

## 7. **References**

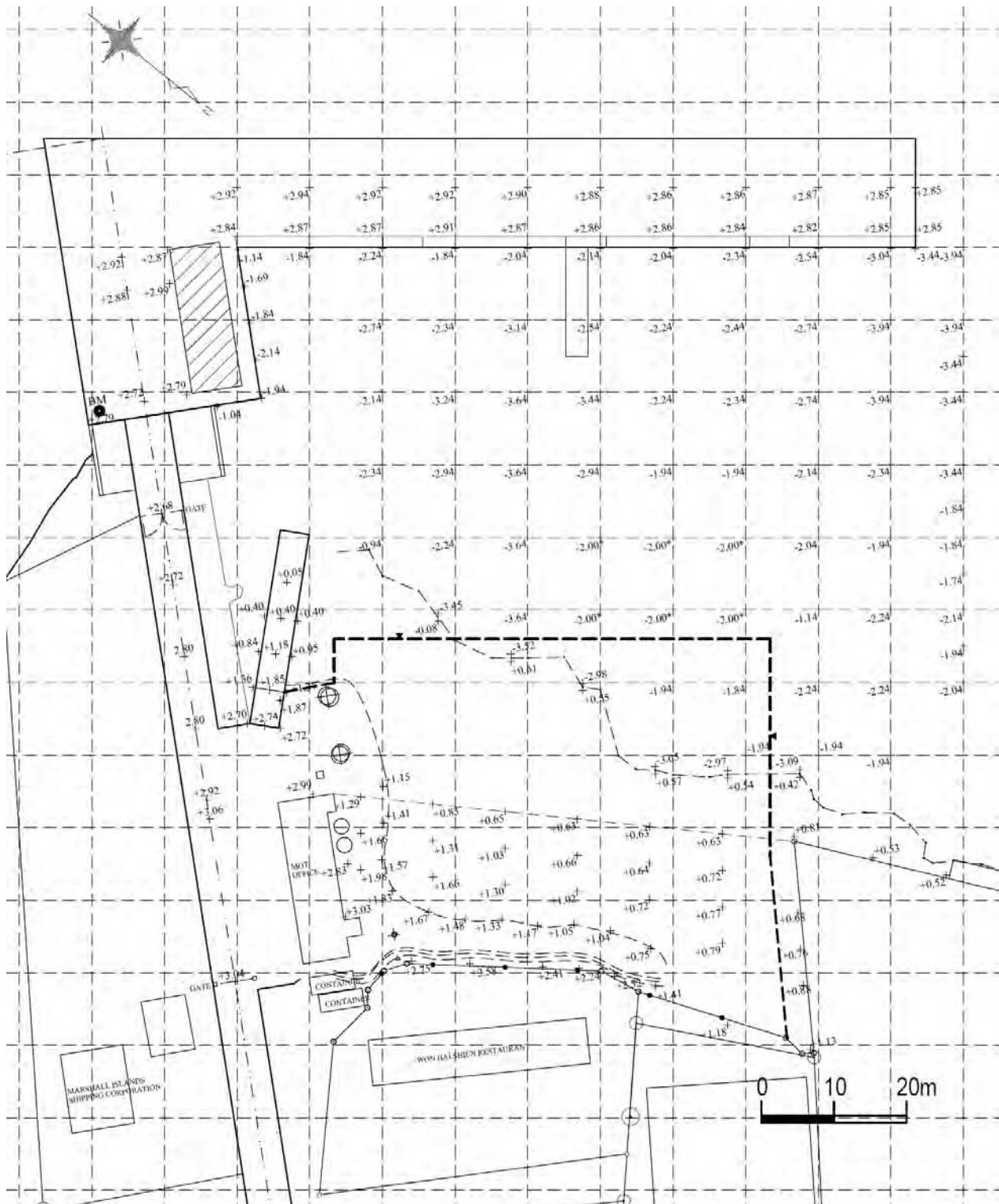
7-1 Topographic and Sounding Survey Map

7-2 Results of Geotechnical Survey

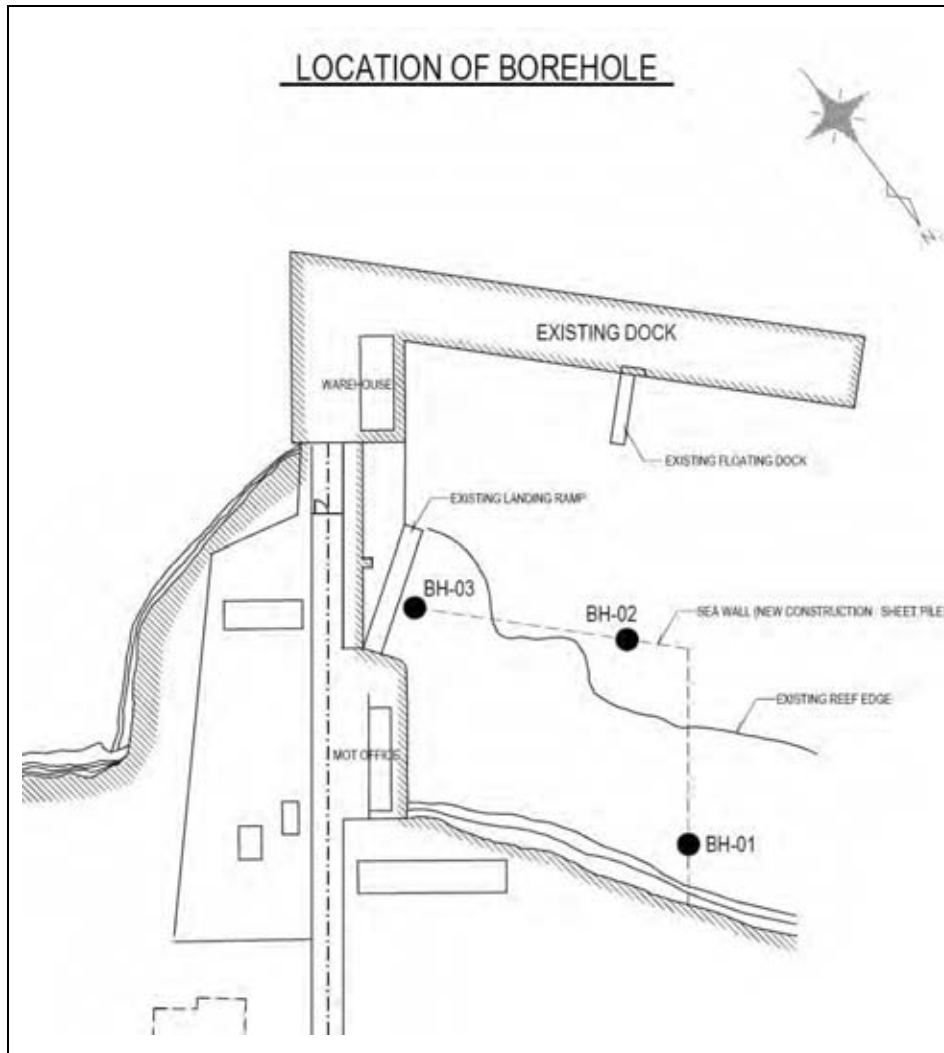
7-3 Water requirement for the planned facility



