1. GENERAL

This report presents the results of our geotechnical engineering exploration and engineering analyses performed in support of the design of the *Seismic Retrofit of Kaholo Bridge* project in the District of Hamakua on the Island of Hawaii. The project location and general vicinity are shown on the Project Location Map, Plate 1.

This report summarizes our findings and presents our geotechnical recommendations based on our field exploration, laboratory testing, and engineering analyses. The recommendations presented herein are intended for the design of the bridge seismic retrofit only. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.1 Project Considerations

The Kaholo Bridge project is located along Hawaii Belt Road (Route 19) in the District of Hamakua on the Island of Hawaii. The project location and vicinity are shown on the Project Location Map, Plate 1. The existing Kaholo Bridge structure traverses Kaholo Stream.

The existing bridge structure is a three-span bridge supported by two intermediate piers and abutments at both ends. Based on the available plans, the existing bridge structure is supported on shallow foundations. The bridge structure is approximately 220 feet in length and is approximately 29.7 feet in width.

The project consists of the seismic retrofit of the Kaholo Bridge. Based on the seismic evaluation performed by KSF, Inc., we understand that appreciable lateral deflections of the bridge structure would occur during a seismic event. The lateral deflection of the bridge structure in the longitudinal direction would be reduced by the passive pressure resistance of the shallow bridge foundations and the stiffness of the abutment fills. To reduce the amount of transverse lateral deflection of the bridge structure, a group of battered micropiles would be installed to provide resistance to the transverse lateral load. During a seismic event, the battered micropiles would engage their lateral resistance resulting in a reduction of the amount of transverse lateral deflection of the bridge structure to an acceptable limit.

1.2 Purpose and Scope

The purpose of our exploration program was to obtain an overview of the surface and subsurface soil conditions at the project site to develop a generalized soil/rock data set to formulate geotechnical recommendations for the design of the seismic retrofit of the existing bridge structure. Our work was performed in general accordance with the scope of services outlined in our revised fee proposal dated November 27, 2019. The scope of our work for this exploration included the following tasks and work efforts:

1. Review of available in-house and geologic information for areas near the bridge.
2. Application of permits from the State of Hawaii – Department of Transportation, Highways Division prior to our drill crew mobilization.
3. Coordination of the utility toning with various utility companies and clearance of the proposed boring locations by our geologist.
4. Traffic control at the boring locations during our field exploration.
5. Mobilization and demobilization of a truck-mounted drill rig and two operators from Honolulu to and from the project site.
6. Drilling and sampling of four borings extending to depths of about 76 to 102.5 feet below the existing ground surface.
7. Performance of a shear wave velocity test of one of the borings to a depth of about 101.7 feet below the existing ground surface.
8. Coordination of the field exploration and logging of the borings by our geologist.
9. Laboratory testing of selected samples obtained during our field exploration as an aid to classify the materials and evaluate their engineering properties.
10. Analyses of the field and laboratory data to formulate geotechnical engineering recommendations for the design of the seismic retrofit of the existing bridge structure.
11. Preparation of this geotechnical engineering report summarizing our work on the project and presenting our findings and recommendations.
12. Coordination of our overall work on the project by our project engineer.

13. Quality assurance of our work and client/design team consultation by our principal engineer.

14. Miscellaneous work efforts such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology and the Logs of Borings are presented in Appendix A. Results of the shear wave velocity profiling are presented in Appendix B. Results of the laboratory tests performed on selected soil/rock samples obtained from our field exploration are presented in Appendix C. Photographs of core samples are provided in Appendix D.

END OF GENERAL