

**PRELIMINARY GEOTECHNICAL ENGINEERING EXPLORATION**  
**OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)**  
**RELOCATION AND EXPANSION PHASE 2**  
**HALAWA, OAHU, HAWAII**

**W.O. 8052-00    FEBRUARY 22, 2021**

Prepared for

**ARCHITECTS HAWAII LIMITED**



**GEOLABS, INC.**

Geotechnical Engineering and Drilling Services

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THIS WORK WAS PREPARED BY  
ME OR UNDER MY SUPERVISION.

  
SIGNATURE      4-30-22  
EXPIRATION DATE  
OF THE LICENSE



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## **GEOLABS, INC.**

*Geotechnical Engineering and Drilling Services*

February 22, 2021

W.O. 8052-00

**Ms. Katie Stephens**  
**Architects Hawaii Limited**  
733 Bishop Street, Suite 3100  
Honolulu, HI 96813

Dear **Ms. Stephens**:

Geolabs, Inc. is pleased to submit our report entitled "Preliminary Geotechnical Engineering Exploration, Oahu Correctional Community Center (OCCC) Relocation and Expansion Phase 2, Halawa, Oahu, Hawaii," prepared in support of the proposed project.

Our work was performed in general accordance with the scope of services outlined in our revised fee proposal, dated December 10, 2019.

Please note that the soil and rock samples recovered during our field exploration (remaining after testing) will be stored for a period of two months from the date of this report. The samples will be discarded after that date unless arrangements are made for a longer sample storage period. Please contact our office for alternative sample storage requirements, if appropriate.

Detailed discussion and preliminary design recommendations are contained in the body of the report. If there is any point that is not clear, please contact our office.

Very truly yours,

**GEOLABS, INC.**

**Gerald Y. Seki, P.E.**

Vice President

GS:AT:cj

**PRELIMINARY GEOTECHNICAL ENGINEERING EXPLORATION  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII  
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**SUMMARY OF FINDINGS AND RECOMMENDATIONS**

Based on our preliminary field exploration results, available boring data, and geologic information, the subsurface conditions across the Oahu Correctional Community Center Relocation and Expansion Phase 2 project site generally consist of stiff/dense fills and older alluvium overlying soft to medium hard basalt rock formation. Groundwater was not encountered during our explorations. However, it should be noted that water levels may vary with seasonal precipitation, perched groundwater, groundwater withdrawal, and other factors.

Based on the anticipated subsurface conditions, we believe that new structures located on competent ground may be supported on shallow footing foundations bearing on the competent near-surface soils or new compacted fills placed to achieve the design finished grades. A preliminary allowable bearing pressure of up to 4,000 pounds per square foot (psf) may be used to design the shallow foundation bearing on the recompacted on-site soils and/or new compacted structural fills needed to achieve the finished grades.

An active lateral earth pressure of 40 pounds per square foot per foot of depth (pcf) for the level backfill condition may be used for the retaining structures. For two horizontal to one vertical (2H:1V) sloping backfill condition, active horizontal and vertical pressure components of 64 and 32 pcf, respectively, may be used in the preliminary design. Retaining walls should be well-drained to reduce the build-up of hydrostatic pressures.

Based on the results of infiltration testing performed within Boring No. 8, an infiltration rate of 3.9 inches per hour may be used for the preliminary design. Due to the potential variability of the subsurface conditions, the absorption capacity of a disposal system should be confirmed by conducting additional infiltration tests during the final design phase and construction, if appropriate.

The information and preliminary recommendations presented herein are intended to be solely in support of the planning and preliminary engineering process; and, as such, may not be sufficient nor be appropriate for detailed design of the individual structures and site elements of the project. Therefore, we recommend conducting additional field exploration as the design for the individual structures and site elements progresses to allow for the formulation of project-specific recommendations for each structure and element.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

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The text of this report should be referred to for detailed discussion and preliminary design recommendations.

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END OF SUMMARY OF FINDINGS AND RECOMMENDATIONS

## SECTION 1. GENERAL

This report presents the results of our preliminary geotechnical engineering exploration and engineering analyses performed for the *Oahu Correctional Community Center (OCCC) Relocation and Expansion Phase 2* project in Halawa on the Island of Oahu, Hawaii. The project location and general vicinity are shown on the Project Location Map, Plate 1.

This report summarizes the findings and presents our preliminary geotechnical recommendations based on field exploration, laboratory testing, and engineering analyses. The preliminary recommendations presented herein are intended for the preliminary design of new structures and site elements for the OCCC Relocation and Expansion Phase 2 project only. The findings and preliminary recommendations presented herein are subject to the additional field exploration and limitations noted at the end of this report.

### 1.1 Project Considerations

The *OCCC Phase 2* project is located at the existing 35-acre Animal Quarantine Station (AQS) property in the Halawa area of Honolulu on the Island of Oahu, Hawaii. The project site is approximately bounded by the Interstate Route H-3 Freeway to the west, and Halawa Valley Street to the north, as shown on the Site Plan, Plate 2.

We understand that the new OCCC facility will occupy the existing AQS facility, and a new AQS facility will be constructed west of the existing facility. In addition, we understand that the new AQS facility is not part of our scope of work. We also understand that the new OCCC facility will include a Detention Building, Pre-Release Building, Warehouse/Plant Building, Staff Parking at Eastern End, Emergency Siren Structure, and Retention Basin.

Based on the anticipated scope of work for the planned project, this preliminary geotechnical exploration report includes discussions on structure foundations, retaining walls, site grading, pavement, and infiltration results.



## **1.2 Purpose and Scope**

The purpose of our geotechnical engineering exploration was to obtain an overview of the surface and subsurface conditions to develop an idealized soil/rock data set to formulate preliminary geotechnical engineering recommendations for the design of the planned project. The work was performed in general accordance with the scope of services outlined in our fee proposal dated December 10, 2019. The scope of work for this exploration included the following tasks and work efforts:

1. Review of available soils and other information in the general project vicinity.
2. Coordinate staking of borehole locations and underground utility line clearance, including submitting a one call application.
3. Trail clearing to provide access for our truck-mounted drill rig using mechanized equipment.
4. Drilling and sampling of nine boreholes to depths of about 5 to 103 feet below existing ground surface for a total of approximately 334 lineal feet.
5. Perform infiltration testing at one location at a depth of 6 feet.
6. Coordination of the trail clearing, field exploration, logging of boreholes and supervision of the infiltration tests by our geologist.
7. Laboratory testing of selected soil and rock samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.
8. Analyses of the field and laboratory data to formulate preliminary geotechnical recommendations for the design of the new facilities.
9. Preparation of this report summarizing our work and presenting our findings and preliminary geotechnical engineering recommendations.
10. Coordination of our overall work on the project by our project engineer.
11. Quality assurance and client-design team consultation by our principal engineer.
12. Miscellaneous work efforts, such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology and the Logs of Borings are presented in Appendix A. Detailed descriptions of the seismic shear wave velocity

test conducted using seismic cone penetration testing equipment, and the results of the shear wave velocity profiling are presented in Appendix B. Results of the laboratory tests performed on selected soil and rock samples obtained from our field exploration are presented in Appendix C. Photographs of the core samples retrieved from the field exploration are presented in Appendix D. Field Infiltration test results are presented in Appendix E. Boring Logs from the Interstate Route H-3 project are presented in Appendix F.

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END OF GENERAL

## SECTION 2. SITE CHARACTERIZATION

Of interest to our geotechnical engineering analysis are the subsurface materials encountered at the project site, the engineering properties of the materials encountered, and the variability of the subsurface conditions across the project site. Therefore, the following sections provide a description of the geologic setting of the project site, the surface and subsurface conditions encountered at the site, and a discussion on the items needed for seismic design, such as seismicity, soil liquefaction and soil profile characteristics for seismic analysis.

### 2.1 Regional Geology

The Island of Oahu was built by the extrusion of basaltic lava from the Waianae and Koolau Shield Volcanoes. The older Waianae Volcano is estimated to be middle to late Pliocene in age, and the Koolau Volcano is estimated to be late Pliocene to early Pleistocene in age. As volcanic activity at the Waianae Volcano ceased, lava flows from the Koolau Volcano banked against its eroded eastern slope forming the Schofield Plateau.

The Koolau Volcanic Shield was built during the late Pliocene Epoch and early Pleistocene Epoch by the extrusion of successive thin-bedded lava flows. The main shield-building stage ceased approximately 2.5 million years ago. Evidence from historic drilled wells indicates that the Island of Oahu has subsided by as much as 1,200 feet since the cessation of the early volcanic activity (Macdonald and Abbott, 1970). During the period of island subsidence, coral-algal reefs began to grow along the southern coast of Oahu forming embayments protected by barrier reefs. A series of lagoons formed behind the barrier reefs, and both terrigenous and marine sediments accumulated in the lagoons (Macdonald and Abbott, 1970).

During the Pleistocene Epoch (Ice Age), many sea level changes occurred as a result of widespread glaciation in the continental areas of the world. As the great continental glaciers accumulated, the level of the oceans fell because there was less water available to fill the oceanic basins. Conversely, as the glaciers receded (melted), global sea levels rose because the volume of water increased. The land mass comprising

the Island of Oahu remained essentially stable during these water level changes, and the fluctuations were eustatic in nature. These glacio-eustatic fluctuations resulted in stands of the sea that were both higher and lower relative to the present sea level on the Island of Oahu.

The higher sea level stands caused landform changes, including the accumulation of deltas and alluvial fans composed of terrigenous sediments in the heads of the old bays, the accumulation of reef deposits at correspondingly higher elevations, and the accumulation of lagoonal and/or marine sediments in the quiet lagoonal waters protected by barrier reefs. The concurrent growth of reefs and the accumulation of lagoonal sediments also resulted in the deposition of coral-algal limestone and marl materials within the predominantly lagoonal sedimentary unit.

The lower sea level stands caused streams to carve drainages into the coastal plain platforms composed of sedimentary and coral reef deposits. In addition, subaerial exposure of the calcareous sediments caused consolidation of the soft deltaic materials and lagoonal deposits and the induration of calcareous reef materials. Furthermore, renewed subaerial erosion acting at the upper elevations of the volcanic shield caused the downstream deposition of terrigenous alluvial sediments under relatively higher energy conditions.

During periods of no significant sea level changes, continued meandering stream action extended the alluvial deltas and fans seaward and deposited alluvial materials overlying the marine-lagoonal sediments.

As discussed above, the majority of the Island of Oahu was formed during the main volcanic shield building stage, which eventually experienced a hiatus. After a long period of volcanic inactivity, during which time erosion incised deep valleys into the Koolau Shield Volcano along with the accumulation of the terrigenous and lagoonal deposits along the coastal areas, volcanic activity returned to portions of the Island of Oahu as a series of localized lava flows followed by explosive cinder and tuff cone formations. These late eruptions belong to the Honolulu Volcanic Series and are believed to have occurred between about 30,000 and 800,000 years ago.

In summary, the project site is located on the Southern flank of the Koolau Volcano and on the lower portion of Halawa valley. In general, the subsurface materials underlying the project site consist of older alluvial soils and basalt formation overlain by recent fills.

## **2.2 Site Description**

The proposed OCCC Relocation and Expansion Phase 2 project is located at the existing AQS facility in the Halawa area of Honolulu on the Island of Oahu, Hawaii. The project site is approximately bounded by Interstate Route H-3 Freeway to the west and Halawa Valley Street to the north.

Based on our field observations, a drainage ditch runs along the southern boundary of the site. In addition, Halawa Stream is located west of the project site. There are facilities for the Department of Health, Department of Agriculture and Department of Land and Natural Resources located on the west and northwest of the project site. The majority of the project site is covered by concrete and asphaltic concrete (AC) pavements. In general, chain-linked fences run along the boundaries of the project site.

Based on our field observations and the Topographic Survey Map provided by Architects Hawaii Limited, the terrain at the project site is gently sloping down towards the southwest with existing ground elevations ranging from about +133 feet Mean Sea Level (MSL) at the northeast to about +95 feet MSL at the southwest.

## **2.3 Subsurface Conditions**

The subsurface conditions at the project site were explored by drilling and sampling ten borings, designated as Boring Nos. 1 through 10. In addition, three bulk samples, designated as Bulk-1 through Bulk-3, were obtained near the ground surface to evaluate the pavement support characteristics of the near-surface soils. The approximate boring and bulk sample locations are shown on the Overall Site Plan, Plate 2, and Site Plans, Plates 3.1 through 3.4.

Based on our field exploration, the project site is generally underlain by 0.5 to 11 feet of surface fill overlying older alluvium. The older alluvium was underlain by soft to medium hard vesicular basalt rock formation extending to the maximum depth explored of 103 feet below ground surface. The fill material generally consisted of medium dense

to very dense silty sands, silty gravel, and sandy gravel, and medium stiff to hard clayey silts, clay, and silty clay. The older alluvium generally consisted of dense to very dense clayey sands, silty sand, silty gravel, and gravelly cobbles, and stiff to hard sandy silt, clayey silts, clay, and silty clay. The basalt rock formation was encountered in Boring No. 4 at a depth of approximately 85.5 feet below the existing ground surface, and was generally soft to medium hard, and highly to extremely weathered.

Groundwater was not encountered within the depths of the drilled borings during our field exploration. However, it should be noted that water levels may vary with seasonal precipitation, perched groundwater, groundwater withdrawal, and other factors.

For illustration purposes only, two Generalized Geologic Cross-Sections depicting the interpreted subsurface conditions at the project site are provided on Plates 4.1 and 4.2. The approximate surface projections of the subsurface profiles prepared for this report are shown on the Overall Site Plan, Plate 2.

Detailed descriptions of the field exploration methodology and graphic representations of the materials encountered in the borings are presented on the Logs of Borings in Appendix A. Detailed descriptions of the seismic shear wave velocity test conducted using seismic cone penetration testing equipment, and the results of the shear wave velocity profiling are presented in Appendix B. We performed laboratory tests on selected soil and rock samples obtained during our field exploration, and the test results are presented in Appendix C. Photographs of the core samples obtained from the boring locations are presented in Appendix D. Field Infiltration test results are presented in Appendix E. Boring Logs from the Interstate Route H-3 project are presented in Appendix F.

#### **2.4 Seismic Design Considerations**

Based on the International Building Code, 2012 Edition (IBC 2012), the project site may be subjected to seismic activity, and seismic design considerations will need to be addressed for the project. The following subsections provide discussions on the seismicity of the Island of Oahu and the soil profile for seismic design.

#### 2.4.1 Earthquakes and Seismicity

In general, earthquakes throughout the world are caused by shifts in the tectonic plates. In contrast, earthquake activity in Hawaii is linked primarily to volcanic activity; therefore, earthquake activity in Hawaii generally occurs before or during volcanic eruptions. In addition, earthquakes may result from the underground movement of magma that comes close to the surface but does not erupt. The Island of Hawaii experiences thousands of earthquakes each year, but most are so small that they can only be detected by sensitive instruments. However, some of the earthquakes are strong enough to be felt, and a few cause minor to moderate damage.

In general, earthquakes associated with volcanic activity are most common on the Island of Hawaii. Earthquakes that are directly associated with the movement of magma are concentrated beneath the active Kilauea and Mauna Loa Volcanoes on the Island of Hawaii. Because the majority of earthquakes in Hawaii (over 90 percent) are related to volcanic activity, the risk of seismic activity and degree of ground shaking diminishes with increased distance from the Island of Hawaii. The Island of Hawaii has experienced numerous earthquakes greater than Magnitude 5 (M5+); however, earthquakes are not confined only to the Island of Hawaii. To a lesser degree, the Island of Maui has experienced several earthquakes greater than Magnitude 5. Therefore, moderate to strong earthquakes have occurred in the County of Maui.

The effects of earthquakes occurring on the Islands of Hawaii and Maui may be felt on the Island of Oahu. For example, small landslides occurred on the Island of Oahu as a result of the Maui Earthquake of 1938 (M6.8). Some houses on the Island of Oahu were reportedly damaged as a result of the Lanai Earthquake of 1871 (M7+). In the last 150 years of recorded history, we are not aware of earthquakes greater than Magnitude 6 that have occurred on the Island of Oahu. An earthquake of Magnitude 4.8 to 5.0 occurred along the Diamond Head Fault in 1948 on the Island of Oahu. The moderate tremor resulted in broken store windows, ruptured building walls, and broken underground water mains.

### 2.4.2 Liquefaction Potential

Based on the International Building Code (2012 Edition), the project site should be evaluated for the potential for soil liquefaction. The effects of potential liquefaction may be taken into consideration in the design of the proposed redevelopment.

Soil liquefaction is a condition where saturated cohesionless soils located near the ground surface undergo a substantial loss of strength due to the build-up of excess pore water pressures resulting from cyclic stress applications induced by earthquakes. In this process, when the loose saturated sand deposit is subjected to vibration (such as during an earthquake), the soil tends to densify and decrease in volume causing an increase in pore water pressure. If drainage is unable to occur rapidly enough to dissipate the build-up of pore water pressure, the effective stress (internal strength) of the soil is reduced. Under sustained vibrations, the pore water pressure build-up could equal the overburden pressure, essentially reducing the soil shear strength to zero and causing it to behave as a viscous fluid. During liquefaction, the soil acquires sufficient mobility to permit both horizontal and vertical movements, and if not confined, will result in significant deformations.

Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands and loose silts with little cohesion. The major factors affecting the liquefaction characteristics of a soil deposit are as follows:

FACTORS	LIQUEFACTION SUSCEPTIBILITY
Grain Size Distribution	Fine and uniform sands and silts are more susceptible to liquefaction than coarse or well-graded sands.
Initial Relative Density	Loose sands and silts are most susceptible to liquefaction. Liquefaction potential is inversely proportional to relative density.
Magnitude and Duration of Vibration	Liquefaction potential is directly proportional to the magnitude and duration of the earthquake.

In general, the subsurface information obtained from the borings drilled indicate that the project site is underlain by stiff to hard alluvial deposits overlying soft to medium



hard basalt rock formation. Based on the subsurface conditions encountered in our field exploration, the geology in the area, and our engineering analyses, the potential for soil liquefaction at the project site is non-existent based on the soil and rock encountered, and the absence of groundwater table within the depths explored. Therefore, the potential for liquefaction is not a design consideration at this project site.

#### 2.4.3 Soil Profile Type for Seismic Design

Our field exploration generally encountered dense to very dense, and stiff to hard older alluvium overlying soft to medium hard basalt rock formation, extending to the maximum depth explored. Seismic shear wave velocity profiling was performed in an effort to more closely analyze the subsurface conditions for seismic design considerations. We performed seismic shear wave velocity profiling using seismic cone penetration testing (SCPT) equipment at discrete depths extending to a maximum depth of approximately 102.7 feet below the existing ground surface at the Boring No. 4 location. Based on the subsurface conditions, the weighted average seismic shear wave velocity for the materials within the upper 100 feet of the soil profile is on the order of about 1,259 feet per second at the test location. Results of the seismic shear wave velocity test are provided in Appendix B.

Based on the subsurface materials encountered at the project site and the shear wave velocity profiling performed, the project site may be classified from a seismic analysis standpoint as a “Very Dense Soil and Soft Rock” site corresponding to a Site Class C based on the ASCE Standard ASCE/SEI 7-10 (Table No. 20.3-1), referenced by the International Building Code, 2012 Edition. Based on Site Class “C”, the following seismic design parameters were estimated and may be used for seismic analysis of the project.

<b>SEISMIC DESIGN PARAMETERS</b>	
<b>Parameter</b>	<b>Value</b>
MCE Peak Bedrock Acceleration, PBA (Site Class B)	0.264
Spectral Response Acceleration (Site Class B), $S_s$	0.573
Spectral Response Acceleration (Site Class B), $S_1$	0.165

<b>SEISMIC DESIGN PARAMETERS</b>	
<b>Parameter</b>	<b>Value</b>
Site Class	"C"
Site Coefficient, $F_a$	1.171
Site Coefficient, $F_v$	1.635
Site Coefficient, $F_{pga}$	1.136
MCE Peak Ground Acceleration, PGA (Site Class C)	0.3
Design Spectral Response Acceleration, $S_{DS}$	0.447
Design Spectral Response Acceleration, $S_{D1}$	0.18

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END OF SITE CHARACTERIZATION

## SECTION 3. DISCUSSION AND RECOMMENDATIONS

Based on our preliminary field exploration results, available boring data and geologic information, the subsurface conditions across the project site are generally stiff/dense competent material. We envision that new structures located on competent ground may be supported on shallow footing foundations bearing on the competent near-surface soils or new compacted fills placed to achieve the design finished grades. In addition, we envision that retaining walls, slabs on-grade, new pavement sections, and new utilities will be required for the planned project.

Detailed discussions and preliminary geotechnical recommendations in support of the OCCC Relocation and Expansion Phase 2 project are presented in the following sections.

### **3.1 Shallow Foundations**

We envision that new structures may be supported on shallow footing foundations bearing on the competent near-surface soils and/or new fills placed to achieve the design finished grades. For planning and preliminary design purposes, an allowable bearing pressure of up to 4,000 pounds per square foot (psf) may be used to design the shallow foundations bearing on the recompacted on-site soils and/or new compacted structural fills needed to achieve the finished grades. These bearing values are for sizing the footings based on dead-plus-live loads and may be increased by one-third ( $\frac{1}{3}$ ) for transient loads, such as those caused by wind or seismic forces.

The bottom of footing excavations should be recompacted to at least 90 percent relative compaction to provide a relatively firm and smooth bearing surface prior to placing reinforcing steel and/or concrete. Soft and/or loose materials encountered at the bottom of footing excavations should be over-excavated to expose the underlying firm materials. The over-excavation may be backfilled with the on-site soils compacted to a minimum of 90 percent relative compaction, or the bottom of footing may be extended down to bear directly on the underlying competent materials.

In general, the bottom of footings should be embedded a minimum of 18 to 24 inches below the lowest adjacent finished grades. Footings constructed near tops of

slopes or on sloping ground conditions should be embedded deep enough to provide a minimum horizontal setback distance of 6 feet measured from the outside edge of the footings (base of footing) to the face of the slope. Footings adjacent to planned (or existing) retaining walls should be embedded deep enough to avoid surcharging the retaining wall foundations, or the planned retaining walls should be designed to resist the additional structural loads.

Foundations next to utility trenches or easements should be embedded below a 45-degree imaginary plane extending upward from the bottom edge of the utility trench or the footing should be embedded to a depth as deep as the inverts of the utility lines. This requirement is necessary to avoid surcharging adjacent below-grade structures with additional structural loads and to reduce the potential for appreciable foundation settlement.

If structure foundations are designed and constructed strictly in accordance with our recommendations, we estimate total settlements of footings supported on the recompacted on-site soils and/or new compacted structural fills to be on the order of about 1 to 1.5 inches or less. We estimate that differential settlements between adjacent footings supported on similar materials to be on the order of about 0.5 to 0.75 inches.

Lateral loads acting on the structures may be resisted by friction developed between the bottom of the foundation and the bearing soil and by passive earth pressure acting against the near-vertical faces of the foundation system. A coefficient of friction of 0.3 to 0.35 may be used for footings bearing on the recompacted on-site soils and/or new compacted structural fills. Resistance due to passive earth pressure may be estimated using an equivalent fluid pressure of 300 to 350 pounds per square foot per foot of depth (pcf). This assumes the soils around the footings are well-compacted. Unless covered by slabs or pavements, the passive pressure resistance in the upper 12 inches of soil should be neglected. In addition, the passive pressure resistance for foundations on slopes should be reduced.

### **3.2 Slabs-On-Grade**

We anticipate the walkways and/or first floor of the new structures for the project will consist of reinforced concrete slabs-on-grade. Based on the existing topography and

the anticipated finished grade, we envision the slabs-on-grade generally will be supported on the recompacted on-site soils and/or new compacted fills placed to raise the existing ground surface to the finished subgrades.

Our field exploration and experience in the area indicate the near-surface clayey soils generally exhibit low to very high shrink/swell characteristics when subjected to fluctuations in the soil moisture contents. Unless slabs-on-grade constructed above these expansive soils are properly designed, there is a potential for future distress to the lightly loaded slabs-on-grade resulting from shrinking and swelling of the clayey soils due to changes in the moisture content. To reduce the potential for appreciable structural distress resulting from swelling of the subgrade soils, we recommend properly preparing the subgrade soils prior to fill placement. In addition, we recommend providing 24 to 36 inches of non-expansive select granular fill materials below the cushion fill to support the concrete slabs-on-grades. Additional testing should be performed at each structure when their locations are finalized to confirm and/or modify these recommendations.

For interior building slabs (not subjected to vehicular traffic or sustained machinery vibration), we recommend placing a minimum 4-inch thick layer of cushion fill consisting of open-graded gravel (ASTM C33, No. 67 gradation) below the slabs. The open-graded gravel cushion fill would provide uniform support of the slabs and would serve as a capillary moisture break. To reduce the potential for appreciable future moisture infiltration through the slab and subsequent damage to floor coverings, an impervious moisture barrier, such as a plastic membrane, is recommended on top of the gravel cushion fill layer. Flexible floor coverings, such as carpet or sheet vinyl, should be considered because they can better mask minor slab cracking. In addition, we recommend designing interior walls to incorporate some flexibility in accommodating a small amount of possible ground movements.

Where the slabs will be subjected to vehicular traffic or sustained machinery vibration, such as trucks and/or forklifts, we recommend providing a 6-inch layer of aggregate subbase below the slabs in lieu of the 4-inch thick gravel cushion fill layer. The moisture barrier also may be omitted for these slabs. The aggregate subbase should

consist of crushed basaltic aggregates compacted to a minimum of 95 percent relative compaction.

For the design of structural slabs supported on aggregate subbase, a modulus of subgrade reaction of about 200 pounds per square inch per inch of deflection (pci) may be used for the compacted aggregate subbase. Where slabs are intended to function as rigid pavements for trucks, a minimum slab thickness of 6 inches may be used for preliminary design purposes. Provisions should be made for proper load transfer across the slab joints that will be subject to vehicular traffic. The thickened edges of slabs adjacent to unpaved areas should be embedded at least 12 inches below the lowest adjacent grade.

In order to reduce the potential for appreciable distress due to differential movements between the heavier footings and the lighter building slab, we recommend using free-floating slabs-on-grade with no structural connections to the wall and column foundations. Joint filler and sealant may be used to fill the openings between the edges of the slab and other structural elements. To further reduce the potential for appreciable distress to the building slabs-on-grade and foundations resulting from water infiltration into the subsurface from areas immediately adjacent to the building foundations, we recommend providing a concrete sidewalk (or pavement) around the perimeter of the new building. Construction joints should be provided at intervals equal to the width of the sidewalk with expansion joints at right-angle intersections.

Based on our experience with expansive soils, minor differential slab movements between the building slab and the abutting sidewalk slabs have been observed on several occasions. We believe this situation may be attributed to the lack of maintenance of the sidewalk subgrade moisture content after the initial subgrade preparation. It should be noted that the moisture content requirement of the clayey subgrades (at least 2 percent above the optimum moisture) is an important requirement considering the expansive nature of the on-site clayey soils. Therefore, the subgrade soils below the sidewalks should be properly moisture-conditioned and kept moist until placement of the select granular fill and concrete. In addition, consideration may be given to structurally

connecting the two abutting slabs with dowels or other structural connections, especially at the entrances to the building and other openings in the walls.

It should be emphasized that the areas adjacent to the slabs should be backfilled tightly against the slab edges with low expansion, relatively impervious soils. These areas also should be graded to divert water away from the slabs and to reduce the potential for water ponding around the slabs and foundations.

### **3.3 Retaining Structures**

Retaining structures may be required for the project construction. Based on the subsurface conditions encountered, the following guidelines may be used for the preliminary design of retaining structures.

#### **3.3.1 Wall Foundations**

In general, we believe the retaining structure foundations may be designed in accordance with the “Shallow Foundations” section herein. Retaining wall foundations should be at least 18 inches wide and the bottom should be embedded a minimum of 24 inches below the lowest adjacent finished grades.

For sloping ground conditions, the footing should extend deeper to obtain a minimum 6-foot setback distance measured horizontally from the outside edge of the footing (base of footing) to the face of the slope. Wall footings oriented parallel to the direction of the slope should be constructed in stepped footings.

#### **3.3.2 Lateral Earth Pressures**

Retaining structures should be designed to resist the lateral earth pressures due to the adjacent soils and surcharge effects. The recommended lateral earth pressures for design of retaining walls, expressed in equivalent fluid pressures of pounds per square foot per foot of depth (pcf), are presented in the following table for retaining wall backfills consisting of on-site clayey soils. These lateral earth pressures do not include hydrostatic pressures that might be caused by groundwater trapped behind the structures.

<b>LATERAL EARTH PRESSURES FOR DESIGN OF RETAINING STRUCTURES</b>			
<b><u>Backfill Condition</u></b>	<b><u>Earth Pressure Component</u></b>	<b><u>Active</u> (pcf)</b>	<b><u>At-Rest</u> (pcf)</b>
Level Backfill	Horizontal	40	60
	Vertical	None	None
Maximum 2H:1V Sloping Backfill	Horizontal	64	81
	Vertical	32	41

We recommend compacting the backfill behind retaining structures to between 90 and 95 percent relative compaction. Over-compaction of the retaining structure backfill should be avoided. The backfill materials should be moisture-conditioned to above the optimum moisture content prior to being utilized as backfill materials.

In general, the at-rest condition should be used for retaining structures where the top of the structure is restrained from movement prior to backfilling of the wall. The active condition should be used only for gravity retaining walls and retaining structures that are free to deflect by as much as 0.5 percent of the wall height.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the retaining structures should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the retaining structure, a rectangular distribution with a uniform pressure equal to 53 percent of the vertical surcharge pressure acting on the entire height of the structure, which is restrained, may be used in the design. For retaining structures that are free to deflect (cantilever), a rectangular distribution equal to 36 percent of the vertical surcharge pressure acting over the entire height of the structure may be used for design.

### 3.3.3 Drainage

Retaining walls should be well-drained to reduce the build-up of hydrostatic pressures. A typical drainage system would consist of a 12-inch wide zone of permeable material, such as open-graded gravel (ASTM C33, No. 67 gradation),



placed directly around a perforated pipe (perforations facing down) at the base of the wall discharging to an appropriate outlet or weepholes. As an alternative, a prefabricated drainage product, such as MiraDrain or EnkaDrain, may be used instead of the drainage material. The prefabricated drainage product also should be connected hydraulically to a perforated pipe at the base of the wall.

Backfill behind the permeable drainage zone may consist of compacted on-site materials or free-draining compacted fills, where specified by the designer. Unless covered by concrete slabs, the upper 12 inches of backfill should consist of low-expansion, relatively impervious materials to reduce the potential for excessive water infiltration behind the walls.

### **3.4 Site Grading**

We understand that the design finished grades of the project have not been set at this time. We anticipate minor cuts and fills may be required to achieve the design finish grade. Items of earthwork that are addressed in the subsequent subsections include the following:

1. Site Preparation
2. Fills and Backfills
3. Fill Placement and Compaction Requirements
4. Excavations
5. Cut and Fill Slopes

#### **3.4.1 Site Preparation**

At the on-set of earthwork, areas within the contract grading limits should be cleared and grubbed thoroughly. Vegetation, debris, deleterious materials, and other unsuitable materials should be removed and disposed of properly to reduce the potential for contaminating the excavated materials to be used as fill materials.

Foundations and slabs of the existing structures to be demolished should be removed. Over-excavations resulting from the demolition operations should be backfilled with compacted fill material. Existing underground utilities to be abandoned should be removed, and the resulting excavation should be properly backfilled with the excavated on-site materials. The on-site materials should be

moisture-conditioned to above the optimum moisture content, placed in 8-inch level loose lifts, and compacted to a minimum of 90 percent relative compaction. Utilities to be abandoned in-place under the proposed structure should be backfilled by pumping lean concrete or Controlled Low Strength Material (CLSM) under low pressure.

After clearing, grubbing, and demolition, the area within the building limits and extending at least 3 feet laterally should be over-excavated, where necessary. Subgrades, including cut areas, areas at grade, or areas designated to receive fills, should be scarified to a minimum depth of about 12 inches, moisture-conditioned to at least 2 percent above the optimum moisture content, and compacted to a minimum of 90 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined in accordance with ASTM D1557. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

Soft and/or loose, weak, yielding areas, or cavities disclosed during site preparation operations should be over-excavated to expose firm ground, and the resulting excavation should be backfilled with general fill materials compacted to a minimum of 90 percent relative compaction. The material resulting from the over-excavation should be removed and disposed of properly or used in landscaping areas, where appropriate.

Where shrinkage cracks are observed after the subgrade compaction, we recommend preparing the subgrade soil again as recommended above. Saturation and subsequent yielding of the exposed subgrade due to inclement weather and poor drainage may require over-excavating the soft areas and replacing these areas with well-compacted fill. The need for over-excavation due to soft subgrade soil conditions should be evaluated in the field.

#### 3.4.2 Fills and Backfills

In general, the excavated on-site materials may be reused as a source of general fill materials provided that deleterious materials such as vegetation and/or organic

matter are removed, and over-sized materials greater than 6 inches in maximum dimension are screened.

Imported general fill materials needed to fill the site may consist of materials with a low to moderate expansion potential. Imported general fill materials should consist of soil materials with a maximum particle size of 3 inches or less with sufficient fines (between 10 and 60 percent particles passing the No. 200 sieve) to prevent the occurrence of voids in the compacted mass. In addition, general fill materials should have a California Bearing Ratio (CBR) value of 8 or greater and a swell of 2 percent or less when tested in accordance with ASTM D1883. It should be noted that the general fill requirements presented herein are intended as guidelines only and may be modified based on additional laboratory testing and field observations on the available fill materials during construction.

Select granular or structural fill materials required for the project construction should consist of non-expansive select granular material, such as crushed basalt. The material should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension and should contain between 10 and 30 percent particles passing the No. 200 sieve. The material should have a laboratory CBR value of 20 or more and should have a maximum swell of 1 percent or less when tested in accordance with ASTM D1883.

Where required, imported fill materials should be tested for conformance with these recommendations prior to delivery to the project site for the intended use. An accredited testing laboratory should test the imported fill materials for conformance with these recommendations prior to delivery to the project site for the intended use.

Aggregate base course and aggregate subbase materials should meet the material requirements for Base Course and Subbase Course as specified in Subsections 703.06 and 703.17, respectively, of the Hawaii Standard Specifications for Road and Bridge Construction (2005). Imported fill materials should be tested for conformance with these recommendations prior to delivery to the project site for the intended use.

### 3.4.3 Fill Placement and Compaction Requirements

General fill materials should be moisture-conditioned to at least 2 percent above the optimum moisture, placed in level lifts of about 8 inches in loose thickness, and compacted to at least 90 percent relative compaction. Select granular fill materials should be moisture-conditioned to above the optimum moisture, placed in level lifts of about 8 inches in loose thickness, and compacted to at least 95 percent relative compaction. Aggregate base course and subbase materials should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 95 percent relative compaction

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with ASTM D1557. Optimum moisture is the water content (percentage by weight) corresponding to the maximum dry density. Compaction should be accomplished by sheepsfoot rollers, vibratory rollers, or other types of acceptable compaction equipment. Water tamping, jetting, or ponding should not be allowed to compact the fills.

### 3.4.4 Excavations

Based on the anticipated grading and our field exploration, excavations will generally be required for the construction of the foundations and installation of the drainage structures and underground utilities. Some of the excavations may encounter boulders within the fill and older alluvium encountered during our field exploration. It is anticipated that most of the materials may be excavated with normal heavy excavation equipment. However, deeper excavations into underlying boulders excavations may require the use of hoerams.

The above discussions regarding the rippability of the subsurface materials are based on field data from the borings drilled at the site. Contractors should be encouraged to examine the site conditions and the subsurface data to make their own reasonable and prudent interpretation.

### 3.4.5 Cut and Fill Slopes

We envision the cut slopes at the project site will generally expose the stiff/dense fill and older alluvium encountered in the drilled borings. In general, cut slopes and permanent fill slopes constructed of the on-site soils may be designed with a slope inclination of two horizontal to one vertical (2H:1V) or flatter. The filling operations should start at the lowest point and continue up in level horizontal compacted layers in accordance with the above general fill placement recommendations.

Fill slopes should be constructed by overfilling and cutting back to the design slope inclination to obtain a well-compacted slope face. Surface water should be diverted away from the tops of slopes, and slope planting should be provided as soon as possible to reduce the potential for erosion of the finished slopes.

### 3.5 Pavement Design

We envision flexible pavement is planned for the project. In general, we anticipate the vehicle loading for the project will consist of primarily passenger vehicles, light pick-up trucks, and buses. For pavements, the flexible pavement design procedure based on the “Guide for the Design of Pavement Structures” (1993) developed by the American Association of State Highway and Transportation Officials (AASHTO) was used in the pavement design.

Based on the results of our field exploration, the pavement subgrades are generally underlain by stiff to hard clays and clayey silts. Based on the low to very high expansive soil conditions, we recommend placing the pavement structural sections on a minimum 36-inch thick layer of non-expansive, select granular fill in lieu of aggregate subbase course. Based on the above assumptions, we recommend using the following flexible pavement sections for preliminary design purposes:

#### Flexible Pavements Subjected to Light Vehicular Traffic and Parking Areas

3.0-Inch Asphaltic Concrete

6.0-Inch Aggregate Base Course (95 Percent Relative Compaction)

9.0-Inch Total Pavement Thickness over 36-Inch Non-Expansive, Select Granular Fill

The pavement subgrade soils should be scarified to a depth of at least 8 inches, moisture-conditioned to at least 2 percent above the optimum moisture content and

compacted to no less than 95 percent relative compaction. Where scarification of the subgrades is not practical, subgrade materials should be proof-rolled with a minimum 10-ton vibratory drum roller for a minimum of eight passes. California Bearing Ratio tests and/or field observations should be performed on the actual subgrade materials during construction to confirm that the above design sections are adequate.

The aggregate base and subbase courses should also be compacted to a minimum of 95 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined in accordance with ASTM D1557. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

Paved areas should be sloped, and drainage gradients should be maintained to carry the surface water off-site. Surface water ponding should not be allowed on-site during or after construction. Where concrete curbs are used to isolate landscaping in or adjacent to the pavement areas, we recommend extending the curbs a minimum of 2 inches into the soils below the aggregate base or subbase course layers to reduce the potential for migration of landscape water into the pavement section. Alternatively, a subdrain system could be constructed to collect excess water from landscaping irrigation. For long-term performance, we recommend constructing a subdrain system adjacent to the paved/landscaped areas.

### **3.6 Underground Utility Lines**

We envision new on-site utility lines (i.e., water, sewer, and drain lines) may be required for the project. We anticipate most of the utility line trenches will be excavated in the compacted fills and/or stiff on-site alluvial soils. In general, we recommend using granular bedding consisting of 6 inches of free-draining granular materials (ASTM C33, No. 67 gradation) below the pipes for uniform support. Free-draining granular materials, such as No. 3B Fine gravel (ASTM C33, No. 67 gradation), also should be used for the initial trench backfill up to about 12 inches above the pipes.

It is critical to use this free-draining material to reduce the potential for the formation of voids below the haunches of the pipes and to provide adequate support for the sides

of the pipes. Improper backfill material around the pipes and improper placement of the backfill could result in backfill settlement and pipe damage.

Where soft and/or loose compressible soils are encountered at or near the invert elevations, we recommend providing a subgrade stabilization layer consisting of 18 to 24 inches of No. 2 Rock (ASTM C33, No. 4 gradation) wrapped in a non-woven filter fabric (Mirafi 180N or equivalent) below the bedding layer for uniform support. The stabilization layer should extend beyond the sides of the pipe a minimum width of one-fourth the outside diameter of the pipe or 12 inches, whichever is greater.

The upper portion of the trench backfill from a level of 12 inches above the pipes to the top of the subgrade or finished grade may consist of the excavated granular materials with a maximum particle size of 6 inches or select granular fill materials. The backfill material should be moisture-conditioned to above the optimum moisture content, placed in maximum 8-inch level loose lifts, and mechanically compacted to at least 90 percent relative compaction. In areas where trenches will be in paved areas, the upper 3 feet of the trench backfill below the pavement finished grade should be compacted to no less than 95 percent relative compaction.

### **3.7 Field Infiltration Testing**

Infiltration testing was conducted at one boring location (Boring No. 8) drilled at the project site to evaluate the infiltration characteristics of the subsurface materials. The test was performed in general accordance with the procedures in Appendix D of the State of Maryland Department of the Environment “Stormwater Design Manual, Volumes I and II” (Rev. 2009). These procedures are consistent with the other states’ procedures and generally may be considered an industry standard.

The field infiltration test was performed by augering the boring to a selected test depth of about 6 feet below the existing ground surface. Upon reaching the test depth, a 4-inch inside diameter PVC solid casing was set to the bottom of the drilled hole to allow infiltration only through the soil exposed at the bottom of the boring. A falling head infiltration test was performed to determine the infiltration rate of the underlying subsurface materials. The test consists of four trials of filling the casing with about 24 inches of water and taking periodic readings over a 1-hour trial period or until the hole

drains completely. The infiltration rates are then calculated based on the results of the fourth and last trial. Results of the final infiltration rate are presented in the table below. Details of our field infiltration test are presented in Appendix E.

<b>SUMMARY OF FIELD INFILTRATION TEST RESULTS</b>			
<b><u>Test Location</u></b>	<b><u>Test Depth</u></b> (feet)	<b><u>Test Elevation</u></b> (feet MSL)	<b><u>Final Infiltration Rate</u></b> (inches/hour)
B-8	6	+93	3.9

Results of the infiltration testing indicated that the infiltration rate measured at the site was 3.9 inches per hour. It should be noted that the infiltration values presented above are the infiltration rates through the subsurface materials exposed at the bottom of the tested borehole and reduces the lateral spreading of the water in the subsurface materials. Due to the potential variability of the subsurface conditions, the absorption capacity of a disposal system should be confirmed by conducting additional infiltration tests during construction, if appropriate.