7-1. Topographic and Sounding Survey Map



7-2. Results of Geotechnical Survey



Location Map of Natural Condition Survey

BORING NO. 1									
Notes:									
<input type="checkbox"/> Undisturbed Sample    SPT = Standard Penetration Test    DATE July 26, 2008 <input type="checkbox"/> Disturbed/Bulk Sample    based on 63.5 kgs (140 lbs)    EQUIPMENT Skid-Mounted Portable Auger <input type="checkbox"/> No Recovery    free falling 76 cm (30 in.)/blow    ELEVATION									
DEPTH (FT.)	DEPTH (M)	DESCRIPTION	GRAPHIC LOG	SAMPLE TYPE	DRILL RATE (cm/min)	SPT (blows/30 cm)	MOISTURE CONTENT, %	DRY DENSITY, g/cc	LABORATORY TESTS
0	0	Water depth at 13 cm above sea floor, 3:15 pm, 7/26/08							
1	1	LIGHT BROWN-WHITE CORAL GRAVEL AND COBBLES (GP) - hard, saturated				15/0			
2	2	LIGHT BROWN-WHITE SILTY SAND (SM) - medium dense, saturated				21			
3	3								
4	4	light grey-white, dense from 3.5 m, with shell fragments				34			SA
5	5	medium dense from 5.5 m				29			SA
6	6								
7	7	LIGHT GREY-WHITE SILTY SANDY GRAVEL (GM) - medium dense, saturated, with some cobbles				25	24.0	1.47	SA Gs=2.675
8	8	LIGHT GREY-WHITE SILTY GRAVELLY SAND (SM) - loose, saturated				6			
9	9	Encountered cavity from 9.1 m - 9.6 m				7			SA Gs=2.730
10	10								
35	35								

LOG OF BORING 1  
Fish Market Center  
Majuro Atoll  
The Marshall Island

GEO-ENGINEERING & TESTING, INC.  
Geotechnical & Material Testing Engineers

Job No. 358.03    Date 08/26/08

PLATE 2

BORING NO. 1									
Notes:									
<input type="checkbox"/> Undisturbed Sample    SPT = Standard Penetration Test    DATE July 26, 2008 <input type="checkbox"/> Disturbed/Bulk Sample    based on 63.5 kgs (140 lbs)    EQUIPMENT Skid-Mounted Portable Auger <input type="checkbox"/> No Recovery    free falling 76 cm (30 in.)/blow    ELEVATION									
DEPTH (FT.)	DEPTH (M)	DESCRIPTION	GRAPHIC LOG	SAMPLE TYPE	DRILL RATE (cm/min)	SPT (blows/30 cm)	MOISTURE CONTENT, %	DRY DENSITY, g/cc	LABORATORY TESTS
11	11	LIGHT BROWN-WHITE SANDY CORAL FINGERS (GP) - medium dense, saturated				7	28.7		Gs=2.579
12	12	(Bottom of borehole = 12.8 m)				18			

LOG OF BORING 1 (continued)  
Fish Market Center  
Majuro Atoll  
The Marshall Island

GEO-ENGINEERING & TESTING, INC.  
Geotechnical & Material Testing Engineers

Job No. 358.03    Date 08/26/08

PLATE 2 (cont'd)

BORING NO. 2									
Notes: Undisturbed Sample SPT = Standard Penetration Test DATE July 29, 2008									
Disturbed/Blank Sample based on 63.5 kgs (140 lbs) EQUIPMENT Skid-Mounted Portable Auger									
No Recovery free falling 76 cm (30 in.)/blow ELEVATION									
DEPTH (FT.)	DEPTH (M)	DESCRIPTION	GRAINED LOG	CLAYLINE TYPE	DRILL RATE (min/ft)	SPT (blows/30 cm)	MOISTURE CONTENT, %	DRY DENSITY, g/cc	LABORATORY TESTS
35	11	(Bottom of borehole at 11.3 m)				20			

GEO-ENGINEERING & TESTING, INC. Geotechnical & Material Testing Engineers		LOG OF BORING 2 (continued)		PLATE
Fish Market Center Majuro Atoll		The Marshall Island		3
Job No. 358.03	Date 08/26/08			

BORING NO. 2									
Notes: Undisturbed Sample SPT = Standard Penetration Test DATE July 29, 2008									
Disturbed/Blank Sample based on 63.5 kgs (140 lbs) EQUIPMENT Skid-Mounted Portable Auger									
No Recovery free falling 76 cm (30 in.)/blow ELEVATION									
DEPTH (FT.)	DEPTH (M)	DESCRIPTION	GRAINED LOG	CLAYLINE TYPE	DRILL RATE (min/ft)	SPT (blows/30 cm)	MOISTURE CONTENT, %	DRY DENSITY, g/cc	LABORATORY TESTS
0	0	(water depth at 0.8 m, 4300 psi, 07/30/08 above sea bed)							
5	1	LIGHT BROWN-WHITE SILTY SAND (SM) - medium dense, saturated light grey-white, loose, with coral cobbles from 0.8 m				5			
10	2	light brown-white, medium dense, with shell fragments from 2.2 m				14			Gs=2.651
15	4					28			
20	5	LIGHT GREY-WHITE CORAL FINGERS AND COBBLES (GP) - hard, saturated				100			
25	6					58/15			
30	9	LIGHT GREY-WHITE SILTY GRAVELLY SAND (SM) - very dense, saturated medium dense from 8.8 m				56	28.0	1.54	SA Gs=2.713
35	10					20			Gs=2.631

GEO-ENGINEERING & TESTING, INC. Geotechnical & Material Testing Engineers		LOG OF BORING 2		PLATE
Fish Market Center Majuro Atoll		The Marshall Island		3
Job No. 358.03	Date 08/26/08			



