December 17, 2015

Mr. Peter Dueño, P.E.
SCS Engineers
7700 N. Kendall Drive, Suite 300
Miami, Florida 33156

Re: Final Report of Subsurface Exploration & Geotechnical Engineering Study
Proposed Douglas Park Improvements
2795 SW 37th Avenue
Miami, Florida
Project No. 14774

Dear Mr. Dueño:

NV5, Inc. (formerly KACO), submits this report in fulfillment of the scope of services described in our Proposal No. 15-0583REV4 dated November 13, 2015. The work was authorized by acceptance of our Professional Services Agreement. This report describes our understanding of the project, presents our evaluations, and provides our professional opinions and recommendations for foundation design and construction for the project.

Sincerely,
NV5, INC.

RICHARD FESDJIAN, P.E. LICENSE No. 79312 STATE OF FLORIDA PROFESSIONAL ENGINEER 12/17/15

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1.0 SITE AND PROJECT INFORMATION

The project site is a park located at 2795 SW 37th Avenue in Miami, Florida. The site is roughly square with average dimensions of 625 feet by 635 feet. It is bounded by SW 28th Street to the south, SW 37th Avenue to the west, single-story school structures to the east and residential structures to the north. A site vicinity map is presented on Drawing 1. Currently the park houses a baseball field in the NW quadrant, tennis and basketball courts and paved parking on the southern portion, and a single story building, playground areas and miscellaneous shelter structures in the western portion of the site. A March 20, 2015 boundary and topographic survey prepared by Keith and Schnars, P.A. which we reviewed indicates ground surface elevations of +9.5 to +15.7 feet with respect to the 1929 National Geodetic Vertical Datum (NGVD).

We were provided with a *Solid Waste Delineation Report* prepared by URS dated January 31, 2014. Based on the information included in this report it appears the project site was previously used for dumping of solid waste. The report delineates the horizontal and vertical extents of the solid waste materials. We are unaware of the past development history of the site beyond its current condition and the information we received regarding previous dumping at the site.

NV5 prepared a report for the project titled *Report of Subsurface Exploration & Geotechnical Engineering Study for the Douglas Park Improvements* dated July 15, 2015. At that time we understood the improvements to comprise the rehabilitation of the parking lot on the west and south boundaries of the park, new walkways around the field, and new bleachers at the southeastern corner of the baseball field.

Based on an email provided by Mr. Peter Dueño from SCS Engineers dated September 10, 2015, we understand the project will be expanded to include demolition of the existing structure located on the western portion of the site and construction of a one-story structure. Details of the proposed structure have not been provided however we anticipate the construction will be reinforced masonry. We estimate column loads for the proposed structure will be 50 to 100 kips, and wall loads will be around 1.5 kips per lineal foot. We anticipate ground floor slabs will be loaded to less than 200 pounds per square foot (psf).

Additionally, we have been requested to review and update our previous geotechnical recommendations to address the following improvements to the park:

- Lowering grades of general areas within the park by 14 inches
- Raising grades of the baseball field by one foot
- Grouting of voids reportedly encountered underneath the tennis courts
- Proposed asphalt walkway around perimeter of the park
- Proposed bleachers near baseball field

2.0 PURPOSE AND SCOPE OF WORK

The purpose of NV5's services on this project is to perform a subsurface exploration and engineering analyses to provide recommendations for design and construction of the proposed project. Specifically this report provides:

- Drawings showing boring locations, a graphic summary of the generalized subsurface conditions, and boring logs with detailed descriptions of the materials encountered.
- Discussion of generalized subsurface conditions at the site including groundwater levels.
- Discussion of feasible foundation type(s) for the proposed construction and improvements.
- Design parameters for the recommended foundation types, including vertical and lateral load resistance.
- Estimates of foundation settlements.
- Recommendations for site preparation and grading, including the re-use of site-excavated materials for fill, fill placement and compaction, pavement and slab subgrade preparation.
- Construction considerations including excavation support and dewatering, and impacts for adjacent structures.

3.0 FIELD EXPLORATION

3.1 BORINGS

The subsurface conditions were explored with fifteen (15) engineering test borings drilled to depths ranging between 8 and 25 feet below existing grade at the approximate locations shown on Drawing 1. Borings B-1 through B-11 were drilled for the July 2015 study, while borings B-12 through B-15 were drilled for the current effort. The test locations were marked and identified in the field by NV5. The borings were drilled in accessible locations with a truck-mounted drill rig utilizing the rotary wash method.

Samples of the subsurface materials were recovered at roughly 2-foot intervals within the upper 10 feet of the boring and at approximately 5-foot intervals thereafter using a Standard Penetration Test split-spoon sampler (SPT) in substantial accordance with ASTM D-1586, "Standard Test Method for Standard Penetration Test and Split-Barrel Sampling of Soils." This test procedure drives a 1.4-inch I.D. split-tube sampler into the subsurface profile using a 140-pound hammer falling 30 inches. The total number of blows required to drive the sampler the second and third six-inch increments is the SPT N-value, in blows per foot, and is an indication of material strength. Upon completion of the borings, the boreholes were backfilled to the ground surface with soil cuttings and the upper few feet with cement grout.

The soil/rock samples recovered from the borings were classified by a geotechnical engineer. The collected samples were later re-examined to confirm field classifications. Visual soil classifications were made in accordance with ASTM D2487 and ASTM D2488. The results of the classification and consequent generalized stratification are shown in Drawing 2, and in the records of test borings in Appendix A (sheets A-1 through A-17). Strata contacts shown on these drawings are approximate. The boring data reflect conditions at the specific test locations only, and at the time the borings were drilled.

3.2 TEST EXCAVATIONS

NV5 performed also eleven (11) test excavations (TEs) at the locations shown on Drawing 1. The TEs were performed using a rubber-tired backhoe and extended to depths of about 8 to 10 feet below the existing grade. The TE logs are presented on sheets B-1 through B-6 in Appendix B.

4.0 LOCAL GEOLOGY

Miami-Dade County is located on the southern flank of a stable carbonate platform on which thick deposits of limestones, dolomites and evaporites have accumulated. The upper two hundred feet of the subsurface profile is composed predominantly of limestone and quartz sand. These sediments were deposited during several glacial and interglacial stages when the ocean was at elevations higher than present.

In many portions of Miami-Dade County, surface sand deposits of the Pamlico Formation are encountered. The Pamlico sands overlie the Miami Limestone. In western Miami-Dade County, portions of the Everglades Region interfinger with the Pamlico sand. The Everglades soil consists of peat and calcareous silt (marl).

The Miami Limestone is a soft to moderately hard, white, porous to very porous, sometimes sandy, oolitic calcareous cemented grainstone. The formation outcrops in portions of Miami-Dade County. The Miami Limestone has a maximum thickness of about 35 feet along the Atlantic Coastal Ridge and thins sharply near the coastline and more gradually in a westerly direction. The Miami Limestone was formed about 130,000 years ago at a time when the sea level was twenty-five feet higher than it is today. This environment facilitated formation of concentrically layered sand sized carbonate grains called oolites. These grains formed by repeated precipitation of calcium carbonate around the nucleus of a sand or shell grain.

The Miami Limestone can be separated into two facies: the barrier bar oolitic facies and the tidal shoal limestone facies. The barrier bar facies is characterized by lenses of oolitic limestone separated by intermittent, 1-inch thick or less, uncemented sand layers (cross-bedded limestone). Zones of higher porosity are characteristic and parallel the bedding planes of the cross-bedded limestone. The tidal shoal limestone facies is characterized by a distinct lack of bedding planes. In addition, burrowing organisms have churned previously deposited sediments, which have resulted in high porosity channels in the rock. These ancient channels give the rock an appearance of a hardened sponge in some areas.

The Fort Thompson Formation underlies the Miami Limestone, and includes sand, sandstone, and limestone. The upper zones of the Fort Thompson Formation consist of sand having a thickness ranging from 5 to 35 feet. The remainder of the formation consists of coralline limestone, quartz sandstone, sandy limestone and freshwater limestone. The type of soils within the formation and the degree of cementation vary with lateral extent and depth.

