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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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March 17, 2014

Mr. Michael Rodney
Michael Roth & Associates
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mrodney@mraap.com

RE: ADDENDUM NO. 2 – FOUNDATION ALTERNATIVES
GEOTECHNICAL ENGINEERING REPORT
VA IDIQ BONHAM AMBULATORY CARE EXPANSION
SAM RAYBURN MEMORIAL VETERANS CENTER
BONHAM, TEXAS

Dear Mr. Rodney:

Our report for the proposed Ambulatory Care Expansion recommends that drilled shafts be used to support the proposed facility to mitigate the potential for structure damage due to swelling clay. This approach and other alternatives are discussed below in accordance with your request.

TABLE 1 - FOUNDATION APPROACHS

General Approach	Comments	Recommendation
Alternative 1a - Drilled shafts with structural floor	This alternative has the least risk of future shrink-swell related distress. Little to no detrimental movement of the foundation and supported structure is anticipated with this approach. Shafts may be designed using criteria provided in the Geotechnical Report and Addendum No. 1. Additional borings should be accomplished to confirm subsurface conditions at depth are similar than those assumed because the existing borings terminate shallower than the recommended shaft depth. If more favorable conditions are encountered in the supplemental borings, it is possible that the drilled shaft lengths could be reduced.	Recommended. Least risk to having undesirable building performance.
Alternative 1b - Drilled shafts with slab-on-grade floor	This alternative is similar to Alternative 1a but eliminates the structural slab. Slab-on-grade design considerations are given in the Geotechnical Report. The use of drilled shafts for foundation support would significantly reduce the potential for detrimental movement of the structure, similar to Approach 1a. Cost savings could result from the elimination of the structural slab; however, the risk of detrimental movement of the slab will increase. A potential of 2 to 4 inches of slab movement of the slab-on-grade floor should be anticipated.	Not Recommended. Considerable risk to the performance of the slab-on-grade floor exists in this alternative.

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General Approach	Comments	Recommendation
Alternative 2a - Remove and replace a portion of the potential swell-susceptible soils with granular fill – shallow foundations with slab-on-grade floor	The swell potential could be partially mitigated and its magnitude reduced by excavation and haul off of a portion of the expansive clay and replacement with granular fill. The structure could be supported on shallow footings with a slab-on-grade floor under this approach. The extent of mitigation and reduction of potential swell will depend on the depth of excavation and replacement. The Geotechnical Report discussed excavation and replacement to a depth of 8 feet. The anticipated post-construction potential swell with this approach is 3/4 to 1-1/2 inches assuming an 8-foot over-excavation depth. This operation can result in the creation of a bathtub that traps free water. The trapped water can aggravate swelling of the clay remaining below the excavation. To mitigate the bathtub potential, granular fill should contain between 20 and 35 percent fines (i.e. material passing the U.S. No. 200 sieve). The installation of one or more sumps to collect and remove water from the base of the excavation should also be considered.	Possible if potential swell is acceptable and site constraints can accommodate the excavation. Additional construction details should be included to isolate slabs from foundations, among other items, to allow for some differential movement.
Alternative 2b - Remove and replace a portion of the potential swell-susceptible soils with non- or low expansive clayey soils – shallow foundations with slab-on-grade floor	This alternative is the same as Alternative 2a other than the over-excavated soil is replaced with other non-swell susceptible clayey soil from an off-site borrow area. Additional testing would be needed to evaluate the effectiveness and suitability of borrow soil. The bathtub potential is of less concern when using clay backfill. Bearing capacity will be lower than that achieved with granular fill. The anticipated potential swell with this approach is from 1 to 2 inches assuming an 8-foot over-excavation depth. However, the potential for differential movement is greater because it is often difficult to place and compact clayey soils (especially those used for swell mitigation as it often requires placing and compacting such soils wet of the optimum moisture content).	Possible. Similar to Alternative 2a but likely to be more problematic for construction than Alternative 2a. Additional construction details should be included to isolate slabs from foundations, among other items, to allow for some differential movement. Greater risk of undesirable movements.
Alternative 2c - Remove and replace a portion of the potential swell-susceptible soils with lime treated soil – shallow foundations with slab-on-grade floor	This alternative is similar to Alternative 2a other than the excavated soil is re-used and is treated with lime to reduce the swell potential. Swell potential reductions may or may not be as effective as with granular fill depending upon the effectiveness of the lime treatment. Additional testing would be needed to evaluate the effectiveness. The bathtub potential is of less concern when using lime-treated soil. The anticipated potential vertical rise with this approach is from 1 to 2 inches assuming an 8-foot over-excavation depth and the effectiveness of the lime treatment. This alternative is not recommended because of difficulty of handling and mixing lime in a small work area near an active facility. The excavated material would need to be stockpiled on site, spread in thin lifts, mixed, allowed to mellow and replaced in thin lifts.	Not recommended.