BORING NO. 3									
<b>Notes:</b> <input type="checkbox"/> Undisturbed Sample SPT = Standard Penetration Test DATE July 29, 2008 <input type="checkbox"/> Disturbed/Bulk Sample based on 63.5 kgs (140 lbs) EQUIPMENT Skid-Mounted Portable Auger <input type="checkbox"/> No Recovery free falling 76 cm (30 in.)/blow ELEVATION --									
DEPTH (FT.)	DEPTH (M.)	DESCRIPTION	GRAPHIC LOG	SOIL TYPE	DRILL RATE (feet/min)	SPT (blows/30 cm)	MOISTURE CONTENT, %	DRY DENSITY, g/cc	LABORATORY TESTS
0	0								
1	0.3	(Water depth at 5.5 cm, 2:00 pm, 07/24/08) LIGHT BROWN-WHITE SANDY CORAL GRAVEL AND COBBLES (GP) - loose to medium dense, saturated, with boulders, concrete fragments, rebars on surface				19			
2	0.6	(Note: Lost drilling water circulation at 1.7 m - 1.8 m)							
3	0.9					55/6			SA
4	1.2					49			SA
5	1.5	loose from 4.2 m				6			
6	1.8	medium dense from 5.1 m				23			
7	2.1					24			
8	2.4					22			
9	2.7								
10	3.0					17			Gs=2.357
Bottom of hole at 10.7 m									
<b>GEO-ENGINEERING &amp; TESTING, INC.</b> Geotechnical & Material Testing Engineers Fish Market Center Majuro Atoll The Marshall Island									
Job No. 358.03 Date 08/26/08									

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
GRAVELS <small>MORE THAN HALF COARSE FRACTIONS LARGER THAN NO. 10 SIEVE</small>	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVELS - SAND MIXTURES	
	GRAVELS WITH OVER 10% FINES	GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES	
SANDS <small>MORE THAN HALF COARSE FRACTIONS SMALLER THAN NO. 10 SIEVE</small>	CLEAN SANDS WITH LITTLE OR NO FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL - SAND - SILT MIXTURES	
	SANDS WITH OVER 10% FINES	GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL - SANDS - CLAY MIXTURES	
SILTS AND CLAYS <small>LIQUID LIMIT LESS THAN 50</small>	LOW PLASTICITY SILTS AND CLAYS	SM	POORLY GRADED SANDS, SPARSELY SANDS	
	HIGH PLASTICITY SILTS AND CLAYS	SC	SILTY SANDS, POORLY GRADED SAND - SILT MIXTURES	
FINE GRAINED SOILS <small>MORE THAN HALF IS SMALLER THAN # 200 SIEVE</small>	LOW PLASTICITY SILTS AND CLAYS	ML	CLAYEY SANDS, POORLY GRADED SAND - CLAY MIXTURES	
	HIGH PLASTICITY SILTS AND CLAYS	CL	POORLY GRADED SANDS, SPARSELY SANDS	
HIGHLY ORGANIC SOILS	LOW PLASTICITY SILTS AND CLAYS	OL	POORLY GRADED SANDS, SPARSELY SANDS	
	HIGH PLASTICITY SILTS AND CLAYS	MH	POORLY GRADED SANDS, SPARSELY SANDS	
		CH	POORLY GRADED SANDS, SPARSELY SANDS	
		OH	POORLY GRADED SANDS, SPARSELY SANDS	
		PH	POORLY GRADED SANDS, SPARSELY SANDS	

**UNIFIED SOIL CLASSIFICATION SYSTEM**

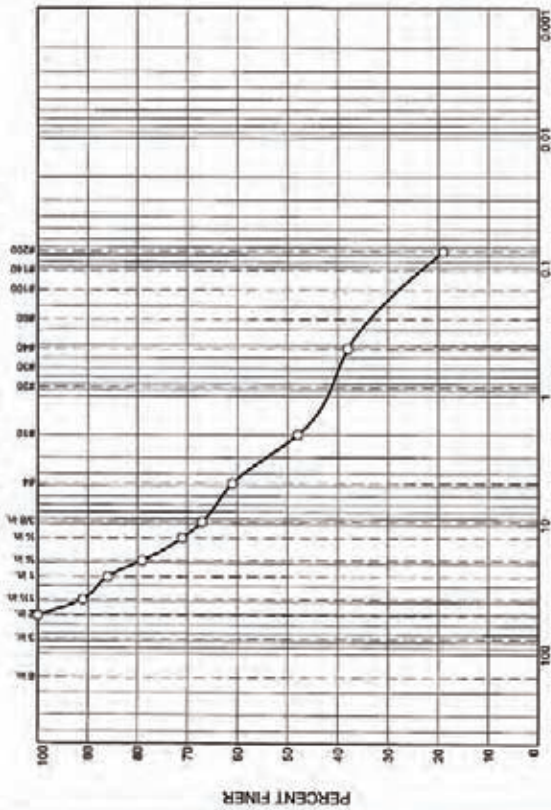
**KEY TO TEST DATA**

SA = Sieve Analysis  
 Consol = Consolidation

= Bulk Sample  
 = "Undisturbed" Sample

GEO-ENGINEERING & TESTING, INC.		SOIL CLASSIFICATION CHART AND KEY TO TEST DATA	
Geotechnical & Material Testing Engineers		FISH MARKET CENTER	
Job No. 358.03		MAJURO ATOLL	
Appr. US/	Date: 09/1/08		

### Particle Size Distribution Report



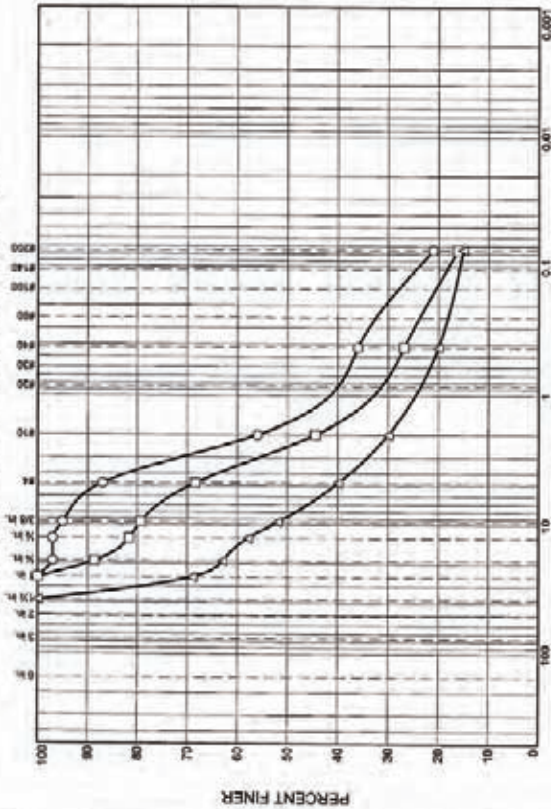
	% +3"	% Gravel			% Sand			% Fines		
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0	21	18	13	10	19	19	19		

SOIL DATA				
SYMBOL	SOURCE	DEPTH (ft.)	Material Description	AASHTO
○	1	5.2 m	LIGHT GREY-WHITE SILTY SAND	SM

Client: Fisheries Engineering Company, Ltd.  
 Project: Fish Market Center  
 Majuro Atoll  
 Project No.: 358/03

GEO-ENGINEERING & TESTING, INC.  
 Geotechnical & Materials Testing Engineers

### Particle Size Distribution Report



	% +3"	% Gravel			% Sand			% Fines		
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0	3	10	31	20	15	21	21		
□	0	11	21	24	17	11	16	16		
△	0	37	23	10	10	5	15	15		

