PROPOSED ASSEMBLY BUILDING
KEAAHALA PLAYGROUND
SOIL EXPLORATION REPORT

KAHOWAA PLACE, KANEHOE, OAHU, HAWAII
TAX MAP KEY: 4-5-29: 26

To:
FURER & HEE, ASSOCIATED ARCHITECTS

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
AUGUST 11, 1975

MUNICIPAL REFERENCE & RECORDS CENTER
City & County of Honolulu
City Hall Annex I
August 11, 1975

FURER & HEE, ASSOCIATED ARCHITECTS
1909 Aleo Place
Honolulu, Hawaii 96822

Gentlemen:

Subject: Proposed Assembly Building
Keaahala Playground
Soil Exploration Report
(for foundation design purposes)
Kahowaa Place, Kaneohe, Oahu, Hawaii
Tax Map Key: 4-5-29: 26

Transmitted herewith is our soil exploration report for foundation design considerations for the Proposed Assembly Building at Keaahala Playground, Kahowaa Place, Kaneohe, Oahu, Hawaii.

For the proposed building, stiff continuous footing foundations are recommended.

If practicable, the proposed building should be relocated away from the existing cesspool that is located at the northeast corner of the building site.

This report includes a Boring Location Sketch, boring logs, laboratory test results, general foundation design recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Edward K. Watanabe

JWS/EKW:vl
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SCOPE OF EXPLORATION

The purpose of this exploration was to evaluate general soil conditions for foundation design considerations for the proposed Assembly Building at Keaahala Playground, Kahowaa Place, Kaneohe, Oahu, Hawaii.

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

FIELD EXPLORATION AND LABORATORY TESTS

Four borings were made at the site at the approximate locations shown on the Boring Location Sketch.

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

Laboratory tests included: natural water content and density, laboratory vane shear, unconfined compression, Atterberg limit, consolidation, ASTM D-1557-70 density and CBR.

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

GEOLOGIC AND SOIL DESCRIPTIONS BY OTHERS

From a review of geologic literature and the U.S. Soil Conservation Service maps of the area, the soils are generally described by others as follows:

Stearns and U.S. Geological Survey, "Geologic and Topographic Map of Island of Oahu," 1938:

Qhb - Honolulu volcanic series
Basalt flows


LoB - Lolekaa silty clay, 3 to 8% slopes
Unified Soil Classification - MH or ML-MH

GENERAL SITE CONDITIONS

The proposed building site is located in the northern portion of Keaahala Playground near the end of Kahowaa Place in Kaneohe.
An existing one-story concrete masonry building and an A.C. paved area are located on the northeast side of the site and along the boundary of the playground area.

A.C. paved volleyball and basketball courts are located at the east corner of the playground area.

A small swale crosses the southwest corner of the proposed building site and drains down towards the northwest (Kulauli Road entrance to the playground). Existing sewer, water and storm drain lines cross near the site. A cesspool about 8 to 10 ft in diameter and 27 ft or more deep is located at the north (near Boring No. 2) corner of the site.

The proposed building site is a fairly flat grassed lawn area with a slight gradient of about 1 to 2% down towards the north.

INTERPRETATION OF SOIL CONDITIONS

From the borings and laboratory test results, the soil conditions in the borings may be generally approximated as follows:

A surface layer about 14 to 18 ft of medium to stiff brown silty clay (MH soils) with clay (CH soils) pockets underlain by medium to stiff brown silty clay (MH soils) with some decomposed rock to about 25 to 30 ft, the depths drilled. Decomposed rock was noted near the bottoms of some of the borings.

Soft or medium soils were noted in Boring No. 3 at about 18 to 24-ft depths and in Boring No. 4 at about 5 to 8 and 13 to 18-ft depths.
Water was noted in Boring No. 3 at about 24-ft depth during the field explorations.

Variations to the above soil and water conditions are to be expected between borings and in localized areas. For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The proposed plan is to construct a one-story concrete and concrete masonry building about 65 ft by 80 ft in plan.

The existing volleyball court will be extended and used for a parking lot. The road from Kahowaa Place into the playground will also be widened.

Some fills are anticipated at the site.

Because of loose or soft pockets below the surface crust, settlements and differential settlements may occur when shallow fills and a one-story concrete structure are placed over the existing surface.

