MOMILANI SUBURB UNIT IX-A - PRELIMINARY SOIL REPORT
(for residential development)

MANANA-UKA & WAIMANO, EWA, OAHU, HAWAII

TAX MAP KEY: 9-7-24

To:
PARK ENGINEERING, INCORPORATED

By:
WALTER LUM ASSOCIATES, INCORPORATED
CIVIL, STRUCTURAL, SOILS ENGINEERS
July 2, 1969
July 2, 1969

PARK ENGINEERING, INC.
1149 Bethel Street, Room 710
Honolulu, Hawaii 96813

Gentlemen:

Subject: Momilani Suburb Unit IX-A
Preliminary Soil Report
(for residential development)
Manana-Uka & Waimano, Ewa, Oahu, Hawaii
Tax Map Key: 9-7-24
Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended

In accordance with your request, a preliminary soil exploration was made at the proposed residential development site for Momilani Suburb Unit IX-A, Ewa, Oahu, Hawaii.

From the field exploration and laboratory test results, it is our opinion that the site may be developed for residential housing. Houses can be supported either directly on stiff existing ground or on properly compacted fills constructed from suitable on-site soils.

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.

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

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

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike
Professional Engineer
Hawaii No. 1450
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MOMILANI SUBURB UNIT IX-A - PRELIMINARY SOIL REPORT  
(for residential development)  
MANANA-UKA & WAIMANO, EWA, OAHU, HAWAII  
TAX MAP KEY: 9-7-24  

SCOPE OF EXPLORATION  
The purpose of this exploration was to determine general soil conditions of the proposed site, Momilani Suburb Unit IX-A, Ewa, Oahu, Hawaii, for residential development.  

This report includes preliminary field exploration, laboratory tests and recommendations regarding the soils at the site.  

PRELIMINARY FIELD EXPLORATION  
Six borings were made at the site. The locations of these borings and five borings made previously for Momilani Suburb Units VIII and VIII-D are shown on Figure 1, Boring Location Plan. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 6. Also attached are the logs of five borings made for the Units VIII and VIII-D soil reports.  

Borings were made with 3-in. diameter augers with tungsten carbide drag bits. Soil samples were recovered with a 2-in. thin-wall-tube sampler and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.
Soil samples were visually identified and tentatively classified in the field. In the laboratory, they were subjected to appropriate tests. The field identifications and classifications were then reviewed and modified to conform with the results of the laboratory tests in accordance with the "Unified Soil Classification System."

LABORATORY TESTS

Laboratory tests included: natural density, moisture content and unconfined compression; Atterberg limits; specific gravity; gradation; AASHO T-180-57 density; expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA and IB.

GENERAL SITE AND SOIL CONDITIONS

The project site is located at the east end of Momilani Suburb Unit VIII.

The existing ground surface generally slopes down towards the north and west at about 5 to 20 percent gradient with steeper localized slopes at the northwest corner of the site next to the old drainageway.

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

A surface layer about 4 to 8 ft of medium to stiff reddish-brown clayey silt underlain by stiff clayey silt and decomposed rock to about 15 to 40 ft, the depths drilled.
some cobbles and boulders were encountered in the borings, particularly toward the eastern part of the site.

Water was not noted in the borings during the field explorations.

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

DISCUSSION AND RECOMMENDATIONS

In general, the proposed grading at this time is to use cut or fill slopes of 20 ft or less in height within the subdivision. A temporary cut slope about 35 ft in height is contemplated along the eastern boundary along Komo Mai Road next to a sugar cane field.

Fills of about 10 to 15 ft are proposed at the northeast corner of the site where an old drainageway crossed the site. Subdrains should be installed before construction of fills in this area.

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.

In the opinion of the Soil Engineer, the on-site soils, in general, have sufficient strength to support the fills and the light residential structures proposed, provided the site is cleared and grubbed, drained and soft spots are removed.
Fills

In general, the on-site soils are suitable for the construction of the proposed fills. The construction of the proposed fills should be done as required by the F.H.A. Data Sheet 79-G; Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. Topsoil and stockpiled soils should be either
   (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

2. All hard surfaces along existing access roads should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

3. Where fills are proposed, the bottom and the sides of the drainageway should be stripped down to stiff natural ground and lined with a blanket of well-graded crushed rock before the placement of fills. A subdrain line with laterals should be placed along the bottom of the drainageway and connected to the subdrain in Unit VIII-D. The final locations of subdrains should be determined in the field after clearing and grubbing.

