AHUIMANU HEIGHTS ESTATES - PRELIMINARY SOIL REPORT

KAHALUU, KOOLAUPOKO, OAHU, HAWAII
TAX MAP KEY: 4-7-31: 7, 9 & 10

To:
WATSON LEE, INCORPORATED

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

JUNE 28, 1972

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

WALTER LUM
EDWARD WATANABE
EZRA KOIKE
WALLACE WAKAHIRO
3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

June 28, 1972

MR. WATSON LEE
Watson Lee, Inc.
33 South King Street, Suite 512
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Ahuimanu Heights Estates
Preliminary Soil Report
(for residential development)
Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

In accordance with your request, soil explorations were made to determine general soil conditions at the proposed residential development site for Ahuimanu Heights Estates, Kahaluu, Koolaupoko, Oahu, Hawaii.

The site is covered with tall grass, brush and trees. A gully crosses thru the central portion of the site.

The surface soils at the site may be generally described as medium to stiff reddish-brown clayey silts and silty clays ("MH" soils) mixed with some decomposed rocks.

The present plan is to fill the gully. Construction of fills, particularly in the gully, should be done with care. Subdrains along low spots and granular fills along the toe of the slope should be used.

Settlement gages should be installed to monitor the performance of fills over the existing gully.

The proposed light residential houses may be supported either directly on the stiff existing ground or on compacted fills constructed from the on-site soils.

The earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended, and the recommendations contained herein.

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

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

AHUIMANU HEIGHTS ESTATES - PRELIMINARY SOIL REPORT

KAHALUU, KOOLAUPOKO, OAHU, HAWAII
TAX MAP KEY: 4-7-31: 7, 9 & 10

SCOPE

The purpose of this exploration was to determine general soil conditions for residential development for the proposed Ahuimanu Heights Estates.

This report includes field explorations, laboratory tests and general recommendations and limitations for site grading and residential foundation design considerations.

FIELD EXPLORATION

Eight exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on the boring logs.

Borings were made with 3 and 4-in. diameter augers using a carbide drag bit or a finger type bit. Soil samples were recovered with 2-in. diameter thin-wall tube samplers and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content and density, unconfined compression, Atterberg limit, grain-size analysis, AASHO T-180-57 density, expansion and CBR.

A summary of the laboratory test results is given in Tables IA thru ID.

SOIL CLASSIFICATION SYSTEM

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 proposed site is located in Kahaluu along the south side of Ahuimanu Road across the intersection of Poomau Street.

The proposed site is covered with tall grass and trees. Wire fences, several horses and an existing house were noted on the site.

The existing ground generally slopes down from west to east at about a 3% grade with variations in localized areas.

A gully crosses the central portion of the site and slopes down toward the east at about a 6% grade with side slopes of about 40 to 60% grades.

INTERPRETATION OF SOIL CONDITIONS

From the field explorations and laboratory test results, the soils may be generally described as follows:

> Medium to stiff reddish-brown clayey silts and silty clays ("MH" soils) mixed with some decomposed rocks to about 25 ft, the depth drilled.

Water was noted at about 10 to 13-ft depths in the borings during the field explorations.

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

DISCUSSION AND RECOMMENDATIONS

In general, the proposed plan is to cut portions of the higher ground and fill the gully and grade the site for residential development.

Cuts and fills over most of the site will vary from little to about 10 ft. Fills from little to about 24 ft are planned in the gully area.

Before fills are placed in the gully or drainageway, trenches should be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths for the bottom and sides of the drainageway. Loose or soft soils along the bottom and sides of the gully and particularly at the toe of slopes should be stripped to firm ground.

Settlement gages should be installed to monitor the performance of fills over the drainageway. After allowing the ground to consolidate for 3 to 6 months or when settlement gages show negligible rates of settlements, building construction may proceed over the compacted fill.

Because of decomposed rocks, some boulders may be encountered in the deeper excavations. The boulders may be used to construct rock buttresses at the toes of slopes. See Figure 1.

High moisture soils may be encountered in the deeper cuts. If used for the construction of fills, compaction may be difficult. A minimum density of 85% of AASHO density is recommended, and 90% wherever practicable.

A grassed storm water retention basin about 8 ft deep with a spillway at the southern edge is planned for Lot 12.

The responsibility for the design construction and maintenance of these temporary structures should be left to the contractor.

Site Grading

In general, the on-site soils may be used for the construction of the proposed fills. Grading work should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

2. Loose surface and stockpiled soils should be stripped to stiff natural ground before the placement of fills. Loose surface soils at finish grade should be scarified and recompacted.

3. Localized soft pockets encountered during the site preparation should be excavated and backfilled with compacted select material.

4. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

5. Where fills are proposed on sidehill areas, gullies and natural drainageways, loose material at the bottom and sides should be stripped down to stiff natural ground before the placement of fills. New fills should be keyed into the stiff natural ground.

6. Where fills are proposed in natural drainageways or gullies, trenches should be cut in a herringbone pattern along the bottom and sides before the placement of fills. Subdrains should be placed in the trenches. The locations of subdrains should be determined in the field after clearing and grubbing.

7. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

8. If boulders are proposed to be used in the construction of fills, they should be generally placed along the toe sections of fill slopes and outside of probable building sites. Before placing any boulders, the subgrade should be

stripped to stiff natural ground and shaped to drain. A layer of filter material should be placed on the subgrade and the boulders placed on the filter layer. The void spaces between boulders should be filled with granular material. A blanket of filter material should be placed against the boulders before earth fills are placed against the boulders. See the attached sketch, Figure 1.

9. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

However, the on-site soils from the deeper cut areas generally will have relatively high water contents and may be difficult to compact. In such cases, the construction of fills should be compacted in one-foot or thinner layers to the maximum density obtainable in the laboratory at the water content approximating the field moisture condition. In addition, the relative density of the compacted soil should be greater than 85% of AASHO T-180-57 density.

10. Provisions should be included to drain the site during and after filling operations.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

If slope heights (top to toe) of greater than 20 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft.

To minimize erosion, the runoff from rainstorms should be diverted away from slopes by berms or ditches whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones, expansive clay pockets or soft spots are encountered in localized areas.

Foundations

For the proposed light residential structures, conventional house foundations such as slab-on-ground or post-and-beam construction may be used.

General recommendations for foundation design are as follows:

1. Bearing values for a given soil usually vary with the size and depth of footings. For light residential structures, bearing values of about 1500 p.s.f. may be used for footings on stiff natural ground or on compacted fills.

2. Soft spots or pockets of loose material encountered in footing excavations or below the building area should be excavated and replaced with well-graded granular material such as coral or other approved material.

3. Concrete slabs on ground should be placed over a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size. The subgrade should be compacted and shaped to a level surface or to drain, if practicable, and generally

should be kept slightly higher than the finish grade outside the building.

