METALS & MATERIALS ENGINEERS

January 25, 2015

BGR Joint Venture
Hurt Building,
Atlanta Georgia 30024

Attention: **Mr. Gregory Goodman**
Project Manager

Subject: **Preliminary Geotechnical Engineering Report**
Intrenchment Creek WRC Decommissioning
Fulton County, Georgia
MME Project No: MME-CE-13-013

Dear Mr. Goodman,

Metals & Materials Engineers, LLC (MME) has completed the geotechnical engineering investigation and study for the decommissioning of the Intrenchment Creek WRC Plant located off Key road in Southeast Fulton County, Georgia. This report addresses the geotechnical aspects of the project including our understanding of the planned construction, subsurface conditions, and soil and rock properties, along with the stratification determined during the investigation. This report also provides analysis, conclusions, and recommendations regarding design and construction of the various structures throughout the project site.

We greatly appreciate the opportunity to provide these engineering services for this project and look forward to continue to assist you on this and other future projects

Sincerely,

Metals and Materials Engineers, LLC (MME)

Haven Kicklighter, P.E.
Senior Engineer

Vissu Dokka
Project Engineer/Manager

Sam Mcintosh, P.E.
Senior Engineer

1. PROJECT INFORMATION

1.1 Project Description

General: This project includes the study, and design of structures associated with the decommissioning of the Intrenchment Creek WRC Plant. The existing plant is located off Key Road in Southeast Fulton County. Improvements include the following structures:

a) Transfer Pump Station: The proposed pump station will be a three level structure with the main floor slab at elevation 814.5 ft and the lower wet well at elevation 779.39 ft. Detailed structural information as to the anticipated column/floor slab loads has not been provided.

b) Headworks: A Headworks structure located as shown on the Boring location plan will be constructed. The structure will have several levels with the lowest slab on grade about 25 ft below the existing ground surface elevation of 822 ft. Detailed structural information as to the anticipated column/floor slab loads has not been provided.

c) 5 MGD Equalization Tanks: Two 140 ft diameter by 42 ft tall circular tanks supported on concrete slab foundations will be constructed within the footprint of the existing Trickling Filters as shown on the Boring Location Plan. Preliminary estimated dead load for each tank consists of 5,000,000 gallons of water plus the dead weight of the structure. Preliminary plans call for the structures to have a sloping slab on grade elevation ranging from 808 ft to 796 ft. Other design information relative to the two existing digesters has not been provided.

d) Chemical Building: The structure will be located south of the existing South Clarifier near Boring B-7 as shown on the Boring location plan. The structure will have a reinforced thickened slab on grade at elevation 819.00 ft. The structure will contain several different types of equipment and tanks of different heights. Detailed structural information as to the anticipated column/floor slab loads has not been provided.

2. FIELD INVESTIGATION

Our field investigation sought to explore subsurface conditions within the planned expansion areas at Intrenchment Creek Plant with emphasis on specific proposed new structures.

2.1 Soil Test Borings

Six (6) soil test borings, designated B-1 through B-7, were performed as a part of this investigation. The boring locations were surveyed in the field by MME personnel using a GPS Unit. The boring location coordinates and the elevations shown on the boring logs were furnished to us by the project surveyor. All boring locations are designated on the Boring Location Plan in Appendix A. The borings for this investigation were drilled by a CME 55 truck-mounted drilling rig and were advanced using hollow stem augers to auger refusal. Standard Penetration Tests (SPT) were conducted at approximately 5-foot intervals. Undisturbed (Shelby Tube) samples were obtained in two borings at various intervals for laboratory testing. At Boring B-1 a groundwater monitoring well was installed for subsequent readings.

The detailed subsurface conditions encountered at the borings are shown on the Soil Test Boring Records in Appendix B. These records represent our interpretation of the subsurface conditions based on the engineer's or geologist's field logs prepared during drilling, and laboratory testing results obtained from various samples. The groundwater levels shown on the Soil Test Boring Records represent measurements made at the time of drilling, or stabilized conditions observed at least 24 hours after completing the borings. The lines designating the interfaces between various strata represent approximate boundaries only, as transitions between materials may be gradual.

3. LABORATORY TESTING

Laboratory testing was performed as part of our geotechnical investigation. Laboratory results and a discussion of testing procedures are provided in Appendix C. The laboratory test program included the following:

Classification Testing: Classification tests were performed to evaluate engineering properties of the soils and to aid in soil parameter correlation. These tests included moisture content (ASTM D 2216), and particle-size analysis (ASTM D 422).
Consolidation Testing: Consolidation tests were performed on three undisturbed samples to assess compression characteristics of the on-site soils. Load increments were held on selected samples for several days, generally beyond the end of primary consolidation to assess secondary compression characteristics.

The plan and subsurface profile in Appendix A show the general subsurface conditions and should be reviewed.

4. SUBSURFACE CONDITIONS

Area Geology

The project site is located in the Piedmont Physiographic Province. Igneous and metamorphic rocks up to 600 million years old underlie the site. Residual soils present in this geologic area have been formed, by the in-place chemical and physical weathering of the parent rock. Weathering is facilitated by fractures, joints, and by the presence of less resistant rock types. The typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced, underlain by sandy silts and silty sands that generally become harder with depth to the top of parent bedrock. The boundary between soil and rock is typically not sharply defined. A transitional zone termed partially weathered rock (PWR) is normally found overlying bedrock. Partially weathered rock is defined for engineering purposes as residual material that can be penetrated with soil drilling equipment but which has a standard penetration resistance exceeding 100 blows per foot (bpf). Differential weathering of the parent rock has resulted in highly variable subsurface conditions over short horizontal distances. Lenses and boulders of hard rock and zones of partially weathered rock may be present within the soil above the general bedrock level.

Soil Conditions

The following paragraphs describe the subsurface materials encountered in our investigation.

Fill - Fill soils were encountered in all borings within the expansion areas The fill soils are of variable consistency and composition

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Alluvial Soils – Alluvial soils were encountered beneath the fill some of the borings. These alluvial deposits would be expected due to the nearby Intrenchment Creek. The alluvial

deposits were generally classified as silty sands which are consistent with old flood plain deposits adjacent to existing streams and rivers.

Residual Soils - Residual soils were encountered and were typically described as very loose to firm micaceous silty fine sand. Based on the grain size test the predominate AASHTO classification is A-2-4.

Rock Conditions - Borings B-5and B-6 encountered auger refusal at depths of 46.5 ft and 53.5 ft, respectively. Boring B-4 encountered partially weathered rock (PWR) at 70 feet. Auger refusal generally is representative of the upper rock surface.

Groundwater Conditions - Groundwater measurements were made in all borings locations. At Boring B-1, a ground water piezometer was set to allow for long-term monitoring of the groundwater in this area. Generally, 24-hr stabilized groundwater readings were measured at depths between 19 ft and 23 ft below existing site grades (between elevations 803 ft and 787 ft).

5.0 GEOTECHNICAL ANALYSIS

Our analysis included settlement analysis using the parameters from the laboratory consolation tests

5.1 Settlement Analysis

Settlement Mechanisms

Settlement of soils under load is generally accepted to occur due to four mechanisms, namely:

- Instantaneous Compression – Elastic compression of the soil mass under the applied load - occurs instantaneously upon load application.
- Initial Consolidation – Consolidation of the soil mass due to collapse of air filled void spaces. This occurs rapidly (effectively instantaneously) upon application of load as air can compress and can typically move rapidly out of Piedmont Soils.
- Hydrodynamic Consolidation – Consolidation of the soil mass due to relief of excess pore pressures. In saturated soil, an increase in stress is initially supported by the pore water, creating an excess pore pressure. Imbalanced pore pressures force water

out of the higher pressure to lower pressure areas. As the water leaves the soil mass, the water filled void spaces in the soil shrink, stress is transferred to the soil matrix, and the mass consolidates, causing settlement under the load. The time rate at which this consolidation occurs is a function of the permeability of the soil and the distance the water must travel to be drained, usually determined by the thickness of the compressible soil mass. In clean sand or gravel with free drainage, hydrodynamic consolidation occurs rapidly. In thick clay zones, hydrodynamic consolidation can take years. Hydrodynamic consolidation is often termed "Primary Consolidation".

- Secondary Compression – Secondary compression is a time-dependent, vertical deformation that occurs at constant effective stress with no change in pore water pressure. Secondary compression may be associated with plastic deformation and realignment of soil particles within the mass, possibly due to electro-chemical or dispersion phenomena. Such realignment occurs during all the phases of compression described above, but continues after these mechanisms have reached completion. The continued realignment generally occurs at a decreasing rate over time. Due to the small magnitude of secondary compression over time and uncertainties regarding the actual mechanism, prediction is imprecise.

Initial and instantaneous compression, which are practically indistinguishable, typically account for 50 to 75 percent of total settlement of the silty fine sands and fine sandy silts common in Atlanta, with a higher contribution in partially saturated soils and lower contribution in saturated soils. Hydrodynamic consolidation typically accounts for most of the balance. Secondary compression after completion of the hydrodynamic consolidation typically contributes about 2.5 to 10 percent of the total settlement over several decades.

Where increased load is due to fill placement (as distinct from large building loads), instantaneous and initial consolidation occur during fill placement operations and require instrumentation to detect. The additional fill volume required to compensate for the settlement is typically small compared to the "shrinkage" value calculated between the volume of borrow and the volume of fill in place, which is usually about 15 percent in the Atlanta area. Hydrodynamic consolidation is generally complete within a few weeks to months, often while construction activities are still on-going and before settlement sensitive structures are constructed over the newly placed fill. However, secondary compression can continue after construction is complete and is therefore important, even though the magnitude may be small relative to the magnitude of other settlement.

6.0 RECOMMENDATIONS

The following conclusions and recommendations are based on the previously discussed project information, our observations at the site, interpretation of the field data obtained during the exploration, the results of the laboratory testing, and our experience with similar subsurface conditions and construction. Subsurface conditions in un investigated locations may vary from those encountered at specific boring and rock drilling locations. If the proposed construction scheme should vary from that previously described, these recommendations will have to be reviewed and revised to reflect the new conditions.

Headworks

This structure will be located as shown on the boring location plan in the vicinity of Boring B-7 within the footprint of the existing south primary clarifier. The structure will have several slab on grade elevations levels varying between elevation 822.50 ft for the main floor to lowest top of slab at elevation 797.25 ft. Detailed structural information as to the anticipated column/floor slab loads has not been provided.

To obtain the lowest bottom elevation will require removal/demolition of the existing structures. It will be necessary to remove the existing structures and underground piping within the footprint of the new tanks. There may be numerous pipes and other utilities traversing between and under the existing structures. These pipes and other open conduits will need to be removed and/or plugged and filled with a cementitious mixture where they run beneath the new structure. The removal/demotion process should extend at least 5 ft beyond the footprint of the proposed new structure

After completion of the removal/demolition process, the exposed subgrade soils should then be inspected by a geotechnical engineer to verify that the subgrade soils are suitable for the planned construction. The geotechnical engineer may determine additional ground improvements techniques such as densifying the in place soils or undercutting and replacement with new fill soils and/ or a granular material will be required. After approval by the engineer, any backfill required to achieve the various design subgrade elevation should be compacted to at least 98% Standard Proctor maximum dry density. We recommend the backfill to the intermediate floor slabs and ground surface slab be a granular minus ½ in size material

Depending upon the depth of the existing structures, new compacted fill or loose to firm residual soils will be encountered. For foundation support we recommend the structure be supported on a reinforced slab on grade/ mat foundation at the various design subgrade elevations. The slabs can be designed for an area loading not to exceed a maximum allowable bearing pressure of 1500 psf. For any compacted fill supported foundation elements at higher elevations, a design maximum allowable soil bearing pressure of 2000 psf is recommended. We anticipate any differential settlement between lower and higher soil supported adjacent slabs will be less than ½ inch provided the new backfill is compacted as discussed

5 MGD Equalization Tanks

These structures will be located within the southern half of the existing trickling filters. The New Equalization tanks will have a slopping slab on grade ranging in elevation from 807.00 ft at the perimeter side walls to 801.36 ft at the center of the center sump. The bottom elevation of the existing trickling filter slab is approx. 798.00 ft. There are numerous pipes and other utilities running between and beneath the existing structure.

The proposed structures will be 140-foot diameter, 42 feet high circular tanks that will contain up to 40 ft of water. Over the majority of the footprint, an area load due to the water of 2500 psf will be imposed. Considering the dead weight of the concrete structures, total foundation load could approach 3000 psf. We understand a mat-foundation or very thick base slab is being considered to support these tanks.

The subsurface soils in the area of the Equalization tanks consist of old fill likely associated with the existing structures underlain by residual or alluvial soils as shown on Figures 1. The existing site grades in the area of the new Equalization tanks vary from around 808.00 ft. To obtain a finished grade of around 808.00 ft, will require excavations varying from zero at the perimeter to 10 to 12 feet at the tank center depending on the bottom elevation of the Trickling Filter. At the bottom elevation of the trickling filter, exposed soils could be a combination of fill, alluvium and/or residual soils of variable consistency from very soft, loose to stiff. This cut condition and the effective preload provided by the existing structures raises the potential for non-uniform settlement across the footprint of new Equalization tanks. In addition the underlying residual and/or alluvial soils between will consolidate under the imposed area loads of the tanks when full of water. Our settlement analysis

indicates potential settlements of 6 to 8 inches within the central portions of the tanks and 4 to 6 inches at the perimeters.

The consolidation test data indicates that due to the sandy nature of the soils the settlement responds quickly to load application. However, since the tanks are usually not fully loaded until after they have been placed in service and all final connections made to the tanks, settlements of the above magnitude could cause significant damage to the connecting pipes and any other such structures. Since settlements of the above magnitude are likely unacceptable, there are several options to mitigate the amount of post construction settlement including preloading and deep foundations. Considering cost, time and the lack of significant amount of potential on-site borrow materials preloading may not be the most cost efficient. As such, we understand deep foundations will be utilized to support the tanks.

Deep foundation options include piles or ground improvement using stone columns. We understand piles are the preferred deep foundation option to support the tanks. Of the various pile options, augered cast-in-place piles (ACP) will likely be the most viable considering the subsurface conditions and cost. It has been our experience that the design pile capacity for this type of area loading is determine by optimizing slab thickness and pile spacing. We recommend a minimum pile spacing of 6 feet. For pile spacings of 6, 8 or 10 feet, the anticipated pile loading could range between 60 and 150 tons. For ACP capacities up to 60 tons, a 14 –inch diameter is recommended; from 60 to 120 tons, a 16-inch diameter and 18 –inch diameter for greater than 120 tons. For these capacities, we recommend the piles extend to auger refusal, which could range from 40 to 75 feet across the two Equalization Tank footprints.

Due to limited number of borings and no borings within the footprints of the two tanks, we recommend an extensive probe and test pile program to confirm the design capacity, and develop installation procedures specific to the site. We recommend at least 10 probe piles drilled within the footprints of the two tanks. We also recommend at least two load test be performed to verify the design pile load capacity. The load test should be performed in general accordance with ASTM D-1143. The specific load test locations will be selected after drilling of the probe piles. We anticipate one load test to confirm short pile conditions and one for deep pile conditions.

MME should be retained to select the probe and load test locations, observe and document installation of the probe and test piles, analyze and report the results of the load testing, and

develop recommendations for production pile installation procedures. Any significant differences from accepted procedures or expected results should be brought to the attention of the foundation design team. Test piles should not be used as production piles.

Selection of the final installation criteria (depth of penetration and minimum torque level) will be based on close collaboration between the pile installer and the geotechnical engineer. The recommendation installation depth may vary somewhat after information from the probe and test pile program is evaluated.

ACP Pile Installation

Prior to installing the pile foundations, it will be necessary to remove the existing structures and underground piping within the footprint of the new tanks. We recommend the following site preparation procedures within the footprint plus 10 feet beyond the footprint for each structure:

- Remove all elements of the existing digesters including slabs and walls that exist within the footprint of the new EQ tanks. The exposed subgrade soils should then be inspected by the geotechnical engineer to verify that the subgrade soils are suitable for the planned construction.
- There may be numerous pipes and other utilities traversing between and under the existing structures. These pipes and other open conduits will need to be removed and/or plugged and filled with a cementitious mixture where they run beneath the EQ tank footprints.
- After completion of the above and approval of the subgrade by the geotechnical engineer, all backfill required to achieve the final subgrade elevation should be clean structural fill compacted at least 95% of its standard proctor maximum dry density.

For the ACP installation, we recommend the installation equipment be in good working order and meet the following criteria:

- The hydraulic swivel is capable of generating a torque of at least 150,000 foot-pounds.
- The pull down cables shall be capable of generating a pull down force of at least 50,000 pounds (25 tons).
- The drilling rig should be equipped with a Data Acquisition System (DAS) capable of monitoring, recording, and documenting the following items: Pile numbers,

Drilling Depth, Drilling Time, Grout Quantity, Grout Pressure, Rate of Drilling and withdrawal, and torque level.

At the time of construction, the contractor should make documentation available to the geotechnical and structural engineers to confirm the required minimum equipment specifications.

During installation, the flight augers should be advanced into the ground continuously. The auger should be stopped after reaching the required penetration depth. At the start of pumping grout, the contractor should pump enough grout to build up to the necessary grout pressure as determined during the test pile program. Once the required pressure is reached, withdrawal of the auger may commence. The auger should be removed from the hole in smooth, continuous manner without grout interruption. A minimum edge to edge spacing of at least 4 pile diameters should be maintained between piles installed on the same day.

During the forming of the pile, two grout monitoring criteria must be achieved. The minimum grout pressure determined during the probe and test pile program shall be achieved. Also, the minimum required pump strokes per linear foot of pile, as determined by pump calibration and load test, shall be achieved. All piles must be installed with a grout ratio in excess of 1:10. The grout ratio is the actual volume of pumped grout divided by the theoretical volume of the pile. It is recommended that the grout pumping system be physically calibrated prior to the installation of the test pile and checked periodically during installation. Should less than the required pump strokes per foot occur, or the grout pressure drop below the predetermined level, or other observations suggest that the integrity of the pile may be compromised; the pile may be rejected by the observing engineer.

The leads shall also be marked to measure auger penetration, at a minimum of 1 foot intervals, in such a manner that the elevation of the auger tip can easily be determined from observations made at the ground level. A plug or shoe should be provided at the point of discharge for protection of the hollow shaft during auguring. Excessively worn augers should be replaced.

MME Engineer should be present during pile installation to observe installation, monitor the information provided by the Data Acquisition System, document pump strokes, and note any other pertinent items. In addition to the items monitored by the DAS, the engineer should also verify pile type, location, length, diameter, and tip & butt elevations. Compressive

strength of the grout should be confirmed by casting and breaking grout cubes on a regular basis, but no fewer than two sets of 6 cubes per day.

Transfer Pump Station

This structure will be located in the area of Boring B-3 as shown on the Boring Location Plan. The completed structure will be a 3 level structure with the main finished floor at elevation 814.5 ft and the lowest wet well elevation at 779.39 ft. To obtain the bottom elevation will require excavation cuts between 35 ft and 40 ft below existing site grades. Based on the nearby Boring B-3, loose residual sandy silty soils will be encountered. In addition, the stabilized groundwater appears to be around elevation 800 ft. Due to the potential of encountering loose silty sands and groundwater at the bottom of the excavation, it is recommended the excavation be extended a minimum of 3.0 feet below the bottom of base slab elevation and backfilled with a stabilization layer. For foundation support we recommend a mat foundation for the wet well slab. The mat can be designed for an area loading not to exceed a maximum allowable bearing pressure of 2000 psf.

There are two options for the 3-foot stabilization layer below the reinforced mat foundation: Option (1) backfill with #57 size gravel or Option (2) backfill with 18 inches of #4 size stone topped with 18 inches of compacted graded aggregate base (GAB). The second option provides a slightly more stable working surface for construction of the mat foundation.

We recommend the backfill to the intermediate floor slab and ground surface slab be a granular minus ½ in size material compacted to a minimum of 98 % standard proctor maximum dry density. All foundations above the base slab can be designed to bear within this compacted backfill and sized for an allowable bearing pressure of 2000 psf. We anticipate any differential settlement between lower and higher soil supported adjacent slabs will be less than ½ inch provided the new backfill is compacted as discussed

At this location, the groundwater level will be 20 feet above the wet well slab elevation. Depending upon the dead weight of the structure, anchors may need to be installed to resist the net uplift force. Chance Helical screw anchors or equivalent may be the most viable option considering the underlying subsurface conditions. Uplift capacities of 20 to 40 kips per anchor nay be available for anchor lengths of 30 feet. If higher capacities are needed rock anchors may be needed

Since the bottom elevation will be 20 + feet below stabilized groundwater level some method of temporary groundwater control will be required to provide a dry excavation and bottom during construction. We recommend the groundwater be lowered and maintained as necessary to a depth of at least 5 feet below the bottom of the bottom slab. Due to depth of the excavation either well points or a series of deep wells will be required to lower and maintain the groundwater at the required depth.

Chemical Building

The structure will have a reinforced thickened slab on grade at elevation 819.00 ft. The structure will contain several different types of equipment and tanks of different heights. Detailed structural information as to the anticipated column/floor slab loads has not been provided.

To achieve the bottom of slab elevations will require excavations from 3 ft to 6 ft. At these levels, either fill or residual soils will be encountered. After completion of the excavation process, the exposed subgrade soils should then be inspected by a geotechnical engineer to verify that the subgrade soils are suitable for the planned construction. The geotechnical engineer may determine additional ground improvements techniques such as densifying the in place soils or undercutting and replacement with new fill soils and/or a granular material will be required. After approval by the engineer, any new backfill required to achieve the design subgrade elevation should be compacted to at least 98% Standard Proctor maximum dry density.

For foundation support we recommend the structure be supported on a reinforced slab on grade/ mat foundation at the design subgrade elevation. The slabs can be designed for loading not to exceed a maximum allowable soil bearing pressure of 2000 psf.

Seismic Design

The *IBC* site class is based on the average soil conditions in the top 100 feet of the subsurface profile. The *IBC* permits the soil properties to be estimated by the Geotechnical Engineer based on known regional geologic conditions where site specific data is not available to a depth of 100 feet. A soil *Site Class* D is recommended to be used for seismic

design considerations, based on the 50 to 70 feet deep borings, our past knowledge and understanding of the area geology and Table 1615.1.1 of the 2012 *International Building Code with Georgia Amendment* (*IBC*).

United States Geological Society (USGS) database for seismic design values in various areas of Georgia according to latitude and longitude were reviewed. According to this database, for the project site latitude and longitude, the maximum earthquake spectral response acceleration values for short term (S_s) and for 1-second period (S_1) are $S_s = 0.180g$ and $S_1 = 0.089g$.

Fill Placement

For any general site fill, the fill material to replace undercut areas or achieve finished grades should be low to moderate plasticity soil (PI less than 30), free of deleterious materials and rock fragments larger than 6 inches in any dimension. Structural fill should be placed in maximum 8-inch thick loose lifts and compacted to at least 98 % percent of the soil's maximum dry density as determined by the Standard Proctor compaction test (ASTM D 680). The upper 2 feet of soil beneath pavements and building slabs should be compacted to at least 100 percent. In addition to these requirements, a minimum absolute dry density of 95 pounds per cubic foot should be achieved for all soil fill placed. Soil moisture during placement should be maintained within 3 percent of the optimum moisture content. Fill material should be placed in horizontal lifts and adequately keyed into stripped and scarified subgrade soils.

Below Grade Wall Design

Earth pressures on below-grade walls are influenced by structural design of the walls, conditions of wall restraint, construction methods, and the strength of the materials being restrained. The most common conditions assumed for earth retaining wall design are the active and at-rest conditions. Recommended design parameters, included equivalent fluid unit weight (EFUW) that assumes a triangular pressure distribution, are outlined in the following table:

Material	Typical Earth Fill	ASTM #57 Stone
Active Coefficient (K_a)	0.40	0.22
At-Rest Coefficient (K_0)	0.56	0.36

Passive Coefficient (K_P)	2.56	N/A
Active EFUW, Drained (pcf)	48	22
At-Rest EFUW, Drained (pcf)	67	36
Passive EFUW, Drained (pcf)	150	230
At-Rest EFUW, Buoyant (pcf)	34	36
Unit Weight Moist, □ (pcf)	120	100
Unit Weight Buoyant (pcf)	60	40
□ (degrees)	26	40
c (psf)	0	0

Active conditions apply to relatively flexible earth retention structures, such as free-standing walls, where some movement and rotation may occur to mobilize the shear strength of soils behind the wall. Walls that are rigidly restrained, such as basement, pit, and tunnel walls, should be designed for the at-rest condition. Where basement walls are backfilled before they are braced by the upper floor beams and floor slabs, they should also be capable of withstanding active earth pressures as self supporting cantilevered walls or temporarily braced.

Experience indicates that development of the active earth pressure case requires a magnitude of horizontal wall movement on the order of 1 percent of the height of the wall. Such deflection often cannot be tolerated or cannot occur due to the rigidity of the wall, foundation conditions, or other design restrictions such as the impact on adjacent structures. In such cases, walls are often designed for either the at-rest condition or a condition intermediate of the active and at-rest conditions, depending on the amount of permissible wall movement.

Passive earth pressure represents the maximum possible pressure when a structure is pushed against the soil, and may be considered in wall foundation design to help resist active or at-rest pressures. Because significant movement is required to develop the full passive pressure, the total calculated passive pressure should be reduced by one-half for design of structures. Passive pressures are not applicable for the stone or lightweight fill as the entire passive zone is unlikely to be comprised of such materials.

The recommended equivalent fluid unit weights assume that constantly functioning drainage systems are installed between walls and soil backfill to prevent the build-up of hydrostatic pressures and that the backfill surface is level without significant surcharge loads. If a positive drainage system is not installed (as for tunnels, elevator pits, etc.), then lateral earth pressures should be determined using the buoyant weight of the soil. Hydrostatic pressures

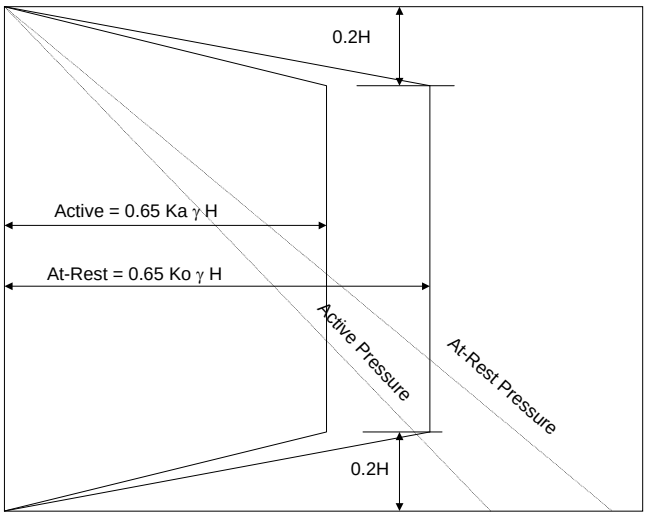
calculated with the unit weight of water (62.4 pcf) should be added to these earth pressures to obtain the total stresses for design.

A value of 0.4 may be used as the allowable coefficient of friction between wall foundations and the underlying soils.

6.1 Top-Down Construction

A special case of below grade walls is walls constructed to support excavations. Examples include temporary or permanent excavation bracing constructed using soldier piles or sheet piles with tie-back anchors, soil nails, or internal rakers and lagging.

The lateral earth pressures on such a braced system are usually not calculated using classical theory (Rankin, Coulomb, etc.) because of differences in deformation during construction. The first tie-back anchor prevents significant deflection, consequently, the lateral earth pressure is higher than the active pressure since no appreciable yielding of the soil mass has occurred. As the excavation continues toward lower restraints, lateral earth pressure causes the facing system between anchors to bulge. These deflections mobilize soil shear strength and result in a lowering of earth pressure. The resulting lateral earth pressure diagram will be irregular in shape with local maximum values occurring near tie-back anchor support levels. For design of top-down shoring to protect excavations, we recommend a trapezoidal distribution as a simplified approximation of earth pressures, which is added to a triangular distribution for hydrostatic loads (if any). The lateral pressure diagram should be as follows:



For shoring that is subject to surcharge loads or that must protect adjacent structures from settlement, higher pressures reflecting surcharge and building loads should be used for design.

Tieback capacity is based on a combination of tieback spacing, embedment length, and embedment materials. During construction, full-scale, field load tests on the anchors (proof and performance load testing) should be performed on tieback anchors to confirm design capacity assumptions.

Construction Inspection

We recommend that the geotechnical engineer or his representative be present during construction for the following inspection activities:

- Observe excavation to confirm that subsurface materials exposed are as anticipated by the design.
- Observe subgrades following excavations to confirm materials exposed are as anticipated and to observe proof rolling of subgrades if deemed necessary
- Observe installation of underground activities including foundation, retaining walls, bedding, and drainage conditions.
- Observe fill placement and conduct tests to confirm specified compaction. Address unanticipated geotechnical conditions that impact the work.

LIMITATIONS:

Our evaluation of design and construction conditions has been based on our understanding of the site and project information and the data obtained during our field exploration. The general subsurface conditions used were based on interpolation of the subsurface data between the borings. The design recommendations in this report have been developed on the basis of the previously described project characteristics and subsurface conditions as determined based on the field investigation and laboratory test program outlined.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after on-site observations of the conditions. Regardless of the thoroughness of a subsurface exploration, there is the possibility that

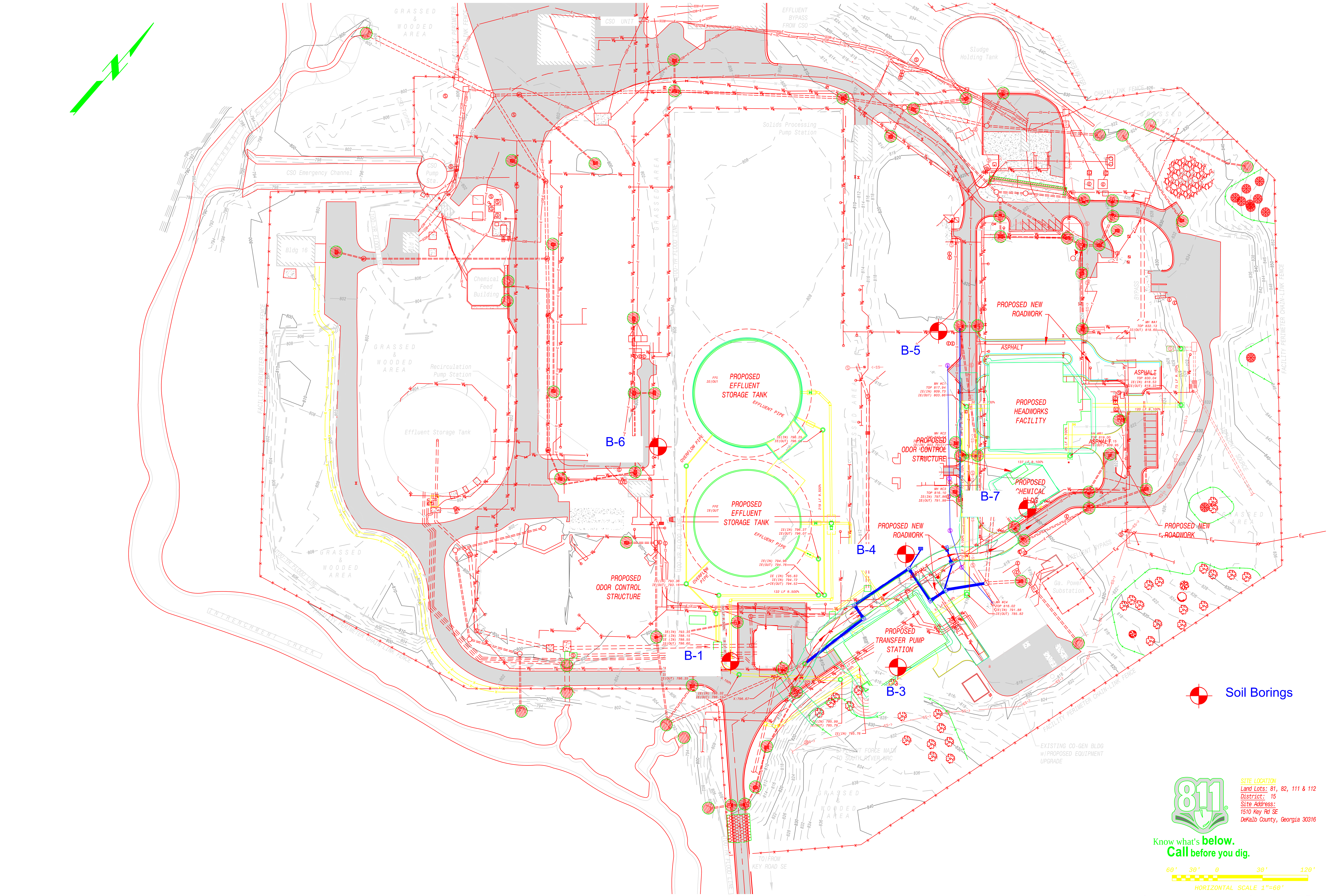
conditions between borings will differ from those at the boring locations; that conditions are not as anticipated by the designers; or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers from MME should observe earthwork to verify that the conditions anticipated in design actually exist.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. MME is not responsible for the conclusions, opinions, or recommendations of others based on these data.

Our investigation did not include any assessment or evaluation of environmental conditions or contamination in the soil, groundwater, or surface water.

