PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
PROPOSED EAST KAPOLEI PHASE II DEVELOPMENT
STUDY AREA I
HONOULIULI, EWA, OAHU, HAWAII

For

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SUMMARY OF FINDINGS AND RECOMMENDATIONS

The field exploration encountered about 6 to 12 inches of topsoil consisting of clayey silt and silty clays. Gravel and asphalt topsoil were also encountered in southwestern boundary of the site. The field exploration generally encountered very stiff to hard and very hard silty clay alluvial soils. A very dense coral formation was encountered in Boring Nos. B-1, B-3, and B-13 near the southern boundary of the property at depths of 13.5, 14, and 14.5 feet below ground surface, respectively. The coral formation was not encountered in the rest of the 15-foot borings within Study Area I. Groundwater was not encountered in any of the borings drilled.

Based on the field exploration and observations, the stiff to hard, near-surface materials encountered at the site should provide adequate support for the proposed residential housing development. However, laboratory tests show that the near-surface, silty clay soils exhibit moderate shrink and swell potential when subjected to changes in moisture content. Special attention should therefore be given to the preparation of subgrade and design of slab-on-grade/pavements for this project. To limit the development of cracks on floor slabs, walls, and pavements as a result of the anticipated activity of the low to moderately expansive subgrade soils, the following available methods of construction may be adopted:

1. Control and maintenance of the near-surface subgrade soil moisture conditions during and after construction.

2. Design the structures to withstand the anticipated incremental movements of the subgrade soils i.e. with post tensioning techniques or design the structures to allow a limited flexibility of movement.

3. Over excavate and replace the near-surface soils with non-expansive select borrow; and/or

4. Provide short geopiers with rammed in aggregates under the footings.

The above construction methods, special design recommendations, and grading schemes are discussed in more detail in the text of this report.

INTRODUCTION

East Kapolei II Development is divided into 2 study areas namely; Study Area I and Study Area II, as shown in the Project Location Map, Plate No. 1. This report is for Study Area I, and is the first of 2 preliminary geotechnical exploration reports being submitted for the East Kapolei II Development. Study Area I consists of the following parcels:

- 12-acre KROC Center;
- 4.7, 8.1, and 4.1-Acre Parks;
- 20.4 and a 19.7 acre Low Density Apartment (LDA) Lots;
- 153-lot subdivision parcel (Increment II-B);
- 220-lot subdivision parcel (Increment II-A);
- 105 ft-wide access road (East-West Road); and
- Subdivision road network.

A 17-acre parcel for a middle school is within Study Area I, but is not included in our investigation. A separate study will be done for this parcel by the Department of Education (DOE) in the future. A sewer line along Mango Tree Road is also within Study Area I, but not included in our study.

Our work was performed in general accordance with our February 12, 2007 proposal to Community Planning and Engineering, Inc. (CP&E). This report summarizes our findings and recommendations.

PROJECT CONSIDERATIONS

The proposed East Kapolei Phase II Development Study Area I consists of individual residential lots, paved roads, 3 community parks, a 12-acre KROC Center, a 26.6 acre Ilima conservation park, a sewer line corridor running along Mango Tree Road south of the property, and 2 low-density apartment (LDA) complexes (Plate No. 2). At the writing of this report, no grading plans were available and the specific locations of the structures have not been designated.

For Study Area I, 22 borings were drilled and 5 test pits were hand excavated by PSC Consultants, LLC (PSC) within the study area to examine the near surface silty clay overburden soils and to obtain samples for CBR and index property tests.

We anticipate the future residence/structures to be 1- to 2-story homes, supported by slab-on-grade with thickened edges and/or shallow-spread or continuous footings to be built by the developer or individual homeowners.

PURPOSE AND SCOPE

The purpose of our preliminary geotechnical exploration was to gather information on the nature, distribution, and characteristics of the subsurface earth materials encountered within Study Area I and to provide applicable recommendations for the development of the proposed residential subdivision within this area. The scope of our exploration consisted of the following tasks and work efforts:

1. Scheduling and planning the investigation;
2. Project coordination and site preparation;
3. Drilling 22 borings to 15 feet below the existing ground surface and excavating 5 hand-dug test pits and collecting bulk samples for classification and laboratory testing;
4. Providing a field engineer to monitor the drilling operations, obtain soil samples at selected depths, and maintain field logs of the soils encountered;
5. Performing laboratory tests on selected soil samples obtained from the borings and test pits to evaluate relevant engineering characteristics of the soils encountered;
6. Analyzing the field and laboratory data;
7. Reviewing soil information and related data on the project site and immediate vicinity; and
8. Preparing and submitting a written preliminary geotechnical engineering exploration report summarizing our findings, conclusions, and recommendations for grading, pavement design, foundations, and other geotechnical aspects.

REGIONAL GEOLOGY

Two basaltic shield volcanoes, Waianae and Koolau, built up the island of Oahu. The Waianae area, which forms the west side of the island, is the older of the 2 areas and was built during the Pliocene Epoch by the extrusion of the lavas of the Waianae Volcanic Series. As volcanic activity in Waianae ceased, lava flows from Koolau banked against the Waianae eroded slope forming a broad Plateau presently known as Schofield Plateau. Physical and chemical weathering followed by erosion of this plateau generated sediments, which were transported to the coast. In the vicinity of the project site and to the south, these sediments accumulated and interbedded with marine sediments and coral algal reef formation to form a sedimentary wedge. The thickness of the sedimentary wedge ranges from zero in the area of the interstate route H-1 highway to over 1,000 feet in Ewa Beach. This wedge forms the Ewa plain and serves as the confining formation over the artesian basal aquifers of southern Oahu. Deposition of sediments has continued from earlier geologic time through the present. Agricultural developments within the last 100 years and recent mass grading work have brought this part of Ewa Plains in Honouliuli, East Kapolei to its present form.

Geology of Study Area and Vicinity

The soils within the study area and surrounding Honouliuli and Ewa plains, belong to the Honouliuli Series (HxA) based on the Soil Survey of Oahu by the US Department of Agriculture Soil Conservation Service, 1972. This series consists of well-drained soils in the Ewa area on the Island of Oahu (Plate No. 3). These soils developed in alluvium derived from basic igneous material. They are nearly level and gently sloping. Elevations range from 15 to 125 feet. The annual rainfall in this area is from 10 to 20 inches, occurring mainly between November and April. Honouliuli soils are geographically associated with Ewa, Lualualei, Mamala, and Waialua.

EXISTING SITE CONDITIONS

The project site is located to the east of the existing Villages of Kapolei Development in the district of Ewa, Oahu, Hawaii. The study area is bound by the North-South Road on the west and by Mango Tree Road on the south. The northern and eastern boundaries of the property lie adjacent to cultivated fields (diversified agriculture). The western portion of Study Area I, comprising about a third of the project area, is currently uncultivated and is overgrown with grass and scattered with occasional Koa and Keawe bushes. Evidence of previous cultivation of sugar cane can be traced from the still upright but decayed remains of the last crops and the almost uniform consistency of the near-surface soils from seasons of reworking. This uncultivated portion of the property is generally dry and shows extensive cracking of the near surface soils due to dry conditions in the uncultivated areas. These shrinkage cracks are about 3 to 5 inches wide at the surface and extend down about 2.5 to 3.5 feet below the surface. The topsoil within the uncultivated parcel contains considerable amounts of organic materials from decayed plant matter. The rest of the project area is currently being cultivated and planted with corn and various vegetable crops. Study Area I is generally flat with slopes estimated at less than 1 percent. Elevations range from about 58 feet in the vicinity of Boring No. B-3 near the southern boundary to about 75 feet at Boring No. B-19 near the northern boundary of Study Area I.

SUBSURFACE EXPLORATION

The subsurface conditions in Study Area I were explored by drilling and sampling 22 borings (Boring Nos. B-1 through B-22) to a depth of 15 feet below the existing ground surface and hand excavating and sampling 5 test pits (Test Pit Nos. TP-1 through TP-5) to depths of about 3.5 feet below the existing ground surface. The approximate locations of the borings and test pits are shown in the Site Plan, Plate No. 2.

The field exploration encountered about 6 to 12 inches of topsoil consisting of clayey silt and silty clays that were observed to be generally dry and loose from cultivation. The topsoil within the uncultivated parcel on the western half of Study Area I contains considerable amounts of organic materials from decayed plant matter. Gravel and asphalt topsoil were also encountered in southwestern boundary of the site. The underlying soils were very stiff to hard and very hard silty clay alluvial soils. A very dense coral formation was encountered in Boring Nos. B-1, B-3, and B-13, near the southern boundary of the property at depths of 13.5, 14, and 14.5 feet below ground surface, respectively. The coral formation was not encountered in the rest of the 15-foot borings within Study Area I. Groundwater was not encountered in any of the borings drilled.

Detailed descriptions of the materials encountered are shown in the Logs of Borings and Logs of Test Pits, Plate Nos. 4 through 25 and 26 through 30, respectively.

DISCUSSIONS AND RECOMMENDATIONS

Our field exploration generally encountered alluvium materials consisting of very stiff to hard brown silty clays. A very dense coral formation was encountered in Boring Nos. B-1, B-3, and B-13, near the southern boundary of the property at depths of 13.5, 14, and 14.5 feet below ground surface, respectively. Stiff to very stiff brown silty clay was encountered in Test Pit Nos. TP-1 through TP-5 to 3.5 feet deep. Laboratory tests indicate that these silty clay alluvial soils have a low to moderate expansion potential (ranging about 3 to 8 percent) when subjected to increases in moisture content, as shown in the CBR expansion tests (Plate Nos. 38 through 42) and one-dimensional swell tests (Plate No. 43). Our site observations also indicate that these soils have the potential to shrink and swell, and develop relatively deep surface cracks when left unattended for extended periods of time.

Earthwork and Grading

The following sections present guidelines for the design and construction of the earthwork and grading for the subject development. Proper site preparation and compaction of any new fills and bonding of the new fills to the existing ground surface will be required to provide a stable fill mass.

Site grading operation should be observed by a representative of PSC. It is important that a representative from our office observe the site grading to evaluate whether any undesirable materials are encountered during the excavation and scarification process and whether the exposed soil conditions are similar to those anticipated in our engineering analysis.

Site Preparation

At the onset of earthwork, the area within the contract grading limits should be cleared of trees, vegetation, debris, rubbish, and other deleterious materials. These materials should be removed and properly disposed of off-site.

After the clearing and removal of unsuitable surface materials, the area should be proof-rolled to locate soft and yielding spots. Soft or yielding areas encountered should be over-excavated to expose firm soil surface and stabilized by backfilling with select material placed in 8-inch thick, loose lifts, moisture-conditioned to at least 2 to 3 percent above the optimum moisture content and compacted to 90 percent relative compaction. In areas to receive fill, the ground surface should be scarified to a depth of 6 inches, moisture-conditioned to at least 2 to 3 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 percentage of the maximum dry density of the same soil established in accordance with ASTM Test designation D 1557-91. The optimum moisture content is the moisture content corresponding to the maximum compacted dry density.

Fill Material and Placement

Fill Material

Except for the parks, materials used for general subdivision site embankment filling should be non-expansive select material, generally less than 3 inches in maximum dimension; should have a plasticity index not exceeding 15, as determined in accordance with ASTM Test Method D 4318-84; and should have maximum 20 percent of particles passing the No. 200 sieve. Offsite borrow materials should be tested by PSC Consultants, LLC to evaluate its suitability for use as select fill prior to its delivery to the project site.

Open Space, Park, and Non-Structural Areas

If desired, the top soil from adjacent areas may be stockpiled and used as fill within parks and open spaces, provided no structures will be constructed over these fills. Future changes in land use in the park fill areas will need a detailed soil investigation, particularly when buildings are planned.

Placement

Fill materials in the subdivision area should be placed in level lifts with a maximum loose thickness of 8 inches, moisture conditioned to at least 2 percent wet of optimum, and compacted to a minimum of 90 percent relative compaction. In roadway areas, the minimum degree of compaction within the upper 2 feet of the subgrade should be 95 percent. Each layer should be spread uniformly and blade-mixed to attain uniformity of the material and water content. Additional fill material should not be placed on any fill layer that has not been properly compacted.

Alternatively, a "Select Removal and Replacement Grading Scheme" can be utilized for the site grading.

Select Removal and Replacement

This method can be done just in the building pad areas thus eliminating the necessity of mass grading/excavating. The scheme would be to over-excavate 2.5 feet of the expansive onsite clay soils, place a geogrid or separating filter fabric on the subgrade, place 1 foot of non-expansive, granular select borrow material or aggregate subbase compacted to 95 percent relative compaction, and place the excavated materials (minus any unsuitable materials) on top of the granular select borrow or aggregate subbase. After footing excavations are performed, the bottom of the proposed footings should rest on top of the prepared select borrow or aggregate subbase. The use of geogrid or filter fabric is also recommended at the subgrade/subbase interface under the proposed subdivision road system.

The above alternative may not work properly unless a professional is retained by the individual homeowners to plan and coordinate the design and construction of the house.

Slopes

Slope Construction

In cases where sloping fills are required, such as at the edge of fill embankments, these may be designed at 2H:1V or flatter. Fill slopes should be constructed by overfilling 2 to 3 feet, then cutting back to the design slope to expose a well-compacted face.

Slope Erosion Protection

Water should be diverted away from the slopes by diversion ditches at the tops and surface drains on slope surface and sub drains may be used to provide adequate drainage. Slope planting should be utilized to reduce erosion potential.

Foundations

Information on the proposed residential structures was not available at the time this report was prepared. We anticipate that 1- to 2-story buildings with relatively light loadings will be constructed. It is our opinion that shallow spread and strip footing foundations, or thickened-edge slab-on-grade foundations bearing on the undisturbed stiff natural soils or properly compacted granular select materials or compacted natural soils may be used to support the proposed residential and other light structures.

Allowable Bearing Pressure

An allowable bearing pressure of 2,500 psf. for dead plus live loads may be used for footings bearing on the undisturbed very stiff to hard natural soils on a minimum of 10-inch thick, properly compacted non-expansive granular select borrow fills over properly prepared and compacted subgrade. The allowable bearing pressure may be increased by 1/3 for transient loadings, such as wind or seismic forces.

Conventional Footings

Footings supported on the very stiff to hard insitu silty clay soils should be embedded at least 24-inches below the lowest adjacent finished grade or floor slab, whichever is lower. Two No. 4 reinforcing bars should be used at the top and bottom of the footings and the slabs should also be designed for expansive soils. If the structures are supported on properly compacted granular select materials then the depths of footing embedment (below lowest adjacent finished subgrade or floor slab, whichever is lower) should be 12 and 18 inches for residential 1- and 2-story buildings, respectively, and the reinforcing bars can be eliminated.

