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資料1 : 調査団員・氏名

(1) 第1次現地調査

役職	氏名	所属
総括	今井 健	JICA 社会基盤・平和構築部 運輸交通・情報通信グループ 第一チーム 企画役
計画管理	山上 啓介	JICA 調達部 契約第三課兼第一課
業務主任／港湾計画1	岩間 賢一	(株) オリエンタルコンサルタンツグローバル
副業務主任／港湾計画2／調達・施工計画／積算	室井 高明	(株) オリエンタルコンサルタンツグローバル
港湾施設設計1	松浦 榮一	(株) I d e s
港湾施設設計2	小林 誠	(株) オリエンタルコンサルタンツグローバル
建築計画・設計	堀米 康男	(株) オリエンタルコンサルタンツグローバル (堀米設計)
自然条件調査	野崎 裕志	(株) オリエンタルコンサルタンツグローバル (個人コンサルタント)
	白取 進吾	(株) オリエンタルコンサルタンツグローバル
環境社会配慮	佐藤 剛	(株) I d e s

(2) 住民説明会（公聴会）への追加派遣

役職	氏名	所属
副業務主任／港湾計画2／調達・施工計画／積算	室井 高明	(株) オリエンタルコンサルタンツグローバル
環境社会配慮	佐藤 剛	(株) I d e s

(3) 第2次現地調査

役職	氏名	所属
総括・計画管理	松山 哲	JICA 資金協力業務部 実施監理第一課 企画役
技術参与	櫻井 進士	JICA 国際協力専門員
業務主任／港湾計画1	岩間 賢一	(株) オリエンタルコンサルタンツグローバル
副業務主任／港湾計画2／調達・施工計画／積算	室井 高明	(株) オリエンタルコンサルタンツグローバル

資料2 : 調査工程

(1) 第1次現地調査 (2014年8月22日~10月4日)

日数	月日	曜	線 路	計画管理	業務主任/船務計画1	業務主任/船務計画2/調 達・施工計画/業務	環境社会配慮	港湾施設設計1	港湾施設設計2	建築計画・設計	自然状況調査		
			今井 隆	山上 啓介	後藤 賢一	高井 清明	佐藤 剛	松浦 崇一	小林 誠	福米 康男	神崎 裕志	白取 通吾	
1	8/22	金	移動(N2090 成田18:30発)										
2	8/23	土	移動(N2090 オークランド着 08:15, N2270 オークランド発09:35 →スタアロフ着 13:25) 【6】サイト状況調査										
3	8/24	日	団内会議										
4	8/25	月	大使館、JICA【3】インセプション説明【4】プロジェクトの背景・目的、内容の確認							【7】環境社会配慮調査/ 【8】サイト状況調査			
5	8/26	火	MOL、TPA協議【9】無償資金説明【6】サイト状況調査				【7】自然条件調査等委託先選定		同上				
6	8/27	水	MOL、TPA、ミンツ協議【6】サイト状況調査				同上		同上				
7	8/28	木	MOL、TPA、ミンツ協議				同上		同上				
8	8/29	金	MOL、TPA ミンツ報告、JICA、大使館報告				同上		同上				
9	8/30	土	移動 スタアロフ発		資料整理		同上		移動(N2090 成田18:30発)				
10	8/31	日	団内会議										
11	9/1	月	【5】地データー調査【6】サイト状況調査				【7】環境社会配慮調査/ 【8】サイト状況調査		【6】サイト状況調査				
12	9/2	火	同上		【5】地データー調査【6】サイト状況 調査【7】自然条件調査		同上		同上				
13	9/3	水	同上		同上		同上		同上				
14	9/4	木	同上		同上		同上		同上				
15	9/5	金	同上		同上		同上		移動(N2090 成田18:30発)				
16	9/6	土	資料整理		同上		同上		移動(N2090 オークランド着 8:15, N2270 オークランド発09:35 →スタアロフ着 13:25)				
17	9/7	日	団内会議 【6】サイト状況調査										
18	9/8	月	【6】サイト状況調査		【6】サイト状況調査 【7】自然条件調査		【7】環境社会配慮調査/ 【8】サイト状況調査		【6】サイト状況調査		【6】自然状況調査 【8】サイト状況調査		
19	9/9	火	同上		【10】調査調査 【7】自然条件調査		同上		同上		移動(N2090 オークランド着 8:15, N2974 オークランド発18:20→スタアロフ 着 22:10)		
20	9/10	水	同上		同上		同上		同上		【6】自然状況調査/ 【8】サイト状況調査		
21	9/11	木	同上		同上		同上		同上		同上		
22	9/12	金	【9】基本方針の検討		【9】基本方針【11】施工調査		同上		【9】基本方針の検討		同上		
23	9/13	土	同上		同上		同上		同上		同上		
24	9/14	日	団内会議										
25	9/15	月	【9】基本方針の検討		【9】基本方針【11】施工調査		【7】環境社会配慮調査/ 【8】サイト状況調査		【9】基本方針の検討		【6】自然状況調査/ 【8】サイト状況調査		
26	9/16	火	同上		同上		同上		同上		同上		
27	9/17	水	同上		同上		同上		同上		同上		
28	9/18	木	同上		同上		同上		同上		同上		
29	9/19	金	同上		同上		同上		同上		移動(N2090 成田18:30発)		
30	9/20	土	同上		同上		同上		同上		移動(N2090 オークランド着 8:15, N2974)		
31	9/21	日	資料整理										
32	9/22	月	団内会議										
33	9/23	火	【9】基本方針【12】運営維持管理		【9】基本方針【11】施工調査		【7】環境社会配慮調査/ 【8】サイト状況調査		【9】基本方針【12】運営維持管理		【9】基本方針、報告書作成		
34	9/24	水	同上		同上		同上		同上		【6】自然状況調査、報告書		
35	9/25	木	同上		同上		同上		同上		同上		
36	9/26	金	同上		調査結果報告(対MOL、PAT)		同上		同上		同上		
37	9/27	土	資料整理、報告書作成				同上		移動(N2099 オークランド発 08:30→成田着 16:50)		資料整理、報告書作成		
38	9/28	日	団内会議										
39	9/29	月	ミンツ、報告書取纏め/各担当業務				同上		【9】基本方針、報告書作成		【6】自然状況調査、報告書		
40	9/30	火	TPA協議/報告書取纏め/各担当業務				同上		同上		移動(N20977 22:10スタアロフ発→オーク ランド着01:15)		
41	10/1	水	TPA、JICA、大使館報告、 移動(N20975 12:05スタアロフ発→オークランド着15:10)				同上		同上		移動(N2099 オークランド発 09:15→成田着 16:50)		
42	10/2	木	移動(N2099 オークランド発 09:15 →成田着 16:50)				同上		同上		同上		
43	10/3	金	同上				移動(N20977 22:10スタアロフ発→オーク ランド着01:15)		移動(N20977 22:10スタアロフ発→オーク ランド着01:15)		同上		
44	10/4	土	同上				移動(N2099 オークランド発 09:30→成田着 16:50)		移動(N2099 オークランド発 09:30→成田着 16:50)		同上		

(2) 住民説明会（公聴会）への追加派遣（2014年11月2日～11月11日）

日数	月日	曜	副業務主任／港湾計画2 ／調達・施工計画／積算	環境社会配慮
			室井 高明	佐藤 剛
1	11/2	日	移動(NZ090 成田発18:30→オークランド着09:20)	
2	11/3	月	移動(NZ970 オークランド発10:15→ヌクアロファ着13:10)	
3	11/4	火	MOI協議、JICA打合せ、PAT協議	
4	11/5	水	PAT、MOI、MOE協議	
5	11/6	木	公聴会準備・開催	
6	11/7	金	水産局協議、PAT協議	
7	11/8	土	現場視察、社内協議	
8	11/9	日	資料整理	
9	11/10	月	移動(NZ973 ヌクアロファ着14:25→オークランド着09:20)	
10	11/11	火	移動(NZ099 オークランド発 09:45 →成田着 16:55)	

(3) 第2次現地調査（2015年2月9日～2月19日）

日数	月日	曜	総括・計画管理	技術参与	業務主任/港湾計画1	副業務主任／港湾計画2 ／調達・施工計画／積算
			松山 哲	櫻井 進士	岩間 賢一	室井 高明
1	2/9	月			移動(KE706 成田発 09:10)	
2	2/10	火	移動(SQ11成田発 20:50)		移動(VA167ヌクアロファ着13:45)	
3	2/11	水	移動(NZ167ヌクアロファ着19:45)		JICA、PAT協議	
4	2/12	木	JICA、MOI協議、PAT協議、現場視察			
5	2/13	金	JICA、M/D署名			
6	2/14	土	FISA訪問、オトワンガオファ号および現地視察			
7	2/15	日	資料整理、社内打ち合わせ			
8	2/16	月	JICA、日本大使館報告、移動(ヌクアロファ発)		JICA、日本大使館説明	
9	2/17	火	移動(成田着)		FISA協議、JICA、MOI挨拶	
10	2/18	水			MOE協議、PAT協議、JICA、移動(NZ977ヌクアロファ発 20:25→オークランド着23:20)	
11	2/19	木			移動(KE130 オークランド発 09:55 →成田着 20:45)	

資料3 : 相手国関係者リスト

主要相手国関係者リストを下に示す。

社会基盤省 (Ministry of Infrastructure: MOI)

Lord Tu'i Vakano	Prime Minister
Mr. Ringo K Fa'oliu	Chief Executive Officer
Ms. Kelera Tonga	Director of Marine & Ports Division
Mr. Tevita Lavemai	Acting Director for Land Transport Division

財務計画省 (Ministry of Finance and National Planning: MOFNP)

Dr. 'Aisalce Eke	Minister
Mr. Tatafu Moeaki	Chief Executive Officer

トンガ港湾公社 (Port Authority Tonga: PAT)

Mr. Mossese Lavemai	General Manager
Mr. Iketau Kaufusi	Infrastructure & Technical Manager
Mrs. Mele Havea Lavemaau	Human Resources Manager
Capt. Hakaumotu Fakapelea	Port Master
Capt. Potesio Tu'angalu	Assistant Pilot

公共事業省 (Ministry of Public Enterprise: MOPE)

Hon. Fe'ao Vakata	Minister
Mr. Siaosi Sovaleni	Chief Executive Officer

環境・情報省 (Ministry of Environment and Communication: MEC)

Hon. Samiu Vaipulu	Minister
Ms. Paula Mau	Chief Executive Officer
Mr. Sione Tukia Lepa	Chief Environment Officer

国家空間計画局 (National Planning Authority Office : NPA)

Lord Ma'afu	Minister of National Planning Authority
Mr. Tukua Tonga	Chief Operating Officer

国内貨客輸送船舶運航公社 (Friendly Island Shipping Agency Limited: FISA)

Mr. Viliami Vakautapola VI

General Manager

Capt. Koli Loa'amanu

Capten of M.V.Otuanga'ofa

国内貨客輸送船舶運航会社 (民間船社) (UATA Shipping Company)

Mr. Etuate Uata

General Manager

在トンガ日本国大使館

葉室和親

特命全権大使

JICA トンガ支所

木川 浩史

支所長

石黒 要

企画調査員

資料4 : 討議議事録 (M/D)

次頁に討議議事録 (写) を添付する。


**Minutes of Discussions
on the Preparatory Survey
for the Project for
Upgrade of Wharf for Domestic Transport**

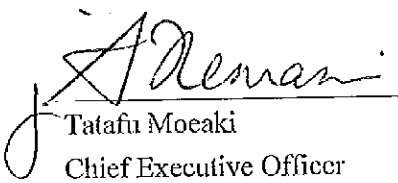
In response to the request from the Government of Kingdom of Tonga (hereinafter referred to as "Tonga"), the Government of Japan decided to conduct a Preparatory Survey on "The Project for Upgrade of Wharf for Domestic Transport" (hereinafter referred to as "the Project"), and entrusted the Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

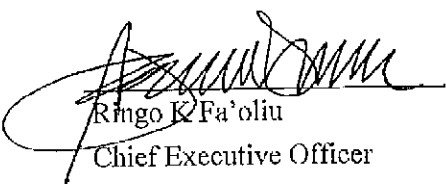
JICA sent the Preparatory Survey Team to Tonga for the Outline Design (hereinafter referred to as "the Team"). The Team is headed by Mr. Ken IMAI, Advisor, Infrastructure and Peace building Department, JICA, and is scheduled to stay in the country from 22nd August to 3rd October, 2014.

The Team held a series of discussions with the officials concerned of Tonga and conducted a field survey in the Project Site. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Nuku'alofa, August 29th, 2014


Ken IMAI
Leader of Preparatory Survey Team
Japan International Cooperation
Agency
Japan


Tafa'u Moeaki
Chief Executive Officer
Ministry of Finance and National
Planning
Tonga


Ringo K'Fa'oliu
Chief Executive Officer
Ministry of Infrastructure
Tonga

ATTACHEMENTS

1. Objective of the Project

The objective of the Project is to improve handling efficiency in order to ensure safety of Nuku'alofa port through separating domestic and international cargos.

2. Project Site

The Project Site is Fuaa Wharf in Nuku'alofa, the capital city of Tonga (Annex-1).

3. Executing and Implementing Agencies

The Executing Agency for the Project is the Ministry of Finance and National Planning, and Implementing Agency for the Project is the Ministry of Infrastructure (hereinafter MOI).

The each Agency charts are shown in Annex-2.

4. Scope of the Project agreed by both sides

4-1. The Tonga side and the Team reconfirmed that the component of upgrade of Nafanua Wharf would not be included in the Project, and the Team would conduct the Preparatory Survey focusing on the component of upgrade of Fuaa Wharf(Annex-6).

4-2. Tonga side and the Team agreed to change the Project Site location to western side sea area of Fuaa Wharf.

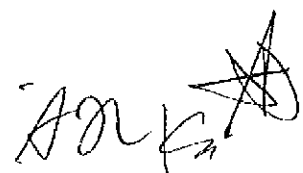
As a result, Tonga side requested construction of a new wharf for a large size vessel at Project Site.

JICA will assess the appropriateness of the request through the Preparatory Survey and will report the findings to the Government of Japan. As a result of the Preparatory Survey, JICA will decide whether the Environmental Category needs to be changed or not.

The Tonga side understands the general rule of Japan's Grant Aid Scheme that final approval of the Project will be decided by the Government of Japan.

5. Japan's Grant Aid Scheme

5-1. The Team informed to the Tonga side about the Japan's Grant Aid Scheme and necessary measures to be taken by Tonga. The Team explained the procedures for

A handwritten signature in black ink, followed by a circular stamp containing a star-like symbol.

the Project described in Annex-3 and 4.

- 5-2. Tonga side will take the necessary measures, as described in Annex-5 for smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented.

6. Environmental and Social Considerations

- 6-1. The Team explained that the Environmental Category of this project is categorized as "Category B" at this moment. However, there is a possibility that JICA will change the Category from B to A in future, if any major environmental impact is identified during the course of the Survey such as existence of large-scale and/or endangered coral species in the Project Site. Tonga side will take necessary measures in accordance to JICA Environmental and Social Consideration Guideline, and the Team will support Tonga side.

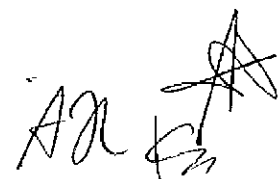
Tonga side agreed that the current project schedule would be delayed and the terms of the Survey extended if the Environmental Category changes from B to A, because of necessary additional procedure and surveys. JICA will inform the result of the Environmental Category decision on Tonga side as soon as possible after the completion of this field survey.

- 6-2. MOI is responsible for obtaining environmental permit of this Project, required under the Environmental Impact Assessment Act 2003. This includes preparation and submission of Proposal notification (Form 1), EIA report and other documents requested by the Ministry of Environment and Communication (hereinafter MEC). The Proposal notification should be submitted to MEC by the end of September 2014, and notify JICA the results of MEC's decision as soon as possible. MOI will also be responsible for organizing public involvement activities (e.g. public consultation meeting) required under the Environmental Impact Assessment Regulation 2010. The Team will provide MOI necessary technical assistance and all the environmental information collected during the course of the Survey. MOI should obtain environmental permit by February 2015 at the latest, unless there is any delay in the works and schedule of the Team, or the changing of the Environmental Category.

7. Schedule of the Survey

Assuming the Environmental Category for this project is "B", Tonga side and the Team agreed to the schedule below.

- 7-1. The Team will proceed with further field survey until 3rd October, 2014.



7-2. JICA will prepare the draft report and the draft specification and dispatch a mission in order to explain their contents around February, 2015.

7-3. If the contents of the draft final report are accepted in principle by the Tonga side, JICA will complete the final report and send it to Tonga around the late part of March, 2015.

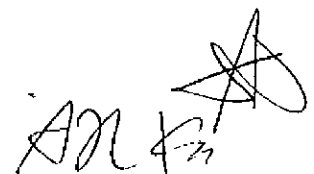
8. Other Relevant Issues

8-1. Tonga side shall, at its own expense, provide the Team with the following items for the convenience of the Survey.

- (1) Security-related information as well as measures to ensure the safety of the Team.
- (2) Information as well as support in obtaining medical service.
- (3) Data and information necessary for the Survey.
- (4) Counterpart personnel.
- (5) Entry permits necessary for the Survey team members to conduct field surveys.
- (6) Work space and internet for the Team

8-2. Tonga side accepted that the following undertakings should be taken by the Tonga side at the Tonga's expenses under the Project if implementation of the Project is approved by the Government of Japan.

- (1) To provide tax exemption for construction materials and equipment for the Project.
- (2) To secure sites for material storing yard, temporary construction yard and waste disposal.
- (3) To remove or relocate not abandoned ships or existing utilities or waste within the Project Site to designated area or Project affected area, before Pre-Qualification (PQ) of the Project.
- (4) To implement coral relocation before PQ, if needed.
- (5) To arrange issuance of license, permission and other necessary procedures (including acquisition of the permit and licenses for disposal of dredged materials) for the Project.
- (6) To secure enough budget and personnel necessary for the operation maintenance of the facilities implemented by the Project, including the periodical maintenance work after the completion of the Project.



