Ranger Consulting, Inc.

Geotechnical, Environmental, Drilling, Construction

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April 20, 2015

Mr. Tommy Crochet, PE
McGee Partners, Inc.
13 Corporate Boulevard
Suite 200
Atlanta, GA 30329

RE: Geotechnical Subsurface Exploration, Engineering Evaluation and Dam Visual Observation
Sun Valley Drive Extension
Roswell, Fulton County, GA

Dear Mr. Crochet:

Ranger Consulting, Inc. (Ranger) is pleased to submit the attached letter report of our geotechnical subsurface exploration and engineering evaluation for the above referenced project. The report of dam visual observations is being submitted under separate cover.

If you have any questions, please contact Sandy Miller or Warren Bailey at 706-290-1782. Ranger appreciates the opportunity to be of service to you on this project.

Sincerely,

Peggy McGee
President

Enclosure

GEOTECHNICAL SUBSURFACE EXPLORATION
AND ENGINEERING EVALUATION
Sun Valley Drive Extension
Roswell, Fulton County, Georgia
April 20, 2015

INTRODUCTION

This report provides the results of the geotechnical subsurface exploration and engineering evaluation performed for the Sun Valley Drive Extension project. Included in this report are foundation investigations for the proposed culvert and retaining wall. A dam visual observation letter report is being submitted under separate cover. The property is located in the City of Roswell, Fulton County, Georgia to the east of the existing Sun Valley Drive approximately ¼-mile east of its intersection with Alpharetta Highway and to the north of the existing Warsaw Road Extension. The subsurface conditions of portions of the site were explored by a series of soil borings, and in some locations, rock coring was performed. The results of the borings and a plan showing their approximate location are included with this report. Descriptions of the subsurface conditions encountered in the borings and recommendations for use in designing the culvert and retaining wall foundations are provided. In addition, there is also discussion of the suitability of the soils encountered for use as roadway fill materials and of the rippability of the rock encountered in the rock core borings.

Borings B-1, its offsets and B-7 were performed in a proposed bio-retention area located to the west of the existing creek. Borings B-5, B-6 and B-10 through B-15 were performed in a proposed bio-retention area located to the east of the existing creek. Borings B-2, its offsets, B-3, B-4, B-8 and B-9 were performed around the existing pond in the areas of the proposed littoral shelves. Borings C-1 through C-3 were performed in the area of the proposed culvert. Borings W-1 and W-2 were performed in the area of the proposed retaining wall. The rock cores R-1 through R-10 were performed in both of the proposed bio-retention areas and the areas of the proposed littoral shelves.

SITE EXPLORATION PROCEDURES

Boring locations for B-1 through B-15, C-1 through C-3, W-1, W-2, and HA-1 through HA-4 were established in the field by representatives of McGee Partners, Inc. and AEC, Inc. along with Ranger Consulting, Inc. personnel. In addition, Ranger personnel established the locations for all of the soil boring offsets (B-1A through B-1F and B-2A through B-2D) and rock cores (R-1 through R-10) based on conversations with Mr. Tommy Crochet of McGee Partners, Inc. Boring elevations were then interpolated from the topographic plan provided by McGee Partners, Inc. Consequently, referenced boring locations and elevations should be considered approximate. An all-terrain, rotary drill rig equipped with hollow stem augers was used to advance the boreholes. Representative soil samples were obtained by the Standard Penetration Test. The rock core borings were advanced to rock using NWJ rods and a tri-cone bit. When rock was encountered, an NQWL bit was used to obtain rock cores approximately 1⅞-inches in diameter.

The drill crew prepared field logs as part of the drilling operations. The boring logs included visual classifications of the materials encountered during drilling and the driller's interpretation of the subsurface conditions between samples. The final boring logs included with this report in Appendix III represent the engineer's interpretation of the field logs and additional visual examination of the soil samples. The borings were backfilled with soil cuttings from the drilling process and marked with wooden stakes so that the locations could later be surveyed by another member of the project team.

LABORATORY TESTING

To aid in classifying the soils and determining their engineering properties, laboratory tests were performed on representative soil samples obtained from the soil test borings. All laboratory testing was performed in general accordance with current ASTM standards and included:

- Six (6) GDOT 810 Series (GDT-4, GDT-6, GDT-7) tests on bulk samples from borings B-1 through B-6;
- Three (3) Atterberg Limits (ASTM D4318);
- Three (3) Sieve Analysis with Hydrometer (ASTM D422);
- Three (3) USCS Classification of soils for engineering purposes (ASTM D2487);
- Nine (9) Moisture Content Determinations (ASTM D216);
- One (1) Resistivity; and
- One (1) pH test.

The laboratory test results are summarized in Table 1 of Appendix II and included in Appendix IV.

SITE AND SUBSURFACE CONDITIONS

The project site is geologically sited in a formation composed of biotitic gneiss, mica schist and amphibolite within the Georgia Piedmont Physiographic Region.

Soil and Rock Conditions

The borings drilled generally encountered approximately 1 to 4 inches of topsoil with the thicker topsoil zones encountered on the eastern portion of the site. Fill was encountered in borings B-1, B1-A through B-1F, B-5, B-6, and B-10 through B-14 to depths varying from 2 to 18 feet below the existing ground surface (bgs). The fill encountered in boring B-1 and its offsets was generally described as micaceous sandy silt or silty sand with rock fragments or organic material

consisting of intermixed topsoil and small wood fragments. The fill encountered in borings B-5, B-6, and B-10 through B-14 was generally described as micaceous clayey sand, silty sand, sandy silt or clayey silt with rock fragments or organic material consisting of intermixed topsoil. Standard penetration resistances in the fill soils varied from 6 to over 100 blows per foot (bpf), but may have been amplified by the presence of rock fragments.

Alluvium (water deposited soil) was encountered in borings C-1 through C-3, W-1 and W-2 to depths varying from 3 to 8 feet bgs. The alluvium generally consisted of silty sand, sandy silt, clayey silt, silty clay or sandy clay with organic fragments. Standard penetration resistances in the alluvial soils varied from 0 to 11 bpf, but may have been amplified by the presence of rock fragments.

Residual soils were encountered in most of the borings beneath the topsoil, fill soil or alluvial soils. The residuum was generally described as silty sand or sandy clay with rock fragments. Standard penetration resistances in the residuum varied from 12 to over 100 bpf.

Auger refusal materials are any very hard or very dense material, such as boulders or the upper surface of bedrock, which cannot be penetrated by a power auger. Auger refusal was encountered in all of the borings performed at depths ranging from 2 to 21 feet bgs [approximate elevations ranging from 1051 to 1025 feet above Mean Sea Level (ft-MSL)]. Summaries of the soil boring fill, alluvium, residual and auger refusal depths are included in Tables 2 and 3 of Appendix II.

Rock coring to determine the nature and continuity of refusal materials was performed in rock core borings R-1 through R-10. Rock quality was variable with recovery values (REC) ranging from 71% to 100%, and rock quality designations (RQD) varying from 18% to 71%. Based on visual observations, the rock is typically soft and weathered near the upper surface of the rock; however, rock quality increases with depth. Rock core depths and rock core and proposed ground surface elevations are included as Tables 4 and 5 in Appendix II, and rock core photographs are included as Figure 4 in Appendix I.

All cores listed on the following table are NQ (1⅞-inches in diameter). REC describes the percent of the rock core run that was recovered. RQD describes the percent of the rock core run that consisted of intact rock core at least 4- inches in length. A summary of the rock core depths and quality are included in Table 3 of Appendix II.

Groundwater Conditions

Groundwater was observed after 24 hours in the culvert borings and wall borings (C-1 through C-3, W-1 and W-2). Stabilized groundwater was encountered at 2 feet bgs (approximate elevations ranging from 1042 to 1040 ft-MSL) in the culvert borings and at depths ranging from 1 to 10 feet bgs (approximate elevation of 1056 ft-MSL) in the wall borings.

Groundwater levels vary with changes in season and rainfall, construction activity, surface water runoff and other site-specific factors. Groundwater levels in the Roswell area are typically lowest in the late summer-early fall and highest in the later winter-early spring; consequently, the water table may vary at times.

Reference should be made to Table 6 in Appendix II for allowable pipe culvert materials based on the laboratory corrosion tests performed on the surface water present in the existing creek.

CONCLUSIONS AND RECOMMENDATIONS

Existing Fill Soils

Based on the GDOT 810 Series testing performed on bulk samples from borings B-1 through B-6, the existing soils to be cut and used as fill in the proposed roadway are Class I-A2 to II-B3 soils. None of these materials should require wasting or removal. Soil moisture content should be maintained within 3 percent of the optimum moisture content. We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting soils. The natural moisture content of the soils from boring B-1 was just over 3 percent of the optimum moisture content, and the natural moisture content of the soils from boring B-2 was more than 6 percent less than the optimum moisture content. Also, fine grained soils including sandy silts were encountered in the proposed cut areas. Establishing subgrades in these fine grained soils may be challenging and could require drying or wetting.

Laboratory testing, including Atterberg Limits, sieve analysis with hydrometer, USCS classification of soils for engineering purposes and moisture content determinations, indicates the residual soils generally encountered just above the underlying rock are silty sands.

For pavement design purposes, Ranger recommends the use of a soil support value of 2.0 based on GDOT county averages. Additionally, a regional factor of 1.8 and a subgrade reaction value, k, of 110 pounds per cubic inch (pci) are recommended for use in pavement design calculations. We recommend an average soil shrinkage factor of 25 percent for use in earthwork calculations for this project.

Quality of Encountered Rock

Based upon the planned finished grades, rock that requires difficult excavation techniques will be encountered during site grading. Rock cores R-1 through R-10 were performed in both of the proposed bio-retention areas and the areas of the proposed littoral shelves. Based on the rock cores recovered, it appears portions of the encountered rock may be excavated using conventional earth moving equipment such as scrapers, loaders, pans, dozers or graders. The encountered thicknesses of this soft, weathered rock varied from approximately ½ to 2½ feet. However, rock which will likely require concentrated ripping with a single-tooth ripper or blasting was encountered above proposed grades in rock cores R-1 through R-5, R-7, R-8 and R-10 (refer to Figure 3 in Appendix I). In some areas, moderately hard to hard rock which will likely require blasting was encountered at depths 1½ to 5½ feet above the proposed finished grades (refer to Tables 4 and 5 in Appendix II). Additionally, subsurface conditions are often erratic and variations in the rock profile can occur in small lateral distances. Therefore, it is likely that very dense soils or rock pinnacles or ledges requiring difficult excavation techniques and/or blasting may be encountered in site areas intermediate of the performed borings.

If blasting is considered at the site, the designer may need to define vibration limits and incorporate vibration monitoring and/or crack surveys in the construction contract. Vibration from construction may cause some concern with surrounding property owners.

Culvert Foundation Investigation

A double 8-foot wide by 6-foot high box culvert, approximately 200 feet long and covered by up to 25 feet of fill, will be constructed in the area of the drained pond and the existing creek. Alluvial soils were encountered to depths of 3 to 6 feet bgs in the area of the culvert. These fine grained, very soft soils should be removed prior to construction of the culvert. Additionally, these alluvial materials are unsuitable for use in embankment construction. These materials, once removed, may be used in thin layers to flatten slopes or may be wasted outside of the construction limits of the project.

We recommend that a 12-inch blanket of Type II foundation backfill material be placed under the barrel of the proposed culvert. Due to the groundwater elevations encountered in the culvert borings (approximate elevations 1042 to 1040 ft-MSL) and the existing creek, the proposed culvert area will likely not be able to be drained. Depending on the subgrade conditions encountered at the time of construction, it may be necessary to place a layer of filter fabric prior to backfill material placement below the culvert.

Wall Foundation Investigation

A mechanically stabilized earth (MSE) retaining wall approximately 280 feet in length and up to 15 feet in height will be constructed near the southern end of the project just north of Warsaw Road Extension. Subsurface soils encountered in the proposed wall area consisted of approximately 8 feet of alluvial soils generally described as sandy clay, sandy silt or clayey silt with rock fragments and organic materials. These fine grained, very soft soils should be removed prior to construction of the retaining wall. The alluvial soils were underlain by residual soils generally described as silty sand. The groundwater elevations observed in borings W-1 and W-2 were 1 and 10 feet below the existing ground surface (approximate elevation of 1056 ft-MSL). Dewatering may be required to prevent the softening of foundation soils during construction.

The following minimum design parameters are recommended for use for the proposed MSE wall:

Parameter	**Value**
Cohesion, C	0 psf
Soil Unit Weight, γ	120 pcf
Angle of Internal Friction, φ	30°
Coefficient of Sliding Friction, μ	0.35

The maximum allowable soil bearing pressure recommended for the proposed wall is 3,000 psf. The bottom of the wall foundation should be embedded at least 3 feet below the existing groundline due to the presence of soft surficial soils in the area. If the MSE wall design pressure exceeds the maximum allowable pressure, then the wall should be constructed to a height

equivalent to the allowable bearing pressure, and after a 30-day waiting period, the wall may be constructed to its final height. Drainage through the wall should be included as part of the design and construction.

Due to the presence of very soft soils and shallow groundwater depths, it is recommended that the foundation soils be undercut three feet in depth and to two feet in depth outside the footing limits. The excavation should then be backfilled with structural backfill material and compacted to 98% maximum dry density.

Site Grading

Prior to proceeding with construction, all vegetation, root systems, topsoil and other deleterious non-soil materials should be stripped from proposed construction areas. Clean topsoil may be stockpiled and subsequently re-used in landscaped areas. Debris-laden materials should be excavated, transported and disposed of off-site in accordance with appropriate solid waste rules and regulations. All existing utility locations should be reviewed to assess their impact on the proposed construction.

After clearing and stripping, areas which are at grade or will receive fill should be carefully evaluated by a geotechnical engineer. The engineer will require proof rolling of the subgrade with multiple passes of a 20 to 30 ton loaded truck or other pneumatic-tired vehicle of similar size and weight. The purpose of the proof rolling is to locate soft, weak, or excessively wet fill or residual soils present at the time of construction. Any unstable materials observed during the evaluation and proof rolling operations should be undercut and replaced with structural fill or stabilized in-place by scarifying and re-densifying.

Previously placed fill materials were encountered during this exploration. Based on our experience, we anticipate fill materials likely exist at other locations between our borings. Old fills are frequently erratic in composition and consistency. In the event that low consistency and/or debris laden fill materials are encountered during construction, typical recommendations would include undercutting and backfilling with structural fill and/or stabilizing in-place with fabric, stone, and/or other remedial techniques. Actual remedial recommendations can best be determined by the geotechnical engineer in the field at the time of construction.

Groundwater was encountered above or near planned grades in the areas of the proposed culvert and retaining wall and will have a significant impact on construction and the nature and extent of remedial subgrade improvement. We believe it would be prudent to schedule construction activities for the drier season of the year, typically late summer, early fall, when groundwater levels and rainfall are usually near their yearly minimum.

Excavations below groundwater may require the installation of a dewatering system. Even after the dewatering systems are installed, these residual materials will be water-softened and subject to degradation due to the high groundwater levels. Construction traffic should be minimized as much as practical to reduce the damage to the subgrade. However, regardless of the protective measures taken, we anticipate that undercutting and stabilization of portions of the residual soil subgrade will still be necessary.

Following undercutting of unstable residual soil areas, we anticipate stabilization of the subgrade will be needed using filter fabric and crushed stone to provide a stable base upon which to place and compact structural fill. If properly designed and installed, the geotextile/stone stabilization layer can be incorporated into the temporary and permanent dewatering systems. The actual extent of the necessary remedial actions required can best be determined in the field by the geotechnical engineer at the time of construction.

As previously mentioned, soft alluvial soils were encountered in the areas of the proposed culvert and retaining wall to depths ranging from 3 to 8 feet bgs. Prior to fill placement, a geotechnical engineer should carefully evaluate subgrade conditions in these areas. In the event that unstable soils are encountered, typical recommendations would include undercutting and replacing with structural fill/stone or stabilizing in-place with fabric and stone, as described below. A temporary dewatering system will be required in the event that groundwater exists at or near subgrade levels.

Stabilization of the exposed groundwater-softened subgrade will likely consist of a woven geotextile overlain by 1 to 2 feet of surge stone capped with 6 to 12 inches of #57 stone and/or compacted graded aggregate base (GAB). The actual extent and nature of the required remedial measures can best be determined in the field by the geotechnical engineer at the time of construction.

Very dense soils, auger refusal materials and/or rock were encountered in a majority of the borings performed at depths above planned grades. As a result, difficult excavation techniques and/or blasting will be required, or the planned grades will have to be raised. The gradation of material removed by ripping or blasting will probably be erratic. Re-use of these materials in fills will require additional effort and control. Preferably, the widespread use of these materials in structural fill areas should be avoided. Typically, approved fill areas where these materials may be used include landscaped areas or other non-structural fill areas, provided the upper limit (elevation) of these materials is at least 2 feet below design subgrade elevations. However, these materials may be placed in structural areas provided the upper limit (elevation) of these materials is at least 3 feet below design subgrade elevations of pavements and 5 feet below the bottom of spread foundations.

Rock pieces with thicknesses over 3 inches should not be incorporated into the fills. Soil should be intermixed with the rock materials in sufficient quantities to prevent void formation within the mass. The soils should be at or near their optimum moisture content. Lift thicknesses should remain as thin as practical and should not exceed 1 foot prior to compaction.

Heavy compaction equipment will be required in order to adequately compact the soil matrix to its required density and to break down the rock materials. Additional effort will be required to pulverize the dense materials in structural fill areas to provide well-compacted, relatively homogeneous fill. Our experience has been that these materials generally require at least 6 passes of heavy vibratory compaction equipment; however, we recommend that actual compaction requirements be determined in the field by the geotechnical engineer.

We recommend the use of an average swell factor of 30 percent for materials classified as hard rock.

GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur across the sites or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, Ranger Consulting, Inc. should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Ranger Consulting, Inc. reviews the changes, and either verifies or modifies the conclusions of this report in writing.

