To: COMMUNITY PLANNING, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
APRIL 5, 1973
COMMUNITY PLANNING, INC.
700 Bishop Street, Suite 608
Honolulu, Hawaii 96813

Gentlemen:

Subject: Maili Offsite Water Main
Along Kaukama Road
Soil Exploration Report
(for water main foundation
design purposes)
Maili, Ewa, Oahu, Hawaii

In accordance with your request, seven borings were made to get an
indication of general subsoil conditions along the proposed route of
the water main along Kaukama Road in Maili. Four boring logs from a
previous report, "Maili Access Road," dated February 20, 1973, are
attached.

The water main is generally planned parallel to the proposed Kaukama
Road extension for a distance of about 1,500 ft, then along the existing
Kaukama Road for a distance of about 3,700 ft and will end at the
intersection of Kaukama Road and Paakea Road.

INTERPRETATION OF SOIL CONDITIONS

From the borings and laboratory test results, the soils encountered in
the borings may be approximated as follows:

A surface layer about 1 to 5 ft of stiff clay and silty
clay (CH and CL soils) underlain with medium to dense
silty or clayey sand and coral (SM and SC soils) to
about 12 to 16 ft, the depths drilled.

A pocket of stiff clayey material was noted in the
previous Boring Nos. 10 and 11 at 6 to 12-ft depths.

Water was not noted in the borings during the field exploration.
Variations to the above soil conditions are to be expected in localized areas. For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The project will involve about one mile of 12-in. water main.

The invert for the water main will vary from about 4 to 6 ft below the existing ground and will generally be above the ground water level.

The terrain is generally flat varying from about elevation 52 to 62 ft.

The southeastern 1/4 of the alignment crosses an undeveloped area overgrown with grass and brush. The rest of the alignment is along an A.C. paved road (Kaukama Road) and small farm lots.

In general, excavation for the water line trench will be mostly through dense or stiff soils or coral formation with invert elevations above the ground water level.

Bracing and shoring of the trench excavations will probably be minor except for safety requirements and unless soft spots are encountered in localized areas.

Soft or loose pockets at the bottom of trenches should be removed and replaced with select on-site soil or well-graded granular borrow material.

Clay (CH) soils encountered at the bottom of trench excavations should be over-excavated about 2 ft and replaced with fairly well-graded select material such as on-site coral or sand.

The bottom of the trench should be shaped to drain and drained into storm drains or manholes whenever practicable, particularly when the trench is in clay soils and the pipe is laid parallel to the contours at the surface.

Crushed rock cradle or concrete cradle may be used for the pipe bedding.
The backfill around the pipe should be granular material such as on-site sand or coral. The backfill should be compacted with mechanical tampers in 6-in. level layers to the top of the pipe.

Unforeseen Conditions

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

Attached are a Boring Location Sketch, the boring logs, laboratory test results and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By

Ezra Koike

JWS/EK:rmf
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.
**Boring Log**

**MAILI OFFSITE WATER MAIN**

**PROJECT**
ALONG KAU KAMA ROAD

**LOCATION**
Maili, Ewa, Oahu, Hawaii

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

**SAMPLER:**
2" STANDARD SPLIT SPOON

---

**TABULAR DATA**

<table>
<thead>
<tr>
<th>Depth (Ft.)</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Undrained Comp.</th>
<th>Vane Shear P.S.E.</th>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>12A</td>
<td>27</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>12B</td>
<td>17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>12</td>
<td>12C</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5%</td>
</tr>
<tr>
<td>15</td>
<td>12D</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4%</td>
</tr>
</tbody>
</table>

**END OF BORING 216.5'**
Boring Log

MAILI OFFSITE WATER MAIN

PROJECT: ALONG KAUKAMA ROAD

LOCATION: Maili, Ewa, Oahu, Hawaii

HAMMER:
- Weight: 140 lbs
- Drop: 30" 

SAMPLER: 2" STANDARD SPLIT SPOON

<table>
<thead>
<tr>
<th>Unit 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.</th>
<th>Vane Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>2&quot; A.C. PAVEMENT</td>
<td>0</td>
<td>A</td>
<td>13-A</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>STIFF, BROWN</td>
<td>5</td>
<td>B</td>
<td>13-B</td>
<td>27</td>
<td>25</td>
<td>73</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>CLAY W/SOME CORAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DENSE, TAN BROWN</td>
<td>10</td>
<td>C</td>
<td>13-C</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SILTY SAND W/ CORAL FRAGMENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>MEDIUM DENSITY, TAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SILTY SAND W/ CORAL</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 @ 19.5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Water Level: NOT NOTICED

Date: 3-8-75

---

BORING NO. 13

Type of Boring: AUGER (MOBILE)

Elev. Datum: 0

Driller: W. LUM ASSOC., INC.