The Fort Thompson Formation is underlain by the Tamiami Formation. The Tamiami Formation consists of sands, silts, clays, and sometime fossiliferous limestone. The upper portions of the Tamiami Formation are permeable and make up the lower reaches of the Biscayne Aquifer. This formation ranges in thickness from zero to 300 feet in South Florida.

5.0 SUBSURFACE CONDITIONS

In general, the subsurface conditions encountered below a depth of about 9 feet in our borings and test excavations are consistent with the geology described above. However, the upper 9 or so feet of the site subsurface appear to have been modified with solid waste materials and other fill components. The detailed subsurface conditions are presented in detail on the records of test boring sheets in Appendix A. The subsurface conditions disclosed by the boring can be generalized as described below.

<u>Layer 1 – Surficial Fill and Sand (Fill)</u>
This layer consists of fine sand and sand with limestone fragments that is about four to twelve feet thick in the borings. The layer is fill and contains varying amounts of construction debris including glass, wood, tires, brick, metal, plastic, and concrete. Construction debris was found in sizes up to 3 inches. SPT N-values recorded in the layer range from less than one to greater than 50 blows per foot (bpf), with an average value of 21 bpf, indicating the layer is typically medium dense. The higher blow counts encountered may indicate that drilling was performed through concrete fragments or hard fill materials.

<u>Layer 2 – Peat:</u>
This layer comprises of peat and was encountered in only in boring B-2. The layer is about 2 feet thick. The stratum is firm with a recorded SPT N-value of six bpf.

Layer 3 – Limestone:
This layer comprises limestone and extends to the maximum boring termination depths of 8 to 25 feet below grade in every boring except for borings B-1 and B-4 where it was not encountered. The stratum is very soft to hard with recorded SPT N-values ranging from four to greater than 50 bpf. The average SPT N-value in the stratum is at least 16 bpf.

For the layers described above, the Table 1 below summarizes our estimates of engineering parameters considered pertinent to the design of foundations for the proposed bleachers and pavements.

TABLE 1 - SUMMARY OF ESTIMATED PERTINENT ENGINEERING PARAMETERS

Layer ID	Description	Thickness (ft)	SPT N-values Range	SPT N-values Avg	Modulus of Elasticity (ksf)	Unconfined Compressive Strength (ksf)	Allowable Side Shear (ksf)
1	Surficial Fill	4 – 12	<1 – 50+	21	400	-	-
2	Peat	2 ±	2	6	<200	-	-
5	Limestone	1 – 11+	4 – 50+	16	10,000	300	3

We note that the values of allowable side shear estimated in Table 1 above are based on our experience and laboratory data from similar rock that we have tested.

Groundwater
Groundwater was encountered in the borings at depths between 7.5 and 10.5 feet below the existing ground surface. These depths correspond approximately to elevations between about +0.9 and +3.9 feet NGVD. On average, stabilized groundwater levels in the general vicinity of the project are expected to vary between elevations +0 to +4 feet NGVD, the variations being primarily as a result of seasonal rainfall. Storm and hurricane events and construction activities also result in variations in the groundwater levels. Notwithstanding the variations acknowledged, we anticipate that groundwater at the site will generally be encountered within the upper 10 to 15 feet of the existing ground surface.

6.0 EVALUATION AND DISCUSSION

6.1 FOUNDATION SUPPORT

Based on the results of the field exploration and our engineering analyses, we consider the site poses some challenges for development of the project from a geotechnical perspective. These are further discussed in the paragraphs below. Detailed recommendations for the proposed building, miscellaneous improvements such as paved asphalt for roadways/walkways, grouting voids reportedly existing underneath tennis courts, and grading adjustments are presented in Section 7 of this report.

6.1.1 Proposed 1-Level Building

The primary concern for foundation design and construction include support of the proposed new structure loads without unacceptable settlement. The fill with debris material encountered in the upper 9 or so feet of the site subsurface was likely placed in an uncontrolled fashion. As such, we cannot be certain of its density/consistency throughout the site.

Nonetheless, we judge that from the standpoint of economy, removing or improving the fill might be cost-prohibitive given the scope of the project and the risk involved in leaving the fill in place as is might be worth it.

Our initial consideration for supporting the proposed structure was shallow foundations. The SPT N-values recorded in the borings indicate an average value of 13 bpf in Layer 1 suggesting the material is medium dense and should be capable of supporting the proposed construction loads after normal site preparation and grading activities. However, because of the uncertainty associated with the composition of the fill, there is always a possibility for settlement over the long term if the fill contains compressible materials within the zone of influence of the new construction loads or organic matter than can decompose over time. This is particularly of concern considering tree trunks up to 4 inches in diameter were observed in the TEs. Additionally, while decomposition is not a concern for inert materials such as concrete and metal, the washout of fines from around these materials could cause them to shift within the body of the fill and thereby result in settlement.

Based on the above considerations we conclude that deep foundation support is appropriate for the proposed structure.

Consistent with current practice in the South Florida area we consider augered, cast-in-place (ACIP) piles to be the most feasible foundation type for this project. Other deep foundation systems such as driven piles and drilled shafts are not considered feasible. In addition to the noise nuisance, vibrations from driven pile foundations could adversely impact existing buildings on the site as well as those on adjacent properties. Drilled shafts are typically economically feasible and attractive only where they are used to carry very large loads that sufficiently justify the slower installation rates and other installation difficulties attendant with such foundations.

The proposed structure can be supported on ACIP piles 14 inches in diameter and tipped at 18 to 20 feet below the existing grade.

It is noteworthy however, that installation of ACIP piles in the uncontrolled fill could be subject to higher than normal grout takes, as well as delays caused by obstructions.

An alternative to pile foundation support would be to improve the ground beneath the proposed structure by either 1) excavating the fill and replacing it with acceptable fill material, or 2) installing vibro-replacement stone columns (VSC) to transfer the structure loads down to the Layer 2 limestone. VSC is a method where a large vibrating probe is inserted into the ground to the desired depth to densify the insitu soils. The probe hole is backfilled with No. 57 stone is used as the backfill material to create a dense aggregate column that provides relatively higher bearing pressures.

For the excavation and replacement option consideration would have to be given to the fact that portions of the excavation would occur beneath the water table and so backfilling of these areas would require either dewatering so that the backfill can be performed in the dry, or use of No. 57 stone to accomplish backfilling below water.

Project ownership would have to evaluate the economic viability of either of these methods as compared to supporting the structure on piles.

6.1.2 Bleachers, Tennis Courts and Pavements/Walkways

The proposed bleachers can be supported with shallow foundations after preparing the site as recommended in Section 7 of this report. Bleachers generally have a higher tolerance for differential settlement than other traditional buildings. The tennis courts, and pavements/walkways can be constructed at grade after customary site preparation. It will likely not be economically justifiable to perform any special site improvement or use deep foundations to accommodate these structures. However the project ownership must accept that there will always be a risk of settlement from the uncontrolled fill and as such these structures could require a maintenance schedule that is more rigorous than usual.

6.2 ESTIMATED SETTLEMENT

We estimate that maximum foundations settlement for the proposed new structures will be less than one (1) inch, with maximum differential settlements on the order of ½ inch. Given the cohesionless nature of the soils present at this site, we predict settlements will occur coincidental with the application of the building dead and live load. The above settlement estimates are for foundations that are designed and constructed as recommended herein. However, due to the uncertainty of the components of the fill materials, long term settlements exceeding one (1) inch should be expected throughout the site. The only solutions to prevent these long term settlements are removing and replacing the fill material or supporting the structures directly on the limestone layer.