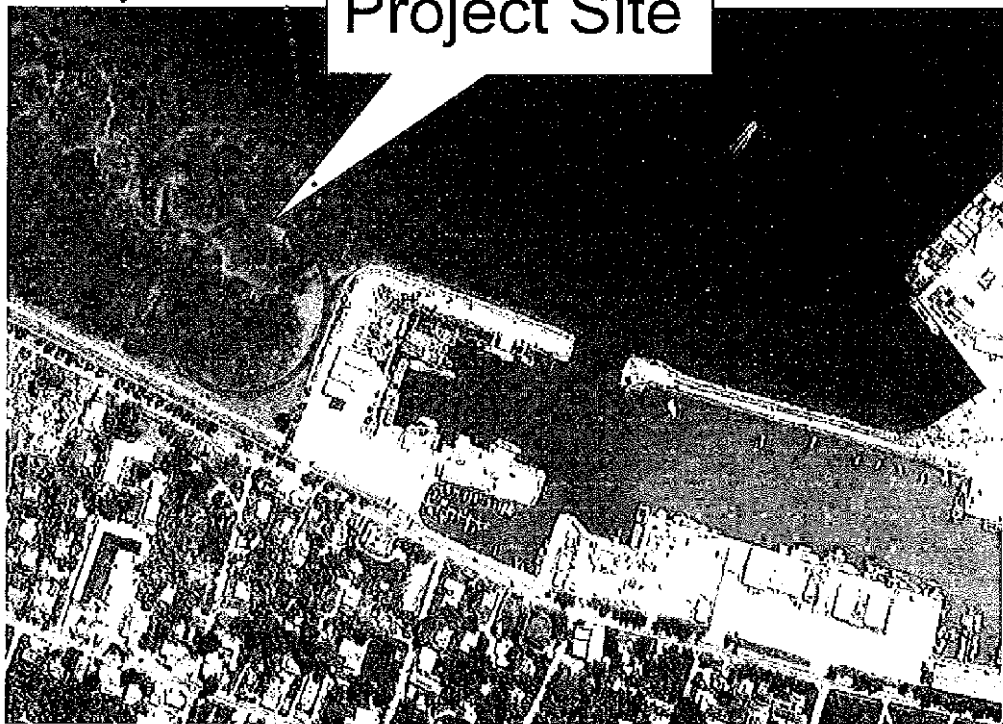
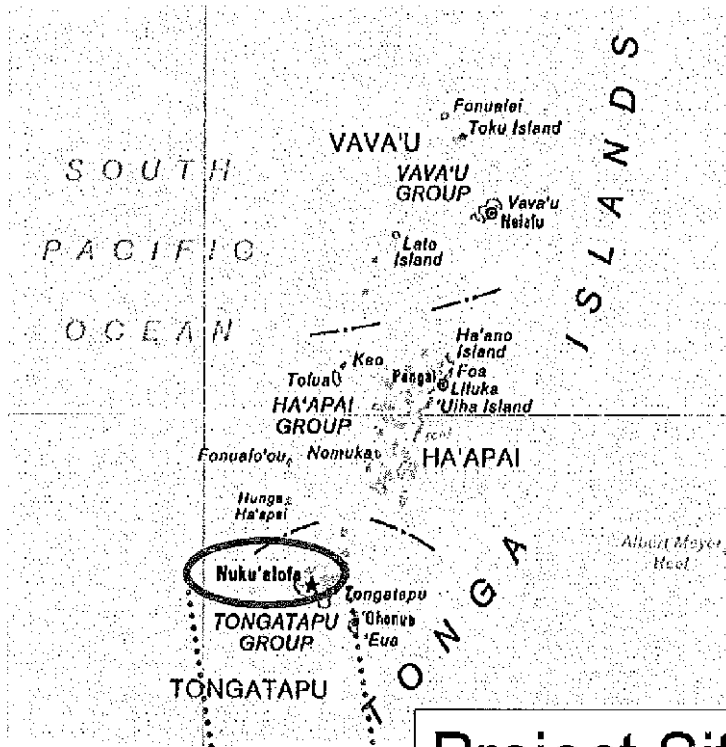
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- Annex-1 Project Site
- Annex-2 Organization Chart
- Annex-3 Japan's Grant Aid
- Annex-4 Flow Chart of Japan's Grant Aid Procedures
- Annex-5 Major Undertakings to be taken by Each Government
- Annex-6 Summary of Preliminary Survey on the Project for Upgrade of Domestic Wharves



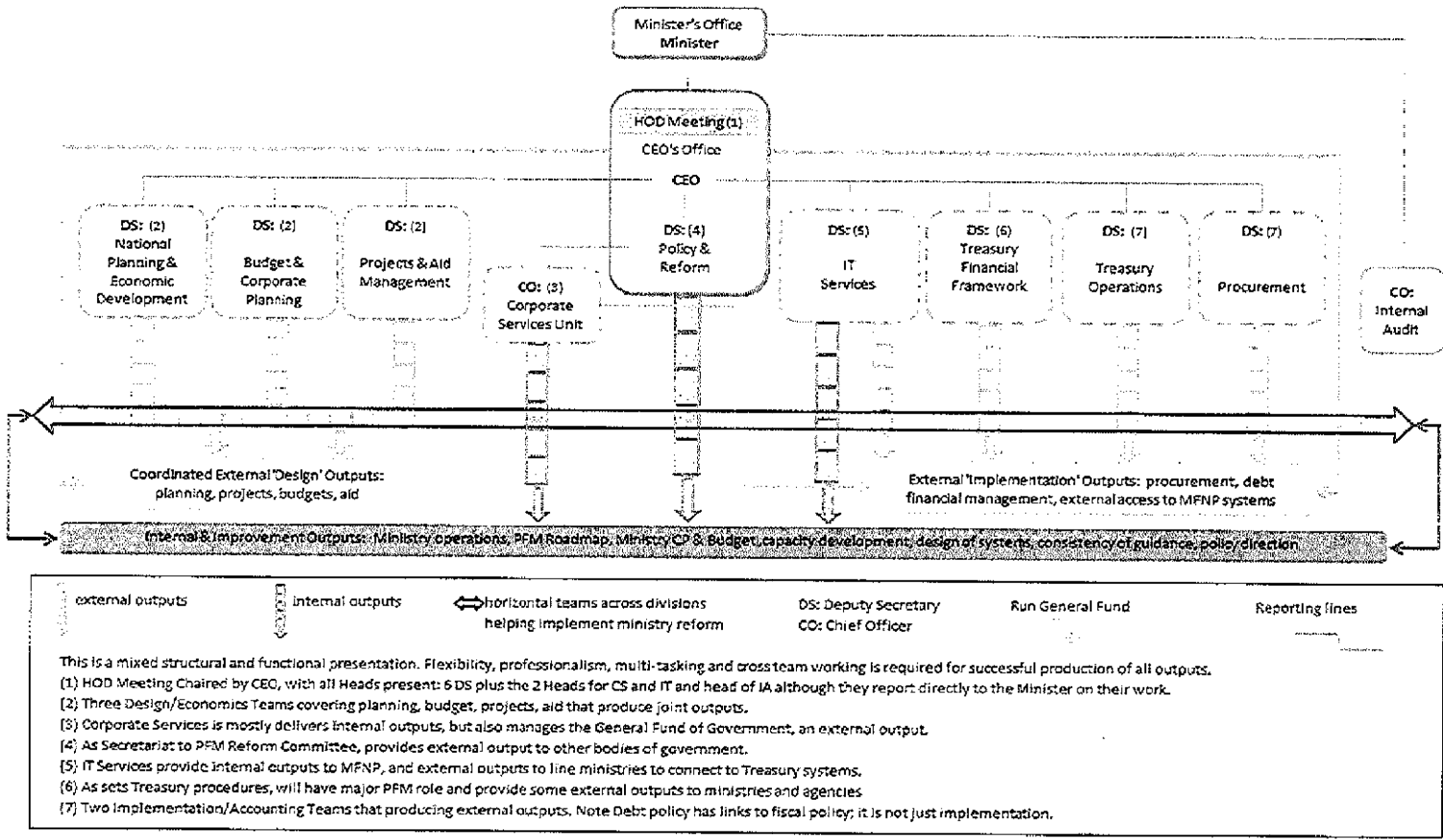
Annex-1

Project Site



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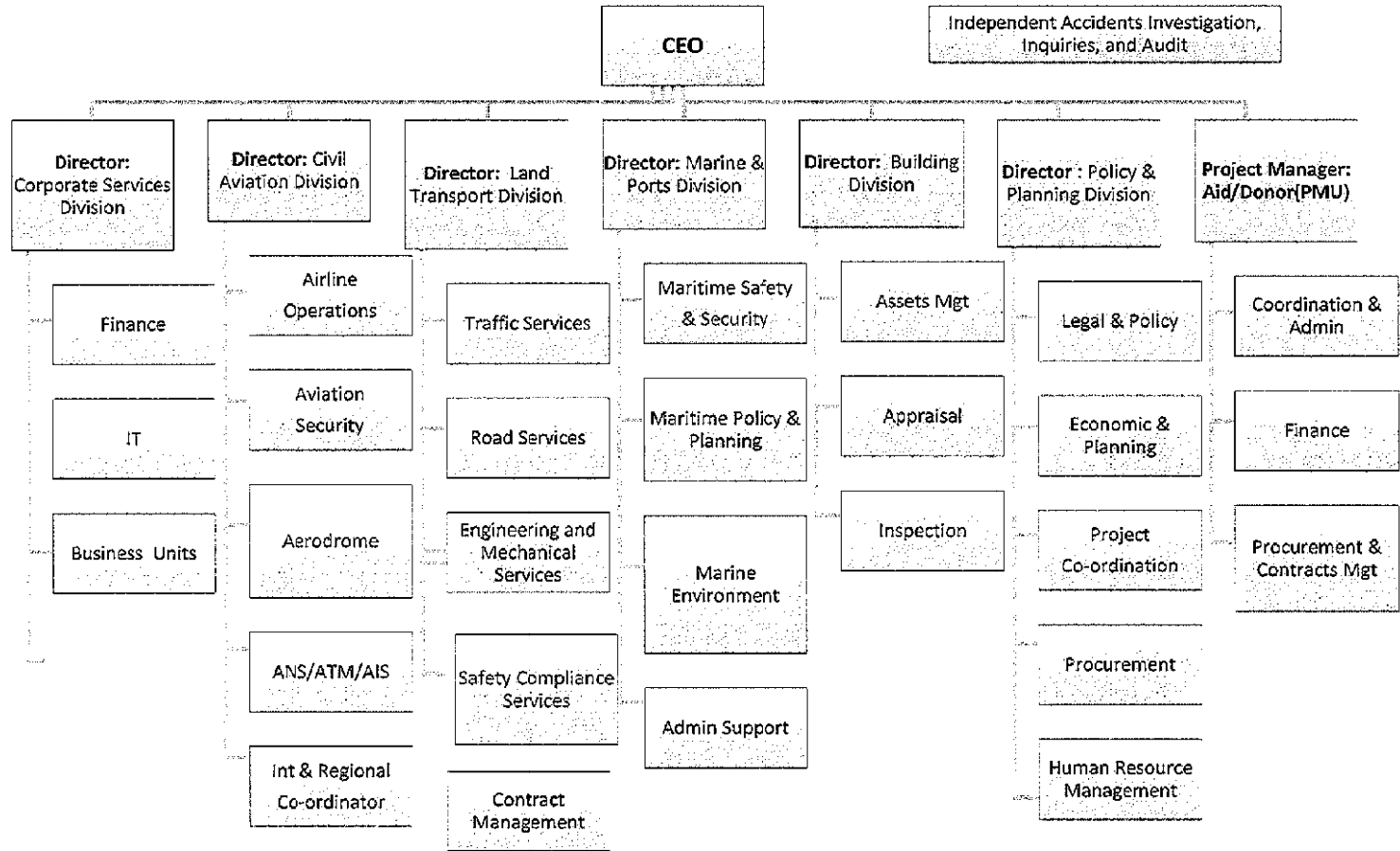
Organizational and Functional Structure: Ministry of Finance and National Planning



Annex2-1

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Organizational and Functional Structure: Ministry of Infrastructure



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Annex 2-2

Annex-3

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for



the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

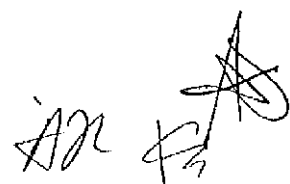
The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey



JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country



In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

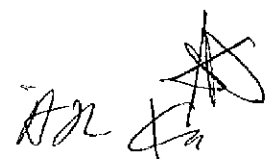
b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

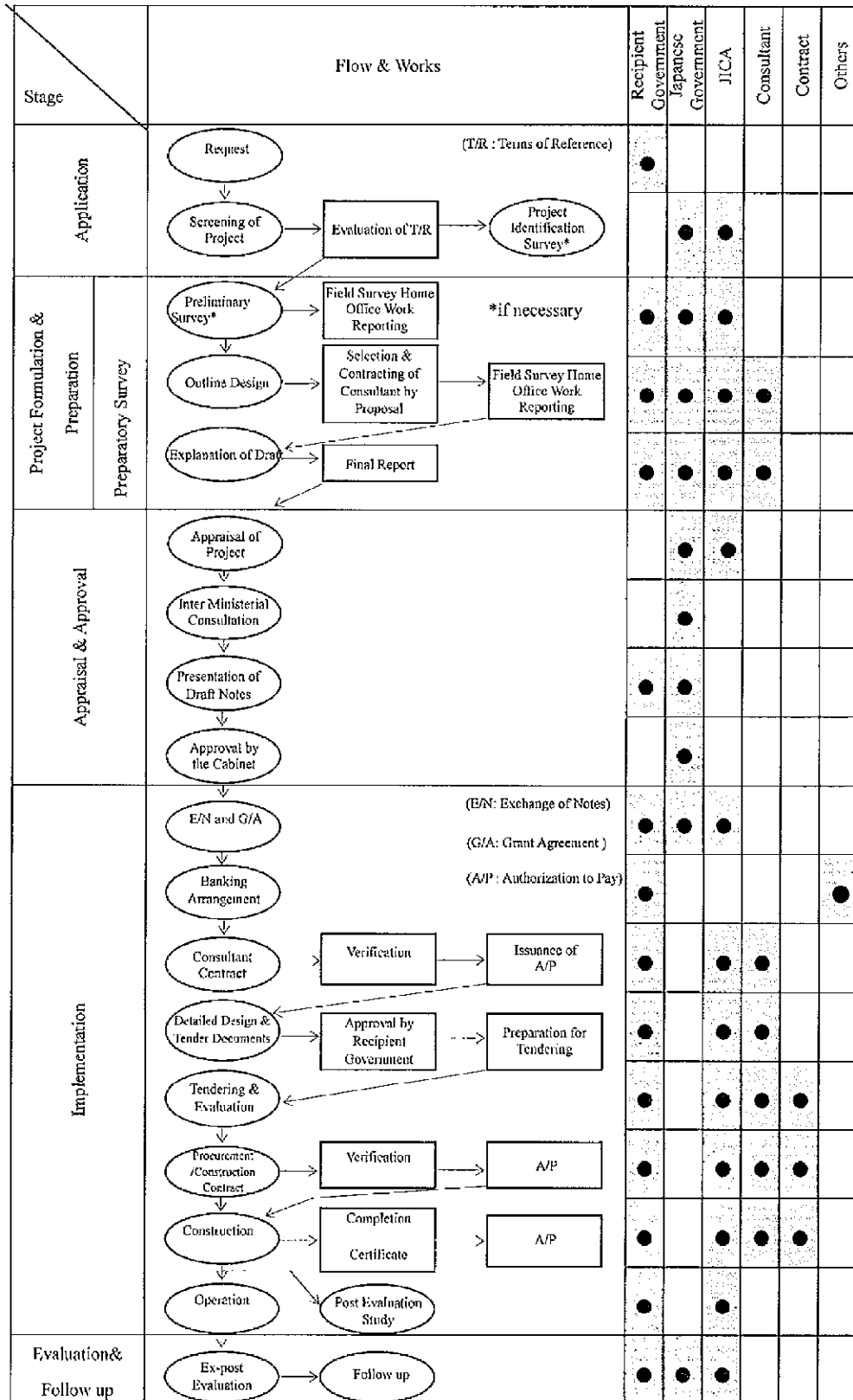
(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

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Annex-4

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



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Annex-5

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure a lot of land and sea necessary for the implementation of the Project and to clear the site		●
2	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Internal transportation from the port of disembarkation to the project site		●
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
4	To accord Japanese physical persons and / or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
5	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		●
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
8	To give due environmental and social consideration in the implementation of the Project.		●
9	To remove or relocate not used ships or existing utilities or waste within the Project site to designated area or Project affected area, before PQ tender of this project		●
10	To take some measures against corals that lies in Project site (if necessary), before PQ tender of this project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

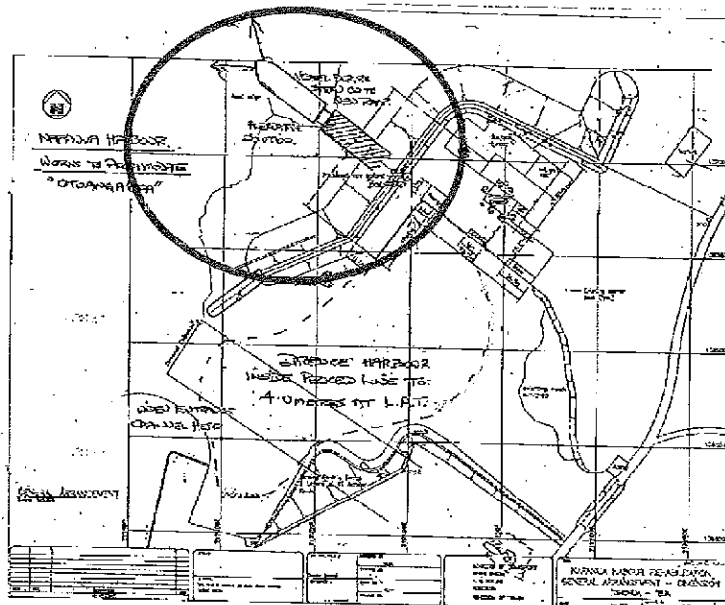
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Annex-6

Summary of Preliminary Survey on the Project for Upgrade of Domestic Wharves

The result of the Preliminary Survey on the Project for Upgrade of Domestic Wharves on February 2014 is as follows;

1. The component of upgrade of Fuaa Wharf is crucial to ensure safety of domestic passengers and cargoes, and it is expected technically feasible. In this sense, the preparatory survey will cover this component.
2. However, under the constrain of the budget, the component of upgrade of Nafanua Wharf seems technically and economically difficult due to the following aspects, which simply consists of outer extension (shown below with red circle) of a new wharf to accommodate "Otuanga'ofa".
 - Calmness of the ocean waters cannot be secured outside the harbor to safely accommodate "Otuanga'ofa" as well as "Onemoto".
 - The new wharf is expected to be used only a few days a year to accommodate "Otuanga'ofa".



3. Therefore, the component of upgrade of Nafanua Wharf will not be included in the preparatory survey.
4. In short, Japan will conduct the preparatory survey focusing on the component of upgrade of Fuaa Wharf.

AN

Memorandum of Discussions for the Outline Design
on the Preparatory Survey
for the Project for
Upgrade of Wharf for Domestic Transport

Ministry of Infrastructure (hereinafter referred to as “MOI”) and the joint venture of the Oriental Consultants Co., Ltd and Ides Inc. on behalf of the JICA Preparatory Survey Team (hereinafter referred to as “the Team”) are confirmed the following items to conduct a Preparatory Survey on “The Project for Upgrade of Wharf for Domestic Transport” (hereinafter referred to as “the Project”).

1. Outline Design

The outline design of the Project will be conducted in Japan based on the Minutes of Discussions which was signed on August 29, 2014 between the JICA and the Tongan Government (hereinafter referred to as “the Minutes”) and the survey results which was conducted by the Team during their stay in Tonga from August 22 to October 3, 2014.

The Team explained to MOI about their survey results and preliminary concept for the outline design of the Project as hereunder. However, contents, components, scale, dimensions and other details of the Project are subject to further study to be finalized based on the discussions in Japanese side.

(1) Port Layout Plan

The port layout was planned as shown in Annex-1 as “General Concept of Port Layout Plan”. The main facilities of the new wharf will be as follows.

- a) Breakwater: Approx. 200 m
- b) Approach Channel: Depth -4.0 m, Width 60 m
- c) Turning Basin: Depth -4.0 m, Area Diameter 120 m
- d) Wharf: L=110 m x B=45 m for M.V. Otuanga’ofa
L=110 m x 25 m for Private Ferry
L=145 m x 15 m for Other Cargo Ships
- e) Terminal Building for Domestic Ferry Passengers: 1 No.
- f) Parking Lots: 1 Lot
- g) Access Road and Walkway: 1 Lot
- h) Yard Lighting Facilities: 1 Lot
- i) Fences and Gates: 1 Lot
- j) Navigational Aids: 1 Lot

The structural type of wharf will be “Sheet Pile Quaywalls” as shown in Annex-2 (Typical Cross-section of Wharf and Breakwater) by the results of the comparative examination. The structural type of breakwater will be a rubble mound breakwater with armor stones. The length and detailed structures of breakwater will be reviewed by the results of the wave analysis which are conducted in Japan.



(2) Terminal Building Plan

The architectural design for Terminal Building is planned as shown in **Annex-3**. Outline of the main functions of the building will be as follows.

- a) Ground Floor: Waiting Hall for the Passenger, Entrance Hall, Ticket Counter and Office, Toilet (20 booths for female, 5 booths and 15 urinals for male), Pump room.
- b) 1st Floor: Restaurant, Kitchen, Toilet, Electrical and Machinery rooms. Restaurant will contribute to the regional activation by its ability to pull in more customers. This floor will be connected to Promenade Deck served as Tsunami Evacuation Deck for the people.
- c) 2nd Floor: Offices for Terminal Operation.
- d) Total floor area will be approx. 2,060m², and 3-story building.
- e) Big Roof can be utilized for Solar Photo Panel and maintenance route.
- f) Waiting Hall, Restaurant and Entrance Hall can accommodate approx. 700 passengers, which are decided by the results of field survey and the study of the traffic data evaluation.
- g) Evacuation Deck for the people on the 1st Floor approx.165m² equipped with Evacuation Slope and exterior, interior stair ways, those facilities combined with restaurant can accommodate more than 700 people in the time of tsunami disaster.
- h) Natural ventilation system will be completely adapted for waiting hall and restaurant.
- i) Emergency Generator and Transformer will be set on 1st Floor to avoid intrusion.
- j) Rain-water harvesting system will be introduced using underground water tank.