4. Because of the downhill creep effect of soils on a slope, some settlements may occur near the tops of slopes. Buildings should generally be placed about 15 ft from the tops of slopes. This distance may be reduced for lower slope heights, e.g., 10 ft for 10-ft-high slopes, but generally not closer than 5 ft from the top of any slope.

5. Construction of retaining walls on slopes should generally be avoided.

6. Good surface drainage away from the foundations of structures should be maintained and the site should be graded to prevent the ponding of water.

Roadway

In general, an estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.

2. Base course - 6-in. base course.

3. Subbase course - 6-in. select material over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding select borrow subbase and borrow material requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness of or eliminate the need for the select borrow subbase or borrow courses.

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 levels thru the walls of the catch basins which are placed in these low areas.

Existing Cesspools

Cesspools may be encountered generally near locations where old residences were located. Cesspools encountered should be flagged in the field, located on the plans and then backfilled.

Before backfilling, sludge should be removed from the bottom of the cesspool. Backfill material should generally be fairly well-graded granular material. The materials should be placed in thin level layers and rammed into place or compacted with vibratory equipment. The top 3 ft should be constructed with soils similar to the surrounding soils and should be constructed in 6-in. compacted layers.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Unforeseen Conditions

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

Site Regrading

After mass grading work is done and cuts and fills are made according to the grading plans, regrading at some future date should be avoided unless done under the guidance of a Soils Engineer.

PROPOSED SPECIFICATION FOR EARTHWORK

AHUIMANU HEIGHTS ESTATES

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Loose surface and stockpiled soils shall be stripped to stiff natural ground before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

The bottom and sides of gullies or natural drainageways shall be stripped down to stiff natural ground before the placement of fills.

Trenches shall be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths for the bottom of the drainageway.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Compaction of High Moisture Fill Material

The on-site soils from the deeper cut areas with relatively high water contents will be difficult to compact.

When used for the construction of fills, these soils shall be compacted in one-foot layers to the maximum density obtainable in the laboratory at the water content approximating the field moisture condition. In addition, the relative density of the compacted soil shall be greater than 85% of AASHO Test No. T-180-57.

Boulder Fills

If boulders are used for the construction of fills, they shall be generally placed along the toe section of slopes. The subgrade shall be stripped to stiff natural ground, shaped to drain and a layer of filter material shall be placed on it. Nesting of boulders shall be avoided. Voids shall be filled with smaller granular soils. A blanket of filter material shall be placed against the boulder fill before construction of fills against it.

Backfilling of Old Cesspools

The following procedures shall be followed for backfilling:

(1) Sludge Removal

Remove the sludge from the bottom of the old cesspool by (a) pumping or (b) by clamshell or any other suitable way. The material shall be disposed of away from the site. The completeness of removal shall be verified by probing and the sludge shall be less than 12 in. at the bottom.

(2) Granular Fill (below 3 ft from finish grade)

Use granular material, graded from 6 to 0 inches. The fines passing the No. 200 sieve shall be less than 10%. The materials shall be placed in thin layers (12 in. maximum) and compacted with vibratory equipment to 90% of AASHO T-180-57 density. Ramming each layer into place with a clamshell bucket will be allowed. The granular fill shall be wetted before placement into the cesspools. Sufficient compaction tests shall be conducted to verify that 90% compaction is obtained by the construction method selected.

(3) Top 3 Ft of Fill

Linings encountered in the cesspools within the top 3 ft from finish grade shall be removed. The fill within the top 3 ft from finish grade shall be constructed from on-site soil in thin layers (6-in. compacted thickness) to 90% of AASHO T-180-57 density. The material at finish grade shall blend with the surrounding soil.

Excavation

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots, seepage water or expansive soil pockets are encountered, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

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 limit or sieve analysis test results.

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES
LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____
Driller: W.LUM ASSOC., INC. Date: MAY 11, 1972
Field Party: MEYER, KAKU, RADOVICH
Type of Boring: AUGER (MOBILE B-40) Diam.: 4"
Elev.: 128' ± * Datum: —
Drill Bit: FINGER TYPE

Water Level				
Time	—			
Date	5-11-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 128' ± ↓ *	0								
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT			1-A	—	54	—	—	—	
MH	MEDIUM LIGHT MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	5		1-B	—	52 LL= 82 PL= 60	—	—	—	
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10		1-C	—	58	—	—	—	
MH	STIFF, LIGHT BROWN CLAYEY SILT W/ DECOMPOSED ROCK	15		1-D	—	54 LL= 80 PL= 61	—	—	—	
	END OF BORING @ 16.5'									

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii

Tax Map Key: 4-7-31: 7, 9 & 10

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: MAY 11, 1972

Field Party: MEYER, KAKU, RADOVICH

Type of Boring: AUGER (MOBILE B-40) Diam.: 4"

Elev.: 116'± * Datum: —

Drill Bit: FINGER TYPE

Water Level: NOT NOTICED
Time: —
Date: 5-11-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 116'± *	0								
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT			2-A	—	47	—	—	—	
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT w/ DECOMPOSED ROCK	5		2-B	—	58	—	—	—	
(MH)	STIFF, MOTTLED GRAY-BROWN CLAYEY SILT w/ DECOMPOSED ROCK	10		2-C	—	64	—	—	—	
(MH)	STIFF, BROWN & GRAY CLAYEY SILT	15		2-D	—	56	—	—	—	
(MH)	STIFF, MOTTLED BROWN & TAN CLAYEY SILT w/ DECOMPOSED ROCK	20		2-E	—	58	—	—	—	
	END OF BORING @ 21.5'									

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES
LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

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

BORING NO. 3 Sheet No. ____ of ____
Driller W.LUM ASSOC., INC. Date MAY 12, 1972
Field Party METER, KAKU, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 104'± * Datum —
Drill Bit T.C. DRAG
Water Level 10.0'
Time —
Date 5-12-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE SAMPLERS BLOWS/0.5'
	ELEV. = 104'± *	0									
(MH)	MEDIUM, DARK BROWN CLAYEY SILT		2"S	3-A	91	47	62	5440	–		3/0.5' 5/0.5'
MH	MEDIUM, BROWN & TAN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	3-B	–	55 LL= 92 PL= 53	–	–	–		
			WATER 5-12-72								
		10	2"SS	3-C	–	73	–	–	–		
MH	MEDIUM MOTTLED BROWN & GRAY CLAYEY SILT W/ DECOMPOSED ROCK	15	2"SS	3-D	–	74 LL= 89 PL= 66	–	–	–		
(MH)	STIFF, BROWN CLAYEY SILT W/ GRAY CLAY POCKETS	20	2"SS	3-E	–	68	–	–	–		
	END OF BORING @ 21.5'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATE

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES
LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

