout plan such as the length of berth, its crown height, position of dolphins and so forth.

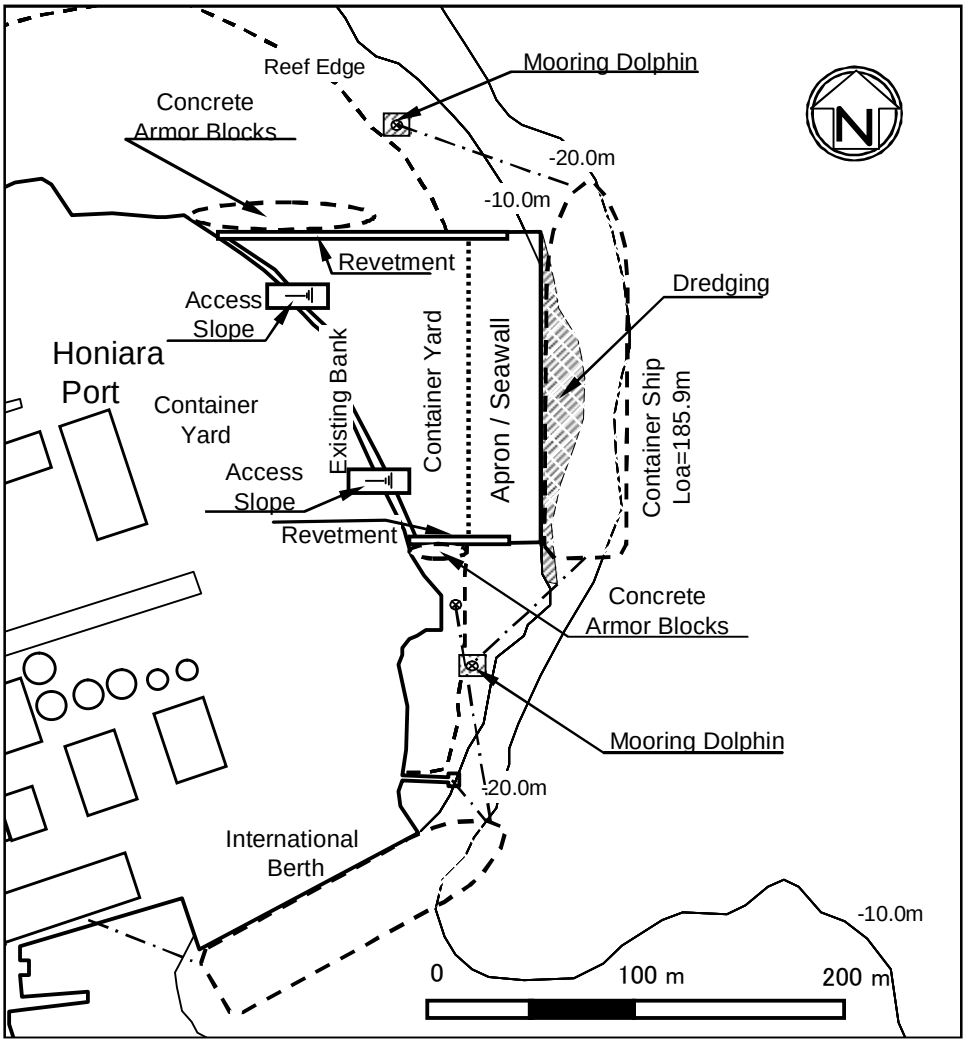


Figure 2.2.2.1-16 Schematic Layout Plan of New International Wharf

1) Offshore Position of Face Line of Berth

Concerning the face line of the berth, the water area for wharf construction is composed of coral reef geography and the bottom geography is in steep slopes. Therefore, the offshore position of face line of the berth is planned so as to lighten dredging volume as much as possible, as well as considering quay structure as a target for the location to be able to obtain necessary berth water depth (D.L.-11.0m) in views of berth structure scale, environmental consideration and the constructability. And, as the dredged material is confirmed to be free of harmful substances like heavy metal from the result of sediment quality survey, it is planned to divert to filling material for construction.

2) Location of Dolphin

As mooring lines are not connected on the berth by the vessel longer than the berth length due to the 150m berth length, dolphins are installed at the sea area of each berth ends in order to fill the gap of shorter berth length. The locations of dolphins are set as follows from the necessary distances of mooring lines on the bow based on the berthing position of container ships, Kwangsi type that run off its ship body with gear equipped in sternward and of Islander type when using Ro-Ro Ramp. From the necessary distance from each ship's body shown in Figure 2.2.2.1-17, 18 the locations are installed at 50m or more from the north end of berth for north side and 60m or more from the south end of berth for south side.

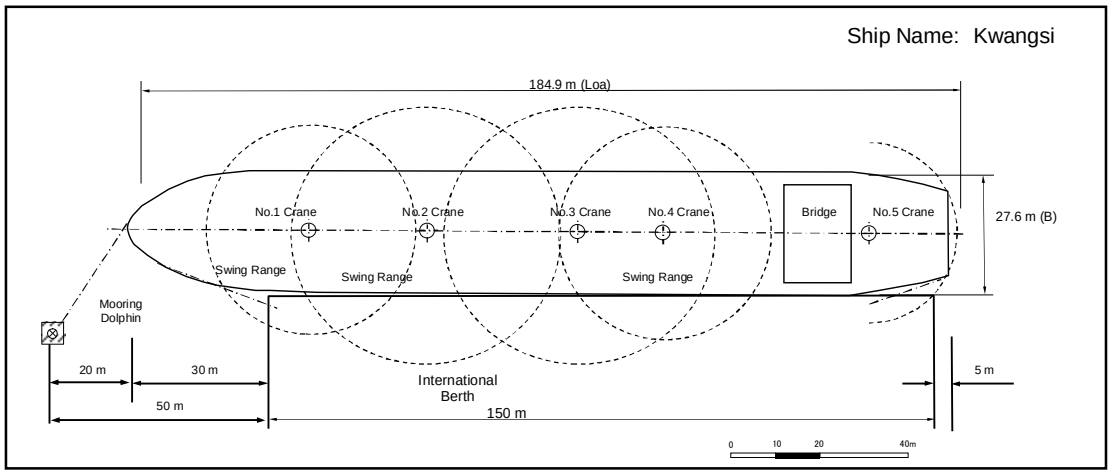


Figure 2.2.2.1-17 Berthing Position of Kwangsi Type Container Ship

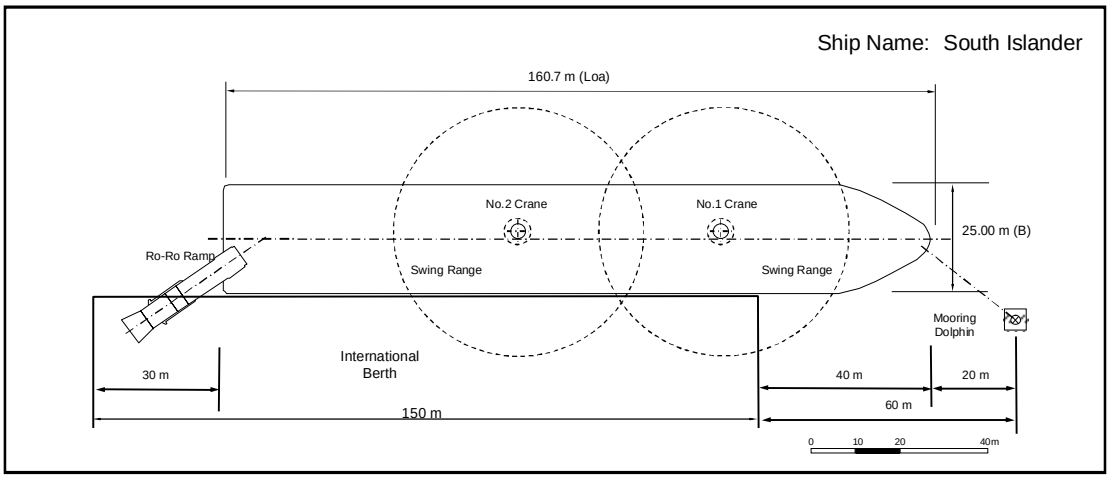


Figure 2.2.2.1-18 Berthing Position of Islander Type Ro-Ro Ship

3) Parapet Installation on North South End Revetment

As the crown height of the berth cannot be made so high to prevent overtopping, slight overtopping becomes allowed. On the end revetment, parapet is going to be installed as same as the berth of the existing international wharf. And the existing bank is located at the back of the new wharf, of which crown height adjacent to the end of the north revetment is around D.L.+4.6m. As there was no overtopping report for these banks by interview to SIPA, the same level of the crown height is considered for wharf using aspect as well. And the height of the parapet in this project is set as 1.0m equivalent to the elevation of D.L. +4.2m.

Crown Height of Parapet = Crown Height of Berth +1.0m = DL. +4.2m

Wave overtopping rate of the end revetment with a parapet installed at the elevation of D.L. +4.2m becomes $0.0078m^3/m/s$ at the north revetment that is smaller than the allowable overtopping volume that is $0.01m^3/m/s$ of "Special Area" where major damages are anticipated by overtopping, spray and others as shown in Table 2.2.2.1-11.

4) Installation of Wave Armor Blocks at North Corner and South Corner of Revetment

As corners of north and south revetment of the wharf are the water area, where waves are reflected and concentrated, will be anticipated the generation of adverse effects by the calmness of surrounding water area, localized scouring by bank and others, so that wave absorption at corners becomes necessary. Since the good quality heavy stone materials cannot be procured there, concrete armor blocks are going to be used. Necessary quantity in case of using the armor blocks (Tetrapods for example) is calculated as below with the wave height in front of north side of wharf as 3.04m by Hudson Formula.

$W = \rho_r H_{1/3}^3 / (K_D (S_r-1)^3 \cot \alpha)$

Where,

W : Necessary mass of blocks (t)

$H_{1/3}$: Design Wave Height (3.14m)

ρ_r : Concrete Density (2.3t/m^3)

S_r : Specific Gravity of Concrete for Seawater ($= \rho_r / \rho_w$)

ρ_w : Seawater Density (1.03t/m^3)

α : Angle with Slope and Level Surface ($\cot \alpha = 4/3$)

K_D : Constant to be determined by Armor Block ($K_D = 8.3$)

As installation area of the armor blocks is in the corners where waves are convergent, the necessary quantity is calculated as 1.5 times of the required calculated weight.

$W = 2.3 \times 3.14^3 / (8.3 \times (2.3/1.03 - 1)^3 \times 4/3) \times 1.5$

$= 3.45 \text{ tons} \times 1.5 = 5.17 \text{ ton} \fallingdotseq 6.3 \text{ ton type}$

5) Structure Plan of Quay Wall

In Japanese ports and harbors, proper structure type of quay wall has selected considering berth water depth, ground conditions and construction conditions selecting from various structure types such as gravity type berth, sheet pile type berth, pile type open jetty. In this project, comparison design concerning three kinds of representative structure types described below adopting in deep water berth is made. The steel pipe sheet pile type is selected as quay wall structure that the stability of the structure is higher for rough waves.

* Sheet Pile Type Quay Wall : Steel Pipe Sheet Pile Type Structure
* Open Type Quay Wall : Steel Pipe Pile Open Type Structure
* Gravity Type Quay Wall : Caisson Type Structure

Design conditions of berth are shown as follow.

Table 2.2.2.1-12 Design Conditions of Quay Wall

1) Berth Dimension	Crown Height Water Depth	D.L. +3.2 m D.L. -11.0 m
2) Target Vessel	Max. Target Vessel	Length (L_{oa}): 199.50 m Draft (d_{max}): 10.50 m Size: 31,000 DWT
	Tractive Force	1,000 kN
	Approach Speed	0.10 m/s
3) Load Condition	Surcharge	40ft Container: 30.48 t 20ft Container: 30.48 t
	Cargo Handling Equipment	Reach Stacker (Front Wheel Axis Load: 101.9 t) Top Lifter (Front Wheel Axis Load: 96.9 t)
4) Natural Condition	Tide Condition Wave Condition	H.W.L. : DL+1.171 m Offshore Wave Height (Ho): 3.66 m (N～NW), Wave Period(T): 6.7 s
	Seismic Condition	Seismic Factor (K_h): 0.15

Figures 2.2.2.1-19 - 21 show the typical cross sections of each structure type. Design water depth in front of berth is -11.0m, sea bottom ground consists of sandy soil from the site survey and the bottom slope is about 1:3 are considered as the main design conditions. Comparison study was made on the point of BH-2 (about 50m north from the south end of berth) where the bottom bathymetry and soil conditions are considered to be typical.

The comparison study was made from the comprehensive points of views such as design, construction, environment, construction period and construction cost. The results are summarized as per Table 2.2.2.1-13. While, dredging and filling works were excluded from the comparison items since they are executed by all 3 structures. And the adopted steel pipe sheet pile type structure was used in the rehabilitation project of the existing international wharf as well. SIPA is familiar to this structural type and was requested actually this type in the technical notes.

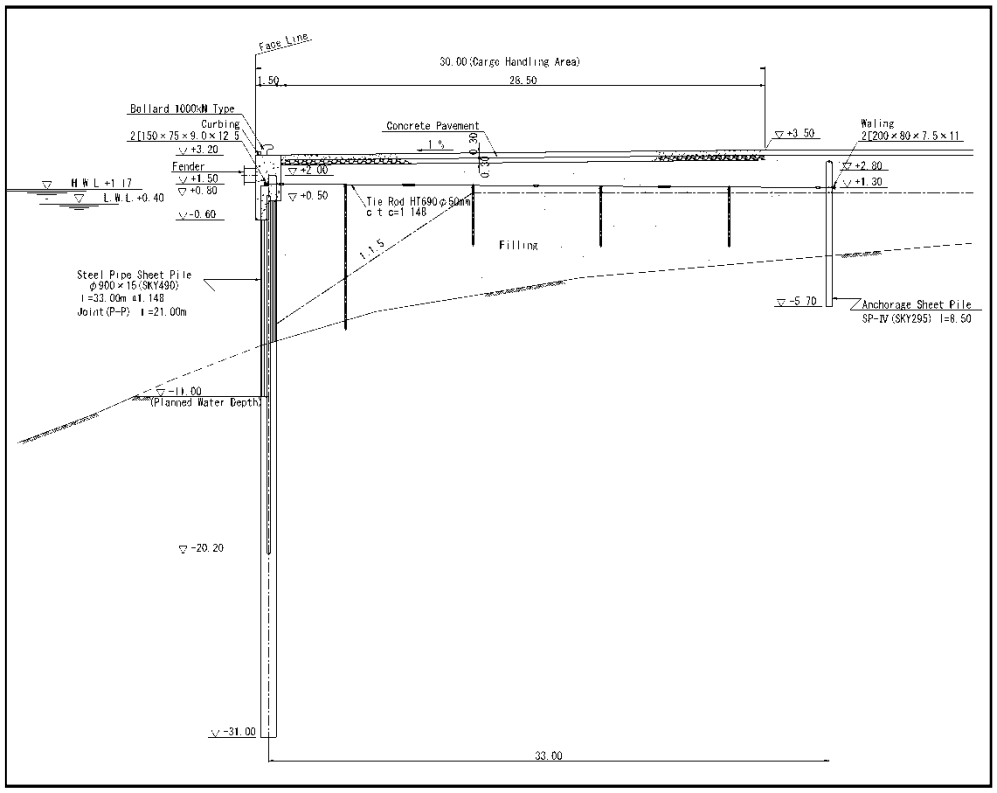


Figure 2.2.2.1-19 Cross Section of Steel Pipe Sheet Pile Type Wharf

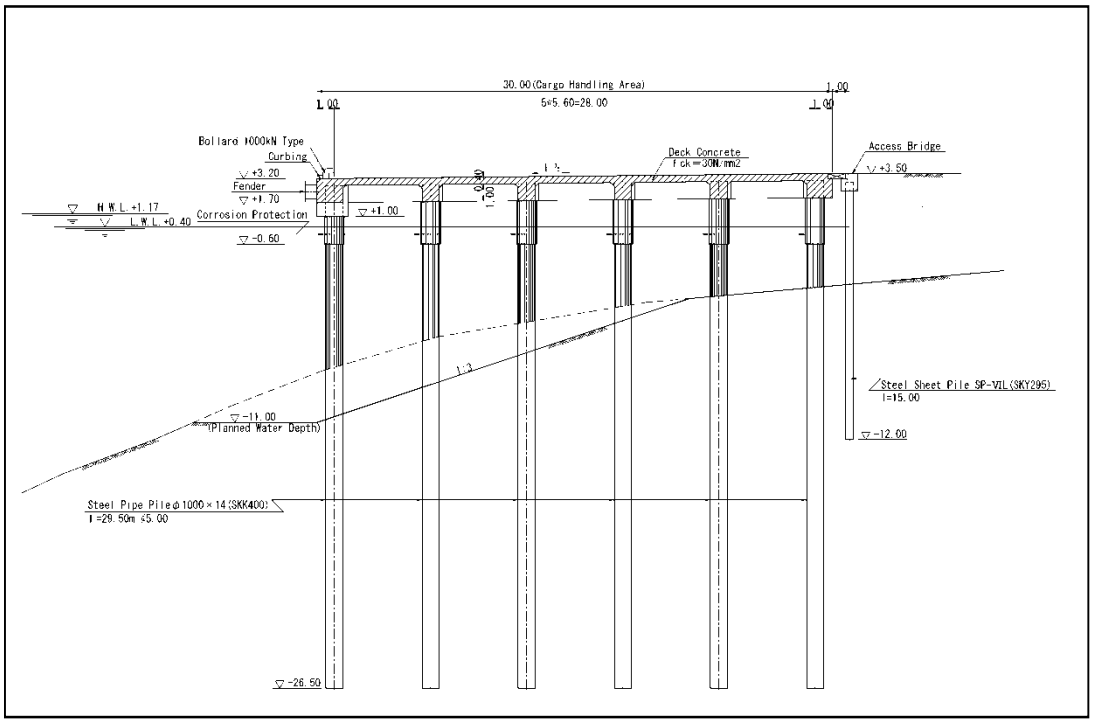


Figure 2.2.2.1-20 Cross Section of Steel Pipe Pile Open Jetty Type

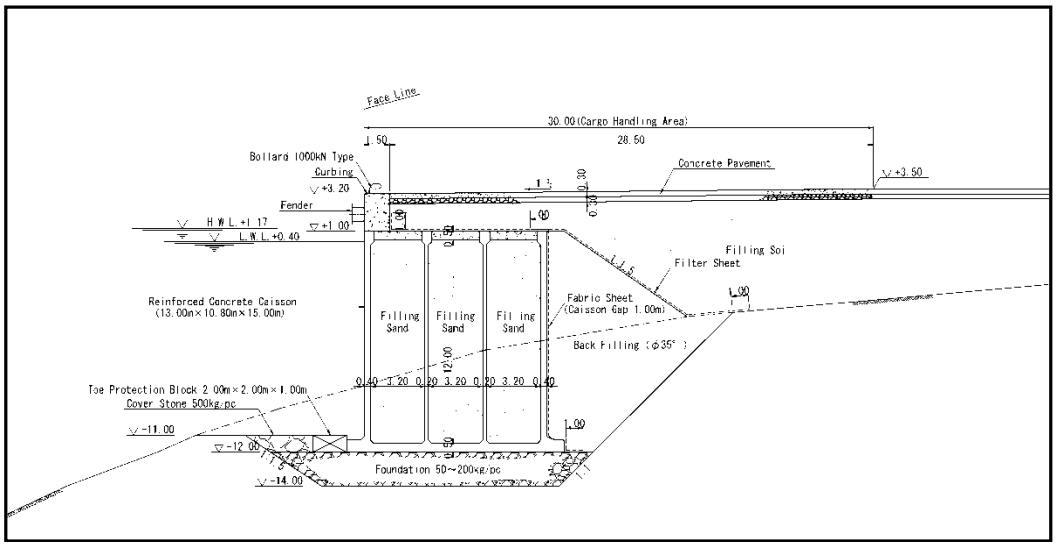


Figure 2.2.2.1-21 Cross Section of Concrete Caisson Type Structure

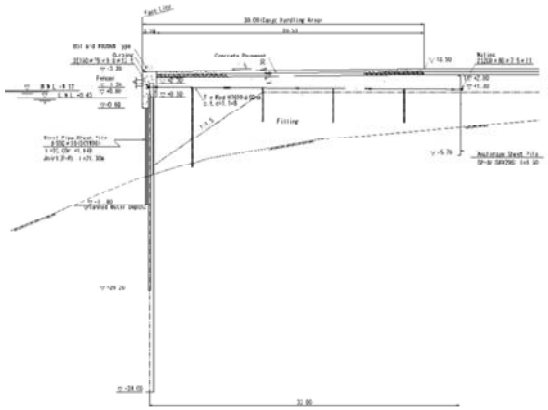
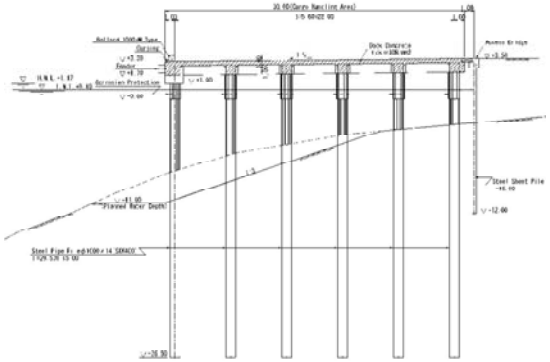
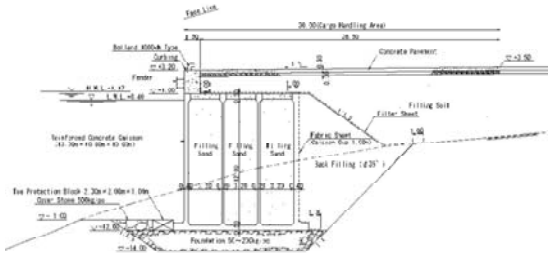
In addition, the structure type of the end revetment is properly planned depending on water depth such as standardized on steel sheet pile anchorage type referring to berth structure cross sections. In other words, the structure type with the same as the berth is for the closer part to berth and the economically appropriate cross section is adopted changing its structures from small diameter steel pipe sheet pile type to steel sheet pile type for the shallower water depth area.

6) Basic Policy on Berth Ancillary

The following items are included in the project as ancillary of the berth in the international wharf.

- Fenders
- Bollards
- Curving and etc.

Table 2.2.2.1-13 Comparison Table of Quay Wall Structure

Berth Structure	Steel Pipe Sheet Pile Structure	Steel Pipe Piled Jetty Structure	Caisson Type Structure
Standard Cross Section (Preliminary Image)			
Design Aspect	* Installation of Anchor Pile at the back is necessary * It is mainly corresponded with the pile length for the varied soil strengths and the slope of sea bottom * Considerations on corrosion protection and joint length are necessary when the pile is stopped at the higher position * Consideration on the prevention measure for sand flow out from the joints parts is necessary	* Construction of back revetment is necessary separetely * It is mainly corresponded with the pile length for the varied soil strengths and the slope of sea bottom * Consideration on up lifting pressure at the time of stormy waves is necessary * Consideration on corrosion protection is necessary when the pile is stopped at the higher position	* It is necessary to lighten soil pressure using quality backfill material at the back * It is mainly corresponded with the thickness of foundation rubble mound for the varied soil strengths and the slope of sea bottom * Consideration on sand flow from the back of caisson
Construction Aspect	* Early stabilization of steel pipe sheet piles is necessary simultaeously with anchoring pile works since this is easy to be affected by wave attack * Preparation for piling measure to solid soil layer is necessary * Procurement of piling barge is necessary	* Quality and progress control become complicated in addition that there become many construction works by the complicated structures with dual structures by piled jetty and earth retaining revetment and beams and slabs of superstructure * It is necessary to connect and fix piles at the early stage by precasting beams, slabs and etc.of superstructure since it is easy to affected by waves * Preparation for piling measure to solid soil layer is necessary * Procurement of piling barge is necessary	* Work and progress controls become complicated since the works becomes two with the construction of mound and the manufacturing of caisson and its installation * Safety management becomes important since underwater construction is executed by divers for the construction of foundation mound and etc. * Batcher plant work boat together with a floating dock are necessary since there is no dry dock or manufacturing yard around there therefore big fleet is required. Furthermore, the crane barge for the construction of mound is also required. The possibility is poor judging from the construction scale
Revetment Portion	* Construction works at the comers becomes slightly difficult since the tie rods for berth and revetment and anchor piles are tangled	* No special point to keep in mind	* The connection part with berth caisson and sheet piles of revetment becomes slightly complicated structure
Environmental Aspect	* Although vibration and noise are made by piling works, the impact to resident is very small	* Although vibration and noise are made by piling works, the impact to resident is very small	* As turbidity is generated during underwater excavation works or when rubble stones are dropped in at the time of construction of mound, the installation of silt protection sheet is necessary.
Maintenance	○	△	
Construction Period	○	△	
Construction Cost	○	△	
Evaluation	○	△	No possibility from the construction scale

7) Shoaling in Waterway and Basin off Berth Front

International wharf facility of Honiara Port is located at Point Cruz Peninsula and the project site for the Second International Wharf is planned at the east side of peninsula. The sea bottom slope of the water area adjacent to the project site is steep and the water depth becomes rapidly deeper to offshore. As the water depth around the site is deeper than the draft of calling ships, the access waterway is not set up and there is no concern on the shoaling of waterway.