### **3.8 Drainage**

Finished grades outside the new structures should be sloped to shed water away from the slabs and foundations and to reduce the potential for ponding around the structures. In addition, it is advised to install roof gutter systems around the buildings and to divert the discharge away from the slab and foundation areas. Excessive landscape watering near the slabs and foundations also should be avoided. Planters next to foundations should be avoided or have concrete bottoms and drains to reduce the potential for excessive water infiltration into the subsurface.

These drainage requirements are essential for the proper performance of the above foundation recommendations because ponded water could cause subsurface soil saturation and subsequent heaving or loss of strength. The foundation excavations should be properly backfilled against the walls or slab edges immediately after setting the concrete to reduce the potential for excessive water infiltration into the subsurface. Drainage swales should be provided as soon as possible and should be maintained to drain surface water runoff away from the slabs and foundations.



### **3.9 Additional Field Exploration**

This exploration was conducted on a preliminary basis to obtain an overview of the general subsurface conditions within the OCCC Relocation and Expansion Phase 2 area. The information and preliminary recommendations presented herein are intended to be solely in support of the planning process; and, as such, may not be sufficient nor be appropriate for detailed design of the individual structures and site elements of the project. Therefore, we recommend that additional field exploration be conducted as the design for the individual structures and site elements progresses to allow for the formulation of project-specific recommendations for each structure and element.

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END OF DISCUSSION AND RECOMMENDATIONS

## SECTION 4. LIMITATIONS

The analyses and recommendations submitted herein are based in part upon information obtained from the field borings. Variations of the subsurface conditions between and beyond the field borings may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented herein.

The locations of the field borings indicated in this report were approximate, having been staked out in the field using a hand-held Global Positioning System (GPS). Elevations of the field borings were estimated by interpolation from the spot elevations and contour lines shown on the Topographic Survey Map transmitted by Architects Hawaii Limited on May 26, 2020. The physical locations and elevations of the borings should be considered accurate only to the degree implied by the methods used.

The stratification breaks shown on the graphic representations of the borings depict the approximate boundaries between soil and/or rock types and, as such, may denote a gradual transition. Water level data from the borings were measured at the times shown on the graphic representations and/or presented in the text of this report. These data have been reviewed and interpretations made in the formulation of this report. However, it must be noted that fluctuation may occur due to variation in tides, rainfall, perched groundwater conditions, groundwater withdrawal, and other factors.

This report has been prepared for the exclusive use of Architects Hawaii Limited and their project consultants for specific application to the *Oahu Correctional Community Center (OCCC) Relocation and Expansion Phase 2* project as described herein in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied.

This report has been prepared solely for the purpose of assisting the architects and engineers in the preliminary planning of the project. Therefore, this report may not contain sufficient data, or the proper information, for use to form the basis for preparation of construction cost estimates.

The owner/client should be aware that unanticipated subsurface conditions are commonly encountered. Unforeseen subsurface conditions, such as perched groundwater, soft deposits, hard layers, or cavities, may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

This geotechnical engineering exploration conducted at the project site was not intended to investigate the potential presence of hazardous materials existing at the project site. It should be noted that the equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

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END OF LIMITATIONS

**CLOSURE**

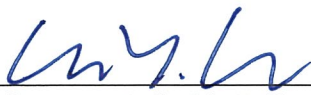
The following plates and appendices are attached and complete this report:

Project Location Map..... Plate 1  
Overall Site Plan ..... Plate 2  
Site Plans ..... Plates 3.1 thru 3.4  
Generalized Geologic Cross-Sections..... Plates 4.1 and 4.2  
Field Exploration ..... Appendix A  
Seismic Shear Wave Velocity Test ..... Appendix B  
Laboratory Tests ..... Appendix C  
Photographs of Core Samples ..... Appendix D  
Infiltration Test Data ..... Appendix E  
Boring Logs from Dames & Moore Report dated August 24, 1987 ..... Appendix F

-ΩΩΩΩΩΩΩΩΩΩ-

Respectfully submitted,

**GEOLABS, INC.**

By   
**Gerald Y. Seki, P.E.**  
Vice President

GS:JS:AT:cj

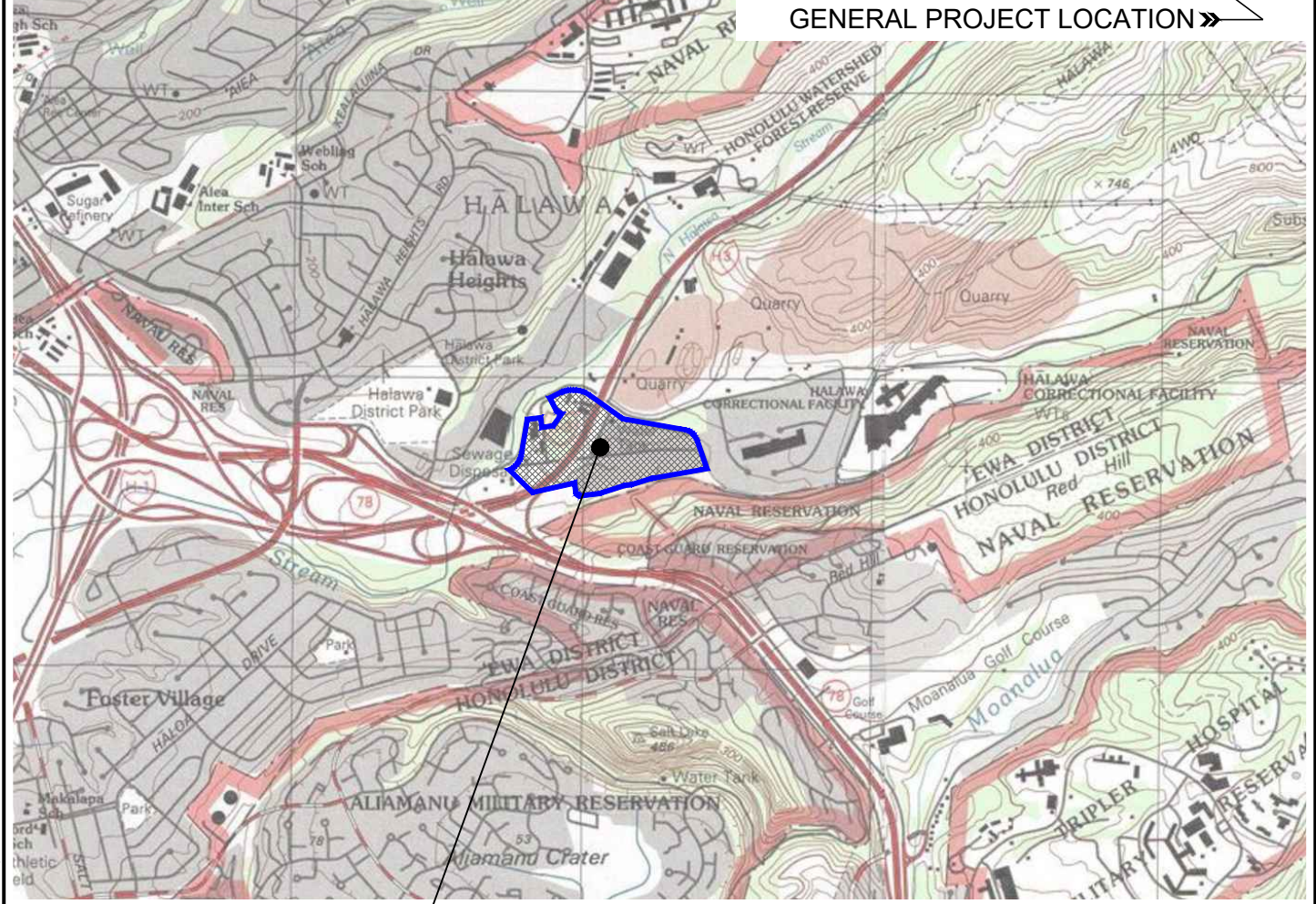
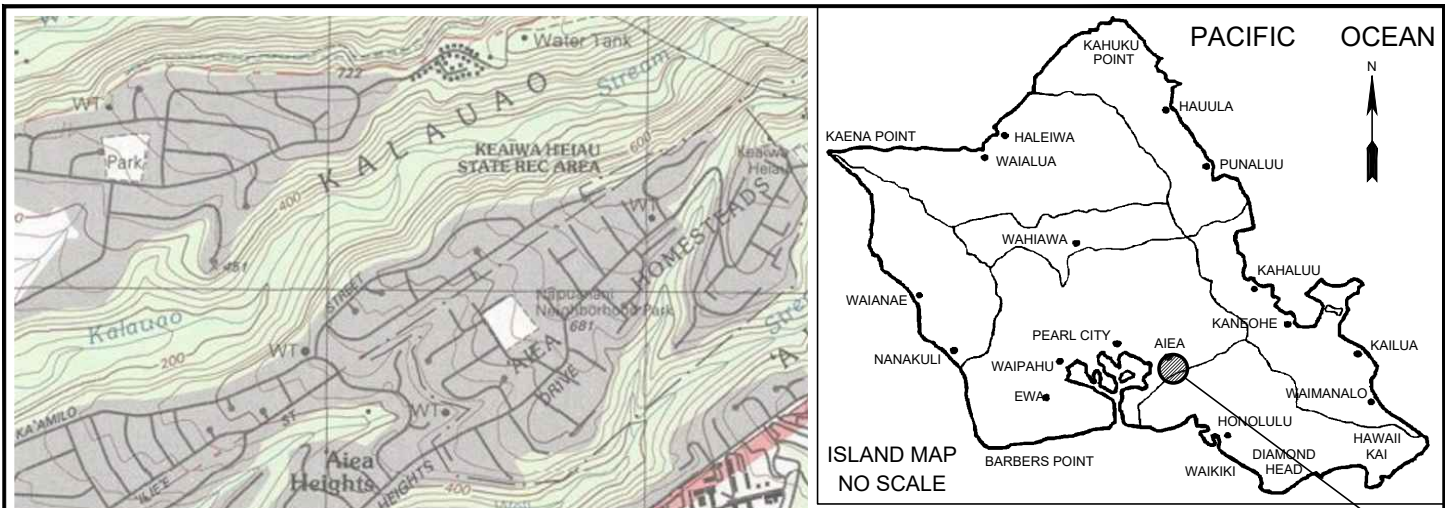
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## PLATES

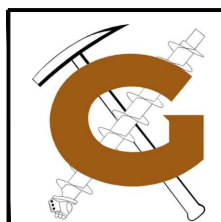
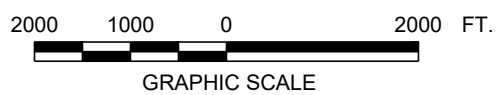
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PROJECT LOCATION

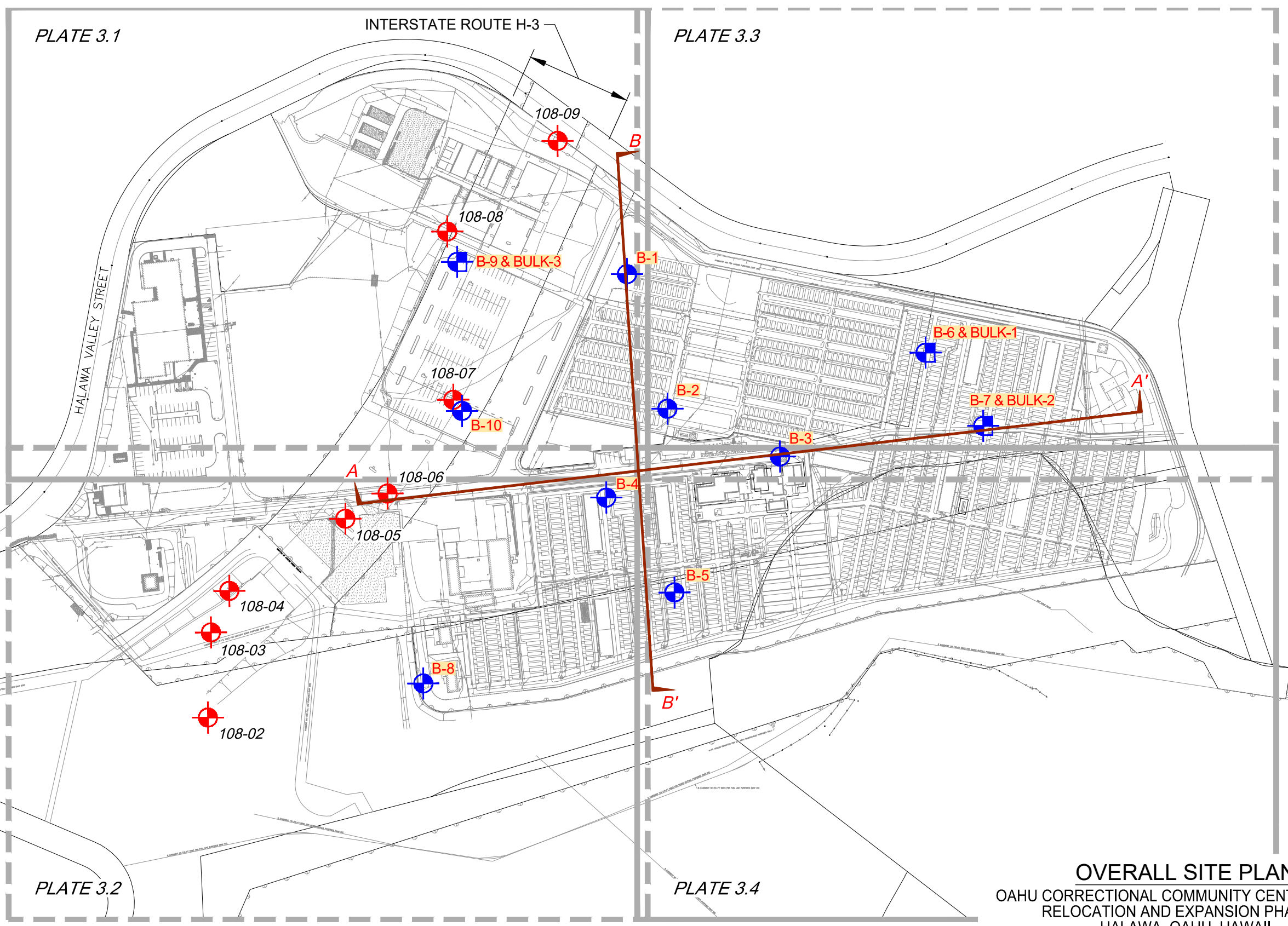
**PROJECT LOCATION MAP**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCC) RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII



<b>GEOLABS, INC.</b>		
<i>Geotechnical Engineering</i>		
DATE	DRAWN BY	PLATE
DECEMBER 2020	HYC	
SCALE	W.O.	1
1" = 2,000'	8052-00	

REFERENCE: MAP CREATED WITH TOPO!® ©2010 NATIONAL GEOGRAPHIC; ©2007 TELE ATLAS, REL. 1/2007.

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**OVERALL SITE PLAN**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII




- LEGEND:**
- APPROXIMATE BORING LOCATION
  - APPROXIMATE BULK SAMPLE LOCATION
  - APPROXIMATE BORING LOCATION (FROM REPORT BY DAMES & MOORE DATED 1987)
  - GENERALIZED GEOLOGIC CROSS-SECTION



			<b>GEOLABS, INC.</b>	
			<i>Geotechnical Engineering</i>	
DATE	DRAWN BY	PLATE		
DECEMBER 2020	HYC			
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1" = 20'	8052-00			

REFERENCE: TOPOGRAPHIC SURVEY MAP TRANSMITTED BY ARCHITECTS HAWAII LIMITED ON MAY 26, 2020.


LEGEND:

-  APPROXIMATE BORING LOCATION
-  APPROXIMATE BULK SAMPLE LOCATION
-  APPROXIMATE BORING LOCATION (FROM REPORT BY DAMES & MOORE DATED 1987)



**SITE PLAN - 1**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII



	<b>GEOLABS, INC.</b> <i>Geotechnical Engineering</i>		
	DATE DECEMBER 2020	DRAWN BY HYC	PLATE
	SCALE 1" = 100'	W.O. 8052-00	<b>3.1</b>

REFERENCE: TOPOGRAPHIC SURVEY MAP TRANSMITTED BY ARCHITECTS HAWAII LIMITED ON MAY 26, 2020.





- LEGEND:**
- APPROXIMATE BORING LOCATION
  - APPROXIMATE BULK SAMPLE LOCATION
  - APPROXIMATE BORING LOCATION (FROM REPORT BY DAMES & MOORE DATED 1987)





**SITE PLAN - 2**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

			<b>GEOLABS, INC.</b>		
			<i>Geotechnical Engineering</i>		
DATE	DRAWN BY	PLATE			
DECEMBER 2020	HYC				
SCALE	W.O.				
1" = 100'	8052-00		<b>3.2</b>		

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REFERENCE: TOPOGRAPHIC SURVEY MAP TRANSMITTED BY ARCHITECTS HAWAII LIMITED ON MAY 26, 2020.

LEGEND:

-  APPROXIMATE BORING LOCATION
-  APPROXIMATE BULK SAMPLE LOCATION





**SITE PLAN - 3**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

	<b>GEOLABS, INC.</b> <i>Geotechnical Engineering</i>	
	DATE DECEMBER 2020	DRAWN BY HYC
	SCALE 1" = 100'	W.O. 8052-00
		PLATE <b>3.3</b>




REFERENCE: TOPOGRAPHIC SURVEY MAP TRANSMITTED BY ARCHITECTS HAWAII LIMITED ON MAY 26, 2020.



- LEGEND:**
-  APPROXIMATE BORING LOCATION
  -  APPROXIMATE BULK SAMPLE LOCATION



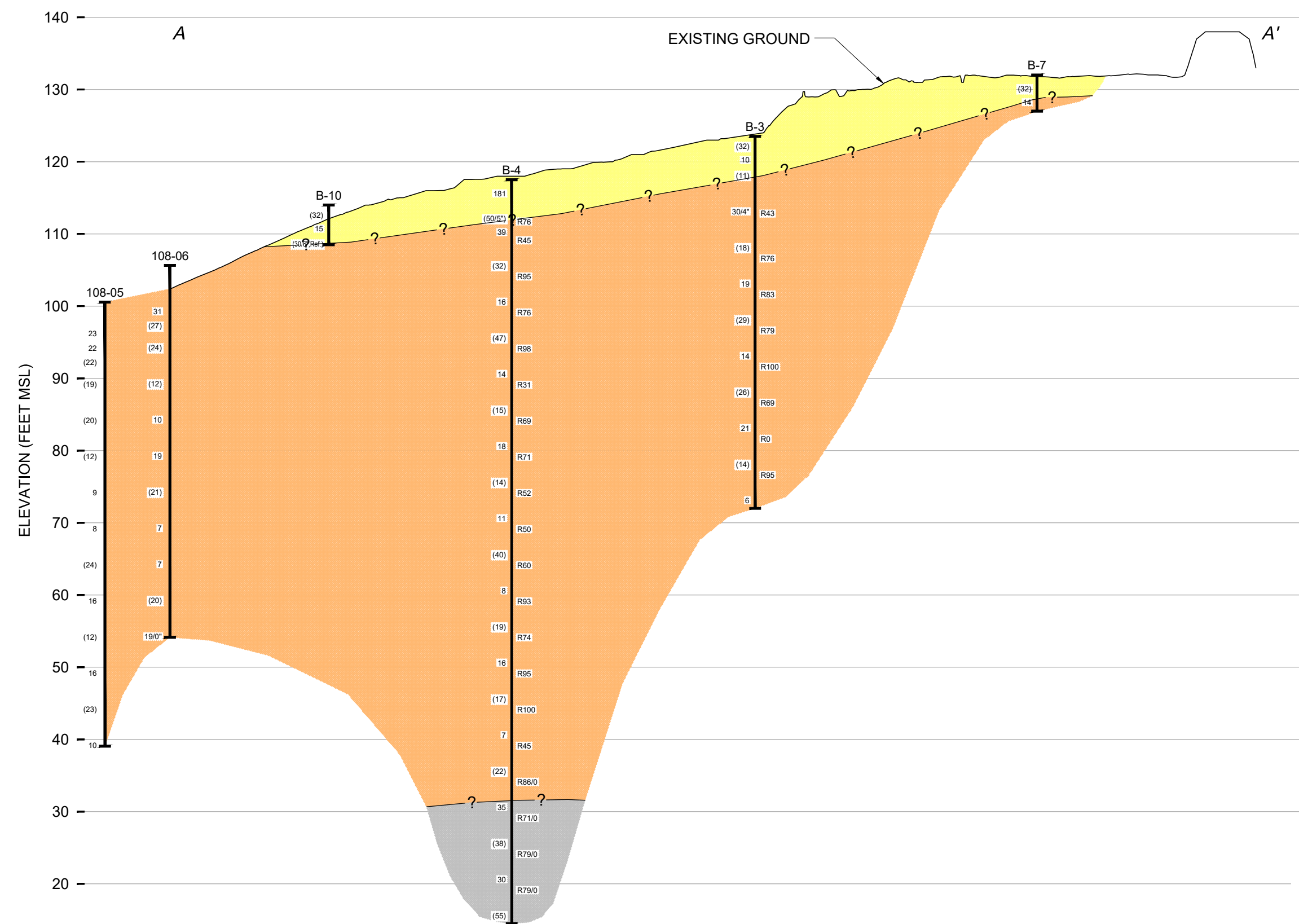
**SITE PLAN - 4**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

	<b>GEOLABS, INC.</b>	
	<i>Geotechnical Engineering</i>	
	DATE DECEMBER 2020	DRAWN BY HYC
SCALE 1" = 100'	W.O. 8052-00	<b>3.4</b>

REFERENCE: TOPOGRAPHIC SURVEY MAP TRANSMITTED BY ARCHITECTS HAWAII LIMITED ON MAY 26, 2020.

CAD User: HENRY File Last Updated: December 17, 2020 1:46:02pm Plot Date: December 17, 2020 - 1:55:01pm  
 File: A:\Drafting\Drafting\Working\8052-00\_OCCC\_Phase2\8052-00SitePlan.dwg\3.4  
 Plotter: DWG To PDF - GEO.pc3 PlotStyle: (PlotEn)Halfsize Pen Settings.ctb

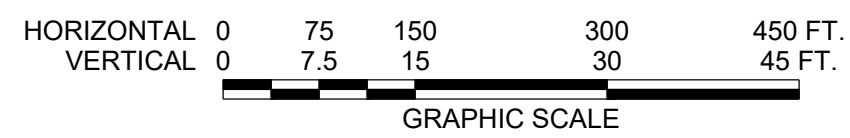
CAD User: HENRY File Last Updated: December 17, 2020 2:01:20pm Plot Date: December 17, 2020 - 2:03:28pm  
 File: A:\Drafting\Working\8052-00\_OCCC\_Phase2\8052-00SubsurfaceProfile.dwg\4.1  
 Plotter: DWG To PDF-Geo.pc3 Plotstyle: GEOLABS-Standard-Half.ctb



**LEGEND:**

- ▼ WATER TABLE MEASURED IN BORING
- 20 BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 2-INCH O.D. STANDARD PENETRATION SAMPLER
- (20) BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 3-INCH O.D. MODIFIED CALIFORNIA SAMPLER
- R100/50 REC/RQD VALUES IN PERCENT
- FILL
- OLDER ALLUVIUM
- BASLT ROCK FORMATION

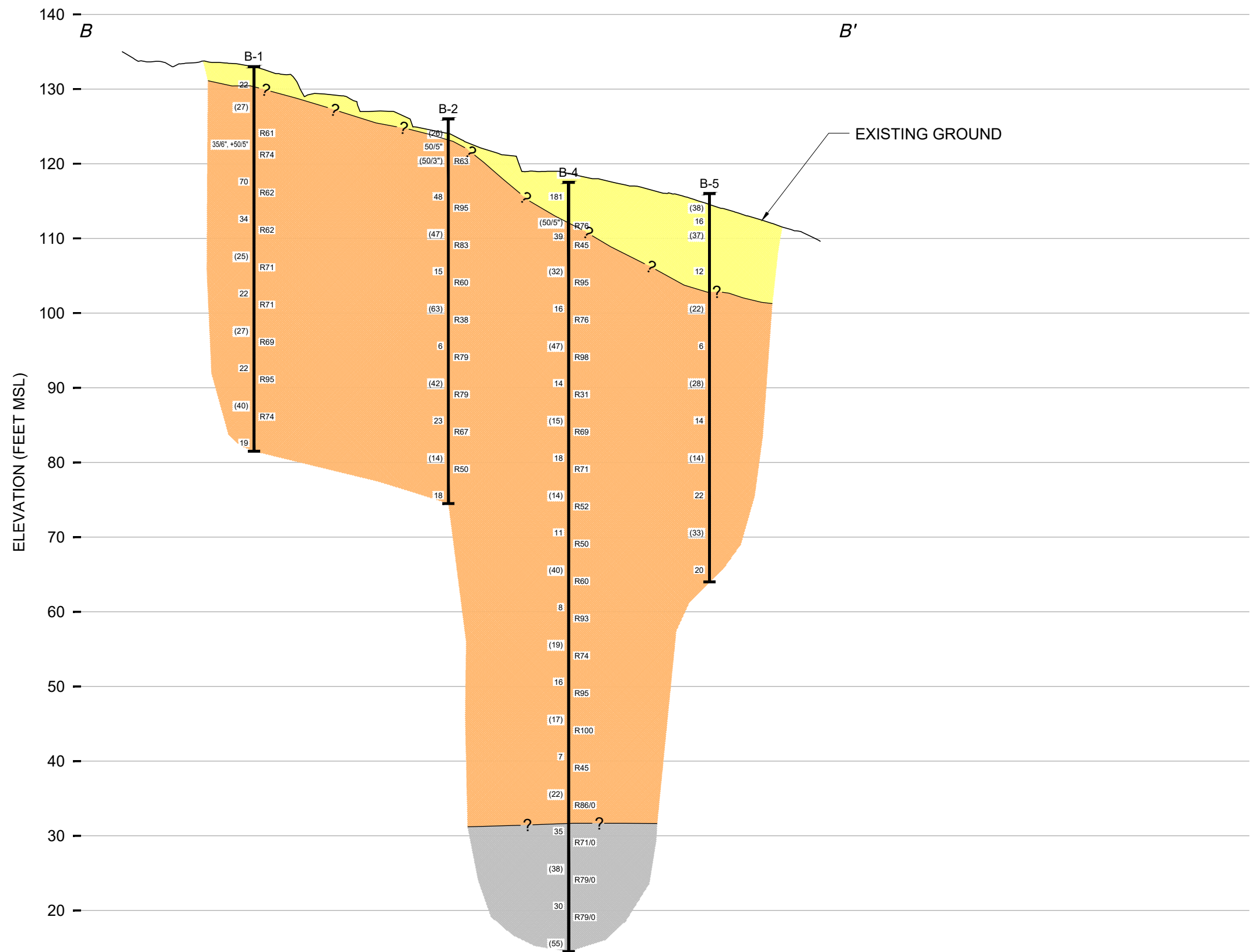
NOTE: THE CONDITIONS ILLUSTRATED ARE BASED ON OUR BORINGS AND GEOLOGICAL INTERPRETATIONS. WHILE THESE ARE BELIEVED TO BE GENERALLY CORRECT, THE CONDITIONS MAY VARY LOCALLY FROM THOSE INDICATED.



**GENERALIZED GEOLOGIC  
 CROSS-SECTION A-A'**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

	<b>GEOLABS, INC.</b>	
	<i>Geotechnical Engineering</i>	
	DATE	DRAWN BY
DECEMBER 2020	HYC	PLATE
SCALE	W.O.	4.1
HORIZ: 1" = 150' VERT: 1" = 15'	8052-00	

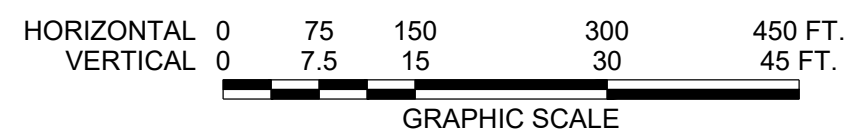
CAD User: HENRY File Last Updated: December 17, 2020 2:01:20pm Plot Date: December 17, 2020 - 2:09:50pm  
 File: A:\Drafting\Working\8052-00\_OCCC\_Phase2\8052-00SubsurfaceProfile.dwg\4.2  
 Plotter: DWG To PDF-Geo.pc3 Plotstyle: GEOLABS-Standard-Half.ctb




**LEGEND:**

- ▼ WATER TABLE MEASURED IN BORING
- 20 BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 2-INCH O.D. STANDARD PENETRATION SAMPLER
- (20) BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 3-INCH O.D. MODIFIED CALIFORNIA SAMPLER
- R100/50 REC/RQD VALUES IN PERCENT
- FILL
- OLDER ALLUVIUM
- BASLT ROCK FORMATION

NOTE: THE CONDITIONS ILLUSTRATED ARE BASED ON OUR BORINGS AND GEOLOGICAL INTERPRETATIONS. WHILE THESE ARE BELIEVED TO BE GENERALLY CORRECT, THE CONDITIONS MAY VARY LOCALLY FROM THOSE INDICATED.



**GENERALIZED GEOLOGIC  
 CROSS-SECTION B-B'**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

			<b>GEOLABS, INC.</b>	
			<i>Geotechnical Engineering</i>	
DATE	DRAWN BY	PLATE		
DECEMBER 2020	HYC			
SCALE	W.O.			
HORIZ: 1" = 150' VERT: 1" = 15'	8052-00			<b>4.2</b>

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## **APPENDIX A**

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## **APPENDIX A**

### Field Exploration

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We explored the subsurface conditions at the project site by drilling and sampling ten borings, designated as Boring Nos. 1 through 10, extending to depths of about 5 to 103 feet below the existing ground surface. The approximate boring locations are shown on the Overall Site Plan, Plate 2, and Site Plans, Plates 3.1 through 3.4. The borings were drilled using a truck-mounted drill rig equipped with continuous flight augers and coring tools.

Our geologists classified the materials encountered in the borings by visual and textural examination in the field in general accordance with ASTM D2488, Standard Practice for Description and Identification of Soils, and monitored the drilling operations on a near-continuous (full-time) basis. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general accordance with ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), as shown on the Soil Log Legend, Plate A-0.1. Deviations made to the soil classification in accordance with ASTM D2487 are described on the Soil Classification Log Key, Plate A-0.2. Graphic representations of the materials encountered are presented on the Logs of Borings, Plates A-1.1 through A-10.

Relatively “undisturbed” soil samples were obtained in general accordance with ASTM D3550, Ring-Lined Barrel Sampling of Soils, by driving a 3-inch OD Modified California sampler with a 140-pound hammer falling 30 inches. In addition, some samples were obtained from the drilled borings in general accordance with ASTM D1586, Penetration Test and Split-Barrel Sampling of Soils, by driving a 2-inch OD standard penetration sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the “Penetration Resistance” on the Logs of Borings at the appropriate sample depths. The penetration resistance shown on the Logs of Borings indicates the number of blows required for the specific sampler type used. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

Pocket penetrometer tests were performed on selected cohesive soil samples in the field. The pocket penetrometer test provides an indication of the unconfined compressive strength of the sample. Results of the pocket penetrometer tests are summarized on the Logs of Borings at the appropriate sample depths.

Core samples of the rock materials encountered at the project site were obtained by using diamond core drilling techniques in general accordance with ASTM D2113, Diamond Core Drilling for Site Investigation. Core drilling is a rotary drilling method that uses a hollow bit to cut into the rock formation. The rock material left in the hollow core of the bit is mechanically recovered for examination and description. Rock cores were described in general accordance with the Rock Description System, as shown on the Rock Log Legend, Plate A-0.3. The Rock Description System is based on the publication

“Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses” by the International Society for Rock Mechanics (March 1977).

Recovery (REC) may be used as a subjective guide to the interpretation of the relative quality of rock masses, where appropriate. Recovery is defined as the actual length of material recovered from a coring attempt versus the length of the core attempt. For example, if 3.7 feet of material is recovered from a 5.0-foot core run, the recovery would be 74 percent and would be shown on the Logs of Borings as REC = 74%.

The Rock Quality Designation (RQD) is also a subjective guide to the relative quality of rock masses. RQD is defined as the percentage of the core run in rock that is sound material in excess of 4 inches in length without any discontinuities, discounting any drilling, mechanical, and handling induced fractures or breaks. If 2.5 feet of sound material is recovered from a 5.0-foot core run in rock, the RQD would be 50 percent and would be shown on the Logs of Borings as RQD = 50%. Generally, the following is used to describe the relative quality of the rock based on the "Practical Handbook of Physical Properties of Rocks and Minerals" by Robert S. Carmichael (1989).

<b><u>Rock Quality</u></b>	<b><u>RQD</u></b> (%)
Very Poor	0 – 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 – 100

The excavation characteristic of a rock mass is a function of the relative hardness of the rock, its relative quality, brittleness, and fissile characteristics. A dense rock formation with a high RQD value would be very difficult to excavate and probably would require more arduous methods of excavation.





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# Soil Log Legend

## UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS	GRAVELS	CLEAN GRAVELS LESS THAN 5% FINES		<b>GW</b> WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES MORE THAN 12% FINES		<b>GP</b> POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				<b>GM</b> SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		SANDS	CLEAN SANDS LESS THAN 5% FINES	
				<b>SP</b> POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SANDS WITH FINES MORE THAN 12% FINES			<b>SM</b> SILTY SANDS, SAND-SILT MIXTURES
				<b>SC</b> CLAYEY SANDS, SAND-CLAY MIXTURES
	FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	
				<b>CL</b> INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				<b>OL</b> ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS		LIQUID LIMIT 50 OR MORE		<b>MH</b> INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				<b>CH</b> INORGANIC CLAYS OF HIGH PLASTICITY
				<b>OH</b> ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				<b>PT</b> PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

### LEGEND

	(2-INCH) O.D. STANDARD PENETRATION TEST	LL	LIQUID LIMIT (NP=NON-PLASTIC)
	(3-INCH) O.D. MODIFIED CALIFORNIA SAMPLE	PI	PLASTICITY INDEX (NP=NON-PLASTIC)
	SHELBY TUBE SAMPLE	TV	TORVANE SHEAR (tsf)
	GRAB SAMPLE	UC	UNCONFINED COMPRESSION OR UNIAXIAL COMPRESSIVE STRENGTH
	CORE SAMPLE	TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION (ksf)
	WATER LEVEL OBSERVED IN BORING AT TIME OF DRILLING		
	WATER LEVEL OBSERVED IN BORING AFTER DRILLING		
	WATER LEVEL OBSERVED IN BORING OVERNIGHT		

Plate

A-0.1



# GEOLABS, INC.

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## Soil Classification Log Key

(with deviations from ASTM D2488)

### GEOLABS, INC. CLASSIFICATION\*

#### GRANULAR SOIL (- #200 <50%)

- **PRIMARY** constituents are composed of the largest percent of the soil mass. Primary constituents are capitalized and bold (i.e., **GRAVEL, SAND**)
- **SECONDARY** constituents are composed of a percentage less than the primary constituent. If the soil mass consists of 12 percent or more fines content, a cohesive constituent is used (**SILTY** or **CLAYEY**); otherwise, a granular constituent is used (**GRAVELLY** or **SANDY**) provided that the secondary constituent consists of 20 percent or more of the soil mass. Secondary constituents are capitalized and bold (i.e., **SANDY GRAVEL, CLAYEY SAND**) and precede the primary constituent.
- **accessory descriptions** compose of the following:
  - with some: >12%
  - with a little: 5 - 12%
  - with traces of: <5%
 accessory descriptions are lower cased and follow the Primary and Secondary Constituents (i.e., **SILTY GRAVEL with a little sand**)

#### COHESIVE SOIL (- #200 ≥50%)

- **PRIMARY** constituents are based on plasticity. Primary constituents are capitalized and bold (i.e., **CLAY, SILT**)
- **SECONDARY** constituents are composed of a percentage less than the primary constituent, but more than 20 percent of the soil mass. Secondary constituents are capitalized and bold (i.e., **SANDY CLAY, SILTY CLAY, CLAYEY SILT**) and precede the primary constituent.
- **accessory descriptions** compose of the following:
  - with some: >12%
  - with a little: 5 - 12%
  - with traces of: <5%
 accessory descriptions are lower cased and follow the Primary and Secondary Constituents (i.e., **SILTY CLAY with some sand**)

**EXAMPLE:** Soil Containing 60% Gravel, 25% Sand, 15% Fines. Described as: **SILTY GRAVEL** with some sand

### RELATIVE DENSITY / CONSISTENCY

Granular Soils			Cohesive Soils			
N-Value (Blows/Foot)		Relative Density	N-Value (Blows/Foot)		PP Readings (tsf)	Consistency
SPT	MCS		SPT	MCS		
0 - 4	0 - 7	Very Loose	0 - 2	0 - 4		Very Soft
4 - 10	7 - 18	Loose	2 - 4	4 - 7	< 0.5	Soft
10 - 30	18 - 55	Medium Dense	4 - 8	7 - 15	0.5 - 1.0	Medium Stiff
30 - 50	55 - 91	Dense	8 - 15	15 - 27	1.0 - 2.0	Stiff
> 50	> 91	Very Dense	15 - 30	27 - 55	2.0 - 4.0	Very Stiff
			> 30	> 55	> 4.0	Hard

### MOISTURE CONTENT DEFINITIONS

Dry: Absence of moisture, dry to the touch

Moist: Damp but no visible water

Wet: Visible free water

### ABBREVIATIONS

WOH: Weight of Hammer

WOR: Weight of Drill Rods

SPT: Standard Penetration Test Split-Spoon Sampler

MCS: Modified California Sampler

PP: Pocket Penetrometer

### GRAIN SIZE DEFINITION

Description	Sieve Number and / or Size
Boulders	> 12 inches (305-mm)
Cobbles	3 to 12 inches (75-mm to 305-mm)
Gravel	3-inch to #4 (75-mm to 4.75-mm)
Coarse Gravel	3-inch to 3/4-inch (75-mm to 19-mm)
Fine Gravel	3/4-inch to #4 (19-mm to 4.75-mm)
Sand	#4 to #200 (4.75-mm to 0.075-mm)
Coarse Sand	#4 to #10 (4.75-mm to 2-mm)
Medium Sand	#10 to #40 (2-mm to 0.425-mm)
Fine Sand	#40 to #200 (0.425-mm to 0.075-mm)

Plate

**A-0.2**

\*Soil descriptions are based on ASTM D2488-09a, Visual-Manual Procedure, with the above modifications by Geolabs, Inc. to the Unified Soil Classification System (USCS).



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# Rock Log Legend

## ROCK DESCRIPTIONS

	<b>BASALT</b>		<b>CONGLOMERATE</b>
	<b>BOULDERS</b>		<b>LIMESTONE</b>
	<b>BRECCIA</b>		<b>SANDSTONE</b>
	<b>CLINKER</b>		<b>SILTSTONE</b>
	<b>COBBLES</b>		<b>TUFF</b>
	<b>CORAL</b>		<b>VOID/CAVITY</b>

## ROCK DESCRIPTION SYSTEM

### ROCK FRACTURE CHARACTERISTICS

The following terms describe general fracture spacing of a rock:

- Massive:** Greater than 24 inches apart
- Slightly Fractured:** 12 to 24 inches apart
- Moderately Fractured:** 6 to 12 inches apart
- Closely Fractured:** 3 to 6 inches apart
- Severely Fractured:** Less than 3 inches apart

### DEGREE OF WEATHERING

The following terms describe the chemical weathering of a rock:

- Unweathered:** Rock shows no sign of discoloration or loss of strength.
- Slightly Weathered:** Slight discoloration inwards from open fractures.
- Moderately Weathered:** Discoloration throughout and noticeably weakened though not able to break by hand.
- Highly Weathered:** Most minerals decomposed with some corestones present in residual soil mass. Can be broken by hand.
- Extremely Weathered:** Saprolite. Mineral residue completely decomposed to soil but fabric and structure preserved.

