DRAFT PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
DEPARTMENT OF HAWAIIAN HOME LANDS
LALAMILO RS10 SUBDIVISION PROJECT
LALAMILO, WAIMEA, BIG ISLAND OF HAWAII

July 28, 2006 PSC Job No. 26301.10/.12

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Our field exploration reveals the project site is generally overlain by stiff, very fine, sandy silt loam (derived from volcanic ash) with varying amounts of clinker gravel, cobbles and boulders (fragmental aa). This soil overburden generally ranges in thickness from 2 to 4 feet and occasionally from 1 foot to 9.5 feet in the areas explored. The project site is underlain mainly by volcanic flows of Pahoehoe, geologically classified at the site as the Hamakua Volcanics. Some voids and layers of fragmental aa were also encountered by our 35-foot exploratory borings within the basaltic rock formation. Excavation in rock will require special equipment.

We believe that the embankment fills may be laid directly over the insitu materials (after clearing, grubbing, scarifying, and compacting) without over-excavation. Over-excavation will not be necessary, except where grade cuts are planned and when filling up slopes where key and bench are required. Over-excavation is also recommended in cases where loose, soft, yielding materials are encountered and where undocumented solid waste fill, such as in the vicinity of Test Pit TP-7 are encountered.

Based on the preliminary plans provided, we understand that drywells and individual wastewater containment systems are being contemplated for the project site. Our field percolation tests indicate a very permeable stratum between 25 to 35 feet in the areas tested. We believe that dry wells constructed to these depths, within the specific locations tested, would provide excellent, free flowing drainage by gravity. It should be noted however that subsurface conditions may vary in areas that were not explored. On the other hand, the percolation rates obtained from the shallow 10- to 15-foot deep wells intended for the individual wastewater systems indicate a fair to good drainage by gravity. The limitations in the use of individual septic tank filter fields will be severe in areas where the bedrock is shallow (1 to 2 feet). Other alternative wastewater disposal systems may be considered, such as a deep-seated communal filtration field.

The subsurface soil resistivity survey conducted throughout the site consistently indicated a low or mildly corrosive potential (to uncoated steel or concrete). Chemical tests on selected soil samples for corrosivity indicated the same results.

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

INTRODUCTION

This report presents the results of our preliminary geotechnical exploration for the Department of Hawaiian Home Lands (DHHL) proposed Lalamilo RS10 Subdivision project located at Lalamilo, Waimea, on the Big Island of Hawaii. The general location and vicinity of the project

site is shown on the Project Location Map, Plate No. 1. Our work on the project was performed in general accordance with our proposal dated April 3, 2006. This report summarizes our findings and recommendations.

PROJECT CONSIDERATIONS

The Lalamilo RS10 Subdivision will consist of approximately 459 units of single-family homes, a park, and subdivision road network. In addition, a stream crossing over Keanuiomanu Stream near the northwestern end of the study area connecting the subdivision to the Lalamilo Phase-I project is proposed. Preliminary plans indicate filling in portions of the Waikoloa Stream to create more housing pads near the southwestern end of the study area. Dry wells will be employed for the disposal of storm water runoff. An individual wastewater system is also proposed for the subdivision.

PURPOSE AND SCOPE

The purpose of our geotechnical exploration is to gather information on the geologic composition; character and distribution; relevant geophysical and chemical properties of the subsurface earth materials encountered on the proposed project site; and to provide specific recommendations pertinent to the proposed subdivision development. Our scope of work for the preparation of this preliminary geotechnical exploration report involved the following:

1. Reviewing the existing available data from published and unpublished sources pertaining to the geology and soil conditions at the site and its vicinity and conducting a reconnaissance survey of the project site;
2. Attended Safety Training by our field personnel at the client's office for Unexploded Ordnance (UXO). We were informed that the project site at Lalamilo was on part of a target maneuvering range of the U.S. Military and, therefore, may contain unexploded ordnances. The compulsory safety training was provided by Donaldson Enterprises, a private firm specializing in bomb disposals. The training provided an overview of the different kinds of explosive devices and how to identity and handle a situation should they be encountered.
3. Planning, scheduling, and coordinating the investigation;
4. Excavating 60 test pits, mostly along the proposed streets and subdivision lots, approximately 300 to 450 feet apart, averaging about 4 feet deep, into the underlying basaltic rock and soil interface, or at backhoe bucket refusal, and obtaining soil samples at selected depths for laboratory testing in the area, as shown on the enclosed test pit location plan for Alternate 2 (Plate No. 2). The exploration also covers Alternate 1 (Plate No. 2A). Rock core samples from our 6 borings to be utilized for areas where deep cuts are planned and for rock hardness evaluation for deeper cuts;

5. Providing a field engineer/geologist to monitor the test pit excavations, sample, perform Dynamic Cone Penetrometer (DCP) tests within the selected test pits, maintain logs of the soils encountered, and conduct field resistivity testing, percolation testing for dry wells and individual wastewater system, among others;
6. Performing laboratory tests on selected bulk soil/rock samples obtained from the test pits to evaluate relevant engineering characteristics of the soils encountered, including CBR tests for pavement design and chemical testing for corrosion design in selected roadway areas;
7. Analyzing the field and laboratory data and performing engineering analyses;
8. Preparing and submitting a written draft geotechnical exploration report summarizing our findings, conclusions, and recommendations for grading, pavement design, foundations, and other geotechnical aspects for the design of the proposed Lalamilo RS10 Subdivision; and
9. Post draft report consultation and meetings and to incorporate review comments before issuing a final preliminary geotechnical exploration report.

Detailed descriptions of our field exploration and laboratory testing are presented in the plates and appendices of this report.

SITE DESCRIPTION AND CHARACTERIZATION

Project Site Location

The project site is located on the lower southern flanks of Kohala Mountain in Waimea. It is nestled within the saddle formed by Mauna Kea on the south and Kohala Mountain to the north. It is bounded on the north by Keanuiomano Stream and on the south by the Waikoloa Stream, on the east by the future Mamalahoa Highway – Kawaihae connector road, and on the west by the property boundary.

Regional Geology

The Island of Hawai'i is the largest in the Hawaiian Archipelago. It covers an area of approximately 4,000 square miles. The island was formed by the activity of 5 shield volcanoes, namely: Kohala, which is the oldest and considered extinct; Mauna Kea; Hualalai; and Mauna Loa and Kilauea, which are both considered active.

Following the cessation of volcanic activity in Kohala and Mauna Kea, activity in the other shields resulted in widespread aerial fall of ash over much of the island. This ash fell upon surface fragmental aa lava flows at the site, filling up voids and interstices, and over time, weathering into a fine, silty soil, which typically exhibits low insitu densities and high natural moisture content. This soil material now forms a fine, sandy silt matrix within the aa providing a stony, sandy silt layer that covers the study area.

Project Site Geology

The project site is underlain mainly by volcanic flows of basaltic rock geologically termed as the Hamakua volcanics (hm) as shown in the geologic map, Plate No. 1-A. These volcanic flows are covered on the surface with a layer of very fine, sandy silt/loam (derived from volcanic ash), mixed with varying amounts of clinker gravel, cobbles, and boulders or fragmental aa. In some of the excavated test pits, the overburden is more of fragmental aa in a silty sand matrix. The depth to bedrock of this surface layer generally ranges anywhere between 2 to 4 feet and in some places can be as deep as 9.5 feet. Our exploratory borings reveal that the bedrock is moderate to closely fractured. Lenticular voids and layers of fragmental aa were also encountered within the rock structure, providing free draining layers for underground storm water dispersion where these are encountered. Rock core samples obtained at the site, are fresh to moderately weathered, vessicated, strong, and hard.

Site Topographic Features

Relative to Kohala Mountain, the site slopes downward toward the south, in the general direction of the Waikoloa Stream. This intermittent stream flows westward towards Kawaihae Bay. Likewise, the study area generally dips westward at about 5.35 degrees in the general direction of Kawaihae Bay. The site elevation ranges from about 2,150 feet near the southwestern end to about 2,443 feet at the northeastern boundary of the property. The terrain is gently undulating, with some steep slopes along the stream gullies.

Existing Site Conditions

The proposed subdivision is generally covered with Bermuda and other grass, and is currently used as pasture for cattle. Occasional basaltic rock cobbles and boulders are strewn over the site. Trees are scarce, except inside the stream gullies where these are protected against the strong winds and where the soil contains more moisture that sustains their growth.

The northeastern portion of the study area bounded by Mamalahoa Highway and Kawaihae Roads appear to be flatter, compared to the rest of the site, and would require minimal grading. The area in the vicinity of Test Pits TP-7, TP-14, and TP-50 is littered with automobile junk, needing a considerable amount of clearing. Near-surface materials excavated in the vicinity of Test Pit TP-7 indicate that this was previously used as a solid waste disposal area. The study area is also subdivided into several pasture compartments with barbed-wire fences.

The site was formerly used for military target practice and may still contain buried unexploded ordnance. Contractors involved with the site preparation should take precautionary measures to insure that the specific area they are working on has been previously cleared of UXO. An environmental assessment is recommended in the portion of the subdivision previously mentioned with prior land use for solid waste disposal area and also as part of a target maneuvering range of the U.S. Military that may contain unexploded ordinances.

Climatic Conditions

Westerly winds estimated at up to 50 miles per hour is common at the study area during most of the year. This is manifested in the few, hardy trees that have managed to grow at the site. The branches of these trees are characteristically bent in natural adaptation to the prevailing wind direction. Contractors bidding on the site grading should consider the wind factor for erosion and dust control management purposes.

Seismicity of Project Site

Shifting tectonic plates and volcanic activity generally cause earthquakes. Earthquakes in Hawaii are primarily linked to the latter. The island of Hawaii experiences numerous earthquakes each year. Most are of small magnitude tremors that only instruments can detect. Some earthquakes, however, are strong enough to be felt and a few may cause minor to moderate damage to structures. Earthquakes in Hawaii that are directly associated with the upward migration of magma, are concentrated beneath the active Kilauea and Mauna Loa Volcanoes near the southern end of the Island. Theoretically, the intensity of ground shaking diminishes with increasing distance from the source generator, which is at the southern end of the island, where Mauna Loa and Kilauea are located. The study area is located on the opposite, northern side of the island. The Island of Hawaii has experienced numerous earthquakes greater than magnitude 6 (M6+). A historical record of destructive earthquakes on the Island of Hawaii from the United States Geological Survey (USGS) are as follows:

Historical Record of Destructive Earthquakes for the Big Island of Hawaii

DATE	LOCATION	MAGNITUDE
October 5, 1929	Hualalai	6.5
August 21, 1951	Kona	6.9
March 28,1868	South Hawaii	7.0
April 2, 1868	South Hawaii	7.9
April 26, 1973	North Hilo	6.2
November 29, 1975	Kalapana	7.2
November 16, 1983	Kaoiki	6.7
June 25, 1989	Kalapana	6.2

Being part of a seismically active island, the Waimea area could experience moderate to severe ground shaking associated with underground volcanic activity depending on the location of the source epicenter.

Seismic Design Considerations

The Uniform Building Code of 1997 classifies the Island of Hawaii under Seismic Zone No. 4 with a seismic zone factor of 0.4. Based on the type of materials encountered from the soil exploration and geologic references to the site, the soil profile for the first 100 feet can be classified as Sc for very dense soil and soft rock. Based on the Geologic Map of Project Site and Vicinity, Plate No. 1-A, the study area is about 2.5 miles south from the nearest fault line at the southern slope of Kohala Mountain. Since these fault lines are not extensive and are not known to be capable of producing large magnitude earthquakes, these may be classified under seismic source type C, as shown in Table 16-U, Seismic Source Type of the 1997 Uniform building Code. Accordingly, the near source factors Na and Nv under such type of source and distance to the site is 1.0, as shown in Tables 16-S and 16-T, Near Source Factors of the Uniform Building Code. The near source factors Na and Nv are used to determine the seismic coefficient Ca and Cv, as shown in Tables 16-Q and 16-R of the Unified Building Code. Accordingly, the site will have seismic coefficients of Ca of 0.4 and a Cv of 0.56.

SUBSURFACE CONDITIONS

Subsurface Exploration

Subsurface conditions at the proposed subdivision site were explored by excavating and sampling 60 test pits spaced at approximately 350 to 450 feet on centers. The depth of excavation ranged between 1 to 6.5 feet where the bedrock was encountered. A portable dynamic cone penetrometer DCP was employed to determine the indicative consistency of the near surface soils along side of selected test pits, where applicable. The test pits were used to determine the thickness of the selected soil to bedrock, obtain soil/rock specimens for laboratory tests, and to observe and record the subsurface soil conditions as it occurs in its natural state.

Six exploratory borings ranging in depths from 10 to 35 feet were also drilled to characterize the underlying lava rock formation and for conducting tests to obtain indicative percolation rates for the proposed dry wells and individual wastewater systems. The approximate locations of the test pits and borings are shown on the Site Plan for Alternate 2, Plate No. 2. No groundwater was encountered in any of the borings drilled.

A ground resistivity survey was also conducted through the proposed subdivision to obtain indicative values of soil resistivity as a means to evaluate the anticipated corrosion potential of the near-surface soil formation. The approximate test locations are shown in Appendix B on the Site Plan with Resisitivity Test Locations, Plate No. B.

Subsurface Soil Conditions

Our field exploration indicated that a surface layer of very fine, sandy silt with varying amounts of gravel, cobbles, and boulders generally cover the project site. The thickness of the surface soil generally ranges from 2 to 4 feet with some locations as shallow as 1-foot and some greater than 4 feet, the deepest of which is about 9.5 feet to bedrock, encountered in Boring B-6. In its pure form, the fine sandy silt contains relatively high amounts of moisture. In the dry state it losses cohesive strength and becomes prone to wind and water erosion, similar to ash. Our field exploration reveals that the soil overburden within the study area contained significant amounts of gravels, cobbles, and boulders. In some areas the overburden is made up of fragmental aa in a very fine, sandy silt matrix. These are reflected in the Logs of Borings/Test Pits, Plate Nos. 3 through 69. The surface materials are underlain with fresh to moderately weathered basaltic flows, also known as the Hamakua volcanic series.

DISCUSSION AND RECOMMENDATIONS

The surface sandy silt soil layers were derived from volcanic ash, which in pure form is not suitable for embankment fills or structural support without special treatment. However, the surface soils encountered in our exploration contain significant amounts of gravels, cobbles, and boulders.

We believe that embankment fills may be laid directly over the insitu materials (after clearing, grubbing, scarifying, and compacting) without over-excavation. Over-excavation will not be necessary, except where grade cuts are planned and when filling up slopes where key and bench are required. Over-excavation is also recommended in cases where loose, soft, yielding materials are encountered and where undocumented solid waste fill, such as in the vicinity of Test Pit TP-7 are encountered.

Earthwork and Grading

The following sections present guidelines for the design and construction of the earthwork and grading for the subject subdivision development and appurtenant structures.

Our field exploration indicates that the stony, sandy silt, surface soils, are generally stiff to very stiff and will not need to be over excavated (except clearing, grubbing, and scarifying). On the other hand, the underlying basaltic/lava rock formation is generally shallow, (averaging about 3 feet in depth) strong, hard and fresh to slightly weathered making it difficult to excavate during grading and trench excavation for utility lines. We, therefore, recommend a development concept that involves minimal cutting into the natural terrain. This will also limit erosion of the native soil and minimize difficult and costly operation of cutting into the hard rock formation.

Site Preparation

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

Areas to receive fill, should be scarified to a depth of 6 inches, moisture-conditioned to at least 2 percent above the optimum moisture content, and compacted to a minimum of 90 percent relative compaction. Relative compaction refers to the in-place, dry density of soil expressed as 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. Soft or yielding areas encountered during site preparation should be over-excavated to expose firm soil surface and stabilized by backfilling with select material placed in 8-inch thick, loose, lifts and compacted to 90 percent relative compaction or 95 percent for fills 2 feet below the proposed road subgrade.

If the subgrade exposes rocky material, where scarification is not practical, the rocky subgrade should be proof rolled with a 15-ton vibratory drum roller, or similar heavy construction equipment, with a minimum of 8 passes, to help detect and collapse near-surface cavities. It is important that the scarification and proof rolling be performed in the presence of a representative of PSC Consultants, LLC (PSC). Cavities disclosed during the proof rolling should be over-excavated and backfilled with select borrow and compacted as above.

Fills and Backfills

General Fill

Materials for general fill purposes should be well-graded, granular soils with no rocks greater than 12 inches in size in the deeper portion of the fill, at least 5 feet below the final grade or below any planned utilities. Materials ranging from 6 to 12 inches should be limited to less than 15 percent of the total general fill. The excavated materials, if less than 12 inches in maximum dimension, may be used as a source of general fill, provided these are processed to meet the above gradation requirements for general fill. If the excavated materials do not contain a sufficient amount of fines to produce the desired gradation for the general fill, offsite borrow or crusher-run onsite materials may be added to produce a well graded material.

Boulders, cobbles, or fractured rock fragment over six inches in size may be used in deeper portions of fills providing they are not nested, and sufficient soils are placed adjacent to them in such a manner that voids are properly filled and compacted, and are below the depths of utility installations.

The onsite soils may be used as general fill and backfill where structural fills are not specifically required, provided that it does not contain organics, debris, and other deleterious materials.

Capping Fill

We recommend that the general fill areas be capped with a minimum of 2 feet of structural fill. Materials used for this structural fill should be non-expansive, select material, generally less than 3 inches in maximum dimension, with sufficient fines to prevent formation of voids in the compacted mass. The capping fill should have a plasticity index not exceeding 15, as determined in accordance with ASTM Test Method D 4318-84, and should have a maximum of 40 percent of particles passing the No. 200 sieve. If additional offsite borrow material is required, it should be tested by PSC to evaluate its suitability for use as select fill prior to its delivery to the project site.

Fill Placement and Compaction Requirements

Structural Fill material should be placed in level lifts with maximum loose thickness of 8 inches; moisture conditioned to least 2 percent above optimum, and properly compacted to a minimum of 95 percent relative compaction. General fills and backfills should be placed in level lifts with a maximum loose thickness of 12 inches, moisture conditioned to least 2 percent above optimum, and properly compacted to a minimum of 90 percent relative compaction. Each layer should be spread uniformly and blade-mixed to attain uniformity of the material and even distribution of water content. Additional fill material should not be placed on any fill layer that has not been properly compacted. Compaction should be accomplished by sheepfoot, vibratory or other types of acceptable compaction equipment.

Excavation

Our field exploration reveals the proposed project site is generally overlain by stiff, very fine, sandy silt (loam) with varying amounts of clinker gravel, cobbles, and boulders (fragmental aa). These near-surface materials can readily be excavated by ordinary heavy excavation equipment such as excavators and dozers with rippers. Excavation through the underlying fresh to slightly weathered basalt/lava rock formation would need special equipment like hoe ram rock breakers, jackhammers, or even blasting. Contractors bidding on the job should satisfy themselves as to what type of equipment is most suitable for their use.

Slopes

In cases where sloping fills are required, such as at the edge of fill embankments consisting of select material, 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. Exposed soil slopes must be covered immediately after construction to limit erosion. Slopes cut into the basaltic rock formation may be made at 1H:1V. Permanent fills placed in slopes steeper

than 5H:1V should be benched. A keyway should be provided for fill slopes greater than 15 feet of vertical height placed in existing ground steeper than 5H:1V. For cut and fill slopes with a vertical height greater than 30 feet, we recommend a minimum of an 8-foot wide bench be constructed at mid slope and provided with a concrete lined swale to reduce potential for erosion from runoff. Water should be diverted away from the slopes by diversion ditches at their tops and surface drains on slope surface and subdrains may be used to provide adequate drainage. Slope planting should be utilized to limit erosion.

Pavements

We anticipate that asphaltic concrete pavements will be required for the roadways in the subdivision. While traffic loading has not been specified, we anticipate a medium vehicle loading for the project consisting primarily of passenger vehicles and delivery trucks. We have made our preliminary pavement design assuming the pavement subgrade soil will consist of compacted onsite materials with a minimum CBR value of 25. The fill material within 2 feet below the pavement subgrade should be compacted to 95 percent relative compaction. Based on the above assumptions, we recommend that the following flexible and rigid pavement sections be used for preliminary design purposes:

Flexible Pavement Section

2-Inches	Asphaltic Concrete
4-Inches	Asphalt Treated Base Course
6-Inches	Aggregate Subbase Course
12-Inches	Total Pavement thickness on a minimum of 2 feet of properly compacted select borrow material or insitu basaltic/lava rock formation.

Rigid Pavement Section

6-Inches	Concrete
6-Inches	Aggregate Subbase Course
12-Inches	Total Thickness

The recommended section considers medium subdivision traffic. In areas with heavier traffic, such as at main collector roads like Road "A" and Road "B", the section should be thickened with an additional 1/2-inch asphaltic concrete to provide adequate support for the anticipated increased traffic loading.

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 road construction to confirm the adequacy of the above pavement sections. The recommended section assumes that adequate drainage will be provided.

Road Drainage

Subdrains should be provided where there is a possibility that runoff from rainfall 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 access of water into the roadbed soil under the pavement should be minimized in order to stabilize the moisture content by incorporating water inhibiting membrane into the design, as described in Item 1.21.1-d of the DOT Pavement Design Manual (Rev. March 2002).

