FOR REFERENCE

not to be taken from this room

PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING
SOIL EXPLORATION REPORT

KILAUEA AVENUE, HONOLULU, HAWAII
TAX MAP KEY: 3-5-17: 35 to 39

To:
MR. JAMES TSUGANA

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

DECEMBER 18, 1970

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex, 650 S. King Street
Honolulu, Hawaii 96813
January 21, 1971

MR. JANES TSUGAWA
Penthouse 1232 Waimanu Street
Honolulu, Hawaii  96814

Dear Mr. Tsugawa:

Subject: Addendum to Soil Exploration Report
Dated December 18, 1970
Proposed 50-Unit Condominium Apartment Building
Kilauea Avenue, Honolulu, Oahu, Hawaii
Tax Map Key: 3-5-17: 35 to 39

Since our soil exploration report of December 18, 1970, the site plan
has been further developed.

This letter should serve as an addendum to our soil report and includes
our comments regarding the latest grading plan.

Because lava rock will probably occur near the present ground surface
for more than a third of the site, some blasting will probably be
required for the foundation excavation. The excavation and blasting
should be done with care because of the close proximity of the existing
apartment buildings and swimming pool. The consulting architect and
engineers should be included in the contractor's general liability
insurance to save the consultants harmless in case a claim should arise
from his construction or blasting activities.

Regarding cut slopes in rock behind the proposed structure, the rock
slopes may be cut at slope ratios of 3/4 horizontal to 1 vertical.
In cases where only boulders and clay deposits are found, the boulders
and clay slopes may have to be adjusted out in the field.

Footing foundations should bear on the bedrock where practicable. In
some instances, the clay and cinder pockets may be relatively deep.
In these cases, adjustments in footing depths should be made out in the
field as these conditions are encountered.

Adobe soils under floor slabs and beams should be removed or kept at
least 2 ft below the bottoms of the concrete floor slabs or grade beams.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike
Professional Engineer
Hawaii No. 1450
December 18, 1970

MR. JAMES TSUGAWA
Penthouse 1232 Waimanu Street
Honolulu, Hawaii 96814

Dear Mr. Tsugawa:

Subject: Proposed 50-Unit Condominium Apartment Building Soil Exploration Report
(for foundation design purposes)
Kilauea Avenue, Honolulu, Oahu, Hawaii
Tax Map Key: 3-5-17: 35 to 39

Transmitted herewith is our soil exploration report for foundation design purposes for the proposed 50-Unit Condominium Apartment Building on Kilauea Avenue, Honolulu, Oahu, Hawaii.

The soil conditions at the site may be generally described as surface soils of brown clay and boulders underlain by lava rock and clinker. The rock profile under the building varies. The clay cover also varies from little to 4 ft or more.

Spread footing foundations extending below the surface clays are recommended.

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
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PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING
SOIL EXPLORATION REPORT

KILAUENA AVENUE, HONOLULU, HAWAII
TAX MAP KEY: 3-5-17: 35 to 39

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for foundation design for the proposed 4-story, 50-Unit Condominium Apartment Building on Kilauea Avenue, Honolulu, Oahu, Hawaii.

This report includes field exploration, laboratory tests and general recommendations for building foundation design.

FIELD EXPLORATION AND LABORATORY TESTS

Five exploratory borings were made at the site at the locations shown on the Boring Location Plan.

Borings were made with 3-in. diameter augers using drag bits and rotary coring using carbide and diamond bits. Soil samples were recovered with a 2-in. o.d. standard split spoon sampler driven with a 140-lb hammer falling 30 inches. Rock samples were recovered with "AX", "BX" and "NX" core barrels.

In addition, three 14-in. diameter auger holes (Boring Nos. 6, 7 & 8) were made along the northern section of the proposed parking area and driveway.

Laboratory tests included: natural water content and Atterberg limit tests.
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 in the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The site of the proposed apartment building is located about 400 ft west of Kilauea Avenue and north of Waialae Garden Apartments.

The site is a rocky hillside sloping down to the southeast at about a 5 to 50% gradient.

Lava rock is exposed in a cut slope below the southeast corner of the site.

The borings are generally located on a berm about 10 to 20 ft wide extending along the side of the hill. Ground cover consisted of grass, kiawe and haole koa. An overhead power line runs nearly parallel to the proposed building on the uphill portion of the proposed building site.

