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July 26, 2011

Mr. Nick Eller
Novant Health
2085 Frontis Plaza Boulevard
Winston-Salem, North Carolina 27103

ECS Project No. 09.17113-C

Reference: Report of Subsurface Exploration and Geotechnical Engineering Analysis
Novant – Clemmons Phase 3 Headwalls and Biocell
Clemmons, North Carolina

Dear Mr. Eller:

ECS Carolinas, LLP (ECS) has completed a subsurface exploration for the subject site as authorized by acceptance of our Proposal No. 09.17849-P dated June 13, 2011. The purposes of this exploration were to explore the subsurface conditions at the site and to develop geotechnical recommendations to guide design and construction of the project. This report presents our evaluations and recommendations, the results of our exploration, our scope of work, and our understanding of the project information.

This report is provided for the use of Novant Health. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written permission of ECS. The unauthorized use of this report by any undesignated third party or parties will be at such party's sole risk and ECS disclaims liability for any such unauthorized third party use or reliance.

ECS appreciates the opportunity to provide our professional services during this phase of your project. Please contact us if you have questions concerning the following report.

Respectfully,

ECS CAROLINAS, LLP

David M. LeGrand Jr., E.I.
Project Manager

Reviewed by: Russell A. Bendel, P.E.
Principal Engineer
Licensed NC 024430

NORTH CAROLINA PROFESSIONAL SEAL 024430 ENGINEER RUSSELL A. BENDEL 7/26/11

Attachments

cc: Kelway A. Howard, P.E., Stimmel Associates, P.A.

REPORT SUMMARY

We request you read the entire contents of this report. Recommendations and clarifications are contained in the body that are not in the report summary.

Project Information

The site is an approximate 124 acre tract located on Harper Road in Clemmons, North Carolina. The site is being evaluated for further development of Village Point Phase 3 Infrastructure. A road that will provide access to the development will be required. The road will cross tributaries to Johnson Creek. ECS previously delineated wetlands on a portion of the site (ECS Project 09-15128). ECS also obtained a Nationwide Permit 3 for impacts associated with maintenance of the Reynolds Pond dam. Other permits may have been issued for the site.

We understand that a set of headwalls will be necessary on the northern and southern sides of the planned roadway for a creek crossing. We also understand that one stormwater biocell will be constructed adjacent the southern headwall.

Project information was obtained from Kelway A. Howard, P.E. with Stimmel Associates, P.A.. We have received a copy of the site plan that illustrates the tracts of property, current topographic contours, planned roadways, property boundaries, and soil boring locations.

Subsurface Conditions

The borings encountered 3 to 6 inches of topsoil. Below the topsoil, the borings encountered possible alluvial soils, undisturbed residual soils, and partially weathered rock materials. Hard, unweathered rock was encountered in five of the eight borings. The encountered conditions are summarized on the Generalized Subsurface Profile in Appendix E. Additional information is provided on the soil boring logs in Appendix E.

Possible alluvial soil consisting of fine to medium sandy silt was encountered in boring B-26 to a depth of approximately 6 feet below existing ground surface. Standard Penetration Test values within the alluvium ranged from 10 to 13 blows per foot.

The undisturbed residual soils encountered beneath the alluvial soils and beneath the topsoil in the remaining borings generally consisted of silty fine to coarse sands, fine to medium sandy silts, and clayey silts. The residual soils had SPT resistance values ranging from 6 to 77 blows per foot.

Partially weathered rock was encountered in four of the eight borings. Partially weathered rock was encountered at depths ranging from approximately 3.5 to 19.5 feet below existing site grades in borings B-21, B-22, B-23, and B-25. In borings B-21, B-22 and B-25, lenses of partially weathered rock materials were encountered between 3.5 and 6.0 feet below existing site grades. Hard, unweathered rock was encountered in five of the eight borings at depths ranging from 6 to 19.5 feet below ground surface.

Recommendation Summary

- Partially weathered rock was encountered at depths ranging from approximately 3.5 to 19.5 feet below existing site grades in borings B-21, B-22, B-23, and B-25. Hard, unweathered rock was encountered in five of the eight borings at depths ranging from 6 to 19.5 feet below ground surface.

- In our opinion, groundwater was at a depth of 3 to 9.5 feet below grade (approximate elevations ranging from 770 to 775 feet) at the time of the exploration. Groundwater was encountered in all borings except borings B-27 and B-28. Temporary groundwater control is expected to be necessary for this project based on the proximity to the identified wetlands.

- Possible alluvial soils encountered in boring B-26 may require localized undercutting to a depth of 6 feet below existing site grades. Some settlement should be anticipated in the area where the pipe is placed due to the proximity to the existing wetlands. The settlement can be minimized by undercutting soils within 3 feet of the outside edges of the pipe.

- The proposed headwalls can be supported on shallow foundations bearing on undisturbed residual soils and/or partially weathered rock materials and the backfill placed in the undercut areas around boring B-26. Shallow foundations should be designed for an allowable net bearing pressure of up to 3,000 pounds per square foot.

DESIGN RECOMMENDATIONS

Foundation Conditions and Settlement

Based on the proposed configuration of the creek crossing and the existing soil conditions at the site, we do not anticipate considerable settlement would occur. Some settlement should be anticipated in the area where the pipe is placed due to the proximity to the existing wetlands. The settlement can be minimized by undercutting soils within 3 feet of the outside edges of the pipe. The project geotechnical engineer should be on-site to provide guidance in the actual undercut needed during construction. The undercut area will likely extend below the existing groundwater table, making it necessary for the contractor to continuously pump water from the undercut excavations until they are backfilled. We recommend backfilling undercut areas with an 8 oz. per square yard non-woven geotextile filter fabric wrapped around surge stone and/or washed stone.

SITE CONSTRUCTION AND EARTHWORK

Subgrade Preparation and Earthwork Operations.

Site preparation should begin with stripping all vegetation, root-zone, and all other soft or unsuitable material. We anticipate a stripping depth of at least 6 inches based on the borings, however deeper stripping depths are typically required in wooded areas. During the wet seasons stripping may be deeper due to saturated soils on the surface.

We do not anticipate widespread undercutting of the soils encountered in the areas of the borings conducted for the proposed headwall locations (B-21 through B-26), although the possible alluvial soils encountered in boring B-26 may require localized undercutting to a depth of 6 feet below existing site grades. The undercut areas should be backfilled with an 8 oz. per square yard, non-woven geotextile placed to encapsulate surge stone and/or washed stone (including the top of the stone).

Site soils, except for wet alluvial soils, can be used as controlled fill. If earthwork is performed during winter or after appreciable rainfall then subgrades may be unstable due to wet soil conditions, which could increase the amount of undercutting or stabilization required.

When dry, the majority of the site soil should provide adequate subgrade support for fill placement and construction operations. When wet, the soil may degrade quickly with disturbance from construction traffic. Good site drainage should be maintained during earthwork operations to prevent ponding water on exposed subgrades.

Excavation Conditions

Some undercut of soft or wet soils will likely be necessary along the planned pipe location. The project geotechnical engineer should be on-site to provide guidance in the actual undercut needed during construction.

Partially weathered rock and auger refusal materials were encountered in the borings. Partially weathered rock was encountered at depths ranging from approximately 3.5 to 19.5

feet below existing site grades in borings B-21, B-22, B-23, and B-25. In borings B-21, B-22 and B-25 lenses of partially weathered rock materials were encountered between 3.5 and 6.0 feet below existing site grades. It should be possible to excavate soils above partially weathered rock using conventional equipment (scrapers, loaders and bulldozers).

Partially weathered rock with SPT values of 50/6" to 50/3" can often be excavated from open-cut excavations by ripping with a Caterpillar D-8 bulldozer equipped with a single tooth ripper. Although it may be possible to rip the top few feet of PWR with SPT values stronger than 50/3", or even auger refusal materials, we recommend the contractor should be prepared to use pneumatic hammers or blasting to excavate these materials. We recommend using pneumatic hammers or blasting to make confined excavations (footings or utility trenches) in any PWR.

The site soils are OSHA Type B and C soils for the purpose of excavation support. Excavations should be constructed in compliance with current OSHA standards for excavation and trenching safety. Excavations should be observed by a "competent person", as defined by OSHA, who should evaluate the specific soil type and other conditions, which may control the excavation side slopes or the need for shoring or bracing.

Groundwater Control

Temporary groundwater control is expected to be necessary for this project based on the proximity to the identified wetlands. In our opinion groundwater was at a depth of 3 to 9.5 feet below grade at the time of the exploration. Groundwater was encountered in all borings except borings B-27 and B-28. Groundwater was encountered above the cave-in depths of the borings at the completion of drilling or at least 24 hours after drilling. Temporary groundwater control measures typically consist of gravity ditches, well points, sump pumps, pumping from gravel lined and cased sumps, or other suitable methods. Whatever method used, the groundwater control should be in place and operating continuously (around the clock) to achieve and maintain the desired drawdown in advance of excavation, proofrolling, compaction or other construction.

Groundwater control is the purposeful drawdown of groundwater below subgrades, foundations, slabs, or pavements to facilitate. It is the contractor's responsibility to plan for and budget for temporary groundwater control. The means and methods of lowering the groundwater are at the contractor's discretion.

CONSTRUCTION OF STRUCTURE

Headwall Foundations

We recommend the proposed headwalls be supported on shallow foundations bearing on undisturbed residual soils and/or partially weathered rock materials, and the backfill placed in the undercut areas around boring B-26. Shallow foundations should be designed for an allowable net bearing pressure of up to 3,000 pounds per square foot. The allowable net soil bearing pressure refers to that pressure which may be transmitted to the foundation bearing soils in excess of the surrounding overburden pressure.

We anticipate undercutting of the possible alluvial encountered in the area of boring B-26 conducted for the proposed headwall locations.

We anticipate total settlements of shallow foundations for the structure should be less than about 1 inch. Differential settlements are expected to be on the order of 1/3 to 1/2 of the total settlements. Settlements of foundations are expected to be primarily the result of elastic compression of the bearing soils and therefore settlements should occur relatively soon after the loads are applied. Settlements of heavily loaded foundations or settlement sensitive equipment should be evaluated on a case-by-case basis.

In order to reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" action, the North Carolina Building Code requires that footings have a minimum width of 16 inches. Footings should be embedded deep enough below exterior grades to reduce potential movements from frost action or excessive drying shrinkage. For this region, we recommend footings be placed at least 1.5 feet below finished grade.

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time; therefore, foundation concrete should be placed the same day that foundations are excavated. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1- to 3-inch thick "mud mat" of "lean" concrete may be placed on the bearing surface to protect the bearing soils. The mud mat should not be placed until the bearing soils have been tested for adequate bearing capacity.

Foundation excavations should be tested to confirm adequate bearing prior to installation of reinforcing steel or placement of concrete to confirm the presence of foundation materials similar to those assumed in the design. We recommend the testing consist of hand auger borings with Dynamic Cone Penetrometer testing performed by an engineer or engineering technician. Unsuitable soils should be undercut to firm soils and the undercut excavations should be backfilled with compacted controlled fill or a material approved by the geotechnical engineer.

Headwalls and Lateral Earth Pressures

We recommend the following parameters for design of retaining walls:

Soil Type	Unit Weight, Pcf	Active Coefficient K_a	At-Rest Coefficient K_o	Passive Coefficient K_p	Friction Angle, degrees	Friction Factor
Undisturbed Residual Soils	120	0.33	0.50	3.00	30	0.35
Partially Weathered Rock	130	0.28	0.44	3.54	34	0.35
Controlled Fill	115	0.39	0.56	2.56	26	0.35

The parameters given above are for walls without appreciable backslopes. Sloping backfill behind the wall will significantly increase the lateral pressure applied to the wall, which will require modification of the earth pressure coefficients recommended above.

The Active Coefficient should be used where the wall is allowed to rotate. Rotation at the top of the wall on the order of 0.5 percent to 1 percent of the wall height is normally required to develop the full Active Earth Pressure condition. If rotation of the top of the wall is not an acceptable condition or if the rotation will be restrained by bracing or by supported floors, then the At Rest Earth Pressure Coefficient should be used to design the wall.

Resistance to lateral sliding of the wall will be derived from friction between the wall foundation and the supporting soil and from passive earth pressure against the outside face of the embedded wall and foundation. We recommend the resistance derived from both sources be considered to act simultaneously. However, we recommend a factor of safety of 2.0 be used to compute the allowable resistance from passive pressure since considerable lateral displacement is typically required to fully mobilize the passive resistance. Additionally, passive earth pressure should be neglected in the top 1.5 feet of embedment to account for seasonal drainage, shrinkage, softening, or erosion.

Retaining wall design should account for any surcharge loads within a 45-degree slope from the base of the wall. Below grade walls that may retain water behind them should be designed to resist hydrostatic pressures in addition to earth pressures unless an adequate wall drainage zone is provided. The surface of the backfill should slope slightly to promote positive surface water flow away from the retaining wall to prevent ponding of water behind the wall.

There are additional design and construction considerations for segmental walls that will depend on the location, height, and interaction with other parts of the site development. We should be authorized to review the preliminary site plan, grading plan, utility plan and landscape plan to develop specific recommendations for segmental wall design and construction. If desired, ECS can provide design services for segmental walls for the project as an additional service.

To achieve a desirable balance between minimizing excessive pressures against the below grade walls and reducing the settlement of the wall backfill, we recommend the wall backfill be compacted to 95 percent of the maximum dry density obtained in accordance with ASTM specification D-698, standard Proctor method. Backfill should consist of controlled fill or washed stone. Heavy earthwork equipment should maintain a minimum horizontal distance away from the below grade walls of 1 foot per foot of vertical wall height up to a maximum of 3 feet. Lighter, hand held compaction equipment should be used closer than 3 feet to the below grade walls.

SPECIFICATION RECOMMENDATIONS

Proofrolling

Exposed subgrades shall be proofrolled using appropriate equipment to identify areas of unstable subgrade. Appropriate equipment shall be a dump truck having a single rear axle with axle weight of at least 10 tons, or a dump truck having a tandem rear axle with axle weight of at least 20 tons. Alternate equipment, such as a fully loaded pan scraper, may be utilized with approval of the geotechnical engineer responsible for evaluating the subgrade during construction.

Proofrolling shall consist of driving the appropriate equipment over the subgrade at a walking pace. The proofrolling equipment shall make overlapping passes across the subgrade in the same direction, with the overlap not exceeding ½ the width of the equipment. A second set of overlapping passes shall then be made in a direction perpendicular to the first set of passes.

Controlled Fill

Controlled fill should be placed in lifts and then compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Method.

The maximum loose lift thickness depends upon the type of compaction equipment used:

EQUIPMENT	MAXIMUM LOOSE LIFT THICKNESS, IN.
Large, Self-Propelled Equipment (CAT 815, etc.)	8
Small, Self-Propelled or Remote Controlled (Rammax, etc.)	6
Hand Operated (Plate Tamps, Jumping Jacks, Wacker-Packers)	4
Trackhoe Mounted rollers/Smooth Drum rollers	6

The moisture content at the time of compaction should be within 5 percent of the optimum moisture content determined by ASTM D698. Some soils will require a moisture content closer to optimum to facilitate compaction, while other soils can be adequately compacted at moisture contents even more than 5 percent away from optimum. For this reason, the moisture content of the fill should not be the sole reason for failing a field density test. If the density test indicates the fill is adequately compacted but the moisture content is more than 5 percent away from the optimum moisture content, the density results should be reviewed by the geotechnical engineer who should then recommend whether the fill should be accepted or rejected.

Controlled fill should be soil that has less than 5 percent fibrous organic content and a liquid limit and plasticity index less than 50 and 20, respectively. Soils with Unified Soil Classification System group symbols of SP, SW, SM, SC, and ML are suitable for use as controlled fill in the roadway embankment. The dam embankment should utilize SM, SC,

ML, MH, CL, and CH soils. Soils with USCS group symbol of CL which meet the restrictions for liquid limit and plasticity index are also suitable for use as controlled fill. Soils with a liquid limit less than 70 and a plasticity index less than 35 can be used as fill deeper than 4 feet below final grade, but only if the soil can be adequately compacted. Soils with a higher liquid limit or plasticity index should not be used as controlled fill.

Controlled fill should be benched into the sides of slopes steeper than 4:1 (H:V) to improve the bond between the fill and the undisturbed soils. Each bench cut into a slope should be at least 12 inches but not more than 60 inches high. The benches should be wide enough to allow operation of the compaction equipment within the benched area so that fill can be placed on the bench and over the rest of the fill in continuous layers.

Compaction Testing

We recommend that all fill operations be observed and tested by an engineering technician to determine if compaction requirements are being met. We recommend at least one field density test be performed for every 2,000 square feet of fill placed per lift. We recommend at least one test per lift of fill for every 50 linear feet of trench backfill.

Density tests in the field should be performed using the Drive Tube Method (ASTM D2937), the Sand Cone Method (ASTM D1556), or the Nuclear Method (ASTM D2922). If the Nuclear Method is used, the moisture content determined by the nuclear density equipment should be verified by performing one moisture content test per ASTM D2216 for every five nuclear density tests.

