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Geotechnical and Materials Engineers
and Environmental Scientists



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October 30, 2012

Mr. Adam Braunstein
H+L/SOM/CRA/SAM Joint Venture
1755 Blake Street, Unit 400
Denver, Colorado 80202-147

Subject: Supplemental Geotechnical Engineering Recommendations, PVS Redesign, Denver
Veterans Affairs Medical Center, Fitzsimons Campus, Aurora, Colorado

Project No. 11-1-416A

Dear Mr. Braunstein:

We understand that the PVS has been redesigned to eliminate the originally designed lower parking level and raise the base level of the structure to an elevation at or above the highest groundwater elevation measured during our 2009 geotechnical study. The results of that study were provided under our Project No. 09-1-431 in a report to the JVT dated December 11, 2009. We also understand that the structure will be waterproofed below the design groundwater level, which is considered to be 8 feet above the highest groundwater elevation measured during our 2009, in order to eliminate the need for a permanent dewatering system.

We understand that the PVS foundation system will now consist of a 30" thick mat slab designed to both support the PVS superstructure and help resist potential hydrostatic uplift in the event the groundwater level rises to the design elevation. The mat foundation will eliminate the need for drilled piers, both for support of compressive loads and to resist hydrostatic uplift. Based on current design drawings, the elevation of the bottom of the mat is anticipated to be above the claystone bedrock underlying the site. Accordingly, mat subgrade conditions are expected to consist primarily of existing natural granular soils with occasional sandy lean clay interbeds underlain at shallow depths by claystone bedrock, or granular structural fill extending to natural soils and/or bedrock.

The bedrock at the PVS site is overlain by saturated overburden soils, and the presence of groundwater above the existing bedrock surface should mitigate the potential for heave due to swelling bedrock, provided excavations for the mat do not extend into the bedrock. We understand that excavations into bedrock of limited area and depth may have already occurred, but that those areas have been below groundwater for several months. We believe it is likely that the sustained exposure of the bedrock surface to water, as well as the anticipated mat contact pressures, will adequately mitigate the potential for heave related to post-construction expansion of the bedrock in those areas. However, new excavation for the mat extending below the current bedrock surface may require over-excavation of the bedrock to some depth and replacement with non-expansive fill. Thick zones of natural clay soils, if encountered, should be removed to natural granular soils or to bedrock and replaced with granular structural fill in accordance with the criteria presented in our 2009 geotechnical engineering report.

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Provided new excavation for the mat does not extend into bedrock, we believe a mat slab foundation is feasible for support of the PVS. Assuming a non-rigid mat, the soil pressure distribution should be computed using a method that models the soil-structure interaction, such as the beam on an elastic foundation procedure. A modulus of vertical subgrade reaction equal to 200 pci may be used for the site subsoils. The modulus value given does not need to be corrected for mat shape and size if used to model small elements in a finite element analysis.

We anticipate average sustained mat contact pressures will not exceed 2,500 psf. For average sustained loads approaching 2,500 psf, and assuming shallow bedrock conditions and symmetrically distributed loads, we estimate total mat settlements will be less than 1 inch. Post-construction differential settlements are estimated to range from 50% to 75% of the total settlement. Total settlements for a mat generating a base contact pressure less than the allowable should generally be proportionally less. Non-uniformity of the subsurface conditions will contribute to total and differential settlements. Based on the anticipated subsurface soil and bedrock conditions, much of the settlement will tend to occur during construction and initial loading of the mat.

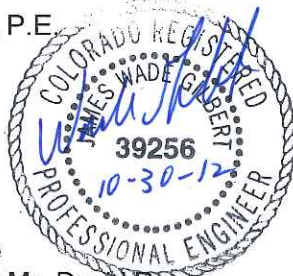
Since the PVS may be below groundwater at times, the lower portion of the PVS perimeter walls up to the design groundwater level will be subject to higher lateral earth pressures due to undrained soil conditions. For portions of the below-ground walls that will be below groundwater, we recommend designing the walls based on an equivalent fluid pressure of 85 pcf. This value assumes that the retained soils will consist of granular materials with less than 20 percent by weight passing the No. 200 sieve and that a limited amount of wall deflection will occur. Accordingly, the equivalent fluid pressure value is slightly less than the equivalent fluid pressure for an "at-rest" condition.

Please let me know if you have any questions.

Sincerely,

KUMAR & ASSOCIATES, INC.

Wade Gilbert, P.E.



JWG/jw

Cc: Book, File

S.A. Miro; Mr. David Renn