6.3 VOIDS UNDERNEATH TENNIS COURTS

Based on the information provided by SCS Engineers, the existing tennis courts may have voids underneath the slab. This may have been caused by differential settlements, decomposition of some of the underlying solid waste materials, or soils washing away due to heavy rain events. We are not aware of the construction date of the tennis courts. If the subsurface conditions beneath the courts are similar to the conditions encountered throughout the site, we recommend as a temporary solution to pump high viscosity, low strength grout. This however does not represent a permanent fix to the settlement and voids underneath the tennis courts. In order to provide a permanent solution to the settlement and cracking, the slabs should be either pile supported, or the deleterious materials should be excavated and replaced with clean fill.

The spacing and frequency of the grouting shall be determined after additional field exploration is performed.

6.4 MISCELLANEOUS ENVIRONMENTAL IMPACTS

Environmental forces consist of sinkholes, freeze thaw damage, shrinking and swelling soils, and hurricane scour can affect the performance of a foundation system. Sinkholes, freeze-thaw, and shrinking/swelling soils are generally not of concern in the South Florida area. While a detailed study of hurricane scour was outside the scope of this study, it is nonetheless our opinion that the foundation systems recommended herein when properly designed and constructed, will resist hurricane scour forces. It is therefore our opinion that these specific environmental forces have a low risk (on a scale of low, moderate, high) of adversely affecting foundation performance at this site provided the foundation system is designed and constructed as recommended herein.

7.0 RECOMMENDATIONS

Our recommendations for geotechnical design and construction of the proposed project are provided below in the following sections.

7.1 SITE PREPARATION AND GRADING

1. Geotechnical site preparation for construction should consist of removal of all existing structures, foundations, pavements, underground utilities, and other deleterious materials within the upper 6 to 12 inches of the proposed foundation footprints plus a five-foot perimeter where possible. Any voids created by the removal of these deleterious materials should be properly backfilled as described in the paragraphs below.

   No information has been provided about existing foundations at the site and we are not aware of the site development history beyond its current condition and the reported historical dumping activities. Where old spread foundations are encountered, they should be removed and replaced with compacted fill if they interfere with new foundations. If the old foundations do not interfere with new construction they should be left in place. Backfilling of old foundation excavations should be performed in accordance with the recommendations provided in this report.

2. After site preparation as described above, areas for structures that will have slabs on grade or pavements (including the walkways) should be proof rolled with at least 10 overlapping passes of a 20-ton roller as it operates at its maximum vibrational frequency and travel at a speed of no more than two feet per second. The proof rolling should be observed by NV5 to identify and mitigate any weak subgrade conditions evidenced by yielding or rutting at the wheels of the roller. Proof-rolling should include planned development footprints plus a five-foot perimeter. To avoid damage to existing foundations, pavements, or utilities, portions of the proof-rolling may have to be performed with a smaller roller or walk-behind compaction equipment.

3. In general fill soils should consist of either inorganic, non-plastic sand having less than 10 percent material passing the No. 200 sieve, or crushed limestone with a maximum rock size of six (6) inches. In particular, fill soils placed within the upper 12 inches of the subgrade of building slabs on grade should consist of either sand with less than 10 percent passing the number 200 sieve, or crushed limestone with a maximum particle size of three inches.

   Based on our boring data portions of the near-surface sandy materials could satisfy the fill criteria. However, given the debris found in the Layer 1 soils, we anticipate that significant sorting and possibly moisture-conditioning will be required prior to re-use. Such sorting could render it uneconomical to use the material for fill. In any event, representative samples of the fill soils should be collected for classification and compaction testing. The maximum dry density, optimum moisture content, gradation, and plasticity should be determined. These tests are needed for quality control of the compacted fill.

4. Fill soils should be placed with loose lift thicknesses of not more than 12-inches, moisture-conditioned to within two (2) percent of the optimum moisture content based on ASTM D-1557, and compacted to a minimum 95 percent relative compaction[1]. One test should be performed for each 2,500 square feet of fill area per lift of fill soils. If during the compaction process fill shows evidence of yielding under the weight of the roller, it should be removed and replaced with properly compacted granular fill as described herein. Fill particles exceeding one (1) inch in size should not be allowed to nest within the fill.

   The vibrations produced by the operation of the roller/compactor should be monitored for potential adverse effect on adjacent existing structures, pavements, and utilities. If existing footing and nearby structures will be affected by the vibration of the compactor, the compaction procedure may require modification as approved by the geotechnical engineer.

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[1] Relative compaction refers to the in-place dry unit weight of a material expressed as a percentage of the maximum dry unit weight of the same material as determined in the laboratory using the Modified Proctor procedure (ASTM D1557).

7.2 FOUNDATION SUPPORT

7.2.1 One-Story Structure

1. Our recommended pile tip elevations, allowable pile axial capacities, and grout strengths for foundation support are presented in the table below.

TABLE 3 - SUMMARY OF PILE ALLOWABLE AXIAL CAPACITIES

Pile Diameter (in)	Min. Pile Tip Elevation (ft. NGVD)	Allowable Compression (kips)	Allowable Tension (kips)	Allowable Lateral (kips)	Minimum Grout Strength (ksi)
14	-7	70	30	4	5

Notes:

1. *Minimum pile tip length based on an estimated site grade of +11 feet NGVD at the time of the borings.*
2. *Required grout strength is for a 28-day test.*

2. For computer structural modeling of the building, an initial vertical spring constant of 70 kips per inch (kpi) may be used for the 14-inch-diameter piles. The vertical spring constant is the working pile load divided by the estimated pile settlement and is based on our experience and a review of available pile load test data in similar subsurface conditions. The initial spring constant value should be refined as the structural model is developed. The design value used should match the settlement estimates.

3. Resistance to lateral loads can be provided by passive pressure acting on the pile caps and grade beams <u>or</u> the lateral resistance of the piles. Both lateral resistance modes should not be used together, as the larger deflections required to mobilize the passive resistance on foundation elements might not be consistent with those used for the pile lateral capacities presented below. Equivalent fluid densities of 180 and 80 pounds per cubic foot may be used to compute the passive pressures acting against the sides of the pile caps and grade beams above and below the groundwater table respectively. Passive resistance of the upper one foot of soil should be neglected, unless it is confined by a slab or pavement. Frictional resistance between the soil and bottom of footings should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in-situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative compaction, and 2) able to withstand horizontal movement on the order of ¼ to 3/8 inch.

4. Pile reinforcing should be designed by the structural engineer to resist the tension and lateral forces applied to the pile systems. We recommend that piles resisting tension loads be reinforced over their entire length. The reinforcement for piles subjected to lateral loads may be designed based on a maximum unfactored bending moment of 150 in-kips. If the pile is not reinforced over the

entire length, we recommend as a minimum, a single No. 7 bar be installed the full length of the pile to verify pile cross-section continuity.

5. Foundations should be designed so that a minimum center-to-center pile spacing of three pile diameters is maintained.

6. Piles should be installed within three inches of specified plan location, and within two percent of vertical line.

7. During grouting of the pile excavation, the auger should be raised at a rate consistent with the capacity of the pump to ensure the entire pile shaft is uniformly grouted and to prevent caving of soils into the pile excavation. The actual grout volume for each ACIP pile should be at least 15 percent greater than the theoretical pile volume. A grout head of at least five feet should be maintained throughout the grouting of the pile shaft. Production piles should be installed in a manner similar to the successfully tested pile.

8. If during pile grouting any abnormalities such as sudden pressure drop or low grout take for a given interval of pile length are observed, the auger should be re-advanced to about five feet below the elevation where the anomaly was observed and the pile shaft properly re-grouted. Pumping should continue while the auger is rotated back down to the required remedial depth.

9. New piles should not be installed close to previously installed piles before the existing pile grout has started to set. As a guideline, the closest distance for installing adjacent piles within six hours should be the greater of eight feet or three pile diameters.

10. Grout should be sampled during piling installation at a minimum frequency corresponding to the greater of one set of at least six cubes each morning and afternoon during production or one set of at least six cubes for each 50 cubic yards of grout placed. Cubes should be tested for compressive strength at intervals of three, 7, 14, and 28 days. At least two cubes should be tested at 28 days. Any remaining cubes should be retained for subsequent intermediate or 56-day breaks if required.