APPENDICES

Appendix A – Exploration Results

Appendix B – Exploration Procedures

Appendix C – Project Description

Appendix D – Report Qualifications

Appendix E – Illustrations

Site Location Map
Boring Location Plan
Generalized Subsurface Profile
Legend Sheet and Unified Soil Classification System
Soil Test Boring Logs

APPENDIX A - EXPLORATION RESULTS

Site Conditions

The site is currently in the process of being developed. Construction of an elementary school is in progress and there are also an existing dam and lake located in the north central portion of the property adjacent I-40. Also, portions of the roadway leading up to the creek crossing have been constructed. Site grades generally slope down from the northeast and southwest toward the central portion of the site. The is site mostly wooded with some fields.

Regional Geology

The site is located in the Piedmont Physiographic province of North Carolina. The Piedmont extends generally from Alabama to southern Pennsylvania and extends from the Valley and Ridge province in the west to the Coastal Plain province to the east. The soils in the Piedmont were formed by in-place weathering of parent rock and are termed residual soils (or saprolite). The typical residual profile consists of a clayey near surface horizon, where weathering is most severe, transitioning to silts and sands with increasing depth. The materials transition to partially weathered rock (PWR), which is designated for geotechnical engineering purposes as residual material with a Standard Penetration Test resistance in excess of 100 blows per foot. The degree of weathering typically decreases with depth until solid bedrock is encountered. Due to differential weathering along seams and less resistant materials, it is not uncommon to encounter seams and layers of harder materials within partially weathered rock.

A review of the Geologic Map of North Carolina (1985) indicates the site is underlain by Metamorphosed Mafic Rock of the Charlotte Belt.

Alluvial (water-deposited) soils are typically encountered at the ground surface along streams and their floodplains and near existing ponds or lakes. These soils can vary in composition from sands to silts and clays depending on the surrounding soils types and the proximity to the source of water that deposited the alluvial soil. Alluvial soils are typically wet to saturated and are generally loose, soft, and compressible because they have not been subjected to pressures greater than their own self-weight.

Soil Conditions

The borings encountered 3 to 6 inches of topsoil. Below the topsoil, the borings encountered possible alluvial soils, undisturbed residual soils, and partially weathered rock materials. Hard, unweathered rock was encountered in five of the eight borings. The encountered conditions are summarized on the Generalized Subsurface Profile in Appendix E. Additional information is provided on the soil boring logs in Appendix E.

Possible alluvial soil consisting of fine to medium sandy silt was encountered in boring B-26 to a depth of approximately 6 feet below existing ground surface. Standard Penetration Test values within the alluvium ranged from 10 to 13 blows per foot.

The undisturbed residual soils encountered beneath the alluvial soils and beneath the topsoil in the remaining borings generally consisted of silty fine to coarse sands, fine to medium sandy silts, and clayey silts. The residual soils had SPT resistance values ranging from 6 to 77 blows per foot.

Partially weathered rock was encountered in four of the eight borings. Partially weathered rock was encountered at depths ranging from approximately 3.5 to 19.5 feet below existing site grades in borings B-21, B-22, B-23, and B-25. In borings B-21, B-22 and B-25, lenses of partially weathered rock materials were encountered between 3.5 and 6.0 feet below existing site grades. Hard, unweathered rock was encountered in five of the eight borings at depths ranging from 6 to 19.5 feet below ground surface.

Groundwater Conditions

In our opinion groundwater was at a depth of 3 to 9.5 feet below grade (approximate elevations ranging from 770 to 775 feet) at the time of the exploration. Groundwater was encountered in all borings except borings B-27 and B-28. Groundwater was encountered above the cave-in depths of the borings at the completion of drilling or at least 24 hours after drilling. The borings caved-in at depths of 6 to 10 feet below existing grades. In this geology, the cave-in depth of a boring is often an indication of the stabilized water level although the water level may be a few feet below the cave-in depth and therefore cannot be directly observed.

In general, shallow unconfined groundwater movement within the soils overlying bedrock is controlled largely by topographic gradients. Movement in this water table is generally from higher to lower elevations. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation, surface water runoff, and other factors. Normally, the highest groundwater levels occur in the late winter and spring and the lowest groundwater levels occur in the late summer and fall.

APPENDIX B - EXPLORATION PROCEDURES

Soil Test Borings

Eight soil test borings, denoted B-21 through B-28 and an offset boring (B-25A), were performed on July 5, 2011 through July 06, 2011 at the approximate locations shown on the Boring Location Plan in Appendix E. The boring locations were selected by Stimmel Associates, P.A. and were staked in the field by a surveyor.

Drilling was performed by *a* CME 550 truck mounted drill rig using continuous-flight hollow stem augers. Soil samples were obtained by means of the split-barrel sampling procedures in accordance with ASTM Specification D-1586. In the split-barrel sampling procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. This value can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the SPT value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

Representative portions of each SPT sample were sealed in airtight containers and returned to our laboratory for classification, testing, and storage. The soil samples were visually classified in general accordance with the Unified Soil Classification System (USCS). The basic elements of the USCS are described on a legend sheet attached in Appendix E and in ASTM D2487. Additional information from each soil boring is provided on the individual soil test boring logs in Appendix E.

Laboratory Testing Program

Selected SPT samples from the borings were tested for natural moisture content in accordance with ASTM D2216. A selected SPT sample from boring B-26 was tested for grain size distribution in accordance with ASTM D422, while a selected SPT sample from boring B-27 was tested for Atterberg Limits in accordance with ASTM D4318. Results are indicated on the individual boring logs in Appendix E.

APPENDIX C - PROJECT DESCRIPTION

The site is an approximate 124 acre tract located on Harper Road in Clemmons, North Carolina. The site is being evaluated for further development of Village Point Phase 3 Infrastructure. A road that will provide access to the development will be required. The road will cross tributaries to Johnson Creek. ECS previously delineated wetlands on a portion of the site (ECS Project 09-15128). ECS also obtained a Nationwide Permit 3 for impacts associated with maintenance of the Reynolds Pond dam. Other permits may have been issued for the site.

We understand that a set of headwalls will be necessary on the northern and southern sides of the planned roadway for a creek crossing. We also understand that one stormwater biocell will be constructed adjacent the southern headwall.

Project information was obtained from Kelway A. Howard, P.E. with Stimmel Associates, P.A.. We have received a copy of the site plan that illustrates the tracts of property, current topographic contours, planned roadways, property boundaries, and soil boring locations.

APPENDIX D – REPORT QUALIFICATIONS

This report has been prepared in order to aid in the evaluation of this site and to assist the Owner and Engineer in the feasibility study of the project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

The recommendations in this report have been developed using generalized subsurface conditions based on the soil test borings performed. Subsurface conditions can vary laterally and with depth, and significantly different conditions may exist at locations between the borings. Conditions different from those encountered by the borings and described in this report may require modifications to the geotechnical recommendations for the project.

The recommendations in this report were developed based on assumptions made by ECS regarding the likely foundation, floor slab, and pavement loads for the facility and the likely site earthwork. While we believe our assumptions to be reasonable based on our experience with similar projects, it is possible that specific project information may lead us to alter or modify our recommendations. We strongly recommend that we be given an opportunity to review design and construction information related to the project as soon as it becomes available so we can assess whether additional exploration or analyses may be warranted.

We recommend that the construction activities be monitored by a qualified geotechnical engineering firm to provide the necessary overview and to check the suitability of the subgrade soils for support of slabs, pavements, and footings. We would be pleased to provide these services.

APPENDIX E – ILLUSTRATIONS

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

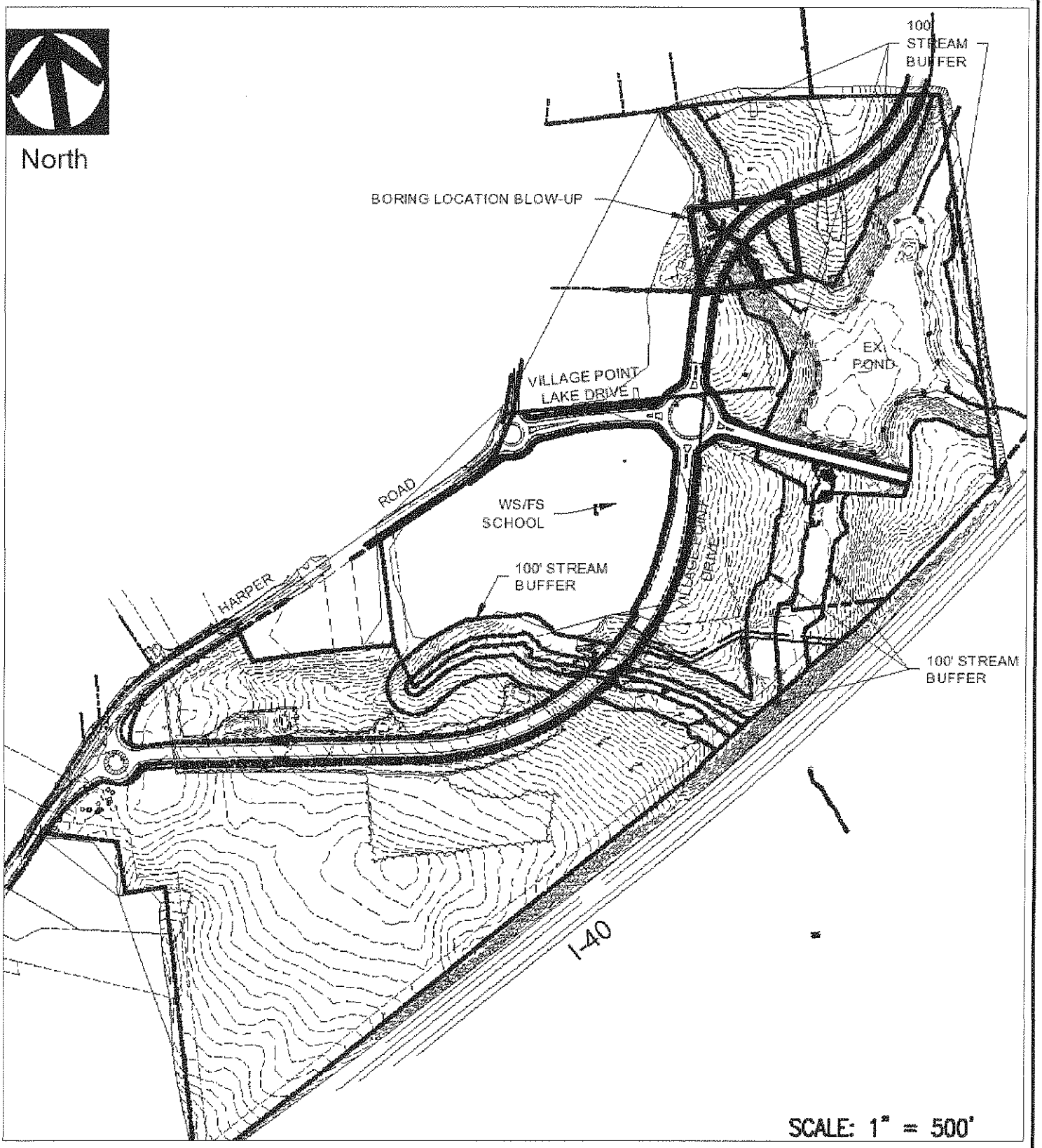
Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▼	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

APPENDIX F – LABORATORY RESULTS



SCALE (1"=500')

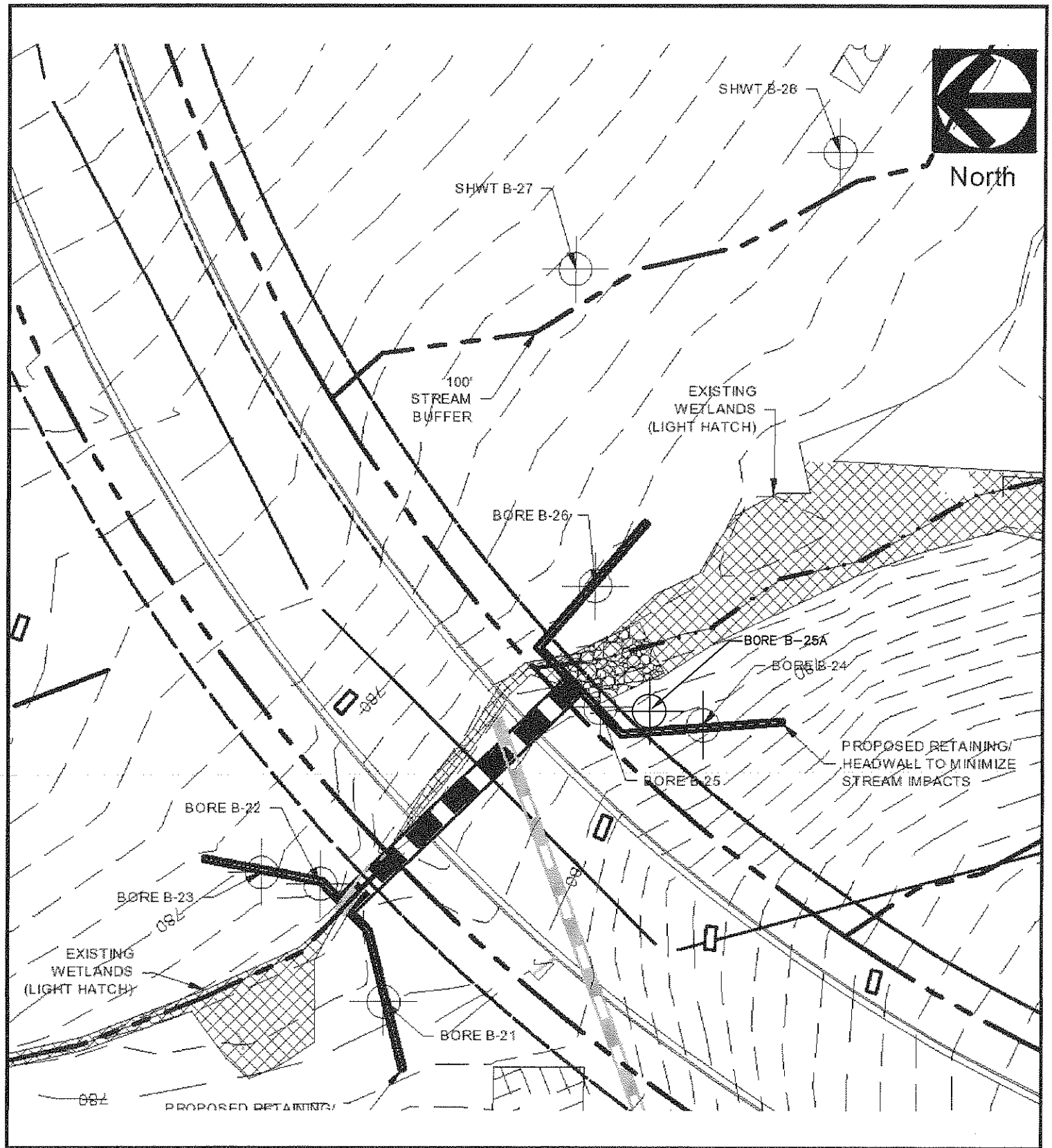
250 500

500 0

REFERENCE:
EXHIBIT FROM
STIMMEL ASSOCIATES, PA
JOB #11-049
SHEET 1 OF 2

ECS LLP
CAROLINAS

FIGURE 1
SITE LOCATION MAP
VILLAGE POINT PHASE 3
CLEMMONS, NC
ECS PROJECT 09.17113-C



SCALE (IN FEET)

20 40

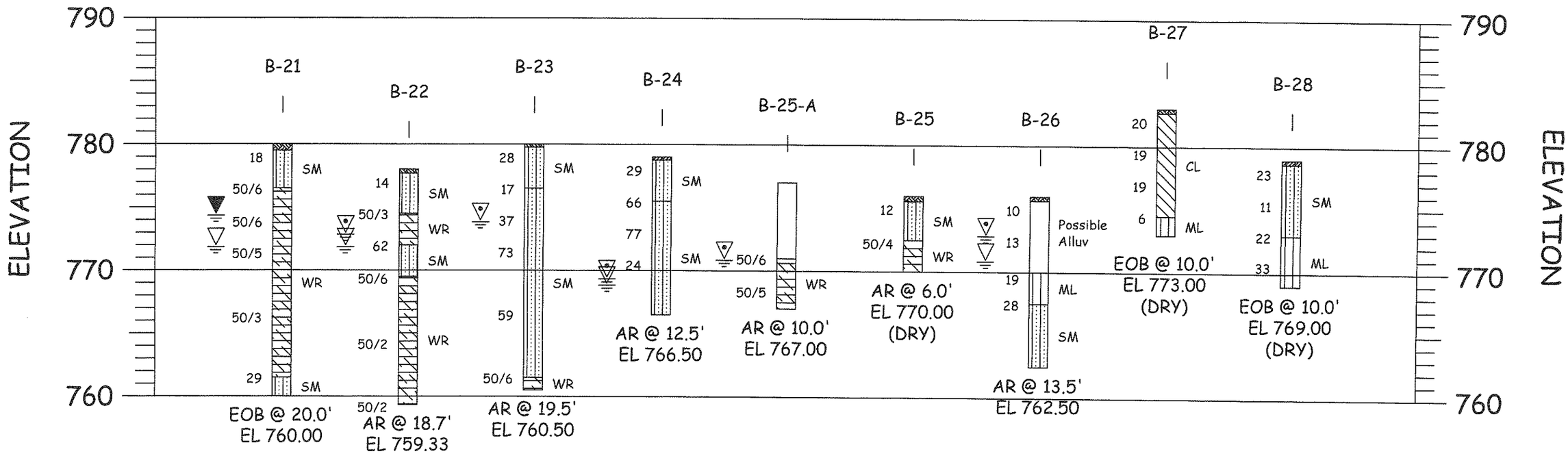
40 0

REFERENCE:
EXHIBIT FROM
STIMMEL ASSOCIATES, PA
JOB #11-049
SHEET 2 OF 2

ECS LLP
CAROLINAS

FIGURE 2
BORING LOCATION PLAN
VILLAGE POINT PHASE 3
CLEMMONS, NORTH CAROLINA

ECS PROJECT 09.17113-C



SOIL CLASSIFICATION LEGEND

- FILL – FILL (POSS/PROB) OF ALL TYPES
- GW – WELL GRADED GRAVEL
- GM – SILTY GRAVEL
- GP – POORLY GRADED GRAVEL
- GC – CLAYEY GRAVEL
- SW – WELL GRADED SAND
- SM – SILTY SAND
- SP – POORLY GRADED SAND
- SC – CLAYEY SAND
- ML – LOW PLASTICITY SILT
- CL – LOW PLASTICITY CLAY
- MH – HIGH PLASTICITY SILT
- CH – HIGH PLASTICITY CLAY
- ALLUV – ALLUVIUM
- RC – ROCK CORE
- WR – PARTIALLY WEATHERED ROCK
- – TOPSOIL
- AP – AUGER PROBE
- EOB – END OF BORING
- AR – AUGER REFUSAL
- –C– CAVE IN DEPTH
- WL – WS OR WD
- WL – BCR
- WL – ACR
- WL – STABILIZED

NOTES:

1. NUMBERS NEXT TO BORINGS REPRESENT STANDARD PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
2. HORIZONTAL DISTANCES NOT TO SCALE.
3. VERTICAL DISTANCES ARE NOT TO SCALE.