APPENDIX

Boring Location Plan
Boring Profile
Boring Logs
Lab Test Results



Boring Location Plan

INTRENCHMENT CREEK WRC DECOMMISSIONING AND SOUTH RIVER WRC PRIMARY CLARIFIERS AND AUXILIARY EQUIPMENT

ICWRC SITEWORK
ICWRC - SITE LAYOUT & BOUNDARY

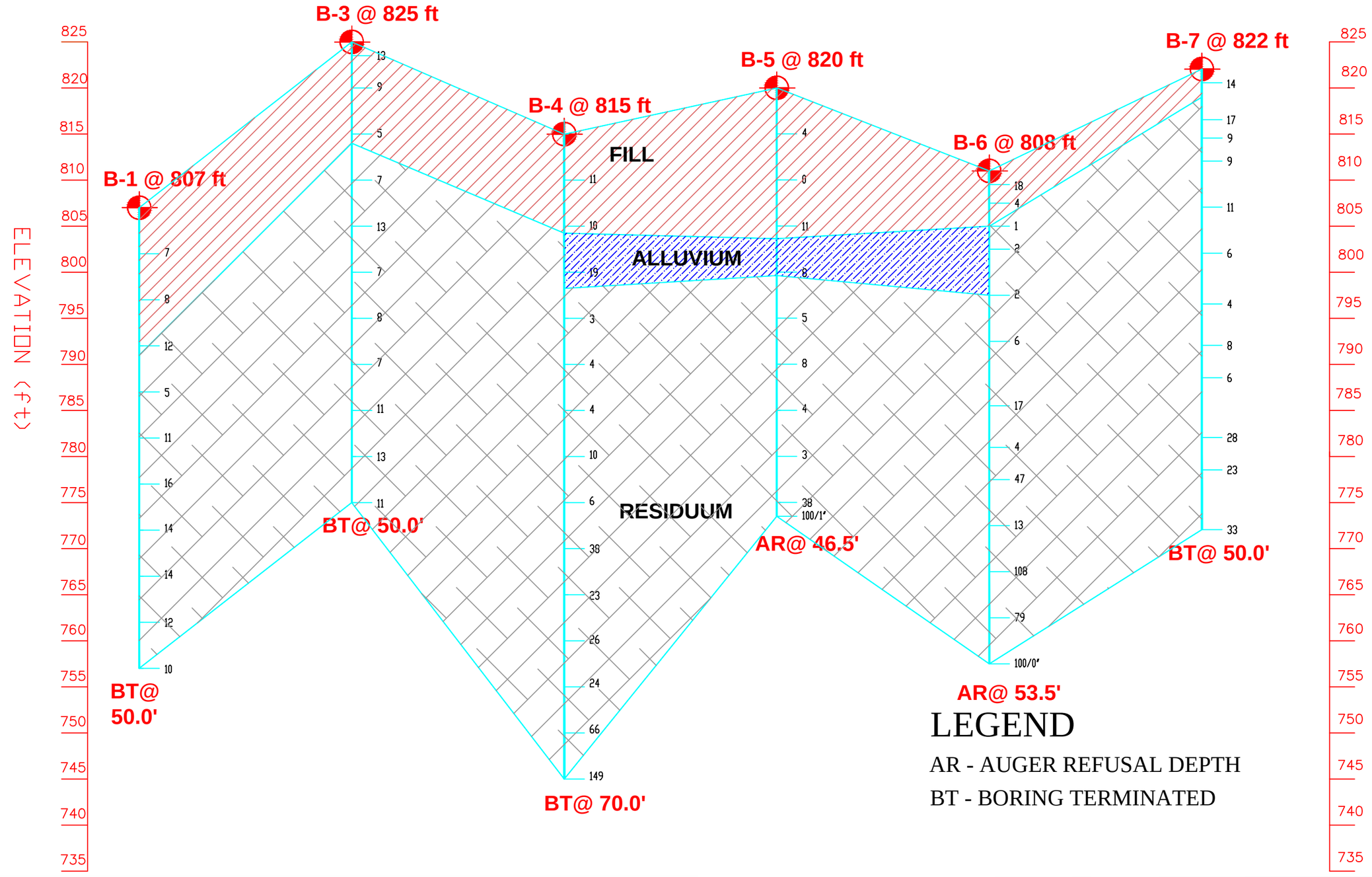
BLACK & VEATCH • GRESHAM, SMITH & PARTNERS • ROHADFOX

DESIGNED: J.C. CROOMS
DETAILED: B.S. AUSTIN
CHECKED: J.C. CROOMS
APPROVED: A.L. WIGGINS
DATE: 2014 AUG 26

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

PROJECT NO.
52324525

CY101
SHEET
OF



LEGEND

AR - AUGER REFUSAL DEPTH

BT - BORING TERMINATED

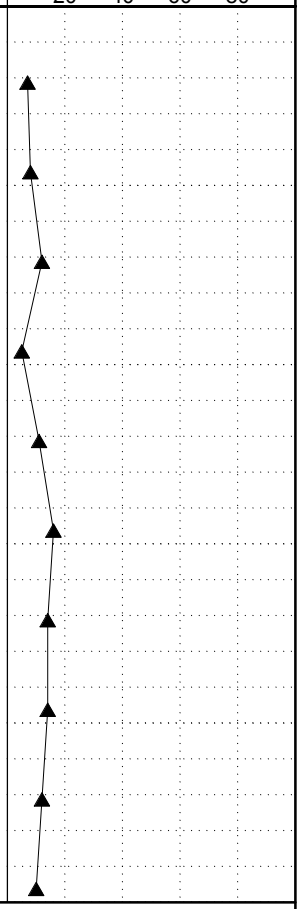
PREPARED FOR:	PREPARED BY:	PROJECT:	INTRENCHMENT CREEK WRC DECOMMISSIONING GEOTECHNICAL BORINGS PROFILE			
BGR JOINT VENTURE 50 HURT PLAZAM SUITE # 1150 ATLANTA, GA 30303	METALS & MATERIALS ENGINEERS 4130 SHIRLEY DRIVE ATLANTA, GA 30336	INTRENCHMENT CREEK WRC DECOMMISSIONING GEOTECHNICAL EVALUATION	Date	Drawn	Approved	Scale
			12/10/2014	VD	SM/HLK	Not To Scale

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-1

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 807 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 28 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 28.2 feet
NOTES E2245966.18, N1346790.72
24hrs AFTER DRILLING 19.3 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(ML) FILL: Firm to stiff reddish brown sandy clayey SILT					
			SS		3-4-3 (7)		
10			SS		3-4-4 (8)		
			SS		10-7-5 (12)		
		(SM) RESIDUUM: Medium dense light gray silty SAND					
20			SS		2-2-3 (5)		
		(SM) Stiff light tan and black silty SAND with some mica and rock fragments					
			SS		5-5-6 (11)		
30			SS		4-6-10 (16)		
			SS		3-6-8 (14)		
40			SS		2-6-8 (14)		
			SS		3-5-7 (12)		
50			SS		5-5-5 (10)		
		Boring terminated at 50 feet below the existing ground surface.					



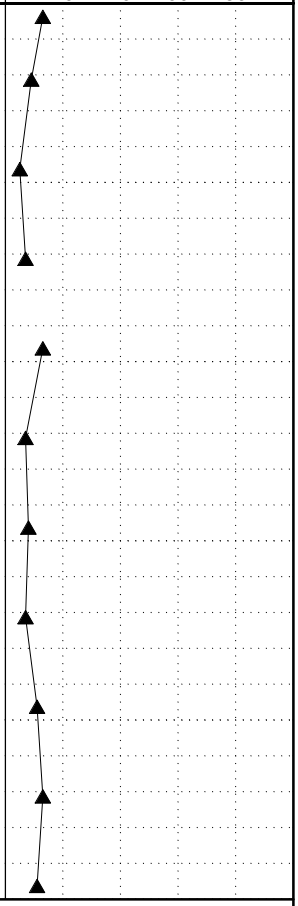
Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-3

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 825 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 33 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 33 feet
NOTES E2246213.59, N1346917.19
24hrs AFTER DRILLING 23.4 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(CL-ML) FILL: Stiff brown and tan clayey SILT with rock fragments	SS		5-6-7 (13)		
			SS		4-4-5 (9)		
		(ML) POSSIBLE FILL: Firm tan and brown sandy SILT					
10			SS		2-2-3 (5)		
		(SM) RESIDUUM: Firm and stiff tan, brown, and black silty SAND with traces of mica	SS		3-3-4 (7)		
			ST				
20			SS		4-6-7 (13)		
			SS		3-3-4 (7)		
30			SS		2-3-5 (8)		
			SS		3-3-4 (7)		
40			SS		3-5-6 (11)		
			SS		5-6-7 (13)		
50			SS		3-5-6 (11)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



Boring terminated at 50 feet below the existing ground surface.

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-4

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/14/14 **COMPLETED** 3/14/14
GROUND ELEVATION 815 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 30 feet
NOTES E2246073.72, N1347003.63
24hrs AFTER DRILLING 23.6 feet

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	(ML) FILL: Stiff red and brown sandy clayey SILT	SS		4-5-6 (11)		
10	(SM) POSSIBLE ALLUVIUM: Medium dense gray silty SAND	SS		4-5-5 (10)		
		SS		4-8-11 (19)		
20	(SM) RESIDUUM: Soft to stiff light tan and brown silty SAND	SS		2-1-2 (3)		
		ST	0			
		SS		2-2-2 (4)		
30		SS		1-2-2 (4)		
		SS		5-4-6 (10)		
40		SS		1-3-3 (6)		
	(SM) Very stiff gray, tan, and black silty SAND with traces of mica	SS		6-8-30 (38)		
50		SS		6-10-13 (23)		
		SS		10-14-12 (26)		
60		SS		13-13-11 (24)		
	(SM) Very dense tan and gray silty SAND with rock fragments	SS		19-32-34 (66)		
70		SS		17-49-100 (149)		
	Boring terminated at 70 feet below the existing ground surface.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

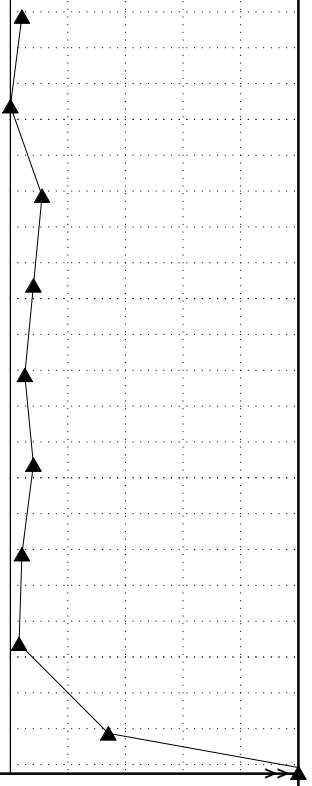
Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-5

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 820 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 38 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 38 feet
NOTES E2245906.09, N1347309.16
24hrs AFTER DRILLING 20.8 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(ML) FILL: Soft brown sandy SILT	SS		3-2-2 (4)		
			SS		0-0-0 (0)		
10		(CL-ML) POSSIBLE FILL: Stiff reddish brown silty CLAY	SS		3-5-6 (11)		
		(SM) POSSIBLE ALLUVIUM: Loose gray silty SAND	SS		2-3-5 (8)		
20		(SM) RESIDUUM: Soft and firm tan, gray, and black silty SAND	SS		1-2-3 (5)		
			SS		3-4-4 (8)		
30			SS		2-1-3 (4)		
			SS		0-2-1 (3)		
40		(SM) Dense to very dense tan and brown silty SAND with rock fragments	SS		4-16-18 (34)		
		Boring encountered auger refusal at 46.5 feet below the existing ground surface.	SS		100/1"		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-6

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 8/5/14 **COMPLETED** 8/5/14
GROUND ELEVATION 808 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 10
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 15
NOTES
AFTER DRILLING NA

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SM) FILL: Medium dense to very loose reddish brown silty medium to fine SAND with mica	SS		5-9-9 (18)		
			SS		1-2-2 (4)		
			SS		0-0-1 (1)		
10		(ML) ALLUVIUM: Very soft gray medium to fine sandy SILT	SS		0-1-1 (2)		
		(SM) RESIDUUM: Very loose, loose, medium dense, and dense orange, white, brown, and black silty medium to fine SAND with mica	SS		1-0-2 (2)		
20			SS		1-2-4 (6)		
			SS		5-7-10 (17)		
30			SS		1-1-3 (4)		
			SS		15-28-19 (47)		
40			SS		3-4-9 (13)		
		(PWR) PARTIALLY WEATHERED ROCK: Sampled as dense orange, white, brown, and black silty medium to fine SAND with mica	SS		5-8-100 (108)		
50		(SM) RESIDUUM: Very loose, loose, medium dense, and dense orange, white, brown, and black silty medium to fine SAND with mica	SS		22-33-46 (79)		
		Boring encountered auger refusal at 53.5 feet below the existing ground surface.	SS		100/0"		

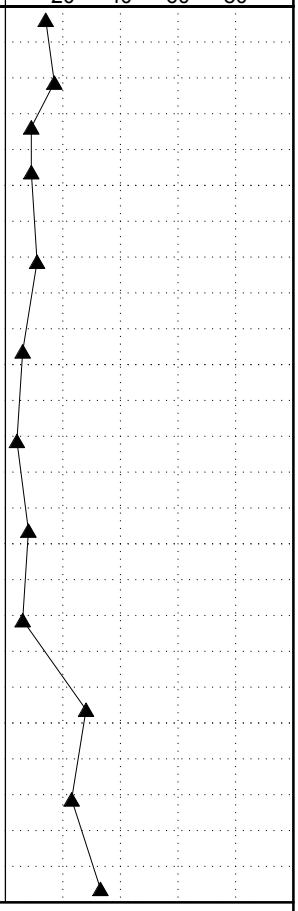
▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-7

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 8/21/14 **COMPLETED** 8/21/14
GROUND ELEVATION 822 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 31 feet
NOTES
AFTER DRILLING NA

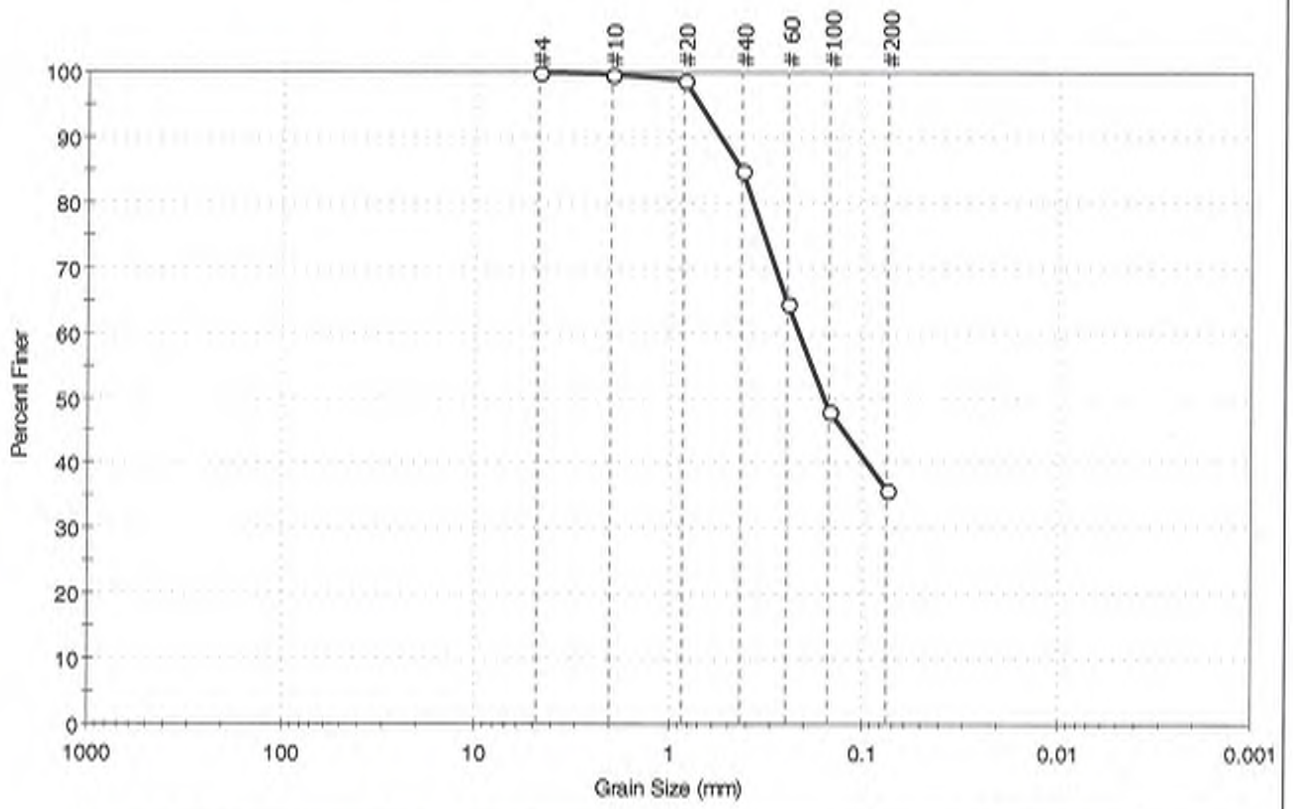
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SM) FILL: Medium dense orange and reddish brown silty medium to fine SAND	SS		2-6-8 (14)		
			SS		4-7-10 (17)		
		(SM) RESIDUUM: Loose orange, reddish brown and white silty medium to fine SAND	SS		3-4-5 (9)		
10			SS		3-3-6 (9)		
		(SM) Medium dense, loose, very loose, and dense reddish brown, white, black, orange, brown, and black silty medium to fine SAND with mica	SS		3-5-6 (11)		
20			SS		2-2-4 (6)		
			SS		1-1-3 (4)		
30			SS		1-3-5 (8)		
			SS		2-3-3 (6)		
40			SS		6-10-18 (28)		
			SS		5-9-14 (23)		
50			SS		6-12-21 (33)		
		Boring was terminated at 50 feet below the existing ground surface.					



GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-3	Test Date:	04/01/14	Checked By:	MCM
Depth :	8.5-10 ft	Test Id:	227511		
Test Comment:	---				
Sample Description:	Moist, reddish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	63.9	36.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	85		
# 60	0.25	65		
#100	0.15	48		
#200	0.075	36		

Coefficients

D_{85} = 0.4254 mm	D_{30} = N/A
D_{60} = 0.2163 mm	D_{15} = N/A
D_{50} = 0.1585 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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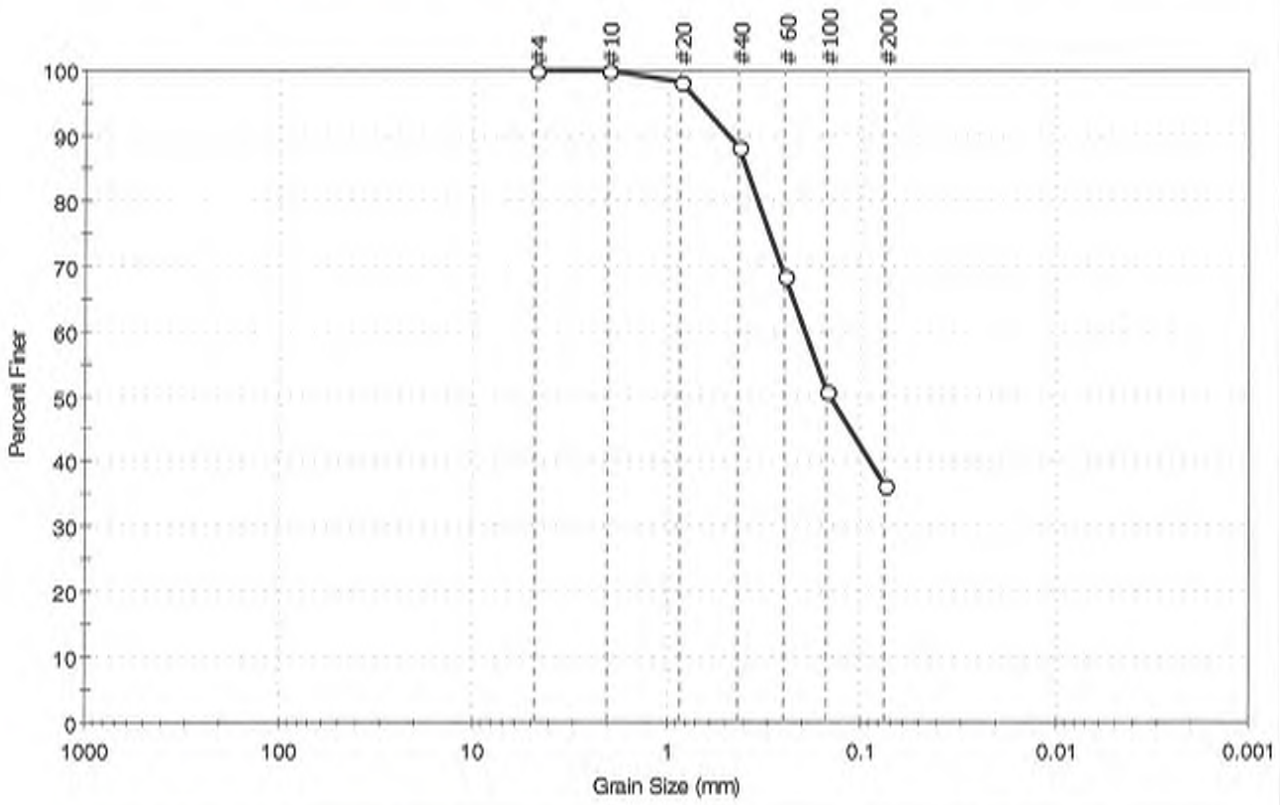
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-6	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227512		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	63.7	36.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	98		
#40	0.42	88		
# 60	0.25	68		
#100	0.15	51		
#200	0.075	36		

Coefficients

D_{85} = 0.3907 mm D_{30} = N/A
D_{60} = 0.1963 mm D_{15} = N/A
D_{50} = 0.1454 mm D_{10} = N/A
C_U = N/A C_C = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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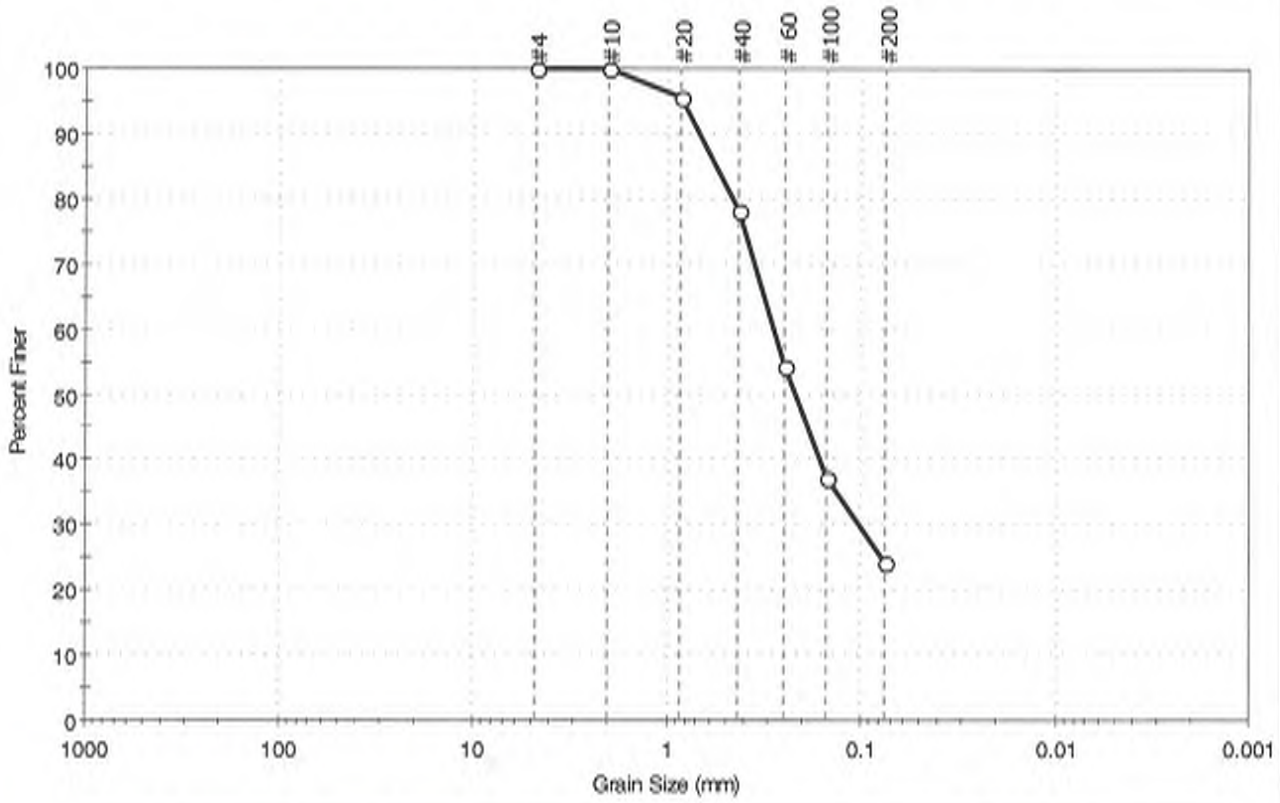
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-9	Test Date:	04/01/14	Checked By:	MCM
Depth :	38.5-40 ft	Test Id:	227513		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	75.7	24.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	96		
#40	0.42	78		
# 60	0.25	54		
#100	0.15	37		
#200	0.075	24		

Coefficients

D_{85} =0.5551 mm	D_{30} =0.1019 mm
D_{60} =0.2835 mm	D_{15} =N/A
D_{50} =0.2198 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

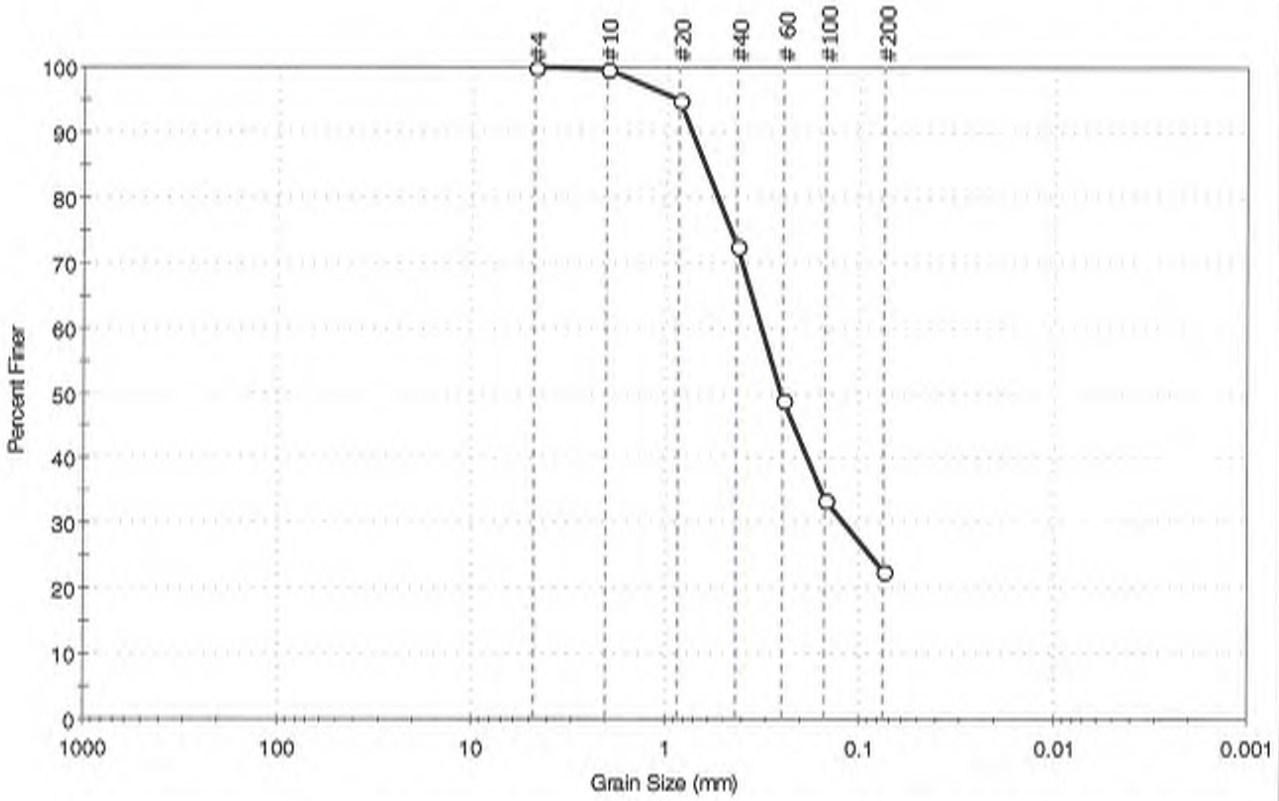
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-10	Test Date:	04/01/14	Checked By:	MCM
Depth :	43.5-45 ft	Test Id:	227514		
Test Comment:	---				
Sample Description:	Moist, brownish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	--	77.4	22.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	95		
#40	0.42	73		
# 60	0.25	49		
#100	0.15	34		
#200	0.075	23		

Coefficients

D_{85} = 0.6240 mm	D_{30} = 0.1189 mm
D_{60} = 0.3198 mm	D_{15} = N/A
D_{50} = 0.2554 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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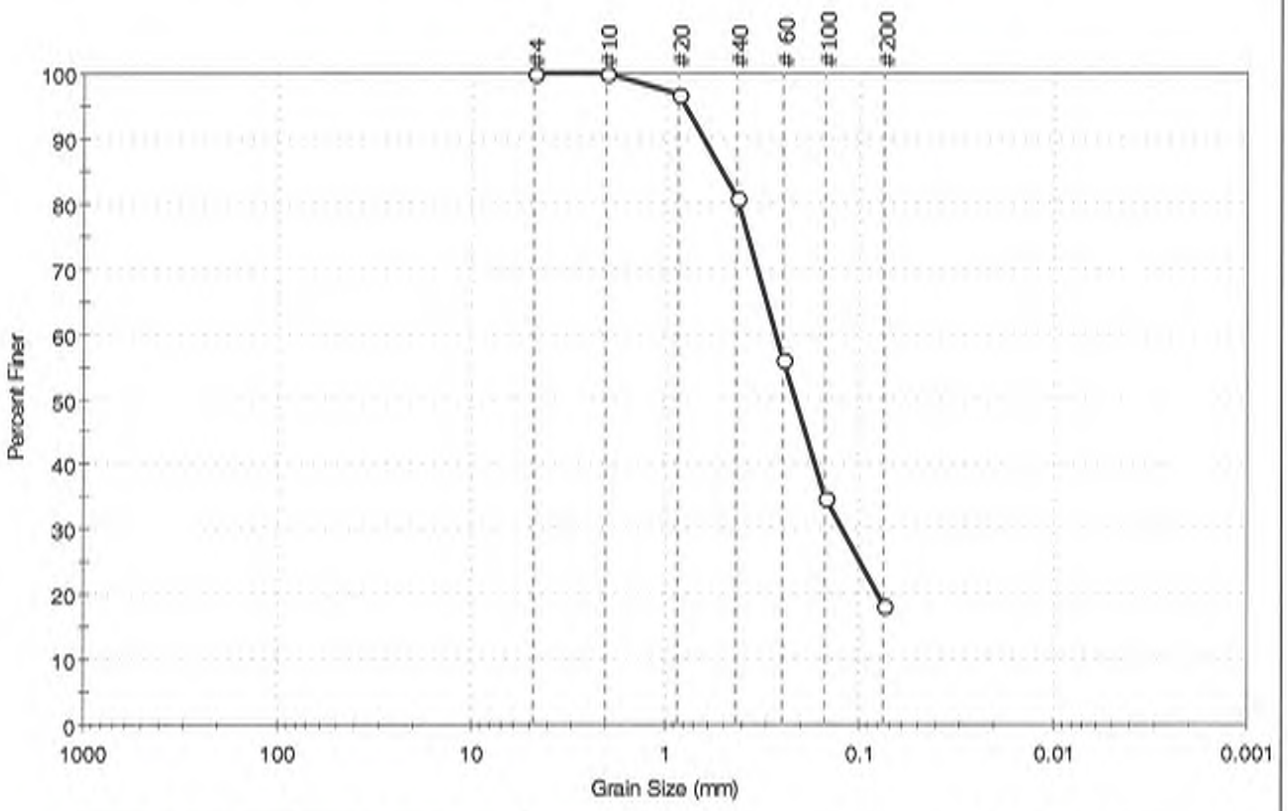
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	tube	Tested By:	jm
Sample ID:	---	Test Date:	04/01/14	Checked By:	MCM
Depth :	15.5-17.5 ft	Test Id:	227525		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	81.6	18.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	97		
#40	0.42	81		
# 60	0.25	56		
#100	0.15	35		
#200	0.075	18		

Coefficients

D_{85} =0.5075 mm	D_{30} =0.1222 mm
D_{60} =0.2727 mm	D_{15} =N/A
D_{50} =0.2166 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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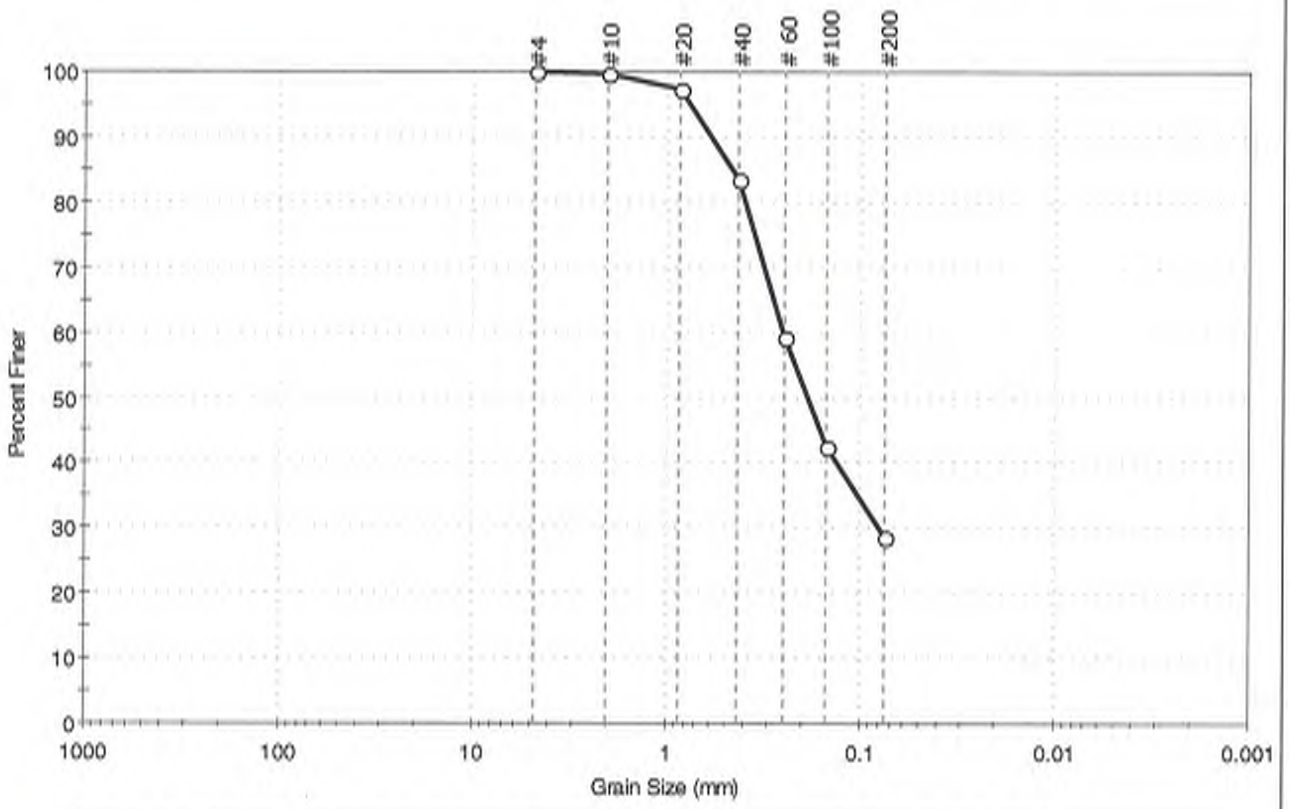
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-4	Test Date:	04/01/14	Checked By:	MCM
Depth :	18.5-20 ft	Test Id:	227515		
Test Comment:	---				
Sample Description:	Moist, reddish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	71.5	28.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	97		
#40	0.42	84		
# 60	0.25	59		
#100	0.15	43		
#200	0.075	29		

