GEOTECHNICAL ENGINEERING EXPLORATION
KAMEHAMEHA HIGHWAY DRAINAGE AND SAFETY IMPROVEMENTS
VICINITY OF MP 3.06 TO MP 3.54
WAIALUA, OAHU, HAWAII
W.O. 7651-00(A) NOVEMBER 30, 2022

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Our field exploration at the project site generally encountered a thin surface fill and/or alluvial soils layer about 0.5 to 4 feet thick underlain by beach deposit, alluvium, clinker materials, and basalt rock formation extending to the maximum depth explored of about 71.5 feet below the existing ground surface. The surface fill layer consisted of about 7 and 8 inches of asphaltic concrete in paved areas and about 0.5 to 3 feet of medium dense to dense silty sand and sandy gravel. The surface alluvial soil layer, about 0.5 to 1 foot thick, consisted of medium dense silty sand. Beach deposit consisting of loose to medium dense poorly graded sand was encountered at depths of about 0.5 to 18 feet below the existing ground surface. Beach deposit was not encountered in the borings drilled along approximately the northern half of the project site. Below the beach deposit, alluvium about 9 feet thick, consisting of soft to hard silty clay and clayey silt with cobbles and boulders, was encountered and underlain by interbedded layers of basalt formation and clinker materials to the maximum depth explored of about 71.5 feet below the existing ground surface. Basalt formation encountered ranged from hard to very hard and moderately to slightly weathered. Clinker materials encountered generally consisted of medium dense to very dense silty/sandy gravel and silty sand.

We encountered groundwater in the drilled borings at depths of about 9.9 to 12.3 feet below the existing ground surface at the time of our field exploration. The groundwater levels measured generally correspond to about Elevations +0.7 to +2.2 feet MSL, respectively. Due to the proximity of the project site to the Pacific Ocean, groundwater levels can fluctuate depending on tidal fluctuations, storm surge conditions, seasonal precipitation, groundwater withdrawal and/or injection, and other factors.

Based on the information provided, we understand that the relatively heavy structural load demands will require supporting the new bridge on a deep foundation system, such as cast-in-place concrete drilled shafts. The drilled shaft foundations would derive support primarily from adhesion between the drilled shaft and the hard to very hard basalt formation and medium dense to very dense clinker materials encountered in our borings drilled. Based on the structural load demands provided for our engineering analyses, drilled shafts with diameter of 3 feet and embedment lengths of 52 feet (Abutment #1), 48 feet (Abutment No. 2), and 54 feet (Center Pier) may be used for design of the new bridge crossing Lauhulu Stream. The recommended drilled shafts lengths are referenced to the design shaft cutoff elevations at +3 feet MSL.

We understand that retaining walls may be used for the wingwalls of the new bridge structure and other retaining walls for grade separation. It is our understanding that Wingwall

No. 1 will be designed as a cantilever wall off the bridge abutment structure and Wingwall Nos. 2 to 4 will be supported by additional drilled shaft foundations. Structural load demands for these additional drilled shafts were not available at the time of this report preparation. Additional analysis and recommendations for the drilled shaft lengths will be provided when structural load demands become available.

Design of retaining walls (not structurally connected to the bridge structure) may be supported by a shallow footing foundation bearing on the recompacted on-site soils. In the event that soft soils are encountered at the footing subgrade elevations, the exposed soft soils within the limits of the footing foundations should be removed and replaced with compacted fills.

Based on the information provided, we understand that site grading consisting of both cut and fill are required for the proposed project. In general, we anticipate the excavations during site grading operations likely will encounter a surface fill/alluvial soil layer and beach deposits. The excavated materials may be used as a source of general fill and backfill materials provided that the materials are processed to meet the gradation requirements discussed herein. Cut and fill slopes should be designed with a maximum inclination of 2H:1V or flatter.

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

END OF SUMMARY OF FINDINGS AND RECOMMENDATIONS