2. Major Undertakings by Tongan Side

MOI accepted that the following undertakings should be taken by the Tongan side at the Tonga's expenses under the Project if implementation of the Project is approved by the Government of Japan.


- (1) To remove or relocate the abandoned ships, existing utilities and wastes within the Project Site as shown in **Annex-4** before Pre-Qualification (PQ) of the Project.
- (2) To secure and clear the sites for material storing yard and temporary construction yard as shown in **Annex-5**.
- (3) To secure and clear the waste disposal yard for the dredged materials as shown in **Annex-5**.
- (4) The following items for the terminal building should be excluded from the Project.
 - Kitchen instrument
 - Electric appliance except lighting equipment, outlets, air-conditioners, fire-alarm boxes, air fans, telephone outlet
 - Movable furniture

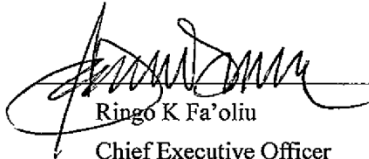
The fixed furniture will be finalized within the project budget based on the discussions in Japanese side.

Above items were confirmed and agreed between MOI and the Team.

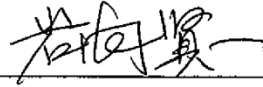
Nuku'alofa, September 26, 2014

Page 2 of 3





Ringó K. Fa'oliu
Chief Executive Officer
Ministry of Infrastructure
Tonga



Kenichi Iwama
Chief Consultants
Oriental Consultants Co., Ltd.
on behalf of JICA Study Team

< Attachment >

Annex-1: General Concept of Port Layout Plan

Annex-2: Typical Cross Section of Wharf and Breakwater

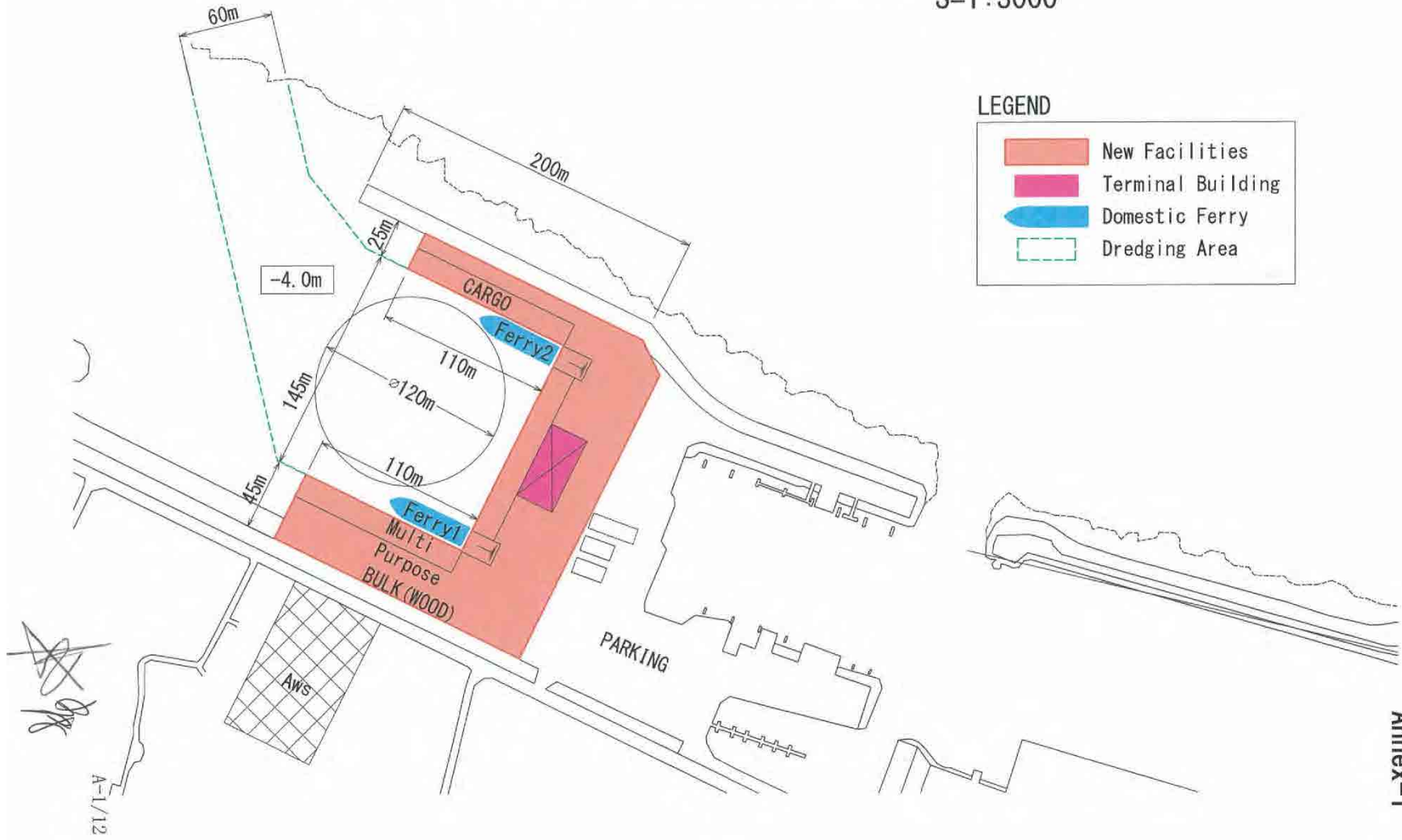
Annex-3: Terminal Building Plan

Annex-4: Ships, Utilities and Wastes to be removed in Fuaa Wharf

Annex-5: Location of Material Storage Yard, Temporary Construction Yard and Waste Disposal Yard

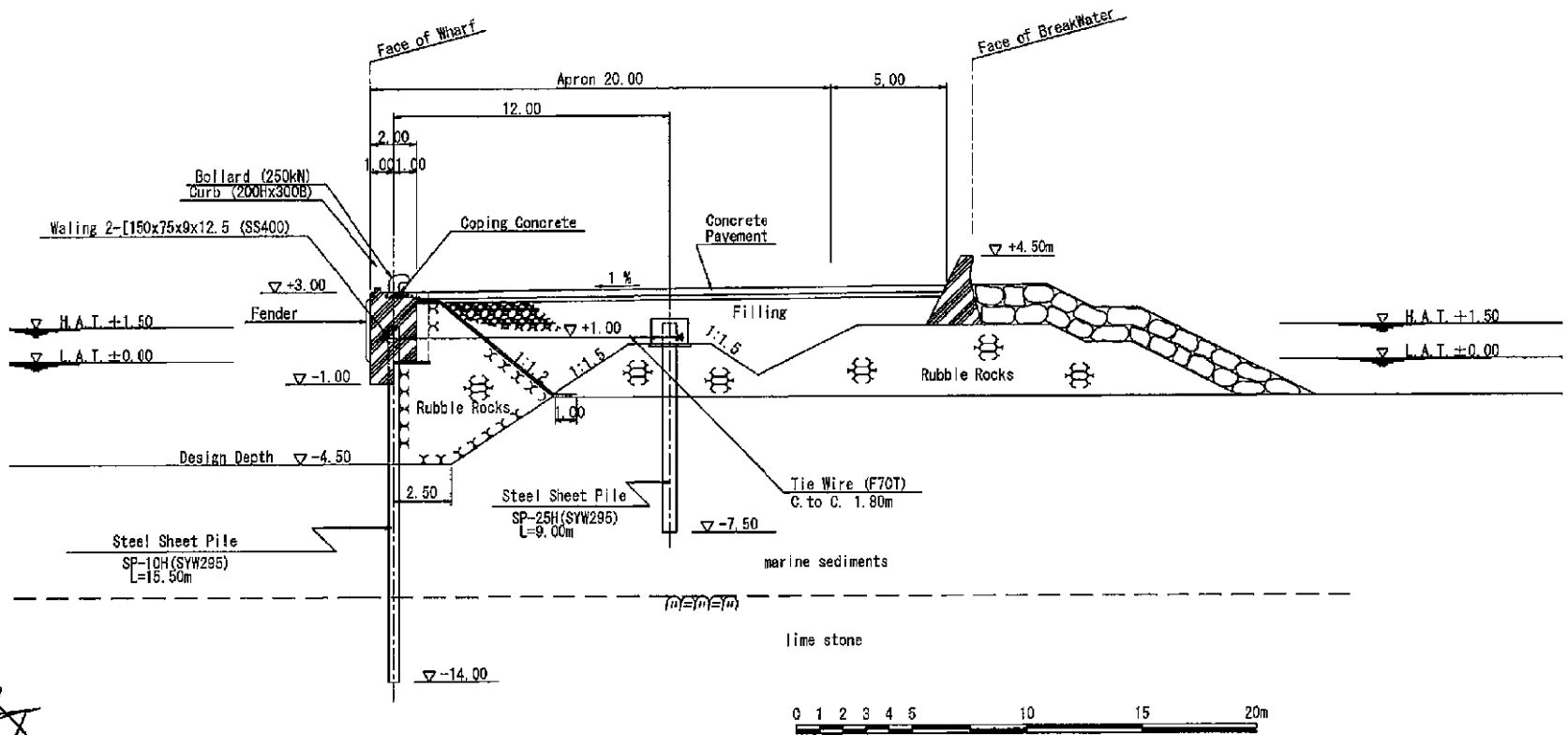
General Concept of Port Layout Plan

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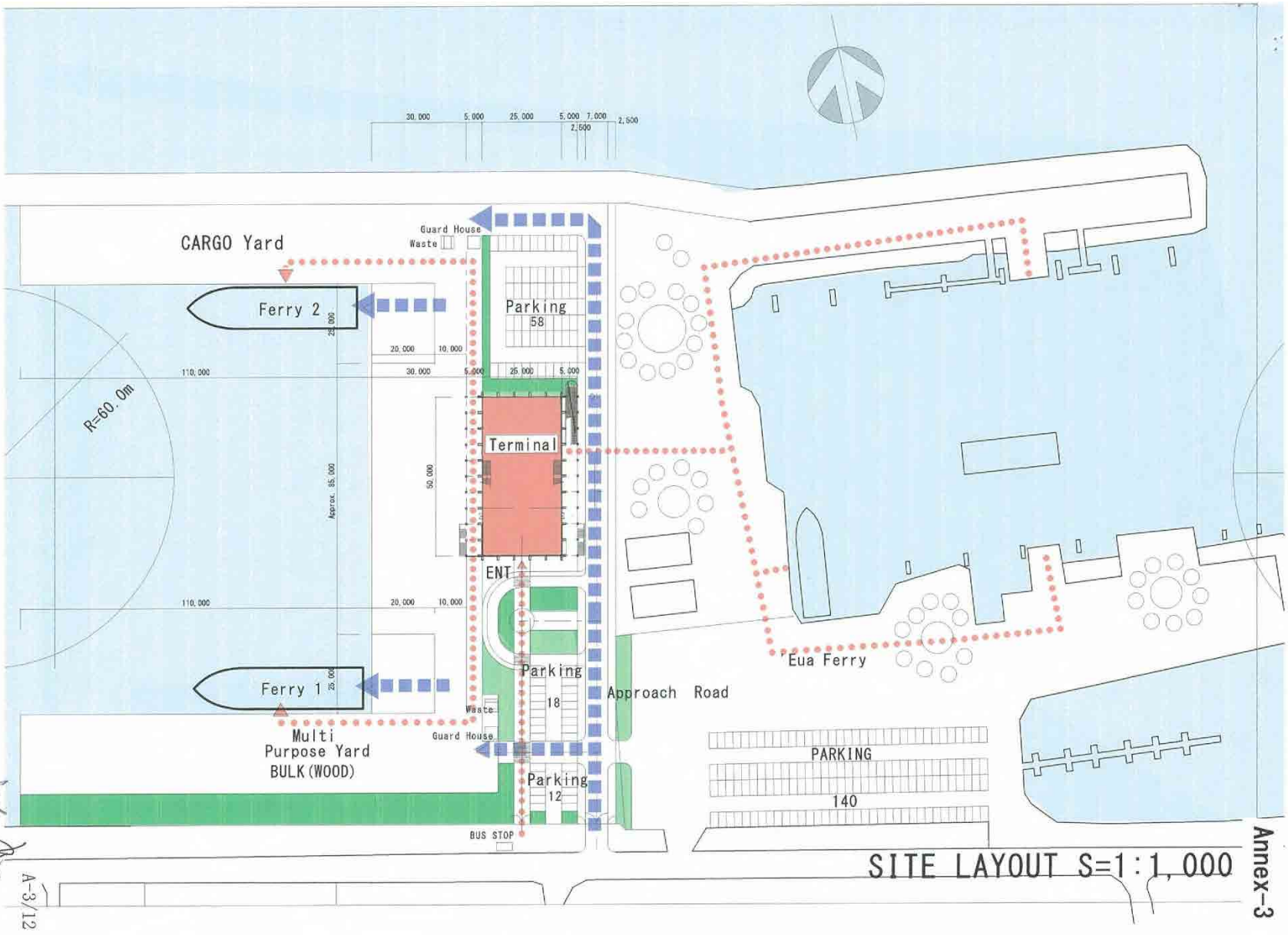
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Annex-2

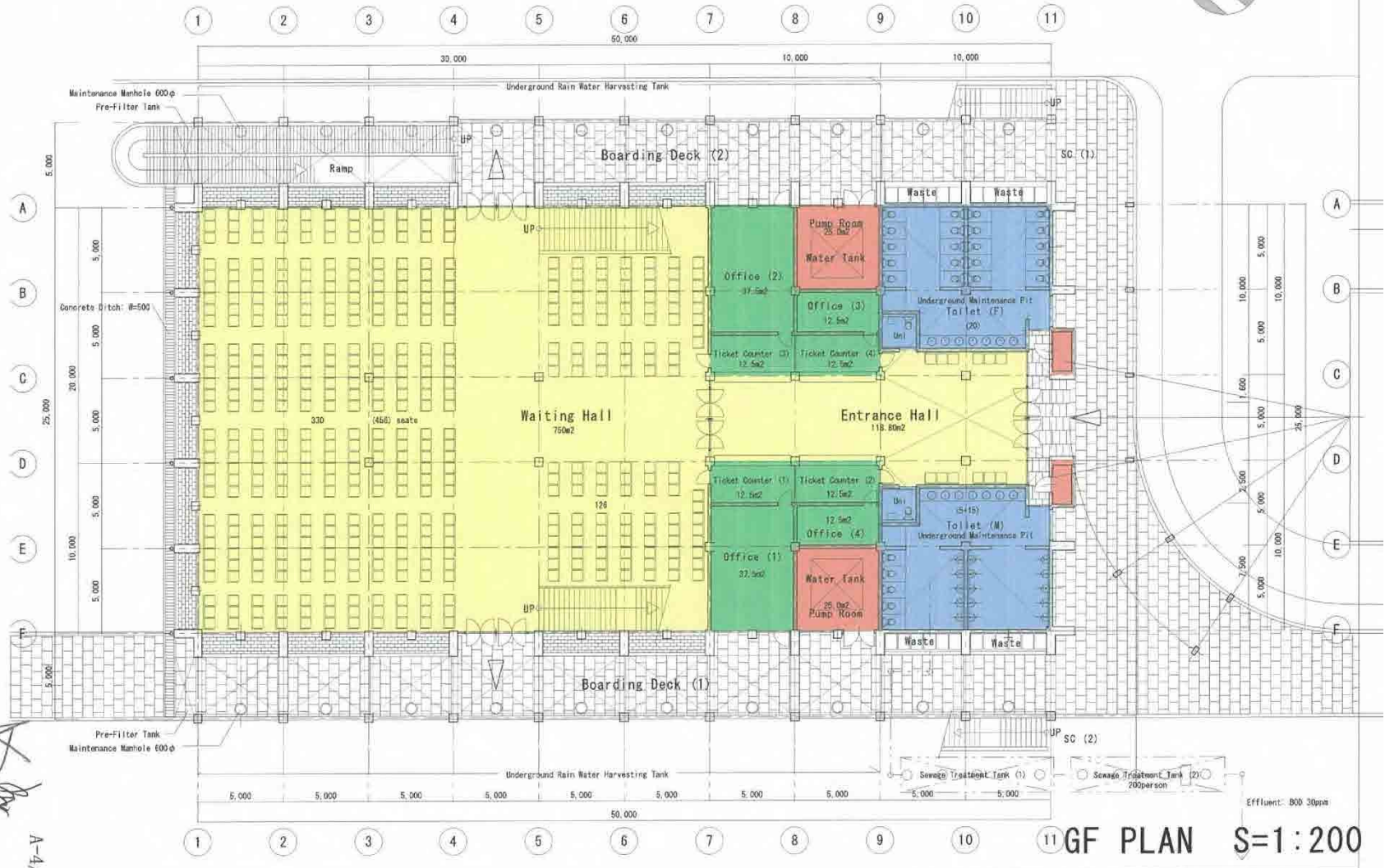
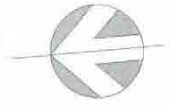


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GF Plan



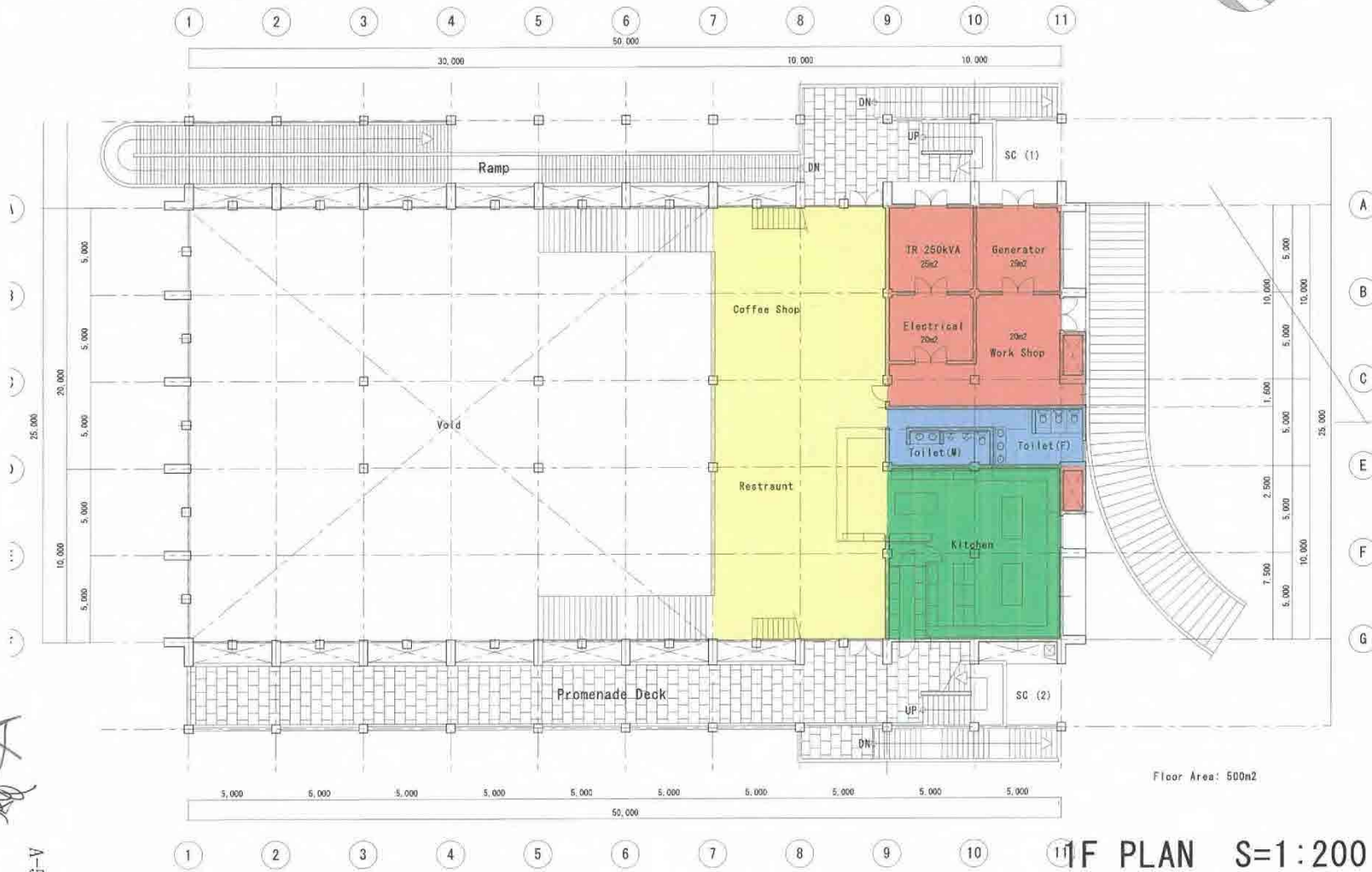
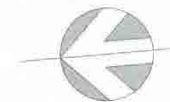
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GF PLAN S=1:200