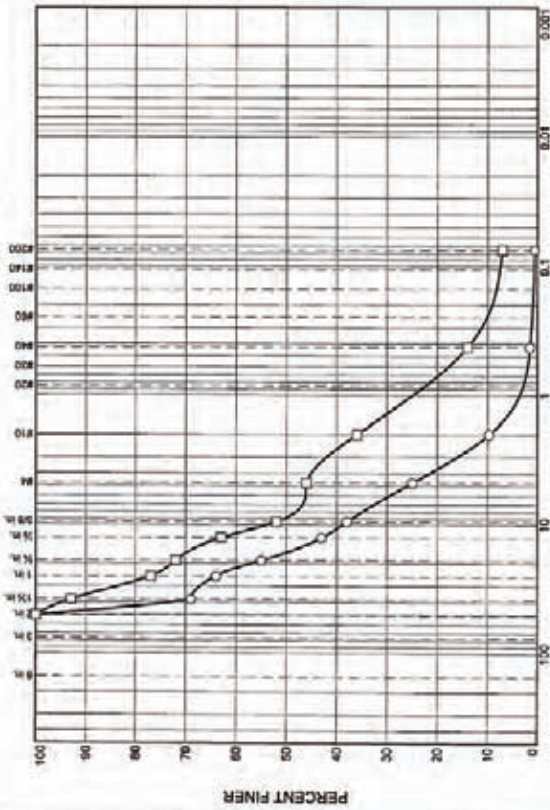
SOIL DATA				
SYMBOL	SOURCE	DEPTH (ft.)	Material Description	AASHTO
○	1	9.1 m	LIGHT GREY-WHITE SILTY GRAVELLY SAND	SM
□	1	3.8 m	LIGHT GREY-WHITE SILTY SAND	SM
△	1	6.8 m	LIGHT GREY-WHITE SILTY SANDY GRAVEL	GM

Client: Fisheries Engineering Company, Ltd.  
 Project: Fish Market Center  
 Majuro Atoll  
 Project No.: 358/03

GEO-ENGINEERING & TESTING, INC.  
 Geotechnical & Materials Testing Engineers



### Particle Size Distribution Report

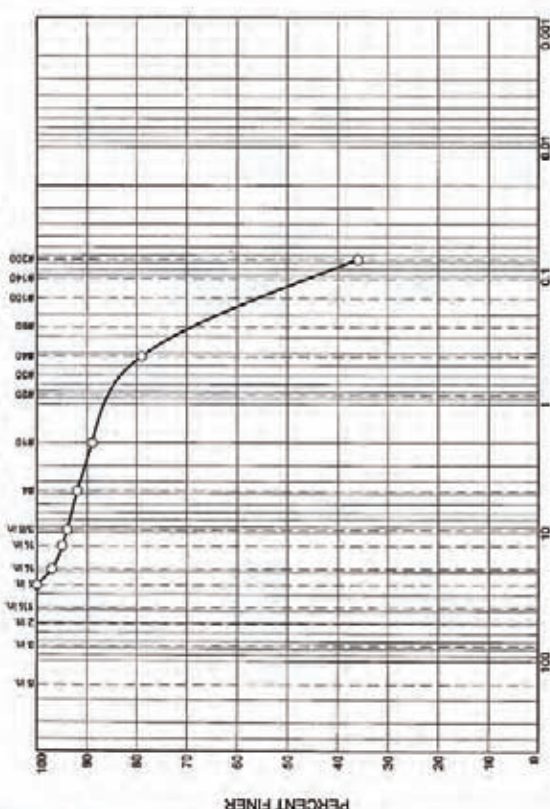


SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	GRAIN SIZE - mm.					AASHTO		
				% Gravel	% Sand	% Fines					
				Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	
○	3		4.2m	45	30	15	8	1	1	1	GP
□	3		2.5m	28	26	10	22	7	7	7	GP

SOIL DATA				
SYMBOL	SOURCE	DEPTH (ft.)	Material Description	AASHTO
○	3	4.2m	LIGHT BROWN-WHITE SANDY CORAL GRAVEL AND COBBLES	GP
□	3	2.5m	LIGHT BROWN-WHITE SANDY CORAL GRAVEL AND COBBLES	GP

Client: Fisheries Engineering Company, Ltd.  
 Project: Fish Market Center  
 Majuro Atoll  
 Project No.: 358.03  
**GEO-ENGINEERING & TESTING, INC.**  
 Geotechnical & Materials Testing Engineers  
 Plate 9