If "Select Removal and Replacement Grading Scheme" is performed, footings should be supported by at least 12 inches of select granular fill or 12-inches aggregate subbase over properly prepared and compacted subgrade and the reinforcing bars can be eliminated.

Use of Geopiers

As an option, short "Drilled Geo-Piers" can be utilized for foundation support of structures. The "Geo-Piers" involves drilling a hole 1 to 2 feet in diameter and about 3 to 5 feet in depth and replacing the material with base course material compacted in 1-foot lifts. The bottom of the piers should be inspected during construction and a geogrid or separating filter fabric should be placed before placement of the base course material. This method eliminates the grading/excavating phase entirely (with the exception of stripping the organic-laden top soils).

Post-Tensioning

A post-tensioned foundation system (post-tensioned thickened edge and post-tensioned floor slab) may also be considered. PSC can provide recommendations for a post-tensioned foundation system upon request.

We estimate the maximum total footing settlements should not exceed 1 inch with maximum differential settlement of 1/2 inches for the above foundation schemes.

Controlled Moisture Conditions Using Geomembrane Barriers

Another alternative construction method to limit the subgrade soil movement is the use of geomembrane barriers. The purpose of this is to prevent the lateral infiltration of water under the structures and to maintain optimum moisture conditions. This can be accomplished by excavating a narrow trench of at least 10 inches wide around the perimeter of the structure (minimum 4 feet away from structures) to a depth of at least 3.5 feet as shown in Appendix A. The trench surface adjacent to the structure including the bottom of the trench is lined with an impermeable geomembrane. The other wall of the trench is lined with a geo-filter fabric. A 4-inch perforated PVC pipe that connects to a subsurface drain is installed at the bottom of the trench (perforation down) before this is backfilled with clean sand. The top of the trench surrounding and adjacent to the residential structures is made impervious with geomembrane and a layer of impermeable clay.

Footings Setback from Slopes

Where footings are located adjacent to or on slopes, the footings should be embedded deep enough to provide a minimum horizontal set-back distance of at least 6 feet measured from the outbound edge of the footing to the face of the slope. Where footings are to be located adjacent to below-grade structures or utilities, the footings should extend to a depth below an imaginary 45-degree plane, projected upward from the bottom of the below-grade structure or utility. This requirement is necessary to avoid surcharging adjacent below-grade structures with additional structural loads and to reduce the potential of foundation settlement.

Lateral Design Parameters

Lateral loads acting on the structure may be resisted by frictional resistance between the base of the footings and the bearing materials and by passive earth pressure developed against the footings. A coefficient of 0.25 may be used to compute the frictional resistance and the passive pressure may be calculated using an equivalent fluid pressure of 250 pounds per square foot per foot of depth (pcf). These values assume that the concrete for footings is poured directly against the footing excavations. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches below finished grade should be neglected in the computation of the passive pressure.

Excavation

Natural soils may be excavated utilizing conventional equipment. The very stiff to hard subsurface silty clay or coral formation should be excavated using heavy-duty equipment. Contractors, especially those digging utilities, should satisfy themselves as to the hardness of deposits and select the most appropriate type of equipment required.

For temporary unsurcharged construction excavations, the excavations should be sloped or shored. Slopes should not be steeper than 1H:1V in granular soils, and 1/2H:1V in fine-grained soils. If there is insufficient space for sloped excavations, shoring should be used. Traffic and surcharge loads should be kept back at least 10 feet from the top of the excavations. Slopes should be inspected during construction/excavation to determine if they need to be flattened based on exposed conditions. Exposed slopes should be kept moist (but not saturated) during construction.

Slabs-On-Grade

We anticipate that concrete slab-on-grade floors will be used for the proposed residential buildings. We recommend that a 4-inch cushion layer of No. 3B fine gravel (ASTM C 33, No. 67 gradation) be used below the slabs. To reduce future moisture infiltration and subsequent damage to floor coverings, A vapor membrane should be incorporated on top of the 3B fine gravel cushion layer to reduce potential damage to moisture sensitive floor coverings by infiltration of moisture. To provide protection to the moisture barrier, a 2-inch layer of moist sand is recommended on top of the moisture barrier/geomembrane. This layer of sand will protect the geomembrane and also aid in the curing of the concrete slab. Flexible soil coverings such as carpet or sheet vinyl should be considered as these can better mask minor slab cracking. It is also recommended that minor interior walls be designed to allow for some flexibility to accommodate the anticipated small amounts of ground movement.

Site Drainage

Subdrains should be provided where there is a possibility that runoff or irrigation could saturate the subsurface soils.

Exposed surface soils should be protected from erosive runoff by providing surface drains, diversion berms, and other flood control devices. The finished lot grade should be shaped to shed water away from foundations and to avoid ponding conditions. In addition, it is advised that each residence and building be equipped with a gutter and downspout system and the water diverted as far away as possible from the house foundations and driveway. Collected water should be drained into an approved drainage system, and not allowed to flow freely on the site. Excessive landscape watering near foundations should be avoided.

Pavements

Although specific traffic loading has not been specified, we anticipate a medium vehicle loading for the project consisting primarily of passenger vehicles and delivery trucks. Because of the expansive nature of the insitu soils, our preliminary pavement design assumes that the pavement subgrade soil will consist of a minimum 12 inches of compacted select borrow granular fill materials or aggregate subbase with a minimum CBR value of 25. Any new fill material within 2 feet above the pavement subgrade should be compacted to 95 percent relative compaction. Based on the above assumptions, we recommend the following pavement sections be used for preliminary design purposes:

2-Inches	Asphaltic Concrete
6-Inches	Base Course
8-Inches	Total Pavement Thickness

(Over 12 inches of select borrow granular material or aggregate subbase compacted to 95 percent relative compaction over 6 inches scarified subgrade compacted to 90 percent relative compaction.)

Coral or non-expansive select granular borrow material consisting of crusher run waste, mud-rock, sand, or cinders may be used as subbase for the road pavement as described in the Standard Specifications for Public Works Construction (1986).

The recommended preliminary section considers medium subdivision traffic. In areas with heavier traffic, such as main collector roads, the section should be thickened with an additional 1/2-inch asphaltic concrete to provide adequate support for the increased traffic loading. These sections should be verified by traffic studies, when available.

The base course should be compacted to 95 percent of its maximum dry density as determined in accordance with ASTM Test Method D 1557-91.

CBR and density test and/or field observations should be performed on the actual subgrade used for the roadway subgrade construction to confirm the adequacy of the above pavement sections. The recommended section assumes that adequate drainage will be provided in the paved areas.

Paved areas should be sloped and drainage gradients maintained to carry all surface water off the site. Surface water ponding should not be allowed anywhere on the site during or after construction.

Sidewalks

It is anticipated that concrete sidewalks along the subdivision roads will be constructed as part of the road network development. The subgrade for the sidewalk should consist of a minimum of 8 inches of select granular borrow fill or aggregate subbase and should be graded to the required cross-section; moisture-conditioned to above optimum moisture content and thoroughly compacted to at least 95 percent relative compaction.

Utility Trenches

We envision that utility lines will be required for the proposed subdivision project. Granular bedding consisting of 6 inches of No. 3B Fine gravel is recommended under the pipes. Free draining granular materials, such as No. 3B Fine gravel (ASTM C 33, No. 67 gradation), should also be used for the trench backfill, up to about 12 inches above the pipes to provide adequate support around the pipes and to reduce compaction requirement of the backfill, and thus reducing the potential for damaging the pipes.

The upper portion of the trench backfill from 1-foot above the pipes to the top of the subgrade or finished grade should consist of select granular material. The backfill should be moisture conditioned, placed in maximum 8-inch, level, loose lifts, and mechanically compacted to not less than 90 percent relative compaction to reduce the potential for future ground subsidence. Where trenches are below pavement areas, the upper 2 feet of the trench backfill above the pavement subgrade should be compacted to 95 percent relative compaction.

Where the sewer line trench bottom is on expansive clay soils, the trench should be over-excavated below invert elevation by at least 18 inches and replaced with No. 3B Fine gravel wrapped with geofabric comparable to Mirafi 140N or equivalent. The aggregate fill shall be placed in 6-inch layers, compacted and brought to within 6 inches of the invert grade as specified
in Section 11.4-B of the Standard Specifications for Public Works Construction. Excavation and backfill for manholes shall likewise be in accordance with Section 11, Trench Excavation and Backfill of the Standard Specifications for Public Works Construction. These over-excavation with granular backfill are measures to limit the effects of possible differential settlements or heave in the utility pipes resulting from changes in moisture content of the surrounding clay soils.

Retaining Walls

We understand that walls may be constructed at the site for grade separation, and boundary delineation. Walls that are subjected to unbalanced lateral loading shall be designed as retaining walls. The retaining wall structures should be designed to resist the lateral earth pressures due to adjacent soils and surcharge effects. Based on the current subsurface soil information, we recommend the following for the design of the retaining walls:

Active Pressure

An active pressure of 35 pcf in equivalent fluid weight is recommended.

Passive Pressure

A passive pressure of 250 pcf in equivalent fluid weight is recommended.

Coefficient of Friction

A coefficient of friction of 0.25 is recommended between the base of the footings and the supporting materials.

The above values assume that the concrete for footings is poured directly against the footing excavations. Unless covered by pavement or slabs, the passive resistance in the upper 12 inches below the finished grade should be neglected in the computation of the passive pressure.

Allowable Bearing Pressure

An allowable bearing pressure of up to 2,500 psf is recommended.

Backfill Requirements

Backfill behind the embedded walls should consist of imported select granular materials. Backfill behind the wall should be compacted to at least 90 percent maximum dry density as determined by ASTM D-1557, but not over compacted. Over compaction of the backfill material should be avoided so as not to create excessive lateral pressures against the wall.

Requirements for Imported Fill Under Foundations

Imported fill under foundations should be non-expansive, select material, generally less than 3 inches in maximum dimension; should have a plasticity index not exceeding 15, as determined in accordance with ASTM Test Method D 4318-84; and should have maximum 20 percent of particles passing the No. 200 sieve. The wall footing should be supported on at least 12 inches of select borrow or granular material compacted to 95 percent of maximum dry density.

The values provided above assume that imported granular fill will be used to backfill behind the wall. An active condition may be used for walls that are free to deflect by as much as 0.5 percent of the wall height. Generally, top of walls, which are not free to deflect beyond this degree or are restrained, should be designed for the at-rest condition. These lateral earth pressure values do not include hydrostatic pressure or surcharge loads that might be caused by groundwater trapped behind the walls.

For sloping backfill behind a wall up to 2H:1V, these values should be increased by a factor of 1.5. The surcharge effect from loads adjacent to retaining structures should also be included in the design of the walls. A rectangular distribution over the height of the wall with a pressure equal to 50 and 65 percent of the surcharge load is recommended for active and at rest conditions, respectively.

Retaining walls should be provided with backdrains or weep holes to prevent the buildup of hydrostatic pressures. If seepage through the wall is objectionable, back-drainage should be collected in a perforated pipe that discharges into gutters or suitable drainage. A typical drainage system would consist of a 1- to 2-foot wide zone of permeable material, such as No. 3B Fine gravel (ASTM C 33, No. 67 gradation), immediately adjacent to the wall with a perforated pipe, with perforations down at the base of the wall. The pipe should be sloped to drain into a suitable drainage system. A geotextile fabric, such as Mirafi 140N, or equivalent, should be placed between the gravel and the compacted backfill material. The drainage material should extend from the base to a height within 2 feet below finished grade. The remaining backfill should consist of an impervious capping of low expansive soil to reduce water infiltration behind the walls.

As an alternative, a prefabricated drainage board, such as MiraDrain, EnkaDrain, may be used in lieu of the permeable 3B Fine gravel material. The prefabricated drainage product should also be hydraulically connected to a perforated pipe, with perforations down, at the base of the wall. It is possible that wet spots in the wall may occur, with or without a perimeter drainage system. If this is objectionable, the exterior portions of the walls should be waterproofed.

Design Review

Drawings and specifications for the proposed construction should be submitted to PSC Consultants, LLC, as geotechnical consultant, for review and written comments prior to construction. This review is needed to evaluate adherence of the plans to the recommendations provided herein. If this review is not made, PSC cannot assume responsibility for the interpretations made by others, or errors resulting there from.

Construction Observation and Testing

The recommendations provided in this report are based on subsurface conditions disclosed by widely spaced exploratory borings and excavations. The geotechnical consultant should check the interpolated subsurface conditions during construction. The geotechnical consultant should attend the pre-construction meeting between the contractors and owners/designers.

During grading, the geotechnical consultant should:

- Observe excavation, placement, and compaction of engineered fill for new structures and pavements;
- Observe preparation and compaction of aggregate base for asphalt/concrete pavement and flatwork subgrade;
- Check and test any imported materials prior to their use as fill;
- Perform field tests to evaluate fill compaction;
- Observe subgrade conditions at the bottom of pipeline trenches;
- Observe fill placement and compaction around the pipes in the utility trenches; and
- Observe the fine-grading and exterior drainage improvements constructed around the finished structures.

The recommendations provided in this report assume that PSC will be retained as the geotechnical consultant during the construction phase of the project. If another geotechnical consultant is selected, we request that the selected consultant provide a letter to the architect/designer and owner/client (with a copy to PSC) indicating that they fully understand

our recommendations and that they are in full agreement with the recommendations contained in this report. If deviations from soil conditions and recommendations presented in this report occur, they should provide amended recommendations as new geotechnical consultants of record for the project.

LIMITATIONS

The analyses and recommendations submitted in this report are based, in part, upon information obtained from field borings. Variations of subsoil conditions between the 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 reevaluate the recommendations provided in this report.

The test pits and boring locations in this report were selected by PSC Consultants LLC, based on our scope of work. The field locations for the borings and test pits were located by Community Planning & Engineering's (CPE) Surveyor as shown on the plans. The physical locations and elevations of the borings should be considered accurate only to the degree implied by the methods used.

The stratification lines shown on graphic representations of the borings depict the approximate boundaries between soil/rock types and, as such, may denote a gradual transition.

This report has been prepared for the exclusive use of Community Planning and Engineering, Inc., their client, and their consultants for specific application to the proposed East Kapolei Development II, Study Area I, in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied.

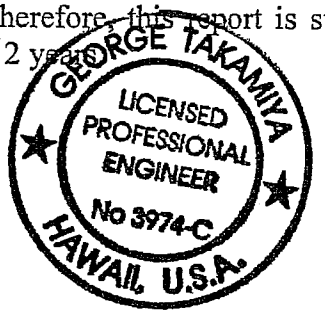
This report has been prepared solely for the purpose of assisting the architect/engineer in the design evaluation of the proposed project. Therefore, it may not contain sufficient data, or proper information to serve as the basis for preparation of construction cost estimates. A contractor wishing to bid on this project is urged to retain a competent geotechnical engineer to assist in the interpretation of this report and/or in the performance of additional site-specific exploration for bid estimating purposes.