Coefficients

D_{85} =0.4557 mm	D_{30} =0.0807 mm
D_{60} =0.2544 mm	D_{15} =N/A
D_{50} =0.1887 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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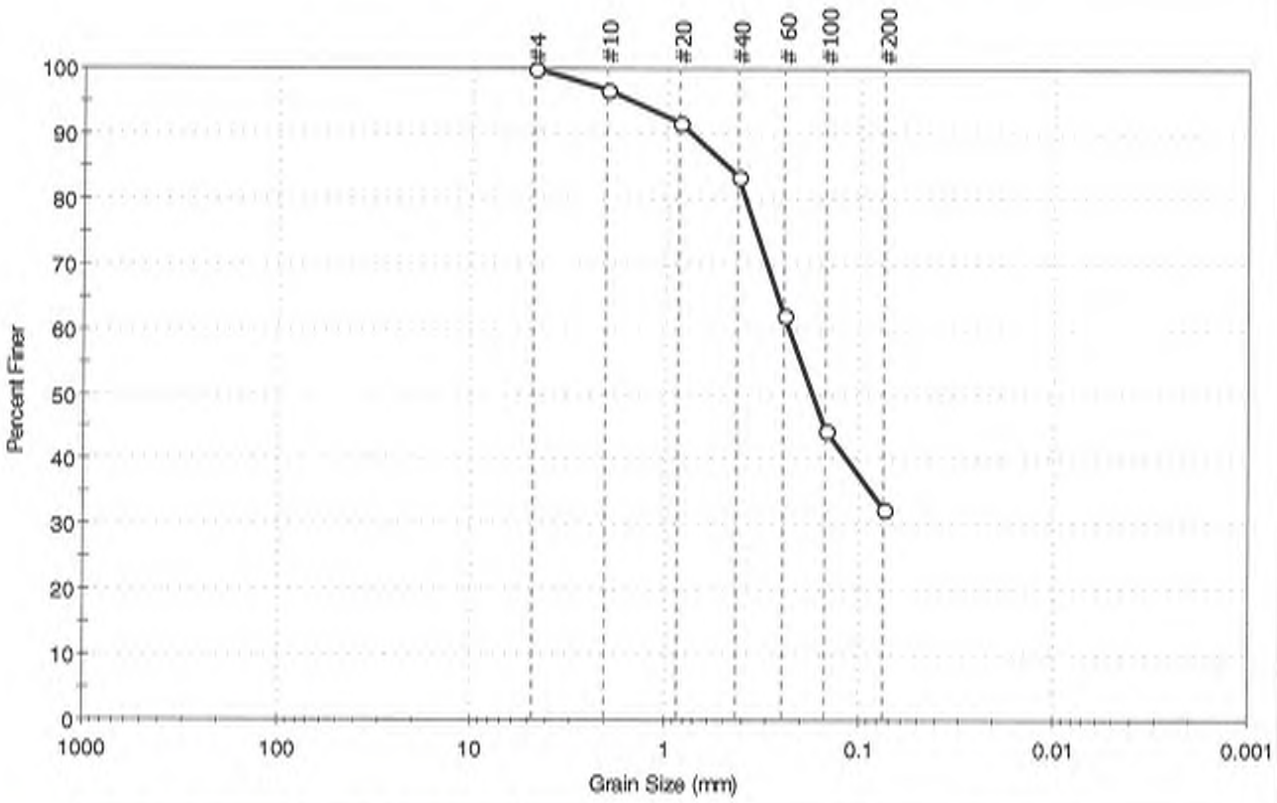
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-5	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227516		
Test Comment:	---				
Sample Description:	Moist, light brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	67.6	32.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	97		
#20	0.85	92		
#40	0.42	84		
# 60	0.25	62		
#100	0.15	45		
#200	0.075	32		

Coefficients

D_{85} = 0.4785 mm	D_{30} = N/A
D_{60} = 0.2348 mm	D_{15} = N/A
D_{50} = 0.1754 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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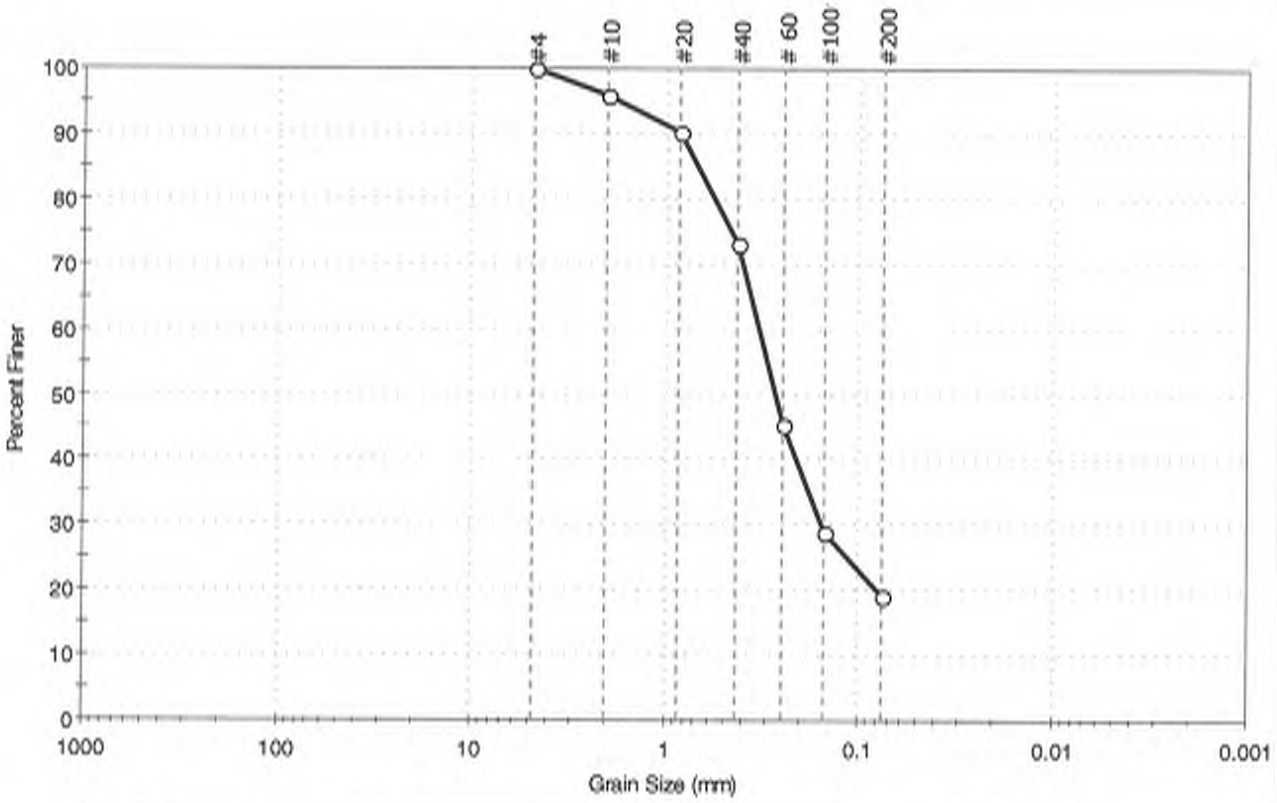
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-7	Test Date:	04/01/14	Checked By:	MCM
Depth :	33.5-35 ft	Test Id:	227517		
Test Comment:	---				
Sample Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	80.9	19.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	96		
#20	0.85	90		
#40	0.42	73		
# 60	0.25	45		
#100	0.15	29		
#200	0.075	19		

Coefficients

D_{85} =0.6852 mm	D_{30} =0.1549 mm
D_{60} =0.3300 mm	D_{15} =N/A
D_{50} =0.2728 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

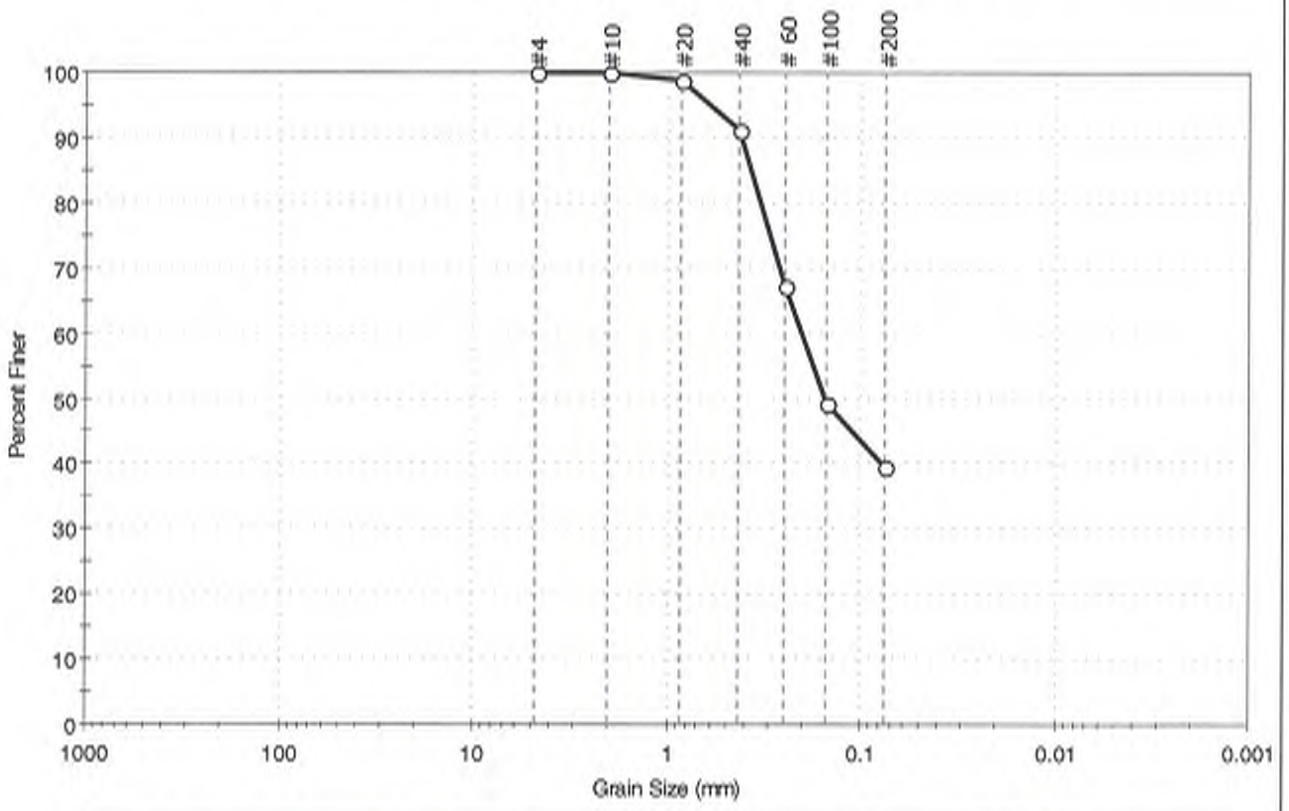
Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-8	Test Date:	04/01/14	Checked By:	MCM
Depth :	38.5-40 ft	Test Id:	227518		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	60.5	39.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	91		
# 60	0.25	67		
#100	0.15	49		
#200	0.075	39		

Coefficients

D_{85} = 0.3712 mm	D_{30} = N/A
D_{60} = 0.2034 mm	D_{15} = N/A
D_{50} = 0.1528 mm	D_{10} = N/A
C_U = N/A	C_C = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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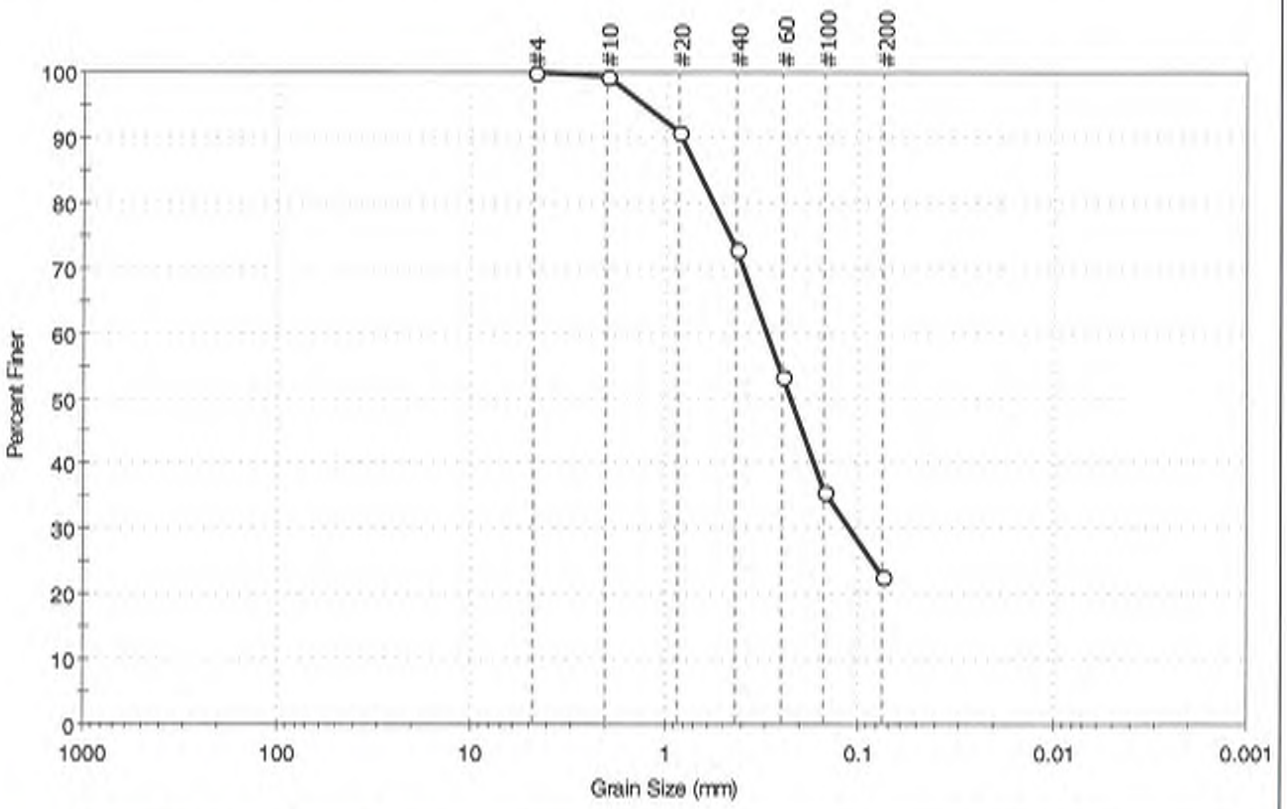
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4A	Sample Type:	tube	Tested By:	jm
Sample ID:	---	Test Date:	04/01/14	Checked By:	MCM
Depth :	19-21 ft	Test Id:	227526		
Test Comment:	---				
Sample Description:	Moist, grayish white silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	77.2	22.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	91		
#40	0.42	73		
# 60	0.25	53		
#100	0.15	36		
#200	0.075	23		

Coefficients

D_{85} = 0.6808 mm	D_{30} = 0.1104 mm
D_{60} = 0.2997 mm	D_{15} = N/A
D_{50} = 0.2267 mm	D_{10} = N/A
C_U = N/A	C_C = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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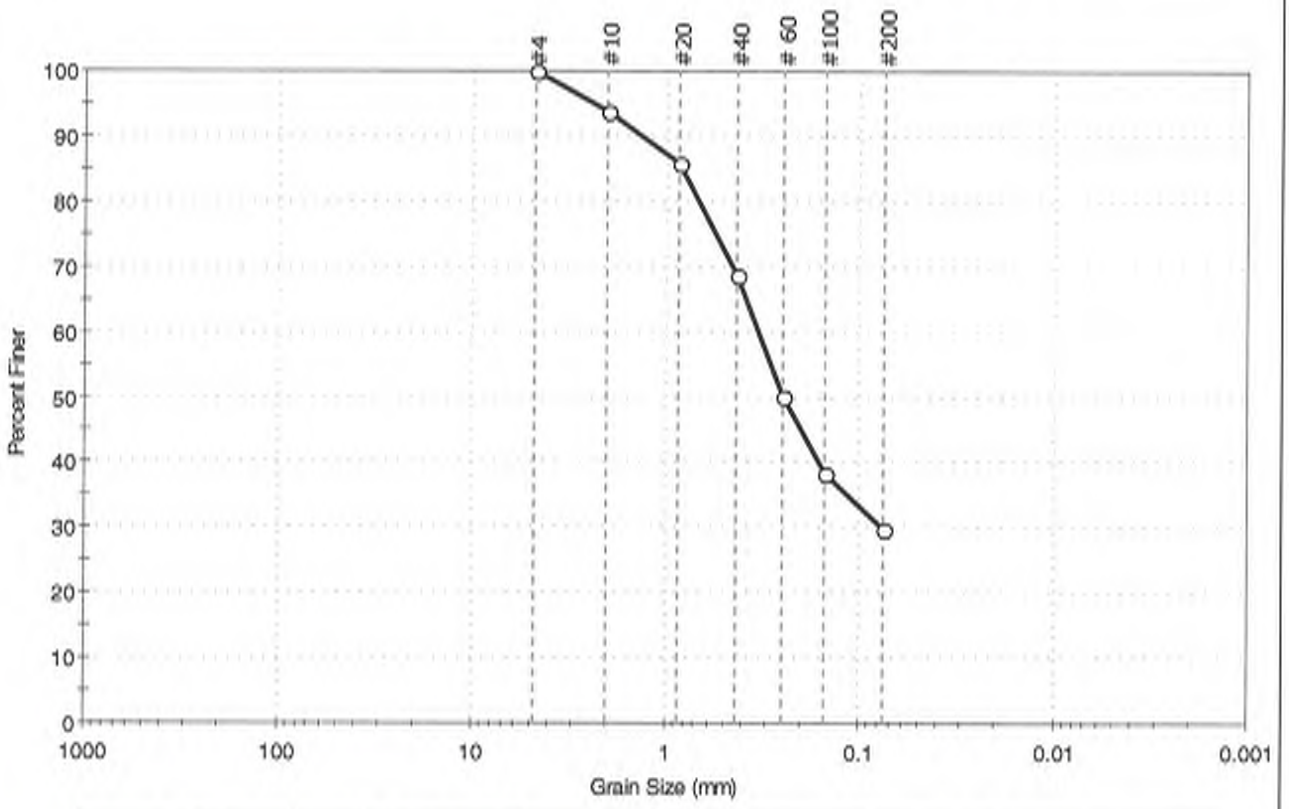
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-4	Test Date:	04/01/14	Checked By:	MCM
Depth :	18.5-20 ft	Test Id:	227519		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	70.1	29.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	94		
#20	0.85	86		
#40	0.42	69		
# 60	0.25	50		
#100	0.15	38		
#200	0.075	30		

Coefficients

D_{85} =0.8221 mm	D_{30} =0.0759 mm
D_{60} =0.3320 mm	D_{15} =N/A
D_{50} =0.2492 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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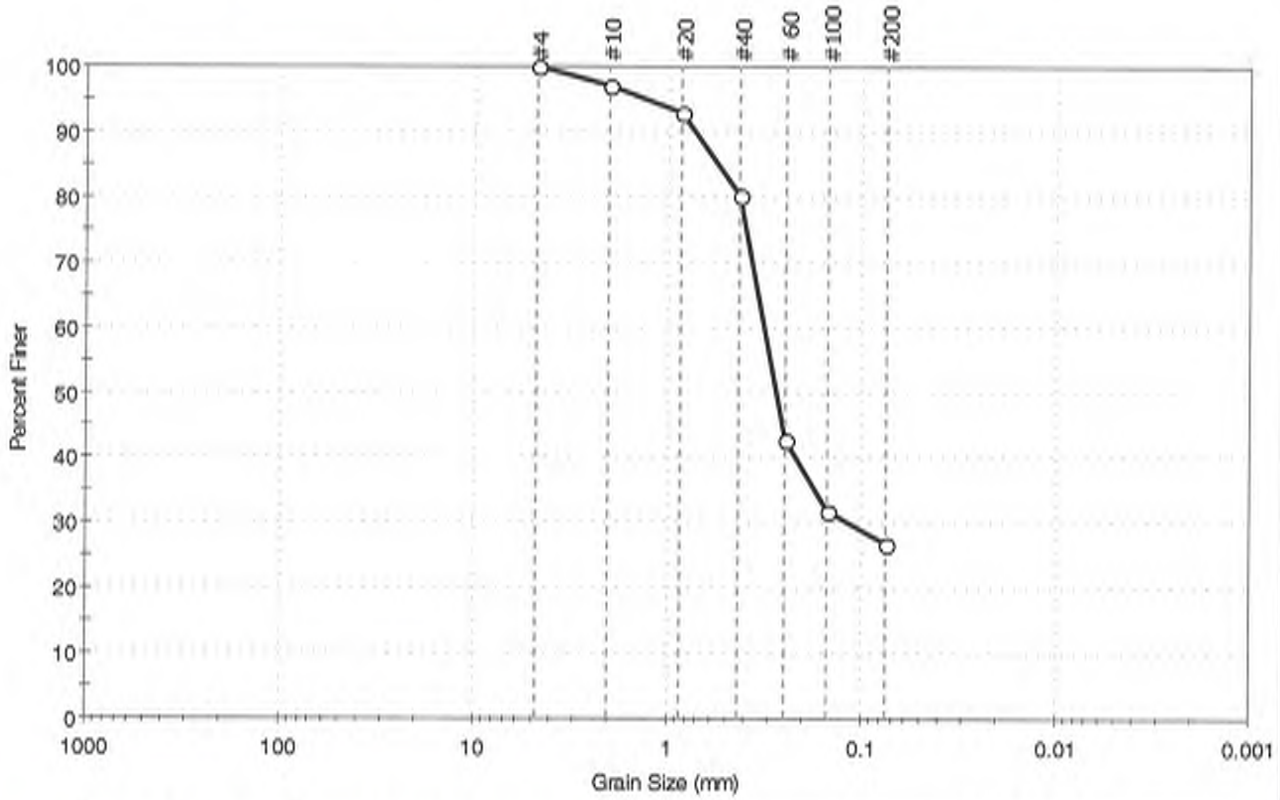
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-5	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227520		
Test Comment:	---				
Sample Description:	Moist, reddish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	73.1	26.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	97		
#20	0.85	93		
#40	0.42	80		
# 60	0.25	43		
#100	0.15	32		
#200	0.075	27		

Coefficients

D_{85} = 0.5489 mm	D_{30} = 0.1159 mm
D_{60} = 0.3192 mm	D_{15} = N/A
D_{50} = 0.2773 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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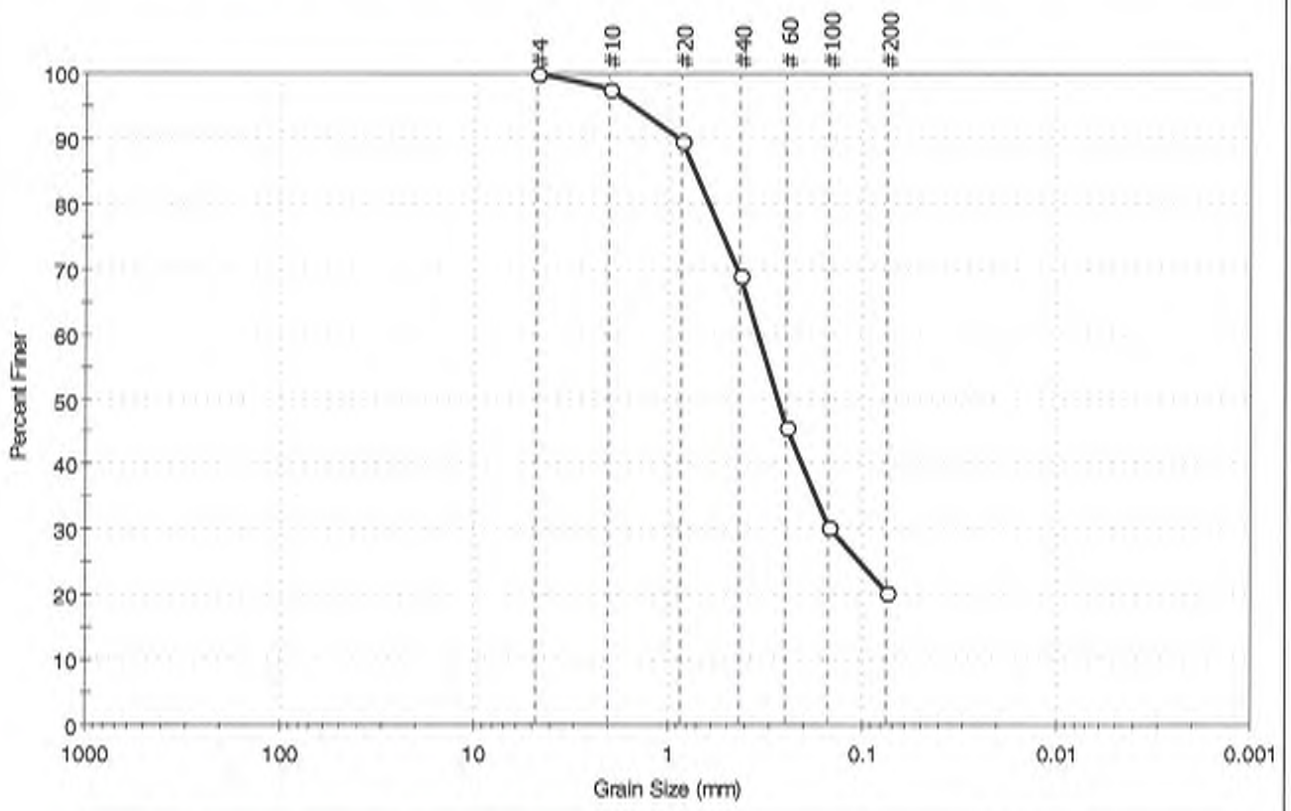
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-6	Test Date:	04/01/14	Checked By:	MCM
Depth :	28.5-30 ft	Test Id:	227521		
Test Comment:	---				
Sample Description:	Moist, brownish red silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	79.6	20.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	90		
#20	0.85	90		
#40	0.42	69		
# 60	0.25	46		
#100	0.15	30		
#200	0.075	20		

Coefficients

D_{85} = 0.7269 mm	D_{30} = 0.1458 mm
D_{60} = 0.3463 mm	D_{15} = N/A
D_{50} = 0.2754 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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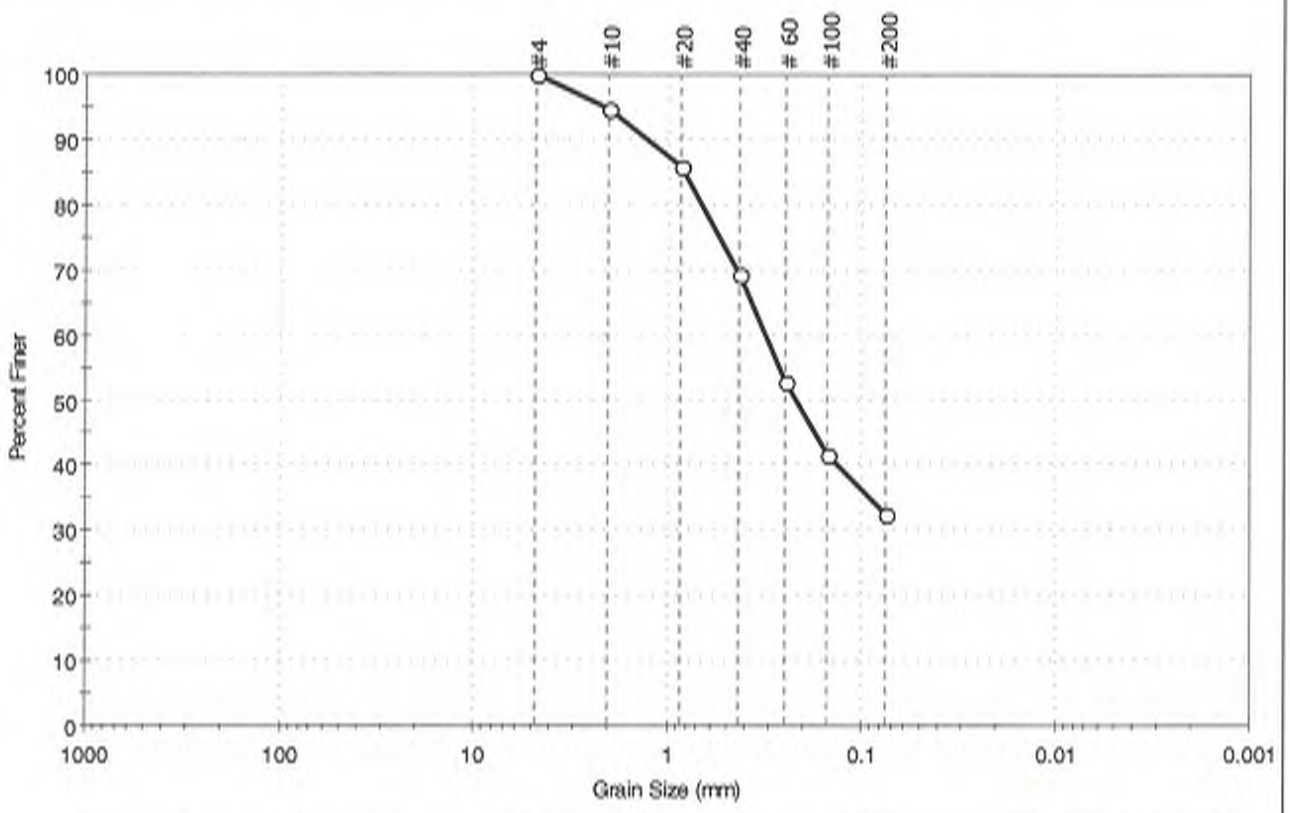
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-7	Test Date:	04/01/14	Checked By:	MCM
Depth :	33.5-35 ft	Test Id:	227522		
Test Comment:	---				
Sample Description:	Moist, brownish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	67.6	32.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	95		
#20	0.85	86		
#40	0.42	69		
# 60	0.25	53		
#100	0.15	42		
#200	0.075	32		