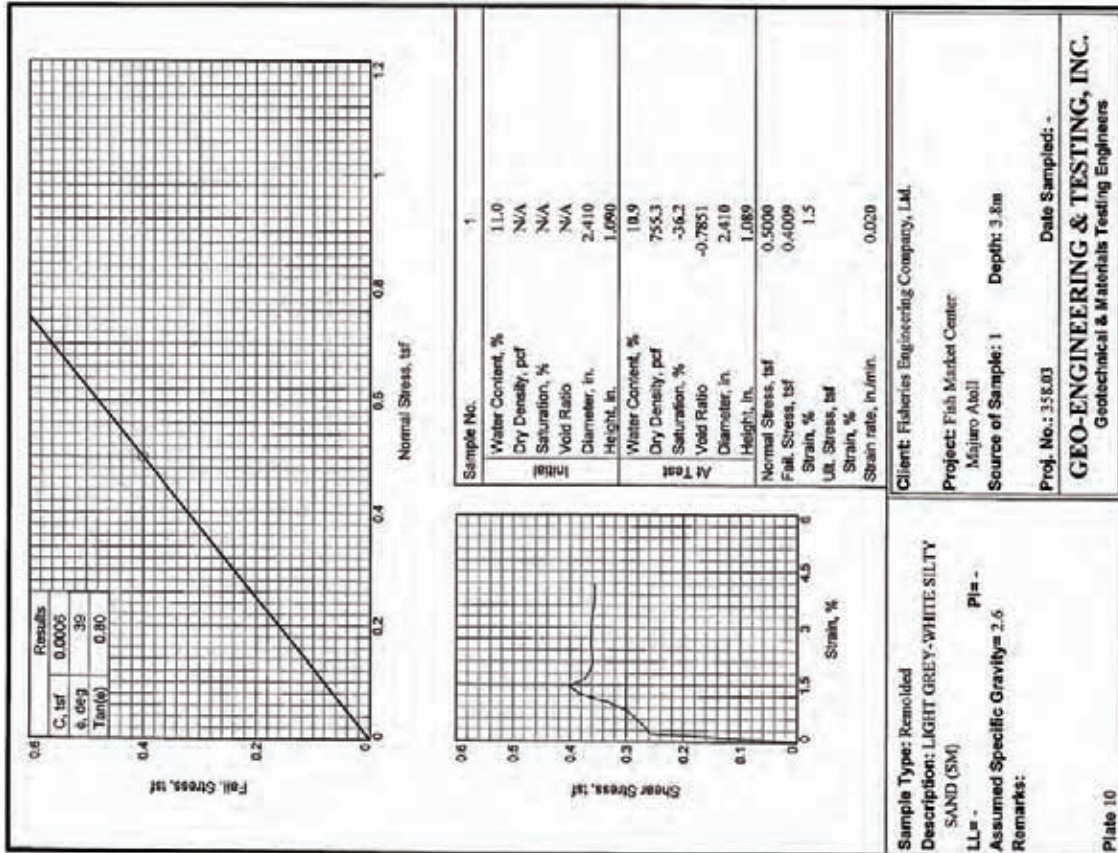
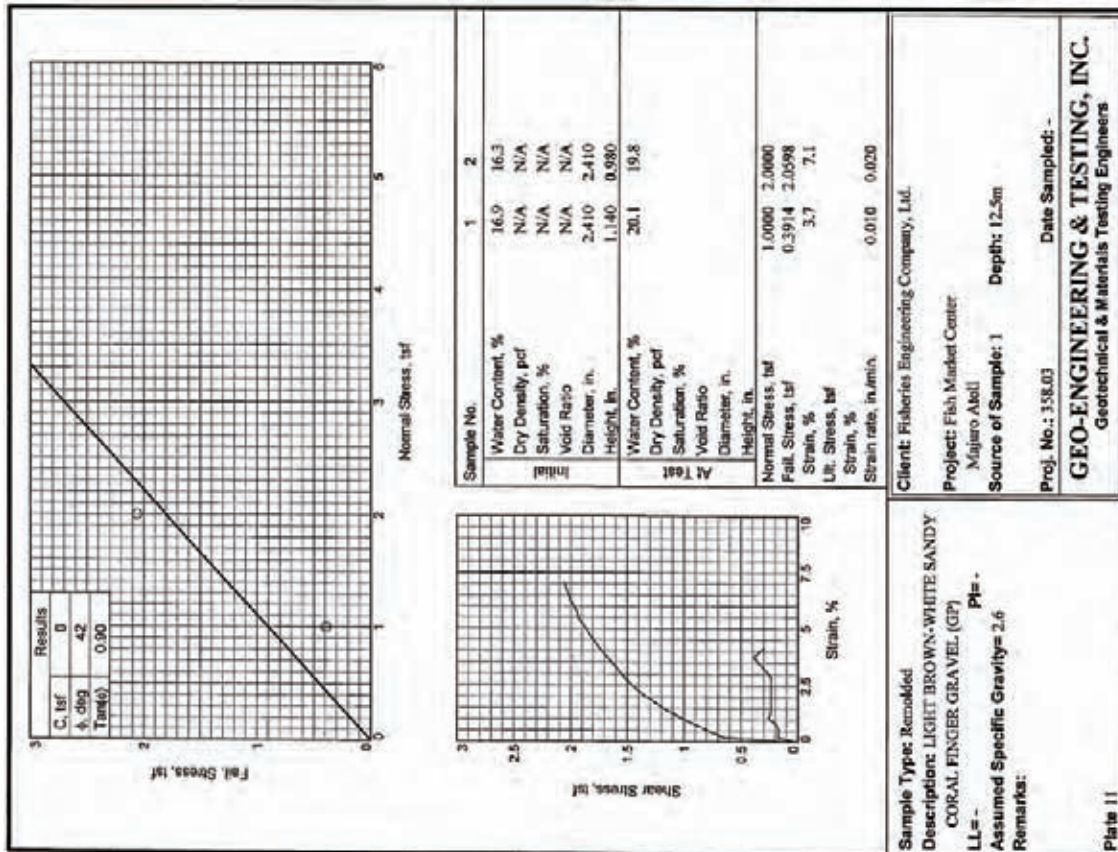
### Particle Size Distribution Report



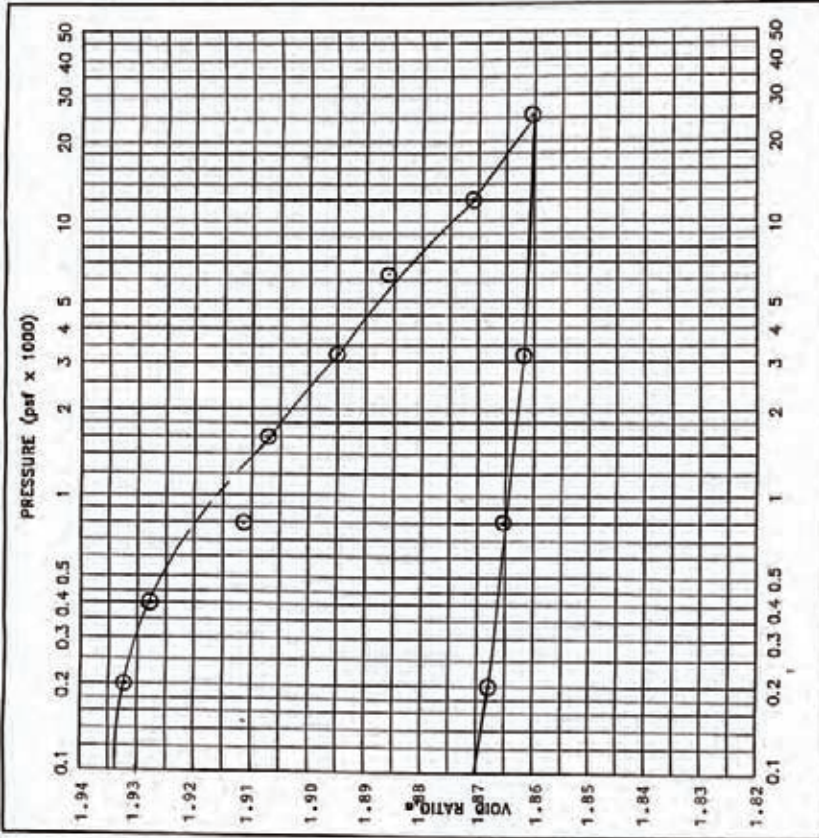
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	GRAIN SIZE - mm.					AASHTO		
				% Gravel	% Sand	% Fines					
				Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	
○	2		5.5m	3	5	3	10	43	36	36	SM

SOIL DATA				
SYMBOL	SOURCE	DEPTH (ft.)	Material Description	AASHTO
○	2	5.5m	LIGHT GREY-WHITE GRAVELLY SILTY SAND	SM