The project site as shown in Figure 2.2.2.1-22 is located at water area closer to the head of east side of Point Cruz Peninsula and this is situated as the water area where sediment is hard to be deposited. Shoaling is considered not to be specially generated in the front water area of berth as shown below.

Topographically, Kua Bay is formed at the south side of Honiara Port and international wharf at the north side and the domestic wharf at the south side are located. The domestic wharf is consisted of small size pile type open jetties and the head water depth from -6.3m to -3.8m. In addition, Mataniko River flows in about 1 km west from Kua Bay. The Patrol Boat Jetty that affects littoral drift and two breakwaters are located at the west side of the project site. And small pocket beach of about 100m long is formed between the Patrol Boat Jetty and the Breakwaters.

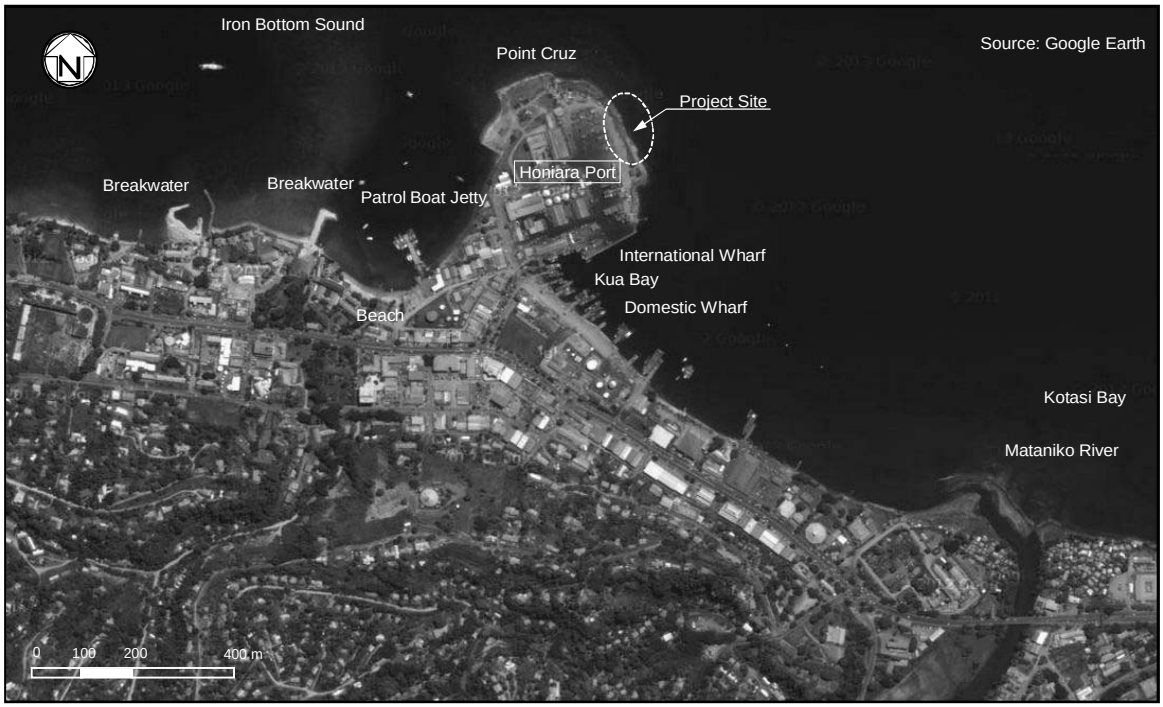


Figure 2.2.2.1-22 Coastal Structures around the Project Site

There are Mataniko River and Lunga River located at the east side of Point Cruz that are source of littoral drift as shown in Figure 2.2.2.1-23 and no river exist in the west side. With the results of brief reconnaissance of the east side coast, several places where are artificially changed their geography and some area where wave armor blocks are installed for beach protection are

observed. And, the maintenance dredging is not conducted in the domestic wharf and there is no critical shortage of water depth by sand deposition. Furthermore, from the result of bathymetric survey adjacent to the international berth in the first preparatory study, there is no place where the water depth is not sufficient and the noteworthy change of water depth by sand deposition was not confirmed. Kua Bay surrounded by the international berth and domestic wharf is presumed as the water area where sand is accumulated and deposited, however as the sand deposition there is not noted, it is implied that the discharged sand from Mataniko River and Lunga River in the east side does not affect the berth side of Honiara Port. Although, sandy beaches distribute in the west side of Point Cruz, all of them are small sizes with shorter beach length and width. Littoral drift from the west side not only prevented by two breakwaters and but is considered to be deposited at around the base of the patrol boat base where is located at the back place of bay. Topographically, it is regarded that the sand of this beach is not transported to and deposited at Point Cruz forming peninsula configuration. As the water depth of the offshore side of the project site is rapidly deeper and the sand transported from the offshore side cannot be considered, littoral drift in front of the proposed berth position is not serious, and therefore the change of water depth by sand deposition is not expected.

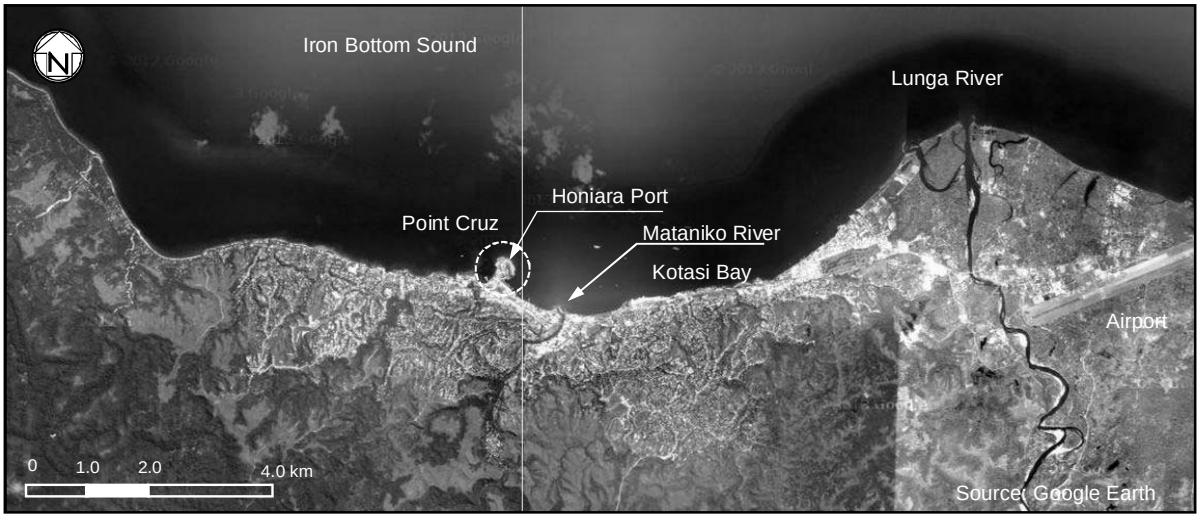


Figure 2.2.2.1-23 Main Rivers around Project Site

Next, the study is made on the critical depth for sediment movement that becomes the target of bathymetric change at the front water area of the berth in The Second International Wharf.

In case of deeper water depth, as waves are not affected by bottom surface, the sediment in the bottom surface is not disturbed by wave intrusion. However, sediment is started to move since the influence of waves reaches to bottom surface when gradually the water depth is getting shallower. This water depth is defined as the critical depth. The critical depth is calculated with estimate equation of Hellermeier (Equ. 2.2.2.1-1) and Birkemeier (Equ. 2.2.2.1-2)

$h_{cH} = 2.28H_e - 68.5 (H^2_e / gT^2_e)$ (Equ. 2.2.2.1-1)

$h_{cB} = 1.75H_e - 57.9 (H^2_e / gT^2_e)$ (Equ. 2.2.2.1-2)

Where, h_{cH} and h_{cB} are the critical water depth calculated with each formula and H_e and T_e are wave height and the period corresponding to each occurrence probability that is 0.137% (12 hours occurrence in a year). The wave height and the period are calculated as follow from Table 2.2.2.1-4.

Wave Height : H_e = 1.5 m, Period : T_e = 5 s

When obtaining the critical depth from this wave with each equation, following critical water depth is calculated.

Hellermeier Equation : h_{cH} = 2.79m
Birkemeier Equation : h_{cB} = 2.09m

Therefore, it is expected that the sediment is transported at the shallower water area than the 2.8m water depth and there is no significant sediment movement at the deeper water area around Honiara Port.

At the berth front, as the waves become standing waves by reflected wave from the quay wall, the wave height is calculated as standing wave height conforming of incident wave and reflected wave. Following critical depth is obtained at the quay wall face, where the wave height of standing wave becomes two times of incident wave. The critical depth for sediment movement at berth front is calculated as around 3.6 m and as the berth design water depth is -11.0m that is more than two times of critical depth, the sediment transport at the bottom surface of the berth front is estimated not to be remarkable.

Standing Wave Height : H_e =1.5 m x 2.0 = 3.0m
Hellermeier Equation : h_{cH} = 4.32m
Birkemeier Equation : h_{cB} = 3.12m

(8) Basic Policy on Access Road Plan

The access road to connect the Second International Wharf and the back side container yard is examined. In-port transportation of containers in Honiara Port is made by tractor & trailers and the road width is set out based on these sizes. And, as the ground height of container yard is lower in comparison with the crown height of the wharf, the access road becomes sloping road in its connection area. As the existing bank is remained as it is where is basis of planning, the access road is constructed by opening a part of the bank.

1) Layout of Access Road

The access road to connect the Second Wharf and the backside container yard is going to be one way traffic on the berth during loading and unloading operation of container ship, as Figure 2.2.2.1-24 shown one each road is installed in the north and south sides. Traffic direction of tractor & trailer is assumed to be anticlockwise rotation. And as in normal time, this road is used for container transportation between the Second International Wharf and the backside container yard, the each access road is planned as double lane.

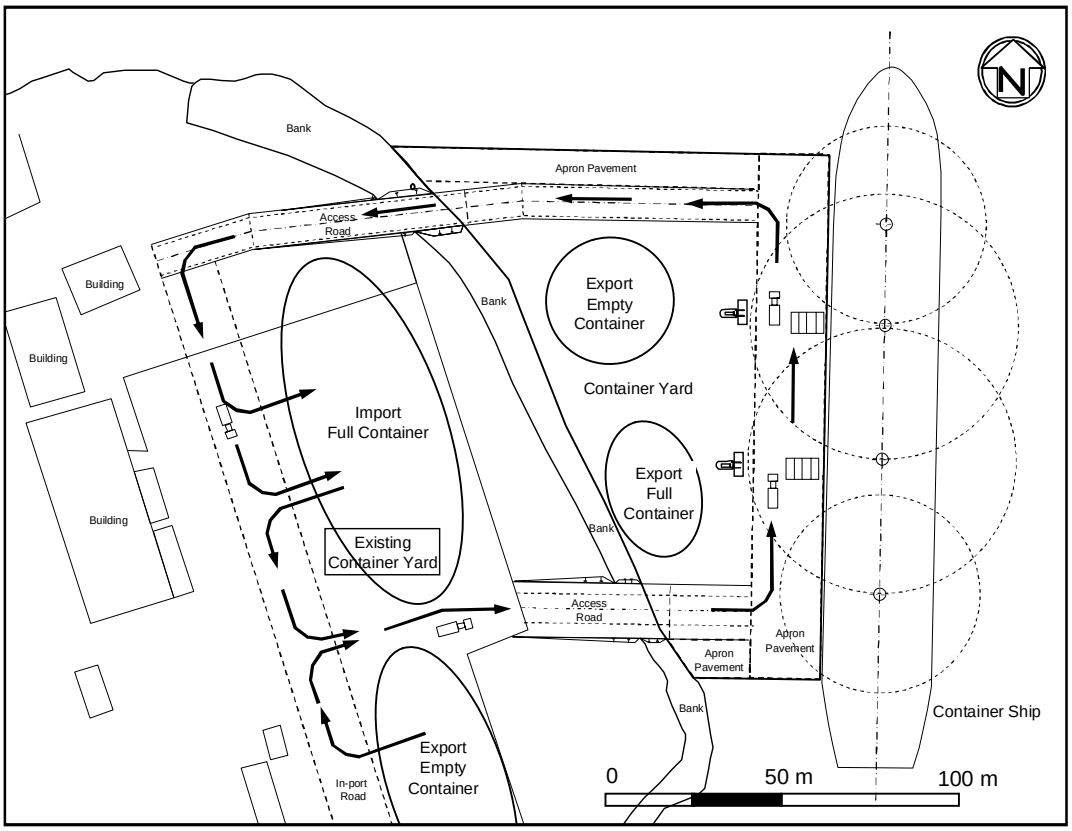


Figure 2.2.2.1-24 Layout Plan of Access Road

2) Width of Road

The access road with double lane has 8.5m width of pavement portion consisted of 3.5m width of tractor & trailer for traffic lane and additional 0.75m shoulders out of traffic lane.

Width of Road Pavement = 3.5m (Traffic Lane) x 2 + 0.75m (Shoulder) x 2 = 8.5m

Track traffic is assumed to be anticlockwise rotation related with backside container yard and the access road in the north side is mainly used for yard of full containers and the south side is for the yard of empty containers. Containers basically handled by tractor & trailer though as the handling by forklift or top lifter is also made according to comments of the person in charge of SIPA, the road width to be able to cope with these cargo handling equipment is ensured. As

the north side access road is closer to the stacking yard of imported full containers, it is assumed that forklifts runs with loading 20ft full container. And as the south side access road is closer to stacking yard of empty containers, it is assumed that forklift runs with empty container mainly. As the empty container includes 40ft containers mixed with 20ft containers, the road width is made also to be able to cope with 40ft containers. Therefore, the width of north and south access roads as shown in Figure 2.2.2.1-25, 26, is set each as 10.0m and 16.0m. And, the expanded road width for direct transportation by forklift is basically unpaved except the boarder portion to the container yard.

Width of North Access Road = 6.0m (Length of 20ft Container) + 2.0m (Allowance) x 2
= 10.0m

Width of South Access Road = 12.0m (Length of 40ftcontainer) + 2.0m (Allowance) x 2
= 16.0m

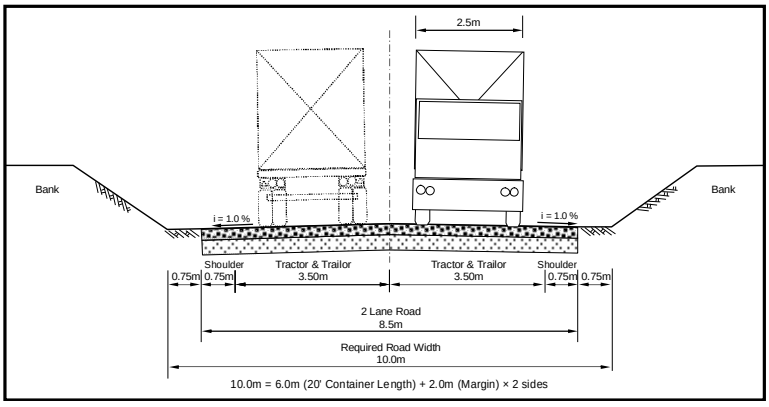


Figure 2.2.2.1-25 Plan Width of North Side Access Road

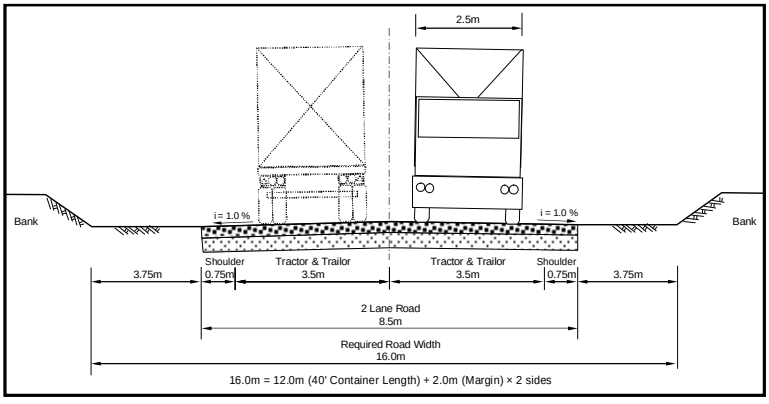


Figure 2.2.2.1-26 Plan Width of South Side Access Road

3) Road Longitudinal Section Plan

Figure 2.2.2.1-27, 28 shows the slope of access roads from the crown height of the new wharf and the ground height of existing container yard. Regarding the north side access road, as

the backside ground height becomes D.L.+3.0m against the wharf crown height (D.L.+3.2m), it can be connected to backside land with almost level slope. In case of the south side access road, as the height of backside container yard becomes D.L.+2.5m against wharf crown height (D.L.+3.2m), the slope to connect between wharf crown and the container yard becomes 1.8%. Land filling is made to the lower side of the existing ground height at the back of bank.

Longitudinal slope in general road is 3% to 8% depending on vehicle speed. As the running speed of tractor trailer for transporting containers in the international wharf is slower than 20km/h for safety sake, the longitudinal slope is within allowable range. And, container direct transportation by top lifter, forklift and others is assumed. As the mast of these equipment for container handling is tilting one and the tilting angle is 3 to 5 degrees back and fore, it is considered to be able to cope with longitudinal slope of the access road.

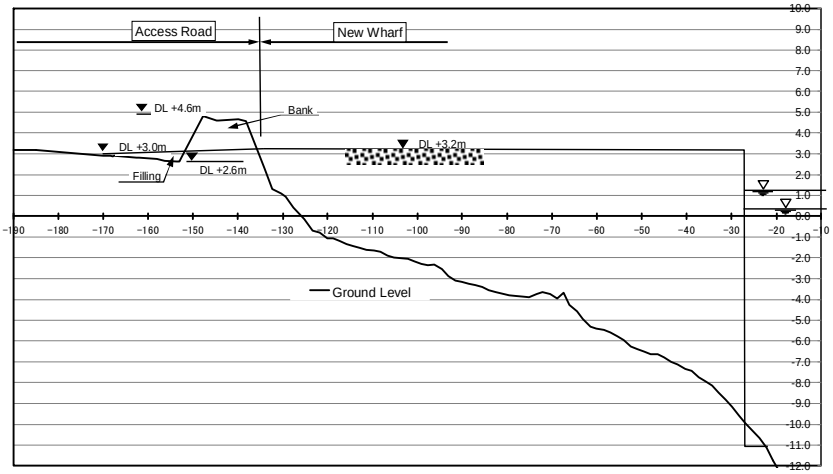


Figure 2.2.2.1-27 Longitudinal Section of North Access Road

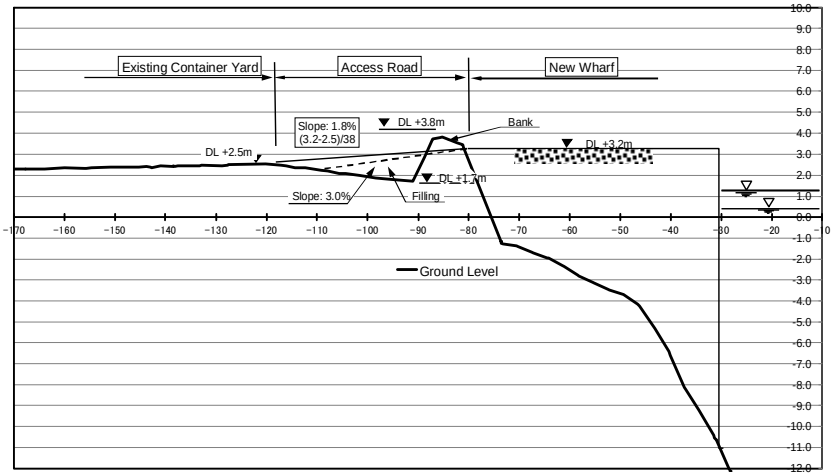


Figure 2.2.2.1-28 Longitudinal Section of South Access Road

4) Road Cross Sectional Plan

Cross section at the bank and at right back of the bank that is the lowest ground level is shown in Figure 2.2.2.1-29 to 32 concerning north side and south side access roads. The slope

of cutting and filling slope is set as 1:1.5.

In case of the north side access road, as D.L.+4.6m that is crown height of the bank is higher than that of south side, there occurred a vertical differenc with about 1.4m between bank and access road. In case of south side access road, as the crown height of the bank is lower, the vertical difference is about 0.6m. Land filling with about 1.3m is necessary at the backside of the bank where the ground level is lower.

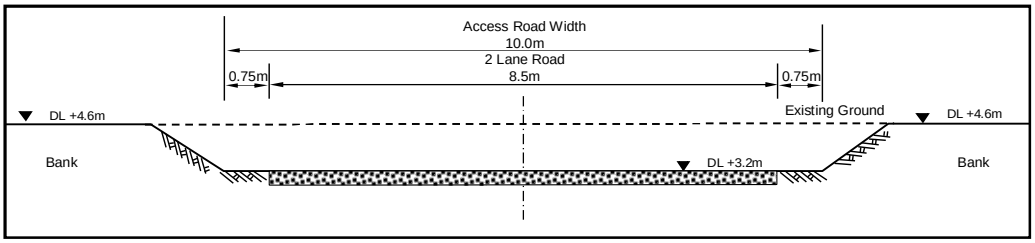


Figure 2.2.2.1-29 Cross Section of Bank Portion of North Access Road

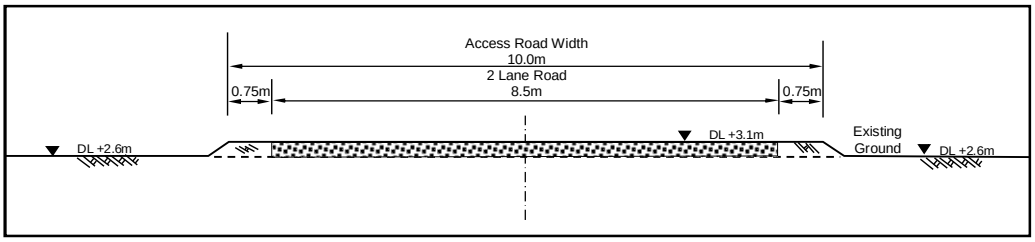


Figure 2.2.2.1-30 Cross Section of Bank Backside Portion of North Access Road

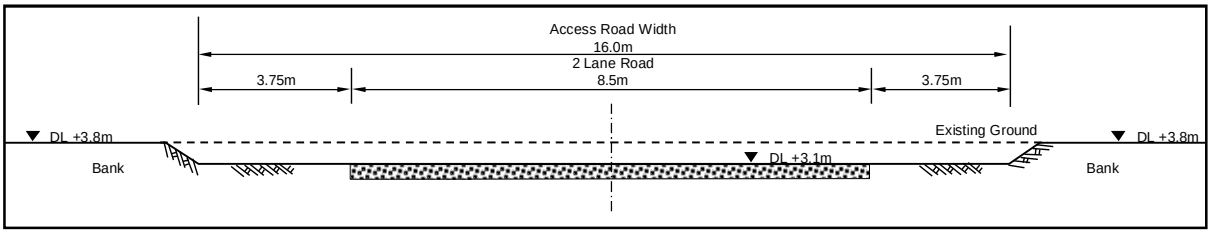


Figure 2.2.2.1-31 Cross Section of Bank Portion of South Access Road

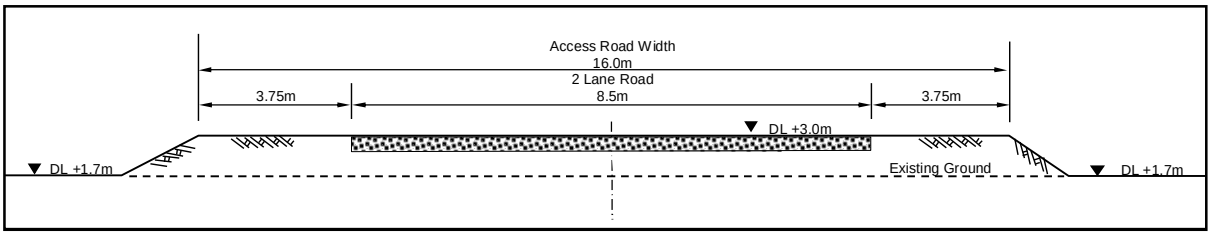


Figure 2.2.2.1-32 Cross Section of Bank Backside Portion of South Access Road

5) Pavement Structure of Access Roads

The pavement structure of access roads is the same as the pavement structure of container yard describing at a later chapter, since cargo handling equipment for containers are run on the road. Pavement thickness is set as 35cm of concrete and 35cm thickness for the base course.

2-2-2-2 Basic Plan for Container Yard

(1) Present Container Handling Operation and Container Yard

1) Yard Facility Layout

In Honiara Port, container yards are allocated in the paved area behind the existing international berth, which has dimensions of about 93m in width (east to west) and 225m in length (south to north). Total paved area is about 1.9 ha (See Fig2.2.2.2-1).