### HARDNESS

The following terms describe the resistance of a rock to indentation or scratching:

- Very Hard:** Specimen breaks with difficulty after several "pinging" hammer blows.  
Example: Dense, fine grain volcanic rock
- Hard:** Specimen breaks with some difficulty after several hammer blows.  
Example: Vesicular, vugular, coarse-grained rock
- Medium Hard:** Specimen can be broked by one hammer blow. Cannot be scraped by knife. SPT may penetrate by ~25 blows per inch with bounce.  
Example: Porous rock such as clinker, cinder, and coral reef
- Soft:** Can be indented by one hammer blow. Can be scraped or peeled by knife. SPT can penetrate by ~100 blows per foot.  
Example: Weathered rock, chalk-like coral reef
- Very Soft:** Crumbles under hammer blow. Can be peeled and carved by knife. Can be indented by finger pressure.  
Example: Saprolite



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Log of Boring

1

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Approximate Ground Surface Elevation (feet) : 133 *											
LL=77 PI=57	33				22					ML	Brown <b>CLAYEY SILT</b> with some organics, medium stiff, moist (fill)
										GM	Brown and gray <b>SILTY GRAVEL (BASALTIC)</b> , medium dense, moist (fill)
Direct Shear Consol.	26	76			27	4.5	5			CH	Brown with trace gray <b>CLAY</b> , very stiff, moist (older alluvium)
										MH	Brown with some gray <b>CLAYEY SILT</b> with some highly weathered gravel, very stiff, moist (older alluvium)
	20		61		35/6" +50/5"		10				Gray with some brown subrounded <b>GRAVELLY COBBLES (BASALTIC)</b> with some clayey silt, very dense, moist (older alluvium)
			74								grades with small boulders locally
	32				70		15				grades with some sand (basaltic)
Sieve - #200 = 27.2%	50		62		34		20			SM	Mottled brown and gray <b>SILTY SAND (BASALTIC)</b> with some highly weathered gravel, dense, moist (older alluvium)
			62							ML	Brown with some gray <b>SANDY SILT</b> with some highly weathered gravel, stiff, moist (older alluvium)
TXUU S <sub>u</sub> =2.7 ksf	36	84			25	4.0	25			MH	Brown with some gray <b>CLAYEY SILT</b> with traces of highly weathered gravel, very stiff, moist (older alluvium)
	42		71								grades with some sand (basaltic)
			71							CH	Brown and gray with multi-color mottling <b>SILTY CLAY</b> with some highly weathered gravel and sand (basaltic), very stiff, moist (older alluvium)

Date Started: August 10, 2020

Date Completed: August 10, 2020

Logged By: S. Latronic

Total Depth: 51.5 feet

Work Order: 8052-00

Water Level: Not Encountered

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)

Drilling Method: 4" Solid-Stem Auger & PQ Coring

Driving Energy: 140 lb. wt., 30 in. drop

Plate

A - 1.1

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20



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OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

1

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
LL=60 PI=31 Consol. TXUU S <sub>v</sub> =5.3 ksf	44	80			27	4.5	35			CH	grades more sandy and gravelly locally
	50		69		22		40				
TXUU S <sub>v</sub> =10.6 ksf	42	75	95		40	4.0	45				
	50		74		19		50				
Boring terminated at 51.5 feet											* Elevations estimated from Topographic Survey Map transmitted by Architects Hawaii Limited on May 26, 2020.
55											
60											
65											
70											

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 10, 2020	Water Level: ▼ Not Encountered	Plate <b>A - 1.2</b>
Date Completed: August 10, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 51.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

2

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Approximate Ground Surface Elevation (feet) : 126 *											
UC=5.7 ksf	30	83			26	4.5				MH CH	Brown with trace gray <b>CLAYEY SILT</b> with a little gravel (basaltic), stiff, moist (fill) Brownish gray <b>CLAY</b> , stiff, moist (older alluvium)
	26				50/5"						
	20		63		50/3"		5				Gray with some brown subrounded <b>GRAVELLY COBBLES (BASALTIC)</b> with some clayey silt, very dense, moist (older alluvium)
	38				48		10			GM	Gray and brown subrounded <b>SILTY GRAVEL (BASALTIC)</b> with some sand and a little clay, dense, moist (older alluvium)
Consol. TXUU S <sub>u</sub> =2.9 ksf	26	83			47	4.5	15			MH	Mottled brown and gray <b>CLAYEY SILT</b> with some highly weathered gravel, very stiff, moist (older alluvium)
			83								
LL=66 PI=32	42				15		20			MH	Brown with trace orange <b>CLAYEY SILT</b> with a little sand (basaltic), stiff to very stiff, moist (older alluvium)
			60								
LL=59 PI=36 Consol. TXUU S <sub>u</sub> =7.2 ksf	30	91			63	4.5	25			CH	Brown <b>SILTY CLAY</b> , hard, moist (older alluvium)
			38								
LL=69 PI=38	49				6		30			CH	Brown <b>SILTY CLAY</b> with some sand (basaltic), medium stiff, moist (older alluvium)
			79								
											grades with gravel (basaltic)
							35			SM	

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 11, 2020	Water Level:  Not Encountered	Plate <b>A - 2.1</b>
Date Completed: August 11, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 51.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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Log of Boring

2

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
(Continued from previous plate)											
Sieve - #200 = 21.9%	43	79	79		42		35			SM	Mottled brown and gray subrounded <b>SILTY SAND (BASALTIC)</b> with some gravel, medium dense, moist (older alluvium)
	45		67		23		40				
Consol. TXUU S <sub>u</sub> =2.1 ksf	48	73	50		14	1.5	45			ML	Brown <b>CLAYEY SILT</b> with some sand (basaltic), medium stiff, moist (older alluvium)
	58				18		50			SM	Reddish brown <b>SILTY SAND (BASALTIC)</b> with some gravel and remnant vesicular structure, medium dense, moist (older alluvium)
Boring terminated at 51.5 feet											
							55				
							60				
							65				
							70				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 11, 2020	Water Level: ▼ Not Encountered	Plate <b>A - 2.2</b>
Date Completed: August 11, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 51.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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Log of Boring  
**3**

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Approximate Ground Surface Elevation (feet): 123.5 *											
Direct Shear Sieve - #200 = 23.2% LL=105 PI=83	13	72			32		5		GM	3-inch <b>ASPHALTIC CONCRETE</b> Brown with orange mottling <b>SILTY GRAVEL</b> with some sand, medium dense, dry (fill)	
	23				10						
	29	82			11	3.0			CH		Gray <b>CLAY</b> , medium stiff, dry (alluvium)
				43	30/4"		10			grades with boulder	
	44	78		76	18		15		SC	grades to brown with multi-color mottling with some sand and cobbles Brown with multi-color mottling <b>CLAYEY SAND</b> with some gravel, medium dense, moist (alluvium)	
Direct Shear Sieve - #200 = 26.6%	48				19		20				
				83							
LL=71 PI=43	37	88			29		25				
				79							
	46				14		30		CH	Brown <b>SILTY CLAY</b> with some sand, stiff, moist (alluvium)	
			100								
							35				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 12, 2020	Water Level: ▽ Not Encountered	Plate
Date Completed: August 12, 2020		
Logged By: A. Taeb	Drill Rig: CME-75DG1 <i>(Energy Transfer Ratio = 80.3%)</i>	<b>A - 3.1</b>
Total Depth: 51.5 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	





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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

3

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
TXUU $S_u=3.0$ ksf	42	78			26	2.5				CH	(Continued from previous plate)
	38		69		21		40				grades with dark gray mottling, very stiff
Direct Shear Sieve - #200 = 94.3%	48	76	0		14		45			ML	Brown with orange and gray mottling <b>SANDY SILT</b> , medium stiff, moist (alluvium)
	55		95		6		50				Boring terminated at 51.5 feet
							55				
							60				
							65				
							70				

Date Started: August 12, 2020

Date Completed: August 12, 2020

Logged By: A. Taeb

Total Depth: 51.5 feet

Work Order: 8052-00

Water Level:  $\nabla$  Not Encountered

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)

Drilling Method: 4" Solid-Stem Auger & PQ Coring

Driving Energy: 140 lb. wt., 30 in. drop

Plate

A - 3.2



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Log of Boring

4

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Approximate Ground Surface Elevation (feet): 117.5 *											
Sieve - #200 = 11.3%	5				181				MH SP-SM		Reddish brown <b>CLAYEY SILT</b> with a little gravel, stiff, moist (fill)
	12	119	76		50/5"				CH		Light tan with some white <b>SILTY SAND</b> with some gravel and a little cobbles (coralline), very dense, moist (fill)
	36				39						Brown with some gray <b>CLAY</b> with a little gravel (basaltic), very stiff, moist (fill)
			45						MH		Brownish gray subrounded <b>GRAVELLY COBBLES (BASALTIC)</b> with a little clayey silt, dense, moist (older alluvium)
LL=85 PI=56 Consol. TXUU S <sub>u</sub> =1.6 ksf	44	69	95		32	4.5			CH		Brown with some gray <b>CLAY</b> with some highly weathered gravel, very stiff to hard, moist (older alluvium)
LL=66 PI=35	48		76		16				CH		Brown with some gray mottling <b>SILTY CLAY</b> with some highly weathered gravel, very stiff, moist (older alluvium)
LL=65 PI=35 Consol. UC=5.7 ksf	36	86	98		47	4.5			CH		Brown with traces of gray <b>SILTY CLAY</b> , very stiff, moist (older alluvium)
	50				14				CH		Brown <b>SILTY CLAY</b> with some sand and a little rounded gravel (basaltic), stiff, moist (older alluvium)
Consol. TXUU S <sub>u</sub> =2.0 ksf	52	66	69		15	1.3					

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 14, 2020	Water Level:  Not Encountered	Plate <b>A - 4.1</b>
Date Completed: August 17, 2020		
Logged By: S. Latronic	Drill Rig: CME-45CY TRACK	
Total Depth: 103 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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HALAWA, OAHU, HAWAII

Log of Boring

4

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
LL=75 PI=46	48		71		18				CH	grades more gravelly locally, very stiff	
LL=75 PI=45 Consol. TXUU S <sub>u</sub> =2.8 ksf	48	72	52		14	1.3			CH	Brown <b>SILTY CLAY</b> with a little sand (basaltic), medium stiff, moist (older alluvium)	
	50		50		11					grades more sandy locally, stiff	
UC=1.7 ksf	41	79	60		40	4.5				grades with silty clay, very stiff	
			93		8				ML	Brown with some gray <b>CLAYEY SILT</b> with some sand (basaltic) and some highly weathered gravel, stiff, moist (older alluvium)	
	59								MH	Brown with some gray <b>CLAYEY SILT</b> with some gravel (basaltic) and a little cobbles, stiff, moist (older alluvium)	
	49	77	74		19	3.0			CH	Mottled brown with trace gray <b>CLAY</b> , very stiff, moist (older alluvium)	
LL=89 PI=62	39		95		16						

Date Started: August 14, 2020

Date Completed: August 17, 2020

Logged By: S. Latronic

Total Depth: 103 feet

Work Order: 8052-00

Water Level: ▼ Not Encountered

Drill Rig: CME-45CY TRACK

Drilling Method: 4" Solid-Stem Auger & PQ Coring

Driving Energy: 140 lb. wt., 30 in. drop

Plate

A - 4.2

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20



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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

4

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
UC=0.5 ksf	52	71			17	2.5				CH	(Continued from previous plate) grades with highly weathered gravel and clayey silt pockets locally
LL=76 PI=45	55		100		7		75			CH	Brown with some gray <b>SILTY CLAY</b> with some highly weathered cobbles (basaltic) and a little sand, medium stiff, moist (older alluvium)
TXUU S <sub>v</sub> =2.6 ksf	46	77	45		22	1.3	80				grades more sandy and gravelly locally, stiff
	53		86	0	35		85				Gray with brown vesicular <b>BASALT</b> , severely fractured, highly to extremely weathered, soft to medium hard (pahoehoe basalt)
	49	79	71	0	38	4.5	90				
	52		79	0	30		95				grades with very stiff clayey silt pockets widely
	39	84	79	0	55	4.5	100				
											Boring terminated at 103 feet

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 14, 2020	Water Level:  Not Encountered	Plate <b>A - 4.3</b>
Date Completed: August 17, 2020		
Logged By: S. Latronic	Drill Rig: CME-45CY TRACK	
Total Depth: 103 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of  
Boring

5

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Approximate Ground Surface Elevation (feet) : 116 *											
LL=63 PI=41	8	113			38				SM	7-inch <b>CONCRETE</b>	
	21				16				MH	Tan <b>SILTY SAND (CORALLINE)</b> with some gravel, medium dense, moist (fill)	
	19	100			37				CH	Brown with some gray <b>CLAYEY SILT</b> with some gravel (basaltic), stiff to very stiff, moist (fill)	
									CH	Brown <b>CLAY</b> with some gravel (basaltic), stiff, moist (fill)	
LL=71 PI=38	24				12					Brown with some gray <b>SILTY CLAY</b> with some gravel (basaltic) and a little construction debris, very stiff, moist (fill)	
										grades to stiff	
Consol. TXUU S <sub>v</sub> =2.9 ksf	39	77			22				CH	Dark brown <b>SILTY CLAY</b> , stiff to very stiff, moist (older alluvium)	
									MH	Brown with some gray <b>CLAYEY SILT</b> with some gravel (basaltic), stiff, moist (older alluvium)	
LL=75 PI=50	55				6				CH	Brown with some multi-color mottling <b>SILTY CLAY</b> with some sand (basaltic) and a little highly weathered gravel, medium stiff, moist (older alluvium)	
									CH	Brown with some gray <b>SILTY CLAY</b> with some highly weathered gravel, very stiff, moist (older alluvium)	
	43	75			28	2.3				grades to stiff	
	43				14				CH		

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 13, 2020	Water Level: ▼ Not Encountered	Plate <b>A - 5.1</b>
Date Completed: August 13, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 52 feet	Drilling Method: 4" Solid-Stem Auger	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

5

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
TXUU S <sub>u</sub> =2.0 ksf	44	75			14	1.5	15			CH	(Continued from previous plate)
LL=89 PI=59	46				22		40				grades more gravelly locally, very stiff
Consol.	42	79			33	4.0	45				grades more sandy locally
	42				20		50				
Boring terminated at 52 feet											
55											
60											
65											
70											

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 13, 2020	Water Level: ▼ Not Encountered	Plate <b>A - 5.2</b>
Date Completed: August 13, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 52 feet	Drilling Method: 4" Solid-Stem Auger	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

6

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					
Sieve - #200 = 16.5% LL=56 PI=41	17	105			39				Reddish brown <b>CLAYEY SILT</b> with a little gravel, stiff, moist (fill) Light tan <b>SILTY GRAVEL (CORALLINE)</b> with some sand, medium dense, moist (fill) Brown with some gray <b>CLAY</b> with some gravel (basaltic), hard, moist (fill)		
	20				32						
	Boring terminated at 5 feet										
							5				
							10				
							15				
							20				
							25				
							30				
							35				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 13, 2020

Date Completed: August 13, 2020

Logged By: S. Latronic

Total Depth: 5 feet

Work Order: 8052-00

Water Level: Not Encountered

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)

Drilling Method: 4" Solid-Stem Auger

Driving Energy: 140 lb. wt., 30 in. drop

Plate

A - 6



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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

7

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation (feet) : 132 *
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					Description
Sieve - #200 = 36.1% LL=91 PI=71	16	93			32	4.0		MH GM  CH	Reddish brown with trace white <b>CLAYEY SILT</b> with a little gravel (coralline), stiff, moist (fill)		
	22				14				Light tannish white <b>SILTY GRAVEL (CORALLINE)</b> with some sand, medium dense, moist (fill)		
							5			Brownish gray to brown <b>CLAY</b> with a little gravel (basaltic), stiff, moist (older alluvium)	
										Boring terminated at 5 feet	
							10				
							15				
							20				
							25				
							30				
							35				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 13, 2020	Water Level: ▼ Not Encountered	Plate  <b>A - 7</b>
Date Completed: August 13, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 5 feet	Drilling Method: 4" Solid-Stem Auger	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	





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RELOCATION AND EXPANSION PHASE 2  
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Log of Boring

8

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation (feet) : 98.5 *
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					Description
Sieve - #200 = 22.6% LL=60 PI=38	6				65				SM	Light tan with some white <b>SILTY SAND (CORALLINE)</b> with some gravel, very dense, moist (fill)	
	15				34				CH	Brownish gray <b>SILTY CLAY</b> with some gravel (basaltic), hard, moist (fill)  grades more gravelly locally Boring terminated at 6 feet	
							5				
							10				
							15				
							20				
							25				
							30				
							35				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 13, 2020	Water Level: ▼ Not Encountered	Plate  <b>A - 8</b>
Date Completed: August 13, 2020		
Logged By: S. Latronic	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 6 feet	Drilling Method: 4" Solid-Stem Auger	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

9

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Description	
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)						
LL=NP PI=NP	19	86			20	2.0				2-inch <b>ASPHALTIC CONCRETE</b> Brownish gray angular <b>SANDY GRAVEL (BASALTIC)</b> , medium dense, moist (fill) Brown with some gray <b>CLAYEY SILT</b> with some gravel (basaltic), stiff, moist (fill) Orangish brown with some gray <b>SANDY SILT</b> with a little highly weathered gravel, hard, moist (older alluvium) Boring terminated at 5 feet		
	30				70						5	10

Date Started: August 11, 2020

Date Completed: August 11, 2020

Logged By: S. Latronic

Total Depth: 5 feet

Work Order: 8052-00

Water Level: ▼ Not Encountered

Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)

Drilling Method: 4" Solid-Stem Auger

Driving Energy: 140 lb. wt., 30 in. drop

Plate

A - 9



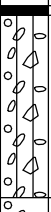
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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Log of Boring

10

Laboratory			Field				Depth (feet)	Sample	Graphic	USCS	Approximate Ground Surface Elevation (feet) : 114 *
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)					Description
Sieve - #200 = 22.2%	15				32		5		GM	3-inch <b>ASPHALTIC CONCRETE</b> Brown with red and gray mottling <b>SILTY GRAVEL</b> with some sand, medium dense, dry (fill) grades with a little clay	
	26				15						GP
	19	82			30/6" Ref.						
							10				
							15				
							20				
							25				
							30				
							35				

BORING LOG 8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 12, 2020	Water Level: ∇ Not Encountered	Plate <b>A - 10</b>
Date Completed: August 12, 2020		
Logged By: A. Taeb	Drill Rig: CME-75DG1 (Energy Transfer Ratio = 80.3%)	
Total Depth: 5.5 feet	Drilling Method: 4" Solid-Stem Auger	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	

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## **APPENDIX B**

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## **APPENDIX B**

### Seismic Shear Wave Velocity Test

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Seismic shear wave velocity profiling of the subsurface materials at the project site was performed using Seismic Cone Penetration Testing (SCPT) equipment. The purpose of the seismic shear wave velocity profiling of the subsurface materials was to more closely analyze the seismic design considerations for the project. Shear wave velocity testing was performed in Boring No. 4. The boring location is shown on the Overall Site Plan, Plate 2, and Site Plan, Plate 3.2.

In order to conduct the shear wave velocity test in the boring, the test boring was advanced utilizing rotary coring methods to the maximum depth of the boring. A log of the materials encountered in the boring is presented on the Logs of Borings in Appendix A. After the boring was advanced to the maximum depth of the borehole, the bored hole was backfilled with 0.25-inch diameter coated bentonite pellets. The temporary casing from the coring operations was used as a tremie pipe to place the bentonite pellets starting from the bottom and advancing upward. When the bentonite pellets are in contact with the groundwater in the borehole, the pellets started to hydrate slowly. As the bentonite pellets hydrate, they swell and soften. The probes were then pushed through the softened bentonite extending to a depth of about 102.7 feet below the existing ground surface.

The cone carries a uniaxial horizontal accelerometer geophone to detect the arrival of a shear wave generated and propagated from the ground surface. The seismic measurements were made when the SCPT had stopped and a shear wave was sent into the subsurface. A shear wave was generated at the surface by striking a loaded plank with a switched hammer. The propagation time of the wave from the hammer blow to the cone was measured at each discrete depth interval. The vector difference of these depths divided by the time difference for the shear wave to arrive at the various depths gave provided the average shear wave velocity over the depth interval.

The shear wave velocities measured in the boring are presented in Appendix B, Plates B-1.1 through B-1.4. The weighted average shear wave velocity calculated for the top 100 feet of the soil profile are on the order of about 1,259 feet per second. The weighted average shear wave velocity was calculated based on the average shear wave velocity method described in accordance with Chapter 20, Site Classification Procedure for Seismic Design contained in ASCE 7-10 (Minimum Design Loads for Buildings and Other Structures).



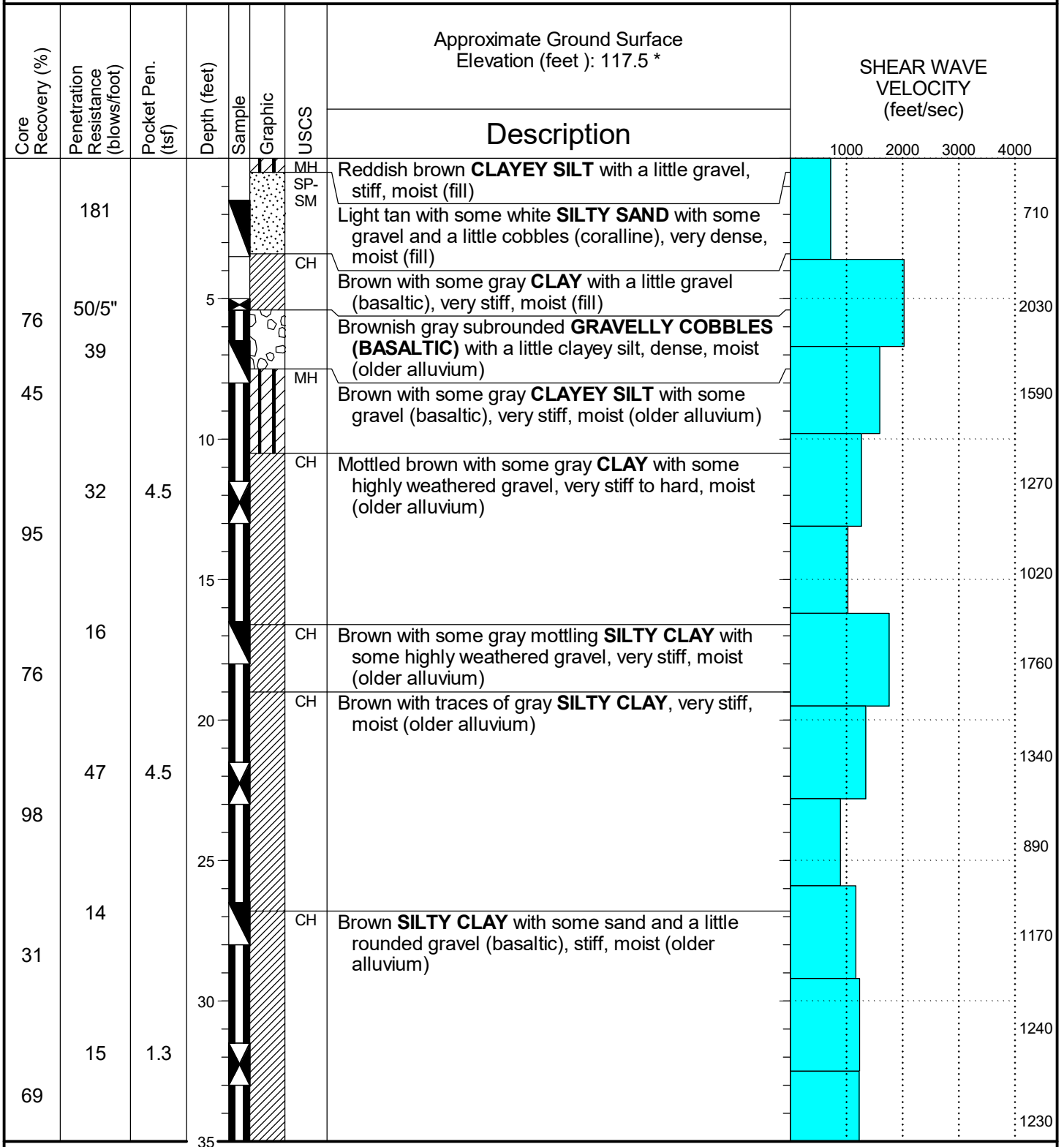
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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Data Plot of  
Boring

4



SHEAR\_WAVE\_PLOT\_8052-00.GPJ\_GEOLABS.GDT\_12/17/20

Date Started: August 14, 2020	Water Level: ▼ Not Encountered	Plate <b>B - 1.1</b>
Date Completed: August 17, 2020		
Logged By: S. Latronic	Drill Rig: CME-45CY TRACK	
Total Depth: 103 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



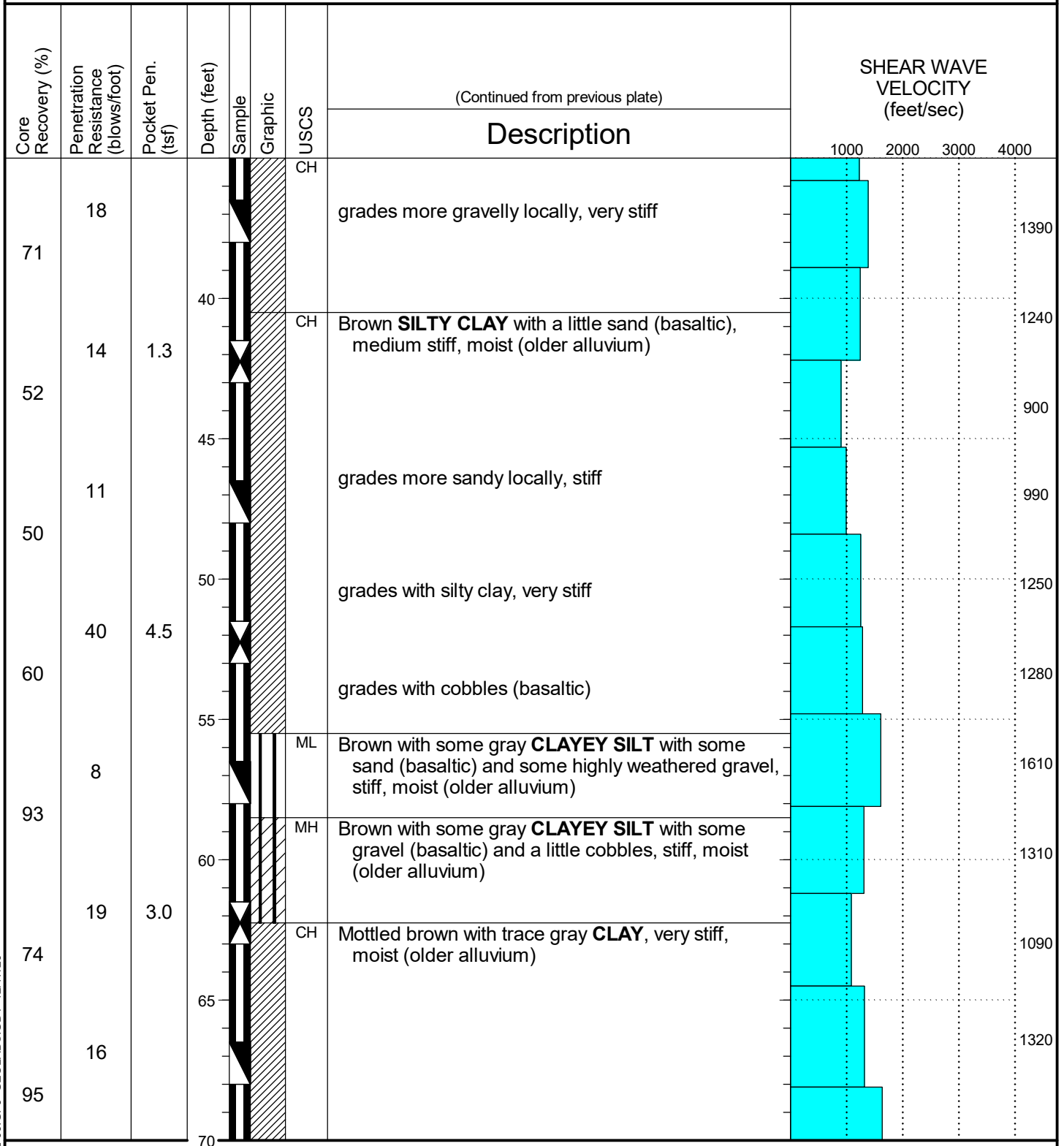
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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Data Plot of  
Boring

4



SHEAR\_WAVE\_PLOT\_8052-00.GPJ\_GEOLABS.GDT\_12/17/20

Date Started: August 14, 2020	Water Level: ▼ Not Encountered	Plate <b>B - 1.2</b>
Date Completed: August 17, 2020		
Logged By: S. Latronic	Drill Rig: CME-45CY TRACK	
Total Depth: 103 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



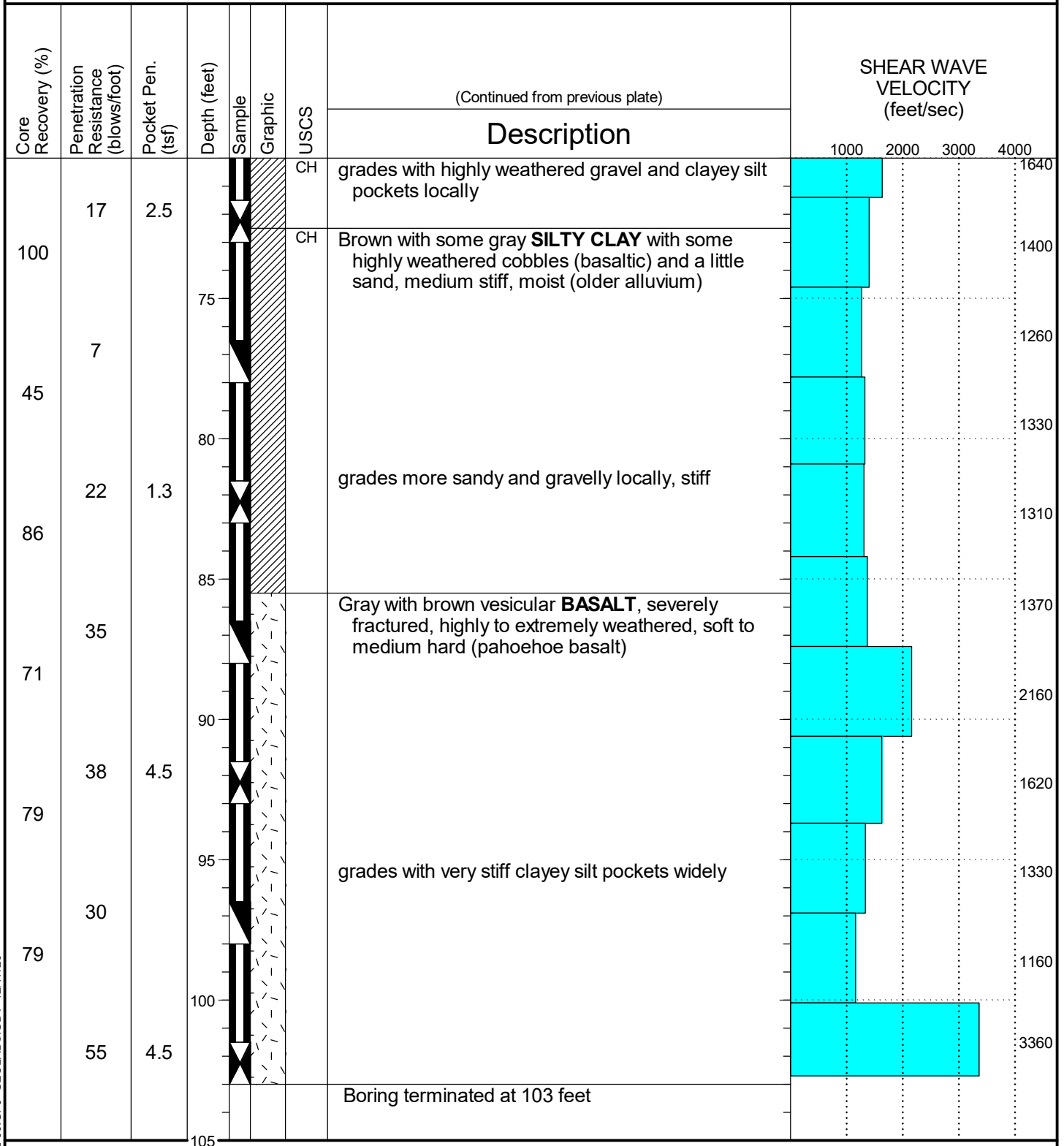
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RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Data Plot of  
Boring

**4**



SHEAR\_WAVE\_PLOT\_8052-00.GPJ GEOLABS.GDT 12/17/20

Date Started: August 14, 2020	Water Level:  Not Encountered	Plate <b>B - 1.3</b>
Date Completed: August 17, 2020		
Logged By: S. Latronic	Drill Rig: CME-45CY TRACK	
Total Depth: 103 feet	Drilling Method: 4" Solid-Stem Auger & PQ Coring	
Work Order: 8052-00	Driving Energy: 140 lb. wt., 30 in. drop	



**SHEAR WAVE VELOCITY TEST RESULTS**

Oahu Correctional Community Center (OCCC)  
Relocation and Expansion Phase 2  
Halawa, Oahu, Hawaii

<b>B-4</b>				
Depth (From)	Depth (To)	Layer Thickness ( $d_i$ )	Estimated Shear Wave Velocity ( $V_{si}$ )	Average Travel Time ( $d_i/V_{si}$ )
(feet)	(feet)	(feet)	(feet/second)	(milliseconds)
0.0	3.6	3.6	714	5.05
3.6	6.7	3.1	2,028	1.54
6.7	9.8	3.1	1,589	1.96
9.8	13.1	3.3	1,265	2.59
13.1	16.2	3.1	1,022	3.05
16.2	19.5	3.3	1,757	1.87
19.5	22.8	3.3	1,342	2.44
22.8	25.9	3.1	888	3.51
25.9	29.2	3.3	1,166	2.81
29.2	32.5	3.3	1,237	2.65
32.5	35.8	3.3	1,225	2.68
35.8	38.9	3.1	1,386	2.25
38.9	42.2	3.3	1,243	2.64
42.2	45.3	3.1	903	3.45
45.3	48.4	3.1	990	3.15
48.4	51.7	3.3	1,246	2.63
51.7	54.8	3.1	1,282	2.43
54.8	58.1	3.3	1,610	2.04
58.1	61.2	3.1	1,305	2.39
61.2	64.5	3.3	1,087	3.02
64.5	68.1	3.6	1,318	2.74
68.1	71.4	3.3	1,636	2.01
71.4	74.6	3.3	1,399	2.35
74.6	77.8	3.1	1,264	2.47
77.8	80.9	3.1	1,329	2.35
80.9	84.2	3.3	1,310	2.50
84.2	87.4	3.3	1,370	2.39
87.4	90.6	3.1	2,161	1.44
90.6	93.7	3.1	1,621	1.92
93.7	96.9	3.3	1,332	2.46
96.9	100.1	3.1	1,157	2.69
100.1	102.7	2.6	3,361	0.78
TOTAL		102.7		80.26
Standard Weighted Average			1,378	feet/second
Computed $V_{s100}$ Using IBC Formula			1,259	feet/second

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## **APPENDIX C**

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## **APPENDIX C**

### Laboratory Tests

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Moisture Content (ASTM D2216) and Unit Weight (ASTM D2937) determinations were performed on selected soil samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings at the appropriate sample depths.

Eight one-inch Ring Swell tests were performed on relatively undisturbed or remolded samples to evaluate the swelling potential of the near-surface soils. The test results are summarized on Plate C-1.

Twenty-two Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits to aid in soil classifications. The test results are summarized on the Logs of Borings at the appropriate sample depths. Graphic presentations of the test results are provided on Plates C-2 through C-4.

Ten Grain Size Distribution tests (ASTM D6913) were performed on selected soil samples to evaluate the gradation characteristics of the soils and to aid in soil classification. Graphic presentations of the grain size distributions are provided on Plates C-5 and C-6.

Four Direct Shear tests (ASTM D3080) were performed on a selected samples to evaluate the shear strength characteristics of the material tested. The test results are presented on Plates C-7 through C-10.

Eleven Consolidation tests (ASTM D2435) were performed on samples of the potentially compressible soils to evaluate the compressibility characteristics of the materials encountered. Results of the consolidation tests are presented on Plates C-11 through C-21.

Four Unconfined Compression tests (ASTM D2166) were performed on selected in-situ samples to evaluate the unconfined compressive strength of the on-site clayey soils. The test results are shown on the Logs of Borings at the appropriate sample depths. Individual stress-strain curves of the unconfined compression tests are presented on Plates C-22 through C-25.

Thirteen Unconsolidated Undrained Triaxial Compression tests (ASTM D2850) were performed on selected soil samples to evaluate the undrained shear strength of the in-situ soils. The approximate in-situ effective overburden pressure was used as the applied confining pressure for the relatively "undisturbed" soil sample. The test results and the stress-strain curves are presented on Plates C-26 through C-38.

Three Modified Proctor compaction tests (ASTM D1557, Method C) were performed on selected bulk soil samples to evaluate the relationship between the moisture content and the dry density of the near-surface soils. The test results are presented on Plates C-39 through C-41.

Appendix C  
Laboratory Tests

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Three laboratory California Bearing Ratio tests (ASTM D1883) were performed on selected bulk soil samples to evaluate the pavement support characteristics of the soils. The test results are presented on Plates C-42 through C-44.

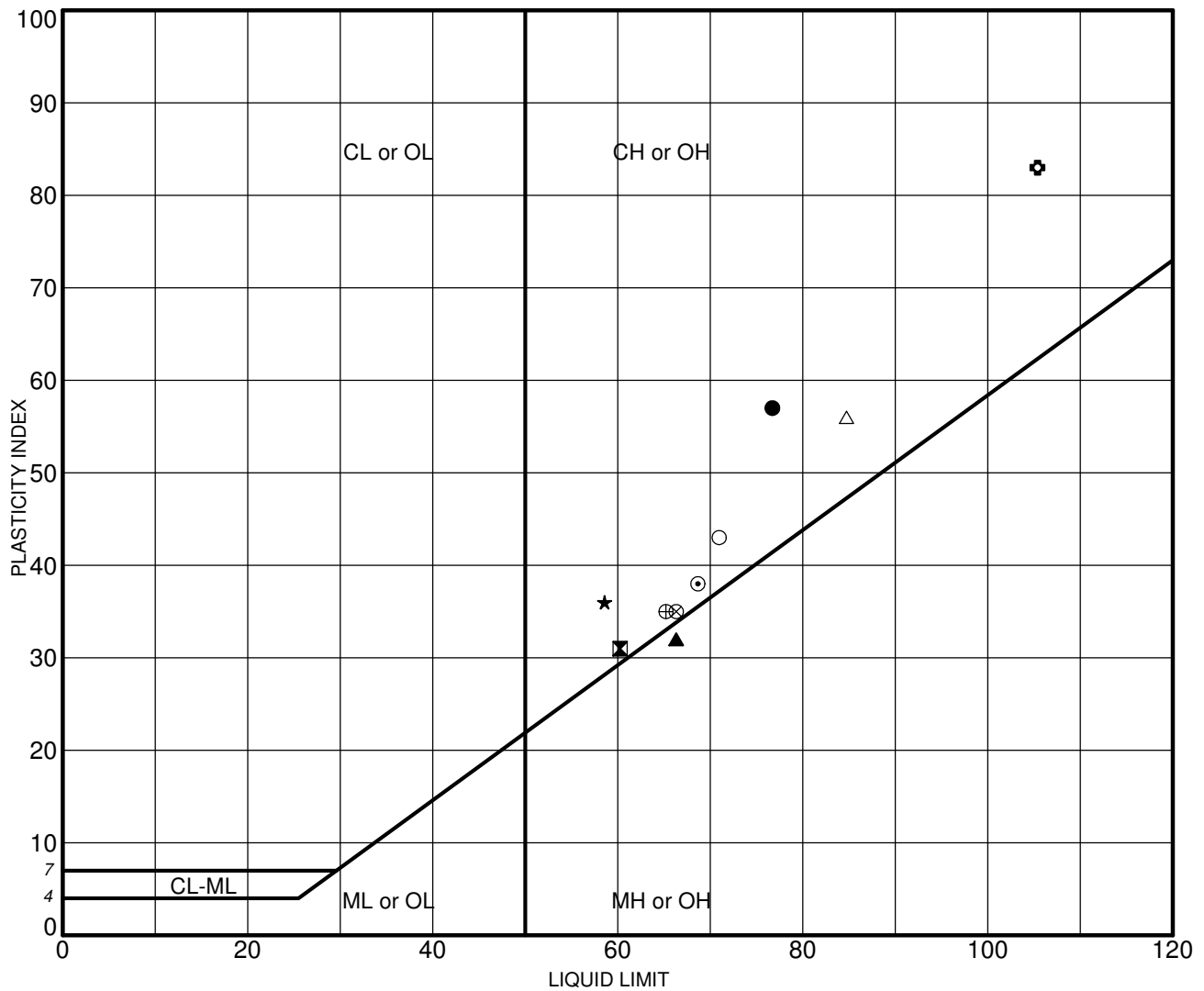
Location	Depth (feet)	Soil Description	Dry Density (pcf)	Moisture Contents			Ring Swell (%)
				Initial (%)	Air-Dried (%)	Final (%)	
B-1**	2.0 - 4.0	Brown with trace gray clay (CH)	93.7	28.3	22.6	33.7	7.1
B-1*	5.0 - 6.5	Brown with some gray clayey silt with some highly weathered gravel	68.3	66.2	60.1	42.4	3.9
B-2*	1.5 - 3.0	Brownish gray clay	82.9	31.3	26.2	51.8	15.1
B-2**	1.5 - 3.0	Brownish gray clay	78.3	27.5	22.3	62.0	30.1
B-4*	1.5 - 3.5	Light tan with some white silty sand (SP-SM) with some gravel	99.9	20.9	15.5	32.7	0.0
B-5*	5.0 - 6.5	Brown with some gray silty clay with some gravel	79.2	10.6	6.8	30.4	5.8
B-6**	3.0 - 5.0	Brown with some gray clay (CH) with some gravel	91.7	26.1	19.6	32.2	1.6
B-9**	1.5 - 3.0	Brown with some gray clayey silt with some gravel	94.7	19.2	13.8	32.4	6.6

NOTE: Samples tested were either relatively undisturbed or remolded in 2.4-inch diameter by 1-inch high rings. They were air-dried overnight and then saturated for 24 hours under a surcharge pressure of 55 psf.