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 of the backfill, 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 below the pavement subgrade should be compacted to 95 percent relative compaction.

Keanuiomano Stream Bridge Crossing

We envision that a reinforced concrete deck girder bridge (RCDG) will be constructed across this stream. Test Pit No.TP-45 was excavated at the approximate location of the south abutment of the proposed Keanuiomano Stream crossing where the depth to bedrock is measured at about 4 feet. On the other side of the stream, the depth to bedrock closest to the north abutment of the crossing may be taken from Boring No. 7 of the Geotechnical Engineering Exploration, Lalamilo Housing, Phase I, Waimea, Island of Hawaii, dated October 28, 2004, by Geolabs, Inc. The depth to bedrock from Boring No. 7, performed by Geolabs, is about 11.5 feet. The stream was observed to flow continuously at the time of the exploration. No boring was drilled at the other end of the proposed crossing, but Boring No. 7 of Geolabs Inc.'s report was utilized and shown on Plate No. 69.

From our preliminary survey of the stream crossing, it is our opinion that it is feasible to construct a bridge across this channel from a geotechnical engineering standpoint. The following parameters are recommended for preliminary design purposes:

Foundation Design

The bridge abutments may be supported on spread footing foundations resting on the bedrock initially designed for an allowable bearing pressure of 6000 psf (287 kPa). This allowable bearing capacity may be increased or decreased depending on the geotechnical conditions at the exact abutment locations, which will be determined from an additional field exploration prior to final design. Other geotechnical design parameters are as follows:

Seismic Data

- Shear wave velocity 2,500 fps
- Effective Peak Rock Acceleration 0.4 g (adapted from Geolabs's report)

Lateral Soil Forces

Seismic Soil Pressure	33 percent increase over active and passive cases
Active Case: Design Value	36 pcf equivalent fluid pressure for pre-approved backfill material
At Rest Case: Design Value	55 pcf equivalent fluid pressure for pre-approved backfill material
Passive Resistance: Design Value	400 pcf equivalent fluid pressure for pre-approved backfill material. Maximum value 4000 psf.

The above preliminary foundation recommendations and design parameters are based on site observations, 1 test pit, TP-45, at the proposed southern abutment, and drilling data from the previous exploration near the proposed northern side of the crossing. These are intended for use in the preliminary design of a bridge structure. The design parameters will be subject to change if the engineering properties of the underlying materials are different from what we have anticipated and should be verified by subsurface drilling at the actual location of the abutments. No proposed bridge plan was available at the time of this writing.

Retaining Wall Structures

We envision that retaining wall structures, such as wing walls and some grade separation walls, may be constructed for the project. In general, the following guidelines may be used for design of the retaining structures planned at the site.

Retaining Wall Structure Foundations

In general, we believe that retaining structure foundations may be designed in accordance with the recommendations presented in the Keanuiomano Stream Bridge Crossing section of this report. The embedment depth for the retaining structure foundations should be a minimum of 24 inches below the lowest adjacent finished grades. In addition, retaining wall footings should have a minimum width of 18 inches.

Static Lateral Earth Pressures

Retaining structures should be designed to resist the lateral earth pressures imposed by adjacent soils and surcharge effects. The recommended lateral earth pressures for design of retaining structures, expressed in pounds per square foot per foot of depth (pcf) of equivalent fluid pressures, are presented in the following table.

Lateral Earth Pressures for Design of Retaining Structures

Backfill Condition	Earth Pressure Component	Active (pcf)	At-Rest (pcf)
Level Backfill	Horizontal	34	54
	Vertical	None	None

The values provided in the table assume that granular soils less than 3 inches in maximum dimension will be used for backfill behind the retaining structures to facilitate compaction of the backfill using smaller sized equipment. The zone of granular soils less than 3 inches in maximum dimension should extend a minimum of 3 feet laterally behind the retaining structures. Backfill beyond this 3-foot zone may consist of structural fills consisting of well-graded granular materials less than 6 inches in largest dimension.

It also is assumed that the backfill behind retaining structures will be compacted to between 90 and 95 percent relative compaction. Over-compaction of the retaining structure backfill should be avoided. In general, an active condition may be used for gravity retaining walls and retaining structures that are free to deflect laterally by as much as 0.5 percent of the wall height. If the tops of the structures are not free to deflect beyond this degree, or are restrained, the retaining structures should be designed for the at-rest condition. These lateral earth pressures do not include hydrostatic pressures that might be caused by groundwater trapped behind the retaining wall structures.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the retaining structures should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the structure, a rectangular

distribution with uniform pressure equal to 28 percent of the vertical surcharge pressure acting on the entire height of the structure, which is free to deflect (cantilever), may be used in design. For retaining structures that are restrained, a rectangular distribution equal to 44 percent of the vertical surcharge pressure acting over the entire height of the structure may be used for design. Additional analyses during design may be needed to evaluate the surcharge effects of point loads and line loads.

Dynamic Lateral Earth Forces

Because the project site is located on the seismically active Island of Hawaii (Seismic Zone 4, in accordance with the 1997 Uniform Building Code), forces due to dynamic lateral earth pressures will need to be considered in the design of retaining structures. The force due to dynamic lateral earth pressures (a_{max}= 0.40g, adapted from Geolabs's report) may be estimated using $18H^2$ pounds per foot of wall length for level backfill conditions, where H is the height of the wall in feet.

The force due to dynamic lateral earth pressure would generally act at the mid-height of the wall. The force due to dynamic lateral earth pressures presented above is in addition to the static lateral earth pressures. An appropriately reduced factor of safety may be used when dynamic lateral earth pressures are accounted for in the design of the retaining structure.

Percolation Testing

Drywells

Our field percolation tests indicate a very permeable stratum between 25 to 35 feet in the areas tested. Water introduced at the rate of 40 gal per minute into the bottom of the test holes through a 2-inch diameter pipe was observed to dissipate at the same rate into the underlying formation. We believe that dry wells constructed to these depths within these specific locations tested would provide excellent, free flowing drainage by gravity. It should be noted, however, that subsurface conditions might vary in other areas that were not explored. The results of tests are found in Appendix C, Percolation Test Results, Plate Nos. C-1 to C-3.

Individual Wastewater Systems

The percolation rates obtained from the shallow 10- to 15-foot deep wells intended for the individual wastewater systems indicate a fair to good drainage by gravity. The limitations in the use of individual septic tank filter fields will be severe in areas where the bedrock is shallow (1 to 2 feet). Other alternative wastewater disposal systems may be considered, such as a deep-seated communal filtration field. The results of these tests are shown in Appendix C, Site Evaluation/Percolation Test, Plate Nos. C-4 to C-6.

Soil Corrosion Potential

A field soil resistivity survey was performed throughout the site using a Wenner 4-Pin Method. The test locations are shown in Appendix B, Site Plan with Resistivity Test Locations, Plate B. The resistivity survey conducted consistently indicated a low or mildly corrosive potential (to uncoated steel or concrete). The results of the chemical tests on selected soil samples for corrosivity corroborated with our field test resistivity test results. Details of the field resistivity survey and chemical analysis of representative soil samples are shown in Appendix B.

Design Review

Drawings and specifications for the proposed construction should be submitted to PSC, 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 the road pavement structures;
- 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;
- Observe the fine-grading and exterior drainage improvements constructed around the finished structures; and
- Perform and check the foundation excavations for the bridge abutment and other appurtenant 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 and Hilo County) indicating that they fully understand our recommendations and that they are in full agreement with the recommendations contained in this report and will take over as the Geotechnical Consultant of Record for this project. 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, test pits and visual observations. Variations of subsoil conditions between the borings and test pits 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, based on preliminary development plans provided. The field locations for the borings and test pits were located by the client's surveyor and modified by our field personnel based on actual site conditions during field exploration work. 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 Lalamilo RS10 Subdivision Development 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 design 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 cavities, soft deposits, hard layers, or clinker layers, 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 are 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
Office Engineer

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

Alex W. Wong, P.E.
Senior Engineer

MGN/ASW/PSC:ch

Enc.:	Plate No. 1	Vicinity Map of Project Site
	Plate No. 1-A	Geologic Map of Project Site and Vicinity
	Plate No. 2	Site Plan (Alternate 2)
	Plate No. 2-A	Site Plan for Alternate 1
	Plate No. 3 through 8-A	Logs of Borings
	Plate No. 9 through 69	Logs of Borings/Test Pits
	Plate No. 70	Soil Classification Chart
	Plate No. 71	Rock Classification System
	Plate Nos. A-1 through A-3	Compaction Test Results (ASTM D-1557)
	Plate Nos. A-4 through A-9	Grain Size Distribution
	Plate Nos. A-10 through A-12	California Bearing Ratio (ASTM D-1883-94)
	Plate No. B	Site Plan with Resistivity Test Locations
	Plate Nos. B-1 through B-6	Summary of Soil Resistivity Test Results (ASTM G-57)
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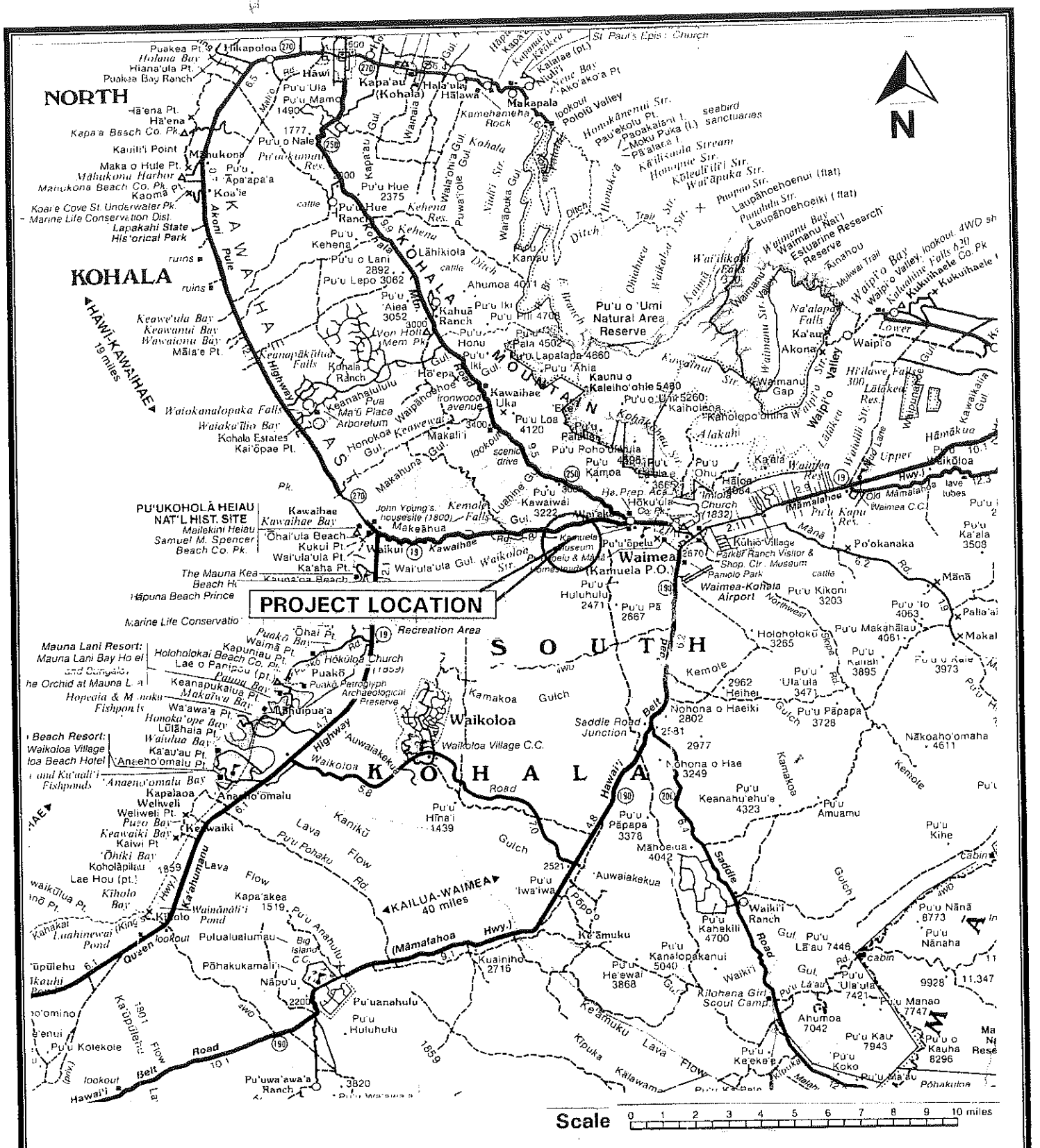
	Plate Nos. C-1 through C-3	Percolation Test Results
	Plate Nos. C-4 through C-6	Site Evaluation/Percolation Test

PSC CONSULTANTS, LLC



Reference: Map of Hawai'i The Big Island (Published by The University of Hawaii Press 2003)

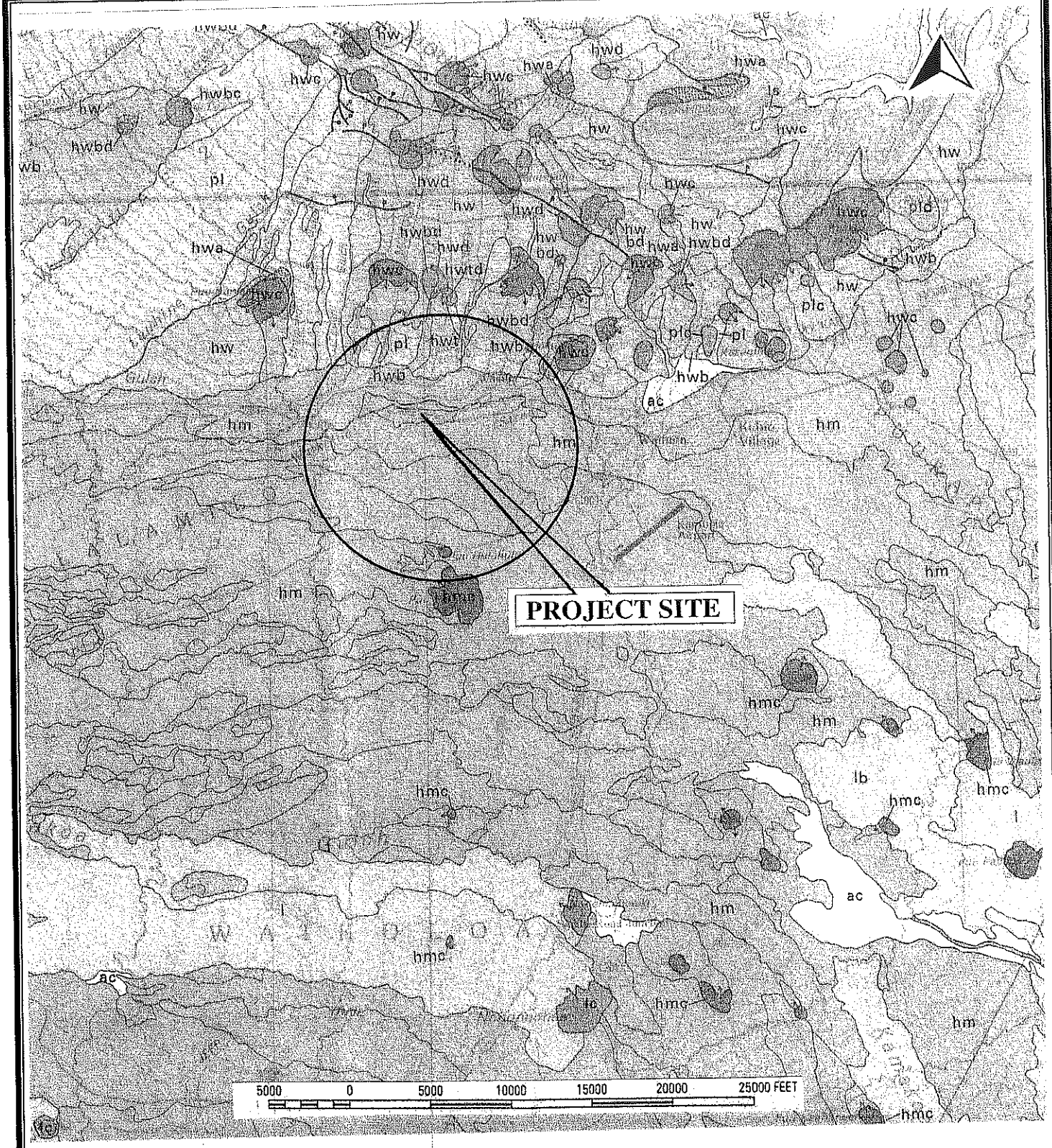
VICINITY MAP OF PROJECT SITE

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, The Big Island of Hawaii

DATE: July 2006 | PROJECT NO.26301.10/12

PLATE NO. 1



Reference: USGS Geologic Map of Hawaii (1996)

SCALE: I INCH :10 000 FT.

GEOLOGIC MAP OF PROJECT SITE AND VICINITY

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

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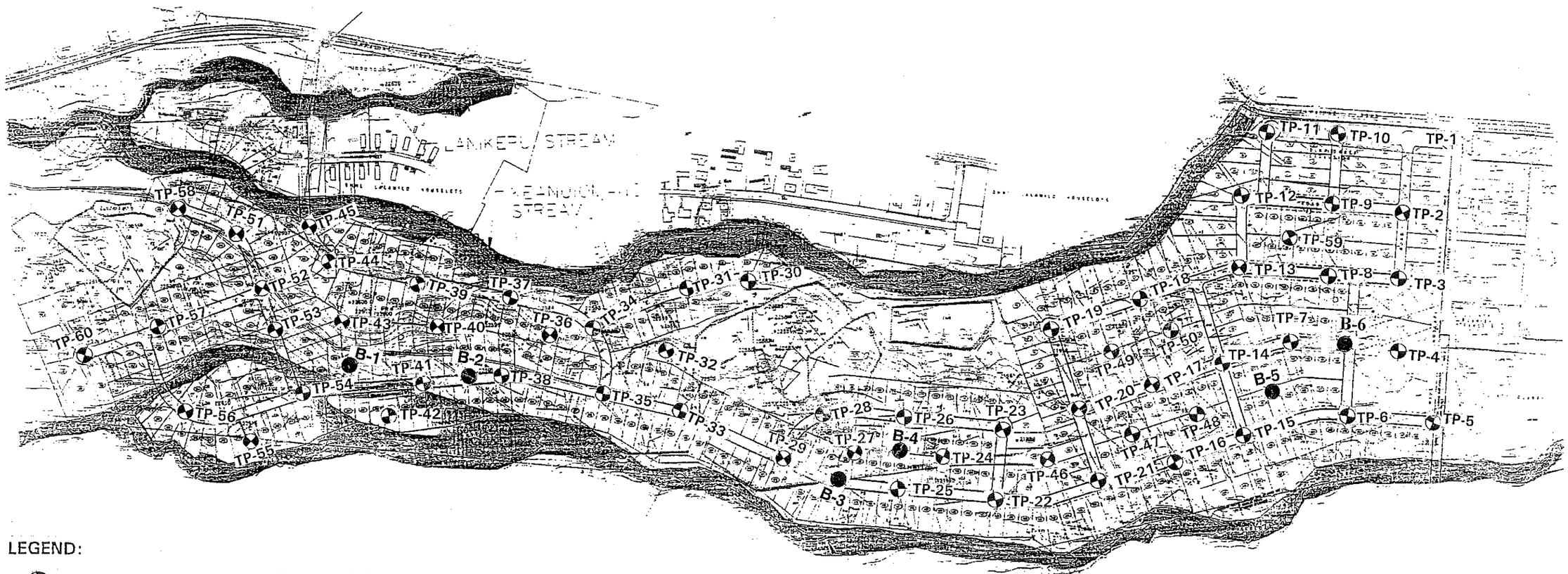
Lalamilo, Waimea, The Big Island of Hawaii

DATE: July 2006 | PROJECT NO.26301.10/12

PLATE NO. 1-A

Approximate Scale 1 in = 525 ft



LEGEND:

- TP-1 PROPOSED TEST PIT LOCATION
- B-1 PROPOSED BORING LOCATION

DHHL LALAMILO
PROPOSED RS10 SUBDIVISION
PREPARED BY CP & E

ALTERNATE 2

AREAS INUNDATED BY THE 100-YEAR FLOOD
ON LANIKEPU, KEANUIOMANO, AND WAIKOLOA STREAMS

Reference: Site Development Plan Provided by CP&E

SITE PLAN

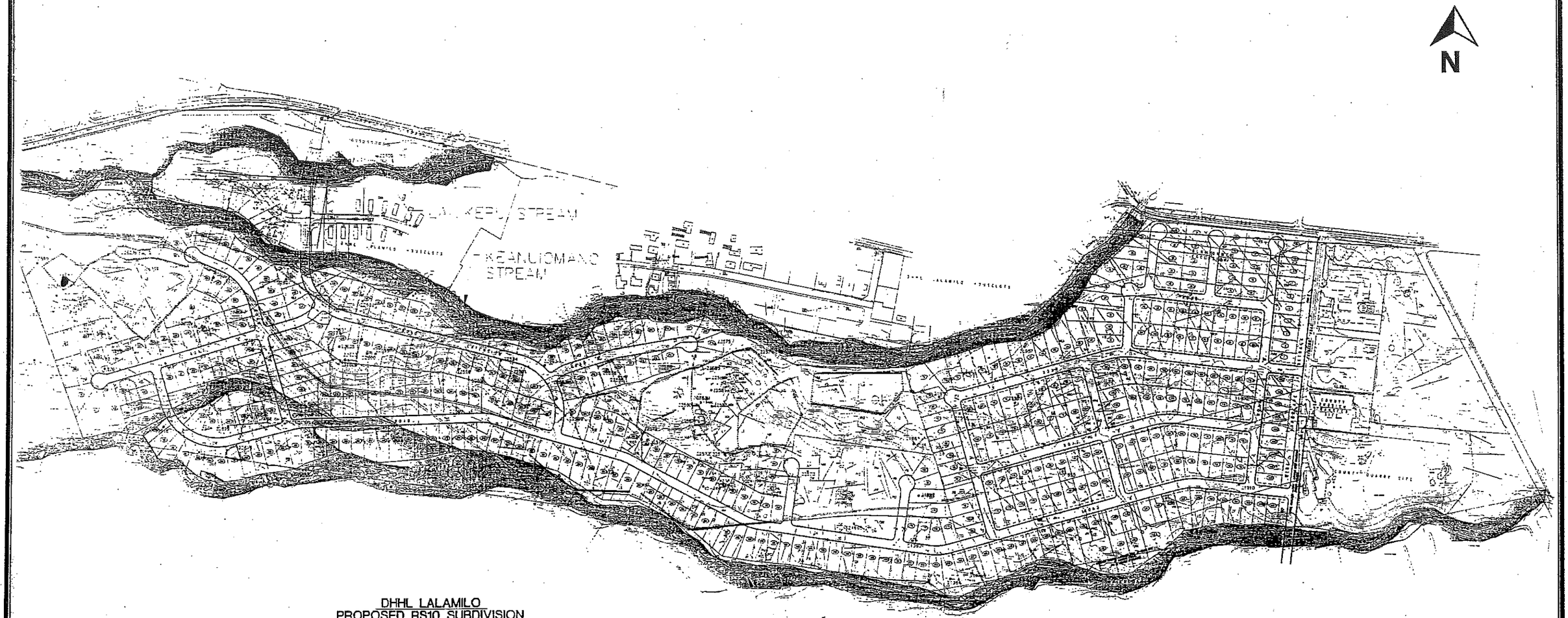
PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006

PSC JOB NO. 26301.10

PLATE NO. 2



DHHL LALAMILO
PROPOSED RS10 SUBDIVISION
PREPARED BY CP & E

ALTERNATE 1

Approximate Scale 1in = 600 ft.