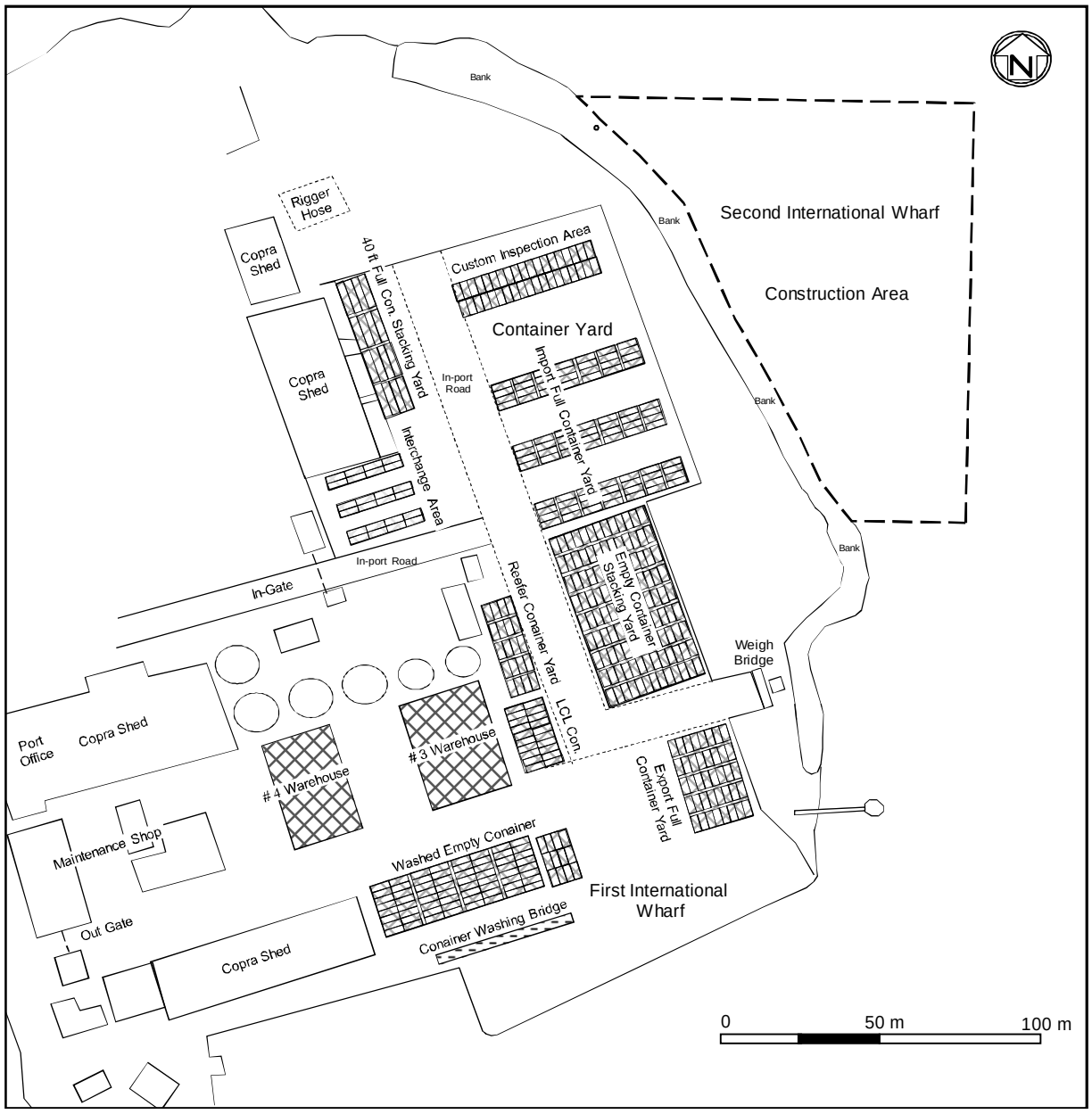


Figure 2.2.2.2-1 Existing Container Yard Layout Plan in Honiara Port

Three (3) container stacking yards, “Export Full Container Yard (EFCY)”, “Empty Container Yard (MTCY)” and “Import Full Container Stacking Yard (IFCY)” are allocated in order from South to North. Owing to this allocation, loading containers are usually carried directly from

EFCY or MTCY to the berth using top lifters and reach stackers (See Photo 2.2.2.2-1).

Photo 2.2.2.2-1 Container Carrying Operation between Berth and Yards by Top Lifter and Reach Stacker

Photo 2.2.2.2-2 Container Handling Operation in the Yard by Top Lifter

As "Import Full Container Stacking Yard (IFCY)", which is allocated on the north side of MTCY, is about 150m from the berth, discharged full containers are carried to the yard using two (2) or three (3) tractors & trailers. Because of the short distance between the berth and yards, role of tractors & trailers in the vessel operation is relatively small compared with other international terminals.

Container handling operation in the yard is performed using top lifters (See Photo 2.2.2.2-2). Therefore, maximum stacking height for full containers is three (3) tiers and for empty containers four (4) tiers in each yard.

"Customs and Quarantine Inspection Yard (CQIY)" is allocated on the north side of IFCY (See Fig.2.2.2.2-1). Import cargoes de-stuffed, inspected and cleared in this yard are transported by the consignees. Heavy cargoes, i.e. cement, are also de-stuffed and cleared here, then delivered to the consignee.

Container delivery to the consignees' trucks or receiving from shippers' trucks is done in the "Interchange Area" allocated near the in-gate (See Fig.2.2.2.2-1). In Honiara area, over eighty percent (80%) of outside trucks are equipped with side lifters. Container lifting on or lifting off the outside trucks is done by themselves (truck drivers) using the side lifters (See Photo 2.2.2.2-3).

Photo 2.2.2.2-3 Container Lift-on and Lift-off Operation Using Side Lifter

More than half of export containers (fifty percent (50%) of export full containers and seventy percent (70%) of export empty containers) from Honiara Port are destined to Australia and New Zealand. According to their quarantine rule, all the containers from South Pacific Countries and Africa are required to be washed, the whole outside surface and inside in case of empty container, with high pressured water. Therefore, all the export containers from Honiara Port to these two countries are obliged to be washed, and the port has "Container Washing Bridges" and "Washed Container Stacking Space" behind the existing international berth (See Photo 2.2.2.2-4). The stacking space should be segregated from the other stacking yard. The existing stacking space is located according to the instruction of the quarantine office of Australia and New Zealand.

Photo 2.2.2.2-4 Container Washing Bridges and Worker in Washing Operation

2) Container Movement in the Yard

In order to draft yard utilization plan which is crucial for ensuring the efficiency of No. 2 international berth, numeric analysis and clarification of present performance of yard operation (i.e. container dwelling time in the yard) and yard capacity is necessary. For this purpose, detailed container movement of all the container vessels recently called (ten vessels called in October 2012) were traced based on the "Back-loading Container Monitoring Record" kept in Back-loading Office of Operation Department; when they were discharged, when they were delivered, when they were received, when they were back loaded. Result of the analysis is

summarized in Table 2.2.2.2-1 as a summary of container flow in the Port while Table 2.2.2.2-2 shows average container dwelling time.

a) Container Movement Pattern in the Port

Container movement in Honiara Port can be categorized into four (4) patterns (See Table 2.2.2.2-1).

[Pattern 1]

Import FCL containers are discharged from a vessel. After once being stacked in the IFCY yard, they are delivered to the consignee as FCL containers. The delivered containers are returned as empty containers and stacked in the MTCY. The containers are then loaded onto the vessel as export empty containers. Containers of this pattern stay during two (2) periods in the Port, one as import full containers, and the other as export empty containers. This movement pattern is the most popular in the Port, and shares sixty (60%) of the total containers handled in the Port.

[Pattern 2]

Import containers, both FCL and LCL, are discharged from a vessel. After once being stacked in the IFCY yard, they are de-stuffed in the CQIY (FCL) or in the LCL container yard beside the No.4 warehouse. The de-stuffed cargoes are delivered to the consignee directly from the yard (FCL container), or through the warehouses (LCL containers). Empty containers are moved to the MTCY, then loaded onto the vessel as export empty containers. Containers of this pattern stay one (1) period in the Port. However their status is changed from import laden containers to export empty containers. This movement pattern is found in about twenty (20%) of the total containers handled in the Port.

[Pattern 3]

Import FCL containers are discharged from a vessel. After once being stacked in the IFCY yard, they are delivered to the consignee as FCL containers. The delivered containers are de-stuffed by the consignees, and some of them are once returned to the Port and again delivered from the Port. Then, after being stuffed by the shippers, they are received as export full containers, stacked in the EFCY in the terminal, and then loaded onto the vessel. Containers of this pattern stay during three (3) periods in the Port, first as import full containers, second as empty containers (for a short time), and third as export full containers. Containers of this pattern are relatively few in this Port, sharing less than twenty percent (20%) of the total containers.

[Pattern 4]

Containers of this pattern are transshipment containers. Discharged FCL containers are once stacked in the EFCY yard, and then loaded onto the second vessel from the same yard. Containers of this movement pattern are very few in the Port.

Table 2.2.2.2-1 Container Flow in Honiara Port

	Container Flow in Honiara Port	Stacking Yard		Number of Containers in each Pattern							
		Discharged Containers from Vessels	Loaded Containers to Vessels	Discharged Containers from Vessels				Loaded Containers to Vessels			
				(Box/Month)		(%)		(Box/Month)		(%)	
Pattern1	Container Discharging (Full Container) → Stacking (Import Full Container) → Delivery; Stacking (Export MT Container) ← Receiving; Container Loading (MT Container)	Import Full Container Stacking Yard	MT Container Stacking Yard	495	814	61%	100%	495	653	61%	80%
Pattern 2	Container Discharging (Full Container) → Stacking (Import Full Container) → Yard Destuffing / LCL Destuffing; Stacking (Export MT Container); Container Loading (MT Container)			158		19%		158		19%	
Pattern 3	Container Discharging (Full Container) → Delivery; Stacking (MT Con.) → Receiving; Delivery; Stacking (Export Full Container) ← Receiving (Full Con.); Container Loading (Full Container)	Import Full Container Stacking Yard	Export Full Container Stacking Yard	149		18%		149	149	18%	18%
Pattern 4	Container Discharging (Full Container) → Stacking (Transship Full Container); Container Loading (Full Container)			12		1%		12	12	1%	1%
	Summary			814		100%		814	814	100%	100%

(*1) Data : Container Movement in October 2012 (SIPA)

b) Container Dwelling Time in Honiara Port

Average container dwelling time is analyzed using the same data described in the above section “a) Container movement pattern in the Port” and summarized in Table 2.2.2.2-2.

[Import Containers]

Almost all import containers, except empty containers which are of a negligibly small quantity, are discharged from vessel in the state of FCL or LCL containers, and stacked in the IFCY. As for FCL containers, which are shown in Patterns 1 and 3, average dwelling time is 10.6 days (See Table 2.2.2-13). Regarding LCL containers which are shown in Pattern 2, average dwelling time is assumed to be the same as FCL containers even though there is no record of timing when each container was de-stuffed and its status was changed from LCL to empty

container.

Table 2.2.2.2-2 Container Average Dwelling Time in Honiara Port
(Actual Data of the Loaded Containers in October 2012)

	Unit	Total Import (Full)		Total Export			Transship	
		FCL	LCL	Full	MT	MT (LCL)	Import	Export
Number of Container	Box	644	158	149	495	158	12	12
		802		802			24	
Total Dwelling Days	Box Day	6,845	1,679	2,244	12,375	4,501	324	
		8,524		19,120			324	
Average Dwelling Time	Day	10.6	10.6	15.1	25.0	28.5	13.5	
		10.6		23.8				

[Export Full Containers]

Average dwelling time of export full containers, which is the period from the time of receiving to the time of loading onto the vessel, is 15.1 days (See Table 2.2.2.2-2). Compared with the dwelling time of import full containers, that of export full containers is relatively longer.

In the terminals of advanced countries, dwelling time of import containers is rather longer than that of export containers. In Honiara Port, as wood product represents a large proportion of its total cargo and its exporters expect this Port to support their warehouse, dwelling time of export containers tend to be longer.

[Export Empty Containers]

Average dwelling time of export empty containers, shown in Pattern 1, is 25.0 days. This figure is longer than that of advanced countries' terminals. There are two (2) main reasons. The first is that customers of the Port (shipping lines) are liable to use this port for their empty container positioning to save cost. It is natural for them to select the most economic port for their empty container positioning. The second is that container depot capacity in the hinterland of the Port is extremely limited (almost non-existent). Hence, Honiara Port is obliged to function as empty container storage space in the island.

In the Scoping Study Report[1)] by PIAC, urgent development of Inland Container Terminal (ICT) is proposed. Considering extra transportation and re-handling costs that the ICT would entail, it is more recommendable for SIPA to revise its tariff policy so as impact the empty container positioning policy of the shipping lines as an urgent measure.

[1)] Honiara Port Scoping Study, Solomon Islands, for Pacific Infrastructure Advisory Centre, The Pacific Region Infrastructure facility (PRIF), November 2011

[LCL Containers]

Average dwelling time of LCL containers (empty container status), shown in Pattern 2, can be calculated at 28.5 days, as a remaining period of whole dwelling time of LCL containers (39.1 days) subtracted by that as full container status (10.6 days) (See Table 2.2.2-13). This long dwelling time of LCL empty containers is mainly due to the extremely long stored empty container (more than two (2) months). By changing the storage policy of these extremely long staying empty containers (i.e. shift to the outside of the stacking yard), average dwelling time of LCL containers (empty container status) can be lowered to the same level as Export Empty Containers (25.0 days).

[Transship Containers]

Average dwelling time of transship containers, shown in Pattern 4, is 13.5 days. Considering ship calling schedule to Honiara Port, this figure is considered to be reasonable.

Summarizing the analysis above, dwelling time of each container group which is the basis for yard capacity estimation of each yard segment, i.e. “import full containers”, “export full containers”, “export empty containers” and transship containers” is shown in Table 2.2.2.2-3.

Table 2.2.2.2-3 Estimated Container Dwelling Time

Container Group		Dwelling Time (Day)
Import Container	Full Container	10.6
Export Container	Full Container	15.1
	Empty Container	25.0
Transship Container	Full Container	13.5

3) Stacking Capacity and Yard Capacity in Honiara Port

a) Stacking Capacity

Existing stacking capacity of the container yard in Honiara Port at the time in April 2013 is summarized in Table 2.2.2.2-4. This capacity corresponds to the ground slots shown in the existing layout plan (See Figure 2.2.2.2-1). Stacking capacity of import full container yard is 444 TEUs with 180 TEU-Gs and three (3) tiers maximum stacking height. In the same way, stacking capacity of export empty container yard and export full container yard is 692 TEUs (with 173 TEU-Gs and four (4) maximum stacking height) and 165 TEUs (with 55 TEU-Gs and three (3) tiers maximum stacking height) respectively. Total stacking capacity of existing yard in the Port reaches 1,300 TEUs. (See Table 2.2.2.2-4)

Table 2.2.2.2-4 Existing Stacking Capacity and Yard Capacity (April, 2013)

Container Yard		Ground Slot Capacity (TEU-Gs)			Maximum Stacking Height	Stacking Capacity (TEU)		
		Import Full	Export Full	Empty		Import Full	Export Full	Empty
		Import Full Contauner Yard	Export Full Container Stacking Yard	Empty Container Yard		Import Full Container Yard	Export Full Container Stacking Yard	Empty Container Yard
Import Full Container	Import Full Container Stacking Yard (20ft)	84			3	252		
	Import Full Container Stacking Yard (40ft)	40			3	120		
	Reefer Container Stacking Area	16			2	32		
	Customs & Quarantine Inspection Area	40			1	40		
Empty Container	Empty Container Stacking Yard			117	4			468
	Washed Empty Container Stacking Yard			56	4			224
Export Full Container	Export Full Container Pre-stacking Yard		40		3		120	
	Washed Full Container Pre-stacking Yard		15		3		45	
Total		180	55	173		444	165	692
Grand Total		408				1,301		
Yard Capacity	Container Average Dwelling Time (Day)					10.6	15.1	25.0
	Turnover Rate (Round/Year)					34.4	24.2	14.6
	Standard Yard Utilization Rate					0.75	0.75	0.75
	Yard Capacity (TEU/Year)					11,467	2,991	7,577
	Total Yard Capacity (TEU/Year)					22,035		

b) Yard Capacity

Existing yard capacity of the container yard in Honiara Port in April 2013 is summarized in Table 2.2.2-16. Generally, yard capacity is calculated using the following formula.

$$\text{Yard Capacity (TEU/Year)} = \text{Stacking Capacity (TEU)} \times \frac{365\ (\text{Day/Year})}{\text{Dwelling Time (Day)}} \times \text{Standard Yard Utilization Ratio (\%)}$$

In the formula above, container yard is not always operated in full stacking height. Full stacking height should be reserved at peak time. Usually, standard (average) yard utilization ratio is considered 75% of the full capacity.

In the calculation, dwelling time and stacking capacity are extracted from Table 2.2.2-14 and Table 2.2.2-15. As dwelling time and stacking capacity differ according to the kind of container yard, i.e. import full container yard, export full/ empty container yard, reefer container yard and customs & quarantine inspection yard, the whole yard capacity is derived from capacity of each kind of kind yard.

Existing yard capacity of the Port in April 2013 is about 22,000 TEUs per year (See Table 2.2.2.2-5).

Table 2.2.2.2-5 Evaluation of Existing Yard Capacity

Container Group		Actual Container Handling Volume (2012)		Average Container Dwelling Time	Turnover Ratio	Standard Yard Utilization Ratio	Required Stacking Capacity	Import Full Container Yard	Export Full Container Yard	Empty Container Yard
		(TEU)	(%)	(Day)	(Round/Year)		(TEU)	(TEU)		
Import Container	Full Container	10,604	49%	10.6	34.4	0.75	411	411		
	Empty Container	69	0%	25.0	14.6	0.75	6			6
	Transshipment	372	2%	13.5	27.0	0.75	18	18		
	Sub-total	11,045	51%							
Export Container	Full Container	2,165	10%	15.1	24.2	0.75	119		119	
	Empty Container	7,867	36%	25.0	14.6	0.75	718			718
	Transshipment	487	2%	13.5	27.0	0.75	24		24	
	Sub-total	10,519	49%							
Total		21,564	100%							
Required Stacking Capacity (a)							1,297	429	143	725
Existing Yard Capacity (b)							1,301	444	165	692
Difference ((b)-(a))								15	22	***-33***
Difference in Slots (TEU Ground Slot)								5.0	7.2	***-8.2***
Actual Yard Utilization								72%	65%	79%

To evaluate estimated existing yard capacity shown in Table 2.2.2.2-4, required yard capacity to handle actual container throughput in 2012 and existing yard capacity is compared (See Table 2.2.2-5). This comparison indicates that 1) actual throughput in 2012 was close to the existing yard capacity, 2) import and export full container yard still has room to handle more containers, and 3) empty containers in 2012 have reached almost full capacity of the empty container yard.

(2) Basic Concept of the Proposed Yard Plan

In this section, a container yard layout plan with 30,000TEU annual capacity is proposed based on the location and dimensions of proposed No.2 international berth plan. Breakdown of the yard capacity is assumed to be 14,518 TEUs (48%) of import full containers, 3,393 TEUs (12%) of export full containers and 12,134 TEUs (40%) of export empty containers.

Basic concept of the proposed yard plan is summarized as follows;

i) Conditions to access the public road, i.e. location of in-gate and out-gate, traffic line of outside truck, are not changed.

ii) Considering that vessel operations on No. 1 and No. 2 international berth in parallel are a crucial requirement in this expansion project, a yard layout plan which ensures that two yard operations for both berths can be performed simultaneously is drafted.

iii) Existing “Container Washing Bridge” is commonly used for containers handled at both No.1 and No. 2 berths. Normally, container washing facility for loading containers at No. 2 berth would be located just behind this berth from the viewpoint of the container traffic line. However, to set up new washing facility on the newly developed area just behind the berth

requires drainage treatment and raises some issues. The idea to set up washing facility in or beside the existing yard area may involve other issues because this area is dusty due to continuous construction and maintenance of port facilities.

iv) As for container transportation between berths and stacking yards, the same way as present will be applied. In the discharging operation, tractors and trailers will be used to carry containers from berth to yard. In the loading operation, top lifters or reach stackers will be used to carry containers from export full container stacking yard (pre-stacking yard) to the berth directly. For both No. 1 and No. 2 berth, export full container stacking yard (pre-stacking yard) is or will be allocated just behind each berth.

v) Stacking yard area which will be developed behind No. 2 international berth is to be used as pre-stacking yards for export full containers and export empty containers. These pre-stacking yards will have enough capacity to handle containers at least for two (2) vessels.

vi) Considering the relatively small capacity of the port (30,000 TEUs in 2020), conventional top lifter system which is presently applied in the Port will be continued.

vii) In this Port all the export full containers are to be weighed before pre-stacking. Loading containers at No. 2 international berth are to be stacked in the pre-stacking yard just behind the berth after weighed on the existing weighing bridge. Therefore, in order to carry containers smoothly from the weighing bridge to the pre-stacking yard behind No. 2 international berth, paved truck pass road is to be set up on the eastern side of the existing empty container yard.

vii) The same value used in the evaluation of existing yard capacity is adopted as the operation norm for estimating yard capacity, i.e. container dwelling time in the port.

In accordance with the basic concept above, yard plan for effective terminal operation with No. 1 and No. 2 international berth is proposed in Figure 2.2.2.2-2. Furthermore, traffic line of inside and outside trucks is also indicated in Figure 2.2.2.2-3. This layout plan has the following characteristics;

i) The southern half of the layout plan (No. 1 international berth side) is the same as existing plan

ii) In the northern half of the layout plan, five (5) blocks of import full container stacking yard are allocated, which is an increase of two (2) blocks to accommodate the increasing container volume in the Port.

iii) As a result, customs & quarantine inspection area is to be shifted to the northern side of previous location. Hence, paved area should be extended to this area.

iv) Just behind No. 2 international berth, pre-stacking yard for export full and empty containers is to be developed.

v) Pass road connecting container stacking yard and No.2 international berth is shown in Figure 2.2.2.2-2. In order to minimize the interference of traffic line during the vessel operation of No. 1 berth and No. 2 berth, traffic lines between No. 2 berth and yards, i.e. import full container stacking yard, is proposed in counter clockwise (See Figure 2.2.2.2-3).

