May 23, 2000

Mr. Marvin Moss
The Laurens County Chamber of Commerce
P.O. Box 248
Laurens, South Carolina 29360

Re: Report of Preliminary Subsurface Exploration
Piedmont Industrial Site
Laurens County, South Carolina
ECS Project No.: 14-1355

Gentlemen:

As authorized by your acceptance of our proposal number 14-0563-P, dated February 17, 2000, Engineering Consulting Services, Ltd. (ECS) has completed the preliminary subsurface exploration and geotechnical feasibility study for the above referenced project. This report contains the results of our preliminary subsurface exploration and a discussion of the overall suitability of the planned development as it relates to our current geotechnical findings. In summary, the site subsurface conditions encountered during this preliminary study indicate to us that the existing soil and groundwater conditions are favorable for use of the subject portion of the site for the planned development. Please note, however, that this study should be considered ***preliminary*** in nature and is based solely on our observations at the site and the subsurface conditions indicated by six widely spaced soil test borings. A more comprehensive geotechnical study will need to be performed once the actual configuration of the planned development and associated improvements is known.

Project Information

Based upon our conversations with Mr. Marvin Moss and Ms. Benita Madden of the Laurens County Chamber of Commerce, the information provided to us, and our observations of the site, it is our understanding that the subject site is consists of an approximately 100 acre tract of land. The subject site is located south of Metric Road and north of Interstate 385 (I-385) in Laurens County, South Carolina. The majority of the site appears to be relatively open, while some portions of the site appear to be moderately wooded. Based upon our past experience on other Upstate industrial projects, we expect that the site will be developed with new structures, pavements, utilities, stormwater management features, and landscaping. More specific information was not available at the time this report was prepared.

Field Exploration

Six widely spaced soil test borings (B-1 through B-6) were drilled at the approximate locations shown on the attached "Boring Location Plan. Each of the test borings were advanced to their planned depth of 15 to 20 feet below the prevailing ground surface. The boring locations were established in the field by estimating distances and angles from existing site features. The Test Boring Records, which depict our interpretation of the subsurface conditions at each boring location, are also attached to this report.

The soil borings were performed using an all-terrain mounted, CME-550 drill rig utilizing continuous-flight, hollow stem augers to advance the boreholes. Drilling fluid was not used in this process. Representative soil samples were obtained by means of the split-barrel sampling procedure in accordance with ASTM D-1586. Split-spoon samples were obtained at approximately 2.5-foot intervals within the upper 10 feet and at approximately 5-foot intervals thereafter. The drilling crew maintained a field log of the soils encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each soil sample were then sealed in glass jars and brought to our laboratory in Greenville, South Carolina for visual examination and formal classification by a geotechnical engineer in general accordance with the Unified Soil Classification System (USCS) guidelines. A copy of these guidelines is attached for your convenience.

Site and Subsurface Conditions

Site Observations: The site of the proposed development is located south of Metric Road, near its intersection with South Carolina Highway 221, in Laurens County, South Carolina. Based upon the topographic information reviewed from the U.S.G.S. 7.5 Minute Topographic Map, "Laurens North, SC", it appears that the existing site grades generally slope upward from Metric Road to the top of a knoll, after which the land slopes downward to the south. The highest site elevations appear to be on the order of 655 feet in the northern portion of the site, while the lowest elevations appear to be on the order of 610 feet in the southernmost portion of the property, adjacent to U.S. Interstate 385 (I-385). The majority of the subject site is open land with pine and hardwood trees existing in the eastern and southern portions of the site.

Local Geology: The project site is located in the Piedmont Physiographic Province of South Carolina. The soils in the Piedmont Province typically consist of residuum (weathered in-place soils) derived from the parent bedrock which typically consists of amphibolite-grade metamorphic rocks. The residuum can be found in both weathered and unweathered states. Although the surficial materials normally retain the structure of the underlying parent bedrock, they typically have a much lower density and exhibit strengths and engineering properties of soil. In a mature weathering profile of the Piedmont Province, the soils are generally found to be finer grained near the surface where more extensive weathering has occurred. With increased depth, the particle size becomes more granular and gradually changes to partially weathered rock and ultimately to unweathered bedrock. The mineral composition of the parent rock and the environment in which the weathering occurs is largely responsible for the residual soil's

engineering properties. It is also important to note that water-deposited or "alluvial" soil are typically found in low lying areas of the Piedmont and adjacent to streams, ponds, etc.

Subsurface Conditions: Each of the test borings initially encountered surficial materials consisting of approximately 6 to 12 inches of topsoil. Beneath the surficial materials, natural residual soils were encountered which extended to the boring termination depth in each boring. The natural residual soils typically classified as clayey sand, silty sand and sandy silt, with N-values typically ranging from 7 to 28 blows per foot (bpf). The finer grained soils (clays and silts) were typically located within the upper approximately 5 to 10 feet of the site subsurface profile.