4. All fills should be constructed in approximately level layers starting at the lower end and working upward.
5. All 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 and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

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

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 in both cuts and fills.

The temporary cut slope (35+ ft high) along the eastern boundary is proposed without a bench. Some slumping or local sloughing may occur which would require remedial work from time to time.

For protection against erosion during construction, it is recommended that runoff water from rainstorms be controlled by berms or other approved methods.

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

Where slopes are cut thru rocky ground, all loose rock outcroppings should be removed. Loose pockets and hollow spots should be cleared out and backfilled.
Slope planting is recommended on cut and fill slopes to minimize erosion.

Foundations
If earthwork is carried out as specified, the stiff natural ground and compacted fills should develop adequate bearing values to support the proposed light residential structures. Guide recommendations for foundation construction are as follows:

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

2. Bearing values for a given soil usually vary with the size and depth of the footings. For light residential structures, bearing values of 1500 p.s.f. on compacted fills and 2000 p.s.f. on stiff natural ground may be used.

3. Because of the downhill creep effect of soils on a slopes, some settlement may occur near the tops of slopes. Therefore, for slopes of about 15 ft or higher, buildings should 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 in no case closer than 5 ft from the top of a slope.

4. Construction of retaining walls on side slopes should be avoided unless the underlying materials are very stiff or hard.
5. Good surface drainage away from the foundations of the proposed structures should be maintained.

Roadways

In general, a rough estimate of the roadway pavement thickness for the light residential traffic anticipated is as follows:

2. Base course - 6-in. base course over a prepared subgrade.

Local adjustments regarding subbase requirements can be made in the field in accordance with the design standards of the City and County of Honolulu as the various soil conditions are encountered at subgrade levels.

It is recommended that subgrades 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.

Allowances should be made in the estimate for an extra subbase course in localized areas for field adjustments.
PROPOSED SPECIFICATION FOR EARTHWORK

MOMILANI SUBURB UNIT IX-A

General Description

This item shall consist of all clearing and grubbing, removing of existing structures, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and all subsidiary work necessary to complete the grading.

Clearing, Grubbing and Preparing Areas to be Filled

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

All vegetable matter shall be removed from the surface upon which fill is to be placed. All topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. All topsoil encountered at finish grade shall be scarified and recompacted.

All hard surfaces along the existing access roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil before the placement of fills.

All loose material along the bottom and the sides of the drainageway shall be stripped down to stiff natural ground and lined with a blanket of well-graded crushed rock before the placement of fills.

Subdrains and laterals shall be placed along the bottom of the natural drainageway before the construction of fills. The final locations of subdrains should be determined in the field after clearing and grubbing.
Where fills are made on sloping areas steeper than 5 horizontal to 1 vertical, the ground at the toe of the slope shall be benched to a generally level condition. As the fill is brought up, it shall be continually keyed into the stiff natural ground by the cutting of steps into the hillside and compacting the fill into these steps. Ground slopes which are flatter than 5 horizontal to 1 vertical shall be benched when considered necessary by the Soil Engineer.

**Materials**

Fill materials shall consist of on-site soils approved by the Soil Engineer and identified in the soil report accepted by the F.H.A. The soils shall contain no more than a trace of organic matter and no particles larger than 6 in. in diameter. Also, it shall contain no more than 40% gravel (#4 sieve to 3 in. sieve sizes) and no more than 10% cobbles larger than gravel and smaller than 6 in. in diameter. Fill material placed in the top 2 ft of fills shall contain no more than 30% gravel and any material larger than 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 moisture content within each layer.

No rocks or cobbles shall be allowed to nest and all voids between rocks must be carefully filled and compacted with small stones or earth.
When the moisture content of the fill material is below that specified by the Soil Engineer, water shall be added until the moisture content is as specified and assures a thorough bonding during the compacting process.

When the moisture content of the material is above that specified by the Soil Engineer, the fill material shall be aerated by blading or by other satisfactory methods until the moisture content is as specified.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than 90% of maximum density in accordance with AASHTO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepfoot 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 moisture content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to insure the obtainment of the desired density.