ECS LLP
CAROLINAS

FIGURE 3
GENERALIZED
SUBSURFACE PROFILE
VILLAGE POINT PHASE 3
CLEMMONS, NORTH CAROLINA

DRAWN BY/DATE:	CHECKED BY/DATE:	PROJECT NO.
JMR/07-21-11		09.17113-C

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▽	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-21	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% (20%, 40%, 60%, 80%, 100%)

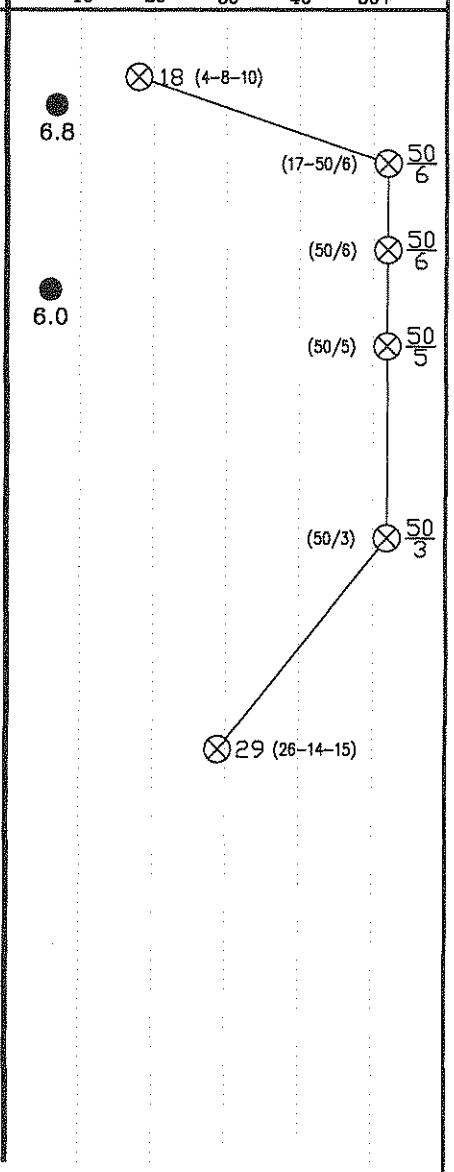
⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL — ENGLISH UNITS
0					Topsoil Depth 6"
	1	SS	18	15	RESIDUAL: Silty Fine to Medium SAND, Trace Mica, Roots, Rock Fragments, Light Orangish Tan, Dry, Medium Dense, (SM)
	2	SS	12	11	PARTIALLY WEATHERED ROCK: Micaceous Fine to Coarse SAND, Trace Quartz Fragments, Silt, Light Gray with White to Light Orangish Gray, Dry to Moist, (WR)
5	3	SS	6	6	
	4	SS	5	5	
10					
	5	SS	3	3	
15					
	6	SS	18	16	RESIDUAL: Silty Fine to Coarse SAND, Trace Mica, Light Grayish Tan, Moist, Medium Dense, (SM)
20					END OF BORING @ 20.0'
25					
30					

BOTTOM OF CASING ▶ — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

WATER LEVELS — ELEVATION (FT)



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 8.00 (WS) OR WD	BORING STARTED 07/06/11	DRILLER: Wingo
WL(BCR) WL(ACR) 5.50	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
WL	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11)

DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-22	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 4"	
	1	SS	18	16	RESIDUAL: Silty Fine to Medium SAND, Trace Roots, Quartz Fragments, Light Orangish Brown, Dry, Medium Dense, (SM)	14 (6-7-7)
	2	SS	9	8	PARTIALLY WEATHERED ROCK: Silty Fine to Medium SAND, Trace Mica, Light Grayish White, Moist, (WR)	(35-50/3) 50/3
5						6.9
	3	SS	18	17	RESIDUAL: Silty Fine to Medium SAND, Trace Mica, Light Grayish White and Tan, Moist, Very Dense, (SM)	(15-30-32) 62
	4	SS	6	6	PARTIALLY WEATHERED ROCK: Fine to Coarse SAND, Trace Mica, Silt, Tannish to Light Grayish White, Moist to Wet, (WR)	(50/6) 50/6
10						
	5	SS	2	2		(50/2) 50/2
15						
	6	SS	2	2		(50/2) 50/2
20					AUGER REFUSAL @ 18.7'	
25						
30						

WATER LEVELS — ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 6.00 (WS) OR WD	BORING STARTED 07/05/11	DRILLER: Wingo
WL(BCR) WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 6.0'
WL 5.00	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

(07/20/2011)

LEA (07-26-11)

DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-23	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 3"	
	1	SS	18	12	RESIDUAL: Sandy Fine to Medium SAND, Trace Mica, Rock Fragments, Light Orangish Tan, Dry, Medium Dense, (SM)	28 (7-10-18)
	2	SS	18	16	RESIDUAL: Fine to Coarse SAND, Trace Mica, Rock Fragments, Light Tannish Gray to Light Orangish Tan, Moist, Medium Dense to Very Dense, (SM)	17 (6-6-11)
5						14.4
	3	SS	18	16		(10-14-23) 37
	4	SS	18	16		(26-33-40) 73
10						
	5	SS	18	16		(12-29-30) 59
15						
	6	SS	12	12	PARTIALLY WEATHERED ROCK: Fine to Coarse SAND, Trace Mica, Light Orangish Tan to Light Brown, Moist, (WR)	(33-50/6) 50/6
20						
25						
30						

AUGER REFUSAL @ 19.5'

WATER LEVELS ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 6.00 (WS) OR WD	BORING STARTED 07/06/11	DRILLER: Wingo
WL(BCR) WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
WL 6.00	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11)

(07/20/2011)

DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-24	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 3"	
	1	SS	18	17	RESIDUAL: Silty Fine SAND, Trace Mica, Light Orangish Tan to Greenish Brown, Dry, Medium Dense, (SM)	29 (7-13-16)
	2	SS	18	16	RESIDUAL: Micaceous Silty Fine to Medium SAND, Trace Rock Fragments, Dark Bluish Gray, Dry to Moist, Very Dense to Medium Dense, (SM)	(14-34-32) 66
5	3	SS	18	17		(24-40-37) 77
	4	SS	18	18		24 (7-10-14)
10					AUGER REFUSAL @ 12.5'	
15						
20						
25						
30						

WATER LEVELS — ELEVATION (FT): 3.2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 10.00 (WS) OR WD	BORING STARTED 07/06/11	DRILLER: Wingo
WL(BCR) WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 10.0'
WL 9.50	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11) (07/20/2011) DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-25	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 5"			
	1	SS	18	17	RESIDUAL: Silty Fine to Medium SAND, Trace Rock Fragments, Mica, Orangish Brown, Moist, Medium Dense, (SM)			12 (6-5-7)
	2	SS	4	4	PARTIALLY WEATHERED ROCK: Silty Fine to Medium SAND With Rock Fragments, Dark Bluish Gray, Dry, (WR)			(50/4) 50/4
5					AUGER REFUSAL @ 6.0'			
10								
15								
20								
25								
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (WS) OR WD	BORING STARTED 07/06/11	DRILLER: Wingo
▽ WL(BCR) ▽ WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @
▽ WL	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11)

(07/20/2011)

DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-25-A	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2} 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					AUGERED WITHOUT SAMPLING			
	1	SS	0	0				
	2	SS	0	0				
5								
	3	SS	12	12	PARTIALLY WEATHERED ROCK: Silty Fine to Coarse SAND With Rock Fragments, Trace Mica, Dark Bluish Gray, Moist, (WR)			(30-50/6) 50/6
	4	SS	5	5				(50/5) 50/5
10					AUGER REFUSAL @ 10.0'			
15								
20								
25								
30								

2.7

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL (WS) OR WD	BORING STARTED 07/06/11	DRILLER: Wingo
WL(BCR) WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
WL 6.00	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11) LEA (07-26-11) (07/20/2011) DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-26	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 4"	
	1	SS	18	15	POSSIBLE ALLUVIUM: Fine to Medium Sandy SILT, Trace Clay, Mica, Dark Greenish Brown to Reddish Brown, Moist, Stiff, (Possible Alluv)	10 (4-3-7)
						20.0
	2	SS	18	16		13 (4-5-8)
5						
	3	SS	18	16	RESIDUAL: Fine Sandy SILT, Dark Bluish Gray to Black, Moist, Very Stiff, (ML)	19 (6-7-12)
	4	SS	18	15	RESIDUAL: Medium to Coarse SAND With Quartz Fragments, Light Orangish Tan, Wet, Medium Dense, (SM)	28 (5-15-13)
10						
					AUGER REFUSAL @ 13.5'	
15						
20						
25						
30						

WATER LEVELS ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 5.00 (WS) OR WD	BORING STARTED 07/05/11	DRILLER: Wingo
WL(BCR) WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
WL 3.00	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11) (07/20/2011) DLaGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-27	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT.: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 4"	
	1	SS	18	16	RESIDUAL: Fine Sandy CLAY, Black Inclusions, Mica, Orangish Tan to Dark Brown with Black, Dry to Moist, Very Stiff, (CL)	20 (6-8-12)
	2	SS	18	16		19 (10-9-10)
5						
	3	SS	18	16		19 (4-8-11)
	4	SS	18	15	RESIDUAL: Clayey SILT, Trace Fine Sand, Dark Reddish Brown, Moist, Medium Stiff, (ML)	6 (1-3-3)
10					END OF BORING @ 10.0'	
15						
20						
25						
30						

WATER LEVELS ELEVATION (FT)

PLASTIC LIMIT % 20 — WATER CONTENT % 16.4 — LIQUID LIMIT % 36

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL (WS) OR WD	BORING STARTED 07/05/11	DRILLER: Wingo
▽WL(BCR) ▽WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
▽WL	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11) (07/20/2011) DLeGrand

CLIENT	JOB #	BORING #	SHEET
Novant Health	17113-C	B-28	1 OF 1

PROJECT NAME: Village Point Phase 3 - Headwalls and Biocell

ARCHITECT-ENGINEER:

SITE LOCATION: Harper Road, Clemmons, NC

CALIBRATED PENETROMETER TONS/FT.^{2}: 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% — 20% 40% 60% 80% 100%

STANDARD PENETRATION BLOWS/FT. ⊗: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0					Topsoil Depth 4"		
	1	SS	18	16	RESIDUAL: Silty Fine to Medium SAND, Trace Quartz Fragments, Light Tannish Brown to Tannish Gray, Dry to Moist, Medium Dense, (SM)		23 (7-11-12)
	2	SS	18	17			11 (3-4-7)
5							
	3	SS	18	16	RESIDUAL: Fine to Medium Sandy SILT, Bluish Gray to Dark Orangish Red-Brown, Moist, Very Stiff to Hard, (ML)		22 (6-8-14)
	4	SS	18	16			(14-16-17) 33
10					END OF BORING @ 10.0'		
15							
20							
25							
30							

● 5.0

● 23.3

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (WS) OR WD	BORING STARTED 07/05/11	DRILLER: Wingo
▽ WL(BCR) ▽ WL(ACR)	BORING COMPLETED 07/06/11	CAVE IN DEPTH @ 7.0'
▽ WL	RIG CME 55 (Truck) FOREMAN Wingo	DRILLING METHOD HSA

LEA (07-26-11)

(07/20/2011)

DLeGrand

APPENDIX F – LABORATORY RESULTS

ECS Carolinas, LLP
Greensboro, NC
Laboratory Testing Summary

Printed on (date): July 26, 2011

Project No. 17113-C **Project Name.** Village Point Phase 3 - Headwalls and Biocell

Project Engineer Russell A. Bendel **Principal Engineer** Russell A. Bendel **Summary By** Lorin E. Akins

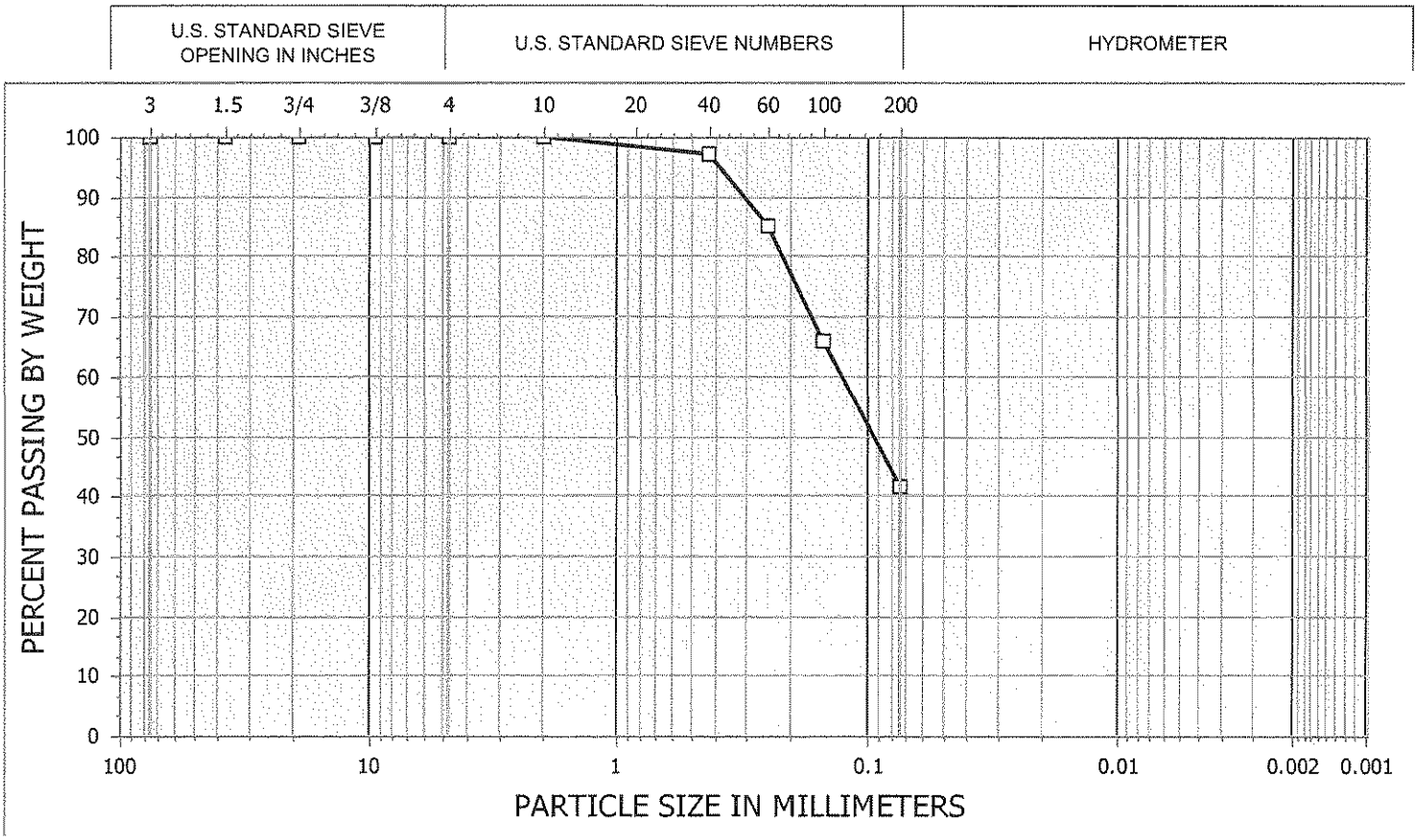
Boring Number	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-21	S-1	1.00 - 2.50	6.8									
B-21	S-3	6.00 - 6.50	6.0									
B-22	S-2	3.50 - 4.25	6.9									
B-23	S-2	3.50 - 5.00	14.4									
B-24	S-3	6.00 - 7.50	3.2									
B-25-A	S-3	6.00 - 7.00	2.7									
B-26	S-1	1.00 - 2.50	20.0					41.5				
B-27	S-2	3.50 - 5.00	16.4	CL	36	20	16					
B-28	S-1	1.00 - 2.50	5.0									
B-28	S-3	6.00 - 7.50	23.3									