INTERPRETATION OF SOIL CONDITIONS

From the field explorations, the soils at the site may be generally described as follows:

A surface layer of about 1 to 4 ft or more of brown clay and boulders underlain by lava rock with clinker pockets and vent spaces to about 31 ft, the maximum depth drilled in Boring No. 3A.
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

The building site is located along the lower slope of a lava flow.

The proposed plan is to construct a 4-story apartment building with a basement about 280 ft by 30 ft in plan, and a paved parking area.

The makai portion of the building will be about elevation 126 ft for the first floor without a basement. The mauka portion will be about elevation 118 ft for the first floor and 109 ft for the basement floor.

The rock profile under the building will vary considerably.

For foundation purposes, the ideal design would be to rest all of the footings on solid rock. This may not always be practicable. Some differential settlements may arise when the underlying formation consists partly of rock and partly of unconsolidated materials.

Adobe surface soils on a hillside will cause considerable trouble to structures constructed on these soils. If practicable, the 1 to 4 ft or more of adobe should be stripped before placing any fill over these soils.
RECOMMENDATIONS

General Site Grading
Clearing and grubbing are essential. Surface layers of adobe soils should be stripped from the sidehill areas.

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.

Fill material may be approved on-site or borrow soils. If practicable, fill material imported to the site should be select soils with a plasticity index generally less than 22.

The on-site adobe may be mixed with the rock from the excavation provided that the adobe is generally less than 15% of the rock-soil mixture.

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

For low cuts thru mixtures of decomposed rock and clinkers, slope ratios of 1 horizontal to 1 vertical or flatter may be used.
If slope heights of greater than 15 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft in both cuts and fills.

If rock fall from the existing slope above the site is considered a problem, an 8 to 10-ft wide ditch for a rock fallout zone may be constructed at the top of the proposed cut slopes. A rock wall should be constructed on the downhill side of the ditch. The base of the rock wall should extend down to bedrock.

For protection against erosion of fill slopes, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

In general, slope planting is recommended on fill slopes to minimize erosion.

**Building Foundations**

In general, spread footing foundations are recommended.

For footings on cinders and decomposed rock, bearing values of 4000 p.s.f. may be used.

For footings on rock, bearing values of 8000 p.s.f. may be used.
If voids are suspected under a footing, a drill hole should be made to a depth of about 6 ft. The drill hole should then be grouted with sand-cement grout. Similarly, if clinker pockets are suspected to be loose and of great depth, drill holes should be made under each footing and grouted with neat cement grout.

**Stiff Grade Beams**

Stiff grade beams between columns are desirable to minimize differential settlements between columns. A stiff grade beam around the perimeter of the building is recommended.

To minimize the effects of cracks because of differential settlements, expansion joints should be provided between abrupt changes in structural configurations, and between joints of retaining walls.

**Slabs on Ground**

Slabs on ground should be placed after the superstructure is constructed and should be separated from grade beams, walls and columns.

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

Retaining walls at the site should be constructed with bases that extend to bedrock.

Select materials should be used for constructing fills behind retaining walls.

Lateral earth pressures equivalent to at-rest conditions or equivalent fluid pressures of 40 p.c.f. may be used. Allowances should be made for lateral pressures generated by vehicular traffic.

Backfill behind retaining walls should be done with small compaction equipment.

Driveways and Parking Areas

In general, the pavement thickness in the proposed driveways and parking areas may be as follows:

2. Base course - 6-in. base course.
3. Subbase - 12-in. select material CBR > 25, over a prepared subgrade.

A leveling course of only about 2 in. in lieu of a 6-in. base course may be required on lava outcrop subgrade.

Subgrades should be compacted and shaped to drain. Outlets should be provided at low points of the paved areas to avoid water pocketing at the subgrade level. Where catch basins are placed in low areas, weep holes should be placed at subgrade levels through the walls of the 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.
BOARING 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**

**PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING**

**LOCATION** Kamehameha Avenue, Honolulu, Hawaii

**Tax Map Key:** 3-5-17: 35 to 39

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

**SAMPLER:**
- 2.5" - 3" STANDARD SPLIT SPOON
- "AX" - AX CORE BARREL

---

**Penetration Data**

<table>
<thead>
<tr>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, clay w/ lava rock</td>
</tr>
<tr>
<td>Mottled lavender &amp; gray lava rock</td>
</tr>
<tr>
<td>Note: Some loss of water at 4.0'</td>
</tr>
</tbody>
</table>