SITE PLAN FOR ALTERNATE 1

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, The Big Island of Hawaii

DATE: July 2006 | PROJECT NO.26301.10/12

Reference: Proposed Site Development Plan (Alternate-1) by CP& E (April 2006)

PLATE NO. 2-A

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-1**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 6/1/06	TYPE RIG: B-59	

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
			0	0		CB-1			ML	**Top Soil**, grass-covered, light brown, volcanic ash with roots, gravel and cobbles.
					62	SPT-1	1			**SILT**, brown, medium stiff to stiff, volcanic ash with gravel and cobbles.
							2			
			0	0		CB-2	3			
							4			
			23%	0		CB-3	5			
							6			
							7			**Basalt Rock Formation**, gray, moderately weathered, closely fractured, with cavities ,vessicated, moderately strong to strong, hard volcanic rock.
							8			
							9			
							10			Boring terminated at about ten (10) feet below ground surface. Groundwater was not encountered.
							11			
							12			

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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BORING 26301.GPJ BORING.GDT 7/5/06

PLATE NO. 3

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-2**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 6/1/06	TYPE RIG: B-59	

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
						CB-1			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILT with roots, Moist.
					19	SPT-1	1			**SILT**, brown, very stiff, with clinker gravel and cobbles, moist. (Soil formed in volcanic ash)
		15.8								
			0	0		CB-2	2			
							3			
							4			
			100	64		CB-3	5			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, hard volcanic rock.
							6			
							7			
							8			
							9			
			100	66		CB-4	10			As above
							11			
							12			
							13			
							14			
			46	25		CB-5	15			Void/Cavity
							16			
							17			
							18			**Basalt Rock Formation**, gray, slightly to moderately weathered, highly fractured, vessicated, moderately strong to strong, hard volcanic rock.
							19			
							20			

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 LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-2**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 6/1/06	TYPE RIG: B-59	

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
			83	25		CB-6				As above
							21			
							22			
							23			
							24			
			63	41		CB-7	25			As above
							26			
							27			
							28			
							29			
			5	0		CB-8	30			Loose clinker gravel and cobbles
							31			
							32			
							33			
							34			
							35			Boring terminated at about 35 feet below ground surface. A 2-inch perforated PVC standpipe was installed to full depth for future water percolation/infiltration testing.
							36			
							37			
							38			
							39			
							40			

SAMPLE TYPE

MC - Modified California SPT - Standard Penetration
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AUG - Auger Cuttings D&M - Dames & Moore

OTHER LABORATORY TESTS

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PLATE NO. 4-A

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-3**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: B-59	

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
			0	0		CB-1			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILT with roots, and some gravel. Moist.
					21	SPT-1	1			**Gravelly SILT** with cobbles, light brown, very stiff, moist. (Soil formed in volcanic ash)
		10.4								
			63	27		CB-2	2			**Basalt Formation**, gray, vessicated, closely fractured, moderately weathered.
							3			
							4			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, hard volcanic rock.
			100	83		CB-3	5			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, moderately hard to hard volcanic rock.
							6			
							7			
							8			
							9			
			73	56		CB-4	10			**Void**
							11			
							12			
							13			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderate to closely fractured, vessicated, moderately strong to strong, hard volcanic rock.
							14			
			81	55		CB-5	15			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, hard volcanic rock.
							16			
							17			
							18			

SAMPLE TYPE

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

OTHER LABORATORY TESTS

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CON - Consolidation Test SG - Specific Gravity
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BORING LOCATION: See Site Plan	DRILLER: Valley Well	BORING NO. B-3
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: B-59	

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
			100	80		CB-6				**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, hard volcanic rock.
							21			
							22			
							23			
							24			
			80	43.33		CB-7	25			**Basalt Rock Formation**, light gray, slightly to moderately weathered, moderately fractured, vessicated, porous, moderately strong to strong, hard volcanic rock.
							26			
							27			
							28			
							29			
			80	27		CB-8	30			**Basalt Rock Formation**, gray, fresh to slightly weathered, moderately fractured, vessicated, moderately strong to strong, hard volcanic rock.
							31			
							32			**Basalt Rock Formation**, grades to dark gray, moderately weathered, moderate to closely fractured, highly vessicated with distinctly observable increase in size of air voids or vessicles, moderately strong to strong, hard volcanic rock.
							33			
							34			
							35			Boring terminated at about 35 feet below ground surface Groundwater was not encountered A 2-inch-diameter PVC perforated stand pipe was installed to full depth on 6/3/06 for percolation and infiltration rate testing.
							36			
							37			
							38			
							39			
							40			

SAMPLE TYPE

MC - Modified California
SPT - Standard Penetration
CB - Core Barrel
SH - Shelby Tube
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OTHER LABORATORY TESTS

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PLATE NO. 5-A

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-4**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: B-59	

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
						CB-1			ML	**Top Soil**, grass-covered, stiff, brown, volcanic ash with roots, gravel and cobbles. Moist.
					39	SPT-1	1			**Gravelly SILT** very stiff to hard, brown to light brown, very fine, (volcanic ash) with clinker gravel and cobbles. Moist.
		16.7								
			100	54		CB-2	2			
							3			**Basalt Rock Formation**, gray, vessicated, closely fractured, slight to moderately weathered, hard, strong.
							4			
			80	50		CB-3	5			**Basalt Rock Formation**, gray, slightly to moderately weathered, moderate to closely fractured, vessicated, moderately strong to strong, hard.
							6			
							7			
							8			
							9			
			100	73		CB-4	10			As above
							11			
							12			
							13			
							14			
							15			Boring terminated at 15 feet below ground surface. Groundwater was not Encountered.
							16			

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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Lalamilo, Waimea, Big Island of Hawaii

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PLATE NO. 6

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-5**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: B-59	

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
			0	0		CB-1			ML	**Top Soil**, grass-covered, stiff, brown, volcanic ash with roots, and gravel. Moist.
					46	SPT-1				**Gravelly SILT/Volcanic Ash** very stiff to hard, brown to light brown volcanic ash with clinker gravel and cobbles. Moist.
		15.7					1			
			75	74		CB-2	2			
							3			**Basalt Rock**, gray, fresh to slightly weathered, moderately fractured, moderately strong to strong, hard.
							4			
			53	23		CB-3	5			**Basalt Rock Formation**, gray, slightly to moderately weathered, vessicated, closely to intensely fractured, moderately strong, moderately hard.
							6			
							7			
							8			
							9			
							10			Boring terminated at about 10 feet below ground surface Groundwater was not encountered.
							11			
							12			

SAMPLE TYPE

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

OTHER LABORATORY TESTS

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Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006 PROJECT NO.: 26301.10/12

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PLATE NO. 7

BORING LOCATION: See Site Plan	DRILLER: Valley Well	**BORING NO. B-6**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: B-59	

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
			0	0	0	CB-1			ML	**Top Soil**, grass-covered, stiff, brown, volcanic ash with roots, and gravel. Moist.
							1			**Gravelly SILT/Volcanic Ash** very stiff to hard, brown to light brown volcanic ash with clinker gravel and cobbles. Moist.
							2			
					38	SPT-1	3			
							4			
			0	0		CB-2	5		ML	
							6			
							7			
							8			
							9			
			90	65		CB-3	10			**Basalt Rock**, gray, fresh to slightly weathered, moderately fractured, moderately strong to strong, hard.
							11			
							12			
							13			
							14			
			100	48		CB-4	15			**Basalt Rock**, gray, fresh to slightly weathered, vessicated, moderate to closely fractured, moderately strong to strong, hard.
							16			
							17			
							18			

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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BORING LOCATION: See Site Plan	DRILLER: Valley Well	BORING NO. B-6
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: B-59	

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
							19			
			100	90		CB-5	20			**Basalt Rock**, gray, fresh to slightly weathered, moderately fractured, moderately strong to strong, hard.
							21			
							22			
							23			
							24			
			66	30		CB-6	25			**Basalt Rock**, gray, slightly to moderately weathered, closely to intensely fractured, moderately strong, hard.
							26			
							27			
							28			
							29			
							30			
							31			
							32			Boring terminated at about 32 feet below ground surface Groundwater was not encountered. A 2- inch diameter perforated pvc standpipe was installed to full depth on 6/3/06 for future water percolation/infiltration tests.
							33			
							34			
							35			
							36			

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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PLATE NO. 8-A

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-1**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					17	DCPT			ML	**Top Soil**, grass-covered, light brown, volcanic ash with roots. Moist.
										SILT, brown to light brown, stiff, with scattered gravel and cobbles. Moist. (Soil formed in volcanic ash) *
		32.0					1			
									ML	
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 feet at the soil-rock interface
							4			
							5			

**Note (Soil formed in volcanic ash) description for the Waimea Series ; USDA Soil Conservation Service 1973 Report*

SAMPLE TYPE

DCPT - Dynamic Cone
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. 9

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-2**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					13	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots and gravel. Moist.
										Gravelly SILTwith cobbles in a stiff grayish-brown sandy silt matrix. Moist. (Soil formed in Volcanic Ash)
		30.6					1			
							2		ML	
							3			
										Basalt/Lava rock formation
							4			Test pit terminated at about 3.5 feet at the soil-rock interface
							5			

SAMPLE TYPE

DCPT - Dynamic Cone
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. 10

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-3**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, dark brown, fine sandy SILT with roots and trace gravel. Moist. (Soil formed in volcanic ash)
									ML	**SILT** dark brown, stiff, very fine with cobbles and gravel. Moist. (Soil formed in volcanic ash)
		34.6					1			
										Basalt rock formation
										Test pit was terminated at about 1.33 feet below ground surface at the soil-rock interface.
							2			

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. 11

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-4**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					17	DCPT			ML	**Top Soil**, grass-covered, light brown, sandy silt with roots and gravel. (Soil formed in volcanic ash)
										Gravelly SILT, very stiff, light brown volcanic ash with cobbles. Moist. (Soil formed in volcanic ash)
		11.8					1			
									ML	
							2			
										Basalt rock formation
										Test pit terminated at about 2.5 feet at the soil-rock interface
							3			
							4			

SAMPLE TYPE

DCPT-Dynamic Cone
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
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PLATE NO. 12

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-5**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots and some gravel. (Soil formed in volcanic ash)
										Clinker Gravel and Cobbles in a grayish-brown, stiff, sandy silt matrix, moist. (Soil formed in volcanic ash)
		21.1					1			
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 feet below ground surface at the soil-rock interface.
							4			
							5			

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. 13

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-6**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					27	DCPT			ML	**Top Soil**, grass-covered, brown, sandy silt with roots, moist. (Soil formed in volcanic ash)
										Silty, Sandy, GRAVEL, clinker gravel in a stiff to very stiff, light brown volcanic ash matrix with some cobbles. Moist.
		6.9					1			
									GW	
							2			
										Basalt rock formation
										Test pit terminated at about 2.5 feet below ground surface at the soil-rock interface.
							3			
							4			

SAMPLE TYPE

DCPT- Dynamic Cone | 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. TP-7**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots, moist.
										Unclassified Fill, Assorted non-biodegradable and biodegradable industrial and domestic waste/landfill consisting mostly of broken glass bottles mixed with other materials like metal wires and cables, springs, rubber tires, wood, plastic, auto parts, animal bones etc.
		54.3					1			
							2			
							3			
							4			Lava rock formation
										Test pit terminated at about 4 feet below ground surface where the lava rock was encountered.
							5			
							6			

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. 15

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-8**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					17	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots, moist. (Soil formed in volcanic ash)
										Gravelly SILT with some cobbles, stiff, very fine, brown, with trace sand. Moist. (Soil formed in volcanic ash)
		10.5					1			
										Basalt/Lava rock formation
										Test pit was terminated at about 1.5 feet below ground surface at the soil-rock interface.
							2			

SAMPLE TYPE

DCPT-Dynamic Cone; 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 LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-9**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					16	DCPT			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith roots, moist. (Soil formed in volcanic ash)
		21.3					1			**Gravelly, Sandy, SILT**, stiff, light brown, very fine, with cobbles. Moist. (Soil formed in volcanic ash)
							2			
							3		ML	
							4			
							5			
										Basalt/Lava rock formation Test pit terminated at about 5.5 ft. below ground surface at the soil and rock interface.
							6			
							7			
							8			

SAMPLE TYPE

DCPT-Dynamic Cone
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. TP-10**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					21	DCPT			ML	**Top Soil**, grass-covered, light brown, stiff, very fine sandy SILT (volcanic ash) with roots. Moist.
										SILT, brown, stiff, with cobbles and clinker gravel. Moist. (Soil formed in volcanic ash)
		27.5					1		ML	
							2			
							3			Basalt rock formation
										Test pit terminated at about 3 feet at the soil-rock interface
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone	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. 18

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-11**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					17	DCPT			ML	**Top Soil**, grass-covered, stiff, dark brown, very fine sandy SILT with roots, Moist. (Soil formed in volcanic ash)
										Gravelly SILT with cobbles, stiff, brown, very fine. Moist. (Soil formed in volcanic ash)
		25.8					1			
							2			
							3			Basalt/lava rock
										Test pit terminated at about 3 ft. below ground surface at the soil and lava rock interface.
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone
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. TP-12**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					12	DCPT			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILT (volcanic ash) with roots.Moist.
										SILT, brown, stiff, very fine with some gravel and cobbles, moist. (Soil formed in volcanic ash)
		26.5					1			
									ML	
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 ft. below ground surface at the soil-rock interface.
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone
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. TP-13**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					10	DCPT			ML	**Top Soil**, grass-covered, stiff, dark brown, very fine sandy SILT(volcanic ash) with roots, moist.
									GM	**Cobbles** with gravel, in a stiff, brown, very fine sandy SILT matrix. Moist.(Fragmental aa)
		12.6					1			
							2			
							3			
							4			Basalt/Lava rock formation
										Test pit terminated at about 4 ft. below ground surface at the soil & lava rock interface
							5			

SAMPLE TYPE

DCPT-Dynamic Cone, 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. 21

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-14
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith roots, moist. (Soil formed in volcanic ash)
										Cobbles and Gravel in a stiff, light brown, very fine sandy silt matrix. Moist. (Fragmental aa lava)
		30.5					1			
							2			
							3		GM	
							4			
							5			
							6			Basalt/Lava rock formation Test pit terminated at about 6 ft. below ground surface at the soil and rock interface.
							7			

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. TP-15**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, brown, grass-covered, very fine sandy SILT (volcanic ash) with roots,moist.
										SILT/volcanic ash, brown, stiff, very fine with some cobbles. Moist.
		17.2					1			
									ML	
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 feet below ground surface at the soil rock interface.
							4			
							5			

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. TP-16**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					16	DCPT			ML	**Top Soil**, grass-covered, brown to light brown, very fine SILT(volcanic ash) with roots, with some gravel.
										SILT, brown, stiff, very fine, with some gravel. Moist. (Soil formed in volcanic ash)
		17.2					1			
							2			
							3			
										Basalt/Lava rock formation
							4			Test pit terminated at about 3.83 ft. below ground surface at the soil - rock interface.
							5			

SAMPLE TYPE

DCPT-Dynamic Cone
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. 24

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-17**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					18	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										SILTwith cobbles and gravel, light brown, stiff, very fine, moist. (Soil formed in volcanic ash)
		22.1					1		ML	
							2			
										Basalt/Lava rock formation Test pit terminated at about 2.2 ft. below ground surface at the soil - rock interface.
							3			
							4			

SAMPLE TYPE

DCPT-Dynamic Cone 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-18**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Boulders, with cobbles and gravel (fragmental aa) in a very fine, brown, sandy silt matrix. Moist.
		23.0					1			
							2			Basalt/Lava rock formation
										Test pit was terminated at about 2 ft. at the soil and rock interface.
							3			
							4			

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-19**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Boulders and Cobbles, in a brown, stiff, very fine sandy Silt matrix, Moist. (Fragmental aa lava)
		17.2					1			
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 ft. below ground surface at the soil - rock interface.
							3			
							4			

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. 27

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-20**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/29/06	TYPE RIG: PC-78	

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
					24	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Gravelly SILTbrown, very stiff, with clinker gravel and cobbles. Moist. (Soil formed in volcanic ash)
		20.7					1			
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 ft. below ground surface at the soil - rock interface.
							3			
							4			

SAMPLE TYPE

DCPT-Dynamic Cone 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. 28

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-21**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy SILT(volcanic ash) with roots, and trace gravel. Moist.
										SILT with gravel, stiff, very fine, brown to light brown, (volcanic ash) . Moist.
		17.2					1			
							2			
							3			
							4			
							5			Basalt/Lava rock formation Test pit terminated at about 5 ft. below ground surface at the soil - rock interface.
							6			

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. 29

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-22**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Cobbles and Boulders with clinker gravel in a brown, stiff, very fine, sandy silt matrix. Moist.
		24.2					1			
							2			
										Basalt/Lava rock formation Test pit terminated at about 2 ft. below ground surface at the soil - rock interface.
							3			
							4			

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. 30

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-23**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, stiff, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Silty GRAVEL, with cobbles in a brown, stiff to very stiff very fine sandy silt matrix. Moist.
		24.6					1			
							2		ML	
							3			
										Basalt /Lava rock formation Test pit terminated at about 3.5 ft. below ground surface at the soil - rock interface.
							4			
							5			

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. 31

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-24**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					13	DCPT			ML	**Top Soil**, grass-covered, brown, stiff sandy silt with roots, and some gravel. Moist. (Soil formed in volcanic ash)
									GM	**Clinker Gravel and Cobbles** in a stiff, very fine, brown sandy silt (volcanic ash) matrix. Moist. (Fragmental aa)
		11.6					1			
										Basalt/lava rock formation
										Test pit terminated at about 1.2 feet at the soil-rock interface.
							2			

SAMPLE TYPE

DCPT-Dynamic Cone; 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. 32

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-25**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, stiff, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										Sandy, Gravelly SILT with cobbles and boulders, light grayish brown, stiff, Moist. (Soil formed in volcanic ash)
		17.3					1			
							2			
							3			
										Basalt/Lava rock formation Test pit terminated at about 3.5 ft. at the soil-rock interface
							4			
							5			

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. 33

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-26**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					9	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILT (volcanic ash) with roots, and some gravel. Moist.
		20.0					1			**Sandy GRAVEL/Gravelly SAND** with cobbles in a stiff brown very fine Silt (volcanic ash) matrix. Moist.
							2			
							3		GM	
							4			
							5			
							6			
							7			Basalt/Lava rock formation Test pit was terminated at about 6.5 feet below ground surface at the soil-rock interface.
							8			

SAMPLE TYPE

DCPT-Dynamic Cone; 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. 34

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-27
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy silt, with roots, gravel and cobbles. (Soil formed in volcanic ash)
										Clinker Gravel and Cobbles in a stiff, brown to light brown volcanic ash matrix. Moist.
		11.6					1			
							2			
									GM	
							3			
							4			
							5			Basalt/lava rock formation Test pit terminated at about 6 ft. below ground surface at the soil-and lava rock interface.
							6			
							7			
							8			