Field density tests shall be made by the Soil Engineer of the compaction of the fill. Where sheepfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary of the compacted material below the disturbed surface as determined by the Soil Engineer. 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.
Excavation

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

Unforeseen Conditions

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

Rainy Weather

No fill material shall 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 by the Soil Engineer indicate that the moisture content and density are as previously specified.
BORING LOGS

Symbols

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

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

Where no parenthesis "SM" is used, the soil sample was classified from either the Atterberg limits or gradation test results.
Boring Log

MOMILANI SUBURB UNIT II-A
BORROW SITE FOR MOMILANI SUBURB

PROJECT: UNITS III & III-D

LOCATION: EWA, OAHU, HAWAII

TMK: 9-7-24

HAMMER:

Weight: 140
Drop: 30"

SAMPLER: 2 1/2 - 6' D.O. THIN WALL TUBE
2 1/4 - 6' STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. 1 of

Driller: WALTER LUM ASSOC., Date: APRIL 7, 1969
Field Party: MAKAGA, MAEHIRO, SCHOLLING, GLORY
Type of Boring: AUGER (MINUTEMAN) Diam. 5"
Elev.: Datum: 212' +
Drill Bit: T.C. DRAG

Water Level: Not Noted

Date: 4-2-69

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**DESCRIPTION**

ELEV.: 212' ± 2

(MH) STIFF, REDDISH BROWN
Silty clay

(Cobble or Boulder

(MH) STIFF, REDDISH BROWN
CLAYY Silt

(Decomposed rock

(WGY CLAY POCKETS

(Cobble or Boulder

(MH) MEDIUM, BROWN
Silty Clay

(Gravel

(MH) STIFF, HOTTLED BROWN
CLAYY Silt

(Decomposed rock

(WGY CLAY POCKETS

END OF BORING & 16' B.

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**NOTE:**

Very hard and rough drilling & B.

moved boring 8'.

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**ELEVATION ESTIMATED FROM GRADING PLAN**
Boring Log : MUMILANI SUBURB UNIT IX-A  
BORROW SITE FOR MIMUMANI SUBURB

PROJECT: UNITS III & VIII-O
LOCATION: EWA, OAHU, HAWAII
TMK: 9-7-74

HAMMER:
Weight: 140*
Drop: 30°

2.5'-2.00 THIN WALL TUBE
2.65'-2.00 STANDARD SPLIT SPONG

SAMPLER:  

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*ELEGVATION ESTIMATED FROM GRADING PLAN
**Boring Log**

**MOMILANI SUBURB UNIT II-A**

**BORROW SITE FOR MOMILANI SUBURB**

**PROJECT**  UNITS III & III-D

**LOCATION**  EWA, OAHU, HAWAII

**TMK:**  9-7-24

**HAMMER:**

- **Weight:** 1400 lbs
- **Drop:** 30 in

**SA人类RER:**

- **2.5 - 2" O.D. THIN WALL TUBE**
- **2.64 - 2" STANDARD SPLIT SPON**

**Driller:** WALTER LUM ASSOC.

**Date:** APRIL 9, 1969

**Type of Boring:** AUGER

**Drill Bit:** T.C. DRAG

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**END OF BORING @ 15.15'**

**ELEVATION ESTIMATED FROM GRADING PLAN**
**Boring Log**  
**MOMILANI SUBURB UNIT II-A**  
**BORROW SITE FOR MOMILANI SUBURB**

**PROJECT**  
UNITS VIII & IX-D

**LOCATION**  
EWA, OAHU, HAWAII

**THK:** 9-7-26

**HAMMER:**
- Weight: 140 lbs
- Drop: 3.0 ft

**SAWPLER:**  
2" 1/8 - 2" O.D. THIN WALL TUBE

**Type of Boring**  
MOBILE AUGER (MINI HITREAT) Diam. 3"  
Elev. 280 ft

**Date:** APRIL 3, 1969

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**Notes:**
- Elevation estimated from grading plan.
Boring Log