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**Water Level**

- **Elev.:** 120' 

**Field Party**

- **Glory, Kaku**

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**Date:** Dec. 23, 1970

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**Standard Penetration Test (SPT)**

- N (Blows per foot): 30/1

---

**Elevation Estimated from Contour Plan**
<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Undrained Compressibility P.S.F.</th>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CH)</td>
<td>BROWN, CLAY</td>
<td>0</td>
<td>2-A</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>40/3</td>
</tr>
<tr>
<td></td>
<td>w/ROCKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HAMMER BOUNCES</td>
</tr>
<tr>
<td></td>
<td>DENSE, NOTTED BROWN, SILTY SAND &amp; DEC. ROCK</td>
<td>5</td>
<td>2-B</td>
<td>NO RECOVERY</td>
<td></td>
<td></td>
<td></td>
<td>35/1</td>
</tr>
<tr>
<td></td>
<td>MOTTLED, REDDISH-BROWN SILTY SAND w/CLAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HAMMER BOUNCES</td>
</tr>
<tr>
<td></td>
<td>BROWN, SILTY CLAY w/trace of sand &amp; cobbles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>2-C</td>
<td>CORED</td>
<td>8.0</td>
<td>RECOV. 4.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LAVA ROCK w/ LAMINATED VENT SPACINGS</td>
<td></td>
<td></td>
<td></td>
<td>CORED</td>
<td>8.0</td>
<td>RECOV. 3.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>2-D</td>
<td>CORED</td>
<td>8.0</td>
<td>RECOV. 4.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>2-E</td>
<td>CORED</td>
<td>2.5</td>
<td>RECOV. 2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-F</td>
<td>CORED</td>
<td>8.0</td>
<td>RECOV. 3.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>END OF CORING 28.5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ELEV = 118'7"**

**NOTE:** Loss of water at 9.5

**A B ELEVATION ESTIMATED FROM CONTOUR PLAN**
### Boring Log

**PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING**

**LOCATION** Kilauea Avenue, Honolulu, Hawaii

**Tax Map Key:** 3-5-17: 35 to 39

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driller</td>
<td>WALTER LUM ASSOC</td>
</tr>
<tr>
<td>Date</td>
<td>DEC. 8, 1970</td>
</tr>
<tr>
<td>Field Party</td>
<td>GLORY, KAKU</td>
</tr>
</tbody>
</table>

**Type of Boring** AUGER (CONCRETE)

**Diam.** 2 1/2"  
**Elev.** 112.5' A

**Hammer:** Weight 140 lbs |

**Drop** 30" |

**Sampler:** 2" STANDARD SPLIT SPOON

---

**Penetration Data**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Unconf. Comp. P.S.</th>
<th>Vane Shear P.S.</th>
<th>N (Blows per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>BROWN, CLAY w/Cobbles</td>
<td>0</td>
<td></td>
<td>3.4</td>
<td>25</td>
<td>33</td>
<td>47</td>
<td>-</td>
<td>-</td>
<td>0 10 20 30 40</td>
</tr>
<tr>
<td></td>
<td>Traces of Gravel</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boulder or Rock</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>End of Boring @ 5'</td>
<td>5</td>
<td></td>
<td>3.8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: Moved Boring 1' away.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Elevation Estimated from Contour Plan*
Boring Log

**PROJECT**: PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING

**LOCATION**: Kilauea Avenue, Honolulu, Hawaii

**Tax Map Key**: 3-5-17: 35 to 39

**HAMMER**: NX CORE BARREL

<table>
<thead>
<tr>
<th>Unconfined Soil Classification</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Unconf. Comp. P.S.F.</th>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CH)</td>
<td>BROWN, CLAY W/ COBBLES &amp; GRAVEL</td>
<td>0</td>
<td>3A-A</td>
<td>CORED - 5.0'</td>
<td>RECOV. - 4.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LAVA ROCK W/ FRACTURES &amp; VENT SPACINGS</td>
<td>5</td>
<td>3A-B</td>
<td>CORED - 5.0'</td>
<td>RECOV. - 4.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: LOSS OF WATER AT 6'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: WATER RETURNED AT 0.5'</td>
<td>10</td>
<td>3A-C</td>
<td>CORED - 6.0</td>
<td>RECOV. - 4.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: LOSS OF WATER AT 14'</td>
<td>15</td>
<td>3A-D</td>
<td>CORED - 5.0'</td>
<td>RECOV. - 2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOTTLED LAVENDER W/ TAN, LAVA ROCK W/ VENT SPACINGS</td>
<td>20</td>
<td>3A-E</td>
<td>CORED - 5.0'</td>
<td>RECOV. - 2.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>END OF CORING @ 31'</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* ELEVATION ESTIMATED FROM CONTOUR PLAN

