



Hirata & Associates

Geotechnical
Engineering

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MEMORANDUM

August 12, 2015
W.O. 15-5822

TO: Stacey Miyamoto
SSFM International
via email: smiyamoto@ssfm.com

FROM: Nathan Tanaka

RE: Preliminary Recommendations
Camp 10 Access Road Bridge Repairs

General Description

Our fieldwork for the subject project was completed on July 16, 2015, by drilling six test borings to depths ranging from about 29 to 32.5 feet. Laboratory testing is still in progress.

Soil Conditions

The three bridge sites are generally underlain by two soil units: clayey silt and completely to highly weathered rock. Initial laboratory testing on the clayey silt indicated a low expansion potential at its insitu moisture content, and a low to moderate expansion potential when recompacted or remolded at near its optimum moisture content. Completely weathered rock is defined as rock which has decomposed to soil, but with its fabric and structure preserved. The following is a brief summary of the soils encountered at the three bridge sites.

Existing Bridge No. 1 - The clayey silt was in a medium stiff condition, extending to depths of about 14.5 and 6 feet in borings B1 and B2, respectively. Boulders were encountered in the clayey silt stratum. Medium dense weathered rock was encountered below the clayey silt in boring B2, extending to a depth of about 20 feet. Hard basalt was encountered below the clayey silt and weathered rock. Neither groundwater nor seepage water was encountered in borings B1 and B2.

Existing Bridge No. 2 - The clayey silt was in a firm condition, transitioning to medium dense to dense weathered rock at depths of about 10 and 11.5 feet in borings B3 and B4, respectively. Seepage water was encountered at depths of about 9.8 feet in borings B3 and B4.

Existing Bridge No. 3 - The clayey silt was in a medium stiff to firm condition, transitioning to medium dense to dense weathered rock at depths of about 5 and 7 feet in borings B5 and B6, respectively. Seepage water was encountered at depths of about 6.9 and 7.3 feet in borings B5 and B6.

Preliminary Recommendations

Based on discussions with the Structural Engineer, estimated loads at each abutment will be approximately 60 kips, resulting in approximately 5 kips per foot of abutment for a 12-foot wide abutment. We understand that it is preferred that new bridge abutments or footings be setback from existing bridge abutments which will remain in-place.

Slope stability analyses were performed for the three bridge sites to determine the required setback distance for foundations to achieve a minimum factor of safety of 1.5. A load of 5 kips per foot, embedded approximately 1.5 feet below ground surface, was assumed in our analyses. Assumed bearing capacities were used to determine the approximate footing widths over which the load was applied. The setback distance is the minimum distance from the slope face to bottom edge of footing required to achieve a minimum safety factor of 1.5. The following is a summary of our slope stability analyses.

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Bridge No.	Slope Height	Slope Gradient	Assumed Bearing Capacity	Minimum Setback Distance
Existing Bridge No. 1	16 feet	0.38H:1V	1,500 psf	6.5 feet
			2,000 psf	8.5 feet
Existing Bridge No. 2	10 feet	0.2H:1V	1,500 psf	5 feet
			2,000 psf	6 feet
Existing Bridge No. 3	7 feet	0.14H:1V	1,500 psf	5 feet
			2,000 psf	5 feet

Settlement analyses were performed to provide an estimate of foundation settlement due to the estimated load of 60 kips at each abutment. Our analyses assumed that foundations will be founded on 18 inches of imported granular structural fill and embedded 18 inches below finish adjacent grade. The following is a summary of our settlement analyses.

Bridge No.	Assumed Bearing Capacity	Estimated Settlement
Existing Bridge No. 1	1,500 psf	1/4 to 1/3 inch
	2,000 psf	1/3 to 3/8 inch
Existing Bridge No. 2	1,500 psf	1/2 to 1 inch
	2,000 psf	5/8 to 1-1/8 inch
Existing Bridge No. 3	1,500 psf	3/8 to 1/2 inch
	2,000 psf	1/2 to 5/8 inch

Based on discussions with Structural Engineer, we understand that some settlement may be acceptable. As a result, we believe that shallow foundations founded on a minimum 18 inches of imported granular structural fill may be used for support of the new bridges provided that the estimated settlements presented above for each respective bridge and allowable bearing capacity is acceptable.

The following soil parameters may be assumed for the preliminary bridge layout and sizing of the foundations.

- Allowable bearing value = 1,500 to 2,000 psf
- Coefficient of friction = 0.4
- Passive pressure = 250 pcf
- Active pressure = 45 and 60 pcf for freestanding and restrained conditions

Please feel free to call if you have any questions or need any additional information.