ADDENDUM NUMBER ONE

ENTERPRISE SOUTH INDUSTRIAL PARK (ESIP)

SANITARY SEWER UPGRADE, PHASE 2

PROJECT:	ESIP Sanitary Sewer Upgrade, Phase II
BWSC JOB NUMBER:	35053-00
OWNER:	City of Chattanooga, Tennessee
ENGINEER:	BARGE, WAGGONER, SUMNER & CANNON, INC. 1110 MARKET STREET, SUITE 200 CHATTANOOGA, TENNESSEE 37402
ADD. NO. 1 ISSUED DATE:	February 21, 2014
BID DATE:	March 20, 2014, 2:00PM LOCAL TIME

ALL BIDS SHALL CONFORM TO THIS ADDENDUM:

This addendum is an amendment to the bid documents for the referenced project, and as such will be made part of the contract documents. Acknowledge receipt of this addendum on the Bid Proposal. Failure to do so may subject the bidder to disqualification.

ITEM 1 The minutes of the Pre-Bid Meeting conducted at the Enterprise South Industrial Park Pump Station site, located at 7141 Discovery Drive, Chattanooga, TN at 10:00 am (local time) on Wednesday, February 19, 2014 are attached and shall be made part of the contract documents.

ITEM 2 The ESIP Pre-Bid Meeting attendee sign-in sheet is attached for the information of all bidders.

ITEM 3 Subsurface investigation report titled "Report of Geotechnical Exploration ESIP Force Main and Gravity Sewer Upgrade Project", dated January 11, 2012, and test boring records at Station 40+00 and 43+50, dated August 15, 2012, are available for review for the information of all bidders. The Owner and Engineer give no guarantee, either expressed or implied, regarding the material to be encountered performing the excavation and earthwork on this project. The bidder is solely responsible for evaluation and interpretation of the information included in the report.

This addendum consists of 72 Pages (including the report listed in Item 3)

CITY OF CHATTANOOGA, TENNESSEE

February 21, 2014
Date

/s/ Lee Norris, Administrator
Department of Public Works

1110 Market Street, Suite 200
Chattanooga, TN 37402
423.756.3025
423.756.8477
bargewaggoner.com

BWSC | Barge Waggoner Sumner & Cannon, Inc.

MEETING NOTES

Date of Meeting: 2/19/2014

Project: ESIP Sanitary Sewer Upgrade – Phase 2

Meeting Location: ESIP Pump Station, 7141 Discovery Drive

BWSC File No.: 35053-00

PARTICIPANTS: Please see attached sign-in attendance sheet

Copy to: Russell Moorehead, Dennis Malone, Bonnie Dodson, Ronald Simmons, Mike Marino, Chris Palmer, Fort Meggs, Andrew Clark, Audra Kelly, Chelle Whitmire-Reno, Alice Cannella, Mike Patrick, Deb Talley.

ITEMS DISCUSSED:

1. The meeting commenced at approximately 10:10 am.
2. Pre-bid meeting agenda and Sign in Sheet provided to all attendees.
3. Project team introduction by Russell Moorehead:
    a. Russell Moorehead, BWSC – Project Manager
    b. Andrew Clark, BWSC – Pump Station Engineer
    c. Rozh Ameen, BWSC – Civil Engineer
    d. Fort Meggs, BWSC – Electrical Designer
    e. Alice Cannella, City of Chattanooga – Project Owner
    f. Mike Patrick, City of Chattanooga – Project Owner
    g. Dennis Malone, City of Chattanooga – Assistant City Engineer
    h. Ronald Simmons, City of Chattanooga – Project Coordinator
    i. Chelle Whitmire-Reno, Southeast Tennessee Development District
    j. Audra Kelly, Southeast Tennessee Development District
    k. Deb Talley, City of Chattanooga – Purchasing
    l. Bonnie Dodson, City of Chattanooga – Technical Information Center
4. Attendees were provided the opportunity to look at the existing pump station wet well after the meeting, for safety reasons, Russell Moorehead requested only one person at a time on the pump station wet well during site review.
5. Attendees were instructed to submit Request for Information (RFI) regarding the project construction plans and specifications to City of Chattanooga Purchasing Department.

