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MAKAKILO CITY, PALAILAI NEIGHBORHOOD  
RESERVOIR NO. 4 - SOIL EXPLORATION REPORT

HONOLULU, EWA, OAHU, HAWAII  
TAX MAP KEY: 9-2-03

To:  
SUNN, LOW, TOM & HARA, INCORPORATED

WALTER LUM ASSOCIATES, INC.  
CIVIL, STRUCTURAL, SOILS ENGINEERS

OCTOBER 8, 1970

MUNICIPAL REFERENCE & RECORDS CENTER  
City & County of Honolulu  
City Hall Annex, 553 S. King Street  
Honolulu, Hawaii 96813

WITHDRAWN

**WALTER LUM ASSOCIATES, INC.**  
**CIVIL, STRUCTURAL, SOILS ENGINEERS**

WALTER LUM  
EDWARD WATANABE  
EZRA KOIKE

3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

October 8, 1970

SUNN, LOW, TOM & HARA, INC.  
1000 Bishop Street  
Honolulu, Hawaii 96813

Gentlemen:

Subject: Makakilo City, Palailai Neighborhood  
Reservoir No. 4 - Soil Exploration Report  
(for foundation design purposes)  
Honouliuli, Ewa, Oahu, Hawaii  
Tax Map Key: 9-2-03

Transmitted herewith is our soil exploration report for the Makakilo City Reservoir No. 4 at Palailai Neighborhood, Honouliuli, Ewa, Oahu, Hawaii.

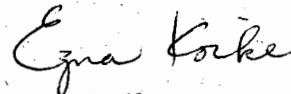
The borings generally indicated mottled-brown clayey silt with decomposed rock to about 20 to 30 ft. Below that was rocky material interbedded with decomposed rock to about 40 ft, the depths drilled.

For the proposed reservoir structure, continuous footing or slab foundations may be considered.

This report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.



Ezra Koike  
Professional Engineer  
Hawaii No. 1450

EK:rmf

C O N T E N T S

	<u>Page</u>
SCOPE OF EXPLORATION . . . . .	1
FIELD EXPLORATION . . . . .	1
LABORATORY TESTS . . . . .	1
GENERAL SITE CONDITIONS . . . . .	2
INTERPRETATION OF SOIL CONDITIONS . . . . .	2
DISCUSSION AND RECOMMENDATIONS . . . . .	3

APPENDICES:

- A. BORING LOCATION PLAN
- B. LOGS OF BORINGS - Boring Nos. 1 thru 3A
- C. SUMMARY OF LABORATORY TEST RESULTS - Tables IA and IB
- D. PLASTICITY CHART
- E. CBR TEST
- F. LIMITATIONS

MAKAKILO CITY, PALAILAI NEIGHBORHOOD  
RESERVOIR NO. 4 - SOIL EXPLORATION REPORT

HONOULIULI, EWA, OAHU, HAWAII  
TAX MAP KEY: 9-2-03

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions at the proposed site of the 1.0 M.G. Makakilo City Reservoir No. 4 for foundation design.

This report includes preliminary field exploration, laboratory tests and recommendations for the tank foundation design.

FIELD EXPLORATION

Three exploratory borings were made at the site as shown on the Boring Location Plan. Borings were made with 3 and 4-in. diameter augers using carbide drag bits and an "AX" core barrel using carbide bits.

Soil samples were recovered with 2-in. standard split spoon and 2-in. o.d. thin-wall tube samplers driven with a 140-lb hammer falling 30 inches.

Rock samples were recovered with an "AX" core barrel.

LABORATORY TESTS

Laboratory tests included: natural water content, Atterberg limits, expansion and CBR. A summary of the laboratory test results is given in Tables IA and IB.

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

#### GENERAL SITE CONDITIONS

The project site is located about 2.5 miles northwest of the intersection of Makakilo Drive and H-1 Freeway. The proposed site is located along a ridge that slopes downward at about 10 to 30% gradient generally from the northeast to the south.

Dirt access roads cross the northern and southern portions of the site.

The existing ground surface appears to be weathered and eroded volcanic rock sparsely covered with brush.