**PROJECT** MomiLANI SUBURB UNIT IX-A

**LOCATION** EWA, OAHU, HAWAII

**HMMER:**
- **Weight:** 140
- **Drop:** 30

**SAMPLER:**
- 2" S - 2" O.D. THIN WALL TUBE
- 2"S - 2" STANDARD SPLIT SPOON

### Penetration Data

**ELEV. = 265'M**

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<td>76</td>
<td>(1820)</td>
<td>SAMPLE CRACKED</td>
<td>-</td>
<td>-</td>
<td>190</td>
<td>20</td>
</tr>
<tr>
<td>30</td>
<td>G-G</td>
<td>49</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>35</td>
<td>G-H</td>
<td>NO RECOVERY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>210</td>
<td>12</td>
</tr>
<tr>
<td>40</td>
<td>G-J</td>
<td>NO RECOVERY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>220</td>
<td>14</td>
</tr>
</tbody>
</table>

**End of boring @ 40.1'**

**ELEVATION ESTIMATED FROM GRADING PLAN**

---

**Notes:**
- **Type of Boring:** AUGER (Moblre) Diam. 3"
## Table 1A - Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample No.</th>
<th>Depth Below Surface</th>
<th>Description</th>
<th>Grading Analysis (% Passing)</th>
<th>Atterberg Limits</th>
<th>Unified Soil Classification</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Boring No.</td>
<td>Sample No.</td>
<td>Depth Below Surface</td>
<td>Description</td>
<td>Grading Analysis (% Passing)</td>
<td>Atterberg Limits</td>
<td>Unified Soil Classification</td>
<td>Specific Gravity</td>
</tr>
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</tr>
</tbody>
</table>

### Atterberg Limits
- **Air Dried or Natural Liquid Limit**: 54
- **Liquid Limit**: 58
- **Plastic Limit**: 31
- **Plasticity Index**: 22
- **Dilatancy**: Quick
- **Toughness**: Medium
- **Dry Strength**: Slight-Med.

### Unified Soil Classification
- MH
- MH
- MH
- MH

### Specific Gravity
- 2.66

### Expansion and CBR Tests
- **Surcharge-51 P.S.F.**
  - Molding Moisture Content, %: 26.8
  - Molding Dry Density, P.C.F.: 14.8
  - Swell upon saturation, %: Nil
  - CBR at 0.1" Penetration: 15.0

### Compaction Test
- **AASHO T-180-57 Method**
  - Dry to Wet or Wet to Dry Max. Dry Density (P.C.F.): 97.2
  - Optimum Moisture (%): 27.0

Walter Lum Associates
Civil, Structural, Soils Engineers
**MOMILANI SUBURB - UNIT IV-A**

**TABLE I-9 - SUMMARY OF LABORATORY TEST RESULTS**

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRADING ANALYSIS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(\% Passing)

| Sieve |  |  |
| 1" |  |  |
| ½" |  |  |
| #4 |  |  |
| #10 |  |  |
| #20 |  |  |
| #40 |  |  |
| #100 |  |  |
| #200 |  |  |

| ATTERBERG LIMITS |  |  |
| Air Dried or Natural |  |  |
| Liquid Limit | 52 | 43 |
| Plastic Limit | 37 | 37 |
| Plasticity Index | 15 | 6 |

| Dilatancy |  |  |
| Toughness | MED-HIGH | MEDIUM |
| Dry Strength | SLIGHT-MED | SLIGHT |

| UNIFIED SOIL CLASSIFICATION |  |  |
| SPECIFIC GRAVITY |  |  |

| EXPANSION AND CBR TESTS |  |  |
| (Surcharge-51 P.S.F.) |  |  |
| Molding Moisture Content, % |  |  |
| Molding Dry Density, P.C.F. |  |  |
| Swell upon saturation, % |  |  |
| CBR at 0.1" Penetration |  |  |

| COMPACTION TEST |  |  |
| (AASHO T-180-57 Method) |  |  |
| Dry to Wet or Wet to Dry |  |  |
| Max. Dry Density (P.C.F.) |  |  |
| Optimum Moisture (%) |  |  |