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. 35

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-28**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					12	DCPT			ML	**Top Soil**, grass-covered, dark brown, sandy silt with roots, and trace gravel. Moist. (Soil formed in volcanic ash)
										Cobbles and Boulders with clinker gravel in a brown, stiff, very fine sandy silt (volcanic ash) matrix.
		8.0					1			
							2			
							3			
							4			Basalt rock formation
										Test pit terminated at about 4 feet below ground surface Groundwater was not encountered.
							5			
							6			

SAMPLE TYPE

DCPT-Dynamic Cone 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. 36

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-29**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy loam/volcanic ash with roots.
										Clinker Gravel and Cobbles in a stiff brown to light brown sandy silt matrix. Moist. (Fragmental aa lava)
		11.3					1			
							2			
							3		GM	
							4			
							5			
							6			Basalt/Lava rock formation
										Test pit terminated at about 6 feet below ground surface at the soil rock interface.
							7			
							8			

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. 37

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-30**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					16	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILTwith roots and some gravel, moist. (Soil formed in volcanic ash)
										Cobbles and GRAVEL in a stiff, brown, very fine sandy silt matrix. Moist.
		14.7					1		GM	
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 ft. below ground surface at the soil-rock interface
							3			
							4			

SAMPLE TYPE

DCPT-Dynamic Cone
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. 38

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-31**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					13	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILTwith roots and some gravel, moist. (Soil formed in volcanic ash)
									ML	**Sandy SILT** with cobbles and gravel, brown, very fine, stiff, moist. (Soil formed in volcanic ash)
		15.8					1			
							2			
							3			Basalt/Lava rock formation
										Test pit was terminated at about 3 feet below ground surface at the soil-rock interface.
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone | 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. 39

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-32**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILTwith roots and some gravel, moist. (Soil formed in volcanic ash)
										SILT, reddish brown, stiff, very fine, with cobbles and gravel. Moist. (Soil formed in volcanic ash)
		18.1					1			
									MG	
							2			
										Basalt/Lava rock formation
							3			Test pit terminated at about 2.85 ft. below ground surface at the soil-rock interface.
							4			

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. 40

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-33**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					12	DCPT			ML	**Top Soil**, grass-covered, brown, very fine sandy SILTwith roots and some gravel, moist. (Soil formed in volcanic ash)
		16.9					1		ML	**Sandy SILT**, stiff, light brown to yellow brown, very fine, with trace gravel.Moist. (Soil formed in volcanic ash)
							2			
							3			Basalt/Lava rock formation Test pit terminated at about 2.85 ft. at the soil-rock interface
							4			

SAMPLE TYPE

DCPT-Dynamic Cone 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. 41

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-34**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILTwith roots and some gravel, moist. (Soil formed in volcanic ash)
									GM	**SILT** light brown, stiff, very fine with some cobbles and gravel. Moist.
		14.3					1			Basalt/Lava rock formation
										Test pit terminated at about 1 ft. below ground surface at the soil-rock interface.
							2			

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. 42

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-35**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, volcanic ash with roots, moist. (Soil formed in volcanic ash)
										SILT, brown to yellowish brown, with scattered cobbles, boulders and some gravel. Moist. (Soil formed in volcanic ash)
		11.4					1			
							2			
										Basalt/Lava rock formation Test pit terminated at about 2.75 ft. below ground surface at the soil-rock interface.
							3			
							4			

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. 43

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-36**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, stiff, very fine sandy SILT with roots, moist.
									GM	**Boulders and Cobbles**, with some clinker gavel, (fragmental aa lava) in a stiff, brown, very fine sandy silt matrix. Moist. (Soil formed in volcanic ash)
		9.6					1			
							2			
							3			Basalt/Lava rock formation
							4			Test pit terminated at about 3 feet below ground surface at the soil and rock interface.

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. 44

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-37**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					16	DCPT			ML	**Top Soil**, grass-covered, light brown, volcanic ash with roots, moist.
										SILT , brown to light brown, stiff to very stiff, very fine, with gravel and Cobbles. Moist. (Soil formed in volcanic ash)
		25.1					1			
							2			
							3		GM	
							4			
							5			
							6			Basalt/Lava rock formation Test pit terminated at about 6 ft. at the soil-rock interface
							7			
							8			

SAMPLE TYPE

DCPT- Dynamic Cone
CB - Core Barrel
AUG - Auger Cuttings
SPT - Standard Penetration
SH - Shelby Tube
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. 45

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-38**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy SILT (volcanic ash) with roots, moist.
										Boulders and Cobbles in a brown, stiff, very fine sandy SILT matrix. Moist. (Fragmental aa lava)
		17.7					1			
							2		GM	
							3			
							4			Basalt/Lava rock formation
										Test pit terminated at about 4 ft. below ground surface at the soil-rock interface.
							5			
							6			

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. 46

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-39**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, stiff, very fine sandy SILT with roots, moist. (Soil formed in volcanic ash)
										SILT, light brown, stiff, very fine, with cobbles and gravel. Moist. (Soil formed in volcanic ash)
		14.3					1			
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 ft. below ground surface at the soil and rock interface.
							3			
							4			

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. 47

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-40**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/30/06	TYPE RIG: PC-78	

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
					16	DCPT			ML	**Top Soil**, grass-covered, brown, very fine silt with roots and some gravel. (Soil formed in volcanic ash)
										Clinker GRAVEL, in a brown, stiff, very fine Silty Sand matrix, with cobbles. Moist.
		10.2					1			
							2			
							3		GM	
							4			
							5			
							6			Basalt/lava rock formation Test pit terminated at about 6 feet at the soil-rock interface
							7			
							8			

SAMPLE TYPE

DCPT-Dynamic Cone | 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. 48

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-41**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
					12	DCPT			ML	**Top Soil**, grass-covered, dark brown to gray, very fine sandy silt with roots . Moist (Soil formed in volcanic ash)
										Gravelly SILT, brown, stiff, with cobbles. Moist. (Soil formed in volcanic ash)
		39.7					1			
									ML	
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 ft. below ground surface at the soil-rock interface.
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone 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. 49

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-42**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy SILT with roots and some gravel. Moist. (Soil formed in volcanic ash)
									ML	**SILT**, brown to light brown, stiff, very fine, with some clinker gravel and cobbles. Moist. (Soil formed in volcanic ash)
		20.3					1			Basalt/Lava rock formation
										Test pit terminated at about 1 ft. below ground surface at the soil-rock interface .
							2			

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. 50

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-43**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine, sandy silt with roots. Moist. (Volcanic ash derived Waimea fine sandy loam).
										Silty GRAVEL with cobbles in a stiff, light brown, very fine sandy silt matrix. Moist.
		13.1					1			
							2			
							3		GM	
							4			
							5			
							6			Basalt/lava rock formation
										Test pit was terminated at about 6 feet below ground surface at the soil-rock interface.
							7			
							8			

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. 51

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-44**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy SILT with roots. Moist. (Soil formed in volcanic ash)
										SILT, light brown, stiff, very fine with some cobbles and gravel. Moist. (Soil formed in volcanic ash)
		27.5					1			
							2		ML	
							3			
							4			Basalt/Lava rock formation
										Test pit terminated at about 4 ft. below ground surface at the soil-rock interface
							5			

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. 52

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-45**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, very fine sandy silt with roots. Moist. (Soil formed in volcanic ash)
										SILT, brown to light brown, very fine, stiff, with some cobbles and gravel. Moist. (Soil formed in volcanic ash)
		30.9					1			
							2		ML	
							3			
							4			Basalt/Lava rock formation
										Test pit was terminated at about 4 ft. below ground surface at the soil-rock interface
							5			
							6			

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. 53

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-46**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots and some gravel. (Soil formed in volcanic ash)
										Sandy SILT, stiff, very fine, brown, moist. (Soil formed in volcanic ash)
									ML	
		16.0					1			**Gravelly SILT**, with cobbles, brown, stiff. (Soil formed in volcanic ash)
							2			
										Basalt/Lava rock formation Test pit terminated at about 2.25 ft. below ground surface at the soil-rock interface.
							3			
							4			

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. 54

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-47
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, light brown, sandy silt with roots. Moist. (Volcanic ash derived Waimea fine sandy loam).
										Sandy, Gravelly SILT, stiff, very fine, brown, with cobbles. Moist. (Soil formed in volcanic ash)
		27.1					1			
										Basalt/Lava rock formation
										Test pit terminated at about 1.2 feet below ground surface at the soil rock interface.
							2			
							3			

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. 55

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-48
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots and some gravel. (Soil formed in volcanic ash)
		16.4								**SILT**, stiff, brown, very fine, with some cobbles. Moist. (Soil formed in volcanic ash)
							1			Basalt/Lava rock formation
										Test pit terminated at about 1 ft. below ground surface at the soil-rock interface
							2			

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. 56

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-49**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots and some gravel. (Soil formed in volcanic ash)
										Boulders,Cobbles and Clinker Gravel , in a brown, very fine, stiff, sandy silt matrix. Moist.
							1			
							2			
							3			Basalt/Lava rock Formation
										Test pit terminated at about 3 feet at the soil-rock interface
							4			
							5			

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 26301.GPJ BORING.GDT 7/6/06

PLATE NO. 57

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-50**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
					11	DCPT			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith roots, moist. (Soil formed in volcanic ash)
		26.9					1		ML	**SILT**, stiff, light brown to brown, very fine , with trace gravel and some cobbles. Moist. (Soil formed in volcanic ash)
							2			
							3			Basalt/Lava rock formation Test pit terminated at about 3 feet below ground surface at the soil and basalt rock interface.
							4			
							5			

SAMPLE TYPE

DCPT-Dynamic Cone 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 26301.GPJ BORING.GDT 7/6/06

PLATE NO. 58

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-51
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
					11	DCPT			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith gravel and roots, moist. (Soil formed in volcanic ash)
										Clinker GRAVEL, with boulders, Poorly sorted, in a brown, very fine, stiff, sandy silt matrix. Moist.
		15.8					1		GM	
										Basalt/Lava rock formation
							2			Test pit terminated at about 1.85 feet below ground surface at the soil-rock interface.
							3			

SAMPLE TYPE

DCPT-Dynamic Cone
CB - Core Barrel
AUG - Auger Cuttings
SPT - Standard Penetration
SH - Shelby Tube
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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BORING 26301.GPJ BORING.GDT 7/16/06

PLATE NO. 59

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-52
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with gravel and scattered cobbles, moist. (Soil formed in volcanic ash)
										Cobbles and Boulders , (fragmental aa lava) with gravel in a fine, brown, sandy silt matrix. Moist.
		25.3					1			
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 ft. below ground surface at the soil-rock interface
							3			

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. 60

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-53
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots, moist. (Soil formed in volcanic ash)
										Sandy, Gravelly SILT, brown to gray brown, stiff, Moist. (Soil formed in volcanic ash)
		8.7					1			
							2			
									ML	
							3			
							4			
							5			Basalt/lava rock formation Test pit terminated at about 5 feet below ground surface at the soil-rock interface.
							6			

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. 61

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-54**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy SILT with gravel and roots, moist. (Soil formed in volcanic ash)
									GM	**Gravel and Cobbles** , in a fine, brown, sandy silt matrix. Moist.(fragmental aa lava)
		11.0					1			
							2			
										Basalt/Lava rock formation
										Test pit terminated at about 2.25 ft. below ground surface at the soil rock interface
							3			

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. 62

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-55**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with gravel, moist. (Soil formed in volcanic ash)
									GM	**Clinker GRAVEL**, with cobbles in a very fine, brown, sandy silt matrix. Moist. (Fragmental aa lava)
		5.9					1			
							2			
							3			Basalt/Lava rock formation
										Test pit terminated at about 3 ft. below ground surface at the soil rock interface
							4			

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. 63

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-56**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, stiff, very fine sandy silt with gravel, moist. (Soil formed in volcanic ash)
										Cobbles and Boulders , with gravel in a fine, brown, sandy silt matrix. Moist.(fragmental aa lava)
		22.3					1			
							2			Basalt/Lava rock formation
										Test pit terminated at about 2 feet below ground surface at the soil-rock interface.
							3			

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. 64

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-57**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with gravel and scattered cobbles, moist. (Soil formed in volcanic ash)
		11.2					1			**Cobbles, Boulders and Gravel**, in a very fine, brown to light brown, sandy silt matrix. Moist. (Fragmental aa lava)
							2			
							3			
							4			Basalt/Lava rock formation Test pit terminated at about 3.5 ft. below ground surface at the soil rock interface.

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. 65

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-58
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, brown, very fine sandy silt with roots, moist. (Soil formed in volcanic ash)
		6.0					1		GM	**Silty GRAVEL**, with cobbles, in a grayish brown, sandy silt matrix. Moist. (Fragmental aa lava)
										Basalt/Lava rock formation
							2			Test pit was terminated at about 1.2 ft. at the soil and rock interface.

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. 66

BORING LOCATION: See Site Plan	DRILLER: PSC	BORING NO. TP-59
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
					15	DCPT			ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith roots, moist. (Soil formed in volcanic ash)
										Gravelly SILT, stiff, brown to light brown, very fine, with cobbles and trace sand. Moist. (Soil formed in volcanic ash)
		25.8					1			
							2			
							3			
							4			
							5			Basalt/Lava rock formation Test pit terminated at about 5 ft. below ground surface at the soil-rock interface.
							6			
							7			

SAMPLE TYPE

DCPT-Dynamic Cone. 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. 67

BORING LOCATION: See Site Plan	DRILLER: PSC	**BORING NO. TP-60**
BORING ELEVATION: TBD	LOGGED BY: MGN	
DATE (S) DRILLED: 5/31/06	TYPE RIG: PC-78	

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
									ML	**Top Soil**, grass-covered, stiff, brown, very fine sandy SILTwith roots, moist. (Soil formed in volcanic ash)
									GM	**Silty GRAVEL** with cobbles in a dark brown, stiff, sandy silt matrix. Moist.
		4.0					1			
							2			
							3			
							4			
							5			Basalt/Lava rock formation Test pit terminated at about 5 feet below ground surface at the soil and rock interface.
							6			

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. 68

GEOLABS, INC. Geotechnical Engineering	LALAMILO HOUSING, PHASE I WAIMEA, ISLAND OF HAWAII	Log of Boring 7

Approximate Ground Surface Elevation (feet MSL): 2221.5 *

Laboratory			Field								Description
Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	
	14				21/.5' +20/.3' Ref.					CL	Light brown **SANDY CLAY** with some basaltic gravel, medium stiff, dry
											grades with some highly weathered basaltic cobbles
	9				52		5				
	9				15/.3' Ref.		10				
			72	72							Gray vesicular **BASALT**, massive, slightly weathered, very hard (basalt formation)
			100	100			15				
							20				
											Boring terminated at 21.5 feet
							25				
							30				
							35				

Date Started:	October 5, 2004	Water Level: ∇ Not Encountered	Plate
Date Completed:	October 6, 2004		
Logged By:	Y. Chiba	Drill Rig: MOBILE B-53	A - 7
Total Depth:	21.5 feet	Drilling Method: 4" Auger & HQ Coring	
Work Order:	5277-00	Driving Energy: 140 lb. wt., 30 in. drop	

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

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

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PLATE NO. 70

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.

PSC CONSULTANTS, LLC SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS	**DHHL: Proposed Lalamilo RS10 Subdivision** Lalamilo, Waimea, Big Island of Hawaii
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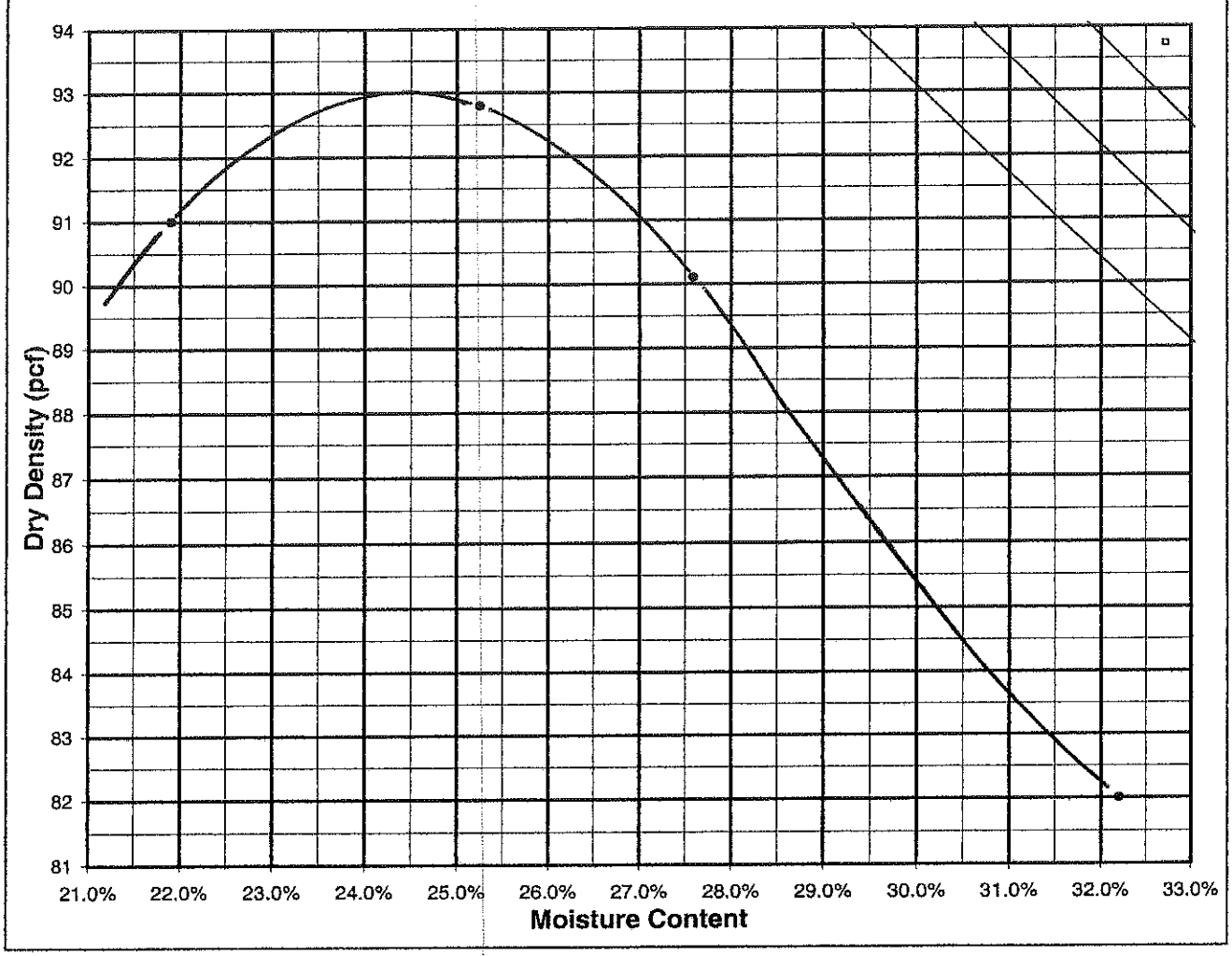
MOISTURE-DENSITY RELATIONSHIP



Sample Source: TP-6

Description: Fine Sandy Silt with Clinker Gravel Passing 3/4" Sieve

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	110.92	116.21	114.95	108.4
Moisture Content	21.90%	25.25%	27.59%	32.20%
Dry Density (pcf)	91.00	92.79	90.10	82.00