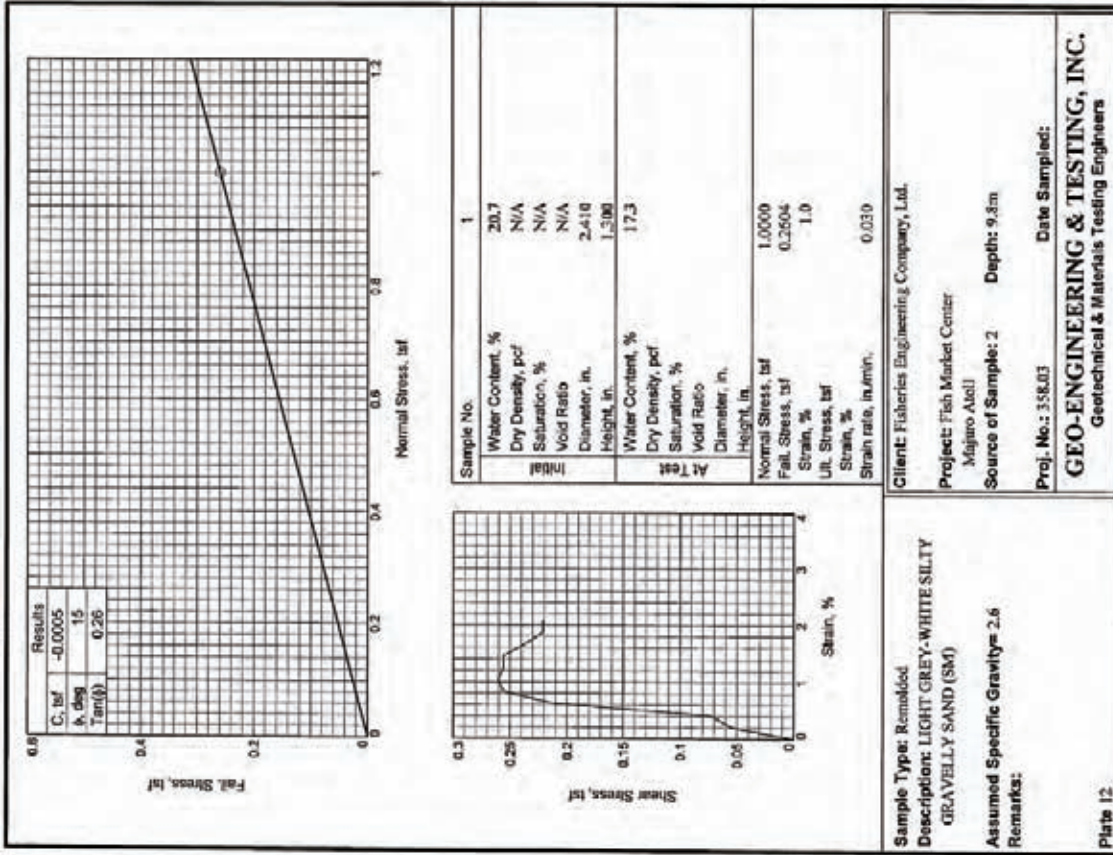
Client: Fisheries Engineering Company, Ltd.  
 Project: Fish Market Center  
 Majuro Atoll  
 Project No.: 358.03  
**GEO-ENGINEERING & TESTING, INC.**  
 Geotechnical & Materials Testing Engineers  
 Plate 8







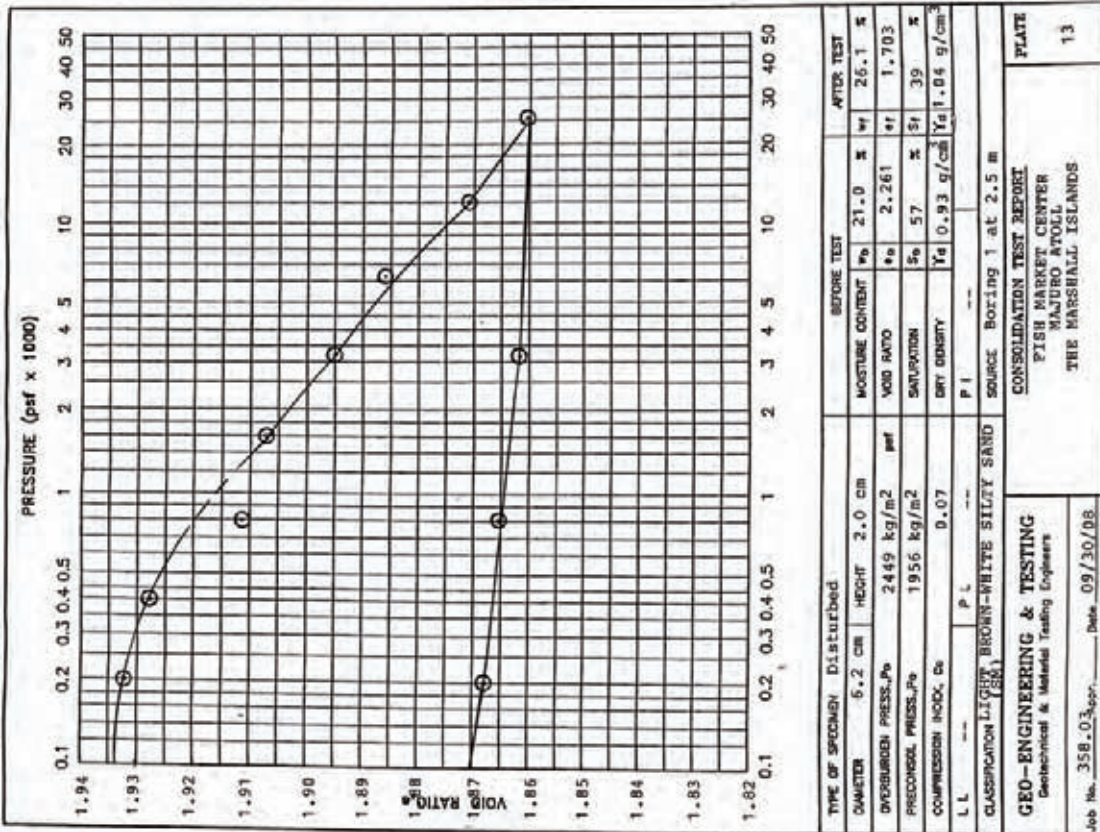
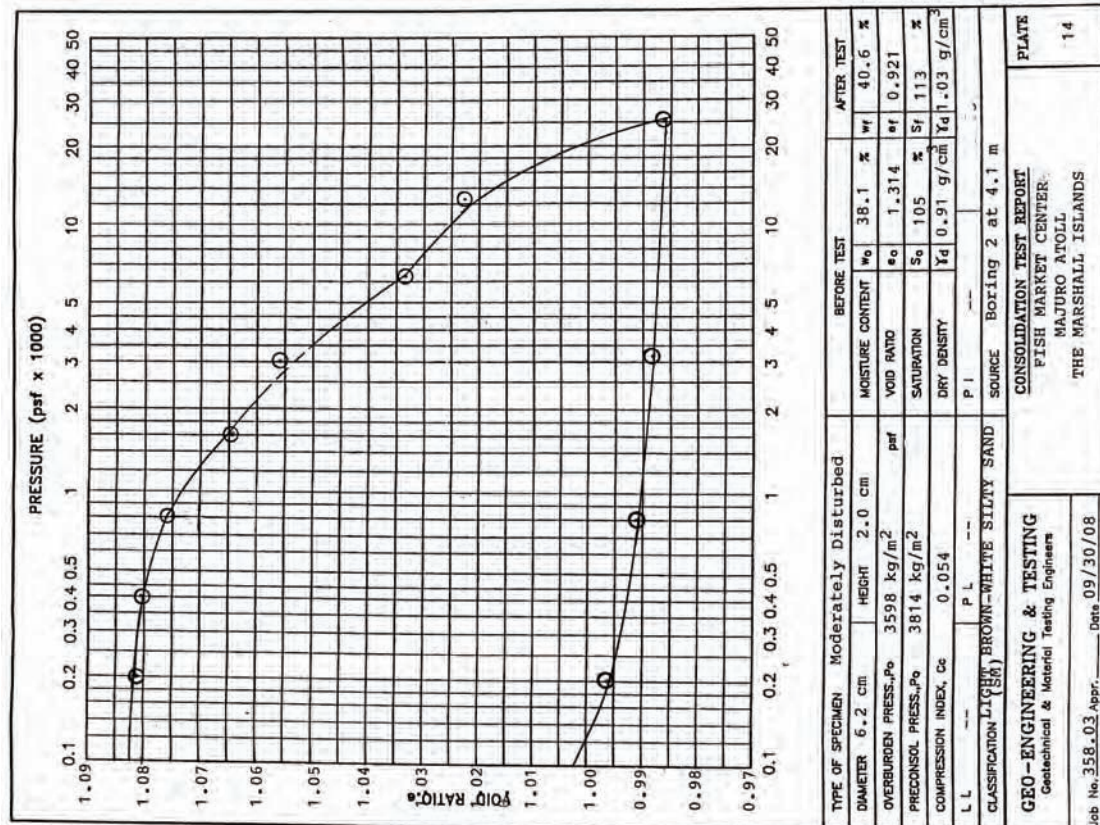
TYPE OF SPECIMEN		BEFORE TEST		AFTER TEST	
DIAMETER	6.2 cm	MOISTURE CONTENT %	21.0	w	26.1
OVERBURDEN PRESS. psf	2449 kg/m <sup>2</sup>	VOID RATIO	2.261	e	1.703
PRECONSOLID. PRESS. psf	1956 kg/m <sup>2</sup>	SATURATION	57	S	39
COMPRESSION INDEX, Cc	0.07	DRY DENSITY	0.93 g/cm <sup>3</sup>	γ <sub>d</sub>	1.04 g/cm <sup>3</sup>
L.L.	—	P.L.	—		
CLASSIFICATION LIGHT BROWN-WHITE SILTY SAND					
SOURCE Boring 1 at 2.5 m					
GEO-ENGINEERING & TESTING Geotechnical & Material Testing Engineers			CONSOLIDATION TEST REPORT FISH MARKET CENTER MAJURO ATOLL THE MARSHALL ISLANDS		
Job No. 356.03 <sub>app.</sub> Date 09/30/08			PLATE 13		