- \* Relatively Undisturbed
- \*\* Remolded

G. RING SWELL TEST 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b>	<b>SUMMARY OF RING SWELL TESTS</b>	
	GEOTECHNICAL ENGINEERING	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	Plate <b>C - 1</b>
	W.O. 8052-00		



	Sample	Depth (ft)	LL	PL	PI	Description
●	B-1	2.0-4.0	77	20	57	Brown with trace gray clay (CH)
⊠	B-1	35.0-36.5	60	29	31	Brownish gray silty clay (CH) with some highly weathered gravel
▲	B-2	20.0-21.5	66	34	32	Brown with trace orange clayey silt (MH) with a little sand
★	B-2	25.0-26.5	59	23	36	Brown silty clay (CH) with a traces of sand
⊙	B-2	30.0-31.5	69	31	38	Brown silty clay (CH) with some sand
⊕	B-3	5.0-6.5	105	22	83	Gray clay (CH)
○	B-3	30.0-31.5	71	28	43	Brown silty clay (CH) with some sand
△	B-4	11.5-13.0	85	29	56	Mottled brown with some gray clay (CH)
⊗	B-4	16.5-18.0	66	31	35	Brown with some gray mottling silty clay (CH)
⊕	B-4	21.5-23.0	65	30	35	Brown with traces of gray silty clay (CH)

NP = NON-PLASTIC

G. ATTERBERG PL-100 LL-120 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

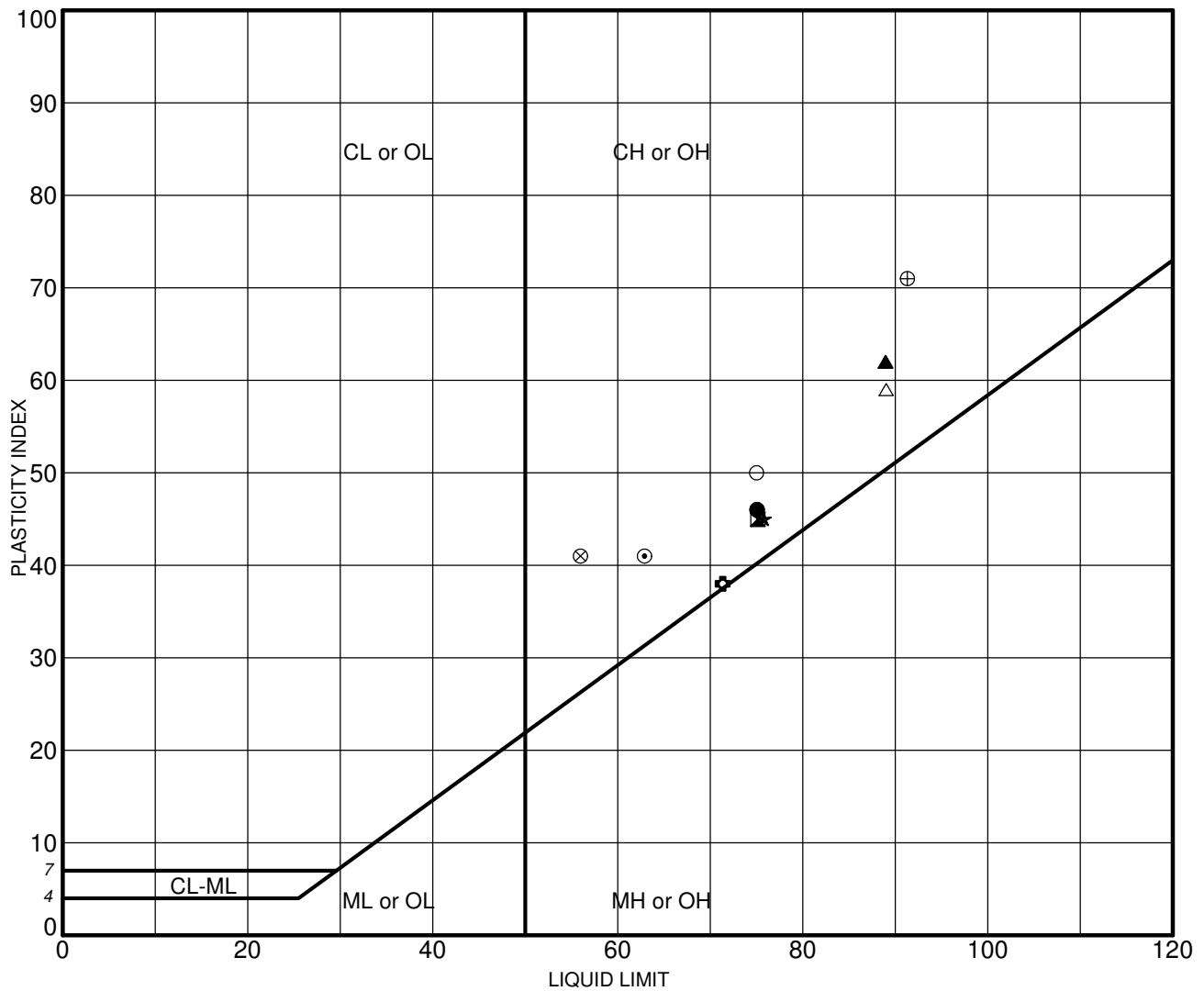
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**ATTERBERG LIMITS TEST RESULTS - ASTM D4318**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Plate  
**C - 2**



	Sample	Depth (ft)	LL	PL	PI	Description
●	B-4	36.5-38.0	75	29	46	Brown silty clay (CH) with some sand
⊠	B-4	41.5-43.0	75	30	45	Brown silty clay (CH) with a little sand
▲	B-4	66.5-68.0	89	27	62	Mottled brown with trace gray clay (CH)
★	B-4	76.5-78.0	76	31	45	Brown with some gray silty clay (CH) with a little sand
⊙	B-5	10.0-12.0	63	22	41	Brown with some gray silty clay (CH)
⊕	B-5	20.0-22.0	71	33	38	Brown with some multi-color mottling silty clay (CH) with some sand
○	B-5	30.0-32.0	75	25	50	Brown with some gray silty clay (CH) with some decomposed gravel
△	B-5	40.0-41.5	89	30	59	Brown with some gray mottling silty clay (CH)
⊗	B-6	3.0-5.0	56	15	41	Brown with some gray clay (CH) with some gravel
⊕	B-7	3.0-5.0	91	20	71	Brownish gray to brown clay (CH) with a little gravel

NP = NON-PLASTIC

G. ATTERBERG PL-100 LL-120 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

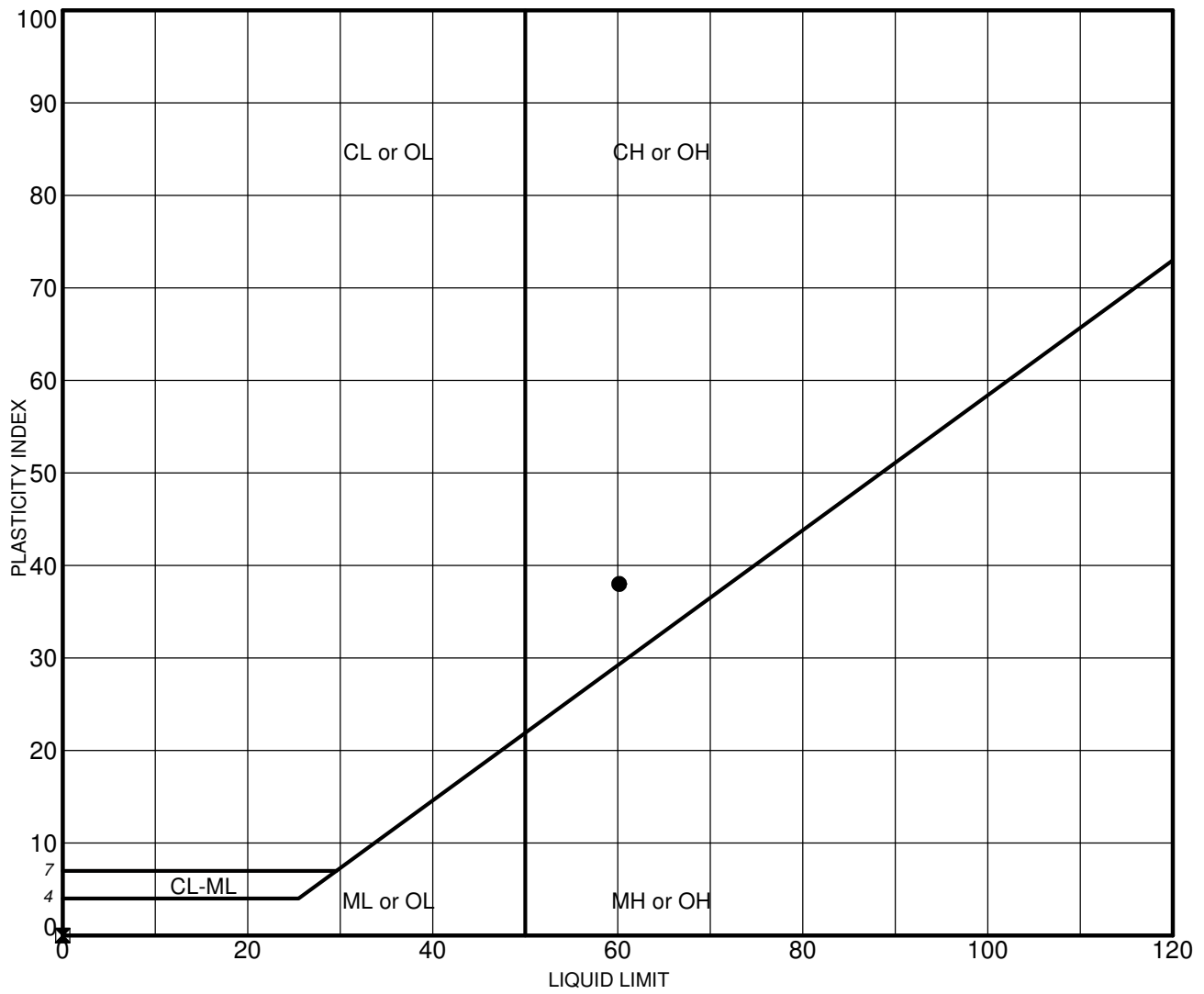
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**ATTERBERG LIMITS TEST RESULTS - ASTM D4318**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

Plate  
**C - 3**



	Sample	Depth (ft)	LL	PL	PI	Description
●	B-8	4.0-6.0	60	22	38	Brownish gray silty clay (CH) with some gravel
☒	B-9	3.0-5.0	NP	NP	NP	Brown with some gray sandy silt (NP) with a little gravel

NP = NON-PLASTIC

G. ATTERBERG PL-100 LL-120 8052-00.GPJ GEOLABS.GDT 12/17/20

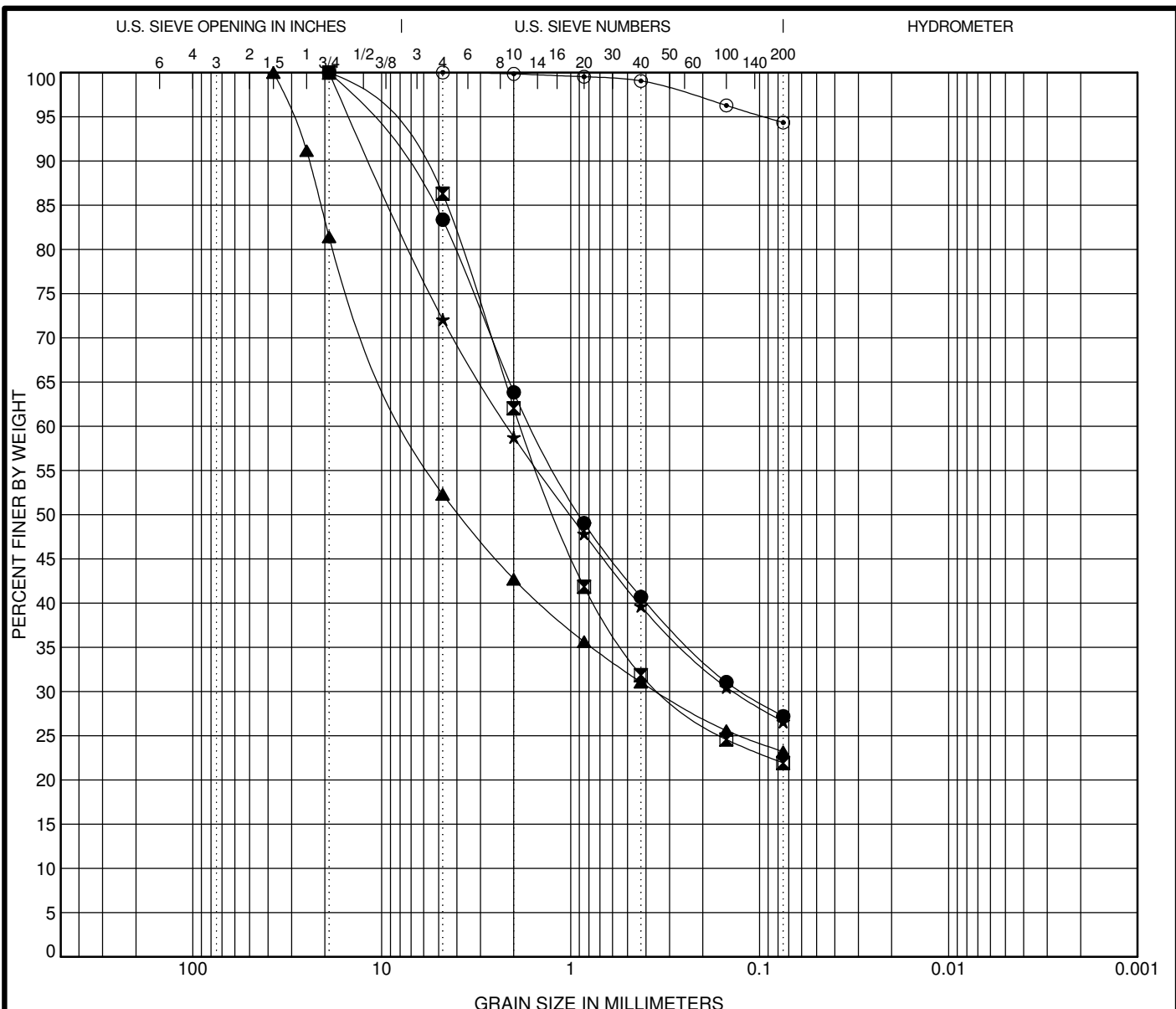


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 W.O. 8052-00

**ATTERBERG LIMITS TEST RESULTS - ASTM D4318**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	Plate <b>C - 4</b>
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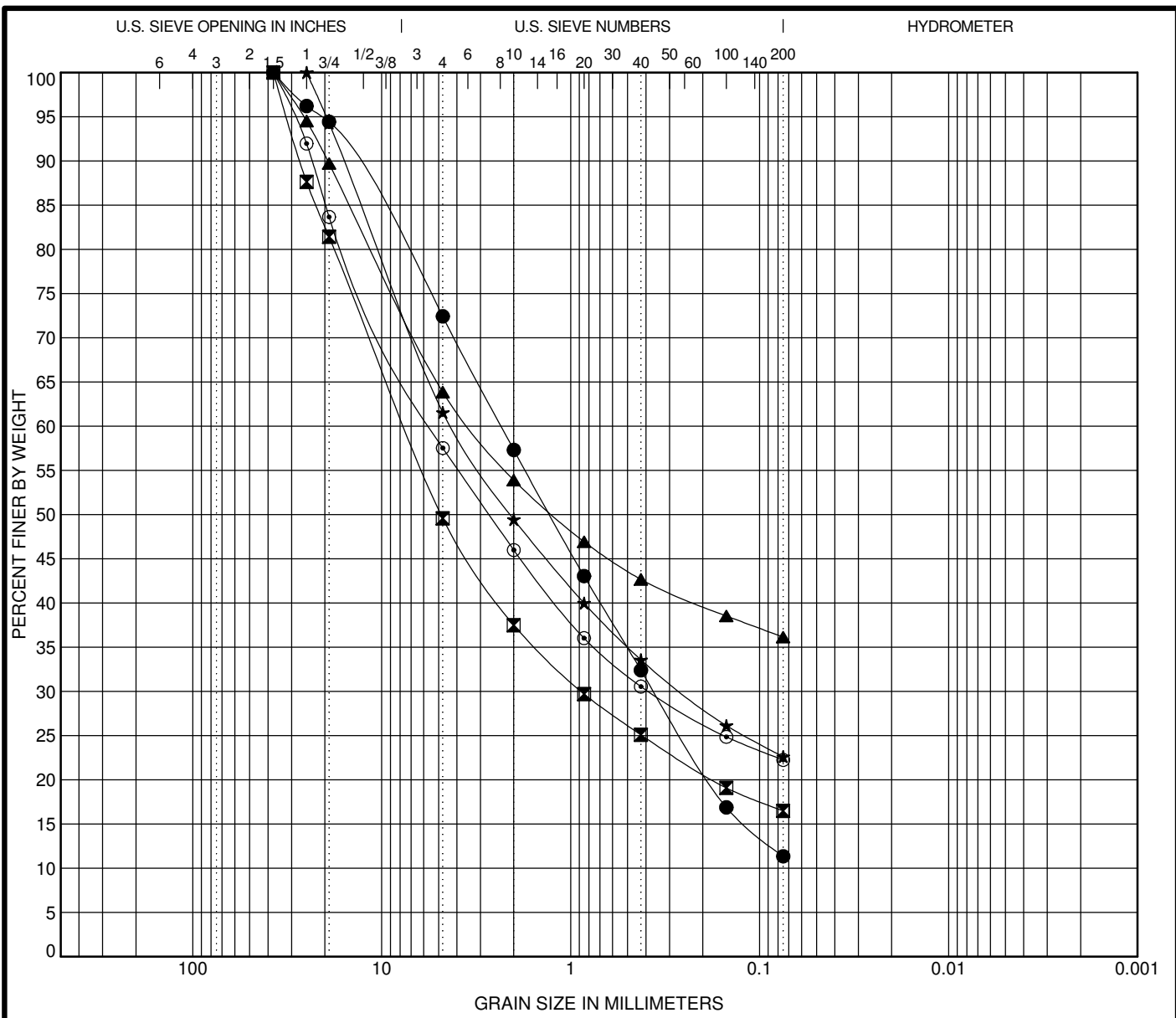
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	B-1	20.0-21.5					
☒	B-2	35.0-36.5					
▲	B-3	1.0-2.5					
★	B-3	15.0-16.5					
◎	B-3	45.0-46.5					

Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
●	B-1	20.0-21.5	19	1.603	0.124	16.6	56.2	27.2
☒	B-2	35.0-36.5	19	1.835	0.326	13.7	64.4	21.9
▲	B-3	1.0-2.5	37.5	6.855	0.348	47.7	29.1	23.2
★	B-3	15.0-16.5	19	2.169	0.138	27.9	45.5	26.6
◎	B-3	45.0-46.5	4.75			0.0	5.7	94.3

G. GRAIN SIZE MOD 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b>	<b>GRAIN SIZE DISTRIBUTION - ASTM D6913</b>	
	GEOTECHNICAL ENGINEERING	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
	W.O. 8052-00	Plate <b>C - 5</b>	

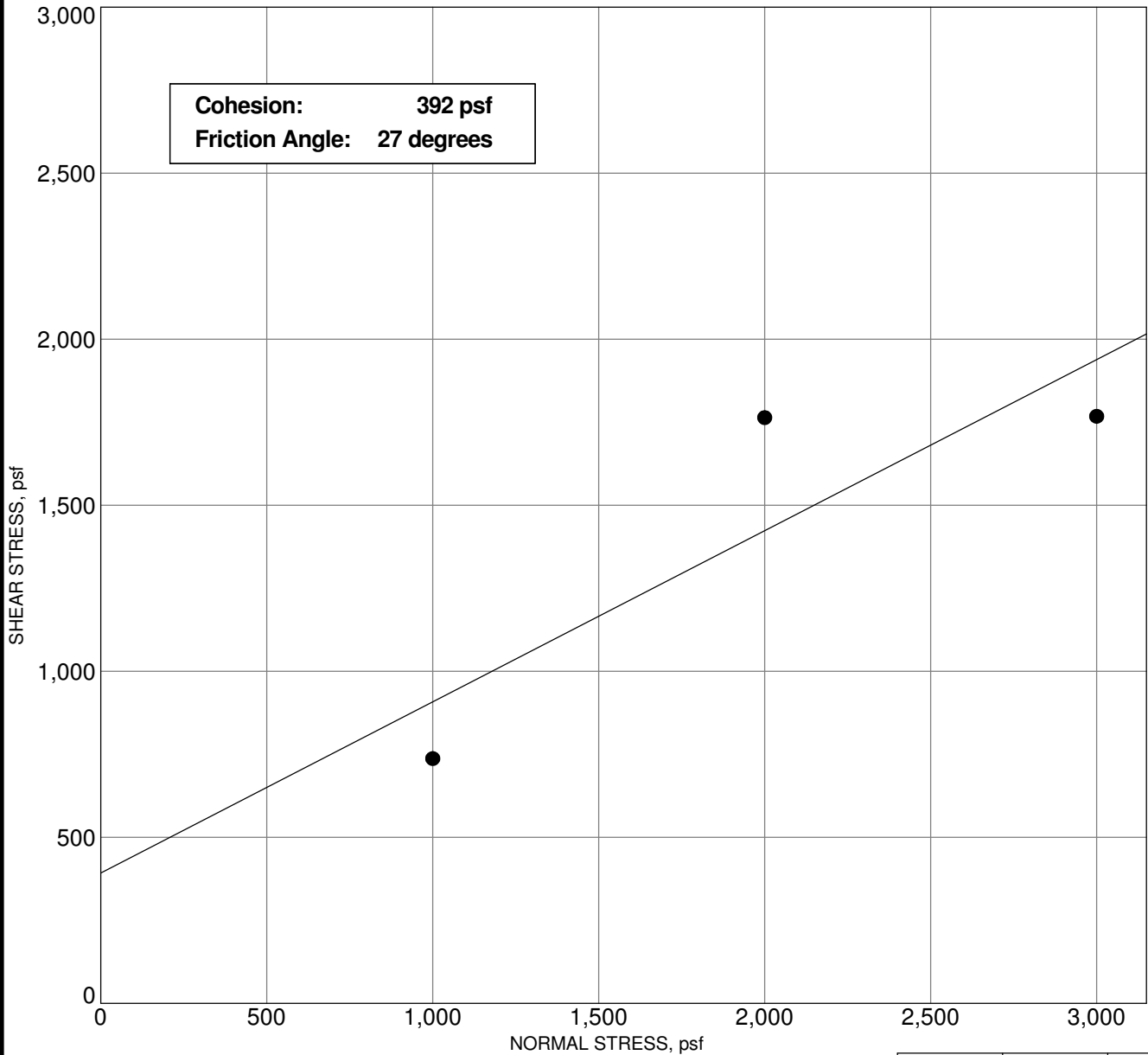


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample	Depth (ft)	Description	LL	PL	PI	Cc	Cu	
● B-4	1.5-3.5	Light tan with some white silty sand (SP-SM) with some gravel				0.9	36.8	
⊠ B-6	1.5-3.0	Light tan silty gravel (GM) with some sand						
▲ B-7	1.5-3.0	Light tannish white silty gravel (GM) with some sand						
★ B-8	1.5-3.5	Light tan with some white silty sand (SM) with some gravel						
⊙ B-10	1.5-2.5	Brown with red and gray mottling silty gravel (GM) with some sand						
Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
● B-4	1.5-3.5	37.5	2.334	0.362		27.6	61.1	11.3
⊠ B-6	1.5-3.0	37.5	7.481	0.878		50.4	33.1	16.5
▲ B-7	1.5-3.0	37.5	3.402			36.2	27.7	36.1
★ B-8	1.5-3.5	25	4.252	0.258		38.5	38.9	22.6
⊙ B-10	1.5-2.5	37.5	5.417	0.385		42.5	35.3	22.2

G. GRAIN SIZE MOD 8052-00.GPJ. GEOLABS.GDT. 12/17/20

	<b>GEOLABS, INC.</b>		<b>GRAIN SIZE DISTRIBUTION - ASTM D6913</b>	
	GEOTECHNICAL ENGINEERING	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2		Plate
	W.O. 8052-00	HALAWA, OAHU, HAWAII		C - 6



		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	17.2	35.2	24.5
	Dry Density, pcf	69.2	64.7	73.4
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	53.9	49.6	47.7
	Dry Density, pcf	68.5	66.9	75.5
	Height, inches	1.011	0.967	0.972
Diameter, inches		2.42	2.42	2.42
Deformation Rate, inch/minute		0.0024	0.0023	0.0024
Normal Stress, psf		<b>1000</b>	<b>2000</b>	<b>3000</b>
Peak Shear Stress, psf		<b>737</b>	<b>1764</b>	<b>1768</b>
Shear Displacement, inches		0.43	0.41	0.42

Sample: B-1  
 Depth: 5.0 - 6.5 feet  
 Description: Brown with some gray clayey silt with some highly weathered gravel

G DIRECT SHEAR 8052-00.GPJ GEOLABS.GDT 12/17/20



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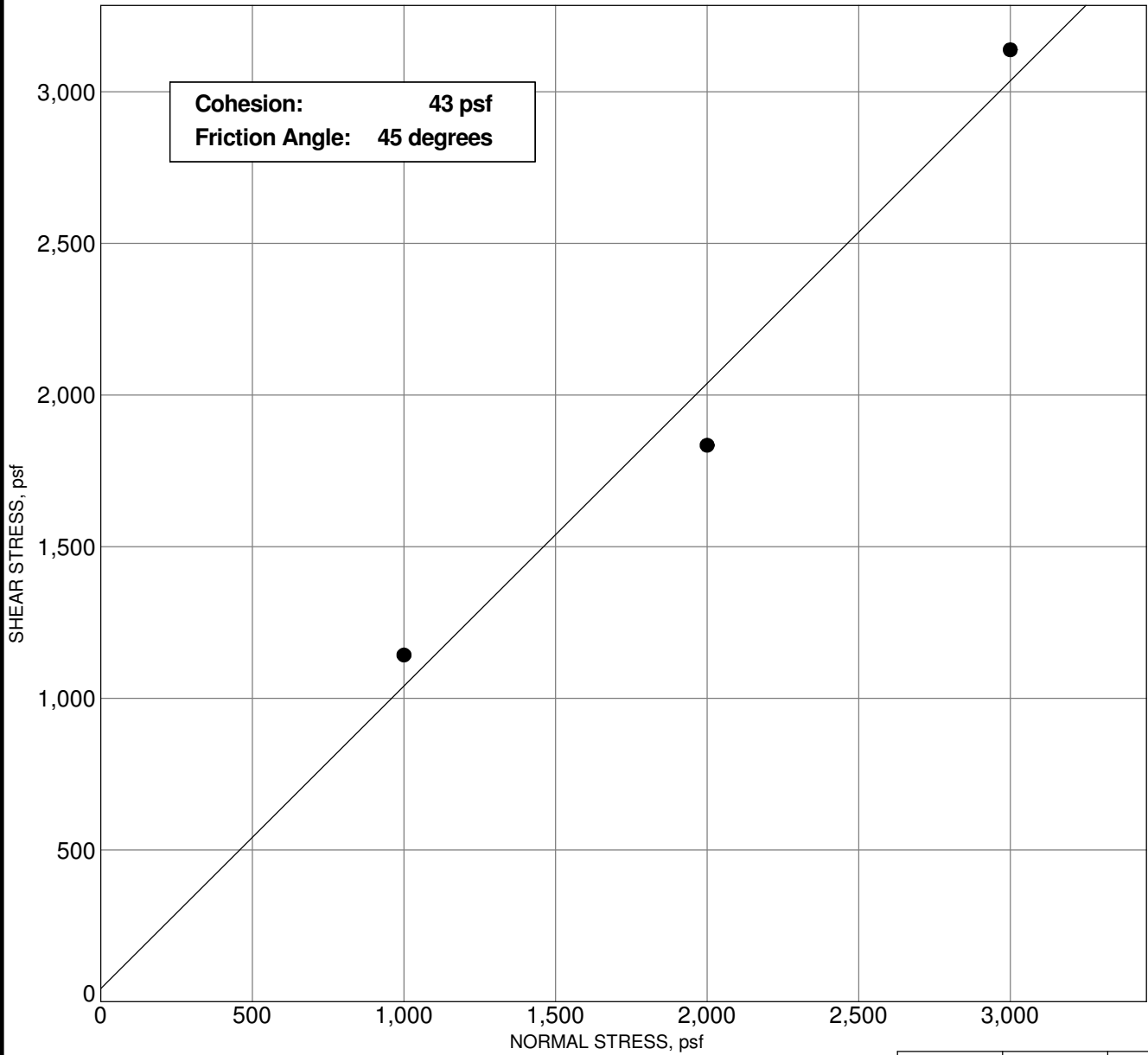
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W.O. 8052-00

**DIRECT SHEAR TEST - ASTM D3080**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 7**



		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	14.8	12.8	15.2
	Dry Density, pcf	90.4	91.2	95.0
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	25.6	22.2	22.5
	Dry Density, pcf	88.8	92.9	95.2
	Height, inches	1.018	0.981	0.998
Diameter, inches		2.42	2.42	2.42
Deformation Rate, inch/minute		0.0025	0.0024	0.0025
Normal Stress, psf		<b>1000</b>	<b>2000</b>	<b>3000</b>
Peak Shear Stress, psf		<b>1143</b>	<b>1834</b>	<b>3138</b>
Shear Displacement, inches		0.43	0.41	0.41

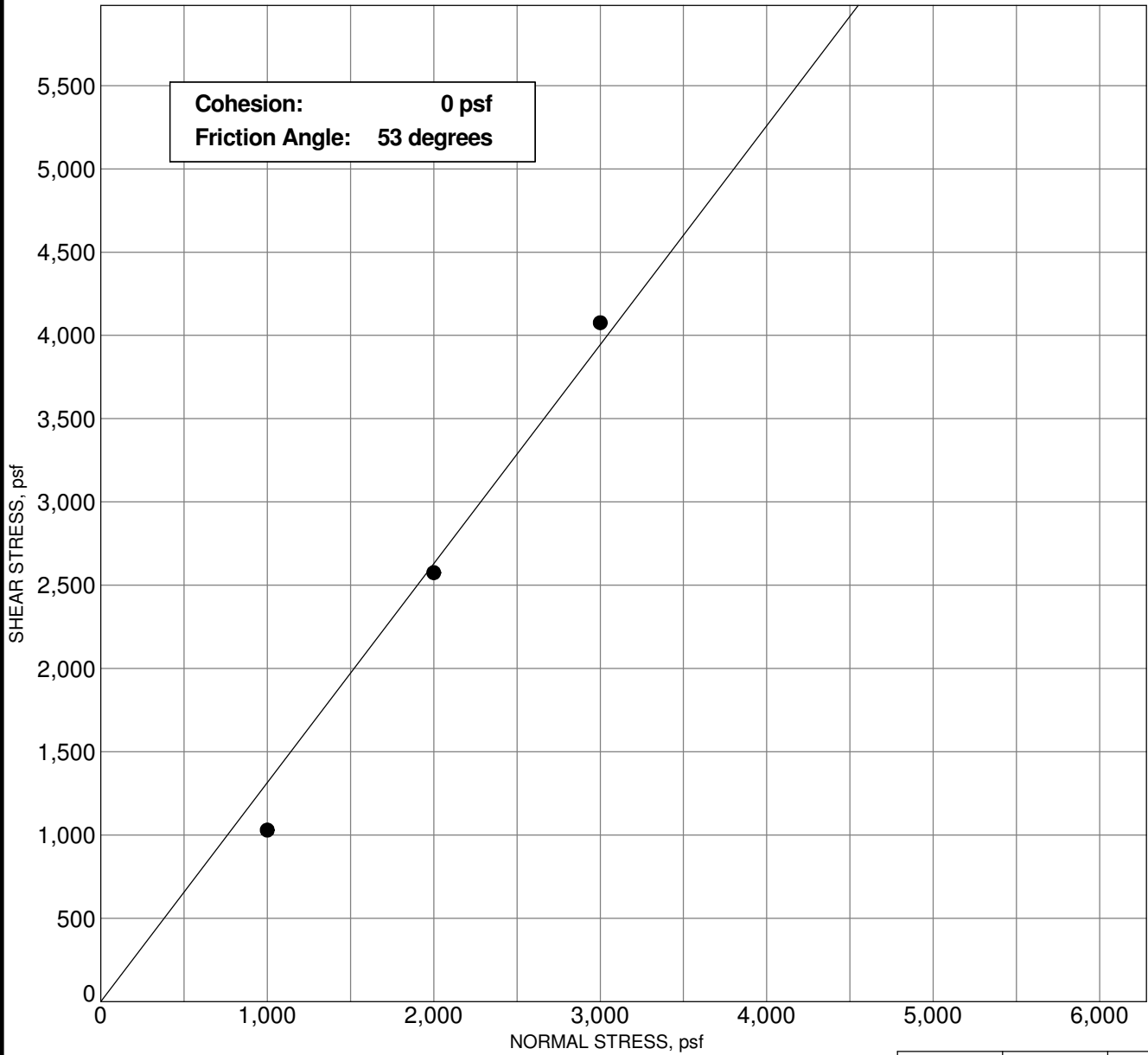
Sample: B-3  
 Depth: 1.0 - 2.5 feet  
 Description: Brown with orange mottling silty gravel (GM) with some sand

G DIRECT SHEAR 8052-00.GPJ GEOLABS.GDT 12/17/20



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**DIRECT SHEAR TEST - ASTM D3080**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII  
 Plate  
**C - 8**



	Sample #1	Sample #2	Sample #3	
INITIAL	Moisture Content, %	46.0	46.9	44.4
	Dry Density, pcf	68.0	68.7	72.4
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	54.3	54.9	51.1
	Dry Density, pcf	68.0	69.5	74.2
	Height, inches	1.000	0.989	0.976
Diameter, inches		2.42	2.42	2.42
Deformation Rate, inch/minute		0.0025	0.0021	0.0022
Normal Stress, psf		<b>1000</b>	<b>2000</b>	<b>3000</b>
Peak Shear Stress, psf		<b>1030</b>	<b>2575</b>	<b>4076</b>
Shear Displacement, inches		0.43	0.40	0.40

Sample: B-3  
 Depth: 15.0 - 16.5 feet  
 Description: Brown with multi-color mottling clayey sand (SC) with some gravel

G DIRECT SHEAR 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

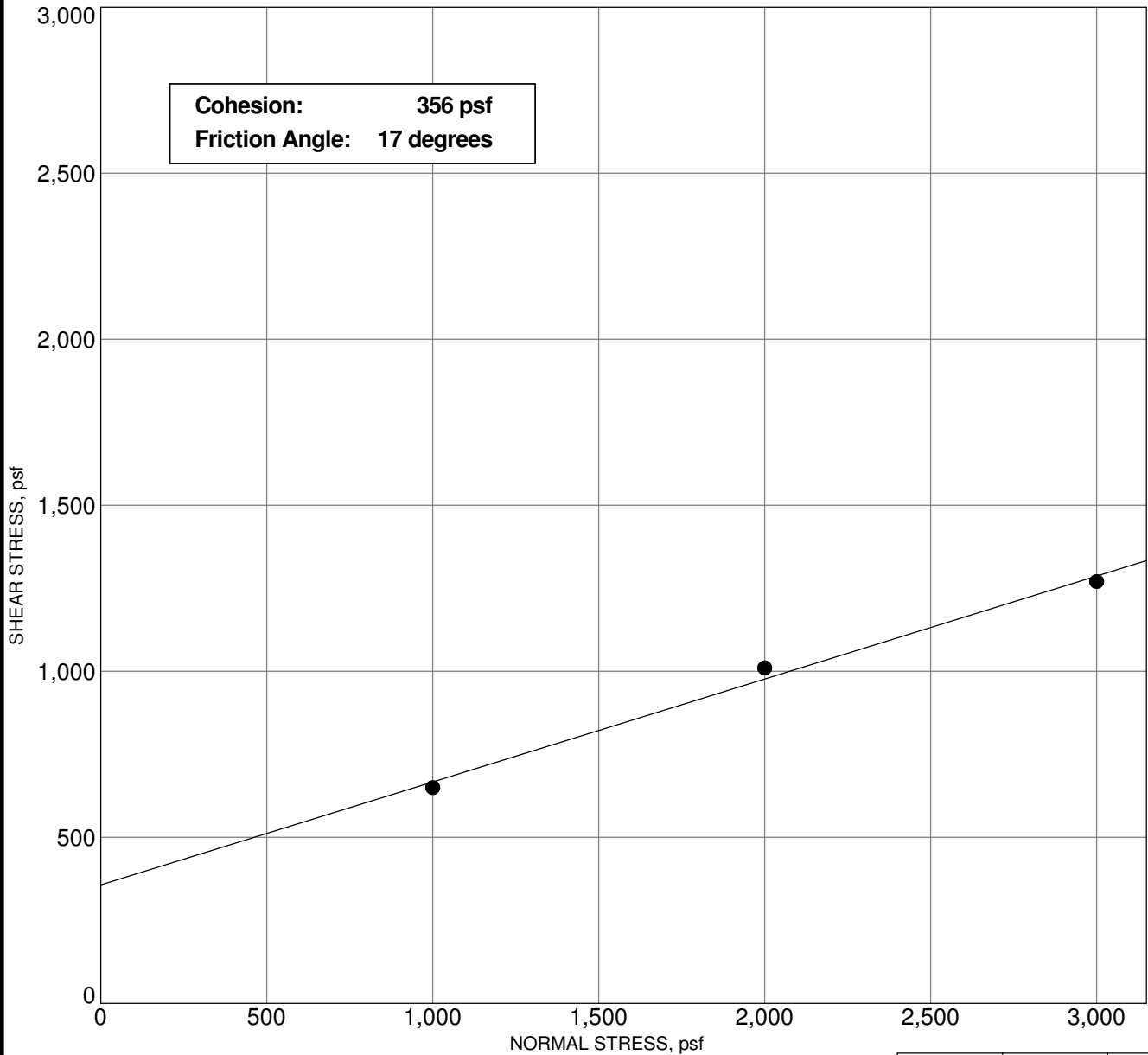
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**DIRECT SHEAR TEST - ASTM D3080**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 9**



		Sample #1	Sample #2	Sample #3
INITIAL	Moisture Content, %	49.4	37.2	39.1
	Dry Density, pcf	66.3	80.2	81.5
	Height, inches	1.00	1.00	1.00
FINAL	Moisture Content, %	57.2	42.1	43.1
	Dry Density, pcf	64.8	81.7	83.0
	Height, inches	1.024	0.981	0.981
Diameter, inches		2.42	2.42	2.42
Deformation Rate, inch/minute		0.0024	0.0022	0.0024
Normal Stress, psf		<b>1000</b>	<b>2000</b>	<b>3000</b>
Peak Shear Stress, psf		<b>650</b>	<b>1010</b>	<b>1270</b>
Shear Displacement, inches		0.43	0.42	0.42

Sample: B-3  
 Depth: 45.0 - 46.5 feet  
 Description: Brown with orange and gray mottling sandy silt

G DIRECT SHEAR 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

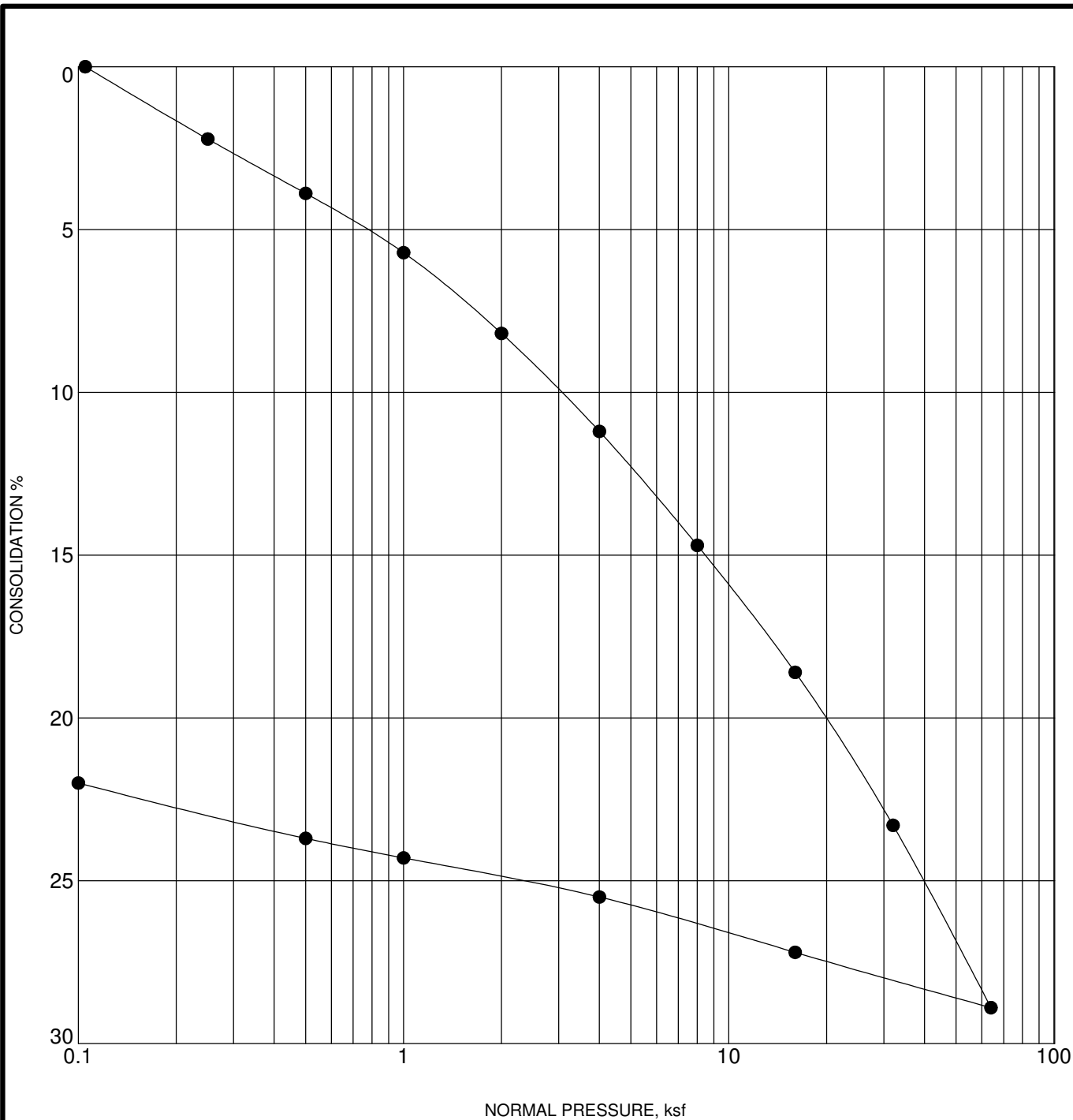
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**DIRECT SHEAR TEST - ASTM D3080**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 10**