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

BORING NO. 4 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date MAY 22, 1972
Field Party GLORY, KAKU, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 90'± * Datum —
Drill Bit FINGER TYPE

Water Level	13.5				
Time	3:35 PM				
Date	5-22-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 90'± *	0									
(MH)	SOFT, DARK BROWN CLAYEY SILT W/ TRACES OF ROOTS		2"S	4-A	—	52	—	—	—		1/1.0' 1/0.5'
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	4-B	—	61	—	—	—		
(MH)	SOFT, MOTTLED TAN BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	10	2"S	4-C	103	67 57	—	1080	—		1/0.5' 2/0.5' 2/0.5'
	MOTTLED BROWN & GRAY CLAYEY SILT & DECOMPOSED ROCK		WATER 5-22-72								
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	15	2"SS	4-D	—	73	—	—	—		
		20	2"SS	4-E	103	68	61	2340	—		
	END OF BORING @ 21.5'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

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

BORING NO. 5 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date MAY 22, 1972
Field Party GLORY, KAKU, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 80'± * Datum —
Drill Bit FINGER TYPE

Water Level	13.5'			
Time	3:30 PM			
Date	5-22-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 80'±*	0									
(MH)	MEDIUM, BROWN CLAYEY SILT		2"S	S-A	100	50	67	5250	—		2/0.5' 3/0.5'
		5	2"SS	S-B	—	57 LL= 103 PL= 57	—	—	—		
MH	MEDIUM, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	S-C	—	57 67	—	1640	—		1/0.5' 3/0.5' 3/0.5'
			WATER 5-22-72								
MH	MEDIUM, TAN & GRAY CLAYEY SILT W/ DECOMPOSED ROCK	15				LL= 88 PL= 61					
			2"SS	S-D	—	82 82	—	—	—	3/1.0'	
MH	MEDIUM, MOTTLED GRAY & LAVENDER CLAYEY SILT W/ DECOMPOSED ROCK					LL= 117 PL= 53					
	END OF BORING @ 17'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii

Tax Map Key: 4-7-31: 7, 9 & 10

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" SS. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. G Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: MAY 12, 1972

Field Party: MEYER, KAKU, RADOVICH

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 128'± * Datum: —

Drill Bit: T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	5-12-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 128'± *	0									
(MH)	STIFF, BROWN CLAYEY SILT W/ GRAVEL & ROOTS		2"SS	G-A	90	41 48	—	—	—		6/0.5' 6/0.5'
(MH)	STIFF, TAN & BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	G-B	—	60	—	—	—		
(MH)	MEDIUM, MOTTLED TAN CLAYEY SILT	10	2"SS	G-C	102	62	63	—	—		2/0.5' 4/0.5'
MH	STIFF, MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	15	2"SS	G-D	—	65 LL= 97 PL= 68	—	—	—		
		20		G-E	—	69	—	—	—		
(MH)	MOTTLED TAN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	25		G-F	—	70	—	—	—		4/0.5' 9/0.5'
	END OF BORING @ 26.5'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES
LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

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

BORING NO. 7 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date MAY 24, 1972
Field Party GLORY, KAKU, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 99'± * Datum —
Drill Bit FINGER TYPE

Water Level	13.5'				
Time	1:00 PM				
Date	5-24-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 99'± *	0									
(MH)	MEDIUM, BROWN CLAYEY SILT W/ROOTS		2"S	T-A	99	39	71	5630	–		2/0.5', 3/0.5'
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	T-B	–	40	–	–	–		
		10	2"S	T-C	105	59	66	2020	–		2/0.5', 3/0.5', 5/0.5'
(MH)	MEDIUM MOTTLED TAN BROWN CLAYEY SILT W/ DECOMPOSED ROCK		WATER 5-24-72								
		15	2"SS	T-D	–	68	–	–	–		
	END OF BORING @ 17'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHT ESTATES

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: AHUIMANU HEIGHTS ESTATES
LOCATION: Kahaluu, Koolaupoko, Oahu, Hawaii
Tax Map Key: 4-7-31: 7, 9 & 10

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

BORING NO. 8 Sheet No. _____ of _____
Driller W. LUM ASSOC., INC. Date MAY 23, 1972
Field Party GLORY, KAKU, RADOVICH
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 92'± * Datum —
Drill Bit FINGER TYPE

Water Level				
Time	—			
Date	5-23-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 92'± *	0									
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT W/ TRACES OF ROOTS		2"S	B-A	101	47	69	3140	–		1/0.5', 3/0.5', 4/0.5'
(MH)	STIFF, BROWN CLAYEY SILT	5				51					
(MH)	MOTTLED TAN BROWN CLAYEY SILT		2"SS	B-B	–	52	–	–	–		
(MH)	MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK										
(MH)	MEDIUM, MOTTLED TAN BROWN & GRAY CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	B-C	101	62	63	1920	–		2/0.5', 3/0.5', 5/0.5'
(MH)	STIFF, MOTTLED REDDISH BROWN & GRAY CLAYEY SILT	15	2"SS	B-D	–	65	–	–	–		
(MH)	TAN, CLAYEY SILT	20									
(MH)	MEDIUM, LAVENDER, GRAY & BROWN SILTY CLAY W/ DECOMPOSED ROCK		2"S	B-E	99	65 66	–	3090	–		3/0.5', 6/0.5'
	END OF BORING @ 22'										

*Elevation Estimated From Contour Map Dated 4-28-72

AHUIMANU HEIGHTS ESTATES

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1	1	
SAMPLE NO.		D	D	
DEPTH BELOW SURFACE	SURFACE	5-6.5'	15-16.5'	
DESCRIPTION	DARK BROWN CLAYEY SILT	LIGHT MOTTLED BROWN CLAYEY SILT W/DECOMP. ROCK	LIGHT BROWN CLAYEY SILT W/DECOMP. 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	87	82	80	
Plastic Limit	49	60	61	
Plasticity Index	38	22	19	
Dilatancy	QUICK	QUICK	QUICK	
Toughness	SLIGHT-MED	SLIGHT	SLIGHT	
Dry Strength	MEDIUM	MEDIUM	SLIGHT-MED.	
UNIFIED SOIL CLASSIFICATION	MH	MH	MH	
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	37.7			
Molding Dry Density, P.C.F.	82.6			
Swell upon saturation, %	1.0			
CBR at 0.1" Penetration	17.2			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO 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 6-19-72 By BT