A4-23

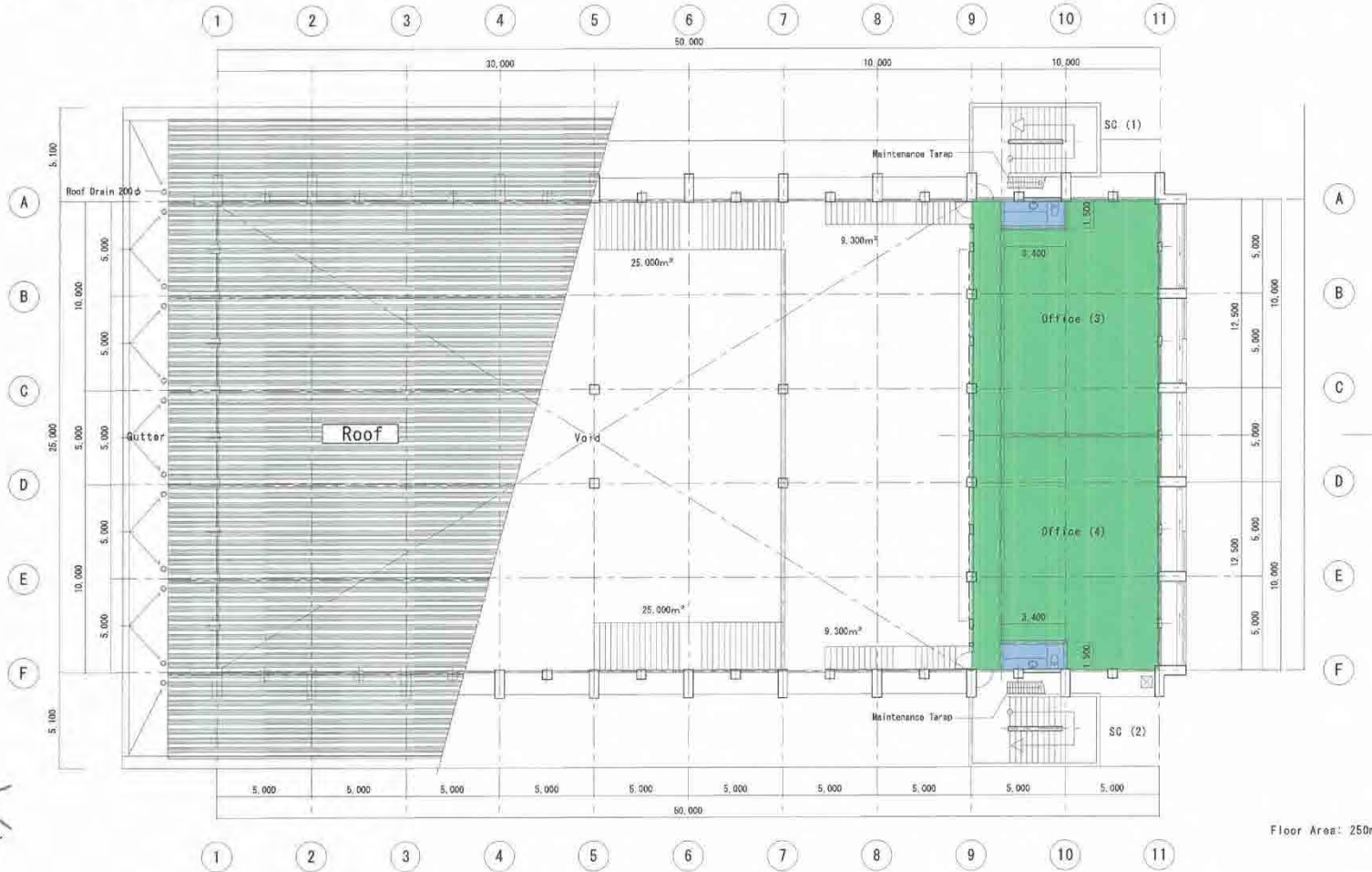
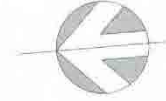
1F Plan



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A-5/12

2F Plan

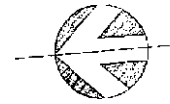
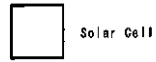


Floor Area: 250m²

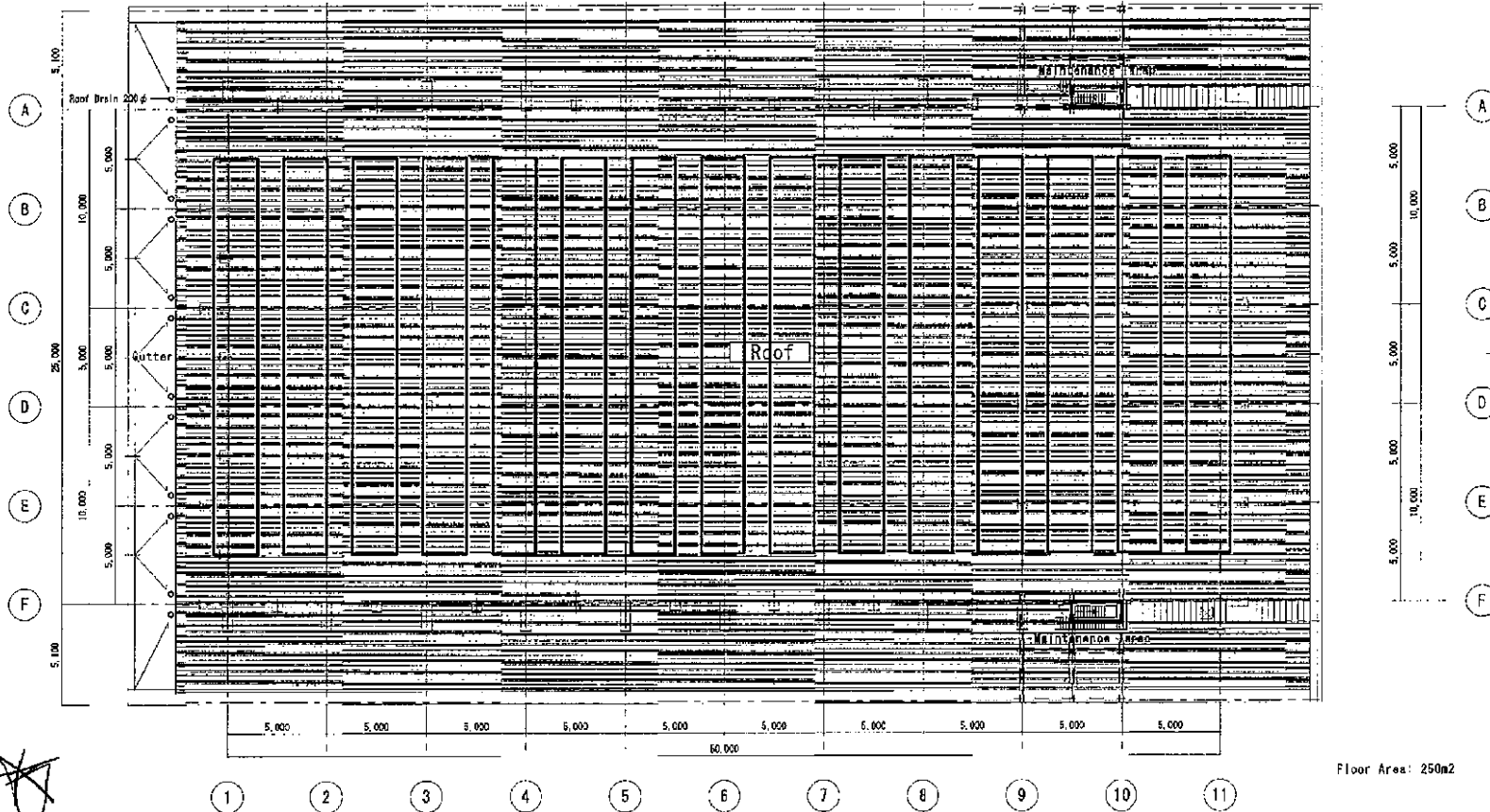
2F PLAN S=1:200

A-6/12

Type E' RF



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Floor Area: 250m²

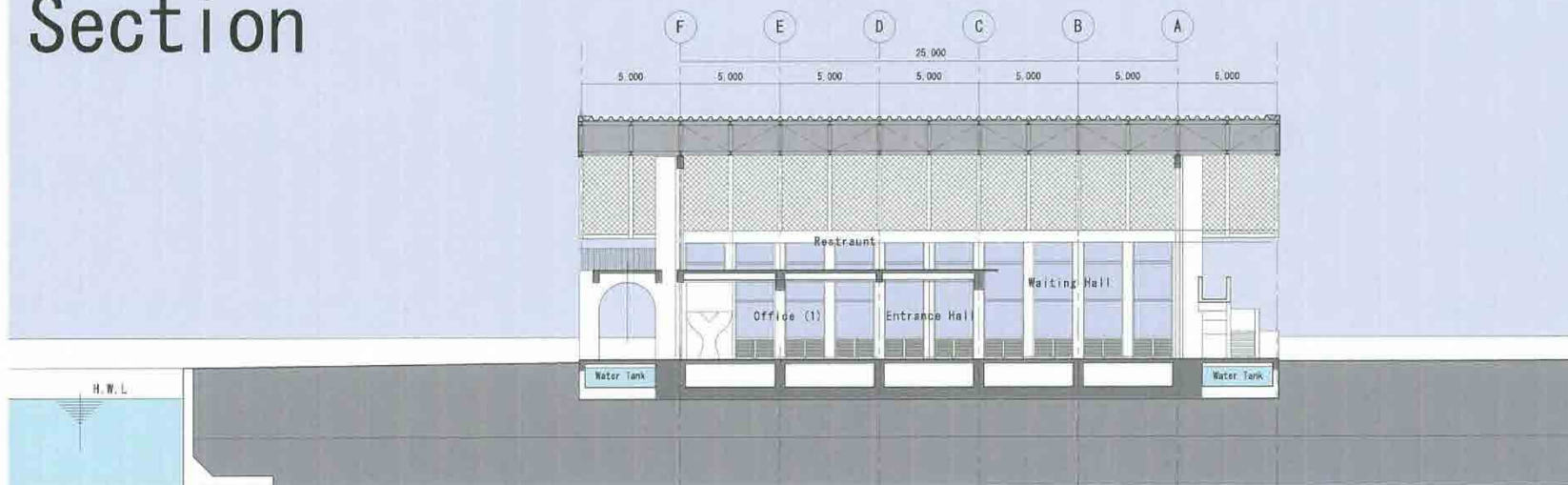
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2F PLAN S=1:200

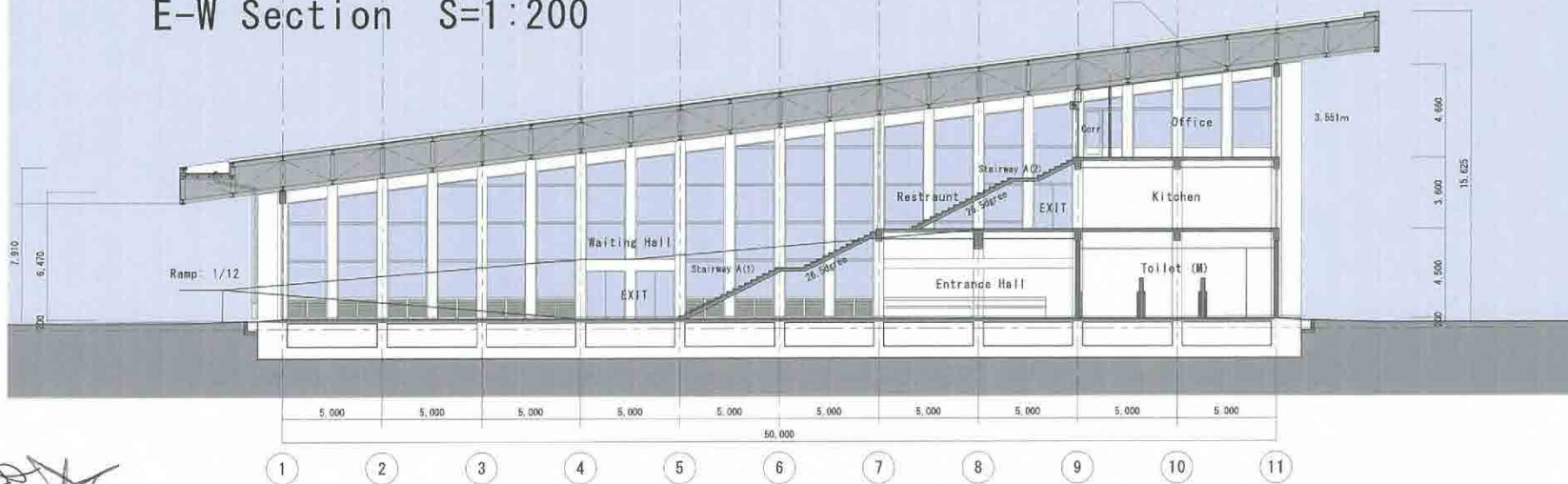
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Section

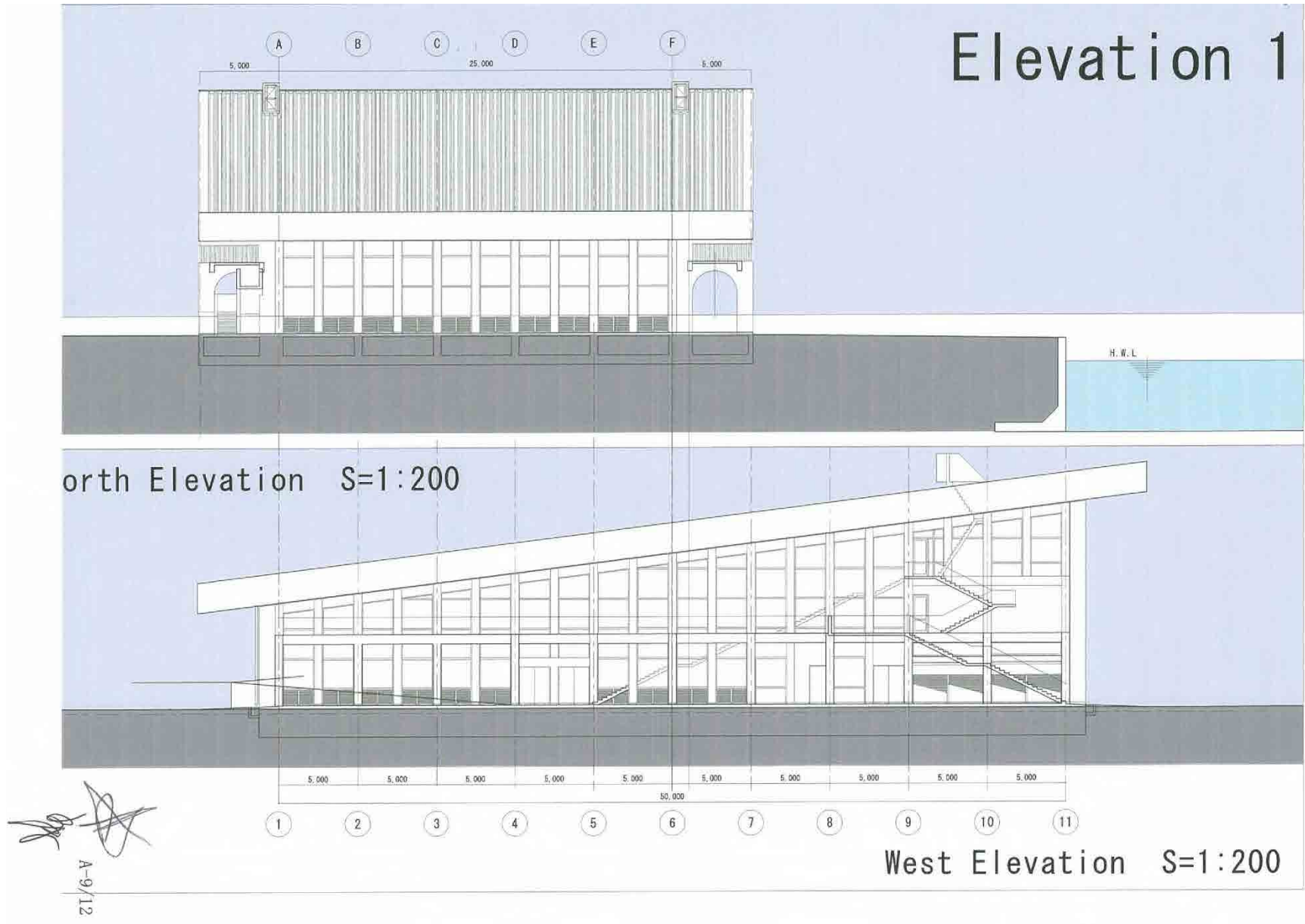


E-W Section S=1:200

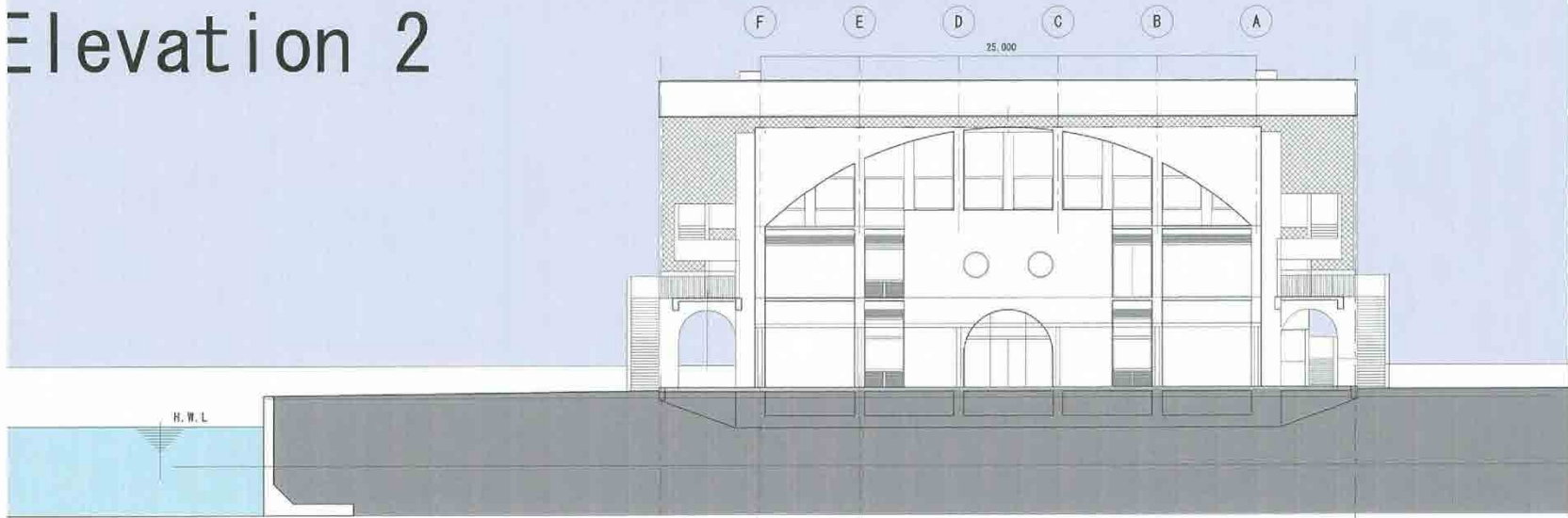


N-S Section S=1:200

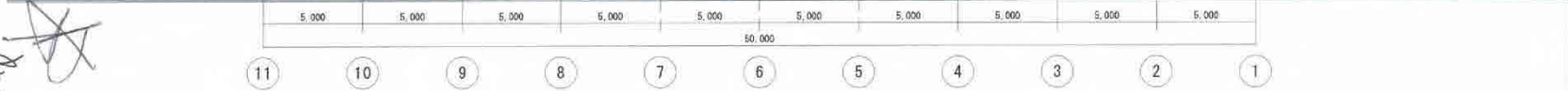
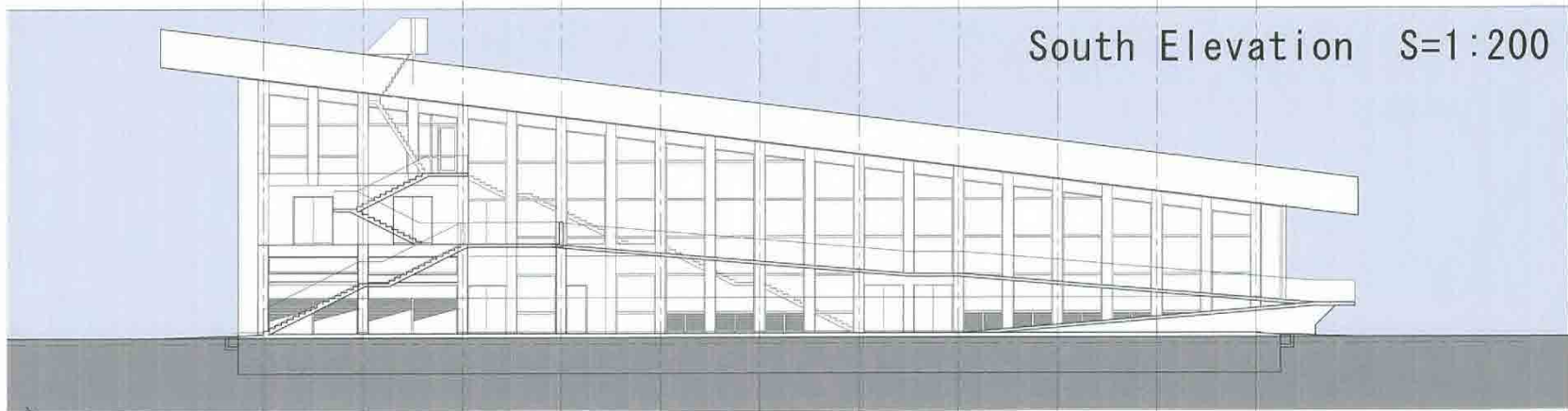
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A-8/12