11. The steel reinforcement should be installed into the pile shaft immediately upon withdrawal of the grouting auger. Spacers should be fitted to the reinforcing cages to assure that they remain centered within the grouted shaft and maintain the required side cover. If obstructions are encountered during insertion of the steel cage, the cage should be extracted, the pile shaft re-drilled to at least five feet below the elevation of the obstruction and re-grouted to the ground surface, and the reinforcement re-installed.

12. An NV5 inspector should provide full-time quality control inspection to document the excavation and grouting of each pile and to provide, in conjunction with a

licensed office engineer, any necessary field adjustments of pile tip elevations.

7.2.2 Bleachers and Miscellaneous Structures

1. After preparing the site as described in Section 7.1 the proposed bleachers and miscellaneous structures may be supported on shallow spread foundations bearing on properly compacted granular fill or the near surface limestone and designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). The bottoms of footings should be embedded at least 18 inches below lowest adjacent grade.

2. To assure an adequate factor-of-safety against a general shearing failure, strip and continuous footings should be at least 16 inches wide, and isolated footings should be no less than 24 inches wide.

3. Lateral forces may be resisted by passive earth pressure acting on the vertical foundation. We recommend using an equivalent fluid weight of 180 pounds per cubic foot (pcf) to compute passive resistance for moist soil above the water table, and 80 pcf to compute passive resistance in submerged soil. Passive resistance in the upper 12 inches of soil should be neglected unless it is confined by a slab or pavement. Frictional resistance between the subgrade and bottom of foundations should be ignored. The above values include a factor of safety of at least 1.5. These values of resistance assume that the foundations are: 1) in-situ soil densified by compaction, or clean sand fill which is compacted to 95 percent relative compaction, and 2) able to withstand horizontal movement on the order of ¼ to 3/8 inch.

4. The bottoms of footing excavations should be compacted to 95 percent relative compaction prior to placement of steel reinforcement and concrete. If the rock formation is exposed at the bottom of the footing, compaction is not necessary.

7.3 PRELIMINARY ASPHALT PAVEMENT THICKNESS DESIGN

7.3.1 Roadway Areas

1. This section presents preliminary recommendations for flexible asphalt pavement thickness design. Final pavement thickness design should be provided by the project civil engineer based on anticipated traffic loadings. Pavements should be designed and constructed in accordance with the current editions of the appropriate Florida Department of Transportation's pavement design manuals.

2. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading*. It is also recommended to strip at least one foot of the surficial material prior to proof-rolling the footprint of the pavement areas. The owner should be aware even after preparation of the site as described under Section 7.1, localized distress in the pavement should be anticipated due to the debris and deleterious materials encountered in the top

nine feet of the borings.

3. We recommend the following preliminary minimum flexible asphalt pavement section:

- 2 inches of S-1 or S-3 surface course
- 8 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FDOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
- 12 inches of stabilized subgrade compacted to at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FDOT) requirements for Type B or Type C Stabilized Subgrade.

Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

To reduce the potential for differential settlement beneath the pavement a geotextile fabric such as Tensar TX-160 can be placed atop the subgrade prior to constructing the pavement section.

7.3.2 Perimeter Walkway Areas

1. As a minimum, flexible pavement subgrade should be prepared as described under Section 7.1, *Site Preparation and Grading*.

2. We recommend the following preliminary minimum flexible asphalt pavement section:

- 1 inch of S-1 or S-3 surface course
- 4 inches of limerock base course compacted to at least 98 percent relative compaction. The limerock base should have a minimum Limerock Bearing Ratio (LBR) of 100 percent. The base course can also be an asphaltic concrete material (FDOT specified ABC-3 or equivalent with a minimum Marshall Stability of 1,000 lbs).
- 8 inches of stabilized subgrade compacted to at least 95 percent relative compaction. The subgrade should have a minimum with a minimum LBR of 40 percent as specified by Florida Department of Transportation (FDOT) requirements for Type B or Type C Stabilized Subgrade.

Limerock or asphaltic concrete should be tested for compliance at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

7.4 GROUND FLOOR SLABS

1. Ground floor slabs may be supported on grade assuming the site is prepared as recommended in Section 7.1 above. However the Owner must accept the risk for potential cracking associated with settlement of the uncontrolled fill at the site. IF such risk is not acceptable, slabs should be structurall supported.

2. Slabs on grade may be designed using a modulus of subgrade reaction of 150 pounds per cubic inch (pci).

3. Slabs should be reinforced for the loads that they will sustain and construction joints should be provided at frequent intervals.

4. Slabs in contact with soil are subject to movement of moisture from the soil upward through the slab. To prevent such moisture vapor transmission, a moisture barrier should be placed on the slab subgrade, and should be protected from damage during construction. Construction joints should be provided with water stops in any permanently submerged areas.

7.5 EXCAVATION AND DEWATERING

1. Shallow excavations into the near-surface materials will likely stand vertical for short periods of time only. The excavation sides will unravel over time as they are exposed to weather and construction traffic. In general, the Layer 2 limestone is expected to stand vertically unsupported if excavated. However localized weaker sandy zones within this layer could become loose if unsupported. Deeper excavations, especially those that extend below the groundwater table, as well as excavations that will remain open for longer periods of time will require support in the form of temporary shoring or sliding trench boxes to prevent instability of excavation walls and to protect workers from injury. All excavations should comply with Occupational Safety and Health Administration (OSHA) design and safety requirements. Shoring designs should be signed and sealed by a Florida-licensed professional engineer, and should be provided for the Owner's review.

2. Particular attention should be paid to any deep excavations and the potential impacts these could have on adjacent structures, especially where such excavations are close to project property lines.

3. Average groundwater elevation is expected to be between about Elevation +0 and +4 feet NGVD for this site. Excavation is unlikely to encounter groundwater. If needed, we judge that localized dewatering if required can be accomplished using pumps and sumps. Dewatering of larger excavations and larger volumes could require the installation of well points or other dewatering systems.

   It should be noted there are two components to the dewatering process. The first is extracting the water from the subsurface and the requirement of the project to maintain a dry excavation to allow construction to proceed. The other component is the ability to discharge the volume of water extracted. The contractor must ensure this capability exists for the site such that all dewatering and consequent effluent discharge will meet the requirements of the local jurisdictional agencies including Miami-Dade County, Florida Department of Environmental Protection (FDEP), Florida Department of Transportation, and South Florida Water Management District (SFWMD) as appropriate. This study did not include specific testing or analysis to determine if dewatering is feasible or if adequate discharge is available. This is the responsibility of the subcontractor.

During dewatering the adjacent properties must be monitored for adverse impacts from dewatering drawdown. The potential for adverse impacts from dewatering is especially heightened where the peaty layer exists. Drawdown of the water table above or within the peaty layer can result in consolidation of this material.

The dewatering subcontractor should submit a proposed design for dewatering operations to the owner for review and approval prior to commencing work.

7.6 OTHER RECOMMENDATIONS

1. With new construction there is always a risk of adversely impacting adjacent structures and utilities. We recommend that pre- and post-construction surveys of adjacent structures and utilities of concern be conducted to document conditions.

2. NV5 should participate in the design development phases of this project in order to modify the recommendations provided above as changes occur during the design development process.

3. NV5 should participate in the evaluation of field problems as they arise and recommend solutions. We should also be involved with site work activities so we can address needed changes to the foundation recommendations if site conditions different from those described herein are encountered.

4. NV5 should observe the foundation installation to satisfy the requirements of the Florida Building Code and municipal agencies.