Date: MAR. 8, 1973

Field Party: MEYER, OSHIRO, KAU

Diam.: 4"
Boring Log

MAILI OFFSITE WATER MAIN

PROJECT ALONG KAUKAMA ROAD

LOCATION Maili, Eva, Oahu, Hawaii

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

SAMPLER: 2" STANDARD SPLIT SPOON

Penetration Data

Standard Penetration Test

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Plastic Limit %</th>
<th>Liquid Limit %</th>
<th>Unconf. Comp.</th>
<th>P.S.F.</th>
<th>Vane Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-A</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>45</td>
</tr>
<tr>
<td>14-B</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>76</td>
</tr>
<tr>
<td>14-C</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>14-D</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

E. CONS. G. C.

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.

14-14-14-14-14

D. CONS. E.
**Boring Log**

**M I A L I  O F F S I T E W AT E R M A I N ALONG K AU K AMA R O A D**

**LOCATION** Mailli, Ewa, Oahu, Hawaii

**HAMMER:**
- **Weight:** 140 lbs.
- **Drop:** 30".

**SAMPLER:** 2" STANDARD SPLIT SPOON

---

**Unified Soil Classification**

<table>
<thead>
<tr>
<th>Description</th>
<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. P.S.F.</th>
<th>Vineyard Penetr. Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 A.C. PAVEMENT HARD, REDDISH BROWN SILT CLAY W/ CORAL (FILL)</td>
<td>5</td>
<td>15-A</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DENSE, TAN, WHITE SILTY SAND &amp; CORAL FRAGMENTS</td>
<td>10</td>
<td>15-B</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>END OF BORING 8.15.5&quot;</td>
<td>15-C</td>
<td>15-C</td>
<td>11</td>
<td>15-D</td>
<td>10</td>
<td>15-E</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

---

**Standard Penetration Test**

- N (Blows per foot)
  - 0 10 20 30 40

---

**PENETRATION DATA**

- **Standard Penetration Test**
  - 2% 4' 45
  - 8/4' .5' 20/0.5' 50/0.4' 79
**Boring Log**

**MAILI OFFSITE WATER MAIN**

**PROJECT**
ALONG KAUKAMA ROAD

**LOCATION**
Maili, Ewa, Oahu, Hawaii

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

**SAMPLE:**
- 2" STANDARD SPLIT SPOON

---

**UNIFIED CLASSIFICATION**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16-A</td>
<td>26</td>
<td>15</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>16-B</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>16-C</td>
<td>12</td>
<td>49</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16-D</td>
<td>12</td>
<td>49</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**DESCRIPTION**
- 2" A.C. PAVEMENT
- STIFF, REDDISH BROWN SILTY CLAY
- W/CORAL FRAGMENTS (FILL)
- DENSE, TAN WHITE CLAYEY SAND
- W/CORAL FRAGMENTS
- DENSE, BROWN CLAYEY SAND
- W/CORAL FRAGMENTS
- END OF BORING @ 15.5'

**PENETRATION DATA**

<table>
<thead>
<tr>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (Blows per foot)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>54</td>
</tr>
</tbody>
</table>

**Boring No. 16**

**Date:** MAR. 7, 1973

Driller: W. LUM ASSOC., INC.
Field Party: MEYER, OSHIRO, KAU
**Boring Log**

**MAILI OFFSITE WATER MAIN**

**PROJECT**   ALONG KAU KAMA ROAD

**LOCATION** Maili, Ewa, Oahu, Hawaii

**HAMMER:**
- Weight: 40 #
- Drop: 30"

**SAMPLER:** 2" STANDARD SPLIT SPOON

**LOCATION**

<table>
<thead>
<tr>
<th>Unified Classification</th>
<th>Description</th>
<th>Depth (ft)</th>
<th>Sampler</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HARD, BROWN CLAY W/ CORAL FRAGMENTS</td>
<td>0</td>
<td>11-A</td>
</tr>
<tr>
<td></td>
<td>DENSE, WHITE CLAYY SAND W/ CORAL FRAGMENTS</td>
<td>5</td>
<td>11-B</td>
</tr>
<tr>
<td></td>
<td>END OF BORING@ 12.5'</td>
<td>10</td>
<td>11-C</td>
</tr>
</tbody>
</table>