#### INTERPRETATION OF SOIL CONDITIONS

The borings generally indicated stiff mottled-brown clayey silt with decomposed rock to about 20 to 30-ft depth. Below that was rocky material interbedded with decomposed rock to a depth of about 40 ft, the depths drilled.

Ground water or seepage was not noted in the borings during the exploration.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

## DISCUSSION AND RECOMMENDATIONS

A 100-ft diameter 1.0 M.G. tank is proposed at the site. The proposed site grading indicates cuts up to about 22 ft in height and shallow fills for a perimeter road.

### Foundations

The plans indicate a bottom of tank elevation of about 1,210 ft.

On the high side of the site, the grading would involve a cut about 22 ft; and on the low side, minor grading is proposed.

For tank foundations, a level platform is usually made by excavating down to about the approximate subgrade below the finish floor of the tank.

The excavation should preferably be made to such depths to generally comply with the following conditions:

1. The excavation should extend 10 ft beyond the outside perimeter of the tank.
2. The depth of excavation to the finish floor at any point around the perimeter of the tank should be about 1/2 the height of the tank.

By making the tank excavation approximately equal to 1/2 the height of the tank, the weight of a full water tank will be approximately equal to the weight of the materials removed. This will minimize differential settlements because little, if any, additional stresses are added to the underlying soft spots, clinker pockets or lava tubes that may go undetected.

For the proposed location, if the tank foundation is set at elevation 1,210, differential settlements of one or more inches may occur.

After the excavation is made for the perimeter and column footings, the ground should be probed for several feet below the excavation to check for soft spots or lava tubes.

The final tank location may be shifted several feet out in the field after the excavation and soil conditions are better exposed.

If soft spots or voids are encountered below the excavation, they should be removed and backfilled with compact crusher run rock (3/4" to 0") or with low grade concrete.

The bottoms of all footing excavations should be well compacted before placing any concrete.

Continuous footing or slab foundations may be used. The footings around the perimeter of the tank should extend at least 3 ft below the finish grade or designed with a cut-off wall that extends below the invert of the perimeter subdrain that is placed around the tank. Bearing values of 2000 p.s.f. may be used.

### Site Grading

Provisions should be made to drain the excavation at all times. Footings for the tank should be constructed immediately after the grading and preparation of the foundation subgrade.

Grading should be done in general conformance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended.

Guide lines regarding site grading are as follows:

1. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.
2. Localized soft pockets encountered during site preparations should be excavated and backfilled with compacted select material or low grade concrete.
3. In general, the on-site soils may be used for the construction of the proposed fills. If fill material is imported to the site, it should be select non-expansive material generally less than 3-in. maximum size and with a plasticity index of less than 15.



4. Fills should be constructed in approximately level layers starting at the lower end and working upward. Fills should be laid in 6-in. compacted layers with a relative density of at least 90% of AASHO T-180-57 density.

### Slopes

Cut slopes of about 2 horizontal to 1 vertical or flatter may be used for the upper 10 to 15 ft. The top of slope should be rounded.

Cut slopes of about 1-1/2 horizontal to 1 vertical may be used in the lower section of the cut.

Fill slopes should be 2 to 1 or flatter.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas. Slope planting is recommended to minimize erosion.

The height of slopes should be limited to about 30 to 40 ft with 8-ft wide benches at about 15 to 20-ft height intervals.

Erosion will be a problem. Runoff should be diverted from the slopes.