WALTER LUM ASSOCIATES
CIVIL, STRUCTURAL, SOILS ENGINEERS
JOB: MOMILANI SUBURB UNIT IX-A
LOCATION: EWA, OAHU, HAWAII

PLASTICITY CHART

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

FROM

MOMILANI SUBURB UNITS VIII AND VIII-D
Boring Log

**PROJECT:** MOMICLANI SUBURB UNIT VIII

**LOCATION:** WAIKIKI - WAIKIFOEWA, OAHU, HAWAII

**TMK:** 7-7-24-1

**HAMMER:**
- Weight: 10lb SLEDGE HAMMER
- Drop: 2" O.D. THIN WALL TUBE

**SAMPLER:**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Description</th>
<th>ELEV = 225' ± 2'</th>
<th>0</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH</td>
<td>STIFF, REDDISH-BROWN CLAYEY SILT.</td>
<td></td>
<td>A</td>
<td>110</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>MEDIUM REDDISH - BROWN SILTY CLAY W/ TRACES OF DECOMPOSED ROCK</td>
<td></td>
<td>B</td>
<td>109</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>ROCK OR BOULDER</td>
<td></td>
<td>C</td>
<td>111</td>
<td>40</td>
</tr>
</tbody>
</table>

**ELEVATION ESTIMATED FROM CONTOUR MAP**

**PENETRATION DATA**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>87</td>
<td>Y1300</td>
<td></td>
<td>3900</td>
</tr>
<tr>
<td>10-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BORING LOG SHEET 10**

**BORING NO. 10**

**Sheet No. 1 of 1**

**Driller:** WALTER LUM ASSOC.

**Date:** 5/20/68

**Field Party:** SOUZA, MAESHIRO

**Type of Boring:** AUGER (MOBILE)

**Diam.:** 3"

**Elev.** 225' ± 2'

**Datum:**

**Drill Bit:** CLAY BIT

**Water Level:** NOT NOTICED

**Time:**

**Date:** 5/20/68

**2" O.D. THIN WALL TUBE SAMPLER**

**Blows Per Foot**

<table>
<thead>
<tr>
<th>Blows Per Foot</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>13/5</td>
<td>15/5</td>
<td>7/5</td>
<td>10/5</td>
<td>45/5</td>
</tr>
</tbody>
</table>

---

*Elevation estimated from contour map.*
Boring Log

**PROJECT:** MOMILANI SUBURB UNIT VIII  
**LOCATION:** MAUNA-IKA L (WAIMANO, EWA, OAHU, HAWAII)  
**TMK:** 5 - 7 - 24 1  
**HAMMER:** 10 lb SLEDGE HAMMER  
**SAMPLER:** 2" O.D. THIN WALL TUBE

**Type of Boring:** AUGER  
**Drill Bit:** CLAY BIT  
**Elev.:** 247'  
**Datum:**  

**Weight:** NOT NOTICED  
**Drum:** -  
**Time:** 5-17-68

---

**DESCRIPTION**  

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>A</td>
<td>98</td>
<td>29</td>
<td>76</td>
<td>8320</td>
<td>0 10 20 30 40 BLOWS/0.5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>B</td>
<td>115</td>
<td>32</td>
<td>87</td>
<td>4580 1600</td>
<td>15/5 19/5</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>C</td>
<td>125</td>
<td>90</td>
<td>96</td>
<td>6920</td>
<td>39/5</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>D</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>25/5 20/5</td>
</tr>
</tbody>
</table>

**ELEVATION ESTIMATED FROM CONTOUR MAP.**
**Boring Log**

**PROJECT**:  **MOMILANI SUBURB UNIT VII**

**LOCATION**:  **MANANA-UKA & WAIMANO, WAIKAULU, HAWAII**

**TUK**:  9-7-74

**HAMMER**:  **10 ft. SLEDGE HAMMER**

**DROP**:  **2' O.D. THIN WALL TUBE**

**SAMPLER**:  **2' O.D. THIN WALL TUBE**

---

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>ELEV. = 262' + 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

**Penetration Data**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>117</td>
<td>35</td>
<td>86</td>
<td>3700</td>
<td>1200</td>
<td>10'/5'</td>
</tr>
<tr>
<td>B</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10'/3'</td>
</tr>
<tr>
<td>C</td>
<td>110</td>
<td>43</td>
<td>77</td>
<td>4930</td>
<td>600</td>
<td>18'/3'</td>
</tr>
<tr>
<td>D</td>
<td>100</td>
<td>42</td>
<td>71</td>
<td>-</td>
<td>1100</td>
<td>8'/5'</td>
</tr>
<tr>
<td>E</td>
<td>117</td>
<td>43</td>
<td>82</td>
<td>6710</td>
<td></td>
<td>18'/3'</td>
</tr>
</tbody>
</table>