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Grain Size (ASTM D 422) Test Summary

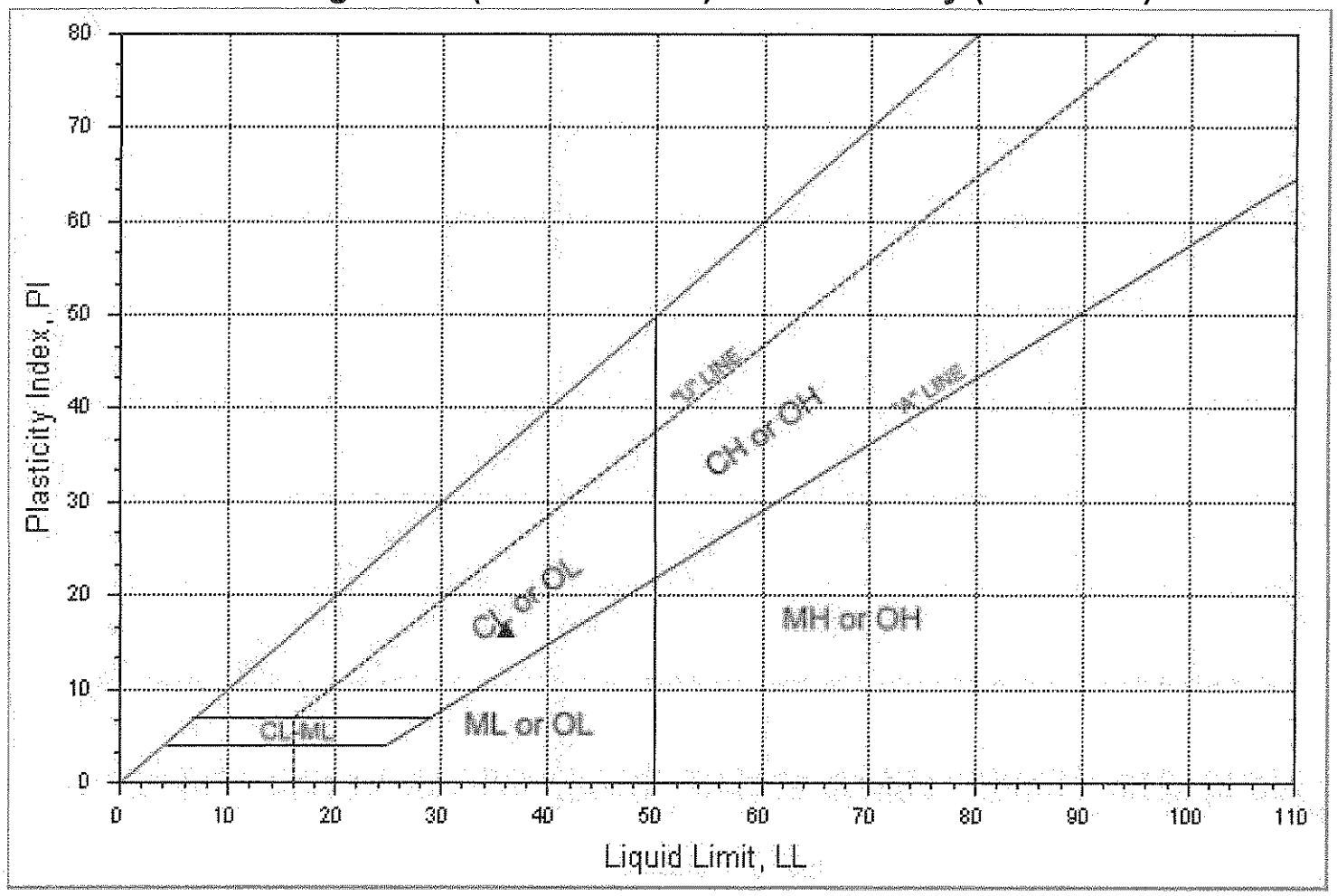
COBBLES	GRAVEL		SAND			SILT OR CLAY	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY



Boring Number Sample Number	Depth (feet)	Test Symbol	LL	PI	Description
B-26 / S-1	1.00 - 2.50	□	----	----	Brown Black Silty Fine SAND

Project No.	17113-C		**ECS Carolinas, LLP**
Project Name:	Village Point Phase 3 - Headwalls and Biocell		
PM:	Russell A. Bendel		
PE:	Russell A. Bendel		**Greensboro, NC**
Printed on(date):	July 26, 2011		

Atterberg Limits (ASTM D 4318) Test Summary (Method A)



All samples are prepared using 'DRY' method unless otherwise noted

Boring Number Sample Number	Depth (feet)	Test Symbol	Description	MC (%)	LL	PL	PI	% Passing #200 Sieve	% Sample Retained on #40 Sieve	Notes
B-27 / S-2	3.50 - 5.00	▲	Tan Brown Fine Sandy CLAY	16.4	36	20	16		----	

Project No.	17113-C		**ECS Carolinas, LLP**
Project Name:	Village Point Phase 3 - Headwalls and Biocell		
PM:	Russell A. Bendel		
PE:	Russell A. Bendel		**Greensboro, NC**
Printed on(date):	July 26, 2011		

REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS

VILLAGE POINT DRIVE EXTENSION
CLEMMONS, NORTH CAROLINA

ECS CAROLINAS, LLP
PROJECT NUMBER 09.17113-O

PREPARED FOR
VILLAGE POINTE LLC
KING, NORTH CAROLINA

JANUARY 15, 2014

ECS CAROLINAS, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities
NC Registered Engineering Firm F-1078

January 15, 2014

Mr. Marvin Gentry
Village Pointe LLC
PO Box 1719
King, North Carolina 27021

ECS Project No. 09.17113-O

Reference: Report of Subsurface Exploration and Geotechnical Engineering Analysis
Village Point Drive Extension
Clemmons, North Carolina

Dear Mr. Gentry:

ECS Carolinas, LLP (ECS) has completed a subsurface exploration for the subject site as authorized by acceptance of our Proposal No. 09.21328-P & 09.21329-P, dated December 16, 2013. The purposes of this exploration were to explore the subsurface conditions at the site and to develop geotechnical recommendations to guide design and construction of the project. This report presents our evaluations and recommendations, the results of our exploration, our scope of work, and our understanding of the project information.

This report is provided for the use of Village Pointe LLC and assignees. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written permission of ECS. The unauthorized use of this report by any undesignated third party or parties will be at such party's sole risk and ECS disclaims liability for any such unauthorized third party use or reliance.

ECS appreciates the opportunity to provide our professional services during this phase of your project. Please contact us if you have questions concerning the following report.

Respectfully,

ECS CAROLINAS, LLP

Lorin Akins

Lorin E. Akins
Project Manager

Reviewed by: Russell A. Bendel, P.E.
Principal Engineer
Licensed NC 024430

NORTH CAROLINA PROFESSIONAL SEAL 024430 1-15-14 ENGINEER RUSSELL A. BENDEL

Attachments

cc: Kelway Howard with Stimmel Associates

EXECUTIVE SUMMARY

We request you read the entire contents of this report. Recommendations and clarifications are contained in the body that are not in the report summary.

Project Information

We understand the proposed project will consist of extending Village Point Drive from Towncenter Drive towards the existing Village Point Drive in Clemmons, North Carolina. The new roadway will extend across an area of previously placed fill associated with the retail/business development. Currently, the site is wooded with an existing pond located in the northern portion of the site and existing wetlands along the southeastern portion of the site. Site grades generally slope downward from the west to east on the western side of the existing wetland and from east to west on the eastern side of the existing wetland. Elevations across the site range from 810 to 778 feet.

A culvert crossing is planned beneath the roadway embankment. Maximum fill depths of 25 feet are expected. A bio-cell is proposed between the existing wetlands and proposed roadway toward the south end of the planned roadway.

Project information was provided by Mr. Kelway Howard with Stimmel Associates. We have received a site sketch indicating the site boundaries, existing and proposed contours, and proposed roadway and culvert crossing.

Subsurface Conditions

The borings encountered fill, alluvial soils and undisturbed residual soils derived from the in-place weathering of parent rock. Hard, unweathered rock was not encountered by the borings. The encountered conditions are summarized on the Generalized Subsurface Profile in Appendix A. Additional information is provided on the soil boring logs in Appendix A.

Fill soils consisting of very soft to stiff clayey silts and fine to medium sandy silts with varying amounts of organic materials were encountered in borings B-1 through B-5 to depths of 6 to 18 feet below existing grades. Standard Penetration Test values within the fill ranged from 2 to 13 blows per foot. We consider the encountered fill to be poorly to adequately compacted based on these SPT values. We did not find evidence of debris or trash.

Alluvial (water-deposited) soils are typically encountered at the ground surface along streams and their floodplains and near existing ponds or lakes. These soils can vary in composition from sands to silts and clays depending on the surrounding soils types and the proximity to the source of water that deposited the alluvial soil. Alluvial soils are typically wet to saturated and are generally loose, soft, and compressible because they have not been subjected to pressures greater than their own self-weight. Alluvial soils consisting of medium stiff fine to medium sandy clay and loose silty fine to medium sand were encountered in boring B-6 at subgrade to a depth of 6 feet below existing grade. Standard Penetration Test values within the alluvial soils ranged from 6 to 7 blows per foot.

The undisturbed residual soils consisted of soft to hard fine to medium sandy silts, clayey silts, and loose to medium dense silty fine to course sands. The residual soils had SPT resistance values ranging from 4 to 65 blows per foot. Partially weathered rock consisting of silty fine to medium sand was encountered in boring B-10 at a depth of 8 feet below existing grade. Auger refusal materials were not encountered by borings.

Groundwater was encountered at elevations ranging from 783 to 794 in the vicinity of soil borings B-3 through B-6. Also, groundwater is at, or just below, the surface in the wetland area where the proposed culvert will be installed.

Recommendation Summary

- The existing fill must be considered undocumented as we have not been provided with in-place density test results for it at this time. Without compaction records and observation reports, and observing evidence of organics in some of the fill samples, we recommend performing test pits to further characterize the existing fill. The decision to build on undocumented fill is essentially an economic decision for the client relative to the level of risk they consider acceptable should the new construction experience subgrade related distress. The risks associated with leaving the undocumented fill in-place beneath structures can be eliminated by removing and replacing the existing fill. If any existing fill are left in place, some risk of future settlement would exist. This risk can be reduced by performing some type of ground improvement. Regardless, some allowance for localized undercutting and replacement of existing unstable or unsuitable fill should be made.

- Soft alluvial soils and variably compacted fill are present in the northern and northeastern portion of the site near borings B-1 through B-6. We recommend removal and replacement of portions of existing undocumented fill and alluvial soils. As long as the undercut materials do not contain excessive organics, the materials can be reused as fill, but may require drying prior to use.

  Alternatively (Option 2), if the owner is willing to accept some risk, the areas where 6 feet or less of controlled fill will be placed (Borings B-1 through B-3) may be able to have little or limited undercut, however, may need to be stabilized with a geogrid (Tensar BX-1100) and 12 to 18 inches of ABC stone. A minimum of 4 feet of compacted fill should then be placed.

  A third option (Option 3) includes areas where 6 feet or greater of controlled fill will be placed (Borings B-4 through B-6) can be stabilized with a two foot bridge lift and a minimum of 4 feet of compacted fill should then be placed. This option will require monitoring settlement of the new and existing embankment fill prior to installing pavements and utilities.

- With either Option 2 or 3, groundwater control is expected to be necessary. The use of a series of French drains, installed prior to grading operations, can lower the groundwater. French drains will help facilitate consolidation of the non-residual materials to be filled upon. Additionally, we recommend that settlement hubs be installed on top of the fill and monitored. Construction should not commence until settlement (or consolidation) of the filled area has reached a minimal point, as determined by the geotechnical engineer. Overfilling the area by 2 feet is also recommended.

- The majority of the on-site soils are suitable for use as controlled fill; however, they are wet. These proposed cut soils are above the optimum moisture content needed to achieve compaction and will require drying by discing or the addition of lime. Depending on the project schedule, drying with lime may be needed, especially for the soils that are more than approximately 10%-15% above the optimum moisture content. Drying with lime will also be needed if grading is performed in the winter and spring. These wetter soils will take longer to dry by discing and would only be possible in late spring, summer, and fall.

- Some near surface soils are moderately to highly plastic. These moisture sensitive soils may not proofroll satisfactorily if wet and should be planned to be utilized in deeper fill areas or fill areas outside pavement areas, or for stormwater pond construction.

- We do not anticipate the need for rock excavation based on the borings.

- We do anticipate undercutting in the existing wetland area along and around the proposed culvert to depths ranging from 5 to 9 feet to develop adequate support. The area can be backfilled with stone wrapped in a geotextile, or with compacted granular soils.

Excavation Conditions

Partially weathered rock was encountered in boring B-10 at a depth of 8 feet below existing grade. Auger refusal materials were not encountered by borings. It should be possible to excavate soils above partially weathered rock using conventional equipment (scrapers, loaders and bulldozers).

Partially weathered rock with SPT values of 50/6" to 50/3" can often be excavated from open-cut excavations by ripping with a Caterpillar D-8 bulldozer equipped with a single tooth ripper. Although it may be possible to rip the top few feet of PWR with SPT values stronger than 50/3", or even auger refusal materials, we recommend the contractor should be prepared to use pneumatic hammers or blasting to excavate these materials. We recommend using pneumatic hammers or blasting to make confined excavations (footings or utility trenches) in any PWR.

The site soils are OSHA Type B and C soils for the purpose of excavation support. Excavations should be constructed in compliance with current OSHA standards for excavation and trenching safety. Excavations should be observed by a "competent person", as defined by OSHA, who should evaluate the specific soil type and other conditions, which may control the excavation side slopes or the need for shoring or bracing.

Groundwater Conditions

Groundwater control is expected to be necessary for this project. Temporary ditching and sump pumps will be necessary in the undercut areas for the culvert. French drains may be necessary in the areas of borings B-3, B-5 and B-6 prior to fill placement.

Groundwater control is the purposeful drawdown of groundwater below subgrades, foundations, slabs, or pavements to facilitate construction and to mitigate long term problems associated with groundwater. It is the contractor's responsibility to plan for and budget for temporary groundwater control. Temporary groundwater control measures typically consist of gravity ditches, well points, sump pumps, pumping from gravel lined and cased sumps, or other suitable methods. The means and methods of lowering the groundwater are at the contractor's discretion. Whatever method used, the groundwater control should be in place and operating continuously (around the clock) to achieve and maintain the desired drawdown in advance of excavation, proofrolling, compaction or other construction.

In our opinion groundwater was between elevations 783 feet and 794 feet at the time of the exploration. The borings caved-in at depths of 13.5 to 17 feet below existing grades. In this geology, the cave-in depth of a boring is often an indication of the stabilized water level although the water level may be a few feet below the cave-in depth and therefore cannot be directly observed.

In general, shallow unconfined groundwater movement within the soils overlying bedrock is controlled largely by topographic gradients. Movement in this water table is generally from higher to lower elevations. Recharge occurs primarily by infiltration along higher elevations and typically discharges into streams or other surface water bodies. The elevation of the shallow water table is transient and can vary greatly with seasonal fluctuations in precipitation, surface

water runoff, and other factors. Normally, the highest groundwater levels occur in the late winter and spring and the lowest groundwater levels occur in the late summer and fall.

Subgrade Preparation

Soft alluvial soils and variably compacted fill are present in the northern and northeastern portion of the site, near borings B-1 through B-6. We recommend removal and replacement of portions of existing undocumented fill and alluvial soils. As long as the undercut materials do not contain excessive organics, the materials can be reused as fill, but may require drying prior to use.