Sample: B-1  
 Depth: 5.0 - 6.5 feet  
 Description: Brown with trace gray clay

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	26.2	39.8
Dry Density, pcf:	70.3	90.2
Void Ratio	2.017	1.352
Degree of Saturation, %	44.2	100.0
Sample Height, inches	1.0000	0.7800

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

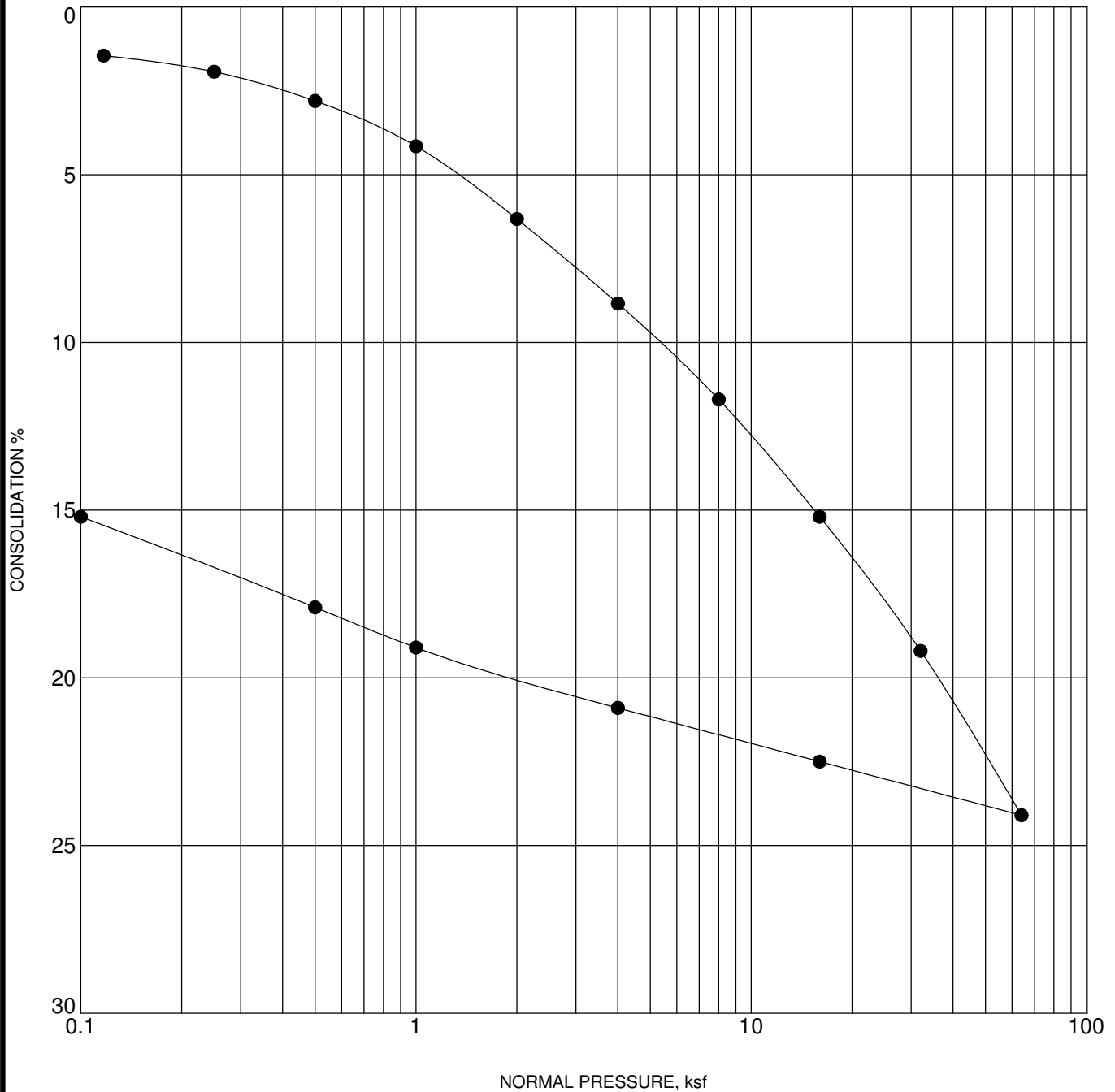
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 11**



Sample: B-1  
 Depth: 35.0 - 36.5 feet  
 Description: Mottled multi-color brown and gray silty clay with some highly weathered gravel and sand  
 Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	29.7	50.0
Dry Density, pcf:	69.4	81.8
Void Ratio	2.425	1.904
Degree of Saturation, %	46.7	100.0
Sample Height, inches	1.0000	0.8500

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

GEOTECHNICAL ENGINEERING

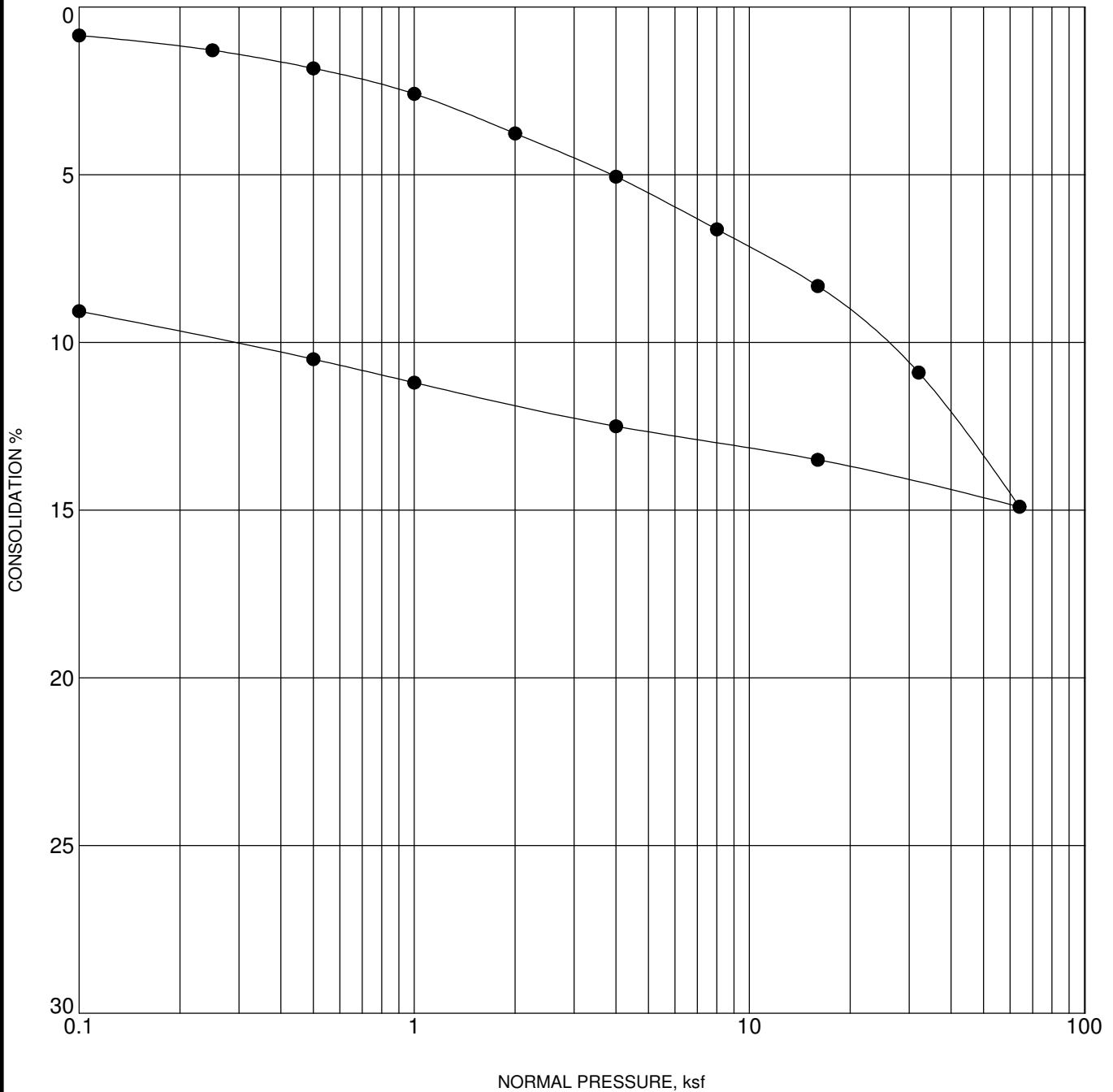
W.O. 8052-00

**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 12**





Sample: B-2  
 Depth: 15.0 - 16.5 feet  
 Description: Mottled brown and gray clayey silt with some highly weathered gravel

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	39.7	44.5
Dry Density, pcf:	77.9	85.7
Void Ratio	1.830	1.574
Degree of Saturation, %	76.6	100.0
Sample Height, inches	1.0000	0.9100

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

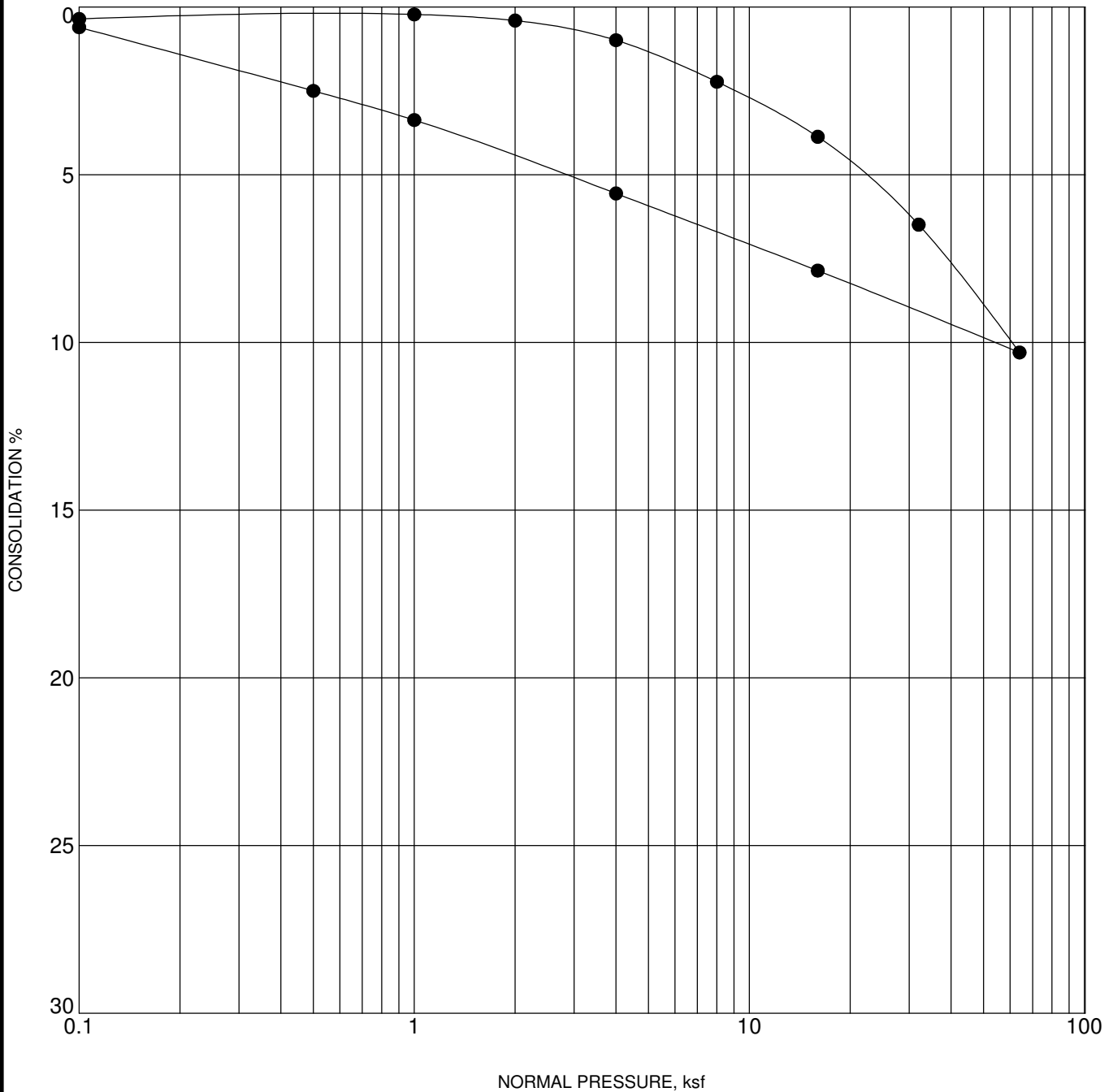
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 13**



Sample: B-2  
 Depth: 25.0 - 26.5 feet  
 Description: Brown silty clay

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	30.3	37.9
Dry Density, pcf:	89.7	90.2
Void Ratio	1.228	1.215
Degree of Saturation, %	78.9	100.0
Sample Height, inches	1.0000	0.9900

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

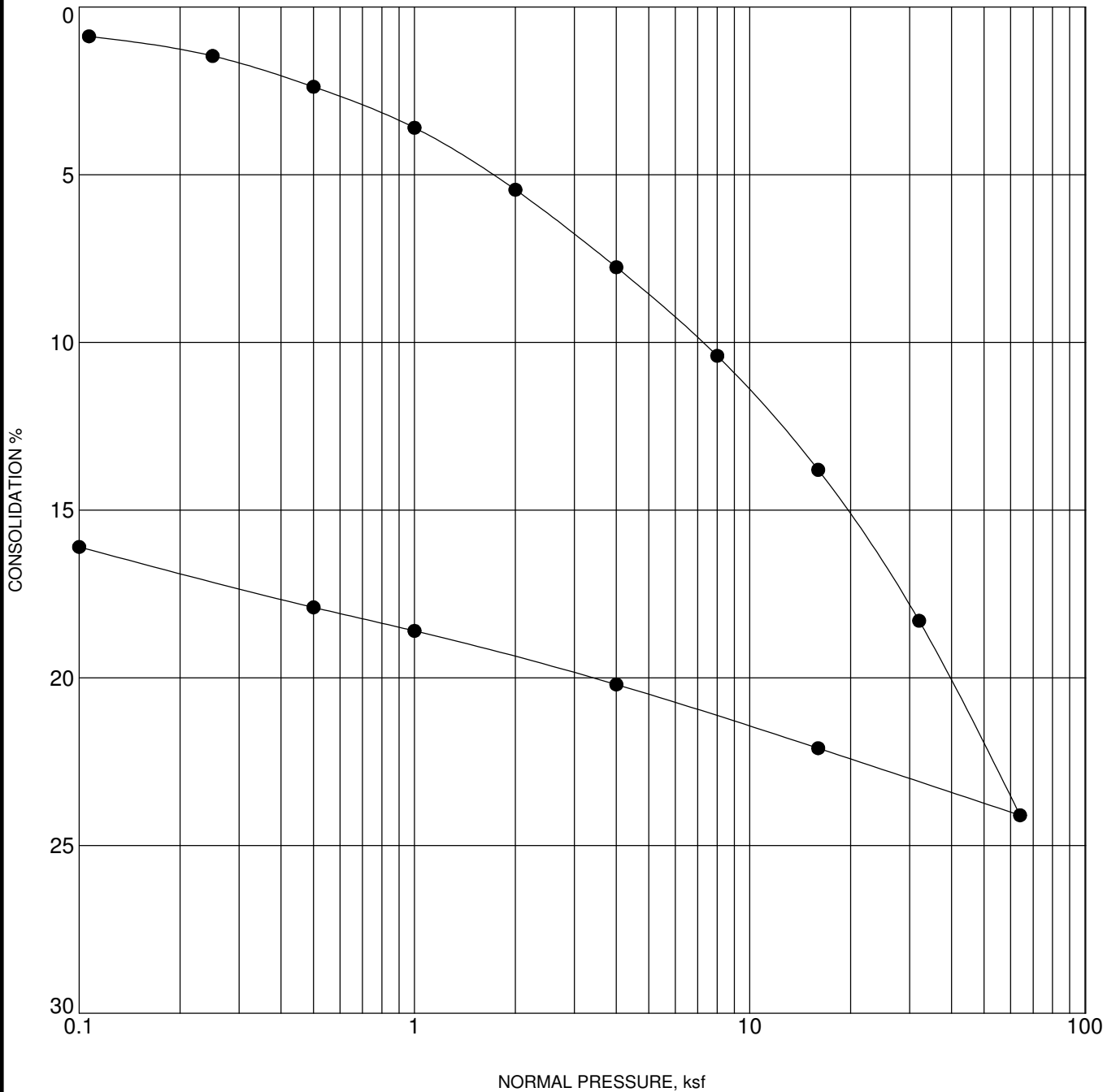
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W.O. 8052-00

**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 14**



Sample: B-2  
 Depth: 45.0 - 46.5 feet  
 Description: Brown clayey silt with some sand

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	20.9	17.1
Dry Density, pcf:	89.7	107.0
Void Ratio	0.687	0.414
Degree of Saturation, %	73.6	100.0
Sample Height, inches	1.0000	0.8400

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



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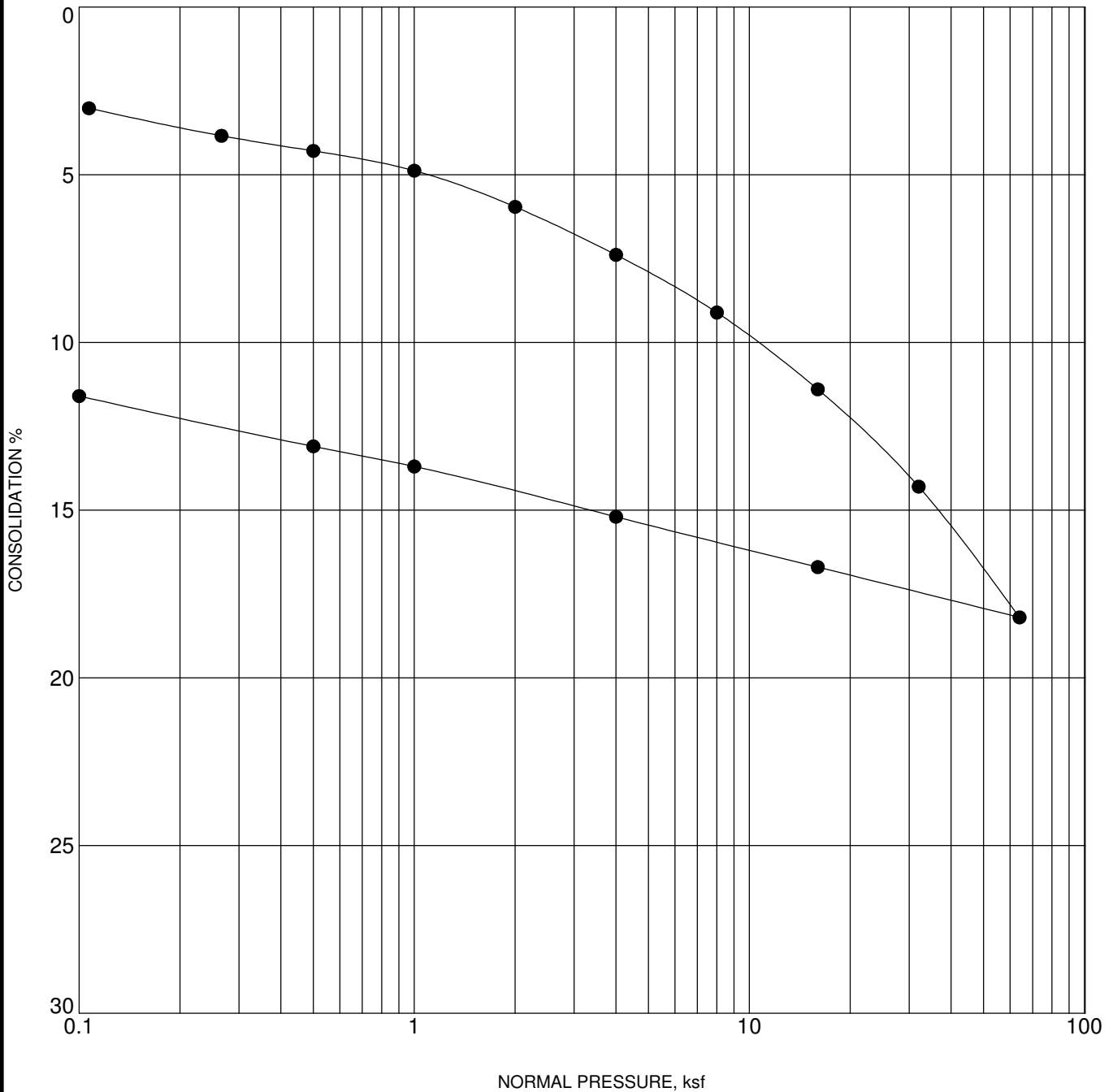
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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 15**



Sample: B-4  
 Depth: 11.5 - 13.0 feet  
 Description: Mottled brown with some gray clay (CH) with some highly weathered gravel  
 Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	48.7	50.4
Dry Density, pcf:	71.7	81.1
Void Ratio	2.281	1.900
Degree of Saturation, %	80.4	100.0
Sample Height, inches	1.0000	0.8800

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20



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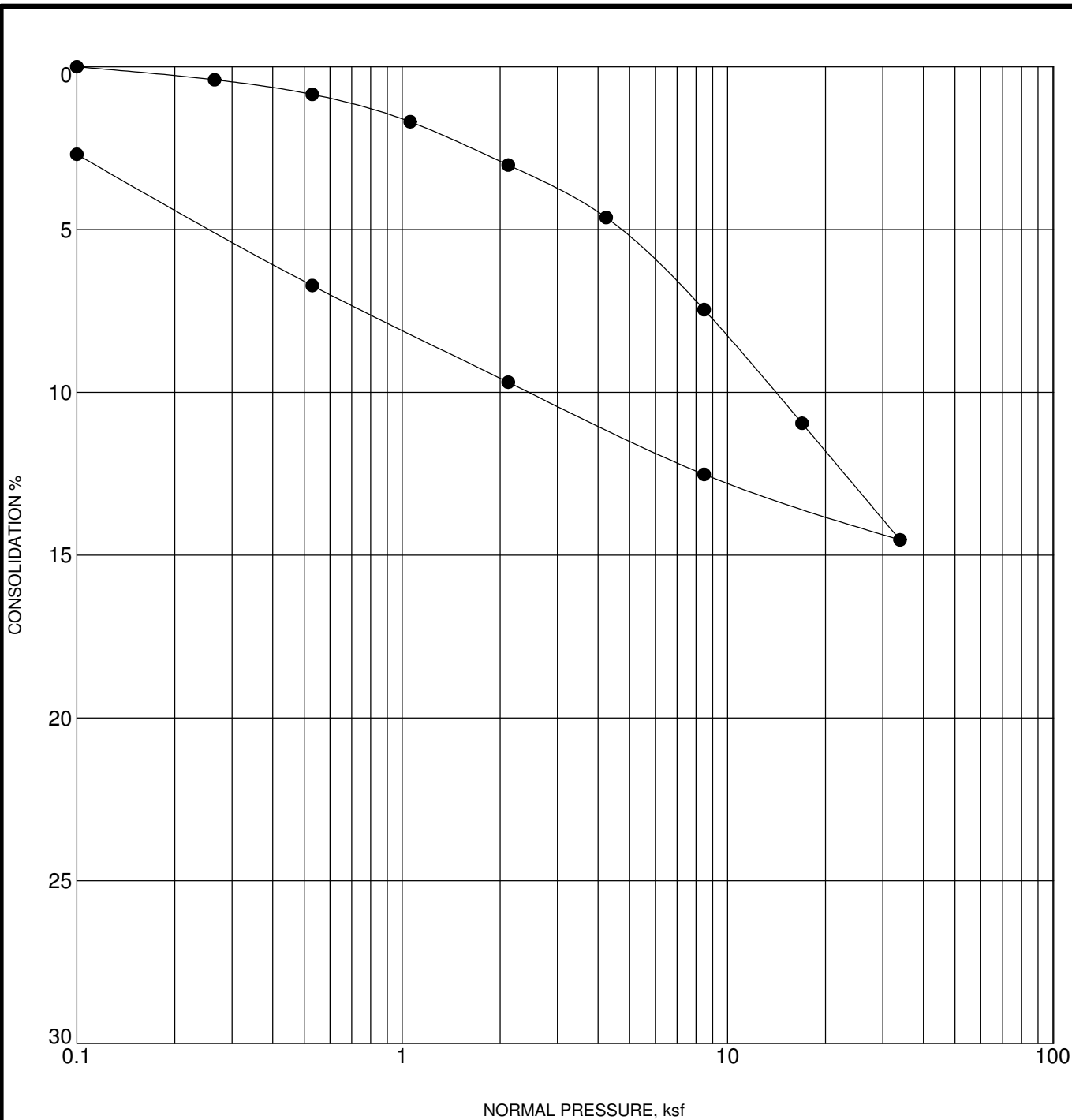
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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 16**



Sample: B-4  
 Depth: 21.5 - 23.0 feet  
 Description: Brown with traces of gray silty clay (CH)

Liquid Limit = 65      Plasticity Index = 35

	Initial	Final
Water Content, %	42.4	45.2
Dry Density, pcf:	80.1	82.3
Void Ratio	1.545	1.477
Degree of Saturation, %	89.6	100.0
Sample Height, inches	1.0000	0.9651

G. CONSOL. 8052-00.GPJ GEOLABS.GDT 12/17/20

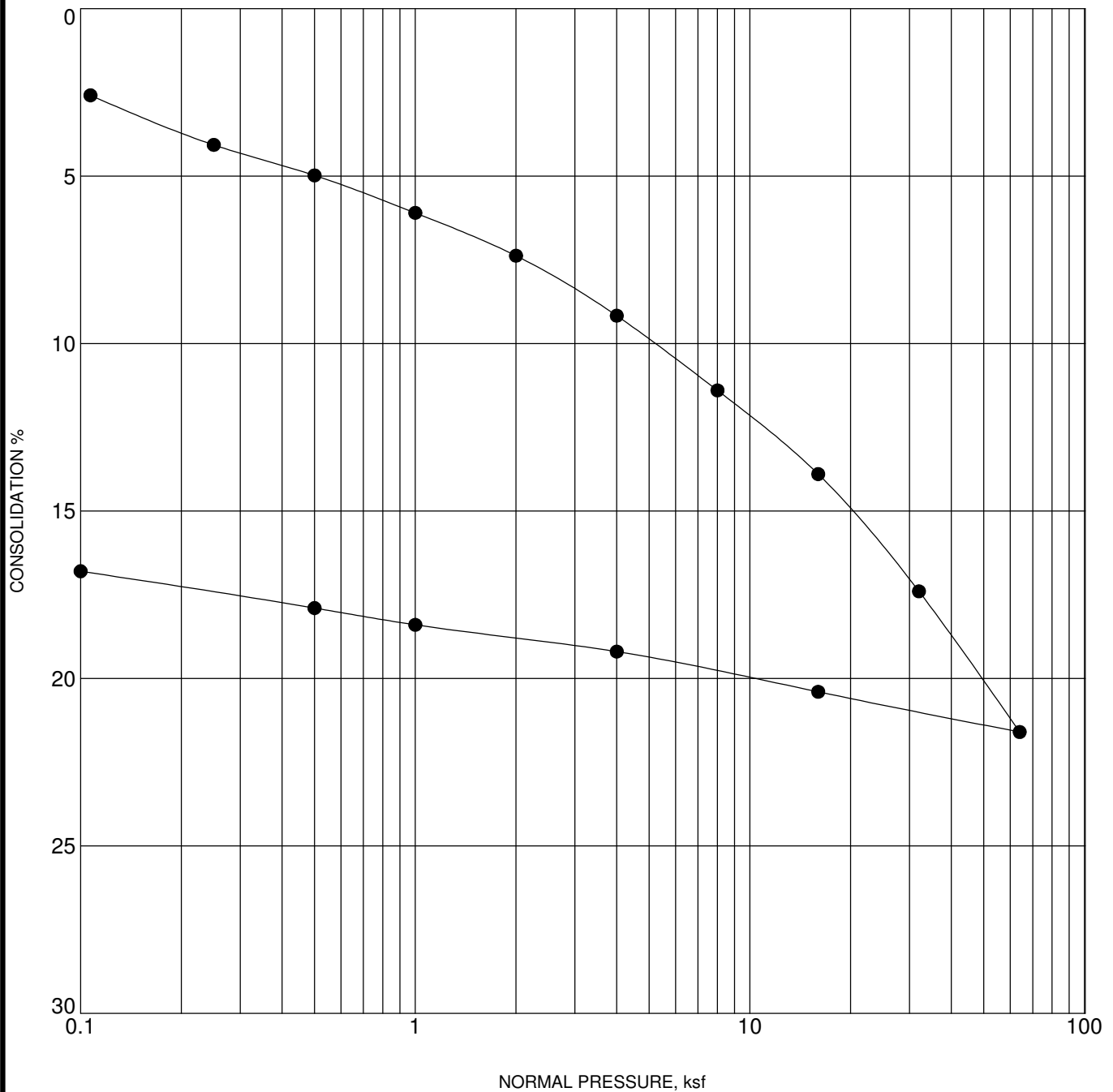


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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 17**



Sample: B-4  
 Depth: 31.5 - 33.0 feet  
 Description: Brown silty clay with some sand

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	45.6	45.6
Dry Density, pcf:	72.1	86.7
Void Ratio	2.273	1.723
Degree of Saturation, %	75.8	100.0
Sample Height, inches	1.0000	0.8300

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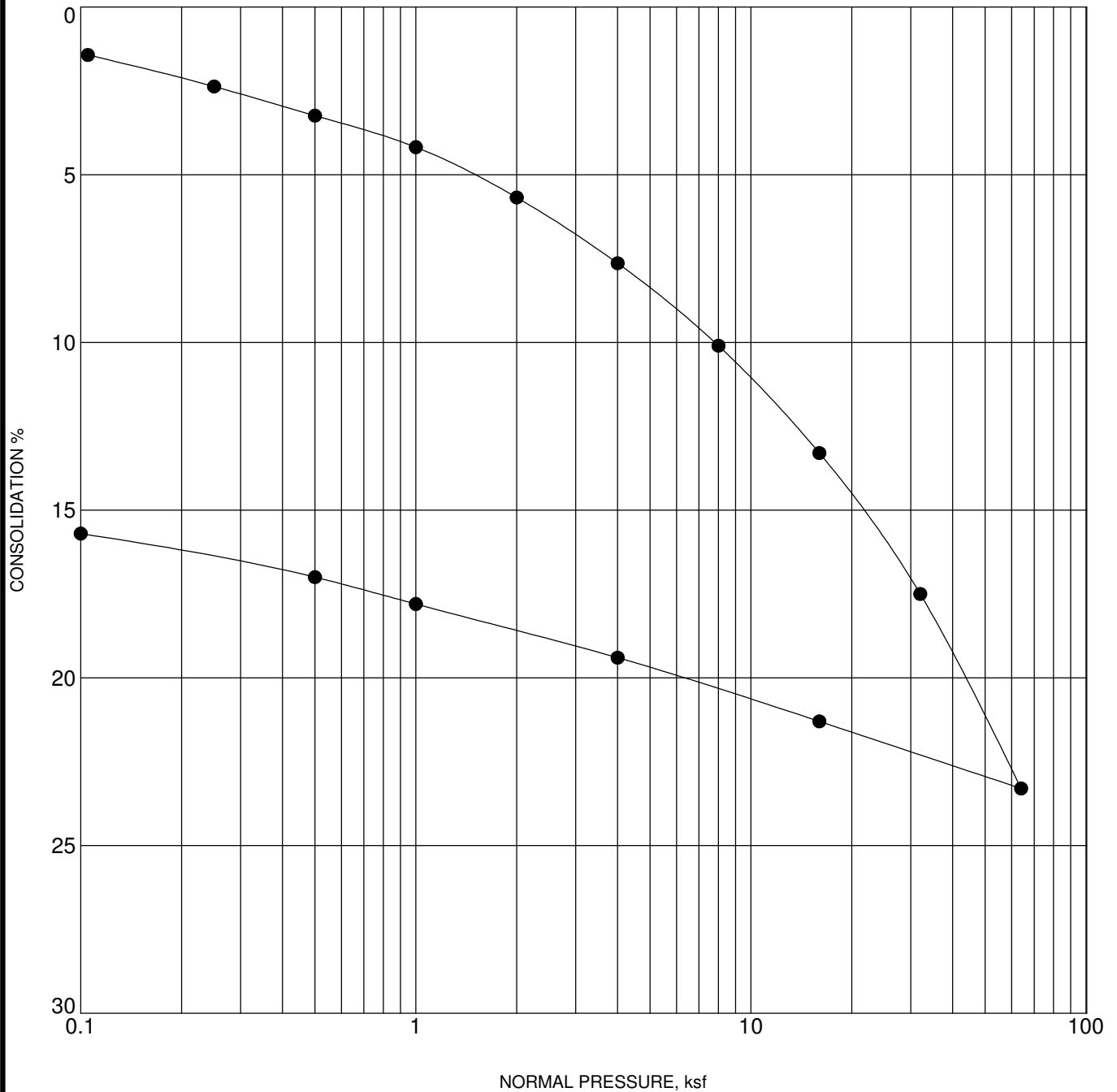
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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 18**



Sample: B-4  
 Depth: 41.5 - 43.0 feet  
 Description: Brown silty clay (CH) with a little sand

Liquid Limit = 75      Plasticity Index = 45

	Initial	Final
Water Content, %	51.0	46.5
Dry Density, pcf:	71.2	84.4
Void Ratio	2.199	1.697
Degree of Saturation, %	84.6	100.0
Sample Height, inches	1.0000	0.8400

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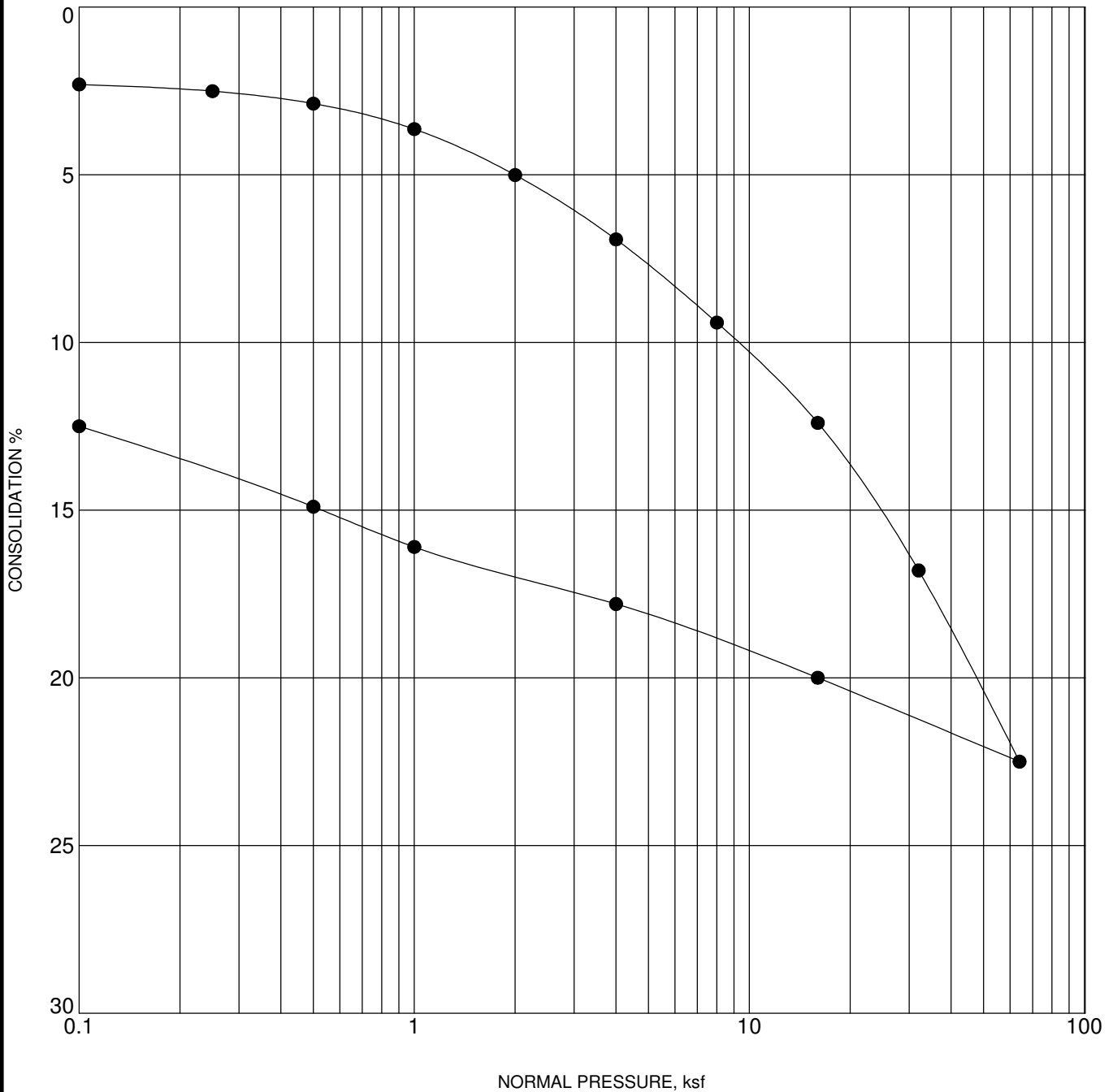
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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 19**



Sample: B-5  
 Depth: 25.0 - 26.5 feet  
 Description: Brown with some gray silty clay with some highly weathered gravel

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	45.3	45.0
Dry Density, pcf:	75.5	86.3
Void Ratio	2.031	1.652
Degree of Saturation, %	81.8	100.0
Sample Height, inches	1.0000	0.8800

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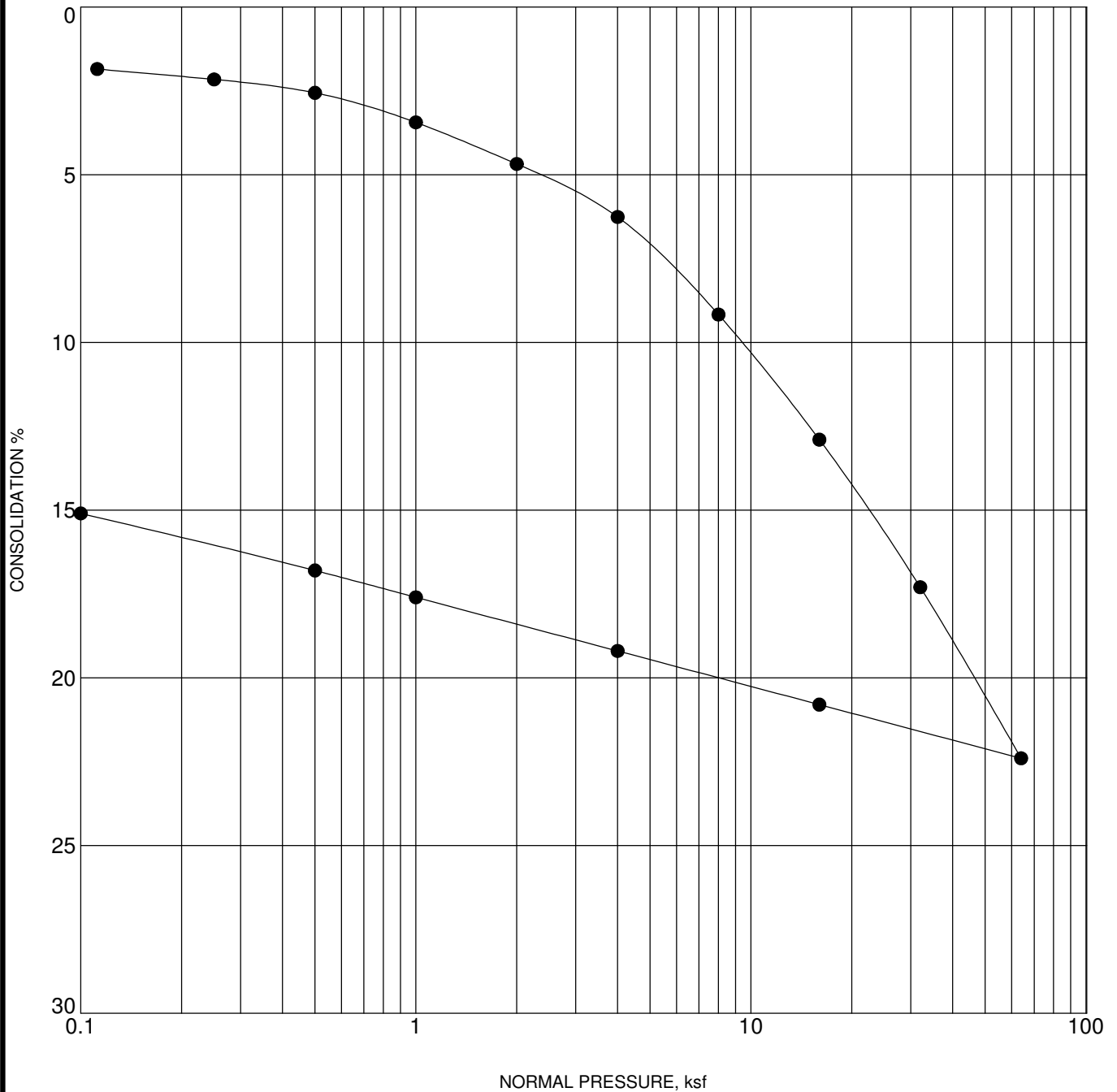
W.O. 8052-00

**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 20**





Sample: B-5  
 Depth: 45.0 - 46.5 feet  
 Description: Brown with some gray mottling silty clay with some sand

Liquid Limit = N/A      Plasticity Index = N/A

	Initial	Final
Water Content, %	46.4	45.8
Dry Density, pcf:	68.8	81.0
Void Ratio	1.905	1.466
Degree of Saturation, %	78.0	100.0
Sample Height, inches	1.0000	0.8500