---

**End of Boring @ 21'**

*ELEVATION ESTIMATED FROM CONTOUR MAP.*

---
Boring Log

PROJECT: MOMILANI SUBURB UNIT VIII
LOCATION: MANANA-UHA & WAIMANO, EWA, OAHU, HAWAII

TMK: 3 - 7 - 24 - 1

HAMMER:
- Weight: 10# SLEDGE HAMMER
- Drop: 

SAMPLER: 2" O.D. THIN WALL TUBE

BORING NO. 21  Sheet No. 1 of 1
Driller: WALTER LUM ASSOC. Date: 5/7/68
Field Party: MARY \ MASON
Type of Boring: AUGER
Diam.: 3"
Elev.: 262' * Datum: 
Drill Bit: CLAY BIT
Water Level: NOT NOTICED
Time: 
Date: 5-7-68

Penetration Data

Elev.: 262' * 3

Depth (ft.) 0 5 10 15
Elev. A 111 28 87 3250 - 7/5' 10/5' 2B/5' 25/5'
B 123 30 95 5500 - 25/5' 25/5'
C 130 37 95 1750 - 42/5'
D 104 41 74 9000 - 13/5' 25/5'

Penet. Data


0 10 20 30 40 BLOWS/0.5'

*ELEVATION ESTIMATED FROM CONTOUR MAP.
**Boring Log**

**PROJECT:**  MOKULUA SUBURB - UNIT VIII-D

**LOCATION:**  EWA, OAHU, HAWAII

**T.M.K.:**  9-7-74

---

**HAMMER:**

- **Weight:** 140lb
- **Drop:** 30"

**SAMPLER:**  2½" - 2" STD. WALL TUBE

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**DESCRIPTION:**

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</tr>
</thead>
<tbody>
<tr>
<td>(MH)</td>
<td>ELEV. = 190' ± 2</td>
<td>2&quot; 4</td>
<td>2-A</td>
<td>119</td>
<td>36</td>
<td>87</td>
<td>6240</td>
<td>1120</td>
<td>4½</td>
<td>4½</td>
</tr>
<tr>
<td>(MH)</td>
<td></td>
<td>2&quot; 4½</td>
<td>2-B</td>
<td>-</td>
<td>37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5½</td>
<td>12/0</td>
</tr>
</tbody>
</table>

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**NOTE:**

- Drilled for 10 min. @ 4½' - No Advance.
- Boring moved 6'.
- Drilled for 15 min. @ 6½' - NO ADVANCE.
- Two attempts indicated similar materials.

---

**END OF BORING @ 6'**

---

**ELEVATION ESTIMATED FROM GRADING PLAN**
GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)

Method for thin wall tube sampling of soils (Tentative)

Method for penetration test and split barrel sampling of soils (Tentative)

ASTM Designation: D 1452-63T

ASTM Designation: D 1587-63T

ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates

Amount of material finer than No. 200 sieve in aggregate

AASHO Designation: T 27-60

AASHO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils

Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.

Determining the plastic limit of soils

Calculating the plasticity index of soils

AASHO Designation: T 89-60

AASHO Designation: T 90-56

AASHO Designation: T 91-54

AASHO Designation: T 100-60

Specific Gravity

Specific gravity of soils

Modified as follows: 500 ML Pycnometer

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)

AASHO Designation: T 180-57

Compaction Test

Moisture-Density relations of soils using a 10# rammer and an 18" drop

Section VIII - TM 5-530

"Materials Testing" by Headquarters, Dept. of the Army

Unified Soil Classification

AASHO Designation: T 100-60

AASHO Designation: T 180-57

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation
LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The borings indicate the subsurface soil conditions encountered only at the drill holes where the borings were made. During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we would be advised immediately to review or reconsider our recommendations in light of the new developments. The owner, architect, or engineer should make certain that the recommendations are incorporated into the plans and are properly carried out during construction.