**PENETRATION DATA**

<table>
<thead>
<tr>
<th>N (Blows per foot)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-B</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-C</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-D</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-E</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BORING NO.** 17

**Sheet No.** of

**Driller** W. LUM ASSOC., INC.
**Date** MAR. 1, 1975

**Field Party** METER, OSHIRO, KAU

**Type of Boring** AUGER (MOBILE)
**Diam.** 4"
**Boring Log**

**MAILI OFFSITE WATER MAIN**

**PROJECT**

ALONG KAUKAMA ROAD

**LOCATION**

MAILI, EWA, OAHU, HAWAII

---

**HAMMER:**

Weight: 140 lbs

Drop: 30"

**SAMPLER:**

2" STANDARD SPLIT SPOON

---

**ELEVATION DATA**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Depth (Ft.)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>Unconf. Comp.</th>
<th>P.S.I.</th>
<th>Vane Shear</th>
<th>Standard Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM</td>
<td>2&quot; A.C. PAVEMENT TAN-WHITE SILTY SAND AND CORAL</td>
<td>0</td>
<td></td>
<td>18-A</td>
<td>11</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STIFF, RED: BROWN: SILTY CLAY W/ CORAL (FILL)</td>
<td>5</td>
<td>18-B</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DENSE, TAN-WHITE SILTY SAND W/ CORAL FRAGMENTS AND SOME CLAY</td>
<td>10</td>
<td>18-C</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>DENSE, TAN-WHITE SANDY CLAY W/ CORAL FRAGMENTS</td>
<td>15</td>
<td>18-D</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>345</td>
<td></td>
</tr>
</tbody>
</table>

**END OF BORING @ 15.2'**

---

**HALLMARKS**

1. **18**
2. **0**
3. **0**
4. **0**
5. **0**

---

**NOTES**

- FINGER TYPE
- WATER LEVEL: NOTED
# Table IA - Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample No.</th>
<th>Depth Below Surface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SURFACE (3-4.5')</td>
<td>BROWN CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5'-6.5'</td>
<td>BROWN CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5'-2'</td>
<td>REDDISH TAN BROWN SILTY SAND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W/SOME W/SOME W/SOME</td>
<td>W/SOME CLAY W/SOME CLAY W/SOME CORAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAND &amp; CORAL</td>
<td>W/SOME CORAL &amp; SOME CLAY W/SOME CORAL</td>
</tr>
</tbody>
</table>

## Grain-Size Analysis (% Passing)

<table>
<thead>
<tr>
<th>Sieve</th>
<th>13</th>
<th>13</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Atterberg Limits

<table>
<thead>
<tr>
<th>Condition</th>
<th>Natural</th>
<th>Natural</th>
<th>Natural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Dried or Natural</td>
<td>54</td>
<td>73</td>
<td>49</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>27</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>Plastic Limit</td>
<td>27</td>
<td>46</td>
<td>23</td>
</tr>
</tbody>
</table>

## Uncompacted Moisture-Density Relations

<table>
<thead>
<tr>
<th>Condition</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry to Wet or Wet to Dry</td>
<td>102.3</td>
<td>24.0</td>
<td></td>
</tr>
</tbody>
</table>

## Remarks:

Date 4-2-13  By PGT
<table>
<thead>
<tr>
<th>BORING NO.</th>
<th>SAMPLE NO.</th>
<th>DEPTH BELOW SURFACE</th>
<th>DESCRIPTION</th>
<th>GRAIN-SIZE ANALYSIS (% Passing)</th>
<th>ATTERBERG LIMITS</th>
<th>UNIFIED SOIL CLASSIFICATION</th>
<th>APPARENT SPECIFIC GRAVITY</th>
<th>EXPANSION AND CBR TESTS</th>
<th>MOISTURE-DENSITY RELATIONS OF SOILS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>15'-15.5'</td>
<td>SURFACE</td>
<td>BROWN CLAYY SAND WICORAL FRAGS</td>
<td>1&quot; 1/2&quot; #4 #10 #20 #40 #100 #200</td>
<td>NATURAL*</td>
<td>CH (SC)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>10'-11.5'</td>
<td>SURFACE</td>
<td>BROWN SANDY CLAY WICORAL FRAGS</td>
<td>100 93.0 82.0 74.5 67.0 59.1 57.2</td>
<td>NATURAL</td>
<td>CL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**
* SAMPLE TESTED ONLY ON THAT PORTION THAT PASSES THE #40 SIEVE.
** UNIFIED SOILS CLASSIFICATION IN PARENTHESES BASED ON VISUAL IDENTIFICATION OF TOTAL SAMPLE.