Elevation 2



South Elevation S=1:200



East Elevation S=1:200

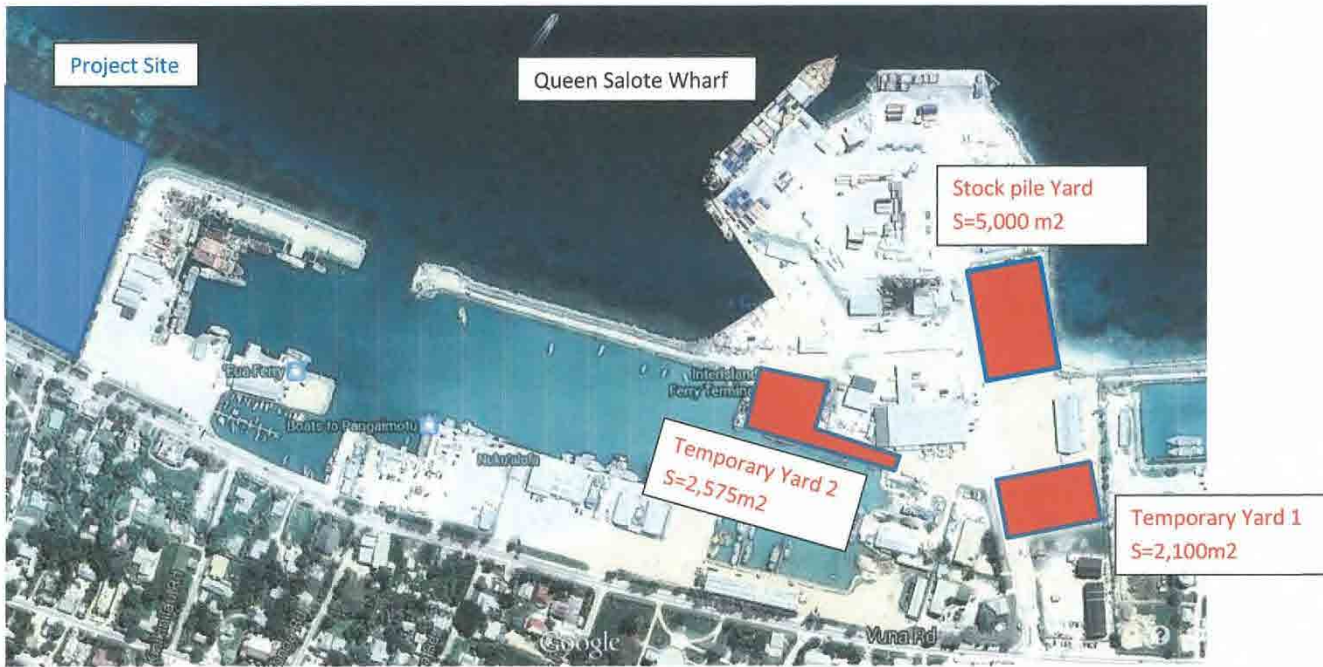
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A 20/12

Annex-4

Abandoned ships, warehouse and wastes to be removed or relocated




A-11/12



Source: JICA Study team based on Google Earth

Figure: Temporary Yard and Stock Pile Yard Plan

Annex-5


A-12/12

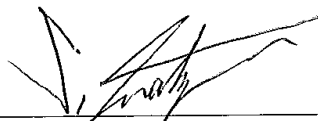
**Minutes of Discussions
on the Preparatory Survey
for the Project for
Upgrade of Wharf for Domestic Transport
in the Kingdom of Tonga
(Explanation of the Draft Outline Design Report)**

On the basis of the discussions and field survey in the Kingdom of Tonga (hereinafter referred to as “Tonga”) in August and September, 2014, and the subsequent technical examination of the results in Japan, Japan International Cooperation Agency (hereinafter referred to as “JICA”) prepared a draft Preparatory Survey Report on the Project for Upgrade of Wharf for Domestic Transport (hereinafter referred to as “the Draft Report”).

In order to explain and discuss with the Tonga side on the contents of the draft report, JICA sent to Tonga the draft report explanation team (hereinafter referred to as “the Team”), which is headed by Mr. Satoru Matsuyama, Advisor, Grant Aid Project Management Division 1, Financial Cooperation Implementation Department, JICA, from February 10 to 17, 2015.

As a result of the discussion, both sides confirmed the main items described in the attached sheets.

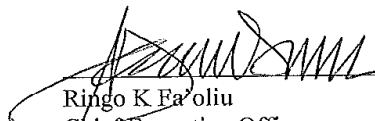
Nuku’alofa, February 13, 2015



Satoru Matsuyama
Leader of the draft report explanation team
Japan International Cooperation Agency



Tatafu Moeaki
Chief Executive Officer
Ministry of Finance and National Planning
Kingdom of Tonga



Ringo K Fa'oliu
Chief Executive Officer
Ministry of Infrastructure
Kingdom of Tonga

ATTACHMENT

1. Components of the Draft Outline Design Report

The Tonga side agreed and accepted in principle the contents of the Draft Report explained by the Team.

2. Japan's Grant Aid Scheme

The Tonga side reconfirmed the Japan's Grant Aid scheme. The Tonga side reassured to take necessary measures as described in Annex-4 and Annex-5 of the Minutes of Discussions (M/D) signed by both sides on August 29, 2014.

3. Schedule of the Study

JICA will complete the Final Outline Design Report of the Preparatory Survey in accordance with the confirmed items and send it to the Tonga side around April, 2015.

4. Cost Estimation

4-1. The Japanese side explained to the Tonga side the rough estimate of the Project Cost described in Annex-1; however, the final Project Cost described in the Exchange of Notes (hereinafter referred to as "E/N") would be appraised by the Government of Japan.

4-2. The both sides agreed that in order to secure a fair and equitable procurement, the Project Cost Estimation attached in Annex-1 should never be duplicated or released to any third party before the signing of all the Contract(s) for the Project.

5. Undertakings by the Tonga side

5-1. The Tonga side will undertake the necessary arrangement/work for the Project listed in Annex-1 at its own expenses based on the contents of the Draft Report.

5-2. The Tonga side agreed to obtain the required environmental permit of the Project from the Ministry of Environment and inform JICA Tonga Office by written by the end of March, 2015.

5-3. The Tonga side agreed to obtain the construction permit including execution permit from relevant authority before Pre-Qualification (PQ) of the Project.

5-4. The Tonga side agreed to secure and prepare the temporary yard before PQ of the Project .

5-5. The Tonga side agreed to remove or relocate abandoned ships and existing utilities/waste within the area of current Fuaa Wharf before PQ of the Project.

5-6. The Tonga side agreed to conduct the following works/procurements in timely

- 1 -

manner mentioned below.

Works/Procurement	Timing of the conduction
Planting Works	21st month after start of construction
Removal Works of Power Pole for Distribution Line	23rd month after start of construction
Works for Electric Register	23rd month after start of construction
Works for Internet Line	23rd month after start of construction
Procurement of equipment for Ferry Operation Office	23rd month after start of construction
Procurement of equipment for Restaurant and Coffee shop	23rd month after start of construction

6. Operation and Maintenance of the Facilities and Equipment

6-1. The Tonga side will secure enough staff and budget necessary for operation and maintenance of the facilities and equipment to be provided by the Project. The annual operation and maintenance costs are estimated as Annex-2, and details are mentioned in the Draft Report.

7. Environmental and Social Considerations

7-1. The both sides agreed to the contents of the Environmental Checklist as shown in Annex-3.

7-2. The Tonga side agreed that monitoring for environmental and social considerations will be conducted by the responsibility of Ministry of Infrastructure and Tonga Port Authority in accordance with the Environmental Monitoring Plan described in the draft report. The results of monitoring will be provided to JICA Tonga Office by filling in the Monitoring Form attached as Annex-4, during construction phase and after completion of the Project.

7-3. The Tonga side agreed that JICA may disclose the monitoring results and may disclose further information as well on demand from the third parties.

8. Disclosure of Information

Both sides confirmed that the study results excluding the Project cost will be disclosed to the public after completion of the Preparatory Survey. All the study results including the Project cost will be disclosed to the public after all the contracts for the Project are concluded.

- Annex-1 Project Cost Estimation
- Annex-2 Annual Maintenance Cost
- Annex-3 Environmental Checklist
- Annex-4 Environmental Monitoring Form



CONFIDENTIAL

Annex-1

Project Cost Estimation

(1) Cost Borne by the Government of Japan

Description		Estimated Cost (million Yen)
Civil Works	- Construction of new wharf	2,872
	- Construction of terminal building	
Detailed Design and Supervision Works		172
TOTAL		3,044

(2) Cost Borne by the Government of Tonga

Description	Estimated Cost (Tonga Pa'anga)	Converted to JPY (million Yen)
Planting Works	140,000	7.83
Removal Works of Power Pole for Distribution Line	9,000	0.5
Works for Electric Register	4,000	0.2
Works for Internet Line	15,000	0.8
Equipment for Ferry Operation Office	27,000	1.5
Equipment for Restaurant and Coffee shop	24,000	1.3
Bank Commissions	72,000	4.0
TOTAL	291,000	16.13

Notes:

- (1) The cost estimates in the above table are provisional and will be further examined by the Government of Japan for the approval of the Grant.
- (2) The total cost of the project JPY 3,044 million is equivalent to USD 29.04 million at the current exchange rate; USD 1.0 = JPY 104.83

Annex-2

Annual Maintenance Cost

Maintenance Items	Tonga Pa'anga
1. Outlying facilities	223,569
2. Terminal building	455,713
3. Paving and outdoor facility	66,463
4. Facility and equipment for navigation	78,487
5. Environmental monitoring	36,232
Total	860,464



Environmental Checklist

Annex-3

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)Y (b)N (c)N (d)N	(a) MOI submitted EIA report to MEC in January 2015. (b) The EIA report is currently under review by MEC. (need to check review status and schedule with MEC) (c) The EIA report is currently under review by MEC. (d) There are no other environmental permits required.
	(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) Public consultation meeting was held on November 2014 by MOI. Around 30 people participated including local residents from Maufanga. There was no objections raised towards the project once the concerns raised by the participants were answered. The project's EIA report is also been posted on MOI and MECs' website for public comment since January. (need to check if any comments were received) MOI has also conducted interviews with several Taovala producers as they will be required to relocate their activity. Some interviewees were reluctant about moving from the current soaking area. MOI will continue to correspond with the Taovala producers and work towards obtaining mutual agreement. (need to check the agreement status with Taovala producers) (b) The stakeholders had no objection on 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 location of the project was initially considered inside Faua wharf but was concluded unfeasible and the remain option was west side of Faua wharf. Once the location was decided three port layout options were considered.
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 mitigating measures taken?	(a)Y	(a) Tonga has no emission standards. Nevertheless, the amount of air pollutant emission will be similar to the current situation as there will be no major additional air pollutant sources. Dust dispersion from the port area is currently an issue especially from unpaved areas. Dust dispersion from the new wharf will be prevented through concrete pavement.

A4-38

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(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) Wastewater from the terminal building will be treated through septic treatment system, which is designed to discharge under World Bank standard (BOD: <30 mg/l).(no discharge standard in Tonga) (b) Ships will be prohibited to discharge any wastewater inside the port area and near land in accordance to Tonga's Marine Pollution Prevention Act 2002. (c) The port will be equipped with a waste reception facility to prevent any leakages of pollutants. (d) There will be slight alteration to the flow regime due to the presence of breakwater but its impact on water quality is considered to be limited to in and around the port area due to its limited length and configuration. (e) Reclamation works will inevitably cause turbidity but its dispersion will be minimized by installing silt curtain.
	(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) The port will be equipped with a waste reception facility where all wastes will be temporary stored. The wastes will then be disposed at the local waste disposal facility or taken to local recycling companies. (b) Dredged soil will be used as reclamation material. Excessive dredged soil will be stored inside the existing port area for later beneficial use. (c) Any toxic waste will be contained in specialized containers and temporary stored at the waste reception facility. The wastes will then be treated/disposed/recycled in accordance to local regulations and norms.
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a)Y	(a) While there are no noise/vibration standards in Tonga, the project will implement the following measures to minimize noise/vibration impacts: - Use of low-noise pile driver (vibratory pile driver) - Noise and vibration monitoring (comparison with Japanese environmental standard) - Regular inspection and maintenance of equipment and vehicles - Avoidance of sensitive areas during transportation of construction materials
	(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) There will be no extraction of groundwater.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a)Y	(a) The dredged material are possible odor source due to decomposition of organic material. Odor impacts will be minimized by drying it as far as possible from the residential area (i.e. north side of Fuaa wharf).

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(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) Dumping of hazardous wastes into the sea will be strictly prohibited in accordance to the Marine Pollution Prevention Act 2002. The port will be equipped with a waste reception facility to prevent any accidental discharge of hazardous wastes.
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) No impact is expected as the nearest protected area is located more than 3 km away from the project site.
3 Natural Environment	(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)Y (e)N	(a) The project site is located over a coral reef. (b) Five endangered coral species under IUCN Red List have been identified in the reefs near the project site. No endangered coral species were found inside the project site. (c) Although around 300 m of coral habitat will be lost through the port construction, such loss is considered to be of moderate significance due to the following: - The affected coral habitat is small in proportion to the overall coral habitat area of Tongatapu north coast which extends over 30 km. - The affected coral habitat can be considered to have limited ecological value due to the relatively low coral diversity, absence of endangered species and presence of many dead corals. The project will minimize impacts on the surrounding coral ecosystem by installing silt curtain and by conducting water quality and coral monitoring. (d) Refer to (c). (e) There are no terrestrial vegetation or wildlife of any significance in the coastal zone.
	(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) The breakwater will inevitably alter the local water circulation but will be limited to around the port area due to its limited length and configuration.
	(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) The project is located in a developed area where the natural shoreline is already artificially altered by the existing port and seawalls.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Are the compensations going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(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?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a)N</p> <p>(b)N</p> <p>(c)N</p> <p>(d)N</p> <p>(e)N</p> <p>(f)N</p> <p>(g)N</p> <p>(h)N</p> <p>(i)N</p> <p>(j)N</p>	(a)-(J) No resettlement is required.
4 Social Environment	(2) Living and Livelihood	<p>(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?</p> <p>(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?</p> <p>(c) Is there a possibility that port and harbor facilities will adversely affect the existing water traffic and road traffic in the surrounding areas?</p> <p>(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?</p>	<p>(a)Y</p> <p>(b)N</p> <p>(c)N</p> <p>(d)N</p>	<p>(a) There are around 20 people that work in the shallow inner reef flat of the project site, where they soak materials used for making traditional mat/cloth (Taovala). Due to the project, these people will be required to relocate their activity to another nearby site. Since there are sufficient spaces available that are close to the current site, relocation should not be of any major significance. Nevertheless, MOI will continue to correspond with Taovala producers to ensure that the project will have minimum impact on their livelihood. MOI will also monitor the Taovala producers to see if any adverse impacts are experienced due to relocation.</p> <p>(b) Refer to (a).</p> <p>(c) There will be no major alteration to the existing water and road traffic.</p> <p>(d) The risk of infectious diseases spreading is low as the majority of the work force will be from the local area.</p>
	(3) Heritage	<p>(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?</p>	(a)N	(a) There are no archeological, historical, cultural and religious heritage sites around the project site.

N/A

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)Y	(a) The current sea view from Vuna road will change to a port dominant view. To mitigate such impacts, trees will be planted along the boundary of the wharf facing Vuna road, which is expected to create a more pleasant view and atmosphere.
	(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 (b)N	(a) (b) There are no ethnic minorities and indigenous peoples around the project site.
	(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 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?	(a)N (b)Y (c)Y (d)Y	(a) No (b) Construction will be implemented under strict safety measures and rules. Furthermore, a safety fence will be installed around the project site during the construction period. Security guards will also be placed at the entrance of the project site. (c) Safety training including traffic safety and public health for workers will be implemented for individuals involved in the project. (d) The project will ensure that such violations do not occur.

N/A

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
5 Others	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a)Y</p> <p>(b)Y</p> <p>(c)Y</p>	<p>(a)</p> <p>Measures to reduce noise/vibration impacts:</p> <ul style="list-style-type: none"> - Use of low-noise pile driver (i.e. vibratory pile driver) - Noise/vibration monitoring - Regular inspection and maintenance of equipment and vehicles - Avoidance of sensitive areas during transportation of construction materials <p>Measures to reduce dust impacts:</p> <ul style="list-style-type: none"> - Water spraying at dusty areas <p>Measures to reduce turbidity impacts:</p> <ul style="list-style-type: none"> - Installation of silt curtain - Water quality monitoring <p>Measures to reduce waste impacts:</p> <ul style="list-style-type: none"> - Storage of waste in designated area to prevent spills and dispersion <p>(b) Silt curtain will be installed to minimize turbidity dispersion towards the surrounding coral ecosystem. Additional mitigation measures will be considered if significant impacts are identified through coral monitoring.</p> <p>(c) The Taovala producers will be monitored to see if any impacts are experienced through relocation.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(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?</p>	<p>(a)Y</p> <p>(b)Y</p> <p>(c)Y</p> <p>(d)N</p>	<p>(a)(b)</p> <ul style="list-style-type: none"> - Monitoring of noise: Daily at two locations - Monitoring of vibration: Daily at two locations - Monitoring of water quality: Daily at six locations - Monitoring of coral health: Monthly at six locations - Monitoring of Taovala producers: Once every six months through interview survey <p>(c) Implementation of the above monitoring (except Taovala producers which will be the responsibility of MOI) will be a requirement under the contract between the construction contractor.</p> <p>(d) Reporting will be conducted in accordance to the conditions stipulated in the EIA approval. The construction contractor will nevertheless be required to report regularly to the construction supervisor and MOI.</p>

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Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
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 (b)N	(a) Although dredging may cause seawater intrusion into the underground freshwater lens, the risk of such occurrence is low for the following reason: - The dredging area is most likely to be outside of the underground freshwater and seawater boundary as dredging is conducted only over the reef flat where groundwater is usually seawater. - The seabed of the dredging area is primarily comprised of impermeable material, which will prevent seawater intrusion towards the underground freshwater lens.