Report Prepared By: _____

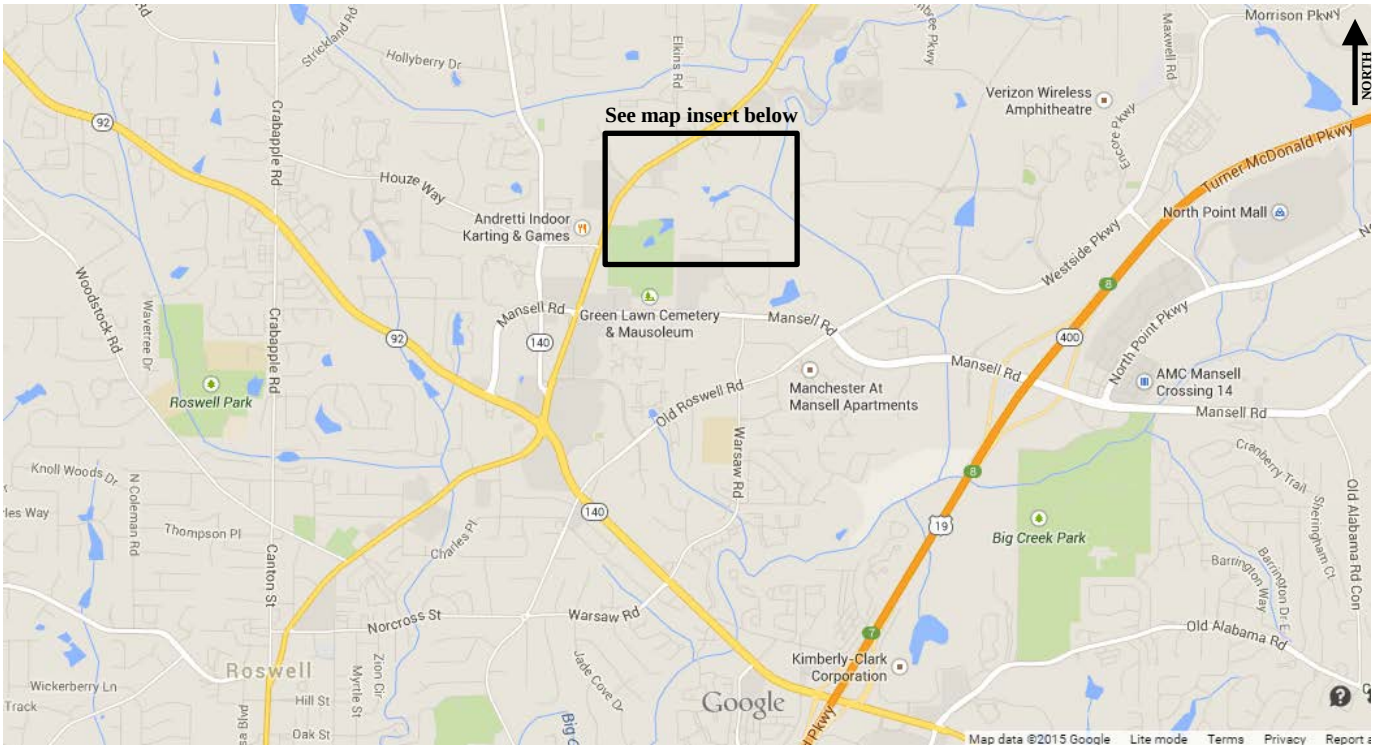
Sandra A. Miller, PE
GA PE No. 36138

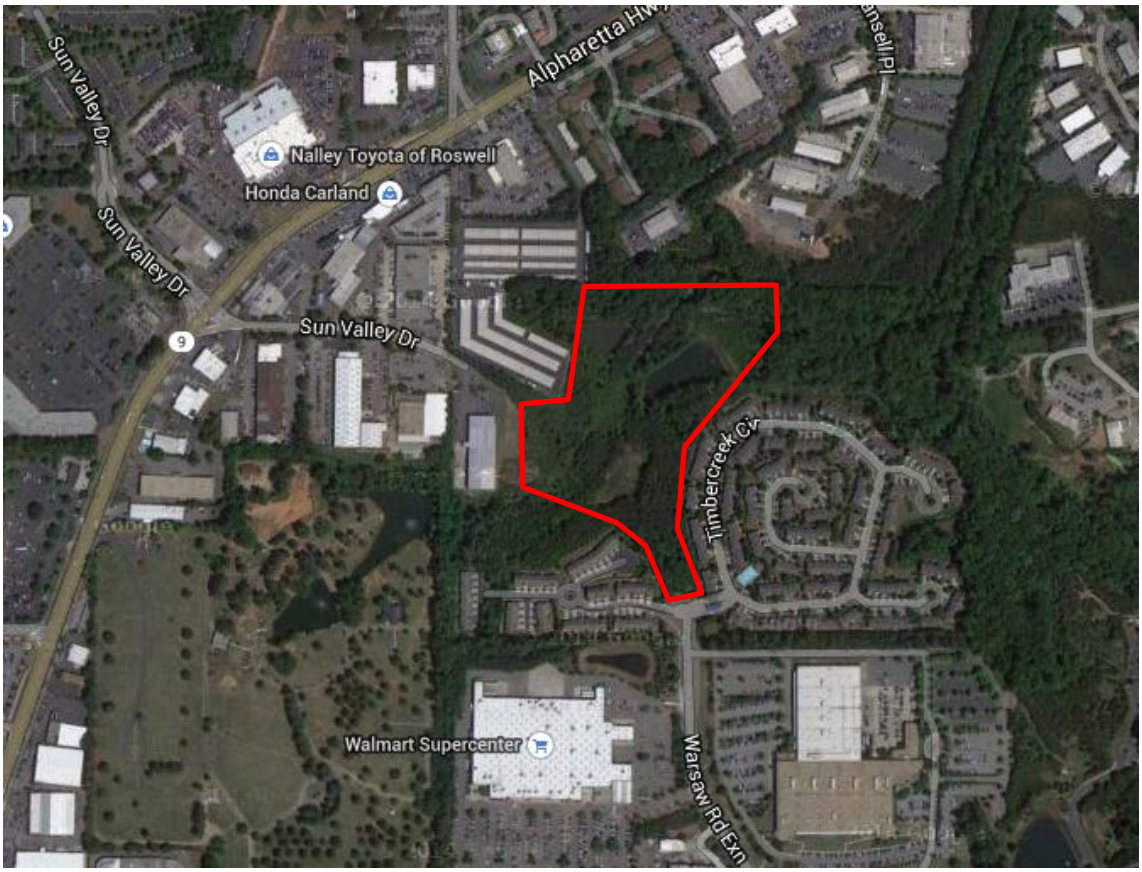
Report Reviewed By: _____

Warren F. Bailey Jr., PE
GA PE No. 11462

APPENDIX I

Figures

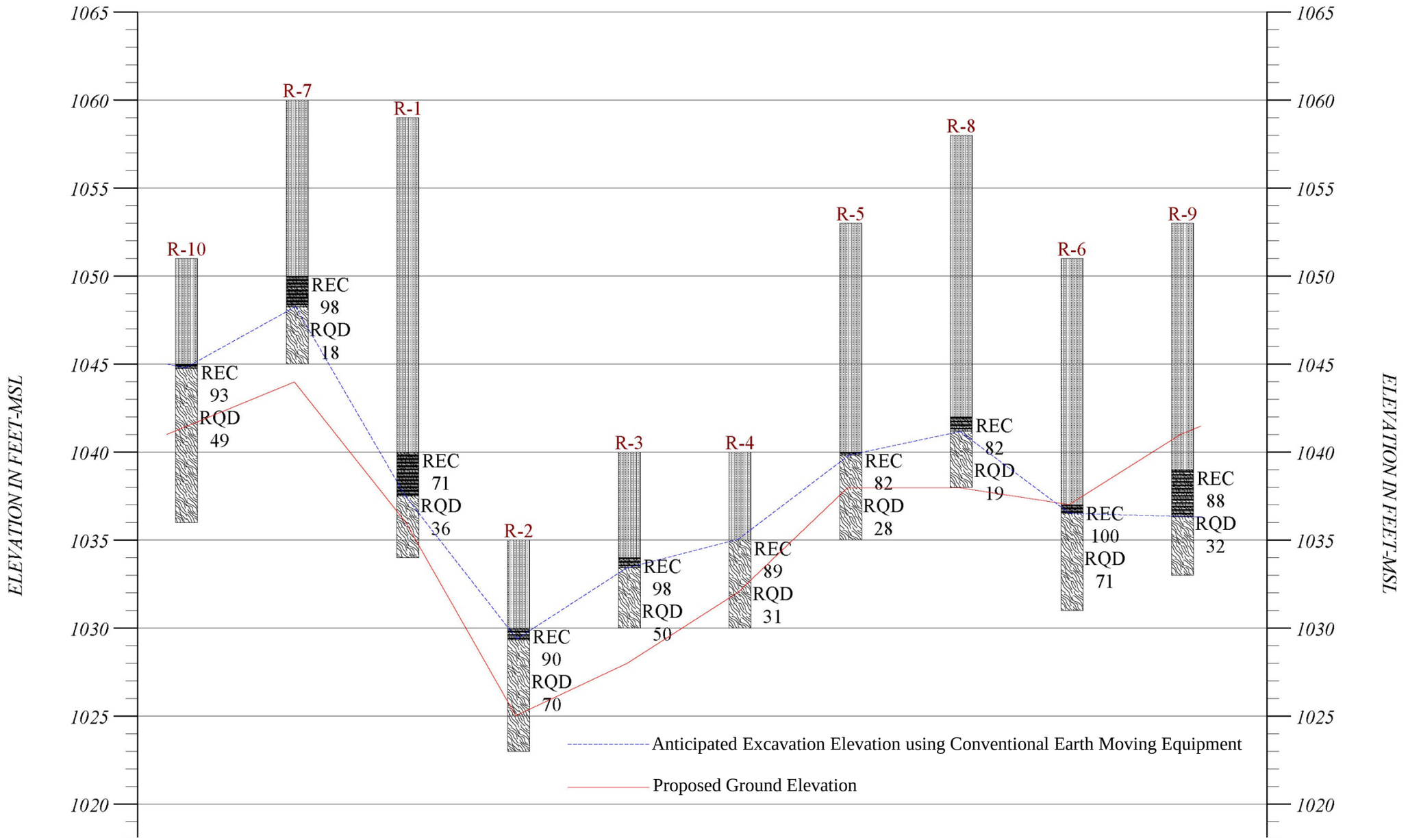




Site location outlined in red should be considered approximate.

Scale: Not to Scale **Drawn by**: S. Miller **Date Drawn**: 04/15/2015	**Project**: Sun Valley Drive Extension City of Roswell Fulton County, Georgia	Site Location Map *Ranger Consulting, Inc.*	**Figure 1**


LIMIT OF DISTURBANCE
TEMPORARY STOCKPILE LOCATION
APPROX. VOLUME 7,500 CY
MATCHLINE A
MATCHLINE B
EXISTING R/W
EXISTING OCS
REMOVE ALL EXISTING TREES FROM DAM. STUMPS FROM TREES UNDER 4" IN DIAMETER MAY BE LEFT IN PLACE. TREES OVER 4" MUST HAVE STUMPS REMOVED AND BACKFILLED WITH SELECT MATERIAL.
B-20.2'
B-2k7'
B-2.2'
B-28.2'
B-20.2'
B-3.8'
B-2.6'
B-8.3'
B-4.6'
B-1C.9'
B-1B.11'
B-1E.18'
B-1A.14'
B-1.17'
B-1F.12'
B-1D.21'
HA-2.6'
B-7.9'
HA-1.4'
B-10
HA-3.4'
B-5.13'
B-11 13'
B-12 16'
B-13' 18'
B-14 15'
B-6.16'
B-15 18'
C-3.5'
C-2.5'
C-1.5'
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-9
R-10
W-1
W-2
SVDS CREEKSIDE AT MANSELL TOWNHOMES ASSOC INC PID 12-2171-0520-072-2
SVDS CREEKSIDE AT MANSELL TOWNHOMES / PILOT HOME CORP PID 12-2260-0545-068-5
CITY OF ROSWELL PID 12-2170-0520-061-4
STORMCEPTOR STM MANUFACTURER'S I.P. PID 12-2170-0520-062-3
RETAINING WALL PID 12-2170-0520-064-5
Sun Valley Drive Extension
Figure 2
Boring Location Plan



Silty Sand
Weathered Biotite Gneiss
Biotite Gneiss
REC - Recovery
RQD - Rock Quality Designation

Scale: Not to Scale
Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Profile

Ranger Consulting, Inc.

Figure 3

Scale: Not to Scale
Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Photographs

Ranger Consulting, Inc.

Figure 4

Scale: Not to Scale
Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Photographs

Ranger Consulting, Inc.

Figure 4

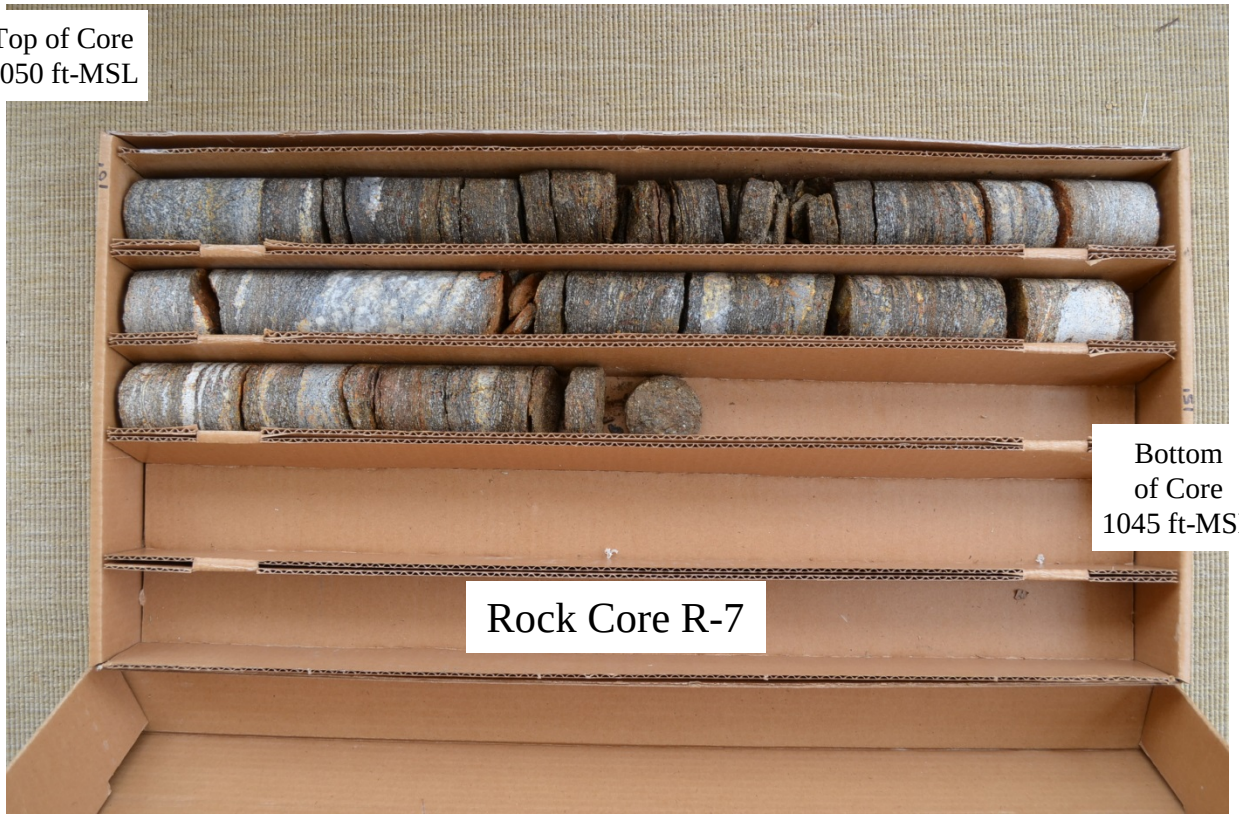
Scale: Not to Scale
Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Photographs

Ranger Consulting, Inc.

Figure 4



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Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Photographs

Ranger Consulting, Inc.

Figure 4

Scale: Not to Scale
Drawn by: S. Miller
Date Drawn: 04/16/2015

Project:
Sun Valley Drive Extension
City of Roswell
Fulton County, Georgia

Rock Core Photographs

Ranger Consulting, Inc.

Figure 4

APPENDIX II

Tables

TABLE 1
SUMMARY OF LABORATORY TESTS

Sun Valley Drive Extension
Roswell, Fulton County, Georgia

Boring Number	B-1	B-2	B-3	B-4	B-5
Depth	0-20’	0-7’	0-8’	0-6’	0-13’
Description	Red brown micaceous silty clayey sand	Orange brown micaceous silty clayey sand	Orange brown micaceous silty clayey sand	Orange brown micaceous silty clayey sand	Brown micaceous silty clayey sand
1½” Sieve	100	100	100	100	100
¾” Sieve	99.8	99.6	99.4	98.0	99.7
#10 Sieve	83.4	84.3	81.4	74.9	86.4
#40 Sieve	70.2	65.9	63.8	56.5	70.7
#60 Sieve	63.6	57.5	56.6	48.7	63.4
200 Sieve	44.4	33.7	35.4	28.2	42.3
% Clay	25.5	10.6	14.5	11.9	21.3
Total Volume Change	15.5	17.4	10.3	8.0	11.0
% Swell	9.39	16.42	9.17	6.57	7.54
% Shrinkage	6.15	1.00	1.15	1.44	3.46
Max. Dry Density	116.2	118.9	119.0	119.3	117.5
% Optimum Moisture	14.5	13.0	12.5	12.5	14.0
% Natural Moisture	17.6	6.8	10.1	13.9	16.3
Liquid Limit	-	-	-	-	-
Plastic Limit	-	-	-	-	-
Plasticity Index	-	-	-	-	-
Erosion Index	4.72	5.95	5.83	6.69	4.96
Resistivity	-	-	-	-	-
pH	-	-	-	-	-
Classification	II-B3	I-A3	II-B2	I-A2	II-B2

TABLE 1
SUMMARY OF LABORATORY TESTS

Sun Valley Drive Extension
Roswell, Fulton County, Georgia

Sample Number	B-6	B-1D	B-5	B-6	SW-1
Depth	0-16’	18.5-20’	8.5-10’	8.5-10’	-
Description	Brown micaceous silty clayey sand	Grey orange tan micaceous silty sand (SM)	Brown micaceous silty sand (SM)	Red brown micaceous silty sand (SM)	Surface Water
1½” Sieve	100	100	100	100	-
¾” Sieve	99.5	100	100	100	-
#10 Sieve	83.1	82.0	85.4	95.7	-
#40 Sieve	62.4	60.0	62.7	83.5	-
#60 Sieve	53.9	49.5	53.4	72.8	-
200 Sieve	33.3	25.7	32.1	41.7	-
% Clay	13.8	7.6	16.8	11.2	-
Total Volume Change	15.8	-	-	-	-
% Swell	13.39	-	-	-	-
% Shrinkage	2.43	-	-	-	-
Max. Dry Density	116.4	-	-	-	-
% Optimum Moisture	13.6	-	-	-	-
% Natural Moisture	16.2	14.1	15.29	25.49	-
Liquid Limit	-	30	34	38	-
Plastic Limit	-	27	29	34	-
Plasticity Index	-	3	5	4	-
Erosion Index	6.07	4.84	6.19	4.96	-
Resistivity	-	-	-	-	18600
pH	-	-	-	-	6.54
Classification	II-B3	-	-	-	-