The preliminary plan shows the building will be located over a cesspool and possibly some underground utility lines. The backfill of underground utility trenches may be soft and cause some differential movement problems. If practicable, the building should be moved away from the cesspool location and the utilities relocated.
Site Grading

Because the site is relatively level, the building site should be raised by filling and graded to drain water away from the proposed structure.

The surface soils are relatively watertight with some water contents below the plastic limit. The surface soils may heave when wetted. To lessen the heaving effects, the silty-clayey surface soils should be scarified and recompacted on the wet side of optimum and not allowed to dry out prior to placing fills.

The filling of the site should be done as soon as practicable and prior to building construction to allow the soils to settle and adjust to the new loads.

Grading work should be done in general conformance with the Revised Ordinances of Honolulu, 1969 As Amended, and the following additional guidelines:

1. The area should be cleared and grubbed.

2. Pipes and other conduits may be encountered below the existing ground surface. The locations should be verified in the field prior to grading operations, If practicable, they should be removed and relocated and the excavations backfilled with fairly well-graded and well-compacted granular material.
3. Before filling, the site may be proofrolled to locate soft or loose pockets. Soft spots are anticipated near the underground utility line. These soft pockets should be removed and replaced with select material compacted in thin lifts.

4. Borrow soils for fill construction should generally be fairly well graded, less than 3-in. maximum sizes, and with plasticity index less than 20.

5. Fills should be constructed in approximately level layers. Fills should be laid in 6-in. compacted layers at 90% of maximum density on the wet side of optimum as determined by the ASTM D-1557-70 method.

Foundations

The boring logs indicated a surface crust about 14 to 18 ft with some loose or soft pockets. Because of underlying soft pockets, some settlements and differential settlements may be anticipated.

For the proposed one-story structure, stiff continuous beam type footings resting on the medium to stiff silty-clayey surface materials or on compacted fill may be considered to bridge over the soft or loose underlying layers and lessen the effects of differential settlements.
Footings near underground utilities should be designed to bridge over or straddle the lines or extend to the bottom of the trench, if practicable. Otherwise, the footings should be located below a 3 horizontal to 1 vertical imaginary plane drawn upward from the bottom of the utility trench.

At the northern corner of the building at the cesspool location, the footings should extend to the bottom of the cesspool. An alternate solution is to support this corner of the building on small diameter pipe piles.

Other guidelines for foundation design considerations are as follows:

1. Footings may be placed on the medium to stiff silty-clayey materials or on well-compacted fill.

   In general, the bottoms of footings should be kept about 2 ft below the finish grade except for footings next to trenches and cesspools.

2. Allowable bearing values of 2500 p.s.f. may be used for footings bearing on the medium to stiff silty-clayey materials or on compacted fills.
The footing pressure on the underlying soft layer (Standard Penetration Test less than 5) should also be checked and should be less than 500 p.s.f. assuming that the pressure is distributed thru the crust according to the Boussinesq theory or by assuming that the pressure under a footing spreads outward with depth uniformly over an area bounded by planes drawn thru the outer edges of the footings at an inclination of about 30 degrees from the vertical.

3. Clay (CH) soils below footings should be removed and replaced with select materials compacted in thin lifts.

4. Soft spots or pockets of loose material or hard spots such as boulders encountered in footing excavations or below the building area should be removed and replaced with select materials compacted in thin lifts.

5. The bottoms of footing excavations should be tamped prior to pouring of concrete.

6. Good surface drainage away from the structure should be maintained and the site should be graded to prevent the ponding of water.
7. Foundations should be well tied together with deep grade beams, particularly around the perimeter of the structure.

8. Perimeter building walls should be well tied together with continuous reinforced grade and bond beams, and also near the tops of the walls. Vertical joints that extend the full height of the wall at window and door openings may be provided to attempt to control cracking patterns.

Existing Cesspools

There is an existing cesspool on the site. The location of the cesspool should be accurately shown on the plans. If other cesspools are encountered during the site preparation work, they should be flagged and located on the plans.

Sludge should be removed from the bottom and the cesspool backfilled with fairly well-graded granular materials. The materials should be placed in thin layers and rammed into place or compacted with vibratory equipment. The top 5 ft of fill should be compacted in 6-in. compacted layers.