Date: 4-2-75

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

PROJECT: MAILI OFF-SITE WATER MAIN

LOCATION: MAILI, OAHU, HAWAII

SAMPLE NO.: 19 SURFACE

SAMPLE DESCRIPTION: BROWN CLAY W/ SOME SAND & CORAL

AGGREGATE: 1/4" MINUS

MOLD SIZE: 4" Ø 4.53" HIGH

HAMMER: 10 LBS. 18" DROP

LAYERS: 5

BLOWS: 25/LAYER

MAXIMUM DRY DENSITY: 102.3 P.C.F.

OPTIMUM MOISTURE CONTENT: 24.06%
MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

PROJECT: MAILI OFF-SITE WATER MAIN
LOCATION: MAILI, OAHU, HAWAII
SAMPLE NO.: 1 T-SURFACE
SAMPLE DESCRIPTION: BROWN SANDY CLAY

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" X 4.584" HIGH
HAMMER: 10LBS 16" DROP
LAYERS: 5
BLOWS: 25/LAYER

MAXIMUM DRY DENSITY - 107.7 P.C.F.
OPTIMUM MOISTURE CONTENT - 9.2%
CBR TEST
PROJECT: MAILI OFF-SITE WATER MAIN
LOCATION: MAILI, OAHU, HAWAII
SAMPLE NO: 13 SURFACE
SAMPLE DESCRIPTION: BROWN CLAY W/SOME SAND & CORAL

TEST RESULTS:
MOLDING MOISTURE, %: 26.1
MOLDING DRY DENSITY, P.C.F: 99.5
CBR @ 0.1" PENETRATION

DATE 3-10-73 BY N1
DATE 3-19-73 BY JS
LOGS OF BORINGS

FROM

"MAILI ACCESS ROAD – FARRINGTON HIGHWAY TO BELT ROAD"

REPORT DATED FEBRUARY 20, 1973
**Boring Log**

**PROJECT**: MAILI ACCESS ROAD

**LOCATION**: Farrington Highway to Belt Road

**MAILI, Waianae, Oahu, Hawaii**

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

**SAMPLER**: 2" STANDARD SPLIT SPOON

---

**LOCATION**: Farrington Highway to Belt Road

**FARRINGTON HIGHWAY**

**FIELD PARTY**:
- **Driller**: W. LUM ASSOC, INC.
- **Date**: JAN. 9, 1973
- **Field Party**: MEYER, KAPOVICH, TAGUCHI

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

**Diam.**: 58" +

**Datum**: 58 + *

**Drill Bit**: FINGER TYPE

**Elev.**: 58 + *

**Date**: 1-9-73

---

### PENETRATION DATA

**Sample No.** | **Depth (ft.)** | **Wet Dens.** | **Water Cont.** | **Dry Dens.** | **Unconf. Cons.** | **Vane Shear** | **NG** | **Hammer Bounces** | **Hammer Bounces**
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
B-A | 0 | 15 | - | - | - | - | 45/5.5 | 25/5.5 | HAMMER BOUNCES
B-B | 0 | 11 | - | - | - | - | 20/5.5 | - | HAMMER BOUNCES
B-C | 0 | 31 | - | - | - | - | 5/5.5 | - | -
B-D | 1 | 11 | - | - | - | - | - | - | -