AHUIMANU HEIGHTS ESTATES

TABLE I 8 - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	3	3		5
SAMPLE NO.	B	D		
DEPTH BELOW SURFACE	5'-6.5'	15'-16.5'		SURFACE
DESCRIPTION	BROWN & TAN CLAYEY SILT W/TRACES OF DECOMP. ROCK	MOTTLED BROWN & GRAY CLAYEY SILT W/DECOMP. ROCK		BROWN CLAYEY SILT
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	92	89		93
Plastic Limit	53	66		55
Plasticity Index	39	23		38
Dilatancy	MED.-QUICK	QUICK		QUICK
Toughness	SLIGHT-MED.	SLIGHT		SLIGHT-MED.
Dry Strength	MEDIUM	MEDIUM		MEDIUM
UNIFIED SOIL CLASSIFICATION	MH	MH		MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				42.4
Molding Dry Density, P.C.F.				74.8
Swell upon saturation, %				1.5
CBR at 0.1" Penetration				12.8
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO 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 6-19-72 By BT

AHUIMANU HEIGHTS ESTATES

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	5	5	5	
SAMPLE NO.	B	D(TOP)	D(BOTTOM)	
DEPTH BELOW SURFACE	5'-6.5'	15'-17'	15'-17'	
DESCRIPTION	MOTTLED BROWN CLAYEY SILT W/DECOMP. ROCK	TAN & GRAY CLAYEY SILT W/DECOMP. ROCK	MOTTLED GRAY & LAVENDER CLAYEY SILT W/DECOMP. 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	103	88	117	
Plastic Limit	57	61	53	
Plasticity Index	46	27	64	
Dilatancy	MED.-QUICK	QUICK	SLOW-MED.	
Toughness	MEDIUM	SLIGHT-MED.	MED.-HIGH	
Dry Strength	MEDIUM	MEDIUM	MEDIUM	
UNIFIED SOIL CLASSIFICATION	MH	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 (AASHO 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 6-19-72 By BT

3-470

AHUIMANU HEIGHTS ESTATES

TABLE I D - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	6	6		
SAMPLE NO.		D		
DEPTH BELOW SURFACE	SURFACE	15'-16.5'		
DESCRIPTION	BROWN SILTY SAND W/GRAVEL & ROOTS	MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK		
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"	94.8			
1/2"	91.9			
#4	91.0			
#10	80.2			
#20	61.2			
#40	53.1			
#100	47.3			
#200	45.8			
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		
Liquid Limit	84	97		
Plastic Limit	49	68		
Plasticity Index	35	29		
Dilatancy	QUICK	QUICK		
Toughness	SLIGHT-MED.	SLIGHT-MED.		
Dry Strength				
UNIFIED SOIL CLASSIFICATION	SM	MH		
APPARENT SPECIFIC GRAVITY	3.10			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	39.9			
Molding Dry Density, P.C.F.	80.2			
Swell upon saturation, %	0.7			
CBR at 0.1" Penetration	10.5			
MOISTURE-DENSITY RELATIONS OF SOILS				
(AASHO T-180-57 Method ___)	A			
Dry to Wet or Wet to Dry	WET TO DRY			
Max. Dry Density (P.C.F.)	79.0			
Optimum Moisture (%)	42.0			

REMARKS:

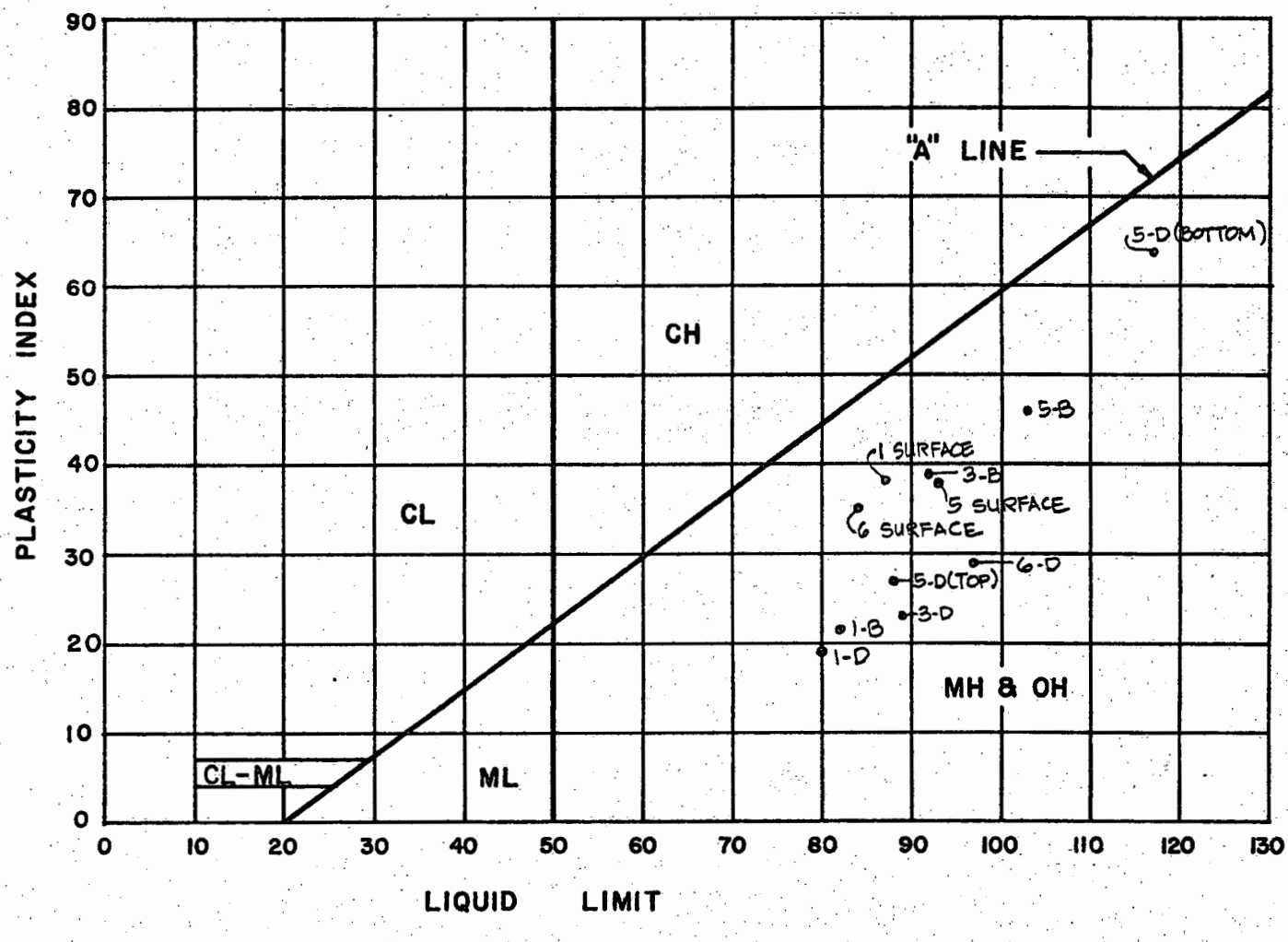
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 6-19-72 By BT

PLASTICITY CHART

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: KAHALUU, KOOLAUPOKO, OAHU, HAWAII