8.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of the Owner and other members of the design/construction team for the specific projects discussed in this report. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation and recommendations submitted in this report are based in part upon the data collected from the field exploration. The nature or extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to evaluate our recommendations as provided in this report. In the event changes are made in the nature, design or locations of the proposed project construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by NV5.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, sinkholes, chemically hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

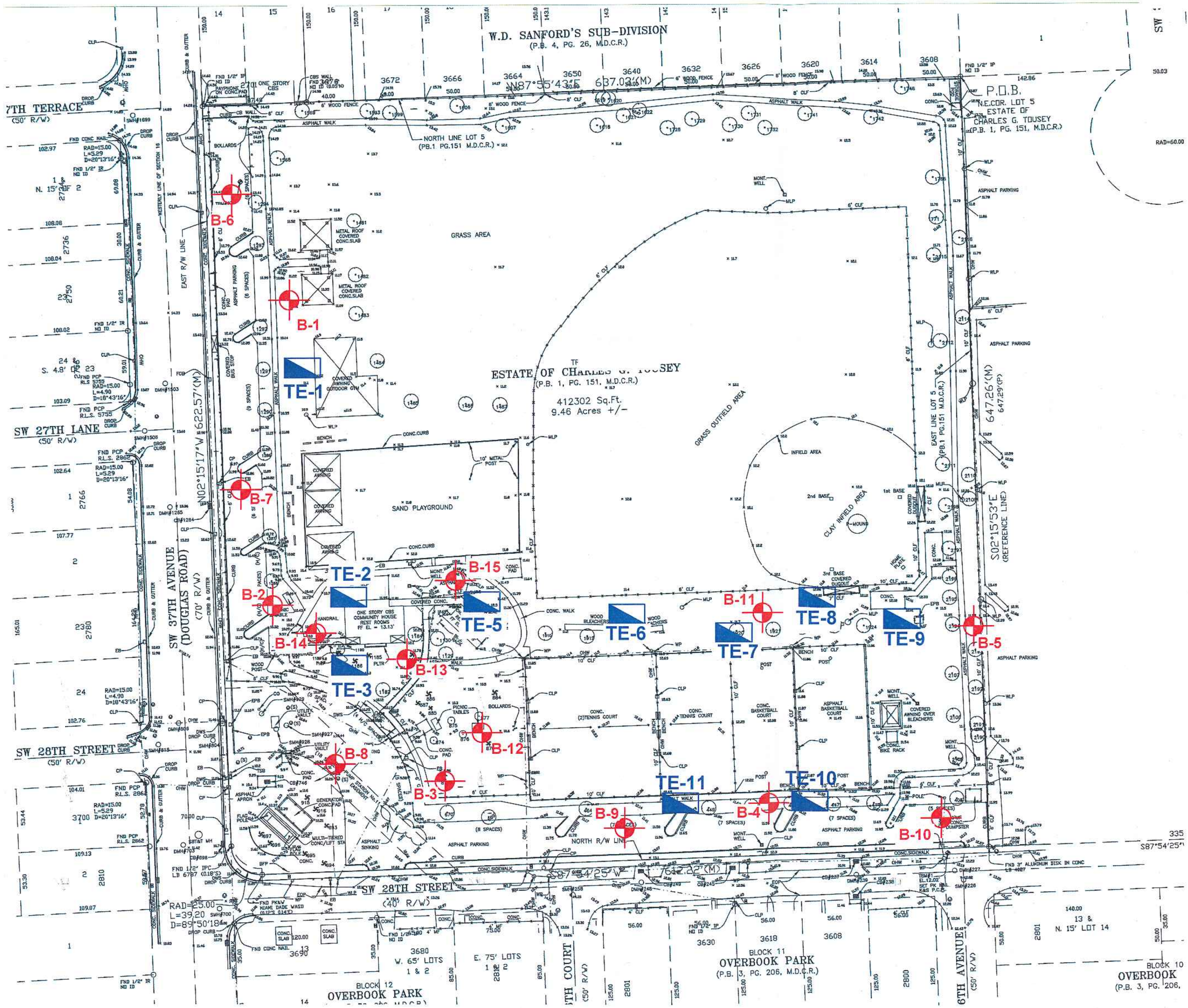
<u>We should be provided the opportunity to review final foundation specifications and review foundation design drawings, in order to ascertain whether our recommendations have been properly interpreted and implemented</u>. If NV5. is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report, we can accept no responsibility for the interpretation of our recommendations made in this report or for foundation performance.

9.0 CLOSURE

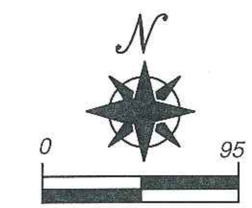
We appreciate the opportunity to provide specialized engineering services on this project and look forward to an opportunity to participate in construction related aspects of the development. If you have questions about information contained in this report contact the writer at 305.901-1921.

****

DRAWINGS



Site Vicinity Map



Approximate Scale in Feet

LEGEND:

B-1 - Soil Boring Test Location

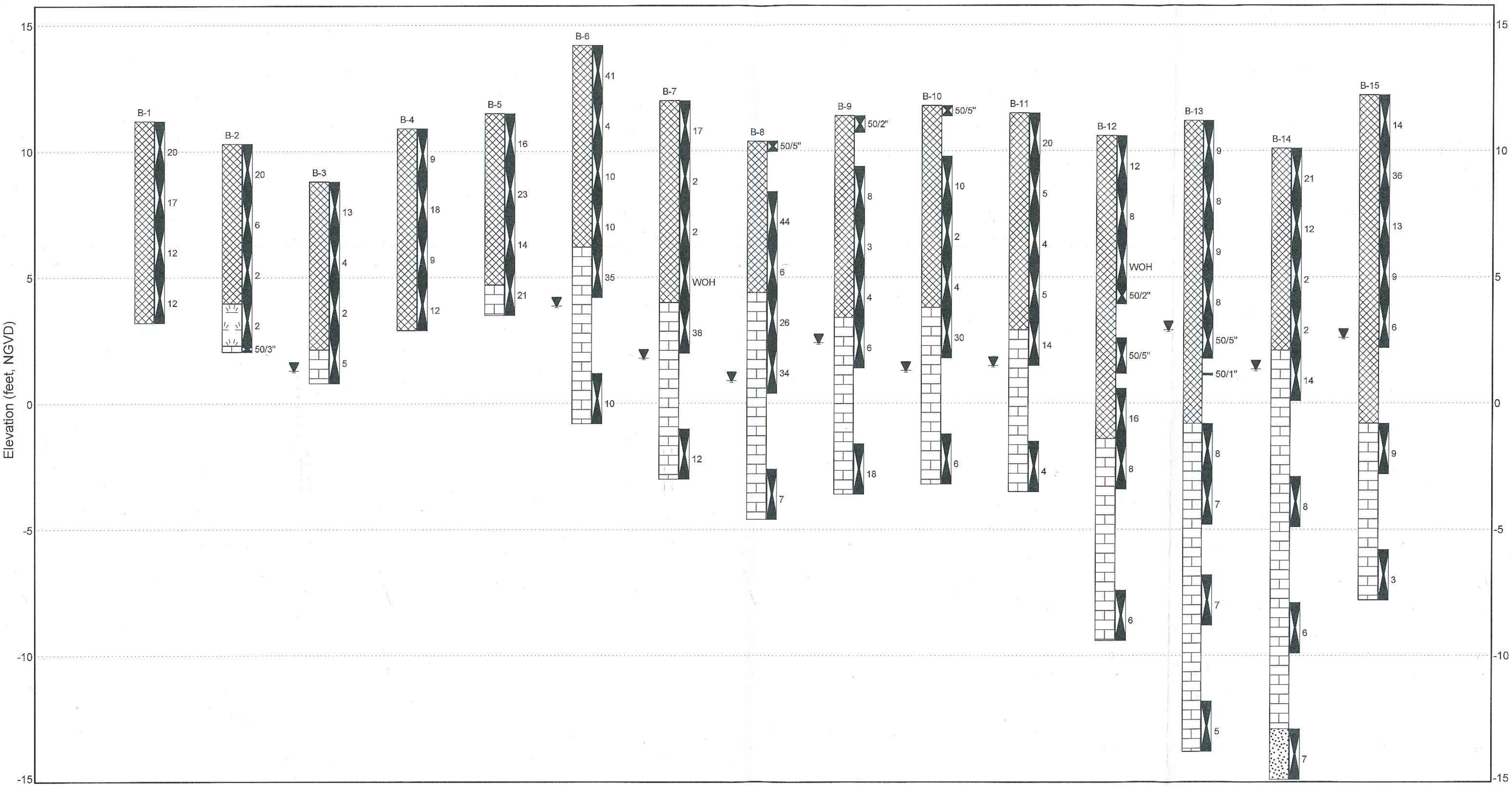
TE-1 - Test Excavation Location

NOTES:

1. Test locations shown are approximate.
2. Test location symbols are not to scale.
3. Base for this drawing was taken from Sheet No. 2, Boundary and Topographic Survey Douglas Park, prepared by Keith and Schnars, P.A., dated 03/20/2015.