### Roadway Pavement

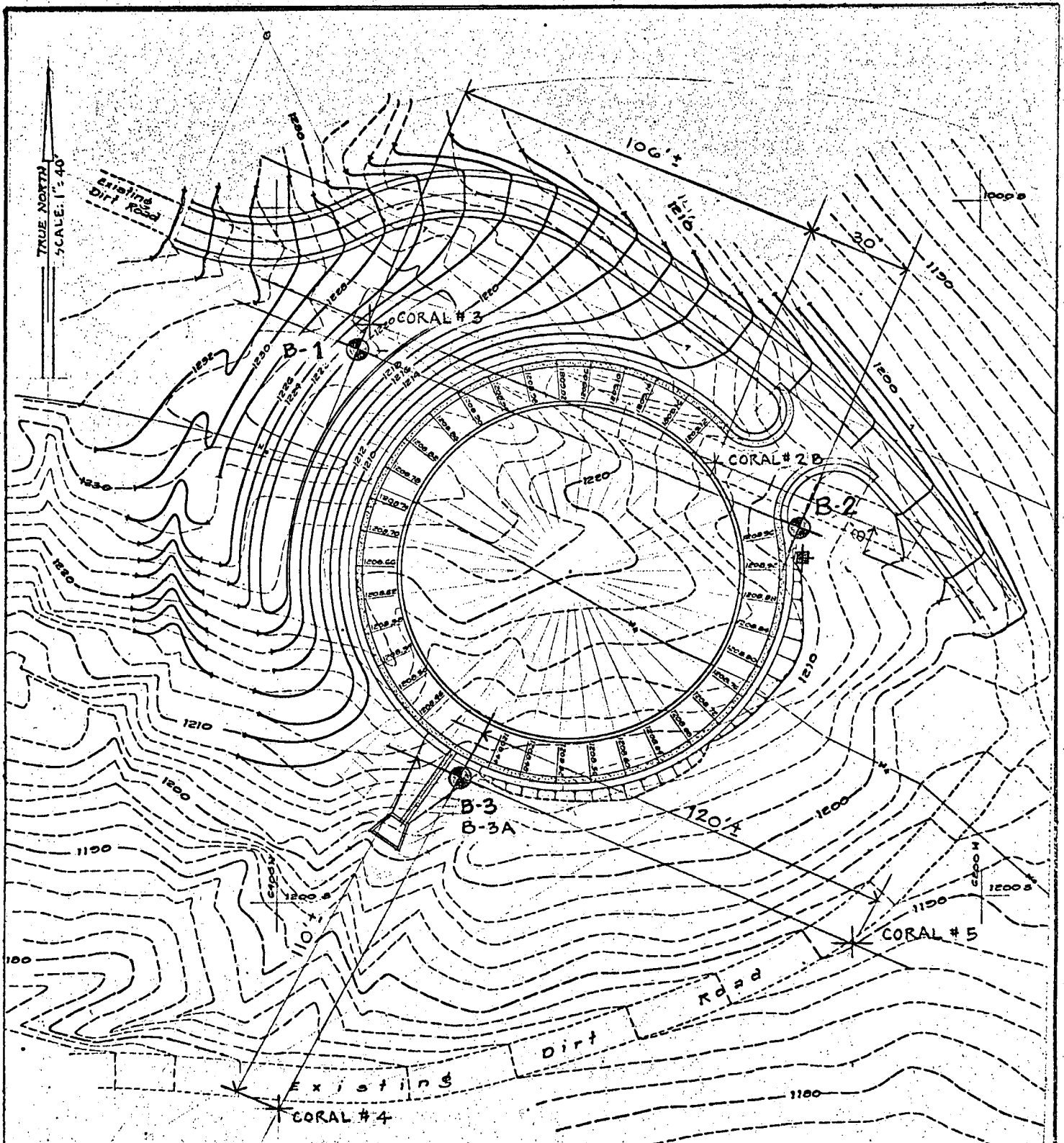
A rough estimate of the roadway pavement thickness for the light traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course over a prepared subgrade.



The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade level thru the walls of catch basins.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots or seepage water may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.



**LEGEND**

-  BORING
-  SURFACE SAMPLE

**BORING LOCATION PLAN**  
**MAKAKILO CITY, PALAILAI NEIGHBORHOOD**  
**RESERVOIR NO. 4**  
 HONOLULU, EWA, OAHU, HAWAII  
 TAX MAP KEY: 0-2-03

**WALTER LUM ASSOCIATES, INC.**  
 CIVIL, STRUCTURAL, SOILS ENGINEERS

## BORING LOGS

### Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limits or sieve analysis test results.