- 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.

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Annex-4

Environmental Monitoring Form

1. Pre-construction phase

(1) Comments from the public and MEC regarding the EIA

Monitoring item	Comments	Response of MOI
Contents of formal comments from the public on the EIA		
Contents of formal comments from MEC on the EIA		

2. Construction phase

(1) Noise (L_{Aeq})

Week	Location	Reference standard (dB)	Weekly Ave. (dB)	Weekly Max. (dB)	Compliance status (e.g. no. of days that exceeded reference standard)	Measures implemented in case of non-compliance
	Boundary of construction site	85 ^{*1}				
	Boundary of nearest residential area	65 ^{*2}				

*1: Based on Noise Regulation Law of Japan

*2: Based on Basic Environment Law of Japan

(2) Vibration (L_{V10})

Week	Location	Reference standard (dB)	Weekly ave. (dB)	Weekly max. (dB)	Compliance status (e.g. no. of days that exceeded reference standard)	Measures implemented in case of non-compliance
	Boundary of construction site	75 ^{*1}				
	Boundary of nearest residential area	-				

*1: Based on Vibration Regulation Law of Japan

(3) Seawater quality (Turbidity)

Week	Location	Reference standard (NTU)*	Weekly ave. (NTU)	Weekly max. (NTU)	Compliance status (e.g. no. of days that exceeded reference standard)	Measures implemented in case of non-compliance
	Coral site 1	2				
	Coral site 2	2				
	Coral site 3	2				
	Construction site boundary 1	-				
	Construction site boundary 2	-				
	Reference site	-				

*: Standard established for this project based on the results of the water quality survey and the following scientific literature: P.L.A. Erfemeijer et al., (2012), Environmental impacts of dredging and other sediment disturbances on corals, Marine Pollution Bulletin 64. The threshold level may be adjusted during the construction phase if it is deemed too high or low, based on the results of the coral health monitoring.

(4) Coral health

Month	Location	Percent live coral coverage (%)	Percent bleaching (%)	Coral stress indicators (e.g. excessive mucus production, discoloration, sedimentation)	Measures implemented in case of adverse impacts identified
	Coral site 1				
	Coral site 2				
	Coral site 3				
	Coral site 4				
	Coral site 5				
	Coral site 6				

(5) Taovala producers

Month	Name	Comments of interviewee	Measures implemented in case of complaint

資料5：基本計画に関する協議経緯（Weekly Meeting 資料）

本現地第一次調査の中盤より MOI 及び PAT と調査団で、Weekly Meeting を行った。その議事メモ（全3回開催分）を次に示す。

第 1 回目 Weekly meeting 議事要旨

日時：9月12日 12：00～13：00

場所：PAT 事務所

参加者：

PAT: Mr. Mosese Lavemai, Mr. Iketau Kaufusi

MOI: Ms. Kelela

JICA Tonga: Mr. Ishiguro, Mr. Feleti

JICA Study Team: Mr. Iwama, Mr. Horigome, Mr. Matsura, Mr. Kobayashi, Mr. Sato

1. 港およびターミナルのレイアウトなどについてのコメント

- 貨物用のスロープを可動式（浮式）にしてはとの提案あり。
- 新しい港の対象船舶は、Otuangaofa と Pulupagi のみではなく、他の国内船舶も利用することを考えている。
- ターミナルビルは、Otuangaofa と Pulupagi の乗客のみではなく、他の船舶の乗客も利用することを考えている。

2. その他

- 埋立をすると、その土地は公共用地（MOI の管轄用地？）になる。
- 道路脇の露店商は、無許可で営業している。
- オーストラリア大使には、Master Plan の説明はしている。騒音などの影響も想定されるので、MOI が早い段階で、大使に接触することを調査団が提案。
- MOI は Pulupagi に、安全対策など改善命令を出しており、3 ヶ月に一回、改善状況を確認している。現在は改善されることを前提に運航許可をだしている。

第2回目 Weekly meeting 議事要旨

日時：9月19日 14:00～15:00

場所：MOI Mr.Ringo's Office 事務所

参加者：

PAT: Mr. Iketau Kaufusi

MOI: Mr. Ringo Fa'oliu, Mr. Esau Tupou

JICA Tonga: Mr. Ishiguro, Mr. Feleti

JICA Study Team: Mr. Muori, Mr. Horigome, Mr. Matsura, Mr. Kobayashi, Mr. Sato

会議の前に、野崎氏の事故について Mr.Ringo に報告。遺憾の意と早期の回復を願う旨、同氏よりコメントをもらった。

1. 財務関連

- 港の構造物（防波堤）の維持管理は、その費用負担も含め PAT の責任である。
- Ministry of Public Enterprise は、PAT を含め、トンガの公社（State Owned Enterprise）を管轄する役割を持つ。
- MOI は、インフラに係る Policy、Planning、Regulation を定める役割を持つ。
- 港の基幹施設（防波堤、埠頭等）の所有者は MOI で PAT はその使用権限を有数する。
- Ministry of Public Enterprise は PAT の株式保有者である。

2. ターミナル関連

- ターミナルのレイアウトや設計を説明。Ringo 氏が省内の専門家と確認するとのこと。
（すでに Building Div.の Mr. Peni に説明済みと Mr. Ringo に伝えた。堀米）
先週の週間会議で使用した PPT の抜粋電子データを Ringo 氏に渡した。これは、大臣への案件概要説明用資料として用いる。
- 浄化槽の排水基準については、Health Department または Kelala に確認するように。
- 耐震構造としては、0.2 G または 0.25 G の基準を適用することを検討している。（Ringo 氏は、国内の Building Code を確認し、現在国としてどちらを採用しているのか、具体的な資料を示すとした。堀米）

3. 環境関連

- EIA のスケジュールを相互確認し、調査団が帰国する前に、Project Notification を環境局に提出するようにする。

4. その他

- Ringo 氏は、10 月 1 日～4 日のいずれかの日から出張する予定。

Summary of 3rd weekly meeting

Date/time: Sep. 26th, 9 : 00-10 : 00

Place: MOI Mr.Ringo's Office

Participants:

MOI: Mr. Ringo Fa'oliu, Mr. Esau Tupou, Ms. Kelela

PAT: Mr. Iketau Kaufusi

JICA Study Team: Mr. Muori, Mr. Iwama, Mr. Horigome, Mr. Matsura, Mr. Shiratori, Mr. Kobayashi, Mr. Sato

5. Passenger terminal

- The JICA team explained the ventilation system of the terminal. No objection was raised by Mr. Ringo and appreciated the energy efficient design of the ventilation system.
- The JICA team explained that the capacity of the solar power system is still under consideration and will be dependent on available budget. The local energy supply may be required depending on the solar generation capacity.
- The JICA team explained the design of the septic system and emphasized the importance of training the port staff regarding maintenance work. Ms. Kelela will check with the Health Department for any information (design standard etc.) regarding the septic system.
- The JICA team explained that the blower and pump equipment of the septic system have a life span of around 10-15 years, hence will require regular replacement.
- The JICA team explained that fixed furniture are currently not covered by the Project but may be included later depending on available budget. This will be subject to further discussions once the cost of the Project is estimated. The Memorandum of Discussion between JICA team and MOI will be amended accordingly.

6. EIA

- Mr. Ringo agreed to submit the Project Notification to MEC before the end of September and send to JICA and the JICA team a copy of the receipt.
- The JICA team and Mr. Ringo agreed to the schedule of the public consultation, which is early November. Mr. Ringo agreed to prepare in advance for the public consultation meeting including sending invitation, arrangement of meeting hall, preparation of documents etc.

7. Others

- The JICA team submitted “Policy of Procurement and Construction Plan”.
- The JICA team requested Mr. Ringo to provide record of past construction experience in Tonga, which is on 2 marine projects, Vuna Wharf and Fuaa Wharf construction projects.
- The memorandum between MOI and JICA team will be signed at 9 am next Monday.
- This third weekly meeting is the last meeting for the 1st site investigation in Tonga.

資料6 : オトワンガオフア号利用客動向調査

今般の現地調査において、オトワンガオフア号を利用する乗客 160 名を対象に動向調査を実施した。動向調査には次頁の質問状をトンガ語に訳して行った。集計作業及び再英訳は現地調査期間中に終了できなかったが、通訳によると同船を利用する旅客は、同じ航路をより安く運航する民間船より快適性を求めていることが分かった。

また、新ターミナル建設に際する要望は、次に 3 点に集約されていることが判明した。

- ✓ 現在の乗船待ちは屋外・無舗装のため、砂埃が激しく新港内は舗装をしてほしい。
- ✓ 上に関連して、船待ちには屋内ターミナルビルが欲しい。
- ✓ ターミナルにはレストランが欲しい。

動向調査 質問状 (英語)

Interview table for the passengers using Otuanga'ofa	
I. Basic Information	
1 Date; 2014 / September /	
2 Gender (put circle): Male Female	age:
3 Traveling from _____	to _____
II. Travel Information	
Please reply to the items in the following (Put circle and tell us details if you choose " others"	
4 What is your purpose to visit the island?	1. Business, 2. Family Business, 3. Vacation,
4-1 If you choose 1, what kind of business?	a: Farmer, b: Tourism, c: Others (please tell us name of business: _____)
4-2 If you choose 2, what kind of business?	a: To go to Hospital b: Affairs to visit Cut cherry c: To meet family or friend d: Others (_____)
5 How often do you use boat?	a. Per month, b. Per week, c. Per year d: Others (_____)
6 Question to person who can have a choice between Otuanga'ofa and Pulpaki. Why did you choose Otuanga'ofa instead of Pulpaki ? Is there any request to Pulpaki?	
7 How is your impression about fee of Otuanga'ofa? Please make a choice from below four items. a: Very expensive b: expensive c: reasonable d: Cheap	
8 Is there request to Otuanga'ofa?	
9 Is there request to Nuku'alofa Port? For example, Any request about car parking space? Or waiting building ? Restaurant?	
Thank you for your cooperation.	
JICA Study Team	
<i>The Preparatory Survey</i>	
<i>for The Project for Upgrade of Wharf for Domestic Transport</i>	
<i>in the Kingdom of Tonga</i>	

資料7：公聴会議事録

次頁に公聴会議事録を添付する。

Minutes of the Public Consultation Meeting of the Project for Upgrade of Wharf for Domestic Transport

Date: November 6th, 2014

Location: Saint Joseph Hall, Maufanga

Starting time: 19:30 pm

End time: 21:30 pm

Participants: See Appendix 1 for the participant list

1. Objective of the meeting

The objective of the meeting was to inform and obtain opinions of the public about the proposed development of Nukualofa Port, its potential environmental impacts and mitigation measures. The stakeholders and public were invited by sending invitation letters. Appendix 2 is the list of invited stakeholders. The local community (Maufanga town and Fasimoeafi town) were also informed via the local town officer and announcement through public radio on November 4th, 5th and 6th.

Over 30 people participated in the meeting including, local residents of Maufanga, shop owners, relevant government agencies and so on. Tonga TV also came to cover the meeting.

2. Opening remarks

Hon. Samiu Vaipulu, the Acting Prime Minister and Acting Minister of the Ministry of Infrastructure opened the meeting by welcoming the participants and explained briefly about the aim of the Project and today's meeting.

3. Remarks by the town officer of Maufanga

The town officer of Maufanga explained that the people of Maufanga are well aware of the Project. While they were invited to today's meeting, the town councilor explained that majority of them are not present today as they have no objection to the Project.

4. Presentation

Ms. Kelela Tonga, the Director of the Marine and Ports Division presented the Project in two parts. The first part focused on introducing the layout and design of the Project. The second part focused on explaining the potential environmental impacts and proposed mitigation measures of the Project. The presentation material is attached as Appendix 3.

5. Q&A session

After the presentation, a Q&A session was held, which is summarized in table below. While many questions and opinions were raised by the participants, once their concerns were answered, nobody expressed any objection towards the Project.

Summary of the Q&A session

	Name/organization	Question/opinion	Answer
1	Ms. Liz Sullivan, Maufanga resident and shop owner	Have you considered other areas for the development of the new domestic wharf such as east side of Fuaa Wharf or the east side of Nukualofa port?	The JICA team considered various options. The east side of Fuaa Wharf was considered unfeasible mainly due to lack of ship maneuvering space. The east side of the Nukualofa port is reserved for the Navy so that is also out of the option. In conclusion, development of the west side of Fuaa Wharf was considered the only feasible option. The west side of Fuaa Wharf is also in line with the Master Plan of PAT.
		Since the number of international ships that berth at Queen Salote Wharf is currently limited, why not use Queen Salote Wharf for the domestic ships?	The port's strategy is to use Queen Salote Wharf exclusively for international ships for security and safety reasons, as well as considering the expected future growth of international cargo including the possibility of developing the Queen Salote Wharf as a transit port.
2	Ms. Siutiti Pousini, Maufanga resident	What will be the benefits for the local residents?	The policy of the Project is to employ local labor force as much as possible.
3	Ms. Seketi Fuko, Maufanga resident and restaurant owner inside the port	Interested in moving my restaurant to the passenger terminal.	-
		How will the surface of the wharf be paved?	The wharf will be paved by concrete, which will prevent dust dispersion.
		Would like to use the excess dredged material.	The excess dredged material is planned to be used by the government for example for backfilling the sports field at the secondary school, which is candidate field of the Pacific Games.
4	Mr. Taani, Fisheries council member	Are the fishing vessels considered within this Project?	The Project is considering only domestic ships. The marina at the Vuna wharf must be completed by PAT so that the yachts can move there and open-up more space inside the port for the fishing vessels.
5	Mr. Teisina Fuko, Maufanga resident and owner of Fuko Fishing	Will not the new port cause traffic congestion of Vuna Road, especially at the entrance?	The traffic volume at Vuna Road is currently much below the road's capacity, and the new port will not cause any significant increase in the traffic volume. However, proper traffic management will be required to avoid any unnecessary congestion.
6	Ms. Daniela Orbassano	How is the Project considering the environmental impacts?	The Project is been conducted in compliance with Tonga's environmental laws and JICA environmental guideline. The project has conducted a detailed environmental survey and will prepare a detailed EIA report. The EIA report is planned to be submitted to MEC at the end of this year, and will be available for public comment through MEC's website.

6. Closing remarks

Hon. Samiu Vaipulu thanked the audience for participating in the meeting.

7. Additional opinions from the participants

Additional opinions about the Project were collected by distributing an opinion form to the participants. There were no opinions that were opposed to the Project but many requested that environmental impacts to be minimized so to safeguard the local community. All the additional opinions are summarized in Appendix 4.

8. Comments from JICA Study Team

No participants were opposed to the Project once their concerns were answered through the meeting. While participation from the Maufanga area was limited in number, it was explained by the Maufanga town officer and later by the Acting Minister of MOI that it was due to the fact that the invited residents had no objection to the Project.

The meeting was organized by MOI despite limited experience in holding such consultation meeting. Since such consultation meeting may be required in future projects, the JICA Study Team will prepare a simple manual that explains step-by-step the required preparation for consultation meeting, which could be referred when planning future meetings.

Appendix 1 Participant list

	Name	Organization/Village
1	John Sullivan	A.J + E Ltd
2	Liz Sullivan	Davina House (Maufanga)
3	Daniela Orbassano	Water Front Lodge
4	Alotaisi Takau	Town officer of Maufanga
5	Siosifa Latu	-
6	Fakatoulelei Kolomalua	MLSNR
7	'Elenoa Manukeu	MOE
8	Kepueli Fe'iloakitau	Maufanga
9	Taniela Fe'ao	Toutai Havelu
10	Seketi Fuko	12 seafood/Maufanga
11	Teisina Fuko	Fuko Fishing
12	'Anasiu Falekaono	TBC
13	Samanda Ryder	Teacher (A.T.I)
14	Une Ngalu	Teacher (A.T.I)
15	Malini Teulilo	Environment/Climate
16	Vilingatoni Sikalu	MEC
17	'Isileli Faka'iloatonga	MOH
18	Lute Filimoehala	National Fisheries Council
19	'Aleki Mataele	National Fisheries Council
20	Andrew Niukapu	Maufanga
21	Fine Tohi	Fangaloto
22	Manu Mataele	Mataika
23	Visone Tangifua	Maufanga
24	Tu'ifua Sakisi	Maufanga
25	'Ofa Latu	Tofoa
26	Siutiti Pousini	Maufanga
27	Siola'a Malimali	Fisheries Department
28	Nunia Mone	Fisheries Department
29	'Aleki Mataele	National Fisheries Council
30	Tu'l Uata	National Fisheries Council
31	Iketau Kaufusi	Ports Authority Tonga
32	Lute Filimoehala	Fisheries Council
33	Taani	Fisheries Council

Appendix 2 List of invited stakeholders

1. CEO for Environment & Communication
2. CEO for MAFFF
3. CEO for Finance
4. Police Commissioner
5. Director for Health
6. Director for Policy & Planning Division
7. Director for Land Transport Division
8. Director for Building Control Division
9. Director for Environment
10. Director for Fisheries
11. CEO for Navy
12. Manager, Port Authority Tonga
13. Teisina Fuko
14. Liz Sullivan
15. Manager, TCC
16. Manager, Water Front
17. Manager, Tonga Broadcasting Commission
18. Australian High Commissioner
19. Manager, Total Company Ltd
20. Manager, Pacific Energy
21. CEO for Friendly Island Shipping Agency
22. Manager, Uata Shipping Line
23. Manager, South Seas Shipping
24. Manager, Tofa Ramsay
25. Manager, 'Eua Ferry Service
26. Ma'ufanga Townofficer
27. Fasimoeafi Seletil elected by Town Council
28. People of Ma'ufanga
29. People of Fasimoeafi

Appendix 3 Presentation material

Part 1:

Part 1
**Introduction on the Project for
Upgrade of Wharf for Domestic
Transport**


November 6th, 2014

Ministry of Infrastructure (MOI)
Japan International Cooperation Agency (JICA)

3

Background

- Domestic inter-island shipping plays a crucial role in providing fundamental means of transportation.
- Six cargo/passenger ships provide sea transport services between Nukualofa and the outer islands.



2

Background

- Wharfs used by domestic ships



4

Background

- Issues of Queen Salote Wharf:
 - ✓ Limited ship berthing area ⇒ high risk of accidents
 - ✓ Limited cargo handling space ⇒ high risk of accidents
 - ✓ Inconvenient to passengers ⇒ lack of waiting space, toilet, restaurant, dust issues etc.
 - ✓ Originally intended for international ships.
 - ✓ Dangerous during cyclones.

↓

Therefore, need a new wharf for domestic cargo/passenger ships!!