Coefficients

D_{85} = 0.8187 mm D_{30} = N/A
D_{60} = 0.3156 mm D_{15} = N/A
D_{50} = 0.2201 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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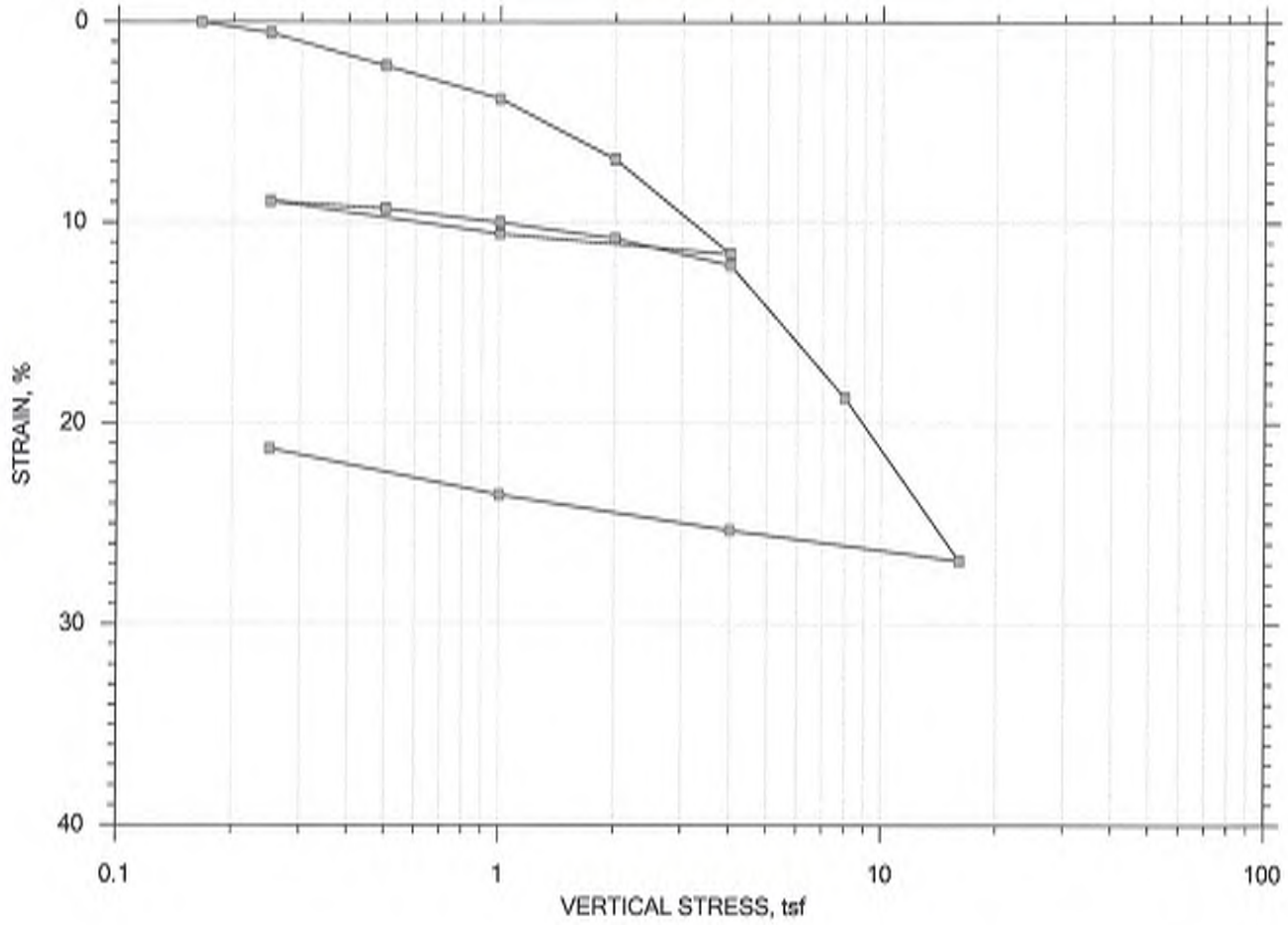
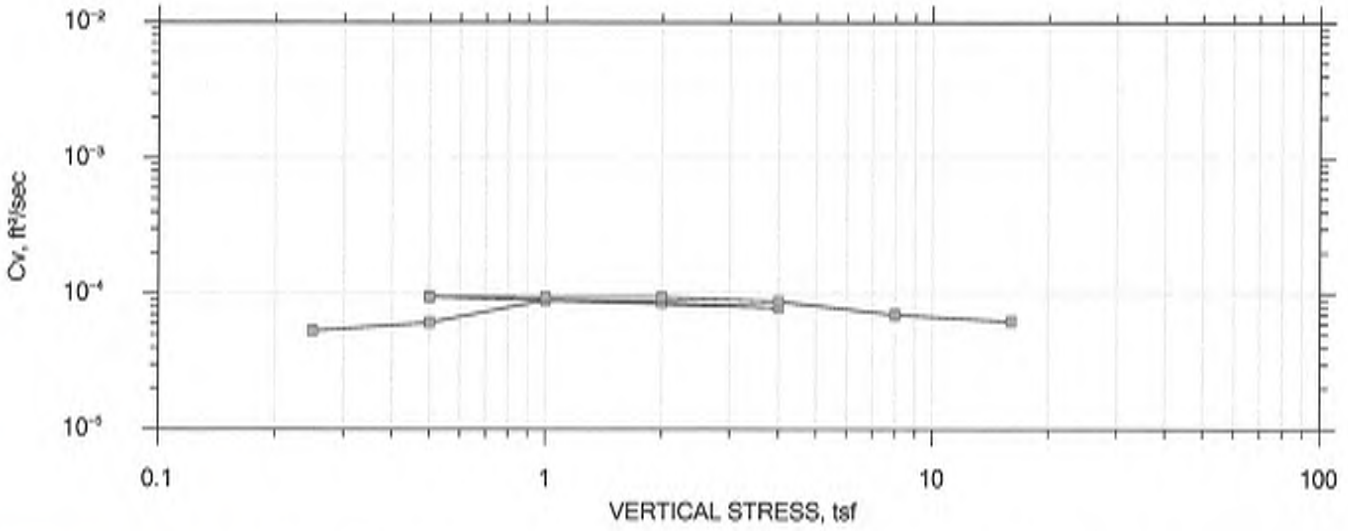
One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

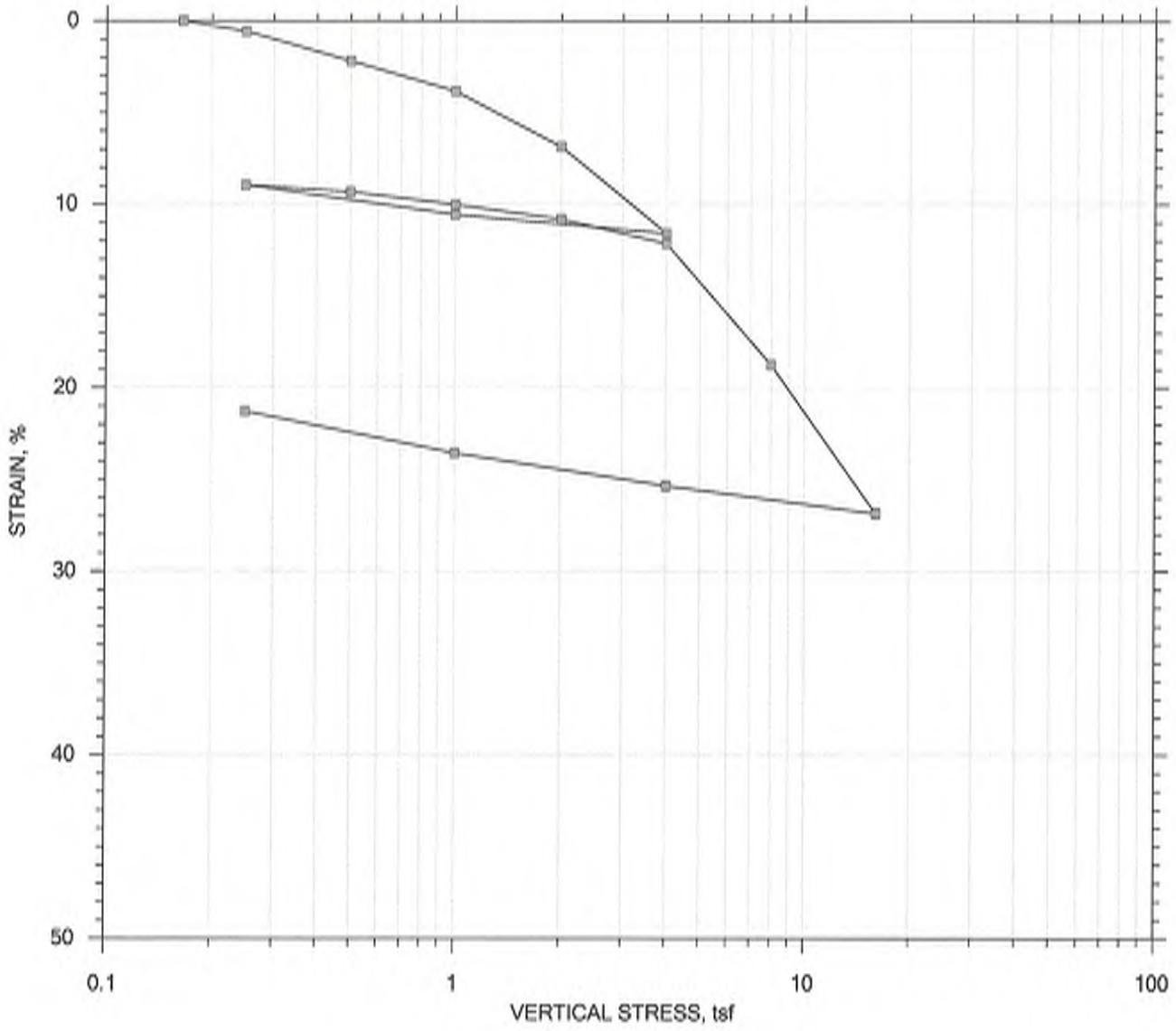




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-3	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 4/2/14	Test No.: C-1.1
	Depth: 15.5-17.5ft	Sample Type: Intact	Elevation: ---
	Description: Moist, yellowish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	32.43	27.41
Preconsolidation Stress: ---				Dry Unit Weight, pcf	77.348	98.095
Compression Ratio: ---				Saturation, %	72.92	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.23	0.76
LL: ---	PL: ---	PI: ---	GS: 2.76			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-3	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 4/2/14	Test No.: C-1.1
	Depth: 15.5-17.5ft	Sample Type: Intact	Elevation: ---
	Description: Moist, yellowish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
Boring No.: B-3	Tested By: jm	Checked By: mcm
Sample No.: ---	Test Date: 4/2/14	Depth: 15.5-17.5ft
Test No.: C-1.1	Sample Type: Intact	Elevation: ---

Soil Description: Moist, yellowish brown silty sand
Remarks:

Estimated Specific Gravity: 2.76	Liquid Limit: ---	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.23	Plastic Limit: ---	Initial Height: 1.00 in
Final Void Ratio: 0.756	Plasticity Index: ---	Final Height: 0.79 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	a27	RING		a24
Wt. Container + Wet Soil, gm	95.020	342.29	337.28	142.76
Wt. Container + Dry Soil, gm	75.960	309.96	309.96	115.55
Wt. Container, gm	17.090	210.30	210.30	16.270
Wt. Dry Soil, gm	58.870	99.665	99.665	99.280
Water Content, %	33.74	32.43	27.41	27.41
Void Ratio	---	1.23	0.756	---
Degree of Saturation, %	---	72.92	100.00	---
Dry Unit Weight, pcf	---	77.348	98.095	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-3
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 4/2/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 15.5-17.5ft
Elevation: ---

Soil Description: Moist, yellowish brown silty sand
Remarks:

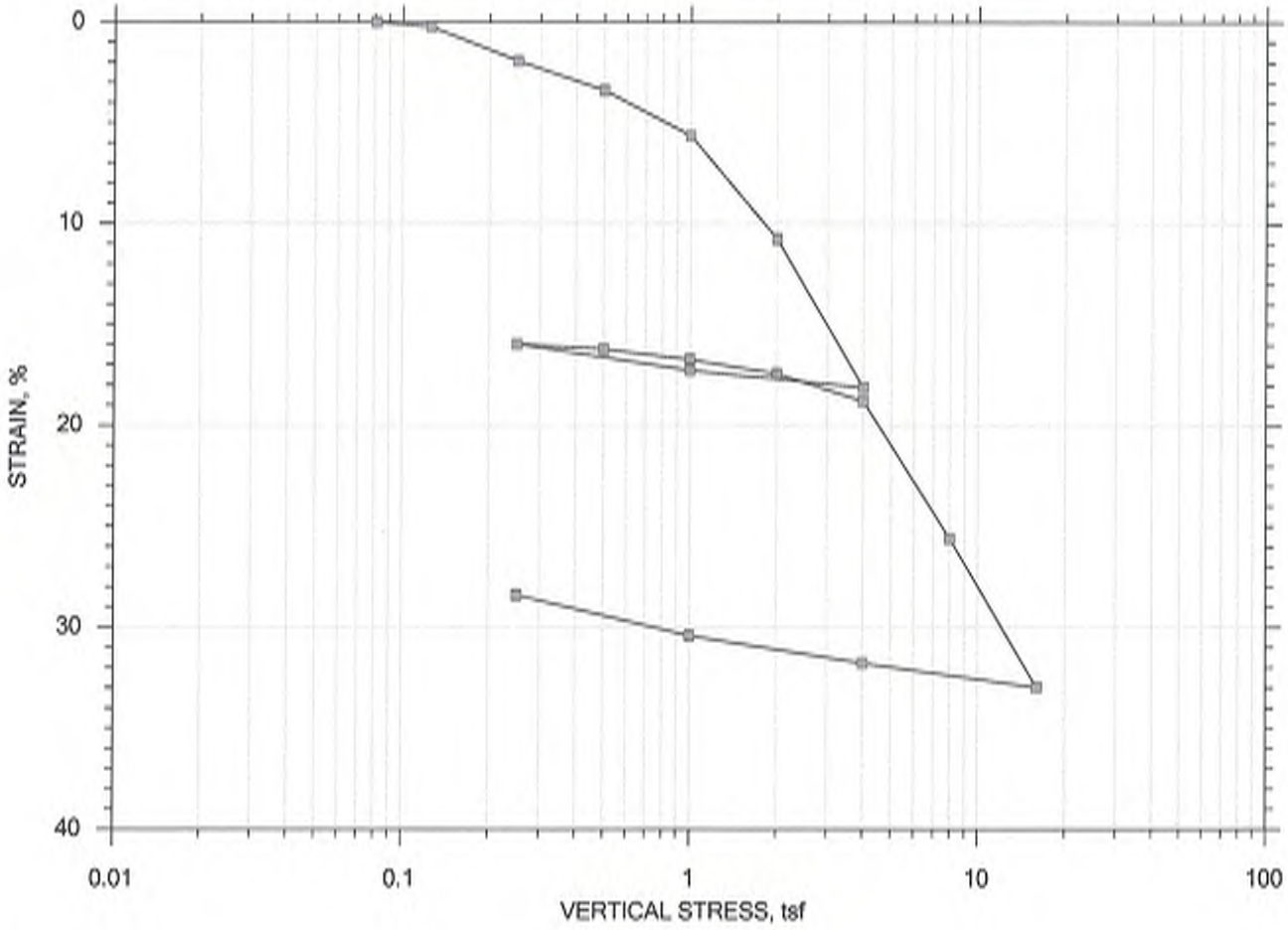
Displacement at End of Increment

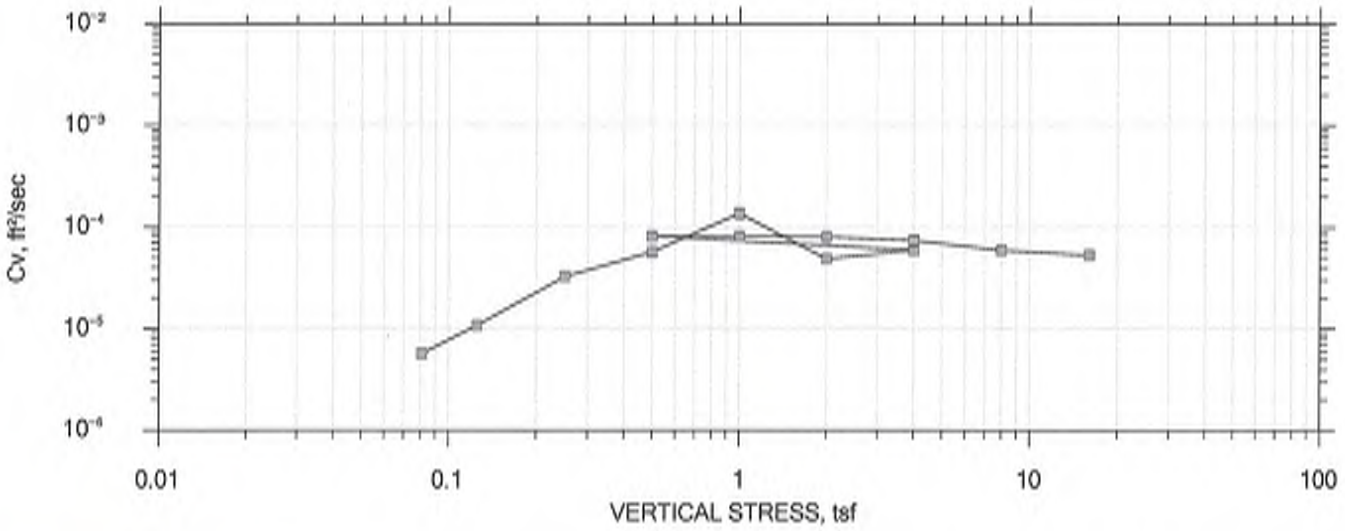
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.165	0.0000	1.23	0.000	0.000	0.00e+000	0.00e+000	0.00e+000
2	0.250	0.005577	1.22	0.558	0.441	5.53e-005	6.56e-002	3.45e-006
3	0.500	0.02186	1.18	2.19	0.424	5.62e-005	6.51e-002	3.49e-006
4	1.00	0.03837	1.14	3.84	0.387	5.96e-005	3.30e-002	1.87e-006
5	2.00	0.06855	1.07	6.85	0.390	5.63e-005	3.02e-002	1.62e-006
6	4.00	0.1158	0.970	11.6	0.394	5.13e-005	2.36e-002	1.18e-006
7	1.00	0.1057	0.992	10.6	0.355	5.46e-005	3.37e-003	1.75e-007
8	0.250	0.08934	1.03	8.93	0.387	5.16e-005	2.18e-002	1.07e-006
9	0.500	0.09313	1.02	9.31	0.360	5.62e-005	1.52e-002	8.11e-007
10	1.00	0.1000	1.00	10.0	0.358	5.59e-005	1.38e-002	7.33e-007
11	2.00	0.1081	0.987	10.8	0.356	5.53e-005	8.09e-003	4.25e-007
12	4.00	0.1213	0.957	12.1	0.366	5.26e-005	6.60e-003	3.30e-007
13	8.00	0.1875	0.810	18.8	0.388	4.52e-005	1.66e-002	7.13e-007
14	16.0	0.2684	0.630	26.8	0.374	3.91e-005	1.01e-002	3.76e-007
15	4.00	0.2533	0.663	25.3	0.355	3.78e-005	1.26e-003	4.53e-008
16	1.00	0.2356	0.703	23.6	0.374	3.74e-005	5.90e-003	2.10e-007
17	0.250	0.2127	0.754	21.3	0.458	3.23e-005	3.06e-002	9.36e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.165	0.0000	1.23	0.000	0.000	0.00e+000	0.00e+000	0.00e+000	0.00e+000
2	0.250	0.005577	1.22	0.558	0.000	0.00e+000	6.56e-002	0.00e+000	0.00e+000
3	0.500	0.02186	1.18	2.19	0.000	0.00e+000	6.51e-002	0.00e+000	0.00e+000
4	1.00	0.03837	1.14	3.84	0.000	0.00e+000	3.30e-002	0.00e+000	0.00e+000
5	2.00	0.06855	1.07	6.85	0.000	0.00e+000	3.02e-002	0.00e+000	0.00e+000
6	4.00	0.1158	0.970	11.6	0.000	0.00e+000	2.36e-002	0.00e+000	0.00e+000
7	1.00	0.1057	0.992	10.6	0.000	0.00e+000	3.37e-003	0.00e+000	0.00e+000
8	0.250	0.08934	1.03	8.93	0.000	0.00e+000	2.18e-002	0.00e+000	0.00e+000
9	0.500	0.09313	1.02	9.31	0.000	0.00e+000	1.52e-002	0.00e+000	0.00e+000
10	1.00	0.1000	1.00	10.0	0.000	0.00e+000	1.38e-002	0.00e+000	0.00e+000
11	2.00	0.1081	0.987	10.8	0.000	0.00e+000	8.09e-003	0.00e+000	0.00e+000
12	4.00	0.1213	0.957	12.1	0.000	0.00e+000	6.60e-003	0.00e+000	0.00e+000
13	8.00	0.1875	0.810	18.8	0.000	0.00e+000	1.66e-002	0.00e+000	0.00e+000
14	16.0	0.2684	0.630	26.8	0.000	0.00e+000	1.01e-002	0.00e+000	0.00e+000
15	4.00	0.2533	0.663	25.3	0.000	0.00e+000	1.26e-003	0.00e+000	0.00e+000
16	1.00	0.2356	0.703	23.6	0.000	0.00e+000	5.90e-003	0.00e+000	0.00e+000
17	0.250	0.2127	0.754	21.3	0.000	0.00e+000	3.05e-002	0.00e+000	0.00e+000

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

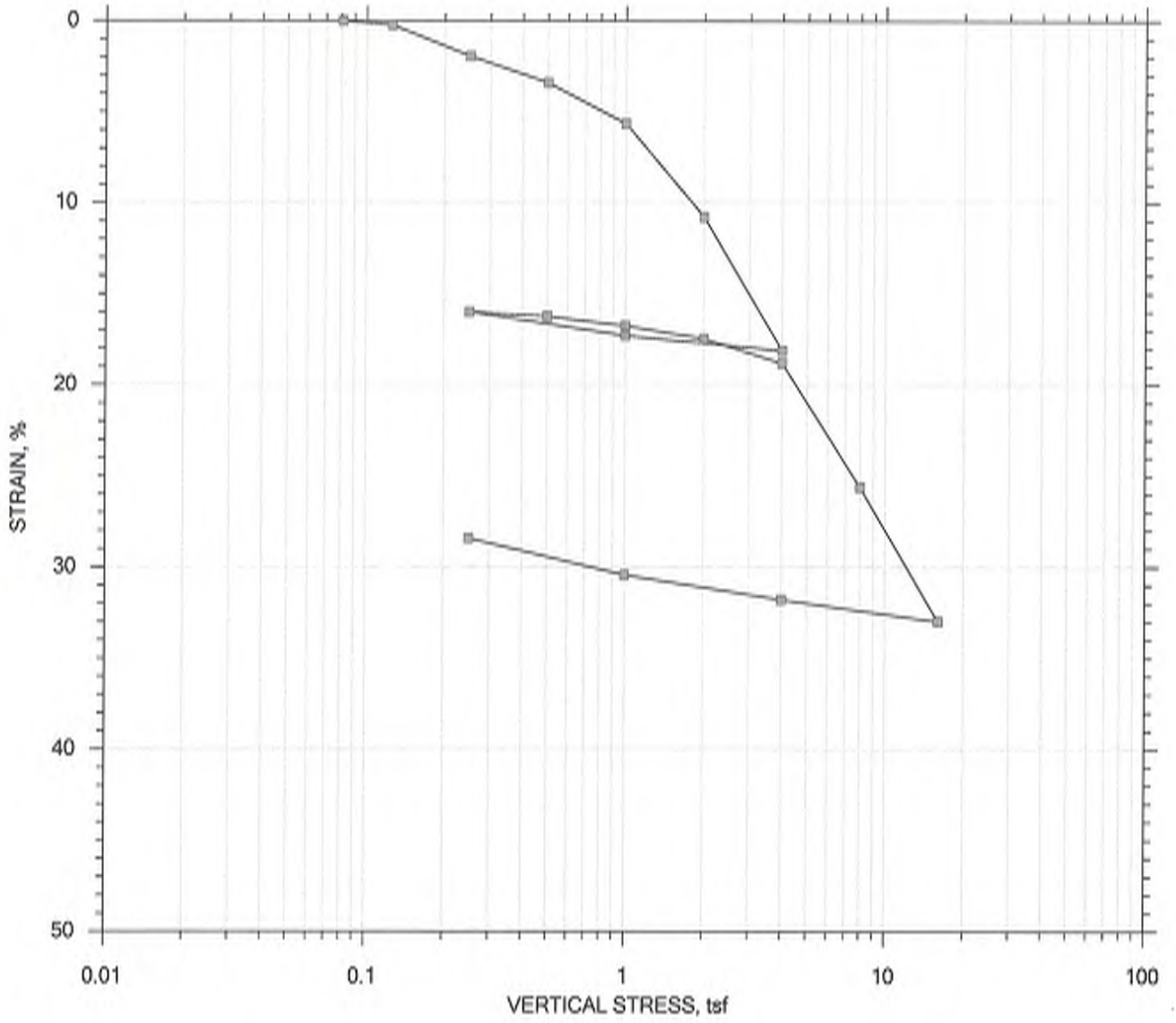




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 3/28/14	Test No.: C-1.1
	Depth: 19-21 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish white silty sand		
	Remarks: (Weathered Rock)		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	31.02	31.80
Preconsolidation Stress: ---				Dry Unit Weight, pcf	65.855	91.978
Compression Ratio: ---				Saturation, %	52.83	100.00
Diameter: 2.5 in		Height: 1.001 in		Void Ratio	1.63	0.88
LL: ---	PL: ---	PI: ---	GS: 2.77			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 3/26/14	Test No.: C-1.1
	Depth: 19-21 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish white silty sand		
	Remarks: (Weathered Rock)		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 3/26/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, grayish white silty sand
Remarks: (Weathered Rock)

Estimated Specific Gravity: 2.77
Initial Void Ratio: 1.63
Final Void Ratio: 0.881

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.72 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A10	RING	a18	a18
Wt. Container + Wet Soil, gm	90.820	127.64	128.30	128.30
Wt. Container + Dry Soil, gm	73.670	101.29	101.29	101.29
Wt. Container, gm	16.410	16.350	16.350	16.350
Wt. Dry Soil, gm	57.260	84.940	84.940	84.940
Water Content, %	29.95	31.02	31.80	31.80
Void Ratio	---	1.63	0.881	---
Degree of Saturation, %	---	52.83	100.00	---
Dry Unit Weight, pcf	---	65.855	91.978	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 3/26/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, grayish white silty sand
Remarks: (Weathered Rock)

Displacement at End of Increment

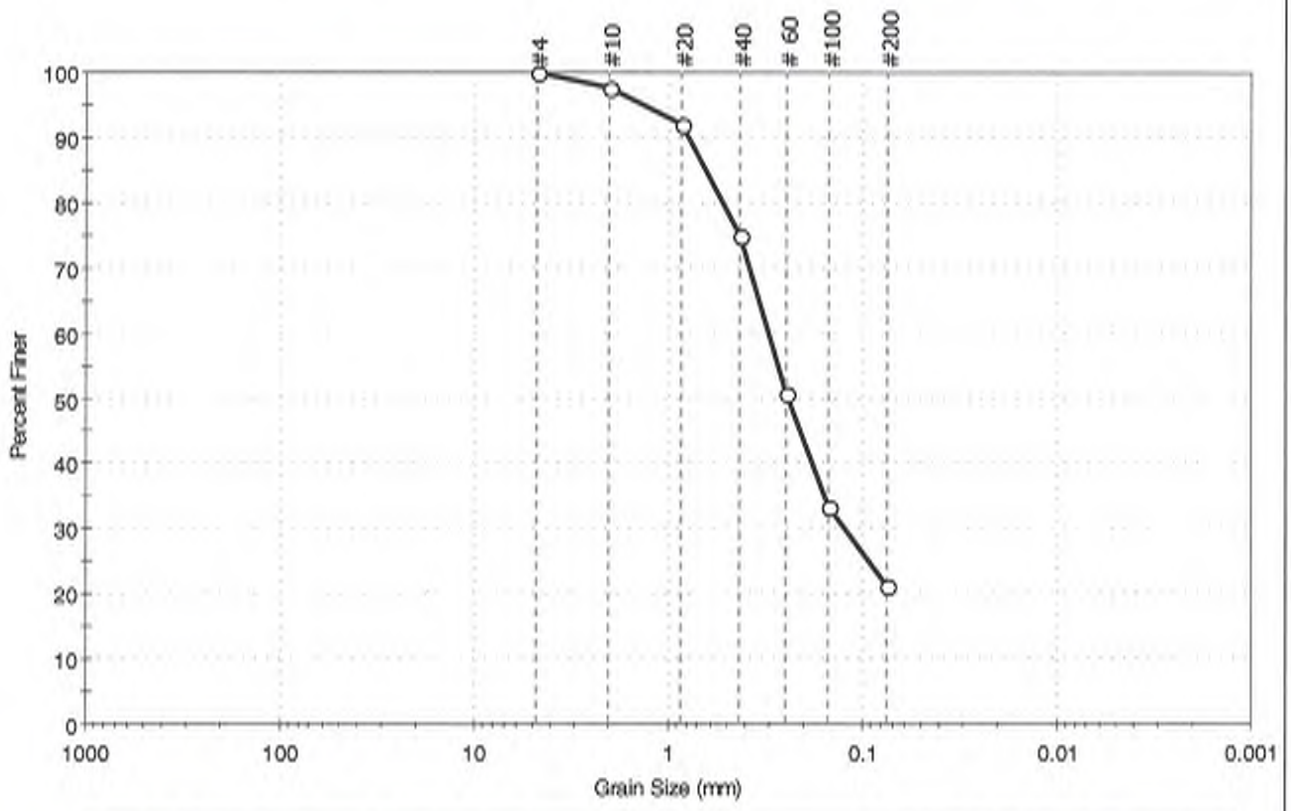
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.0810	1.580e-005	1.63	0.00158	1.003	2.45e-005	1.95e-004	4.54e-009
2	0.125	0.002338	1.62	0.234	5.297	4.63e-006	5.27e-002	2.32e-007
3	0.250	0.01934	1.58	1.93	0.767	3.14e-005	1.36e-001	4.06e-006
4	0.500	0.03395	1.54	3.39	0.416	5.60e-005	5.84e-002	3.11e-006
5	1.00	0.05646	1.48	5.64	0.417	5.37e-005	4.50e-002	2.30e-006
6	2.00	0.1078	1.34	10.8	0.449	4.62e-005	5.12e-002	2.25e-006
7	4.00	0.1813	1.15	18.1	0.413	4.36e-005	3.67e-002	1.52e-006
8	1.00	0.1730	1.17	17.3	0.355	4.69e-005	2.75e-003	1.23e-007
9	0.250	0.1599	1.21	16.0	0.373	4.59e-005	1.74e-002	7.61e-007
10	0.500	0.1624	1.20	16.2	0.358	4.83e-005	9.97e-003	4.59e-007
11	1.00	0.1676	1.19	16.7	0.358	4.79e-005	1.04e-002	4.73e-007
12	2.00	0.1745	1.17	17.4	0.356	4.74e-005	6.91e-003	3.12e-007
13	4.00	0.1881	1.13	18.8	0.369	4.47e-005	6.79e-003	2.89e-007
14	8.00	0.2562	0.955	25.6	0.388	3.84e-005	1.70e-002	6.21e-007
15	16.0	0.3300	0.762	33.0	0.373	3.30e-005	9.21e-003	2.89e-007
16	4.00	0.3180	0.793	31.8	0.350	3.21e-005	9.94e-004	3.04e-008
17	1.00	0.3045	0.829	30.4	0.364	3.21e-005	4.51e-003	1.38e-007
18	0.250	0.2843	0.882	28.4	0.429	2.85e-005	2.69e-002	7.30e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.0810	1.580e-005	1.63	0.00158	0.000	0.00e+000	1.95e-004	0.00e+000	0.00e+000
2	0.125	0.002338	1.62	0.234	0.216	2.64e-005	5.27e-002	1.32e-006	0.00e+000
3	0.250	0.01934	1.58	1.93	0.000	0.00e+000	1.36e-001	0.00e+000	0.00e+000
4	0.500	0.03395	1.54	3.39	0.000	0.00e+000	5.84e-002	0.00e+000	0.00e+000
5	1.00	0.05646	1.48	5.64	0.000	1.44e-002	4.50e-002	6.17e-004	0.00e+000
6	2.00	0.1078	1.34	10.8	0.106	4.54e-005	5.12e-002	2.21e-006	0.00e+000
7	4.00	0.1813	1.15	18.1	0.000	0.00e+000	3.67e-002	0.00e+000	0.00e+000
8	1.00	0.1730	1.17	17.3	0.000	0.00e+000	2.75e-003	0.00e+000	0.00e+000
9	0.250	0.1599	1.21	16.0	0.000	0.00e+000	1.74e-002	0.00e+000	0.00e+000
10	0.500	0.1624	1.20	16.2	0.000	0.00e+000	9.97e-003	0.00e+000	0.00e+000
11	1.00	0.1676	1.19	16.7	0.000	0.00e+000	1.04e-002	0.00e+000	0.00e+000
12	2.00	0.1745	1.17	17.4	0.000	0.00e+000	6.91e-003	0.00e+000	0.00e+000
13	4.00	0.1881	1.13	18.8	0.000	0.00e+000	6.79e-003	0.00e+000	0.00e+000
14	8.00	0.2562	0.955	25.6	0.000	0.00e+000	1.70e-002	0.00e+000	0.00e+000
15	16.0	0.3300	0.762	33.0	0.000	0.00e+000	9.21e-003	0.00e+000	0.00e+000
16	4.00	0.3180	0.793	31.8	0.000	0.00e+000	9.94e-004	0.00e+000	0.00e+000
17	1.00	0.3045	0.829	30.4	0.000	0.00e+000	4.51e-003	0.00e+000	0.00e+000
18	0.250	0.2843	0.882	28.4	0.000	0.00e+000	2.69e-002	0.00e+000	0.00e+000

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4A	Sample Type:	tube	Tested By:	bhe
Sample ID:	---	Test Date:	04/18/14	Checked By:	MCM
Depth :	28-30	Test Id:	227687		
Test Comment:	---				
Sample Description:	Moist, grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	78.8	21.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	98		
#20	0.85	92		
#40	0.42	75		
# 60	0.25	51		
#100	0.15	33		
#200	0.075	21		