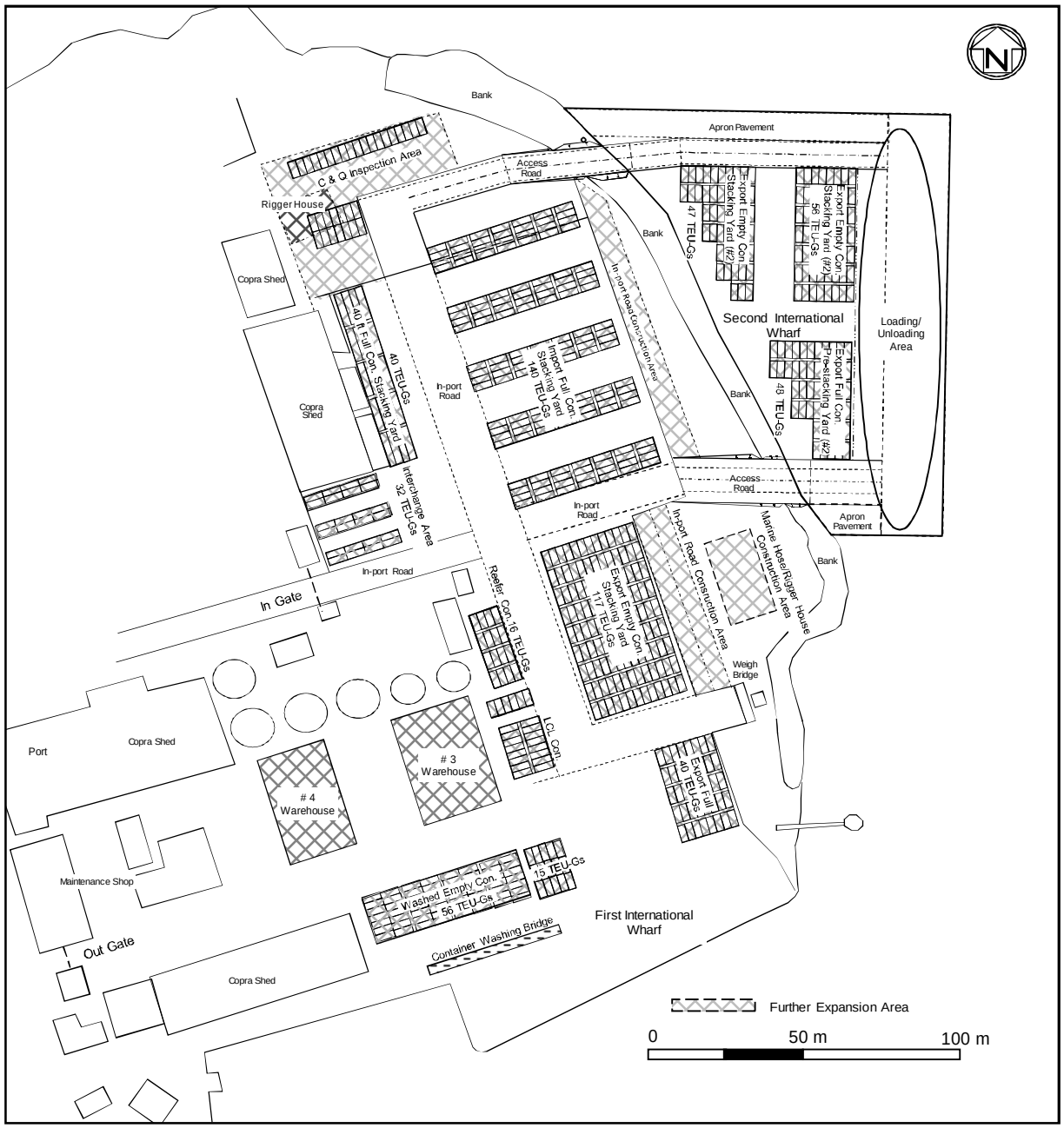


Figure 2.2.2.2-2 Yard Layout Plan with No.2 International Berth

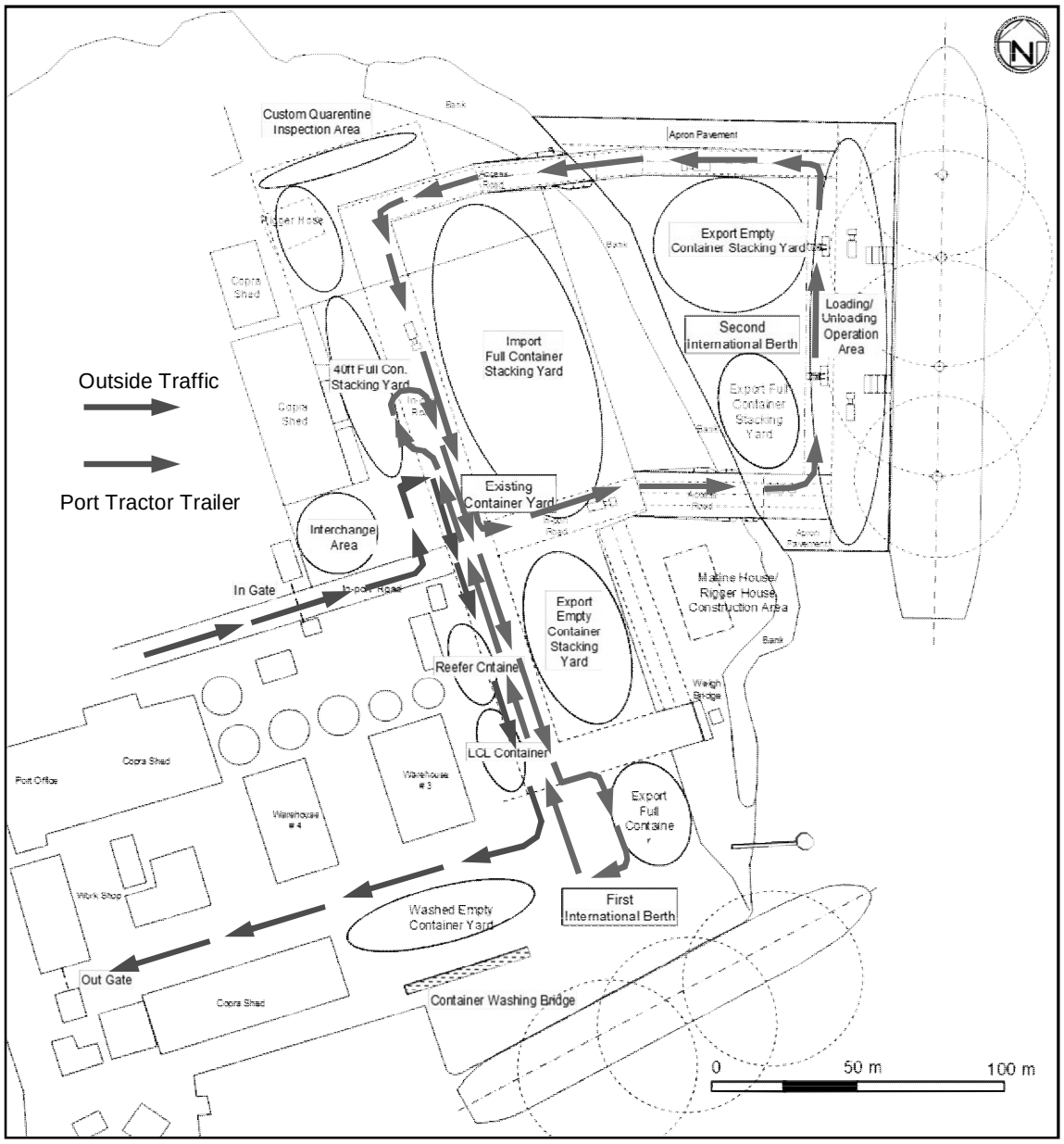


Figure 2.2.2.2-3 Traffic Line of Inside and Outside Trucks

(3) Yard Capacity after No. 2 International Berth Development

1) Container Stacking Capacity

According to the proposed yard layout plan in Fig.3.2.2.2-1, container stacking capacity of the Port after No.2 international berth development is estimated in Table 3.2.2.2-1.

After No.2 international berth has been constructed, import full container stacking yard (20ft) is to be expanded, and ground slots will be increased from 84 TEUs (at present) to 140 TEUs. As a result, total ground slots for import full containers will be increased from 180 to 230 TEUs, and its stacking capacity will also be increased from 444 to 606 TEUs (See Table 2.2.2.2-6)

Table 2.2.2.2-6 Stacking Capacity and Yard Capacity after Expansion (2015～2020)

Container Yard		Ground Slot Capacity (TEU-Gs)			Maximum Stacking Height	Stacking Capacity (TEU)		
		Import Full	Export Full	Empty		Import Full	Export Full	Empty
		Import Full Container Yard	Export Full Container Stacking Yard	Empty Container Yard		Import Full Container Yard	Export Full Container Stacking Yard	Empty Container Yard
Import Full	Import Full Container Stacking Yard (20ft)	140			3	420		
	Import Full Container Stacking Yard (40ft)	40			3	120		
	Reefer Container Stacking Area	16			2	32		
	Customs & Quarantine Inspection Area	34			1	34		
Empty	Empty Container Stacking Yard (No.1)			117	4			468
	Empty Container Stacking Yard (No.2)			103	4			412
	Washed Empty Container Stacking Yard			56	4			224
Export Full	Export Full Container Pre-stacking Yard (No.1)		40		3		120	
	Export Full Container Pre-stacking Yard (No.2)		48		3		144	
	Washed Full Container Pre-stacking Yard		15		3		45	
Total		230	103	276		606	309	1,104
Grand Total		609				2,019		
Yard Capacity	Container Average Dwelling Time (Day)					10.6	15.1	25.0
	Turnover Rate (Round/Year)					34.4	24.2	14.6
	Standard Yard Utilization Rate					0.75	0.75	0.75
	Yard Capacity (TEU/Year)					15,650	5,602	12,089
	Total Yard Capacity (TEU/Year)					33,341		

As for export full container stacking yard, 48 TEUs ground slots will be set up in the newly developed space just behind No.2 international berth. As a result, total ground slots for export full containers will be increased from 55 to 103 TEUs, and its stacking capacity will also be increased from 165 to 309 TEUs (See Table 2.2.2.2-6)

As for export full container stacking yard, 103 TEUs ground slots will be also set up in the newly developed space just behind No.2 international berth. As a result, total ground slots for export empty containers will be increased from 173 to 276 TEUs, and its stacking capacity will also be increased from 692 to 1,104 TEUs (See Table 2.2.2.2-6)

Hence, total stacking capacity in the Port will be increased from 1,301 (at present) to 2,019 TEUs, and capacity will become 1.5 times greater after No.2 international berth has been completed.

2) Container Yard Capacity

Based on the stacking capacity described in the previous section and container dwelling time indicated in Table 2.2.2.2-3, yard capacity after No. 2 international berth development is estimated (See Table 2.2.2.2-6). As shown in this table, increased yard capacity will reach 33,000 TEU per annum, and 1.5 times greater compared with existing yard capacity shown in Table 2.2.2.2-4.

This yard capacity is enough to accommodate the targeted container throughput in 2020 (30,000TEU). According to the forecasted container handling volume in 2020 (import full containers: 14,518 TEUs, export full containers: 3,393 TEUs, export empty containers: 11,125 TEUs), the yard capacity of proposed yard plan was evaluated. This evaluation result is described in Table 2.2.2.2-7.

Table 2.2.2.2-7 Evaluation of Yard Capacity after Expansion

Container Group		Estimated Container Handling Volume (2020)		Estimated Container Dwelling Time	Turnover Ratio	Standard Yard Utilization Ratio	Required Stacking Capacity	Import Full Container Yard	Export Full Container Yard	Empty Container Yard
		(TEU)	(%)	(Day)	(Round/Year)		(TEU)	(TEU)		
Import Container	Full Container	14,518	50%	10.6	34.4	0.75	562	562		
	Empty Container	0	0%	25.0	14.6	0.75	0			0
	Transshipment	0	0%	13.5	27.0	0.75	0	0		
	Sub-total	14,518	50%			0.75				
Export Container	Full Container	3,393	12%	15.1	24.2	0.75	187		187	
	Empty Container	11,125	38%	25.0	14.6	0.75	1,016			1,016
	Transshipment	0	0%	13.5	27.0	0.75	0		0	
	Sub-total	14,518	50%							
Total		29,036	100%							
Required Stacking Capacity (a)							1,765	562	187	1,016
Stacking Capacity after Expansion (b)							2,019	606	309	1,104
Difference ((b)-(a))								44	122	88
Difference in Slots (TEU Ground Slot)								14.6	40.6	22.0
Estimated Yard Utilization								70%	45%	69%

As shown in Table 2.2.2.2-7, estimated yard utilization is less than 75% (standard yard utilization ratio) in every yard. Therefore, proposed yard plan can accommodate the forecasted cargo handling volume in2020.

(4) Basic Policy on Pavement of Container Yard

1) Pavement Area of Container Yard

The pavement of container yard is executed for the area out of the new wharf and the existing container yard in conjunction of the construction of the new wharf. Enlarged portion related with the Second International Wharf is shown in Figure 2.2.2.2-4. With this container yard plan, concrete pavement is installed. For the berth aprons in wharf and north and south ends revetment, concrete pavement is installed as a part of each wharf facility.

The north side of the existing container yard is paved since the area surrounded by access roads is used as container yard. And as the road in customs and quarantine inspection area and the east side of full and empty container yard is constructed depending on the future increase of container handling volume, this is implemented by the obligation of the recipient country.

SIPA has an engineering department in the organization and it is possible to manage this kind of pavement by itself. Furthermore, in conjunction with a new construction of customs and quarantine inspection area, as it is necessary to remove the tool warehouse (Rigger House), the area at the east side of empty container stacking yard as the alternative site is proposed.

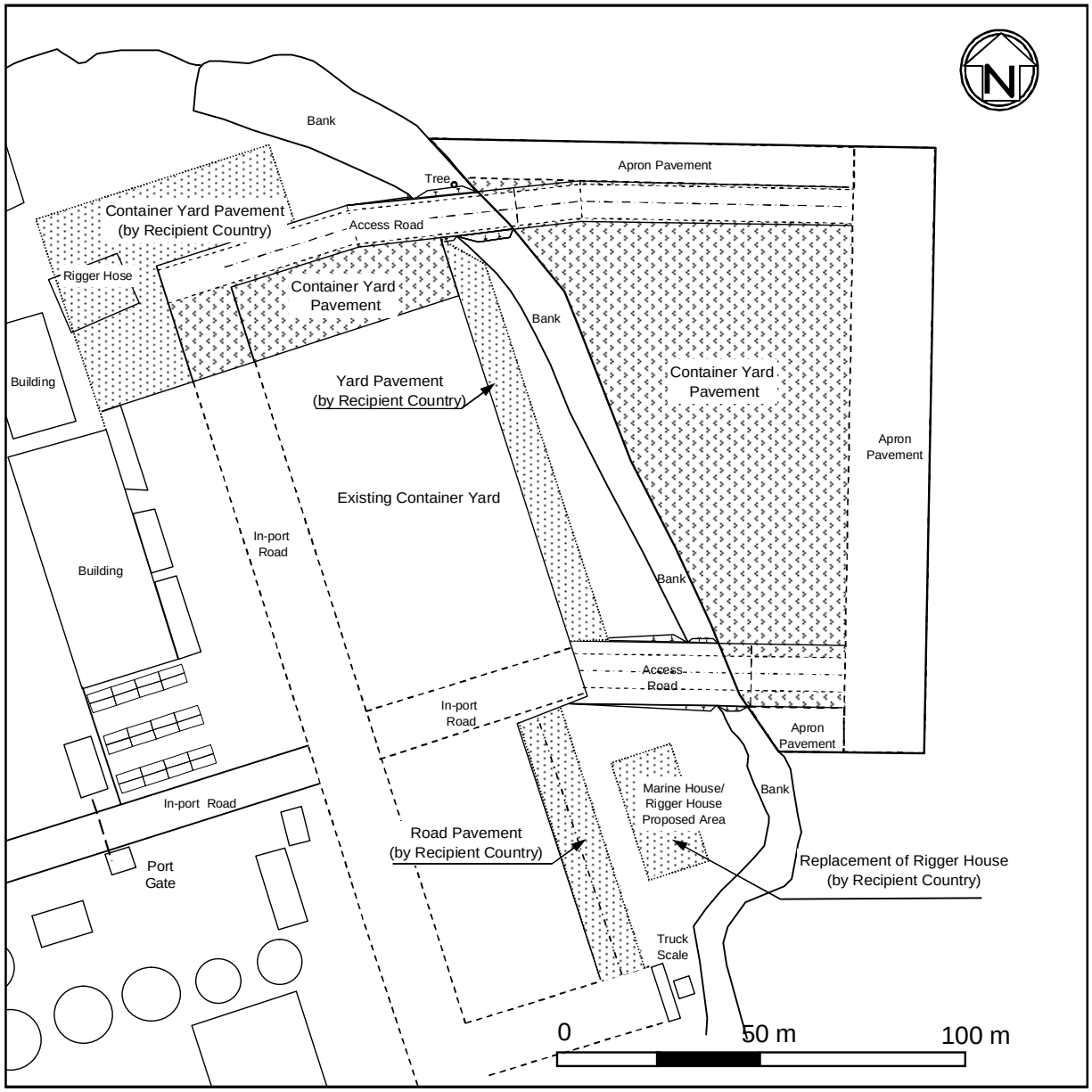


Figure 2.2.2.2-4 Paving Area of Container Yard

2) Cross Section of Container Yard Pavement

Concrete pavement that is excellent in its strength and durability is adopted as the pavement of container yard since cargo handling heavy equipment like top lifter or reach stacker handle full container with the maximum weight of 30.48 tons. Concentrated load at the corners with front wheel load of top lifter and when full container is loaded with 3 layers is assumed as the loading condition. Subgrade at the existing yard has bearing capacity with about 10 to 20 N value from the boring survey result and as compaction is made on sandy purchasing materials for the area of the Second International Wharf to be a newly land filling area, each design bearing capacity factor (K_{30}) is considered as 70 N/cm^3. In case that the design bearing capacity factor (K_{30}) of base course is 200 N/cm^3 that is standard, the thickness of base course is calculated as 35 cm from

the relationship with bearing capacity factor of subgrade with “Technical Standards of Ports and Habours in Japan”. The thickness of concrete slab is defined as 35cm that is the maximum slab thickness in case that cargo handling equipment like large forklift is operated from the reference figure of the thickness of concrete slab in the above technical standards. In addition, reinforcement steel bars for crack and precaution reinforcement are installed in concrete slabs portion. Therefore, the cross section of pavement structure of container yard becomes as per Figure 2.2.2.2-5.

As the result that wheels loads of above cargo handling equipment and concentrated load of full container are acted on this pavement structure, it is understood that is of adequate strength.

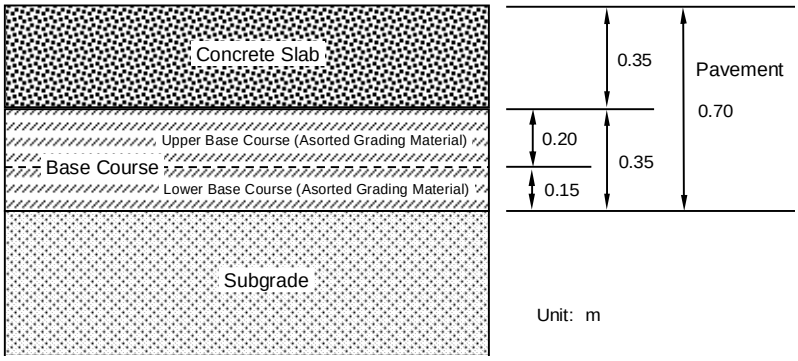


Figure 2.2.2.2-5 Cross Section of Pavement of Container Yard

2-2-2-3 Basic Plan for Accessories

(1) Basic Policy on Water Supply Facility

SIPA is to extend the water supply pipe up to back of the new wharf and pipe laying from the back to inside of yard is executed by this project.

(2) Basic Policy on Lighting Facility

Night cargo handling works are made in the international wharf of Honiara Port. Although the berthing of vessels from water area is not made at the existing wharf but the leaving from the wharf is made. The ship masters of calling vessels express their intention to berth if the lighting facility is installed in the new wharf. Therefore, proper lighting pursuant to lighting standard is adopted in berth apron portion and container yard portion. According to the rules of the International Convention for the Safety of Life at Sea (SOLAS) of International Maritime Organization (IMO), the installation of lighting facility is obliged as part of security facility in the international port.

The illumination intensity for outside facilities is shown in Table 2.2.2.3-1 depending on facility. Wharf apron and container yard are 30lx and 20lx respectively and necessary lighting facilities are installed. About 1 to 5 lx illumination as security is considered.

Table 2.2.2.3-1 Standard Illumination of Apron, Yard and Walkway

Facility		Standard Illumination (lx)
Apron	Berthing Facility for Passenger or Vehicle and Berthing Facility for Pleasure Boat	50
	Other Berthing Facilities	30
Yard	Container Yard, Cargo Handling Area	20
Walkway	Passenger or Vehicle Landing Facility	50
	Other Walkways	20

(Source: Technical Standards for Port and Harbor Facilities in Japan)

(3) Basic Policy on Beacon

Beacon that indicates the position of the new wharf location when the visibility is poor at the time of bad weather and night time, rainy weather, heavy fog and etc. is planned. Although, currently the entering port during night is prohibited in Honiara Port, it is necessary to prepare at an emergency case. And, as there are some intention to enter port at night, each one beacon at the both ends of the berth to indicate the position of the Second International Wharf.

The specification (draft) of Beacon is as follows,

* Type : Beacon
* Quantity : 2 units (both ends of berth)
* Light Color : Yellow
* Light Emitting Part : LED Lantern
* Lighting Distance : 5 nautical miles

2-2-2-4 Project Outline

The outline of facilities to be constructed in this project is as follows, and the layout plan of each facility is shown in Figure 2.2.2.4-1.

(1) Outline of New International Wharf

Table 2.2.2.4-1 Outline of New International Wharf

Facility	Component	Contents of Plan
Second International Wharf	Target Ship Length Water Depth Dredging Crown Height Mooring Dolphin	Container Ship 150m DL -11.0m Berth Front Water Area DL +3.2m 2 units
Revetment	North Revetment Extension South Revetment Extension Parapet Height Armor Block	122m 33m DL +4.2m 6.3ton Type
Land Area of New Wharf	Area (Berth Apron) (North End Revetment) (South End Revetment)	Approx.10,600m^2 (L150m × W20m = 3,000m^2) (L95m × W10m = 950m^2) (L15m × W10m = 150m^2)
Access Road	North Access Road (New Wharf Portion) (Existing Yard Portion) South Access Road (New Wharf Portion) (Existing Yard Portion)	Pavement Width 8.5m (Total Width10m) (Length 82m x Pavement Width8.5m = 697m^2) (Length 84m x Pavement Width 8.5m = 714m^2) Pavement Width 8.5m (Total Width 16m) (Length 23m x Pavement Width 8.5m = 196m^2) (Length 37m x Pavement Width 8.5m = 315m^2)

(2) Outline of Container Yard

Table 2.2.2.4-2 Outline of Container Yard

Facility	Dimension	Contents of Plan
New International Wharf	Area	Approx. 5,360m^2
Existing Yard Area	Area	Approx. 1,340m^2

(3) Outline of Accessories

Table 2.2.2.4-3 Outline of Accessories

Facility	Item	Contents of Plan
Water Supply Facility		New Wharf Portion
Lighting Facility		Apron Portion : 30lx Yard Portion : 20lx
Beacon		Lighting Distance: 5 N. Miles, 2 Units
Berth Accessories	Fender, Bollard, Curving, etc.	

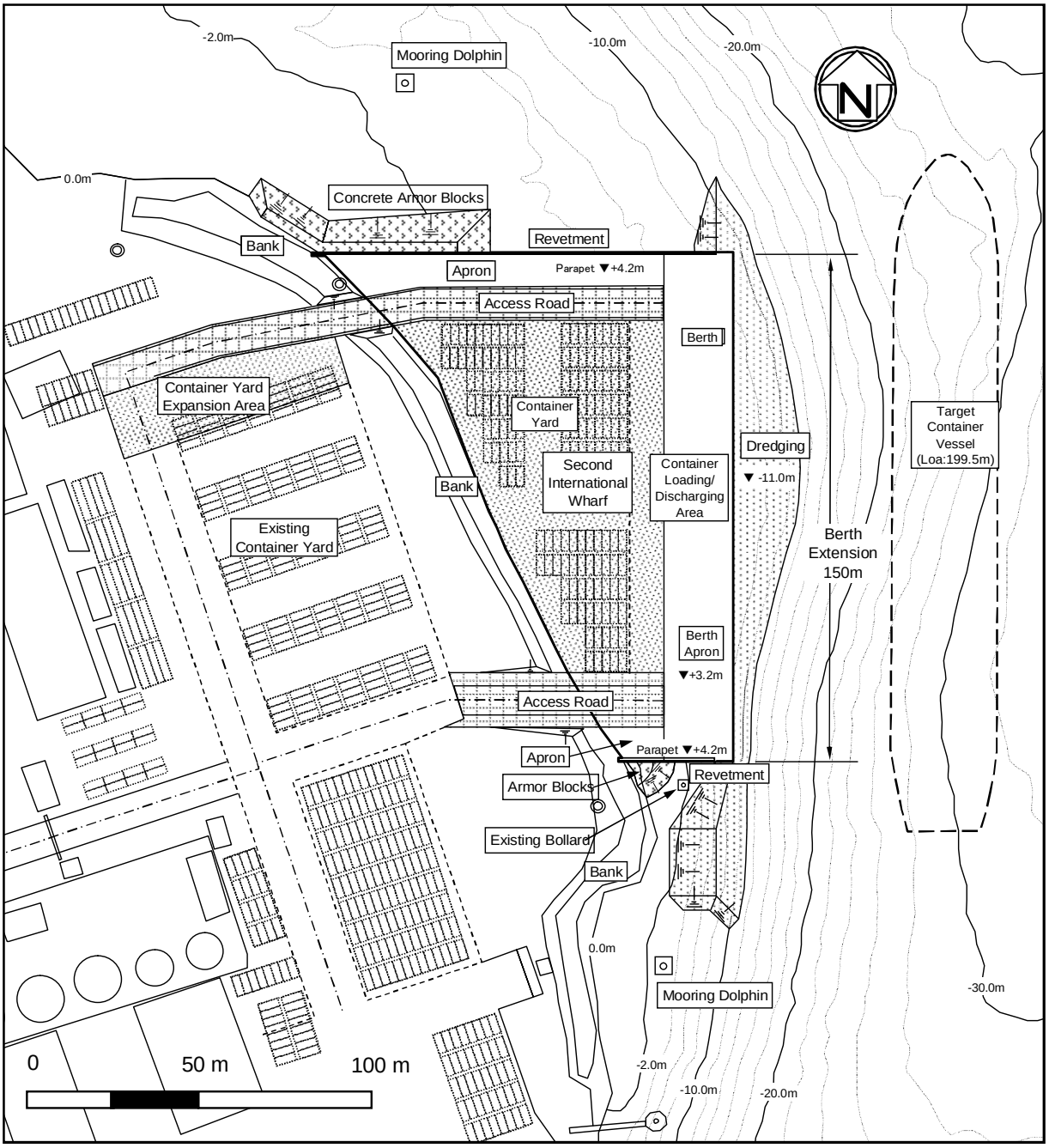


Figure 2.2.2.4-1 Brief Layout Plan of New International Wharf

2-2-3 Outline Design Drawing

Drawings of the facilities included in the Project are shown as follows.