Alternatively (Option 2), if the owner is willing to accept some risk, the areas where 6 feet or less of controlled fill will be placed (Borings B-1 through B-3) may be able to have little or limited undercut, however, may need to be stabilized with a geogrid (Tensar BX-1100) and 12 to 18 inches of ABC stone. A minimum of 4 feet of compacted fill should then be placed.

A third option (Option 3) includes areas where 6 feet or greater of controlled fill will be placed (Borings B-4 through B-6) can be stabilized with a two foot bridge lift and a minimum of 4 feet of compacted fill should then be placed. This option will require monitoring settlement of the new and existing embankment fill prior to installing pavements and utilities.

With either Option 2 or 3, groundwater control is expected to be necessary. The use of a series of French drains, installed prior to grading operations, can lower the groundwater. French drains will help facilitate consolidation of the non-residual materials to be filled upon. Additionally, we recommend that settlement hubs be installed on top of the fill and monitored. Construction should not commence until settlement (or consolidation) of the filled area has reached a minimal point, as determined by the geotechnical engineer. Overfilling the area by 2 feet is also recommended.

Site preparation should begin with stripping all vegetation, root-zone, and all other soft or unsuitable material from the proposed embankment footprint and pavement areas. We expect a stripping depth of at least 2 to 4 inches based on the borings, however, deeper stripping depths are typically required in wooded areas. Stripping depths will vary depending on the time of the year. During the wet seasons stripping may be deeper due to saturated soils on the surface.

Following stripping and rough excavation, but prior to placing controlled fill, the exposed subgrades should be proofrolled. Unstable areas identified by proofrolling should be undercut to firm materials unless the options listed above are selected. The unstable materials should be evaluated by the project geotechnical engineer to determine if these materials may remain in place. Any undercut areas should be backfilled with controlled fill.

Appropriate proofrolling equipment typically consists of a dump truck having a single rear axle with axle weight of at least 10 tons, or a dump truck having a tandem rear axle with axle weight of at least 20 tons. Alternate equipment, such as a fully loaded pan scraper, may be utilized with approval of the geotechnical engineer responsible for evaluating the subgrade during construction.

Proofrolling consists of driving the appropriate equipment over the subgrade at a walking pace. The proofrolling equipment should make overlapping passes across the subgrade in the same direction, with the overlap not exceeding ½ the width of the equipment. A second set of overlapping passes should then be made in a direction perpendicular to the first set of passes.

Earthwork

The site soils are suitable for use in construction; however, they are wet. Drying of wet soils, may be accomplished by spreading and discing or by other mechanical or chemical means. The ability to dry wet soils, and therefore the ability to use them for fill, will be reduced if earthwork is performed during late winter or spring. Depending on the project schedule, drying with lime may be needed, especially for the soils that are more than approximately 10%-15% above the optimum moisture content. Drying with lime will also be needed if grading is performed in the winter and spring. These wetter soils will take longer to dry by discing and would only be possible in late spring, summer, and fall.

We recommend a shrinkage factor of 10 to 15 percent when calculating earthwork quantities using on-site soils for fill. Some near surface soils are moderately to highly plastic. These moisture sensitive soils may not proofroll satisfactorily if wet and should be planned to be utilized in deeper fill areas or fill areas outside pavement areas, or for stormwater pond construction.

When dry, the majority of the site soils should provide adequate subgrade support for fill placement and construction operations. When wet, the soil may degrade quickly with disturbance from construction traffic. Good site drainage should be maintained during earthwork operations to prevent ponding water on exposed subgrades. Soil subgrades should be protected from rain by "sealing" the subgrades prior to forecast precipitation. Sealing subgrades can be performed by rolling with rubber-tired equipment, but ruts should not be created, or by rolling with a smooth steel-drum roller without vibration. Subgrades that have been sealed should be scarified prior to receiving additional fill.

If site soils are initially placed at planned subgrade elevations and are left exposed over a period of time, the exposed soils may become soft and wet and may become holding areas for trapped water. Even compacted fill soils left exposed for long periods of time will degrade due to exposure. The lack of confinement at the surface and cycles of wetting and drying through the seasons will soften and loosen the compacted fill, or in the case of cut subgrades the removal of overburden pressure promotes rebound and can allow the surficial soils to relax over time. The disturbance can extend as deep as 1 foot, or possibly more depending on soil types and exposure conditions. Leaving site grades high allows for a sacrificial layer of soil that can then be removed from the final subgrade at the time of future construction to reduce the need for undercutting and replacement below planned grades.

Controlled Fill

Controlled fill should be compacted to at least 95 percent of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Method. Aggregate base course (ABC) stone should be compacted to 95 percent of standard Proctor maximum dry density under building slabs and to at least 100 percent density under pavements.

The maximum loose lift thickness depends upon the type of compaction equipment used:

EQUIPMENT	MAXIMUM LOOSE LIFT THICKNESS, IN.
Large, Self-Propelled Equipment (CAT 815, etc.)	8
Small, Self-Propelled or Remote Controlled (Rammax, etc.)	6
Hand Operated (Plate Tamps, Jumping Jacks, Wacker-Packers)	4
Trackhoe Mounted rollers/Smooth Drum rollers	6

The moisture content at the time of compaction should be within 5 percent of the optimum moisture content determined by ASTM D698. Some soils will require a moisture content closer to optimum to facilitate compaction, while other soils can be adequately compacted at moisture contents even more than 5 percent away from optimum. For this reason, the moisture content of the fill should not be the sole reason for failing a field density test. If the density test indicates the fill is adequately compacted but the moisture content is more than 5 percent away from the optimum moisture content, the density results should be reviewed by the geotechnical engineer who should then recommend whether the fill should be accepted or rejected.

Controlled fill should be soil that has less than 5 percent fibrous organic content and a liquid limit and plasticity index less than 50 and 30, respectively. Soils with Unified Soil Classification System group symbols of SP, SW, SM, SC, and ML are suitable for use as controlled fill. Soils with USCS group symbol of CL which meet the restrictions for liquid limit and plasticity index are also suitable for use as controlled fill. Soils with a liquid limit of 70 or less and a plasticity index less than 35 can be used as fill deeper than 4 feet below final grade, but only if the soil can be adequately compacted.

Controlled fill should be benched into the sides of slopes steeper than 4:1 (H:V) to improve the bond between the fill and the undisturbed soils. Each bench cut into a slope should be at least 12 inches but not more than 60 inches high. The benches should be wide enough to allow operation of the compaction equipment within the benched area so that fill can be placed on the bench and over the rest of the fill in continuous layers.

We recommend that all fill operations be observed and tested by an engineering technician to determine if compaction requirements are being met. The testing agency should perform a sufficient number of tests to confirm that compaction is being achieved. For mass grading operations we recommend a minimum of one density per 500 cubic yards of fill placed or per 1 foot of fill thickness, whichever results in more tests. We recommend at least one test per 1 foot thickness of fill for every 100 linear feet of utility trench backfill.

Density tests in the field should be performed using the Drive Tube Method (ASTM D2937), the Sand Cone Method (ASTM D1556), or the Nuclear Method (ASTM D2922). If the Nuclear Method is used, the moisture content determined by the nuclear density equipment should be verified by performing one moisture content test per ASTM D2216 for every five nuclear density tests.

Pavement Construction

Pavements for the project are expected to consist of light duty parking areas and heavy duty pavements in driveway areas. Based on our experience with soils similar to those encountered at the site, we recommend the following minimum pavement sections for the project provided the subgrade can be successfully proofrolled during construction. Please note that these sections are considered minimum sections.

Asphalt Pavements

Pavement Type	Asphalt Surface Course, in. NCDOT S9.5C	Asphalt Binder Course, in. NCDOT I19.0D	Aggregate Base Course, in. NCDOT ABC Stone
Heavy Duty	1	2.5	8
Light Duty	2	--	6

Pavements

Pavement Type	Concrete (4,500 psi @ 28 days)	Aggregate Base Course, in. NCDOT ABC Stone
Heavy Duty	6	4

The materials should be in accordance with NCDOT Standard Specifications for Roads and Structures.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the subgrade materials becoming saturated over a long period of time.

Large, front-loading trash dumpsters frequently impose concentrated front-wheel loads on pavements during loading. This type of loading typically results in rutting of the pavement and ultimately pavement failures. We recommend that the pavement in trash pickup areas consist of an 8-inch thick concrete slab. The slab should be sized to accommodate both the dumpster and the entire truck.

We recommend performing one field density test for every 10,000 square feet of ABC stone placed in pavement areas to verify compaction. The testing should be performed using the Nuclear Method (ASTM D-2922) with direct transmission using a probe depth equal to the thickness of the stone layer. After density testing and prior to placement of the asphalt

concrete, the surface of the stone base course should be proofrolled. Unstable areas should be corrected prior to placement of asphalt concrete.

We recommend continuous monitoring of asphalt concrete placement and compaction by an engineering technician. The temperature of the asphalt concrete should be checked prior to spreading. The thickness and percent compaction of the asphalt concrete should be checked by obtaining 6" diameter cores of the compacted asphalt.

We recommend obtaining one core for every 10,000 square feet of asphalt placed per lift, with at least three cores per lift of asphalt concrete material per day. Each core should be tested to determine the bulk specific gravity (BSG) according to AASHTO T-166, and the percent compaction should be computed based on comparison of the BSG to the Rice specific gravity of the material determined by AASHTO T-209 at the asphalt plant.

Permanent Site Slopes

We recommend that permanent cut slopes less than 10 feet tall through undisturbed residual soils be constructed at 2:1 (horizontal: vertical) or flatter. Permanent fill slopes less than 20 feet tall may be constructed using controlled fill at a slope of 2.5:1 or flatter. A slope of 3:1 or flatter may be desirable to permit establishment of vegetation, safe mowing, and maintenance. The surface of all cut and fill slopes should be adequately compacted. All permanent slopes should be protected using vegetation or other means to prevent erosion.

Fill slopes should be constructed by placing controlled fill in horizontal lifts which extend to or slightly beyond the slope face. Each lift of fill should be compacted to the specified minimum density before placing the subsequent lift. The compaction equipment should travel parallel to the slope face to ensure that fill at the face of the slope is compacted to the same level as the fill farther back from the face. If needed, tracked equipment or compaction equipment can roll up and down the slope face to compact loose surficial soils to reduce erosion, but this method should not be used to construct the slope. In some cases it may be advantageous to overbuild the fill slope (place fill beyond the limits of the slope face) and then cut back into the fill to leave a clean, compacted slope face exposed.

Fill slopes and fill pads should not be constructed by placing fill against berms. If not prohibited by plan and specification, the grading contractor will sometimes construct berms out of site strippings or unsuitable soil along the limits of fill slopes and then will place controlled fill in horizontal lifts against the berms. This practice will produce a slope constructed of uncompacted materials adjacent to a zone of compacted fill with a nearly vertical interface between the two zones of fill. Over time, sometimes after appreciable rainfall, the uncompacted slope material will settle or slough away which removes the confining pressure holding the compacted fill in place. Without the confining pressure from the slope material, the compacted fill will become unstable and will slough, slide, or push out laterally. This can create problems for pavements and structures located close to the crest of the slope.

Retaining Walls and Lateral Earth Pressures

According to the North Carolina Building Code, retaining systems which provide a total vertical grade change of 5 feet over a horizontal distance of 50 feet or less must be designed and constructed under the responsible charge of a licensed professional engineer. This includes retaining walls less than 5 feet tall that may have slopes above or below the walls.

We recommend the following parameters for design of retaining walls:

Soil Type	Unit Weight, Pcf	Active Coefficient K_a	At-Rest Coefficient K_o	Passive Coefficient K_p	Friction Angle, degrees	Friction Factor
Undisturbed Residual Soils	115	0.39	0.56	2.56	26	0.35
Controlled Fill	115	0.39	0.56	2.56	26	0.35

The parameters given above are for walls without appreciable backslopes. Sloping backfill behind the wall will significantly increase the lateral pressure applied to the wall, which will require modification of the earth pressure coefficients recommended above.

The Active Coefficient should be used where the wall is allowed to rotate. Rotation at the top of the wall on the order of 0.5 percent to 1 percent of the wall height is normally required to develop the full Active Earth Pressure condition. If rotation of the top of the wall is not an acceptable condition or if the rotation will be restrained by bracing or by supported floors, then the At Rest Earth Pressure Coefficient should be used to design the wall.

Resistance to lateral sliding of the wall will be derived from friction between the wall foundation and the supporting soil and from passive earth pressure against the outside face of the embedded wall and foundation. We recommend the resistance derived from both sources be considered to act simultaneously. However, we recommend a factor of safety of 2.0 be used to compute the allowable resistance from passive pressure since considerable lateral displacement is typically required to fully mobilize the passive resistance. Additionally, passive earth pressure should be neglected in the top 1.5 feet of embedment to account for seasonal drainage, shrinkage, softening, or erosion.

Retaining wall design should account for any surcharge loads within a 45-degree slope from the base of the wall. Below grade walls that may retain water behind them should be designed to resist hydrostatic pressures in addition to earth pressures unless an adequate wall drainage zone is provided. The surface of the backfill should slope slightly to promote positive surface water flow away from the retaining wall to prevent ponding of water behind the wall.

If segmental block retaining walls will be utilized in cut areas of the site, the wall face should be located far enough away from adjacent property lines, structures, or other site constraints to permit construction of the segmental block wall. We recommend the face of the wall be located away from the site constraint by at least 2 times the total change in elevation that the retaining wall, including any slopes above or below the wall, will provide. This separation should provide approximately one wall height behind the wall face to accommodate the geogrid reinforcing sheets while still allowing enough space to make a temporary excavation for construction of the segmental wall.

There are additional design and construction considerations for segmental walls that will depend on the location, height, and interaction with other parts of the site development. We should be authorized to review the preliminary site plan, grading plan, utility plan and landscape plan to develop specific recommendations for segmental wall design and construction. If desired, ECS can provide design services for segmental walls for the project as an additional service.

We also note that segmental walls are constructed of fill soils, so slopes above segmental walls should not be steeper than 2.5:1. Slopes should be avoided below retaining walls whenever possible because of concern for global stability and foundation bearing capacity. Additional design and construction considerations for segmental walls that will depend on the location, height, and interaction with other parts of the site development should be addressed prior to design and construction of the walls.

To achieve a desirable balance between minimizing excessive pressures against the below grade walls and reducing the settlement of the wall backfill, we recommend the wall backfill be compacted to 95 percent of the maximum dry density obtained in accordance with ASTM specification D-698, standard Proctor method. Backfill should consist of controlled fill or washed stone. Heavy earthwork equipment should maintain a minimum horizontal distance away from the below grade walls of 1 foot per foot of vertical wall height up to a maximum of 3 feet. Lighter, hand held compaction equipment should be used closer than 3 feet to the below grade walls.

Exploration Procedures

Eleven soil test borings, denoted B-1 through B-11, were performed on January 3 and January 6, 2014 at the approximate locations shown on the Boring Location Plan in Appendix A. The boring locations were selected by ECS and others and were staked in the field using GPS coordinating system. Boring elevations were interpolated from topographic contours shown on the Village Point Drive Extension site plan provided by Stimmel Associates.

Drilling was performed by a CME 550X ATV drill rig using continuous-flight hollow stem augers. Soil samples were obtained by means of the split-barrel sampling procedures in accordance with ASTM Specification D-1586. In the split-barrel sampling procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. This value can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the SPT value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

We also performed eleven (11) NCDOT DCP's in the existing wetland area along and around the proposed culvert location in an effort to determine the depth and extent of soft soils. The DCP testing was continuous from the surface to the termination depth of approximately 5 to 10 feet. The NCDOT DCP has a removable tip that stays in the ground once the ½-inch diameter driving rods are removed. No soil samples were collected.

Representative portions of each SPT sample were sealed in airtight containers and returned to our laboratory for classification, testing, and storage. The soil samples were visually classified in general accordance with the Unified Soil Classification System (USCS). The basic elements of the USCS are described on a legend sheet attached in Appendix E and in ASTM D2487. Additional information from each soil boring is provided on the individual soil test boring logs in Appendix E.

Laboratory Testing

Representative soil samples obtained during our field exploration were selected and tested in our laboratory to verify field classifications and to help determine pertinent engineering properties of the site soils. Laboratory testing included visual classifications in accordance with the Unified Soil Classification System, (USCS, as described in ASTM D 2487), natural moisture content (ASTM D 2216), Atterberg limits (ASTM D 4318), and wash #200 (ASTM D 1140). The laboratory testing was performed in general conformance with the referenced ASTM standards. The test results are presented in the Laboratory Testing Summary in the Appendix of this report. Select index property test results are also included on the Boring Logs and individual test data sheets in the Appendix.

Selected SPT samples from borings B-1 through B-5, B-7 and B-8 were tested for natural moisture content in accordance with ASTM D2216. Results are indicated on the individual boring logs in Appendix A.

Selected SPT samples from borings B-3 and B-4 were tested for Atterberg Limits in accordance with ASTM D4318 and wash #200 in accordance with ASTM D1140. Results are presented in Appendix B.