Based upon our past experience with these types of soils, it appears that a majority of the site soils should be suitable for support of conventional shallow foundations and re-use as engineered fill. However, it may be necessary to moisture condition the on-site soils to facilitate proper compaction. Additionally, the near surface soils which contain unsatisfactory amounts of cultivated organic matter should not be considered suitable for support of the planned construction or re-use as structural fill. However, soils containing excessive amounts of cultivated organic materials may be used in non-structural areas.

It is important to note that materials identified as partially weathered rock were encountered beyond a depth of approximately 14 feet in Boring B-1. Partially weathered rock (PWR) is defined as materials which exhibit a standard penetration resistance of greater than 100 blows per foot (bpf). The PWR was sampled as extremely dense silty sand with rock fragments. Due to the relatively sandy nature of the PWR, it appears that these materials could be excavated with heavy earth moving equipment equipped with rock teeth or rippers.

Groundwater was not encountered in any of the test borings at the time of our exploration. However, groundwater elevations should be expected to vary depending on seasonal fluctuations in precipitation, surface water absorption characteristics, and other factors, and may be encountered at higher elevations in the future. Groundwater elevations in the Piedmont are typically at their lowest during the summer and early fall and at their highest in the winter and early spring.

The above paragraphs provide a general summary of the subsurface conditions encountered at the boring locations at the time of our exploration. The six borings were performed at widely spaced locations throughout the site. Consequently, the subsurface information collected during this study may not reflect the existing subsurface conditions in all portions of the site. Once the final site configuration is known, and the proposed development has been sited, additional subsurface exploration will need to be performed to assess the subsurface conditions in previously unexplored portions of the site and within the immediate areas of the new construction.

The attached Test Boring Records contain detailed information regarding the subsurface conditions encountered at each boring location. These Test Boring Records represent our visual classification of the samples retrieved during the field exploration. The stratification lines on the boring logs designate approximate boundaries between various subsurface strata and the in-situ transitions should be expected to be more gradual.

Geotechnical Development Considerations

Based on the subsurface conditions encountered within the test borings, our understanding of the proposed construction, and our past experience with similar subsurface conditions, the explored portions of the subject site appear highly favorable for the planned development from a geotechnical standpoint.

General Site Preparation: The first step in preparing the site for the proposed construction should be to remove all vegetation, rootmat, topsoil, deleterious materials, and any other soft or unsuitable materials from the existing ground surface. These operations should extend at least 10 feet, where possible, beyond the proposed built over portions of the site. After proper clearing, stripping, and grubbing, and prior to fill placement, the exposed subgrade soils should be carefully examined by an experienced geotechnical engineer or his authorized representative to identify any localized unstable, or otherwise unsuitable materials. After examining the exposed soils, loose and yielding areas should be identified by proofrolling the exposed subgrades with an approved piece of equipment, such as a loaded dump truck, having a single-axle weight of at least 10 tons. Any soft or unsuitable materials encountered during proofrolling operations should be examined by the geotechnical engineer for the most appropriate remedial measure activity.

Engineered Fills: Based upon the soil encountered within the test borings, it appears that the majority of the site soils should be suitable for re-use as engineered fills. An examination of the soils recovered during our current exploration, and our previous experience in the area, indicates that the majority of the natural residual soils will generally be suitable for re-use as engineered fill. It may be necessary to moisture condition engineered fill soils during placement to facilitate proper compaction. Existing soils containing significant amounts of organic matter will not be suitable for re-use. Engineered fills placed within built over portions of the site should be placed in lifts not exceeding 8 to 10 inches in loose lift thickness, moisture conditioned to within their working range of optimum moisture content. For the residual soils in the Piedmont region, the typical working range of optimum moisture is approximately 3 to 4 percent of the optimum moisture content. Care should be taken to provide a smooth, gently sloping ground surface at the end of each days earthwork activities to help reduce the potential for the absorption of surface water.

Additionally, all new fills should be compacted to at least 95 percent of their standard Proctor maximum dry. In areas of deep fills, it may be necessary to compact the fill to at least 98 percent of their standard Proctor maximum dry density to minimize the potential for fill induced settlements to adversely influence the planned construction. Depending upon the actual site usage, it may be prudent to compact the upper 12 to 24 inches of the site subgrades to a minimum of 100 percent of their standard Proctor maximum dry density.

Foundation Considerations: Provided the subgrade preparation and earthwork operations are completed in accordance with sound construction practice and the general recommendations provided above, the anticipated development can likely be supported on conventional shallow foundations bearing on approved natural soils and/or properly compacted engineered fill. For newly placed engineered fills, the criteria previously discussed must be strictly adhered to. Based upon our past experience with similar soils and provided the recommendations provided herein are strictly followed, the use of net allowable soil bearing pressure on the order of 2,500 to 4,000 pounds per square foot (psf) can likely be utilized for proportioning continuous wall footings and isolated column footings.

To reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" failures, we recommend that continuous footings have a minimum width of 18 inches and that isolated column footings have a minimum lateral dimension of 30 inches. Furthermore, all footings should bear at a depth to provide adequate frost cover protection. For this region, we recommend the bearing elevation for all foundations be a minimum depth of 18 inches below finished exterior grade.

The settlement of a structure is a function of the compressibility of the bearing materials, bearing pressure, actual structural loads, fill depths, and the bearing elevation of footings with respect to the final ground surface elevation. Estimates of settlement for foundations bearing on engineered or non-engineered fills is strongly dependent on the quality of fill placed. Factors which may affect the quality of the fill include maximum loose lift thickness of the fills placed and the amount of compactive effort placed on each lift. Consequently, the need for proper quality control/assurance observation and testing during all phases of construction, especially earthwork and foundation construction, cannot be over-emphasized.

Slab-On-Grade Considerations**:** Concrete floor slabs can then be designed as conventional slabs-on-grade provided that the slab subgrade soils have been properly prepared. Upon completion of additional subsurface exploration and laboratory testing, an appropriate modulus of subgrade reaction (k_s) can be determined. We recommend that all floor slab construction be isolated from the foundations so differential settlement of the structure will not induce shear stresses in the floor slab. We also recommend that all slabs-on-grade be underlain by a minimum of 4 inches of open graded aggregate (#57 stone) to help prevent the capillary rise of groundwater from adversely effecting the slab. If floor covering such as tile or carpet will be utilized for interior finishes, a polyethylene vapor barrier is recommended beneath the floor slab for moisture control considerations.

Pavement Design and Construction Considerations: Based on our past experience with similar facilities and subsurface conditions, we would expect that the asphaltic concrete pavement sections may consist of 6 to 12 inches of properly compacted aggregate base course materials, and 2 to 4 inches of asphaltic concrete. Portland cement concrete pavement sections would likely consist of 4 to 6 inches of properly compacted aggregate base course stone and 5 to 7 inches of Portland cement concrete having a design flexural strength of at least 650 pounds per square inch (psi). All Portland cement concrete pavements should incorporate proper steel reinforcing and joint spacing.

The final design pavement sections for the planned facilities should be developed based upon the actual anticipated traffic conditions and laboratory California Bearing Ratio (CBR) testing of the actual pavement subgrade soils. All materials used in pavement construction should meet the minimum requirements outlined in the SCDOT Standard Specifications.

Drainage Considerations: Positive drainage should be provided around the perimeter of all built over portions of the site to minimize the potential for moisture infiltration into the foundation, slab, and pavement subgrade soils. We recommend that landscaped areas adjacent to all structures be sloped away from the construction to promote positive drainage. Parking lots, sidewalks, and any other paved areas on the site should also be sloped to divert surface water away from all structures.

The need for construction dewatering should be determined at the time of construction. If grading operations are performed during the wet seasons (i.e. fall and winter) the use of gravity flow ditches may be necessary to divert precipitation and surface water away from the construction areas.

Closure

Our preliminary geotechnical evaluation of the site has been based on our understanding of the site, the project information provided to us, and the data obtained from the six widely spaced soil test borings. In evaluating the boring data, we have examined previous correlations between penetration resistance values and foundation bearing pressures observed in soil conditions similar to those at the site. The assessment of site environmental conditions for the presence of pollutants in the soil, rock, and ground water of the site was beyond the scope of this preliminary geotechnical exploration. Please note the recommendations contained in this report are ***preliminary*** in nature and should not be used in formulating final design criteria. A more comprehensive subsurface exploration will be required once the actual configurations of the final development have been determined.

We appreciate the opportunity to be of service to you during the early design phase of this project and look forward to helping you meet our development goals for the property. If you have any questions concerning the information presented in this report, or if we can be of further assistance, please do not hesitate to contact us.

Sincerely,

ENGINEERING CONSULTING SERVICES, LTD.

Alice M. Walter, E.I.T.
Staff Geotechnical Engineer

Stephen J. Geiger, P.E.
Principal Engineer

Enclosures

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ATTACHMENTS

Boring Location Plan

Unified Soil Classification System

Reference Notes For Boring Logs

Boring Logs B-1 through B-6

REPORT OF
PRELIMINARY SUBSURFACE EXPLORATION
AND
GEOTECHNICAL ENGINEERING EVALUATION

PIEDMONT INDUSTRIAL SITE

Prepared For
THE LAURENS COUNTY CHAMBER OF COMMERCE

MAY 23, 2000