ALLIED LABORATORIES

Department of Professional Engineering Consultants, P. A.

July 14, 2008

Mr. Eric J. Glover, P.E.
Ruggles & Bohm, P.A.
924 North Main
Wichita, Kansas 67203

Re: **Exploratory Borings**
Sierra Hills 2nd Addition
143rd Street East & Pawnee Street
Sedgwick County, Kansas
Allied File No. 74-08042-2-3697

Mr. Glover,

As requested, Allied Laboratories has performed a subsurface exploration for the referenced project. The exploration was conducted to obtain information on the subsurface conditions and provide general recommendations for project design. All work was performed under the direction of a registered Professional Engineer.

The following sections present the results of the field exploration, laboratory testing and our recommendations for project design. The analysis and recommendations are based on the subsurface conditions encountered in the borings and the project information available at the time of this report. If project details including structure locations, elevations, loads, cut and fill depths or other conditions change during design, or if the subsurface conditions vary from those described in this report, the analysis and recommendations may need to be re-evaluated and adjusted.

FIELD EXPLORATION

The field exploration conducted on July 2, 2008 consisted of 3 exploratory borings. The borings were drilled to depths of 15 feet with a truck mounted Mobile Drill B-53 drill rig using 6 inch continuous flight auger. Subsurface conditions in the exploratory borings were logged in the field by Allied Laboratories personnel referencing ASTM D-2488. Water level measurements were obtained in the borings shortly after completion of drilling and approximately 24 hours after drilling. Samples of the subsurface soils were obtained from auger cuttings during drilling.

Boring locations were determined and marked in the field by the client. Approximate boring locations are shown on the attached Boring Location Sketch (Figure 1). Ground surface elevations were assumed to be 100.0 at the boring locations. Ground surface elevations and boring locations determined by the drilling crew are approximate.

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LABORATORY TESTING

Soil samples obtained during the field exploration were observed and visually classified in our laboratory referencing ASTM D-2488 procedures which are based on the Unified Soil Classification System. Selected samples were tested to determine engineering and physical properties. Tests were performed referencing current ASTM procedures unless otherwise noted on the attached figures. Tests performed included moisture content, minus 200 content, and Atterberg Limits. Laboratory test results are summarized on the attached boring logs and figures.

SITE CONDITIONS

This section presents brief descriptions of the soil, bedrock, groundwater and other conditions encountered in the exploratory borings and observed at the site. The attached Boring Logs should be reviewed for additional information on the subsurface conditions at each boring location. Sharp transitions between various soil/bedrock types are presented on the boring logs. However, soil transitions may occur gradually and depths to the transitions are approximate. The borings are based on visual observations and periodic sampling. Additional sampling, testing and Petrographic analysis may provide a different classification of soil and bedrock types.

SOILS/BEDROCK

The subsurface profile in the borings consisted of natural clay soils overlying highly weathered shale bedrock. The upper clay soils were generally characterized as moist to very moist to wet with a medium stiff to stiff consistency. Moisture contents for the samples tested ranged from approximately 23 to 37 percent. The clay soils were visually characterized as lean to fat clay with a medium to high plasticity. Liquid limit values ranging from 53 to 60 and plasticity index values ranging from 32 to 40 were obtained on the three samples of the clay soils tested. Scattered gravel and possible gravel seams were encountered in the lower portion of boring B-2.

The underlying highly weathered shale bedrock was encountered at a depth of approximately 6 feet in boring B-1 and at a depth of approximately 13 feet in boring B-2. The shale bedrock was characterized as moist to very moist with wet seams with a stiff consistency. Moisture contents of 22.3 and 26.7 percent were obtained on the two samples tested. The bedrock typically consisted of weathered to highly weathered clay shale from the Wellington Formation. Although not encountered in the borings, hard gypsum and limestone seams/layers can be present in this formation.

GROUNDWATER

Groundwater was observed in all of the borings shortly after drilling and approximately 24 hours after drilling. The measured water levels were at 8 feet below the ground surface in boring B-2 and 14.6 feet below the ground surface in boring B-1 shortly after drilling. The measured water levels approximately 24 hours after drilling ranged from 4 feet below the ground surface in boring B-1 to 9.2 feet below the ground surface in boring B-3.

Groundwater in this formation is typically present as seepage or perched water which is usually encountered at the soil/bedrock interface or in weathered/fractured zones in the bedrock. However, wet zones may also be present in the clay soils at this site. The water levels presented may not necessarily indicate where free water will be encountered during construction. Additional water may accumulate in borings or excavations left open for longer periods. Groundwater levels may also fluctuate several feet depending on climatic conditions, time of year, surface runoff, water levels in nearby streams, and other factors beyond the scope of this report.

ANALYSIS AND RECOMMENDATIONS

Geotechnical recommendations based on the proposed construction and subsurface conditions encountered in the borings at the locations and times indicated are presented in the following sections. The recommendations are based on an interpretation of the project site conditions from the information obtained in the exploratory borings. Adjustments to these recommendations may be required if the proposed construction changes, or subsurface conditions are encountered other than described in this report.