Coefficients

D_{85} =0.6413 mm	D_{30} =0.1236 mm
D_{60} =0.3058 mm	D_{15} =N/A
D_{50} =0.2437 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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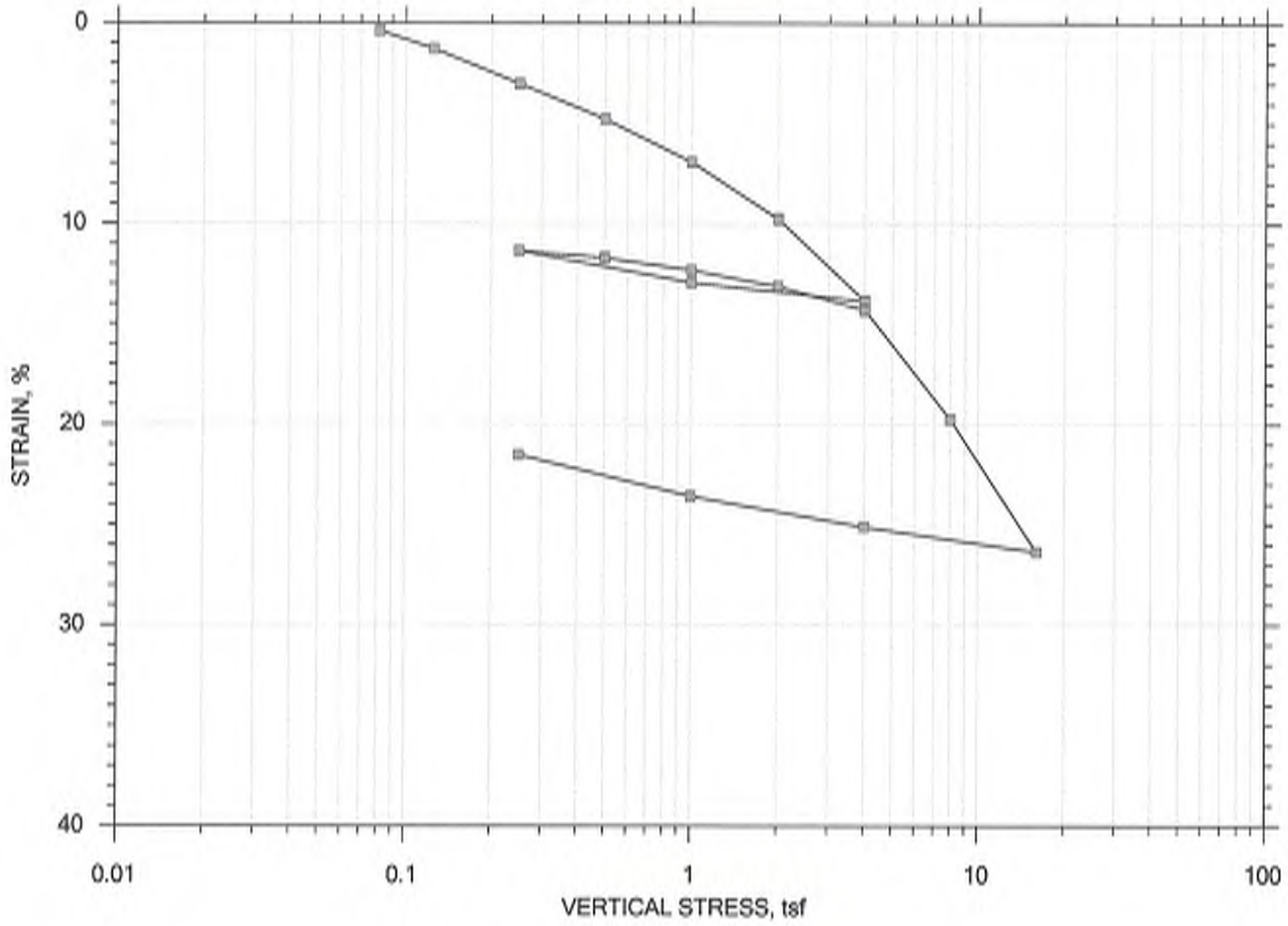
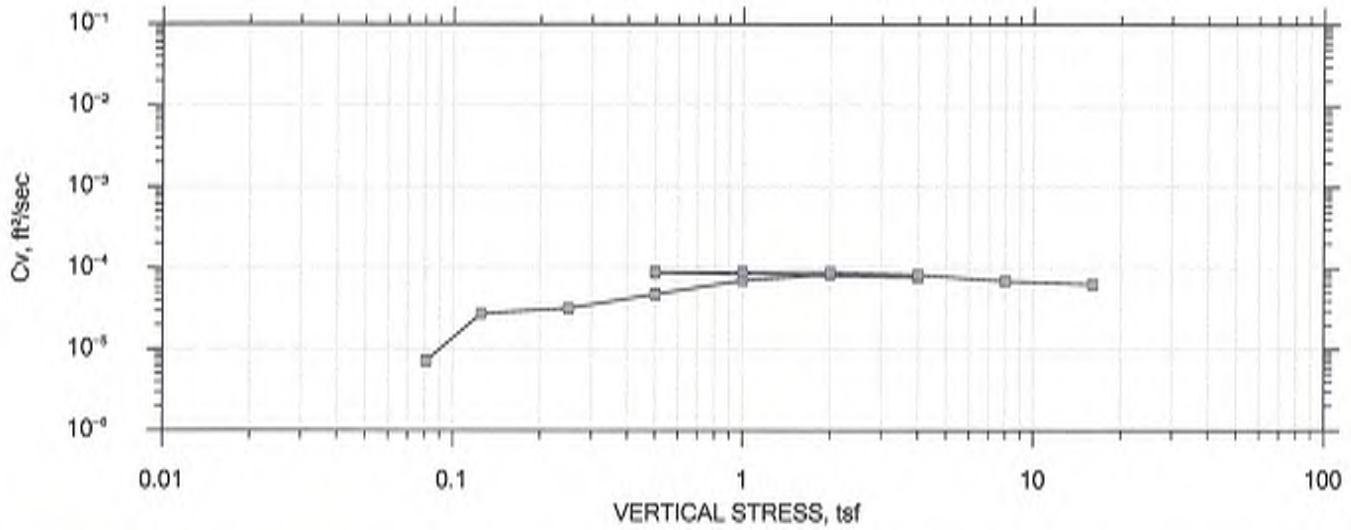
SUMMARY REPORT

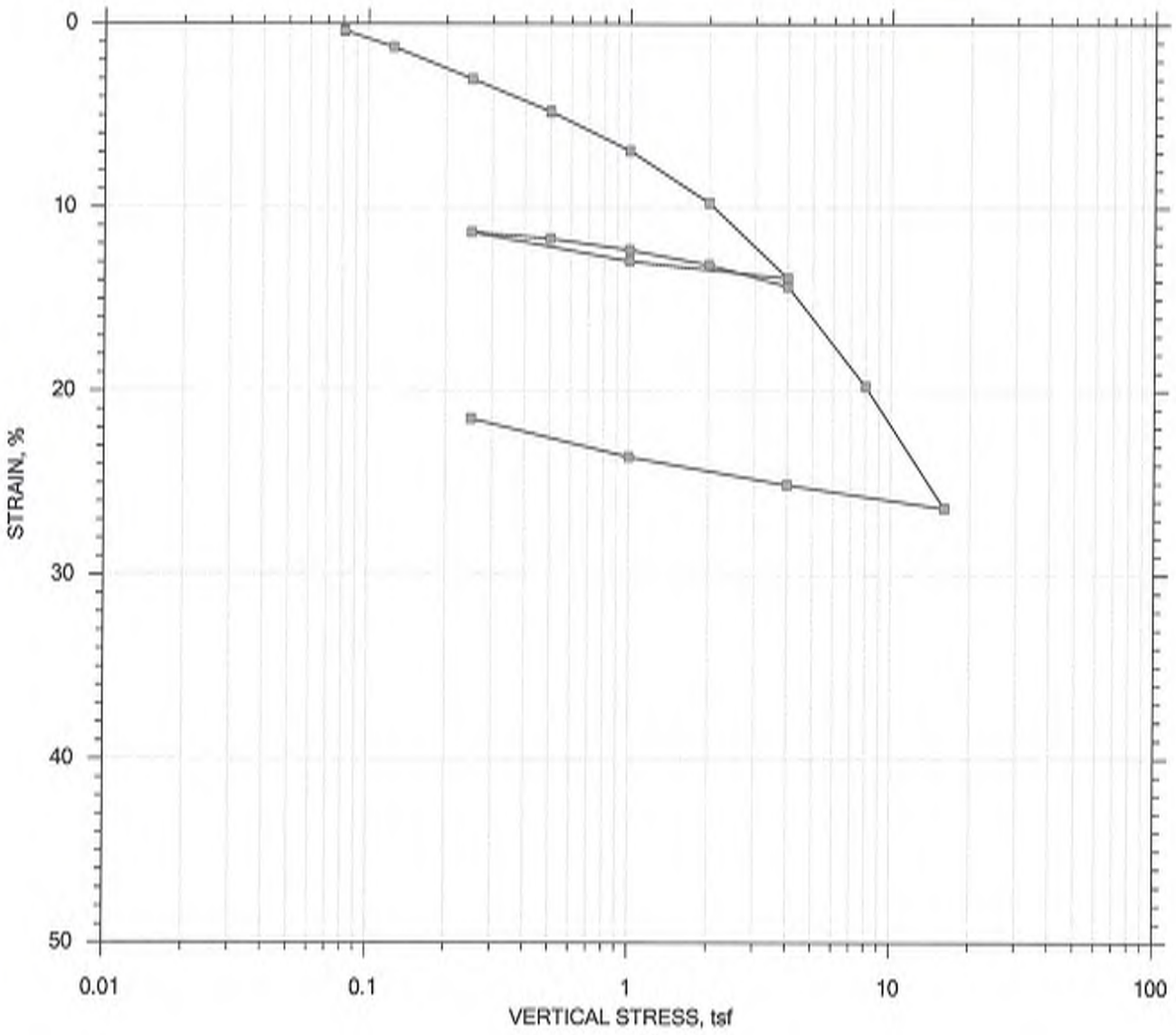




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: mcm	Checked By: njh
	Sample No.: ---	Test Date: 4/16/14	Test No.: C-3.1
	Depth: 28-30 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	35.88	25.04
Preconsolidation Stress: ---				Dry Unit Weight, pcf	79.75	101.62
Compression Ratio: ---				Saturation, %	85.66	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.15	0.69
LL: ---	PL: ---	PI: ---	GS: 2.75			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: mcm	Checked By: njh
	Sample No.: ---	Test Date: 4/16/14	Test No.: C-3.1
	Depth: 28-30 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
Boring No.: B-4A	Tested By: mcm	Checked By: njh
Sample No.: ---	Test Date: 4/16/14	Depth: 28-30 ft
Test No.: C-3.1	Sample Type: Intact	Elevation: ---

Soil Description: Moist, grayish brown silty sand
Remarks:

Estimated Specific Gravity: 2.75	Liquid Limit: ---	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.15	Plastic Limit: ---	Initial Height: 1.00 in
Final Void Ratio: 0.688	Plasticity Index: ---	Final Height: 0.78 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	a29	RING	a30	a30
Wt. Container + Wet Soil, gm	117.32	156.86	145.72	145.72
Wt. Container + Dry Soil, gm	91.400	119.99	119.99	119.99
Wt. Container, gm	17.090	17.230	17.230	17.230
Wt. Dry Soil, gm	74.310	102.76	102.76	102.76
Water Content, %	34.88	35.88	25.04	25.04
Void Ratio	---	1.15	0.688	---
Degree of Saturation, %	---	85.66	100.00	---
Dry Unit Weight, pcf	---	79.750	101.62	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-3.1

Location: Atlanta, GA
Tested By: mcm
Test Date: 4/16/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: njh
Depth: 28-30 ft
Elevation: ---

Soil Description: Moist, grayish brown silty sand
Remarks:

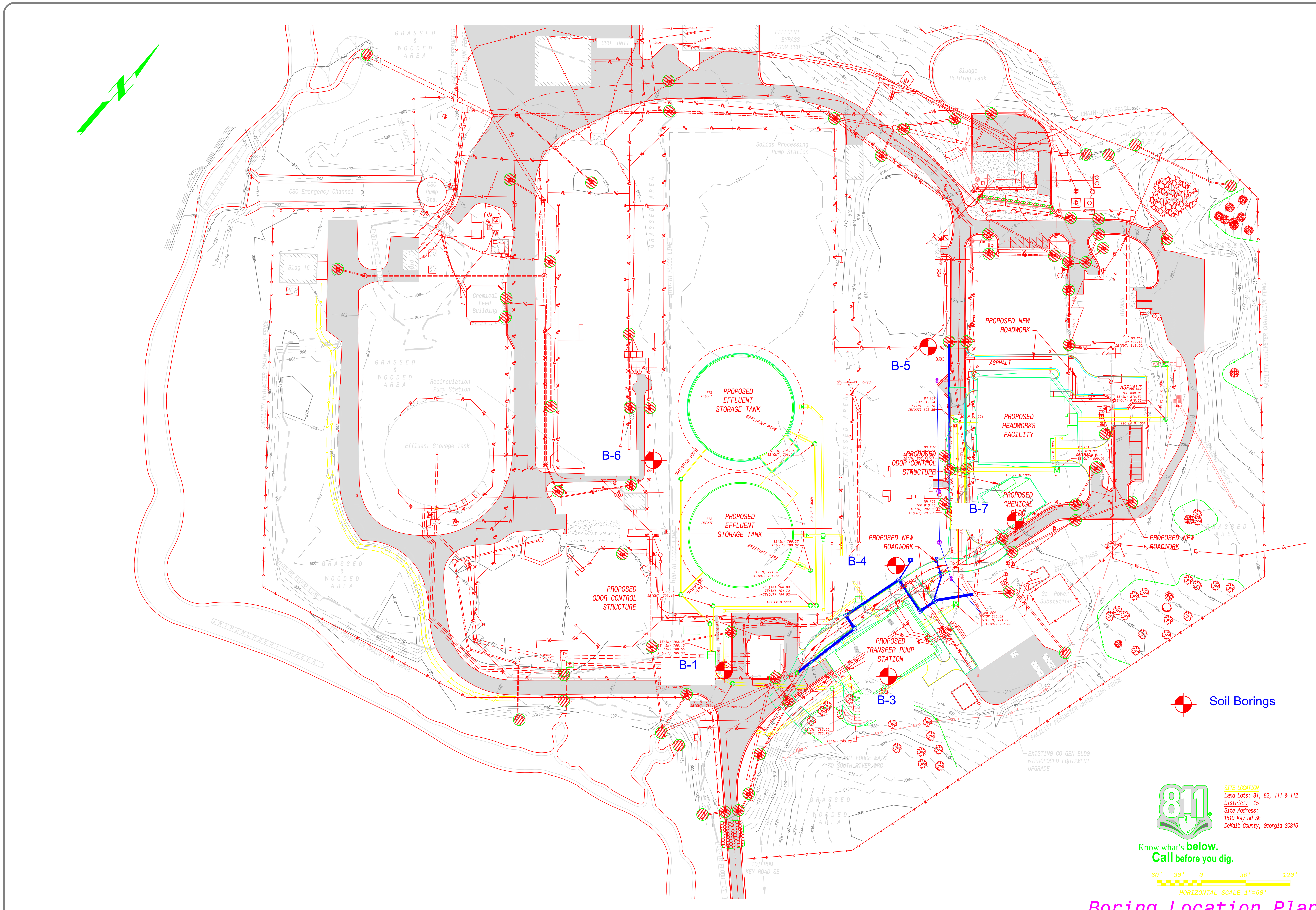
Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.0810	0.003823	1.14	0.382	5.110	4.78e-006	4.72e-002	2.15e-007
2	0.125	0.01283	1.13	1.28	1.110	2.17e-005	2.05e-001	4.23e-006
3	0.250	0.03022	1.09	3.02	0.822	2.86e-005	1.39e-001	3.78e-006
4	0.500	0.04796	1.05	4.80	0.466	4.86e-005	7.10e-002	3.28e-006
5	1.00	0.06927	1.00	6.93	0.403	5.40e-005	4.26e-002	2.19e-006
6	2.00	0.09758	0.941	9.76	0.383	5.38e-005	2.83e-002	1.45e-006
7	4.00	0.1385	0.853	13.8	0.387	4.93e-005	2.04e-002	9.60e-007
8	1.00	0.1293	0.873	12.9	0.356	5.17e-005	3.05e-003	1.50e-007
9	0.250	0.1136	0.907	11.4	0.399	4.75e-005	2.10e-002	9.47e-007
10	0.500	0.1171	0.899	11.7	0.362	5.31e-005	1.39e-002	7.02e-007
11	1.00	0.1232	0.886	12.3	0.359	5.28e-005	1.23e-002	6.19e-007
12	2.00	0.1312	0.869	13.1	0.357	5.24e-005	7.98e-003	3.98e-007
13	4.00	0.1429	0.843	14.3	0.366	4.99e-005	5.86e-003	2.78e-007
14	8.00	0.1974	0.726	19.7	0.382	4.42e-005	1.36e-002	5.72e-007
15	16.0	0.2636	0.584	26.4	0.372	3.91e-005	8.28e-003	3.08e-007
16	4.00	0.2510	0.611	25.1	0.350	3.87e-005	1.05e-003	3.86e-008
17	1.00	0.2358	0.644	23.6	0.368	3.81e-005	5.06e-003	1.84e-007
18	0.250	0.2151	0.688	21.5	0.456	3.23e-005	2.76e-002	8.48e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.0810	0.003823	1.14	0.382	0.599	9.48e-006	4.72e-002	4.26e-007	0.00e+000
2	0.125	0.01283	1.12	1.28	0.192	3.92e-005	2.05e-001	5.68e-006	0.00e+000
3	0.250	0.03022	1.09	3.02	0.000	0.00e+000	1.39e-001	0.00e+000	0.00e+000
4	0.500	0.04796	1.05	4.80	0.000	0.00e+000	7.10e-002	0.00e+000	0.00e+000
5	1.00	0.06927	1.00	6.93	0.000	0.00e+000	4.26e-003	0.00e+000	0.00e+000
6	2.00	0.09758	0.941	9.76	0.000	0.00e+000	2.83e-002	0.00e+000	0.00e+000
7	4.00	0.1385	0.853	13.8	0.000	0.00e+000	2.04e-002	0.00e+000	0.00e+000
8	1.00	0.1293	0.873	12.9	0.000	0.00e+000	3.05e-003	0.00e+000	0.00e+000
9	0.250	0.1136	0.907	11.4	0.000	0.00e+000	2.10e-002	0.00e+000	0.00e+000
10	0.500	0.1171	0.899	11.7	0.000	0.00e+000	1.39e-002	0.00e+000	0.00e+000
11	1.00	0.1232	0.886	12.3	0.000	0.00e+000	1.23e-002	0.00e+000	0.00e+000
12	2.00	0.1312	0.869	13.1	0.000	0.00e+000	7.98e-003	0.00e+000	0.00e+000
13	4.00	0.1429	0.843	14.3	0.000	0.00e+000	5.86e-003	0.00e+000	0.00e+000
14	8.00	0.1974	0.726	19.7	0.000	0.00e+000	1.36e-002	0.00e+000	0.00e+000
15	16.0	0.2636	0.584	26.4	0.000	0.00e+000	8.28e-003	0.00e+000	0.00e+000
16	4.00	0.2510	0.611	25.1	0.000	0.00e+000	1.05e-003	0.00e+000	0.00e+000
17	1.00	0.2358	0.644	23.6	0.000	0.00e+000	5.06e-003	0.00e+000	0.00e+000
18	0.250	0.2151	0.688	21.5	0.006	5.84e-004	2.76e-002	1.54e-005	0.00e+000

APPENDIX

Boring Location Plan
Boring Profile
Boring Logs
Lab Test Results



MME METAIRIE & MATERIALS ENGINEERS

BGR JOINT VENTURE BLACK & VEATCH • GRESHAM, SMITH & PARTNERS • ROHADFOX

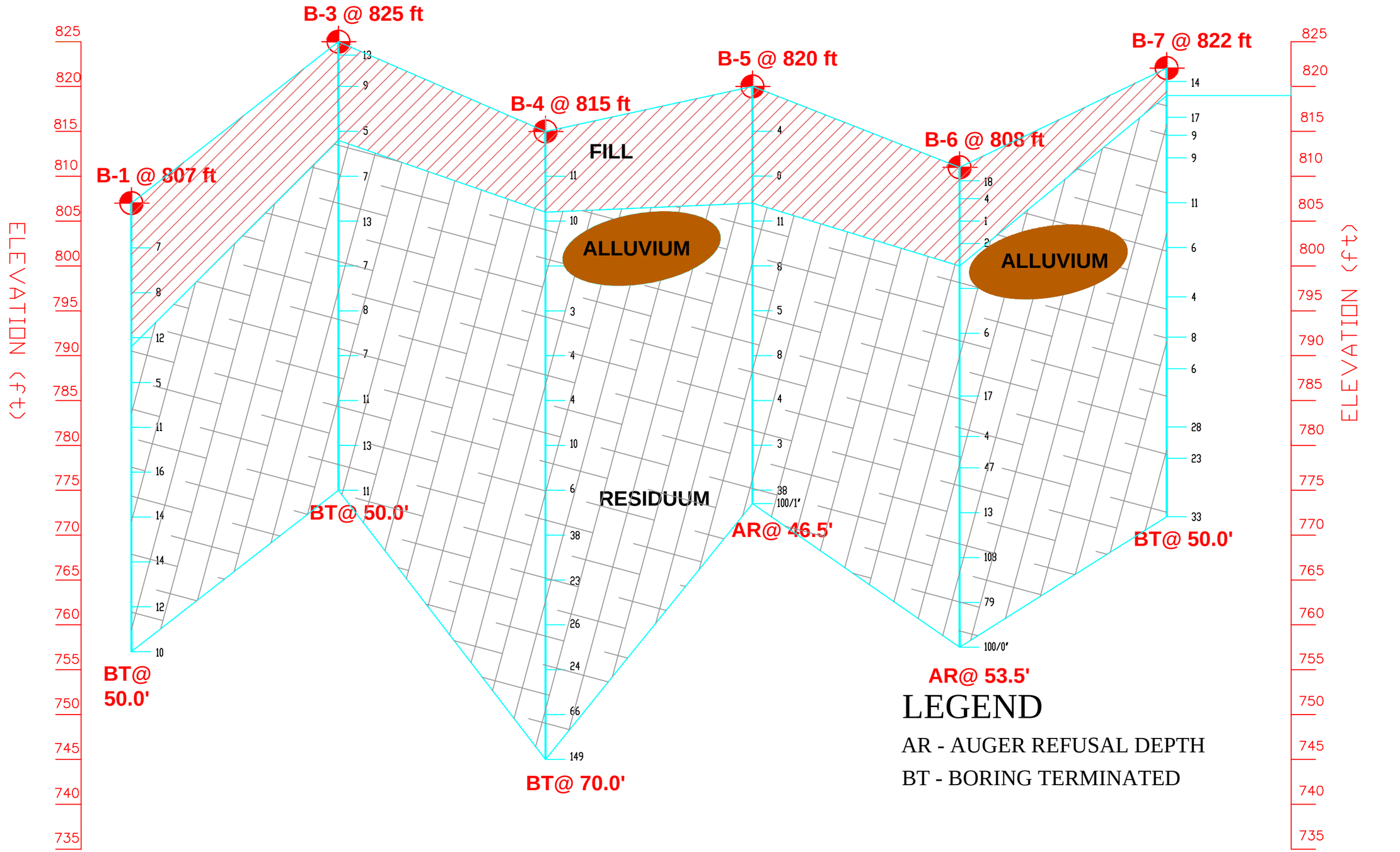
INTRENCHMENT CREEK WRC DECOMMISSIONING AND SOUTH RIVER WRC PRIMARY CLARIFIERS AND AUXILIARY EQUIPMENT

ICWRC SITEWORK
ICWRC - SITE LAYOUT & BOUNDARY

PROJECT NO.
52324525

CY101
SHEET
OF

Boring Location Plan



LEGEND

AR - AUGER REFUSAL DEPTH

BT - BORING TERMINATED

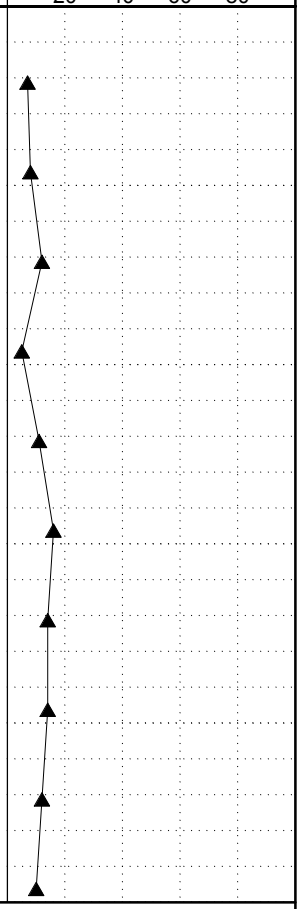
PREPARED FOR:	PREPARED BY:	PROJECT:	INTRENCHMENT CREEK WRC DECOMMISSIONING GEOTECHNICAL BORINGS PROFILE			
BGR JOINT VENTURE 50 HURT PLAZAM SUITE # 1150 ATLANTA, GA 30303	METALS & MATERIALS ENGINEERS 4130 SHIRLEY DRIVE ATLANTA, GA 30336	INTRENCHMENT CREEK WRC DECOMMISSIONING GEOTECHNICAL EVALUATION	Date	Drawn	Approved	Scale
			12/10/2014	VD	HLK	Not To Scale

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-1

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 807 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 28 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 28.2 feet
NOTES E2245966.18, N1346790.72
24hrs AFTER DRILLING 19.3 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(ML) FILL: Firm to stiff reddish brown sandy clayey SILT					
			SS		3-4-3 (7)		
10			SS		3-4-4 (8)		
			SS		10-7-5 (12)		
		(SM) RESIDUUM: Medium dense light gray silty SAND					
20			SS		2-2-3 (5)		
		(SM) Stiff light tan and black silty SAND with some mica and rock fragments					
			SS		5-5-6 (11)		
30			SS		4-6-10 (16)		
			SS		3-6-8 (14)		
40			SS		2-6-8 (14)		
			SS		3-5-7 (12)		
50			SS		5-5-5 (10)		
		Boring terminated at 50 feet below the existing ground surface.					



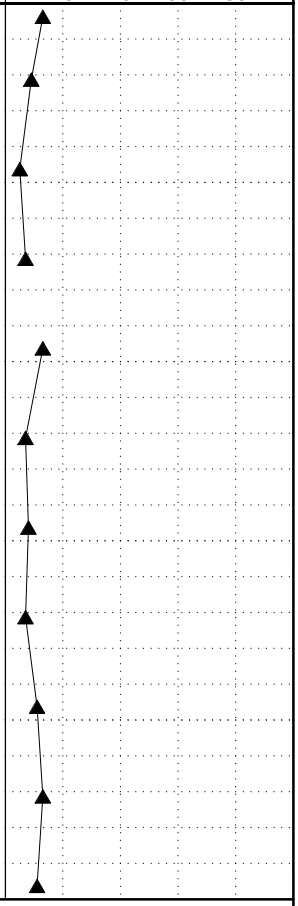
Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-3

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 825 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 33 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 33 feet
NOTES E2246213.59, N1346917.19
24hrs AFTER DRILLING 23.4 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(CL-ML) FILL: Stiff brown and tan clayey SILT with rock fragments	SS		5-6-7 (13)		
			SS		4-4-5 (9)		
		(ML) POSSIBLE FILL: Firm tan and brown sandy SILT					
10			SS		2-2-3 (5)		
		(SM) RESIDUUM: Firm and stiff tan, brown, and black silty SAND with traces of mica	SS		3-3-4 (7)		
			ST				
20			SS		4-6-7 (13)		
			SS		3-3-4 (7)		
30			SS		2-3-5 (8)		
			SS		3-3-4 (7)		
40			SS		3-5-6 (11)		
			SS		5-6-7 (13)		
50			SS		3-5-6 (11)		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



Boring terminated at 50 feet below the existing ground surface.

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-4

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/14/14 **COMPLETED** 3/14/14
GROUND ELEVATION 815 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 30 feet
NOTES E2246073.72, N1347003.63
24hrs AFTER DRILLING 23.6 feet

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0	(ML) FILL: Stiff red and brown sandy clayey SILT	SS		4-5-6 (11)		
10	(SM) POSSIBLE ALLUVIUM: Medium dense gray silty SAND	SS		4-5-5 (10)		
		SS		4-8-11 (19)		
20	(SM) RESIDUUM: Soft to stiff light tan and brown silty SAND	SS		2-1-2 (3)		
		ST	0			
		SS		2-2-2 (4)		
30		SS		1-2-2 (4)		
		SS		5-4-6 (10)		
40		SS		1-3-3 (6)		
	(SM) Very stiff gray, tan, and black silty SAND with traces of mica	SS		6-8-30 (38)		
50		SS		6-10-13 (23)		
		SS		10-14-12 (26)		
60		SS		13-13-11 (24)		
	(SM) Very dense tan and gray silty SAND with rock fragments	SS		19-32-34 (66)		
70		SS		17-49-100 (149)		
	Boring terminated at 70 feet below the existing ground surface.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

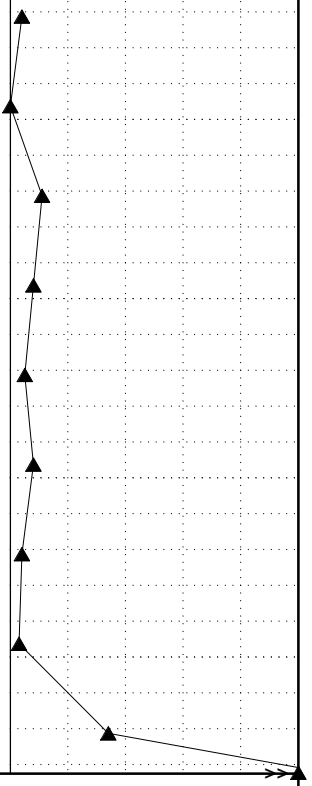
Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-5

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 3/13/14 **COMPLETED** 3/13/14
GROUND ELEVATION 820 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 38 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 38 feet
NOTES E2245906.09, N1347309.16
24hrs AFTER DRILLING 20.8 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(ML) FILL: Soft brown sandy SILT	SS		3-2-2 (4)		
			SS		0-0-0 (0)		
10		(CL-ML) POSSIBLE FILL: Stiff reddish brown silty CLAY	SS		3-5-6 (11)		
		(SM) POSSIBLE ALLUVIUM: Loose gray silty SAND	SS		2-3-5 (8)		
20		(SM) RESIDUUM: Soft and firm tan, gray, and black silty SAND	SS		1-2-3 (5)		
			SS		3-4-4 (8)		
30			SS		2-1-3 (4)		
			SS		0-2-1 (3)		
40		(SM) Dense to very dense tan and brown silty SAND with rock fragments	SS		4-16-18 (34)		
		Boring encountered auger refusal at 46.5 feet below the existing ground surface.	SS		100/1"		

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-6

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 8/5/14 **COMPLETED** 8/5/14
GROUND ELEVATION 808 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 10
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 15
NOTES
AFTER DRILLING NA

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SM) FILL: Medium dense to very loose reddish brown silty medium to fine SAND with mica	SS		5-9-9 (18)		
			SS		1-2-2 (4)		
			SS		0-0-1 (1)		
10		(ML) ALLUVIUM: Very soft gray medium to fine sandy SILT	SS		0-1-1 (2)		
		(SM) RESIDUUM: Very loose, loose, medium dense, and dense orange, white, brown, and black silty medium to fine SAND with mica	SS		1-0-2 (2)		
20			SS		1-2-4 (6)		
			SS		5-7-10 (17)		
30			SS		1-1-3 (4)		
			SS		15-28-19 (47)		
40			SS		3-4-9 (13)		
		(PWR) PARTIALLY WEATHERED ROCK: Sampled as dense orange, white, brown, and black silty medium to fine SAND with mica	SS		5-8-100 (108)		
50		(SM) RESIDUUM: Very loose, loose, medium dense, and dense orange, white, brown, and black silty medium to fine SAND with mica	SS		22-33-46 (79)		
		Boring encountered auger refusal at 53.5 feet below the existing ground surface.	SS		100/0"		

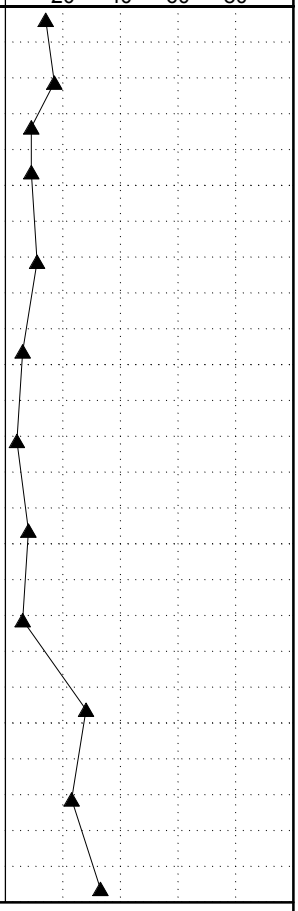
▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Metals & Materials Engineers
4130 Shirley Dr. SW
Atlanta, GA 30336

BORING NUMBER B-7

CLIENT BGR JV
PROJECT NAME Intrenchment Creek
PROJECT NUMBER MME-13-013
PROJECT LOCATION Atlanta, GA
DATE STARTED 8/21/14 **COMPLETED** 8/21/14
GROUND ELEVATION 822 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Premier Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30 feet
LOGGED BY Vissu Dokka **CHECKED BY** Haven Kicklighter
AT END OF DRILLING 31 feet
NOTES
AFTER DRILLING NA

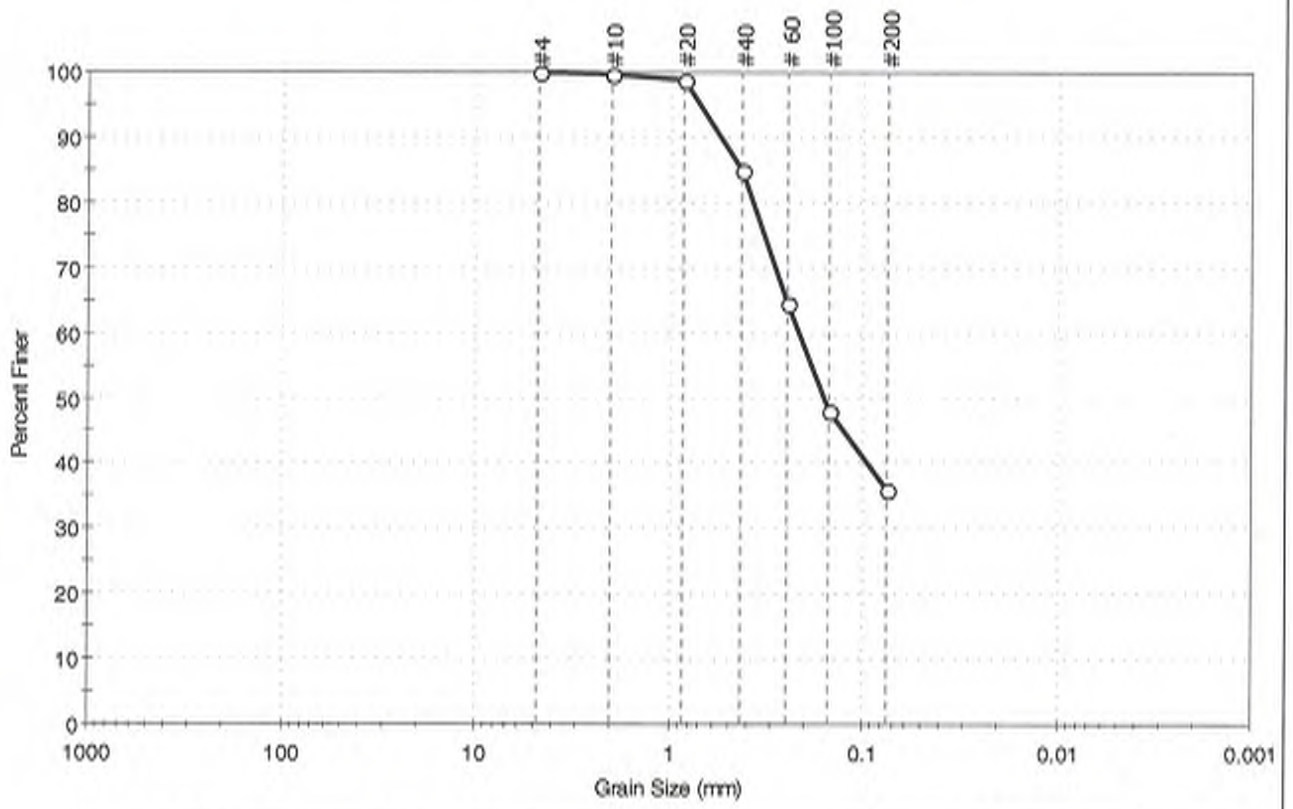
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)
0		(SM) FILL: Medium dense orange and reddish brown silty medium to fine SAND	SS		2-6-8 (14)		
			SS		4-7-10 (17)		
		(SM) RESIDUUM: Loose orange, reddish brown and white silty medium to fine SAND	SS		3-4-5 (9)		
10			SS		3-3-6 (9)		
		(SM) Medium dense, loose, very loose, and dense reddish brown, white, black, orange, brown, and black silty medium to fine SAND with mica	SS		3-5-6 (11)		
20			SS		2-2-4 (6)		
			SS		1-1-3 (4)		
30			SS		1-3-5 (8)		
			SS		2-3-3 (6)		
40			SS		6-10-18 (28)		
			SS		5-9-14 (23)		
50			SS		6-12-21 (33)		
		Boring was terminated at 50 feet below the existing ground surface.					



GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-3	Test Date:	04/01/14	Checked By:	MCM
Depth :	8.5-10 ft	Test Id:	227511		
Test Comment:	---				
Sample Description:	Moist, reddish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	63.9	36.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	85		
# 60	0.25	65		
#100	0.15	48		
#200	0.075	36		

Coefficients

D_{85} = 0.4254 mm	D_{30} = N/A
D_{60} = 0.2163 mm	D_{15} = N/A
D_{50} = 0.1585 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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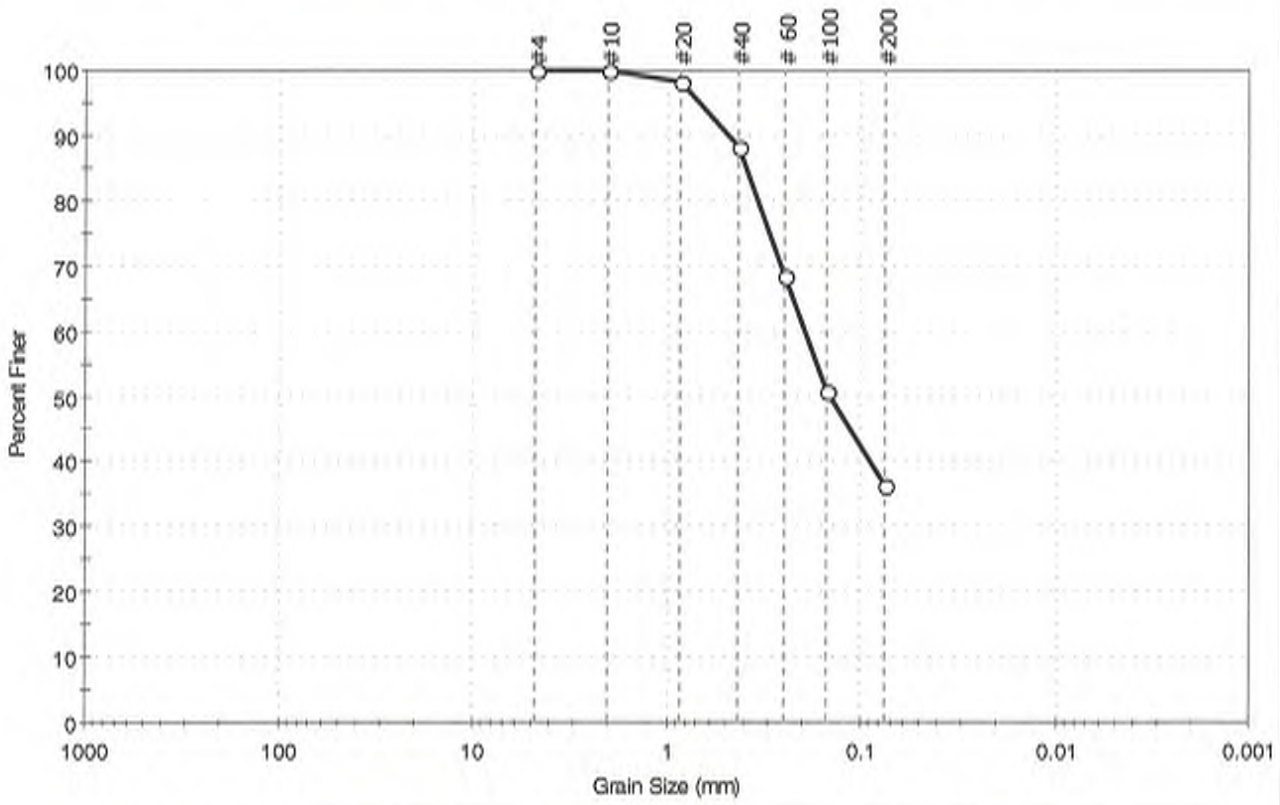
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-6	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227512		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	63.7	36.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	98		
#40	0.42	88		
# 60	0.25	68		
#100	0.15	51		
#200	0.075	36		

Coefficients

D_{85} = 0.3907 mm D_{30} = N/A
D_{60} = 0.1963 mm D_{15} = N/A
D_{50} = 0.1454 mm D_{10} = N/A
C_U = N/A C_C = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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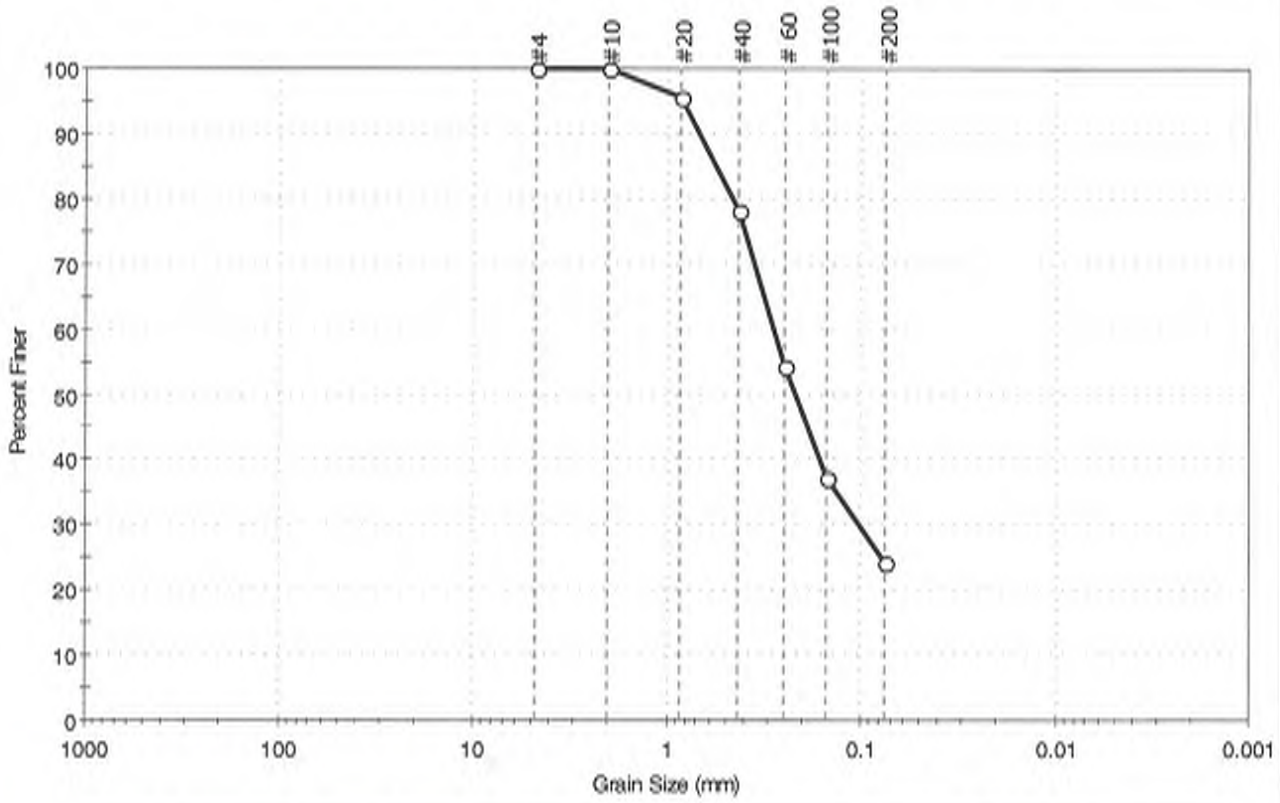
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-9	Test Date:	04/01/14	Checked By:	MCM
Depth :	38.5-40 ft	Test Id:	227513		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	75.7	24.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	96		
#40	0.42	78		
# 60	0.25	54		
#100	0.15	37		
#200	0.075	24		

Coefficients

D_{85} =0.5551 mm	D_{30} =0.1019 mm
D_{60} =0.2835 mm	D_{15} =N/A
D_{50} =0.2198 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

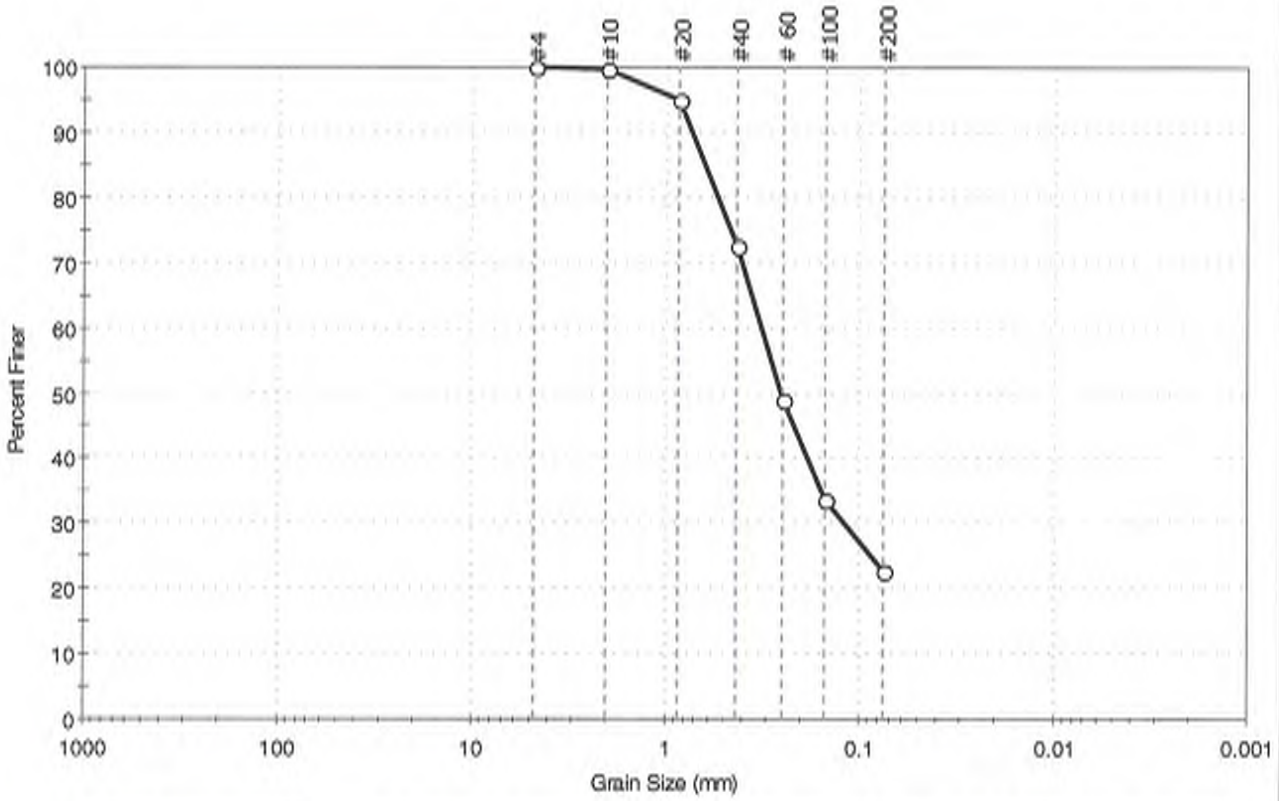
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	jar	Tested By:	jm
Sample ID:	S-10	Test Date:	04/01/14	Checked By:	MCM
Depth :	43.5-45 ft	Test Id:	227514		
Test Comment:	---				
Sample Description:	Moist, brownish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	--	77.4	22.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	95		
#40	0.42	73		
# 60	0.25	49		
#100	0.15	34		
#200	0.075	23		

Coefficients

D_{85} = 0.6240 mm	D_{30} = 0.1189 mm
D_{60} = 0.3198 mm	D_{15} = N/A
D_{50} = 0.2554 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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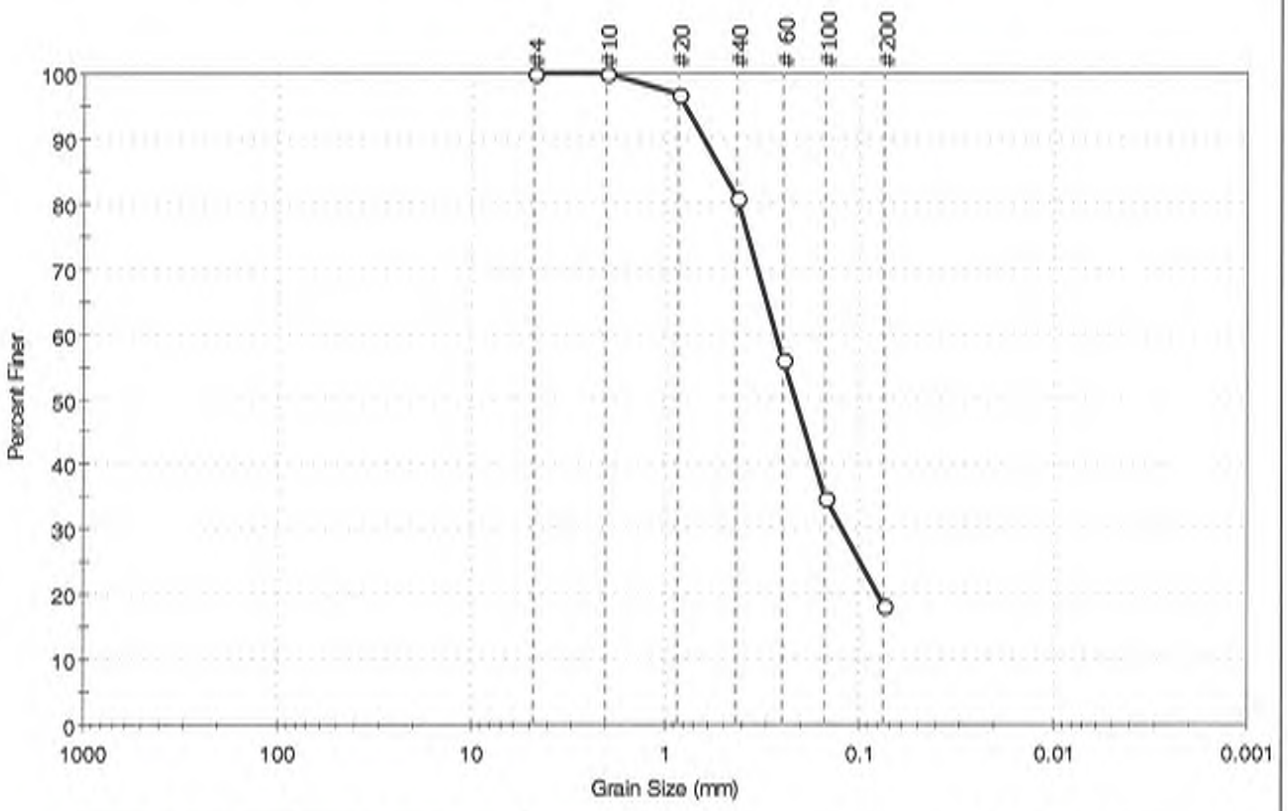
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-3	Sample Type:	tube	Tested By:	jm
Sample ID:	---	Test Date:	04/01/14	Checked By:	MCM
Depth :	15.5-17.5 ft	Test Id:	227525		
Test Comment:	---				
Sample Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	81.6	18.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	97		
#40	0.42	81		
# 60	0.25	56		
#100	0.15	35		
#200	0.075	18		

Coefficients

D_{85} =0.5075 mm	D_{30} =0.1222 mm
D_{60} =0.2727 mm	D_{15} =N/A
D_{50} =0.2166 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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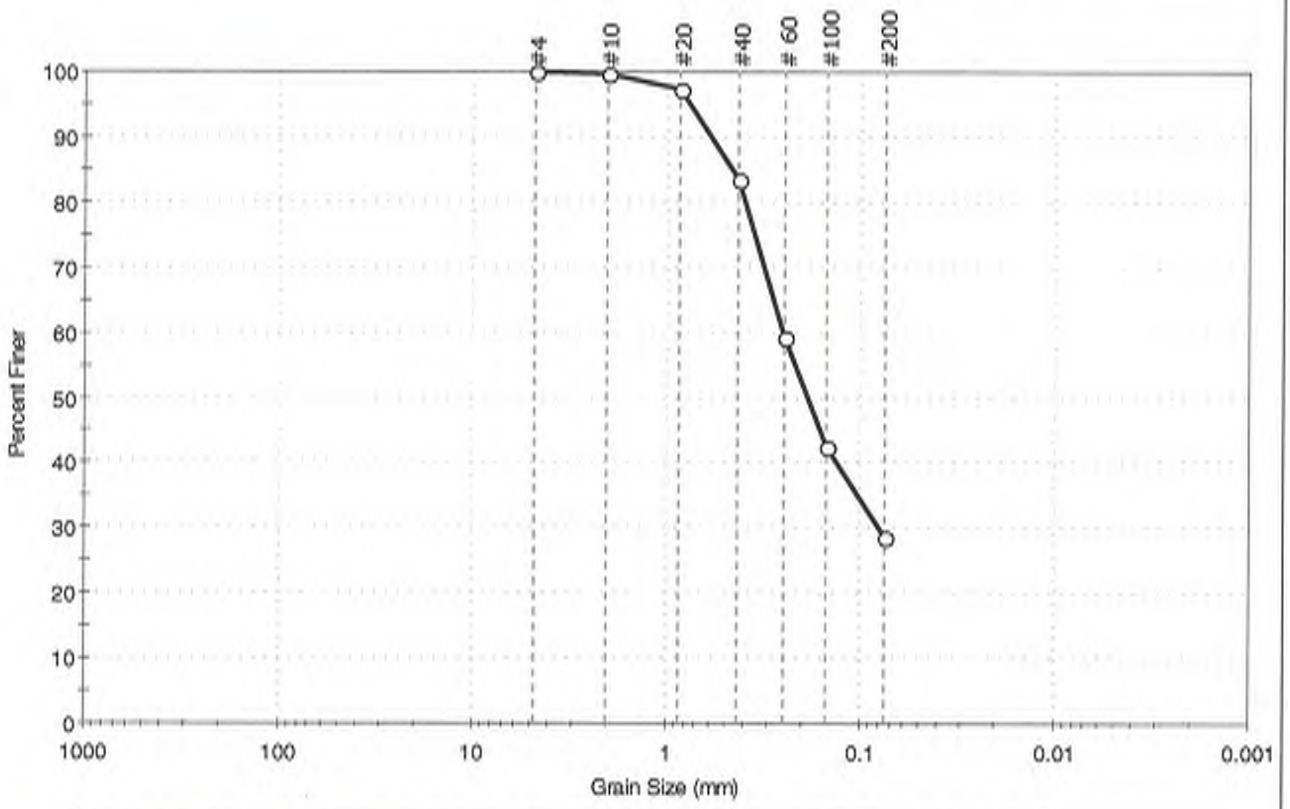
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-4	Test Date:	04/01/14	Checked By:	MCM
Depth :	18.5-20 ft	Test Id:	227515		
Test Comment:	---				
Sample Description:	Moist, reddish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	71.5	28.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	97		
#40	0.42	84		
# 60	0.25	59		
#100	0.15	43		
#200	0.075	29		

Coefficients

D_{85} =0.4557 mm	D_{30} =0.0807 mm
D_{60} =0.2544 mm	D_{15} =N/A
D_{50} =0.1887 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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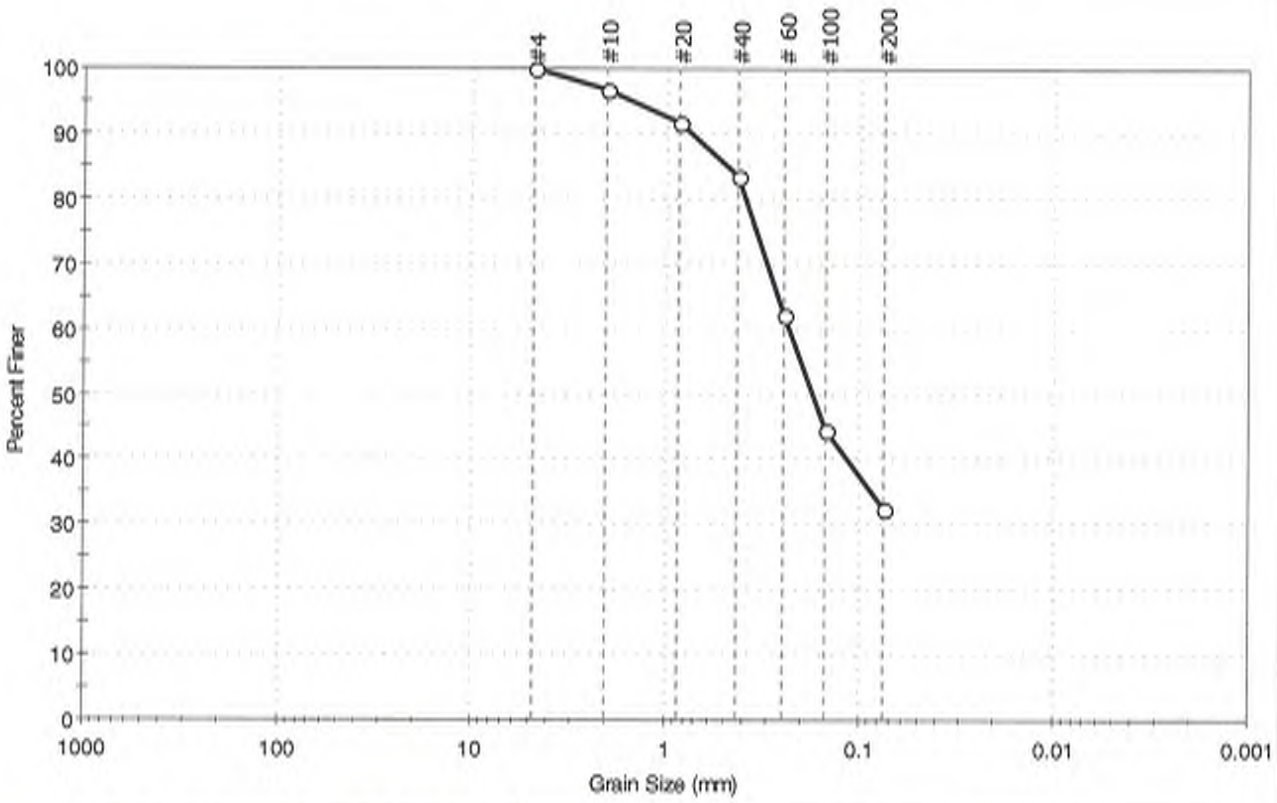
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-5	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227516		
Test Comment:	---				
Sample Description:	Moist, light brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	67.6	32.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	97		
#20	0.85	92		
#40	0.42	84		
# 60	0.25	62		
#100	0.15	45		
#200	0.075	32		

Coefficients

D_{85} = 0.4785 mm	D_{30} = N/A
D_{60} = 0.2348 mm	D_{15} = N/A
D_{50} = 0.1754 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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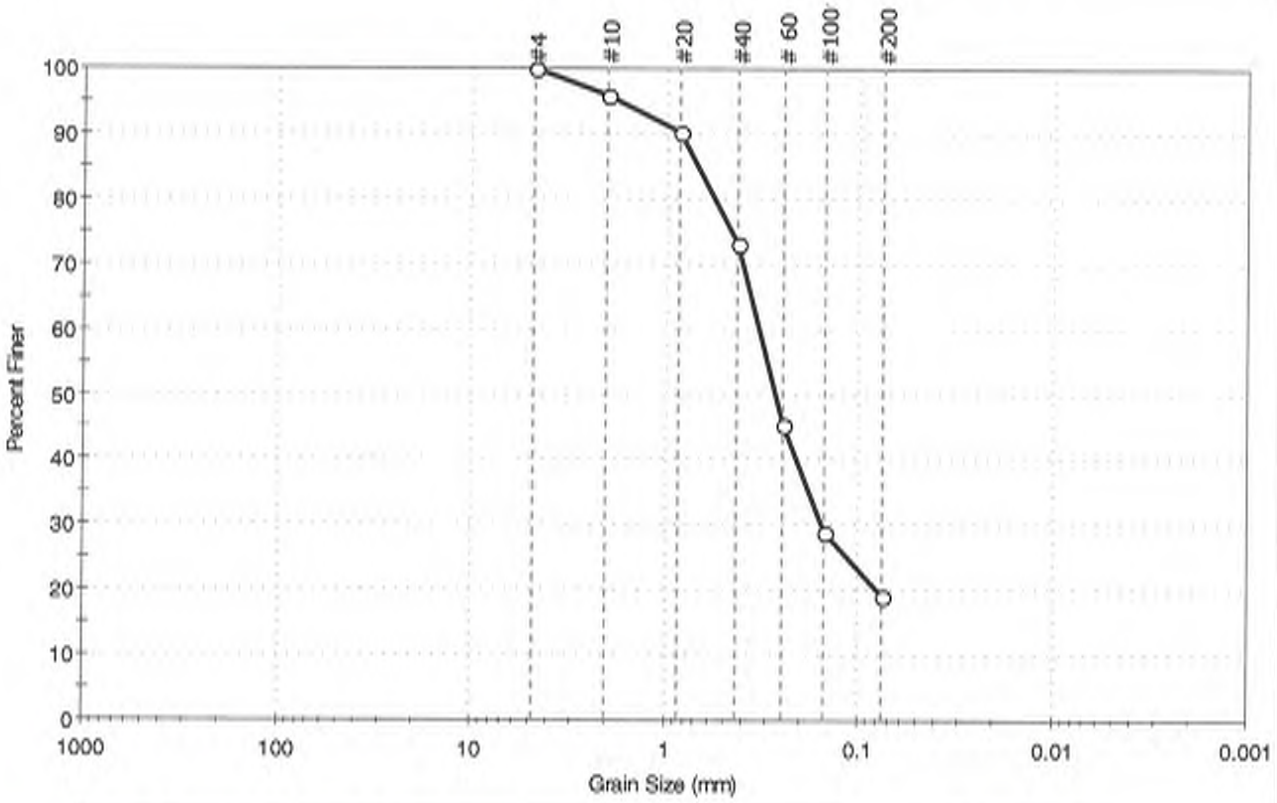
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-7	Test Date:	04/01/14	Checked By:	MCM
Depth :	33.5-35 ft	Test Id:	227517		
Test Comment:	---				
Sample Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	80.9	19.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	96		
#20	0.85	90		
#40	0.42	73		
# 60	0.25	45		
#100	0.15	29		
#200	0.075	19		

Coefficients

D_{85} =0.6852 mm	D_{30} =0.1549 mm
D_{60} =0.3300 mm	D_{15} =N/A
D_{50} =0.2728 mm	D_{10} =N/A
C_U =N/A	C_C =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

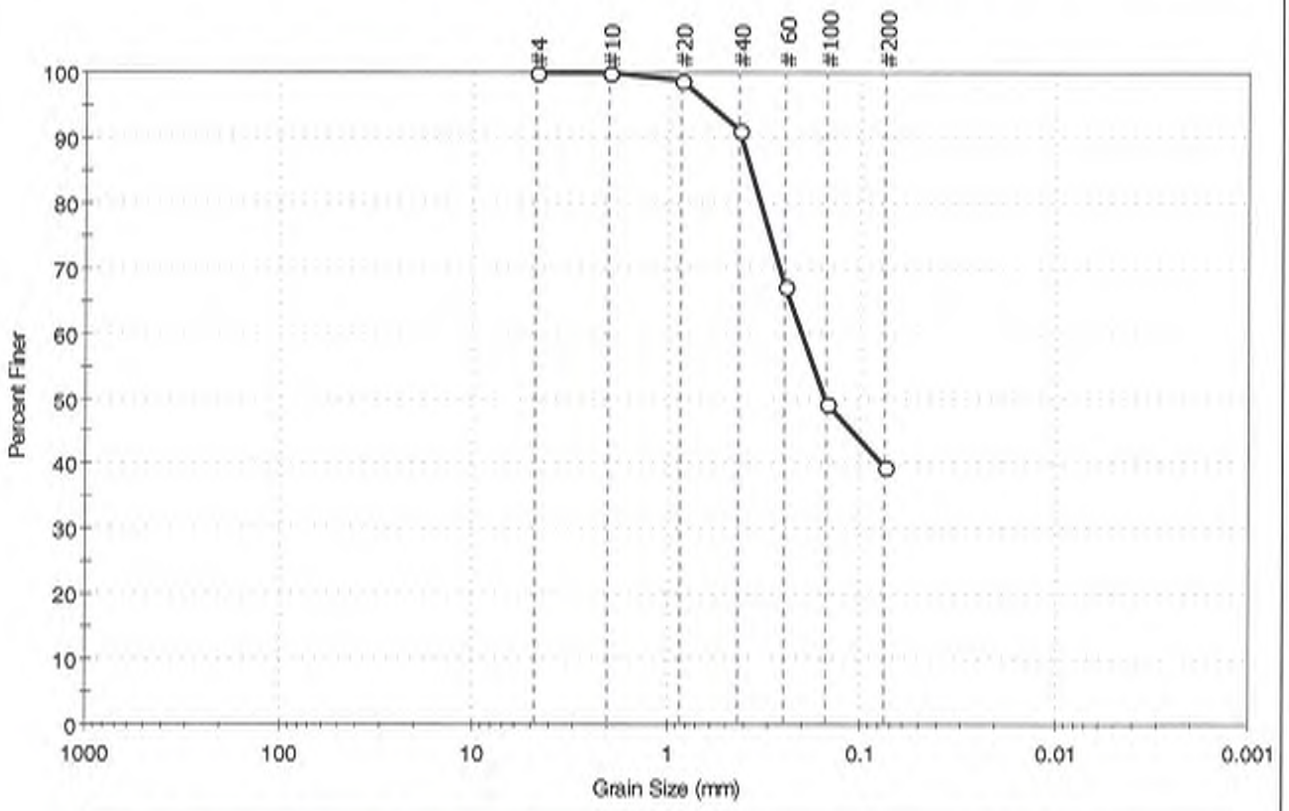
Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4	Sample Type:	jar	Tested By:	jm
Sample ID:	S-8	Test Date:	04/01/14	Checked By:	MCM
Depth :	38.5-40 ft	Test Id:	227518		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	60.5	39.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	91		
# 60	0.25	67		
#100	0.15	49		
#200	0.075	39		

Coefficients

D_{85} = 0.3712 mm	D_{30} = N/A
D_{60} = 0.2034 mm	D_{15} = N/A
D_{50} = 0.1528 mm	D_{10} = N/A
C_U = N/A	C_C = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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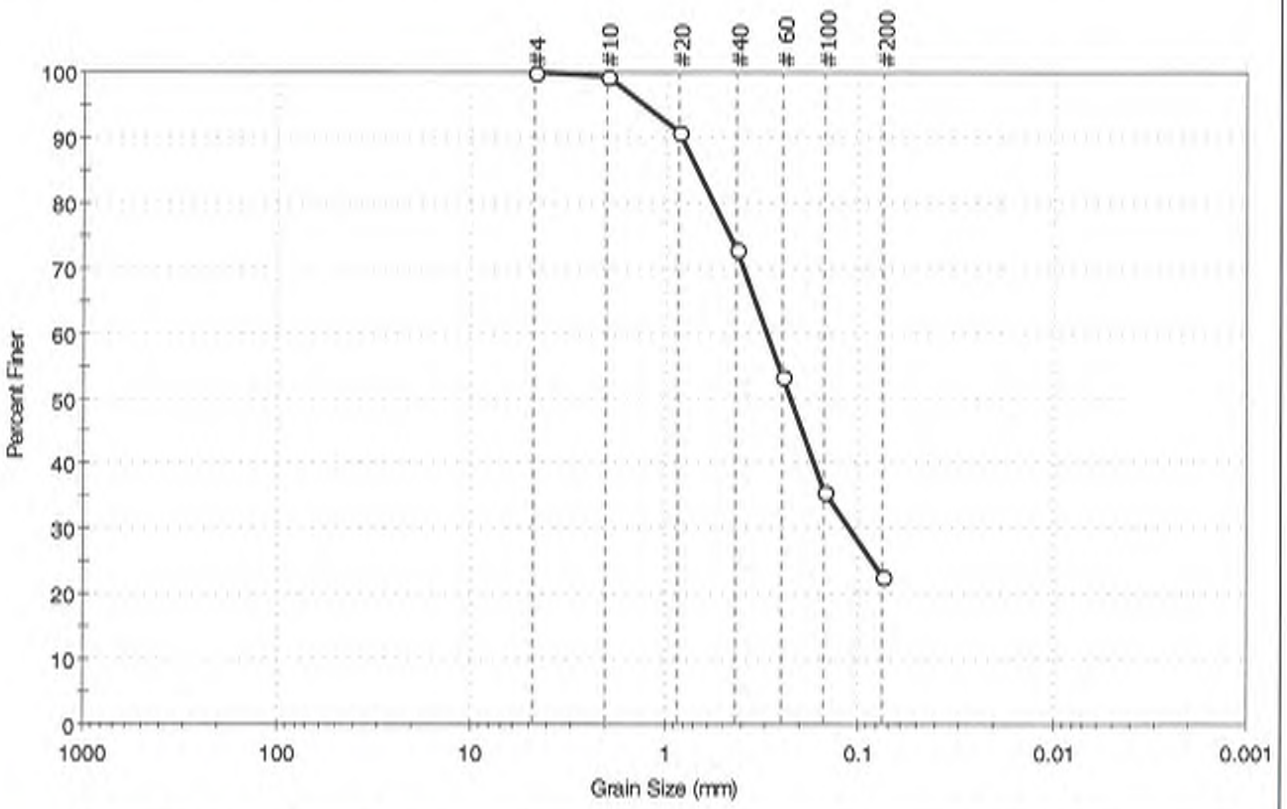
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4A	Sample Type:	tube	Tested By:	jm
Sample ID:	---	Test Date:	04/01/14	Checked By:	MCM
Depth :	19-21 ft	Test Id:	227526		
Test Comment:	---				
Sample Description:	Moist, grayish white silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	---	77.2	22.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	91		
#40	0.42	73		
# 60	0.25	53		
#100	0.15	36		
#200	0.075	23		