NV5

DRAWING TITLE: *Site Vicinity Map & Test Location Plan*			DWN BY: RS
PROJECT NAME: *Douglas Park Improvements*			CKD BY: GLW
PROJECT LOCATION: *2795 SW 37th Avenue, Miami, Florida*	PROJECT NO: 14774	DATE: 12/17/15	DWG NO: 1	APD BY



GENERALIZED SUBSURFACE PROFILE

N|V|5

PROJECT NAME: Douglas Park Improvements

PROJECT LOCATION: 2795 SW 37th Avenue, Miami, Florida

PROJECT NUMBER: 14774

DATE: 12/17/15

DRAWN BY: RS

CHECKED BY: GLW

DRAWING NO: 2

LEGEND

- Fill
- Peat
- Limestone
- Sand
- Standard Penetration Test
- Water Level

APPENDIX A

BORING LOG DATA

BORING NUMBER B-1

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 11.2 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUND WATER LEVELS: --- Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	SPT	2-9-11-20 (20)	SP		SAND, medium dense, dark brown with trace of glass and vegetation (FILL)	10
	SPT	16-10-7-7 (17)			SAND, medium dense, brown with trace of limestone fragments (FILL)	
5	SPT	7-9-3-8 (12)			SAND, medium dense, brown with trace of limestone fragments (FILL)	5
	SPT	6-4-8-8 (12)			SAND, medium dense, brown with trace of limestone fragments and wood (FILL)	

Boring terminated at 8.0 feet.

BORING NUMBER B-2

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 **COMPLETED** 6/27/15 **GROUND ELEVATION** 10.3 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** --- Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0			SP		SAND, medium dense, black with vegetation (FILL)	10
	SPT	6-10-10-17 (20)			SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	7-3-3-5 (6)			SAND, loose, brown with trace of limestone fragments (FILL)	
5	SPT	1-1-1-1 (2)			SAND, very loose, brown with trace of limestone fragments (FILL)	5
				6.3	SAND, very loose, brown (FILL)	4.0
	SPT	1-1-1-2 (2)	PT		PEAT, very soft, black (POSSIBLE FILL)	
				8.0		2.3
	SPT	50/3" (100)	LS	8.3	LIMESTONE, moderately hard, tan with some sand	2.1

Boring terminated at 8.0 feet.

BORING NUMBER B-3

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 **COMPLETED** 6/27/15 **GROUND ELEVATION** 8.8 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 7.5 ft / Elev 1.3 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	4-7-6-4 (13)	SP		SAND, medium dense, dark brown with vegetation and trace of limestone fragments (FILL) SAND, medium dense, brown with trace of limestone fragments (FILL)	
	SPT	2-2-2-1 (4)	SP		SAND, very loose, brown with trace of glass and wood (FILL)	5
5	SPT	2-1-1-2 (2)	SP		SAND, very loose, brown with trace of glass and wood (FILL)	
	SPT	2-1-4-6 (5)	SP	6.7	SAND, loose, dark brown with trace of glass (FILL)	2.1
			LS	8.0	▼ LIMESTONE, very soft, tan	0.8

Boring terminated at 8.0 feet.

NV5

BORING NUMBER B-4

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 10.9 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUND WATER LEVELS: --- Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	SPT	3-4-5-11 (9)	SP		SAND, loose, dark brown with organics (FILL)	10
	SPT	13-9-9-11 (18)	SP		SAND, medium dense, brown (FILL)	
5	SPT	4-6-3-5 (9)	SP		SAND, loose, with trace of limestone (FILL)	5
	SPT	3-2-10-39 (12)	SP	8.0	SAND, medium dense, dark brown with some wood (FILL)	2.9

Boring terminated at 8.0 feet.

BORING NUMBER B-5

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 **COMPLETED** 6/27/15 **GROUND ELEVATION** 11.5 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** --- Not Encountered

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	6-6-10-12 (16)	SP		SAND, medium dense, brown with limestone fragments (FILL)	10
	SPT	12-12-11-9 (23)	SP		SAND, medium dense, brown with brick (FILL)	
5	SPT	10-8-6-8 (14)	SP		SAND, medium dense, brown with limestone fragments and brick (FILL)	5
	SPT	9-11-10-7 (21)	SP	6.8	SAND, medium dense, brown with limestone fragments and brick (FILL)	4.7
			LS	8.0	LIMESTONE, soft, tan with sand	3.5

Boring terminated at 8.0 feet.

BORING NUMBER B-6

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/26/15 **COMPLETED** 6/26/15 **GROUND ELEVATION** 14.2 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 10.3 ft / Elev 3.9 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	39-30-11-10 (41)	SP		SAND, dense, brown with some limestone fragments and trace of brick (FILL)	
	SPT	4-2-2-2 (4)	SP		SAND, very loose, brown with trace of limestone fragments (FILL)	10
5	SPT	4-4-6-9 (10)	SP		SAND, loose, tan with some limestone fragments (FILL)	
	SPT	6-5-5-8 (10)	SP	8.0	SAND, loose, tan with some limestone fragments (FILL)	6.2
10	SPT	13-23-12-15 (35)	LS		LIMESTONE, medium hard, tan with some sand (▼ ground water level)	5
15	SPT	9-6-4-8 (10)	LS	15.0	LIMESTONE, very soft, tan	0 / -0.8

Boring terminated at 15.0 feet.

N|V|5

BORING NUMBER B-7

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/26/15 **COMPLETED** 6/26/15 **GROUND ELEVATION** 12 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 10.2 ft / Elev 1.8 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	SPT	10-9-8-5 (17)	SP		SAND, medium dense, dark brown with limestone fragments (FILL)	10
	SPT	2-1-1-1 (2)			SAND, very loose, dark brown (FILL)	
5	SPT	1-1-1-1 (2)			SAND, very loose, brown with trace of wood (FILL)	
	SPT	1-WOH-WOH-2 (WOH)		8.0	SAND, very loose, black with trace of limestone fragments (FILL)	5 4.0
10	SPT	7-14-24-21 (38)	LS		LIMESTONE, medium hard, tan with some sand	
					▼	0
15	SPT	14-5-7-7 (12)		15.0	LIMESTONE, very soft, tan	-3.0

Boring terminated at 15.0 feet.

BORING NUMBER B-8

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/27/15 COMPLETED 6/27/15 GROUND ELEVATION 10.4 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUND WATER LEVELS: 9.5 ft / Elev 0.9 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	50/5" (100)	SP		SAND, very dense, tan with trace of limestone fragments (FILL)	10
	SPT	49-24-20-7 (44)			SAND, dense, dark brown to tan (FILL)	
5	SPT	3-3-3-2 (6)			SAND, loose, tan (FILL)	5
	SPT	3-14-12-38 (26)	LS		LIMESTONE, soft, tan with sand	
10	SPT	15-16-18-24 (34)			▼ LIMESTONE, medium hard, tan	0
15	SPT	5-4-3-7 (7)		15.0	LIMESTONE, very soft, tan	-4.6

Boring terminated at 15.0 feet.