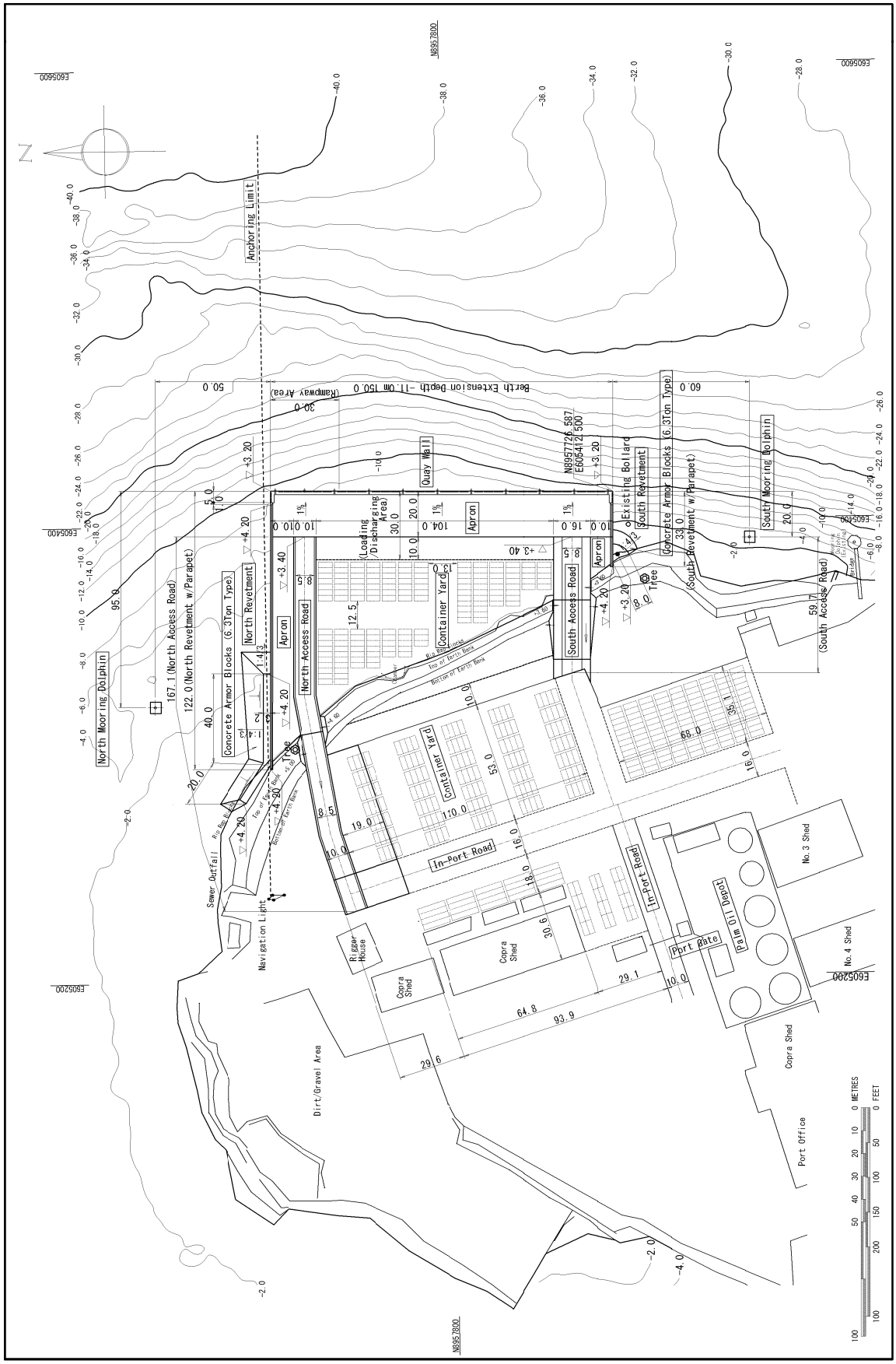


Figure 2.2.3-1 General Layout Plan of New International Wharf

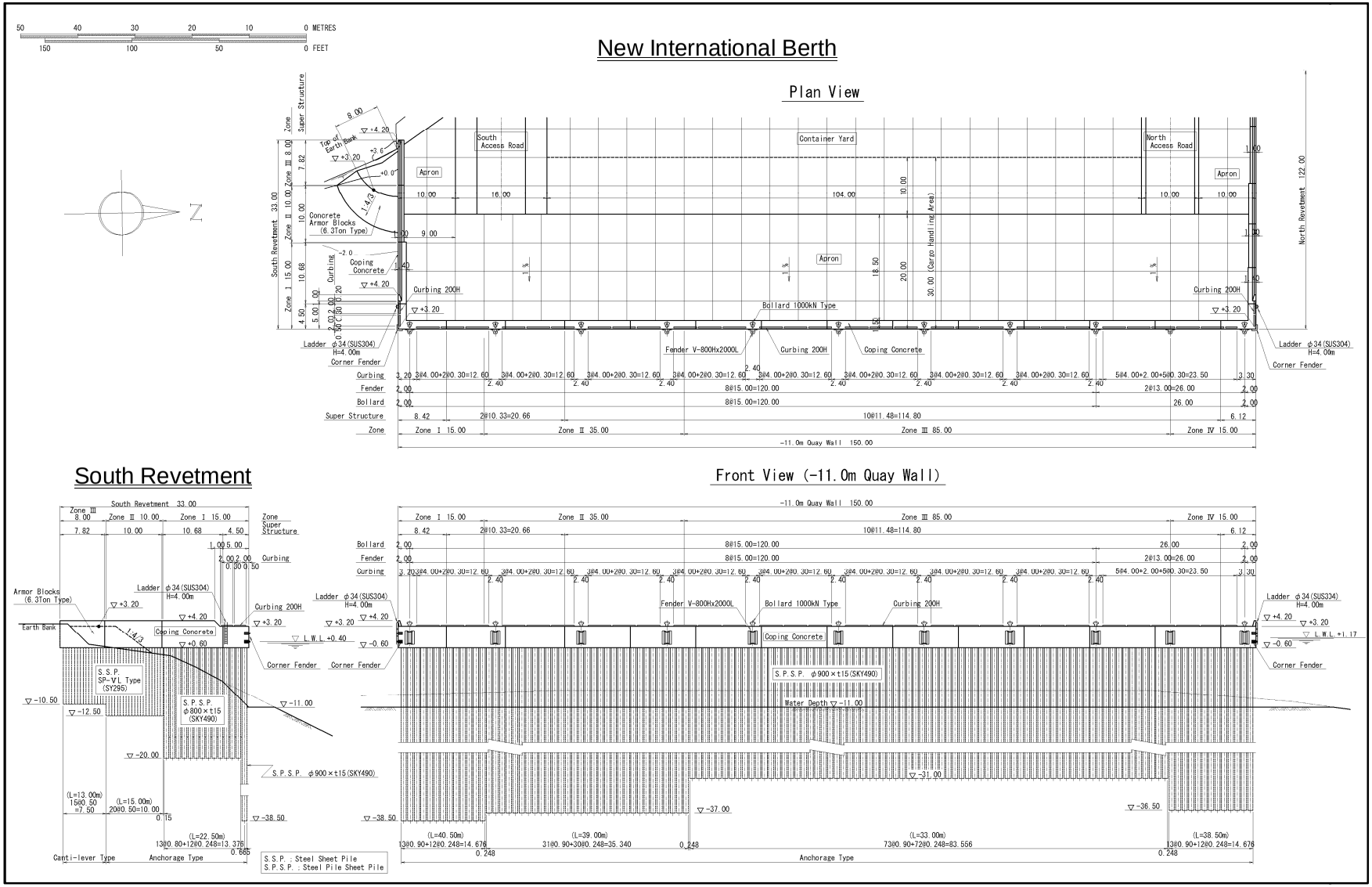


Figure 2.2.3-2 Plan and Front View of New International Berth and South Revetment

New International Berth and North Revetment

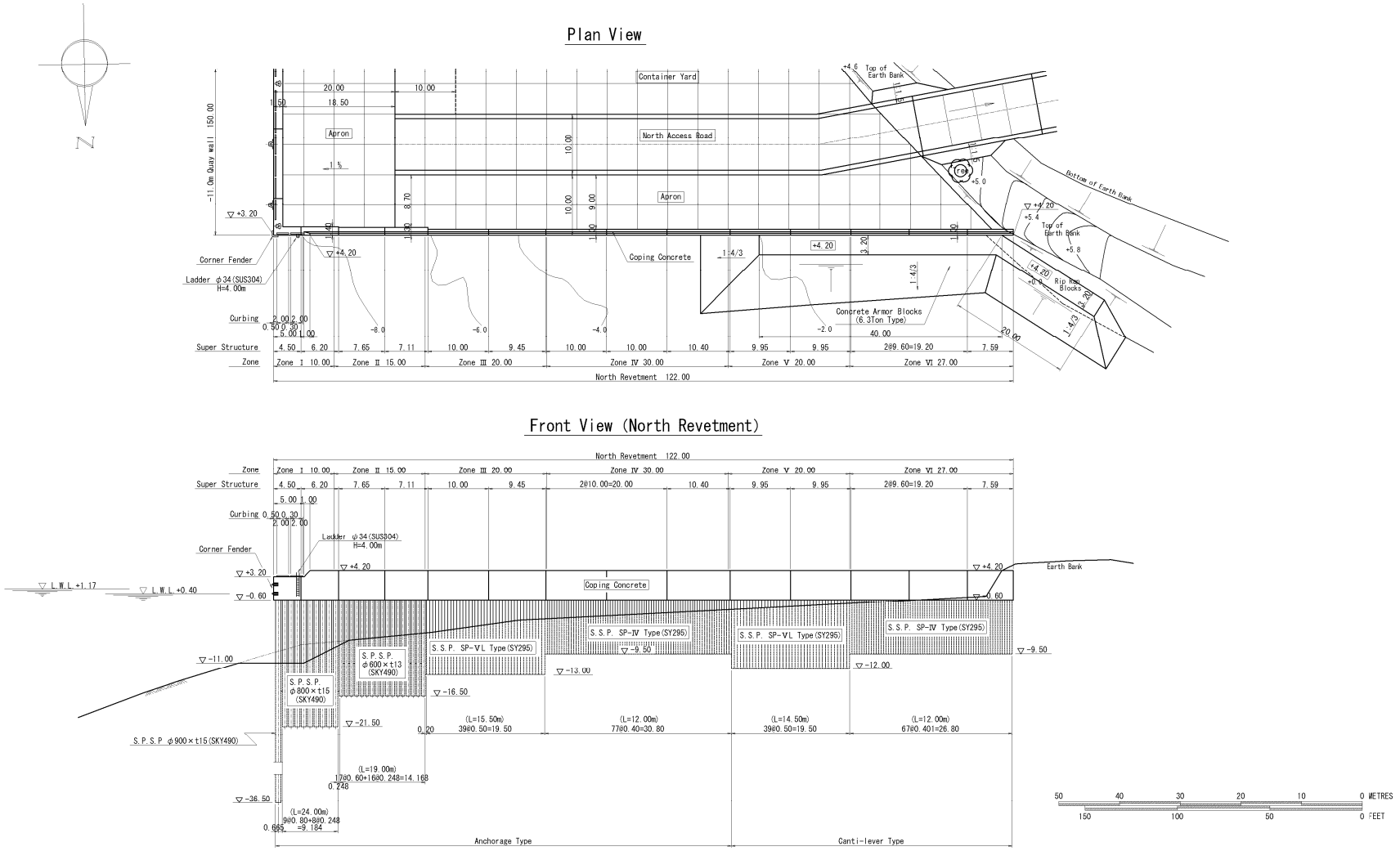


Figure 2.2.3-3 Plan and Front View of North Revetment

New International Berth
Standard Cross Section [Zone II]

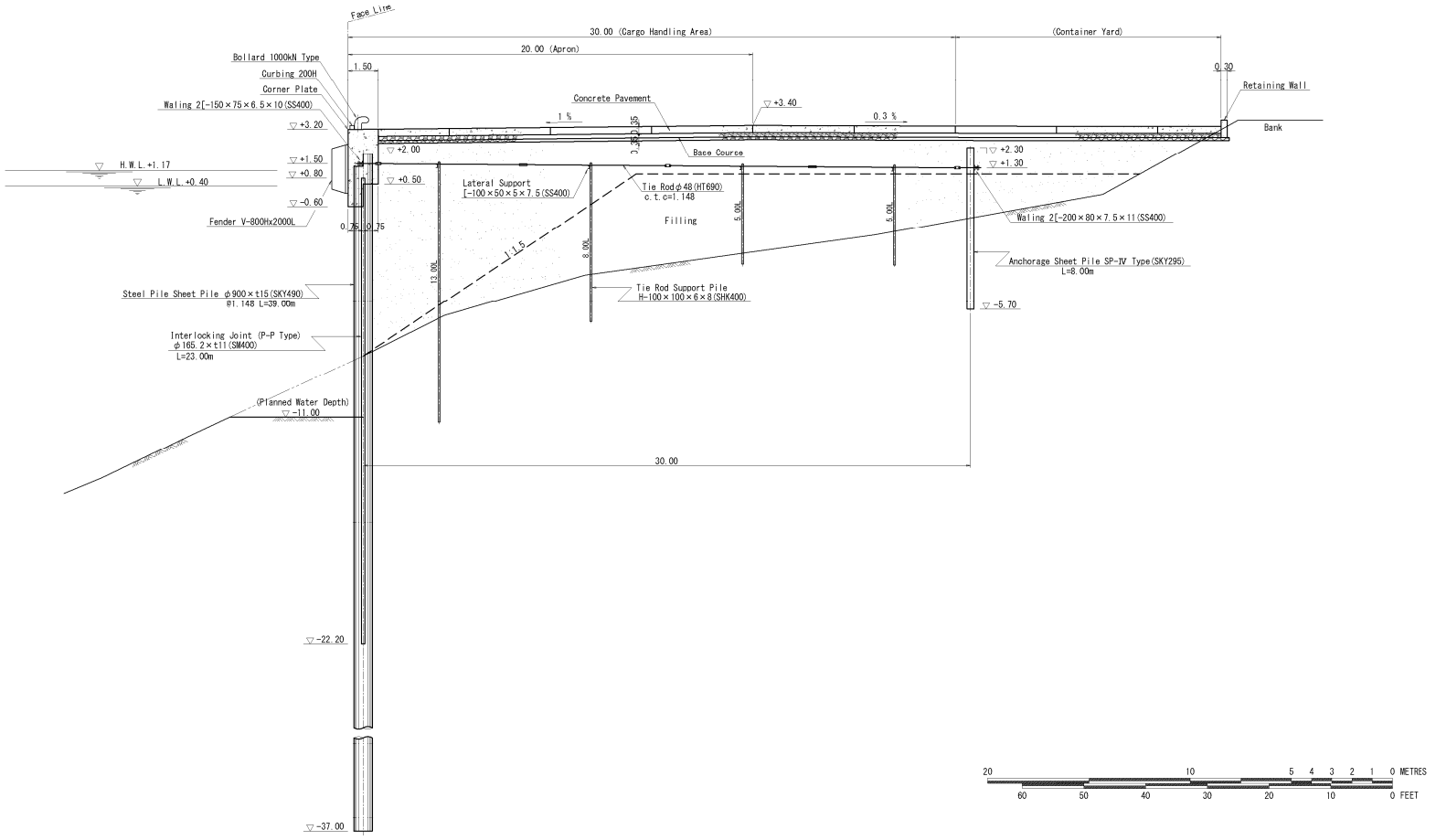
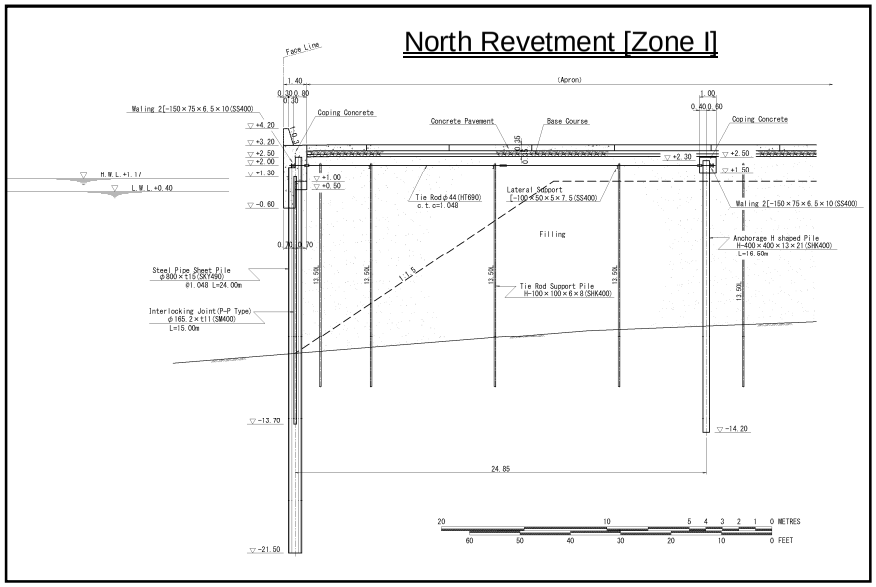
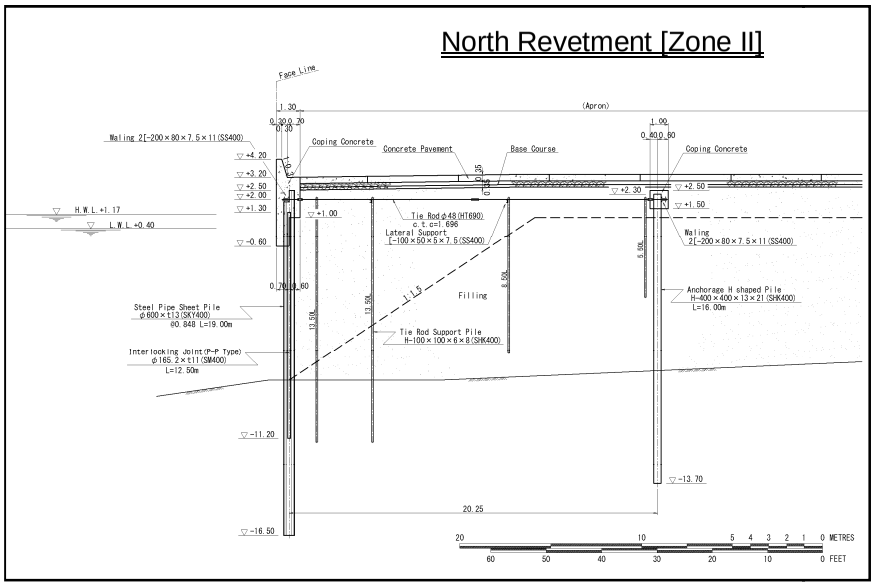
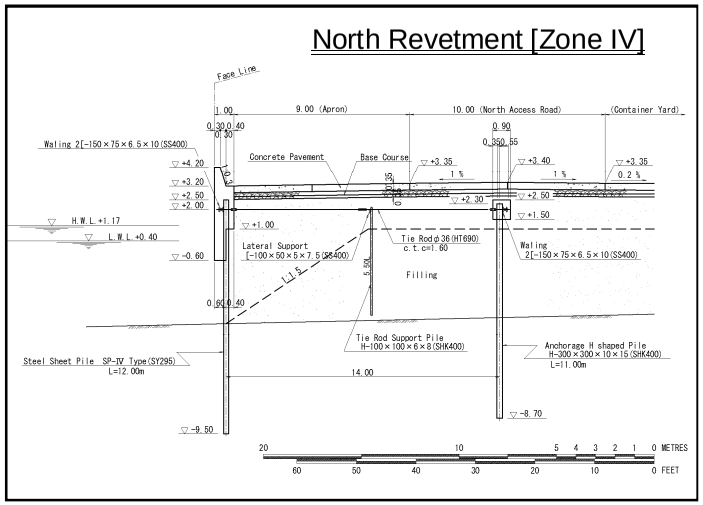


Figure 2.2.3-4 Standard Cross Section of New International Berth







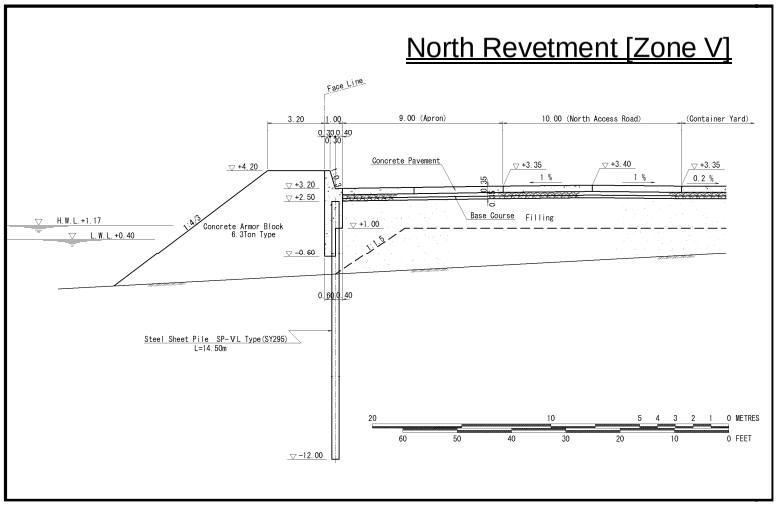


Figure 2.2.3-5 Standard Cross Section of North Revetment

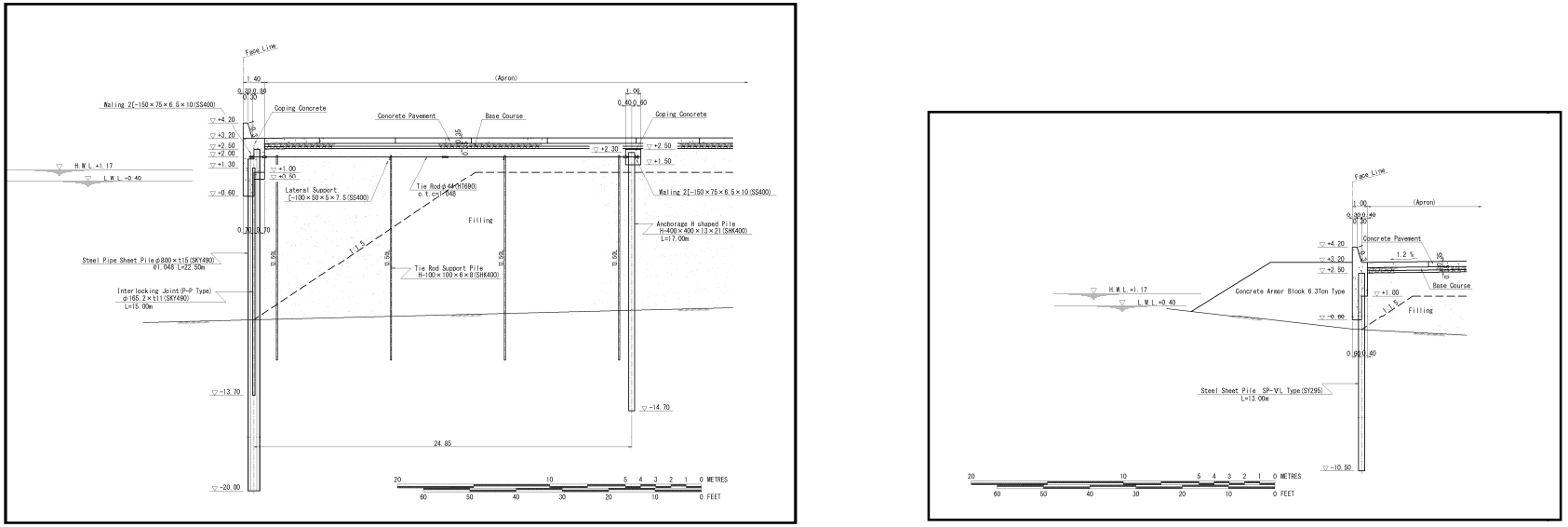
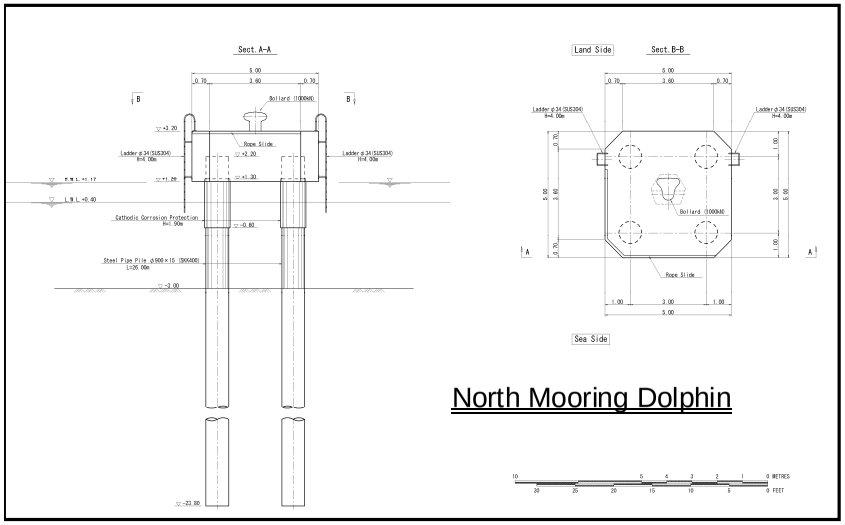