TABLE 2
SOIL BORING FILL, RESIDUAL AND AUGER REFUSAL DEPTHS

Sun Valley Drive Extension
Roswell, Fulton County, Georgia

Boring	Fill		Residual		Auger Refusal	
	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)
B-1	0-17	1058-1041	N/E	N/E	17	1041
B-1A	0-13	1059-1046	13-14	1046-1045	14	1045
B-1B	0-8	1060-1052	8-11	1052-1049	11	1049
B-1C	0-8	1060-1052	8-9	1052-1051	9	1051
B-1D	0-18	1057-1039	18-21	1039-1036	21	1036
B-1E	0-18	1059-1041	N/E	N/E	18	1041
B-1F	0-12	1060-1048	N/E	N/E	12	1048
B-2	N/E	N/E	0-2	1035-1033	2	1033
B-2A	N/E	N/E	0-7	1035-1028	7	1028
B-2B	N/E	N/E	0-2	1035-1033	2	1033
B-2C	N/E	N/E	0-2	1035-1033	2	1033
B-2D	N/E	N/E	0-2	1035-1033	2	1033
B-3	N/E	N/E	0-8	1033-1025	8	1025
B-4	N/E	N/E	0-6	1040-1034	6	1034
B-5	0-8	1053-1045	8-13	1045-1040	13	1040
B-6	0-6	1051-1045	6-16	1045-1035	16	1035
B-7	N/E	N/E	0-6	1052-1046	6	1046
B-8	N/E	N/E	0-3	1040-1037	3	1037
B-9	N/E	N/E	0-6	1038-1032	6	1032
B-10	0-12	1049-1037	N/E	N/E	12	1037
B-11	0-13	1047-1034	N/E	N/E	13	1034
B-12	0-18	1056-1038	N/E	N/E	18	1038
B-13	0-13	1058-1045	13-18	1045-1040	18	1040
B-14	0-8	1053-1045	8-15	1045-1038	15	1038
B-15	N/E	N/E	0-17	1053-1036	17	1036
HA-1	0-4	1046-1042	N/E	N/E	4	1042
HA-2	0-6	1047-1041	N/E	N/E	6	1041
HA-3	0-2	1045-1043	N/E	N/E	2	1043
HA-4	0-4	1057-1053	N/E	N/E	4	1053

TABLE 3
SOIL BORING ALLUVIUM, RESIDUAL AND AUGER REFUSAL DEPTHS

Sun Valley Drive Extension
Roswell, Fulton County, Georgia

Boring	Alluvium		Residual		Auger Refusal	
	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)
C-1	0-6	1043-1037	N/E	N/E	6	1037
C-2	0-3	1042-1039	3-5	1039-1037	5	1037
C-3	0-3	1044-1041	3-5	1041-1039	5	1039
W-1	0-8	1057-1049	8-16	1049-1041	16	1041
W-2	0-8	1066-1058	8-15	1058-1051	15	1051

TABLE 4
ROCK CORE DEPTHS

Rock Core	Soil		Rippable Rock		Blast Rock		REC	RQD
	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)	Depth (ft)	Approx. Elev. (ft-MSL)		
R-1	0-19	1059-1040	21-23.5	1040-1037.5	23.5-25	1037.5-1034	71	36
R-2	0-5	1035-1030	5-5.5	1030-1029.5	5.5-12	1029.5-1023	90	70
R-3	0-6	1040-1034	6-6.5	1034-1033.5	6.5-10	1033.5-1030	98	50
R-4	0-5	1040-1035	N/E	N/E	5-10	1035-1030	89	31
R-5	0-13	1053-1040	N/E	N/E	13-18	1040-1035	82	28
R-6	0-14	1051-1037	14-14.5	1037-1036.5	14.5-20	1036.5-1031	100	71
R-7	0-10	1060-1050	10-12	1050-1048	12-15	1048-1045	98	18
R-8	0-16	1058-1042	16-17	1042-1041	17-20	1041-1038	82	19
R-9	0-14	1053-1039	14-16.5	1039-1036.5	16.5-20	1036.5-1033	88	32
R-10	0-6	1051-1045	N/E	N/E	6-15	1045-1036	93	49

TABLE 5
ROCK CORE AND PROPOSED GROUND SURFACE ELEVATIONS

Sun Valley Drive Extension
Roswell, Fulton County, Georgia

Rock Core	Proposed Elevation (ft-MSL)	Rippable Rock Approx. Elev. (ft-MSL)	Blast Rock Approx. Elev. (ft-MSL)	REC	RQD
R-1	1036	1040	1037.5	71	36
R-2	1025	1030	1029.5	90	70
R-3	1028	1034	1033.5	98	50
R-4	1032	N/E	1035	89	31
R-5	1038	N/E	1040	82	28
R-6	1037	1037	1036.5	100	71
R-7	1044	1050	1048	98	18
R-8	1038	1042	1041	82	19
R-9	1041	1039	1036.5	88	32
R-10	1041	N/E	1045	93	49

pH	6.54
Resistivity	18600

Project: Sun Valley Drive Extension **City:** Roswell **County:** Fulton

Table 6

Pipe Culvert Material Alternates

For Piedmont/Blue Ridge Region

TYPE OF PIPE INSTALLATION					CONCRETE	CORRUGATED STEEL AASHTO M-36		CORRU-GATED ALUMINUM AASHTO M-196	PLASTIC			
						ALUMINUM COATED (TYPE 2) CORR. STEEL	PLAIN ZINC COATED	PLAIN UNCOATED ALUMINUM	CORR. POLY-ETHYLENE AASHTO M-252	CORR. POLY-ETHYLENE SMOOTHED LINED AASHTO M-294 TYPE "S"	POLY VINYL CHLORIDE (PVC) PROFILE WALL AASHTO M-304	POLY VINYL CHLORIDE (PVC) CORRUGATED SMOOTH INTERIOR ASTM F-949
STORM DRAIN	LONGITUDINAL INTERSTATE AND TRAVEL BEARING				X							
	LONGITUDINAL NON-INTERSTATE AND NON-TRAVEL BEARING				X	X		X		X	X	X
	CROSS DRAIN	GRADE ≤ 10%	ADT < 250		X	X	X	X		X	X	X
			250 < ADT < 1,500		X	X*		X		X	X	X
			1,500 < ADT < 15,000		X					X	X	X
			ADT > 15,000		X							
		GRADE > 10%	ADT < 250			X	X	X		X	X	X
			ADT > 250					X		X	X	X
SIDE DRAIN					X	X	X	X		X	X	X
PERMANENT SLOPE DRAIN						X	X	X		X	X	X
PERFORATED UNDERDRAIN						X	X	X	X	X		X

* This type pipe can be used if the addition of Type "B" Coating (AASHTO M-190, Half Bituminous Coated with Paved Invert) is utilized.

NOTES:

1 Allowable materials are indicated by an "X".

2 Structural requirements of storm drain pipe will be in accordance with Georgia Standard 1030-D or 1030-P, whichever is applicable, and the Standard Specifications.

3 Graded aggregate backfill shall be used in cross drain applications for all plastic pipes (AASHTO M-294, HDPE pipe; AASHTO M-304, PVC pipe; ASTM F-949, PVC pipe).

4 The Contractor shall provide additional storm sewer capacity calculations if a pipe material other than concrete is selected.

5 Pipe used under mechanically stabilized earth (MSE) walls, within MSE wall backfill, or within five feet of an MSE wall face shall be Class V Concrete Pipe.

6 Project specific pH and Resistivity values are entered into the respective boxes above to determine allowable pipe materials.

Rev. 03-22-10

APPENDIX III

Boring Logs

Ranger Consulting, Inc.

BORING NO.: B-1

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1058 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
		FILL: Stiff red brown micaceous fine sandy silt	ML							
	1055									
5						1		12		
	1050									
		Medium dense grey brown silty medium to fine sand with organic fragments and topsoil	SM							
10						2		11		
	1045									
15						3		14		
		Auger Refusal at 17 feet								
	1040									
20										
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1A

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1059 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches	ML							
		FILL: Stiff red brown micaceous fine sandy silt								
	1055									
5						1		12		
		Stiff brown micaceous fine sandy silt with organic fragments and topsoil								
	1050									
10						2		11		
		RESIDUAL: Very dense orange brown micaceous silty coarse to fine sand	SM			3		100/6"		
	1045	Auger Refusal at 14 feet								
15										
	1040									
20										
	1035									
25										
	1030									
30										

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1B

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1060 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1060	TOPSOIL: 2 inches	SM							
		FILL: Loose red brown micaceous silty medium to fine sand								
5	1055					1		9		
		RESIDUAL: Very dense tan orange micaceous silty coarse to fine sand with rock fragments	SM							
10	1050					2		56		
		Auger Refusal at 11 feet								
15	1045									
20	1040									
25	1035									
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1C

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1060 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1060	TOPSOIL: 2 inches	ML							
		FILL: Red brown micaceous coarse to fine sandy silt								
5	1055									
		RESIDUAL: Brown micaceous silty medium to fine sand	SM							
10	1050	Auger Refusal at 9 feet								
15	1045									
20	1040									
25	1035									
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1D

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1057 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches	ML							
		FILL: Very stiff red brown micaceous fine sandy silt								
	1055									
5						1		17		
	1050									
		Firm red brown micaceous fine sandy silt								
10						2		8		
	1045									
		No Sample Recovered (13.5 - 15 feet)								
15						3		6		
	1040									
		RESIDUAL: Very dense grey orange tan micaceous silty medium to fine sand	SM							
20						4		100/10"		
		Auger Refusal at 21 feet								
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1E

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1059 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
		FILL: Stiff red brown micaceous silty fine sand	SM							
5	1055					1		10		
10	1050	Medium dense orange grey micaceous silty medium to fine sand				2		17		
15	1045	Firm brown micaceous fine sandy clay with rock fragments	CL			3		7		
20	1040	Auger Refusal at 18 feet								
25	1035									
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-1F

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1060 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1060	TOPSOIL: 2 inches	SM							
		FILL: Loose brown micaceous silty fine sand								
5	1055					1		10		
		Very dense brown micaceous silty coarse to fine sand								
10	1050					2		100/10"		
		Auger Refusal at 12 feet								
15	1045									
20	1040									
25	1035									
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-2

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	TOPSOIL: 2 inches	SM							
		RESIDUAL: Very dense orange brown micaceous silty coarse to fine sand with rock fragments				1	◪	100/8"		
		Auger Refusal at 2 feet								
5	1030									
10	1025									
15	1020									
20	1015									
25	1010									
30	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-2A

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	TOPSOIL: 2 inches	SM							
		RESIDUAL: Very dense red brown micaceous silty medium to fine sand				1		100/4"		
						2		100/12"		
5	1030									
		Auger Refusal at 7 feet								
10	1025									
15	1020									
20	1015									
25	1010									
30	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-2B

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	TOPSOIL: 2 inches	SM			1	◪	100/8"		
		RESIDUAL: Very dense brown micaceous silty medium to fine sand with rock fragments								
		Auger Refusal at 2 feet								
5	1030									
10	1025									
15	1020									
20	1015									
25	1010									
30	1005									

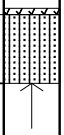
Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-2C

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	TOPSOIL: 2 inches	SM			1	◪	100/12"		
		RESIDUAL: Very dense red brown micaceous silty medium to fine sand								
		Auger Refusal at 2 feet								
5	1030									
10	1025									
15	1020									
20	1015									
25	1010									
30	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-2D

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	TOPSOIL: 2 inches	SM							
		RESIDUAL: Very dense grey orange brown micaceous silty medium to fine sand				1	◪	100/12"		
		Auger Refusal at 2 feet								
5	1030									
10	1025									
15	1020									
20	1015									
25	1010									
30	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-3

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1033 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches	SM							
		RESIDUAL: Medium dense orange brown micaceous silty medium to fine sand				1		26		
	1030									
5		Very dense orange brown micaceous silty medium to fine sand with rock fragments				2		100/12"		
						3		100/10"		
	1025	Auger Refusal at 8 feet								
10										
	1020									
15										
	1015									
20										
	1010									
25										
	1005									
30										
	1000									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-4

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1040 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1040	TOPSOIL: 3 inches								
		RESIDUAL: Medium dense orange brown micaceous silty fine sand	SM			1		15		
5	1035	Dense brown micaceous fine sandy clay	CL			2		32		
		Auger Refusal at 6 feet								
10	1030									
15	1025									
20	1020									
25	1015									
30	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-5

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1053 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 4 inches								
		FILL: Stiff red brown micaceous clayey fine sand	SC			1		11		
	1050									
5		Medium dense brown micaceous silty medium to fine sand	SM			2		12		
		Stiff brown micaceous fine sandy silt with topsoil	ML			3		14		
	1045									
10		RESIDUAL: Medium dense brown micaceous silty medium to fine sand	SM			4		24		
	1040	Auger Refusal at 13 feet								
15										
	1035									
20										
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-6

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-24-2015
ELEVATION: 1051 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> C: 8 ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1050	TOPSOIL: 4 inches FILL: Medium dense to loose brown micaceous silty medium to fine sand	SM			1		12		
5	1045	Loose brown micaceous clayey medium to fine sand	SC			2		10		
		RESIDUAL: Very dense white brown micaceous silty medium to fine sand	SM		C	3		51		
10	1040	Medium dense red brown micaceous silty medium to fine sand				4		14		
15	1035	Very dense tan brown micaceous silty coarse to fine sand				5		100/6"		
		Auger Refusal at 16 feet								
20	1030									
25	1025									
30	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-7

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1052 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1052	TOPSOIL: 2 inches	SM							
		RESIDUAL: Medium dense orange brown micaceous silty medium to fine sand with rock fragments								
	1050									
5						1	■	25		
		Auger Refusal at 6 feet								
	1045									
10										
	1040									
15										
	1035									
20										
	1030									
25										
	1025									
30										
	1020									

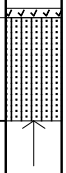
Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-8

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1040 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1040	TOPSOIL: 3 inches RESIDUAL: Brown micaceous silty medium to fine sand	SM							
		Auger Refusal at 3 feet								
5	1035									
10	1030									
15	1025									
20	1020									
25	1015									
30	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-9

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1038 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 3 inches								
		RESIDUAL: Dense orange brown micaceous silty medium to fine sand	SM							
	1035									
5						1		33		
		Auger Refusal at 6 feet								
	1030									
10										
	1025									
15										
	1020									
20										
	1015									
25										
	1010									
30										
	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-10

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-30-2015
ELEVATION: 1049 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 4 inches								
		FILL: Stiff red brown micaceous clayey silt	ML							
	1045									
5						1		14		
		Stiff red brown micaceous clayey silt with rock fragments								
	1040									
10						2		10		
		Auger Refusal at 12 feet								
	1035									
15										
	1030									
20										
	1025									
25										
	1020									
30										

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-11

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-30-2015
ELEVATION: 1047 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1047	TOPSOIL: 3 inches								
		FILL: Very stiff red brown sandy silt with clay	CL-ML							
5	1045					1		27		
	1042									
10	1040	Medium dense red brown silty medium to fine sand with clay and rock fragments	SM			2		15		
	1037									
15	1035	Auger Refusal at 13 feet								
	1032									
20	1030									
	1027									
25	1025									
	1022									
30	1020									
	1017									
	1015									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-12

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-30-2015
ELEVATION: 1056 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1056	TOPSOIL: 4 inches								
	1055	FILL: Very stiff brown micaceous fine sandy silt	ML							
5	1050					1		17		
		Medium dense red brown micaceous silty medium to fine sand	SM							
10	1045					2		13		
15	1040					3		16		
		Auger Refusal at 18 feet								
20	1035									
25	1030									
30	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-13

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-30-2015
ELEVATION: 1058 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 4 inches								
		FILL: Stiff brown micaceous fine sandy silt with rock fragments	ML							
	1055									
5						1		13		
	1050									
10						2		7		
	1045									
		RESIDUAL: Medium dense brown tan micaceous silty medium to fine sand	SM							
15						3		25		
	1040									
		Auger Refusal at 18 feet								
20										
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-14

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▽: N/E

DATE: 03-30-2015
ELEVATION: 1053 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 4 inches								
		FILL: Dense orange brown micaceous silty coarse to fine sand with clay and rock fragments	SM							
	1050									
5						1		46		
	1045									
		RESIDUAL: Medium dense brown micaceous silty fine sand	SM							
10						2		24		
	1040									
		Very dense brown micaceous silty fine sand				3		100/6"		
15		Auger Refusal at 15 feet								
	1035									
20										
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: B-15

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-30-2015
ELEVATION: 1053 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 4 inches								
		RESIDUAL: Very dense orange brown micaceous silty medium to fine sand	SM							
	1050									
5						1		51		
	1045									
		Very dense orange brown micaceous silty medium to fine sand with rock fragments				2		100/8"		
10										
	1040									
15						3		18		
		Auger Refusal at 17 feet								
	1035									
20										
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: HA-1

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Hand Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1046 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		TOPSOIL: 2 inches	ML							
	1045	FILL: Red brown micaceous fine sandy silt								
5	1040	Hand Auger Refusal at 4 feet								
10	1035									
15	1030									
20	1025									
25	1020									
30	1015									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: HA-2

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Hand Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1047 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 1 inch	ML							
		FILL: Red brown micaceous medium to fine sandy silt with rock fragments								
	1045									
5										
		Hand Auger Refusal at 6 feet								
	1040									
10										
	1035									
15										
	1030									
20										
	1025									
25										
	1020									
30										
	1015									

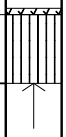
Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: HA-3

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Hand Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1045 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1045	TOPSOIL: 2 inches FILL: Red brown micaceous medium to fine sandy silt with rock fragments	ML							
		Hand Auger Refusal at 2 feet								
5	1040									
10	1035									
15	1030									
20	1025									
25	1020									
30	1015									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: HA-4

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Hand Auger
DEPTH TO WATER> Initial ▽: N/E After 24 Hours ▼: N/E

DATE: 03-25-2015
ELEVATION: 1057 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1057	TOPSOIL: 3 inches								
		FILL: Red brown micaceous medium to fine sandy silt	ML							
	1055									
5		Hand Auger Refusal at 4 feet								
	1050									
10										
	1045									
15										
	1040									
20										
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: C-1