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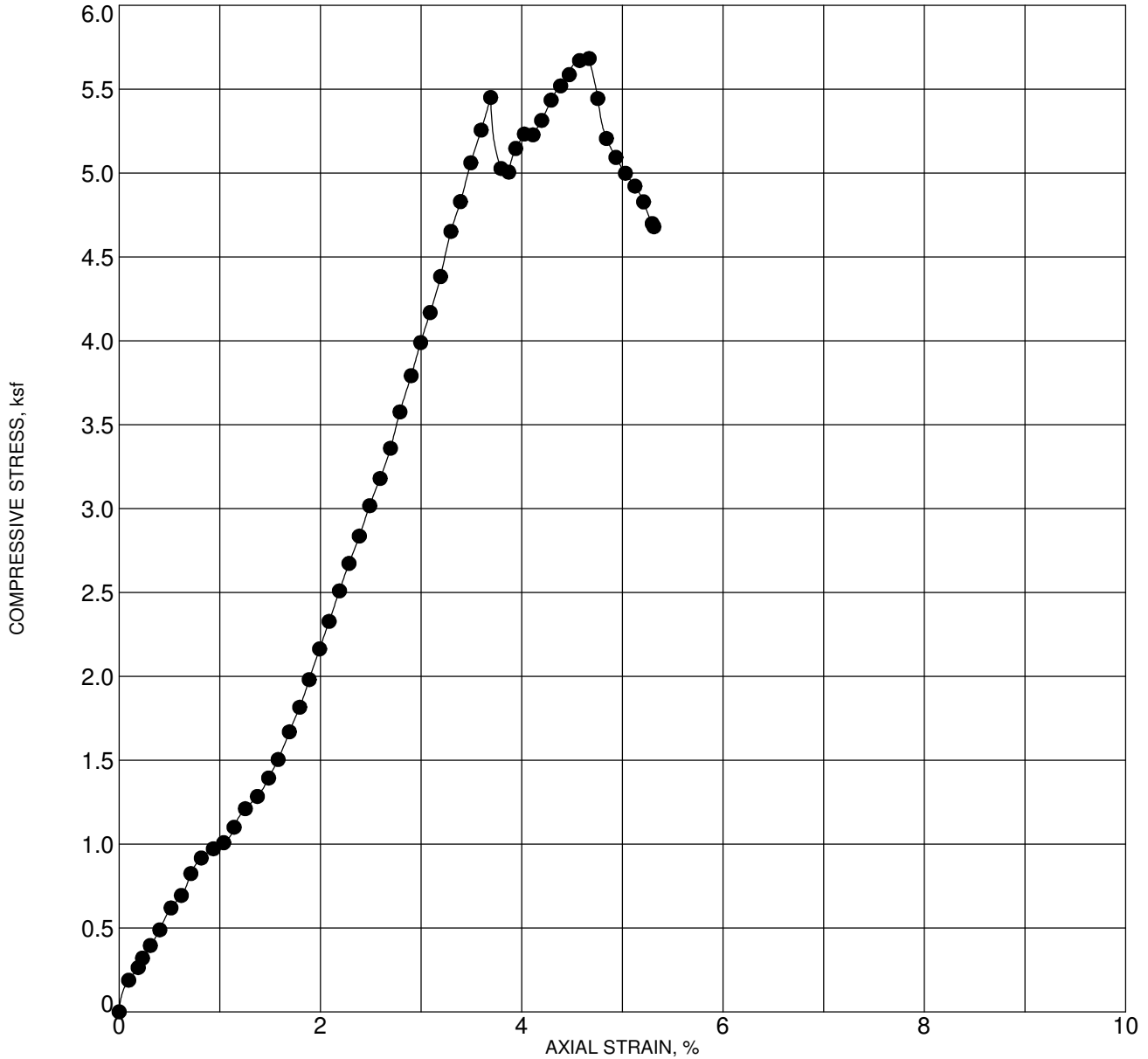
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**CONSOLIDATION TEST - ASTM D2435**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 21**



Unconfined Compressive Strength (ksf):	5.68
Axial Strain at Failure (%):	4.7
Strain Rate (% / minute):	0.99

Location: B-2  
 Depth: 1.5 - 3.0 feet  
 Description: Brownish gray clay  
 Test Date: 9/21/2020

Dry Density (pcf)	83.3	Sample Diameter (inches)	2.400
Moisture (%)	29.6	Sample Height (inches)	5.130

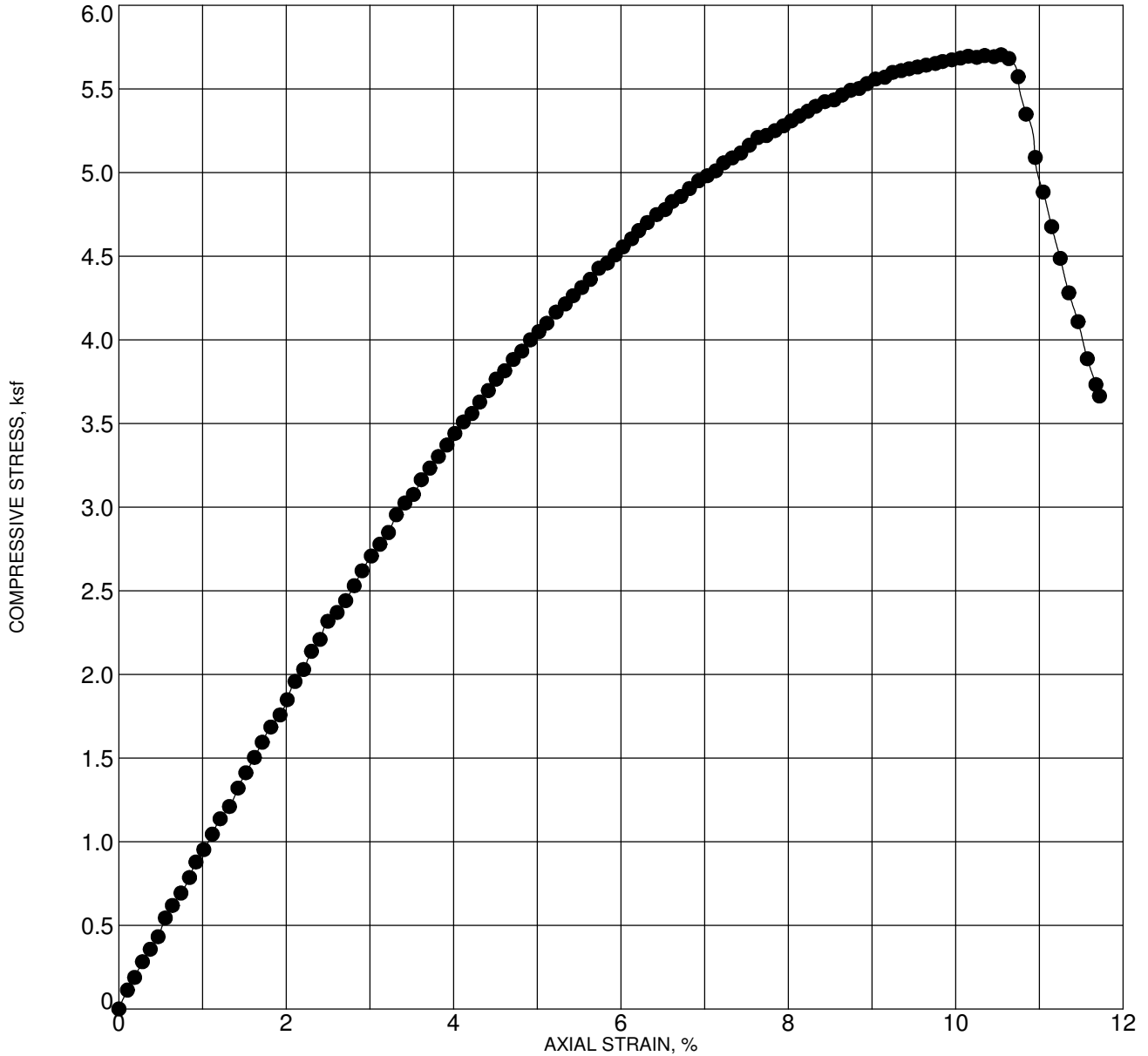


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 W.O. 8052-00

**UNCONFINED COMPRESSION TEST - ASTM D2166**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 22**



Unconfined Compressive Strength (ksf):	5.70
Axial Strain at Failure (%):	10.5
Strain Rate (% / minute):	1.00

Location: B-4  
 Depth: 21.5 - 23.0 feet  
 Description: Brown with traces of gray silty clay (CH)  
 Test Date: 9/18/2020

Dry Density (pcf)	85.9	Sample Diameter (inches)	2.400
Moisture (%)	35.8	Sample Height (inches)	5.167

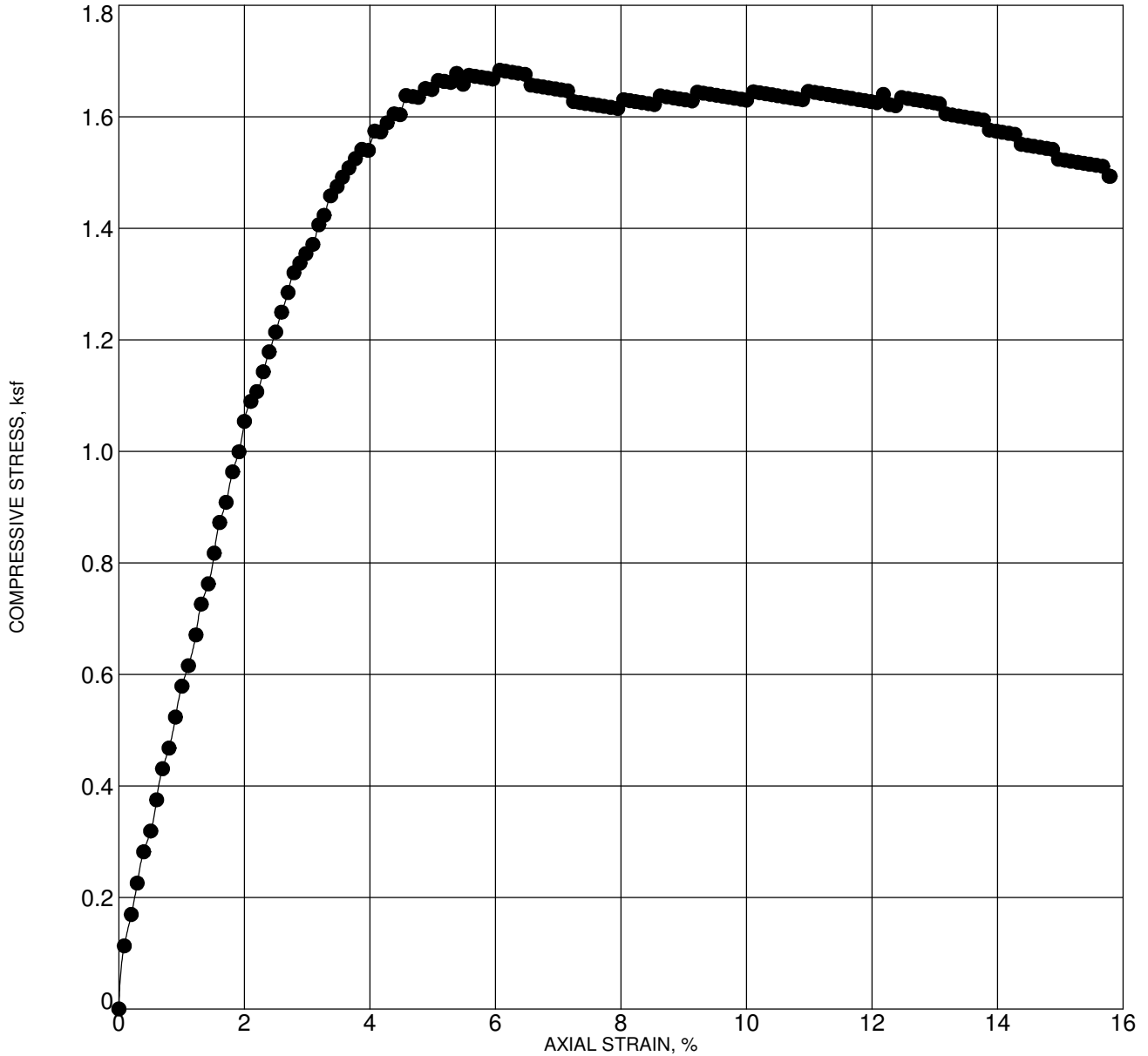


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 GEOTECHNICAL ENGINEERING  
 W.O. 8052-00

**UNCONFINED COMPRESSION TEST - ASTM D2166**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 23**



Unconfined Compressive Strength (ksf):	1.68
Axial Strain at Failure (%):	6.1
Strain Rate (% / minute):	1.00

Location: B-4  
 Depth: 51.5 - 53.0 feet  
 Description: Brown silty clay with a little sand  
 Test Date: 9/21/2020

Dry Density (pcf)	78.5	Sample Diameter (inches)	2.400
Moisture (%)	41.4	Sample Height (inches)	5.130

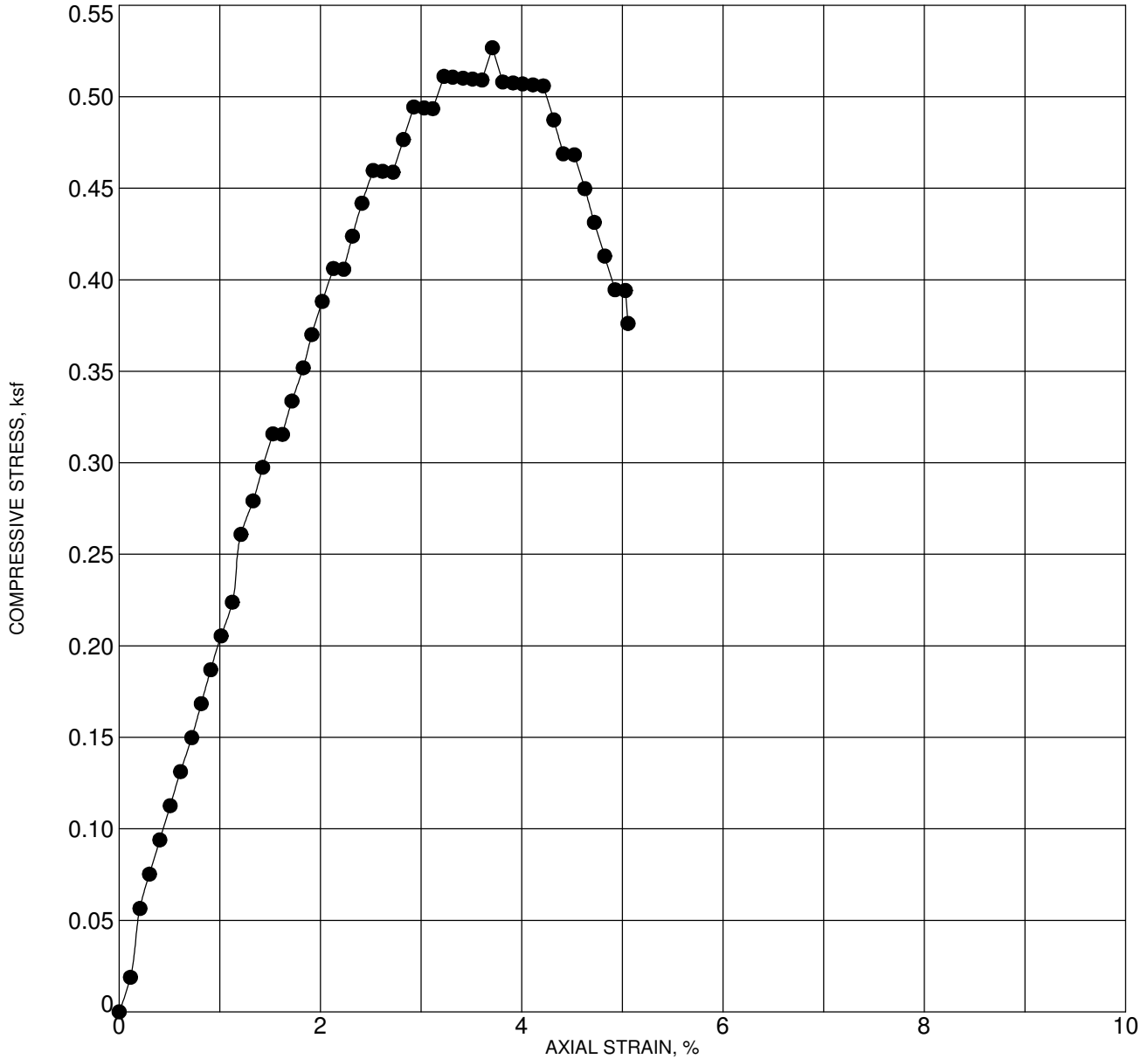


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**UNCONFINED COMPRESSION TEST - ASTM D2166**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 24**



Unconfined Compressive Strength (ksf):	0.53
Axial Strain at Failure (%):	3.7
Strain Rate (% / minute):	1.00

Location: B-4  
 Depth: 71.5 - 73.0 feet  
 Description: Mottled brown with trace gray clay  
 Test Date: 9/21/2020

Dry Density (pcf)	70.9	Sample Diameter (inches)	2.400
Moisture (%)	52.4	Sample Height (inches)	5.130

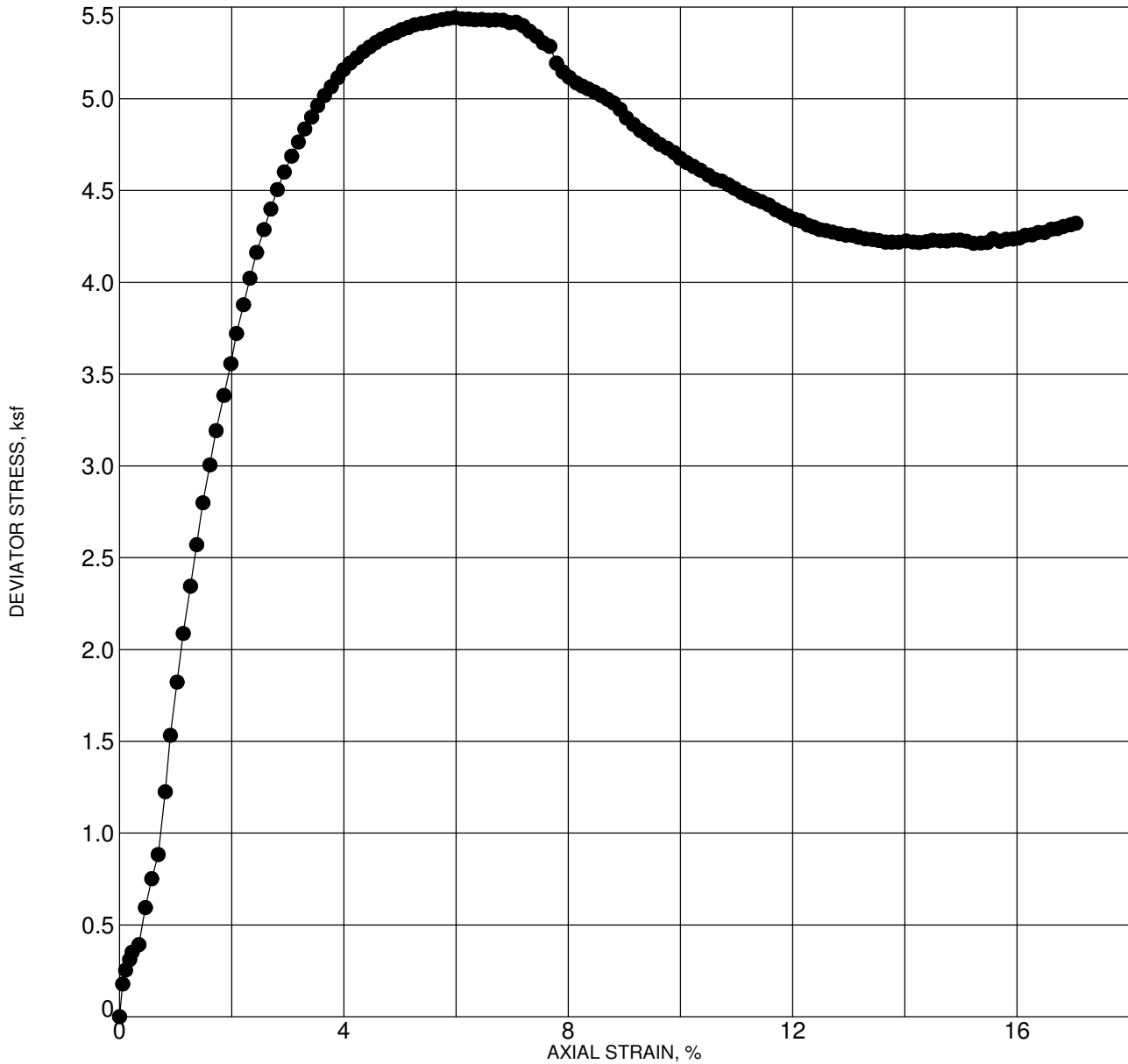


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 W.O. 8052-00

**UNCONFINED COMPRESSION TEST - ASTM D2166**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 25**




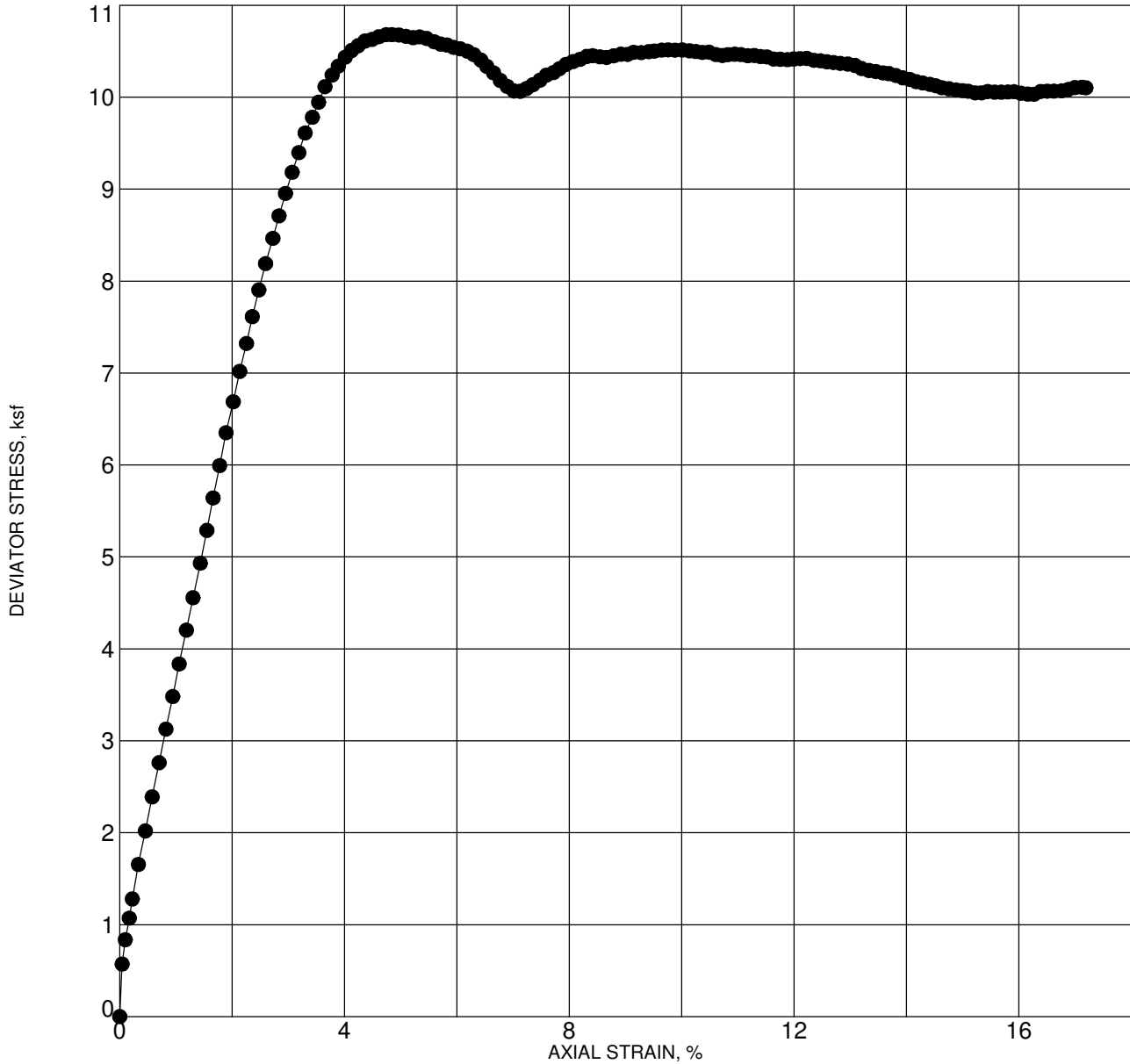
Max. Deviator Stress (ksf):	5.4
Confining Stress (ksf):	2.9

Location: B-1  
 Depth: 25.0 - 26.5 feet  
 Description: Brown with some gray sandy silt with some highly weathered gravel  
 Test Date: 9/18/2020

Dry Density (pcf)	83.1	Sample Diameter (inches)	2.413
Moisture (%)	37.4	Sample Height (inches)	5.133
Axial Strain at Failure (%)	6.0	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 26</b>




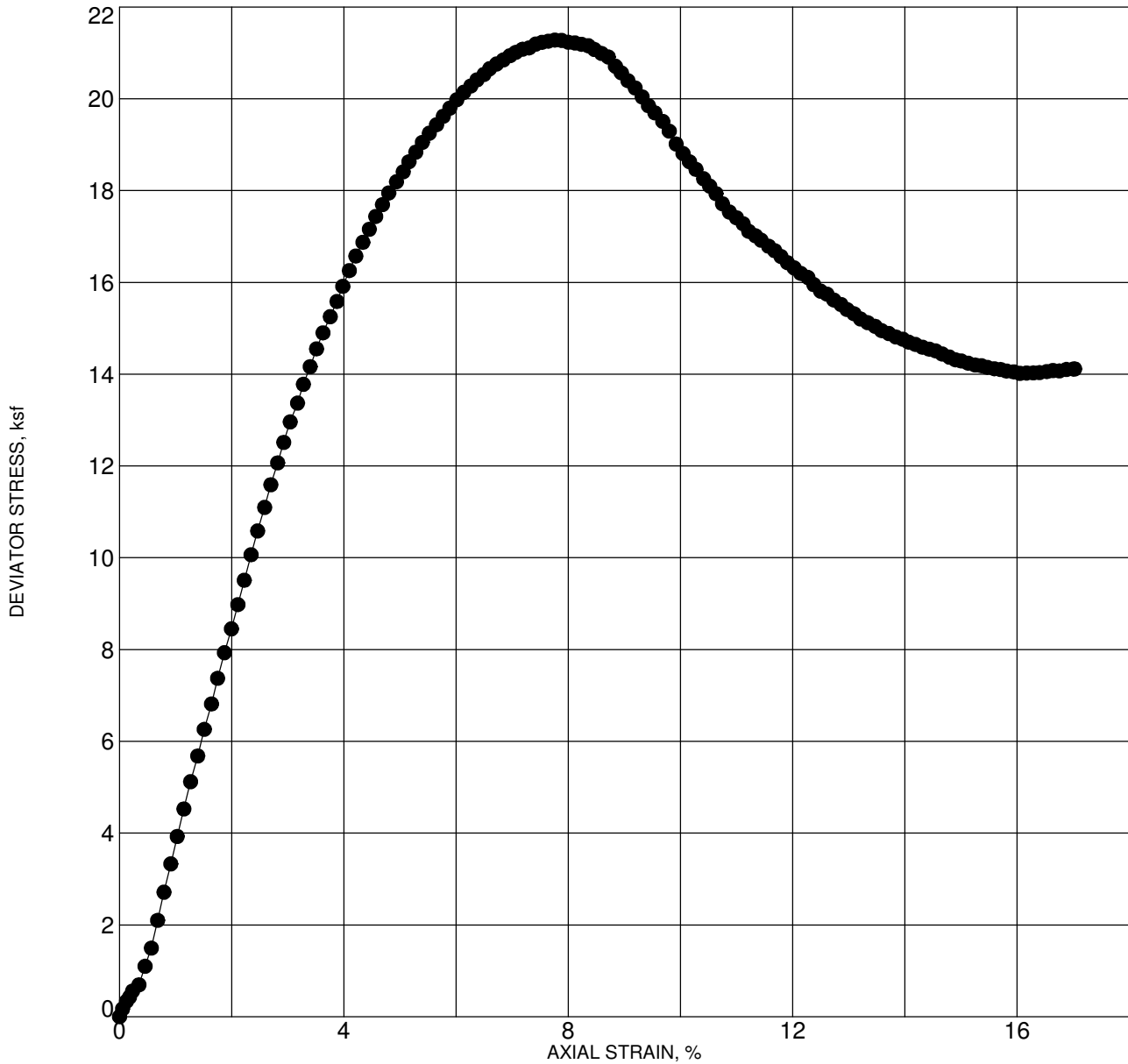
Max. Deviator Stress (ksf):	10.7
Confining Stress (ksf):	4.0

Location: B-1  
 Depth: 35.0 - 36.5 feet  
 Description: Mottled multi-color brown and gray silty clay with some highly weathered gravel and sand  
 Test Date: 9/30/2020

Dry Density (pcf)	73.6	Sample Diameter (inches)	2.413
Moisture (%)	44.8	Sample Height (inches)	5.133
Axial Strain at Failure (%)	5.0	Strain Rate (% / minute)	0.71

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 27</b>




Max. Deviator Stress (ksf):	21.3
Confining Stress (ksf):	5.1

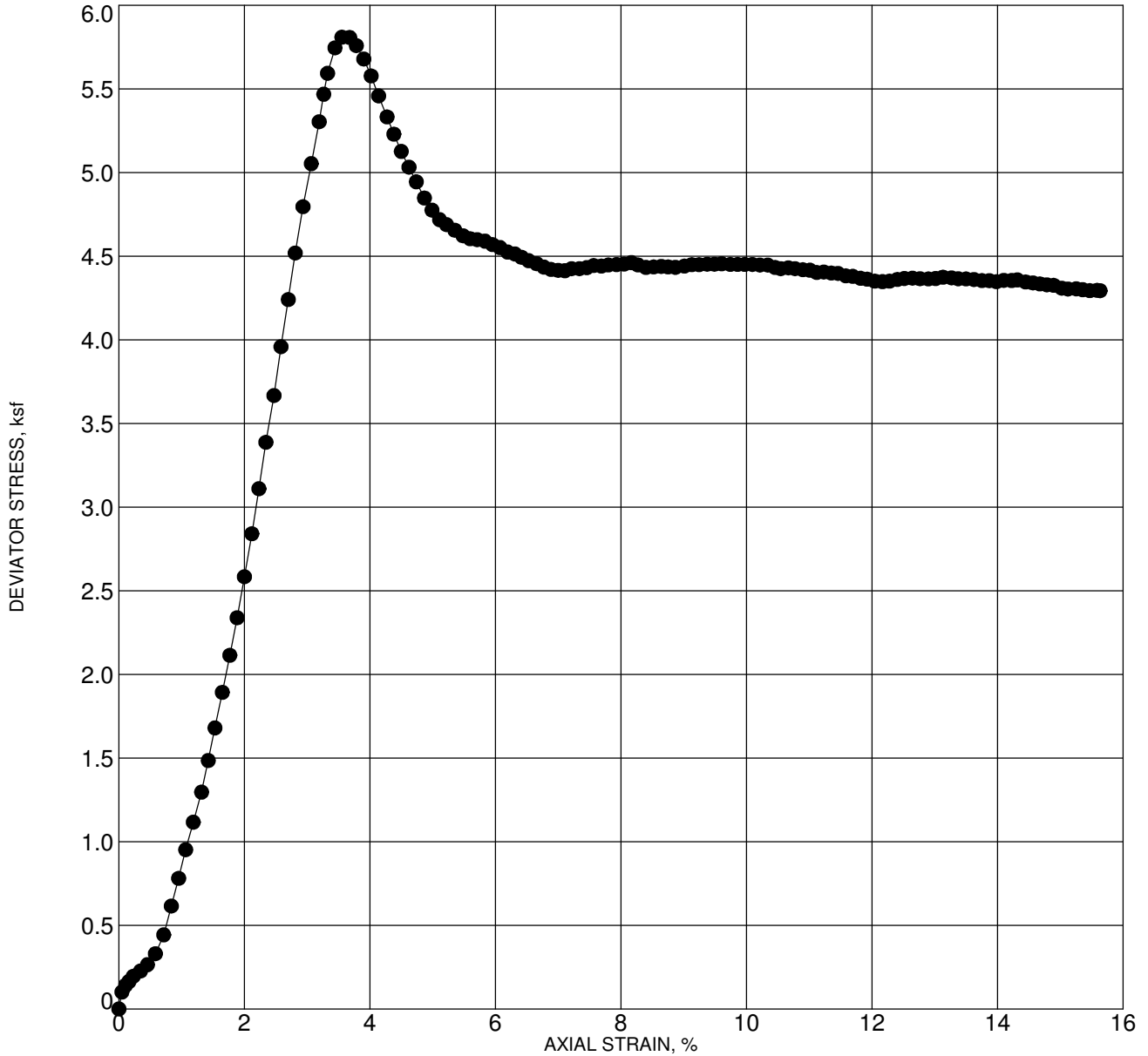
Location: B-1  
 Depth: 45.0 - 46.5 feet  
 Description: Mottled multi-color brown and gray silty clay with some highly weathered gravel and sand  
 Test Date: 9/30/2020

Dry Density (pcf)	72.7	Sample Diameter (inches)	2.413
Moisture (%)	46.0	Sample Height (inches)	5.167
Axial Strain at Failure (%)	7.8	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 28</b>






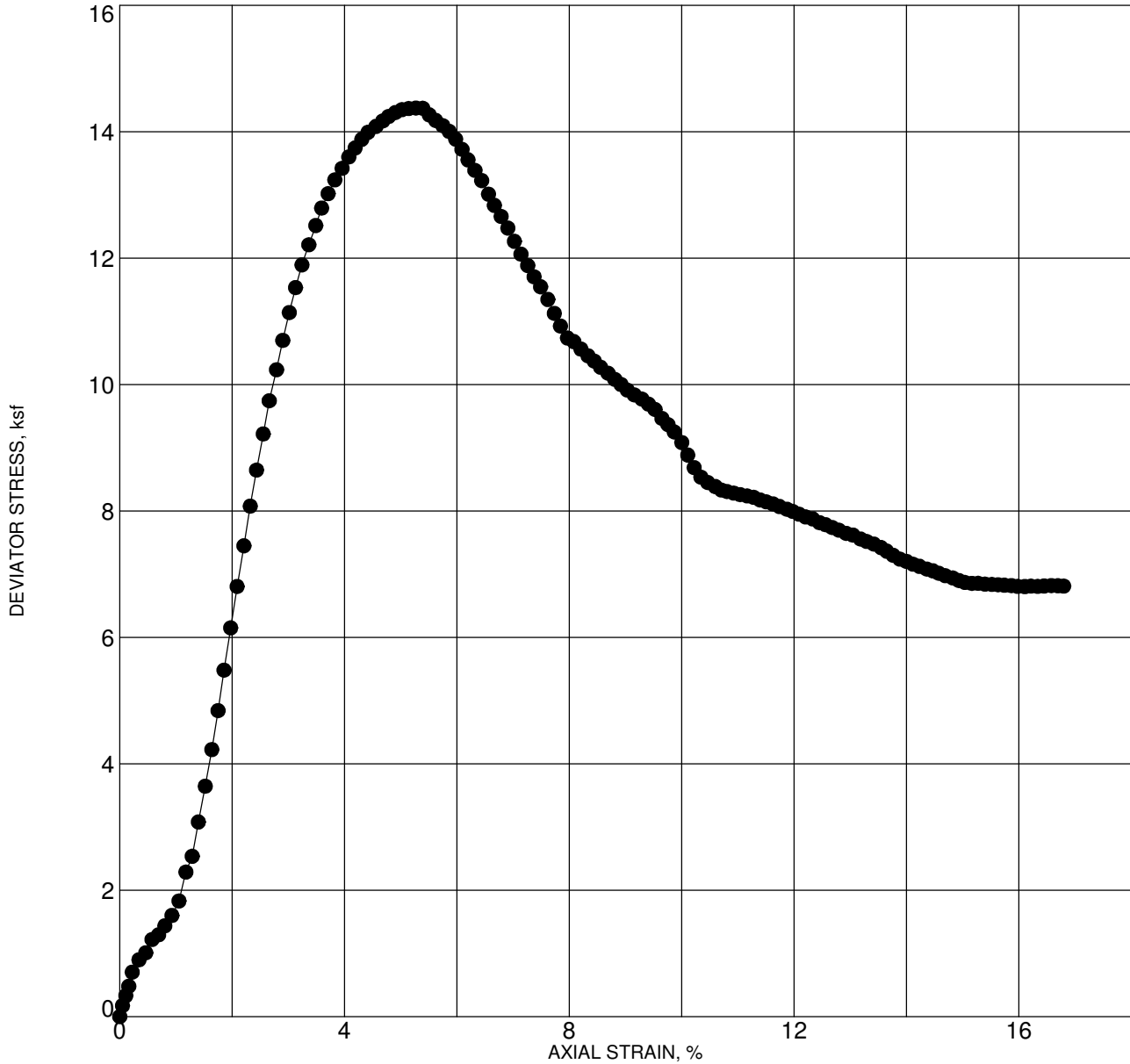
Max. Deviator Stress (ksf):	5.8
Confining Stress (ksf):	1.7

Location: B-2  
 Depth: 15.0 - 16.5 feet  
 Description: Mottled brown and gray clayey silt with some highly weathered gravel  
 Test Date: 10/1/2020

Dry Density (pcf)	77.0	Sample Diameter (inches)	2.407
Moisture (%)	36.5	Sample Height (inches)	5.133
Axial Strain at Failure (%)	3.7	Strain Rate (% / minute)	0.69

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAxIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 29</b>




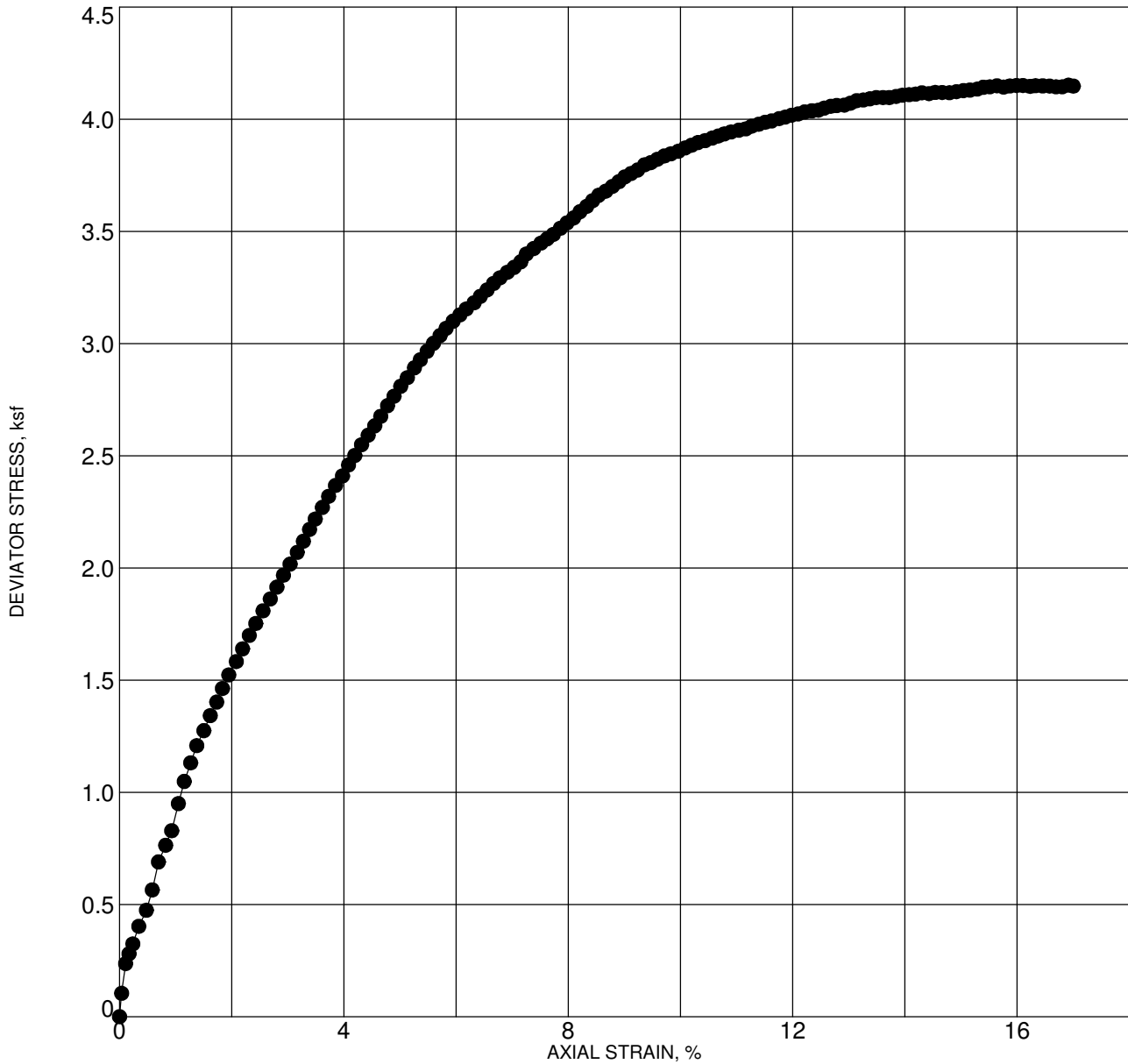
Max. Deviator Stress (ksf):	14.4
Confining Stress (ksf):	1.7

Location: B-2  
 Depth: 25.0 - 26.5 feet  
 Description: Brown silty clay  
 Test Date: 10/1/2020