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**BORING NO.** 3A  **Driller** WALTER LUM ASSOCIATES  **Date** DEC. 8 (9, 1970

**FIELD PARTY** GLORY KAKU  **Drill Bit** T.C. CORING  **Datum** 112' *

**Type of Boring** ROTARY (CORE)  **Dia** 2 3/8"

**Eve** 112' *  **Weight**  **Drop**

**Water Level**  **Time**

**Date** 12-0-70

---

**PENETRATION DATA**

<table>
<thead>
<tr>
<th>Standard Penetration Test</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Blows per foot)</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>
## Boring Log

**PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING**

**LOCATION** Kilauea Avenue, Honolulu, Hawaii

**Tax Map Key:** 3-5-17: 35 to 39

### Driller
- **Name:** GLORY KAKU
- **Date:** DEC. 10 / 11, 1970

### Tax Map Key
- **ELEV.:** 107.64 ft

### Soil Classification

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Content</th>
<th>Liquid Limit</th>
<th>Unconfined Compress.</th>
<th>Vane Shear P.S.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.45</td>
<td>4-A</td>
<td>36</td>
<td>28</td>
<td>-</td>
<td>-</td>
<td>6.5</td>
<td>21/3</td>
</tr>
<tr>
<td>5.0</td>
<td>4-B</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>4-C</td>
<td>18</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>15.0</td>
<td>4-D</td>
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<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>4-E</td>
<td>CORED-RECOV.</td>
<td>1.5</td>
<td>1.0</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.5</td>
<td>4-F</td>
<td>CORED-RECOV.</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.5</td>
<td>4-G</td>
<td>CORED-RECOV.</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AX CORE BARREL**

**AX CORE BARREL**

**END OF BORING @ 28.5**

### Notes
- **ELEVATION ESTIMATED FROM CONTOUR PLAN**

---

**BORING NO.:** 4

**Type of Boring:** ROTARY (AS JK) Diam. 9"
# Boring Log

**Project:** Proposed 50-Unit Condominium Apartment Building  
**Location:** Kilauea Avenue, Honolulu, Hawaii  
**Tax Map Key:** 3-5-17: 35 to 39

## Boring Log Details
- **Hammer:**
  - Weight: 140 lb
  - Drop: 30 in
- **Sampler:**
  - Standard Drill Bit
  - Split Spoon: "dx" - bx core barrel  
  - Ax - Ax core barrel

## PENETRATION DATA

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Content</th>
<th>Liquid Limit</th>
<th>Unconfined Comp. (psi)</th>
<th>Vein Shear Fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'95</td>
<td>S-A</td>
<td>2.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2'95</td>
<td>S-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2'95</td>
<td>S-C</td>
<td></td>
<td></td>
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<tr>
<td>2'95</td>
<td>S-D</td>
<td>2.6</td>
<td></td>
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</tr>
<tr>
<td>2'95</td>
<td>S-E</td>
<td>2.4</td>
<td></td>
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</tr>
<tr>
<td>2'95</td>
<td>S-F</td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Elevation Estimated from Contour Plan**

---

*Standard Penetration Test (SPT)*  
- Elevation: 102'4"  
- 50 blow hammer bounces