The owner/client should be aware that unanticipated soil/rock conditions are commonly encountered. Unforeseen soil/rock conditions, such as perched ground water, soft deposits, hard layers, or cavities, may occur in localized areas and may require 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 extra costs.

The findings in this report are valid as of the present date. However, changes in the soil conditions can occur with the passage of time, whether they may be due to natural processes, or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation, or from the broadening of knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review by the controlling agencies and is valid for a period of 2 years.

Respectfully submitted,

PSC CONSULTANTS, LLC



Melchor Nolasco
Project Engineer

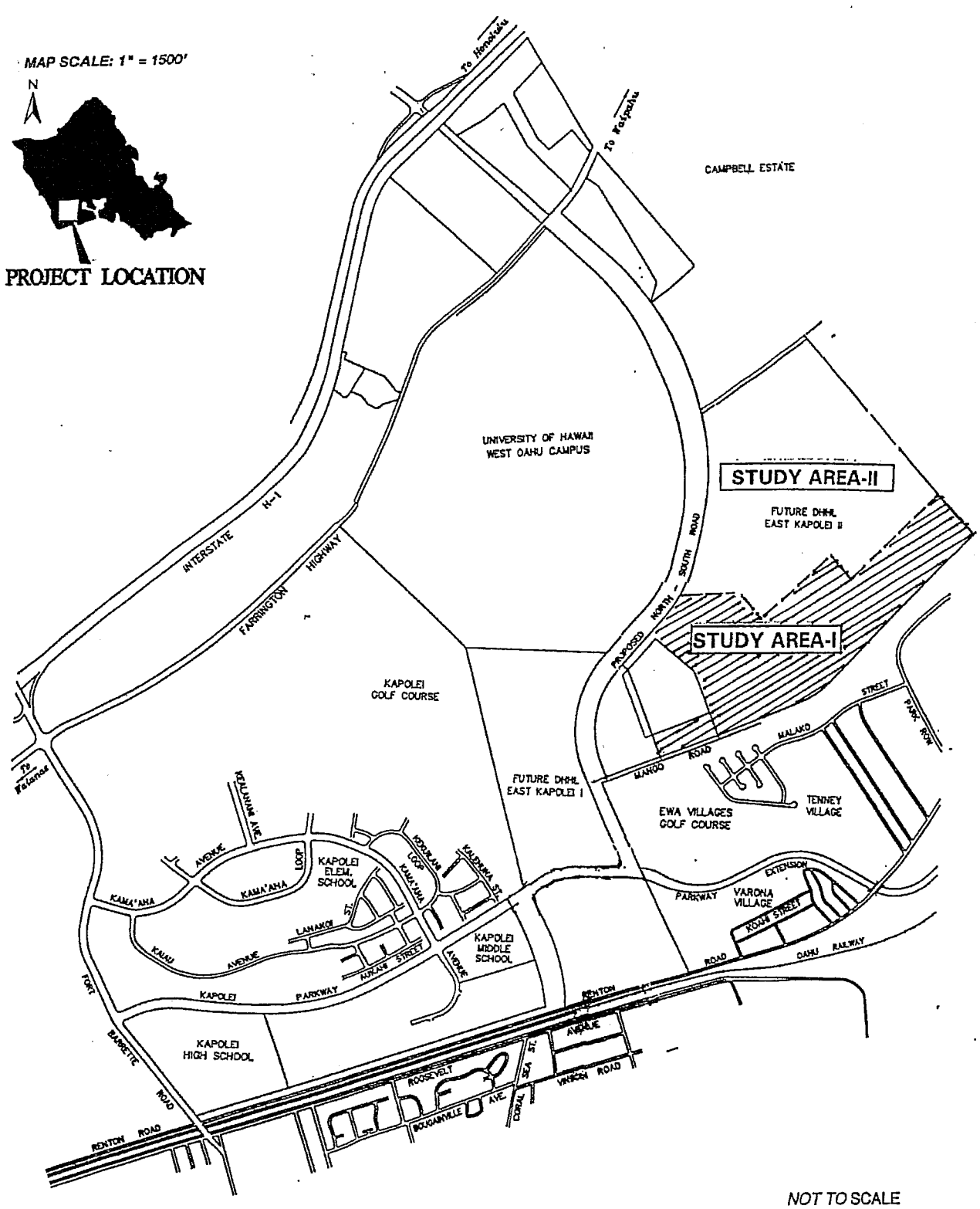
This work was prepared by
me or under my supervision
(License Expires April 30, 2008)

George Takamiya, P.E.
Senior Engineer

MGN/AW:ch

Enc.:

Plate No. 1	Project Location Map
Plate No. 2	Site Plan
Plate No. 3	Soils Classification Map
Plate No. 4 through 25	Logs of Borings
Plate Nos. 26 through 30	Logs of Test Pits
Plate No. 31A	Soils Classification Chart
Plate No. 31B	Rock Classification Chart
Plate No. 32	Atterberg Limits
Plate Nos. 33 through 37	Compaction Curve
Plate Nos. 39 through 43	California Bearing Ratio
Appendix A	Remedial Design – Subdrain with Vertical Moisture Barrier



PROJECT LOCATION MAP

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei II Development
Study Area I, Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJ. NO.27303.10

PLATE NO. 1

EAST KAPOLEI II DEVELOPMENT PLAN PHASING

HONOULIULI, EWA, OAHU, HAWAII

PREPARED BY:
COMMUNITY PLANNING AND ENGINEERING, INC.
FOR:
DEPARTMENT OF HAWAIIAN HOME LANDS

200 100 0 200 400
Graphic Scale in Feet

UH WEST OAHU CAMPUS
105' R/W
120' R/W
70' R/W
EAST-WEST ROAD
NORTH-SOUTH ROAD
LDA
28.8 AC.
PARK
4.8 AC.
INCREMENT II F
226 LOTS
INCREMENT II E
187 LOTS
INCREMENT II D
204 LOTS
INCREMENT II C
148 LOTS
INCREMENT II B
153 LOTS
INCREMENT II A
220 LOTS
ELEM. SCHOOL
12 AC.
KROC CENTER
12.0 AC.
PARK
4.7 AC.
HECO SUB STA.
4 AC.
LANDSCAPE EASEMENT AROUND HECO SUB STATION
20' WIDE EASEMENT FOR KROC CENTER
20' WIDE EASEMENT FOR ACCESS TO MIDDLE SCHOOL LOT
20' WIDE EASEMENT FOR ACCESS TO ELEM. SCHOOL LOT
MIDDLE SCHOOL
17.3 AC.
40' WIDE EASEMENT FOR ACCESS TO ELEM. SCHOOL LOT
PROPOSED ABUTILON
CONTINGENCY
RESERVE AREA
26.6 AC.
LDA
20.4 AC.
PARK
8.1 AC.
PARK
4.1 AC.
LDA
19.7 AC.
TRUE NORTH
Scale 1 in. = 200 ft.
STUDY AREA-II
STUDY AREA-I

INC. IIE	187 LOTS
INC. IIF	226 LOTS
SUBTOTAL	1,138 LOTS
MULTI-FAMILY UNITS	
SUBTOTAL	1,000
TOTAL UNITS	2,138 UNITS

LEGEND:
- PROPOSED BORING LOCATION
- PROPOSED TEST PIT LOCATION

Reference: East Kapolei II Development Plan by CP&E (September 2006)

East Kapolei II Development Plan With Test Pit & Boring Locations

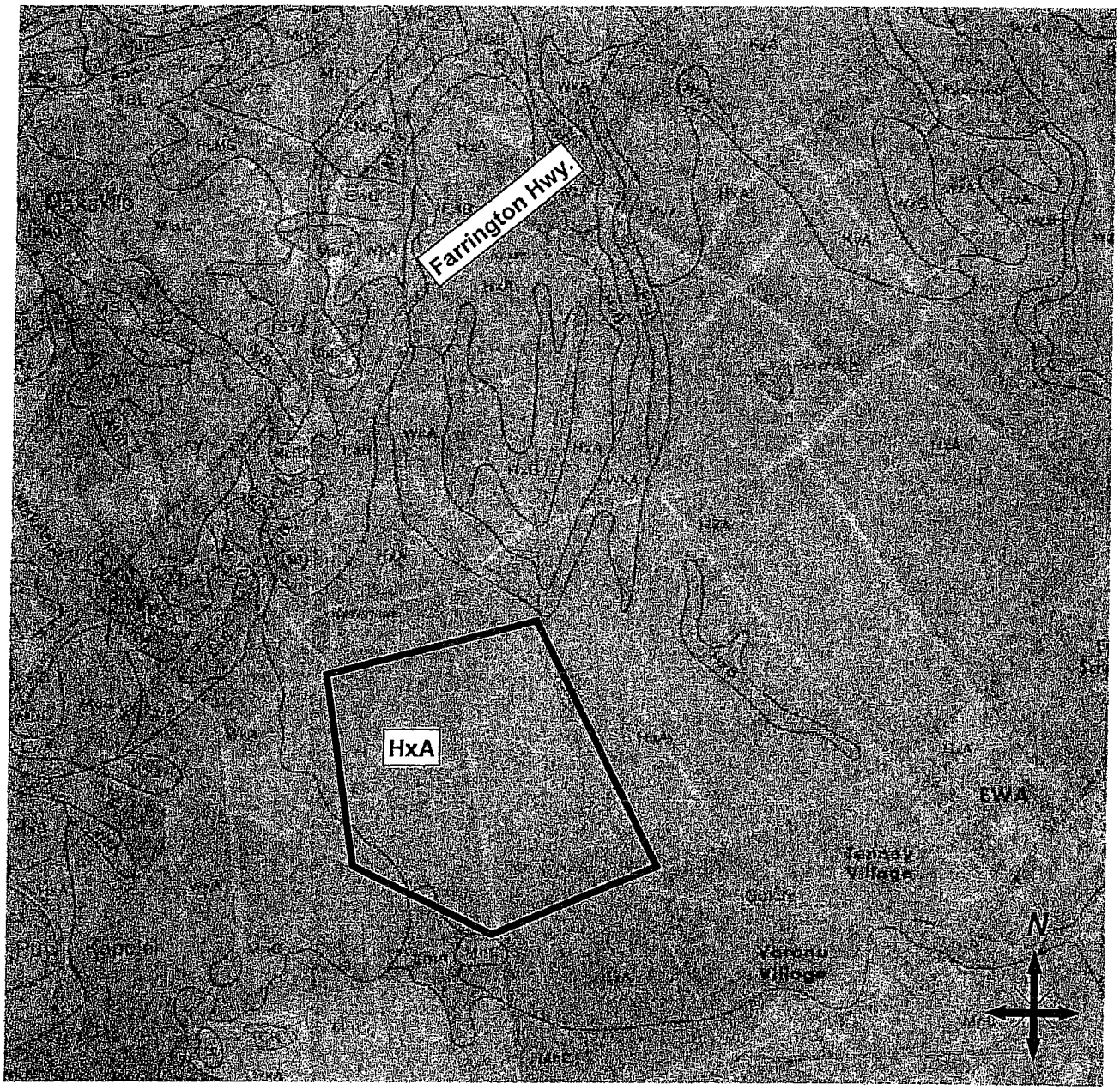
PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei II Development, Study Area-I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007

PROJECT NO.: 27303.10

PLATE NO. 2



APPROXIMATE SITE LOCATION

HxA Honouliuli Clay, 0 to 2 percent slopes

REFERENCE: Soil Survey of Kauai, Oahu, Maui, Molokai, and Lanai State of Hawaii, United States Department of Agriculture 1972

NOT TO SCALE

PSC CONSULTANTS, LLC

SOILS CLASSIFICATION MAP

East Kapolei II Soil Study
Farrington Highway & Farm Road
Honouliuli, Ewa, Oahu, Hawaii

DATE: MAY 2007	PROJECT NO. 27303.10	PLATE NO. 3

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-1**
BORING ELEVATION: 64.4	LOGGED BY: MGN	
DATE (S) DRILLED: 3/11/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1		GP	**Coralline GRAVEL**, with sand, light brown, poorly graded, dense, slightly moist. (Macadam fill)
										63.4
							2			**Silty CLAY**, brown, hard, moist.
							3			
		19.0			50	SPT-1	4			
							5			
						AUG-2	6			
							7		CL	
							8			
		22.9			45	SPT-2	9			
							10			
						AUG-3	11			
							12			
							13			
					40/2"	SPT-3	14			
										50.9
							15			**Coral Formation** , very dense.
										49.4
							16			Boring terminated at 15 feet below ground surface Groundwater not encountered
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 4

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-2**
BORING ELEVATION: 62.7	LOGGED BY: MGN	
DATE (S) DRILLED: 3/11/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			62.5 **ASPHALT**
							1		GP	**Coralline GRAVEL**, with sand, light tan, poorly graded, dense to very dense, moist. (Macadam surface fill) 61.7
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			
		20.0			22	SPT-1	4			
							5			
						AUG-2	6			
							7		CL	
							8			
		23.8			25	SPT-2	9			
							10			
						AUG-3	11			
							12			50.7
							13			**Silty CLAY**, brown, hard, moist.
		22.2			35	SPT-3	14		CL	
							15			47.7
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
UC - Unconfined Compression
CON - Consolidation Test
SG - Specific Gravity
PI - Atterberg Limits
SA - Sieve Analysis

LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 5

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-3**
BORING ELEVATION: 58.0	LOGGED BY: MGN	
DATE (S) DRILLED: 3/11/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			57.8 **ASPHALT**
							1		GP	**Coralline GRAVEL**, with sand, light tan, poorly graded, dense, slightly moist. (macadam fill)
										57.0
							2		CL	**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			55.0
		18.5			55	SPT-1	4			**Silty CLAY**, brown, very hard, moist.
						AUG-2	5		CL	
							6			
							7			51.0
										Silty CLAY, brown, hard, moist.
		19.2			38	SPT-2	8		CL	
							9			
						AUG-3	10			48.0
										Silty CLAY, brown, very hard, moist.
							11			
							12		CL	
							13			
		19.7			50/6"	SPT-3	14			44.0
										CORAL, very dense.
							15			43.0
										Boring terminated at 15 feet below ground surface Groundwater not encountered
							16			
							17			

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
UC - Unconfined Compression
CON - Consolidation Test
SG - Specific Gravity
PI - Atterberg Limits
SA - Sieve Analysis

LOG OF BORING

Geotechnical & Environmental Consultants
Construction Management, Testing & Inspection

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 6

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-4**
BORING ELEVATION: 58.9	LOGGED BY: MGN	
DATE (S) DRILLED: 3/18/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			58.7 **ASPHALT**
							1		GP	**Coralline GRAVEL**, with sand, poorly graded, dense, slightly moist. (Macadam fill) 57.9
							2			**Silty CLAY**, brown, hard, low plasticity, moist.
							3			
		17.4			45	SPT-1	4			
							5			
						AUG-2	6			
							7			
							8		CL	
		18.0			47	SPT-2	9			
							10			
						AUG-3	11			
							12			
							13			
		21.8			37	SPT-3	14			
							15			43.9
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