## Boring Log

PROJECT MAKAKILO CITY RESERVOIR No. 4  
 LOCATION Honouliuli, Ewa, Oahu, Hawaii  
 Tax Map Key: 9-2-03

BORING NO. 1 Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
 Driller WALTER LUM A550C Date AUGUST 17/18, 1970  
 Field Party SUZUKI, KAIKU  
 Type of Boring AUGER (ACKER ACE) Diam. 4"  
 Elev. 1230' ± \* Datum \_\_\_\_\_  
 Drill Bit T.C. DRAG

HAMMER:  
 Weight 140#  
 Drop 30"  
2" S - 2" O.D. THIN WALL TUBE  
 SAMPLER: 2" S - 2" STANDARD SPLIT SPOON

Water Level NOT NOTICED  
 Time \_\_\_\_\_  
 Date B-18-70

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					
										Standard Penetration Test					
										2" O.D. THIN WALL TUBE					
										N (Blows per foot)					
										0	10	20	30	40	BLOWS/0.5'
MH	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	0 - 2.5	2" S	1-A	44	28	72	-	-						
(MH)	STIFF, MOTTLED BROWN, CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	2.5 - 5	2" S	1-B	-	36	-	-	-						
GH	STIFF, MOTTLED BROWN, CLAY W/DECOMPOSED ROCK	5 - 10	2" S	1-C	36	48	88	-	-						
(MH)	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	10 - 15	2" S	1-D	-	44	-	4420	-					4/5	5/5
	DECOMPOSED ROCK	15 - 20	2" S	1-E	-	44	-	-	-			5/5	10/5		
(MH)	MEDIUM TO SOFT, MOTTLED BROWN CLAYEY SILT W/TRACES OF LIGHT RED CLAY (DECOMPOSED ROCK)	20 - 25	2" S	1-F	-	51	-	-	-						
	LAVA ROCK	25 - 30	2" S	1-G	-	49 17	-	3020	-					2/5	5/2
	MOTTLED BROWN, CLAYEY SILT & DECOMPOSED ROCK	30 - 35	2" S	1-H	-	25	-	-	-						40/5
	END OF BORING @ 41.5'	35 - 40	2" S	1-I	-	38	-	-	-				15/5		28/5

\* ELEVATION ESTIMATED FROM GRADING PLAN

**Boring Log**

PROJECT MAKAKILO CITY RESERVOIR NO. 4  
 LOCATION Honouliuli, Ewa, Oahu, Hawaii  
 Tax Map Key: 9-2-03  
 HAMMER: Weight 140\*  
 Drop 30"  
 SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
 Driller WALTER LUM ASSOC. Date AUGUST 18<sup>th</sup> 1970  
 Field Party SUZUKI, KAKU, YAMAMOTO  
 Type of Boring AUGER (ACKER ACE) Diam. 4"  
 Elev. 1208' ± \* Datum \_\_\_\_\_  
 Drill Bit T.C. DRAG  
 Water Level NOT NOTIFIED  
 Time \_\_\_\_\_  
 Date 8-19-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					
										Standard Penetration Test					
	ELEV. = 1208' ± *									N (Blows per foot)					
										0	10	20	30	40	
(SM)	DECOMPOSED ROCK	0 - 5	2-A	17 21										11/5	28/5
MH	STIFF, DARK REDDISH BROWN SILTY CLAY w/ DECOMPOSED ROCK	5 - 10	2-B	38	44	70									
		10 - 15	2-C		45										
		15 - 20	2-D	33	41	66									
		20 - 25	2-E	NO RECOVERY											50/1
	LAVA ROCK	25 - 30	2-F	NO RECOVERY											55/1
	ROCK	30 - 35	2-G	NO RECOVERY											50/3
	DECOMPOSED ROCK	35 - 40	2-H	NO RECOVERY											62/2
	LAVA ROCK	40 - 40.1	2-I	NO RECOVERY											30/1
	END OF BORING @ 40.1'														

\* ELEVATION ESTIMATED FROM GRADING PLAN

## Boring Log

PROJECT MAKAKILO CITY RESERVOIR NO. 4  
 LOCATION Honouliuli, Ewa, Oahu, Hawaii  
 Tax Map Key: 9-2-03  
 HAMMER:  
 Weight 140#  
 Drop 30"  
 SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
 Driller WALTER LUM ASSOC. Date AUGUST 20, 1970  
 Field Party SUZUKI, KAKU, LOK  
 Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"  
 Elev. 1208' ± \* Datum \_\_\_\_\_  
 Drill Bit T.C. DRAG & ROLLER ROCK  
 Water Level NOT NOTICED  
 Time \_\_\_\_\_  
 Date 8-20-70

### PENETRATION DATA

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Standard Penetration Test				
										N (Blows per foot) <sup>7</sup>				
										0	10	20	30	40
(MH-ML)	STIFF, REDDISH BROWN, CLAYEY SILT w/ DECOMPOSED ROCK	0		3-A		10								
	LAVA ROCK			3-B		6								30.5
	END OF BORING @ 7'													
	* ELEVATION ESTIMATED FROM GRADING PLAN.													
	NOTE: STOPPED AT 7' AND DRILLED BOR. NO. 3A 2' AWAY.													