Building foundations and ground floor slab should be designed to bridge over the cesspool and the foundations extended to the bottom of the cesspool.
An alternate solution is to support the structure on small diameter pipe piles. The piles should extend below the bottom of the cesspool. A 3-1/2-in. diameter pipe may be used for the pipe piles with an allowable load of 7 kips per pile.

**Slab on Ground**

Because of some soft or loose underlying pockets, some settlement of the ground floor slab may occur.

The existing surface soils are generally silty-clayey materials that will tend to shrink or swell with the moisture variations. Because the water content of the surface soils may be below the plastic limit, the soils may be expansive in localized areas when the soils adjust to the new environmental conditions created by the building construction. To reduce the expansive effects and the heave and hump-like effects at the mid-span of the slab, the dry surface soils should be scarified and recompacted on the wet side of optimum and not allowed to dry out prior to pouring of concrete.

To reduce the effects of settlements, slabs on ground should be placed after the superstructure is constructed. This will allow the structure or ground to settle as much as practicable within the construction period without dragging the floor slab down along the edges of the slab. This will also minimize the heave and hump-like effects at the mid-span of the slab.
The floor slab should be separated from grade beams, walls and columns to permit the slab to float independently.

For slab on ground, a base course of 4 in. of well-graded gravel is recommended. To avoid the accumulation of capillary moisture below the floor slab, the gravel for the base course should be well graded 3/4 to 1/4-in. in size or some other form of capillary break should be provided.

The subgrade should be compacted and shaped to drain. The elevation of the subgrade should be kept higher than the surrounding ground outside the building whenever practicable.

**Joints and Connection Details**

To lessen the effects resulting from the wavy surface at the ground floor level, non-bearing partitions, doors, windows, etc., should be designed with loose fits or other precautions taken to allow for some future adjustments or maintenance.

Sidewalks and entry slabs next to the building should be supported on seats that would permit some rotation and maintain a smooth transition from the sidewalk and entry slab to the building.
Driveway and Parking Area

The plan indicates that the existing volleyball court will be used as a parking lot. If the existing pavements are not sufficient to support the anticipated traffic loads, some future maintenance may be required.

For light automobile traffic and drained subgrade conditions, the driveway and parking area pavement section for the general soil conditions may be as follows:


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

3. Subbase course - 12-in. select material over a prepared subgrade.

4. Borrow - 12-in. borrow soils over a prepared subgrade where clays (CH soils) are encountered below the subbase course.

Provisions in the contract documents should allow for local adjustments regarding select borrow subbase and borrow 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 placed in these low areas.

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

Because of the variability of soil deposits, site improvements, designs and construction techniques, existing or changed conditions may be encountered that cannot be foreseen with even the most exhaustive studies of site and project conditions. These unforeseen conditions should be recognized when encountered and then evaluated so that the designs or the construction methods may be modified accordingly, if necessary.

Unforeseen or changed or undetected conditions such as soft spots, existing utility trenches, underground structures, pipes, voids or cavities, boulders, expansive soil pockets, seepage water or water level changes with weather, etc., may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.
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 grain-size analysis test results.
**Boring Log**

**PROJECT**
KEAAHALA PLAYGROUND

**LOCATION**
Kahowaa Place, Kaneohe, Hawaii

**Tax Map Key:** 4-5-29: 26

**HAMMER:**

- **Weight:** 140#
- **Drop:** 20"

**SAMPLER:**

- 2 1/2' N-S 2' STANDARD SPLIT SPOON
- 3' 5 - 3' O.D. THIN WALL TUBE

**Boring No.:** 1  
**Date:** JULY 17, 1975

**Driller:**  
**Field Party:** MEYER, KAKU, CHOW

**Type of Boring:** AUGER (CME 55)  
**Diam.:** 4"

**Elev. Datum:** HAMMER: 6'

**Water Level Not Noticed**

**Time:** —  
**Date:** 7-16-75

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**Penetration Data**

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<th>Standard Penetration Test</th>
<th>3&quot; O.D. THIN WALL TUBE</th>
<th>SAMPLER</th>
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<td>20</td>
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<td>30</td>
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<th>Description</th>
<th>Depth (ft.)</th>
<th>Sample No.</th>
<th>Plastic Limit %</th>
<th>Water Content %</th>
<th>Liquid Limit %</th>
<th>Unconfined Compressibility (N psi)</th>
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<td>(MH)</td>
<td>MEDIUM, REDDISH, BROWN SILTY CLAY W/ROOTS</td>
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<tr>
<td>CH</td>
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<td>(MH)</td>
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<td>(CH)</td>
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<td>(SM)</td>
<td>DENSE, BROWN SILT SAND W/ DECOMPOSED ROCK</td>
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**End of Boring:** 7-17-75