NV5

BORING NUMBER B-9

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/26/15 **COMPLETED** 6/26/15 **GROUND ELEVATION** 11.4 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 9.0 ft / Elev 2.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	45-50/2" (100)	SP		SAND, very dense, tan with limestone fragments (FILL)	10
	SPT	14-4-4-4 (8)	SP		SAND, loose, brown with trace of limestone fragments (FILL)	
5	SPT	1-2-1-3 (3)	SP		SAND, very loose, brown with trace of limestone fragments (FILL)	5
	SPT	1-1-3-3 (4)	SP	8.0	SAND, very loose, brown with trace of limestone fragments (FILL)	3.4
10	SPT	6-3-3-3 (6)	LS		▼ LIMESTONE, very soft, tan	0
15	SPT	8-7-11-10 (18)	LS	15.0	LIMESTONE, very soft, tan	-3.6

Boring terminated at 15.0 feet.

BORING NUMBER B-10

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/26/15 **COMPLETED** 6/26/15 **GROUND ELEVATION** 11.8 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 10.5 ft / Elev 1.3 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	50/5" (100)	SP		SAND, very dense, tan with limestone fragments (FILL)	10
	SPT	22-7-3-2 (10)			SAND, loose, brown with trace of limestone fragments (FILL)	
5	SPT	3-1-1-1 (2)			SAND, very loose, dark brown with trace of limestone fragments (FILL)	
	SPT	2-2-2-2 (4)		8.0	SAND, very loose, dark brown with trace of limestone fragments (FILL)	5 / 3.8
10	SPT	3-13-17-12 (30)	LS		LIMESTONE, very soft, tan	
					▼ (ground water level)	0
15	SPT	5-4-2-3 (6)		15.0	LIMESTONE, very soft, tan	-3.2

Boring terminated at 15.0 feet.

NV5

BORING NUMBER B-11

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 6/26/15 COMPLETED 6/26/15 GROUND ELEVATION 11.5 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUND WATER LEVELS: 10.0 ft / Elev 1.5 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY S. Becca

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	SPT	10-11-9-9 (20)	SP		SAND, medium dense, dark brown (FILL)	10
	SPT	4-3-2-4 (5)	SP		SAND, loose, dark brown with trace of limestone fragments (FILL)	
5	SPT	3-2-2-3 (4)	SP		SAND, very loose, black with trace of glass (FILL)	
	SPT	4-3-2-3 (5)	SP		SAND, loose, brown with trace of rock, glass (FILL)	5
8.6	SPT	14-10-4-4 (14)	SP		SAND, brown with trace of limestone fragments (FILL)	2.9
10			LS		LIMESTONE, very soft, tan with some sand (▼ ground water)	
			LS			0
15.0	SPT	5-2-2-1 (4)	LS		LIMESTONE, very soft, tan	-3.5

Boring terminated at 15.0 feet.

NV5

BORING NUMBER B-12

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 PROJECT LOCATION 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 11/25/15 COMPLETED 11/25/15 GROUND ELEVATION 10.6 ft HOLE SIZE 3 inches

DRILLING CONTRACTOR NV5 GROUND WATER LEVELS: ---

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa CHECKED BY A.Sarsour

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	1-6-6-10 (12)	SP		SAND, medium dense, brown with topsoil and trace of roots and limestone fragments (FILL)	10
	SPT	9-5-3-2 (8)	SP		SAND, loose, dark brown with light gray concrete rubble (FILL)	
5	SPT	WOH-WOH-WOH-1 (WOH)	SP		SAND, very loose, brown with pieces of wood (FILL)	5
	SPT	1-50/2" (100)	SP			
			SP		SAND, dense, brown with pieces of wood (FILL)	
	SPT	30-34-50/5" (100)	SP		SAND, dense, brown with pieces of wood (FILL)	
10	SPT	4-8-8-10 (16)	SP		SAND, medium dense, brown with wood (FILL)	0
				12.0		-1.4
	SPT	11-4-4-4 (8)	LS		LIMESTONE, very soft, tan	
15			LS			-5
	SPT	3-3-3-5 (6)	LS		LIMESTONE, very soft, tan	
20				20.0		-9.4

Boring terminated at 20.0 feet.

BORING NUMBER B-13

NV5

PROJECT NAME Douglas Park Improvements
PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida
DATE STARTED 11/25/15 **COMPLETED** 11/25/15 **GROUND ELEVATION** 11.2 ft **HOLE SIZE** 3 inches
DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 8.3 ft / Elev 2.9 ft
DRILLING METHOD Rotary drill with wash, mud & casing
LOGGED BY D. Correa **CHECKED BY** A.Sarsour
NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0	SPT	1-5-4-3 (9)	SP		SAND, loose, brown with top soils and a trace of limestone fragments (FILL)	10
	SPT	2-3-5-9 (8)			SAND, loose, gray to brown with trace of limestone fragments (FILL)	
5	SPT	3-5-4-5 (9)			SAND, loose, brown with limestone fragments (FILL)	5
	SPT	2-4-4-5 (8)			SAND, loose, brown with pieces of wood (FILL)	
	SPT	5-14-50/5" (100)			▼ SAND, dense, brown with wood and trace of limestone fragments (FILL)	
10	SPT	50/1" (100)		12.0	SAND, dense, brown wood with limestone fragments (FILL)	0 / -0.8
	SPT	8-5-3-4 (8)	LS		LIMESTONE, very soft, tan	
15	SPT	5-4-3-2 (7)			LIMESTONE, very soft, tan	-5
20	SPT	5-4-3-3 (7)			LIMESTONE, very soft, tan	-10
25	SPT	3-3-2-3 (5)		25.0	LIMESTONE, very soft, tan	-13.8

Boring terminated at 25.0 feet.

BORING NUMBER B-14

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 11/25/15 **COMPLETED** 11/25/15 **GROUND ELEVATION** 10.1 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 8.8 ft / Elev 1.4 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** A.Sarsour

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						10
	SPT	2-10-11-11 (21)	SP		SAND, medium dense, dark gray with trace of limestone fragments, topsoil, and roots (FILL)	
	SPT	7-7-5-4 (12)	SP		SAND, medium dense, gray with limestone fragments (FILL)	
5	SPT	1-1-1-1 (2)	SP		SAND, very loose, gray with limestone fragments (FILL)	5
	SPT	WOH-1-1-13 (2)	SP		SAND, very loose, brown with limestone fragments and wood (FILL)	
8.0						2.1
	SPT	12-7-7-15 (14)	LS		LIMESTONE, very soft, tan with trace of sand	
10						0
15	SPT	10-5-3-2 (8)	LS		LIMESTONE, very soft, tan	-5
20	SPT	8-3-3-4 (6)	LS		LIMESTONE, very soft, tan	-10
23.0						-12.9
25	SPT	8-5-2-3 (7)	SP		SAND, loose, tan	-14.9
25.0						

Boring terminated at 25.0 feet.

BORING NUMBER B-15

NV5

PROJECT NAME Douglas Park Improvements

PROJECT NUMBER 14774 **PROJECT LOCATION** 2795 SW 37th Avenue, Miami, Florida

DATE STARTED 11/25/15 **COMPLETED** 11/25/15 **GROUND ELEVATION** 12.2 ft **HOLE SIZE** 3 inches

DRILLING CONTRACTOR NV5 **GROUND WATER LEVELS:** 9.6 ft / Elev 2.6 ft

DRILLING METHOD Rotary drill with wash, mud & casing

LOGGED BY D. Correa **CHECKED BY** A.Sarsour

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (ft., NGVD)
0						
	SPT	5-7-7-9 (14)	SP		SAND, medium dense, brown with top soil and a trace of limestone fragments (FILL)	10
	SPT	14-16-20-13 (36)	SP		SAND, dense, brown with trace of limestone fragments and concrete rubble (FILL)	
5	SPT	11-6-7-10 (13)	SP		SAND, medium dense, brown with concrete rubble (FILL)	
	SPT	7-5-4-5 (9)	SP		SAND, loose, gray with limestone fragments and trace of wood (FILL)	5
10	SPT	4-3-3-5 (6)	SP		▼ SAND, loose, dark gray trace of peat and wood (FILL)	0
				13.0		-0.8
15	SPT	7-5-4-7 (9)	LS		LIMESTONE, very soft, tan	-5
20	SPT	3-2-1-2 (3)	LS	20.0	LIMESTONE, very soft, tan	-7.8

Boring terminated at 20.0 feet.