---

**UNIFIED SOIL CLASSIFICATION**

- **ELEV. = 58.7**

**CH**
- MEDIUM, BROWN, CLAY
- W/ SAND & CORAL

**GM**
- DENSE, WHITE
- SILTY SAND & CORAL

**GM**
- DENSE, TAN
- SILTY SAND W/ CORAL

**TAN W/ BROWN
SI LTY SAND W/ DECOMPOSED ROCK W/ TRACES OF WHITE CORAL & SOME CLAY

**END OF BORING @ 15.5**

---

*ELEVATION ESTIMATED FROM CONTOUR MAP BY COMMUNITY PLANNING, INC.*
**Boring Log**

**PROJECT**  
MAILI ACCESS ROAD

**LOCATION**  
Farrington Highway to Belt Road  
Maili, Waianae, Oahu, Hawaii

**HAMMER:**  140#

**Weight**  
140#

**Drop**  
30"

**ELEV.**  
G1 ± Z

**Type of Boring**  
AUGER (MOBILE)

**Diam.**  
4"  
**Datum**  

**DATE**  
1-9-73

**FIELD PARTY**  
MEYER, RADOVICH, TAGUCHI

**PENETRATION DATA**

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Sampler</th>
<th>Wet Bulk P.C.F.</th>
<th>Water Cont. %</th>
<th>Dry Bulk P.C.F.</th>
<th>Unsoil Compress.</th>
<th>Vane Shear</th>
<th>P.S.F.</th>
<th>STD Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9-A</td>
<td>25</td>
<td>12</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>21/0.5</td>
</tr>
<tr>
<td>10</td>
<td>9-B</td>
<td>5</td>
<td>12</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50/0.5</td>
</tr>
<tr>
<td>11.5</td>
<td>9-C</td>
<td>5</td>
<td>12</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50/0.5</td>
</tr>
</tbody>
</table>

**DESCRIPTION**

- (CH) STIFF, DARK BROWN CLAY W/ROOTS
- DENSE, TAN SAND & CORAL
- WHITE CORAL FRAGMENTS
- MEDIUM DENSITY, TAN SILTY SAND W/ CORAL
- END OF BORING @ 11.5'

**ELEVATION ESTIMATED FROM CONTOUR MAP BY COMMUNITY PLANNING, INC.**
# Boring Log

**PROJECT**: MAILI ACCESS ROAD  
**LOCATION**: Farrington Highway to Belt Road  
**Hammertime**: Maili, Waianae, Oahu, Hawaii

**Hammer**:
- **Weight**: 140 lbs
- **Drop**: 30"

**Sampler**: 2" Standard Split Spoon

**Boring No.**: 10  
**Driller** W. LUM ASSOC., INC.  
**Date**: JAN. 9, 1973  
**Field Party**: MEYER, RADOVICH, TAGUCHI  
**Type of Boring**: AUGER (MOBILE)  
**Diam.**: 4"

**Elev.**: 52' 7"  
**Datum**:  
**Drill Bit**: FINGER TYPE  
**Water Level**: Noted  
**Time**:  
**Date**: 1-9-73

---

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Wet Density P.C.F</th>
<th>Water Cont. P.C.F</th>
<th>Dry Density P.C.F</th>
<th>Uncorr. Comp. P.C.F</th>
<th>Penetration Test</th>
<th>N (Blows per foot)</th>
</tr>
</thead>
</table>

- **(CH)** STIFF, BROWN CLAY W. ROOTS  
- **(GC)** STIFF, BROWN CLAY & WHITE CORAL (DECOMPOSED CORAL)  
- **MH** STIFF, GRAY & BROWN SILTY CLAY (DECOMPOSED ROCK)  
- **END OF BORING @ 11.5'**

**ELEVATION ESTIMATED FROM CONTOUR MAP BY COMMUNITY PLANNING, INC.**
### Boring Log

**PROJECT**
MAILI ACCESS ROAD

**LOCATION**
Farrington Highway to Belt Road  
Maili, Wai`anae, Oahu, Hawaii

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

**SAMPER:**
2" STANDARD SPLIT SPOON

---

**Penetration Data**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Wet Density</th>
<th>Dr. Density</th>
<th>Wet Cont.</th>
<th>Dr. Cont.</th>
<th>Unconf. Comp.</th>
<th>Vic. Shear</th>
<th>Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A</td>
<td>37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4/6.5'</td>
<td>19/6.5'</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20/6.5'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **ELEVATION ESTIMATED FROM CONTOUR MAP BY COMMUNITY PLANNING, INC.**

---

**Driller:** W. LUM ASSOC., INC.  
**Date:** JAN 9, 1973

**Field Party:** MEYER, RADOVICH, TAGUCHI

**Type of Boring:** AUGER (Mozilla)  
**Diam:** 4"

**Elev:** 56' + 0"  
**Datum:** FINGER TYPE

**Elev. Adjustment:**
- **Water Level:**
  - **Time:**
  - **Date:** 1/9/73

---

**Depth:**
- **(CH):** MEDIUM REDDISH BROWN CLAY W/SOME CORAL
- **(SM):** DENSE TAN & WHITE SILTY CORAL & SAND
- **(MH):** STIFF TAN & WHITE SILTY CLAY W/SAND & CORAL
- **(ML):** STIFF, LIGHT BROWN SANDY SILT (DECOMPOSING ROCK)

**End of Boring:** 11.5'
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.