Coefficients

D_{85} = 0.6808 mm	D_{30} = 0.1104 mm
D_{60} = 0.2997 mm	D_{15} = N/A
D_{50} = 0.2267 mm	D_{10} = N/A
C_U = N/A	C_C = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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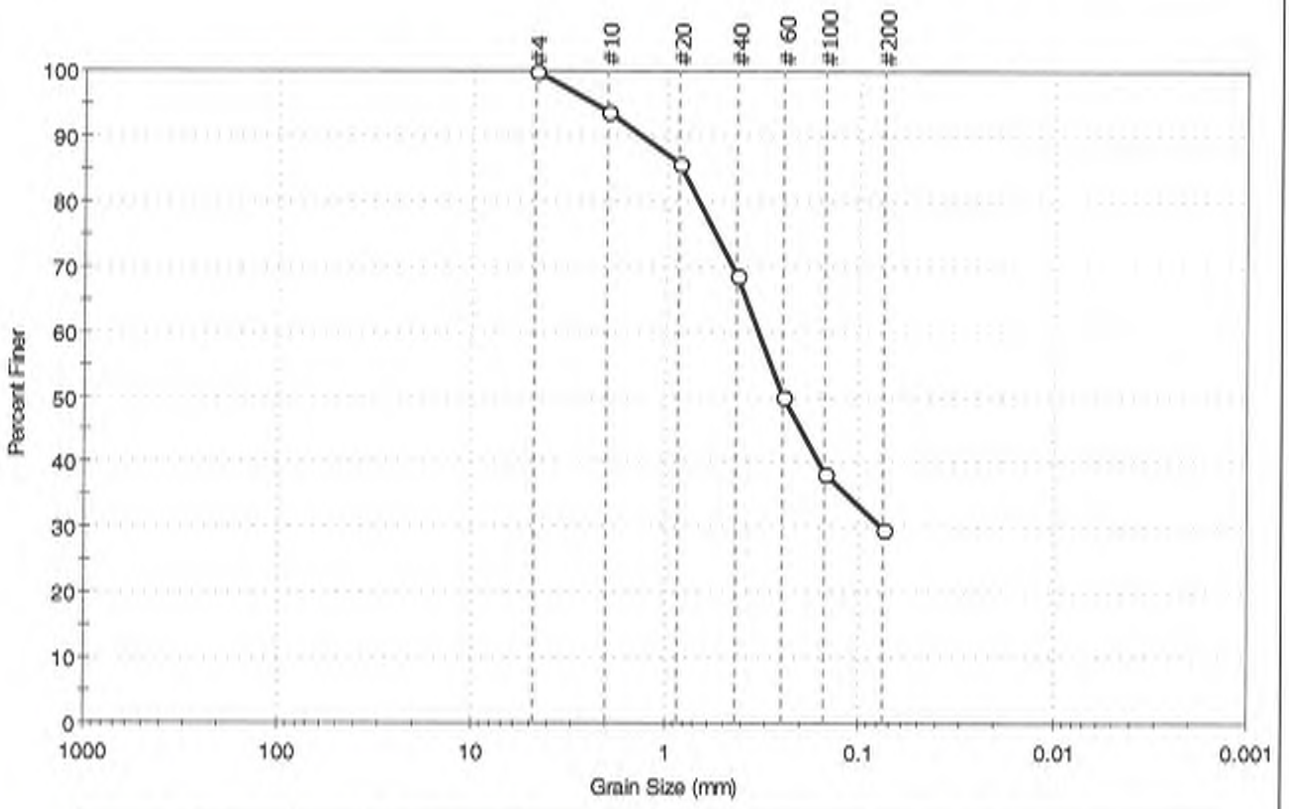
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-4	Test Date:	04/01/14	Checked By:	MCM
Depth :	18.5-20 ft	Test Id:	227519		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	70.1	29.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	94		
#20	0.85	86		
#40	0.42	69		
# 60	0.25	50		
#100	0.15	38		
#200	0.075	30		

Coefficients

D_{85} =0.8221 mm	D_{30} =0.0759 mm
D_{60} =0.3320 mm	D_{15} =N/A
D_{50} =0.2492 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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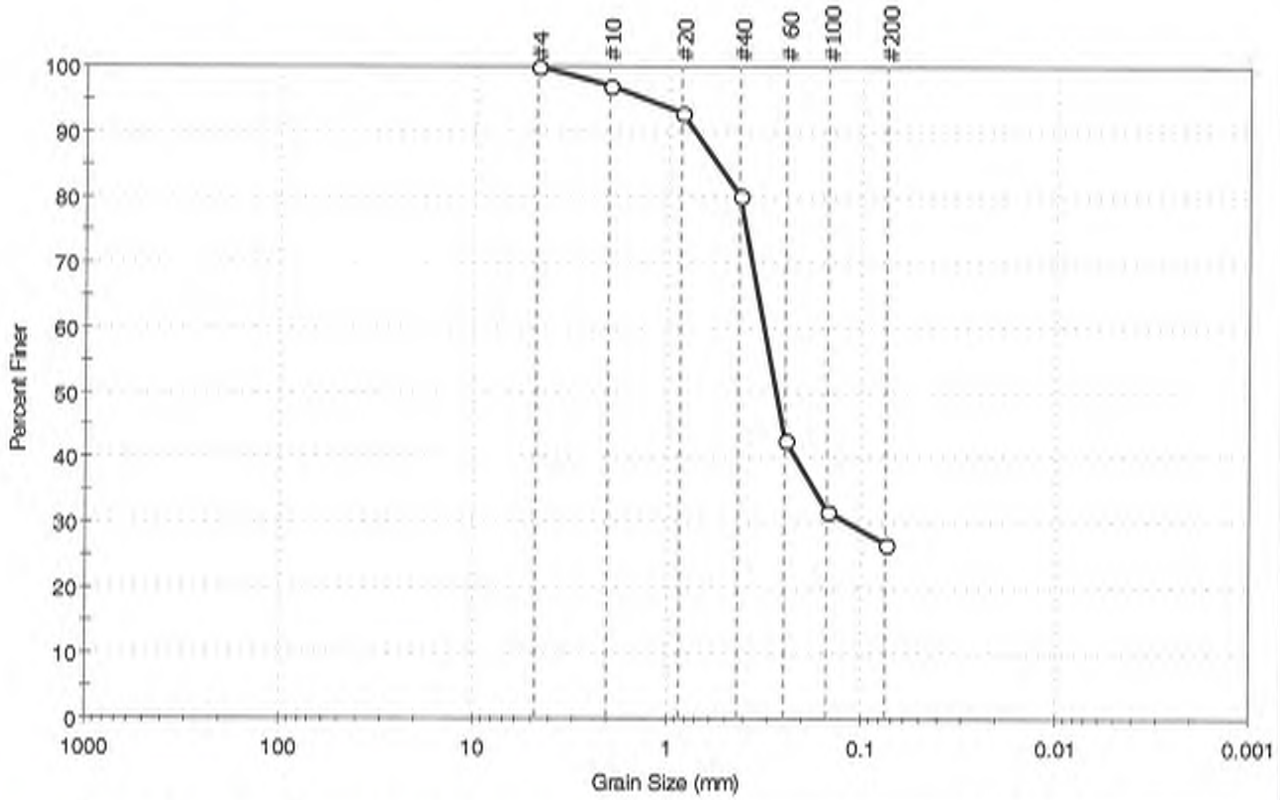
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-5	Test Date:	04/01/14	Checked By:	MCM
Depth :	23.5-25 ft	Test Id:	227520		
Test Comment:	---				
Sample Description:	Moist, reddish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	73.1	26.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	97		
#20	0.85	93		
#40	0.42	80		
# 60	0.25	43		
#100	0.15	32		
#200	0.075	27		

Coefficients

D_{85} = 0.5489 mm	D_{30} = 0.1159 mm
D_{60} = 0.3192 mm	D_{15} = N/A
D_{50} = 0.2773 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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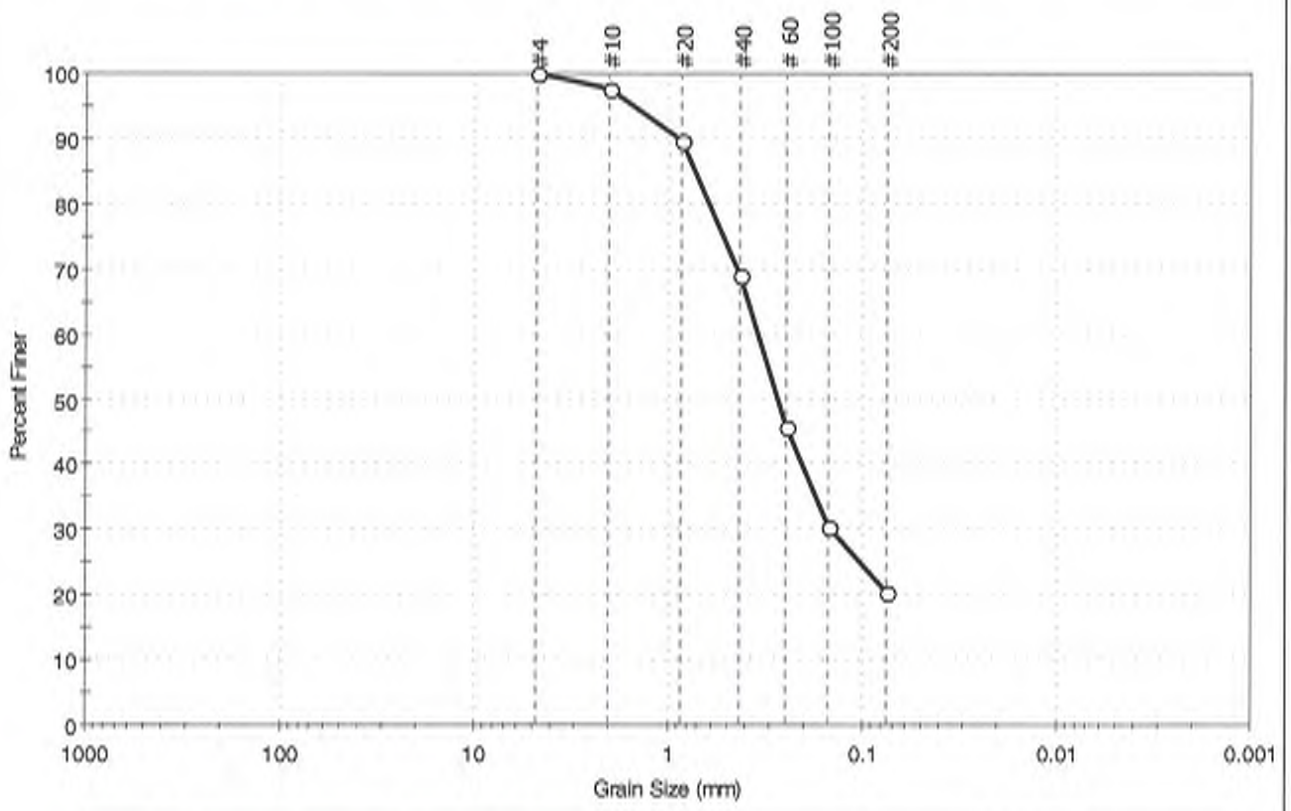
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-6	Test Date:	04/01/14	Checked By:	MCM
Depth :	28.5-30 ft	Test Id:	227521		
Test Comment:	---				
Sample Description:	Moist, brownish red silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	79.6	20.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	90		
#20	0.85	90		
#40	0.42	69		
# 60	0.25	46		
#100	0.15	30		
#200	0.075	20		

Coefficients

D_{85} = 0.7269 mm	D_{30} = 0.1458 mm
D_{60} = 0.3463 mm	D_{15} = N/A
D_{50} = 0.2754 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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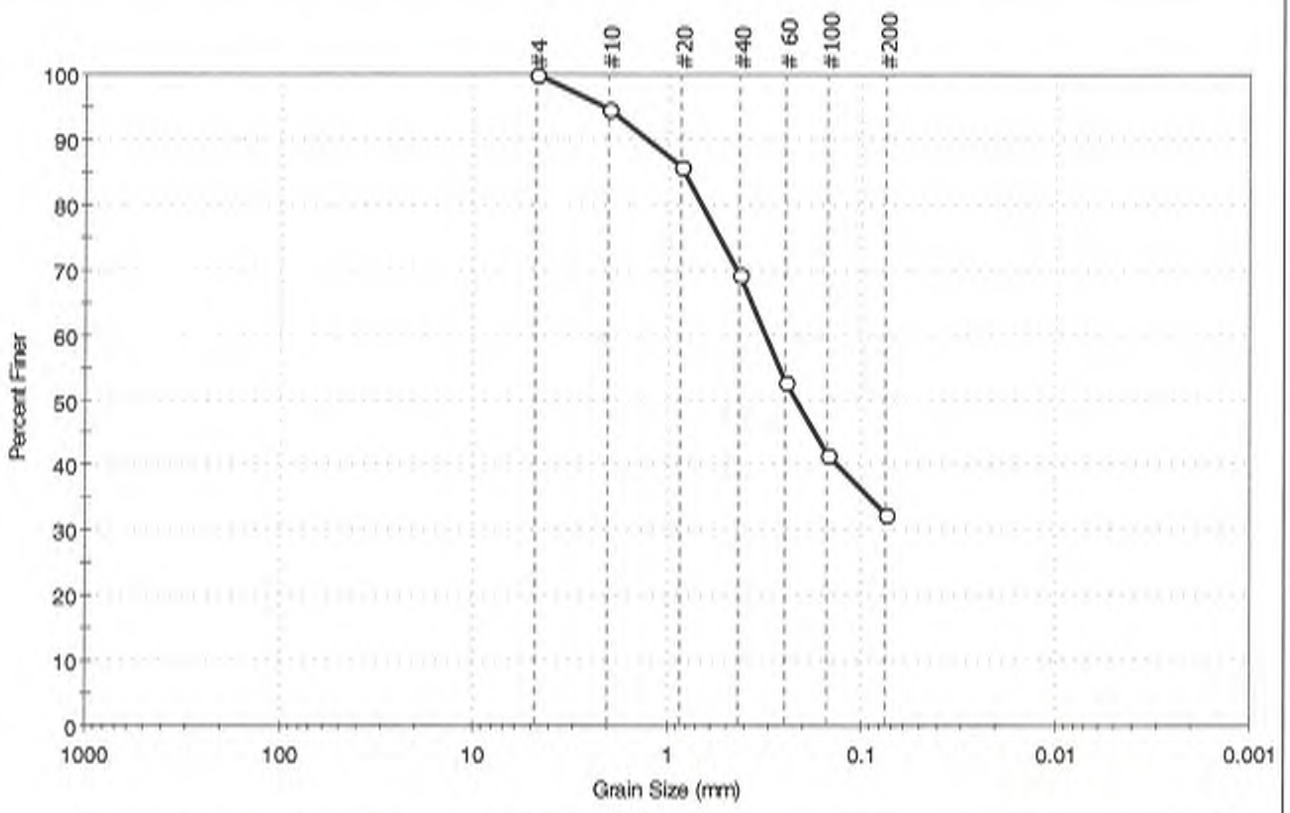
GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-5	Sample Type:	jar	Tested By:	jm
Sample ID:	S-7	Test Date:	04/01/14	Checked By:	MCM
Depth :	33.5-35 ft	Test Id:	227522		
Test Comment:	---				
Sample Description:	Moist, brownish yellow silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	67.6	32.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	95		
#20	0.85	86		
#40	0.42	69		
# 60	0.25	53		
#100	0.15	42		
#200	0.075	32		

Coefficients

D_{85} = 0.8187 mm D_{30} = N/A
D_{60} = 0.3156 mm D_{15} = N/A
D_{50} = 0.2201 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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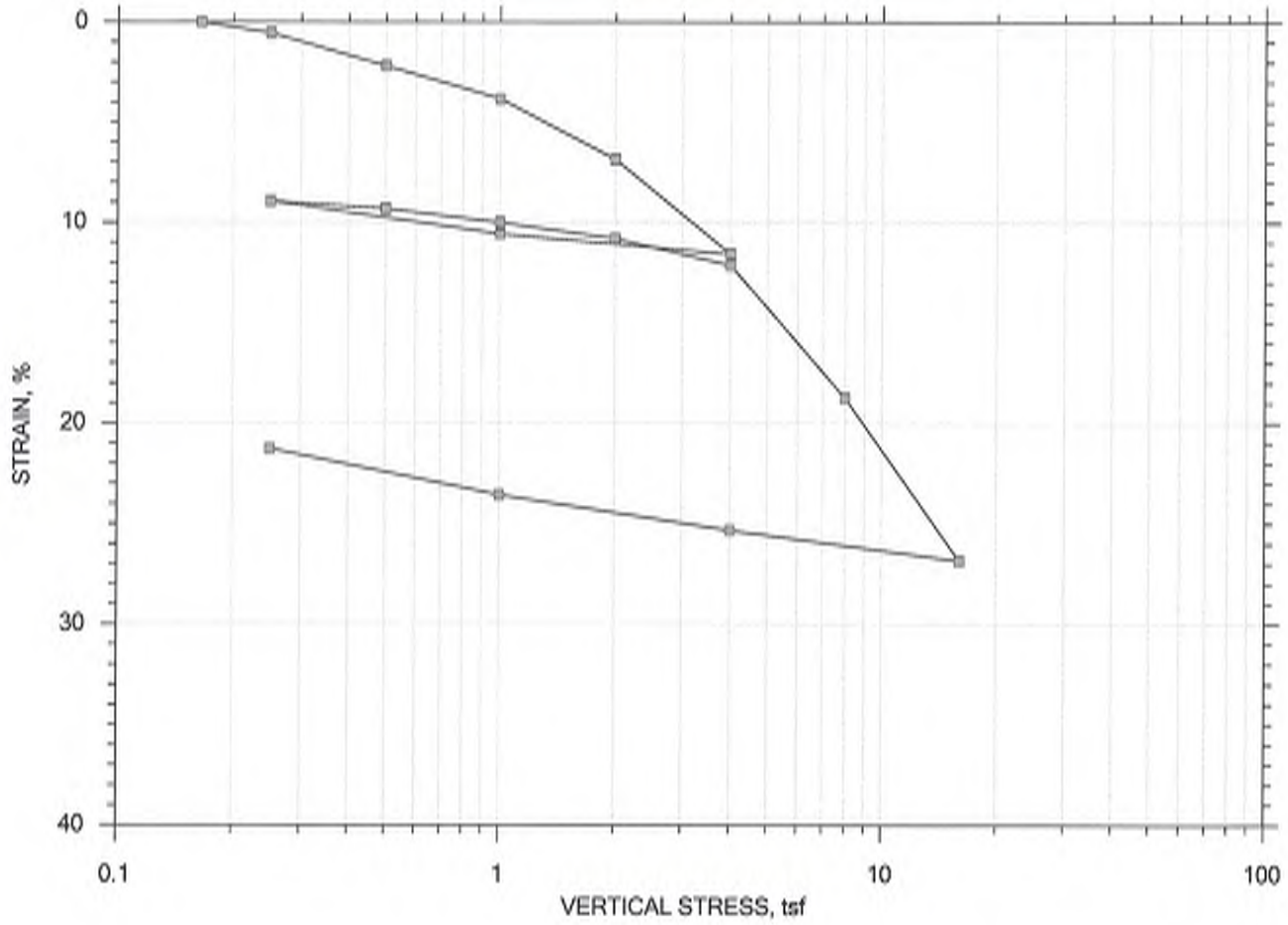
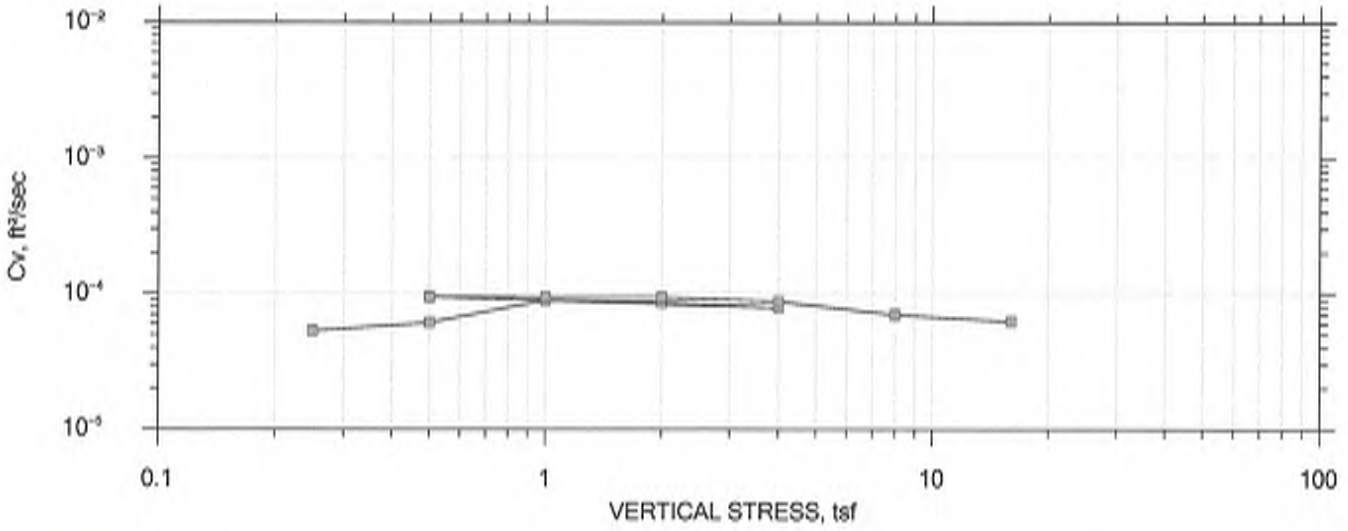
One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

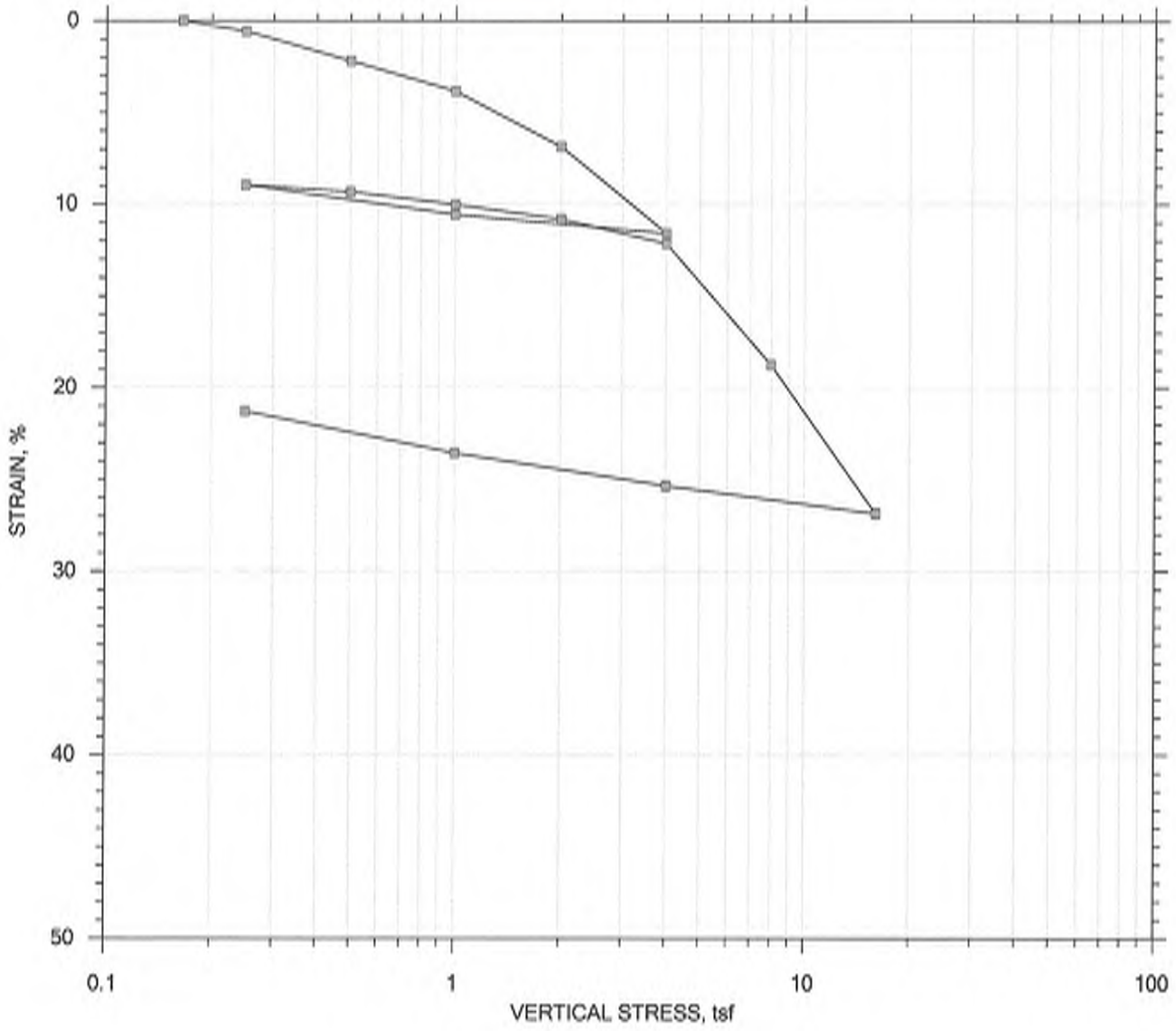




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-3	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 4/2/14	Test No.: C-1.1
	Depth: 15.5-17.5ft	Sample Type: Intact	Elevation: ---
	Description: Moist, yellowish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	32.43	27.41
Preconsolidation Stress: ---				Dry Unit Weight, pcf	77.348	98.095
Compression Ratio: ---				Saturation, %	72.92	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.23	0.76
LL: ---	PL: ---	PI: ---	GS: 2.76			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-3	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 4/2/14	Test No.: C-1.1
	Depth: 15.5-17.5ft	Sample Type: Intact	Elevation: ---
	Description: Moist, yellowish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
Boring No.: B-3	Tested By: jm	Checked By: mcm
Sample No.: ---	Test Date: 4/2/14	Depth: 15.5-17.5ft
Test No.: C-1.1	Sample Type: Intact	Elevation: ---

Soil Description: Moist, yellowish brown silty sand
Remarks:

Estimated Specific Gravity: 2.76	Liquid Limit: ---	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.23	Plastic Limit: ---	Initial Height: 1.00 in
Final Void Ratio: 0.756	Plasticity Index: ---	Final Height: 0.79 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	a27	RING		a24
Wt. Container + Wet Soil, gm	95.020	342.29	337.28	142.76
Wt. Container + Dry Soil, gm	75.960	309.96	309.96	115.55
Wt. Container, gm	17.090	210.30	210.30	16.270
Wt. Dry Soil, gm	58.870	99.665	99.665	99.280
Water Content, %	33.74	32.43	27.41	27.41
Void Ratio	---	1.23	0.756	---
Degree of Saturation, %	---	72.92	100.00	---
Dry Unit Weight, pcf	---	77.348	98.095	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-3
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 4/2/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 15.5-17.5ft
Elevation: ---

Soil Description: Moist, yellowish brown silty sand
Remarks:

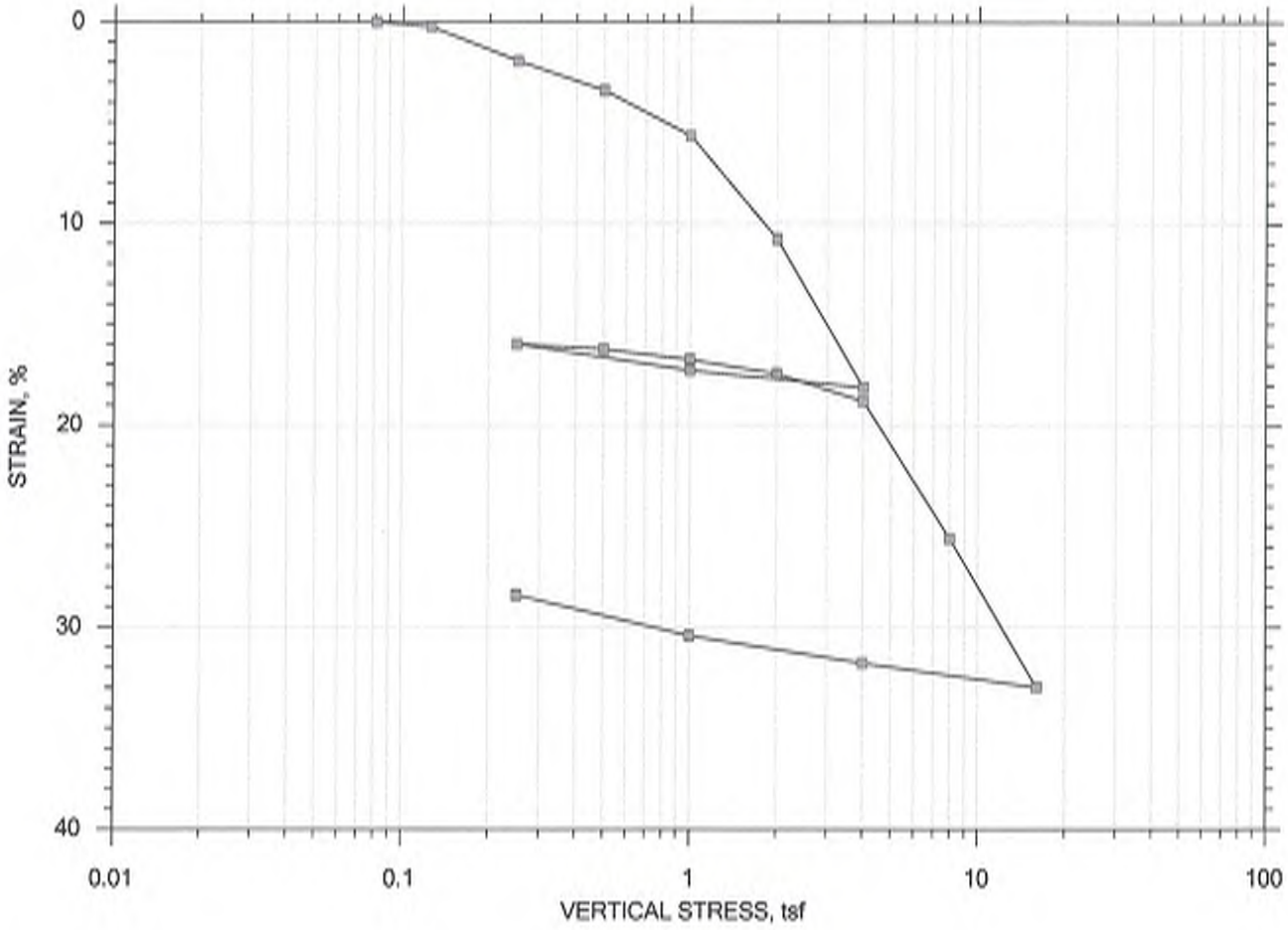
Displacement at End of Increment

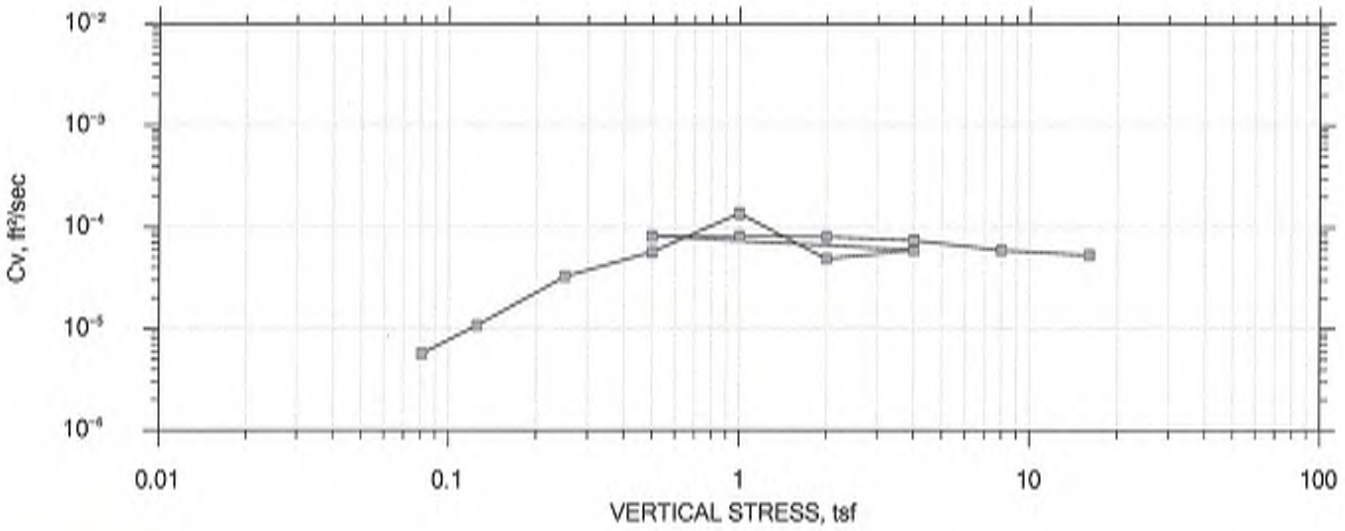
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.165	0.0000	1.23	0.000	0.000	0.00e+000	0.00e+000	0.00e+000
2	0.250	0.005577	1.22	0.558	0.441	5.53e-005	6.56e-002	3.45e-006
3	0.500	0.02186	1.18	2.19	0.424	5.62e-005	6.51e-002	3.49e-006
4	1.00	0.03837	1.14	3.84	0.387	5.96e-005	3.30e-002	1.87e-006
5	2.00	0.06855	1.07	6.85	0.390	5.63e-005	3.02e-002	1.62e-006
6	4.00	0.1158	0.970	11.6	0.394	5.13e-005	2.36e-002	1.18e-006
7	1.00	0.1057	0.992	10.6	0.355	5.46e-005	3.37e-003	1.75e-007
8	0.250	0.08934	1.03	8.93	0.387	5.16e-005	2.18e-002	1.07e-006
9	0.500	0.09313	1.02	9.31	0.360	5.62e-005	1.52e-002	8.11e-007
10	1.00	0.1000	1.00	10.0	0.358	5.59e-005	1.38e-002	7.33e-007
11	2.00	0.1081	0.987	10.8	0.356	5.53e-005	8.09e-003	4.25e-007
12	4.00	0.1213	0.957	12.1	0.366	5.26e-005	6.60e-003	3.30e-007
13	8.00	0.1875	0.810	18.8	0.388	4.52e-005	1.66e-002	7.13e-007
14	16.0	0.2684	0.630	26.8	0.374	3.91e-005	1.01e-002	3.76e-007
15	4.00	0.2533	0.663	25.3	0.355	3.78e-005	1.26e-003	4.53e-008
16	1.00	0.2356	0.703	23.6	0.374	3.74e-005	5.90e-003	2.10e-007
17	0.250	0.2127	0.754	21.3	0.458	3.23e-005	3.06e-002	9.36e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.165	0.0000	1.23	0.000	0.000	0.00e+000	0.00e+000	0.00e+000	0.00e+000
2	0.250	0.005577	1.22	0.558	0.000	0.00e+000	6.56e-002	0.00e+000	0.00e+000
3	0.500	0.02186	1.18	2.19	0.000	0.00e+000	6.51e-002	0.00e+000	0.00e+000
4	1.00	0.03837	1.14	3.84	0.000	0.00e+000	3.30e-002	0.00e+000	0.00e+000
5	2.00	0.06855	1.07	6.85	0.000	0.00e+000	3.02e-002	0.00e+000	0.00e+000
6	4.00	0.1158	0.970	11.6	0.000	0.00e+000	2.36e-002	0.00e+000	0.00e+000
7	1.00	0.1057	0.992	10.6	0.000	0.00e+000	3.37e-003	0.00e+000	0.00e+000
8	0.250	0.08934	1.03	8.93	0.000	0.00e+000	2.18e-002	0.00e+000	0.00e+000
9	0.500	0.09313	1.02	9.31	0.000	0.00e+000	1.52e-002	0.00e+000	0.00e+000
10	1.00	0.1000	1.00	10.0	0.000	0.00e+000	1.38e-002	0.00e+000	0.00e+000
11	2.00	0.1081	0.987	10.8	0.000	0.00e+000	8.09e-003	0.00e+000	0.00e+000
12	4.00	0.1213	0.957	12.1	0.000	0.00e+000	6.60e-003	0.00e+000	0.00e+000
13	8.00	0.1875	0.810	18.8	0.000	0.00e+000	1.66e-002	0.00e+000	0.00e+000
14	16.0	0.2684	0.630	26.8	0.000	0.00e+000	1.01e-002	0.00e+000	0.00e+000
15	4.00	0.2533	0.663	25.3	0.000	0.00e+000	1.26e-003	0.00e+000	0.00e+000
16	1.00	0.2356	0.703	23.6	0.000	0.00e+000	5.90e-003	0.00e+000	0.00e+000
17	0.250	0.2127	0.754	21.3	0.000	0.00e+000	3.05e-002	0.00e+000	0.00e+000

