SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

2.1 GENERAL SITE GEOLOGY

The Island of Maui was built by two major volcanoes, the older West Maui and the more recent East Maui, also known as Haleakala. The Isthmus of Maui is a narrow, gently sloping plain located between these two volcanoes. The project site is located at the northern portion of this gently sloping plain. Based on the geologic maps of the Island of Maui (Stearns, 1939 and Sherrod and others, 2007), the general area of the project site is underlain by Lava Flows (Qkul) of the Kula Volcanic Series.

The Isthmus of Maui was created by lava flows from Haleakala ponding on West Maui. It is comprised of alluvium washed from the slopes of West Maui and Haleakala. The erosional processes were dominated by the detachment of soil and rock masses from the mountain walls, and the soil materials were transported downslope toward the Isthmus primarily by gravity as colluvium. Colluvial accumulations often consist of material that is generally deposited by gravity fall, rain wash and mudflow. Once these materials reached the stream in the central portion of a valley, alluvial processes became dominant, and the sediments were transported and deposited as alluvium.

Underlying the alluvial soil deposits are overlapping lava flows from the West Maui and Haleakala Volcanoes. The bulk of the Haleakala Shield was built during the late Pliocene and early Pleistocene Epoch by thinly bedded basaltic lava flows of the Honomanu Volcanic Series. During the Pleistocene Epoch, the characteristics of the lava changed to very hard, thickly bedded flows of andesitic composition. These lava flows have been grouped as the Kula Volcanic Series. Typically, the basalt rock formation consists of thinly to thickly bedded a’a and pahoehoe type lava flows.

The surface soils underlying the project sites are classified as Jaucus Sand (JcC) and Molokai Silty Clay Loam (MuA and MuB) by the U.S. Soil Conservation Service in their publication “Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii” (1972). The

Jaucas Sand (JcC) soil type is described as light brown, excessively drained, calcareous soils that occur in narrow strips on coastal plains adjacent to the ocean that developed in wind and water deposited sand from coral and seashells.

Conversely, Molokai Silty Clay Loam (MuA and MuB) is described as dark reddish brown, sticky and plastic silty clay loam that formed in material weathered from basic igneous rock. In addition, this soil has a low shrink swell potential and severe erosion hazard. Mass grading work and development along Palapala Drive have brought the project site to its present form.

2.2 SITE DESCRIPTION

The project site is located at the existing DOT Kahului Baseyard at 650 Palapala Drive in Kahului on the Island of Maui, Hawaii. We understand the project area is about 1.75 acres and is generally bordered by Mua Street to the north, Haleakala Highway to the south, existing parking areas to the south, Kuleana Street to the east, and existing parking and access road areas to the west.

At the time of our field exploration, the project site was generally occupied by the existing fuel station and maintenance, truck shed, and repair shop building structures. In addition, the site was generally covered by asphaltic concrete and Portland cement concrete pavements for parking and driveway areas and the existing wash rack.

Based on our field observations, the project site appears to gradually slope down from east to west. Based on a topographic survey map provided, we anticipate existing ground surface elevations at the site to range from about +31 to +25 feet Mean Sea Level (MSL) on the eastern and western portions of the site, respectively.

2.3 FIELD EXPLORATION

We explored the subsurface conditions at the project site by drilling and sampling two borings, designated as Boring Nos. 1 and 2, extending to depths of about 14.7 and 11.2 feet below the existing ground surface, respectively. The borings were drilled utilizing a truck-mounted drill rig equipped with continuous flight augers. The approximate boring locations are shown on the Site

Plan, Plate 2. It should be noted that each boring was terminated on apparent hard basalt rock formation that could not be penetrated by the drilling equipment.

Our engineer monitored the drilling operations on a near continuous (full-time) basis and classified the materials encountered in the borings by visual and textural examination in the field in general accordance with ASTM D2488. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general accordance with ASTM D2487 and the Unified Soil Classification System. Graphic representations of the materials encountered are presented on the Logs of Borings in Appendix A.