General Approach	Comments	Recommendation
Alternative 2d - Remove and replace with moisture conditioned soil – shallow foundations with slab-on-grade floor	This alternative is similar to Alternative 2a other than the excavated soil is re-used and is moisture-conditioned to reduce the swell potential. Swell potential reductions may or may not be as effective as with granular fill depending upon the effectiveness of the moisture conditioning. The bathtub potential is of less concern when using clay backfill. The anticipated potential swell with this approach is from 1 to 2 inch assuming an 8-foot over-excavation depth. However, the potential for differential movement is greater because it is often difficult to place and compact clayey soils (especially those used for swell mitigation as it requires placing and compacting such soils wet of the optimum moisture content). The alternative involves excavating the soil, spreading it out, adding water to raise the moisture content to some value wet of the optimum moisture content for fill placement, then replacing and compacting the soil in lifts. The alternative would require temporarily stockpiling the soil somewhere on site. Strict moisture control during placement and compaction will be required and may be difficult for the contractor to achieve. Bearing capacity of the compacted soil will depend on the placement moisture content and compaction procedures and will need to be evaluated. Bearing capacity will be lower than that achieved with granular fill. Fill placed wet of optimum moisture may be soft and prone to detrimental settlement, particularly if the soil is over-conditioned, i.e. placed excessively wet.	Not recommended. Grading control to achieve suitable results will be difficult. High risk of undesirable post-construction movement of the over-excavation alternatives.
Alternative 3 – Combination of drilled shafts and partial removal and replacement of existing clays	This alternative would consist of a combination of Alternatives 1 and 2, i.e. supporting the structure on drilled shafts/structural slab for the portion of the proposed structure (Alternative 1) adjacent to the existing building (to avoid the over-excavation) and removal of the swell-susceptible soils farther away from the existing structure (Alternative 2) where there is room to make such deep excavations and then using spread footings and a slab-on-grade floor. We do not recommend this approach as it results in two different foundation support systems for the same structure.	Not recommended. Use of multiple foundation support systems on one structure is often problematic.
Alternative 4 – No remediation - shallow footings with slab-on-grade floor	This alternative involves construction of the structure using conventional shallow foundations and slab-on-grade floors without mitigation. Bearing capacity for shallow foundations has not been provided due to the concern with the swell potential of the subgrade. Bearing capacity recommendations can be provided upon request. The anticipated potential swell with this approach is 2 to 4 inches. In addition, the potential for differential movement is high because no over-excavation is conducted, which can reduce the total movement but also reduce the potential for sharp, differential movement that can result from high and low swell potential materials within close proximity beneath the structure.	Not Recommended. Considerable risk to the performance of the structure and slab-on-grade floor exists in this alternative. Highest risk of all alternatives.

General Approach	Comments	Recommendation
Alternative 5 - Basement supported on shallow footings with slab-on-grade or structural floor	Swell-susceptible soils exist within the entire profile beneath the site. While excavation for the basement removes some of the potential soils of concern, it also unloads swell-susceptible soils. If groundwater penetrates these soils, it is possible to have as much damage of the basement slab as a slab-on-grade floor. Because it is difficult to prevent water from finding a path to below the slab it is prudent to assume some swell of the basement slab from wetting. As such, we recommend assuming 1 to 2 inches of potential swell of the slab and designing the structure to accommodate such movement – similar to that described for Alternative 2a. Additional recommendations can be provided for this approach should you desire to pursue it. Our borings did not encounter groundwater and hence the potential for additional wetting and swell beneath a basement slab. However; the VA comments concerning the water intrusion conditions at the Mental Health wing and the 13-foot water depth noted on the 1977 Boring 2 log provided on the previous structure plans raises concerns regarding the potential for water intrusion into the basement excavation. The need for sub-drainage and waterproofing should be expected based on the current information.	Possible if potential swell is acceptable and site constraints can accommodate the excavation.

If you have questions concerning this letter please contact me or Bill Kremer at 314-564-8110 or via email at wbk@shanwil.com.

Sincerely,

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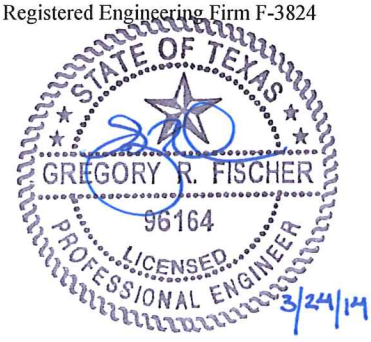

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