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East Kapolei Phase II Development
Study Area II
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/21/07

PLATE NO. 7

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-5**
BORING ELEVATION: 59.7	LOGGED BY: MGN	
DATE (S) DRILLED: 3/18/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, silty clay with organic material, loose, dry.
							1			58.7 — **Silty CLAY**, brown, hard, moist.
							2			
							3			
		23.0			40	SPT-1	4			
							5			
						AUG-2	6			
							7			
							8		CL	
		22.7			46	SPT-2	9			
							10			
						AUG-3	11			
							12			
							13			
		25.6			45	SPT-3	14			
							15			44.7 — Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

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East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 8

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-6**
BORING ELEVATION: 65.0	LOGGED BY: MGN	
DATE (S) DRILLED: 3/18/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, silty clay with organic material, loose, dry.
							64.0			
							1			**Silty CLAY**, brown, very stiff, low plasticity, moist.
							2			
							3		CL	
		22.4			21	SPT-1	4			
							5			
						AUG-2				
							60.0			**Silty CLAY**, brown, hard, moist.
							6			
							7		CL	
							8			
		20.5			32	SPT-2	9			
							10			
						AUG-3				
							55.0			**Silty CLAY**, brown, very hard, moist.
							11			
							12		CL	
							13			
		10.7			62	SPT-3	14			
							15			
							50.0			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

Geotechnical & Environmental Consultants
Construction Management, Testing & Inspection

East Kapolei Phase II Development
Study Area II
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

PLATE NO. 9

BORING 2730310.GPJ BORING.GDT 5/21/07

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-7**
BORING ELEVATION: 63.8	LOGGED BY: MGN	
DATE (S) DRILLED: 3/18/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			63.6 ASPHALT
							1		GP	**Coralline GRAVEL**, with sand, light tan, poorly graded, dense, slightly moist. (Macadam fill) 62.8
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			
		22.1			19	SPT-1	4		CL	
							5			
						AUG-2	6			
							7			56.8
							8			**Silty CLAY**, brown, hard, moist.
		24.2			38	SPT-2	9			
							10			
						AUG-3	11		CL	
							12			
							13			
		30.4			40	SPT-3	14			
							15			48.8
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
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LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 10

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-8**
BORING ELEVATION: 60.8	LOGGED BY: MGN	
DATE (S) DRILLED: 3/24/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										59.8
							2			**Silty CLAY**, brown, hard, moist.
							3			
		17.4			53	SPT-1	4			
						AUG-2	5			
							6			
							7		CL	
							8			
		18.4			36	SPT-2	9			
						AUG-3	10			
							11			
							12			
										48.3
							13			**Silty CLAY**, brown, very hard, moist.
		19.8			55	SPT-3	14		CL	
							15			45.8
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 11

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-9**
BORING ELEVATION: 64.2	LOGGED BY: MGN	
DATE (S) DRILLED: 3/27/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										63.2
							2			**Silty CLAY**, brown, stiff, low to medium plasticity, moist.
							3		CL	
					11	SPT-1	4			
		24.1				AUG-2	5			59.2
							6			**Silty CLAY**, brown, very stiff, low plasticity, moist.
							7			
							8			
					21	SPT-2	9			
		24.3				AUG-3	10		CL	
							11			
							12			
							13			
					22	SPT-3	14			
		27.8					15			49.2
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
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LOG OF BORING

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Study Area I
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BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 12

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-10**
BORING ELEVATION: 64.4	LOGGED BY: MGN	
DATE (S) DRILLED: 3/27/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, loose, dry.
							63.4			
							1			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							2			
		6.2					3			
					17	SPT-1	4		CL	
							5			
		22.0				AUG-2	6			
							7			
							8			
							56.4			
					41	SPT-2	9			**Silty CLAY**, brown, hard, moist.
							10		CL	
		22.2				AUG-3	53.9			
							11			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							12			
							13		CL	
					20	SPT-3	14			
							15			
		29.7					49.4			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

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East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

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BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 13

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. B-11
BORING ELEVATION: 67.6	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										66.6
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			
		22.7			16	SPT-1	4			
						AUG-2	5			
							6			
							7			
							8		CL	
		27.9			23	SPT-2	9			
						AUG-3	10			
							11			
							12			
							13			
		24.2			27	SPT-3	14			
							15			
										52.6
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 14

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-12**
BORING ELEVATION: 68.8	LOGGED BY: AA	
DATE (S) DRILLED: 3/26/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, little gravel, loose, dry.
							1			67.8
							2		CL	**Silty CLAY**, brown, hard, moist.
		14.0					3			65.8
					75	SPT-1	4			**Silty CLAY**, brown, very hard, moist.
		17.4				AUG-2	5			
							6			
							7		CL	
							8			
					67	SPT-2	9			
		21.9				AUG-3	10			
							11			
							12			56.8
							13			**Silty CLAY**, brown, hard, moist.
					31	SPT-3	14		CL	
		22.6					15			53.8
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
UC - Unconfined Compression
CON - Consolidation Test
SG - Specific Gravity
PI - Atterberg Limits
SA - Sieve Analysis

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BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 15

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-13**
BORING ELEVATION: 67.0	LOGGED BY: AA	
DATE (S) DRILLED: 3/26/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1				**Top Soil**, brown, clayey silt with organic materials, loose, dry.
							1			66.0
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			
		36.3			24	SPT-1	4		CL	
							5			
		20.0				AUG-2	6			61.0
							7			**Silty CLAY** , brown, hard, moist.
							8			
					37	SPT-2	9			
							10			
		24.0				AUG-3	11		CL	
							12			
							13			
					30/1"	SPT-3	14			
							15			52.5
		22.9								**CORAL**, very dense. 52.0
							16			Boring terminated at 15 feet below ground surface. Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
UC - Unconfined Compression
CON - Consolidation Test
SG - Specific Gravity
PI - Atterberg Limits
SA - Sieve Analysis

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PLATE NO. 16

BORING 2730310.GPJ BORING.GDT 5/18/07

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-14**
BORING ELEVATION: 76.0	LOGGED BY: MGN	
DATE (S) DRILLED: 3/24/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										75.0
							2		CL	**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
										73.5
							3			**Silty CLAY**, brown, very hard, moist.
		17.4			48	SPT-1	4			
									CL	
						AUG-2	5			
							6			
							7			
										69.0
										Silty CLAY, brown, very stiff, low plasticity, moist.
							8			
		17.7			20	SPT-2	9			
						AUG-3	10			
							11		CL	
							12			
							13			
		23.6			29	SPT-3	14			
							15			
										61.0
										Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 17

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-15**
BORING ELEVATION: 67.2	LOGGED BY: MGN	
DATE (S) DRILLED: 3/24/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, loose, dry.
							66.5			
							1			**Silty CLAY**, brown, hard, moist.
							2			
							3			
		18.2			46	SPT-1	4			
							5			
						AUG-2	6			
							7		CL	
							8			
		20.7			41	SPT-2	9			
							10			
						AUG-3	11			
							12			
							13			
		24.7			58	SPT-3	14		CL	
							15			
							16			
							17			

54.7

Silty CLAY, brown, very hard, moist.

52.2

Boring terminated at 15 feet below ground surface
Groundwater was not encountered.

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
CON - Consolidation Test
PI - Atterberg Limits
UC - Unconfined Compression
SG - Specific Gravity
SA - Sieve Analysis

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PLATE NO. 18

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-16**
BORING ELEVATION: 69.2	LOGGED BY: AA	
DATE (S) DRILLED: 3/27/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										68.2
							2		CL	**Silty CLAY**, brown, very stiff, low plasticity, moist.
										66.7
							3			**Silty CLAY**, brown, hard, moist.
					36	SPT-1	4			
		19.1								
						AUG-2	5			
							6			
							7			
							8			
					42	SPT-2	9		CL	
		23.8								
						AUG-3	10			
							11			
							12			
							13			
					45	SPT-3	14			
		17.8								
							15			54.2
										Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 19

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-17**
BORING ELEVATION: 71.3	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, loose, dry.
							70.3			**Silty CLAY**, brown, very stiff, low plasticity, moist.
							1			
							2			
							3			
		23.4			22	SPT-1	4			
						AUG-2	5			
							6			
							7			
							8		CL	
		25.1			30	SPT-2	9			
						AUG-3	10			
							11			
							12			
							13			
		24.9			25	SPT-3	14			
							15			
							56.3			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 20

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-18**
BORING ELEVATION: 72.8	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	1			**Top Soil**, brown, clayey silt with organic material, loose, slightly moist.
										71.8
										Silty CLAY, brown, very stiff, low plasticity, moist.
							2			
							3			
		24.0			20	SPT-1	4			
						AUG-2	5			
							6			
							7			
							8		CL	
		24.9			27	SPT-2	9			
						AUG-3	10			
							11			
							12			
							13			
		25.0			28	SPT-3	14			
							15			
										57.8
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
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BORING 27303I0.GPJ BORING.GDT 5/18/07

PLATE NO. 21

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-19**
BORING ELEVATION: 75.1	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt, dry.
							1			74.1
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3			
		23.3			17	SPT-1	4			
						AUG-2	5			
							6			
							7			
							8		CL	
		24.9			28	SPT-2	9			
						AUG-3	10			
							11			
							12			
							13			
		23.4			24	SPT-3	14			
							15			60.1
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 22

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-20**
BORING ELEVATION: 78.3	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Silty CLAY**, brown, stiff, slightly moist.
							1			
							2			
							3		CL	
		26.6			13	SPT-1	4			
						AUG-2	5			
							6			72.3
							7			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							8			
		24.5			23	SPT-2	9			
						AUG-3	10		CL	
							11			
							12			
							13			
		22.0			28	SPT-3	14			
							15			63.3
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 23

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-21**
BORING ELEVATION: 77.6	LOGGED BY: MGN	
DATE (S) DRILLED: 3/25/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, loose, dry.
							1			76.6
							2			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							3		CL	
		23.2			19	SPT-1	4			
						AUG-2	5			72.6
							6			**Silty CLAY**, brown, very hard, moist.
							7		CL	
							8			
		21.1			34	SPT-2	9			
						AUG-3	10			67.6
							11			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							12		CL	
							13			
		26.8			27	SPT-3	14			
							15			62.6
							16			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
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PLATE NO. 24

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. B-22**
BORING ELEVATION: 76.3	LOGGED BY: AA	
DATE (S) DRILLED: 3/27/07	TYPE RIG: Diedrich (D-25)	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
						AUG-1	0			**Top Soil**, brown, clayey silt with organic material, loose, dry.
							75.3			
							1			**Silty CLAY**, brown, very stiff, low to medium plasticity, moist.
							2			
							3			
					30	SPT-1	4			
		20.3					5			
						AUG-2	6		CL	
							7			
							8			
					17	SPT-2	9			
		24.5					10			
						AUG-3	11			
							12			
							64.3			**Silty CLAY**, some coral gravel, brown, very stiff, low to medium plasticity, moist.
							13			
					20	SPT-3	14		CL	
		24.9					15			
							61.3			Boring terminated at 15 feet below ground surface Groundwater was not encountered.
							16			
							17			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 25

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-1**
BORING ELEVATION: 69.0	LOGGED BY: AA	
DATE (S) DRILLED: 4/25/07	TYPE RIG:	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							1		MH	**Clayey SILT**, brown, clayey silt with organic material, loose, dry.
										67.8
							2		CL	**Silty CLAY**, brown, stiff, low to medium plasticity, slightly moist.
							3			
							4			65.5
										Test Pit terminated at approximately 3.5 feet below ground surface Groundwater was not encountered.

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

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PLATE NO. 26

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-2**
BORING ELEVATION: 65.0	LOGGED BY: AA	
DATE (S) DRILLED: 4/25/07	TYPE RIG:	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							1		MH	**Clayey SILT**, brown, clayey silt with organic material, loose, dry.
										63.8
							2		CL	**Silty CLAY**, brown, stiff, low to medium plasticity, moist.
							3			61.5
							4			Test Pit terminated at approximately 3.5 below ground surface Groundwater not encountered.

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
AUG - Auger Cuttings
D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density
CON - Consolidation Test
PI - Atterberg Limits
UC - Unconfined Compression
SG - Specific Gravity
SA - Sieve Analysis

LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 27

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-3**
BORING ELEVATION: 71.8	LOGGED BY: AA	
DATE (S) DRILLED: 4/17/07	TYPE RIG:	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							1		CL	**Silty CLAY**, brown, loose, dry.
										70.8
										Silty CLAY, brown, stiff, slightly moist.
							2		CL	
							3			
							4			68.3
										Test Pit terminated at approximately 3.5 feet below ground surface Groundwater was not encountered.

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

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East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 28

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-4**
BORING ELEVATION: 63.7	LOGGED BY: AA	
DATE (S) DRILLED: 4/17/07	TYPE RIG:	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							1			**Top Soil**, brown, clayey silt with organic material, loose, dry.
										62.7
							2		CL	**Silty CLAY**, brown, stiff, slightly moist.
							3			
							4			60.2
										Test Pit terminated at approximately 3.5 feet below ground surface Groundwater not encountered

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

Geotechnical & Environmental Consultants
Construction Management, Testing & Inspection

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/18/07

PLATE NO. 29

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-5**
BORING ELEVATION: 75.0	LOGGED BY: MGN	
DATE (S) DRILLED: 4/16/07	TYPE RIG:	

OTHER LAB TESTS	DRY UNIT WEIGHT (pcf)	MOISTURE CONTENT (%)	CORE RECOVERY (%)	R.Q.D. (%)	NUMBER OF BLOWS/12"	SAMPLE NUMBER	DEPTH IN FEET	GRAPHIC SYMBOL	U.S.C.S.	GEOTECHNICAL DESCRIPTION
							1			**Top Soil**, brown, clayey silt with some organic material, loose, dry.
										74.0
							2		CL	**Sily CLAY**, brown, stiff, low to medium plasticity, slightly moist.
							3			71.5
							4			Test Pit terminated at approximately 3.5 feet below ground surface Groundwater was not encountered.