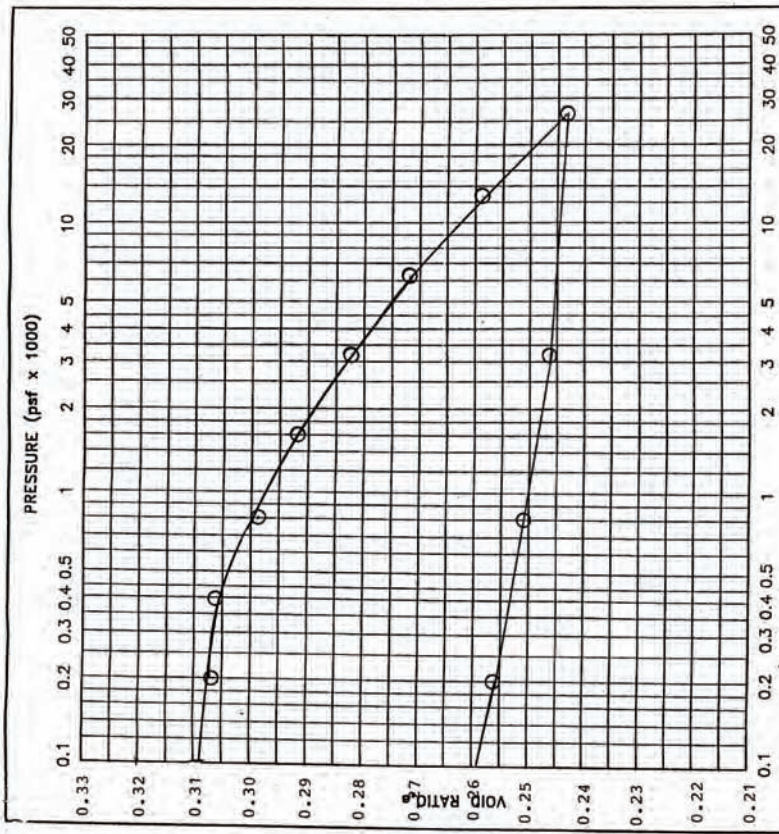
Client: Fisheries Engineering Company, Ltd.  
 Project: Fish Market Center  
 Source of Sample: 2 Depth: 9.8m  
 Project No.: 356.03 Date Sampled:  
 Major Atoll  
 Sample Type: Remolded  
 Description: LIGHT GREY-WHITE SILTY GRAVELLY SAND (SM)  
 Assumed Specific Gravity: 2.6  
 Remarks:  
 GEO-ENGINEERING & TESTING, INC.  
 Geotechnical & Material Testing Engineers