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**Note:**  
- \( \gamma_w = \text{Wet Density}, \text{pcf} \)  
- \( \gamma_d = \text{Dry Density}, \text{pcf} \)

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*Elevation estimated from Topo Map dated 8-26-74.*
# Boring Log

**PROPOSED ASSEMBLY BUILDING**

**KAAHALA PLAYGROUND**

**PROJECT**

Kahawaa Place, Kaneohe, Hawaii

**LOCATION**

Tax Map Key: 4-5-29: 26

**WALTER LUM ASSOCIATES, INC.**

3030 WAIKÄLE AVENUE • HONOLULU, HAWAII 96816 • PHONE 731-7931

**BORING NO.** 2  
**Sheet No.** 1 of 4

**Driller** M. LUM ASSOC., INC.  
**Date** JULY 17, 1975

**MEYER, KAKU, CHON**

**Type of Boring** AUGER (CME 55)  
**Diam.** 4"

**HAMMER:**

**Weight** 140 #

**Drop** 2' 55" - 2" STANDARD SPLIT SPOON

**3" G. D. THIN WALL TUBE**

**FIELD PARTY MEETING, KAKU, TA: Tax Map Key: 4-5-29: 26**

**DATE:** 7-17-75

---

**PROJECT KEMJILA PLAYGROUND**

Driller: M. LUM ASSOC., INC.

Date: JULY 17, 1975

Field Party Meeting, Kaku, Ta: Tax Map Key: 4-5-29: 26

**DATE:** 7-17-75

---

**LOCATION:** Kahawaa Place, Kaneohe, Hawaii

**Tax Map Key:** 4-5-29: 26

---

**SAMPLER:**

**Drill Bit:** FINGER TYPE

**Weight:** 140 #

**Drop:** 2' 55" - 2" STANDARD SPLIT SPOON

**3" G. D. THIN WALL TUBE**

---

## PENETRATION DATA

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<thead>
<tr>
<th>Sample No.</th>
<th>Plastic Limit (%)</th>
<th>Water Cont. (%)</th>
<th>Liquid Limit (%)</th>
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<th>Penetration Test N (Blows per foot)</th>
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<td>MH CLAYET SILT W/ DECOMPOSED ROCK</td>
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**NOTE:**

*Elevation estimated from Topo Map dated 8-26-74.*

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**HYDRAULIC PRESSURE:** 625 psi/in.  
950 psi/0.5 in.
### Boring Log

**PROJECT**
PROPOSED ASSEMBLY BUILDING

**LOCATION**
KEAAHALA PLAYGROUND
Kahowaa Place, Kaneohe, Hawaii

**Tax Map Key:** 4-5-29: 26

**HAMMER:**
- **Weight:** 140 lbs
- **Drop:** 20"
- **2"-5"-2" STANDARD SPLIT SPOON**

**SAMPLER:**
- **3" S - 3" O.D. THIN WALL TUBE**

#### PENETRATION DATA

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<tr>
<th>Depth (ft)</th>
<th>ELEV. = 59' 1&quot; X 2'</th>
<th>Sampler</th>
<th>Sample No.</th>
<th>Plastic Limit</th>
<th>Water Cont.</th>
<th>Liquid Limit</th>
<th>Unconfined Comp.</th>
<th>P.S.F.</th>
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**NOTE:**
- *Elevation estimated from Topo Map dated 8-26-74.*

**HYDRAULIC PRESSURE**
350 psi/1.5'

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**END OF BORING @ 30'**
7-17-75