Dry Density (pcf)	89.8	Sample Diameter (inches)	2.407
Moisture (%)	30.9	Sample Height (inches)	5.167
Axial Strain at Failure (%)	5.4	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 30</b>




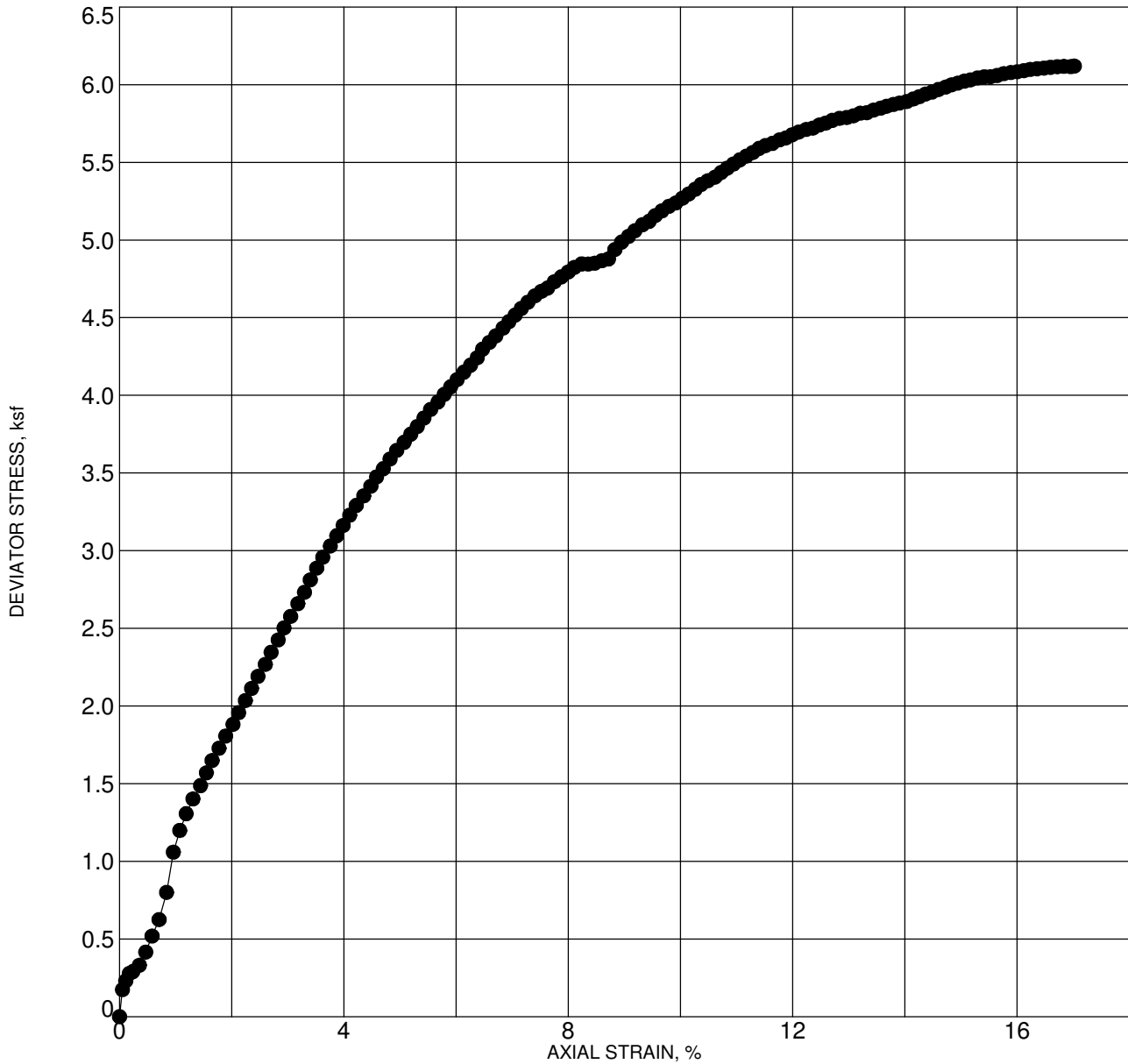
Max. Deviator Stress (ksf):	4.1
Confining Stress (ksf):	3.9

Location: B-2  
 Depth: 45.0 - 46.5 feet  
 Description: Brown clayey silt with some sand  
 Test Date: 10/1/2020

Dry Density (pcf)	71.9	Sample Diameter (inches)	2.413
Moisture (%)	50.3	Sample Height (inches)	5.133
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 31</b>



Max. Deviator Stress (ksf):	6.0
Confining Stress (ksf):	3.9

Location: B-3  
 Depth: 35.0 - 36.5 feet  
 Description: Brown silty clay with some sand  
 Test Date: 10/1/2020

Dry Density (pcf)	74.8	Sample Diameter (inches)	2.413
Moisture (%)	47.9	Sample Height (inches)	5.133
Axial Strain at Failure (%)	14.9	Strain Rate (% / minute)	0.70

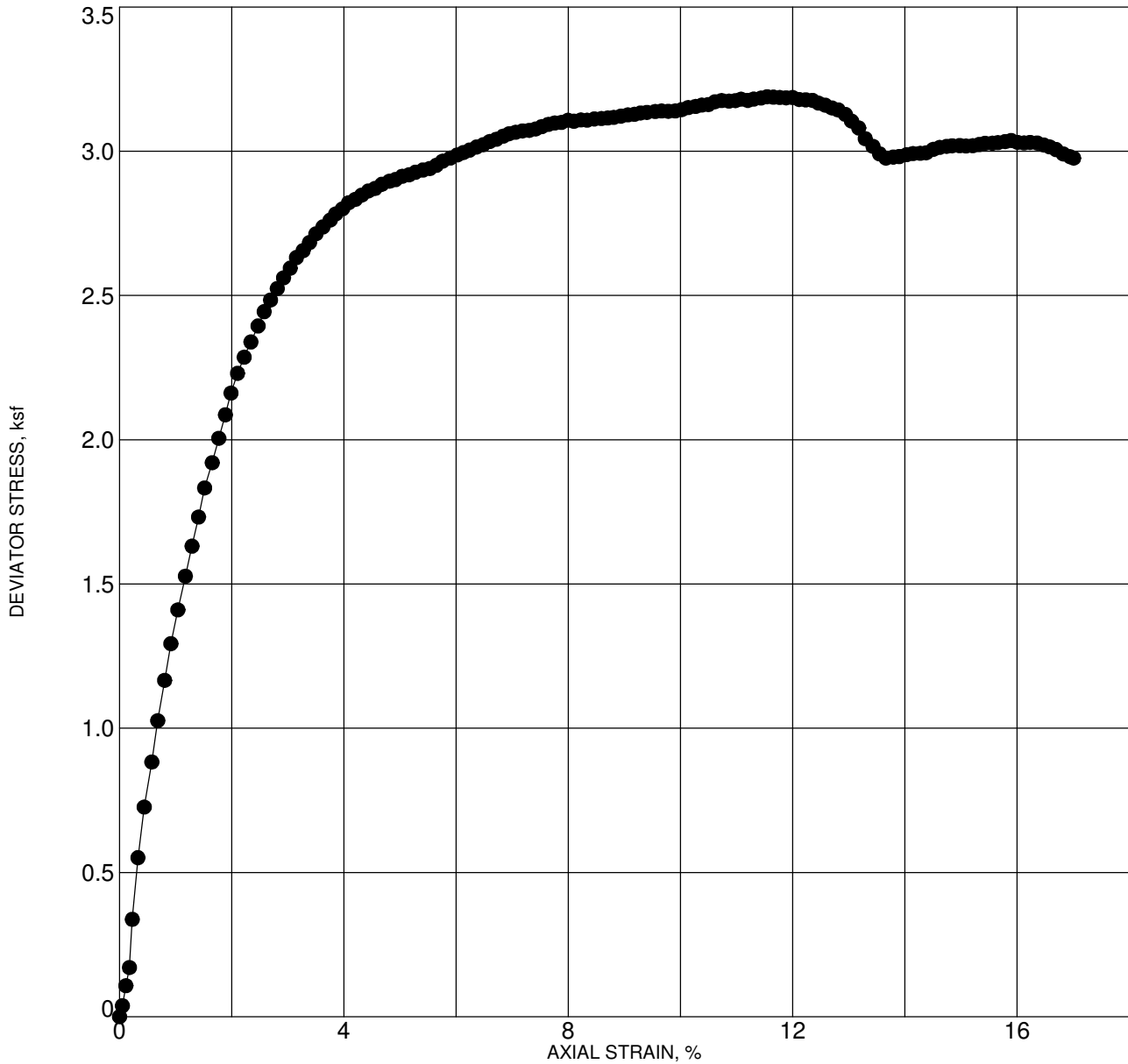


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 W.O. 8052-00

**TRIAXIAL UU COMPRESSION TEST - ASTM D2850**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 32**

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20




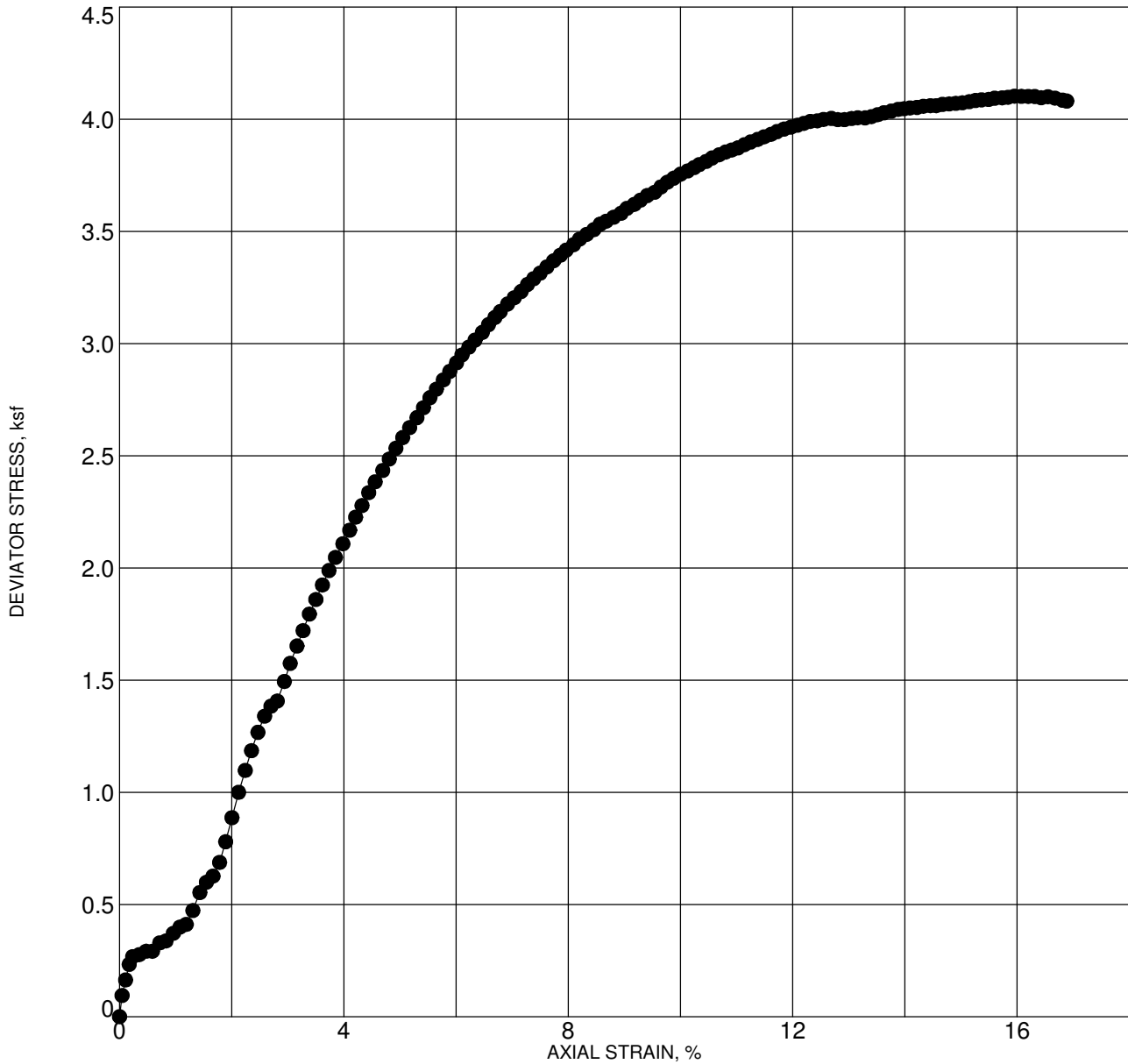
Max. Deviator Stress (ksf):	3.2
Confining Stress (ksf):	1.3

Location: B-4  
 Depth: 11.5 - 13.0 feet  
 Description: Mottled brown with some gray clay (CH) with some highly weathered gravel  
 Test Date: 10/2/2020

Dry Density (pcf)	68.6	Sample Diameter (inches)	2.413
Moisture (%)	44.7	Sample Height (inches)	5.133
Axial Strain at Failure (%)	12.0	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAxIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 33</b>




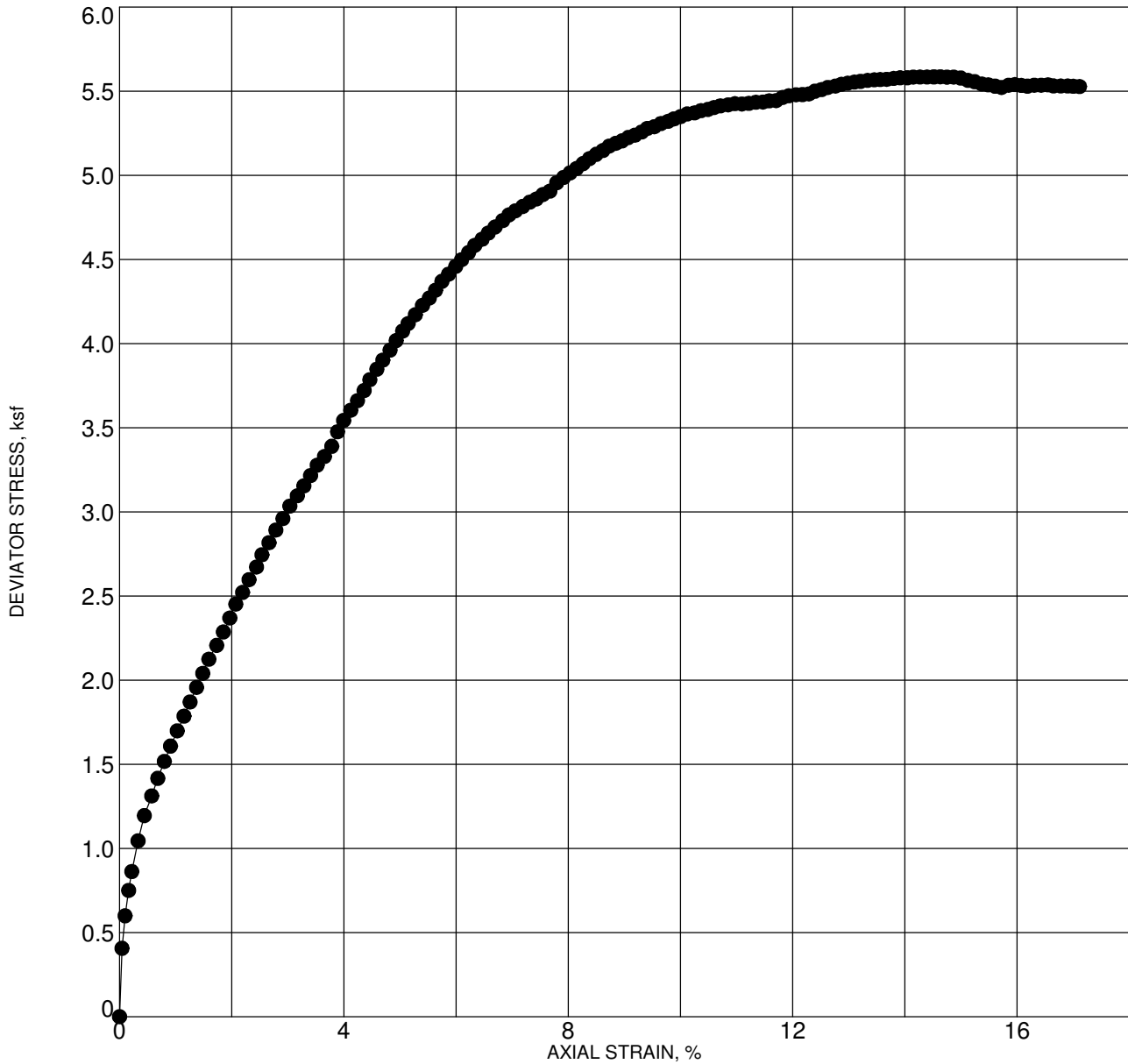
Max. Deviator Stress (ksf):	4.1
Confining Stress (ksf):	3.5

Location: B-4  
 Depth: 31.5 - 33.0 feet  
 Description: Brown silty clay with some sand  
 Test Date: 10/2/2020

Dry Density (pcf)	69.8	Sample Diameter (inches)	2.413
Moisture (%)	43.3	Sample Height (inches)	5.067
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.70

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	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 34</b>




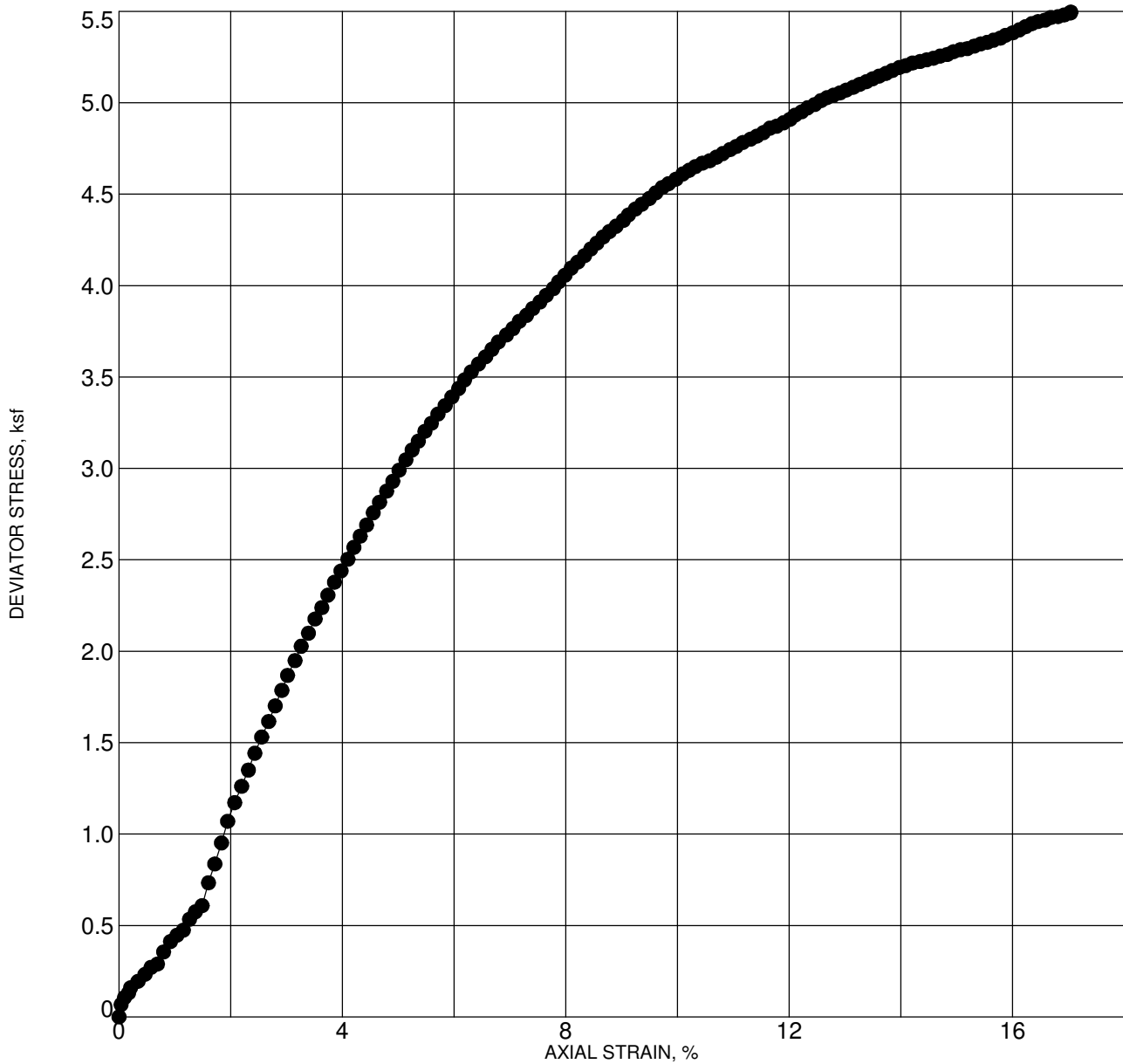
Max. Deviator Stress (ksf):	5.6
Confining Stress (ksf):	4.6

Location: B-4  
 Depth: 41.5 - 43.0 feet  
 Description: Brown silty clay (CH) with a little sand  
 Test Date: 10/14/2020

Dry Density (pcf)	71.3	Sample Diameter (inches)	2.407
Moisture (%)	50.6	Sample Height (inches)	5.133
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.71

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 35</b>



Max. Deviator Stress (ksf):	5.3
Confining Stress (ksf):	9.0

Location: B-4  
 Depth: 81.5 - 83.0 feet  
 Description: Brown with some gray silty clay  
 Test Date: 10/14/2020

Dry Density (pcf)	76.6	Sample Diameter (inches)	2.403
Moisture (%)	47.3	Sample Height (inches)	5.133
Axial Strain at Failure (%)	14.9	Strain Rate (% / minute)	0.70



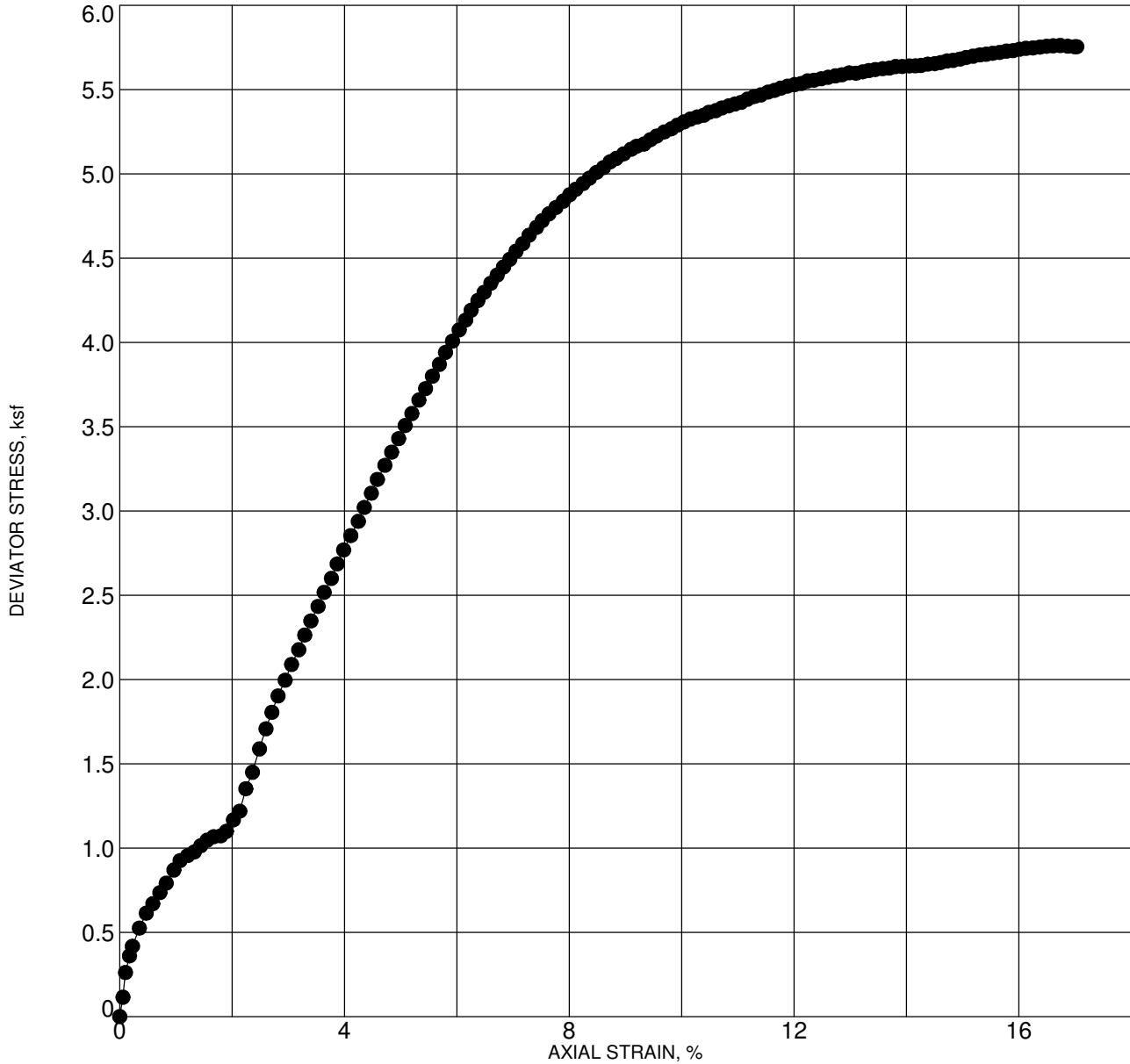
**GEOLABS, INC.**  
 GEOTECHNICAL ENGINEERING  
 W.O. 8052-00

**TRIAXIAL UU COMPRESSION TEST - ASTM D2850**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 36**

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20






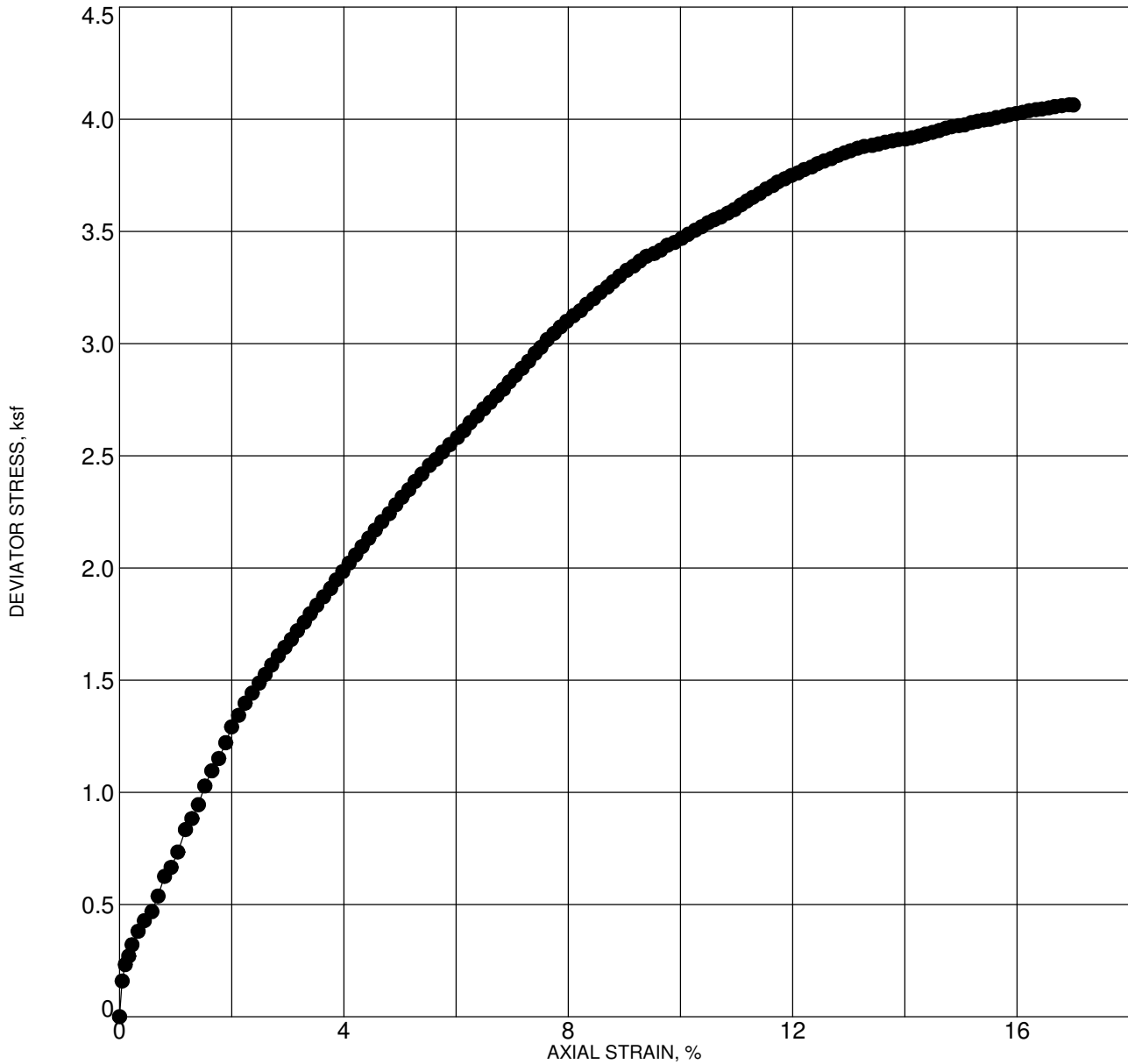
Max. Deviator Stress (ksf):	5.8
Confining Stress (ksf):	2.8

Location: B-5  
 Depth: 25.0 - 26.5 feet  
 Description: Brown with some gray silty clay with some highly weathered gravel  
 Test Date: 10/15/2020

Dry Density (pcf)	76.4	Sample Diameter (inches)	2.403
Moisture (%)	41.2	Sample Height (inches)	5.133
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.70

G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 37</b>




Max. Deviator Stress (ksf):	4.0
Confining Stress (ksf):	3.8

Location: B-5  
 Depth: 35.0 - 36.5 feet  
 Description: Brown with some gray mottling silty clay with some sand  
 Test Date: 10/15/2020

Dry Density (pcf)	69.9	Sample Diameter (inches)	2.407
Moisture (%)	55.8	Sample Height (inches)	5.133
Axial Strain at Failure (%)	15.0	Strain Rate (% / minute)	0.71

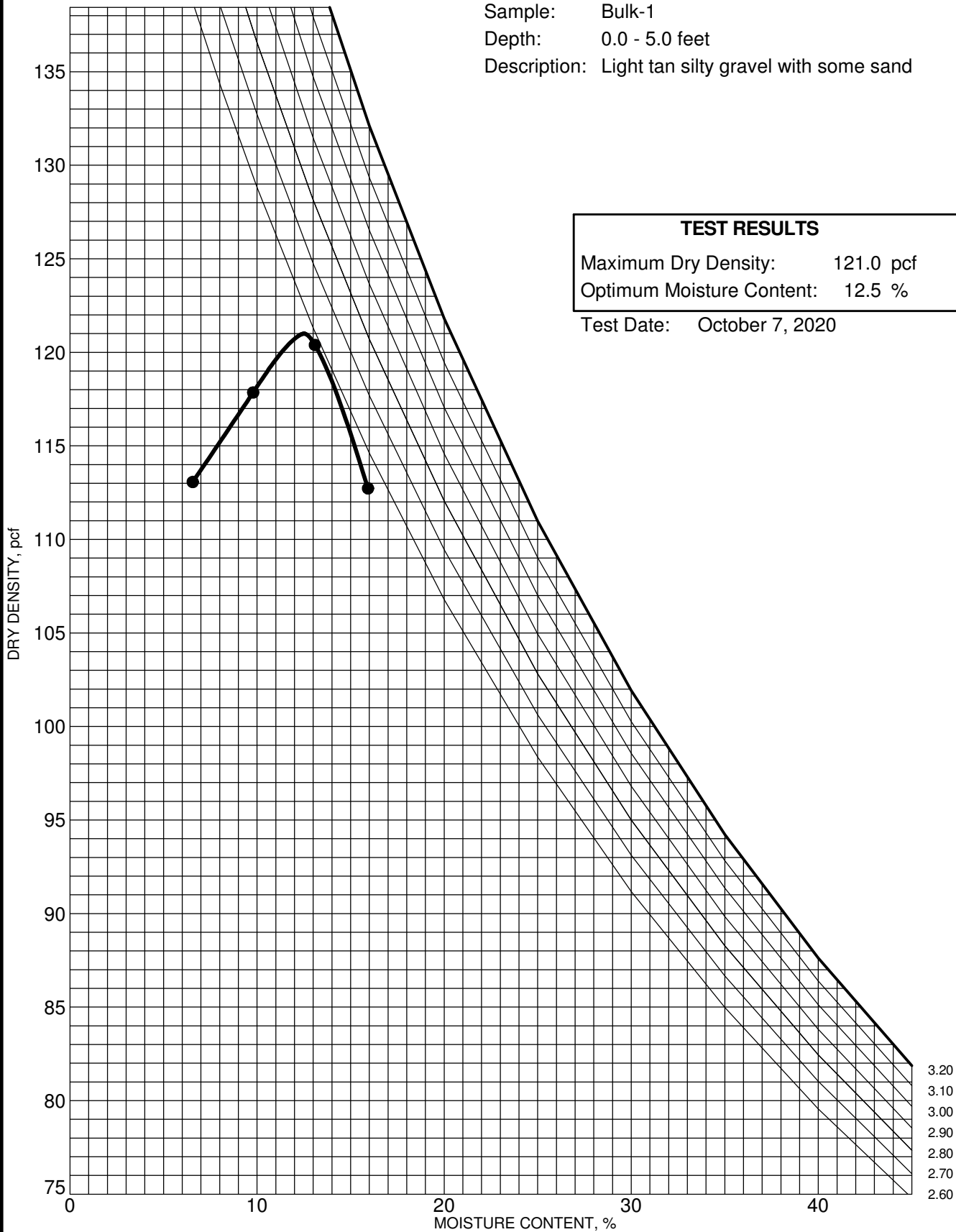
G TXUU 8052-00.GPJ GEOLABS.GDT 12/17/20

	<b>GEOLABS, INC.</b> GEOTECHNICAL ENGINEERING	<b>TRIAXIAL UU COMPRESSION TEST - ASTM D2850</b>	
	W.O. 8052-00	OAHU CORRECTIONAL COMMUNITY CENTER (OCCC) RELOCATION AND EXPANSION PHASE 2 HALAWA, OAHU, HAWAII	
			Plate <b>C - 38</b>

Sample: Bulk-1  
 Depth: 0.0 - 5.0 feet  
 Description: Light tan silty gravel with some sand

**TEST RESULTS**  
 Maximum Dry Density: 121.0 pcf  
 Optimum Moisture Content: 12.5 %

Test Date: October 7, 2020



G. COMPACTION 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

GEOTECHNICAL ENGINEERING

W.O. 8052-00

**MOISTURE-DENSITY RELATIONSHIP - ASTM D1557 C**

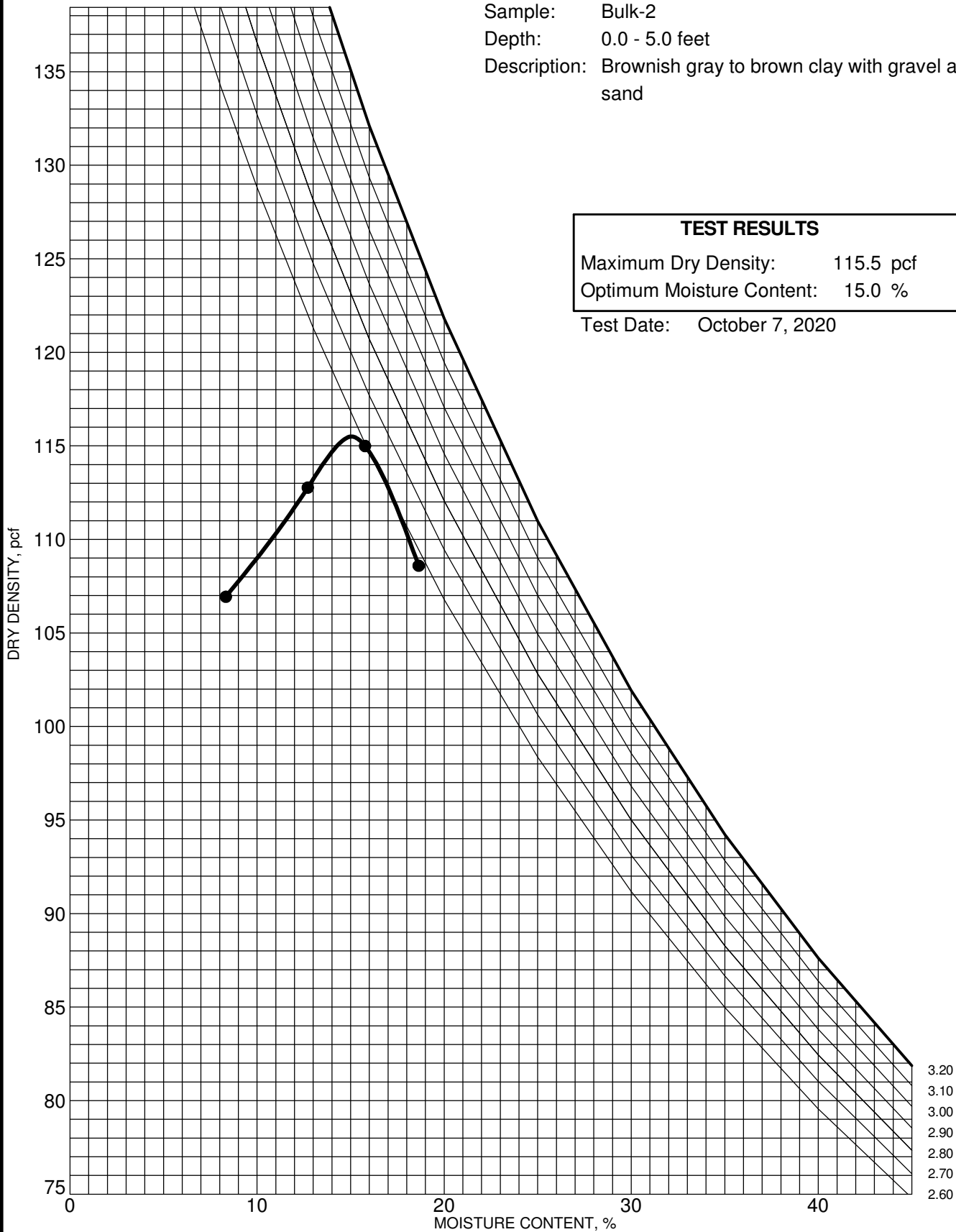
OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 39**

Sample: Bulk-2  
 Depth: 0.0 - 5.0 feet  
 Description: Brownish gray to brown clay with gravel and sand

**TEST RESULTS**  
 Maximum Dry Density: 115.5 pcf  
 Optimum Moisture Content: 15.0 %

Test Date: October 7, 2020



G. COMPACTION 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**  
 GEOTECHNICAL ENGINEERING  
 W.O. 8052-00

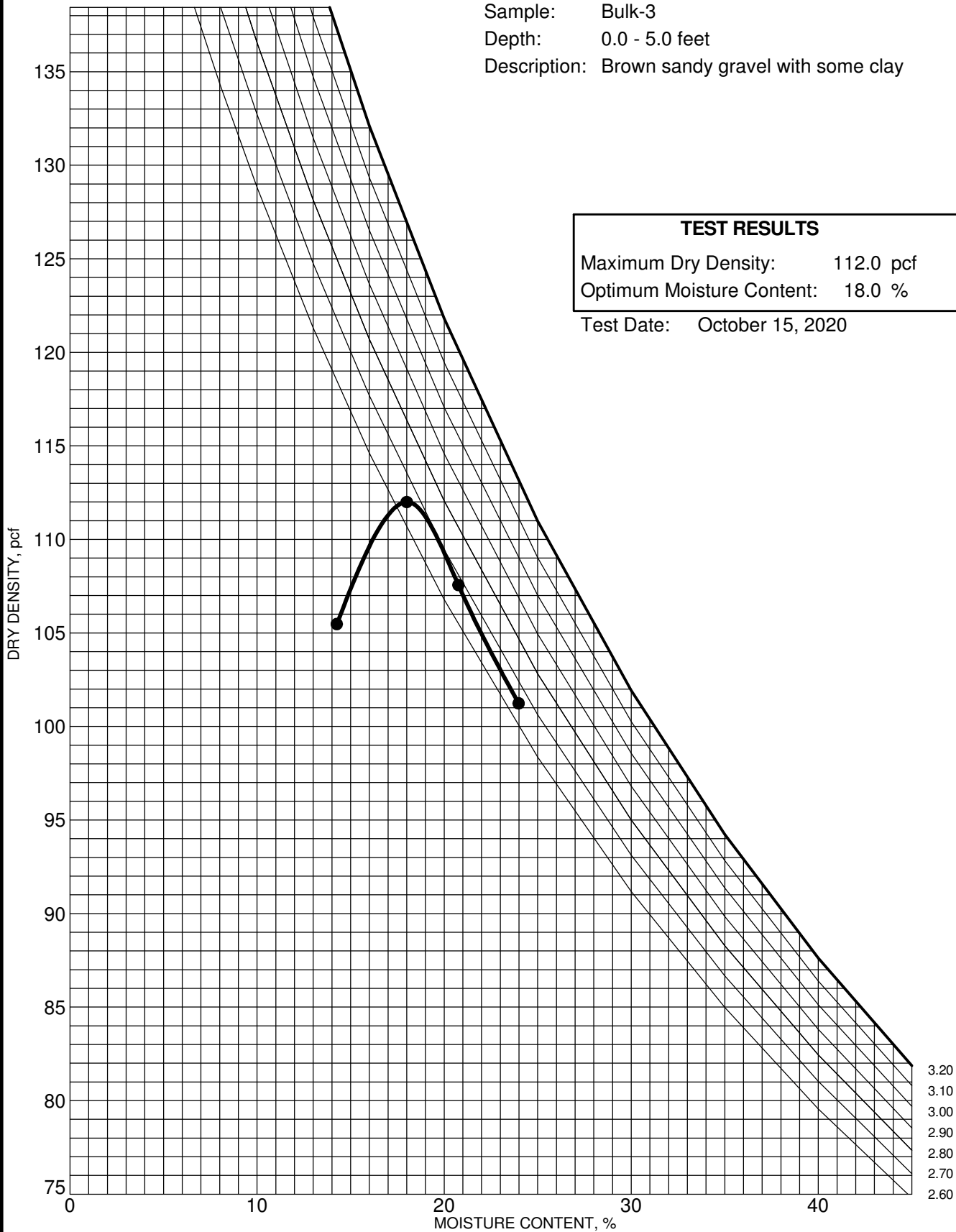
**MOISTURE-DENSITY RELATIONSHIP - ASTM D1557 C**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 40**