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

DATE 6-19-72 BY BT

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

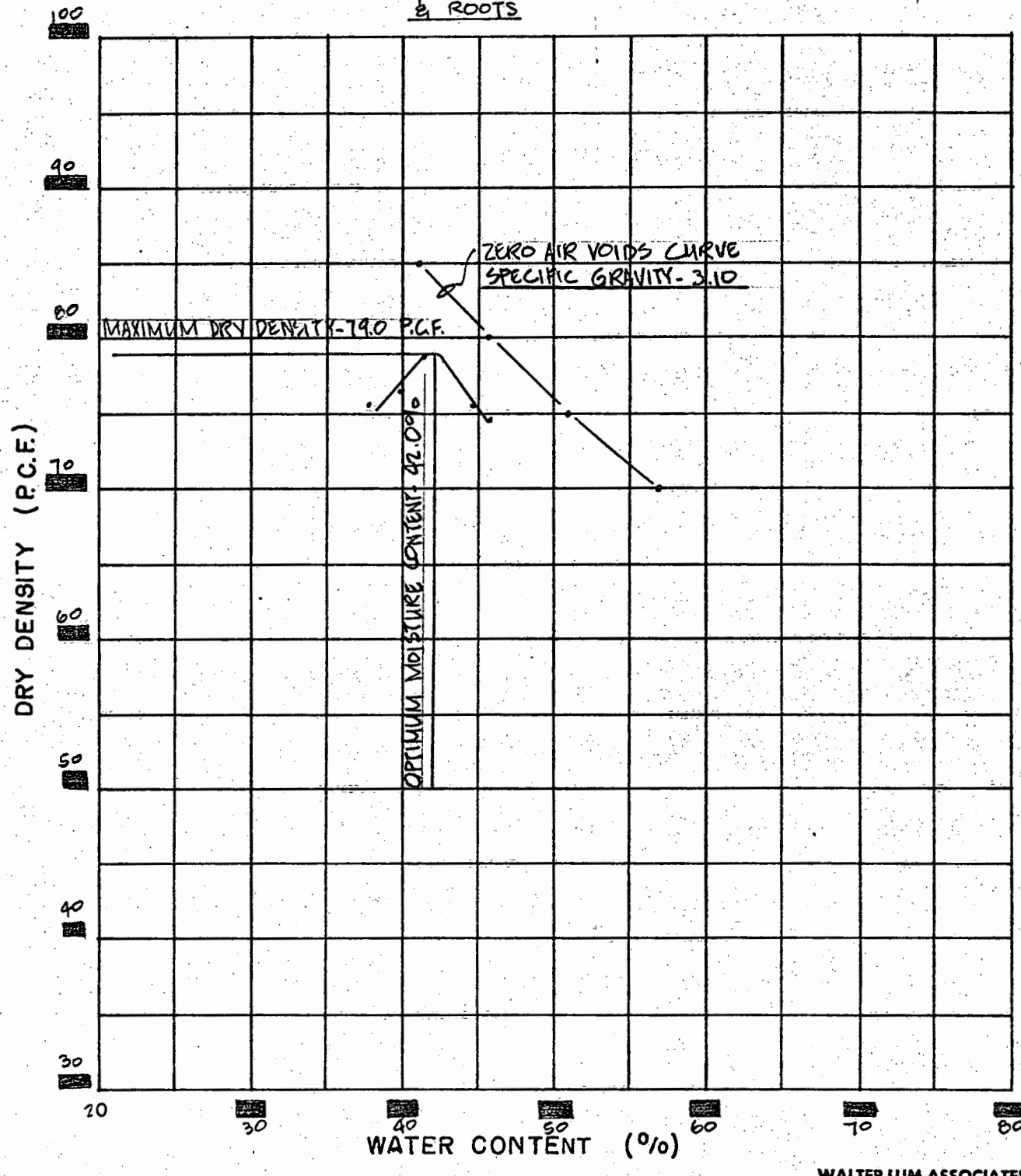
PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: KAHALUU, KOOLAUPOKO, OAHU, HAWAII

SAMPLE NO.: 6 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY SAND W/GRAVEL & ROOTS

AGGREGATE: ¼" MINUS
MOLD SIZE: 4" ϕ 4.59" HIGH
HAMMER: 10LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