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
CB - Core Barrel SH - Shelby Tube
AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

MD - Moisture/Density UC - Unconfined Compression
CON - Consolidation Test SG - Specific Gravity
PI - Atterberg Limits SA - Sieve Analysis

LOG OF BORING

PSC *Geotechnical & Environmental Consultants Construction Management, Testing & Inspection*

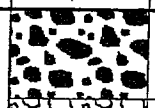
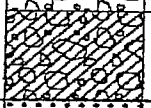
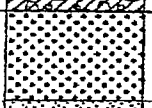
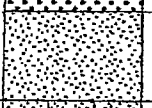
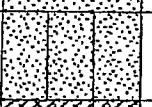
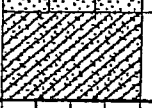
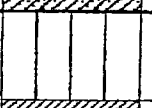
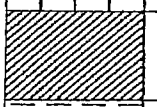
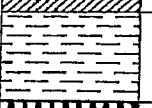
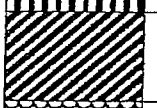
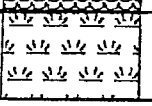
East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

DATE: May 2007 | PROJECT NO.: 27303.10

BORING 2730310.GPJ BORING.GDT 5/16/07

PLATE NO. 30

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS — 50% OR MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS — 50 % OR MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN OR EQUAL TO 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

UNIFIED SOIL CLASSIFICATION SYSTEM

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu Hawaii

DATE: May 2007 | Project No.27303.10

PLATE NO. 31-A

I. CONSOLIDATION OF SEDIMENTARY ROCKS; usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated

P = poorly consolidated

M = moderately consolidated

W = well consolidated

II. BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	Very Thick-Bedded
Blocky	2.0 to 4.0 ft.	Thick-Bedded
Slabby	0.2 to 2.0 ft.	Thin-Bedded
Flaggy	0.05 to 0.2 ft.	Very Thin-Bedded
Shaly or Platy	0.01 to 0.05 ft.	Laminated
Papery	Less than 0.01 ft.	Thinly Laminated

III. FRACTURING

Intensity	Size of Pieces in Feet
Very Little Fractured	Greater than 4.0
Occasionally Fractured	1.0 to 4.0
Moderately Fractured	0.5 to 1.0
Closely Fractured	0.1 to 0.5
Intensely Fractured	0.05 to 0.1
Crushed	Less than 0.05

IV. HARDNESS

1. Soft – reserved for plastic material alone.
2. Low Hardness – can be gouged deeply r carved easily with a knife blade.
3. Moderately Hard – can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
4. Hard – can be scratched with difficulty; scratch produces little powder and is often faintly visible.
5. Very Hard – cannot be scratched with a knife blade; leaves a metallic streak.

V. STRENGTH

1. Plastic or very low strength.
2. Friable – crumbles easily by rubbing with fingers.
3. Weak – an unfractured specimen of such material will crumble under light hammer blows.
4. Moderately Strong – specimen will withstand a few heavy hammer blows before breading.
5. Strong – specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6. Very Strong – specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

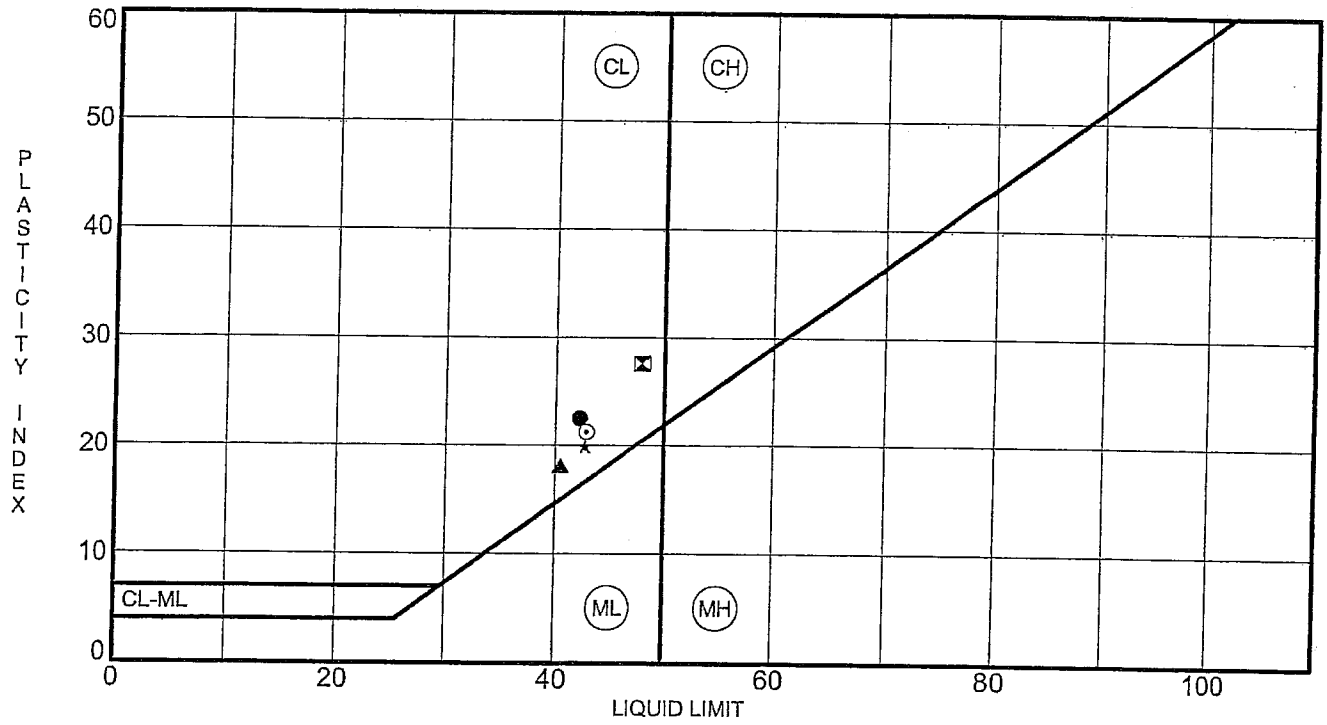
VI. WEATHERING – The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation and freezing and thawing.

D. Deep – moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.

M. Moderate – slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected; moderate to occasionally intense discoloration; moderately coated fractures.

L. Little – no megascopic decomposition of minerals; little or no affect on normal cementation; slight and intermittent, or localized discoloration; few stains on fracture surfaces.

F. Fresh – unaffected by weathering agents; no disintegration or discoloration; fractures usually less numerous than joints.



	Specimen Identification	LL	PL	PI	Fines	Classification
●	B-10Sample depth 3.5-5 ft.	42	20	22		Lean Silty CLAY of medium plasticity
⊠	B-20Sample depth 3.5-5 ft.	48	20	28		Lean Silty CLAY of medium plasticity
▲	TP-1Sample depth 0-3.5 ft.	40	22	18		Lean Silty CLAY of medium plasticity
★	TP-2Sample depth 0-3.5 ft.	43	23	20		Lean Silty CLAY of medium plasticity
⊙	TP-4Sample depth 0-3.5 ft.	43	22	21		Lean Silty CLAY of medium plasticity

ATTERBERG LIMITS DATA

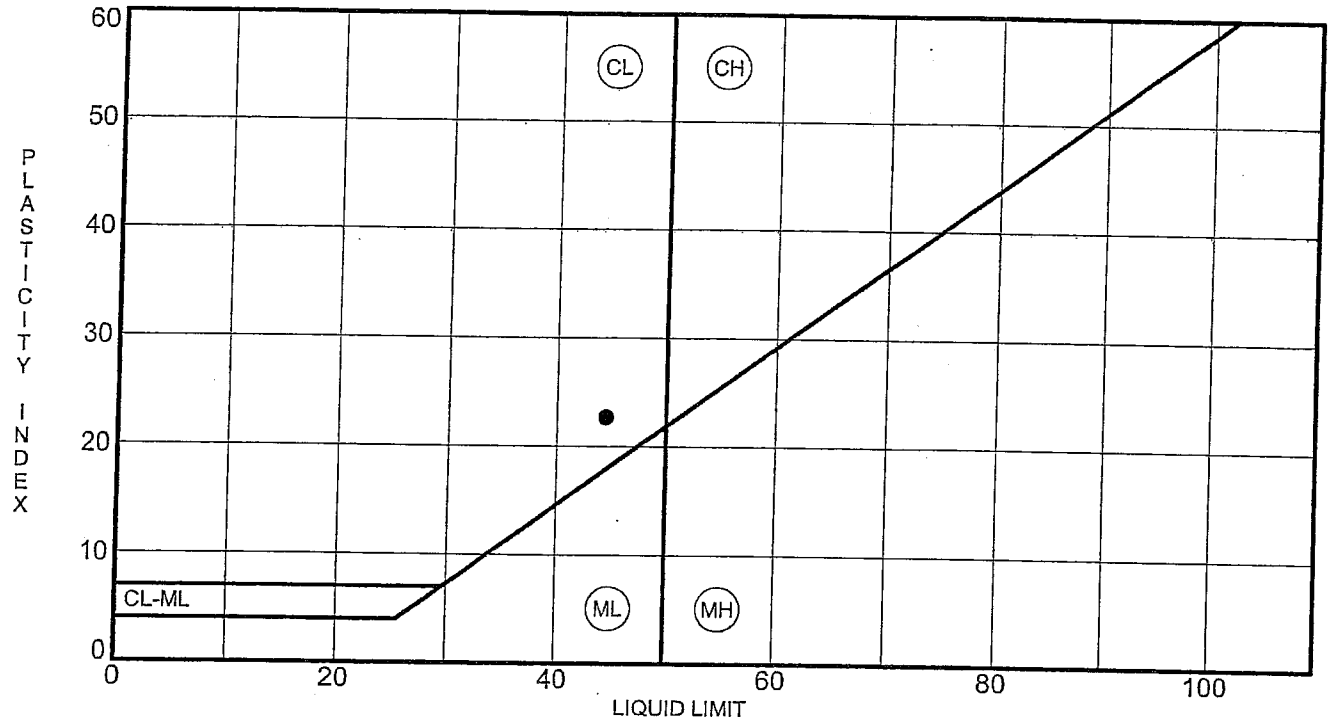
PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

Date: May 2007 | Project No.: 27303.10

PLATE NO. 32-A

US ATTERBERG LIMITS 2730310.GPJ BORING.GDT 5/7/07



Specimen Identification	LL	PL	PI	Fines	Classification
● TP-5 Sample Depth 0-2 ft.	45	22	23		Lean Silty CLAY of medium plasticity

ATTERBERG LIMITS DATA

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

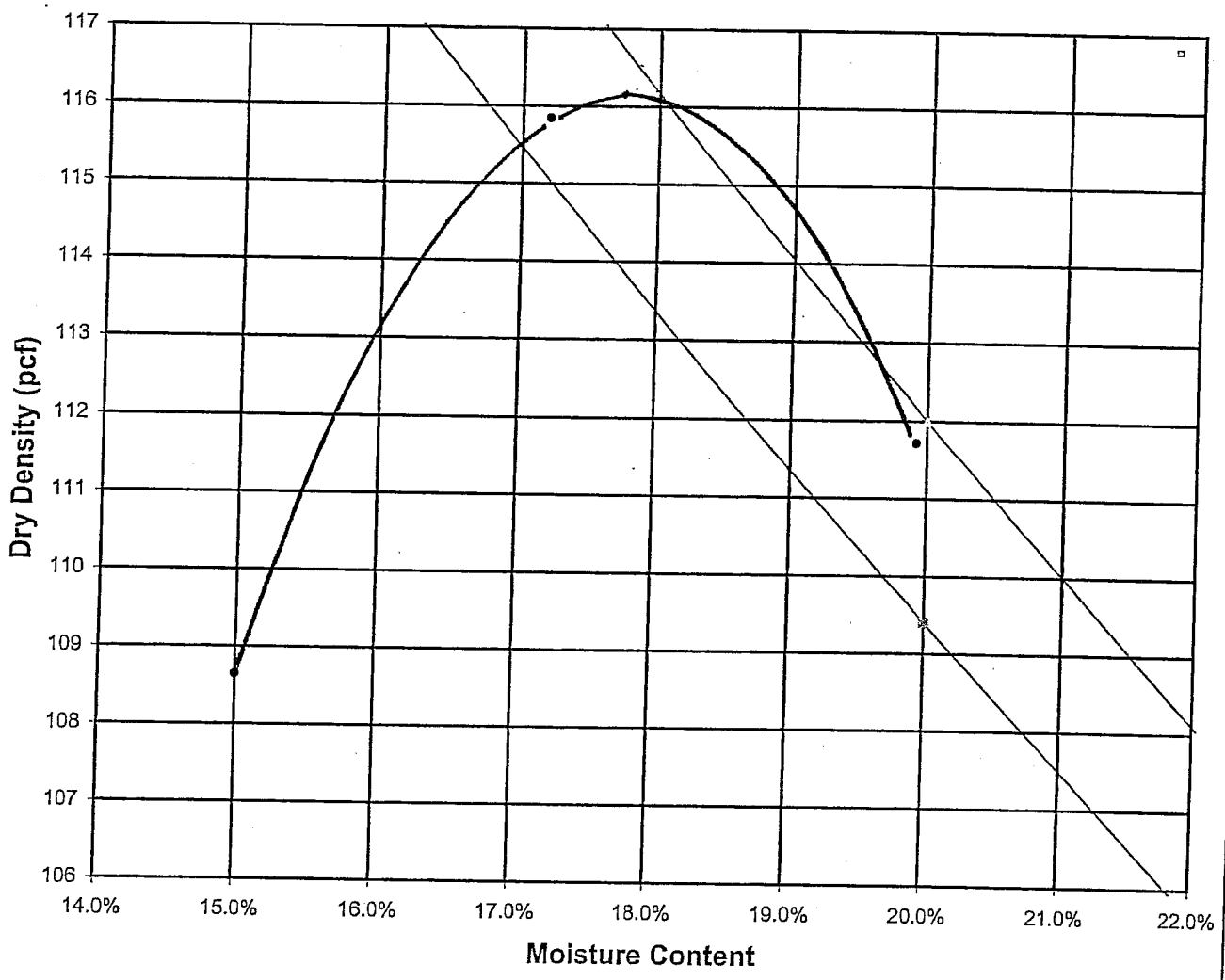
East Kapolei Phase II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

Date: May 2007 | Project No.: 27303.10

PLATE NO. 32-B

US ATTERBERG LIMITS 2730310.GPJ BORING.GDT 5/7/07

MOISTURE-DENSITY RELATIONSHIP



Sample Source: E.Kapolei Phase II TP-1 Description: silty sandy brownish CLAY

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	124.94	135.77	133.97	
Moisture Content	15.00%	17.20%	19.92%	
Dry Density (pcf)	108.65	115.85	111.72	

Maximum Dry Density (pcf): 116.2
Optimum Moisture Content (%) : 17.75%
Test Method: ASTM D-1557