Maximum Dry Density (pcf): 93.0

Optimum Moisture Content (%) : 24.5

Test Method: ASTM D-1557

Atterberg Limits

LL PL PI

COMPACTION TEST RESULTS

ASTM D-1557

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision

Lalamilo, Waimea, Big Island of Hawaii

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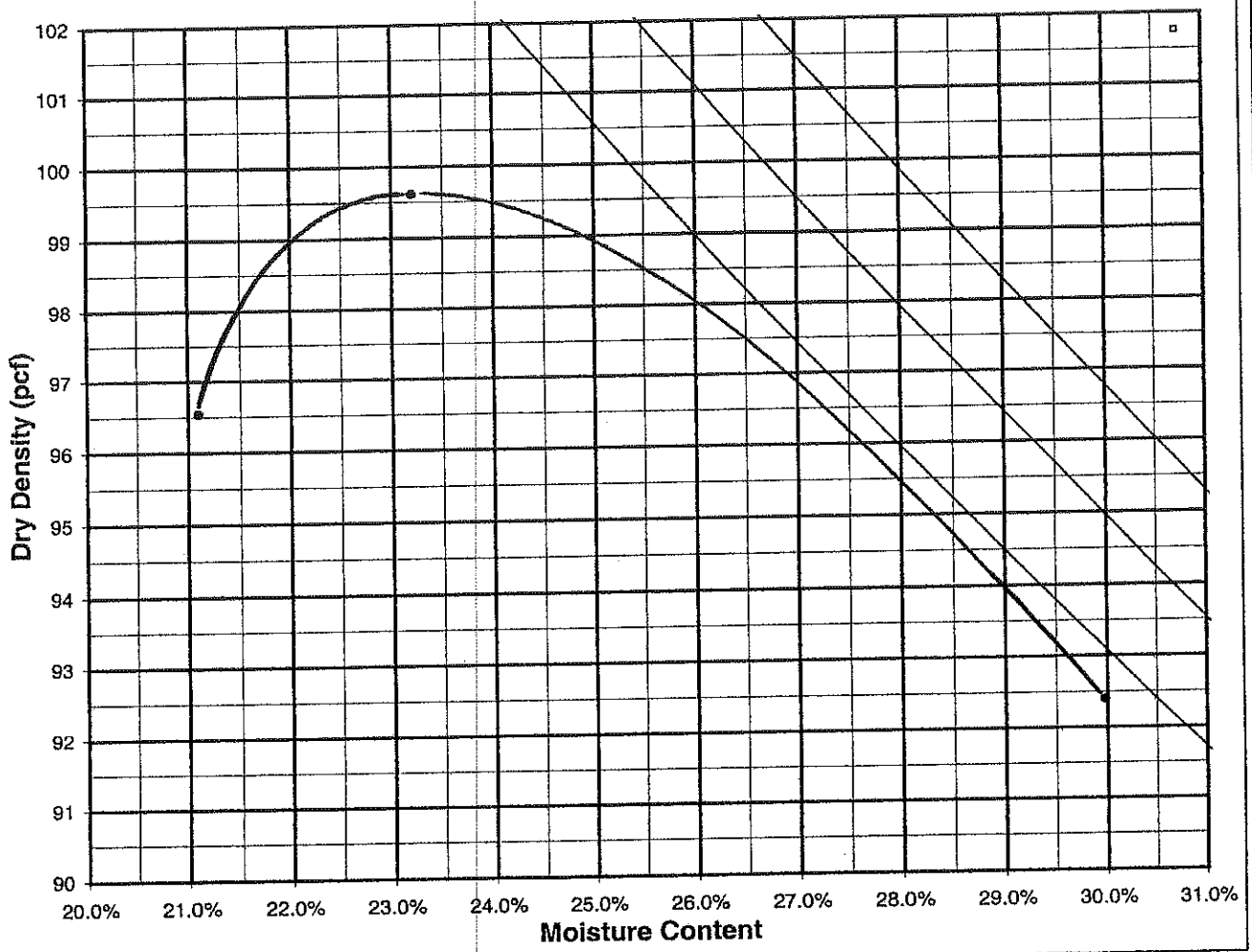
PLATE NO.A-1

A:\Labshts\26301.10-12 Lalamilo TP-6 Compaction Test Data\Points Only

MOISTURE-DENSITY RELATIONSHIP



Sample Source: TP-26

Description: Fine Silt (Volcanic Ash) with Some Clinker Gravel Passing 3/4" Sieve

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	116.9	122.7	120	
Moisture Content	21.10%	23.20%	29.98%	
Dry Density (pcf)	96.54	99.61	92.40	

Maximum Dry Density (pcf): 99.6
Optimum Moisture Content (%) : 23.2
Test Method: ASTM D-1557

Atterberg Limits

LL	PL	PI

COMPACTION TEST RESULTS

ASTM D-1557

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision

Lalamilo, Waimea, Big Island of Hawaii

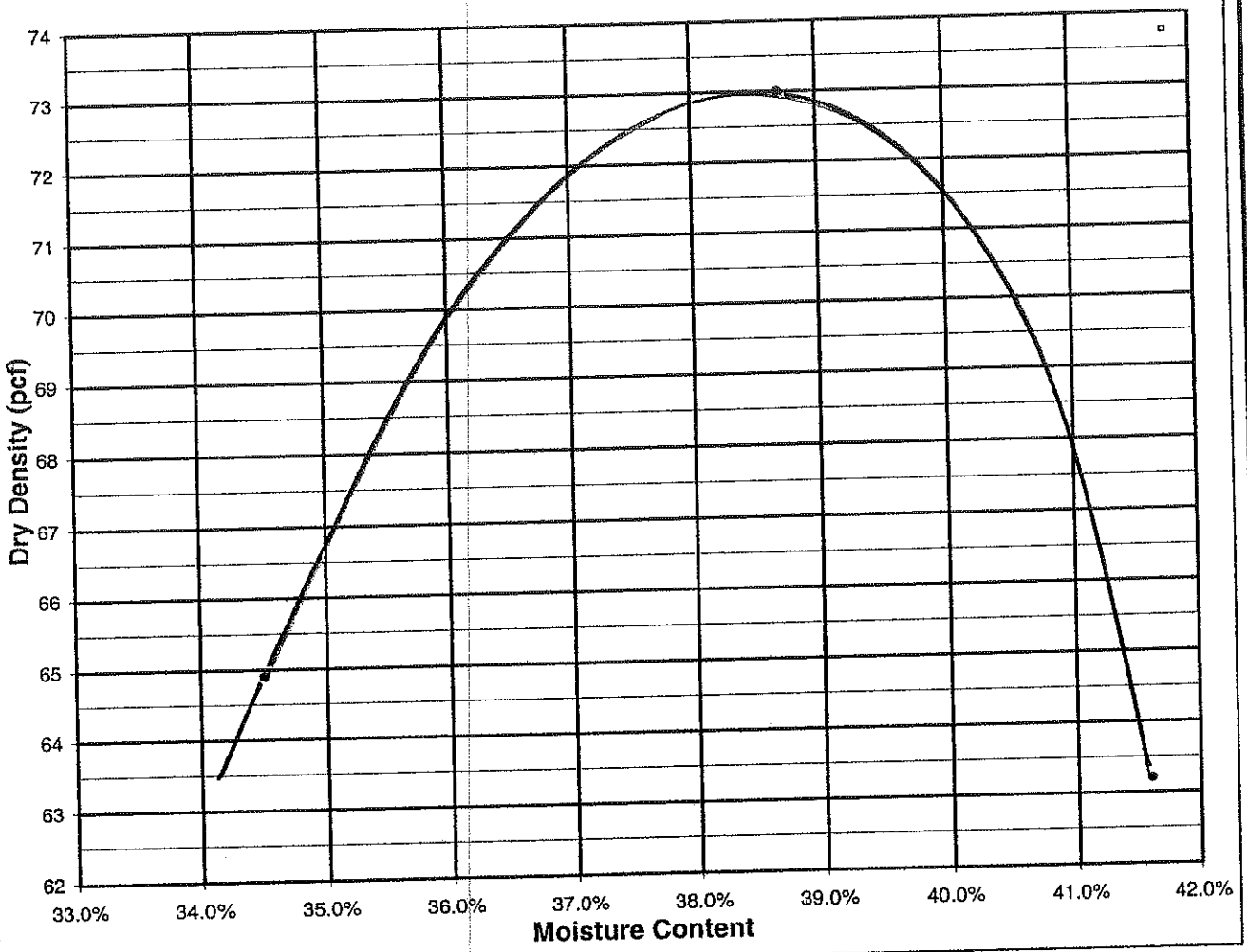
Date: July 2006

PROJECT NO. 26301.10

PLATE NO.A-2

A:\Labshts\26301.10-12 Lalamilo TP-26 Compaction Test Data\Points Only

MOISTURE-DENSITY RELATIONSHIP



Sample Source: TP-6

Description: Fine Sandy Silt with Clinker Gravel Passing 3/4" Sieve

	Test Point 1	Test Point 2	Test Point 3	Test Point 4
Wet Density (pcf)	87.29	100.74	89.49	
Moisture Content	34.50%	38.70%	41.60%	
Dry Density (pcf)	64.90	73.00	63.20	

Maximum Dry Density (pcf): 73.0
Optimum Moisture Content (%) : 38.7
Test Method: ASTM D-1557

Atterberg Limits

LL	PL	PI

COMPACTION TEST RESULTS

ASTM D-1557

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision

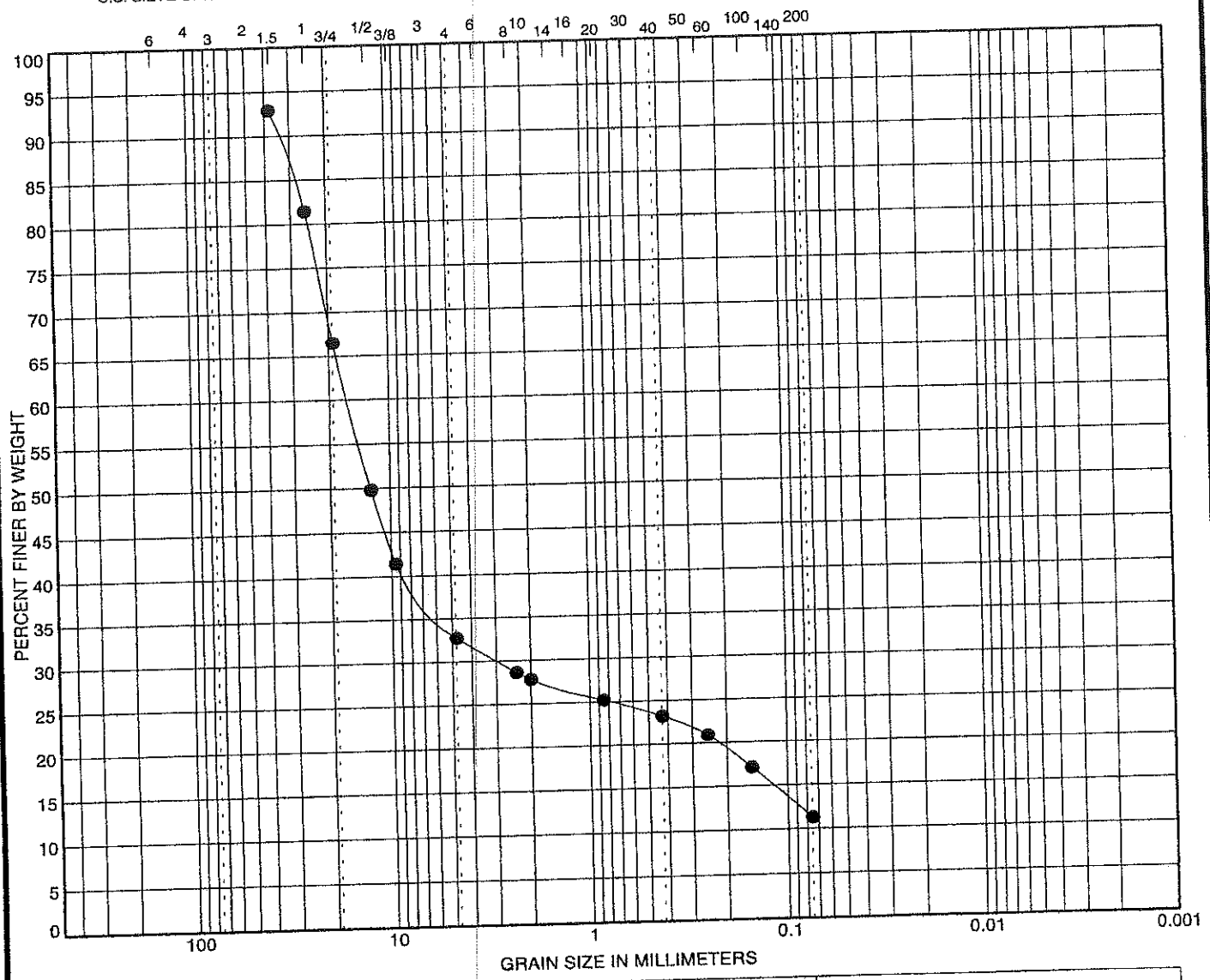
Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006

PROJECT NO. 26301.10

PLATE NO.A-3

A:\Labshts\26301.10-12 Lalamilo TP-51 Compaction Test Data\Points Only



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● TP-6 Depth 1.0 ft.	Sandy GRAVEL with Silt (GW)				8.57	250.35

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-6 1.0	38.1	16.15	2.988		60.2	21.4	11.3	

PSC

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

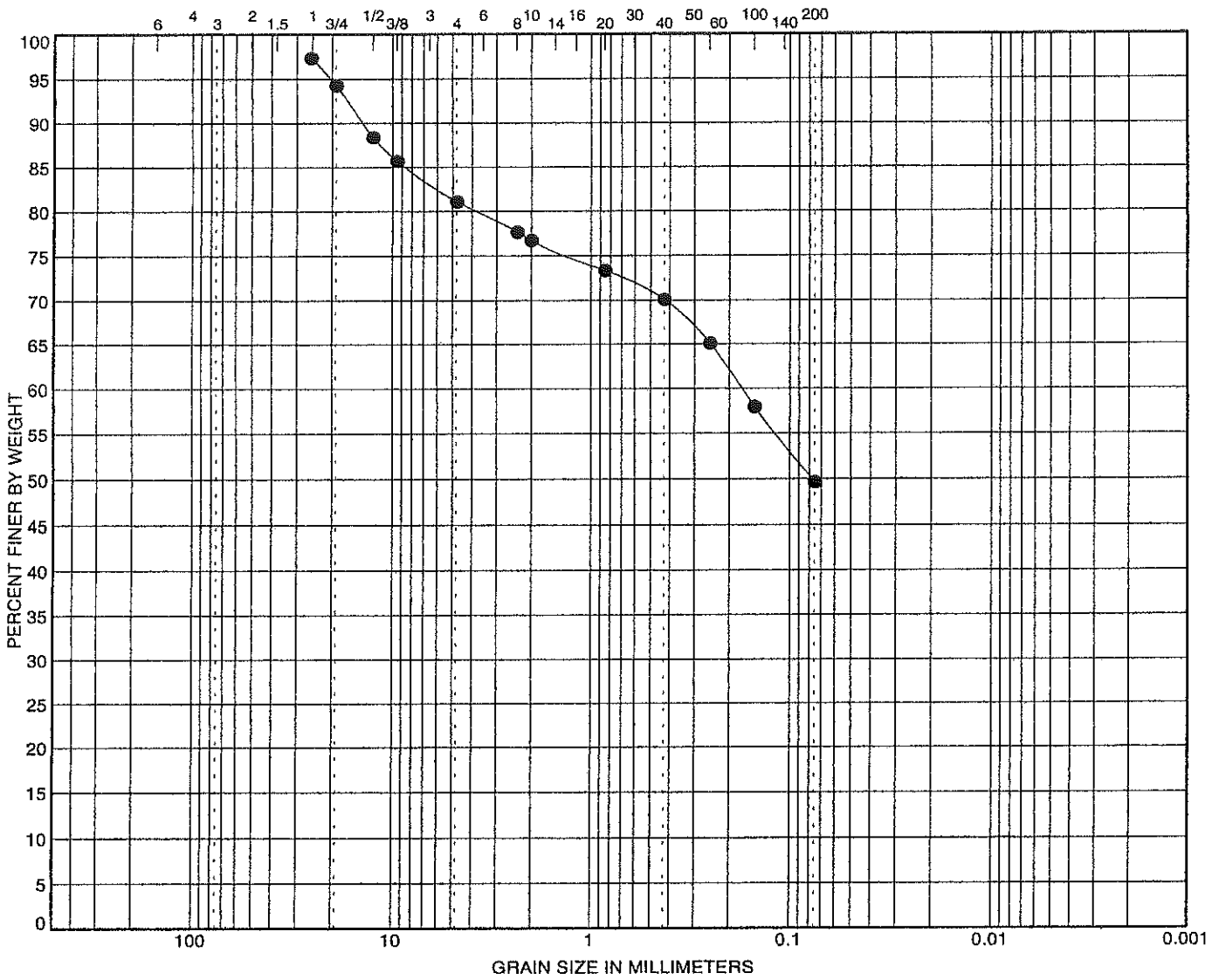
Project: DHHL Proposed Lalamilo RS10 Subdivision

Location: Lalamilo, Walmea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

PLATE NO. A-4

US_GRAIN_SIZE 26301.GPJ BORING.GDT 7/16/06



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**TP-9**	**Depth 2.0 ft.**	**Gravelly, Sandy, SILT (ML)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-9**	**Depth 2.0**	**25.4**	**0.174**			**16.3**	**31.4**	**49.6**	

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

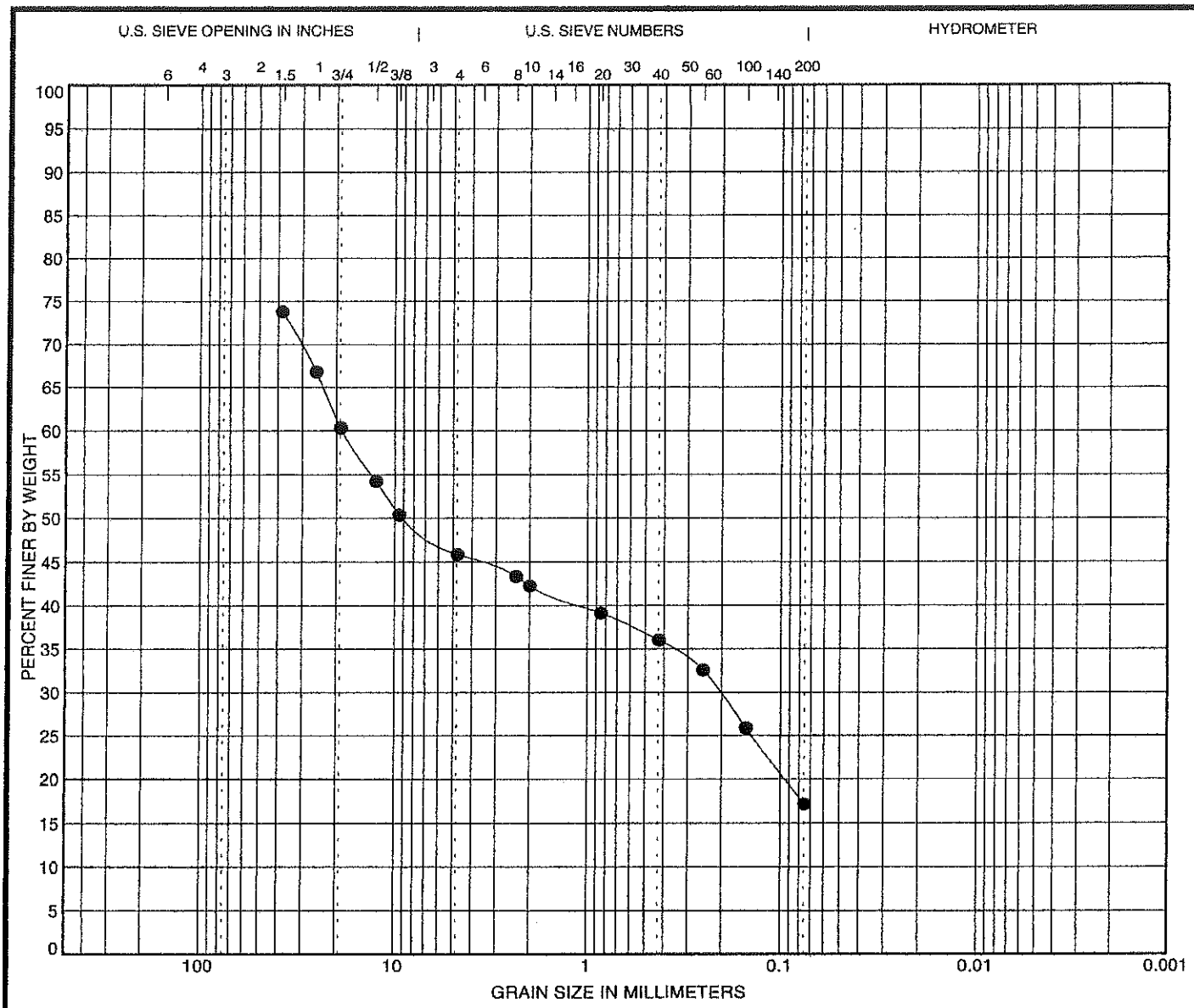
Project: DHHL Proposed Lalamilo RS10 Subdivision

Location: Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

US_GRAIN_SIZE 26301.GPJ BORING.GDT 7/16/06

PLATE NO. A-5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-26 Depth 2.0 ft.**	**Silty, Sandy GRAVEL/Gravelly SAND (GM)**					

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-26 Depth 2.0 ft.**	**38.1**	**18.583**	**0.206**		**28.0**	**28.7**	**17.1**	