MAKAKILO RESERVOIR #4

**Boring Log**

PROJECT MAKAKILO CITY RESERVOIR NO. 4  
 LOCATION Honouliuli, Ewa, Oahu, Hawaii  
 Tax Map Key: 9-2-03  
 HAMMER:  
 Weight \_\_\_\_\_  
 Drop \_\_\_\_\_  
 SAMPLER: 2"45 - 2" STANDARD SPLIT SPOON  
"AX" - AX CORE BARREL

BORING NO. 3A Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
 Driller WALTER LUM ASSOC. Date AUGUST 21-24, 1970  
 Field Party SUZUKI, KAKU, LOK  
 Type of Boring ROTARY (CONCORE) Diam. 3"  
 Elev. 1208' ± \* Datum \_\_\_\_\_  
 Drill Bit ROLLER ROCK & T.C. CORING  
 Water Level NOT NOTICED  
 Time \_\_\_\_\_  
 Date 8-27-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA				
										Standard Penetration Test				
	ELEV. = 1208' ± *	0								N (Blows per foot)				
										0	10	20	30	40
	STIFF, MOTTLED BROWN, CLAYEY SILT	0 - 4.5	"AX"											
	LAVA ROCK	4.5 - 10	"AX"											
(MH)	STIFF, DARK GRAY-BROWN SILTY CLAY W/ DECOMPOSED ROCK	10 - 15	"AX"											
	STIFF, BROWN SILTY CLAY & DECOMPOSED ROCK	15 - 20	2"45	3A-C			40							
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	20 - 25	"AX"											
	LAVA ROCK	25 - 30	"AX"											
(MH)	MEDIUM, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	30 - 35	2"45	3A-E			40							
	LAVA ROCK	35 - 38	"AX"											
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	38 - 40	"AX"											
	LAVA ROCK	40 - 40.0	"AX"											
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	40.0 - 40.7	"AX"											
	LAVA ROCK	40.7 - 60.3	"AX"											
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	60.3 - 60.7	"AX"											
	LAVA ROCK	60.7 - 60.9	"AX"											
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	60.9 - 61.0	"AX"											
	END OF BORING @ 40.0'	40												

\* ELEVATION ESTIMATED FROM GRADING PLAN



MAKAKILO CITY, PALAIALI NEIGHBORHOOD  
RESERVOIR NO. 4

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1	2 *
SAMPLE NO.	A	C	
DEPTH BELOW SURFACE	0.0' to 1.5'	10.0' to 11.5'	SURFACE
DESCRIPTION	MOTTLED BROWN CLAYEY SILT w/ DEC. ROCK	MOTTLED BROWN CLAY w/ DEC. ROCK	REDDISH- BROWN CLAYEY SILT
<b>GRAIN-SIZE ANALYSIS</b>			
(% Passing)			
Sieve			
1"			100
1/2"			100
#4			100
#10			99.9
#20			99.8
#40			99.6
#100			98.9
#200			98.0
<b>ATTERBERG LIMITS</b>			
Air Dried or Natural	NATURAL	NATURAL	NATURAL
Liquid Limit	72	88	62
Plastic Limit	44	36	39
Plasticity Index	28	52	23
Dilatancy	SLOW-MED.	SLOW	QUICK
Toughness	MEDIUM	MEDIUM	SLIGHT
Dry Strength	MEDIUM	MEDIUM-HIGH	SLIGHT-MED
UNIFIED SOIL CLASSIFICATION	MH	CH	MH
APPARENT SPECIFIC GRAVITY			
<b>EXPANSION AND CBR TESTS</b>			
(Surcharge-51 P.S.F.)			
Molding Moisture, %			40.2
Molding Dry Density, P.C.F.			81.8
Swell upon saturation, %			0.5
CBR at 0.1" Penetration			10.7
<b>MOISTURE-DENSITY RELATIONS OF SOILS</b>			
(AASHTO T-180-57 Method)			
Dry to Wet or Wet to Dry			
Max. Dry Density (P.C.F.)			
Optimum Moisture (%)			

REMARKS:  
\* SURFACE SAMPLE TESTED TAKEN ADJACENT  
TO BORING NO. INDICATED.