Atterberg Limits
LL PL PI

COMPACTION TEST RESULTS
ASTM D-1557

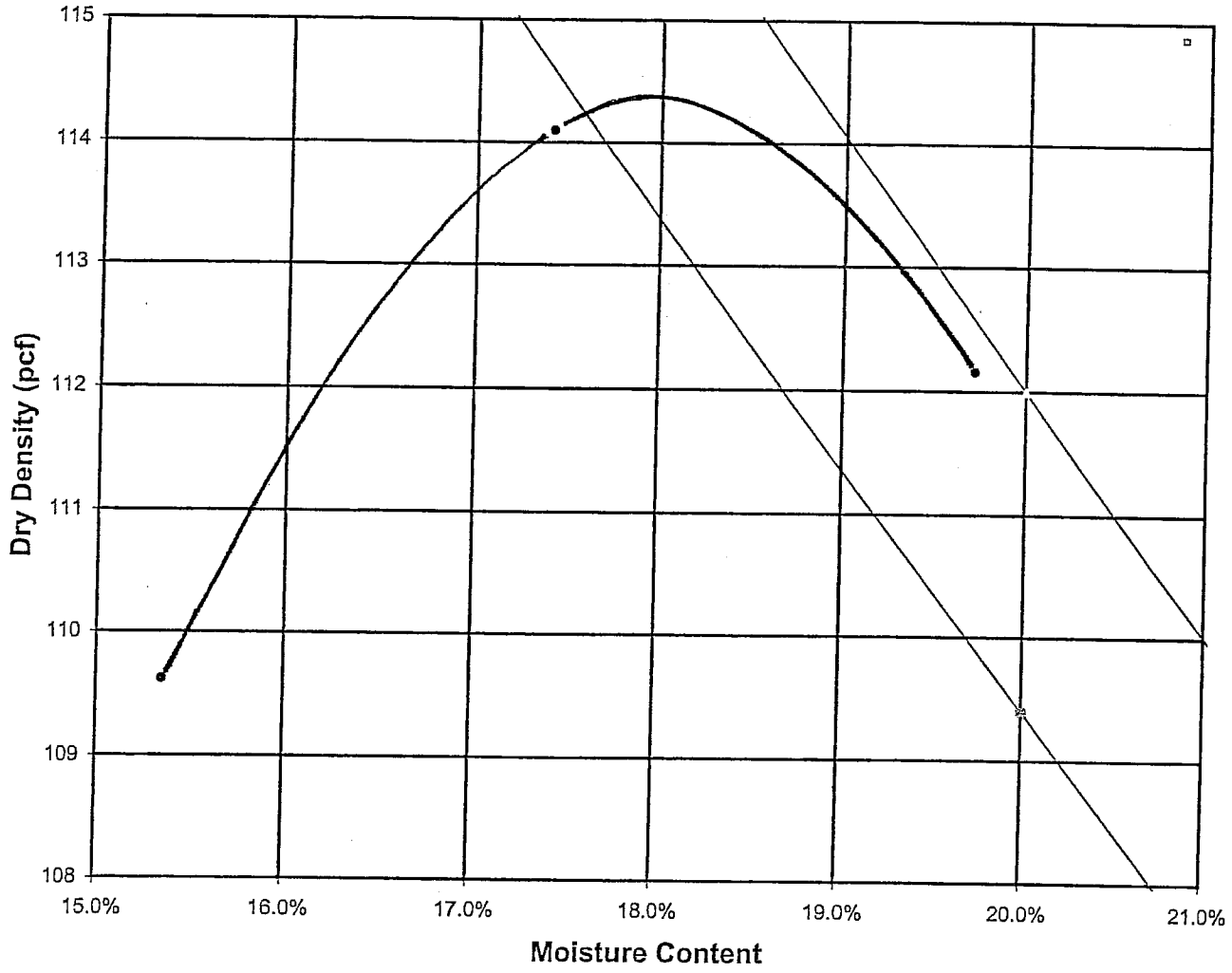
PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei Phase II Dev. Mon.
Moisture Density Relationship
East Kapolei Oahu, Hawaii
Date: April 27, 2007 | Project No. 27303.10

A:\Labshts\27303.10 E Kapolei II TP-1\Points Only

PLATE NO.33

MOISTURE-DENSITY RELATIONSHIP



Sample Source: E.Kapolei Phase II TP-2 Description: silty sandy brownish CLAY

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	126.44	133.97	134.27	
Moisture Content	15.35%	17.42%	19.72%	
Dry Density (pcf)	109.62	114.10	112.16	

Maximum Dry Density (pcf): 114.5
Optimum Moisture Content (%) : 17.90%
Test Method: ASTM D-1557

Atterberg Limits

LL	PL	PI

COMPACTION TEST RESULTS
ASTM D-1557

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

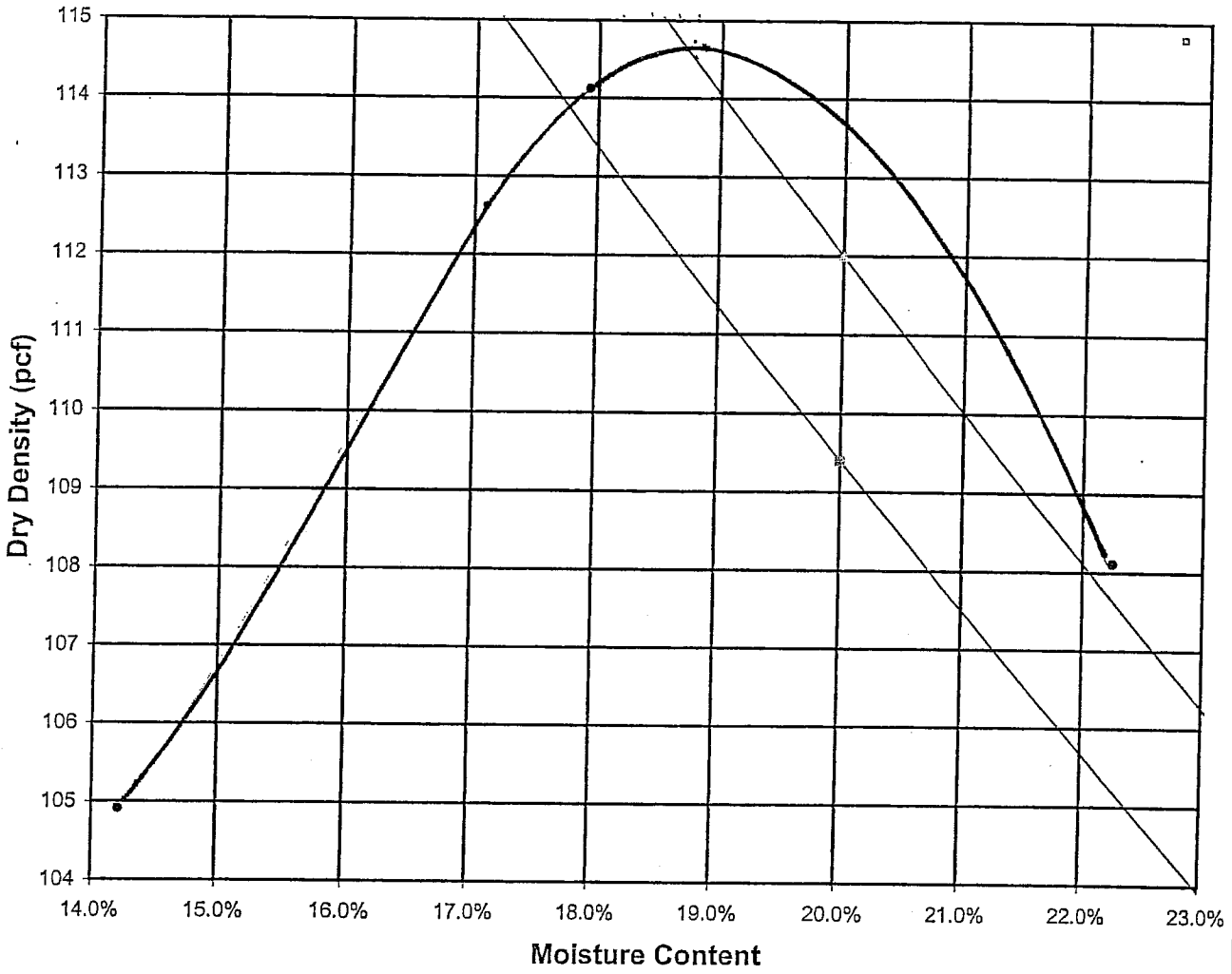
East Kapolei Phase II Dev. Mon.
Moisture Density Relationship
East Kapolei Oahu, Hawaii

Date: April 30, 2007 | Project No. 27303.10

A:\Labshts\27303.10 E Kapolei II TP-2\Points Only

PLATE NO.34

MOISTURE-DENSITY RELATIONSHIP



Sample Source: E.Kapolei Phase II TP-3 Description: Silty, Sandy, CLAY

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	119.82	134.58	132.16	
Moisture Content	14.22%	17.93%	22.25%	
Dry Density (pcf)	104.91	114.12	108.11	

Maximum Dry Density (pcf): 114.75
Optimum Moisture Content (%) : 18.8%
Test Method: ASTM D-1557

Atterberg Limits
LL PL PI

COMPACTION TEST RESULTS
ASTM D-1557

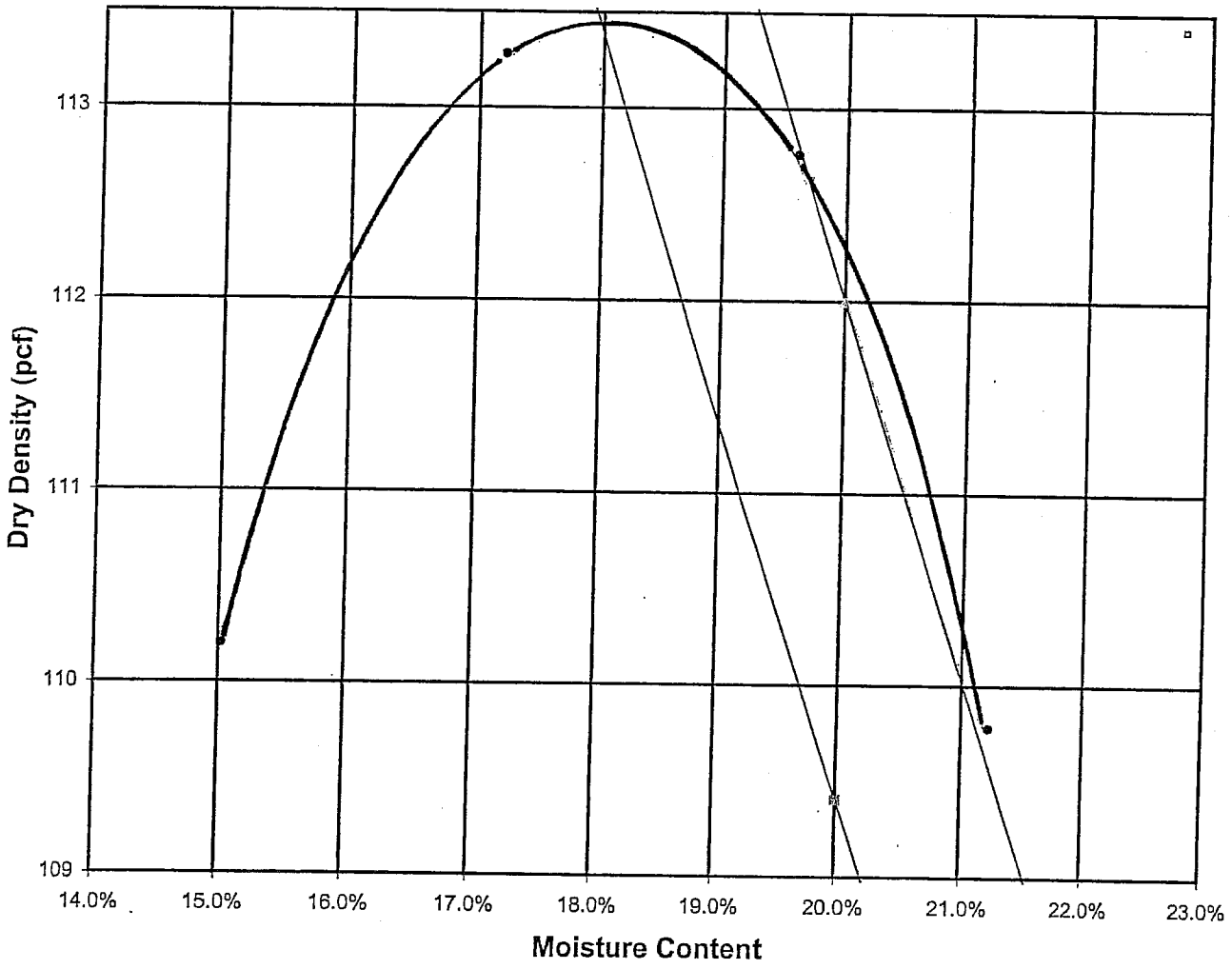
PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

East Kapolei Phase II Dev. Mon.
Moisture Density Relationship
East Kapolei Oahu, Hawaii
Date: April 23, 2007 | Project No. 27303.10

A:\Labshts\27303.10 E Kapolei II TP-3\Points Only

PLATE NO.35

MOISTURE-DENSITY RELATIONSHIP



Sample Source: E.Kapolei Phase II TP-4 Description: silty sandy brownish CLAY

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	126.75	132.77	134.87	133.07
Moisture Content	15.02%	17.21%	19.61%	21.22%
Dry Density (pcf)	110.20	113.28	112.76	109.78

Maximum Dry Density (pcf): 113.4
Optimum Moisture Content (%) : 17.90%
Test Method: ASTM D-1557