Sample: Bulk-3  
 Depth: 0.0 - 5.0 feet  
 Description: Brown sandy gravel with some clay

**TEST RESULTS**  
 Maximum Dry Density: 112.0 pcf  
 Optimum Moisture Content: 18.0 %

Test Date: October 15, 2020



G. COMPACTION 8052-00.GPJ GEOLABS.GDT 12/17/20



**GEOLABS, INC.**

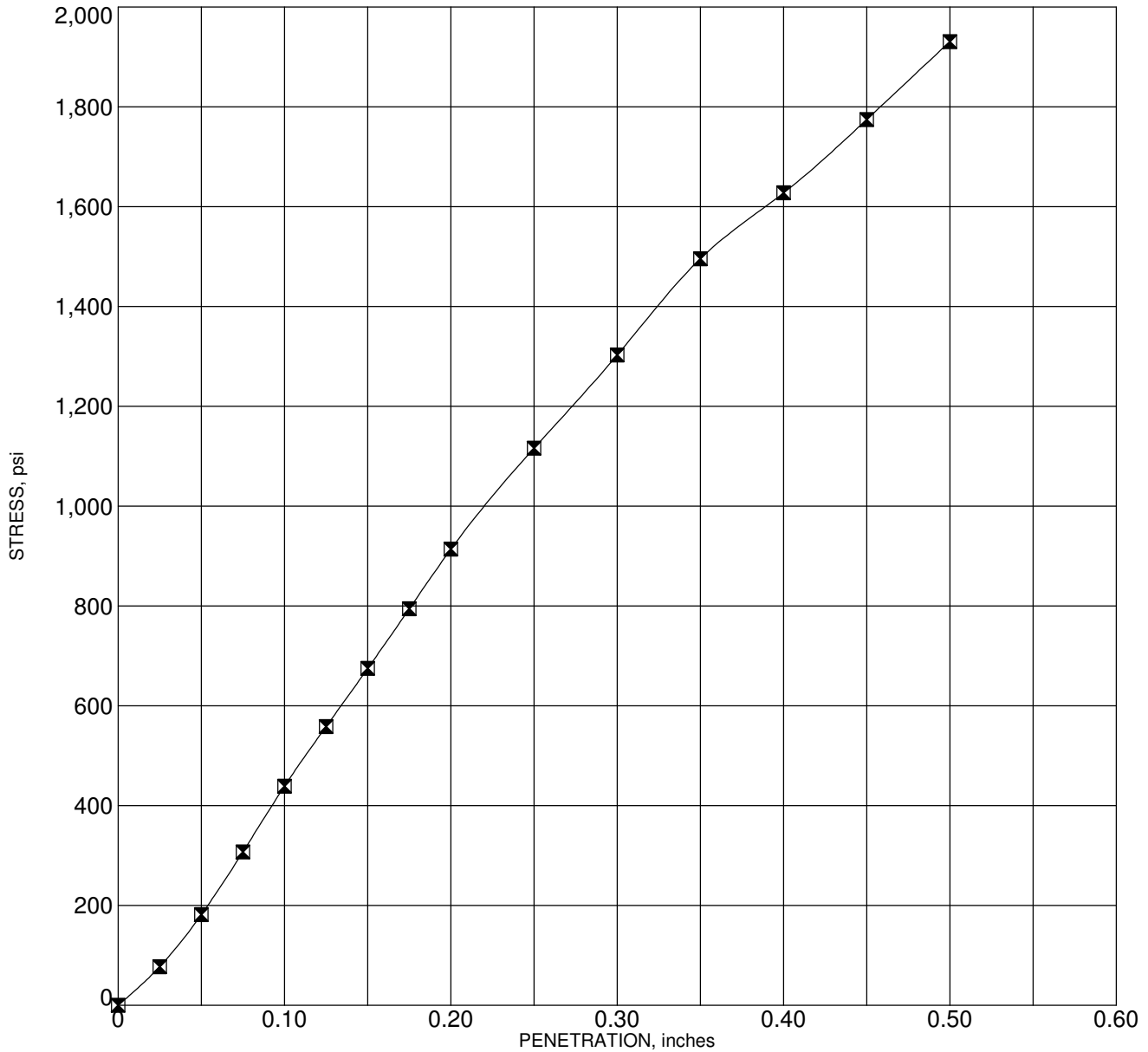
GEOTECHNICAL ENGINEERING

W.O. 8052-00

**MOISTURE-DENSITY RELATIONSHIP - ASTM D1557 C**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 41**



Corr. CBR @ 0.1"	50.5
Corr. CBR @ 0.2"	64.6
Swell (%)	0.04

Sample: Bulk-1  
 Depth: 0.0 - 5.0 feet  
 Description: Light tan silty gravel with some sand

Molding Dry Density (pcf)	123.1	Hammer Wt. (lbs)	10
Molding Moisture (%)	12.0	Hammer Drop (inches)	18
Days Soaked	5	No. of Blows	56
Aggregate	3/4 inch minus	No. of Layers	5



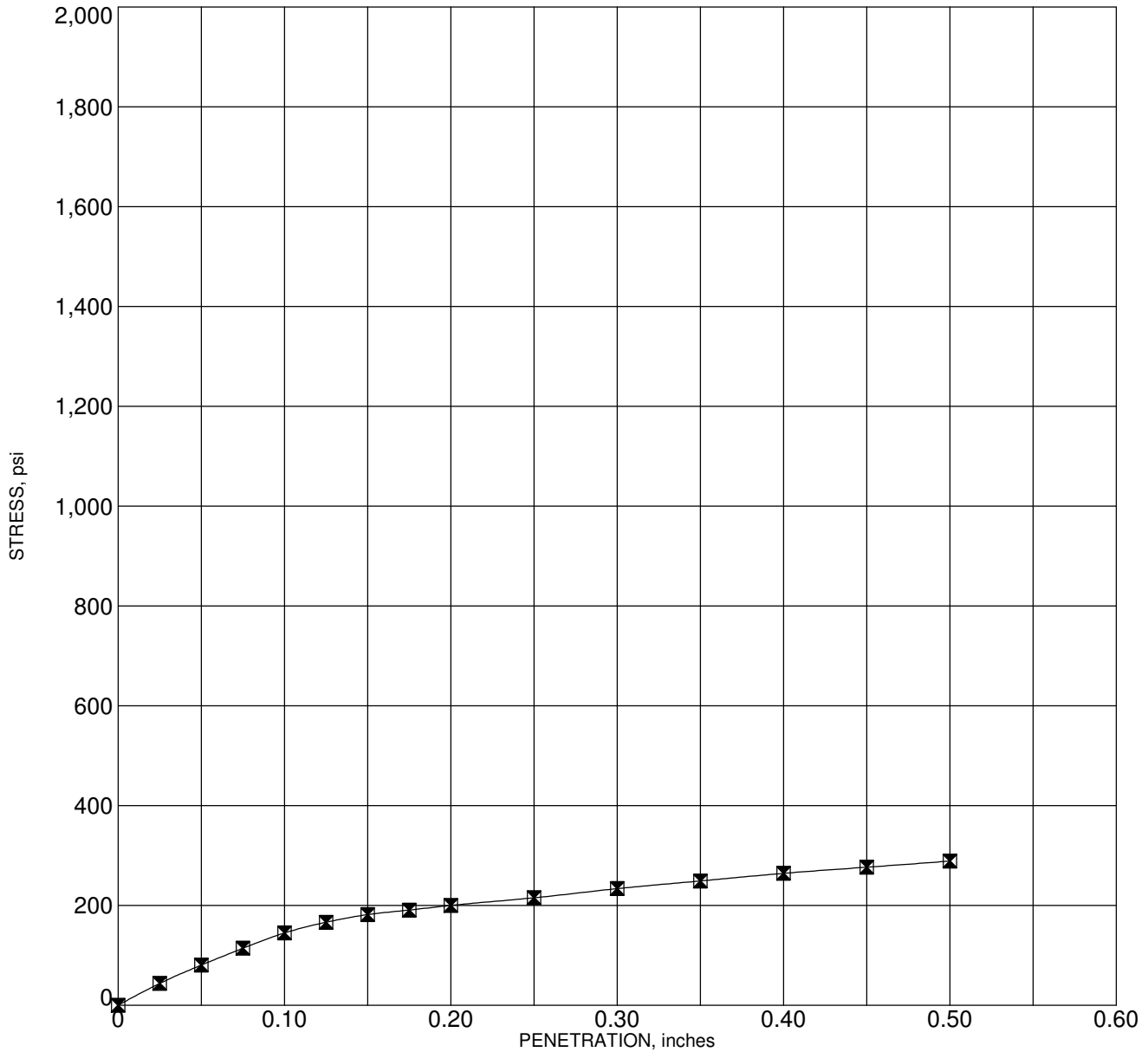
**GEOLABS, INC.**  
 GEOTECHNICAL ENGINEERING  
 W.O. 8052-00

**CALIFORNIA BEARING RATIO - ASTM D1883**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 42**

G. CBR. 8052-00.GPJ GEOLABS.GDT. 12/17/20



Corr. CBR @ 0.1"	14.5
Corr. CBR @ 0.2"	13.3
Swell (%)	1.85

Sample: Bulk-2  
 Depth: 0.0 - 5.0 feet  
 Description: Brownish gray to brown clay with gravel and sand

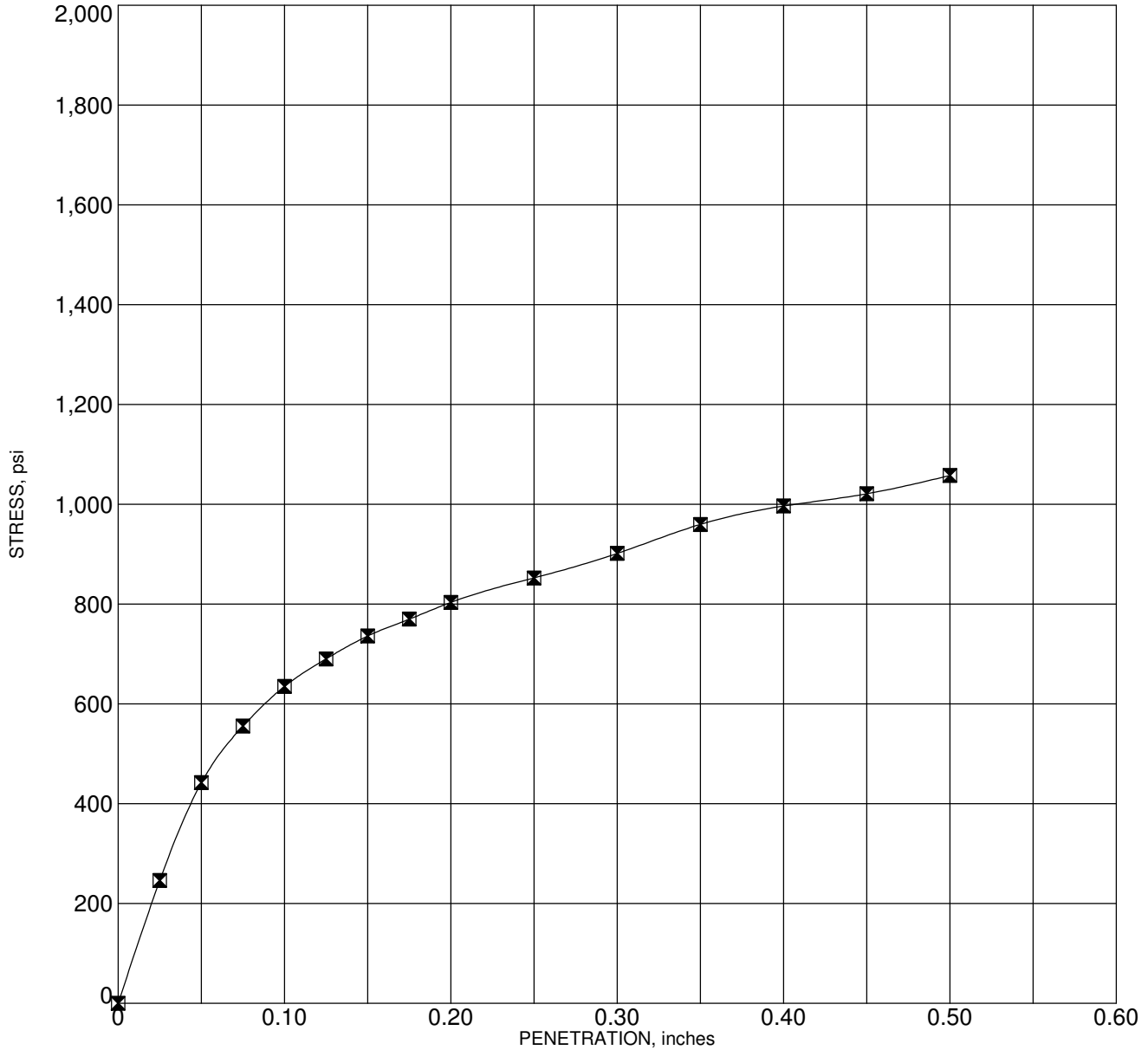
Molding Dry Density (pcf)	115.5	Hammer Wt. (lbs)	10
Molding Moisture (%)	14.7	Hammer Drop (inches)	18
Days Soaked	5	No. of Blows	56
Aggregate	3/4 inch minus	No. of Layers	5



**GEOLABS, INC.**  
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 W.O. 8052-00

**CALIFORNIA BEARING RATIO - ASTM D1883**  
 OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 43**



Sample: Bulk-3  
 Depth: 0.0 - 5.0 feet  
 Description: Brown sandy gravel with some clay

Corr. CBR @ 0.1"	63.5
Corr. CBR @ 0.2"	53.6
Swell (%)	0.55

Molding Dry Density (pcf)	111.5	Hammer Wt. (lbs)	10
Molding Moisture (%)	17.6	Hammer Drop (inches)	18
Days Soaked	5	No. of Blows	56
Aggregate	3/4 inch minus	No. of Layers	5



**GEOLABS, INC.**  
 GEOTECHNICAL ENGINEERING  
 W.O. 8052-00

**CALIFORNIA BEARING RATIO - ASTM D1883**

OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

Plate  
**C - 44**



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## **APPENDIX D**

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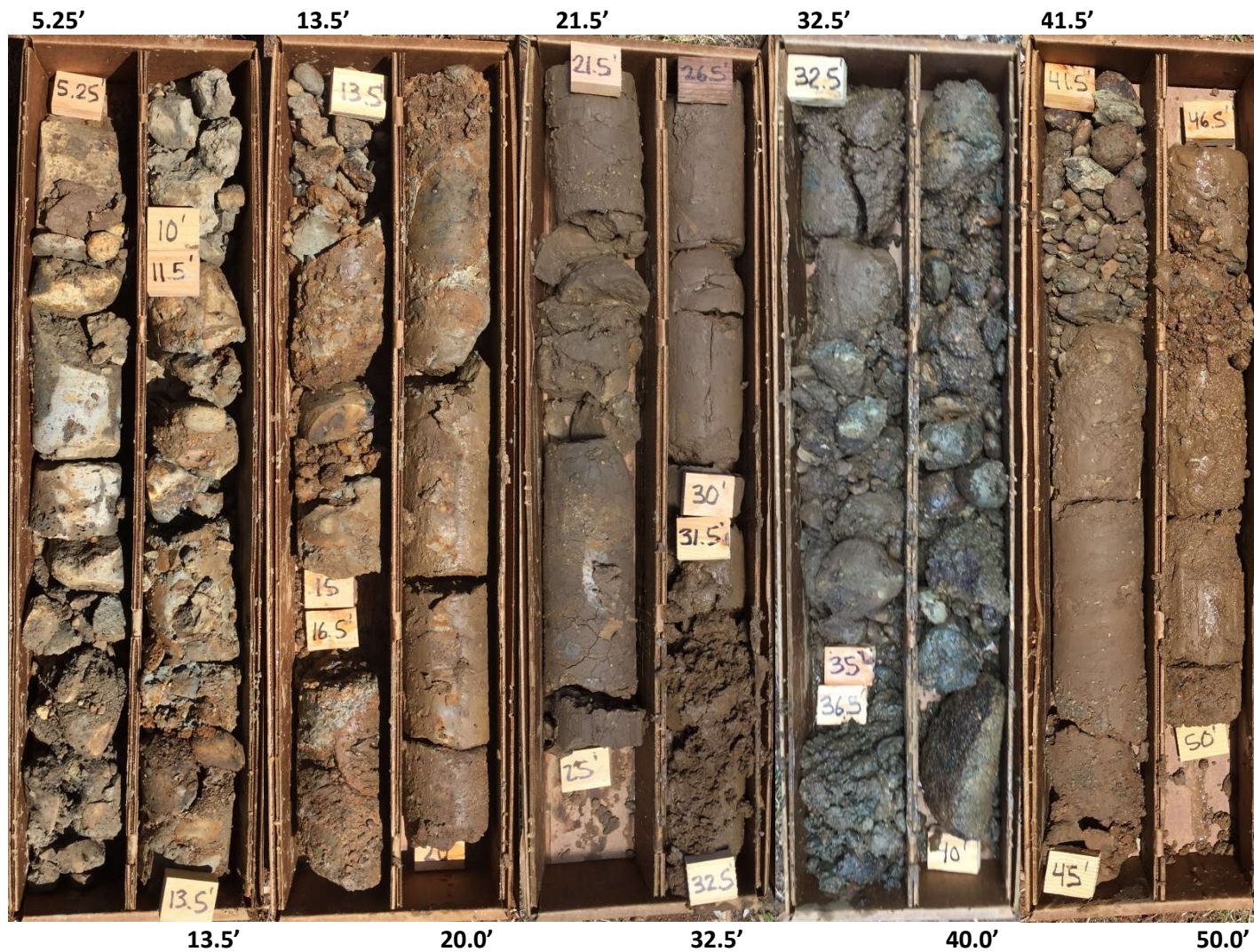
OAHU CORRECTIONAL COMMUNITY CENTER (OCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

B-1 8.5' TO 50.0'



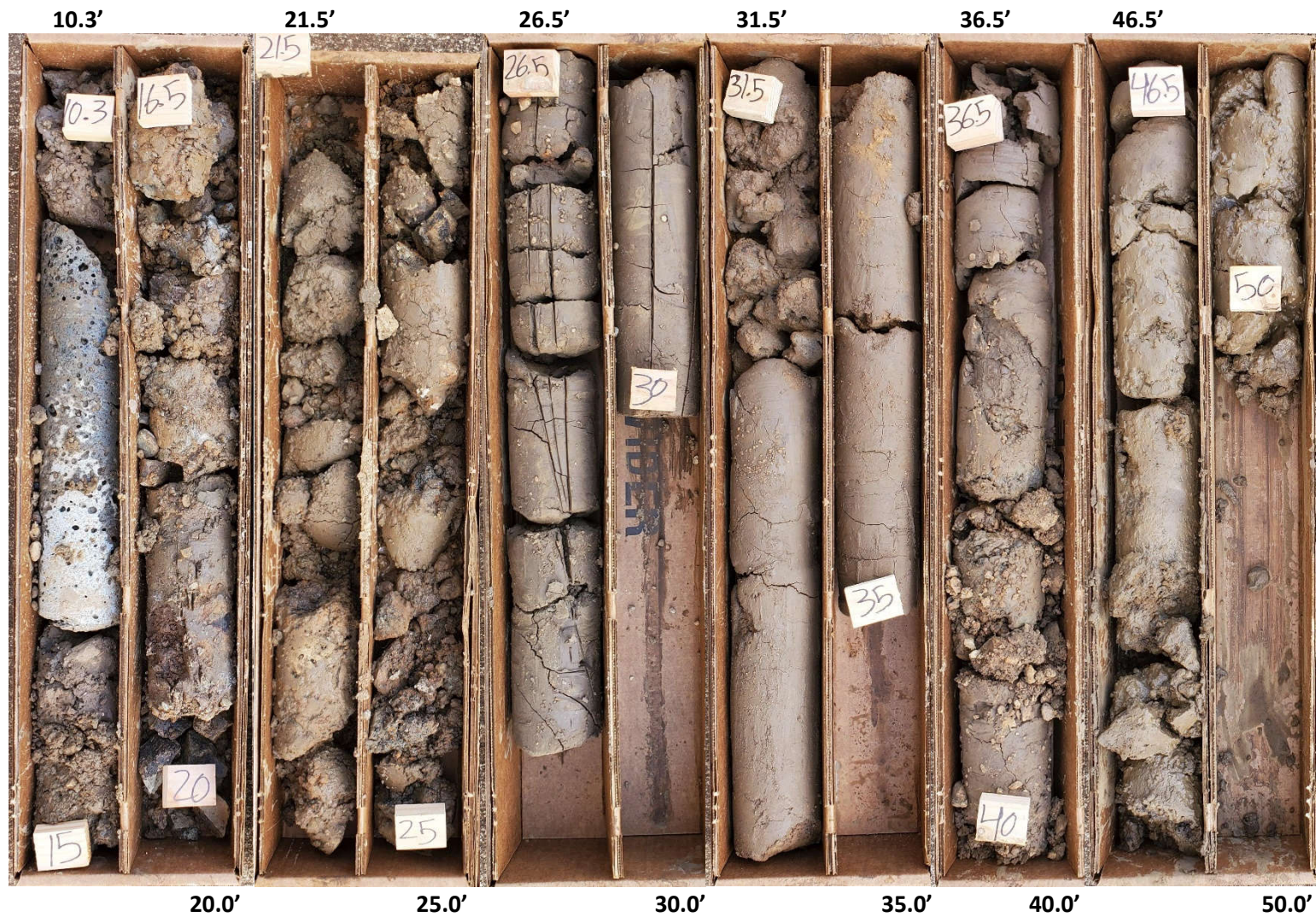
OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

B-2 5.25' TO 50.0'



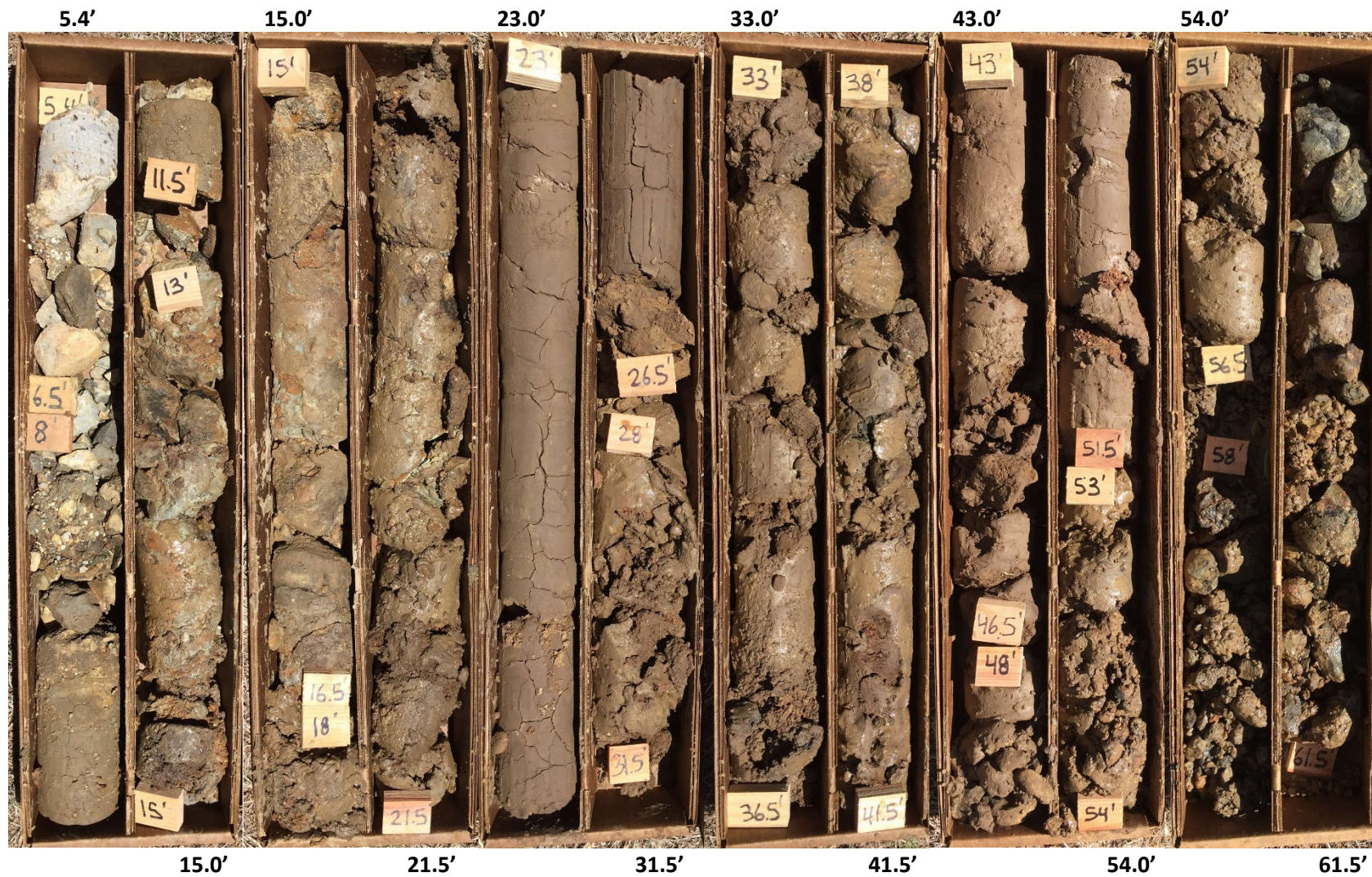
OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

B-3 10.3' TO 50.0'



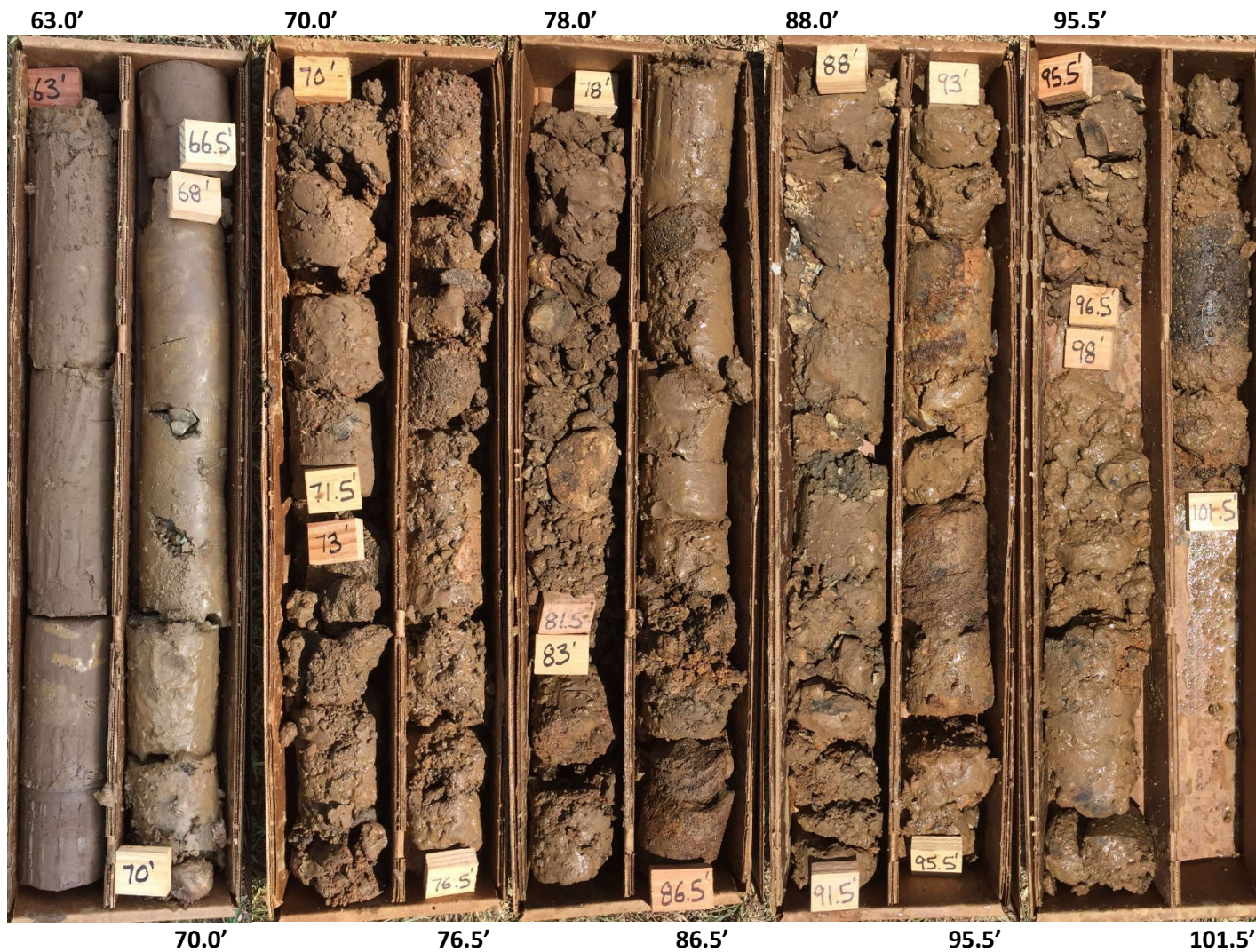
OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
 RELOCATION AND EXPANSION PHASE 2  
 HALAWA, OAHU, HAWAII

B-4 5.4' TO 61.5'



OAHU CORRECTIONAL COMMUNITY CENTER (OCCC)  
RELOCATION AND EXPANSION PHASE 2  
HALAWA, OAHU, HAWAII

B-4 63.0' TO 101.5'



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## **APPENDIX E**

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## **APPENDIX E**

### Field Infiltration Test

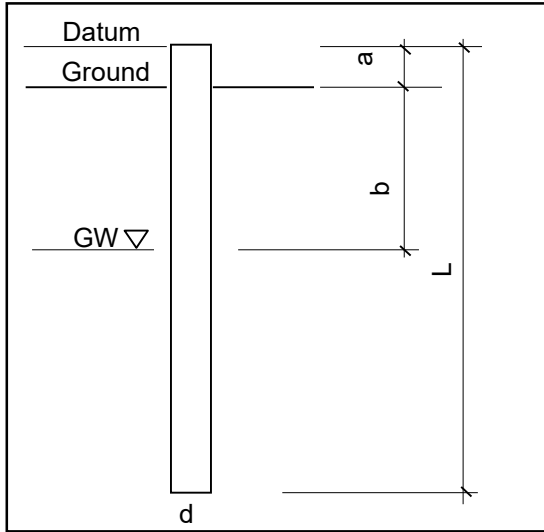
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As part of our field exploration program, we performed one infiltration test in Boring No. 8 at the approximate location shown on the Overall Site Plan, Plate 2, and Site Plan, Plate 3.2. The test was performed in general accordance with the procedures in Appendix D of the State of Maryland, Department of the Environment “Stormwater Design Manual, Volumes I and II” (rev. 2009). These procedures are consistent with other state’s procedures and may generally be considered an industry standard.

The field infiltration test was performed by advancing the boring to the selected test depth of about 6 feet below the existing ground surface. Upon reaching the test depth, a solid casing was set to the bottom of the drilled hole to allow infiltration only through the soil exposed on the bottom of the boring. Falling head infiltration tests were performed to determine the infiltration rate of the underlying subsurface materials. The test consisted of four trials of filling the casing with 24 inches of water and taking periodic readings over a one-hour trial period or until the water in the casing is drained. The test results are presented on Plate E-1.



# INFILTRATION TEST RECORD



Project:	OCCC Relocation - PH2
W.O.:	8052-00
Test No.:	1
Date of Testing:	8/14/2020
Method of Testing:	BMP Falling Head (Flush Bottom)
Source of Water:	Bucket
Boring Number:	B-8
GW level, b (from ground):	N/A feet
Datum, a (above ground):	0.6 feet
Depth of Boring:	6.0 feet
Length, L (from datum):	6.6 feet
Diameter of Casing, d (I.D.):	4.0 inches

Testing Trial	Elapsed Time (minutes)	Time (hh:mm)	Depth to Water (measured from datum) (inches)	Percolation Rate (inches per hour)
<b>Trial 1</b>	<b>0</b>	<b>8:51</b>	<b>55.00</b>	
	15	9:06	55.87	
	30	9:21	57.06	
	45	9:36	58.00	
	60	9:51	58.63	3.63
<b>Trial 2</b>	<b>0</b>	<b>9:58</b>	<b>55.00</b>	
	15	10:12	56.125	
	30	10:28	57.19	
	45	10:43	57.88	
	60	10:58	58.75	3.75
<b>Trial 3</b>	<b>0</b>	<b>10:59</b>	<b>55.00</b>	
	15	11:14	55.88	
	30	11:29	56.94	
	45	11:44	57.75	
	60	11:59	58.63	3.63
<b>Trial 4</b>	<b>0</b>	<b>12:02</b>	<b>55.00</b>	
	15	12:17	56.50	
	30	12:32	57.19	
	45	12:47	58.00	
	60	13:02	58.88	3.88

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## **APPENDIX F**

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# Boring 108-02

Surface Elevation 86 ± Feet  
MSL Datum

Moisture Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Moisture Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
35.9	83	9			0 - 3	GW		3-inch asphaltic concrete
					3 - 5	MH		Gray slightly sandy basalt gravel, very dense (fill)
		7			5 - 10	ML		Reddish brown silt, medium stiff (fill)
					10 - 15			Mottled brown to orange-brown sandy clayey silt, medium stiff (fill)
31.2	84	10			15 - 20	GM		Dark gray clayey silty sandy gravel, medium dense to dense (recent alluvium)
		22			20 - 21.5			

Boring completed at 21.5 feet on 08-10-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ☒ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 300 -lb. weight dropping 30 inches

Dames & Moore

DRAWN BY J.H. DATE 10-17-84 FILE 4108-10E-11 (Phase 2) CHECKED BY \_\_\_\_\_  
 REVISIONS \_\_\_\_\_ BY \_\_\_\_\_ DATE \_\_\_\_\_

# Boring 108-03

Surface Elevation 92 ± Feet  
MSL Datum

Molature Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Molature Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
40.5	63	30		■	10	SM	SM	Mottled black, reddish brown, and gray weathered, weakly cemented cinder sand, very dense (tuff)
44.9	63	32		■				
		21		■				
		15		■	20	ML	ML	Dark brown gravelly sandy silt, dense (old alluvium)

Boring completed at 21.5 feet on 08-07-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ⊠ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 300 -lb. weight dropping 30 inches

Dames & Moore

PLATE A-1.6

DRAWN BY: [redacted] DATE: 10-1-84  
 CHECKED BY: [redacted] FILE: 4408-108-11 (Phase 2)  
 REVISIONS: [redacted] BY: [redacted] DATE: [redacted]

FILE 4408-1CS-11  
 BY Blidge DATE 10-9-84  
 CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_

REVISIONS  
 BY \_\_\_\_\_ DATE \_\_\_\_\_  
 BY \_\_\_\_\_ DATE \_\_\_\_\_  
 PLATE \_\_\_\_\_

# BORING 108-04

SURFACE ELEVATION 94 ± Feet  
 MSL Datum

MOISTURE CONTENT IN %	DRY DENSITY IN PCF	BLOWS/FT. ON SAMPLER	CORE AND % RECOVERY	SAMPLES AND/OR CORES	DEPTH IN FEET	GRAPH SYMBOL	LETTER SYMBOL
		14			90		GM/CM

## DESCRIPTION

Mottled brown and yellowish brown clayey silty weathered basalt gravel and

Boring completed at 91.5 feet on 08-07-84  
 Groundwater not encountered

# LOG OF BORINGS

NOTES:

- DEPTH AT WHICH UNDISTURBED SAMPLE WAS TAKEN
  - DEPTH AT WHICH DISTURBED SAMPLE WAS TAKEN
  - DEPTH AT WHICH SAMPLE WAS LOST DURING EXTRACTION
  - DEPTH AND LENGTH OF CORE RUN
- DRIVING ENERGY- 300 -LB WEIGHT DROPPING 30 INCHES

# Boring 108-05

Surface Elevation 100.5 ± Feet  
MSL Datum

Moisture Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Moisture Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
		23					GM/SM	Mottled brown and reddish brown clayey silty weathered basalt gravel and sand, very dense (old alluvium)
		22						
40.5	80	22						
41.5	78	19			10			
		20						
50.3	70	20						
		12			20		ML	Brown sandy clayey silt, dense (weathered volcanic cinder sand, old alluvium)
49.2	69	12						
		9						
		8			30			
		24					GM/ML	Brown sandy clayey basalt gravel and silt, dense (weathered volcanic cinder sand and basalt gravel, old alluvium)
47.0	73	24						
		16			40			
		12						
44.5	72	12						
		16			50			
52.4	69	23						
		10			60			

Boring completed at 61.5 feet on 08-07-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ⊠ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 300 -lb. weight dropping 30 inches

Dames & Moore

DRAWN BY *[Signature]* DATE *10/10/84*  
 CHECKED BY *[Signature]* FILE *11005-108-11*  
 REVISIONS \_\_\_\_\_ BY \_\_\_\_\_ DATE \_\_\_\_\_

# Boring 108-06

Surface Elevation 105 ± Feet  
MSL Datum

Moisture Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Moisture Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
49.8	73	31			0 - 10	▲	GM	Brown and gray silty clayey rounded basalt gravel, dense to very dense (old alluvium)
45.9	73	24			10 - 20	▲		
50.3	68	12			20 - 21	▲		
		10			21 - 22	■	MH	Mottled brown and reddish brown clayey silt, stiff (old alluvium)
		19			22 - 30	▲	GM	Brown silty sandy clayey rounded weathered basalt gravel, dense (old alluvium)
45.0	65	21			30 - 40	▲		
		7			40 - 41	■	MH	Brown clayey silt, medium stiff (old alluvium)
		7			41 - 42	■		
47.2	74	20			42 - 50	▲	GM	Mottled brown, reddish brown, and black sandy clayey weathered basalt gravel, dense (old alluvium)
		19			50 - 51.5	▲		

Boring completed at 51.5 feet on 08-08-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ⊠ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 300 -lb. weight dropping 30 inches

Dames & Moore

PLATE A-1.9

DRAWN BY: [redacted] DATE: [redacted] CHECKED BY: [redacted] DATE: [redacted]  
 REVISIONS: [redacted] BY: [redacted] DATE: [redacted]  
 FILE: 4408-A-P-11 (1 of 2)

# Boring 108-07

Surface Elevation 109.8 ± Feet  
MSL Datum

Moisture Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Moisture Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
		64/5"					ML	Brown to reddish brown clayey silt, loose (fill)
		129					GM/MH	Gray clayey silt and silty rounded basalt gravel, very stiff to dense (old alluvium)
		75/5"						
		80/5"			10			
		60/5"					MH	Brown sandy clayey silt, very stiff (old alluvium)
35.0	84	90			20			
		63						grading with weathered basalt gravel
38.1	78	55			30			

Boring completed at 31.5 feet on 08-13-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ⊠ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 140 -lb. weight dropping 30 inches

Dames & Moore

DRAWN BY DATE 10-10-84  
 CHECKED BY FILE 1108-108-11 (10/10/84)  
 REV STONS BY DATE





# Boring 108-09

Surface Elevation 13.0 ± Feet  
MSL Datum

Moisture Content in %  
Dry Density in PCF  
Blows/Ft. on Sampler  
Core and % Recovery  
Samples and/or Cores  
Depth in Feet  
Graph Symbol  
Letter Symbol

## Description

Moisture Content in %	Dry Density in PCF	Blows/Ft. on Sampler	Core and % Recovery	Samples and/or Cores	Depth in Feet	Graph Symbol	Letter Symbol	Description
		23/6"		■			ML	Brown sandy gravelly silt, medium dense (possible fill)
42.3	77	51/9"		■	10		GM/MH	Mottled brown and reddish brown sandy clayey weathered basalt gravel, dense (old alluvium)
48.3	73	26		■				
		16		■	20		MH	Mottled brown and dark gray clayey silt, stiff to very stiff (old alluvium)
47.5	74	15		■				
54.3	66	13		■	30		GM/MH	Mottled brown and reddish brown clayey weathered basalt gravel and gravelly clayey silt, stiff and dense (old alluvium)
		40/5"		■				
47.7	74	18		■	40			
		17		■				
45.8	71	25		■	50			
		13		■				
		16		■	60			

Boring completed at 61.5 feet on 08-06-84  
Groundwater not encountered

## LOG OF BORINGS

### NOTES:

- - depth at which undisturbed sample was taken
- ⊠ - depth at which disturbed sample was taken
- - depth at which sample was lost during extraction
- I - depth and length of core run

Driving Energy - 300 -lb. weight dropping 30 inches

Dames & Moore

PLATE A-1.12

DRAWN BY: [Signature] DATE: 10-15-84  
 CHECKED BY: [Signature] FILE: 4408-108-11 (Mass. 2)  
 REVISIONS: [Blank] BY: [Blank] DATE: [Blank]