Soil samples were obtained in general accordance with ASTM D1586 by driving a 2-inch OD standard penetration sampler with a 140-pound hammer falling 30 inches. In addition, relatively undisturbed soil samples were obtained in general accordance with ASTM D3550 by driving a 3-inch OD Modified California sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the "Sampling Resistance" on the Logs of Borings at the appropriate sample depths. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

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

2.4 LABORATORY TESTING

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

Two Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits. The samples tested had relatively low Plasticity Indices (PIs) of about 14 and 15 and plotted as low plasticity silt (ML) and low plasticity clay (CL) on a Standard

Plasticity Chart. The test results are summarized on the Logs of Borings at the appropriate sample depth. Graphic presentations of the Atterberg Limits test results are provided on Plate B-1.

One Sieve Analysis test (ASTM C117 and C136) was performed on a selected soil sample to evaluate the gradation characteristics of the soil and to aid in soil classification. A graphic presentation of the grain size distribution is provided on Plate B-2.

Two one-inch ring swell tests were performed on relatively undisturbed (natural) and remolded samples to evaluate the swelling potential of the on-site soils. Swell test results of about 0.5 and 1.0 percent were observed, indicating the on-site soils have a low swelling potential when subjected to moisture fluctuations. The ring swell test results are summarized on Plate B-3.

One laboratory California Bearing Ratio (CBR) test (ASTM D1883) was performed on a mixture of bulk samples of the near-surface soils to evaluate the pavement support characteristics of the on-site soils. Results of our laboratory CBR test indicates the sample of on-site soils tested had a CBR value of about 12 with a corresponding swell of about 0.8 percent. The CBR test results are presented on Plate B-4.

2.5 SUBSURFACE CONDITIONS

Our borings generally encountered pavement structures consisting of about 3 and 5 inches of asphaltic concrete and about 3 and 6 inches of base material overlying alluvial soils and basalt rock formation extending down to the maximum depth explored of about 14.7 feet below the existing ground surface. The alluvial soils were encountered to depths of about 11 and 14.5 feet below the existing ground surface and generally consisted of loose to medium dense silty sand and stiff to very stiff sandy silt and sandy clay.

Hard basalt rock formation was encountered underlying the alluvial soils and extended down to the maximum depth explored of about 14.7 feet below the existing ground surface. We did not encounter groundwater in the borings at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors.

2.6 SEISMIC DESIGN CONSIDERATIONS

Based on the International Building Code, 2006 Edition (IBC 2006) and American Society of Civil Engineers Standard ASCE/SEI 7-10 (ASCE 7-10), the project site may be subject to seismic activity, and seismic design considerations will need to be addressed. Based on the subsurface materials encountered at the project site, the geologic setting of the area, and our engineering analyses, we anticipate the project site may be classified from a seismic analysis standpoint as being a "Stiff Soil Profile" site corresponding to a Site Class D soil profile type based on the IBC 2006 (Table No. 1613.5.2).

Based on Site Class D, the following seismic design parameters were estimated and may be used for seismic analysis of the project.

SUMMARY OF SEISMIC DESIGN PARAMETERS	
Mapped MCE Spectral Response Acceleration, S_S	0.987g
Mapped MCE Spectral Response Acceleration, S_1	0.253g
Site Class	D
Site Coefficient, F_a	1.105
Site Coefficient, F_v	1.894
Design Spectral Response Acceleration, S_{DS}	0.727g
Design Spectral Response Acceleration, S_{D1}	0.319g
Peak Ground Acceleration, PGA	0.364g
Site Modified Peak Ground Acceleration, PGA_M	0.414g

Based on the subsurface conditions encountered, the phenomenon of soil liquefaction is not a design consideration for this project site.

END OF SITE CHARACTERIZATION AND FINDINGS