6. Bid date is March 20th, 2014 at 2:00 PM. Deadline for submittals of RFI's is March 13th, 2014 (5 days prior to bid date per contract).
7. Brief Project Description – Russell Moorehead reviewed project highlights:
    a. The purpose of this project is to provide additional interim capacity through existing 6" force main and ultimate capacity of 4 mgpd through new force main and gravity sewer.
    b. Limited sewer flow control in pump station.
    c. VW Parshall Flume elevation is ±709. Contractor to be aware and make provisions not to flood the existing flume.
    d. Fort Meggs: There will be a power outage for the change of electrical service (including replacement of the pad mounted transformer serving the site) to the site by EPB. The contractor is to coordinate the outage with EPB and inform the City of Chattanooga in advance of the power outage. The contractor is responsible for temporary power and pumping as required to keep the pump station in operation during the power outage. The contractor is to coordinate with EPB to make the necessary arrangements for the connection of the new power service.
    e. Fort Meggs: The contractors are instructed to review the phasing requirements for electrical work as detailed in the "SEQUENCE OF ELECTRICAL WORK" on drawing E1.03. The contractor is responsible for costs associated with mobilization and demobilization for each phase. The City of Chattanooga will not approve extras or Change Orders for work associated with performing multiple mobilization, startups or other tasks associated with the CONDITIONS 1, 2, and 3 as described on drawing E1.03 and elsewhere in the contract documents.
    f. Discussion regarding critical elevations on gravity sewer on Woodland Park Baptist Church Site at Plantation Pipeline Crossing. There is approximately 1.1 ft of cover between the top of proposed gravity sewer and bottom of existing Plantation Pipeline. The first 2500 LF of gravity sewer installation is critical to achieve the required designed clearance.
    g. Discussion regarding Pavestone lot at rear of Bonnyshire Industrial Park: Contractor to minimize impacts of the existing concrete pavers in the existing parking lot. Upon completion of pipe installation, contractor shall replace the pavers in the parking lot to the original lines and grades. Replacement of display area is not required.
8. Funding agency requirements by Chelle Whitmire-Reno: State Revolving Fund (SRF), and The U.S. Department of Commerce Economic Development Administration (EDA)
    a. Contractor shall submit certified payroll.
    b. Contractor will be required to pay employees weekly.

c. Wage rates will be checked 10 days prior to bidding. If it is determined that wages have been updated, plan holders will be notified via addendum.
d. Funding agency requirements also apply to subcontractors. Primary contractor is responsible for labor.
e. Completion time is 270 days (substantial completion) in order to meet hard deadline established by EDA grant.

9. Contractors are advised to carefully review Section 01015 "Sequence of Work" of the contract specifications. Contractor pricing should include all requirements set forth in the referenced section of the contract specifications.
10. Instruction to Bidders by Deb Talley: Contractors are advised to carefully review Section 00200 "Instruction to Bidders". Contractor identification form shall be completed. Contractors must list all sub-contractors on the outside of the bid envelope. Form has been provided in contract documents for this purpose. Contractors to include one copy inside the bid package and one copy outside of the bid package. Contractors are advised to fill in all blanks, place "NA" in blanks intentionally left blank.
11. Questions/Comments:
    a. Question: Blasting Allowed?
    Answer: If a contractor deems necessary to perform blasting, contractor is responsible to obtain the appropriate blasting permits. Geotechnical Report will be provided via Addendum No. 1.

    b. Question: Permitting Requirements?
    Answer: All Railroad, Plantation Pipeline, and TDEC NOC permits have been obtained. Contractor will need to sign NOC. Contractor is responsible to obtained building permits, land disturbing permits, and street cut permit, including associated fees. Contractor is also responsible for any inspection fees. The Rail Road, Plantation Pipeline, and Colonial Pipeline approvals are included in the project contract specification/manual.

