



ECS MID-ATLANTIC, LLC

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June 11, 2012

Mr. Kenton Drury
E & G Group
1350 Beverly Road
Suite 200
McLean, Virginia 22101

ECS Project No. 01:11949-A

Reference: Subsurface Exploration and Geotechnical Engineering Summary of 2321 4th Street NE, Washington D.C.

Dear Mr. Drury:

ECS Mid-Atlantic, LLC ("ECS") was retained by E & G Group ("Applicant") to provide subsurface exploration and geotechnical engineering services for Applicant's proposed six-story mixed-use development project at 2321 4th Street NE, Washington D.C. The proposed development, consists of a new construction, six-story building. The building includes building amenities, building services, parking and retail on the ground floor, and residential space on the upper five floors. Below-grade levels are not proposed. This letter summarizes the results of our findings, as detailed in our *Final Report of Subsurface Exploration and Geotechnical Engineering Analysis* (2321 4th Street NE, Washington D.C.) dated February 23, 2012, and prepared for Applicant ("Report").

Ten soil borings were drilled as part of a site study. Six test pits were performed (to 12-foot depths) in connection with the current subsurface exploration to characterize the surficial fill materials. Representative soil samples were also tested. This letter summarizes ECS's findings and recommendations with respect to the foundation and floor slab design as well as groundwater management for the project. This letter may be provided to the Board of Zoning Adjustment to aid them in their review process.

Foundation

The soil borings indicated a significant amount of heterogeneous and variably dense fill material ranging from a depth of 6 to 13 feet below the existing site grades. Such fill materials may settle to undesirable levels due to the weight of the foundation loads. However, the depth of the fill soils are generally too deep to make undercut and replacement options economically feasible. Thus, to minimize possible damage to the proposed structure due to settlement of these fill materials, we recommend that the building foundations be supported on shallow spread and continuous footings founded on aggregate piers.

Short aggregate piers involve excavating a portion of the soil under the foundation and re-filling the excavation with vibrated stone or compacted select aggregate material. Aggregate piers can be utilized under the entire building footprint to support walls and columns. The piers should be designed by a Specialty Contractor and should extend through the existing fill soils into suitable natural soils. Footings supported by the piers should be designed for bearing pressures determined by the design/build contractor of these systems. Settlement should be limited to one inch of total settlement and half an inch of differential settlement. To provide frost protection, footings in heated areas should be at least 2 feet deep and perimeter footings should be at least 2.5 feet deep.

There should be no utilities or utility easements in the influence zone of the foundation (the area beneath a 45-degree line extending downward from the exterior edge of the outermost footing).

Floor Slab

The existing fill may also present a problem for the floor slab support. We recommend two options to address the existing fill, given that the complete replacement of the fill is not likely feasible. The first option (recommended) is to use additional short aggregate piers, as described above, under the slab area. The second option is to support the slab on an engineered fill layer of at least 12 inches of a select granular fill, ideally placed below any utility excavations, underlain by a geogrid such as a Tensar TX140, or equivalent. The aggregate pier option presents a lower risk of undesirable post-construction slab settlement the geogrid-reinforced, engineered fill option.

The slabs-on-grade should be underlain by at least 4 inches of No. 57 stone (or an equivalent), to act as a capillary break and help prevent the rise of water. A perimeter drain line may be installed outside the building but is not necessary as long as the site is properly sloped to allow for surface drainage. In addition, to minimize the differential settlement, we recommend isolating the floor slab from the foundation to avoid stresses on the floor slab. If piers are used, mesh reinforcement should also be included in the design of the floor slab to minimize the width of shrinkage cracks.

Groundwater

Groundwater was encountered in the borings at depths of 12 to 22 feet; however groundwater was not observed in any of the test pits. Groundwater is not expected to be a significant difficulty during construction of the project. The long term continuous groundwater table at the site is expected to be below shallow foundation construction. Perched groundwater conditions may be encountered during construction operations. During construction, French drains are recommended for groundwater control, but sump pumps and trenching may also be utilized. Proper site drainage is recommended to help maintain the integrity of the soil, which will provide adequate subgrade support when kept dry, but will deteriorate quickly when wet.

Closing

In summary, the site is underlain by variably dense, heterogeneous fill material to a depth of 6 to 13 feet below the planned foundation levels. The depth of the unsuitable fill soils are generally too deep to make undercut and replacement options economically feasible. Therefore, we recommend that the building foundations be supported on shallow spread and continuous footings founded on aggregate piers. We also recommend that the floor slab either be supported on additional aggregate piers or on a geogrid reinforced select fill mat.

Should you have any questions regarding the information contained in this letter, please do not hesitate to contact our office. The information contained in this letter is only intended to summarize the geotechnical report prepared by ECS for the site and should not be relied upon for design as a standalone document.

Respectfully Submitted,

ECS MID-ATLANTIC, LLC

A handwritten signature in black ink, appearing to be 'J. Shelton', written over a horizontal line.

Jeffrey A. Shelton, P.E., LEED.AP
Principal Engineer