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: 3 After 24 Hours ▽: 2

DATE: 03-25-2015
ELEVATION: 1043 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ▽: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
		ALLUVIUM: Very loose brown tan micaceous silty coarse to fine sand	SM		▽	1		0		
	1040				▽					
		Very soft brown micaceous medium to fine sandy silt	ML							
5						2		2		
		Auger Refusal at 6 feet								
	1035									
10										
	1030									
15										
	1025									
20										
	1020									
25										
	1015									
30										
	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: C-2

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: 2 After 24 Hours ▼: 2

DATE: 03-25-2015
ELEVATION: 1042 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
	1040	ALLUVIUM: Very soft red brown micaceous silty clay with organic fragments	CL-ML		▼	1		0		
5		RESIDUAL: Very hard grey green micaceous silty coarse to fine sand with clay and rock fragments	SM			2		100/6"		
		Auger Refusal at 5 feet								
	1035									
10										
	1030									
15										
	1025									
20										
	1020									
25										
	1015									
30										
	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: C-3

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: 2 After 24 Hours ▼: 2

DATE: 03-25-2015
ELEVATION: 1044 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
		ALLUVIUM: Very soft brown fine sandy clay with organic fragments	CL		▼	1		0		
	1040	RESIDUAL: Very hard grey brown micaceous silty fine sand	SM			2		100/10"		
5		Auger Refusal at 5 feet								
	1035									
10										
	1030									
15										
	1025									
20										
	1020									
25										
	1015									
30										

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: W-1

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: 13 After 24 Hours ▼: 1

DATE: 04-01-2015
ELEVATION: 1057 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0		TOPSOIL: 2 inches								
	1055	ALLUVIUM: Very soft orange brown fine sandy clay with organic fragments	CL		▼	1		2		
5		Firm tan orange micaceous fine sandy silt	ML			2		7		
	1050					3		6		
10		RESIDUAL: Medium dense orange brown micaceous silty fine sand	SM			4		13		
	1045				▽	5		30		
15						6		27		
	1040	Auger Refusal at 16 feet								
20										
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: W-2

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: 3-1/4" Hollow Stem Auger
DEPTH TO WATER> Initial ▽: 12 After 24 Hours ▼: 10

DATE: 04-01-2015
ELEVATION: 1066 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		TOPSOIL: 2 inches	ML							
	1065	ALLUVIUM: Firm to stiff red brown clayey silt with rock fragments				1		6		
5						2		11		
	1060					3		10		
		RESIDUAL: Medium dense white brown micaceous silty medium to fine sand	SM		▼	4		12		
10	1055				▽	5		22		
		Very dense white brown micaceous silty coarse to fine sand with rock fragments				6		100/8"		
15		Auger Refusal at 15 feet								
	1050									
20										
	1045									
25										
	1040									
30										
	1035									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Topsoil
	Silt
	Silty sand
	Low plasticity clay
	Clayey sand
	Silty low plasticity clay
Misc. Symbols	
	Drill refusal
	Depth to caving
	Water depth at least 24 hours after drilling
Soil Samplers	
	Standard penetration test

Notes:

1. Exploratory soil borings were drilled on 03-24-2015, 03-25-2015 and 03-30-2105 to 04-01-2015 using a 3-1/4 inch diameter hollow stem continuous flight power auger.

2. The rock core borings were drilled on 03-31-2015 and 04-01-2015 using a mud rotary techniques with a tri-cone bit through the soil and a 1-7/8 inch diameter NQWL bit to core the rock.

3. Boring locations were taped from existing features and elevation extrapolated from the provided topographic plan.

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

Ranger Consulting, Inc.

BORING NO.: R-1

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1059 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		Brown silty sand	SM							
5	1055									
10	1050									
15	1045									
20	1040	Moderately soft to soft brown fragmented to weathered incompetent biotite gneiss							71	36
		Moderately hard to hard white grey solid incompetent biotite gneiss with quartz								
25	1035	Coring Terminated at 25 feet								
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-2

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1035 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1035	Grey brown silty sand	SM							
5	1030	Soft brown weathered competent biotite gneiss Moderately hard grey white broken biotite gneiss							90	70
10	1025	Coring Terminated at 12 feet								
15	1020									
20	1015									
25	1010									
30	1005									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-3

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 04-01-2015
ELEVATION: 1040 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1040	Grey green silty sand	SM							
5	1035	Soft dark brown grey weathered competent biotite gneiss Medium soft to medium hard brown white grey fractured biotite gneiss							98	50
10	1030	Coring Terminated at 10 feet								
15	1025									
20	1020									
25	1015									
30	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-4

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 04-01-2015
ELEVATION: 1040 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1040	Grey green silty sand	SM							
5	1035	Moderately soft to moderately hard grey brown white fragmented to fractured biotite gneiss							89	31
10	1030	Coring Terminated at 10 feet								
15	1025									
20	1020									
25	1015									
30	1010									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-5

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1053 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		Brown silty sand	SM							
	1050									
5										
	1045									
10										
	1040	Soft brown weathered incompetent biotite gneiss							82	28
15		Moderately soft to moderately hard brown grey fragmented to fractured biotite gneiss								
		Moderately hard grey white broken biotite gneiss with quartz								
	1035	Coring Terminated at 18 feet								
20										
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-6

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 04-01-2015
ELEVATION: 1051 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1050	Grey brown silty sand	SM							
5	1045									
10	1040									
15	1035	Soft brown weathered competent biotite gneiss Soft to moderately soft weathered to fragmented competent biotite gneiss Moderately hard grey white broken to solid competent biotite gneiss							100	71
20	1030	Coring Terminated at 20 feet								
25	1025									
30	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-7

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1060 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0	1060	Grey brown silty sand	SM							
5	1055									
10	1050	Soft to moderately soft grey brown weathered incompetent biotite gneiss							98	18
		Moderately soft to soft grey brown white fragmented to weathered biotite gneiss with quartz								
15	1045	Coring Terminated at 15 feet								
20	1040									
25	1035									
30	1030									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-8

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1058 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		Grey brown silty sand	SM							
	1055									
5										
	1050									
10										
	1045									
15										
		Soft brown weathered incompetent biotite gneiss							82	19
		Moderately soft to moderately hard brown grey white fractured incompetent biotite gneiss with quartz								
	1040									
20										
		Coring Terminated at 20 feet								
	1035									
25										
	1030									
30										
	1025									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-9

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 04-01-2015
ELEVATION: 1053 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
		Grey brown silty sand	SM							
	1050									
5										
	1045									
10										
	1040									
15		Soft brown weathered incompetent biotite gneiss							88	32
		Moderately soft brown grey fractured incompetent biotite gneiss								
	1035	Moderately hard to hard white grey broken incompetent biotite gneiss								
20										
		Coring Terminated at 20 feet								
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

Ranger Consulting, Inc.

BORING NO.: R-10

PROJECT: Sun Valley Drive Extension
CLIENT: McGee Partners, Inc.
LOCATION: Roswell, Fulton County, Georgia
DRILL / METHOD: Mud Rotary, NQWL Rock Coring
DEPTH TO WATER> Initial ▽: N/O After 24 Hours ▼: N/O

DATE: 03-31-2015
ELEVATION: 1051 ft-MSL
LOGGED BY: K. Young
CREW CHIEF: B. Ozment
DEPTH TO CAVING> ⌭: ft

Depth (feet)	Elevation (ft-MSL)	Strata Description	USCS	Graphic	Groundwater	Sample Number	Sample Type	N-Value	% Rock Recovery	% Rock RQD
0										
	1050	Grey brown silty sand	SM							
5										
	1045	Soft brown weathered competent biotite gneiss							93	49
		Moderately soft to moderately hard brown grey white fractured competent biotite gneiss with quartz								
10										
	1040									
15										
		Coring Terminated at 20 feet								
	1035									
20										
	1030									
25										
	1025									
30										
	1020									

Notes: N/E - Not Evident; N/O - Not Observed
Boring elevations were interpolated from the provided topographic plan and should therefore be considered approximate.
This information pertains only to this boring and should not be considered indicative of the site.

KEY TO SYMBOLS

Symbol Description

Strata symbols

Silty sand

Weathered metamorphic rocks

Metamorphic rocks

Misc. Symbols

Drill refusal

Soil Samplers

Rock core

Notes:

1. **Exploratory soil borings were drilled on 03-24-2015, 03-25-2015 and 03-30-2105 to 04-01-2015 using a 3-1/4 inch diameter hollow stem continuous flight power auger.**

2. **The rock core borings were drilled on 03-31-2015 and 04-01-2015 using a mud rotary techniques with a tri-cone bit through the soil and a 1-7/8 inch diameter NQWL bit to core the rock.**

3. **Boring locations were taped from existing features and elevation extrapolated from the provided topographic plan.**

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

APPENDIX IV

Laboratory Results

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19738/B-1	Depth/Elev.	0-20'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	19650.0	18238.3
Mass of Mat. retained on No.10 sieve, g		3020.9
Material Retained on No.10 sieve, %		16.6

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

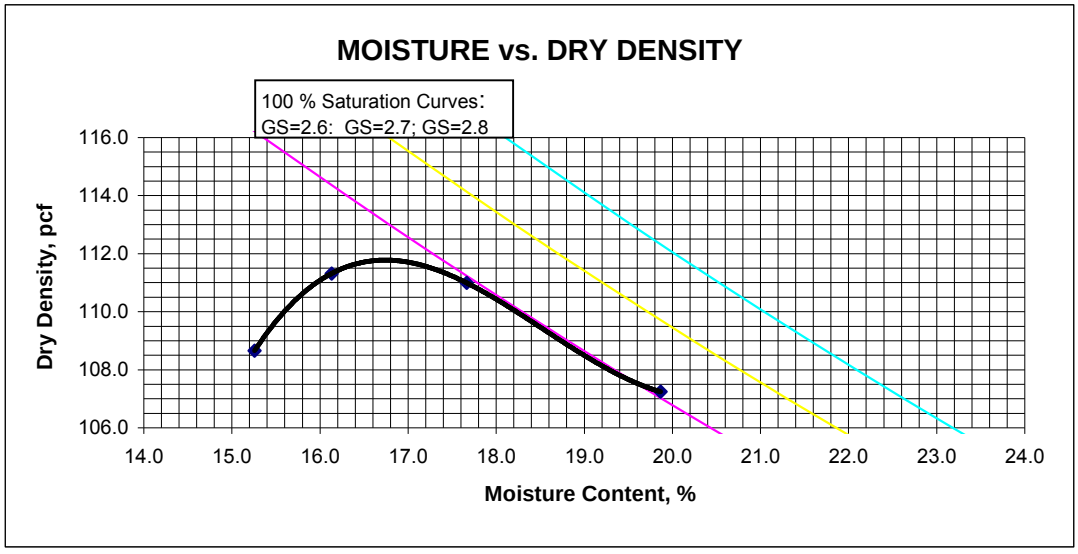
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	332.20	533.20
Mass of Dry Sample & Tare, g	296.70	500.90
Mass of Tare, g	94.80	83.60
Moisture Content, %	17.6	7.7

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6103.0	6164.0	6184.0	6153.0		
Mass of Wet Sample & Tare, g	518.6	580.1	536.6	569.1		
Mass of Dry Sample & Tare, g	466.6	516.8	475.6	495.6		
Mass of Tare, g	125.8	124.4	130.3	125.6		
Moisture Content, %	15.3	16.1	17.7	19.9		
Wet Density, pcf	125.2	129.3	130.6	128.5		
Dry Density, pcf	108.7	111.3	111.0	107.2		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**111.8**	**Optimum Moisture Content, %**	**16.8**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**116.2**	**Corrected Optimum Moisture Content, %**	**14.5**

USCS (ASTM D2487; D2488)	NA		
AASHTO (M 145)	NA		
	Class	Sub-class	
GA DOT	NA	NA	

DESCRIPTION: NA

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19738/B-1	Depth/Elev.	0-20'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	111.8
Optimum Moisture Content (O.M.C.), %	16.8

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	16.8

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1113.79

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	533.20	538.60
Mass of Dry Soil and Tare, g	500.90	473.20
Mass of Tare, g	83.60	89.20
Moisture Content, %	7.7	17.0

Water Adjustment, g 100.9

SWELL TESTING

Initial Dial Gage Reading, inch	0.126	Swell, %	**9.39**
Final Dial Gage Reading, inch	0.220	Swell Mold ID #	231
Change in Dial Gage Readings, inch	0.094	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.758		Original Volume, in^3	12.67
Final Dial Gage Reading, inch	0.731	0.678	Final Volume, in^3	11.89
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**6.15**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	111.8
% Retained on No. 10 Sieve	16.6
Conversion Factor	0.855

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**15.5**	**13.3**

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19738/B-1	Depth/Elev.	0-20'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT	
Mass of Wet Sample & Tare, g	332.2
Mass of Dry Sample & Tare, g	296.7
Mass of Tare, g	94.8
Moisture Content, %	17.6

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)	
Mass of Wet Sample & Tare, g	533.20
Mass of Dry Sample & Tare, g	500.90
Mass of Tare, g	83.60
Moisture Content, %	7.7

TOTAL SAMPLE	
Total mass of air-dried sample before sieving on No.10 & tare, g	19650.0
Mass of Tare, g	0.0
Total Mass of dry sample, g	18238.3

FINE PORTION of MATERIAL USED for SIEVE	
Mass of Air-Dried Fine Material & Tare, g	53.90
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.03
% of Total Sample Passing No. 10 Sieve	83.4

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

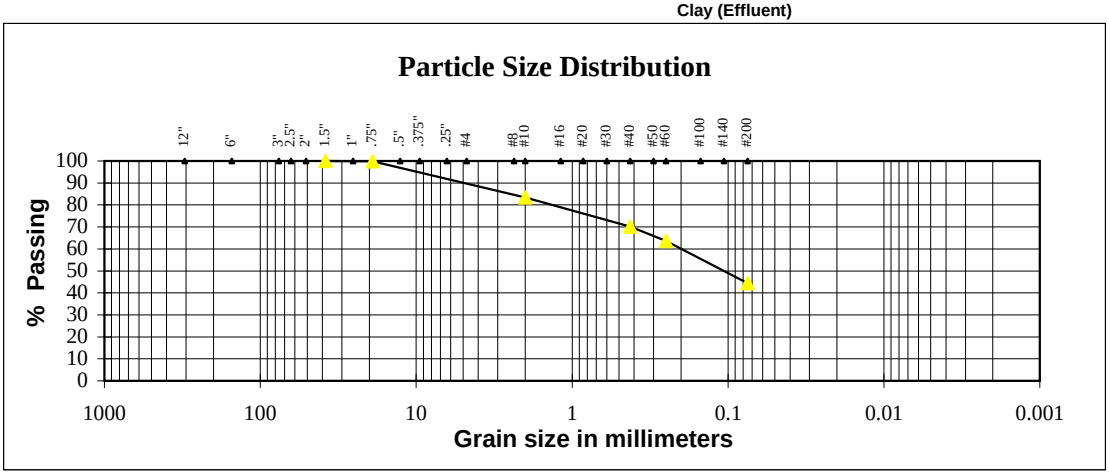
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	34.3	34.3	0.2	99.8
#10	3020.9	3020.9	16.6	83.4

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	7.94	7.94	15.9	84.1	70.2
#60	11.90	11.90	23.8	76.2	63.6
#200	23.39	23.39	46.8	53.2	44.4
Total	34.76	34.76	69.5	-	
Clay (Effluent)				30.5	25.5



GA DOT	Class	Sub-class
	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	16.6
% COARSE Sand	13.2
% FINE Sand	25.8
% FINES (Silt-Clay)	44.4
% Clay	25.5
% TOTAL SAMPLE	100.0

DESCRIPTION

NA

REMARKS

USCS (ASTM D2487; D2488)	AASHTO (M 145)		
NA	NA	Oven ID #	12/14/2015
		Balance ID#	1/6/7
		Sieve Shaker ID #	54/130

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19739/B-2	Depth/Elev.	0-7'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	16567.2	15744.1
Mass of Mat. retained on No.10 sieve, g		2467.7
Material Retained on No.10 sieve, %		15.7

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

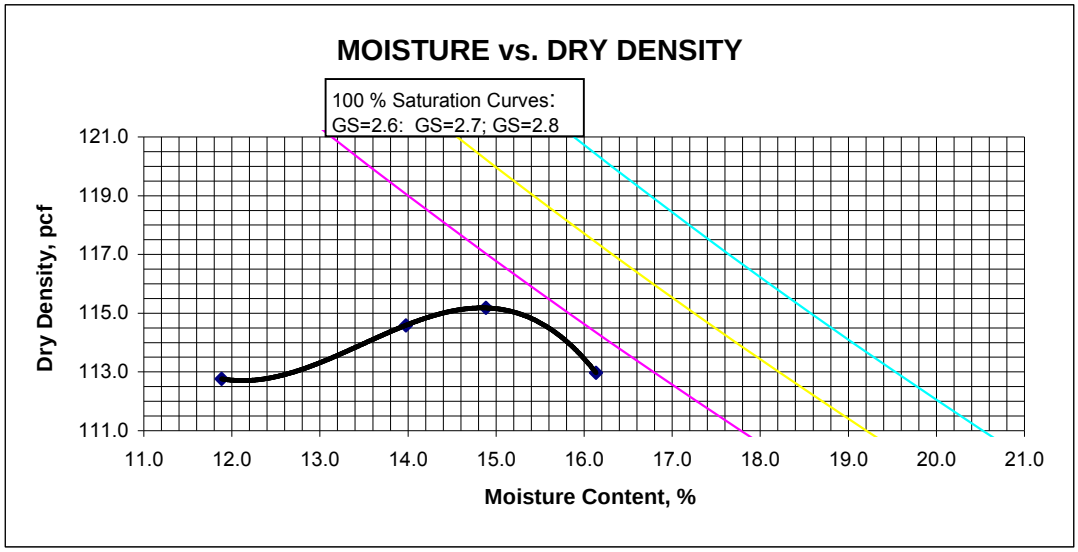
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	313.80	470.70
Mass of Dry Sample & Tare, g	300.30	453.50
Mass of Tare, g	102.70	124.50
Moisture Content, %	6.8	5.2

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6117.0	6184.0	6210.0	6193.0		
Mass of Wet Sample & Tare, g	600.5	610.0	616.0	623.6		
Mass of Dry Sample & Tare, g	556.2	556.8	559.8	562.3		
Mass of Tare, g	183.4	176.1	182.2	182.4		
Moisture Content, %	11.9	14.0	14.9	16.1		
Wet Density, pcf	126.2	130.6	132.3	131.2		
Dry Density, pcf	112.8	114.6	115.2	113.0		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**115.2**	**Optimum Moisture Content, %**	**14.9**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**118.9**	**Corrected Optimum Moisture Content, %**	**13.0**