**WALTER LUM ASSOCIATES, INC.**  
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 10-1-70 By W.W.

MAKAKILO CITY, PALAILAI NEIGHBORHOOD  
RESERVOIR NO. 4

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	2	2	2	
SAMPLE NO.	A	B	D	
DEPTH BELOW SURFACE	0.0' TO 1.5' ±	5'-6.5'	15'-16.5'	
DESCRIPTION	LIGHT BROWN SILTY SAND & DECOMPOSED ROCK.	DARK REDDISH BROWN SILTY CLAY W/ DEC. ROCK	DARK REDDISH BROWN SILTY CLAY W/ DEC. ROCK	
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit		70	66	
Plastic Limit	NON-PLASTIC	38	33	
Plasticity Index		32	33	
Dilatancy	QUICK	SLOW	SLOW	
Toughness	VERY SLIGHT	MEDIUM	MEDIUM	
Dry Strength	VERY SLIGHT	MEDIUM	MEDIUM	
UNIFIED SOIL CLASSIFICATION	(SM)	MH	MH	
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHTO T-180-57 Method)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

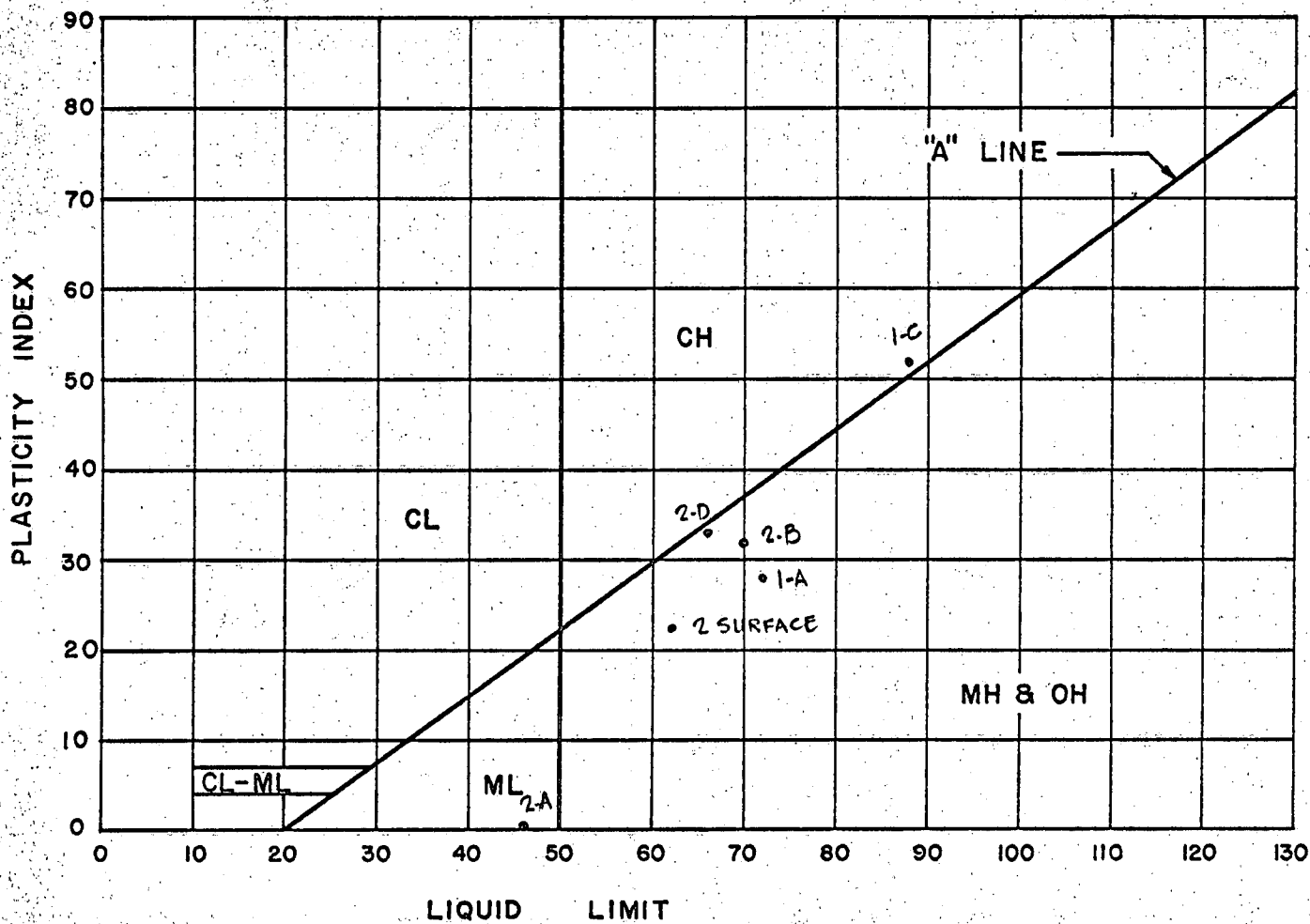
**WALTER LUM ASSOCIATES, INC.**  
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 10-1-70 By W.W.