---

**Location Details:**  
- Kilauea Avenue, Honolulu, Hawaii
  - Tax Map Key: 3-5-17: 35 to 39

---

**Notes:**  
- Elevation estimated from contour plan
# Boring Log

**PROPOSED 50-UNIT CONDOMINIUM APARTMENT BUILDING**

**LOCATION**
Kilauea Avenue, Honolulu, Hawaii

**Tax Map Key:** 3-5-17: 35 to 39

---

**HAMMER:**

- **Weight:**
- **Drop:**

**SAMPLER:**

---

## PENETRATION DATA

<table>
<thead>
<tr>
<th>Unified Soil Classification</th>
<th>Depth (ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Unified Comp.</th>
<th>Vane Shear</th>
<th>N (Blows per foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORING NO. 0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROWN, CLAY &amp; COBBLES</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRAY, SILTY SAND (DECOMPOSED ROCK) W/ COBBLES &amp; BOULDERS</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>END OF BORING &amp; 6.0'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| BORING NO. 1              | 0.0        |         |            |               |              |               |            |                  |
| BROWN, CLAY & SAND        | 2.0        |         |            |               |              |               |            |                  |
| LAVA ROCK OR BOULDER      | 3.0        |         |            |               |              |               |            |                  |
| END OF BORING & 3.0'       |            |         |            |               |              |               |            |                  |

| BORING NO. 2              | 0.0        |         |            |               |              |               |            |                  |
| BROWN, CLAY & SOME SAND   | 3.0        |         |            |               |              |               |            |                  |
| LAVA ROCK OR BOULDER      | 4.0        |         |            |               |              |               |            |                  |
| END OF BORING & 4.0'       |            |         |            |               |              |               |            |                  |

**ELEVATION ESTIMATED FROM CONTOUR PLAN**
## Table 1A - Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>2</th>
<th>4 (TOP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE NO.</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>DEPTH BELOW SURFACE</td>
<td>0.5'-2'</td>
<td>0.5'-2'</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>BROWN CLAY W/COCOBLES &amp; GRANULE</td>
<td>DARK BROWN CLAY W/TRACE OF ROOTS</td>
</tr>
</tbody>
</table>

### Grain-Size Analysis (% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>1&quot;</th>
<th>1/2&quot;</th>
<th>#4</th>
<th>#10</th>
<th>#20</th>
<th>#40</th>
<th>#100</th>
<th>#200</th>
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</thead>
<tbody>
<tr>
<td>% Passing</td>
<td></td>
<td></td>
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</tbody>
</table>

### Atterberg Limits

<table>
<thead>
<tr>
<th></th>
<th>Air Dried or Natural</th>
<th>Natural</th>
<th>Natural</th>
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</thead>
<tbody>
<tr>
<td>Liquid Limit</td>
<td>67</td>
<td>67</td>
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</tr>
<tr>
<td>Plastic Limit</td>
<td>25</td>
<td>25</td>
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</tr>
<tr>
<td>Plasticity Index</td>
<td>42</td>
<td>51</td>
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<tr>
<td>Dilatancy</td>
<td>NONE</td>
<td>NONE-SLOW</td>
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</tr>
<tr>
<td>Toughness</td>
<td>HIGH</td>
<td>MED-HIGH</td>
<td></td>
</tr>
<tr>
<td>Dry Strength</td>
<td>HIGH</td>
<td>HIGH</td>
<td></td>
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</tbody>
</table>

### Unified Soil Classification

<table>
<thead>
<tr>
<th></th>
<th>CH</th>
<th>CH</th>
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</thead>
<tbody>
<tr>
<td>Apparent Specific Gravity</td>
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</table>

### Expansion and CBR Tests

<table>
<thead>
<tr>
<th></th>
<th>(Surcharge-51 P.S.F.)</th>
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</thead>
<tbody>
<tr>
<td>Molding Moisture, %</td>
<td></td>
</tr>
<tr>
<td>Molding Dry Density, P.C.F.</td>
<td></td>
</tr>
<tr>
<td>Swell upon saturation, %</td>
<td></td>
</tr>
<tr>
<td>CBR at 0.1&quot; Penetration</td>
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</table>

### Moisture-Density Relations of Soils

<table>
<thead>
<tr>
<th></th>
<th>(AASHO T-180-57 Method)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry to Wet or Wet to Dry</td>
<td></td>
</tr>
<tr>
<td>Max. Dry Density (P.C.F.)</td>
<td></td>
</tr>
<tr>
<td>Optimum Moisture (%)</td>
<td></td>
</tr>
</tbody>
</table>

### Remarks:

**Date:** 12-15-70  **By:** D.T.
PLASTICITY CHART

PROJECT: PROPOSED 50-UNIT CONDOMINIUM

LOCATION: WAILAIAE, HONOLULU, OAHU, HAWAII

DATE 12-15-70 BY B.T.
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.