Atterberg Limits

LL PL PI

COMPACTION TEST RESULTS

ASTM D-1557

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

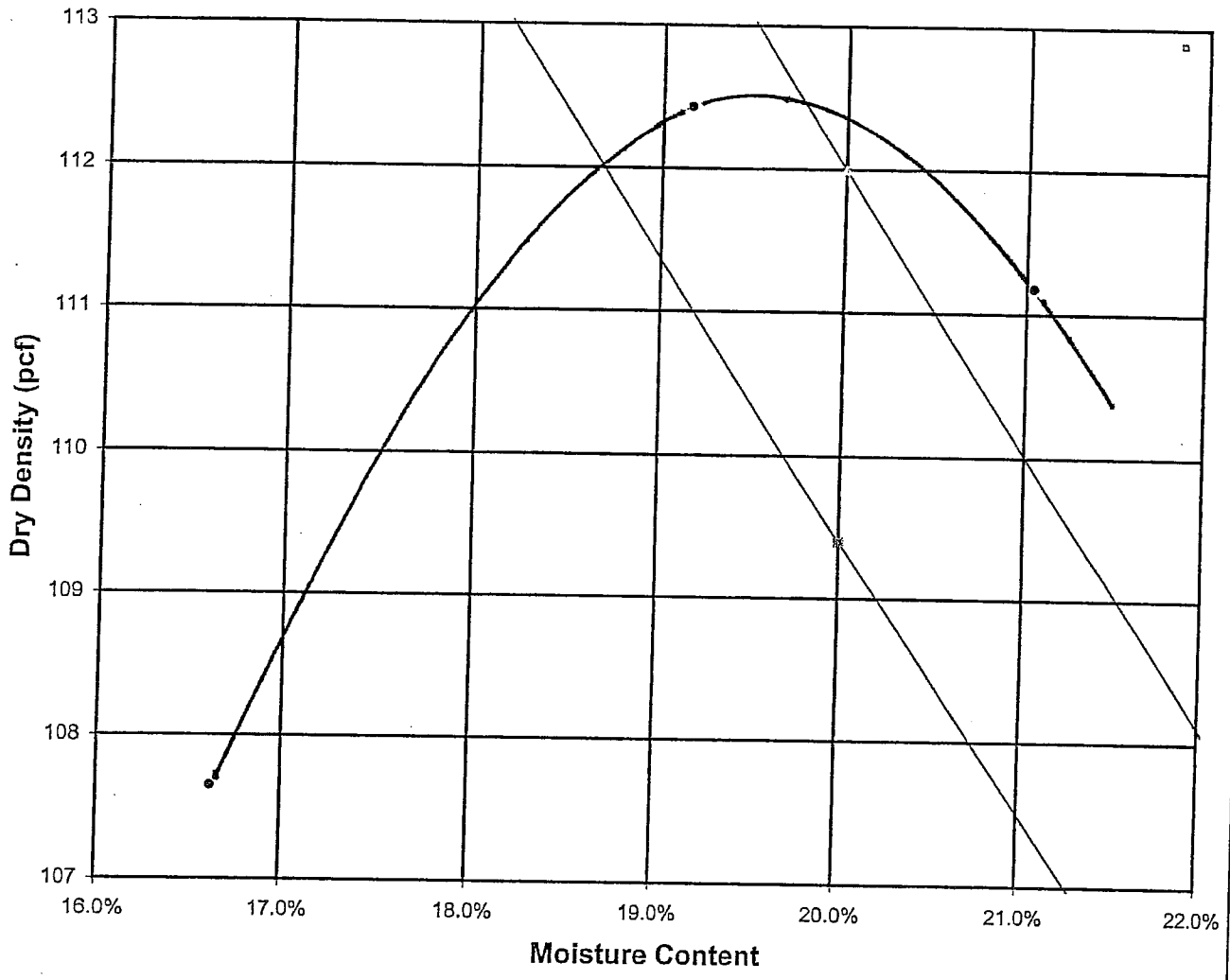
East Kapolei Phase II Dev. Mon.
Moisture Density Relationship
East Kapolei Oahu, Hawaii

Date: April 24, 2007 | Project No. 27303.10

A:\Labshts\27303.10 E Kapolei II TP-4\Points Only

PLATE NO.36

MOISTURE-DENSITY RELATIONSHIP



Sample Source: E.Kapolei Phase II TP-5 Description: silty sandy brownish CLAY

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	125.54	133.97	134.57	
Moisture Content	16.62%	19.16%	21.04%	
Dry Density (pcf)	107.65	112.43	111.18	

Maximum Dry Density (pcf): 112.5
Optimum Moisture Content (%) : 19.60%
Test Method: ASTM D-1557

Atterberg Limits
LL PL PI

COMPACTION TEST RESULTS
ASTM D-1557

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

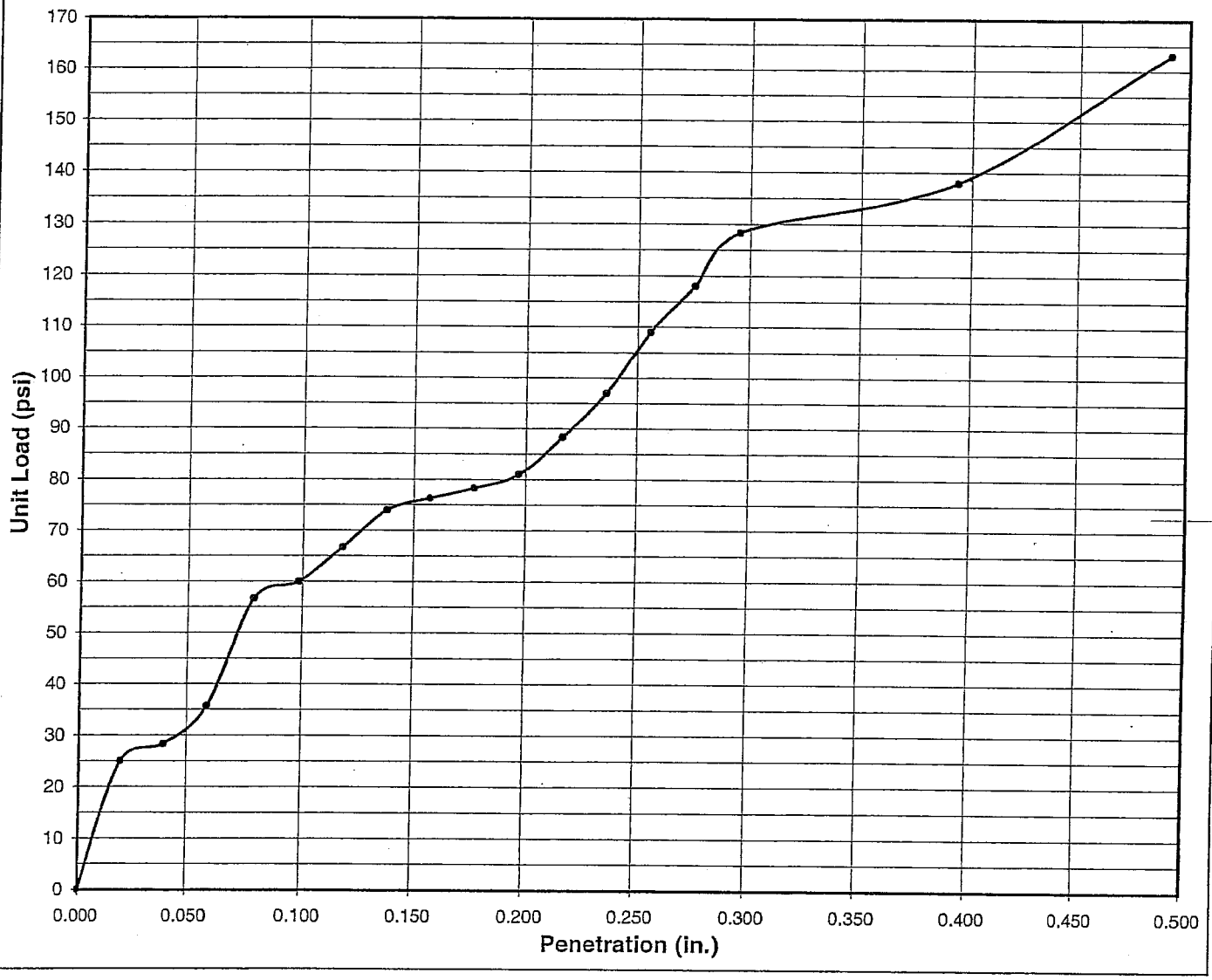
East Kapolei Phase II Dev. Mon.
Moisture Density Relationship
East Kapolei Oahu, Hawaii

Date: April 23, 2007 | Project No. 27303.10

A:\Labshts\27303.10 E Kapolei II TP-5\Points Only

PLATE NO.37

CBR CURVE



Sample Source: TP-2 **Depth:** 0-3.5 **Description:** Brown Silty CLAY (CH)

	Before Expansion	After Expansion
Relative Compaction (%):	100.00%	96.74%
Moisture Content (%):	16.63%	19.15%
Dry Density (pcf):	116.20	112.42
Percent Swell or Expansion Value (%):	3.37%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" Corrected:	4.82%	
CBR Value @ 0.2" Corrected:	4.45%	

Atterberg Limits

LL	PL	PI

CALIFORNIA BEARING RATIO
ASTM D-1883-94

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

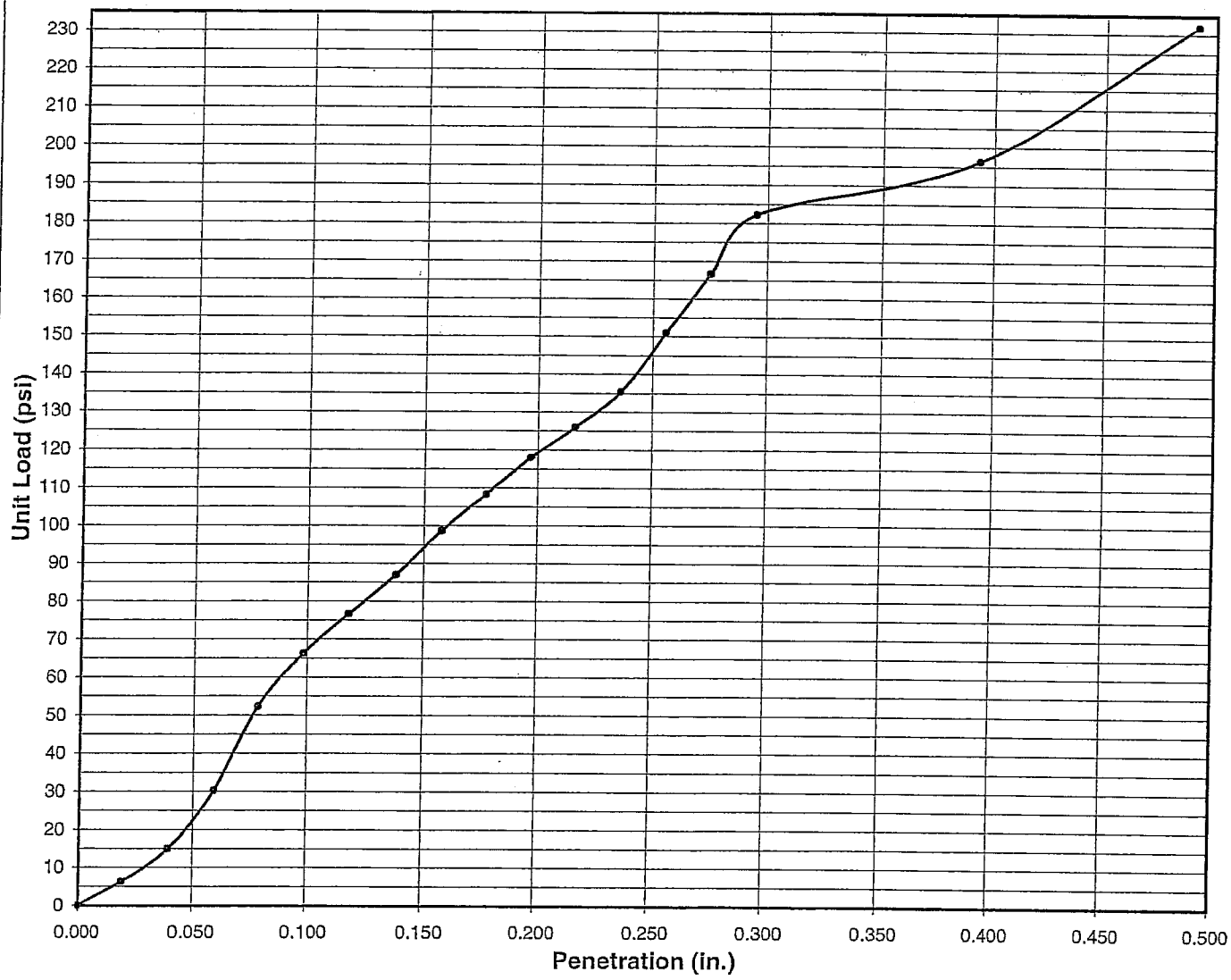
East Kapolei-II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

Date: May, 2007 | PROJECT NO. 27303.10

A:\Labshts\27303.20 E. Kapolei II SAI TP 1 CBR\CBR Curve

PLATE NO. 38

CBR CURVE



Sample Source: TP-2 **Depth:** 0-3.5 **Description:** Brown Silty CLAY (CH)

	Before Expansion	After Expansion
Relative Compaction (%):	100.00%	99.45%
Moisture Content (%):	16.28%	18.00%
Dry Density (pcf):	116.66	113.47
Percent Swell or Expansion Value (%):	2.81%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" Corrected:	6.40%	
CBR Value @ 0.2" Corrected:	6.30%	

Atterberg Limits

LL	PL	PI

CALIFORNIA BEARING RATIO
ASTM D-1883-94

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

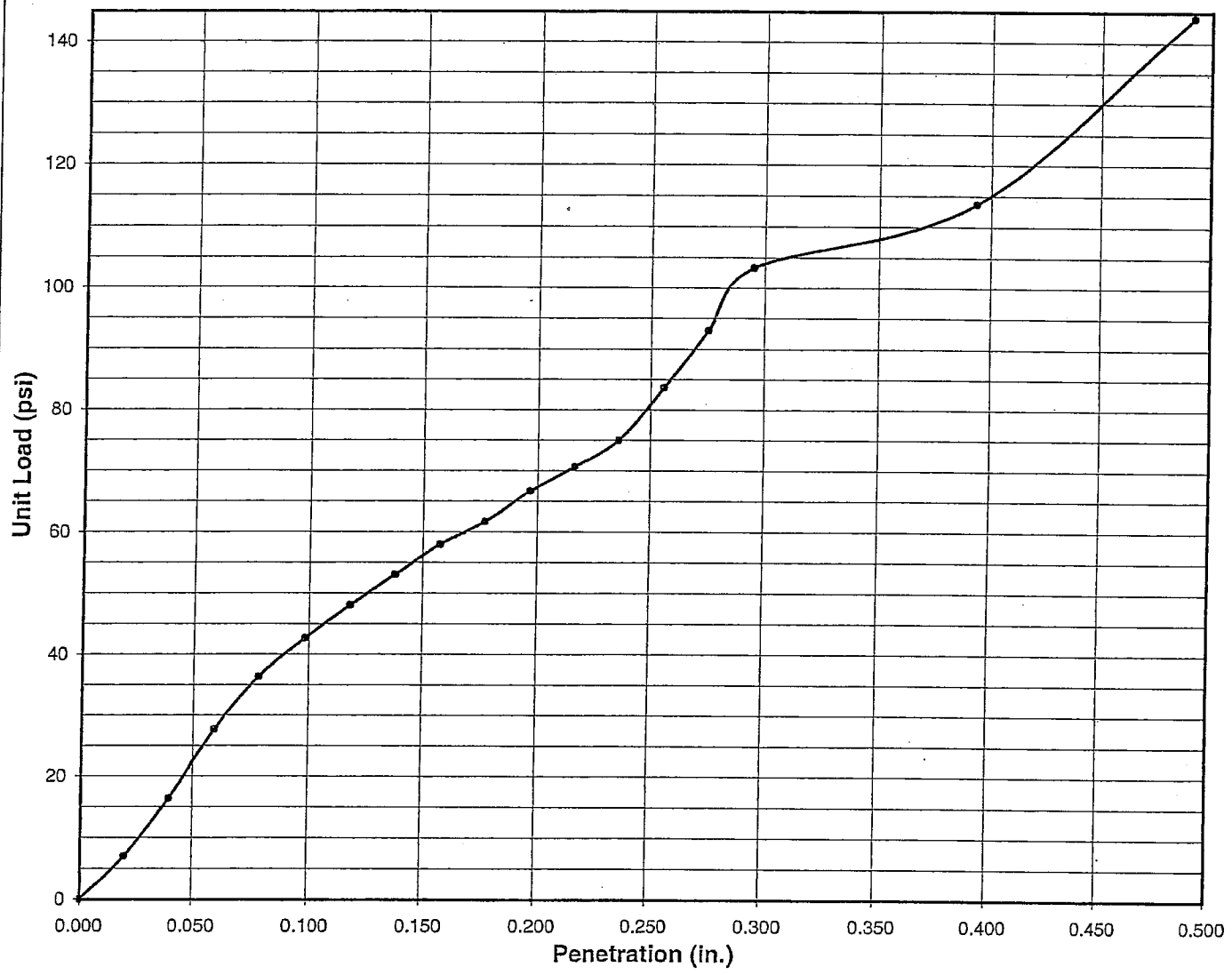
East Kapolei-II Development
Study Area I
Honouliuli, Ewa, Oahu, Hawaii