PSC

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

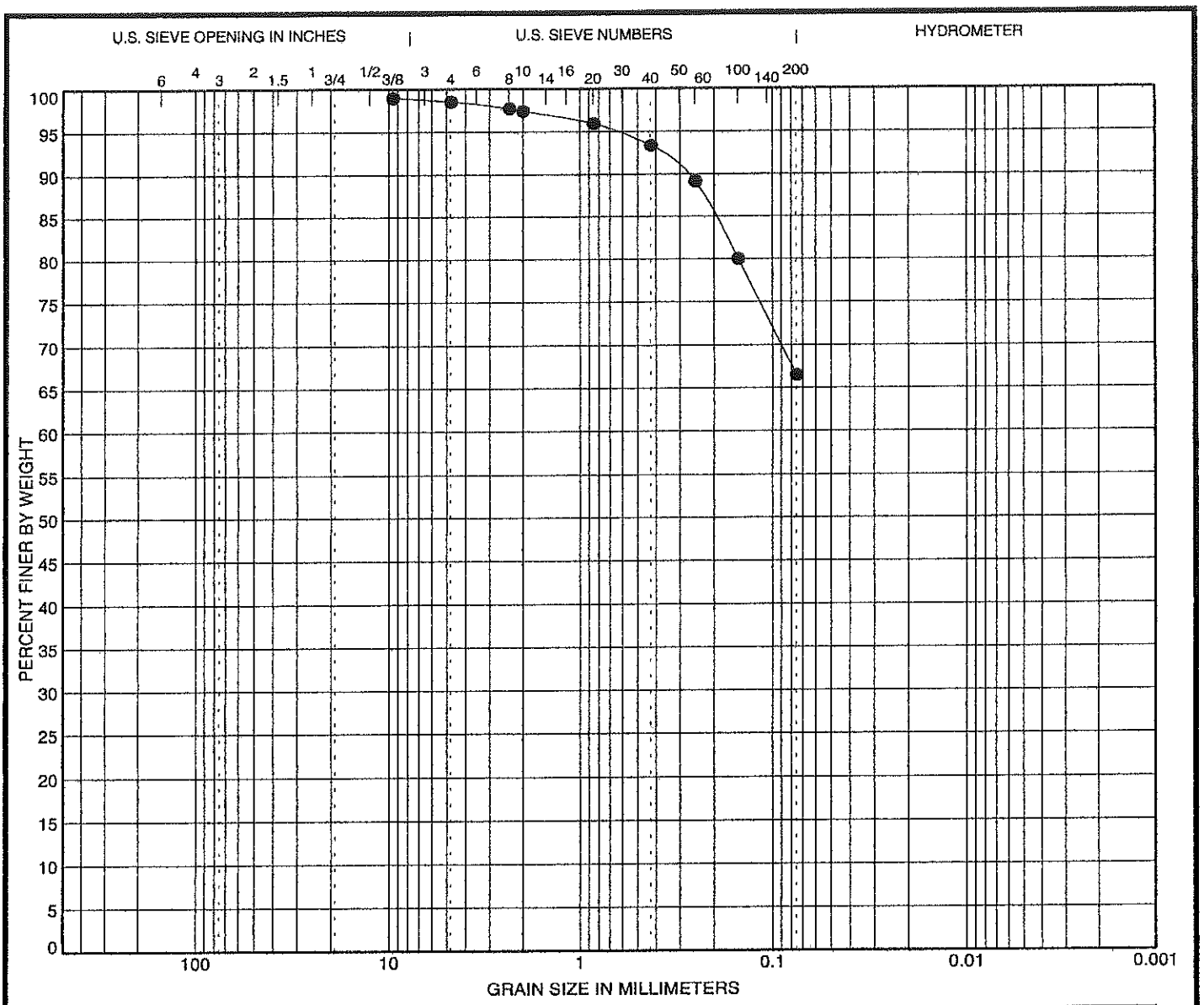
Project: DHHL Proposed Lalamilo RS10 Subdivision

Location: Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

US_GRAIN_SIZE 26301.GPJ BORING.GDT 7/16/06

PLATE NO. A-6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**TP-33 Depth 2.0 ft.**	**Sandy SILT with trace Gravel (ML)**					

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-33 Depth 2.0 ft.**	**9.5**				**0.4**	**32.0**	**66.5**	

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

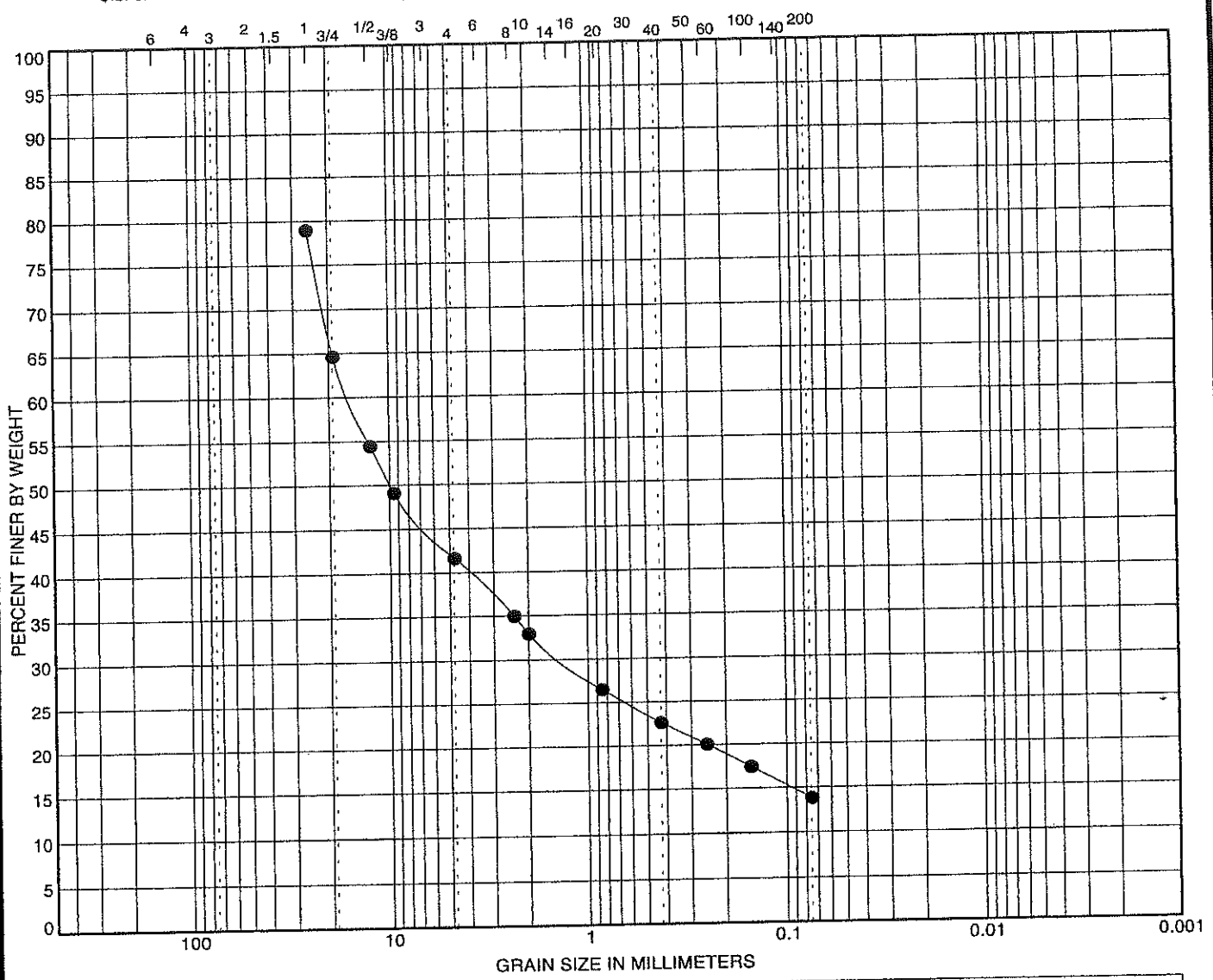
Project: DHHL Proposed Lalamilo RS10 Subdivision

Location: Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

US_GRAIN_SIZE 26301.GPJ BORING.GDT 7/16/06

PLATE NO. A-7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	TP-40 Depth 2.0 ft.	Silty, Sandy, GRAVEL (GM)					

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-40 Depth 2.0 ft.	25.4	15.724	1.355		37.3	27.8	13.8	

PSC

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

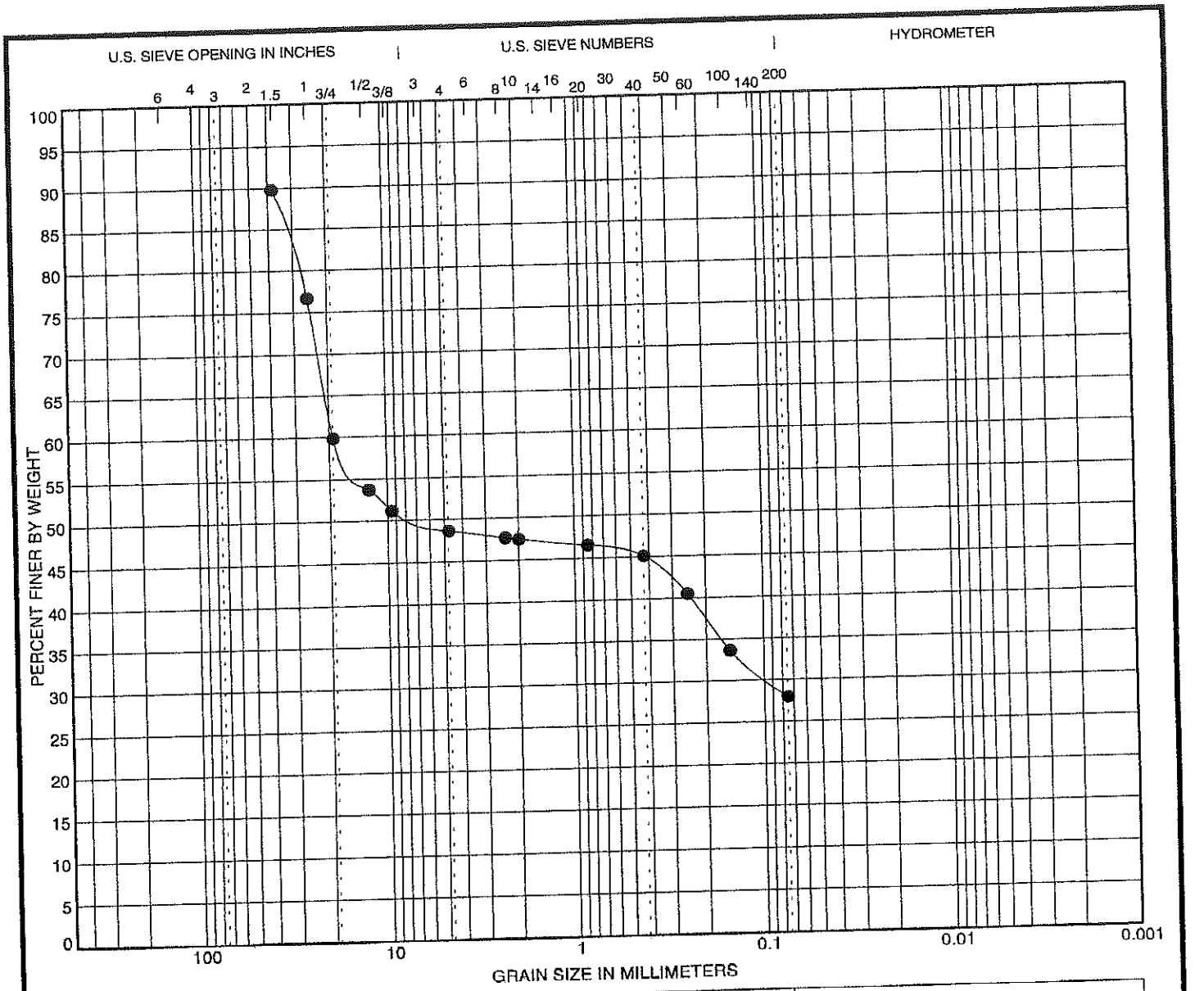
Project: DHHL Proposed Lalamilo RS10 Subdivision

Location: Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

PLATE NO. A-8

US_GRAIN_SIZE 26301.GPJ BORING.GDT 7/16/06



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	TP-51 Depth 1.0 ft.	Sandy, Silty, GRAVEL (GM)					

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-51 Depth 1.0 ft.	38.1	19.061	0.097		41.2	20.7	27.9	

PSC

Geotechnical & Environmental Consultants
Construction Materials Testing Services

GRAIN SIZE DISTRIBUTION

Project: DHHL Proposed Lalamilo RS10 Subdivision

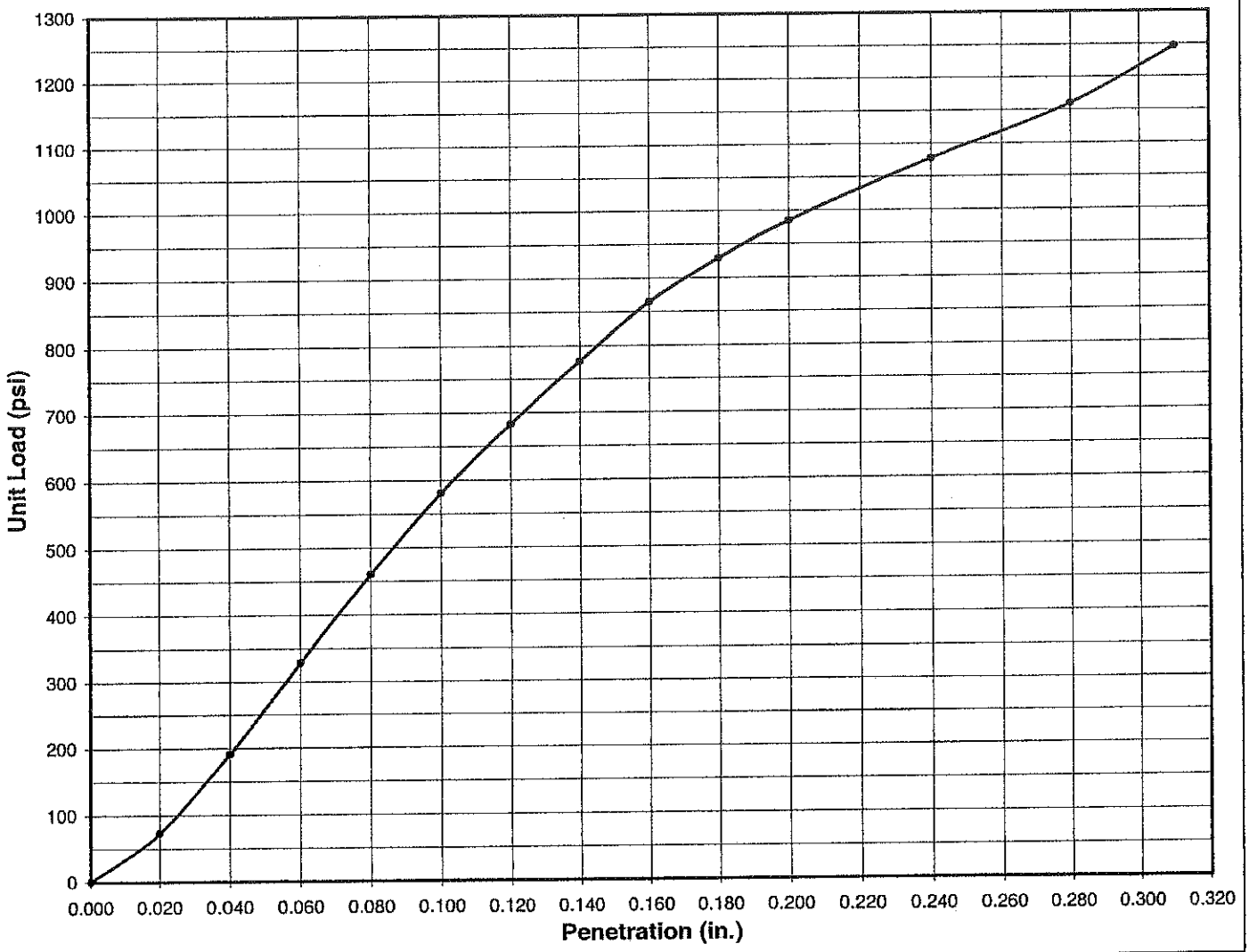
Location: Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No.: 26301.10/12

PLATE NO. A-9

US GRAIN SIZE 26301.GPJ BORING.GDT 7/16/06

CBR CURVE



Sample Source: TP-6 **Depth:** 1.5ft **Description:** Silty, Sandy, Gravel passing 3/4" sieve

	Before Expansion	After Expansion
Relative Compaction (%):	99.77%	99.35%
Moisture Content (%):	26.90%	27.70%
Dry Density (pcf):	92.79	92.40
Percent Swell or Expansion Value (%):	0.39%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" :	58	
CBR Value @ 0.2" :	65	

Atterberg Limits

LL	PL	PI

CALIFORNIA BEARING RATIO

ASTM D-1883-94

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision

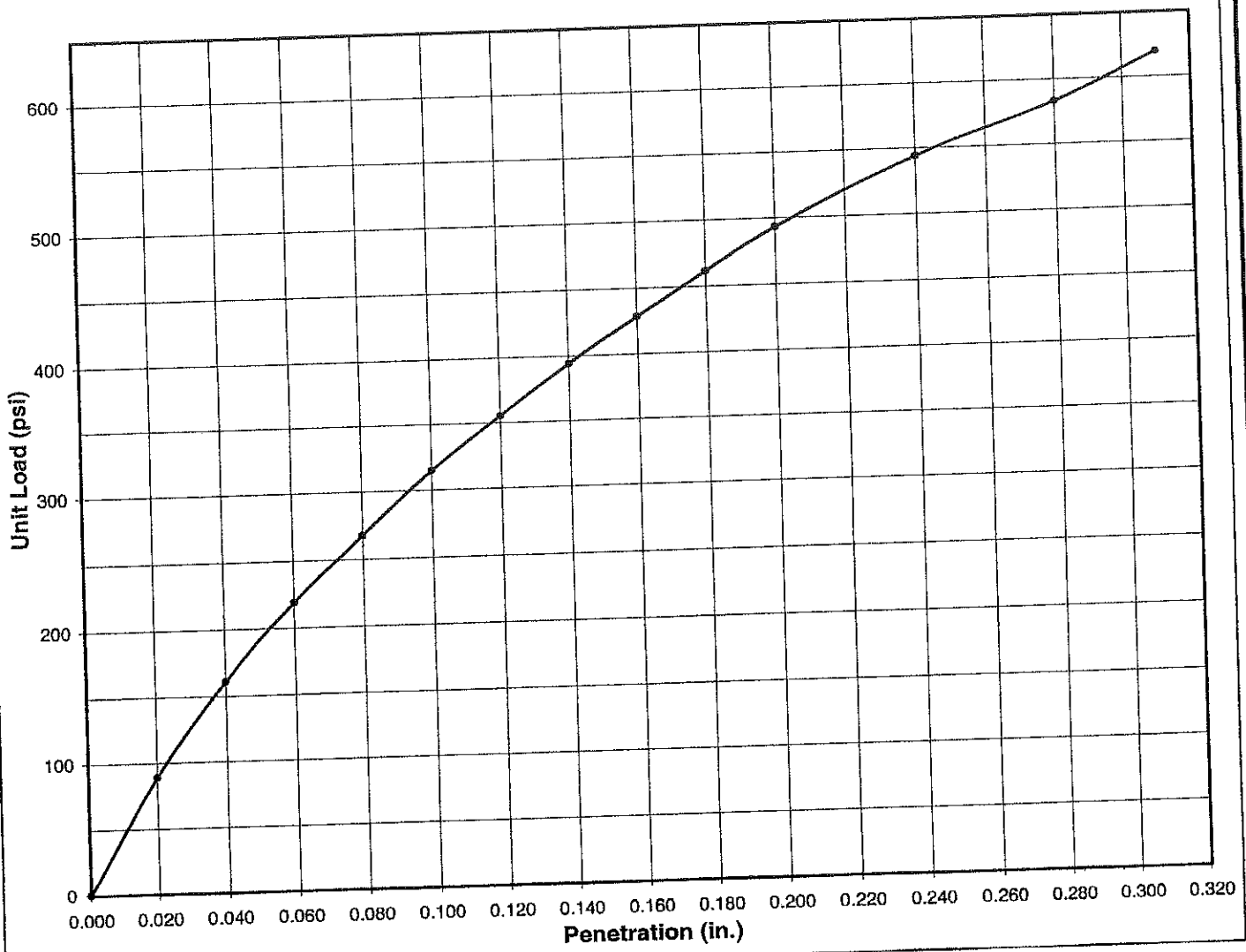
Lalamilo, Waimea, Big Island of Hawaii

Date: July, 2006 | PROJECT NO. 24302.10

PLATE NO. A-10

A:\Labshts\26301.10 CBR-TP-6 Lalamilo\CBR Curve

CBR CURVE



Sample Source: TP-26 **Depth:** 1.5ft **Description:** Silty, Sandy, Gravel passing 3/4" sieve

	Before Expansion	After Expansion
Relative Compaction (%):	84.50%	82.56%
Moisture Content (%):	31.00%	36.00%
Dry Density (pcf):	84.16	82.24
Percent Swell or Expansion Value (%):	0.56%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" :	31.5	
CBR Value @ 0.2" :	32.88	