Closing

This report has been prepared in order to aid in the evaluation of this site and to assist the Owner and Engineer in the feasibility study of the project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

The recommendations in this report have been developed using generalized subsurface conditions based on the soil test borings performed. Subsurface conditions can vary laterally and with depth, and significantly different conditions may exist at locations between the borings. Conditions different from those encountered by the borings and described in this report may require modifications to the geotechnical recommendations for the project.

The recommendations in this report were developed based on assumptions made by ECS regarding the likely pavement loads and the likely site earthwork. While we believe our assumptions to be reasonable based on our experience with similar projects, it is possible that specific project information may lead us to alter or modify our recommendations. We strongly recommend that we be given an opportunity to review design and construction information related to the project as soon as it becomes available so we can assess whether additional exploration or analyses may be warranted.

We recommend that the construction activities be monitored by a qualified geotechnical engineering firm to provide the necessary overview and to check the suitability of the subgrade soils for support of slabs, pavements, and footings. We would be pleased to provide these services.

APPENDICES

Appendix A – Illustrations

Site Location Map
Boring Location Plan
Generalized Subsurface Profile
Legend Sheet and Unified Soil Classification System
Soil Test Boring Logs
Wildcat Dynamic Cone Logs

Appendix B – Laboratory Test Results

Laboratory Testing Summary
Atterberg Limits
Wash #200

APPENDIX A – ILLUSTRATIONS

SCALE 1" = 1,000'

500 1000

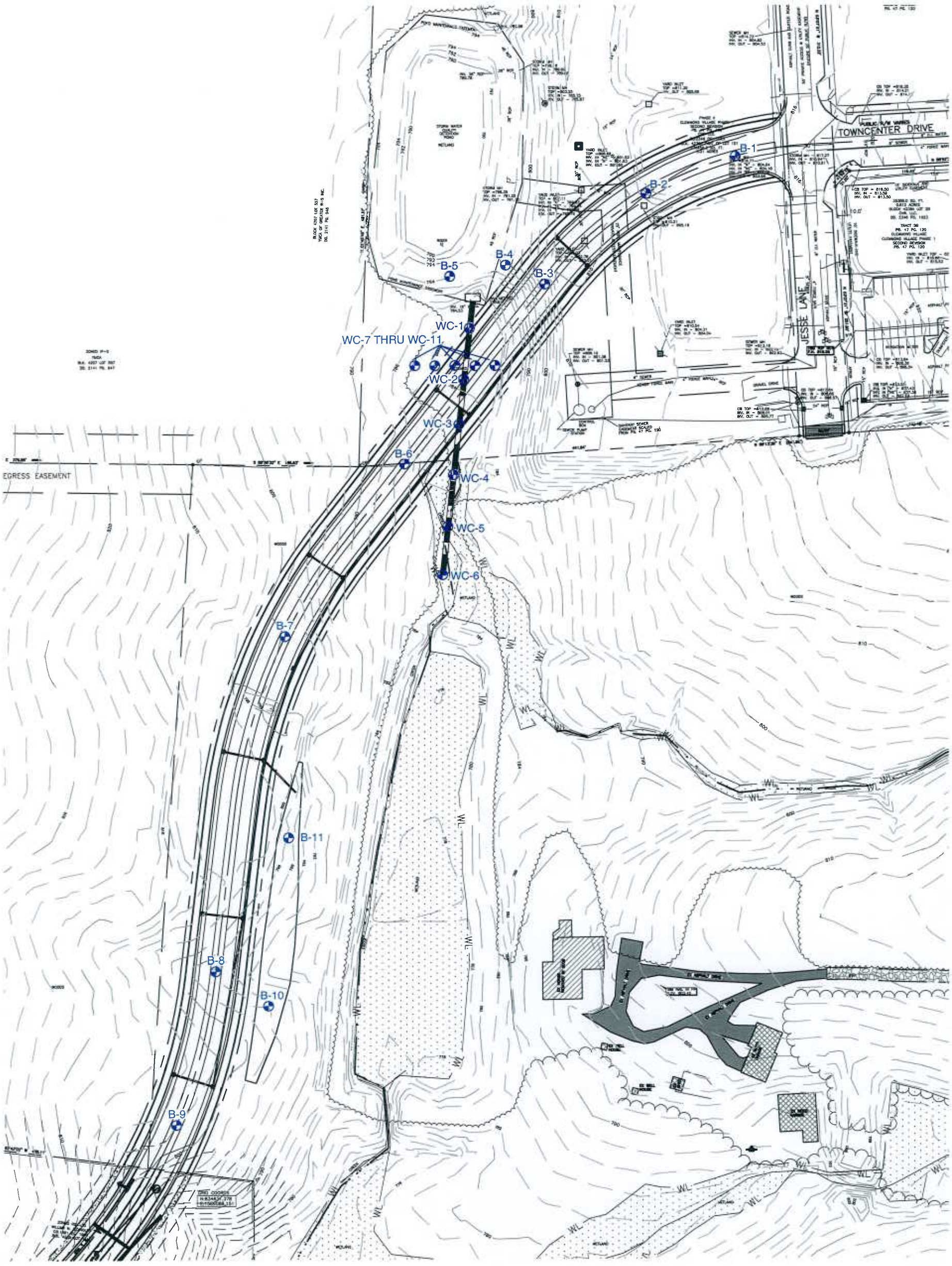
1000 0

REFERENCE:
2013 DigitalGlobe, GeoEye,
U.S. Geological Survey,
U.S.D.A. Farm Service Agency,
2013 Google

ECS LLP
CAROLINAS

FIGURE 1
SITE LOCATION MAP
VILLAGE POINT DRIVE EXTENSION
CLEMMONS, NORTH CAROLINA

DRAWN BY/DATE:		PROJECT NO.
JMR/01-08-14		09-17113-0



SCALE 1"=100'

50 100

100 0

REFERENCE:
SITE SKETCH BY
STIMMEL ASSOCIATES

ECS LLP
CAROLINAS

FIGURE 2
BORING LOCATION PLAN
VILLAGE POINT DRIVE EXTENSION
CLEMMONS, NORTH CAROLINA

DRAWN BY/DATE:		PROJECT NO.
JMR/01-07-14		09.17113-0

SOIL CLASSIFICATION LEGEND

- FILL - FILL (POSS/PROB) OF ALL TYPES.
- GW - WELL GRADED GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GC - CLAYEY GRAVEL
- SW - WELL GRADED SAND

ST - SHELBY TUBE

- ML - LOW PLASTICITY SILT
- CL - LOW PLASTICITY CLAY
- MH - HIGH PLASTICITY SILT

RC - ROCK CORE

- SM - SILTY SAND
- SP - POORLY GRADED SAND
- SC - CLAYEY SAND

PM - PRESSURE METER

- CH - HIGH PLASTICITY CLAY
- OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
- OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
- PT - PEAT
- WR - WEATHERED ROCK
- PWR - PARTIALLY WEATHERED ROCK
- HWR - HIGHLY WEATHERED ROCK
- DR - DECOMPOSED ROCK

SURFACE MATERIALS

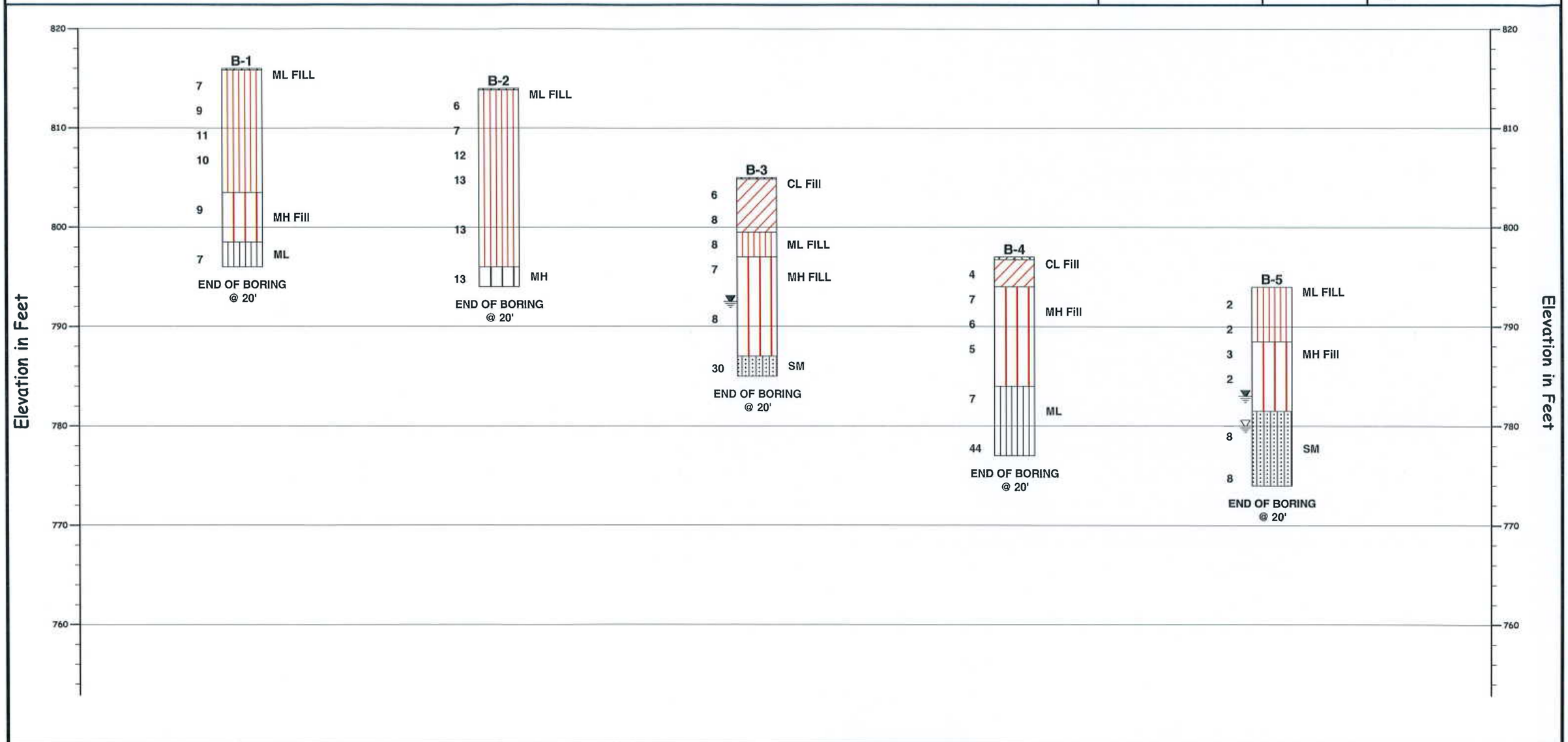
- TOPSOIL
- ASPHALT
- GRAVEL
- CONCRETE
- VOID

ROCK TYPES

- IGNEOUS
- METAMORPHIC
- SEDIMENTARY

SYMBOL LEGEND

- WATER LEVEL - DURING DRILLING/SAMPLING
- WATER LEVEL - BEFORE CASING REMOVAL
- WATER LEVEL - AFTER CASING REMOVAL
- WATER LEVEL - AFTER 24 HOURS



NOTES:

1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

GENERALIZED SUBSURFACE SOIL PROFILE

Village Point Drive Extension
Village Pointe LLC
Village Point Drive, Clemmons, North Carolina

PROJECT NO.: 17113-O | DATE: 1/14/2014 | VERTICAL SCALE: 1"=10'

SOIL CLASSIFICATION LEGEND

- FILL - FILL (POSS/PROB) OF ALL TYPES.
- GW - WELL GRADED GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GC - CLAYEY GRAVEL
- SW - WELL GRADED SAND

ST - SHELBY TUBE

- ML - LOW PLASTICITY SILT
- CL - LOW PLASTICITY CLAY
- MH - HIGH PLASTICITY SILT

RC - ROCK CORE

- SM - SILTY SAND
- SP - POORLY GRADED SAND
- SC - CLAYEY SAND

PM - PRESSURE METER

- CH - HIGH PLASTICITY CLAY
- OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
- OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
- PT - PEAT
- WR - WEATHERED ROCK
- PWR - PARTIALLY WEATHERED ROCK
- HWR - HIGHLY WEATHERED ROCK
- DR - DECOMPOSED ROCK

SURFACE MATERIALS

- TOPSOIL
- ASPHALT
- GRAVEL
- CONCRETE
- VOID

ROCK TYPES

- IGNEOUS
- METAMORPHIC
- SEDIMENTARY

SYMBOL LEGEND

- WATER LEVEL - DURING DRILLING/SAMPLING
- WATER LEVEL - BEFORE CASING REMOVAL
- WATER LEVEL - AFTER CASING REMOVAL
- WATER LEVEL - AFTER 24 HOURS

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

GENERALIZED SUBSURFACE SOIL PROFILE

Village Point Drive Extension
Village Pointe LLC
Village Point Drive, Clemmons, North Carolina

PROJECT NO.: 17113-O | DATE: 1/9/2014 | VERTICAL SCALE: 1"=10'

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▼	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-1	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - - - REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION 816

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT	CALIBRATED PENETROMETER TONS/FT^2
0					Topsoil Depth [2"]				
	S-1	SS	18	17	FILL: Fine Sandy SILT, With Mica, Light Brown, Moist, Medium Stiff to Stiff (ML FILL)	815	3 3 4	7	25.8
	S-2	SS	18	16			3 4 5	9	25.5
5					FILL: Fine Sandy SILT, With Mica, Light Brown, Moist, Stiff (ML FILL)	810	3 5 6	11	
	S-3	SS	18	18					
	S-4	SS	18	16	FILL: Fine Sandy SILT, With Mica, Light Brown, Wet, Stiff (ML FILL)		4 5 5	10	
10						805			
					FILL: Clayey SILT, Trace Mica, Tan and Gray, Wet, Stiff (MH FILL)				
	S-5	SS	18	6			3 4 5	9	
15						800			
					RESIDUAL: Fine Sandy SILT, With Mica, Brown and Dark Brown, Wet, Medium Stiff (ML)				
	S-6	SS	18	18			2 3 4	7	
20					END OF BORING @ 20.00'	795			
25						790			
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) DRY	BORING COMPLETED 01/06/14	CAVE IN DEPTH
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-2	1 OF 1
PROJECT NAME	ARCHITECT-ENGINEER		
Village Point Drive Extension			

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - — - REC% ——

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION 814

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT	CALIBRATED PENETROMETER TONS/FT²
0					Topsoil Depth [2"]				
	S-1	SS	18	16	FILL: Fine Sandy SILT, Trace Clay and Mica, Brown to Orangish Brown, Moist, Medium Stiff to Stiff (ML FILL)		2 3 3	6	26.9
	S-2	SS	18	16		810	3 4 3	7	30.4
5	S-3	SS	18	16			4 5 7	12	
	S-4	SS	18	16		805	4 6 7	13	
10	S-5	SS	18	16		800	5 6 7	13	
15	S-6	SS	18	17	RESIDUAL: Clayey SILT, With Fine Sand Tan and Gray, Moist, Stiff (MH)	795	4 5 8	13	
20					END OF BORING @ 20.00'				
						790			
25									
						785			
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) DRY	BORING COMPLETED 01/06/14	CAVE IN DEPTH @ 17.00'
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-3	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - — - REC% ——

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

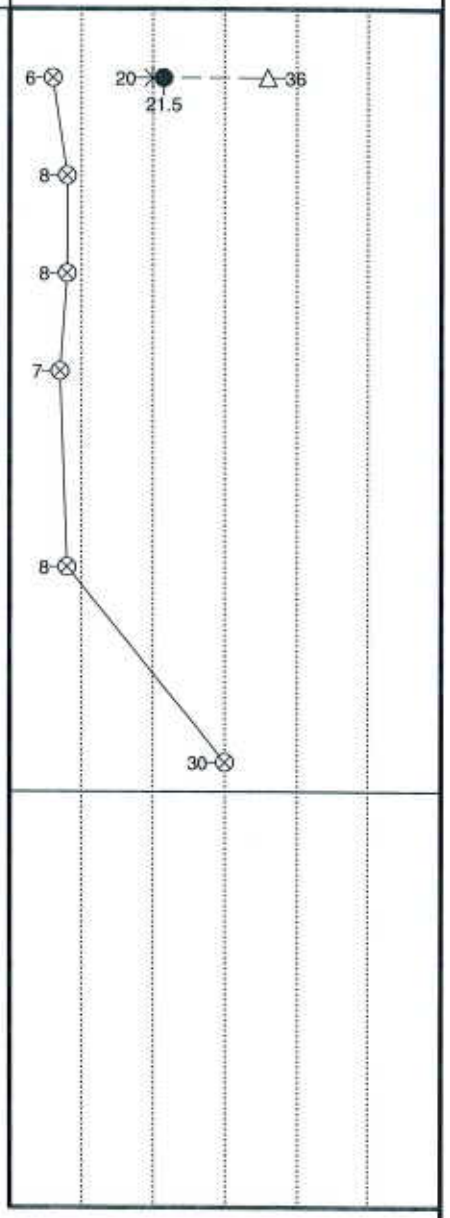
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 805