Figure 2.2.3-6 Standard Cross Section of South Revetment



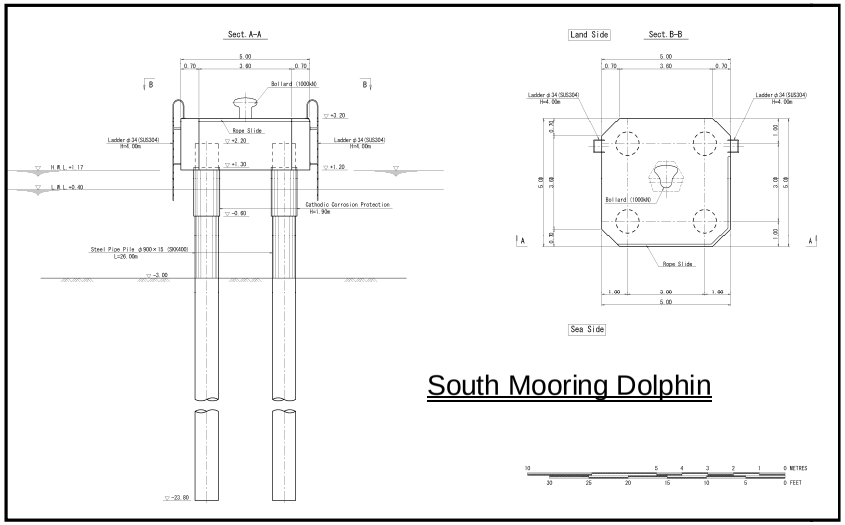


Figure 2.2.3-7 Plan and Front View of Mooring Dolphin

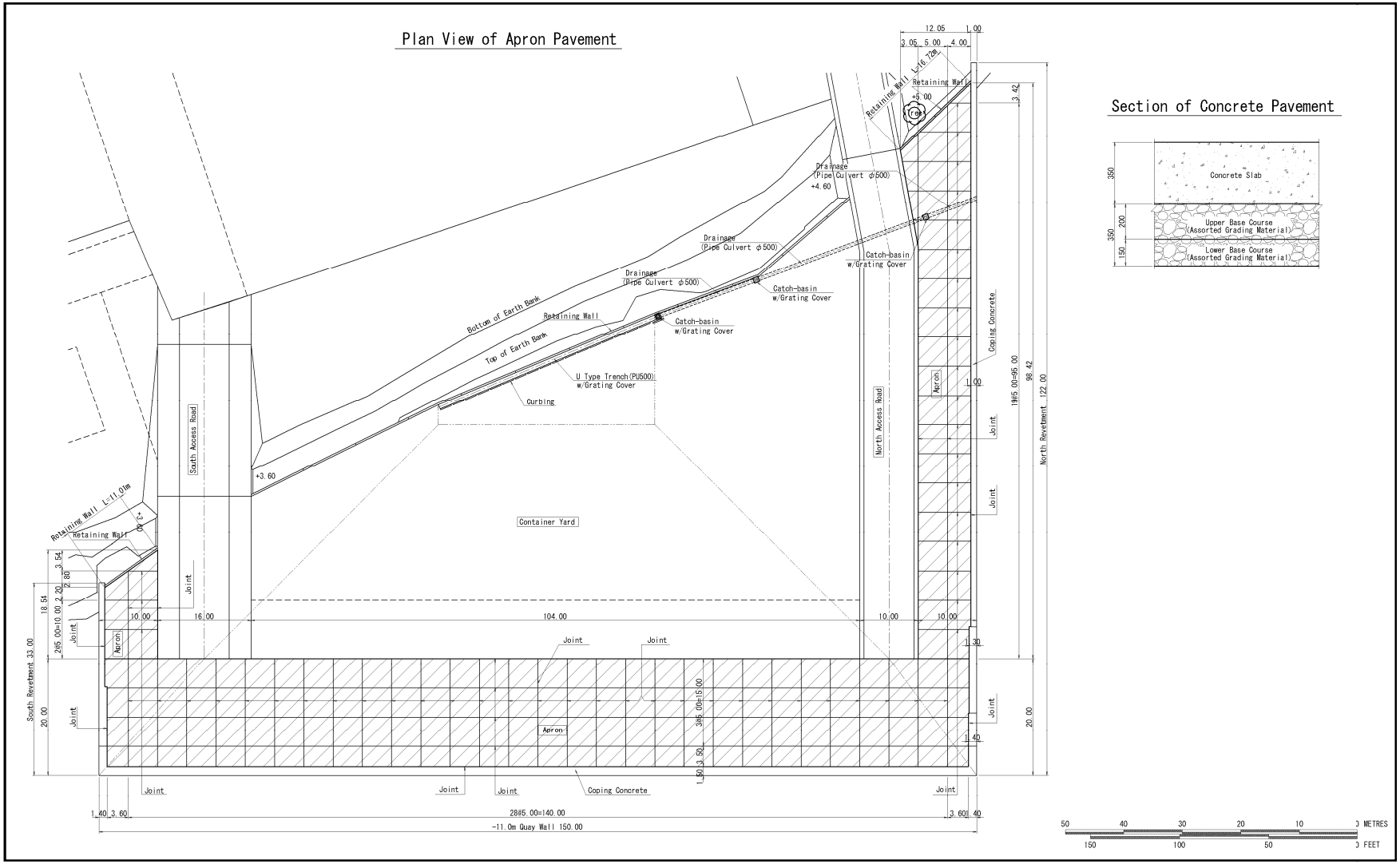


Figure 2.2.3-8　Paving Plan of Apron

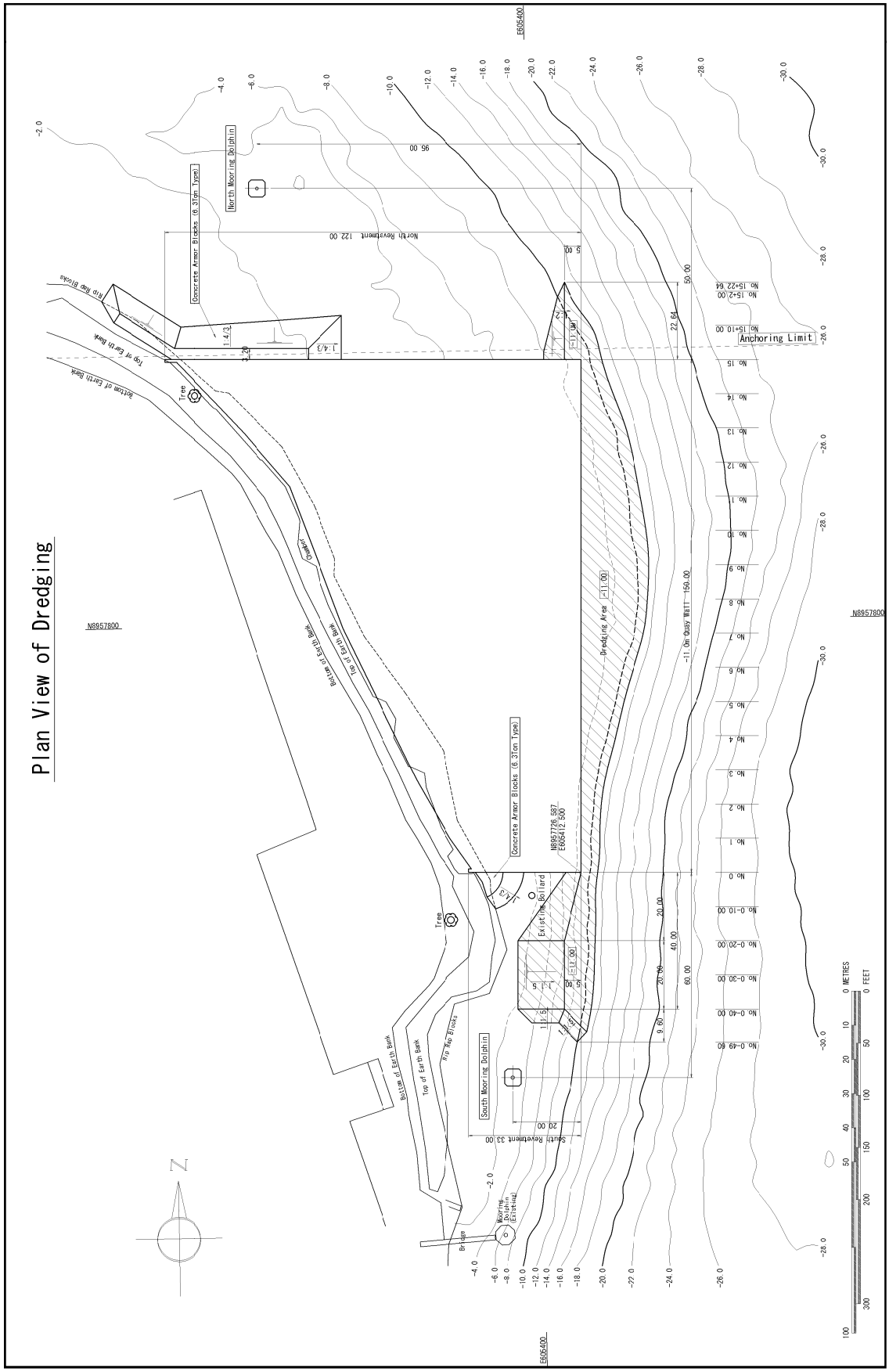


Figure 2.2.3-9 Dredging Plan adjacent to New International Berth

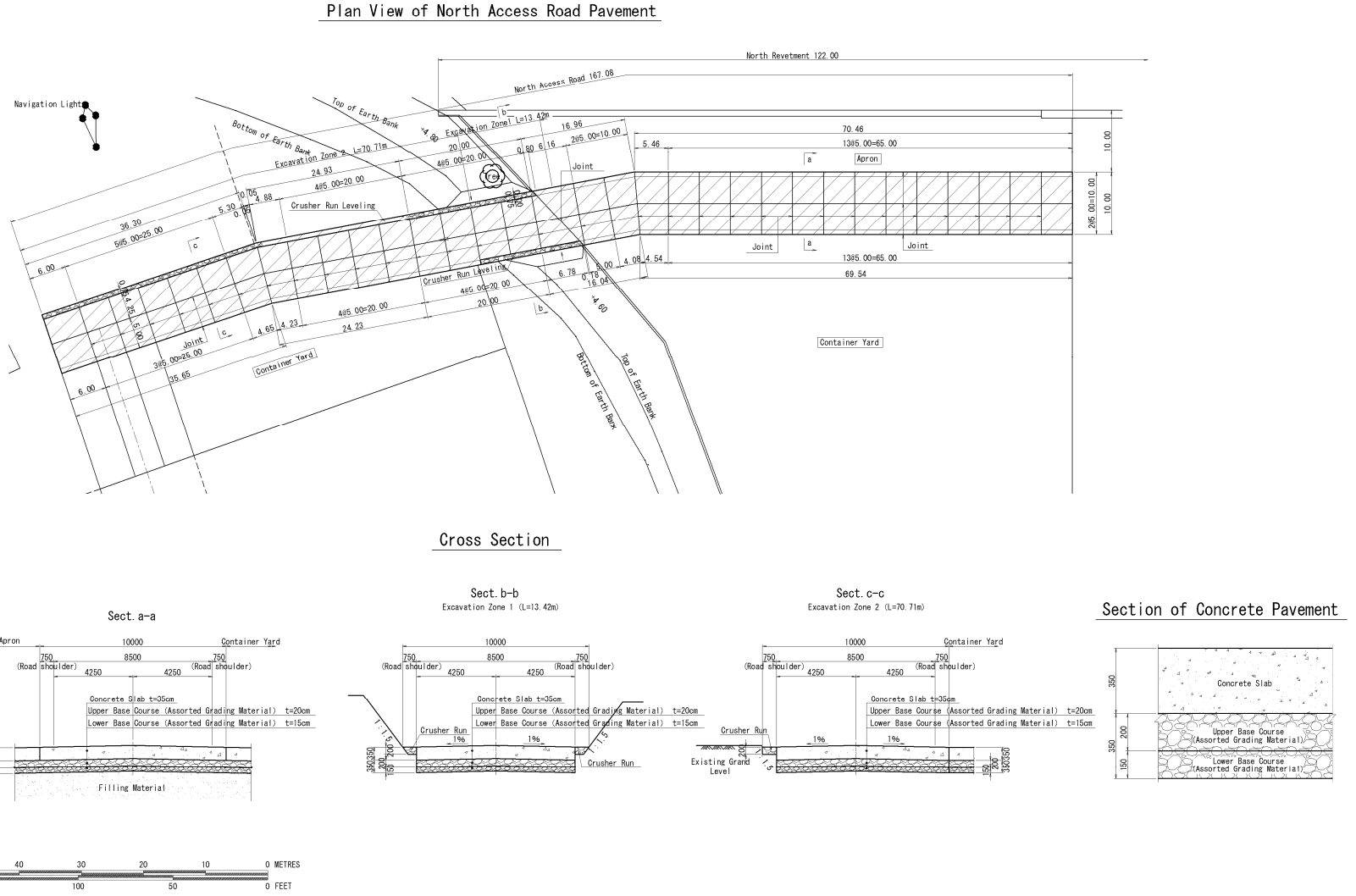
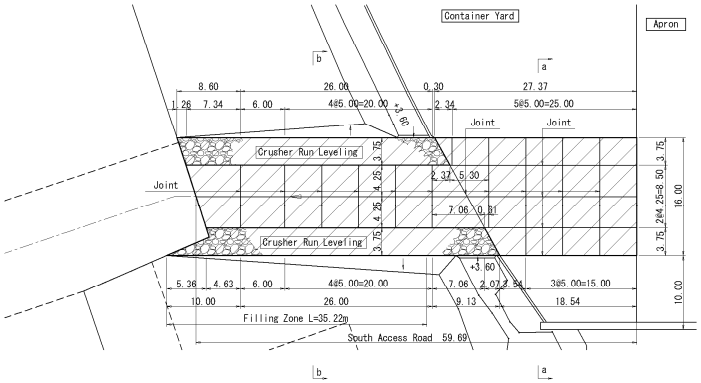


Figure 2.2.3-10　Paving Plan of North Access Road

Plan View of South Access Road Pavement



Cross Section

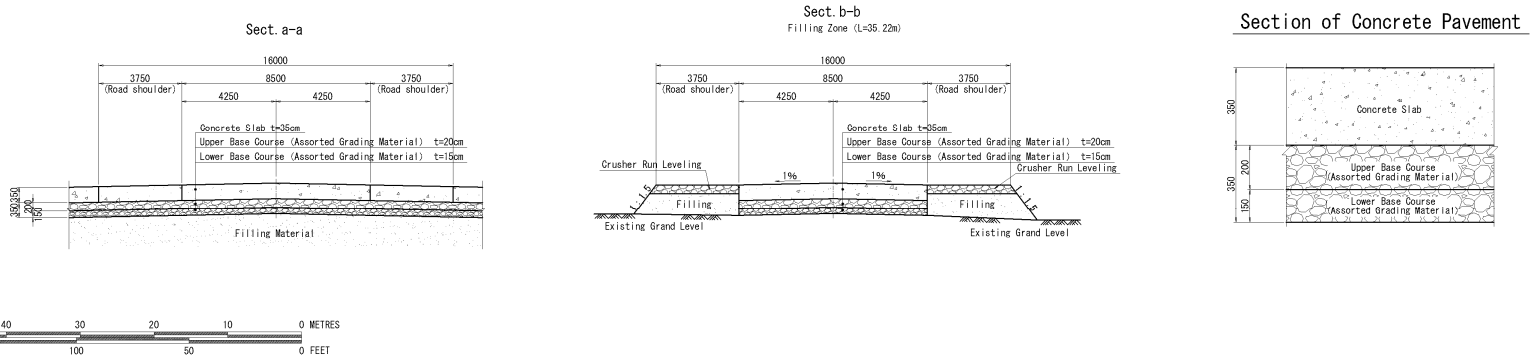


Figure 2.2.3-11 Paving Plan of South Access Road

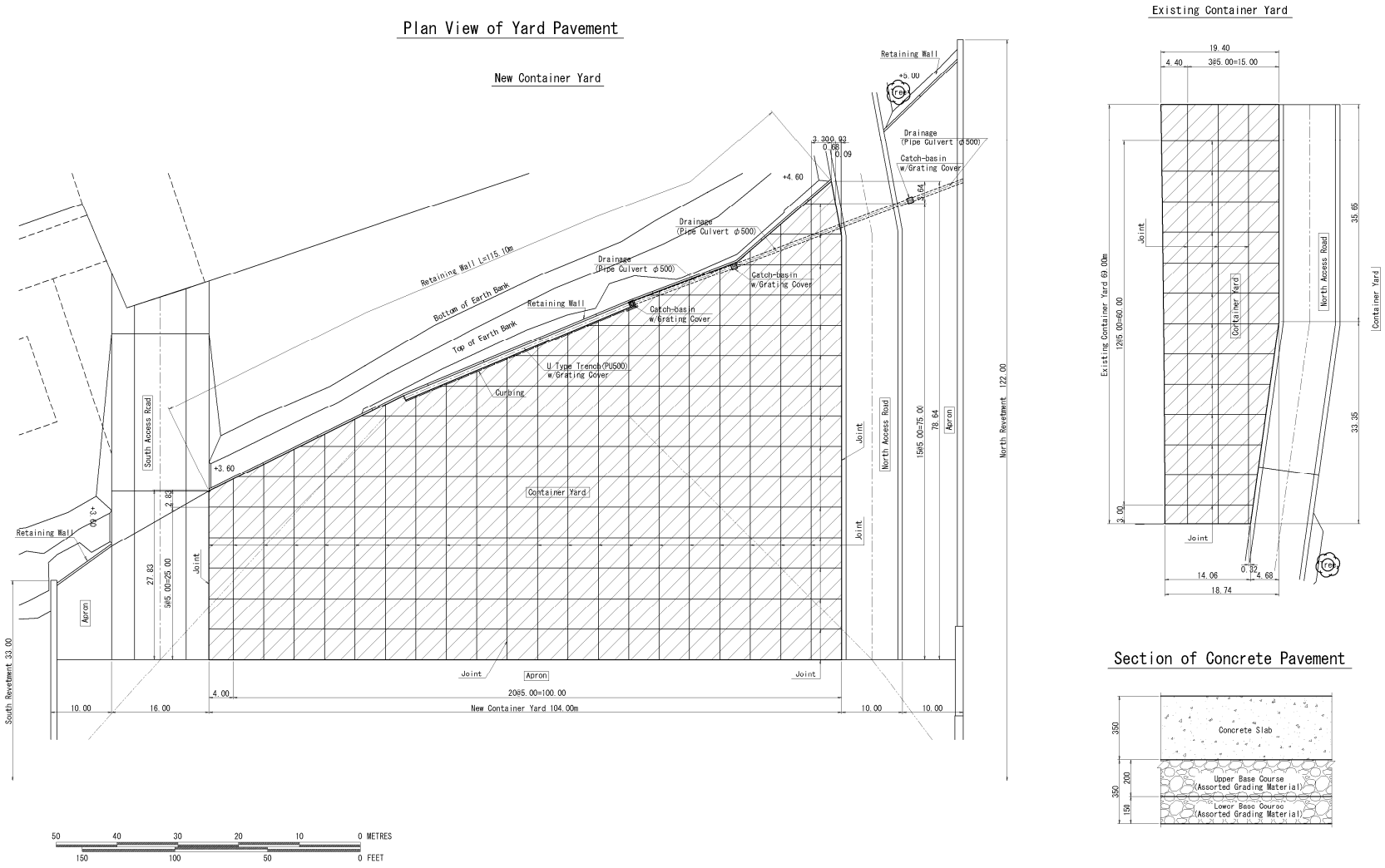


Figure 2.2.3-12 Paving Plan of Container Yard

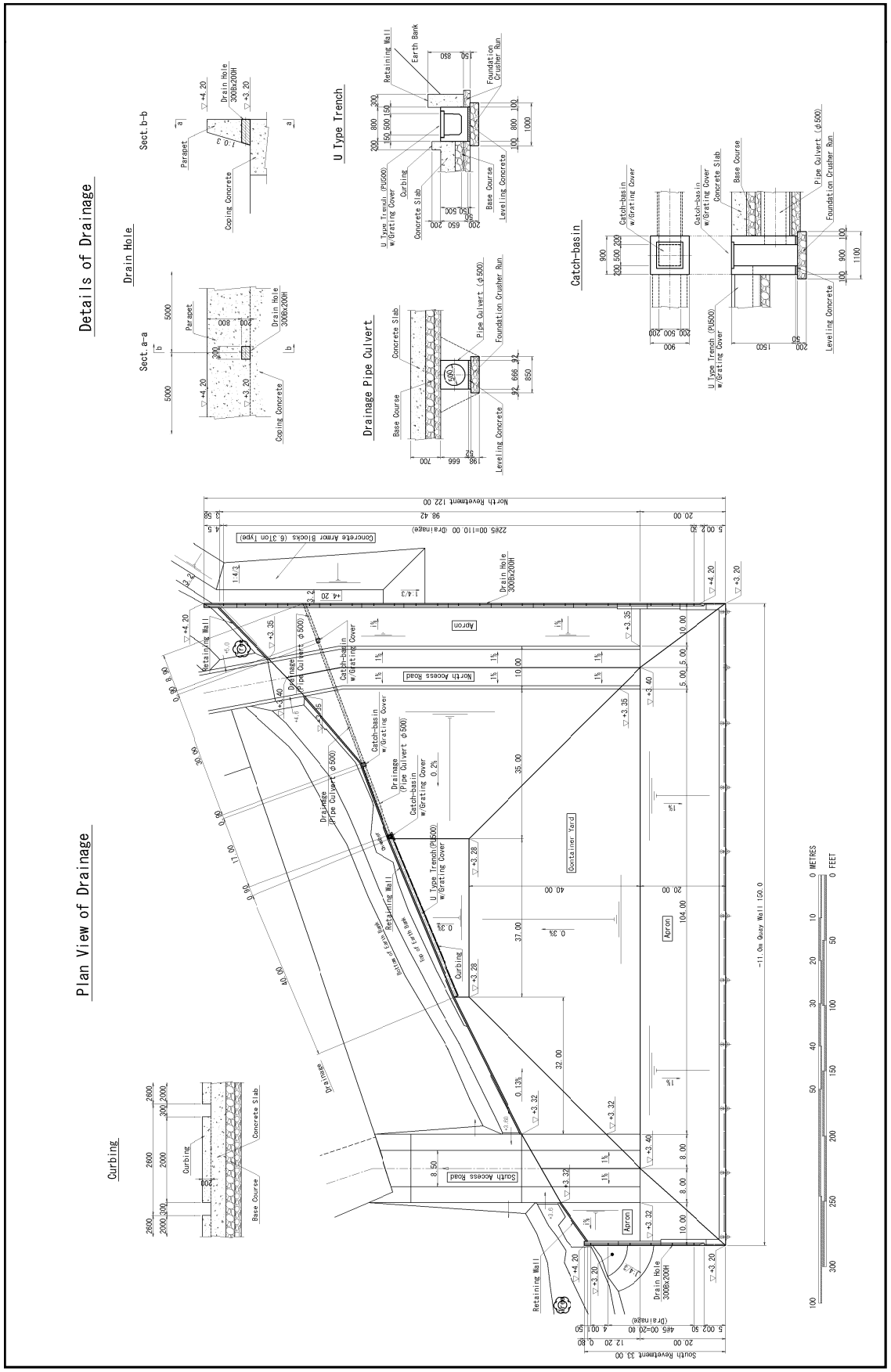


Figure 2.2.3-13 Drainage Plan

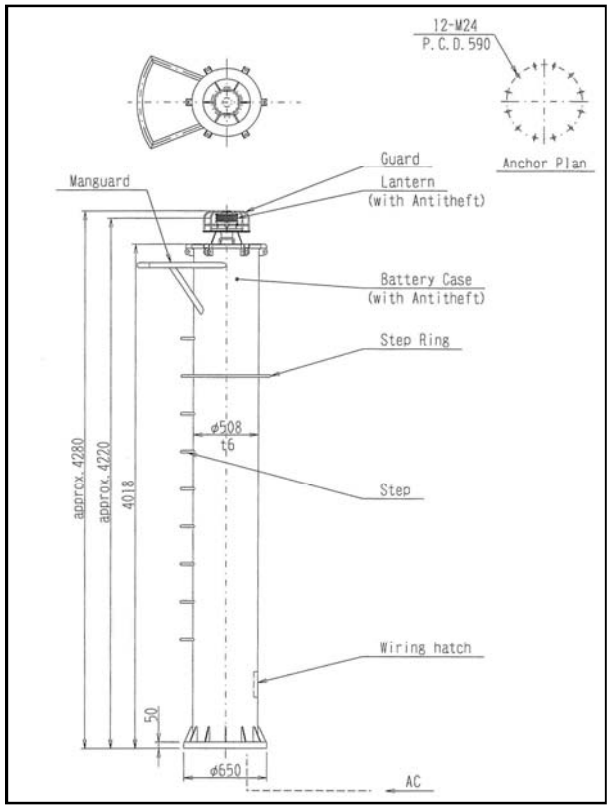


Figure 2.2.3-14 Beacon
(for reference only)

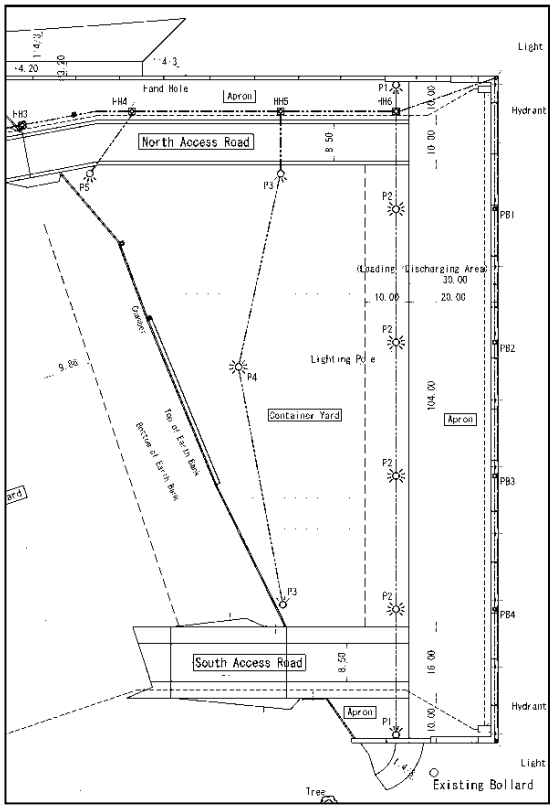


Figure 2.2.3-15 Lighting Facility Layout
(for reference only)

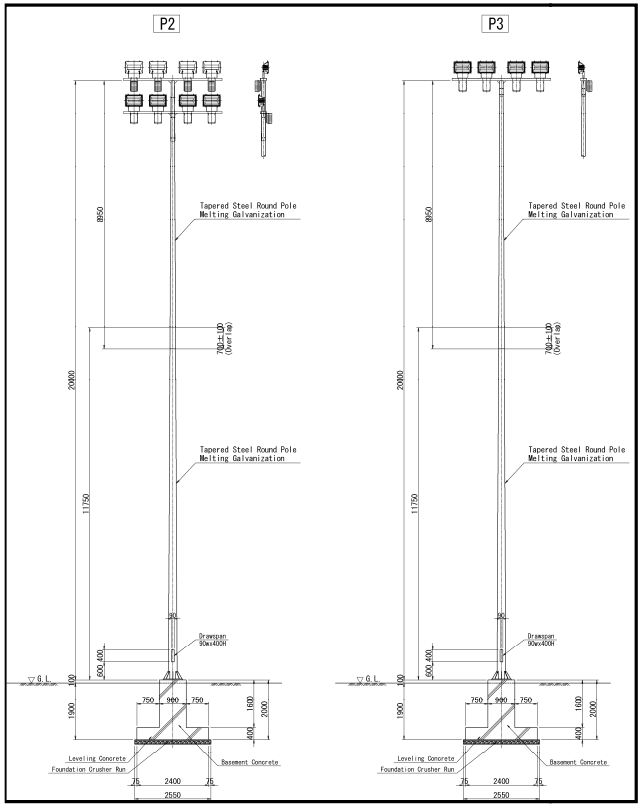


Figure 2.2.3-16 Lighting Pole
(for reference only)

2-2-4 Implementation Plan

Implementation plan such as construction plan and procurement plan is established considering the natural conditions and the social conditions comprising the actual situation of local industries of construction companies and others based under the precondition that this project is implemented as the Japanese grant aid cooperation. At planning stage of construction and procurement plans, it becomes important to implement construction works in accordance with proper construction standards, construction supervision, construction methodology, material and equipment procurement condition, construction schedule and quality control plan reflecting specific condition in Solomon Islands.