Atterberg Limits

LL	PL	PI

CALIFORNIA BEARING RATIO

ASTM D-1883-94

PSC Consultants, LLC

SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

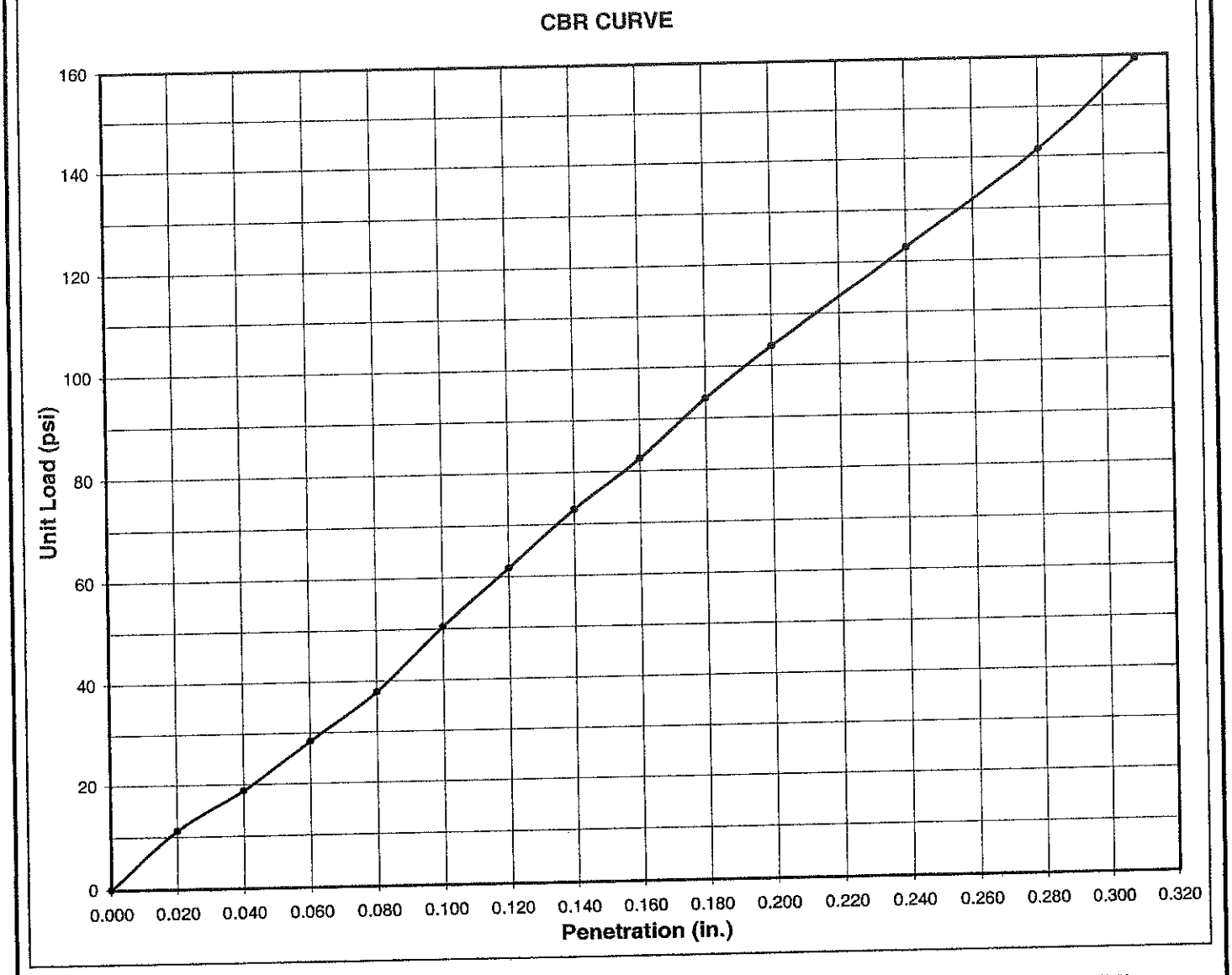
DHHL Proposed Lalamilo RS10 Subdivision

Lalamilo, Waimea, Big Island of Hawaii

Date: July, 2006 | PROJECT NO. 24302.10

PLATE NO. A-11

A:\Labshts\26301.10 CBR-TP-26 Lalamilo\CBR Curve



Sample Source: TP-51 **Depth:** 1.5ft **Description:** Very fine Sandy SILT (volcanic ash) w/ some gravel

	Before Expansion	After Expansion
Relative Compaction (%):	99.54%	97.47%
Moisture Content (%):	38.70%	42.70%
Dry Density (pcf):	72.67	71.15
Percent Swell or Expansion Value (%):	2.32%	
Compaction Test Method:	ASTM D-1557 A	
CBR Value @ 0.1" :	5.04	
CBR Value @ 0.2" :	6.92	

Atterberg Limits

LL	PL	PI

CALIFORNIA BEARING RATIO
ASTM D-1883-94

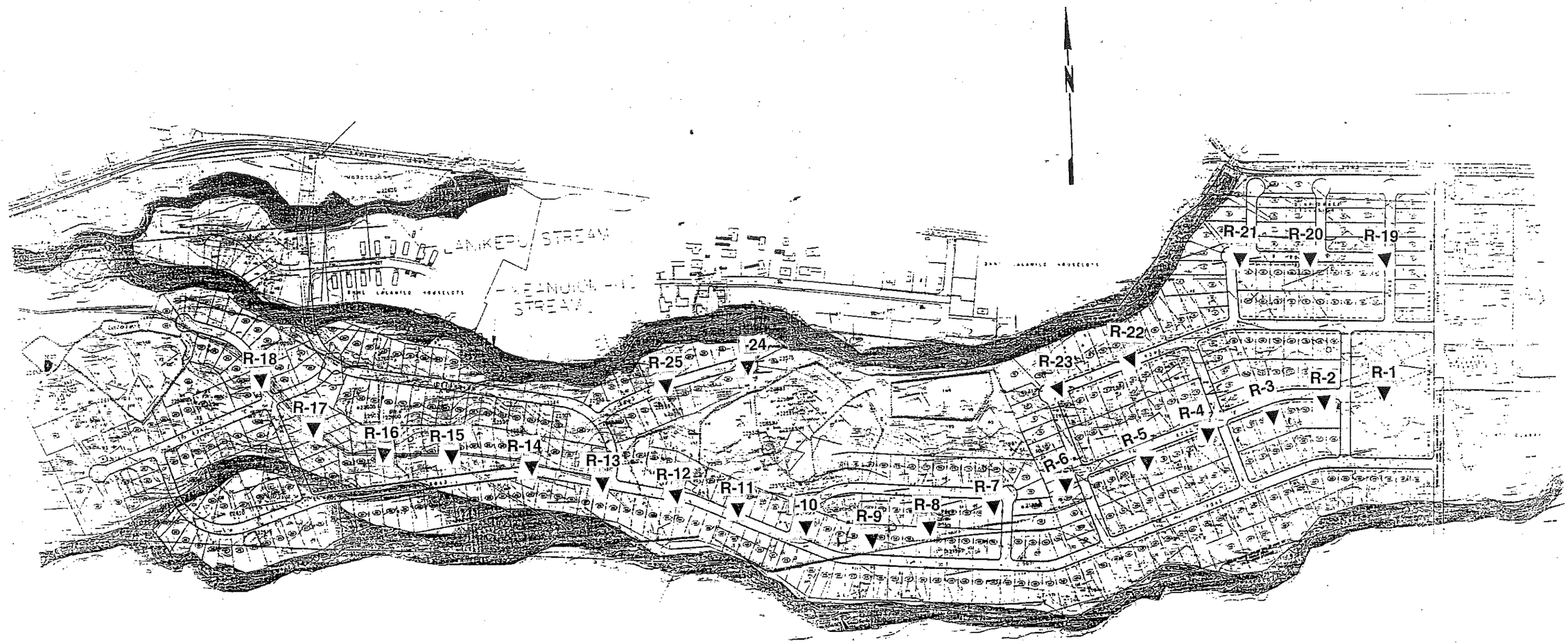
PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

Date: July, 2006 | PROJECT NO. 24302.10

PLATE NO. A-12

A:\Labshts\26301.10 CBR-TP-51 Lalamilo\CBR Curve



Approximate Scale 1 in = 525 ft

LEGEND:

▼ Approximate Resistivity Test Locations

SITE PLAN WITH RESISTIVITY TEST LOCATIONS

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006 | PSC JOB NO. 26301.10

PLATE NO. B

Survey Location: Existing East-West Dirt Road Alignment
Pipe Size: To Be Determined
Test Date: July 9-11, 2006

TEST NO.	LOCATION	PIN SPACING (FT.)	RESISTANCE (OHMS)	RESISTIVITY (OHM-CM)	CORROSION RATING
1	Test Pit TP-4	4	47.000	36002	5
	Existing East-West Dirt Road	8	30.000	45960	5
		12	23.000	52854	5
2	Approximately 300 ft. West	4	34.000	26044	5
	from Test Location No.1	8	18.000	27576	5
		12	16.000	36768	5
3	Approximately 300 ft. West	4	70.000	53620	5
	from Test Location No. 2	8	39.000	59748	5
		12	28.000	64344	5
4	Approximately 300 ft. West	4	39.000	29874	5
	from Test Location No. 3	8	20.000	30640	5
		12	22.000	50556	5
5	Approximately 300 ft. West	4	63.000	48258	5
	from Test Location No. 4	8	36.000	55152	5
		12	32.000	73536	5
6	Approximately 300 ft. West	4	80.000	61280	5
	from Test Location No. 5	8	37.000	56684	5
		12	32.000	73536	5
7	Approximately 300 ft. West	4	28.000	21448	5
	from Test Location No. 6	8	15.000	22980	5
		12	16.000	36768	5
8	Approximately 300 ft.West	4	63.000	48258	5
	from Test Location No. 7	8	37.000	56684	5
		12	32.000	73536	5
9	Approximately 300 ft.West	4	79.000	60514	5
	from Test Location No. 8	8	41.000	62812	5
	Approx 150 ft. East of B-3	12	35.000	80430	5

RESISTIVITY RANGE (OHM-CM)	CORROSION RATING	ANTICIPATED CORROSION ACTIVITY
0 -1,000	1	Extremely Corrosive
1,001 - 3,000	2	Very Corrosive
3,001 - 5,000	3	Corrosive
5,001 - 10,000	4	Moderately Corrosive
OVER 10,000	5	Mildly Corrosive

SUMMARY OF SOIL RESISTIVITY TEST RESULTS
(Wenner 4-Pin Method ASTM G-57)

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

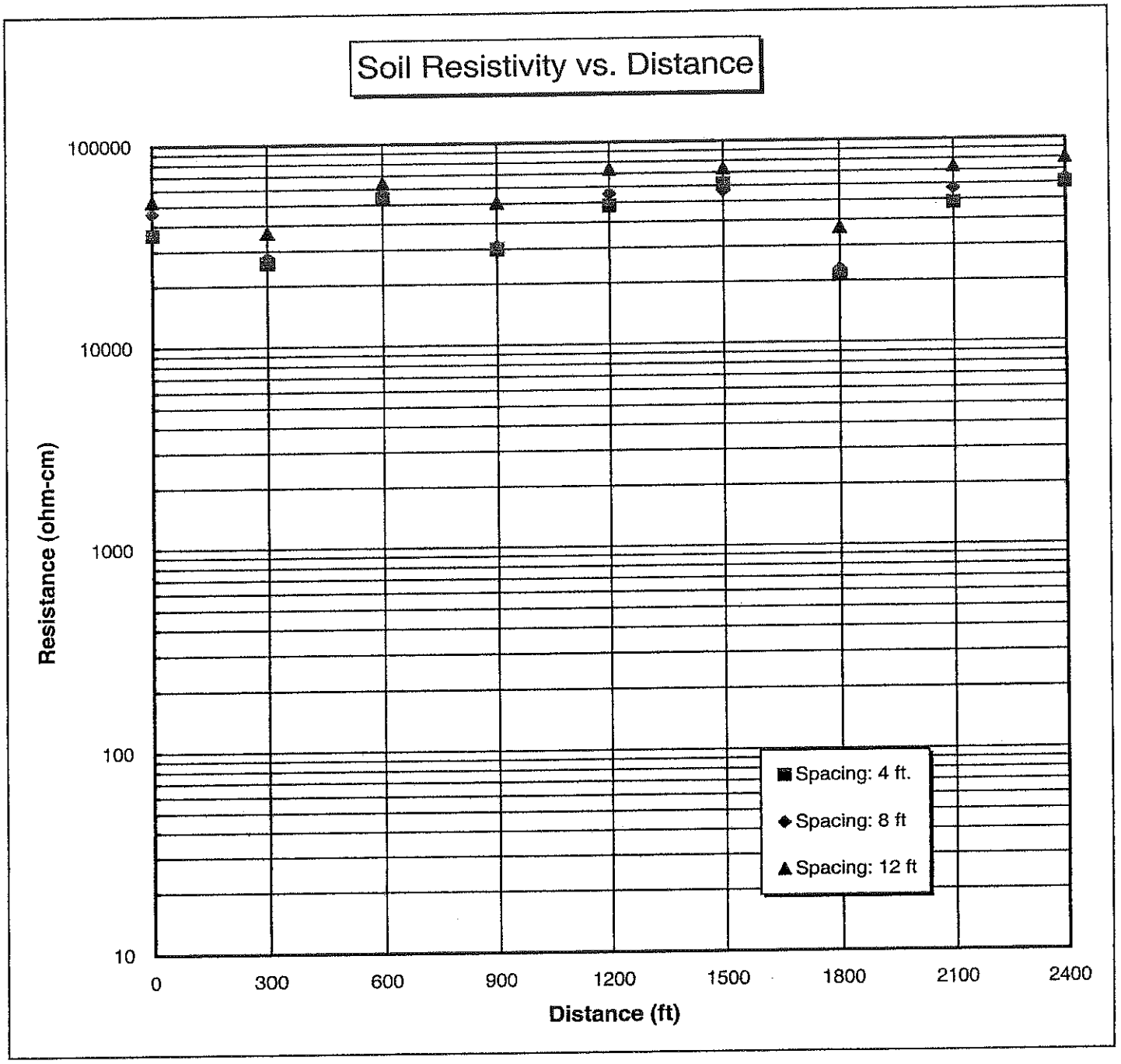
DHHL: Proposed Lalamilo RS10 Subdivision
Resistivity Survey for Soil Corrosion Potential
Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No. 26301.10

PLATE NO. B-1

A:\BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\1-Lalamilo

Survey Location: Existing Dirt Road From Test Pit TP-4 to Approximately 150 ft west of B-3
Pipe Size: To Be Determined
Test Date: July 9-11, 2006



SUMMARY OF SOIL RESISTIVITY TEST RESULTS (Wenner 4-Pin Method ASTM G-57)		
PSC Consultants, LLC SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS	**DHHL: Proposed Lalamilo RS10 Subdivision** **Resistivity Survey for Soil Corrosion Potential** **Lalamilo, Waimea, Big Island of Hawaii**	
	Date: July 2006	Project No. 26301.10

PLATE NO.B-2

A:BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\4-Lalamilo Pl

Survey Location: Along Existing East-West Dirt Road Alignment from +/-150 ft.West from Boring B-3
Pipe Size: To Be Determined
Test Date: July 9-11, 2006

TEST NO.	LOCATION	PIN SPACING (FT.)	RESISTANCE (OHMS)	RESISTIVITY (OHM-CM)	CORROSION RATING
10	Approximately 150 ft. West of Boring B-3	4	57.000	43662	5
		8	28.000	42896	5
		12	21.000	48258	5
11	Approximately 300 ft West from Test Location 10	4	51.000	39066	5
		8	61.000	93452	5
		12	76.000	174648	5
12	Approximately 300 ft West from Test Location 11	4	120.000	91920	5
		8	48.000	73536	5
		12	40.000	91920	5
13	Approximately 300 ft. West from Test Location 12	4	120.000	91920	5
		8	100.000	153200	5
		12	50.000	114900	5
14	Approximately 300 ft. West from Test Location 13	4	38.000	29108	5
		8	30.000	45960	5
		12	26.000	59748	5
15	Approximately 300 ft. West from Test Location 14 (Near Boring B-2)	4	35.000	26810	5
		8	27.000	41364	5
		12	21.000	48258	5
16	Approximately 300 ft. West from Test Location 15 +/-50 ft. East of B-1	4	76.000	58216	5
		8	54.000	82728	5
		12	67.000	153966	5
17	Approximately 300 ft. West from Test Location 16	4	110.000	84260	5
		8	60.000	91920	5
		12	83.000	190734	5
18	Approximately 300 ft. West from Test Location 17	4	54.000	41364	5
		8	53.000	81196	5
		12	48.000	110304	5

RESISTIVITY RANGE (OHM-CM)	CORROSION RATING	ANTICIPATED CORROSION ACTIVITY
0 -1,000	1	Extremely Corrosive
1,001 - 3,000	2	Very Corrosive
3,001 - 5,000	3	Corrosive
5,001 - 10,000	4	Moderately Corrosive
OVER 10,000	5	Mildly Corrosive

SUMMARY OF SOIL RESISTIVITY TEST RESULTS
(Wenner 4-Pin Method ASTM G-57)

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

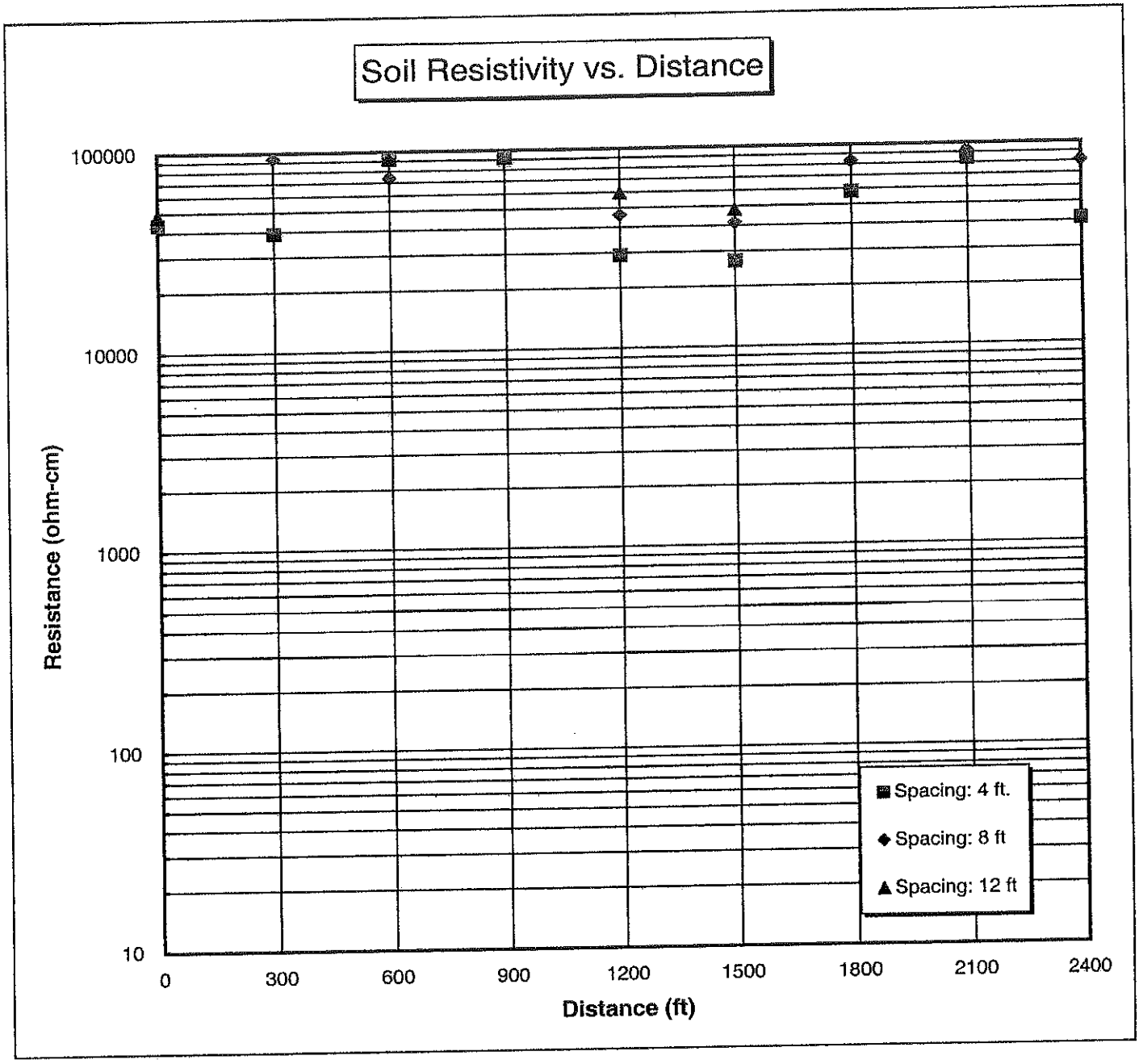
DHHL: Proposed Lalamilo RS10 Subdivision
Resistivity Survey for Soil Corrosion Potential
Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No. 26301.10

PLATE NO. B-3

A:\BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\2-Lalamilo

Survey Location: Along Existing East-West Dirt Road Alignment From Approximately 150 feet Wes
Pipe Size: To Be Determined
Test Date: July 9-11, 2006



SUMMARY OF SOIL RESISTIVITY TEST RESULTS (Wenner 4-Pin Method ASTM G-57)		
PSC Consultants, LLC SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS	**DHHL: Proposed Lalamilo RS10 Subdivision** **Resistivity Survey for Soil Corrosion Potential** **Lalamilo, Waimea, Big Island of Hawaii**	
	Date: July 2006	Project No. 26301.10

PLATE NO. B-4

A:BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\5-Lalamilo 2 Pl

Survey Location: Proposed Road "C", Road "A" and Road "B"
Pipe Size: To Be Determined
Test Date: July 9-11, 2006