POND CONSTRUCTION

Exploratory boring results indicate very moist to wet clay soils and highly weathered shale will be encountered at the pond locations. Depending on the intended use of the pond and the pond bottom elevation, a compacted clay liner may be required to maintain a static water level due to the highly weathered shale materials and seepage zones at this site. Typically, a 12 inch thick compacted clay liner is sufficient to adequately seal the ponds. The upper clay soils at the boring locations had plasticity index values in excess of 25 and appear to be suitable for a clay liner.

Exploratory boring results also indicate that soft/wet soils may be present in portions of the ponds. Seepage water could be present during excavation of the ponds which may require dewatering prior to excavation or pumping of the seepage water. Disking and drying of the subgrade materials may also be necessary to provide a stable base for construction of the pond liner.

ENGINEERED FILL

All new engineered fill should be placed under controlled conditions with observation and testing by a qualified testing firm under the direction of a Professional Engineer. We recommend the pond liner material be compacted to a minimum of 95 percent of Standard Proctor (ASTM D-698). Liner fill materials consisting of fat and lean clays (CH, CL) should be placed from minus 2 to plus 4 percent of optimum moisture content. All fill material should be placed with a maximum compacted lift thickness of 6 inches. Smaller lift thickness may be necessary for energy sensitive soils (i.e. clay) or if light compaction equipment is used. Moisture sensitive soils (i.e. silt) may require stricter moisture control to achieve the required compaction.

GENERAL NOTES AND LIMITATIONS

Geotechnical recommendations are based on periodic sampling in widely spaced, small diameter borings. Subsurface conditions may vary from those encountered in the borings. This may require engineering judgment and adjustments to the geotechnical recommendations during construction. A Geotechnical Engineer should be retained for the construction monitoring to assure subsurface conditions are similar or the required adjustments are made.

The conclusions and recommendations presented are based on the data obtained from the borings at the locations indicated. No other warrantees or guarantees are intended. The nature and extent of subsurface conditions may vary across the site. If subsurface conditions are encountered other than described in this report, the recommendations presented may need to be re-evaluated and adjusted.

Prepared by,

Allied Laboratories
Department of Professional Engineering Consultants, P. A.

STEVEN M. HERMAN — LICENSED — 12585 — PROFESSIONAL ENGINEER — REGISTERED

Steven M. Herman, P.E. 7-14-08
Geotechnical Division Manager

attachments

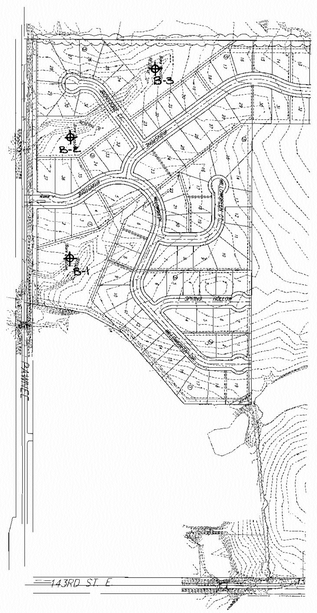

FIGURE 1

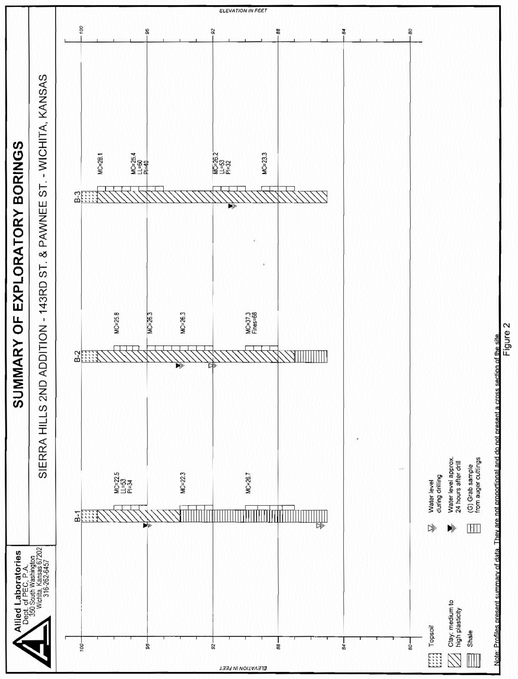

Figure 2

FOR INFORMATION ONLY

Sierra Hills 2nd Addition
Soil Report
WICHITA, KANSAS

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DESIGNED	EJG
DRAWN	EJG
CHECKED	
DATE	April 30, 2009
UTILITY	
DATE	-----
JOB NO.	32685E
SHEET	6 OF 23

ENGINEERING FILE: Engineering Base {Soil Report}
PROJECT NUMBER: 468-84518