		Class	Sub-class
USCS (ASTM D2487; D2488)	NA		
AASHTO (M 145)	NA		
GA DOT		NA	NA

DESCRIPTION: NA

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Fax: 770-923-8973
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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19739/B-2	Depth/Elev.	0-7'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	115.2
Optimum Moisture Content (O.M.C.), %	14.9

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	14.9

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1140.38

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	470.70	530.00
Mass of Dry Soil and Tare, g	453.50	473.70
Mass of Tare, g	124.50	94.00
Moisture Content, %	5.2	14.8

Water Adjustment, g 110.3

SWELL TESTING

Initial Dial Gage Reading, inch	0.130	Swell, %	**16.42**
Final Dial Gage Reading, inch	0.295	Swell Mold ID #	228
Change in Dial Gage Readings, inch	0.165	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.748		Original Volume, in^3	12.54
Final Dial Gage Reading, inch	0.745	0.736	Final Volume, in^3	12.42
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**1.00**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	115.2
% Retained on No. 10 Sieve	15.7
Conversion Factor	0.860

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**17.4**	**15.0**

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Tested By	RI
Date	04/02/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19739/B-2	Depth/Elev.	0-7'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT

Mass of Wet Sample & Tare, g	313.8
Mass of Dry Sample & Tare, g	300.3
Mass of Tare, g	102.7
Moisture Content, %	6.8

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)

Mass of Wet Sample & Tare, g	470.70
Mass of Dry Sample & Tare, g	453.50
Mass of Tare, g	124.50
Moisture Content, %	5.2

TOTAL SAMPLE

Total mass of air-dried sample before sieving on No.10 & tare, g	16567.2
Mass of Tare, g	0.0
Total Mass of dry sample, g	15744.1

FINE PORTION of MATERIAL USED for SIEVE

Mass of Air-Dried Fine Material & Tare, g	52.62
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.01
% of Total Sample Passing No. 10 Sieve	84.3

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

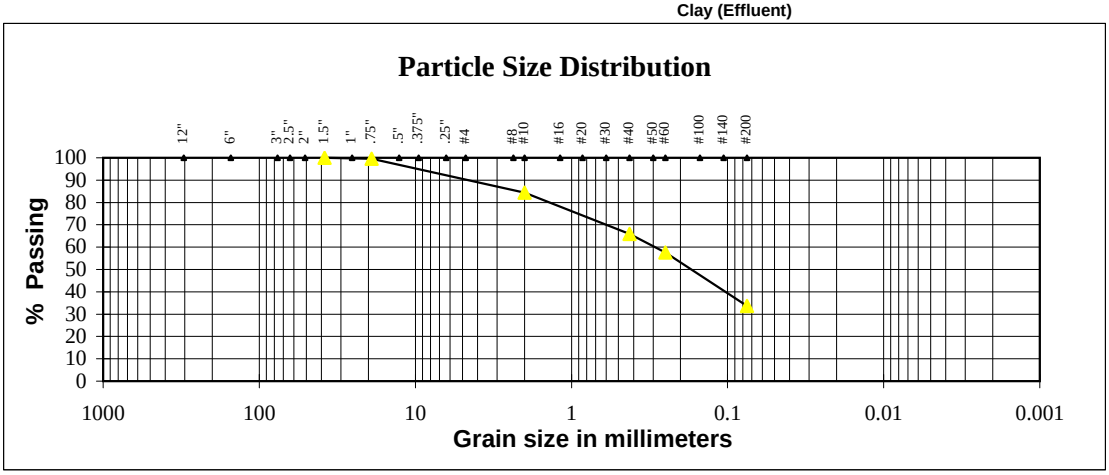
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	64.1	64.1	0.4	99.6
#10	2467.7	2467.7	15.7	84.3

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	10.93	10.93	21.9	78.1	65.9
#60	15.89	15.89	31.8	68.2	57.5
#200	30.00	30.00	60.0	40.0	33.7
Total	43.70	43.70	87.4	-	
Clay (Effluent)				12.6	10.6



	Class	Sub-class
GA DOT	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	15.7
% COARSE Sand	18.4
% FINE Sand	32.2
% FINES (Silt-Clay)	33.7
% Clay	10.6
% TOTAL SAMPLE	100.0

DESCRIPTION: NA

REMARKS:

USCS (ASTM D2487; D2488)	NA	AASHTO (M 145)	NA

Oven ID #	12/14/2015
Balance ID#	1/6/7
Sieve Shaker ID #	54/130

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Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19740/B-3	Depth/Elev.	0-8'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	17826.1	17068.1
Mass of Mat. retained on No.10 sieve, g		3171.8
Material Retained on No.10 sieve, %		18.6

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

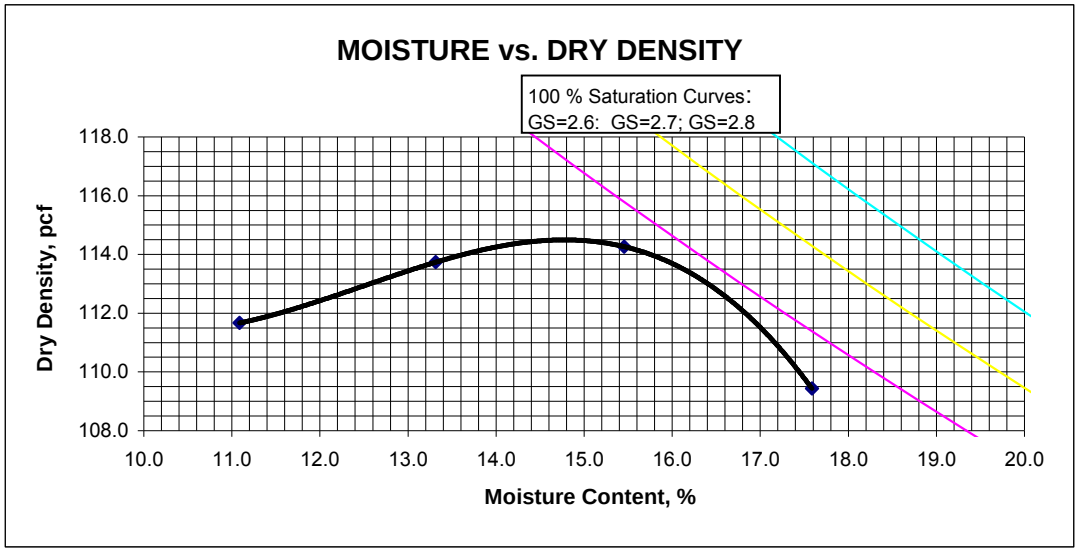
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	345.40	533.10
Mass of Dry Sample & Tare, g	323.00	515.90
Mass of Tare, g	101.30	128.60
Moisture Content, %	10.1	4.4

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6085.0	6158.0	6204.0	6155.0		
Mass of Wet Sample & Tare, g	528.8	530.7	620.4	601.2		
Mass of Dry Sample & Tare, g	489.0	483.5	554.6	538.7		
Mass of Tare, g	130.0	129.0	128.8	183.3		
Moisture Content, %	11.1	13.3	15.5	17.6		
Wet Density, pcf	124.0	128.9	131.9	128.7		
Dry Density, pcf	111.7	113.7	114.3	109.4		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**114.5**	**Optimum Moisture Content, %**	**14.8**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**119.0**	**Corrected Optimum Moisture Content, %**	**12.5**

USCS (ASTM D2487; D2488)	NA		
AASHTO (M 145)	NA		
	Class	Sub-class	
GA DOT	NA	NA	

DESCRIPTION: NA

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Tested By	RI
Date	04/02/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19740/B-3	Depth/Elev.	0-8'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	114.5
Optimum Moisture Content (O.M.C.), %	14.8

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	14.8

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1148.97

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	533.10	541.60
Mass of Dry Soil and Tare, g	515.90	484.90
Mass of Tare, g	128.60	95.40
Moisture Content, %	4.4	14.6

Water Adjustment, g 119.0

SWELL TESTING

Initial Dial Gage Reading, inch	0.128	Swell, %	**9.17**
Final Dial Gage Reading, inch	0.220	Swell Mold ID #	229
Change in Dial Gage Readings, inch	0.092	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.747		Original Volume, in^3	12.53
Final Dial Gage Reading, inch	0.746	0.729	Final Volume, in^3	12.39
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**1.15**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	114.5
% Retained on No. 10 Sieve	18.6
Conversion Factor	0.835

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**10.3**	**8.6**

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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19740/B-3	Depth/Elev.	0-8'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT

Mass of Wet Sample & Tare, g	345.4
Mass of Dry Sample & Tare, g	323.0
Mass of Tare, g	101.3
Moisture Content, %	10.1

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)

Mass of Wet Sample & Tare, g	533.10
Mass of Dry Sample & Tare, g	515.90
Mass of Tare, g	128.60
Moisture Content, %	4.4

TOTAL SAMPLE

Total mass of air-dried sample before sieving on No.10 & tare, g	17826.1
Mass of Tare, g	0.0
Total Mass of dry sample, g	17068.1

FINE PORTION of MATERIAL USED for SIEVE

Mass of Air-Dried Fine Material & Tare, g	52.23
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.01
% of Total Sample Passing No. 10 Sieve	81.4

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

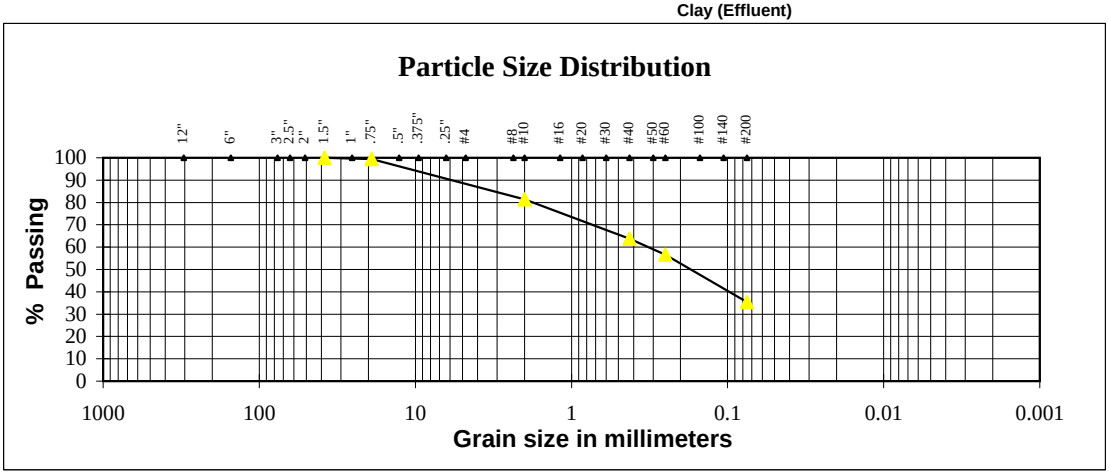
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	104.3	104.3	0.6	99.4
#10	3171.8	3171.8	18.6	81.4

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	10.84	10.84	21.7	78.3	63.8
#60	15.22	15.22	30.4	69.6	56.6
#200	28.28	28.28	56.5	43.5	35.4
Total	41.12	41.12	82.2	-	
Clay (Effluent)				17.8	14.5



	Class	Sub-class
GA DOT	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	18.6
% COARSE Sand	17.6
% FINE Sand	28.4
% FINES (Silt-Clay)	35.4
% Clay	14.5
% TOTAL SAMPLE	100.0

DESCRIPTION

NA

REMARKS

USCS (ASTM D2487; D2488)	NA	AASHTO (M 145)	NA
Oven ID #	12/14/2015		
Balance ID#	1/6/7		
Sieve Shaker ID #	54/130		

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19741/B-4	Depth/Elev.	0-6'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	20051.0	18998.8
Mass of Mat. retained on No.10 sieve, g		4767.1
Material Retained on No.10 sieve, %		25.1

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

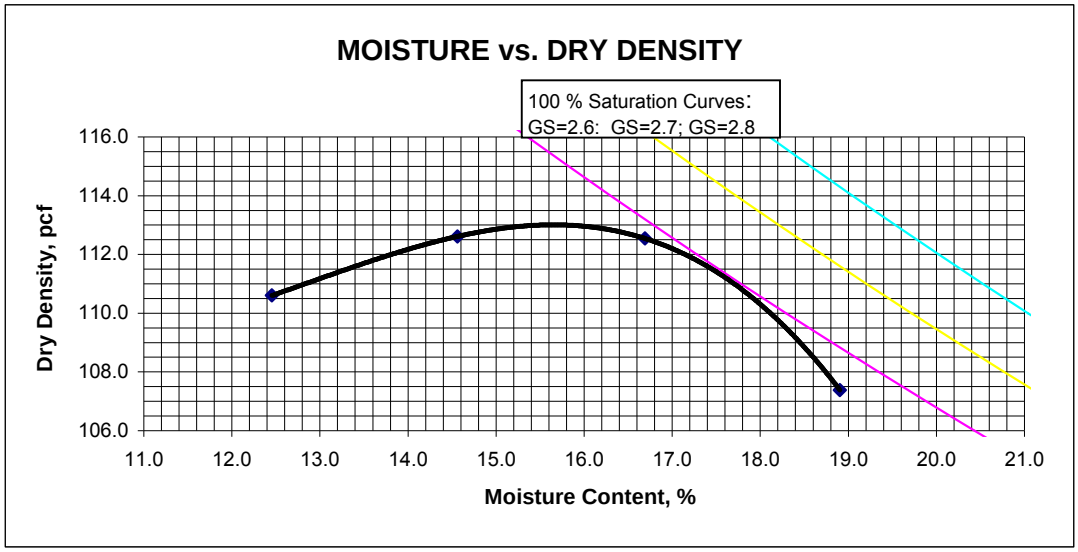
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	326.40	509.10
Mass of Dry Sample & Tare, g	298.00	487.60
Mass of Tare, g	93.60	99.40
Moisture Content, %	13.9	5.5

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6090.0	6160.0	6195.0	6140.0		
Mass of Wet Sample & Tare, g	601.0	612.8	615.3	592.8		
Mass of Dry Sample & Tare, g	553.8	558.3	552.8	518.3		
Mass of Tare, g	174.8	184.0	178.3	124.2		
Moisture Content, %	12.5	14.6	16.7	18.9		
Wet Density, pcf	124.4	129.0	131.3	127.7		
Dry Density, pcf	110.6	112.6	112.5	107.4		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**113.0**	**Optimum Moisture Content, %**	**15.7**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**119.3**	**Corrected Optimum Moisture Content, %**	**12.5**

DESCRIPTION: NA

	Class	Sub-class
USCS (ASTM D2487; D2488)	NA	
AASHTO (M 145)	NA	
GA DOT	NA	NA

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Web: www.test-llc.com

Tested By	RI
Date	04/02/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19741/B-4	Depth/Elev.	0-6'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	113.0
Optimum Moisture Content (O.M.C.), %	15.7

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	15.7

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1137.03

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	509.10	545.20
Mass of Dry Soil and Tare, g	487.60	484.90
Mass of Tare, g	99.40	98.50
Moisture Content, %	5.5	15.6

Water Adjustment, g 115.5

SWELL TESTING

Initial Dial Gage Reading, inch	0.129	Swell, %	**6.57**
Final Dial Gage Reading, inch	0.195	Swell Mold ID #	226
Change in Dial Gage Readings, inch	0.066	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.745		Original Volume, in^3	12.50
Final Dial Gage Reading, inch	0.742	0.727	Final Volume, in^3	12.32
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**1.44**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	113.0
% Retained on No. 10 Sieve	25.1
Conversion Factor	0.783

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**8.0**	**6.3**

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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19741/B-4	Depth/Elev.	0-6'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT

Mass of Wet Sample & Tare, g	326.4
Mass of Dry Sample & Tare, g	298.0
Mass of Tare, g	93.6
Moisture Content, %	13.9

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)

Mass of Wet Sample & Tare, g	509.10
Mass of Dry Sample & Tare, g	487.60
Mass of Tare, g	99.40
Moisture Content, %	5.5

TOTAL SAMPLE

Total mass of air-dried sample before sieving on No.10 & tare, g	20051.0
Mass of Tare, g	0.0
Total Mass of dry sample, g	18998.8

FINE PORTION of MATERIAL USED for SIEVE

Mass of Air-Dried Fine Material & Tare, g	52.78
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.01
% of Total Sample Passing No. 10 Sieve	74.9

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

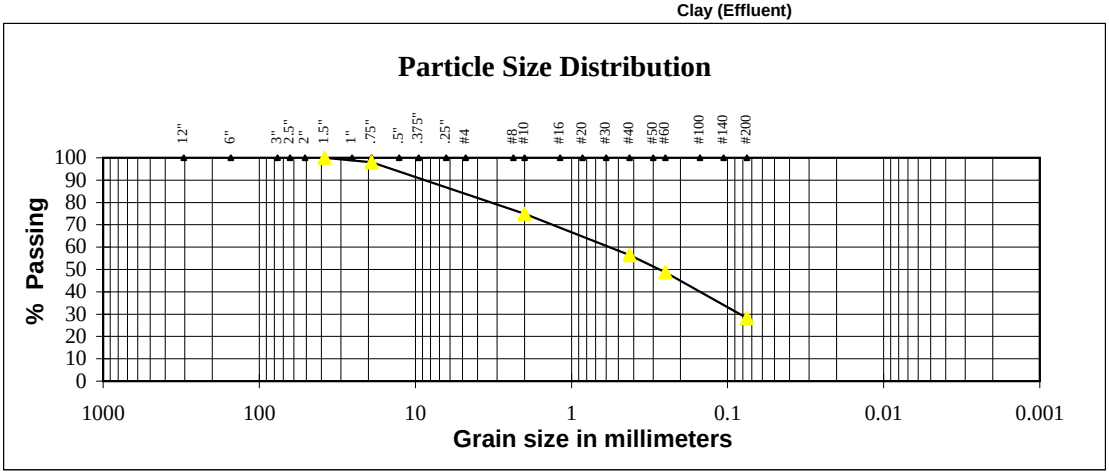
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	377.8	377.8	2.0	98.0
#10	4767.1	4767.1	25.1	74.9

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	12.29	12.29	24.6	75.4	56.5
#60	17.53	17.53	35.1	64.9	48.7
#200	31.19	31.19	62.4	37.6	28.2
Total	42.06	42.06	84.1	-	
Clay (Effluent)				15.9	11.9



	Class	Sub-class
GA DOT	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	25.1
% COARSE Sand	18.4
% FINE Sand	28.3
% FINES (Silt-Clay)	28.2
% Clay	11.9
% TOTAL SAMPLE	100.0

