



RA Consultants LLC

Geotechnical Engineering

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February 28, 2015

15C1019

Mr. Akiva Kobre,
Sr. Vice President, Development
Fortis Property Group, LLC
45 Main Street, Suite 800
Brooklyn, NY 11201

Re: Report of Phase 1
Deskstudy
Geotechnical Investigation,
88-94 Amity Street
Brooklyn, NY

Dear Mr. Kobre:

This report is submitted in accordance with our proposal dated February 20, 2015 as authorized by you on February 23, 2015. It covers Phase 1 of our geotechnical services for the proposed construction at the referenced address. Phase 1 is a desk study to provide preliminary foundation recommendations based on available information from a nearby site. The project is part of the proposed development of the existing Long Island College Hospital (LICH) site.

The site is located on Amity Street approximately midway between Hicks and Henry Streets in the Cobble Hill Section of Brooklyn. It consists of Lot No. 14 on Brooklyn Block No. 295. The site footprint is approximately 15,000 sq. ft and is part of the existing LICH complex. Currently the site is occupied by one 7-story residential building with a cellar. We understand that the existing building on site will be demolished to make way for 7- to 8- four story individual townhouses with a common below grade garage. The site is bordered on the east by the landmarked 5-story Pohemus hospital building, a robust but old brick and masonry building. A driveway and existing four story brick townhouse structure borders the site on the west and open yards border the site on the south.

We completed a geotechnical investigation at 118 Congress Street, approximately one block south of the project site. The anticipated subsurface conditions described below are based on the results of that investigation.

ANTICIPATED SUBSURFACE CONDITION

Geologic Conditions

The site lies within the terminal moraine of the Wisconsin Glacier that receded some 14,000 years ago. The subsoils consisting of glacial till have been deposited and overloaded by the advancing and retreating glaciers that have overridden underlying Cretaceous Age deposits. Bedrock likely is more than 100-ft deep at the site.

The anticipated subsurface conditions as disclosed by the borings at 118 Congress Street may be generalized as follows:

Fill - an uncontrolled man-made deposit consisting of a mixture of sand, gravel, silt and rock fragments (class 7 per the New York City Building Code). The anticipated fill stratum thickness is about 10-ft thick with highly variable Standard Penetration (SPT) Test N-values.

Glacial Till - consisting of a heterogeneous mixture of sand, silt, clay and gravel (SP, SM, MH, typically 3a and occasionally 5a per NYCBC) is anticipated below the fill. Typical SPT N-values are expected to exceed between 50- blows/ft.

Cretaceous Age Deposits - These old deposits typically consist of hard clays (CL, CH 4a per the Code) with layers of very dense sand (SM, SP, 3a per the Code). Typical N-values in the cohesive clay soils may exceed 45-blows/ft and the N-values in the sand layers may exceed 75-blows/ft.

Groundwater: the groundwater table was observed at 26-ft below sidewalk level at Congress street (see Figure 1) in boring B-2w. Groundwater levels should be expected to vary with seasonal and tidal fluctuations and other unknown factors.

The borings at 118 Congress Street penetrated to about 50-ft below sidewalk grade without encountering bedrock. We expect that bedrock at the Amity Street site is at least 100-ft below grade.

Groundwater at 118 Congress Street was encountered about 23-ft below grade. The site grade at Amity Street is about 8-ft higher than at Congress Street (per Google Earth). Therefore we anticipate that groundwater at the project site will be about 30-ft below ground surface. Groundwater levels may vary with weather, seasonal, tidal and other unknown conditions.

EVALUATION AND RECOMMENDATIONS

Foundations

With dense to very dense sands lying less than 5-ft below proposed subgrade level and a proposed four story structure (column loads probably less than 550-kips) spread footings would be the most appropriate foundations to support the structure. The footings may be designed with a net allowable bearing value of 6-tons/ft². The footings should bear on natural soils at nominal depth below the basement floor slab. If fill is encountered below proposed footing subgrade it should be excavated and removed. The footing may be placed on natural material with a pier

extension or the excavated material may be replaced with compacted crushed stone or gravel. The minimum footing width should be 3-ft.

We estimate that settlements may be up to about ½-in with this design. Differential settlements may be around ¼-in. Most settlement is expected to occur during construction.

Slabs on Grade

Before placement of basement slabs the natural subgrade (including footing subgrades) should be compacted with at least 4-passes of a twin drum walk-behind vibratory roller. Basement slabs may bear directly on subgrade after placement of a 4-in thick (minimum) natural gravel or crushed stone layer to stabilize the subgrade during construction.

The crushed stone or gravel layer may be used for underslab drainage if desired as described below. However, if used for that purpose its thickness should be increased to 6-in, minimum.

The basement slabs may be designed with a coefficient of subgrade reaction up to 500-t/ft³ for a one square foot area.

Groundwater Control

During Construction - We anticipate that groundwater control during construction should be nominal. The contractor should be prepared to remove stormwater infiltration or localized high levels by pumping and sumps, as necessary.

After Construction- A reasonable design water level would allow for several ft of potential groundwater rise in the future. However, we anticipate that temporary or sustained groundwater level increases would not rise to the subgrade level. Nevertheless, a perimeter footing drain should be installed to collect and dispose of possible storm water infiltration. This should consist of a 6-in (min) diameter perforated PVC pipe surrounded by at least 6-in of natural gravel or crushed stone drainage medium having a maximum particle size of 1-in and zero percent passing the No. 200 sieve. The drainage medium should be wrapped with a non-woven geotextile (e.g. Mirafi 120, or equal). The drain should carry the temporary discharge to a sump for disposal. The estimated quantity of temporary discharge is approximately ¼-gal/min/ft of drain.