2-2-4-1 Implementation Policy

(1) Basic Matters for Implementation

1) Cabinet Meeting

This project under the scheme of Japanese grant aid cooperation is implemented through the approval in the Cabinet Meeting of the Government of Japan and conclusion of Exchange of Notes (E/N) between the Government of Solomon Islands and the Government of Japan, as well as Grant Agreement (G/A) concluded between JICA and the Government of Solomon Islands. This project is implemented on an assumption of A-type government bonds, so that the Cabinet Meeting, E/N and G/A are made twice at the time of detailed design stage and tender & construction stage.

2) Exchange of Notes

After concluding E/N and G/A on detailed design, a consultant service agreement is concluded for detailed design between the Consultant who has a Japanese nationality and the government of Solomon Islands, the detailed design work is promptly commenced. Necessary period for detailed design works from Consultant Agreement to Drawing Approval is expected to take about 4 months after above conclusion of E/N and G/A for detailed design. The schedule of detailed design is assumed as below.

* Conclusion of E/N and G/A for detailed design after approval of cabinet meeting
* One (1) month after conclusion of E/N and G/A : Consultant Agreement (Detailed Design)
* Three (3) months after conclusion of E/N and G/A : Approval by Cabinet Meeting for Tender and Construction Works
* Four (4) months after conclusion of E/N and G/A : Approval of Drawing

And basically the Cabinet Meeting for tender and construction works is held four (4) months after the Cabinet Meeting for detailed design and E/N and G/A are concluded after the approval of the Cabinet Meeting for tender and construction works. After that, the Consultant Agreement of the same procedure as detailed design is concluded between the Consultant that has a Japanese nationality, and the Government of Solomon Islands and the tender related works are commenced

promptly. It takes about four (4) months as necessary period for the tender works (Consultant Agreement to Commencement of Construction Works) after conclusion of E/N and G/A for the above tender and construction works. The schedule for tender works is expected as below.

* Conclusion of E/N and G/A for tender and construction works
  : after approval in the Cabinet Meeting for tender and construction works
* Conclusion of the Consultant Agreement (combined with the approval of drawing)
  : One (1) month after conclusion of E/N and G/A
* Two (2) months after conclusion of E/N and G/A
  : Public Announcement of Prequalification (P/Q)
* Four (4) months after conclusion of E/N and G/A
  : Execution of Tender and Commencement of Construction Works

3) Related Works from Detailed Design to Tender

The Consultant compiles drawings, specifications and cost estimation that are necessary documents for construction works, and other relevant documents that are necessary for the tender of construction works and its contracting. After that, upon the agreement of these documents by the Government of Solomon Islands, P/Q is announced and through the procedure of P/Q evaluation and checking of tender documents, a construction company that has Japanese nationality is selected by tender.

4) Tender Method

The tender of this project is executed by the tender method for facility (construction) project of the scheme.

5) Construction and Procurement Contract

The construction works are executed based on the Contract concluding between the Government of Solomon Islands and the Japanese construction company that is selected by the Tender.

6) Construction Period

To shorten the construction period, various construction methods are intended comparing since the urgent implementation is required for this construction works. The procurement works are executed smoothly to shorten the required period by considering the efficient procurement procedures since all the major construction material is imported from outside. Twenty four (24) months are considered to be necessary for the construction works.

(2) Construction and Procurement Policy

1) Consideration on Port Activity

This construction works is carried out in the port area where is currently in services and the water area for the construction is adjacent to the water area for various ships such as small boats, interisland ferries, container ships, oil tankers. And, as the existing berth facility becomes necessary to be used as the facility to unload the materials and equipment for the construction, it is important to consider on securing safety and shortening construction period as well as adjusting port activities and construction works during executing construction works.

2) Utilization of Local Construction Companies

In views of creating employment opportunity, promoting of technical transfer and vitalization of local economy, local engineers and labors as well as construction materials and equipment are used at the utmost extent. As the local construction companies have no experiences of large scale port and harbor construction works including marine works and their work scopes are limited to general construction works, utility works, and road construction works, the positive utilization for hiring common labors, simple works included in the construction works and etc. is intended.

3) Dispatching Technical Experts

It is considered necessary to dispatch operators of heavy construction machinery and vessels, technical experts and etc. for the bunch of large scale works of piling works of steel pipe sheet pile, the fabrication of steel bars, the erectors, forming and dismantling for concrete reinforcement at the time of construction works.

4) Logistic Plan of Construction Materials and Equipment

A precise logistic plan is important to be examined so as not to occur the delay of execution plan, because liner vessel service from Japan to Honiara Port is limited to 1 to 2 times in a month.

2-2-4-2 Implementation Conditions

(1) Safety Management

This project site and the temporary yard are located within a port area operated by SIPA and no residence is existed. However, as the materials and equipment procured locally to be transported on land is transported in urban area where is narrow and congested by large vehicles, it is necessary to tie up with police office for the smooth passage of people, by solving the problems such as many road parking cars and mitigating chronic traffic jam. And, this project site and the temporary construction yard are located at relatively safe bonded area but it is necessary to enhance this area by installing fences and guardsmen so as to prevent invaders as well as placing a sign board for construction showing “Keep Out Area”.

As this project site is located at the connecting water area with the existing port, in addition that working water area is clearly specified using identification buoy in order to make paid attention to accident during dredging and excavation works, complete safety measure is required such as preparing patrol boats at the position of wharf construction and the surrounding sea area.

(2) Rules and Regulations

1) Environmental Authorization and Environment Protection

Environmental license related with this project is essential to be issued by Minister of Environment of Solomon Islands, since this license is a prerequisite for the execution of this construction works. Therefore, MID and SIPA are required to obtain the environmental license before concluding E/N. And, when executing construction works, the compliance to the comments being incidental to environmental license and related rules and regulations is required.

2) Development Approval of Honiara City

It is necessary to get construction permit from Honiara City Council for the construction of this project. Such acquisition procedure is completed before commencement of construction works.

3) Work Permit for Relevant Staff of Japanese and the Third Countries

Engineers, experts and labors and others dispatched from Japan and the third countries related with this project are promptly applied for the work permit after entering the country.

(3) Construction Works

1) Preparation Work

The procurement for steel pipe sheet piles needs about five (5) months in its order and manufacturing and about one (1) month for the transportation therefore, at least about six (6) months preparation period is required.

2) Removal of Obstacles in Project Site

Site clearance including removal of obstacles in the project site and temporary construction yard as the obligation of the Government of Solomon Islands is conducted before commencing the construction works.

3) Provision of Temporary Construction Yard

It is necessary to secure enough land as temporary construction yard to store materials and equipment to be used for the construction works. Although, it is confirmed that a vacant lot owned by SIPA located at north side of SIPA's office as shown in Figure 2.2.4.1-1 in this survey, some adjustment within SIPA organization become necessary depending on the progress of construction works.

Figure 2.2.4.1-1 Location of Temporary Construction Yard

4) Traffic Safety during Construction Period

Although construction vehicles are possible to go through the container yard as the access road to the construction site of the new international wharf, it is considered to be congested among container handling equipment and transportation vehicles. Therefore, the construction vehicles are accessed to the construction site by using in-port road at sea side of container yard.

(4) Procurement

1) Construction Materials and Equipment

The cheaper price is adopted in comparison with the price from Japan or the third countries in case that local estimated price is more expensive.

Although the procurement of main construction machineries is considered from Japan or the third countries, the countries to transport and rent construction machineries to Solomon Islands are Australia, New Zealand and Singapore. In cost-wise comparison with Japanese machineries, their rental costs are higher and it is possible that the procurement cost from Japan becomes cheaper since there is no significant difference in its transportation cost.

The main construction machineries to be procured from Japan are namely large crawler crane, work vessels such as crane barge, flat barge, anchor barge, tag boat and others, backhoe (long arm) and etc.

For one example, although several local companies own crawler cranes with 40 tons, the number of cranes is limited, monopolistic and lack versatility. In addition to that, their prices are so expensive and there is no guarantee to be rented therefore, it is procured from Japan.

Steel reinforcing bars that is possible to procure locally is mainly the product of New Zealand (ANZ specification) but the price is very expensive. Moreover, in case of mass procurement, there is a concern that cheap steel bars from China may be included and the quality is not always guaranteed. According to the intension of local construction companies, it is requested to be supplied Japanese steel bars that the quality is well controlled from the main contractor.

Ready mixed concrete, concrete aggregate and filling materials are possible to procure locally. However as the prices are relatively expensive. Depending on the cost comparison with local procurement of ready mixed concrete, the method is considered to bring in crushing plant and concrete plant into the site. Particularly, in case that construction company other than Solomon Islands executes construction works directly, it is very difficult to negotiate with land owner of quarry and there was the case that landowner unfairly raised their price. Therefore there was an alternative idea that this obligation charged to the government of the Solomon Islands in the project of other donors. Therefore, the estimated price from local company is used in the rough estimation of this project, SIPA confirmed to entirely support to the procurement negotiation with the landowner to make the price met for SIPA level.

2) Price Escalation

Price escalation is calculated based on the economic growth rate in Solomon Islands and prediction of inflation rate set out by IMF[2)].

The predicted value of inflation rate related with the average prices in Solomon Islands are described as 4.475% in 2013 and 4.595% in 2014.

Commodity price fluctuation ratio for 17 months from May 2013 to September 2014 can be calculated with following formula.

May to December, 2013	4.475×8/12 = 2.983%
January to September, 2014	4.595×9/12 = 3.446%

Therefore, the commodity price escalation ratio is obtained as 6.43% (2.983 + 3.446 = 6.43%).

2-2-4-3 Scope of Works

(1) Demarcation of Japanese Side

i) Consultant services like detailed design, assistance of tender and supervision of construction works.

ii) Provision of all necessary construction machineries, construction materials and labors for the construction works by Japanese side of this project.

iii) Execution of marine and domestic transportation for importing materials and equipment to be necessary for the construction works by Japanese side of this project.

iv) Quality inspection to be necessary for the construction works by Japanese side of this project.

[2)] http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/weoselgr.aspx

(2) Construction Works as Obligation of Japan Side

1) International Wharf

i) Berth

ii) Revetment

iii) Dredging and Filling

iv) Mooring Dolphins

2) Container Yard

i) Yard Pavement

3) Accessories

i) Water Supply Facility

ii) Lighting Facility

iii) Beacons

4) Soft Component

Soft component is not conducted by this project

(3) Major Works as Obligation of Solomon Islands

i) Execution of EIA : 250,000 SI$

ii) Acquisition of construction permit to be issued by Honiara City
: equivalent to 0.3% of the project cost (SI$)

iii) Bank commission for banking arrangement
: equivalent to 0.1% of the project cost (SI$)

2-2-4-4 Construction Supervision

In accordance with the Grant Aid Cooperation Scheme of the Government of Japan, with the Consultant that well understood of the Second Preparatory Survey, consistent and smooth detailed design and supervision on construction works of the project are executed. The Consultant is going to dispatch a resident engineer for construction supervision works who has adequate experiences on construction site and execute supervision of construction works and liaison works and in addition, dispatch expert engineer on the progress of construction when necessary and conduct inspection and instruction of construction works. Major works included in the consultant services are as follows.

(1) Detailed Design and Supervision Works

1) Making up of Tender Documents

According to the results of this report, following documents are made up and get approval of MID and SIPA, after completion of detailed design of each facility.

* Tender Drawings
* Tender Documents

2) Tender

MID and SIPA select a construction company that has Japanese nationality by the tender. The attendant representing the Government of Solomon Islands to the tender and the following conclusion of the contract must have all the rights to approve the construction contract. The Consultant assists MID and SIPA for the following works.

* Public Announcement for Pre-Qualification (P/Q)
* Evaluation of P/Q
* Execution of Tender and Tender Evaluation
* Contract Negotiation

3) Supervision on Construction Works

Receiving the verification of construction contract by JICA, the Consultant issues "Commencement of Works" to the construction company and commence the supervision works. In the supervision works, the Consultant reports the progress of construction works to MID, SIPA, Embassy of Japan and JICA Solomon Office, directly. For the construction company, the Consultant works related with work progress, quality and safety and administrative works for payment and provide the improvement measures and proposal in the technical aspects of construction works.

Defect inspection is conducted one (1) year after completion of supervision works. And the consultant works is completed and finalized with this inspection.

(2) Supervision Policy and Main Points

1) Liaison and Report among Parties Concerned

Close liaison and report to the concerned organizations in Solomon Islands and the one in Japanese officials are made in order to target the completion of facilities on time based on the implementation schedule.

2) Positive Approach to Construction Parties

Prompt and proper instructions and expertise are made to the construction parties in order to target the facility construction to meet with the design drawings and technical specifications.

3) Technical Transfer

Taking the approach to transfer the construction methodology and construction technology, it makes effective as the project under the scheme of Grant Aid Cooperation.

4) Expertise Relevant to Maintenance Management

Concerning the maintenance management after handing over completed facilities, proper expertise and instruction are made for encouraging the smooth operation and management.

(3) Construction Supervision Framework

1) Cooperation on Construction Contract

Selection of Construction Company, Decision of Construction Contracting Method, Making up Construction Contract (draft), Reviewing Detailed Breakdown of Constructions Works, Witness to Construction Contract and etc. are performed.

2) Review and Confirmation of Shop Drawing

Review and confirmation are performed for shop drawings, construction materials, finishes and materials for utilities that are submitted by a construction company.

3) Construction Supervision

Review on construction plan, construction schedule and other relevant matters, and instruction to the construction company as well as progress reporting of construction works to the Client are performed.

4) Payment Approval Procedure

Cooperation is made on the review of invoice and procedure concerning the construction cost to be paid during and after construction works.

5) Quality Control

As this project is the construction of the new international wharf, the marine works for construction of berth structure is one of the major items. The quality control is conducted paying attention to the following points.

i) Main works are piling steel pipe sheet piles and concrete works. The bearing resistance of piles, proper arrangement of steel reinforcing bars in concrete works, concrete mixture and sufficient compaction of consolidation are confirmed.

ii) A Japanese staff who has an experience of marine works or the related construction works and the qualification as the resident supervising engineer is allocated.

iii) Construction company allocates a Japanese staff who has an experience of supervision works for marine works or the related construction works and the related qualifications as the project manager.

iv) Ensuring supervision works such as taking-over inspection based on the design documents (special specification, drawings and technical specifications), step inspection to next stage, final inspection and etc., necessary achievement of construction works is obtained.

6) Implementation Progress

i) In order to preserve the progress plan of construction works, allocation of skilled workers and stable supply of materials and equipment for construction works are performed.

ii) The instruction and supervision to the construction company are made so as to make a flexible and realistic supervision system including such as using materials and equipment from surrounded countries as well.

iii) In order to secure safety of calling vessels to Honiara Port, a patrol boat and etc. is arranged for marine works and inform her of the interruption and commencement of construction works.

7) Safety Control

i) A resident supervising engineer and supervisors of the construction company ensure to make the safety control system focusing on the marine construction works.

ii) Construction management plan is made including the safety control for the third party due to the congestion among container handling equipment, container transportation vehicles and construction vehicles for the temporary road from temporary yard to the end of berth.

iii) Preventive measures for the unexpected accident are to be taken by related parties through daily training.

iv) Marine works need to take safety measures like arranging a pilot boat since the area is congested with calling vessels to Honiara Port and consider the work intermission during the ship maneuvering around if necessary.

8) Inspection

The Consultant inspects the progress when necessary during construction period and supervises the construction company. The Consultant witnesses the handing over the facilities in the contract upon confirming that the construction works completed and performed the contractual coverage and complete his work after obtaining the signature by the Client.

And, the Consultant reports the progress to the Government of Japan during construction period regarding payment schedule and necessary matters on handing over.

2-2-4-5 Quality Control Plan

Control items, control contents, control method, quality standard, frequency of measurement and coordinating method are based on the Special Specification (Tender documents and Drawings, Questions and Answers) and “Port and Harbor Construction Work Quality Control Standard” that is described in Port and Harbor Construction Work Common Specification.

Quality control items of main works and the test method are shown in Table 2.2.4.5-1.

Table 2.2.4.5-1 Quality Control Items of Main Works and Test Method

Main Work	Detailed Work	Q/C Items	Test Method
Berth Construction	Piling of Steel Pipe Sheet Pile	Material	Chemical Analysis, Mechanical Properties, External Appearance, Measurement for Configuration and Size, Welding Portion
		Quality of Main Portion	Piling Record, Centering Position of Steel Pipe Sheet Pile, Crown Height of Steel Pipe Sheet Pile, Slope of Steel Pipe Sheet Pile
Concrete Casting	Reinforcing Steel Bars	Material Quality	Chemical Analysis, Mechanical Properties, Measurement for Shape Size
	Concreting	Element Quality	Quality Test for Cement, Water and Aggregate
		Concrete Quality	Slump, Air Content, Compressive Strength, Chloride Ion Concentration Measurement, Temperature
Installation of Fenders	Fender	Material Quality	Physical Test of Rubber, Measurement for Shape Size
Installation of Bollard	Bollard	Material Quality	Chemical Analysis, Mechanical Properties, Measurement for Shape Size

2-2-4-6 Procurement Plan

(1) Construction Circumstances

1) Construction Company

A few construction companies in Solomon Islands is available that can be a subcontractor for this project owning large construction machineries like crane and having experience of general civil works like bridge and road. In these companies, there are some companies that has experienced as a subcontractor of other Grant Aid Cooperation. For these construction companies, no problem is considered to be on the construction quality of civil works. Therefore, technically, construction companies in Solomon Islands are considered to be a subcontractor under a Japanese construction company. However a few these companies occupy almost all small scale public works in Solomon Islands and subcontracting works of large scale of civil works. And their material cost and leasing cost of construction machinery are relatively expensive. According to the above local construction circumstances, the procurement plan is made considering the procurement from the third countries and Japan. And, there is a case that small scale construction works in Honiara Port is done directly by SIPA that owns small construction machines. As quarry is managed by private company now however rock crushing works is not possible due to the aging of machine, only filling material (gravel mixed sand) for banking is supplied to road construction works under the Department of Public Works.

2) Construction Machinery

Local construction companies in Solomon Islands own general construction machineries, though the type and quantity are very limited. Especially, the stocks for maintenance of consumables like wire and spare parts is poor for the cranes that situation is not acceptable for the prior checking by Japanese construction company. And they do not own large dredger (grab

dredger) that is planned in this project and pile driving barge, nor these machineries and working boats to be rented locally. As these companies have own networks with New Zealand, Australia, Singapore and other countries rented the cheapest construction machine at their necessity for the construction works, the rental cost is relatively expensive. With the above, the construction machineries that cannot be procured locally are basically procured from Japan.

3) Labors

It is considered that general construction works can be done using local labor and migrant labors from neighboring countries who lives in Solomon Islands.

(2) Procurement Circumstance

Construction materials produced in Solomon Islands are stone aggregate material and ready mixed concrete.

Aggregate for concrete, rubble stone for foundation, armor stone can be used since the quarry is existed in the suburb of Honiara City. And, ready mixed concrete is made by the method to mix adding water at construction site transported after directly pouring cement and aggregate at the plant that is automatically weighed into concrete mixer vehicle (10 ton). As the time for transportation is not affected, local plant is supposed to be used.

Cement imported mainly from PNG and Fiji is procured locally.

1) Steel Material

As the heavy-duty corrosion protection coating is not necessary for steel pipe sheet piles, it is procured from Japan. As reinforcing steel bars imported from New Zealand are possible to procure locally, however the price is relatively expensive; it is procured from the third countries or Japan. Other steel materials like steel angles are procured from Japan or the third countries.

2) Procurement Policy

Local procurement is prevailed as much as possible studying the quality with test result and the supply capability such as delivery and quantity carefully for the materials and equipment to be able to supply locally. The procurement from the third countries and Japan is kept to the minimum, in respect of the cost and delivery time.

a) Procurement from Japan

Precise procurement and transportation plan is established for the materials of order-made or domestic fabrication procured from Japan, since it takes long period from order, manufacturing, packing to delivery.

Construction machineries are basically procured from Japan.

b) Local Procurement

Stone materials, aggregates and others that are the main material out of local procurement materials are decided adequately considering the aggregate site, quality, delivery capability and other conditions.

c) Cost

The cheaper one is adopted comparing each cost of local procurement and procurement from Japan. In case of procurement from Japan, it needs to pay attention on the additional cost for packing, transportation cost, insurance and port dues as well as the related tax exemption of imported materials for the project.

d) Procurement Items

i) Construction Materials

Almost all construction materials are imported and the materials that can be locally procured are very limited. Procurement sources of main construction materials in this project are as per shown in Table 2.2.4.6-1.

Table 2.2.4.6-1 Procurement Sources of Construction Materials

Work Item	Material	Local	Japan	Third Country
Civil Facility	Steel Material such as Steel Pipe Pile an Sheet Pile		○	
	Concrete Aggregate	○		
	Re-bar		○	○
	Cement	○		
	Form and Timber		○	○
	Fuel	○		
Auxiliary Facility	Beacon		○	
	Fender		○	
	Bollard		○	○
	Lighting Facility		○	○

ii) Construction Machineries

According to the procurement situation of local construction machinery availability, construction machineries are procured from Japan. The procurement sources being necessary to implement this project is as per shown in Table 2.2.4.6-2.

Table 2.2.4.6-2 Procurement Sources of Construction Machineries

Main Construction Machinery	Local	Japan	Third Country
Crane Berge (35 – 45 t Crane)		○	
Flat Berge (200t, 300t Capacity)		○	
Tag Boat (450 PS)		○	
Anchor Boat		○	
Transportation Boat		○	
Diver Boat		○	
Back Hoe (0.6 m^3)	○		
Back Hoe (1.0 m^3)		○	
Wheel Loader (1,5 m^3)		○	
Dump Truck (10 ton)	○		
Crawler Crane (100 ton)		○	
Rough Terrain Crane (25 ton, 50 ton)		○	
Vibration Hammer (125 KWA)		○	
Tractor & Trailer (20 ton)	○		
Concrete Mixing Plant (30 m^3/hr)		○	
Agitator Truck (4.4 m^3)	○		
Clam Shell Bucket (0.8 m^3)		○	
Welding Machine (500 A)		○	
Generator (25 – 400 KVA)		○	

(3) Tax Exemption

It is confirmed that the taxes and duties for the imported materials and equipment related with this project are exempted only for the Japanese construction company. However, the Japanese construction company that receives the tax exemption is required to inform all the imported materials and equipment to SIPA and MID beforehand and go through procedures to Ministry of Finance and Treasury.

And, in case of materials and equipment locally procured, it is possible to receive the tax exemption for the materials and equipment applied to SIPA and MID beforehand for the concrete materials and equipment or the oils that are used a lot and went through procedures to Ministry of Finance and Treasury however the tax refund is supposed to be very difficult.