Date: May, 2007 | PROJECT NO. 27303.10

A:\Labshts\27303.20 E. Kapolei II SAI TP 1 CBR\CBR Curve

PLATE NO. 39

CBR CURVE



Sample Source: TP-3 **Depth:** 0-3.5 **Description:** Brown Silty CLAY (CH)

	Before Expansion	After Expansion
Relative Compaction (%):	100.00%	96.00%
Moisture Content (%):	118.82%	21.14%
Dry Density (pcf):	114.73	110.78
Percent Swell or Expansion Value (%):	3.57%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" Corrected:	3.63%	
CBR Value @ 0.2" Corrected:	3.86%	

Atterberg Limits

LL	PL	PI
51.50	44	7.5

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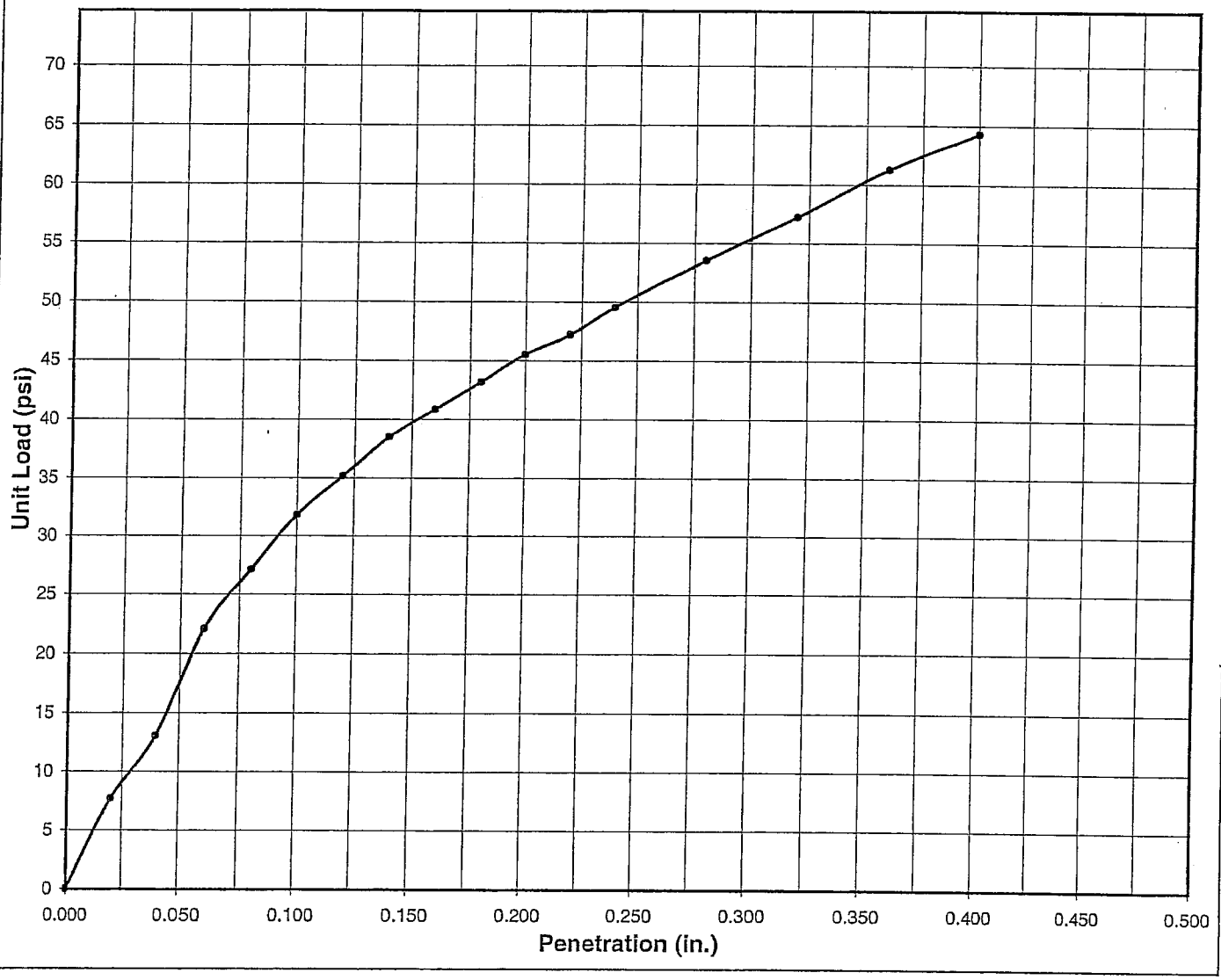
PLATE NO. 40

A:\Labshts\27303.20 E. Kapolei II SAI TP 3 CBR\CBR Curve

CBR CURVE



Sample Source: TP-4 **Depth:** 0-3.5 ft. **Description:** Brown CLAY

	Before Expansion	After Expansion
Relative Compaction (%):	97.13%	92.00%
Moisture Content (%):	17.97%	23.64%
Dry Density (pcf):	110.04	104.40
Percent Swell or Expansion Value (%):	5.40%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" :	2.5	
CBR Value @ 0.2" :	2.1	

Atterberg Limits

LL	PL	PI

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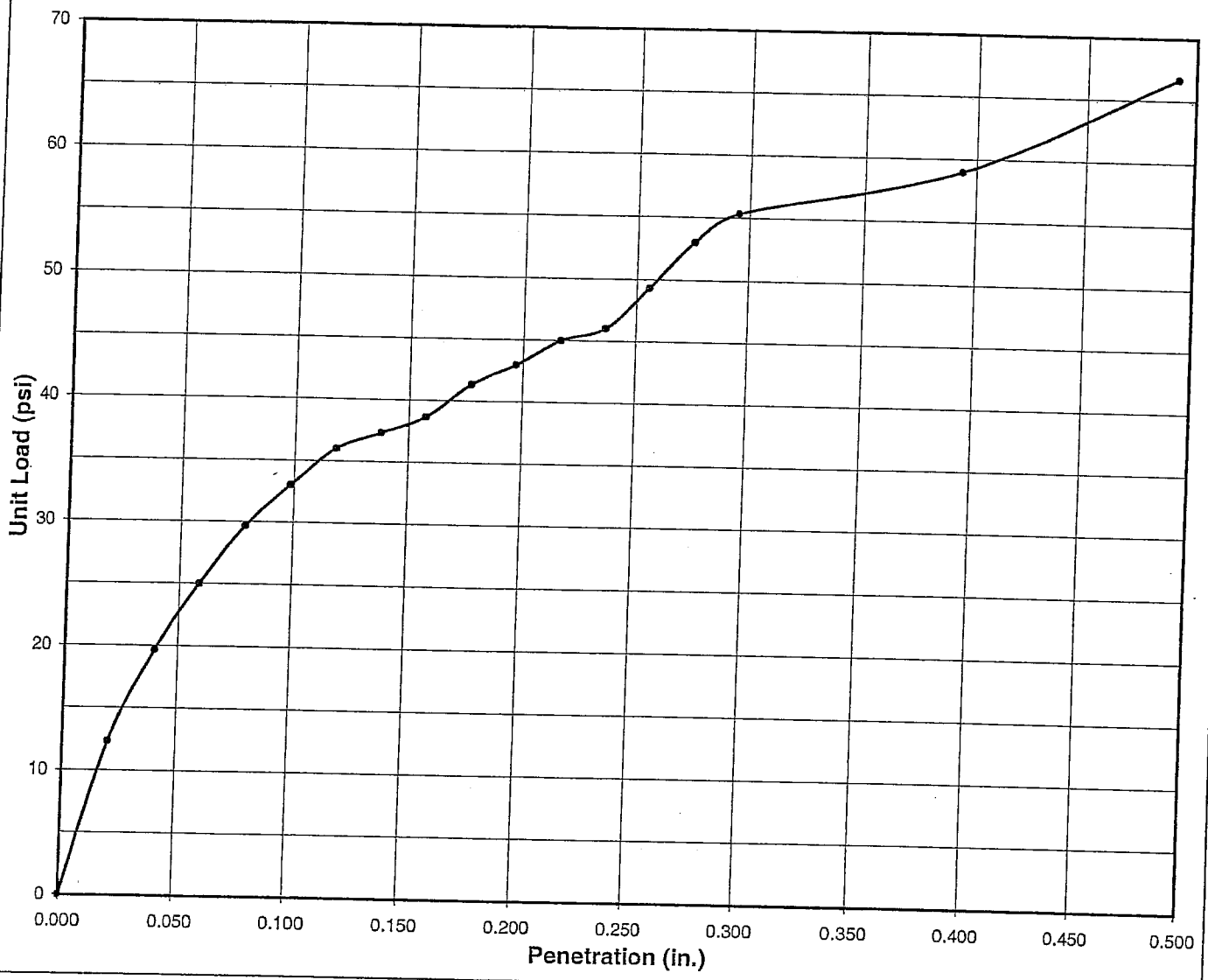
A:\Labshts\27303.20 CBR Clay E.Kapolei II SA1, TP4\CBR Curve

PLATE NO. 41

CBR CURVE



Sample Source: TP-5 **Depth:** 0-3.5 **Description:** Brown Silty CLAY (CH)

	Before Expansion	After Expansion
Relative Compaction (%):	99.21%	93.82%
Moisture Content (%):	13.98%	20.54%
Dry Density (pcf):	111.55	105.48
Percent Swell or Expansion Value (%):	5.75%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" Corrected:	2.44%	
CBR Value @ 0.2" Corrected:	1.86%	

Atterberg Limits

LL	PL	PI
45.00	22	23

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A:\Labshts\27303.20 E. Kapolei II SAI TP 5 CBR\CBR Curve

PLATE NO. 42

One Dimensional Swell Test

Sample Source	Sample Depth	Molding Moisture (%)	Surcharge (psf)	Percent Swell (%)
TP-1	0-3.5 ft.	19.23	71.28	3.77
TP-2	0-3.5 ft.	15.84	69.66	8*
TP-3	0-3.5 ft.	22	63.66	2.8
TP-4	0-3.5 ft.	20.28	69.21	3.72
TP-5	0-3.5 ft.	22.51	71.43	4.53

Note 1: The above swell test samples were obtained by pressing 1-inch ring samplers (with a hydraulic press) into the compacted and extruded soil samples from the proctor test specimens at approximately 2% above optimum moisture content (except Sample TP-2*). This procedure aims to simulate field conditions after moisture conditioning and compaction of the insitu soils. The surcharge load simulates a floor slab or pavement dead load. The samples were then soaked for 72 hours or until no further expansion were observed.

Note 2: Sample TP-2 was remolded at approximately 2% below its optimum moisture content and shows a relatively higher swell value of 8%. This demonstrates the relationship of the soils initial moisture content and its sensitivity to swelling resulting from moisture absorption.

One Dimensional Swell Test

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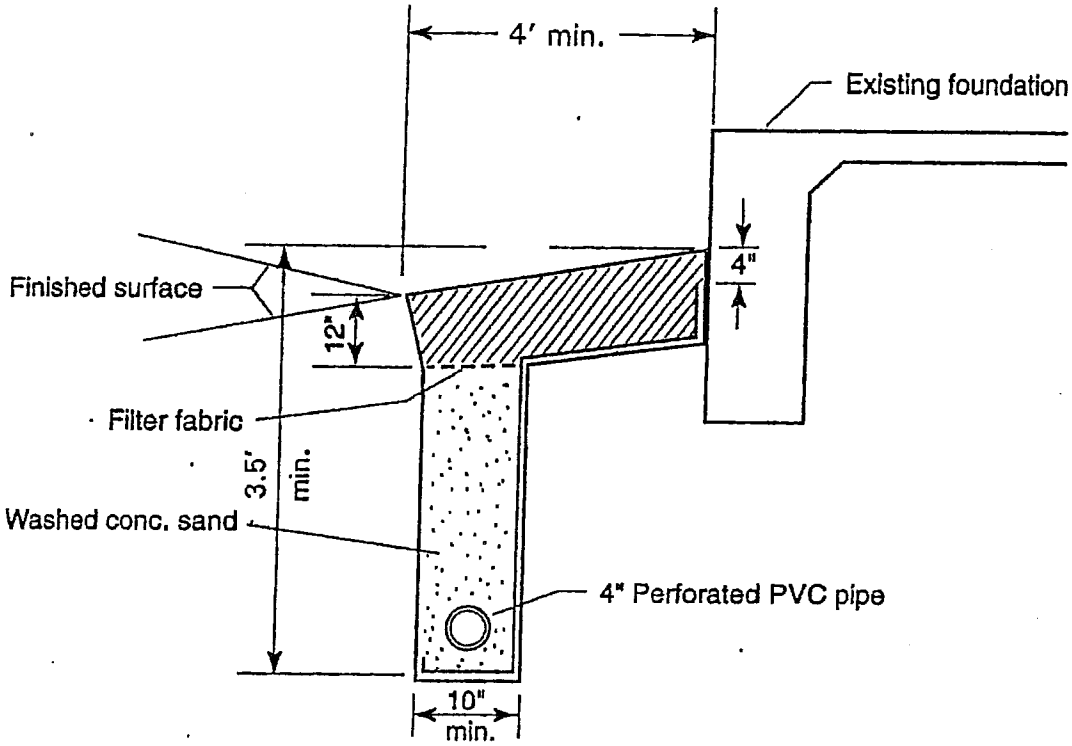
PLATE NO. 43



Reference: Kirby Meyers Remediation Design: (GEOMEMBRANES & the Control of Expansive Soils in Construction by M Steinberg, 1998)

Remediation Design-Subdrain with Vertical Moisture Barrier

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