# PLASTICITY CHART

PROJECT: MAKAKILO CITY, PALALAI NEIGHBORHOOD  
RESERVOIR NO. 4

LOCATION: HONOLULU, EWA, OAHU, HAWAII



WALTER LUM ASSOCIATES, INC.  
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 10-1-70 BY W.W.

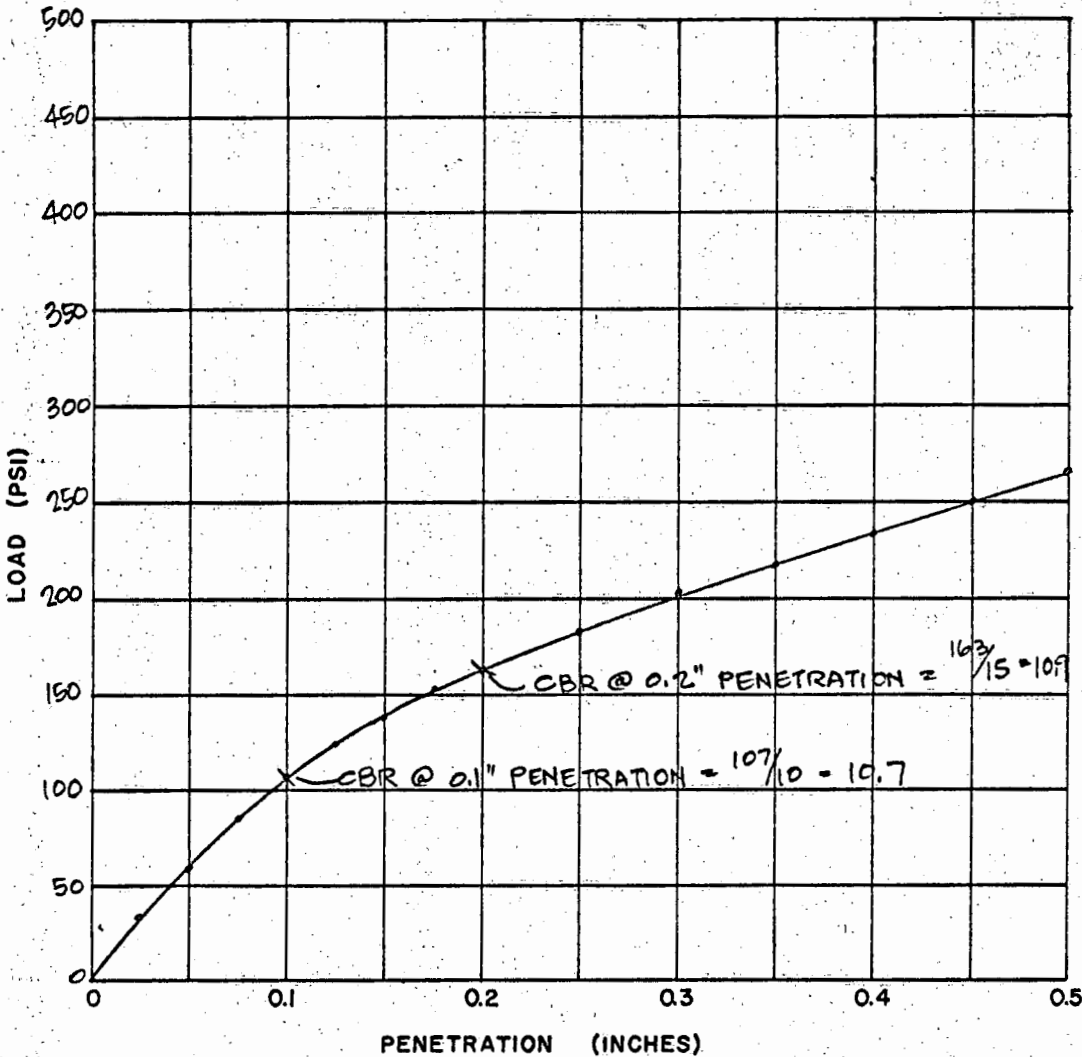
# CBR TEST

PROJECT: MAKAKILO CITY, PALALAI NEIGHBORHOOD  
RESERVOIR NO. 4

LOCATION: HONOLULU, EWA, OAHU, HAWAII

SAMPLE NO: 2 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS)	LOAD (PSI)
0.025	100	33
0.050	180	60
0.075	250	83
0.100	320	107
0.125	370	123
0.150	415	138
0.175	455	152
0.200	490	163
0.250	550	183
0.300	605	202
0.350	655	218
0.400	700	233
0.450	750	250
0.500	800	267

AGGREGATE 1/4" MINUS  
HAMMER WEIGHT 10 LBS.  
HAMMER DROP 18"  
No. OF BLOWS 56/LAYER  
No. OF LAYERS 5

## TEST RESULTS:

MOLDING MOISTURE, % 40.2  
MOLDING DRY DENSITY, P.C.F. 81.8  
CBR @ 0.1" PENETRATION 10.7

DATE 10-6-70 BY C.M.  
DATE 10-13-70 BY BT

WALTER LUM ASSOCIATES, INC.  
CIVIL STRUCTURAL, SOILS ENGINEERS

### LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

**WALTER LUM ASSOCIATES, INC.**

**CIVIL, STRUCTURAL, SOILS ENGINEERS**

3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

WALTER LUM  
EDWARD WATANABE  
EZRA KOIKE  
WALLACE WAKAHIRO

B9906 026

596

March 7, 1974

SUNN, LOW, TOM & HARA, INC.  
Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813

Gentlemen:

Subject: Addendum No. 1  
Makakilo City Reservoir No. 4  
Honouliuli, Ewa, Oahu, Hawaii