DESCRIPTION

NA

REMARKS

USCS (ASTM D2487; D2488)	NA	Oven ID #	12/14/2015
AASHTO (M 145)	NA	Balance ID#	1/6/7
		Sieve Shaker ID #	54/130

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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19742/B-5	Depth/Elev.	0-13'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	17621.0	16427.8
Mass of Mat. retained on No.10 sieve, g		2234.2
Material Retained on No.10 sieve, %		13.6

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

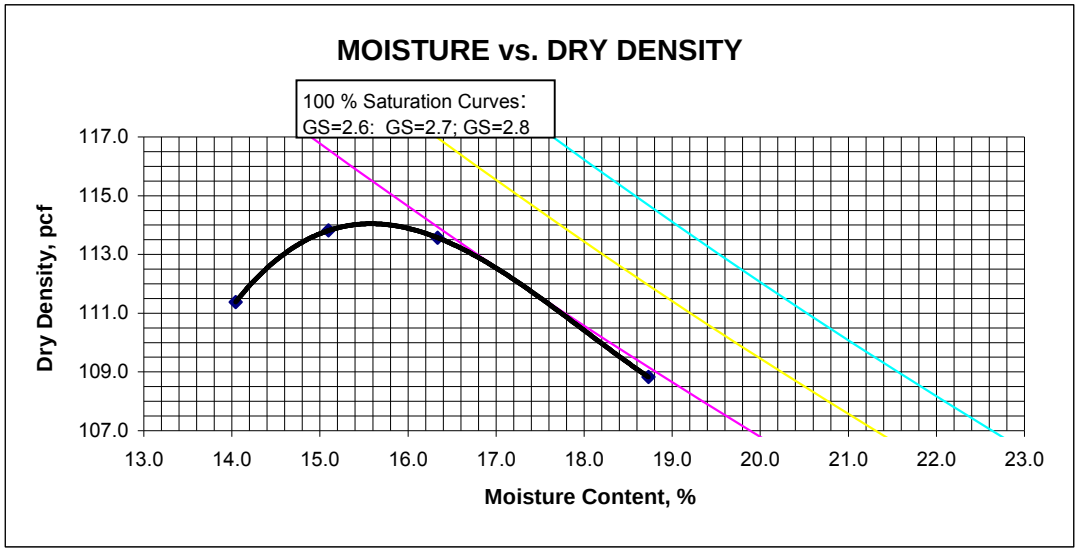
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	307.90	496.80
Mass of Dry Sample & Tare, g	277.50	469.30
Mass of Tare, g	91.20	90.70
Moisture Content, %	16.3	7.3

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6130.0	6190.0	6207.0	6163.0		
Mass of Wet Sample & Tare, g	535.2	553.3	540.2	551.1		
Mass of Dry Sample & Tare, g	484.8	497.5	482.6	483.9		
Mass of Tare, g	125.9	127.9	130.0	125.1		
Moisture Content, %	14.0	15.1	16.3	18.7		
Wet Density, pcf	127.0	131.0	132.1	129.2		
Dry Density, pcf	111.4	113.8	113.6	108.8		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**114.1**	**Optimum Moisture Content, %**	**15.6**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**117.5**	**Corrected Optimum Moisture Content, %**	**14.0**

USCS (ASTM D2487; D2488)	NA		
AASHTO (M 145)	NA		
	Class	Sub-class	
GA DOT	NA	NA	

DESCRIPTION: NA

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1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	RI
Date	04/02/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19742/B-5	Depth/Elev.	0-13'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	114.1
Optimum Moisture Content (O.M.C.), %	15.6

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	15.6

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1118.74

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	496.80	537.20
Mass of Dry Soil and Tare, g	469.30	480.10
Mass of Tare, g	90.70	112.50
Moisture Content, %	7.3	15.5

Water Adjustment, g 93.3

SWELL TESTING

Initial Dial Gage Reading, inch	0.120	Swell, %	**7.54**
Final Dial Gage Reading, inch	0.195	Swell Mold ID #	230
Change in Dial Gage Readings, inch	0.075	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.750		Original Volume, in^3	12.57
Final Dial Gage Reading, inch	0.734	0.712	Final Volume, in^3	12.13
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**3.46**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	114.1
% Retained on No. 10 Sieve	13.6
Conversion Factor	0.879

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**11.0**	**9.7**

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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19742/B-5	Depth/Elev.	0-13'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT

Mass of Wet Sample & Tare, g	307.9
Mass of Dry Sample & Tare, g	277.5
Mass of Tare, g	91.2
Moisture Content, %	16.3

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)

Mass of Wet Sample & Tare, g	496.80
Mass of Dry Sample & Tare, g	469.30
Mass of Tare, g	90.70
Moisture Content, %	7.3

TOTAL SAMPLE

Total mass of air-dried sample before sieving on No.10 & tare, g	17621.0
Mass of Tare, g	0.0
Total Mass of dry sample, g	16427.8

FINE PORTION of MATERIAL USED for SIEVE

Mass of Air-Dried Fine Material & Tare, g	53.64
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.01
% of Total Sample Passing No. 10 Sieve	86.4

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

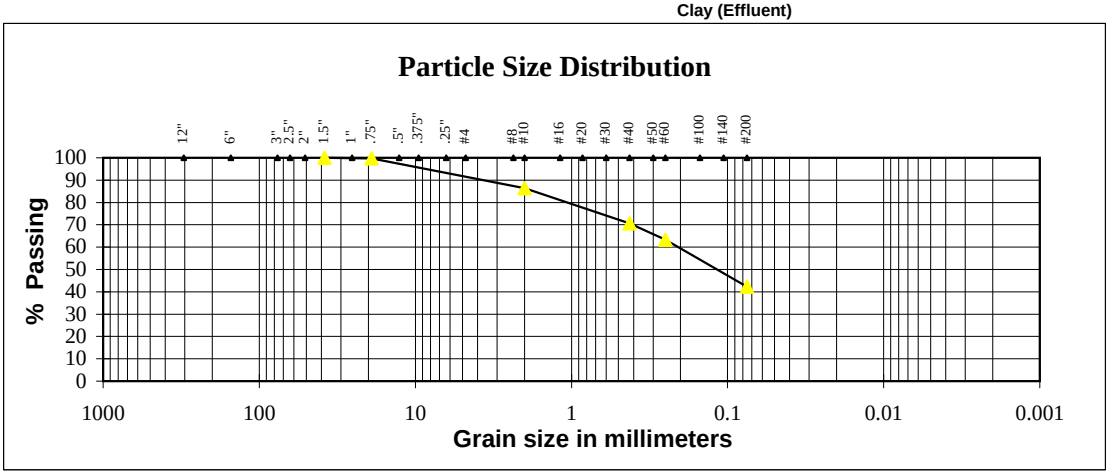
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	55.4	55.4	0.3	99.7
#10	2234.2	2234.2	13.6	86.4

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	9.09	9.09	18.2	81.8	70.7
#60	13.32	13.32	26.6	73.4	63.4
#200	25.54	25.54	51.1	48.9	42.3
Total	37.69	37.69	75.4	-	
Clay (Effluent)				24.6	21.3



	Class	Sub-class
GA DOT	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	13.6
% COARSE Sand	15.7
% FINE Sand	28.4
% FINES (Silt-Clay)	42.3
% Clay	21.3
% TOTAL SAMPLE	100.0

DESCRIPTION

NA

REMARKS

USCS (ASTM D2487; D2488)	NA	AASHTO (M 145)	NA

Oven ID #	12/14/2015
Balance ID#	1/6/7
Sieve Shaker ID #	54/130

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Web: www.test-llc.com

Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19743/B-6	Depth/Elev.	0-16'
Location	-	Add. Info	-

GDT-7
Method of Test for Determining Maximum Density of Soils

SAMPLE DATA

	Air-Dried	Oven-Dried*
Total Mass of Soil before sieving, g	16500.0	15263.2
Mass of Mat. retained on No.10 sieve, g		2575.1
Material Retained on No.10 sieve, %		16.9

Note: Values based on calculated oven-dried mass

MOISTURE CONTENT

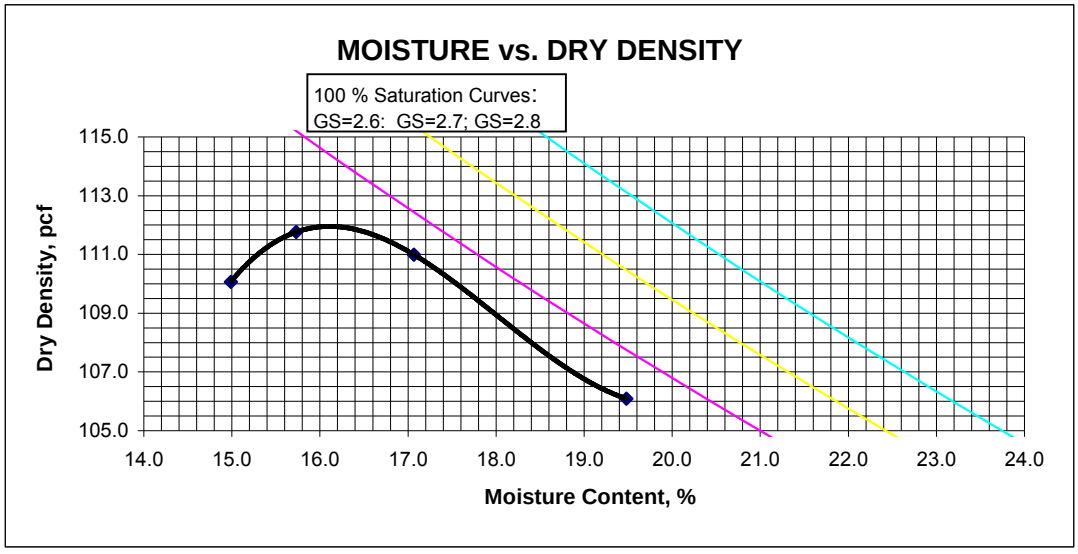
	Natural	Air-Dry Material
Mass of Wet Sample & Tare, g	523.40	502.50
Mass of Dry Sample & Tare, g	463.70	472.00
Mass of Tare, g	95.00	95.60
Moisture Content, %	16.2	8.1

REMARKS

TEST DATA

Points	1	2	3	4	5	6
Mass of Mold and Soil, g	6123.0	6165.0	6174.0	6126.0		
Mass of Wet Sample & Tare, g	522.8	540.2	535.0	555.1		
Mass of Dry Sample & Tare, g	470.9	483.7	475.9	485.6		
Mass of Tare, g	124.6	124.5	129.6	128.8		
Moisture Content, %	15.0	15.7	17.1	19.5		
Wet Density, pcf	126.6	129.3	129.9	126.8		
Dry Density, pcf	110.1	111.8	111.0	106.1		

Mold ID Number	314
Mass of Mold, g	4211.3
Volume of Mold, ft^3	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3



Maximum Dry Density, pcf	**112.0**	**Optimum Moisture Content, %**	**16.1**
Absorption, % (assumed)	2		
Corrected Maximum Dry Density, pcf	**116.4**	**Corrected Optimum Moisture Content, %**	**13.6**

DESCRIPTION: NA

	Class	Sub-class
USCS (ASTM D2487; D2488)	NA	
AASHTO (M 145)	NA	
GA DOT	NA	NA

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Tested By	RI
Date	04/02/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19743/B-6	Depth/Elev.	0-16'
Location	-	Add. Info	-

GDT- 6

Method of Test for Determining Volume Change of Soil

SAMPLE PREPARATION (Material passing No.10 Sieve)

Proctor Data (GDT- 7 or GDT- 67)

Maximum Dry Density, pcf	112.0
Optimum Moisture Content (O.M.C.), %	16.1

Moisture Content Requirements

Difference from O.M.C., %	0.0
Target Moisture Content, %	16.1

Soil Preparation

Mass of Wet Soil and Bag, g	1200.00
Mass of Bag, g	0.00
Mass of Wet Soil, g	1200.00
Mass of Dry Soil, g	1110.05

Moisture Content

	Before Adjustment	After Adjustment
Mass of Wet Soil and Tare, g	502.50	539.20
Mass of Dry Soil and Tare, g	472.00	478.40
Mass of Tare, g	95.60	100.50
Moisture Content, %	8.1	16.1

Water Adjustment, g 88.8

SWELL TESTING

Initial Dial Gage Reading, inch	0.126	Swell, %	**13.39**
Final Dial Gage Reading, inch	0.260	Swell Mold ID #	227
Change in Dial Gage Readings, inch	0.134	Dial Gage ID #	105
Preset Dial Gage Gap, inch	0.875		

SHRINKAGE TESTING

	Height	Diameter		
Initial Dial Gage Reading, inch	0.749		Original Volume, in^3	12.55
Final Dial Gage Reading, inch	0.736	0.727	Final Volume, in^3	12.25
Preset Dial Gage Gap, inch	0.250	3.250	Shrinkage, %	**2.43**
Dial Gage ID #	360	359	Shrink Mold ID #	201
Stand ID #	55	177		

Proctor Dry Density (Minus No. 10 Material), pcf	112.0
% Retained on No. 10 Sieve	16.9
Conversion Factor	0.855

	Minus No.10 Soil	Composite Soil
TOTAL VOLUME CHANGE, %	**15.8**	**13.5**

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Tested By	RI
Date	04/01/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Bulk
Sample ID	19743/B-6	Depth/Elev.	0-16'
Location	-	Add. Info	-

GDT- 4
Method of Test for Determining Gradation of Soil

NATURAL MOISTURE CONTENT

Mass of Wet Sample & Tare, g	523.4
Mass of Dry Sample & Tare, g	463.7
Mass of Tare, g	95.0
Moisture Content, %	16.2

MOISTURE CONTENT of AIR-DRIED MATERIAL (Minus No. 10 Sieve)

Mass of Wet Sample & Tare, g	502.50
Mass of Dry Sample & Tare, g	472.00
Mass of Tare, g	95.60
Moisture Content, %	8.1

TOTAL SAMPLE

Total mass of air-dried sample before sieving on No.10 & tare, g	16500.0
Mass of Tare, g	0.0
Total Mass of dry sample, g	15263.2

FINE PORTION of MATERIAL USED for SIEVE

Mass of Air-Dried Fine Material & Tare, g	54.06
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	50.01
% of Total Sample Passing No. 10 Sieve	83.1

SIEVE ANALYSIS

GRADATION OF PLUS NO.10 Material

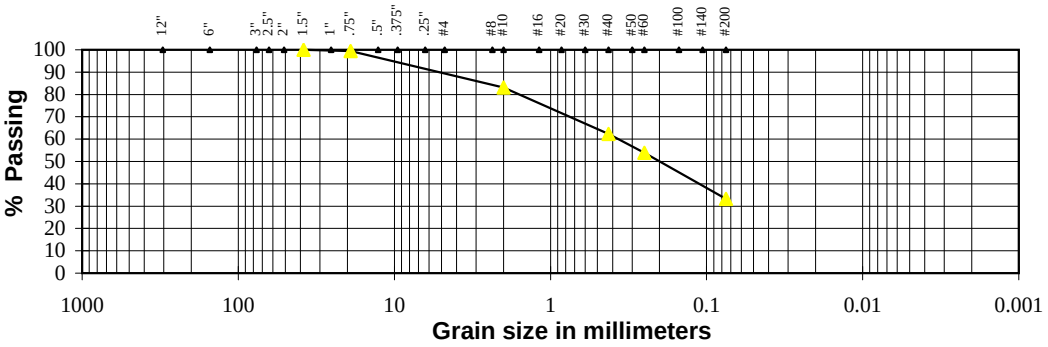
Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING
1.5"	0.0	0.0	0.0	100.0
.75"	77.4	77.4	0.5	99.5
#10	2575.1	2575.1	16.9	83.1

GRADATION OF MINUS NO.10 Material

Mass of Tare, g: 0.0

Sieve Size	Accumulative mass of Sample & Tare, g	Accumulative mass of Sample, g	% RETAINED	% PASSING	Adjusted for Total % Passing
#40	12.48	12.48	25.0	75.0	62.4
#60	17.56	17.56	35.1	64.9	53.9
#200	30.00	30.00	60.0	40.0	33.3
Total	41.71	41.71	83.4	-	
Clay (Effluent)				16.6	13.8



	Class	Sub-class
GA DOT	NA	NA

Soil Classification (AASHTO M-145)

% Gravel	16.9
% COARSE Sand	20.7
% FINE Sand	29.1
% FINES (Silt-Clay)	33.3
% Clay	13.8
% TOTAL SAMPLE	100.0

DESCRIPTION

NA

REMARKS

USCS (ASTM D2487; D2488)	NA	Oven ID #	12/14/2015
AASHTO (M 145)	NA	Balance ID#	1/6/7
		Sieve Shaker ID #	54/130

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	NK
Date	02/11/00
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19744/B-1D	Depth/Elev.	18.5-20'
Location	-	Add. Info	-

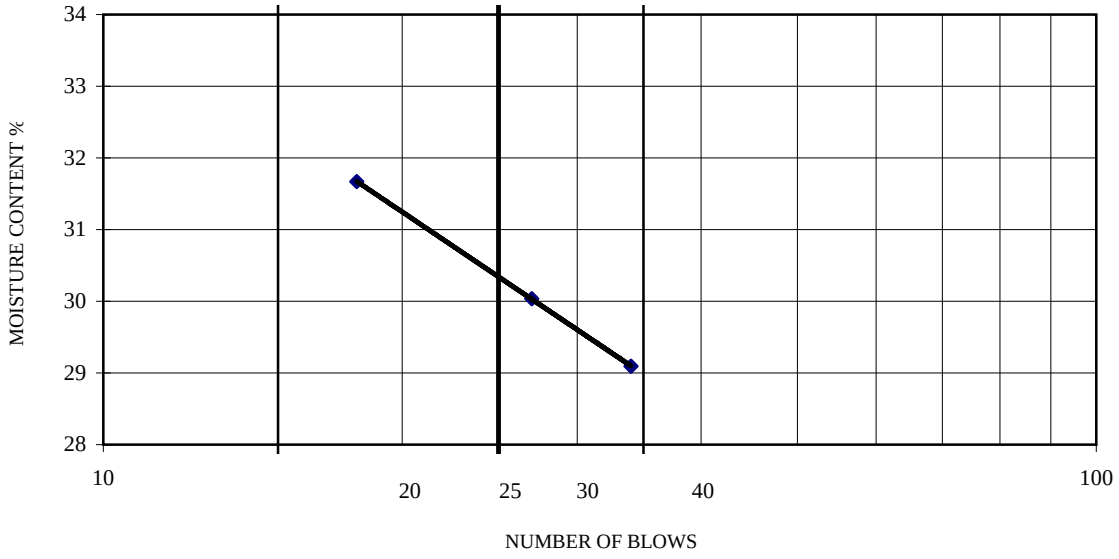
ASTM D 4318/AASHTO T 88, T 89

Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits)