Plate 12

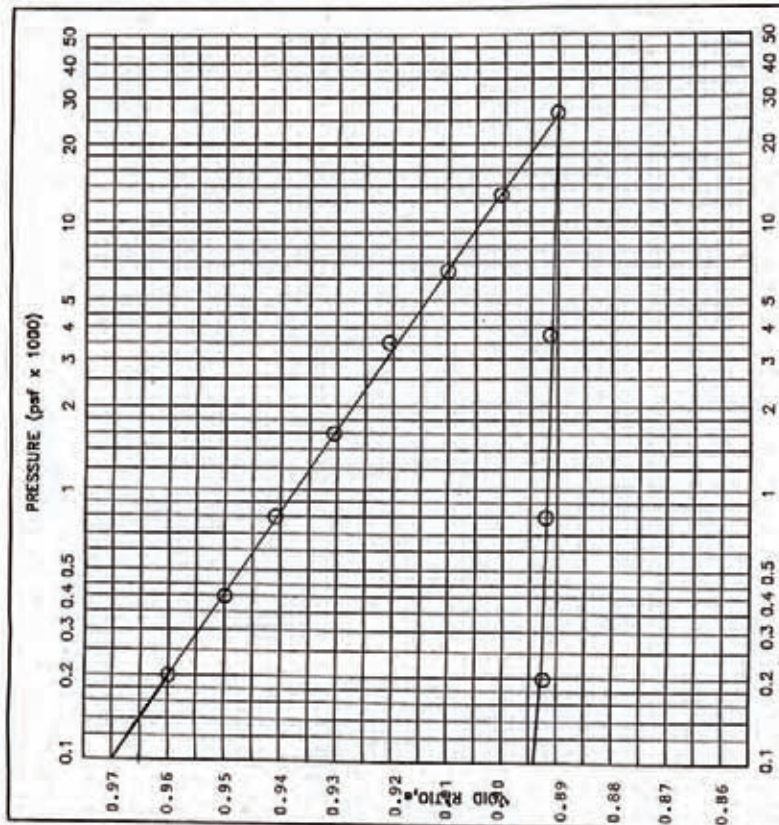








TYPE OF SPECIMEN		BEFORE TEST		AFTER TEST	
DIAMETER	6.2 cm	HEIGHT	2.0 cm	MOISTURE CONTENT	18.0 %
OVERBURDEN PRESS., P <sub>o</sub>	7675 kg/m <sup>2</sup>	VOID RATIO	0.25	VOID RATIO	0.240
PRECONSOL. PRESS., P <sub>o</sub>	3912 kg/m <sup>2</sup>	SATURATION	0.31	SATURATION	61 %
COMPRESSION INDEX, C <sub>c</sub>	0.034	DRY DENSITY	1.70 g/cm <sup>3</sup>	DRY DENSITY	1.79 g/cm <sup>3</sup>
LL	--	PL	--	PI	--
CLASSIFICATION: LIGHT GREY-WHITE SILTY SAND					
SOURCE: Boring 2 at 11.2 m					
GEO-ENGINEERING & TESTING					
Geotechnical & Material Testing Engineers					
FISH MARKET CENTER					
MAJURO ATOLL					
THE MARSHALL ISLANDS					
Job No.	358.03	Appr.	Date	09/30/08	
					PLATE
					16



TYPE OF SPECIMEN		BEFORE TEST		AFTER TEST	
DIAMETER	6.2 cm	HEIGHT	2.0 cm	MOISTURE CONTENT	43.2 %
OVERBURDEN PRESS., P <sub>o</sub>	5916 kg/m <sup>2</sup>	VOID RATIO	0.91	VOID RATIO	0.801
PRECONSOL. PRESS., P <sub>o</sub>	--	SATURATION	0.97	SATURATION	153 %
COMPRESSION INDEX, C <sub>c</sub>	0.032	DRY DENSITY	0.84 g/cm <sup>3</sup>	DRY DENSITY	0.97 g/cm <sup>3</sup>
LL	--	PL	--	PI	--
CLASSIFICATION: LIGHT GREY-WHITE CORAL FLINGER					
SOURCE: Boring 2 at 7.1 m					
GEO-ENGINEERING & TESTING					
Geotechnical & Material Testing Engineers					
FISH MARKET CENTER					
MAJURO ATOLL					
THE MARSHALL ISLANDS					
Job No.	358.03	Appr.	Date	09/30/08	
					PLATE
					15

**SUMMARY OF LABORATORY TEST RESULTS**

**A. UNCONFINED COMPRESSION**

Boring No.	Depth (m)	Vertical Stress (kN/cm <sup>2</sup> )	Moisture Content	Dry Density (g/cm <sup>3</sup> )
BH-1	3.8	111	15.9%	1.94
BH-1	5.2	78	20.2%	1.84
BH-1	9.8	68	20.1%	1.59
BH-1	12.6	153	25.6%	1.63
BH-2	9.8	150	13.3%	1.75
BH-2	11.3	152	21.6%	1.69

**B. SPECIFIC GRAVITY OF SOIL SOLID**

Boring No.	Depth (m)	Bulk Gravity
BH-1	6.8	2.675
BH-1	9.8	2.730
BH-1	11.0	2.529
BH-2	2.4	2.651
BH-2	8.5	2.713
BH-2	9.8	2.631
BH-3	9.8	2.357

<b>GEO-ENGINEERING &amp; TESTING, INC.</b> Geotechnical & Material Testing Engineers Job No. 353.03    Appr.: JUS    Date: 10/10/08	<b>SUMMARY OF LABORATORY TEST RESULTS</b>	
	FISH MARKET CENTER MAJURO ATOLL THE MARSHALL ISLANDS	
	<b>PLATE</b> <b>17</b>	

7-3 Water requirement for the planned facility

1) Office	80 Lit./person x *1	7 people *2	=	560.0 Lit.
2) Fish handling area (floor cleaning)	5.6 Lit./m <sup>2</sup> x *3	137 m <sup>2</sup>	=	764.4 Lit.
3) Retail room (floor cleaning)	5.6 Lit./m <sup>2</sup> x *3	56 m <sup>2</sup>	=	313.6 Lit.
4) Preparation room (floor cleaning)	5.6 Lit./m <sup>2</sup> x *3	22.8 m <sup>2</sup>	=	127.7 Lit.
5) Preparation room (for cleaning fish)	114 kg x *4	1 Lit./kg *5	=	114.0 Lit.
6) Changing room (for shower)	34.5 Lit./person x *6	7 people *7	=	241.5 Lit.
7) Water for ice (including evaporation)	1000 Lit. multiplied by *8	1.15 *9	=	1150.0 Lit.
8) Fish handling area (for ice water)	200 Lit. *10	10 containers *11	=	2000.0 Lit.
Total				3946.8 Lit.
				∴ 4.0 m <sup>3</sup> /day

\*1 Source: Practical Planning and Design for Plumbing Sanitation, 2nd ed., published by The Society of Heating Air Conditioning and Sanitary Engineers of Japan

\*2 Number of market staff

\*3 Floor cleaning requires around 8 Lit. (8mm) - 10 Lit. (reference figure for similar conditions). However, using a high pressure water washer may reduce this by 30% . (8Lit. x 70% = 5.6Lit./ m2)

\*4 Volume of fish handled daily

\*5 Source: FAO Fisheries Circular No.905 FIIU/C905

\*6 Source: Manual of Air Conditioning and Sanitation Engineering, 13th ed., published by The Society of Heating Air Conditioning and Sanitary Engineers of Japan; average amount of water used by various kinds of spouts (showers) is 11.5 Lit./mm, based on 3 minute use by 1 person

\*7 4 market staff and 3 boat crew

\*8 Makes 1t of ice

\*9 Includes 15% evaporation from plate ice making machine

\*10 Part of 550 Lit. for insulated tank

\*11 Number of individual insulated tank