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [2"]	805	
	S-1	SS	18	16	FILL: Silty CLAY, With Fine to Medium Sand, Trace Roots and Small Wood Fragments, Brown, Wet, Medium Stiff (CL FILL)		3 3 3
	S-2	SS	18	16			2 3 5
5					FILL: Fine to Medium Sandy SILT, With Quartz Fragments, Trace Clay, Dark Brown, Wet, Medium Stiff (ML FILL)	800	
	S-3	SS	18	4			3 4 4
	S-4	SS	18	17	FILL: Fine Sandy SILT, With Clay, Trace Roots and Wood Fragments, Dark Brown, Wet, Medium Stiff (MH FILL)		2 3 4
10						795	
	S-5	SS	18	8	FILL: Clayey SILT, With Fine to Medium Sand, Trace Roots and Wood Fragments, Dark Brown, Moist, Medium Stiff (MH FILL)		3 4 4
15						790	
	S-6	SS	18	18	RESIDUAL: Silty Fine to Medium SAND, Trace Mica, Tannish Orange, Moist, Medium Dense (SM)		9 12 18
20					END OF BORING @ 20.00'	785	
25						780	
30						775	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) 12.50	BORING COMPLETED 01/06/14	CAVE IN DEPTH @ 17.00'
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-4	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - - - REC% ——

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

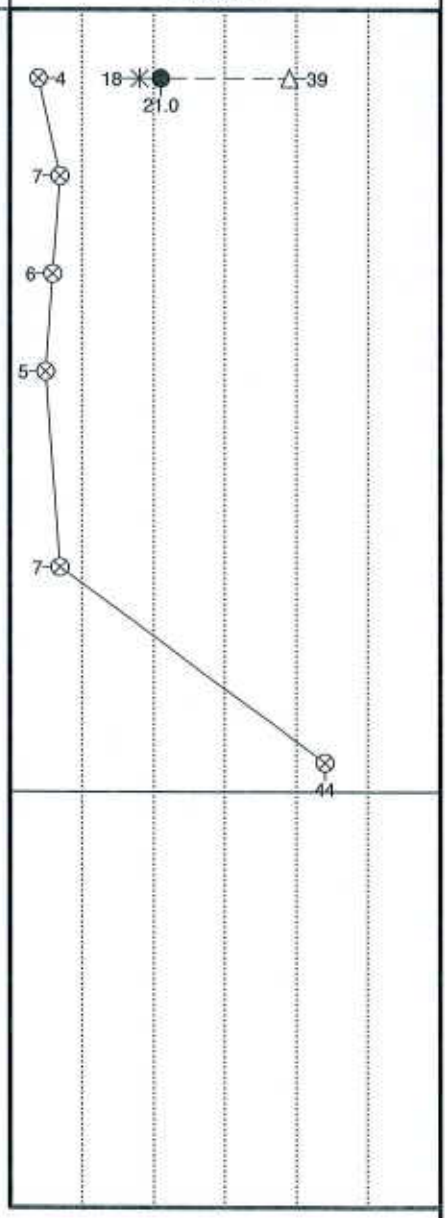
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 797

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [3"]		
	S-1	SS	18	15	FILLL: Silty CLAY, With Fine to Medium Sand, Tan and Light Gray, Wet, Soft, (CH FILL)	795	2 2 2
5	S-2	SS	18	17	FILL: Fine Sandy SILT, With Clay and Wood Fragments, Dark Brown and Black, Wet, Medium Stiff, (MH FILL)		1 5 2
	S-3	SS	18	16		790	2 3 3
10	S-4	SS	18	15	FILL: Fine to Medium Sandy SILT, With Clay, Trace Roots, Brown, Wet, Medium Stiff, (MH FILL)	785	2 3 2
15	S-5	SS	18	16	RESIDUAL: Fine to Medium Sandy SILT, Brown, Wet, Medium Stiff (ML)	780	5 3 4
20	S-6	SS	18	16	SILT, Trace Fine Sand, Light Brown, Moist, Hard (ML)		14 19 25
					END OF BORING @ 20.00'	775	
25						770	
30							



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) DRY	BORING COMPLETED 01/06/14	CAVE IN DEPTH
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-5	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - - - REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 794

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					FILL: Fine Sandy SILT, Trace Mica, Light Brown, Moist, Very Soft (ML FILL)			
	S-1	SS	18	15			1 1 1	2
	S-2	SS	18	14		790	1 1 1	2
5					FILL: SILT, With Fine Sand and Clay, Trace Roots, Dark Brown and Black, Wet, Soft, (MH FILL)			
	S-3	SS	18	15			1 2 1	3
	S-4	SS	18	14	FILL: SILT, With Fine Sand, With Roots and Clay, Trace Mica, Brown, Wet, Very Soft, (MH FILL)	785	1 1 1	2
10								
	S-5	SS	18	16	RESIDUAL: Silty Fine to Medium SAND, Trace Mica, Light Brown and Dark Brown, Wet, Loose (SM)	780	2 4 4	8
15								
	S-6	SS	18	16		775	2 3 5	8
20					END OF BORING @ 20.00'			
						770		
25								
						765		
30								

Water content: 31.1 (S-1)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 14.00 WS ☐ WD ☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) 11.00	BORING COMPLETED 01/06/14	CAVE IN DEPTH @ 13.50'
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-7	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - — - REC% ——

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

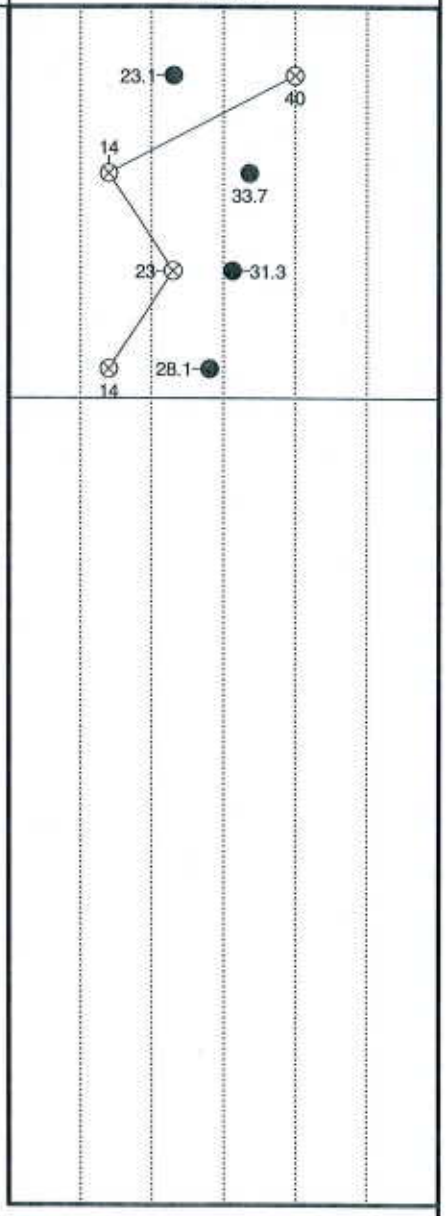
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION

SURFACE ELEVATION 800

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [3"]	800	
	S-1	SS	18	17	RESIDUAL: Silty Fine to Medium SAND, Red and Black, Moist, Dense (SM)		7 24 16
	S-2	SS	18	16	SILT, With Clay and Fine Sand, Orange, Moist, Stiff (MH)		5 6 8
5						795	
	S-3	SS	18	16	Fine to Medium Sandy SILT, Trace Mica and Rock Fragments, Orangish Brown, Moist, Very Stiff (ML)		7 10 13
	S-4	SS	18	17	Silty Fine to Medium SAND, Orangish Brown, Dry, Medium Dense (SM)		6 7 7
10					END OF BORING @ 10.00'	790	
15						785	
20						780	
25						775	
30						770	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY	WS ☐ WD ☐	BORING STARTED 01/06/14	
WL(BCR)	WL(ACR) DRY	BORING COMPLETED 01/06/14	CAVE IN DEPTH
WL		RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

CLIENT	JOB #	BORING #	SHEET
Village Pointe LLC	17113-O	B-8	1 OF 1

PROJECT NAME: Village Point Drive Extension

ARCHITECT-ENGINEER:

SITE LOCATION: Village Point Drive, Clemmons, North Carolina

NORTHING | EASTING | STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - — - REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION 796

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT	WATER CONTENT%
0					Topsoil Depth [3"]				
	S-1	SS	18	18	Residual: Fine Sandy SILT, Trace Clay and Roots, Orangish Brown, Moist, Soft (ML)	795	1 2 2	4	24.8
	S-2	SS	18	18	SILT, With Fine Sand, Orangish Brown, Wet, Medium Stiff (ML)		2 3 2	5	31.5
5									
	S-3	SS	18	18	SILT, Trace Fine Sand, Light Orange, Wet, Medium Stiff (ML)	790	2 3 3	6	32.7
	S-4	SS	18	18			2 3 4	7	31.2
10					END OF BORING @ 10.00'	785			
15						780			
20						775			
25						770			
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 01/06/14	
WL(BCR) WL(ACR) DRY	BORING COMPLETED 01/06/14	CAVE IN DEPTH
WL	RIG 550 ATV FOREMAN John Wingo	DRILLING METHOD HSA

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-1
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
	2	7.7	••	2	VERY LOOSE	SOFT
5 ft	10	38.6	••••••••••••	11	MEDIUM DENSE	STIFF
	10	38.6	••••••••••••	11	MEDIUM DENSE	STIFF
	2	7.7	••	2	VERY LOOSE	SOFT
6 ft	4	15.4	••••	4	VERY LOOSE	SOFT
	4	15.4	••••	4	VERY LOOSE	SOFT
2 m	4	15.4	••••	4	VERY LOOSE	SOFT
7 ft	8	27.4	••••••••	7	LOOSE	MEDIUM STIFF
	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
	10	34.2	••••••••••	9	LOOSE	STIFF
8 ft	10	34.2	••••••••••	9	LOOSE	STIFF
	11	37.6	••••••••••••	10	LOOSE	STIFF
	22	75.2	••••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
9 ft	27	92.3	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-2
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	30	115.8	••••••••••••••••••••••••••••••	25+	DENSE	HARD
	42	162.1	••	25+	DENSE	HARD
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-3
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	2	8.9	••	2	VERY LOOSE	SOFT
2 ft	3	13.3	•••	3	VERY LOOSE	SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
	16	61.8	••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
	4	15.4	••••	4	VERY LOOSE	SOFT
5 ft	30	115.8	••••••••••••••••••••••••••••••••	25+	DENSE	HARD
	30	115.8	••••••••••••••••••••••••••••••••	25+	DENSE	HARD
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-4
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
5 ft	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
6 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
2 m	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
7 ft	7	23.9	••••••	6	LOOSE	MEDIUM STIFF
	11	37.6	••••••••••	10	LOOSE	STIFF
	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
8 ft	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
9 ft	23	78.7	••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
	30	102.6	••••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-5
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	10	38.6	••••••••••••	11	MEDIUM DENSE	STIFF
- 4 ft	10	38.6	••••••••••••	11	MEDIUM DENSE	STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 5 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 6 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 2 m	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 7 ft	10	34.2	•••••••••	9	LOOSE	STIFF
-	18	61.6	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	15	51.3	••••••••••••••••	14	MEDIUM DENSE	STIFF
- 8 ft	12	41.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
-	13	44.5	•••••••••••••	12	MEDIUM DENSE	STIFF
- 9 ft	9	30.8	••••••••	8	LOOSE	MEDIUM STIFF
-	12	41.0	••••••••••••	11	MEDIUM DENSE	STIFF
-	18	61.6	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 3 m 10 ft	21	71.8	••••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
-	22	67.3	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-6
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	3	13.3	•••	3	VERY LOOSE	SOFT
1 m	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
4 ft	3	11.6	•••	3	VERY LOOSE	SOFT
	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
	12	46.3	••••••••••••••	13	MEDIUM DENSE	STIFF
5 ft	27	104.2	••••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
	41	158.3	••	25+	DENSE	HARD
	43	166.0	••	25+	DENSE	HARD
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-7
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	3	13.3	•••	3	VERY LOOSE	SOFT
1 ft	3	13.3	•••	3	VERY LOOSE	SOFT
	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	3	11.6	•••	3	VERY LOOSE	SOFT
4 ft	3	11.6	•••	3	VERY LOOSE	SOFT
	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
5 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
6 ft	9	34.7	••••••••••	9	LOOSE	STIFF
	14	54.0	••••••••••••••••	15	MEDIUM DENSE	STIFF
2 m	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
7 ft	18	61.6	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
	12	41.0	••••••••••••	11	MEDIUM DENSE	STIFF
	18	61.6	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
8 ft	15	51.3	••••••••••••••	14	MEDIUM DENSE	STIFF
	20	68.4	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
	20	68.4	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-8
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
	12	46.3	••••••••••••	13	MEDIUM DENSE	STIFF
	13	50.2	•••••••••••••	14	MEDIUM DENSE	STIFF
5 ft	14	54.0	••••••••••••••	15	MEDIUM DENSE	STIFF
	16	61.8	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
	20	77.2	••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
6 ft	18	69.5	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
	16	61.8	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
2 m	20	77.2	••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
7 ft	31	106.0	••••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-9
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	3.9	•	1	VERY LOOSE	VERY SOFT
4 ft	3	11.6	•••	3	VERY LOOSE	SOFT
	4	15.4	••••	4	VERY LOOSE	SOFT
	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
5 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
	3	11.6	•••	3	VERY LOOSE	SOFT
	4	15.4	••••	4	VERY LOOSE	SOFT
6 ft	4	15.4	••••	4	VERY LOOSE	SOFT
	17	65.6	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
2 m	19	73.3	•••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
7 ft	16	54.7	••••••••••••••••	15	MEDIUM DENSE	STIFF
	13	44.5	••••••••••••••	12	MEDIUM DENSE	STIFF
	20	68.4	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
8 ft	13	44.5	••••••••••••••	12	MEDIUM DENSE	STIFF
	20	68.4	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
	20	68.4	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-10
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
	1	4.4	•	1	VERY LOOSE	VERY SOFT
3 ft	2	8.9	••	2	VERY LOOSE	SOFT
1 m	2	8.9	••	2	VERY LOOSE	SOFT
	4	15.4	••••	4	VERY LOOSE	SOFT
4 ft	10	38.6	••••••••••	11	MEDIUM DENSE	STIFF
	22	84.9	••••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
5 ft	14	54.0	••••••••••••••	15	MEDIUM DENSE	STIFF
	27	104.2	••••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
	31	119.7	••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
6 ft	40	154.4	••	25+	DENSE	HARD
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

WILDCAT DYNAMIC CONE LOG

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27406

PROJECT NUMBER: 17113-O
DATE STARTED: 01-09-2014
DATE COMPLETED: 01-09-2014

HOLE #: WC-11
CREW: Travis/Adam
PROJECT: Village Pointe Drive Extension
ADDRESS:
LOCATION: Clemmons, North Carolina

SURFACE ELEVATION: 784
WATER ON COMPLETION: n/a
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 m	12	53.3	••••••••••••••••	15	MEDIUM DENSE	STIFF
-	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
- 4 ft	4	15.4	••••	4	VERY LOOSE	SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 5 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 6 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 2 m	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
- 7 ft	10	34.2	••••••••••	9	LOOSE	STIFF
-	11	37.6	••••••••••	10	LOOSE	STIFF
-	25	85.5	••••••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
- 8 ft	33	112.9	••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

APPENDIX B – LABORATORY RESULTS

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-1	1.00 - 2.50	25.8									
	S-2	3.50 - 5.00	25.5									
B-2												
	S-1	1.00 - 2.50	26.9									
	S-2	3.50 - 5.00	30.4									
B-3												
	S-1	1.00 - 2.50	21.5	CL	36	20	16	43.3				
B-4												
	S-1	1.00 - 2.50	21.0	CL	39	18	21	46.8				
B-5												
	S-1	1.00 - 2.50	31.1									
B-7												
	S-1	1.00 - 2.50	23.1									
	S-2	3.50 - 5.00	33.7									
	S-3	6.00 - 7.50	31.3									
	S-4	8.50 - 10.00	28.1									
B-8												
	S-1	1.00 - 2.50	24.8									
	S-2	3.50 - 5.00	31.5									
	S-3	6.00 - 7.50	32.7									
	S-4	8.50 - 10.00	31.2									