The basement walls should be waterproofed to a level at least 5-ft above the top of slab, and damp proofed above that. A vapor barrier should be provided below the basement slab.

An added precaution to protect against uplift damage to the basement slab caused by water potential main breaks could be an under slab drainage system. This would consist of a 6-in (min) thick drainage medium as described above placed over a geotextile (as above) placed on the subgrade. Perforated 6-in diameter PVC pipes spaced approximately 20-ft apart should be installed within the drainage medium. The pipes should be surrounded by at least 6-in of the drainage medium and connected to sumps fitted with submersible duplex pumps. Sumps should be spaced and provided for every 7,500 –ft² of basement area. Total pumping capacity should be at least 150-gal/min. Alternatively, the basement slabs may be water proofed and designed to resist the uplift pressures, or the basement may be allowed to flood through a sump.]

Excavations and Lateral Support

Construction of the common basement will require careful consideration of the existing basement walls on the North, South and West sides of the site to determine if they can be re-used for the new basement. If not, temporary support of excavation (SOE) as described below may be used. Underpinning of the Pohemus building may be required if the proposed basement grade is lower than the existing Pohemus footings. If sufficient space is available lateral restraint for the existing footings may be provided by means of a berm. The top of berm should be at least 3-ft wide adjacent to the footing and the side slope should be no steeper than 1:1½ (v:h).

In open areas without existing basements (or where existing basement walls cannot be re-used) temporary support of excavation (SOE) system will required to construct the proposed basement walls for the new building. Probably it will consist of a soldier pile and lagging retaining wall. The soldier piles should be installed without impact pile driving in pre-drilled holes and the holes should be backfilled with lean concrete or grout. Walls with a single level of bracing may be designed for active earth pressures based on a soil total unit weight of 125-lbs/ft³ and an effective friction angle of 32°. At depths at least 3-ft below subgrade level the total unit weight may be taken as 130-lbs/ft³ and the effective friction angle may be assumed as 35°. Walls with multiple bracing levels should be designed for a rectangular pressure distribution with the intensity equal to 0.65 x the maximum active pressure. Contractor surcharge loadings should be included in the calculated earth pressures.

Permanent basement walls may be designed for the following two conditions:

1. Earth pressures at rest based on a triangular distribution with the earth pressure increasing at a rate of 63-lbs/ft²/ft of depth.
2. Active earth pressures plus seismic pressures. This may be based on a triangular pressure distribution with a seismic earth pressure coefficient of 0.4 and soil unit weight of 125-lbs/ft³. The centroid of the distributed lateral loading should be taken as 0.45 x height of wall above the base of the wall.

Potential Effects on Adjacent Structures

We anticipate no negative effects on nearby structures or facilities.

Properly restrained excavations in sands with groundwater controlled typically can result in settlements or lateral movements of the adjacent ground or building on the order of ¼ - to ½ per cent of the excavation depth. The movement usually is a maximum at the excavation face and diminishes gradually with distance to about zero at a distance of about one to one and a half times the depth of the excavation.

Also, well designed and executed underpinning can result in settlements of the underpinned structure of up to ¾ -in.

The existing landmarked Pohemus building will require monitoring of vibrations and movements to verify that it will be unaffected by the proposed construction as will the one story structure bordering the Southwest area of the site. We anticipate that vibration levels will be small because no impact pile driving will be allowed. Further movements due to excavation and/or underpinning should be small because the depth of underpinning and excavation should be small and no groundwater is anticipated.

Seismic Considerations

The site may be characterized as “C Very dense soil” in accordance with Table 1615.1.1 of the New York City Building Code.

Based on the anticipated N-values liquefaction need not be considered in the design, in our opinion.

Recommended Exploration Program

In order to provide appropriate design information and to comply with the 2014 New York City Building Code (NYCBC), we recommend drilling a minimum of 6 borings at the site. This would comply with NYCBC requirements assuming that shallow foundations would be utilized. Half of the borings must be located within the site footprint. Figure 1 shows a proposed exploration plan.

At least one boring should penetrate at least 5-ft into bedrock or to 100-ft in order to determine the seismic site class. The remaining borings should penetrate approximately 35- to 50-ft below grade. It may be possible to shorten the deep boring depending on actual results encountered. The borings should be sampled generally at 5-ft depth intervals using the Standard Penetration Test method (ASTM D 1586) and an observation well should be installed in one of the completed borings. If bedrock is encountered it should be cored with an N-size, double tube, diamond tipped core barrel. We recommend excavating two to four test pits along the neighboring buildings to determine if underpinning will be necessary based on the depth of the neighboring foundations. One to two test pits will be needed along each of the neighboring buildings.

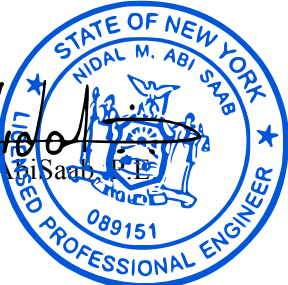
LIMITATIONS

This report is based on the data from a nearby site. Site specific borings are necessary as described above along with evaluation of the new data to confirm the subsurface conditions and recommendations given above.

We appreciate this opportunity to be of service and look forward to working with you as the project proceeds.

Very truly yours,
RA CONSULTANTS LLC


Robert Alperstein, P.E.


Nidal M. Abi Saab




THENCE easterly along Armity Street, 102 feet 0 inches to the point or place of BEGINNING.

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FHA Project No. 012-13028-NP-EC

SURVEY 3 OF 4