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

DATE 5-24-72 BY SK

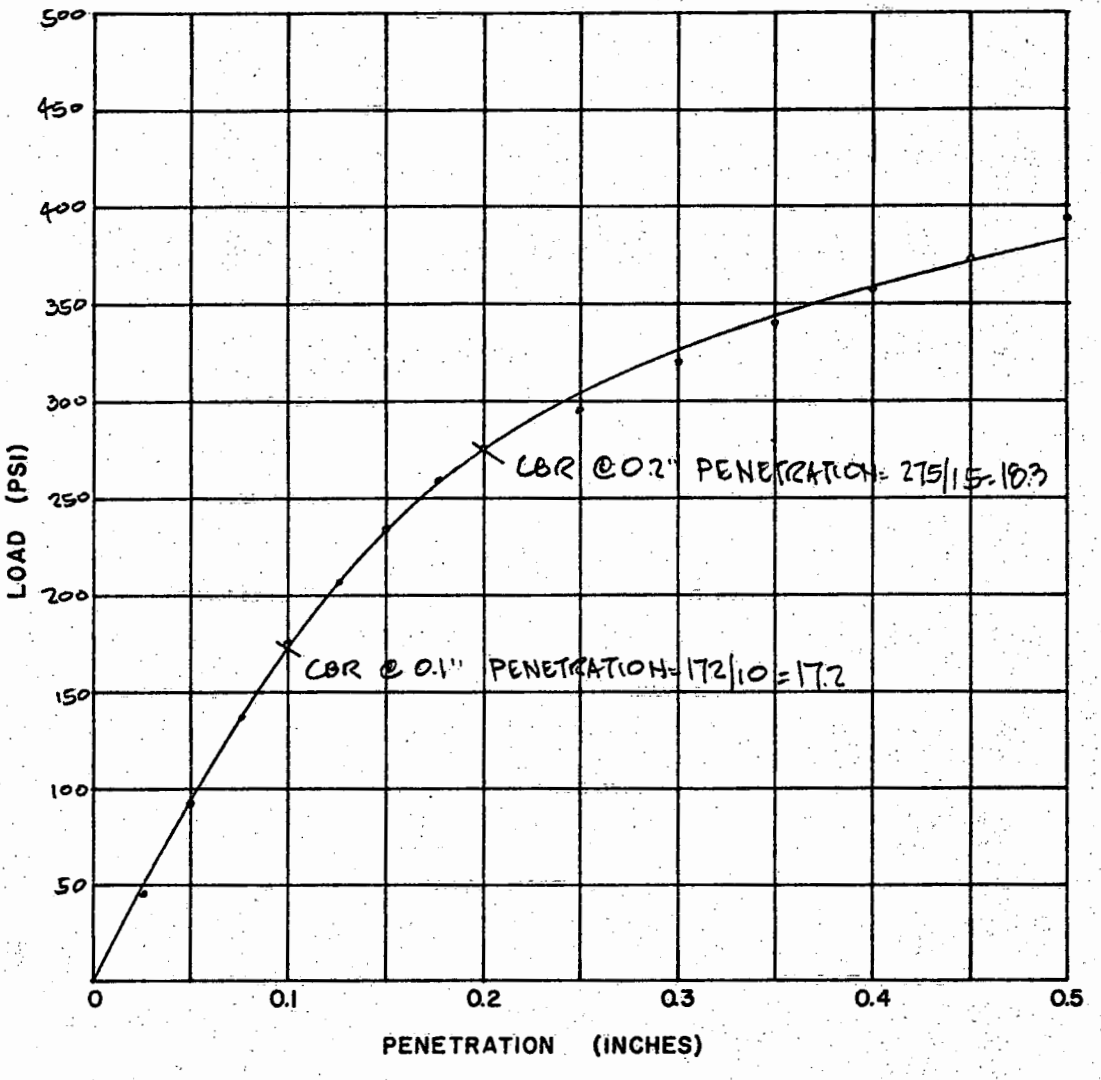
CBR TEST

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: KAHALUU, KOOLAUPOKO, OAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: DARK BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS)	LOAD (PSI)
0.025	135	45
0.050	280	93
0.075	410	137
0.100	525	175
0.125	620	207
0.150	705	235
0.175	780	260
0.200	830	277
0.250	890	297
0.300	960	320
0.350	1020	340
0.400	1070	357
0.450	1120	373
0.500	1180	393

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 37.7

MOLDING DRY DENSITY, P.C.F. 82.6

CBR @ 0.1" PENETRATION 17.2

DAYS SOAKED 4

DATE 5-20-72 BY FM

DATE 5-25-72 BY SK

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

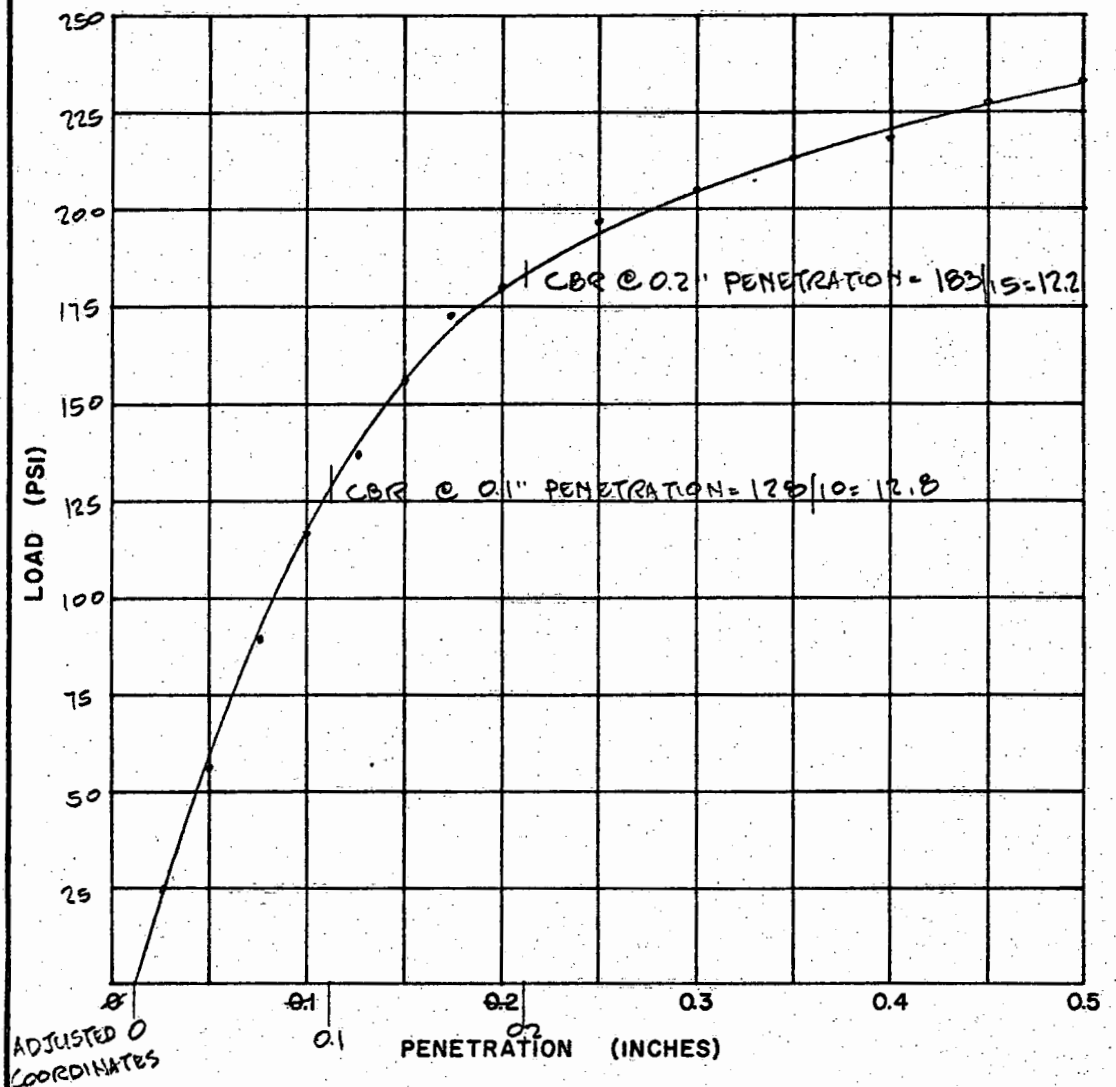
CBR TEST

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: KAHALUU, KOOLAUPOKO, OAHU, HAWAII

SAMPLE NO: 5 SURFACE

SAMPLE DESCRIPTION: BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	75	25
0.050	170	57
0.075	270	90
0.100	350	117
0.125	415	138
0.150	470	157
0.175	520	173
0.200	540	180
0.250	590	197
0.300	615	205
0.350	640	213
0.400	655	218
0.450	680	227
0.500	700	233