LIQUID LIMIT

Number of Blows	34	27	18
Mass of Wet Sample & Tare, g	42.37	43.32	46.91
Mass of Dry Sample & Tare, g	38.39	39.22	42.53
Mass of Tare, g	24.71	25.57	28.70
Moisture Content, %	29.09	30.04	31.67

Oven ID #	12/13/14/15
Balance ID #	2
Liquid Limit Device ID #	56



PLASTIC LIMIT

Mass of Wet Sample & Tare, g	35.47	32.55
Mass of Dry Sample & Tare, g	32.79	30.91
Mass of Tare, g	22.82	24.73
Moisture Content, %	26.88	26.54

PREPARATION PROCEDURE: DRY

NOTE: MATERIAL PASSING NO. 40 SIEVE WAS USED FOR TEST

NATURAL MOISTURE

Mass of Wet Sample & Tare, g	242.90
Mass of Dry Sample & Tare, g	230.10
Mass of Tare, g	139.40
Moisture Content, %	14.11

LIQUID LIMIT (LL)	30
PLASTIC LIMIT (PL)	27
PLASTICITY INDEX (PI)	3
LIQUIDITY INDEX (LI)	-4.30

DESCRIPTION: Dark Yellowish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

AASHTO (M 145): NA

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: www.test-llc.com

Tested By	AV
Date	03/26/15
Checked By	KB

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19744/B-1D	Depth/Elev.	18.5-20'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

As-Received Moisture Content

Mass of Wet Sample & Tare, g	242.90
Mass of Dry Sample & Tare, g	230.10
Mass of Tare, g	139.40
Moisture Content, %	14.1

Moisture Content of Material Used for Hydrometer Analysis

Mass of Wet Sample & Tare, g	242.90
Mass of Dry Sample & Tare, g	230.10
Mass of Tare, g	139.40
Moisture Content, %	14.1

Mass of Total Sample before separation on #4 sieve & Tare, g	556.50
Mass of Tare, g	0.00
Total Mass of Dry Sample, g	487.68

Mass of Sample used for hydrometer analysis, g	81.17
Dry Mass, g	71.13
% of Total Sample passing #4 sieve	88.9

SIEVE ANALYSIS

PORTION OF SAMPLE RETAINED ON #4 SIEVE

Mass of Tare, g: 0.00

Sieve Size		Sample & Tare, g	% RETAINED	%PASSING
12"	COBBLES		0.0	100.0
3"			0.0	100.0
2.5"	COARSE		0.0	100.0
2"	GRAVEL		0.0	100.0
1.5"			0.0	100.0
1"			0.0	100.0
.75"		0.00	0.0	100.0
.5"	FINE GRAVEL	17.27	3.5	96.5
.375"		27.50	5.6	94.4
#4	COARSE SAND	53.94	11.1	88.9

PORTION OF SAMPLE PASSING #4 SIEVE (Hydrometer Backsieve)

Sieve Size		Cumulative Mass retained, g	% PASSING
#10	MEDIUM	5.55	82.0
#20	SAND	13.44	72.1
#40		23.17	60.0
#60	FINE SAND	31.52	49.5
#100		40.36	38.5
#200	FINES	50.61	25.7

Remarks

HYDROMETER ANALYSIS

Length of Dispersion Period	1 Minute
Mechanical Dispersion Device ID #	61
Amount of Dispersing Agent (ml)	125.0
Specific Gravity (assumed)	2.700
Specific Gravity (tested)	
Starting time	13:28

PARTICLE-SIZE ANALYSIS

% COBBLES	0.0	% MEDIUM SAND	22.0
% COARSE GRAVEL	0.0	% FINE SAND	34.3
% FINE GRAVEL	11.1	% FINES	25.7
% COARSE SAND	6.9	% TOTAL SAMPLE	100.0
% CLAY(<0.005mm)	7.6	% CLAY(<0.002mm)	5.3

Date	Time	Testing time (min)	Reading	Temp (°C)	K	Composite Correction	Actual Reading	Effective Depth (cm)	a	Particle Diam. (mm)	Percent Passing
04/01/15	13:30	2	21.0	19.2	0.01361	5.0	16.0	13.7	0.99	0.0357	19.8
04/01/15	13:33	5	18.0	19.2	0.01361	5.0	13.0	14.2	0.99	0.0230	16.1
04/01/15	13:43	15	15.0	19.2	0.01361	5.0	10.0	14.7	0.99	0.0135	12.4
04/01/15	13:58	30	14.0	19.2	0.01361	5.0	9.0	14.9	0.99	0.0096	11.1
04/01/15	14:28	60	12.5	19.2	0.01361	5.0	7.5	15.1	0.99	0.0068	9.3
04/01/15	17:38	250	10.0	19.2	0.01361	5.0	5.0	15.6	0.99	0.0034	6.2
04/02/15	13:28	1440	9.0	19.2	0.01361	5.0	4.0	15.7	0.99	0.0014	5.0

Hydrometer 152H ID #	451190	Oven ID #	12/13/14/15
Sieve Shaker ID #	54/130	Balance ID#	1/6/7

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: www.test-llc.com

Tested By	AV
Date	03/26/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19744/B-1D	Depth/Elev.	18.5-20'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

Particle-Size Analysis

Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

D_{10}	NA	mm
D_{30}	NA	mm
D_{60}	NA	mm
Cu	NA	
Cc	NA	

DESCRIPTION: Dark Yellowish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

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1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	NK
Date	03/31/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19745/B-5	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

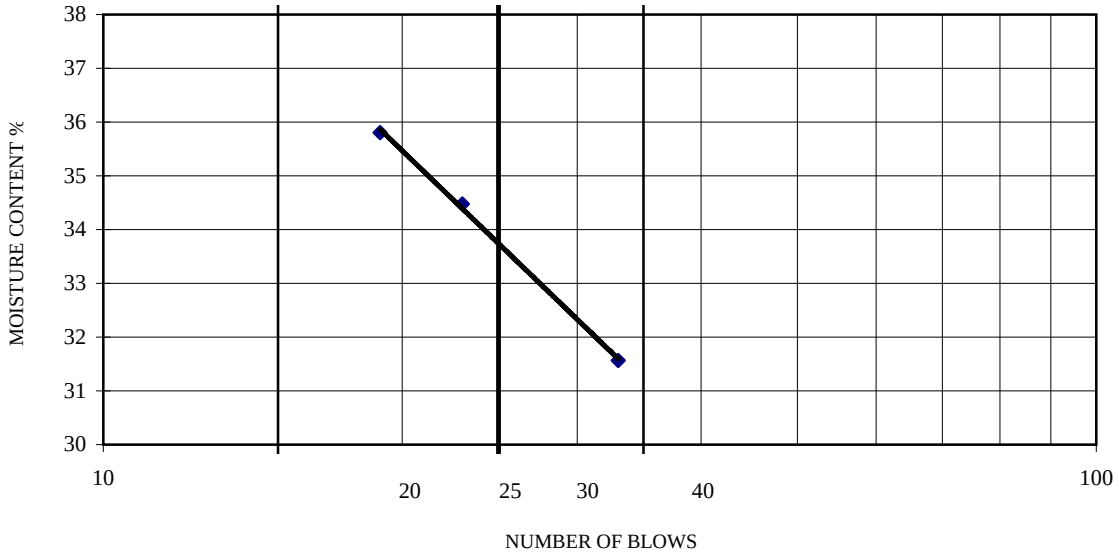
ASTM D 4318/AASHTO T 88, T 89

Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits)

LIQUID LIMIT

Number of Blows	33	23	19
Mass of Wet Sample & Tare, g	47.45	43.50	44.45
Mass of Dry Sample & Tare, g	42.93	39.58	39.14
Mass of Tare, g	28.61	28.21	24.31
Moisture Content, %	31.56	34.48	35.81

Oven ID #	12/13/14/15
Balance ID #	2
Liquid Limit Device ID #	56



PLASTIC LIMIT

Mass of Wet Sample & Tare, g	29.87	34.82
Mass of Dry Sample & Tare, g	27.84	32.41
Mass of Tare, g	20.75	23.92
Moisture Content, %	28.63	28.39

PREPARATION PROCEDURE: DRY

NOTE: MATERIAL PASSING NO. 40 SIEVE WAS USED FOR TEST

NATURAL MOISTURE

Mass of Wet Sample & Tare, g	226.10
Mass of Dry Sample & Tare, g	209.50
Mass of Tare, g	100.90
Moisture Content, %	15.29

LIQUID LIMIT (LL)	34
PLASTIC LIMIT (PL)	29
PLASTICITY INDEX (PI)	5
LIQUIDITY INDEX (LI)	-2.74

DESCRIPTION: Reddish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

AASHTO (M 145): NA

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: www.test-llc.com

Tested By	AV
Date	03/26/15
Checked By	LB

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19745/B-5	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

As-Received Moisture Content

Mass of Wet Sample & Tare, g	226.10
Mass of Dry Sample & Tare, g	209.50
Mass of Tare, g	100.90
Moisture Content, %	15.3

Moisture Content of Material Used for Hydrometer Analysis

Mass of Wet Sample & Tare, g	226.10
Mass of Dry Sample & Tare, g	209.50
Mass of Tare, g	100.90
Moisture Content, %	15.3

Mass of Total Sample before separation on #4 sieve & Tare, g	515.10
Mass of Tare, g	0.00
Total Mass of Dry Sample, g	446.80

Mass of Sample used for hydrometer analysis, g	78.15
Dry Mass, g	67.79
% of Total Sample passing #4 sieve	93.7

SIEVE ANALYSIS

PORTION OF SAMPLE RETAINED ON #4 SIEVE

Mass of Tare, g: 0.00

Sieve Size		Sample & Tare, g	% RETAINED	%PASSING
12"	COBBLES		0.0	100.0
3"			0.0	100.0
2.5"	COARSE		0.0	100.0
2"	GRAVEL		0.0	100.0
1.5"			0.0	100.0
1"			0.0	100.0
.75"		0.00	0.0	100.0
.5"	FINE GRAVEL	9.40	2.1	97.9
.375"		11.05	2.5	97.5
#4	COARSE SAND	28.32	6.3	93.7

PORTION OF SAMPLE PASSING #4 SIEVE (Hydrometer Backsieve)

Sieve Size		Cumulative Mass retained, g	% PASSING
#10	MEDIUM	6.00	85.4
#20	SAND	13.85	74.5
#40		22.43	62.7
#60	FINE SAND	29.16	53.4
#100		36.23	43.6
#200	FINES	44.59	32.1

Remarks

HYDROMETER ANALYSIS

Length of Dispersion Period	1 Minute
Mechanical Dispersion Device ID #	61
Amount of Dispersing Agent (ml)	125.0
Specific Gravity (assumed)	2.700
Specific Gravity (tested)	
Starting time	13:30

PARTICLE-SIZE ANALYSIS

% COBBLES	0.0	% MEDIUM SAND	22.7
% COARSE GRAVEL	0.0	% FINE SAND	30.6
% FINE GRAVEL	6.3	% FINES	32.1
% COARSE SAND	8.3	% TOTAL SAMPLE	100.0
% CLAY(<0.005mm)	16.8	% CLAY(<0.002mm)	10.6

Date	Time	Testing time (min)	Reading	Temp (°C)	K	Composite Correction	Actual Reading	Effective Depth (cm)	a	Particle Diam. (mm)	Percent Passing
04/01/15	13:32	2	25.0	19.2	0.01361	5.0	20.0	13.1	0.99	0.0348	27.4
04/01/15	13:35	5	23.0	19.2	0.01361	5.0	18.0	13.4	0.99	0.0223	24.6
04/01/15	13:45	15	20.5	19.2	0.01361	5.0	15.5	13.8	0.99	0.0131	21.2
04/01/15	14:00	30	19.5	19.2	0.01361	5.0	14.5	14.0	0.99	0.0093	19.8
04/01/15	14:30	60	18.0	19.2	0.01361	5.0	13.0	14.2	0.99	0.0066	17.8
04/01/15	17:40	250	16.5	19.2	0.01361	5.0	11.5	14.5	0.99	0.0033	15.7
04/02/15	13:30	1440	11.0	19.2	0.01361	5.0	6.0	15.4	0.99	0.0014	8.2

Hydrometer 152H ID #	451190	Oven ID #	12/13/14/15
Sieve Shaker ID #	54/130	Balance ID#	1/6/7

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084

Phone: 770-938-8233

Fax: 770-923-8973

Web: www.test-llc.com

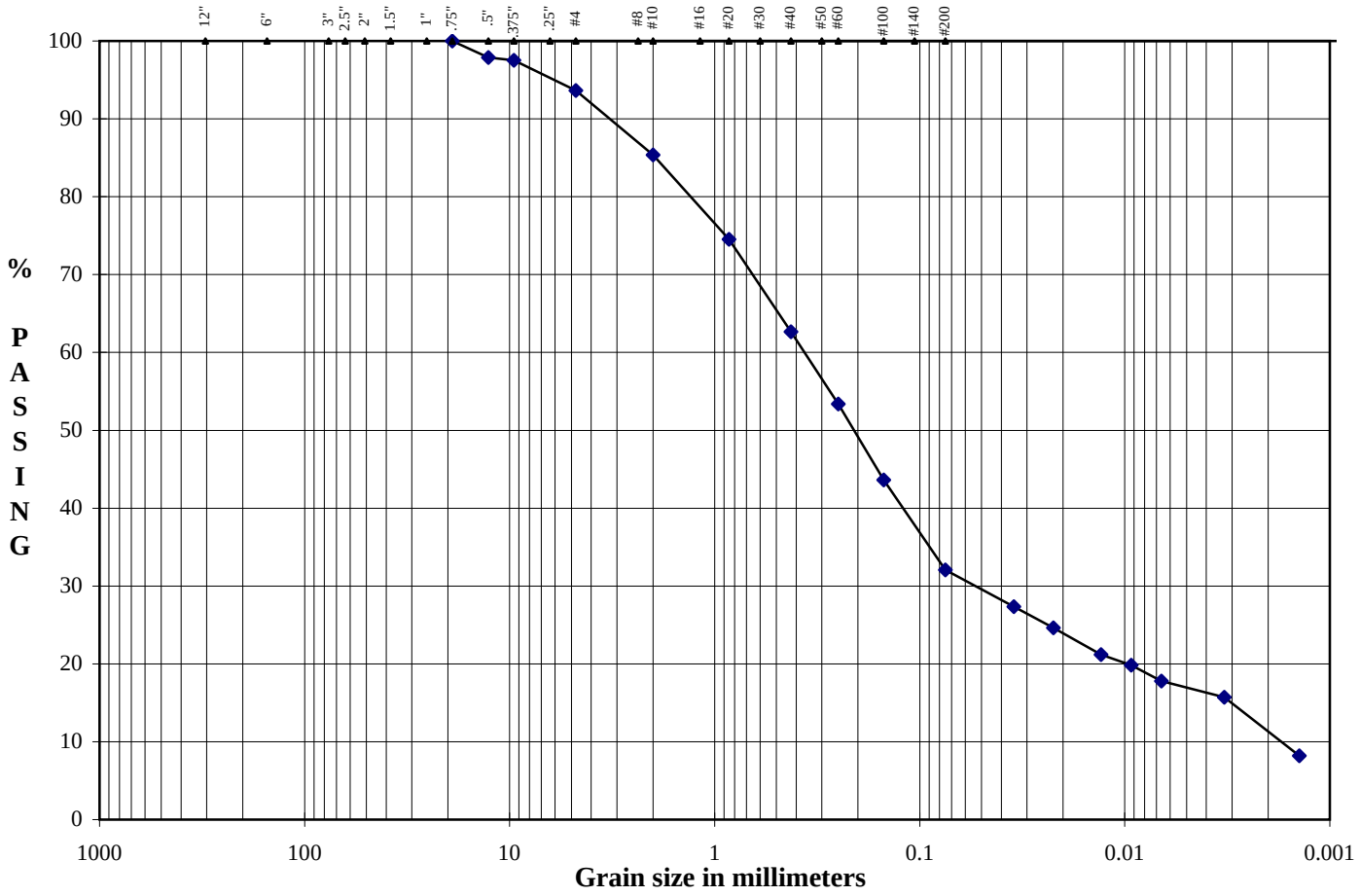
Tested By	AV
Date	03/26/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19745/B-5	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

Particle-Size Analysis



Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

D_{10}	NA	mm
D_{30}	NA	mm
D_{60}	NA	mm
Cu	NA	
Cc	NA	

DESCRIPTION: Reddish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	NK
Date	03/31/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19746/B-6	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

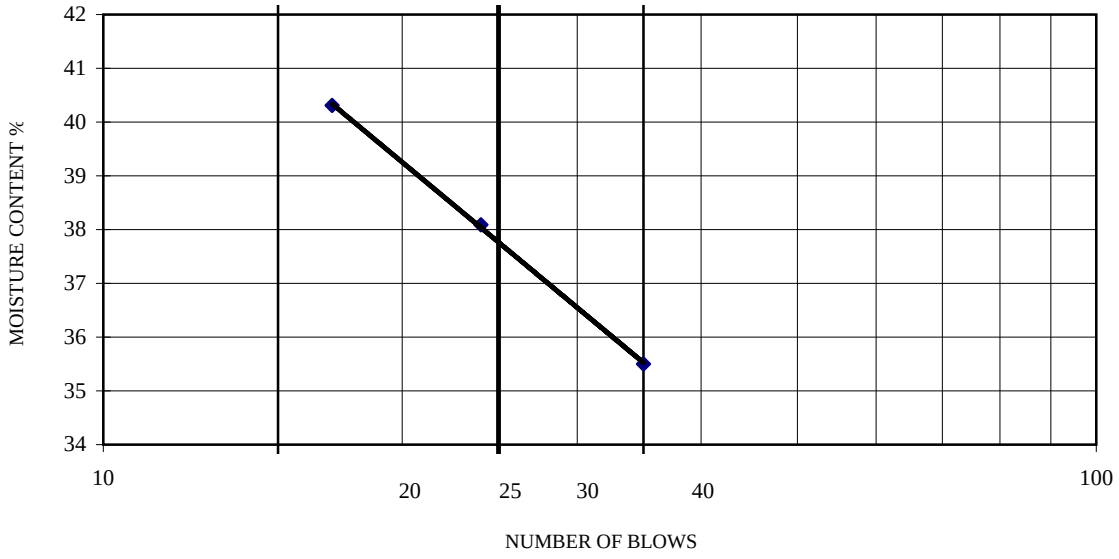
ASTM D 4318/AASHTO T 88, T 89

Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits)