TEST NO.	LOCATION	PIN SPACING (FT.)	RESISTANCE (OHMS)	RESISTIVITY (OHM-CM)	CORROSION RATING
19	Test Pit TP-2	4	32.000	24512	5
	(Along Proposed Road "C")	8	17.000	26044	5
		12	15.000	34470	5
20	Approximately 300 ft. West from	4	68.000	52088	5
	Test Location 19 along Rd."C"	8	39.000	59748	5
		12	24.000	55152	5
21	Approximately 300 ft. West from	4	43.000	32938	5
	Test Location 20 along Rd."C"	8	22.000	33704	5
		12	15.000	34470	5
22	Test Pit TP-18	4	75.000	57450	5
	(Along Proposed Road "A")	8	43.000	65876	5
		12	32.000	73536	5
23	Approximately 300 ft. West -	4	58.000	44428	5
	Southwest of Test Location 22	8	30.000	45960	5
	(Along Proposed lower Road "A")	12	26.000	59748	5
24	Test Pit TP-30	4	68.000	52088	5
	(Along Proposed Road "B")	8	57.000	87324	5
		12	50.000	114900	5
25	Approximately 300 ft. West -	4	107.000	81962	5
	Southwest of Test Location 24	8	76.000	116432	5
	(Along Proposed Road "B")	12	77.000	176946	5

RESISTIVITY RANGE (OHM-CM)	CORROSION RATING	ANTICIPATED CORROSION ACTIVITY
0 -1,000	1	Extremely Corrosive
1,001 - 3,000	2	Very Corrosive
3,001 - 5,000	3	Corrosive
5,001 - 10,000	4	Moderately Corrosive
OVER 10,000	5	Mildly Corrosive

SUMMARY OF SOIL RESISTIVITY TEST RESULTS
(Wenner 4-Pin Method ASTM G-57)

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

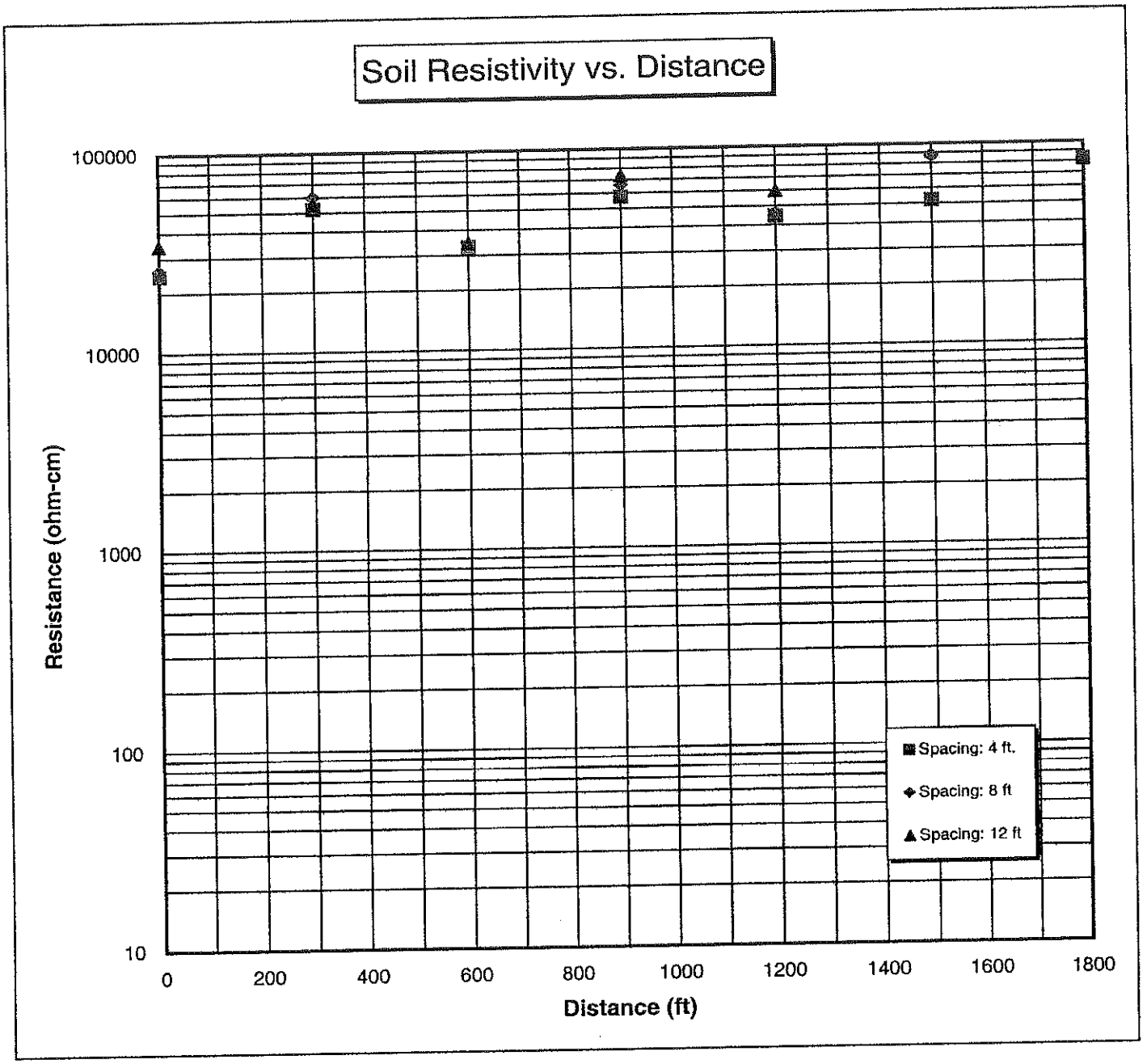
DHHL: Proposed Lalamilo RS10 Subdivision
Resistivity Survey for Soil Corrosion Potential
Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | Project No. 26301.10

PLATE NO. 5

A:\BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\3-Lalamilo

Survey Location: Proposed Road "C", Road "A" and Road "B"
Pipe Size: To Be Determined
Test Date: July 9-11, 2006



Note: This Plot Combines the Resistivity Test Data from Proposed Roads A, B, and C

SUMMARY OF SOIL RESISTIVITY TEST RESULTS (Wenner 4-Pin Method ASTM G-57)		
PSC Consultants, LLC SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS	**DHHL: Proposed Lalamilo RS10 Subdivision** **Resistivity Survey for Soil Corrosion Potential** **Lalamilo, Waimea, Big Island of Hawaii**	
	Date: July 2006	Project No. 26301.10

PLATE NO. B-6

A:\BWS13\26301.10 DHHL Lalamilo RS10 Subdivision Resistivity Survey\6-Lalamilo Pl

Project Location: DHHL Lalamilo RS10 Subdivision, LalamiloWaimea, Big Island of Hawaii
Pipe Size:
Test Date: Jun-06

SAMPLE SOURCE	SAMPLE DEPTH (FT)	LOCATION	pH	CHLORIDES ppm	SULFATES ppm	RATING 1 YES / NO
TP-6	2	See Resistivity Test Location Plan	6.86	20.0	20.0	NO
TP-26	2	See Resistivity Test Location Plan	7.08	21.0	20.0	NO
TP-51	1.5	See Resistivity Test Location Plan	7.09	26.0	18.0	NO

Corrosion Rating 1 Equals:

pH: < 5.0
Chlorides:=300 ppm or greater
Sulfates: > 2000 ppm (soil)
> 1,500 ppm (water)
ND = Not Detected

SUMMARY OF CHEMICAL TEST RESULTS
(Corrosion Potential)

PSC Consultants, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL Proposed Lalamilo RS10 Subdivision
Soil Corrossivity Potential Survey
Lalamilo, Waimea, Big Island of Hawaii

Date: July 2006 | PROJECT NO. 26301.10

PLATE NO. B-7

A:\BWS13\26301.10 Lalamilo Chemical Test Summary\Lab Tests

Oceanic Analytical Laboratory, Inc.

Date: *Jun 27, 2006*

Result Summary

Client:	PSC Consultants, LLC	**Client Sample ID:**	TP 6
Work Order:	0606080	**Tag Number:**	
Project:	Lalamilo, 26301	**Collection Date:**	06/12/2006 0:00
Lab ID:	0606080-02A	**Matrix:**	SOIL

Analyses	Result	Reporting Limit	Units	Dilution Factor	Date Prepared	Date Analyze	Batch ID	Qual Notes
						SW9045B		
CORROSIVITY BY PH								
pH	***6.86***	1.00	pH Units	1	6/20/06	6/20/2006 4:46:00 PM	R33115	

Qualifiers

ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

B - Analyte detected in the associated Method Blank

* - Value exceeds Maximum Contaminant Level

S - Spike Recovery outside accepted recovery limits

R - RPD outside accepted recovery limits

E - Value above quantitation range

PLATE NO. B-8

Oceanic Analytical Laboratory, Inc.

Date: *Jun 27, 2006*

Result Summary

Client:	PSC Consultants, LLC	**Client Sample ID:**	TP 26
Work Order:	0606080	**Tag Number:**	
Project:	Lalamilo, 26301	**Collection Date:**	06/12/2006 0:00
Lab ID:	0606080-03A	**Matrix:**	SOIL

Analyses	Result	Reporting Limit	Units	Dilution Factor	Date Prepared	Date Analyze	Batch ID	Qual Notes
CORROSIVITY BY PH						SW9045B		
pH	*7.08*	1.00	pH Units	1	6/20/06	6/20/2006 4:47:00 PM	R33115	

Qualifiers

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

PLATE NO. B-9

Oceanic Analytical Laboratory, Inc.

Date: *Jun 27, 2006*

Result Summary

Client:	PSC Consultants, LLC	**Client Sample ID:**	TP 51
Work Order:	0606080	**Tag Number:**	
Project:	Lalamilo, 26301	**Collection Date:**	06/12/2006 0:00
Lab ID:	0606080-01A	**Matrix:**	SOIL

Analyses	Result	Reporting Limit	Units	Dilution Factor	Date Prepared	Date Analyze	Batch ID	Qual Notes
CORROSIVITY BY PH					SW9045B			
pH	*7.09*	1.00	pH Units	1	6/20/06	6/20/2006 4:45:00 PM	R33115	

Qualifiers

ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

PLATE NO. B-10

17461 Derian Ave., Suite 100, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3297
1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Del Mar Analytical

LABORATORY REPORT

Prepared For: Oceanic Analytical Laboratory
99-193 Aiea Heights Dr. #121
Aiea, HI 96701
Attention: Aidan Scott

Project: 0606080

Sampled: 06/12/06
Received: 06/15/06
Issued: 06/23/06 14:26

NELAP #01108CA

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. The Chain of Custody, 1 page, is included and is an integral part of this report.
This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

LABORATORY ID	CLIENT ID	MATRIX
IPF1726-01	0606080-01	Soil
IPF1726-02	0606080-02	Soil
IPF1726-03	0606080-03	Soil

Reviewed By:

Del Mar Analytical - Irvine
Nima Ebrahim
Project Manager

PLATE NO. B-11

Del Mar Analytical

17461 Derian Ave., Suite 100, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3297
1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Oceanic Analytical Laboratory
99-193 Aiea Heights Dr. #121
Aiea, HI 96701
Attention: Aidan Scott

Project ID: 0606080

Report Number: IPF1726

Sampled: 06/12/06
Received: 06/15/06

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IPF1726-01 (0606080-01 - Soil)								
Reporting Units: mg/kg								
Chloride	EPA 300.0	6F20069	5.0	26	0.998	6/20/2006	6/20/2006	
Sulfate	EPA 300.0	6F20069	5.0	18	0.998	6/20/2006	6/20/2006	
Sample ID: IPF1726-02 (0606080-02 - Soil)								
Reporting Units: mg/kg								
Chloride	EPA 300.0	6F20069	5.0	20	0.998	6/20/2006	6/20/2006	
Sulfate	EPA 300.0	6F20069	5.0	20	0.998	6/20/2006	6/20/2006	
Sample ID: IPF1726-03 (0606080-03 - Soil)								
Reporting Units: mg/kg								
Chloride	EPA 300.0	6F20069	5.0	21	0.995	6/20/2006	6/20/2006	
Sulfate	EPA 300.0	6F20069	5.0	20	0.995	6/20/2006	6/20/2006	

Del Mar Analytical - Irvine
Nima Ebrahim
Project Manager

The results pertain only to the samples tested in the laboratory. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical.

Location:	Boring B-2
Date:	July 8, 2006
Depth of Hole:	35 feet
Diameter of Hole:	4 inches (with 2 in casing perforated @ 30-35')
Approximate Ground Surface Elev.:	TBD
Calculated Coefficient of Permeability	Indeterminate
Injection Rate (Gallons per minute)	40*

**Note: 40 gpm is the observed maximum discharge rate of water (from a 300 gal Tank) introduced into the boring through a 2 inch –diameter perforated casing inside the borehole. At this considerable rate of flow, no water is retained in the well.*

PERCOLATION TEST RESULTS

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006 | PSC JOB NO. 26301.12

PLATE NO. C-1

Location:	Boring B-3
Date:	July 8, 2006
Depth of Hole:	35 feet
Diameter of Hole:	4 inches (with 2 in casing perforated @ 30-35')
Approximate Ground Surface Elev.:	TBD
Calculated Coefficient of Permeability	Indeterminate
Injection Rate (Gallons per minute)	40*

**Note: 40 gpm is the observed maximum discharge rate of water (from a 300 gal Tank) introduced into the boring through a 2 inch –diameter perforated casing inside the borehole. At this considerable rate of flow, no water is retained in the well.*

PERCOLATION TEST RESULTS

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006 | PSC JOB NO. 26301.12

PLATE NO. C-2

Location:	Boring B-6
Date:	July 7, 2006
Depth of Hole:	32 feet
Diameter of Hole:	4 inches (with 2 in casing perforated @ 27-32')
Approximate Ground Surface Elev.:	TBD
Calculated Coefficient of Permeability	Indeterminate
Injection Rate (Gallons per minute)	40*

**Note: 40 gpm is the observed maximum discharge rate of water (from a 300 gal Tank) introduced into the boring through a 2 inch –diameter perforated casing inside the borehole. At this considerable rate of flow, no water is retained in the well.*

PERCOLATION TEST RESULTS

PSC CONSULTANTS, LLC
SOILS, FOUNDATION, AND GEOLOGICAL ENGINEERS

DHHL: Proposed Lalamilo RS10 Subdivision
Lalamilo, Waimea, Big Island of Hawaii

DATE: July 2006 | PSC JOB NO. 26301.12

PLATE NO. C-3

SITE EVALUATION/PERCOLATION TEST

DATE/TIME: June 6, 2006

TEST PERFORMED BY: Melchor Nolasco

OWNER: Department of Hawaiian Homelands

TAX MAP KEY: Boring No. B-1

ELEVATION: TBD FT.

DEPTH TO GROUNDWATER TABLE: N/A FT. BELOW GRADE
DEPTH TO BEDROCK (IF OBSERVED): 6.5 FT. BELOW GRADE
DIAMETER OF HOLE: 4 IN.
DEPTH TO HOLE BOTTOM: 10 FT. BELOW GRADE

DEPTH BELOW GRADE	SOIL PROFILE (COLOR, TEXTURE, OTHER)
0-6.5 ft.	Light brown, very fine sandy SILT (ML) with cobbles
6.5 – 10 ft.	Basalt/Lava Rock Formation

PERCOLATION READINGS

TIME 12 IN OF WATER TO SEEP AWAY: 5 MIN (FIRST TRIAL READING)
TIME 12 IN OF WATER TO SEEP AWAY: 13 MIN (SECOND TRIAL READING)

FOR PEROLATION TESTS IN NON-SANDY SOILS, PRESOAK THE TEST HOLE FOR AT LEAST 4 HOURS. RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 10 MINUTES FOR 1 HOUR; OR IF THE TIME FOR THE FIRST 6 INCHES TO SEEP AWAY IS GREATER THAN 30 MINUTES, RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 30 MINUTES FOR 4 HOURS OR UNTIL 2 SUCCESSIVE DROPS DO NOT VARY BY MORE THAN 1/16 INCH.

TIME INTERVAL	DROP IN INCHES	TIME INTERVAL	DROP IN INCHES
10	9		
10	1.5		
10	1.5		
10	1.5		
10	1		
10	1		
10	1		

PERCOLATION RATE (TIME/FINAL WATER LEVEL DROP): 10 MIN/IN.

AS THE ENGINEER RESPONSIBLE FOR GATHERING AND PROVIDING SITE INFORMATION AND PERCOLATION TEST RESULTS, I ATTEST TO THE FACT THAT THE ABOVE SITE INFORMATION IS ACCURATE AND THAT THE SITE EVALUATION WAS CONDUCTED IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 11-62, "WASTEWATER SYSTEMS" AND THE RESULTS WERE ACCEPTABLE.

ENGINEER'S SIGNATURE/STAMP

PLATE NO. C-4

SITE EVALUATION/PERCOLATION TEST

DATE/TIME: June 5, 2006

TEST PERFORMED BY: Melchor Nolasco

OWNER: Department of Hawaiian Homelands

TAX MAP KEY: Boring No. B-4

ELEVATION: TBD FT.

DEPTH TO GROUNDWATER TABLE: N/A FT. BELOW GRADE
DEPTH TO BEDROCK (IF OBSERVED): 3.0 FT. BELOW GRADE
DIAMETER OF HOLE: 4 IN.
DEPTH TO HOLE BOTTOM: 15 FT. BELOW GRADE

DEPTH BELOW GRADE	SOIL PROFILE (COLOR, TEXTURE, OTHER)
0-3.0 ft.	Light brown, very fine sandy SILT (ML) with gravel
3.0 – 15 ft.	Basalt/Lava Rock Formation

PERCOLATION READINGS

TIME 12 IN OF WATER TO SEEP AWAY: 7 MIN (FIRST TRIAL READING)
TIME 12 IN OF WATER TO SEEP AWAY: 7 MIN (SECOND TRIAL READING)

FOR PEROLATION TESTS IN NON-SANDY SOILS, PRESOAK THE TEST HOLE FOR AT LEAST 4 HOURS. RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 10 MINUTES FOR 1 HOUR; OR IF THE TIME FOR THE FIRST 6 INCHES TO SEEP AWAY IS GREATER THAN 30 MINUTES, RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 30 MINUTES FOR 4 HOURS OR UNTIL 2 SUCCESSIVE DROPS DO NOT VARY BY MORE THAN 1/16 INCH.

TIME INTERVAL	DROP IN INCHES	TIME INTERVAL	DROP IN INCHES
10	15		
10	12		
10	12		
10	11		
10	8		
10	6		
10	6		
10	6		

PERCOLATION RATE (TIME/FINAL WATER LEVEL DROP): 1.66 MIN/IN.

AS THE ENGINEER RESPONSIBLE FOR GATHERING AND PROVIDING SITE INFORMATION AND PERCOLATION TEST RESULTS, I ATTEST TO THE FACT THAT THE ABOVE SITE INFORMATION IS ACCURATE AND THAT THE SITE EVALUATION WAS CONDUCTED IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 11-62, "WASTEWATER SYSTEMS" AND THE RESULTS WERE ACCEPTABLE.

ENGINEER'S SIGNATURE/STAMP

PLATE NO. C-5

SITE EVALUATION/PERCOLATION TEST

DATE/TIME: June 5, 2006

TEST PERFORMED BY: Melchor Nolasco

OWNER: Department of Hawaiian Homelands

TAX MAP KEY: Boring No. B-5

ELEVATION: TBD FT.

DEPTH TO GROUNDWATER TABLE: N/A FT. BELOW GRADE
DEPTH TO BEDROCK (IF OBSERVED): 3.0 FT. BELOW GRADE
DIAMETER OF HOLE: 4 IN.
DEPTH TO HOLE BOTTOM: 10 FT. BELOW GRADE

DEPTH BELOW GRADE	SOIL PROFILE (COLOR, TEXTURE, OTHER)
0-3.0 ft.	Light brown, very fine sandy SILT (ML) with gravel
3.0 – 10 ft.	Basalt/Lava Rock Formation

PERCOLATION READINGS

TIME 12 IN OF WATER TO SEEP AWAY: 18 MIN (FIRST TRIAL READING)
TIME 12 IN OF WATER TO SEEP AWAY: 18 MIN (SECOND TRIAL READING)

FOR PEROLATION TESTS IN NON-SANDY SOILS, PRESOAK THE TEST HOLE FOR AT LEAST 4 HOURS. RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 10 MINUTES FOR 1 HOUR; OR IF THE TIME FOR THE FIRST 6 INCHES TO SEEP AWAY IS GREATER THAN 30 MINUTES, RECORD TIME INTERVALS AND WATER DROPS AT LEAST EVERY 30 MINUTES FOR 4 HOURS OR UNTIL 2 SUCCESSIVE DROPS DO NOT VARY BY MORE THAN 1/16 INCH.

TIME INTERVAL	DROP IN INCHES	TIME INTERVAL	DROP IN INCHES
10	7		
10	7		
10	6		
10	2.5		
10	2		
10	2		
10	2		
10	2		

PERCOLATION RATE (TIME/FINAL WATER LEVEL DROP): 5 MIN/IN.

AS THE ENGINEER RESPONSIBLE FOR GATHERING AND PROVIDING SITE INFORMATION AND PERCOLATION TEST RESULTS, I ATTEST TO THE FACT THAT THE ABOVE SITE INFORMATION IS ACCURATE AND THAT THE SITE EVALUATION WAS CONDUCTED IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 11-62, "WASTEWATER SYSTEMS" AND THE RESULTS WERE ACCEPTABLE.

ENGINEER'S SIGNATURE/STAMP

PLATE NO. C-6