2-2-4-7 Operation Guidance Plan

Procurement of equipment is not included in this project, so that the initial operation training and maintenance training are not executed.

2-2-4-8 Soft Component (Technical Assistance) Plan

As this project is to implement the new international wharf in addition to the exiting international wharf, the soft component is not included due to applicable of well-organized current operation and management system.

2-2-4-9 Implementation Schedule

In case that this project is implemented under the scheme of Grant Aid Cooperation by the Government of Japan (A type government bond), firstly E/N for detailed design by both governments is concluded and G/A is concluded between JICA and the Government of Solomon Islands. After that, the agreement for detailed design is concluded between a Japanese Consultant and the Government of Solomon Islands. The detailed design works is performed and tender documents are prepared on the basis of this agreement. And, after conclusion of E/N for construction works between both countries, G/A is concluded between JICA and the Government of Solomon Island, a Japanese Consultant is selected by the Government of Solomon Islands and the contract for the supervision of construction works is concluded between the Government of Solomon Islands and the Consultant. Thereafter, the construction company that has Japanese nationality is selected through the tender and construction contract with the support of contracted consultant and the project is completed through the construction works.

(1) Detailed Design

After conclusion of the Consultant Agreement between the implementation agency of Solomon Islands and the Consultant that has Japanese nationality, the Consultant commences the detailed design works through the verification of JICA on the contract. In the detailed design works, detailed design documents, specifications, tender conditions and etc. are made up based on the basic design report of this project. During this time, discussion with the government of Solomon Islands is made and the final approval on the total tender documents is obtained by the government of Solomon Islands. The required period for the detailed design is about four (4) months from the conclusion of consultant agreement.

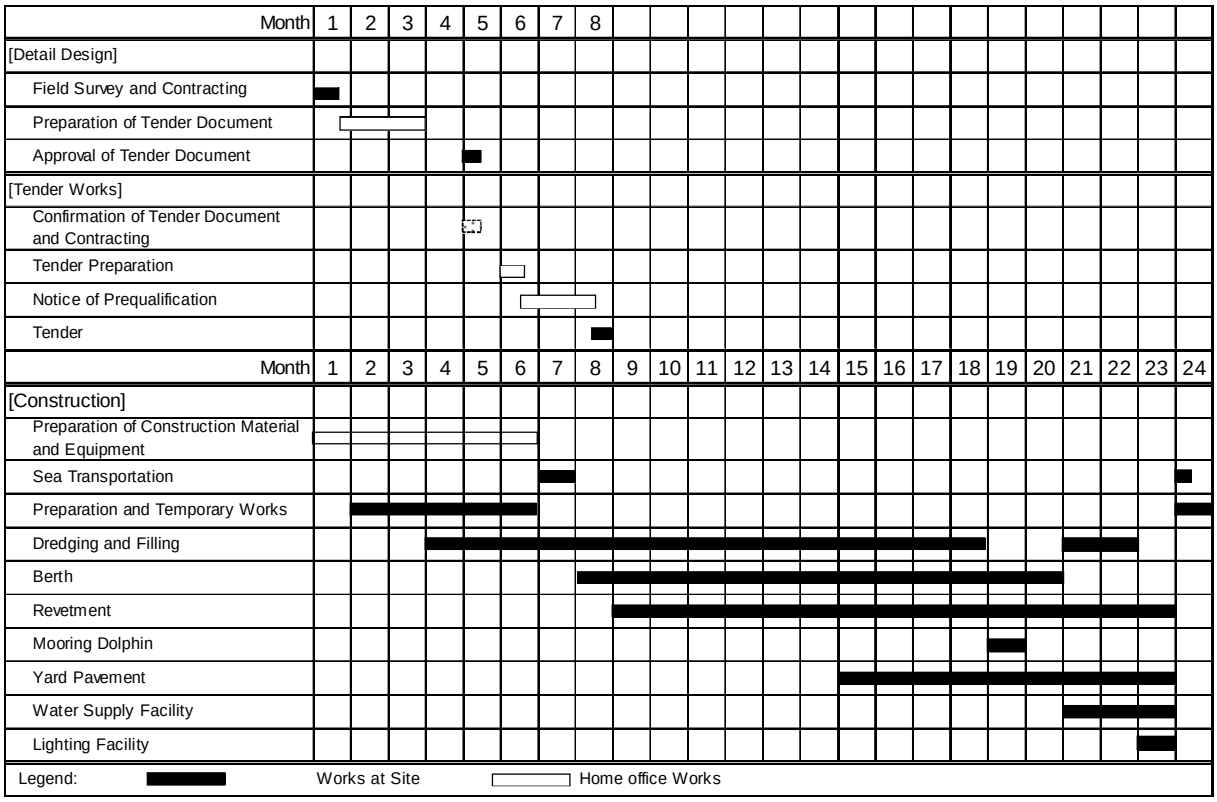
(2) Tender

The construction company that has Japanese nationality for this project is selected by the tender. The tender is held through tender call, receipt of request for tendering, prequalification, distribution of tender documents, tender, evaluation of tender result, designation of contractor and construction contract in order and it takes about four (4) months.

(3) Construction Works

After conclusion of construction contract, the construction works are commenced through the verification of the contract by JICA. As the result of estimation for construction period on the presupposition that accident due to force majeure is not occurred considering facilities scale, component, local construction circumstances of this project, it becomes about four (4) months for detailed design, about four (4) months for tender works, and about twenty four (24) months for construction works. Table 2.2.4.9-1 shows the project implementation schedule.

Table 2.2.4.9-1 Project Implementation Schedule (Draft)



2-3 Obligations of Recipient Country

1) Land securement for temporary yard neighboring to the project site.
2) Implementation of EIA, acquisition of Environmental Permit and Facility Construction Permit (Honiara City Council).
3) Site clearance and removal of wastes and debris in the project site.
4) Services of electricity, water and etc. to the new international wharf construction area.
5) Securement of staff and the budget for operation and maintenance of facilities.
6) Exemption of tax and other duties assessed to the imported materials and equipment from overseas.
7) Exemption of tax and other duties assessed in Solomon Islands to Japanese to enter into Solomon Islands to perform works related with the contract verified.
8) Necessary undertaking provided to Japanese to enter and stay to/in Solomon Islands for performing their works related with the contract verified.
9) Commission payment for Banking Arrangement (B/A) and Authorization to Pay (A/P).
10) Proper and effective utilization of constructed facilities under the scheme of Japanese Grant Aid Cooperation.
11) Bearing all the cost to be out of Grant Aid Cooperation by the Government of Japan.

2-4 Project Operation Plan

(1) Operation and Maintenance Structure

Operation and maintenance structure of Honiara Port is consisted of Operation Department, Engineering Department, Finance Department and Corporative Services Department under General Manager as the organization chart of SIPA is shown. The Operation Department performs the port cargo handling works directly by themselves other than port control works of calling vessels in the international wharf of Honiara Port. Rehabilitation and maintenance works of port facilities are performed by Engineering Department and domestic jetty construction, land reclamation and other relevant works in the domestic wharf are properly performed as well as maintaining the international wharf.

This project is to construct the new international wharf for the secured area of the international wharf. Concerning the operation system, it is necessary to have double operation system for container cargo handling works as well since the berths where container ships can be berthed are increased to two quays by the construction of the Second International Wharf. For the time being, it is considered to handle container only at the Second International Wharf, as the Second International Wharf becomes the exclusive use for container ships and other calling vessels are berthed to the existing international wharf, which contributes to improving the berth rotation rate by shortening the cargo handling time due to the efficiency of container cargo handling. Concerning the cargo handling system, it is considered that double wharves system is to be promoted depending on the forthcoming increase of calling number of container ships and cargo handling volume through maintaining the current system. And the maintenance works of facilities are possible to cope by the existing Engineering Department. Therefore, as the same operation and maintenance systems of the present organization are considered to be maintained for the time being even after the implementation of the new international wharf. Operation and maintenance system to be newly established are not necessary nor to employ new personnel in conjunction with the implementation of this project.

(2) Maintenance Method

This project is consisted of the constructions of new international wharf, container yard and accessories, of which the maintenance is taken care by the Engineering Department of SIPA. There are planning, engineering and maintenance groups and workshop including construction works and machineries in the Engineering Department, which is capable for the construction of small size jetty or pavement and its repair works of container yard. Therefore, the maintenance of the project facilities is considered to be possible to be performed by SIPA.

Maintenance method of each project facility is as per shown below.

1) New International Wharf

The main facility of berth in the new international wharf and the north and south revetment is planned and designed with 50 years' service life and the maintenance work is not required basically. However, as the berth ancillary facilities such as fenders and curving are deteriorated

depending on the berth usage, proper maintenance is necessary. And, the water depth of berth front is presumed not to be so changed judging from the situations of geography of surrounding water area and the waves, though prompt dredging is executed when sand deposition is generated.

In order to maintain and use the new international wharf for the future as well, early discovery of damages and the precise treatment are inevitable and it is required that the periodical inspection of the berth facilities and the repair of necessary places by the hand of SIPA after implementation of this project.

Checking points by periodical inspection are described below.

* Depths of berth and front water area : confirmation of DL -11.0m
* Superstructure of berth : cracks, damages and damages of fenders, bollards and etc.
* Substructure (steel pipe sheet pile) : damages, deformations and rust
* Superstructure of revetment : cracks, damages and etc.
* Substructure of revetment (steel pipe sheet pile and steel sheet pile) : damages, deformations and rust
* Mooring dolphin : damages, deformation and rust
* Armor block : damages of armor blocks and the scattering
* Access road : cracks, damages and subsidence

2) Container Yard

Paving method of container yard is the concrete pavement with sufficient pavement thickness and the strength are kept for equipment and vehicles to be necessary for container handling in the new international wharf.

The repair works described below are necessary as well as checking by periodical inspection for the subsidence of road surface or the rutting concerning the maintenance works for container yard.

* Surface of pavement : cracks, damages and subsidence
* Leveling and reinforcement of unpaved area in side strip

3) Accessories

Water supply facility, lighting facility and beacons are included as the accessories. The following points described below are necessary as the maintenance and management method for each facility and necessary measures are required.

[Water Supply Facility]

* Confirmation of water supply situation and water pressure
* Damage of cap to water supply part

[Lighting Facility]

* Confirmation of lighting and ageing deterioration of lighting tools
* Damages of lighting illuminating lamp

[Beacon]

* Confirmation of lighting at lantern part
* Damages of body itself

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The cost to be borne by the Government of Solomon Islands shall be estimated as follows according to the estimation condition shown in below (2).

(1) Cost Born by the Government of Solomon Islands

Component	Amount (SI$)	Yen Equivalent (million Yen)
i) Execution of EIA	250,000	Approx. 2.7
ii) Construction Permit	564,000	Approx. 7.5
iii) Extension of Electricity and Water Lines to the Project Site	44,000	Approx. 0.6
iv) Commission Payment for Banking Arrangement	196,000	Approx. 2.6
Total	1,054,000	Approx. 13.4

(2) Cost Estimation Condition

1) Cost Estimation Month : April 2013

2) Exchange Rate : 1.00 US$ = 93.46 Yen

: 1.00 SI$ = 13.29 Yen

3) Construction Period : Implementation schedule of detailed design and construction are as on the Works Schedule.

4) Others : Cost estimation is made under the Grant Aid Cooperation scheme of the Government of Japan

2-5-2 Operation and Maintenance Cost

(1) Port Revenue

Improvement of safety and resolution of berth waiting time and efficient container handling for calling container ships are made by the installation of this project. The future increase of port income is expected depending on the increase number of calling ships and cargo handling volume that can be forecasted. Main port income items in the international wharf are as follows.

* Port Charge : US$ 8.00 x Loa of Calling Ship
* Wharfage : US$ 2.50 x Loa of Calling Ship x Berthing Time
* Pilotage : US$ 15.00 x Loa of Calling Ship
* Container Handling Charge : US$ 350.00 x Container (20ft and 40ft)
* Container Storage Charge : Free within 14 days

Empty Container : after 15th day US$ 10.20 x Container (20ft and 40ft)

(2) Maintenance Cost

The maintenance cost to be necessary for the project facilities are as per shown below.

1) Cost for Electricity

Lighting facility of the new international wharf :

SI$ 6.47 + 7,200 kwh/month x SI$ 6.75/kwh = SI$ 48,600/month

SI$ 48,600 x 12 months = SI$ 583,200/year

2) Cost for Water

Water supply facility at the new international wharf is to supply water to calling ships and as the fee is collected according to the supply volume, this is not included in the maintenance cost.

3) Cost for Maintenance

* International Wharf Facilities : Maintenance cost does not counted for the time being for the wharf facility.
Inspections are necessary for water depth adjacent of the berth, on-land facility and revetment structures, as well as ancillary facilities, annually.

* Container Yard : The maintenance cost is not counted for the time being for yard pavement.
Daily inspection is necessary.

* Accessories

Lighting Facility : Maintenance for aging and deterioration of lighting parts and replacement of lumps

Beacons : Maintenance for aging deterioration of lantern parts and replacement of battery and lump

With the above, the annual estimated cost for operation and maintenance is made as shown in Table 2.5.2-1 by the implementation of this project. This operation and maintenance cost is approximately 1.35% of annual income of SIPA to the amount of SI$ 67.30 million and it is considered to be defrayable.

Table 2.5.2-1 Estimated Annual Operation and Maintenance Cost by the Project

Item	Estimated Cost (SI$/year)
Electricity	SI$ 583,200/year
Other Maintenance	SI$ 322,000/year
Total	SI$ 905,200/year

In addition to the annual maintenance costs, it is recommended to reserve an accumulated fund for future repair of the wharf facilities and replacement of costly consumables.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

The items to be preconditions for the project implementation are as follows.

(1) Securing the construction site for the project and utilization control of the water basin,

(2) Execution of EIA related to the project and acquisition of environmental license relevant to the project facilities,

(3) Acquisition of a construction permit from Honiara City Council relevant to the project facilities,

(4) Site clearance of the construction site,

(5) Line connection of electricity and public water up to the point adjacent to the project site,

(6) Securing the access way to the project site during the construction period,

(7) Securing the necessary temporary construction yard and dumping site for the execution of the project,

(8) Arrangement of Banking Arrangement (B/A) and Authorization to Pay (A/P), as well as execution of prompt payment in accordance with the A/P and Agreement / Contract,

(9) Exemption of tax and other levies assessed to construction materials and equipment imported from overseas,

(10) Provision of necessary undertakings that are given to the entry, stay and work permits, and tax exemption for Japanese persons and the third country persons entering into Solomon Islands to execute the contracted works verified,

(11) Installation of fence and gate to be necessary under SOLAS convention,

(12) Appropriate and effective utilization of the facilities constructed by Grant Aid Cooperation of the Government of Japan and

(13) Bearing all expenses other than the extent covered by Grant Aid Cooperation of the Government of Japan relevant to the project.

3-2 Necessary Inputs by Recipient Country

The items that the recipient country should undertake in order to accomplish and maintain the project effects are as shown in Table 3.2-1.

Table 3.2-1 Necessary Inputs by Recipient Country

Timing	Items
(1) Before Construction	1) Execution of EIA, acquisition of environmental license and construction permit from Honiara City Council relevant to the project facilities, 2) Work permit and tax exemption for Japanese and third country persons related with the project, (3) Tax exemption for construction materials, equipment and etc. related with the project, (4) Securement of access way to the project site during construction works, (5) Securement of the construction site and the temporary construction yard necessary for implementation of the project, (6) Clearance of the project site, (7) Utilization Control of the front water area of the project site and (8) Arrangements of Banking Arrangement（B/A）and Authorization to Pay (A/P)
(2) During Construction	(1) Line connection of electricity and public water up to the point adjacent to the project site, (2) Utilization and safety control of the existing port activities associated with the execution of the construction works for the new international wharf, (3) Utilization control of the front water area of the project site, (4) Necessary arrangement and coordination on the procurement of local materials such as land filling material, when in some difficulty, (5) Securement of the dumping site, when necessary and (6) Approval for payment in accordance with the A/P and agreements.
(3) After Completion	(1) Proper and efficient utilization of the facilities constructed under the scheme of Grant Aid Cooperation, (2) Periodical inspection and maintenance management for the facilities of the new international wharf, (3) Relevant staff allocation to operation and maintenance for the new international wharf (4) Installation of cargo handling equipment necessary to operate the new international wharf and ensuring the personnel assignment and (5) Installation of fence and gate required under SOLAS convention.

3-3 Important Assumptions

The external conditions to develop and maintain the effect of the project after completion of facilities are as shown below.

(1) Proper utilization of the new international wharf as the exclusive wharf for container ships,

(2) No vessel's accident or alike occurs around the new international berth and the front water area to be an obstacle for the berth utilization,

(3) For effective utilization of the new international wharf, necessary cargo handling equipment and staff are procured and employed,

(4) Stable operation of SIPA as the implementation institution,

(5) No future change of sea conditions adjacent to the site,

(6) No large scale natural disaster occurred and

(7) No unexpected political uncertainty shall be emerged.

3-4 Project Evaluation

3-4-1 Relevance

(1) Present Situation and Issues of the Sector

Solomon Islands is comprised of 6 major islands such as Guadalcanal Island where Honiara of capital city is located, Malaita Island, New Georgia Island, Santa Isabel Island, Choiseul Island and San Cristobal Island and other about 1,000 of small islands where inter-inland sea transportation has substantially developed. Port and small scale landing facility are available in each island and the domestic feeder net-work is formed centering Honiara Port. Sea transportation becomes the life line for the isolated islands where the road condition is not well implemented. The international ports in Solomon Islands are Honiara port and Noro Port. 90% of the international cargoes are handled at Honiara Port.

Honiara Port is composed of international wharf and domestic wharves, both of which are managed and operated by Solomon Islands Port Authority (SIPA). As to the international wharf, 46m portion of total 120m of the berthing facility is supposed to be constructed for the general cargoes and unable to correspond to the container handling. Therefore, the loaded container is handled only on the 74m portion in the east side of the quay. And, domestic wharves with about 9 jetties for interisland transportation are located just behind the international wharf and many cargo and passenger boats, cargo boats and passenger boats take roles of inter-island sea transportation. Domestic wharf is also very crowded and SIPA is planning additional jetties and the expansion of land area. Tanker mooring buoys are located at offshore of the east side of domestic wharf and used by oil tankers required not to berth alongside.

International wharf in Honiara Port is consisted of one berthing facility with the extension of 120m and land facilities like container yard with about 3.0ha located at the back. The international wharf has been constructed as a general cargo wharf, therefore it is in the situation that cannot correspond to recent containerization as well as increasing size and number of calling vessels. As the result, various problems and issues become obvious and it is considered to be necessary to construct the second international wharf. Specific problems are listed as follows,

- Congestion of calling ships
- Low efficiency of cargo handling operation
- Safety of ship operation

In order to settle the above problems, it is considered to be necessary to construct the Second International Wharf in addition to the existing international wharf. And the necessity and the urgency of the project port facility construction are fully recognized.

(2) Consistency with Development Plans of Solomon Islands

In the national development strategy (2011 to 2022) made by the Government of Solomon Islands, a poverty and discrepancy reduction in the course of economic growth was aimed as one of the target, since the tribal conflict is supposed to be caused by the regional economic discrepancy. To facilitate the current situation, the economic activity and industrial promotion, the construction of economic and social infrastructures such as in the transportation, water supply, electricity and communications becomes urgent requirements. Particularly, the sea transportation is the life line to support the economic activities of this country. And the ports and harbors are absolutely imperative as the base for import and export as well as domestic cargoes, of which facilities become economic and social infrastructures to be closely connected with people's life. Therefore, in view of the ensuring social services to people and the access to the market, the improvement of the port facility and sea transportation services become inevitable for the economic growth of this country.

And, in the National Infrastructure Investment Plan (NIIP) summarizing the national infrastructure development plans, this project is ranked as higher priority project group out of the project implementation lists.

While, SIPA, the implementation agency, is now producing Master Plan for the port facilities and studying the effective land utilization in the port area taking the construction of the new international wharf by this project and forthcoming demands of port cargo into the consideration, including elimination and consolidation of warehouses, utilization of unused lands, construction of copra wharf and etc.

(3) Beneficial Effects

Upgrading and enhancement of the international wharf in Honiara Port through this project make the promotion of smooth import and export cargoes and contribute to the economic development of Solomon Islands with the realization of effective and efficient port operation and cargo handling works.

The construction of the new international wharf in Honiara Port is beneficial to the port staff and port users directly. Honiara Port handles the most of import and export cargoes of Solomon Islands which are distributed throughout the country, therefore all the people in Solomon Islands become beneficiary in an indirect sense.

Direct Beneficiary	: Port staff relevant to Honiara Port and port users
Indirect Beneficiary	: All 540 thousand people in Solomon Islands

(4) Constituency with Policies and Principals of Japanese Cooperation

As the aid policy of the Government of Japan to Solomon Islands, achievement of sustainable economic growth and upgrading people's life standard through the enhancement of social economic infrastructures are stated. In order to promote sustainable economic growth as

the strategic field, placing the priority to support the construction and maintenance on key economic and social infrastructures like transportation, traffic, power & energy, water supply and etc. that are imperative for people's living and economic activity are explained.

Upgrading and enhancement of the international wharf by this project are to contribute to the achievement of sustainable economic growth and promotion of people's life standard by enhancing social and economic infrastructures. In addition that, this project is for transportation and traffic that are strategic field and the consistency with the aid policies of the Government of Japan is ensured.

With the above, as this project widely contributes to the promotion of Basic Human Needs (BHN) and the poverty reduction, the relevancy of the implementation under the scheme of Grant Aid Cooperation by the Government of Japan can be confirmed for the part of this cooperation.

3-4-2 Effectiveness

(1) Quantitative Effects

The outcome of quantitative effects by this project is as shown in Table 3.4.2-1.

1) Elimination of Berth Waiting by Container Ships

With the implementation of the new international wharf in addition to the existing international wharf, Honiara Port equips two berths which facilitate the congestion of calling ships and eliminate basically berth waiting time of liner container ships.

As the result of survey from container ship call schedule to Honiara Port, 10 to 12 container ships are monthly calling to Honiara Port, out of which 4 to 5 vessels are monthly obliged to wait for berthing at the scheduled calling date due to the occupancy by other container ships. Such berth waiting time by container ships will be nearly solved under the double berth system combined with the existing wharf.

Criterion Number
= 4 to 5 ships/month (monthly calling container ships: 10 to 12)
Target Number
= nearly Zero

2) Improvement in Efficiency of Container Handling Operation

As the new international wharf implemented will enable the container handling operation through all the extension of the berth, geared cranes on container ship can be effectively operated and the efficiency of container cargo handling operation will be improved. In case of the existing wharf, the berth extension is shorter comparing to overall length of calling ships and container handling area is limited, which cause a drop of cargo handling efficiency due to

simultaneous operation of ship geared crane.

Criterion Number

= 1.5 cranes x 60 min. / 6 min. (crane cycle time) = 15 TEU/hour

Target Number

= 2.0 cranes x 60 min. / 6 min. (crane cycle time) = 20 TEU/hour

3) Upgrading Efficiency of Vehicles Handling Operation

Container ships equipped Ro-Ro ramp can be berthed to the new international wharf and the vehicles handling operation will be upgraded due to the direct discharge to the wharf by using Ro-Ro ramp. For the existing international wharf, Ro-Ro ramp cannot be used and the discharge operation of vehicles is done by staffing into containers.

Criterion Number

= 60 min. / 6 min. (cycle time) / vehicle = 10 vehicles/hour

Target Number

= 60 min. / 2 min. (cycle time) / vehicle = 30 vehicles/hour

4) Increase of Stacking Capacity of Containers

The exiting empty container yard is insufficient and the exiting container yard is expected not to accommodate the forthcoming increase of container handling volume. Since the increase of container stacking capacity by implementation of the new container yard and the expansion of the existing container yard by the project, congestion mitigation of the container yard and the correspondence to forthcoming increase of container handling volume become possible.

Criterion Number

= Grand Slot Capacity : 408 TEU-Gs, Yard Capacity: 22,035 TEU/year

Target Number

= Grand Slot Capacity : 609 TEU-Gs, Yard Capacity: 33,341 TEU/year

Table 3.4.2-1 Quantitative Effects

Index	Criterion Number (Year 2013)	Target Number (Year 2019)
1) Number of Waiting Container Ships for Berth	4 to 5 ships/month	Nearly 0 ship/month
2) Efficiency of Container Handling Operation (Number of Container Handled per Hour)	15 TEU/hour	20 TEU/hour
3) Efficiency of Vehicle Discharge from Ro-Ro Ship (Number of Vehicle Discharged per Hour)	10 vehicles/hour	30 vehicles/hour
4) Increase of Stacking Capacity of Container Yard	22,035 TEU/year (Insufficient Shortly)	33,341 TEU/year (Sufficient for Target Year)

(2) Qualitative Effects

The outcomes of qualitative effects by this project are as shown below.

1) Promotion of Logistics

The function as the international port is enhanced and the logistics are promoted by inputting the new international wharf.

2) Reduction of Transportation Cost

Reduction of transportation cost can be expected by upgrading the safety and efficiency of container handling operation in Honiara Port.

3) Shortening of Port Time and Elimination of Berth Waiting Time

As a benefit for shipping companies, shortening of port time and elimination of berth waiting time of calling container ships are expected by implementation of the project.

With the above contents, the relevancy of this project is sufficient and the efficiency is considered to be significant.