**DECORATED ROCK OR BOLDER?**

**MEDIUM - STIFF MOTTLED BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK**

**DECOMPOSED ROCK?**

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**35/00' HAMMER BOUNCES**
<table>
<thead>
<tr>
<th>TABLE I A</th>
<th>SUMMARY OF LABORATORY TEST RESULTS</th>
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<tr>
<td><strong>BORING NO.</strong></td>
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<td><strong>SAMPLE NO.</strong></td>
<td>SURFACE</td>
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<td><strong>DEPTH BELOW SURFACE</strong></td>
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<td><strong>DESCRIPTION</strong></td>
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<td>(% Passing)</td>
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<td>1-1/2&quot;</td>
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<td>1/2&quot;</td>
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<td><strong>ATTERBERG LIMITS</strong></td>
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<td><strong>UNIFIED SOIL CLASSIFICATION</strong></td>
<td>MH</td>
</tr>
<tr>
<td><strong>APPARENT SPECIFIC GRAVITY</strong></td>
<td>2.81</td>
</tr>
<tr>
<td><strong>CBR TEST</strong></td>
<td></td>
</tr>
<tr>
<td>(Surcharge - 51 P.S.F.)</td>
<td></td>
</tr>
<tr>
<td>Molding Moisture, %</td>
<td>31.8</td>
</tr>
<tr>
<td>Molding Dry Density, P.C.F.</td>
<td>89.9</td>
</tr>
<tr>
<td>Swell upon saturation, %</td>
<td>3.5</td>
</tr>
<tr>
<td>CBR at 0.1&quot; Penetration</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>MOISTURE-DENSITY RELATIONS OF SOILS</strong></td>
<td></td>
</tr>
<tr>
<td>(ASTM D-1557-70, Method A)</td>
<td></td>
</tr>
<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>
<tr>
<td><strong>REMARKS:</strong></td>
<td></td>
</tr>
</tbody>
</table>

Date: 8-6-76 By: PT

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS
# Table I - Summary of Laboratory Test Results

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample No.</th>
<th>Depth Below Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2.5'-4'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOTTLED BROWN CLAYEN Silt &amp; CLAY &amp; SOME ROOTS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5'-16'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DARK BROWN CLAYEN Silt &amp; CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0'-15'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOTTLED BROWN CLAYEN Silt &amp; CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15'-16'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MOTTLED BROWN CLAYEN Silt &amp; CLAY</td>
</tr>
</tbody>
</table>

## Grain-Size Analysis

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

## Atterberg Limits

- **Air Dried or Natural**
  - Liquid Limit
  - Plastic Limit
  - Plasticity Index
  - Dilatancy
  - Toughness
  - Dry Strength

## Unified Soil Classification

- MH

## Apparent Specific Gravity

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.86</td>
</tr>
</tbody>
</table>

## CBR Test

- **(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

- **(ASTM D-1557-70, Method A)**
  - Dry to Wet or Wet to Dry
  - Max. Dry Density (P.C.F.)
  - Optimum Moisture (%)

## Remarks:

Date: 8-6-75

By: [Signature]
MOISTURE-DENSITY CURVE (ASTM D-1557-70, METHOD A)

PROJECT: PROPOSED ASSEMBLY BUILDING
LOCATION: KEAAHALA PLAYGROUND
SAMPLE NO.: "8" SURFACE
SAMPLE DESCRIPTION: BROWN SILTY CLAY

AGGREGATE: 3/4" MINUS
MOLD SIZE: 48" X 48" X 48"
HAMMER: 10 LBS., 16" DROP
LAYERS: 5
BLOWS: 56/layer

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

DATE 7-28-75  BY  C.H.
**CBR TEST**

**PROJECT:** PROPOSED ASSEMBLY BUILDING  
KEAHUALA PLAYGROUND

**LOCATION:** KAHOWAA PLACE, KANE'OHE, HAWAII

**SAMPLE NO:** "A" SURFACE

**SAMPLE DESCRIPTION:** MOTTLEC. BROWN SILTY CLAY

---

**CBR PENETRATION DATA**

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.025</td>
<td>36</td>
<td>12</td>
</tr>
<tr>
<td>0.050</td>
<td>74</td>
<td>25</td>
</tr>
<tr>
<td>0.075</td>
<td>116</td>
<td>39</td>
</tr>
<tr>
<td>0.100</td>
<td>158</td>
<td>52</td>
</tr>
<tr>
<td>0.125</td>
<td>202</td>
<td>67</td>
</tr>
<tr>
<td>0.150</td>
<td>241</td>
<td>80</td>
</tr>
<tr>
<td>0.175</td>
<td>276</td>
<td>92</td>
</tr>
<tr>
<td>0.200</td>
<td>309</td>
<td>103</td>
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<tr>
<td>0.250</td>
<td>355</td>
<td>118</td>
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<tr>
<td>0.300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.450</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AGGREGATE 1/4" MINUS  
HAMMER WEIGHT 10 LBS.  
HAMMER DROP 12"  
No. OF BLOWS 56/LAYER  
No. OF LAYERS 5