4

Aim of the Project

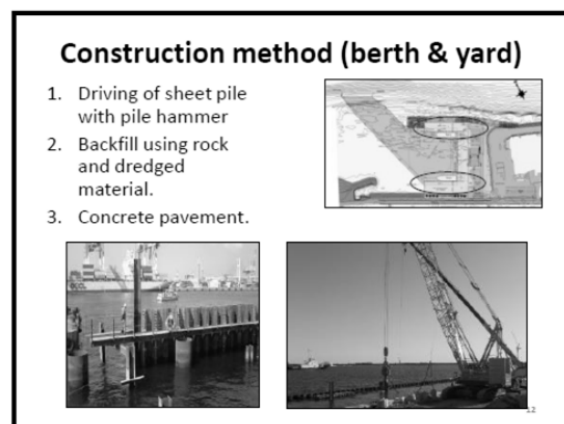
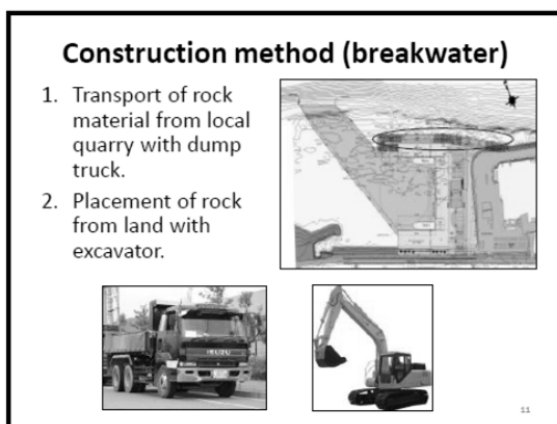
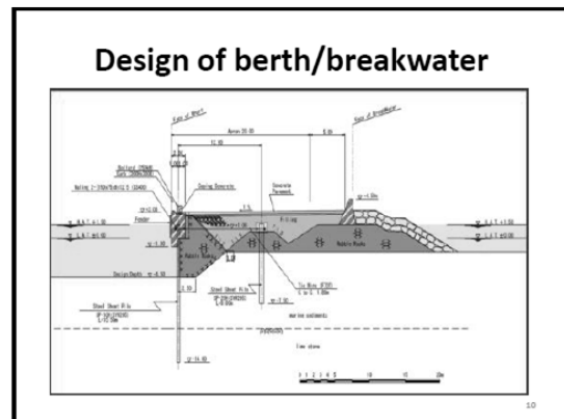
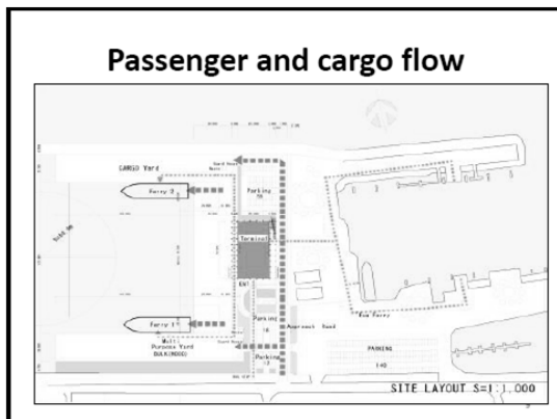
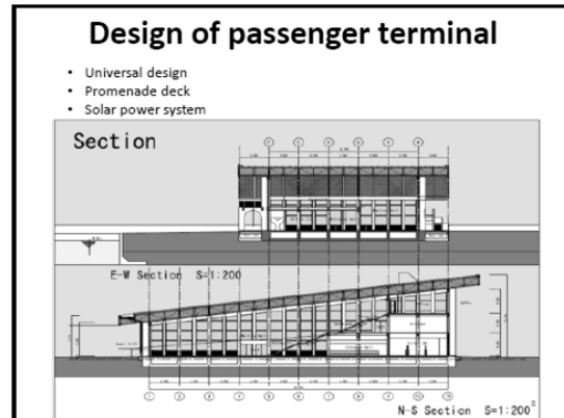
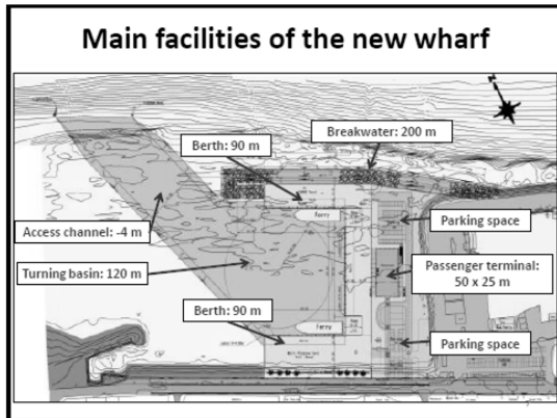
- Tonga Government requested Japanese Government for Grant Aid assistance.
- JICA dispatched Japanese experts to consider solutions. (Project period: August 2014-March 2015)
- JICA team proposed to construct a new wharf west-side of Fuaa wharf.

3

Image of the new wharf



4



Construction method (access channel & turning basin)

1. Dredging with excavator on barge
2. Dredged material used for backfilling.
3. Extra dredged material stored inside port for later use.



13

Construction timeframe

- A total of 2 years (2016-2017)
- Approx. 1 year civil works
- Approx. 1 year passenger terminal building

14

Others

- Working hours: 8:00-17:00
- Safety: Installation of fence and security guard
- Around 140 workers (skilled and unskilled): majority from local labor force



15

Part 2

Part 2
**Potential environmental impacts of
the Project and proposed
mitigation measures**

1

Introduction

- The Project requires environmental approval from MEC under EIA Act (2003).
- An environmental impact assessment (EIA) must be conducted to obtain environmental approval.
- Public consultation is an essential process of the EIA to inform the people in advance about the Project and likely environmental impacts.
- The opinions raised in the meeting will be reflected into the final Project design including environmental mitigation measures.

2

Aim of Part 2

- To explain the potential environmental impacts of the Project and proposed mitigation measures covering pollution, and natural and social environment.



3

**Environmental impacts during
construction phase and proposed
mitigation measures**

4

Main noise impacts

- Pile driving works of quay wall



Sheet pile Pile driving

5

Noise mitigation measures of pile driving works

- Use of low-noise pile drivers:
✓ Hydraulic vibratory hammer

Pile driving may be noisy sometimes but will be limited to day time and for around 2 months. Noise monitoring will also be conducted.

6

Main noise impacts

- Dump trucks (transporting of rock materials)



7

Noise mitigation measures

- Use of trucks with standard noise suppression devices.
- Regular maintenance of trucks.
- Passing of sensitive areas will be minimized.
- Work only during day time.

Impacts should be limited as traffic volume of construction trucks will be around 2/hour

8

Main air quality impacts

- Dust emission from construction site



9

Dust mitigation measures

- Regular water spraying
- Installation of fence



10

Main water quality impacts

- Dispersion of turbid plumes



11

Water pollution mitigation measures

- Installation of silt curtain
- Monitoring of water quality



12

Main ecosystem impacts

- Loss of corals and seagrass

Coral/seagrass mitigation measures

- Minimize impacts to nearby corals and seagrass by installing silt curtain around dredging site.
- Monitoring of corals and seagrass.

Social impacts

- Relocation of soaking area of Taovala materials

Social impacts

- Relocation of soaking area of Taovala materials

Environmental impacts during operation phase and proposed mitigation measures

Main noise impacts

- Noise from cargo handling activities and cargo/passenger vehicles

Noise increase only prior to departure and arrival of domestic ships

Main water quality impacts

- Wastewater discharge from passenger terminal (e.g. from toilet and kitchen)
- Wastewater discharge from domestic ships

19

Water pollution mitigation measures

- Wastewater from passenger terminal will be treated with septic tank.
- Treated wastewater will be discharged (via soak pit) into the sea under international standards (BOD: < 30 ppm).
- Wastewater discharge from ships will be strictly prohibited inside the port and near land according to national law.

20

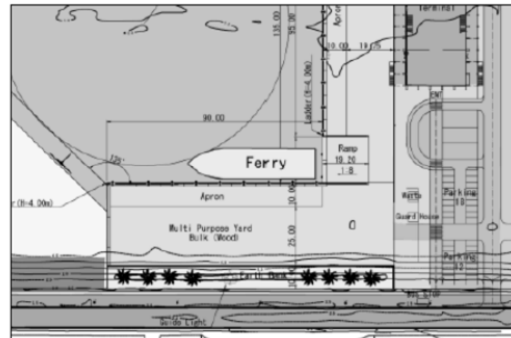
Main social impacts

- Current seaview will change to a port dominant view



Creation of greenway

21



Conclusion

- Employ environmentally friendly construction methods.
- Monitoring will be strictly implemented.
- Grievance mechanism for complaints.
- Final EIA document to be submitted at the end of this year.

23

Thank you for your attention!

24

Appendix 4 Additional opinions

- The idea is good. The wharf looks internationally standardized. Hopefully the wharf will not affect the livelihood of the people. (Tu'ifua Sakisi, Maufanga resident)
- The proposal is wonderful but hopefully this won't have an impact on the western side of the island, resulting from reclamation of the wharf. (Visone Tangifua, Maufanga resident)
- This is an important meeting for this is mostly relevant to our environment. ('Ofa Latu, Tofoa)
- Very good meeting, good project for the economic development but we'll see for the environment just to make sure that it is not impacted on the environment and our communities are safe guarded. (Lute Filimoehala, Fisheries council)
- A highly interesting presentation with great knowledge and enthusiasm. (Losilini Loto'atea)
- I know that the Ministry (project) would need the dredged material for back filling. Asking if this project dredged material can extent to people of Tukutonga, Patangata and Popua, of whom cannot pay for gravel for back filling of their households. If you can consider the 12 Seafood Restaurant to be included in the list for those Restaurants at the new Terminal. (Seketi Fuko, 12 seafood/Maufanga)
- Include everyone in getting to know about this project. Let the people know that the environmental impacts indicated in the project study can be minimized or protected. The noise, the dust and the waste water from the septic tank. ('Isileli Faka'iloatonga, MOH)
- Thank you for involving us in this proposal/ plan for the development of the country. Work plan is good. Not many people turned up to this public Consultation meeting? May be it's the communication method used? (Kennedy Penitani)
- Very much support the project. (Taniela Fe'ao, Toutai Havelu)
- The project is very good but we are hoping that fisheries sector would be considered in such development (Lute Filimoehala, National Fisheries Council)
- Fishing is my livelihood, thanks for the development of new domestic wharf to get all domestic ships out of the fishing vessels area and give us space. (Taani, National Fisheries Council)

資料8：公聴会開催マニュアル

次頁に公聴会開催マニュアルを添付する

Manual for the preparation of public consultation meeting (prepared by JICA Study Team)

1. Introduction

Public consultation is an essential process required under Tonga's EIA Regulation (2010) as well as JICA's environmental guideline (Guidelines for Environmental and Social Considerations 2010). This manual explains the necessary steps typically required for the preparation of public consultation meeting.

2. Procedures

Step 1: Identification of stakeholders

A wide range of stakeholders should be invited by considering the project's location, scale, impacts and so on. Stakeholders typically consist among others the following:

- Project affected people (e.g. local residents, farmers, fishermen)
- Local commercial and industrial enterprises (e.g. hotels, restaurants)
- Local government authorities
- Representative of local council
- NGOs
- Media

Step 2: Selection of meeting hall

Once the stakeholders are identified select a suitable meeting hall, which should be located in area convenient for the stakeholders. Also consider whether the hall has sufficient space and facilities (e.g. chairs, table, power source). If the presentation is by Power Point, make sure that the hall can be darkened for clear view of the presentation material.

Step 3: Setting of date and time of the meeting

The date and time of the meeting should be set by considering the most suitable time for the stakeholders so to enable maximum participation.

Step 4: Announcement to the public

Once the location and date are determined, announce to the public about the meeting through a combination of methods so that the information is disseminated thoroughly to the public, by for example through letters, posters, media, church service, notice board, local council and so on. Announcement should be made at least 1-2 weeks prior to the meeting, which should include the following information:

- Objective of the meeting
- Agenda of the meeting
- Location, date and time of the meeting

Step 5: Staff assignment

Assign the staff for the following roles typically required for public consultation meeting.

- Master of ceremony
- Opening and closing remarks
- Presenter of the Project
- Note taker
- Assistant (at least 2-3 people)

Step 6: Preparation of presentation materials

Presentation materials should be prepared in a manner that is understandable for the general public by using graphics as much as possible.

Step 7: Preparation of equipment and materials

Following are equipment and materials typically required for the meeting:

[Equipment]

- Projector and projection screen
- Extension cable
- PC
- Pointer
- Microphone and speaker
- Camera

[Material]

- Copy of meeting agenda and presentation material (should be distributed to the participants during registration)
- Registration sheet (see Appendix 1 for sample)
- Opinion sheet (see Appendix 2 for sample)

3. Time frame

The following table shows the time typically required for the preparation of public consultation meeting.

	Days																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Step 1: Identification of stakeholders	■	■	■	■	■	■	■																							
Step 2: Selection of meeting hall	■	■	■	■	■	■	■																							
Step 3: Setting of date and time of meeting	■	■	■	■	■	■	■																							
Step 4: Announcement to the public														■	■															
Step 5: Staff assignment								■	■																					
Step 6: Preparation of presentation materials																														
Step 7: Preparation of equipment and materials																														
Date of public consultation																														

Further reading:

International Finance Corporation (IFC), Doing Better Business Through Effective Public Consultation and Disclosure – A Good Practice Manual

Appendix 1 Sample registration sheet

No.	Name	Organization/village	Contact (Email, Tel.)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

Appendix 2 Sample opinion sheet

Please fill in your opinion about today's meeting

Name: _____

Name of organization: _____

Occupation/position: _____

Contact (email, phone, etc.): _____

Contact point:

Name:

Email:

資料9 : 土質柱状図

次頁に土質柱状図を添付する



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH01
Hole Location: Land Based
SHEET 1 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100														
CO-ORDINATES: 7661536.64 mN 688329.51 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 4/9/14														
R.L.: 2.90 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 5/9/14														
DATUM:		DRILL FLUID: Sea Water		DRILLED BY: Webster Drilling														
				LOGGED BY: CRG CHECKED: KJH														
GEOLOGICAL		ENGINEERING DESCRIPTION																
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour.
																		ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
Fill (Clean, reclamation)	Tidally controlled	0	0	Wash				2.5	0.5									No Recovery
		17	17	SPT		4 3 1 2 2 N=8		1.0	1.0									GRAVEL, with minor sand and silt, yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				1.5	1.5									No Recovery
		33	33	SPT		4 1 3 4 3 N=11		2.0	2.0									GRAVEL, with some sand and trace silt, light yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				2.5	2.5									No Recovery
		18	18	SPT		16 6 6 6 4 N=22		3.0	3.0		S							GRAVEL, with minor sand and silt, yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				3.5	3.5									No Recovery
Marine Sediments		67	67	SPT		2 2 1 0 0 N=3		4.0	4.0									Sandy silty GRAVEL, with trace clay, light greyish brown with yellow white clasts. Loose, saturated, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				4.5	4.5									No Recovery

T-T DATATEMPLATE.GDT CRG

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH01
Hole Location: Land Based
SHEET 2 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100													
CO-ORDINATES: 7661536,64 mN 688329,51 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 4/9/14													
R.L.: 2.90 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 5/9/14													
DATUM:		DRILL FLUID: Sea Water		DRILLED BY: Webster Drilling													
GEOLOGICAL		ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION
																	Soil type, minor components, plasticity or particle size, colour.
																	ROCK DESCRIPTION
																	Substance: Rock type, particle size, colour, minor components.
																	Defects: Type, inclination, thickness, roughness, filling.
Marine Sediments			78	SPT		1 for 450 mm N=0											SILT, with some gravel and minor sand, light yellowish grey. Soft, saturated, low plasticity.
			0	Push Tube													No Recovery 5.5
			0	Push Tube													No Recovery - material indicated to be too loose to stay in sampler
			100	SPT		1 0 0 1 1 N=2											Sandy gravelly SILT, with trace clay, light greyish brown with yellowish white clasts. Soft, saturated, low plasticity. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
			0	Wash													No Recovery 6.5
			22	SPT		1 0 0 1 0 N=1											SILT, with some gravel minor sand and trace clay, light grey. Soft, saturated, low plasticity. Shell fragments.
			0	Piston Sampler													No Recovery 7.5
			50	Piston Sampler													Sandy silty GRAVEL, with shell fragments and trace clay, light greenish grey with white clasts. Soft, saturated. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
			89	SPT		2 0 1 0 0 N=1											Silty sandy GRAVEL, with trace clay, greyish brown with yellowish white clasts. Soft, saturated. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
			0	Wash													No Recovery 8.5
			36	SPT		1 0 0 0 1 N=1											SILT, with some gravel minor sand and trace clay, light grey. Soft, saturated, low plasticity. Shell fragments.
			0	Wash													No Recovery 9.5

T-T DATATEMPLATE.GDT.crg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH01
Hole Location: Land Based
SHEET 3 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100													
CO-ORDINATES: 7661536,64 mN 688329,51 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 4/9/14													
R.L.: 2.90 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 5/9/14													
DATUM:		DRILL FLUID: Sea Water		DRILLED BY: Webster Drilling													
GEOLOGICAL		ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSION STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION
																	Soil type, minor components, plasticity or particle size, colour.
																	ROCK DESCRIPTION
																	Substance: Rock type, particle size, colour, minor components.
																	Defects: Type, inclination, thickness, roughness, filling.
Marine Sediments		100	SPT		1 1 0 1 N=3		-7.5										Sandy SILT, with trace gravel and clay, greyish brown with yellowish white clasts. Soft, saturated, low plasticity.
		0					10.5										No Recovery 10.5
		100	Push Tube					-8.0									SILT, with some clay and sand, dark yellowish brown. Soft, medium to high plasticity, dilatant.
		82	SPT		2 2 2 5 3 N=12		-8.5										SILT, with minor sand, dark black brown, volcanogenic (tuff(?)), airfall texture. Stiff, moist, moderate plasticity.
		0	Wash					11.5									No Recovery 11.5
Limestone (Raised coral reef)					15 4 5 9 5 N=23		-9.5										Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.
		44	SPT				12.0										
		0	Wash					12.5									
		38	SPT		5 4 7 6 8 N=25		-10.5										
		0	Wash					13.5									
	33				21 for 60 mm bouncing *N>50		-11.0										
	0	Wash					-11.5										
							-12.0										

T-T DATATEMPLATE.GDT.crg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH01
Hole Location: Land Based
SHEET 4 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100												
CO-ORDINATES: 7661536,64 mN 688329,51 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 4/9/14												
R.L.: 2.90 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 5/9/14												
DATUM:		DRILL FLUID: Sea Water		DRILLED BY: Webster Drilling												
GEOLOGICAL		ENGINEERING DESCRIPTION														
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION
																Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
Limestone (Raised coral reef)		26	SPT		10 13 12 for 40 mm bouncing *N>50		-12.5									Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.
		100	HQ3				15.5									
		100	HQ3					-13.0								
		0				10 for 80 mm bouncing *N>50		16.0								
		87	HQ3					-13.5								
								16.5								
								-14.0								
						12 8 8 12 14 N=42		17.0								
								-14.5								
								17.5								
							-15.0									
							18.0									
					11 7 8 7 15 N=37		-15.5									
							18.5									
							-16.0									
							19.0									
					24 39 11 for 35mm N>50		-16.5									
							19.5									
							-17.0									
							20									

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Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH01
Hole Location: Land Based
SHEET 5 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal			LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100														
CO-ORDINATES: 7661536,64 mN 688329,51 mE			DRILL TYPE: HPP-150 RC			HOLE STARTED: 4/9/14														
R.L.: 2.90 m			DRILL METHOD: SPT Wash HQ3			HOLE FINISHED: 5/9/14														
DATUM:			DRILL FLUID: Sea Water			DRILLED BY: Webster Drilling														
						LOGGED BY: CRG CHECKED: KJH														
GEOLOGICAL				ENGINEERING DESCRIPTION																
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)		COMPRESSIVE STRENGTH (MPa)		DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
															10	20	50	100		
Limestone (<i>Raised coral reef</i>)			44	SPT		5 10 12 10 15 N=47		-17.5												<i>Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.</i>
								20.5												End of Hole @ 20.45 m - Target Depth <i>Donut trip hammer used, 40 blows a minute, NWJ rod, standard 24" split spoon</i> Soil descriptions presented in plain text are populated from Laboratory PSD testing; Soil descriptions presented in <i>italics</i> are populated from engineering geology field descriptions.
								-18.0												21.0
								21.0												21.0
								-18.5												21.5
								21.5												21.5
								-19.0												22.0
								22.0												22.0
								-19.5												22.5
								22.5												22.5
								-20.0												23.0
								23.0												23.0
								-20.5												23.5
								23.5												23.5
								-21.0												24.0
								24.0												24.0
								-21.5												24.5
								24.5												24.5
								-22.0												25
								25												25

T-T DATATEMPLATE.GDT CRG

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH02
Hole Location: Land Based
SHEET 1 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100													
CO-ORDINATES: 7661636.17 mN 688376.46 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 6/9/14													
R.L.: 3.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 9/9/14													
DATUM:		DRILL FLUID: Sea Water / Mud		DRILLED BY: Webster Drilling													
				LOGGED BY: CRG CHECKED: KJH													
GEOLOGICAL		ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
Fill (Clean, reclamation)	Tidally controlled	0	0	Wash				3.0									No Recovery
		0	0	Wash				2.5									
		44	44	SPT		2 3 1 1 1 N=6		2.0	1.0								Sandy GRAVEL, with minor silt and trace clay, light yellowish brown with white clasts. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				1.5									No Recovery
		11	11	SPT		4 1 1 0 0 N=2		2.0	1.0								GRAVEL, with minor sand and silt, yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				2.5									No Recovery
		62	62	SPT		9 4 4 4 8 N=20		3.0	0.0								GRAVEL, with minor sand and silt, trace concrete fragments, yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				3.5									No Recovery
Marine Sediments		3	3	SPT		1 0 1 2 2 N=5		4.0	-1.0			S					GRAVEL, yellowish white. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
		0	0	Wash				4.5	-1.5								No Recovery
								5									