    c. Question: Railroad insurance and flaggers?
    Answer: Contractors are responsible for associated fees and should be included in contractors bid pricing.

    d. Question: Easement requirements?
    Answer: All easement have been acquired.

    e. Question: Existing ESIP pump station capacity?
    Answer: 400,000.00 gpd

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f. Question: Church Access?
Answer: Contractors responsible to coordinate with church to acquire additional access authorization if different from access shown on the plans.

g. Question: Will traffic control plan be required?
Answer: Traffic control will be required. Contractor to provide traffic control plans, and submit to City of Chattanooga for review and approval.

h. Question: Vincent Bayles of Morgan Contracting asked the following question during the site inspection phase of the ESIP Pump Station Prebid Meeting: "Are there any special items or special requirements in the contract documents?"
Answer: The contractor is responsible for reviewing the plans, specifications, and project site to fully familiarize himself with the project requirements prior to preparing and submitting his bid.

i. Question: Purpose of pump station upgrade?
Answer: To accommodate additional flows, including but not limited to potential expansion of VW plant, and Amazon facility holiday season employee population.

j. Question: Carey Davis of Water & Waste Equipment asked the following question during the site inspection phase of the ESIP Pump Station Prebid Meeting: "Where to pick up construction plans and specifications?"
Answer: Contract documents can be obtained at City of Chattanooga, Purchasing Department. 101 E. 11th Street, Suite G13, Chattanooga, TN 37402, Phone (423)757-5189, Fax (423)757-0949.

12. Pump station tour and site review by attendees on their own.

These notes represent my understanding of items discussed and conclusions reached. Participants are requested to review these items and advise of necessary corrections or revisions.

Signed: ______________________ **Date:** 02/21/2014
Rozh Ameen, PE

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NAME Adams and Sons, Inc. COMPANY RICK ADAMS ADDRESS P.O. BOX 5407 CITY, STATE ZIP Sevierville, TN 37864	TELEPHONE: MOBILE NUMBER: EMAIL ADDRESS: FAX:
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NAME MIKE PATRICK COMPANY CITY OF CHATTANOOGA ADDRESS CITY, STATE ZIP	TELEPHONE: MOBILE NUMBER: EMAIL ADDRESS: FAX:
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ESIP Sanitary Sewer Upgrade, Phase 2 Contract No. W-10-005
Chattanooga, Tennessee
PRE-BID MEETING: February 19, 2014 @ 10:00AM
ESIP Pump Station, 7141 Discovery Drive

PRE-BID SIGN-IN SHEET

NAME COMPANY ADDRESS CITY, STATE ZIP	TELEPHONE NUMBER MOBILE NUMBER EMAIL ADDRESS FAX NUMBER
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REPORT OF
GEOTECHNICAL EXPLORATION

ESIP Force Main and Gravity Sewer Upgrade Project
Chattanooga, Tennessee
S&ME Project No. 1811-11-210

Prepared For:

Barge, Waggoner, Sumner and Cannon
1110 Market Street, Suite 200
Chattanooga, Tennessee 37402

Prepared By:

S&ME

4291 Highway 58, Suite 101
Chattanooga, Tennessee 37416

January 11, 2012

S&ME

January 11, 2012

Barge, Waggoner, Sumner and Cannon
1110 Market Street, Suite 200
Chattanooga, Tennessee 37402

Attention: Mr. Russell D. Moorehead, PE, LEED

Reference: Report of Geotechnical Exploration
ESIP Force Main and Gravity Sewer Upgrade Project
Chattanooga, Tennessee
S&ME Project No. 1811-11-210

Dear Mr. Moorehead

This report presents the results of the geotechnical exploration for the ESIP Force Main and Gravity Sewer Upgrade Project site in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal No. 1111247, dated October 24, 2011.