---

**TEST RESULTS:**

MOLDING MOISTURE, %: 31.8
MOLDING DRY DENSITY, P.C.F. 69.9  
CBR @ 0.1" PENETRATION: 5.2
DAYS SOAKED: 5

---

DATE: 7.28.75 BY N.N.  
DATE: 7.29.75 BY C.H.
**CBR TEST**

**PROJECT:** PROPOSED ASSEMBLY BUILDING  
KEAAHALA PLAYGROUND

**LOCATION:** KAHOWA PLACE, KANEHOE, HAWAII

**SAMPLE NO:** "10" SURFACE

**SAMPLE DESCRIPTION:** BROWN SILTY CLAY

---

**CBR PENETRATION DATA**

<table>
<thead>
<tr>
<th>PENETRATION (INCHES)</th>
<th>LOAD (LBS)</th>
<th>LOAD (PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.025</td>
<td>53</td>
<td>18</td>
</tr>
<tr>
<td>0.050</td>
<td>92</td>
<td>31</td>
</tr>
<tr>
<td>0.075</td>
<td>136</td>
<td>45</td>
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<tr>
<td>0.100</td>
<td>175</td>
<td>58</td>
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<tr>
<td>0.125</td>
<td>210</td>
<td>70</td>
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<tr>
<td>0.150</td>
<td>244</td>
<td>81</td>
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<tr>
<td>0.175</td>
<td>276</td>
<td>92</td>
</tr>
<tr>
<td>0.200</td>
<td>304</td>
<td>101</td>
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<tr>
<td>0.250</td>
<td>348</td>
<td>116</td>
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<tr>
<td>0.300</td>
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<td>132</td>
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<tr>
<td>0.350</td>
<td>437</td>
<td>146</td>
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<tr>
<td>0.400</td>
<td>478</td>
<td>159</td>
</tr>
<tr>
<td>0.450</td>
<td>510</td>
<td>173</td>
</tr>
<tr>
<td>0.500</td>
<td>567</td>
<td>189</td>
</tr>
</tbody>
</table>

**CBR @ 0.2" PENETRATION: 100% 6.7**

**CBR @ 0.1" PENETRATION: 50% 5.8**

**AGGREGATE 1/4" minus**

**HAMMER WEIGHT 10 LBS.**

**HAMMER DROP 16"**

**No. OF BLOWS 50/LAYER**

**No. OF LAYERS 5**

---

**TEST RESULTS:**

MOLDING MOISTURE, %. 33.8

MOLDING DRY DENSITY, P.C.F. 86.5

CBR @ 0.1" PENETRATION 5.8

DAYS SOAKED 5

**DATE:** 7.20.75 BY N.N.

**DATE:** 7.29.75 BY C.H.

---

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

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

This report was prepared only for the indicated use of the site. 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, changed conditions, and changes in the state of the art of soil engineering.

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

Contract documents and specifications often prescribe supervision by the soil engineer. It should be understood by all parties that the soil engineer's actual scope of work is very limited. We as the soil engineer do not assume the day to day physical direction of the works, nor minute examination of the elements, nor do we assume the responsibility for the safety of the contractor's workmen. Supervision, inspection, control, etc., by the soil engineer generally mean taking of soil tests and making visual observations, sometimes on only an intermittent basis relating to earthwork or foundations for the project. The soil engineer does not guarantee the contractors' performance, but rather looks for general conformance to the intent of the plans and soil report. Any discrepancy noted by the soil engineer regarding earthwork or foundations will be referred to the project engineer or architect or contractor for action.

Although the soil report may comment or discuss construction techniques or procedures for the design engineer's guidance, the report should not be interpreted to prescribe or dictate construction procedures or to relieve the contractor in anyway of his responsibility for the construction.