LIQUID LIMIT

Number of Blows	35	24	17
Mass of Wet Sample & Tare, g	44.15	46.82	43.37
Mass of Dry Sample & Tare, g	40.05	41.59	38.15
Mass of Tare, g	28.50	27.86	25.20
Moisture Content, %	35.50	38.09	40.31

Oven ID #	12/13/14/15
Balance ID #	2
Liquid Limit Device ID #	56



PLASTIC LIMIT

Mass of Wet Sample & Tare, g	32.56	34.93
Mass of Dry Sample & Tare, g	30.23	32.27
Mass of Tare, g	23.32	24.37
Moisture Content, %	33.72	33.67

PREPARATION PROCEDURE	DRY

NOTE: MATERIAL PASSING NO. 40 SIEVE WAS USED FOR TEST

NATURAL MOISTURE

Mass of Wet Sample & Tare, g	266.30
Mass of Dry Sample & Tare, g	240.20
Mass of Tare, g	137.80
Moisture Content, %	25.49

LIQUID LIMIT (LL)	38
PLASTIC LIMIT (PL)	34
PLASTICITY INDEX (PI)	4
LIQUIDITY INDEX (LI)	-2.13

DESCRIPTION: Yellowish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

AASHTO (M 145): NA

TIMELY ENGINEERING SOIL TESTS, LLC

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Web: www.test-llc.com

Tested By	AV
Date	03/26/15
Checked By	LB

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19746/B-6	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

As-Received Moisture Content

Mass of Wet Sample & Tare, g	266.30
Mass of Dry Sample & Tare, g	240.20
Mass of Tare, g	137.80
Moisture Content, %	25.5

Moisture Content of Material Used for Hydrometer Analysis

Mass of Wet Sample & Tare, g	266.30
Mass of Dry Sample & Tare, g	240.20
Mass of Tare, g	137.80
Moisture Content, %	25.5

Mass of Total Sample before separation on #4 sieve & Tare, g	531.40
Mass of Tare, g	0.00
Total Mass of Dry Sample, g	423.47

Mass of Sample used for hydrometer analysis, g	79.69
Dry Mass, g	63.50
% of Total Sample passing #4 sieve	99.9

SIEVE ANALYSIS

PORTION OF SAMPLE RETAINED ON #4 SIEVE

Mass of Tare, g: 0.00

Sieve Size		Sample & Tare, g	% RETAINED	%PASSING
12"	COBBLES		0.0	100.0
3"			0.0	100.0
2.5"	COARSE		0.0	100.0
2"	GRAVEL		0.0	100.0
1.5"			0.0	100.0
1"			0.0	100.0
.75"			0.0	100.0
.5"	FINE GRAVEL		0.0	100.0
.375"		0.00	0.0	100.0
#4	COARSE SAND	0.22	0.1	99.9

PORTION OF SAMPLE PASSING #4 SIEVE (Hydrometer Backsieve)

Sieve Size		Cumulative Mass retained, g	% PASSING
#10	MEDIUM	2.73	95.7
#20	SAND	5.53	91.2
#40		10.48	83.5
#60	FINE SAND	17.28	72.8
#100		26.19	58.7
#200	FINES	37.03	41.7

Remarks

HYDROMETER ANALYSIS

Length of Dispersion Period	1 Minute
Mechanical Dispersion Device ID #	61
Amount of Dispersing Agent (ml)	125.0
Specific Gravity (assumed)	2.700
Specific Gravity (tested)	
Starting time	13:32

PARTICLE-SIZE ANALYSIS

% COBBLES	0.0	% MEDIUM SAND	12.2
% COARSE GRAVEL	0.0	% FINE SAND	41.8
% FINE GRAVEL	0.1	% FINES	41.7
% COARSE SAND	4.3	% TOTAL SAMPLE	100.0
% CLAY(<0.005mm)	11.2	% CLAY(<0.002mm)	8.3

Date	Time	Testing time (min)	Reading	Temp (°C)	K	Composite Correction	Actual Reading	Effective Depth (cm)	a	Particle Diam. (mm)	Percent Passing
04/01/15	13:34	2	26.0	19.2	0.01361	5.0	21.0	12.9	0.99	0.0346	32.7
04/01/15	13:37	5	22.0	19.2	0.01361	5.0	17.0	13.6	0.99	0.0224	26.5
04/01/15	13:47	15	18.0	19.2	0.01361	5.0	13.0	14.2	0.99	0.0133	20.3
04/01/15	14:02	30	16.0	19.2	0.01361	5.0	11.0	14.6	0.99	0.0095	17.1
04/01/15	14:32	60	13.5	19.2	0.01361	5.0	8.5	15.0	0.99	0.0068	13.2
04/01/15	17:42	250	11.0	19.2	0.01361	5.0	6.0	15.4	0.99	0.0034	9.3
04/02/15	13:32	1440	10.0	19.2	0.01361	5.0	5.0	15.6	0.99	0.0014	7.8

Hydrometer 152H ID #	451190	Oven ID #	12/13/14/15
Sieve Shaker ID #	54/130	Balance ID#	1/6/7

TIMELY ENGINEERING SOIL TESTS, LLC

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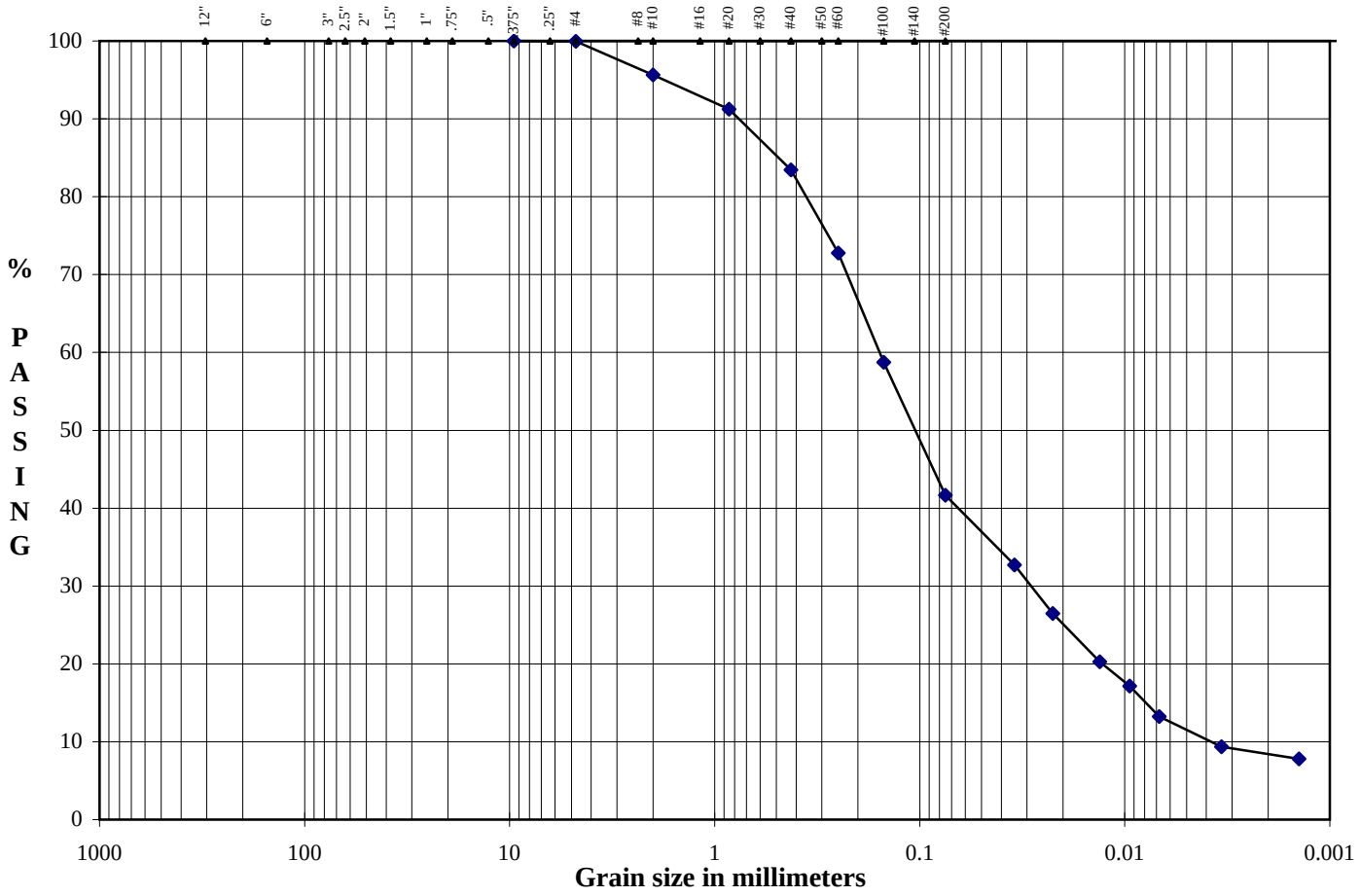
Tested By	AV
Date	03/26/15
Checked By	

Client Pr. #	150411-007	Lab. PR. #	1595-02-1
Pr. Name	Sun Valley Drive Extension	S. Type	Jar
Sample ID	19746/B-6	Depth/Elev.	8.5-10'
Location	-	Add. Info	-

ASTM D 422/AASHTO T 88

Standard Test Method for Particle-Size Analysis of Soils (with Hydrometer Analysis)

Particle-Size Analysis



Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

D_{10}	NA	mm
D_{30}	NA	mm
D_{60}	NA	mm
Cu	NA	
Cc	NA	

DESCRIPTION: Yellowish Brown Silty Sand

USCS (ASTM D2487; D2488): SM

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

April 16, 2015

Sandy Miller
Ranger Consulting
3147 Martha Berry Highway
Rome GA 30165

TEL: (770) 954-1947
FAX: (770) 954-1947

RE: Sun Valley Dr Ext

Dear Sandy Miller: Order No: 1504627

Analytical Environmental Services, Inc. received 1 samples on 4/8/2015 1:19:00 PM for the analyses presented in following report.

No problems were encountered during the analyses. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits. Any discrepancies associated with the analyses contained herein will be noted and submitted in the form of a project Case Narrative.
AES' certifications are as follows:
-NELAC/Florida Certification number E87582 for analysis of Environmental Water, soil/hazardous waste, and Drinking Water Microbiology, effective 07/01/14-06/30/15.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Organics, Inorganics), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 09/01/15.

These results relate only to the items tested. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Tara Westervelt
Project Manager

ANALYTICAL ENVIRONMENTAL SERVICES, INC

3080 Presidential Drive, Atlanta GA 30340-3704
TEL.: (770) 457-8177 / TOLL-FREE (800) 972-4889 / FAX: (770) 457-8188

AES

CHAIN OF CUSTODY

Work Order: 1504627

Date: 8 Apr 2015 Page 1 of 1

COMPANY:	ADDRESS:
Ranger Consulting, Inc.	3147 Martha Berry Hwy Rome, GA 30165
PHONE: 678-596-0862	FAX:
SAMPLED BY: Sandy Miller	SIGNATURE:

#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	Grab	Composite	Matrix (See codes)	ANALYSIS REQUESTED: Resistivity	pH	PRESERVATION (See codes): NA	NA	REMARKS	No # of Containers
1	SW-1	8 Apr 2015	1240	X		SW						1
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

Visit our website www.aesatlanta.com to check on the status of your results, place bottle orders, etc.

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
1:	8 Apr 2015 1319	1: Kadaja Reeves	4/8/15 1:19p
2:		2:	
3:		3:	

SPECIAL INSTRUCTIONS/COMMENTS:

SHIPMENT METHOD
OUT / / VIA:
IN / / VIA:
(CLIENT) FedEx UPS MAIL COURIER
GREYHOUND OTHER_____

PROJECT INFORMATION

PROJECT NAME: Sun Valley Dr Ext
PROJECT #: 150411-007
SITE ADDRESS: Roswell, GA
SEND REPORT TO: smiller@rangerconsulting.net
INVOICE TO: (IF DIFFERENT FROM ABOVE)
QUOTE #:_____ PO#:_____

RECEIPT
Total # of Containers: 1

Turnaround Time Request
- (X) Standard 5 Business Days
- ( ) 2 Business Day Rush
- ( ) Next Business Day Rush
- ( ) Same Day Rush (auth req.)
- ( ) Other _____

STATE PROGRAM (if any): _____
E-mail? Y / N; Fax? Y / N
DATA PACKAGE: I II III IV

SAMPLES RECEIVED AFTER 3PM OR ON SATURDAY ARE CONSIDERED RECEIVED THE NEXT BUSINESS DAY. IF TURNAROUND TIME IS NOT INDICATED, AES WILL PROCEED WITH STANDARD TAT OF SAMPLES. SAMPLES ARE DISPOSED 30 DAYS AFTER REPORT COMPLETION UNLESS OTHER ARRANGEMENTS ARE MADE.

MATRIX CODES: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) DW = Drinking Water (Blanks) O = Other (specify) WW = Waste Water

PRESERVATIVE CODES: H+I = Hydrochloric acid + ice I = Ice only N = Nitric acid S+I = Sulfuric acid + ice S/M+I = Sodium Bisulfate/Methanol + ice O = Other (specify) NA = None

White Copy - Original; Yellow Copy - Client

Analytical Environmental Services, Inc

Date: 16-Apr-15

Client: Ranger Consulting
Project: Sun Valley Dr Ext
Lab ID: 1504627

Case Narrative

pH Analysis by Method E150.1/SM4500 H+ B:

Sample for pH analysis by Method E150.1/SM4500 H+ B was received and analyzed outside holding time requirement of "immediate or 15 minutes".

Analytical Environmental Services, Inc **Date:** 16-Apr-15

Client:	Ranger Consulting	**Client Sample ID:**	SW-1
Project Name:	Sun Valley Dr Ext	**Collection Date:**	4/8/2015 12:40:00 PM
Lab ID:	1504627-001	**Matrix:**	Surface Water

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Resistivity SW9050A								
Resistivity (@100% Moisture Saturation)	18600	0		ohms*cm	R289734	1	04/13/2015 09:00	OM
Hydrogen Ion (pH) by SM4500 H+ B								
pH	6.54	0.0100	H	pH Units	R289596	1	04/10/2015 10:50	JS

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	NC	Not confirmed
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc.

Sample/Cooler Receipt Checklist

Client Ranger Consulting Work Order Number 1504627

Checklist completed by Katie Forum 4/8/15
Signature Date

Carrier name: FedEx __ UPS __ Courier __ Client ✓ US Mail __ Other _____

Shipping container/cooler in good condition? Yes ✓ No __ Not Present __

Custody seals intact on shipping container/cooler? Yes __ No __ Not Present ✓

Custody seals intact on sample bottles? Yes __ No __ Not Present ✓

Container/Temp Blank temperature in compliance? (0°≤6°C)* Yes ✓ No __

Cooler #1 3.4°C Cooler #2 _____ Cooler #3 _____ Cooler #4 _____ Cooler#5 _____ Cooler #6 _____

Chain of custody present? Yes ✓ No __

Chain of custody signed when relinquished and received? Yes ✓ No __

Chain of custody agrees with sample labels? Yes ✓ No __

Samples in proper container/bottle? Yes ✓ No __

Sample containers intact? Yes ✓ No __

Sufficient sample volume for indicated test? Yes ✓ No __

All samples received within holding time? Yes __ No ✓

Was TAT marked on the COC? Yes ✓ No __

Proceed with Standard TAT as per project history? Yes __ No __ Not Applicable ✓

Water - VOA vials have zero headspace? No VOA vials submitted ✓ Yes __ No __

Water - pH acceptable upon receipt? Yes ✓ No __ Not Applicable __

Adjusted? _____ Checked by KF

Sample Condition: Good ✓ Other(Explain) _____

(For diffusive samples or AIHA lead) Is a known blank included? Yes __ No ✓

See Case Narrative for resolution of the Non-Conformance.

* Samples do not have to comply with the given range for certain parameters.

\\Aes_server\I\Sample Receipt\My Documents\COCs and pH Adjustment Sheet\Sample_Cooler_Recipt_Checklist_Rev1.rtf

Analytical Environmental Services, Inc

Date: 16-Apr-15

Client: Ranger Consulting
Project Name: Sun Valley Dr Ext
Lab Order: 1504627

Dates Report

Lab Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
1504627-001A	SW-1	4/8/2015 12:40:00PM	Surface Water	Resistivity			04/13/2015
1504627-001A	SW-1	4/8/2015 12:40:00PM	Surface Water	Hydrogen Ion (pH) by SM4500 H+ B			04/10/2015

Client: Ranger Consulting
Project Name: Sun Valley Dr Ext
Workorder: 1504627

ANALYTICAL QC SUMMARY REPORT

BatchID: R289596

Sample ID: **LCS-R289596**	Client ID:				Units: **pH Units**		Prep Date:		Run No: **289596**	
SampleType: **LCS**	TestCode: **Hydrogen Ion (pH) by SM4500 H+ B**				BatchID: **R289596**		Analysis Date: **04/10/2015**		Seq No: **6156538**	
Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	7.000	0.0100	7.000		100	90	110				

Sample ID: **1504656-001ADUP**	Client ID:				Units: **pH Units**		Prep Date:		Run No: **289596**	
SampleType: **DUP**	TestCode: **Hydrogen Ion (pH) by SM4500 H+ B**				BatchID: **R289596**		Analysis Date: **04/10/2015**		Seq No: **6156568**	
Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	6.550	0.0100						6.530	0.306	20	H

Sample ID: **1504674-001ADUP**	Client ID:				Units: **pH Units**		Prep Date:		Run No: **289596**	
SampleType: **DUP**	TestCode: **Hydrogen Ion (pH) by SM4500 H+ B**				BatchID: **R289596**		Analysis Date: **04/10/2015**		Seq No: **6156560**	
Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	8.140	0.0100						8.130	0.123	20	H

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: Ranger Consulting
Project Name: Sun Valley Dr Ext
Workorder: 1504627

ANALYTICAL QC SUMMARY REPORT

BatchID: R289734

Sample ID: **LCS-R289734**	Client ID:		Units: **ohms*cm**	Prep Date:	Run No: **289734**
SampleType: **LCS**	TestCode: **Resistivity SW9050A**		BatchID: **R289734**	Analysis Date: **04/13/2015**	Seq No: **6160152**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	9107	0	10000		91.1	90	110				

Sample ID: **1504627-001ADUP**	Client ID: **SW-1**		Units: **ohms*cm**	Prep Date:	Run No: **289734**
SampleType: **DUP**	TestCode: **Resistivity SW9050A**		BatchID: **R289734**	Analysis Date: **04/13/2015**	Seq No: **6160154**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	18620	0						18590	0.186	20	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		