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 12.4

MOLDING DRY DENSITY, P.C.F. 74.8

CBR @ 0.1" PENETRATION 12.8

DAYS SOAKED 5

DATE 5-25-72 BY LJ

DATE 5-31-72 BY SK

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

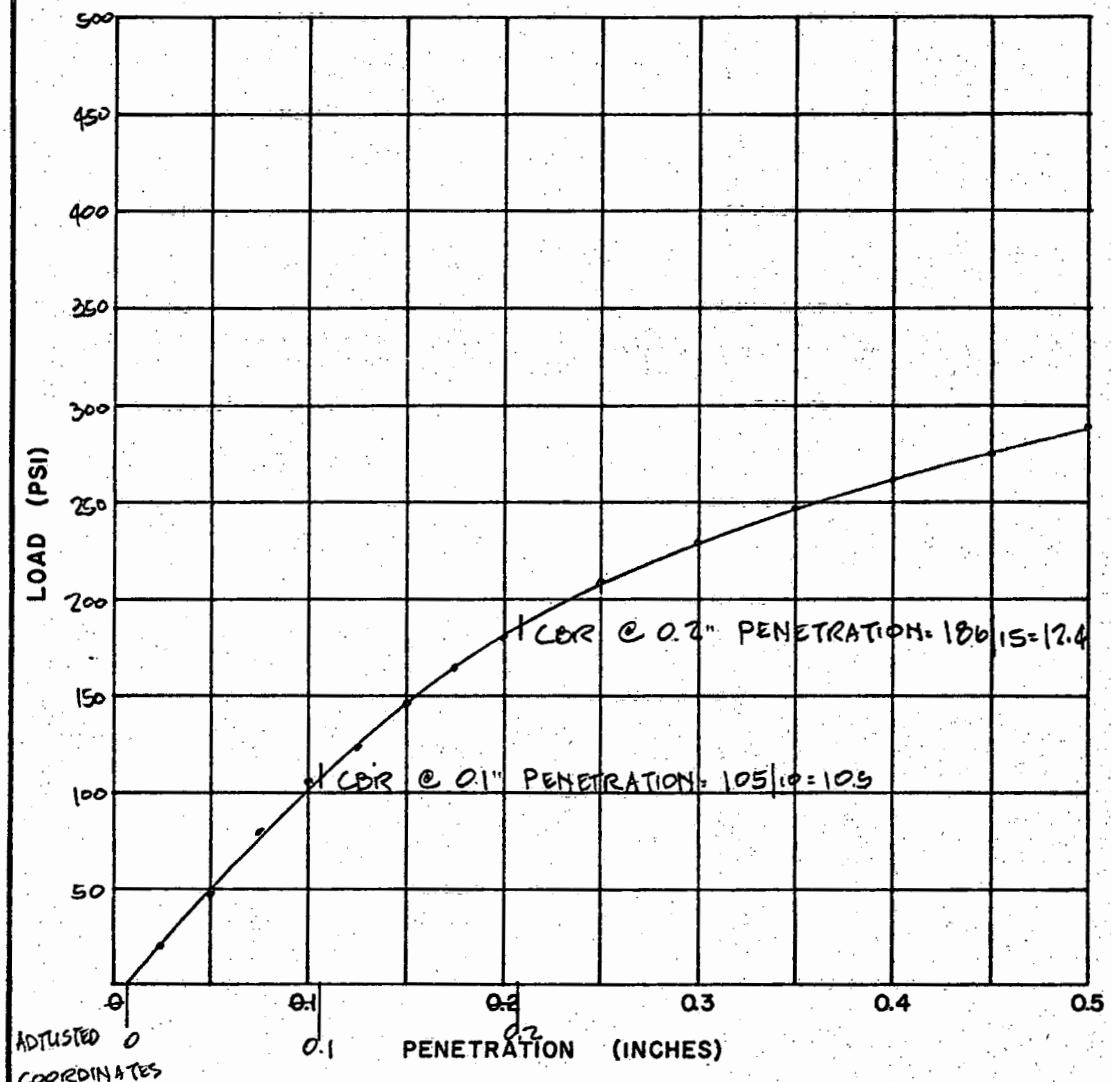
CBR TEST

PROJECT: AHUIMANU HEIGHTS ESTATES

LOCATION: KAHALUU, KOOLAUPOKO, OAHU, HAWAII

SAMPLE NO: 6 SURFACE

SAMPLE DESCRIPTION: BROWN SILTY SAND W/GRAVEL & ROOTS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	60	20
0.050	145	48
0.075	240	80
0.100	315	105
0.125	370	123
0.150	440	147
0.175	495	165
0.200	540	180
0.250	630	210
0.300	690	230
0.350	745	248
0.400	785	262
0.450	830	277
0.500	870	290

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

TEST RESULTS:

MOLDING MOISTURE, %. 39.9
MOLDING DRY DENSITY, P.C.F. 80.2
CBR @ 0.1" PENETRATION 10.5
DAYS SOAKED 4

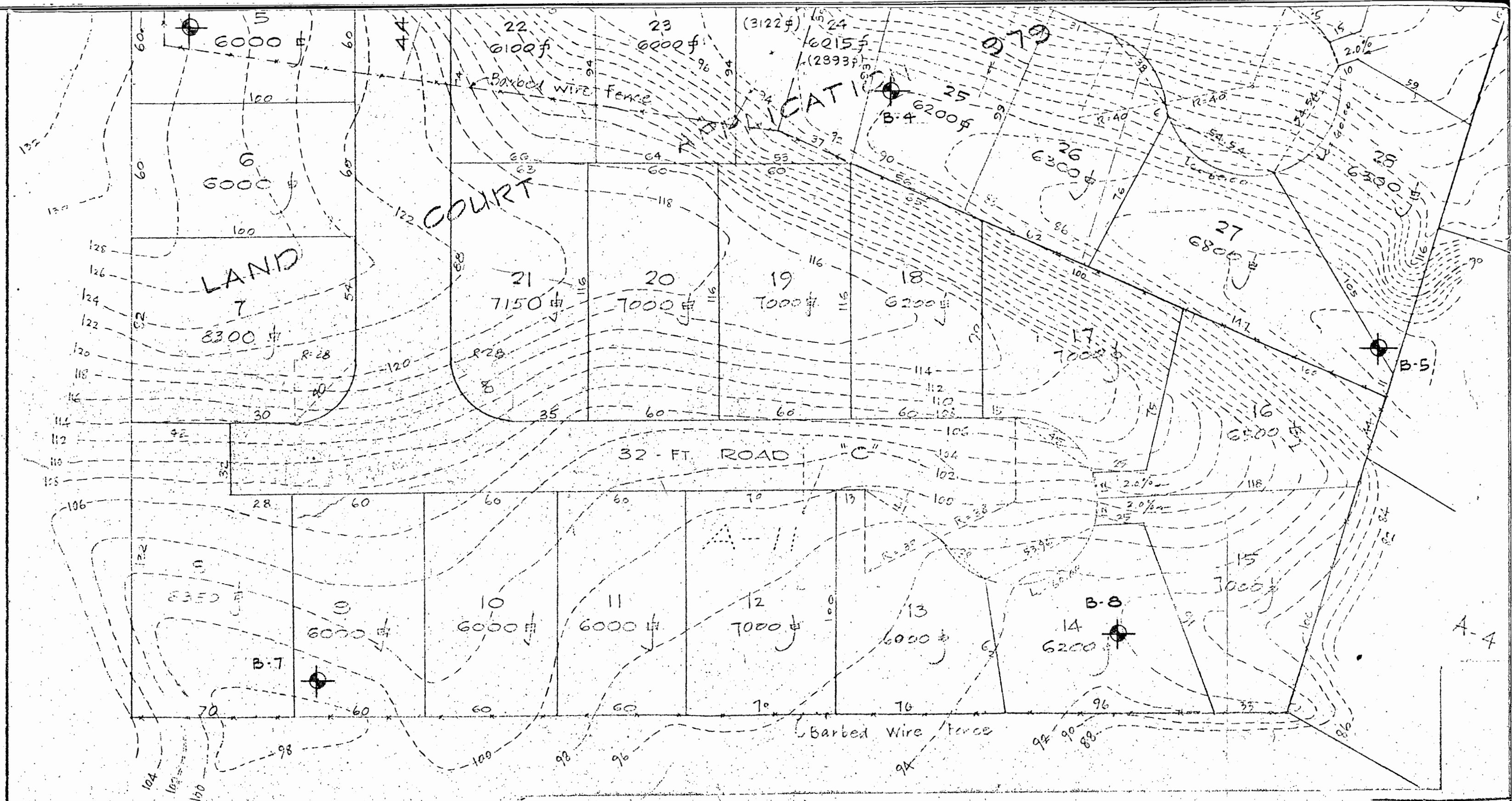
DATE 5-19-72 BY MO
DATE 5-24-72 BY SK

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

10-470

BORING LOCATION PLAN
AHUIMANU HEIGHTS ESTATES
KAHALUU, OAHU, HAWAII
TAX MAP KEY: 4-7-31: 7, 9 & 10

Dr.	WALTER LUM ASSOCIATES, INC.	Sheet
Date 6/72	3030 WAIALAE AVE.	
Rev.	CIVIL ENGINEERS	of
	PHONE 737-7931	



BORING LOC
AHUIMANU
KAHALUU, OA
TAX MAP KEY:

Dr. ____
Date 6/72
Rev. ____

WALTE

TRUE NORTH
SCALE: 1" = 40'

AHUIMANU ROAD

POOMAU STREET

EXISTING PAVEMENT

MASTER PLAN
ROAD WIDENING
To Kam. Hwy.

44 FT ROAD "A"

44 FT ROAD "B"

(MAP (3)

1 7150 ф
2 6000 ф
3 6000 ф
4 6000 ф
35 7000 ф
36 7000 ф
37 7500 ф
38 12100 ф House Gar.
39 6600 ф
40 6600 ф
41 6600 ф
42 6600 ф
43 6600 ф
32 6072 ф (5194 ф)
33 6000 ф
34 6400 ф
31 6300 ф
30 6300 ф
29 6100 ф
20,000 ф

A-10 A-9 A-8 A-7

B-1 B-2 B-3 B-6

R=115.00 R=160.00 R=20 R=715.94 R=1015.00

EXISTING PAVEMENT

POOMAU STREET

AHUIMANU ROAD

TRUE NORTH
SCALE: 1" = 40'

MASTER PLAN
ROAD WIDENIN
To Kam. Hwy.

R=115.00

R=160.00

R=75.94

R=20

B-1

B-2

B-3

B-6

A-10

A-8

A-7

A-12

1
7150 ±

2
6000 ±

3
6000 ±

4
6000 ±

35
7000 ±

36
7000 ±

37
7500 ±

38
12100 ±
House
Gar.

39
6600 ±

40
6600 ±

41
6600 ±

42
6600 ±

43
6600 ±

34
6400 ±

33
6000 ±

32
6072 ±
(5194 ±)

31
6300 ±

30
6300 ±

29
6100 ±

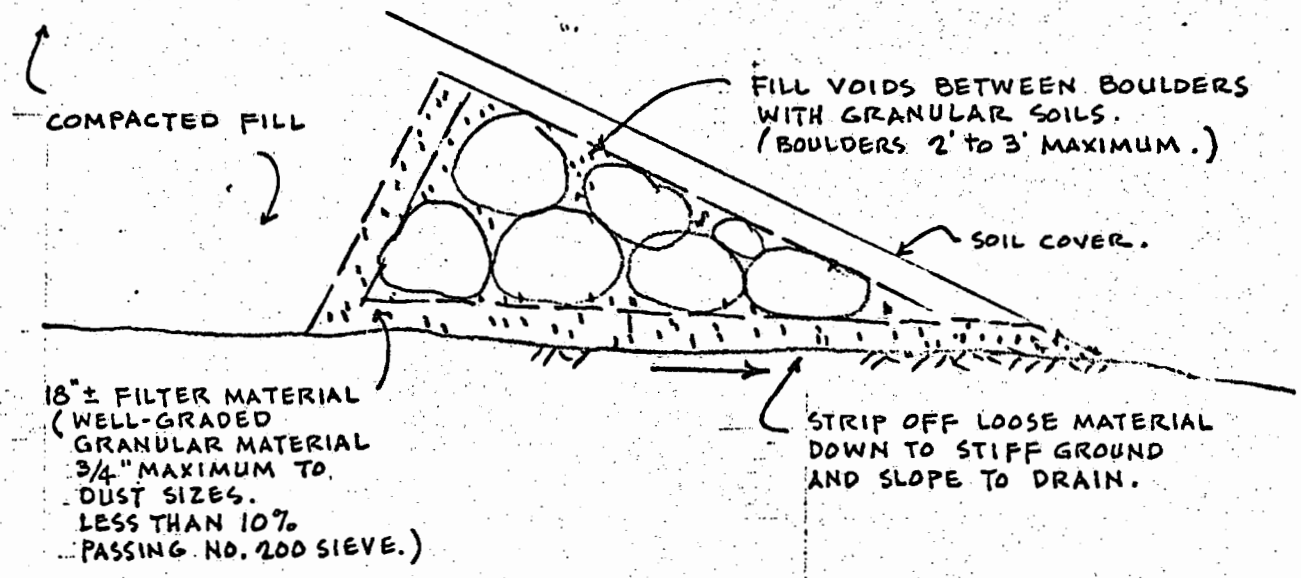
20,800

(378 ±)

44 FT. ROAD "A"

44 FT. ROAD "B"

(MAP (3)



SECTION

NOT TO SCALE

FIGURE 1

PROPOSED BOULDER FILL

AHUIMANU HEIGHTS ESTATES

KAHALUU, OAHU, HAWAII

TAX MAP KEY: 4-7-31: 7, 9 & 10

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

JUNE, 1972

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.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

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.