KEY TO SYMBOLS

Symbol Description

Strata symbols

	Fill		Concrete
	Silty sand		Asphalt
	Limestone		Sandstone
	Sand		
	Peat		

Misc. Symbols

	Groundwater level measured at boring completion. The date checked is indicated.	WOH	Weight of Hammer
	Boring continues		
	End of Boring		

Soil Samplers

	Standard penetration test. 140 lb. hammer dropped 30"

Notes:

1. Exploratory borings were drilled between 06/26/2015 and 11/25/2015 using a 3-inch diameter rotary drill with mud, wash & casing.

2. Groundwater was encountered at depths ranging from 7.5 to 10.5 feet below grade upon boring completion.

3. Boring locations were taped from existing features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified in the field by offsetting from existing reference marks and using a cloth tape and survey wheel.

3. The borehole was backfilled to site grade following boring completion, and patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions and recommendations presented in the report text.

6. "Field Test Data" shown on the Record of Test Boring indicated as 11/6 refers to the Standard Penetration Test (SPT) and means 11 hammer blows drove the sampler 6 inches. SPT uses a 140-pound hammer falling 30 inches.

7. The N-value from the SPT is the sum of the hammer blows required to drive the sampler the second and third 6-inch increments.

8. The soil/rock strata interfaces shown on the Record of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Record of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

9. Relative density for sands/gravels and consistency for silts/clays and limestone are described as follows:

SPT Blows/ Foot	Sands/Gravels Relative Density	SPT Blows/Foot	Silt/Clay Relative Consistency	SPT Blows/ Foot	Limestone Relative Consistency
0-4	Very loose	0-2	Very Soft	0-20	Very Soft
5-10	Loose	3-4	Soft	21-30	Soft
11-30	Medium Dense	5-8	Firm	31-45	Medium Hard
31-50	Dense	9-15	Stiff	46-60	Moderately Hard
Over 50	Very Dense	16-30	Very Stiff	61-50/2"	Hard
		Over 30	Hard	Over 50/2"	Very Hard

10. Grain size descriptions are as follows:

NAME	SIZE LIMITS
Boulder	12 inches or more
Cobbles	3 to 12 inches
Coarse Gravel	3/4 to 3 inches
Fine Gravel	No. 4 sieve to 3/4 inch
Coarse Sand	No. 10 to No. 4 sieve
Medium Sand	No. 40 to No. 10 sieve
Fine Sand	No. 200 to No. 40 sieve
Fines	Smaller than No. 200 sieve

11. Definitions related to adjectives used in soil/rock descriptions:

PROPORTION	ADJECTIVE
About 10%	with a trace
About 25%	with some
About 50%	and

APPROXIMATE ROOT DIAMETER	ADJECTIVE
Less than 1/32"	Fine roots
1/32" to 1/4"	Small roots
1/4" to 1"	Medium roots
Greater than 1"	Large roots

APPENDIX B

TEST EXCAVATION LOGS

NV5

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-1**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	10.6
DEPTH TO GROUNDWATER, FEET:	8.0
TERMINATION DEPTH, FEET:	8.0
DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat and some roots. (Top 1" Grass) - FILL
2.0 – 4.0	Brown SAND with Limestone Fragments - FILL
4.0 – 8.0	Dark Brown Sand & Debris (Wood, glass, tires & concrete fragments) - FILL

TEST EXCAVATION NUMBER:	**TE-2**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G.Curioni
SURFACE ELEVATION, FEET NGVD:	10.7
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0
DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat and Roots. (Top 1" Grass) - FILL
2.0 – 3.0	Grey Sand - FILL
3.0 – 9.0	Dark Gray Sand with traces of Limestone fragments & Debris (Wood, glass and concrete fragments) - FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-3**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.8
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Soil with traces of Peat and some roots (Top 1" Grass) - FILL
2.0 – 4.0	Brown SAND with Limestone Fragments - FILL
4.0 – 9.0	Dark Brown Sand with Debris (wood, plastic & concrete fragments) - FILL

TEST EXCAVATION NUMBER:	**TE-4**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	9.9
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand & roots (Top 1" Grass) – FILL
2.0 – 5.0	Dark Brown Sand & Debris (Wood, cans and glass) – FILL
5.0 – 9.0	Tan Sand with Limestone Fragments – FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-5**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0
DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown to Gray Sand with traces of Peat and roots (Top 1" Grass) - FILL
2.0 – 4.0	Grey SAND – FILL
4.0 – 6.0	Tan Sand with Limestone Fragments – FILL
6.0 – 10.0	Dark Brown Sand with Debris (Concrete Fragments) – FILL

TEST EXCAVATION NUMBER:	**TE-6**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G Curioni
SURFACE ELEVATION, FEET NGVD:	11.2
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0
DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand & roots (Top 1" Grass) – FILL
2.0 – 4.0	Brown Sand with Limestone Fragments – FILL
4.0 – 9.0	Dark Brown Sand with Debris (Plastic, Wood and Metal) – FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-7**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.7
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 1.0	Dark Brown Sand with traces of Peat. (Top 1" Grass) - FILL
1.0 – 3.0	Brown Sand with brick fragments – FILL
3.0 – 5.0	Grey Sand with Limestone fragments - FILL
5.0 – 10.0	Dar Brown Sand with debris (Wood, and concrete fragments) - FILL

TEST EXCAVATION NUMBER:	**TE-8**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.3
DEPTH TO GROUNDWATER, FEET:	10.5
TERMINATION DEPTH, FEET:	10.5

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with roots (Top 1" Grass) - FILL
2.0 – 3.0	TAN SAND with Limestone Fragments - FILL
3.0 – 4.0	Dark Brown Sand with trace of peat, wood & glass fragments. - FILL
4.0 – 10.5	Brown Sand with traces of limestone fragments. - FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-9**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.9
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 2.0	Dark Brown Sand with traces of Peat. (Top 1" Grass) – FILL
2.0 – 5.0	Brown Sand with roots and Limestone Fragments. – FILL
5.0 – 10.0	Dark Brown Sand with concrete fragments - FILL

TEST EXCAVATION NUMBER:	**TE-10**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	10.8
DEPTH TO GROUNDWATER, FEET:	10.0
TERMINATION DEPTH, FEET:	10.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 1.0	Dark Brown Sand and roots. (Top 1" Grass) - FILL
1.0 – 3.0	Brown Sand with Limestone fragments – FILL
3.0 – 4.0	Dark Brown Sand - FILL
4.0 – 8.0	Grey Sand – FILL
8.0 – 10.0	Dark Sand with Limestone fragments, wood and glass - FILL

RECORD OF TEST EXCAVATION
Douglas Park Improvements
NV5 PROJECT NO. 14774

TEST EXCAVATION NUMBER:	**TE-11**
DATE OF EXCAVATION:	November 25, 2015
OBSERVED BY:	G. Curioni
SURFACE ELEVATION, FEET NGVD:	11.35
DEPTH TO GROUNDWATER, FEET:	9.0
TERMINATION DEPTH, FEET:	9.0

DEPTH BELOW GROUND SURFACE, FEET	SOIL/ROCK DESCRIPTION
0.0 – 1.0	Light tan to Gray Sand with roots (Top 1" Grass) - FILL
1.0 – 4.0	Tan Sand – FILL
4.0 – 9.0	Dark Brown sand with Limestone Fragments and wood. - FILL