A soil exploration report was made for a proposed 1.0 M.G. Makakilo City Reservoir No. 4, October 8, 1973. The proposed reservoir has since been changed to a 2.0 M.G. reservoir. The structure has been changed from a 100-ft diameter by 20-ft high tank to a 115-ft diameter by 30-ft high tank. The design elevation of the tank bottom has been lowered from elevation 1,210 ft to 1,200 ft.

The tank has been moved from the western portion of the ridge and will be centrally located on the ridge in an excavation.

Portions of the footing excavations may be in decomposed rock or rock. Other sections may be in silty clay soils.

Where the bottoms of footing excavations are in silty clay soils, the lower 2/3 of the perimeter footings should extend down to decomposed rock or rock or to about 8 ft below the bottom of the tank.

Bearing values of about 3000 p.s.f. may be considered for footings resting on stiff natural ground or on compacted select backfill.

It is assumed that the bottoms of the perimeter wall footing and interior column footing excavations would be probed for soft spots or voids and that adjustments would be made in the field as they are encountered.

SUNN, LOW, TOM & HARA, INC., March 7, 1974

2

Allowances should be provided in the contract for additional borings or probings to be done after the site is excavated if soft spots, voids, clay soils or other unexpected conditions are encountered or suspected.

The Limitations regarding our soil engineering services are attached.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Ezra Koike  
Ezra Koike

EK:ms

cc: Finance Realty Company, Ltd.