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BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH02
Hole Location: Land Based
SHEET 2 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100															
CO-ORDINATES: 7661636.17 mN 688376.46 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 6/9/14															
R.L.: 3.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 9/9/14															
DATUM:		DRILL FLUID: Sea Water / Mud		DRILLED BY: Webster Drilling															
GEOLOGICAL		ENGINEERING DESCRIPTION																	
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION		
																	SOIL type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.		
Marine Sediments			17	SPT		2 0 1 1 1 N=3		-2.0									GRAVEL, with minor sand and silt, yellowish white. Medium dense, dry, gap graded. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.		
			0	Wash				5.5									No Recovery		
			0	Wash					2.5										
			38	SPT			1 0 1 0 0 N=1		6.0									SILT, with some gravel, light yellowish brown. Soft. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.	
			0	Wash					6.5									No Recovery	
			0	Wash					3.5										
			5 3 1 2 2 N=8	SPT					7.0									Sandy GRAVEL, with minor silt and trace clay, light yellowish brown with white clasts. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.	
			0	Wash					7.5									No Recovery	
			89	SPT			1 1 1 0 N=3		8.0										Gravelly SAND, with some silt and trace clay, light yellowish brown with grey/white clasts. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
			0	Piston Sampler					8.5										No Recovery No Recovery - material indicated to be too loose to stay in sampler
		73	SPT			3 2 1 16 28 N=47		9.0										SILT, with some sand and minor gravel, yellowish brown. Soft.	
		0	Wash					9.5										No Recovery	
								10											

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BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH02
Hole Location: Land Based
SHEET 3 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100															
CO-ORDINATES: 7661636.17 mN 688376.46 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 6/9/14															
R.L.: 3.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 9/9/14															
DATUM:		DRILL FLUID: Sea Water / Mud		DRILLED BY: Webster Drilling															
				LOGGED BY: CRG CHECKED: KJH															
GEOLOGICAL		ENGINEERING DESCRIPTION																	
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.		FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
Marine Sediments				100	SPT		1 for 450 mm N=0		-7.0									Silty gravelly SAND, with trace clay, light yellowish brown with white/grey clasts. Gravel is coral, white/grey, fine/coarse. Gap graded, sub angular.	
				0	Push Tube				10.5									No Recovery 10.5	
				54	Push Tube				-7.5									Sandy SILT, with some gravel and shell fragments, minor clay, light greenish grey. Soft to firm.	
							2 0 1 0 1 N=2		11.0									SILT, with some gravel and minor sand (shell), greenish brown. soft, wet. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.	
				100	SPT				-8.0										No Recovery 11.5
				0	Wash				-8.5										
							2 1 2 2 1 N=6		12.0										Sandy GRAVEL with minor silt and trace clay, dark greyish brown with light yellow and white clasts. Gravel is coral, white/grey, fine/coarse, Gap graded, sub angular.
				100	SPT				-9.0										No Recovery 12.5
				0	Wash				-9.5										
							5 1 1 1 1 N=4		13.0										SILT, with some gravel and sand (shell), dark brown. soft, wet.
Limestone (Raised coral reef)				100	SPT				-10.0										No Recovery 13.5
				0	Wash				-10.5										
				60	SPT		17 16 10 10 14 for 65 mm N>50		14.0									Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %. Returned as [Sandy Coral GRAVEL, with minor silt and trace clay, light yellowish brown with white clasts.]	
				0	Wash				-11.5										No Recovery 14.5
								15											

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BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH02
Hole Location: Land Based
SHEET 4 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal			LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100													
CO-ORDINATES: 7661636.17 mN 688376.46 mE			DRILL TYPE: HPP-150 RC			HOLE STARTED: 6/9/14													
R.L.: 3.10 m			DRILL METHOD: SPT Wash HQ3			HOLE FINISHED: 9/9/14													
DATUM:			DRILL FLUID: Sea Water / Mud			DRILLED BY: Webster Drilling													
GEOLOGICAL			ENGINEERING DESCRIPTION																
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION		
																	Soil type, minor components, plasticity or particle size, colour.		
Limestone (Raised coral reef)																	ROCK DESCRIPTION		
																	Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.		
			84	SPT		33 9 18 23 for 35 mm N>50		-12.0										Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.	
			78	HQ3				-12.5											15.5
			76	HQ3				-12.5											15.5
			10			10 7 8 6 6 N=27		-13.0											16.0
			36	SPT				-13.0											16.0
			68	HQ3				-13.5											16.5
			47	HQ3				-13.5											16.5
			100	HQ3				-14.0											17.0
			36	SPT		10 5 5 5 10 N=25		-14.0											17.0
			80	HQ3				-14.5											17.5
			73	HQ3				-14.5											17.5
			20			20 8 7 5 4 N=24		-15.0											18.0
			50	SPT				-15.0											18.0
			95	HQ3				-15.5											18.5
			20			20 15 15 20 for 55 mm N>50		-16.0											19.0
			56	SPT				-16.0											19.0
			100	HQ3				-16.5										19.5	
			100	HQ3				-16.5										19.5	
								20										20	

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TONKIN & TAYLOR LTD
BOREHOLE LOG

BOREHOLE No: BH02
Hole Location: Land Based
SHEET 5 OF 5

PROJECT: JICA Study Team - Domestic Ferry Terminal			LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100																
CO-ORDINATES: 7661636.17 mN 688376.46 mE			DRILL TYPE: HPP-150 RC			HOLE STARTED: 6/9/14																
R.L.: 3.10 m			DRILL METHOD: SPT Wash HQ3			HOLE FINISHED: 9/9/14																
DATUM:			DRILL FLUID: Sea Water / Mud			LOGGED BY: CRG CHECKED: KJH																
GEOLOGICAL				ENGINEERING DESCRIPTION																		
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.				FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
Limestone (<i>Raised coral reef</i>)						100	34	SPT		50 for 145 mm N>50	-17.0										<i>Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.</i>	
						89	HQ3		17 6 5 15 24 N=50	-17.5	-17.5										20.5	
						52	SPT			-18.0	-18.0										21.0	
						100	HQ3			-18.5	-18.5										21.5	
						100	HQ3			-19.0	-19.0										22.0	
						41	SPT		7 8 10 32 for 65 mm N>50	-19.5	-19.5											22.5
						100	HQ3			-20.0	-20.0											23.0
						44	SPT		20 14 12 13 11 N=50	-21.0	-21.0											23.5
										-20.5	-20.5											End of Hole @ 23.45 m - Target Depth <i>Donut trip hammer used, 40 blows a minute, NWJ rod, standard 24" split spoon</i> Soil descriptions presented in plain text are populated from Laboratory PSD testing; Soil descriptions presented in <i>italics</i> are populated from engineering geology field descriptions.
										-21.0	-21.0											24.0
										-21.5	-21.5											24.5
										-25.0	-25.0											25.0

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BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH03
Hole Location: Reef Based, on platform
SHEET 1 OF 3

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100														
CO-ORDINATES: 7661604.15 mN 688238.32 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 11/9/14														
R.L.: -0.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 18/9/14														
DATUM:		DRILL FLUID: Sea Water / Mud		LOGGED BY: CRG CHECKED: KJH														
GEOLOGICAL		ENGINEERING DESCRIPTION																
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.		FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
Marine Sediments				0	Wash				-0.5				S					No Recovery
				11	SPT				0.5									Sandy GRAVEL, with trace silt, light yellowish white. Loose. Gravel is coral. [Top of living reef]
				0			1 0 2 1 1 N=4		1.0									No Recovery SILT, with some gravel, greenish grey. Soft. Gravel is coral yellowish white.
				56	SPT				1.5									No Recovery Silty gravelly SAND, with trace clay, light yellowish brown. Soft. Gravel is coral, white/grey.
				69	SPT				2.0									No Recovery SILT, with some gravel, greenish grey. Soft. Gravel is coral yellowish white.
				38	SPT		1 1 0 0 0 N=1		2.5									No Recovery Sandy GRAVEL, with minor silt and trace clay, light yellowish brown. Soft. Gravel is coral, white/grey.
				38	SPT				3.0									No Recovery SILT, with some gravel, greenish grey. Stiff. Gravel is coral yellowish white.
				90	Push Tube				3.5									No Recovery Push Tube
				87	SPT		1 0 0 1 0 N=1		4.0									Gravelly SAND, with some silt and trace clay, light yellowish brown. Soft. Gravel is coral, gray/white.
				60	Push Tube				4.5									No Recovery Sandy SILT, with some gravel and shell fragments, and minor clay, light greensih grey. Soft. Gravel is coral, white/grey.
									5.0									

T-T DATATEMPLATE.GDT CRG

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BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH03
Hole Location: Reef Based, on platform
SHEET 2 OF 3

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100																		
CO-ORDINATES: 7661604.15 mN 688238.32 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 11/9/14																		
R.L.: -0.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 18/9/14																		
DATUM:		DRILL FLUID: Sea Water / Mud		LOGGED BY: CRG CHECKED: KJH																		
GEOLOGICAL		ENGINEERING DESCRIPTION																				
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)		COMPRESSIVE STRENGTH (MPa)		DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.			
														10	20	1.0	2.0					
Marine Sediments			100	SPT		450 mm under RW* N=0													Gravelly SAND, with some silt and trace clay, light yellowish brown. Gravel is coral, grey/white.			
			0	Push Tube				-5.5	5.5										No Recovery Push Tube 5.5			
			75	Push Tube					-6.0	6.0										SILT, with some gravel, greenish grey. Firm. Gravel is coral yellowish white. 6.0		
			89	SPT		1 0 2 1 2 N=5			-6.5	6.5										No Recovery Push Tube 6.5		
			60	Push Tube					-7.0	7.0											Sandy GRAVEL, with minor silt, light yellowish brown. Loose. gravel is coral, grey/white. 7.0	
			56	SPT		8 4 3 3 3 N=13			-7.5	7.5											No Recovery 7.5 Sandy GRAVEL, with minor silt, greenish brown. Medium dense. Gravel is coral, white.	
			67	SPT					-8.0	8.0											No Recovery 8.0	
	Limestone (Raised coral reef)			33	SPT		9 11 8 4 4 N=27			-8.5	8.5										Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %. [SPT samples returned as coarse angular gravels] 8.5	
				33	SPT					-9.0	9.0											9.0
				63	SPT		14 12 7 16 15 for 55 mm N>50			-9.5	9.5											9.5
			38	SPT					-10.0	10											10	

T-T DATATEMPLATE.GDT.cvg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH03
Hole Location: Reef Based, on platform
SHEET 3 OF 3

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga		JOB No: 751064.100																
CO-ORDINATES: 7661604.15 mN 688238.32 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 11/9/14																
R.L.: -0.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 18/9/14																
DATUM:		DRILL FLUID: Sea Water / Mud		LOGGED BY: CRG CHECKED: KJH																
GEOLOGICAL		ENGINEERING DESCRIPTION																		
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION		
																		Soil type, minor components, plasticity or particle size, colour.		
ROCK DESCRIPTION																				
Substance: Rock type, particle size, colour, minor components.																				
Defects: Type, inclination, thickness, roughness, filling.																				
Limestone (<i>Raised coral reef</i>)			74	SPT		26 25 25 for 45 mm N>50												<i>Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %.</i> [SPT samples returned as coarse angular gravels]		
			0					-10.5	10.5										10.5	
			38	SPT																
			0						-11.0	11.0										11.0
			44	SPT			11 6 6 8 8 N=28													
			96	HQ3					-11.5	11.5										11.5
			33	SPT			24 18 30 2 for 5 mm N>50													
			100	HQ3					-12.0	12.0										12.0
			100	HQ3					-12.5	12.5										12.5
			67	SPT			11 8 9 9 8 N=34													
		100	HQ3					-13.0	13.0									13.0		
		100	HQ3					-13.5	13.5									13.5		
		0	SPT			30 for 100mm bouncing *N>50														
								-14.0	14.0									14.0		
								-14.5	14.5									14.5		
								-15.0	15									15		
End of Hole @ 14.1 m - Target Depth <i>Donut trip hammer used, 40 blows a minute, NWJ rod, standard 24" split spoon</i> Soil descriptions presented in plain text are populated from Laboratory PSD testing; Soil descriptions presented in <i>italics</i> are populated from engineering geology field descriptions.																				

T-T DATATEMPLATE.GDT CRG

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH04
Hole Location: Reef Based, on platform
SHEET 1 OF 4

PROJECT: JICA Study Team - Domestic Ferry Terminal			LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100												
CO-ORDINATES: 7661754.98 mN 688231.86 mE			DRILL TYPE: HPP-150 RC			HOLE STARTED: 20/9/14												
R.L.: -0.10 m			DRILL METHOD: SPT Wash HQ3			HOLE FINISHED: 23/9/14												
DATUM:			DRILL FLUID: Sea Water / Mud			LOGGED BY: CRG CHECKED: KJH												
GEOLOGICAL			ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	10 20 30 40 50 60 70 80 90 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000	10 20 30 40 50 60 70 80 90 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
Marine Sediments			0	Wash				-0.5				S					No Recovery	
			71	SPT		5		-1.0									0.5	Sandy GRAVEL, with minor silt, light grey. Loose, poorly graded. Gravel is coral, grey.
			40	SPT		8		-1.5									1.0	No Recovery GRAVEL, with some sand, minor silt and trace clay, light yellowish brown. Loose. Gravel is coral, grey/white.
			89	SPT		2		-2.0									1.5	No Recovery GRAVEL, with minor silt, greenish grey. Gravel is coral, white, angular.
			33	SPT		4		-2.5									2.0	No Recovery GRAVEL, with some sand, minor silt and trace clay, light yellowish brown. Loose. Gravel is coral, grey/white.
			60	SPT		3		-3.0									2.5	No Recovery GRAVEL, with trace silt, white with greenish grey. Gravel is coral, angular.
			44	SPT		1		-3.5									3.0	No Recovery Silty GRAVEL. Loose.
			47	SPT		2		-4.0									3.5	No Recovery Silty gravelly SAND, with trace clay, light yellowish brown. Soft. Gravel is coral, grey/white.
			82	Shelby Tube		2		-4.5									4.0	No Recovery Sandy SILT, with some gravel and minor clay, light greenish grey. Soft to firm. Gravel is coral and shell fragments.
			100	SPT		1		-5.0									4.5	No Recovery Sandy GRAVEL, with some silt and trace clay, light yellowish brown. Soft. Gravel is coral, grey/white.

T-T DATATEMPLATE_GDI.crg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH04
Hole Location: Reef Based, on platform
SHEET 2 OF 4

PROJECT: JICA Study Team - Domestic Ferry Terminal	LOCATION: Fua Wharf, Nuku'alofa, Tonga	JOB No: 751064.100
CO-ORDINATES: 7661754.98 mN 688231.86 mE	DRILL TYPE: HPP-150 RC	HOLE STARTED: 20/9/14
R.L.: -0.10 m	DRILL METHOD: SPT Wash HQ3	HOLE FINISHED: 23/9/14
DATUM:	DRILL FLUID: Sea Water / Mud	LOGGED BY: CRG CHECKED: KJH

GEOLOGICAL	ENGINEERING DESCRIPTION																	
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSION STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
	10	20	30	40	50	60	70	80	90	100	150	200	250	300	350	400		
Marine Sediments			86	Shelby Tube				-5.5									No Recovery	
			100	SPT				5.5									Silty SAND, with some gravel and trace clay, light yellowish brown. Soft. Gravel is coral, grey/white.	
			0	Shelby Tube				6.0									No Recovery	
			0	Shelby Tube				6.5									No Recovery	
			89	SPT			1 0 3 8 11 N=22	7.0									SILT, with trace sand and gravel, greenish grey. Soft to firm.	
			78	SPT			3 4 6 3 3 N=16	7.5									No Recovery	
			100	SPT				8.0									No Recovery	
			56	Piston Sampler				8.5										No Recovery
			40	SPT				9.0										Silty gravelly SAND, with trace clay, light yellowish brown. Soft. Gravel is coral, grey/white.
			73	SPT			14 10 6 4 6 N=26	9.5										No Recovery
		76	SPT				10.0										No Recovery	

T=J DATATEMPLATE.GDT crg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH04
Hole Location: Reef Based, on platform
SHEET 3 OF 4

PROJECT: JICA Study Team - Domestic Ferry Terminal		LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100														
CO-ORDINATES: 7661754.98 mN 688231.86 mE		DRILL TYPE: HPP-150 RC		HOLE STARTED: 20/9/14															
R.L.: -0.10 m		DRILL METHOD: SPT Wash HQ3		HOLE FINISHED: 23/9/14															
DATUM:		DRILL FLUID: Sea Water / Mud		LOGGED BY: CRG CHECKED: KJH															
GEOLOGICAL		ENGINEERING DESCRIPTION																	
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)		COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
	10	20	30	40	50	60								70	80	90	100		150
Limestone (Raised coral reef)			86	SPT		24 11 20 15 for 70mm bouncing *N>50												No Recovery	
			0					-10.5	10.5									Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %. [SPT samples returned as coarse angular gravels]	
			67	SPT															
			0						-11.0	11.0									
			80	SPT			19 12 18 15 5 for 25mm bouncing N>50												
			100	HQ3					-11.5	11.5									
			100	HQ3					-12.0	12.0									
			0						-12.5	12.5									
			86	HQ3					-13.0	13.0									
			56	SPT					-13.5	13.5									
			100	HQ3					-14.0	14.0									
		70	HQ3					-14.5	14.5										
								-15.0	15.0										

T-T DATATEMPLATE.GDT.crg

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014



TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH04
Hole Location: Reef Based, on platform
SHEET 4 OF 4

PROJECT: JICA Study Team - Domestic Ferry Terminal			LOCATION: Fua Wharf, Nuku'alofa, Tonga			JOB No: 751064.100													
CO-ORDINATES: 7661754.98 mN 688231.86 mE			DRILL TYPE: HPP-150 RC			HOLE STARTED: 20/9/14													
R.L.: -0.10 m			DRILL METHOD: SPT Wash HQ3			HOLE FINISHED: 23/9/14													
DATUM:			DRILL FLUID: Sea Water / Mud			LOGGED BY: CRG CHECKED: KJH													
GEOLOGICAL				ENGINEERING DESCRIPTION															
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION	
																		Substance: Rock type, particle size, colour, minor components.	
Limestone (<i>Raised coral reef</i>)			67	SPT		24 13 10 8 12 for 45 mm N>50	-	-15.5	15.5	[Brick pattern]								ROCK DESCRIPTION	
																			Substance: Rock type, particle size, colour, minor components.
			75	HQ3		17 8 for 10 mm bouncing *N>50		-16.0	16.0	[Brick pattern]								Slightly weathered to unweathered, voided (up to 30%), yellowish white to white, coralline LIMESTONE. Extremely weak to moderately strong dependant on limestone structure and void %. [SPT samples returned as coarse angular gravels]	
			54	HQ3				-16.5	16.5	[Brick pattern]									
			50	SPT		10 7 20 for 75 mm bouncing *N>50		-17.0	17.0	[Brick pattern]								End of Hole @ 17.3 m - Target Depth Donut trip hammer used, 40 blows a minute, NWJ rod, standard 24" split spoon Soil descriptions presented in plain text are populated from Laboratory PSD testing; Soil descriptions presented in <i>italics</i> are populated from engineering geology field descriptions.	
								-17.5	17.5	[Brick pattern]									
								-18.0	18.0	[Brick pattern]									
								-18.5	18.5	[Brick pattern]									
								-19.0	19.0	[Brick pattern]									
								-19.5	19.5	[Brick pattern]									
								-20.0	20.0	[Brick pattern]									

T-T DATATEMPLATE.GDT CRG

Log Scale 1:25

BORELOG 751064.100 - CLIENT.GPJ 9-Dec-2014