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

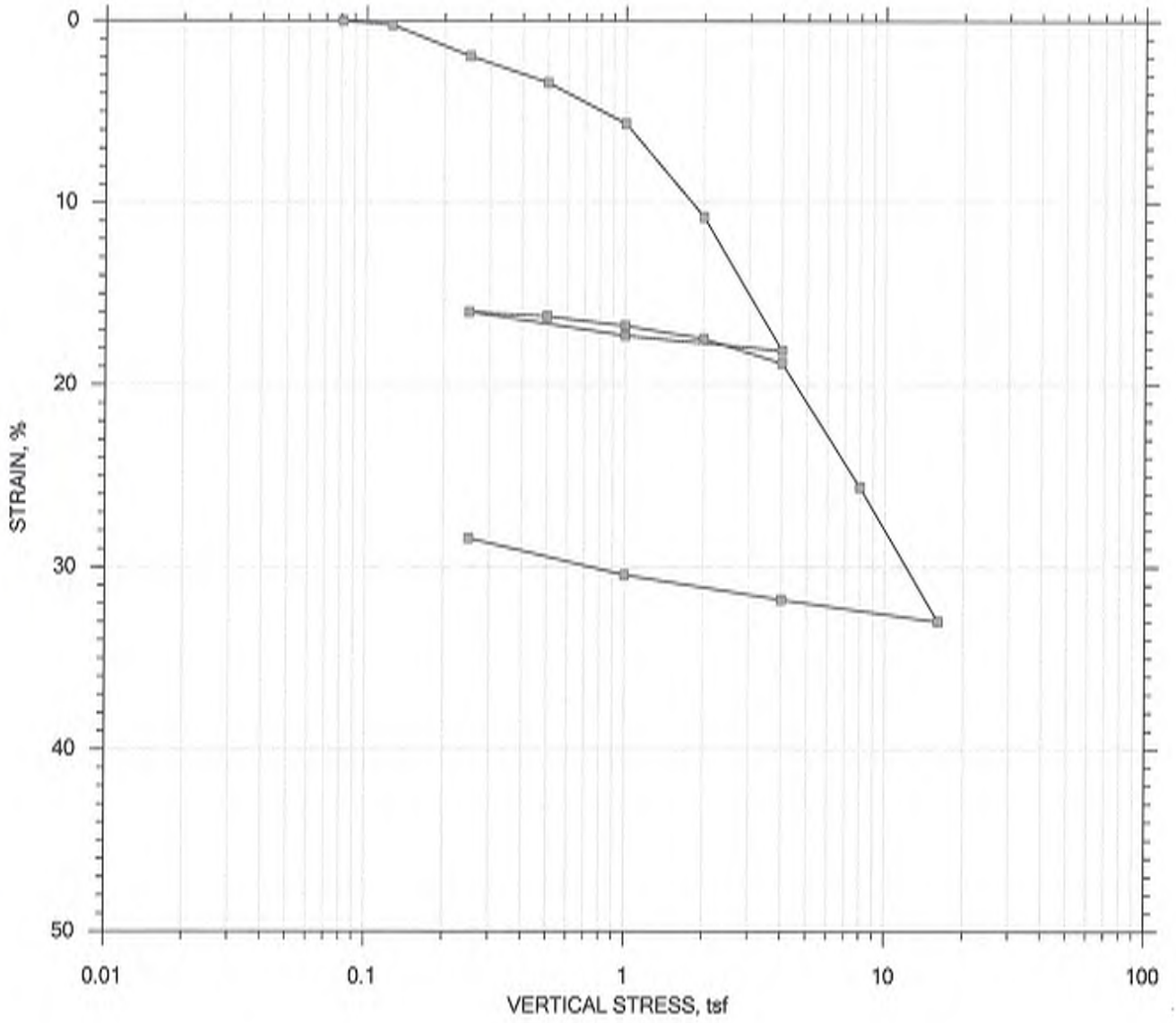




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 3/28/14	Test No.: C-1.1
	Depth: 19-21 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish white silty sand		
	Remarks: (Weathered Rock)		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	31.02	31.80
Preconsolidation Stress: ---				Dry Unit Weight, pcf	65.855	91.978
Compression Ratio: ---				Saturation, %	52.83	100.00
Diameter: 2.5 in		Height: 1.001 in		Void Ratio	1.63	0.88
LL: ---	PL: ---	PI: ---	GS: 2.77			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: jm	Checked By: mcm
	Sample No.: ---	Test Date: 3/26/14	Test No.: C-1.1
	Depth: 19-21 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish white silty sand		
	Remarks: (Weathered Rock)		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 3/26/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, grayish white silty sand
Remarks: (Weathered Rock)

Estimated Specific Gravity: 2.77
Initial Void Ratio: 1.63
Final Void Ratio: 0.881

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.72 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A10	RING	a18	a18
Wt. Container + Wet Soil, gm	90.820	127.64	128.30	128.30
Wt. Container + Dry Soil, gm	73.670	101.29	101.29	101.29
Wt. Container, gm	16.410	16.350	16.350	16.350
Wt. Dry Soil, gm	57.260	84.940	84.940	84.940
Water Content, %	29.95	31.02	31.80	31.80
Void Ratio	---	1.63	0.881	---
Degree of Saturation, %	---	52.83	100.00	---
Dry Unit Weight, pcf	---	65.855	91.978	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-1.1

Location: Atlanta, GA
Tested By: jm
Test Date: 3/26/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: mcm
Depth: 19-21 ft
Elevation: ---

Soil Description: Moist, grayish white silty sand
Remarks: (Weathered Rock)

Displacement at End of Increment

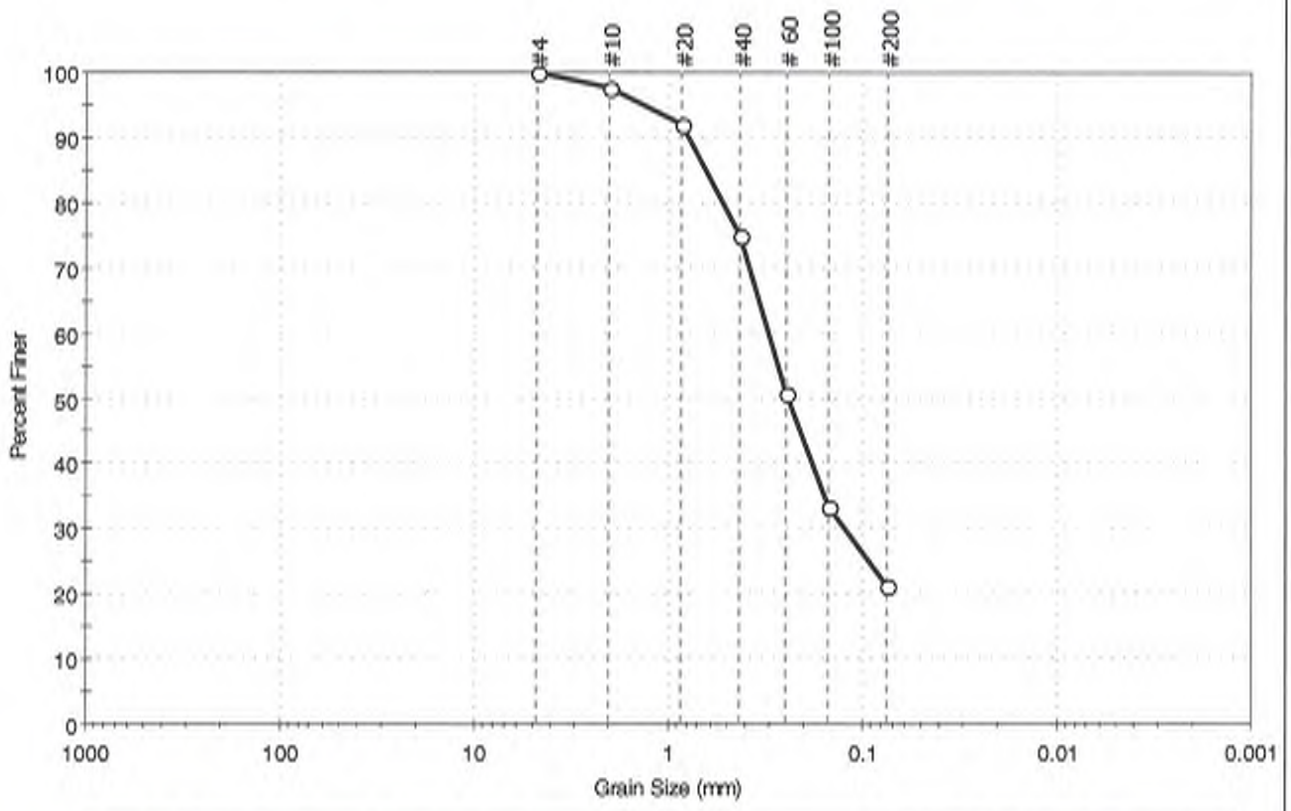
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.0810	1.580e-005	1.63	0.00158	1.003	2.45e-005	1.95e-004	4.54e-009
2	0.125	0.002338	1.62	0.234	5.297	4.63e-006	5.27e-002	2.32e-007
3	0.250	0.01934	1.58	1.93	0.767	3.14e-005	1.36e-001	4.06e-006
4	0.500	0.03395	1.54	3.39	0.416	5.60e-005	5.84e-002	3.11e-006
5	1.00	0.05646	1.48	5.64	0.417	5.37e-005	4.50e-002	2.30e-006
6	2.00	0.1078	1.34	10.8	0.449	4.62e-005	5.12e-002	2.25e-006
7	4.00	0.1813	1.15	18.1	0.413	4.36e-005	3.67e-002	1.52e-006
8	1.00	0.1730	1.17	17.3	0.355	4.69e-005	2.75e-003	1.23e-007
9	0.250	0.1599	1.21	16.0	0.373	4.59e-005	1.74e-002	7.61e-007
10	0.500	0.1624	1.20	16.2	0.358	4.83e-005	9.97e-003	4.59e-007
11	1.00	0.1676	1.19	16.7	0.358	4.79e-005	1.04e-002	4.73e-007
12	2.00	0.1745	1.17	17.4	0.356	4.74e-005	6.91e-003	3.12e-007
13	4.00	0.1881	1.13	18.8	0.369	4.47e-005	6.79e-003	2.89e-007
14	8.00	0.2562	0.955	25.6	0.388	3.84e-005	1.70e-002	6.21e-007
15	16.0	0.3300	0.762	33.0	0.373	3.30e-005	9.21e-003	2.89e-007
16	4.00	0.3180	0.793	31.8	0.350	3.21e-005	9.94e-004	3.04e-008
17	1.00	0.3045	0.829	30.4	0.364	3.21e-005	4.51e-003	1.38e-007
18	0.250	0.2843	0.882	28.4	0.429	2.85e-005	2.69e-002	7.30e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.0810	1.580e-005	1.63	0.00158	0.000	0.00e+000	1.95e-004	0.00e+000	0.00e+000
2	0.125	0.002338	1.62	0.234	0.216	2.64e-005	5.27e-002	1.32e-006	0.00e+000
3	0.250	0.01934	1.58	1.93	0.000	0.00e+000	1.36e-001	0.00e+000	0.00e+000
4	0.500	0.03395	1.54	3.39	0.000	0.00e+000	5.84e-002	0.00e+000	0.00e+000
5	1.00	0.05646	1.48	5.64	0.000	1.44e-002	4.50e-002	6.17e-004	0.00e+000
6	2.00	0.1078	1.34	10.8	0.106	4.54e-005	5.12e-002	2.21e-006	0.00e+000
7	4.00	0.1813	1.15	18.1	0.000	0.00e+000	3.67e-002	0.00e+000	0.00e+000
8	1.00	0.1730	1.17	17.3	0.000	0.00e+000	2.75e-003	0.00e+000	0.00e+000
9	0.250	0.1599	1.21	16.0	0.000	0.00e+000	1.74e-002	0.00e+000	0.00e+000
10	0.500	0.1624	1.20	16.2	0.000	0.00e+000	9.97e-003	0.00e+000	0.00e+000
11	1.00	0.1676	1.19	16.7	0.000	0.00e+000	1.04e-002	0.00e+000	0.00e+000
12	2.00	0.1745	1.17	17.4	0.000	0.00e+000	6.91e-003	0.00e+000	0.00e+000
13	4.00	0.1881	1.13	18.8	0.000	0.00e+000	6.79e-003	0.00e+000	0.00e+000
14	8.00	0.2562	0.955	25.6	0.000	0.00e+000	1.70e-002	0.00e+000	0.00e+000
15	16.0	0.3300	0.762	33.0	0.000	0.00e+000	9.21e-003	0.00e+000	0.00e+000
16	4.00	0.3180	0.793	31.8	0.000	0.00e+000	9.94e-004	0.00e+000	0.00e+000
17	1.00	0.3045	0.829	30.4	0.000	0.00e+000	4.51e-003	0.00e+000	0.00e+000
18	0.250	0.2843	0.882	28.4	0.000	0.00e+000	2.69e-002	0.00e+000	0.00e+000

GeoTesting EXPRESS

Client:	Metals & Materials Engineers, LLC				
Project:	Intrenchment Creek				
Location:	Atlanta, GA			Project No:	GTX-301589
Boring ID:	B-4A	Sample Type:	tube	Tested By:	bhe
Sample ID:	---	Test Date:	04/18/14	Checked By:	MCM
Depth :	28-30	Test Id:	227687		
Test Comment:	---				
Sample Description:	Moist, grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	78.8	21.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	98		
#20	0.85	92		
#40	0.42	75		
# 60	0.25	51		
#100	0.15	33		
#200	0.075	21		

Coefficients

D_{85} =0.6413 mm	D_{30} =0.1236 mm
D_{60} =0.3058 mm	D_{15} =N/A
D_{50} =0.2437 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape :

Sand/Gravel Hardness :

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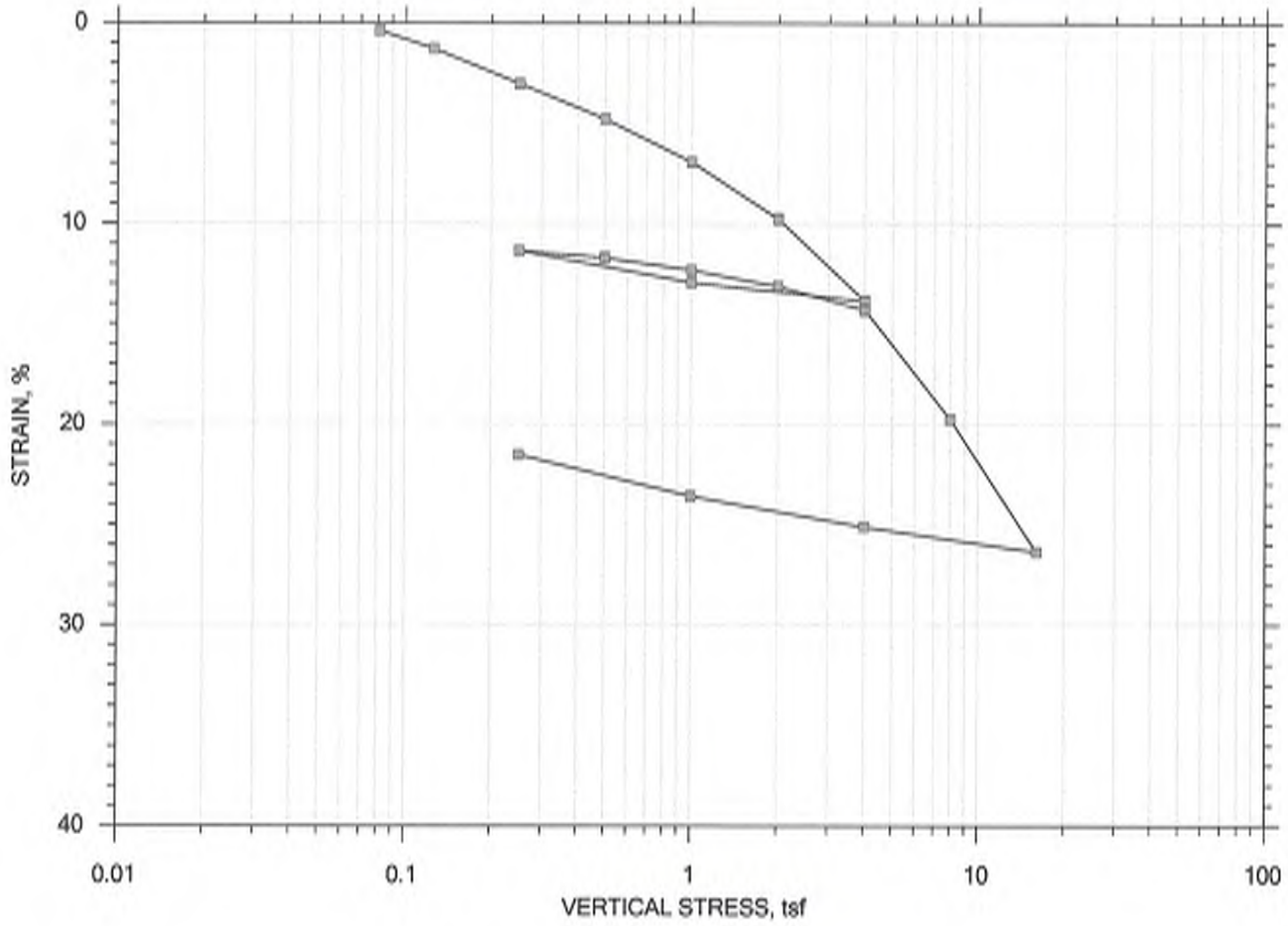
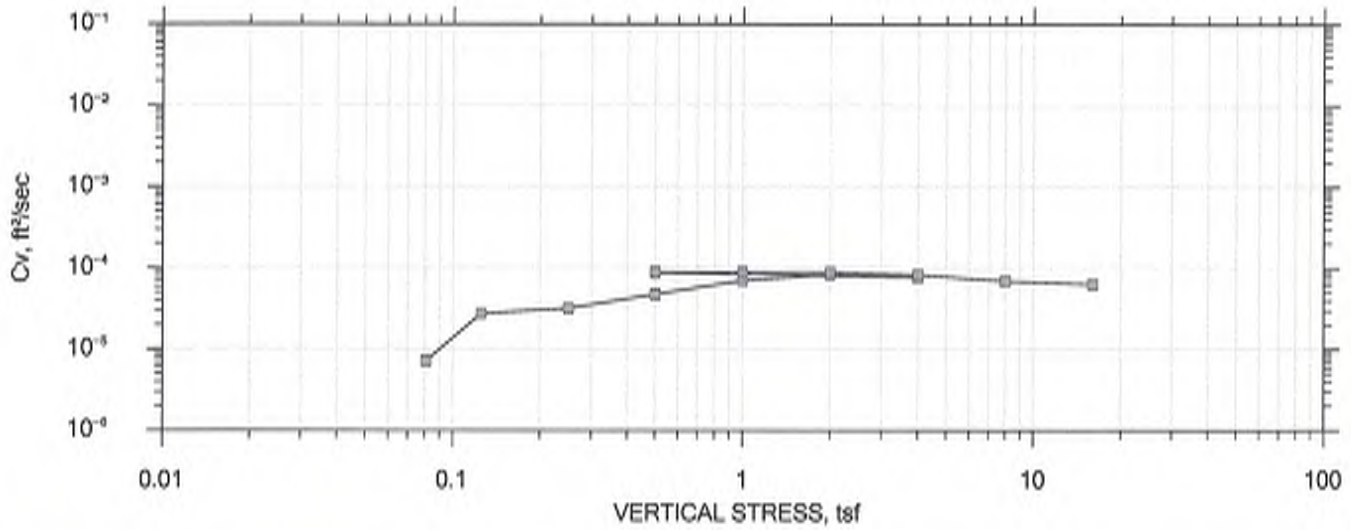
One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT

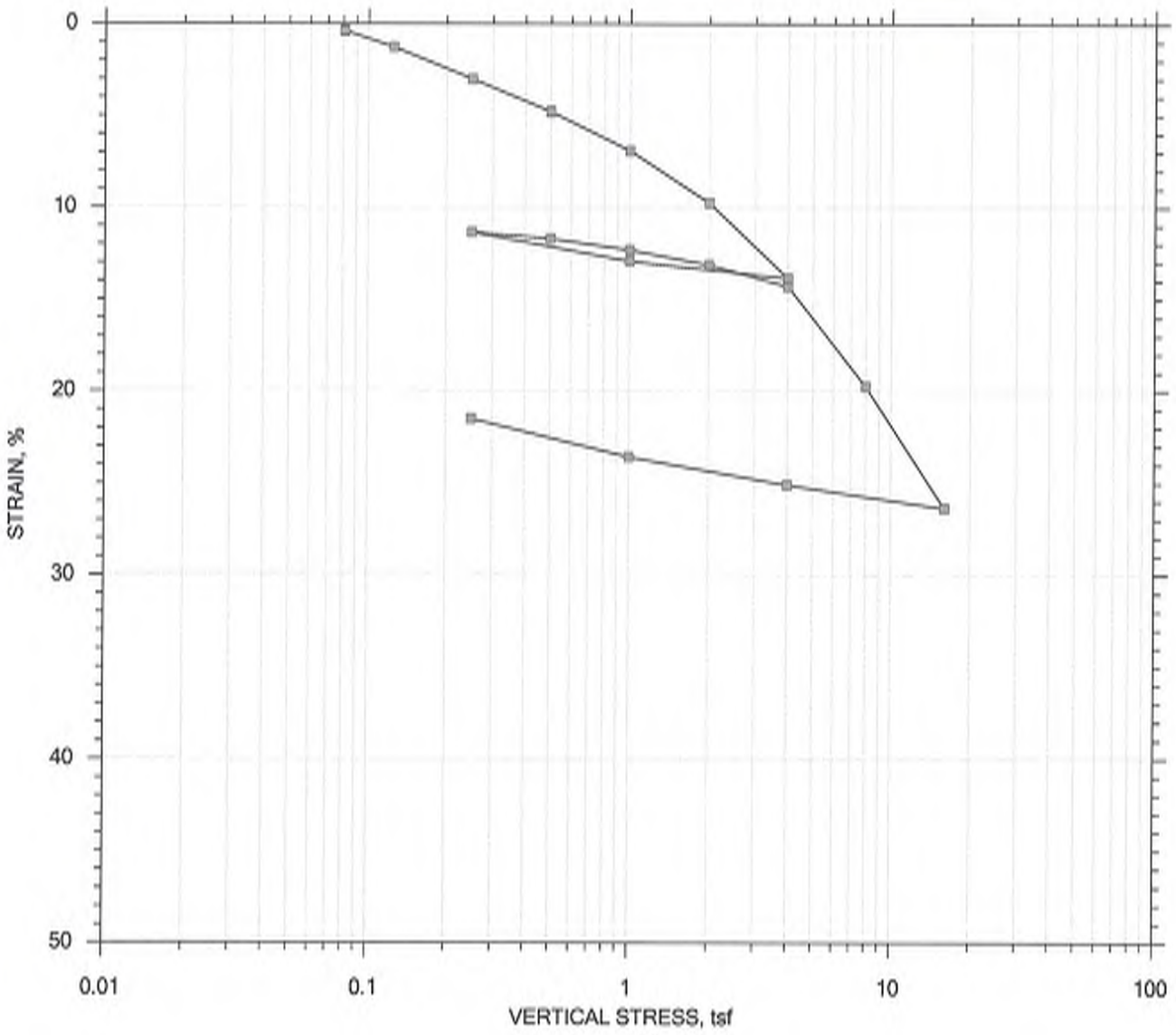




GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: mcm	Checked By: njh
	Sample No.: ---	Test Date: 4/16/14	Test No.: C-3.1
	Depth: 28-30 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Current Vertical Effective Stress: ---				Water Content, %	35.88	25.04
Preconsolidation Stress: ---				Dry Unit Weight, pcf	79.75	101.62
Compression Ratio: ---				Saturation, %	85.66	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.15	0.69
LL: ---	PL: ---	PI: ---	GS: 2.75			

GeoTesting EXPRESS	Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
	Boring No.: B-4A	Tested By: mcm	Checked By: njh
	Sample No.: ---	Test Date: 4/16/14	Test No.: C-3.1
	Depth: 28-30 ft	Sample Type: Intact	Elevation: ---
	Description: Moist, grayish brown silty sand		
	Remarks:		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek	Location: Atlanta, GA	Project No.: GTX-301589
Boring No.: B-4A	Tested By: mcm	Checked By: njh
Sample No.: ---	Test Date: 4/16/14	Depth: 28-30 ft
Test No.: C-3.1	Sample Type: Intact	Elevation: ---

Soil Description: Moist, grayish brown silty sand
Remarks:

Estimated Specific Gravity: 2.75	Liquid Limit: ---	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.15	Plastic Limit: ---	Initial Height: 1.00 in
Final Void Ratio: 0.688	Plasticity Index: ---	Final Height: 0.78 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	a29	RING	a30	a30
Wt. Container + Wet Soil, gm	117.32	156.86	145.72	145.72
Wt. Container + Dry Soil, gm	91.400	119.99	119.99	119.99
Wt. Container, gm	17.090	17.230	17.230	17.230
Wt. Dry Soil, gm	74.310	102.76	102.76	102.76
Water Content, %	34.88	35.88	25.04	25.04
Void Ratio	---	1.15	0.688	---
Degree of Saturation, %	---	85.66	100.00	---
Dry Unit Weight, pcf	---	79.750	101.62	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D2435 - Method B

Project: Intrenchment Creek
Boring No.: B-4A
Sample No.: ---
Test No.: C-3.1

Location: Atlanta, GA
Tested By: mcm
Test Date: 4/16/14
Sample Type: Intact

Project No.: GTX-301589
Checked By: njh
Depth: 28-30 ft
Elevation: ---

Soil Description: Moist, grayish brown silty sand
Remarks:

Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft²/sec	Mv 1/tsf	k cm/sec
1	0.0810	0.003823	1.14	0.382	5.110	4.78e-006	4.72e-002	2.15e-007
2	0.125	0.01283	1.13	1.28	1.110	2.17e-005	2.05e-001	4.23e-006
3	0.250	0.03022	1.09	3.02	0.822	2.86e-005	1.39e-001	3.78e-006
4	0.500	0.04796	1.05	4.80	0.466	4.86e-005	7.10e-002	3.28e-006
5	1.00	0.06927	1.00	6.93	0.403	5.40e-005	4.26e-002	2.19e-006
6	2.00	0.09758	0.941	9.76	0.383	5.38e-005	2.83e-002	1.45e-006
7	4.00	0.1385	0.853	13.8	0.387	4.93e-005	2.04e-002	9.60e-007
8	1.00	0.1293	0.873	12.9	0.356	5.17e-005	3.05e-003	1.50e-007
9	0.250	0.1136	0.907	11.4	0.399	4.75e-005	2.10e-002	9.47e-007
10	0.500	0.1171	0.899	11.7	0.362	5.31e-005	1.39e-002	7.02e-007
11	1.00	0.1232	0.886	12.3	0.359	5.28e-005	1.23e-002	6.19e-007
12	2.00	0.1312	0.869	13.1	0.357	5.24e-005	7.98e-003	3.98e-007
13	4.00	0.1429	0.843	14.3	0.366	4.99e-005	5.86e-003	2.78e-007
14	8.00	0.1974	0.726	19.7	0.382	4.42e-005	1.36e-002	5.72e-007
15	16.0	0.2636	0.584	26.4	0.372	3.91e-005	8.28e-003	3.08e-007
16	4.00	0.2510	0.611	25.1	0.350	3.87e-005	1.05e-003	3.86e-008
17	1.00	0.2358	0.644	23.6	0.368	3.81e-005	5.06e-003	1.84e-007
18	0.250	0.2151	0.688	21.5	0.456	3.23e-005	2.76e-002	8.48e-007

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/sec	Mv 1/tsf	k cm/sec	Ca %
1	0.0810	0.003823	1.14	0.382	0.599	9.48e-006	4.72e-002	4.26e-007	0.00e+000
2	0.125	0.01283	1.12	1.28	0.192	3.92e-005	2.05e-001	5.68e-006	0.00e+000
3	0.250	0.03022	1.09	3.02	0.000	0.00e+000	1.39e-001	0.00e+000	0.00e+000
4	0.500	0.04796	1.05	4.80	0.000	0.00e+000	7.10e-002	0.00e+000	0.00e+000
5	1.00	0.06927	1.00	6.93	0.000	0.00e+000	4.26e-003	0.00e+000	0.00e+000
6	2.00	0.09758	0.941	9.76	0.000	0.00e+000	2.83e-002	0.00e+000	0.00e+000
7	4.00	0.1385	0.853	13.8	0.000	0.00e+000	2.04e-002	0.00e+000	0.00e+000
8	1.00	0.1293	0.873	12.9	0.000	0.00e+000	3.05e-003	0.00e+000	0.00e+000
9	0.250	0.1136	0.907	11.4	0.000	0.00e+000	2.10e-002	0.00e+000	0.00e+000
10	0.500	0.1171	0.899	11.7	0.000	0.00e+000	1.39e-002	0.00e+000	0.00e+000
11	1.00	0.1232	0.886	12.3	0.000	0.00e+000	1.23e-002	0.00e+000	0.00e+000
12	2.00	0.1312	0.869	13.1	0.000	0.00e+000	7.98e-003	0.00e+000	0.00e+000
13	4.00	0.1429	0.843	14.3	0.000	0.00e+000	5.86e-003	0.00e+000	0.00e+000
14	8.00	0.1974	0.726	19.7	0.000	0.00e+000	1.36e-002	0.00e+000	0.00e+000
15	16.0	0.2636	0.584	26.4	0.000	0.00e+000	8.28e-003	0.00e+000	0.00e+000
16	4.00	0.2510	0.611	25.1	0.000	0.00e+000	1.05e-003	0.00e+000	0.00e+000
17	1.00	0.2358	0.644	23.6	0.000	0.00e+000	5.06e-003	0.00e+000	0.00e+000
18	0.250	0.2151	0.688	21.5	0.006	5.84e-004	2.76e-002	1.54e-005	0.00e+000