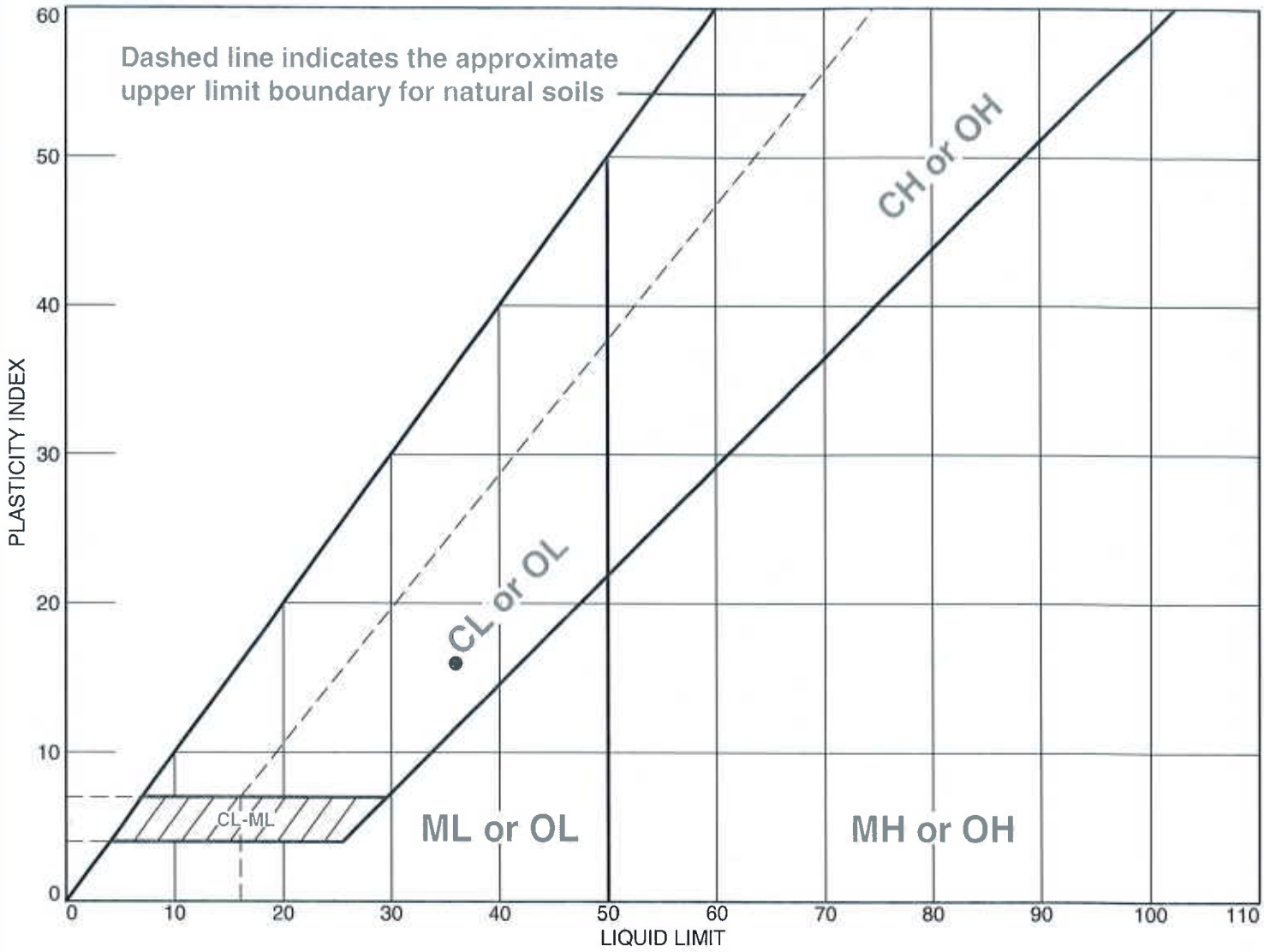
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 17113-O
Project Name: Village Point Drive Extension
PM: Lorin E. Akins
PE: Russell A. Bendel
Printed On: Wednesday, January 15, 2014

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27407
Phone: (336) 856-7150 Fax: (336) 464-2869

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: Fine to Medium Sandy CLAY, With Organics, Dark Brown, Moist, Medium Stiff	36	20	16		43.3	CL

Project No. 17113-O **Client:** Village Pointe LLC

Project: Village Point Drive Extension

● **Source of Sample:** B-3 **Depth:** 1.00-2.50 **Sample Number:** S-1

Remarks:

ECS Carolinas, LLP
4811 Kogel Boulevard
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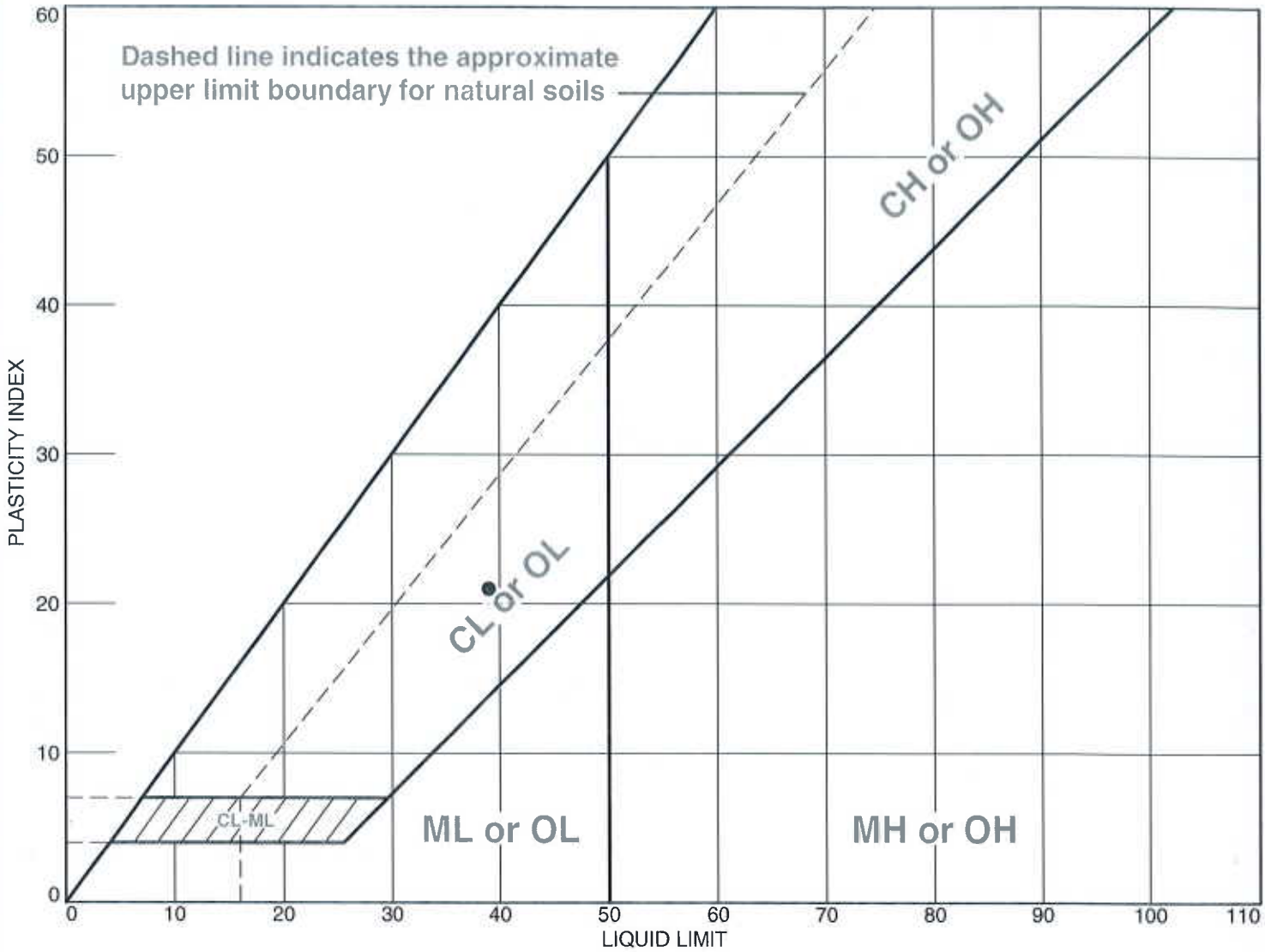
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	ALLUVIAL: Fine to Medium Sandy silty CLAY, Trace Organics, Tan and Light Gray, Moist, Soft, ALLUVIAL	39	18	21		46.8	CL

Project No. 17113-O **Client:** Village Pointe LLC

Project: Village Point Drive Extension

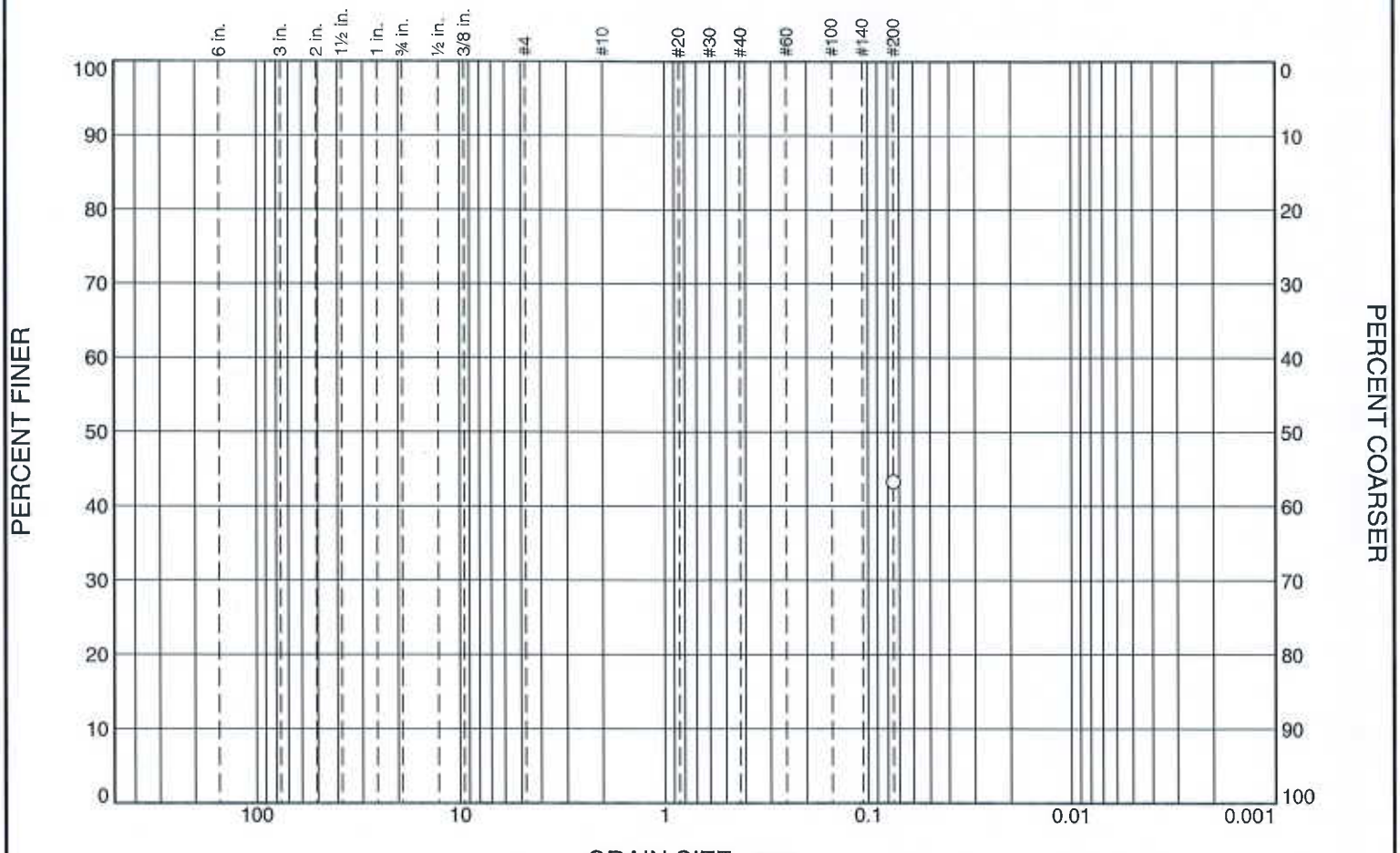
● **Source of Sample:** B-4 **Depth:** 1.00-2.50 **Sample Number:** S-1

Remarks:

ECS Carolinas, LLP
4811 Koger Boulevard
Greensboro, NC 27407
Phone: (336) 656-7150 Fax: (336) 454-2660

Figure

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
				43.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	43.3		

* (no specification provided)

Soil Description

FILL: Fine to Medium Sandy CLAY, With Organics, Dark Brown, Moist, Medium Stiff

Atterberg Limits

PL= 20 LL= 36 PI= 16

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B-3 **Depth:** 1.00-2.50
Sample Number: S-1 **Date:**

ECS Carolinas, LLP
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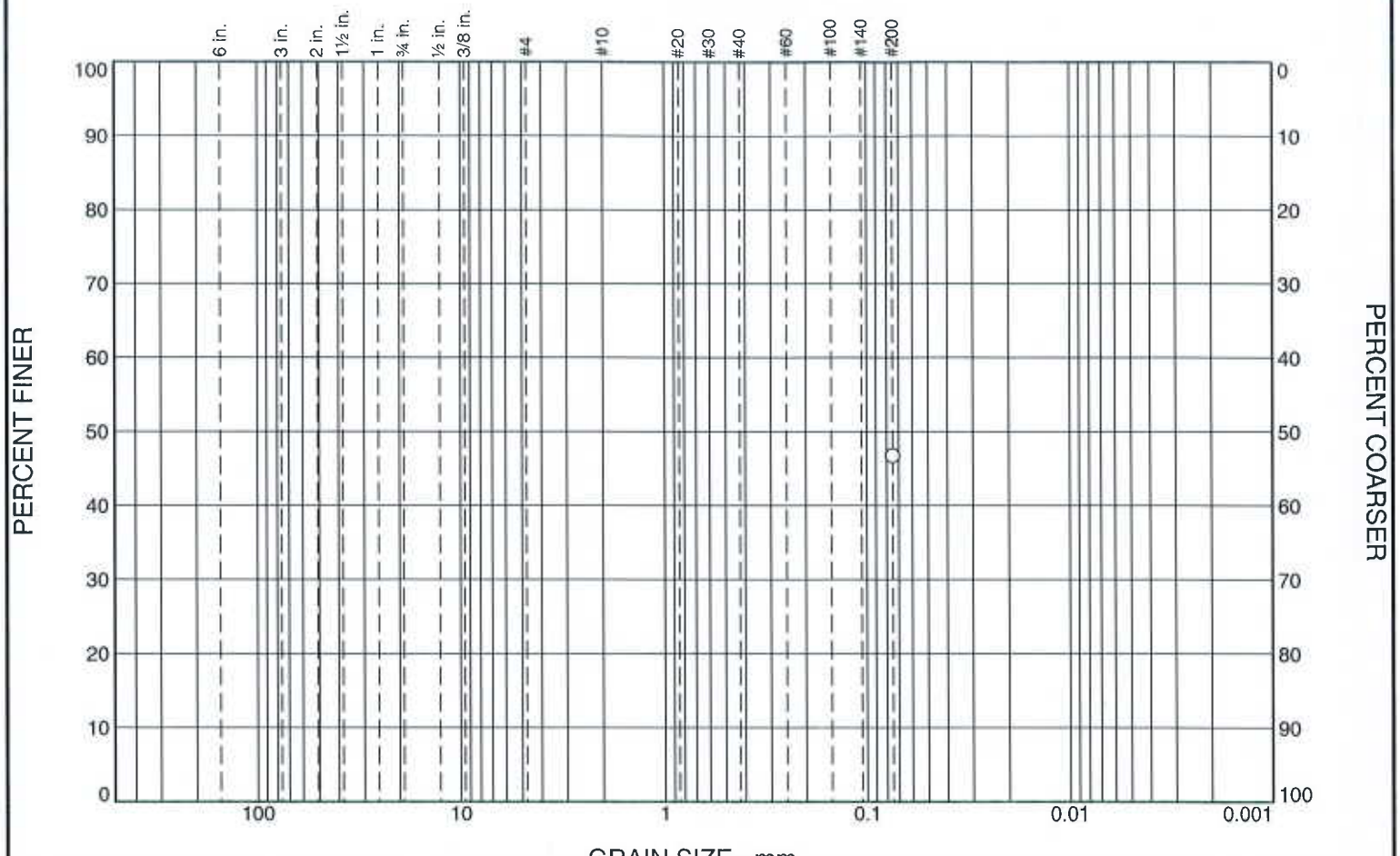
Phone: (336) 856-7150 Fax: (336) 464-2869

Client: Village Pointe LLC
Project: Village Point Drive Extension
Project No: 17113-O **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
				46.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	46.8		

* (no specification provided)

Soil Description

ALLUVIAL: Fine to Medium Sandy silty CLAY, Trace Organics, Tan and Light Gray, Moist, Soft, ALLUVIAL

Atterberg Limits

PL= 18 LL= 39 PI= 21

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: B-4 **Depth:** 1.00-2.50
Sample Number: S-1 **Date:**

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Greensboro, NC 27407
Phone: (336) 856-7150 Fax: (336) 464-2869

Client: Village Pointe LLC
Project: Village Point Drive Extension
Project No: 17113-O **Figure**