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Project No. 04.10070157
November 15, 2010

San Antonio Water System
c/o Camp Dresser & McKee, Inc.
12357-A Riata Trace Parkway, Suite 210
Austin, Texas 78727

Attention: Mr. William T. Reynolds, P.E

Supplemental Geotechnical Information
SAWS Western Watershed Sewer Relief Line Project, Phase I
Multiple Concrete Junction and Siphon Boxes
Quintana Road to SW Loop 410
San Antonio, Texas

Introduction

This letter is written as a supplement to Fugro Consultants, Inc.'s (Fugro's) geotechnical data study (Report No. 04.10070157) dated September 10, 2010. The conditions in the referenced data study apply to this supplemental letter. Camp Dresser & McKee, Inc. (CDM) has requested excavation and backfill design parameters and allowable design bearing pressures for various concrete junction and siphon boxes along the alignment. Fugro was authorized to proceed on October 12, 2010 by Mr. William Reynolds, P.E. through electronic mail correspondence.

Boring Information

Fugro has performed borings along the alignment in our previous data study. The soils information presented herein is based on a general overview of the site conditions as encountered in the borings near the concrete structures. The material encountered in the borings was highly variable along the pipeline alignment. The borings generally consisted of sandy low plasticity 'lean' clay (CL), highly plastic 'fat' clay (CH), gravels (GW-GM, GP-GC, and GC) and clayey sand (SC). Fugro should be subcontracted to provide observations during construction to determine if the recommended soil parameters included in this letter are applicable based on the conditions encountered during construction.

Foundation Evaluation

Foundation Type and Depth. Based on our understanding of the project, the junction boxes and siphon boxes will be supported below grade on shallow foundations. The junction box and siphon box walls should be designed by the designing engineer to resist the anticipated lateral loads. The sidewalls of the structures will act as retaining walls. We assume sidewalls will be less then about 10 ft in height.

Bearing Capacity and Lateral Resistance Considerations. In general, the planned structures will exert relatively light loads with respect to the net bearing pressures of the supporting soils. Based on the results of our study, the soils at the site are suitable for shallow bearing support. Pertinent foundation design parameters are discussed below.

Design Parameters. Shallow foundations may be designed using net allowable bearing pressures presented below. Lateral resistance design parameters are also included in the following table for the existing near-surface soils as well as for imported crushed limestone fill. The allowable bearing pressures for imported crushed limestone and clean gravel imported fill are valid provided the structures are bearing on a minimum of 1 ft of the fill (otherwise, the values should be for the underlying material). The fill should be placed and compacted in accordance with the recommendations contained herein.

Parameter	**Soil Type**				
Soil type	Crushed Limestone	Clean Gravel	Clayey Gravel	Clayey Sand	Lean/Fat Clay
Wet soil unit weight, γ_w	140 pcf	115 pcf	130 pcf	125 pcf	120 pcf
Buoyant soil unit weight, γ_b	75 pcf	50 pcf	70 pcf	60 pcf	55 pcf
Allowable Bearing Capacity (FS=2)	4,000 psf	3,500 psf	3,000 psf	2,500 psf	1,000 psf
Coefficient of lateral earth pressure, k_a	0.3	0.3	0.4	0.5	0.6
Coefficient of lateral earth pressure, k_p	3.7	3.5	3.0	2.5	2.0
Coefficient of lateral earth pressure, k_o	0.3	0.3	0.5	0.6	0.8
Sliding Adhesion	NA	NA	NA	NA	250 psf
Coefficient of Friction	0.5	0.5	0.4	0.3	NA
Modulus of subgrade reaction	150 pci	125 pci	100 pci	100 pci	100 pci

The above values do not consider hydrostatic pressures. If hydrostatic pressures are allowed to build up behind the walls of the structures, these pressures should be included in the design calculations or a permeable drainage layer will need to be included to reduce the anticipated pressures.

Crushed limestone or clean gravel fill may be desired for grading or backfill. Under transient load conditions, the allowable bearing pressures may be increased by 500 psf. Note, the forces due to the water flow should not be considered transient. Foundations must be proportioned so that

the maximum contact pressure under dead, live and transient loads does not exceed the allowable net bearing pressures. During the excavation for the foundations, care should be taken to not disturb the underlying subgrade soils. The excavation bottoms and sides should be observed by a geotechnical engineer or his representative prior to the placement of concrete.

Vertical Movement. Most problems resulting from plastic clays involve swelling as evidenced by upward heaving of the soil or structure, therefore, producing detrimental cracking. The difference between the field water content at the time of construction and the equilibrium water content finally achieved in the subsurface sometime after completion of the structure is the most important consideration in designed foundations established on soils with high swell potential. Heave values increase as the initial moisture content decreases. However, moisture contents and heave movements may vary to some extent (seasonally) even after equilibrium is reached. The designer may wish to consider shrink/swell movements will occur in the expansive clay soils at the site.

Select Fill. Crushed limestone select fill should consist of Flexible Base Type A or C; Grades 1 to 3 as specified by TxDOT, Standard Specifications for Construction of Highways, Streets and Bridges, Item 247, current edition. Compact the flexible base material to at least 98 percent of the maximum dry density as determined using TxDOT Test Method TEX-113-E. Hold water contents to ± 2 percent of the optimum moisture content, and maintain compacted lift thicknesses to 6 inches or less.

Clean gravel fill should be a washed, crushed, coarse-grained material with sizes ranging mostly between ¼ and ½ inch, and no more than 5 percent passing the No. 200 sieve. An acceptable gradation would be 67 Stone ASTM C 33. The gravel fill should be placed in 6-inch thick lifts in a dry condition and vibrated in place with a minimum of four complete over lapping passes, with a vibratory plate compactor until no further densification is achieved.

Construction Surveillance and Control. Engineering overview and on-site surveillance during subgrade preparation fill placement and compaction, and foundation construction is essential to provide a well-constructed system. For the site preparation anticipated at this site, we recommend these construction activities be monitored by Fugro Consultants to provide the necessary overview and verify the intent of our recommendations. These subgrade preparation services would include monitoring and testing of fill placement and compaction, and field observations and laboratory testing to evaluate the quality of construction materials. We would be pleased to discuss a scope of work with you and submit a proposal to provide these services.

OSHA Soil/Rock Classifications for Temporary Trench Design. Trench safety is the sole responsibility of the contractor and the contractor is required to retain the services of a licensed professional engineer to design the trench safety system to comply with OSHA requirements.

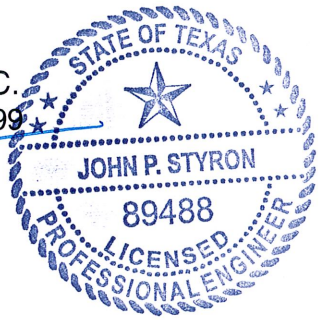
Refer to the "OSHA Soil/Rock Classifications for Temporary Trench Design" section in Fugro's report under Project No. 04.100700157.

Closing

Fugro appreciates the opportunity to be of service to you on this project. Please call if we can be of any additional assistance.

Sincerely,

FUGRO CONSULTANTS, INC.
TBPE Firm Registration No. F-299



John P. Styron, P.E., LEED AP
Geotechnical Manager

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