This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations. S&ME appreciates this opportunity to be of service to you. Please call if you have questions concerning this report or any of our services.

Respectfully submitted,

S&ME, Inc.

Drew Reed, EI
Staff Professional

James P. McGirl, PE
Senior Engineer

JAMES P. McGIRL REGISTERED ENGINEER AGRICULTURE COMMERCE No. 00021591 STATE OF TENNESSEE

Table of Contents

Appendices

EXECUTIVE SUMMARY

This summary is presented for the convenience of the reader. The full report text should be studied and understood before preparing an estimation of quantities or preparing designs based on this report, as it contains important information and recommendations that are not included in this brief summary.

1. The geotechnical exploration included drilling and sampling of 29 soil test borings. The samples collected during our exploration were returned to our Chattanooga laboratory where they were further evaluated by a professional engineer.

2. Natural moisture content and Atterberg Limits laboratory tests were performed on selected samples to aid our soil classification and to evaluate the on-site soil's volume change potential. In addition, an unconfined compression test was performed on a relatively undisturbed sample to support our temporary slope evaluation.

3. Subsurface conditions generally consisted of fill, alluvium, or residuum to boring termination or auger refusal depths. These soils generally consisted of soft to stiff silty clay.

4. Planned boring depths were determined based on the provided sewer main profiles and borings were advanced to a depth just below the planned depth of the sewer main. Auger refusal was encountered in 6 of the 29 borings at depths ranging from about 7.8 to 12.8 feet below the existing ground surface. Auger refusal was not encountered in the borings drilled beyond Station 35+20 of the gravity fed portion of the sewer alignment and no borings in the force main section of the sewer alignment encountered auger refusal. The remaining borings were terminated at their predetermined depths ranging from about 10 to 15 feet below the existing ground surface.

5. Groundwater was encountered in the borings drilled between Stations 1+75 and 75+00 of the gravity fed portion of the sewer main at depths ranging from about 1.6 to 8.2 feet below the existing ground surface at the time of drilling. Groundwater was encountered at Station 40+55 of the force main at a depth of about 11.2 feet below the existing ground surface at the time of drilling. Groundwater control will be necessary during construction, particularly during the construction of the gravity fed portion of the alignment.

6. Rock excavation will be required to construct the gravity portion of the sewer. The rock will require a hoe ram or blasting to excavate.

7. The planned alignment is believed to be suitable for the proposed construction provided that necessary steps are taken during planning and construction. This includes groundwater control, rock excavation and side wall stability control.

8. In general, the on-site fill soils are acceptable for use as trench backfill. However, laboratory testing at the time of construction should be performed to provide data for the evaluation of compaction.

9 Based on our review of samples obtained during our subsurface exploration and laboratory test results, a maximum temporary slope of 1.5H:1V should be used to estimate excavation quantities. However, in the gravity portion of the sewer alignment, a trench box will also be required due to soft soil conditions and an elevated groundwater table.

1.0 INTRODUCTION

S&ME, Inc. has completed the geotechnical exploration at the ESIP Force Main and Gravity Sewer project in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal Number 1111247 dated October 24, 2011. Our services were authorized by Mr. Matthew Stovall of BWSC on November 15, 2011.

The purpose of our work was to explore the subsurface soil conditions and groundwater level, provide soil and rock slope excavation recommendations, and provide applicable earthwork recommendations. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations relative to the above considerations.

The scope of our geotechnical services did not include an environmental assessment for evaluating the presence or absence of wetlands, or hazardous or toxic materials. Design of mechanically stabilized earth walls or other retaining walls and a detailed slope stability was also outside the scope of our services.

A Site Location Plan, Boring Location Plan, and a Subsurface Boring Profile are included in Appendix I. The Test Boring Records, a discussion of the field investigative procedures, and a legend of soil classification and symbols are included in Appendix II. Appendix III contains a discussion of the laboratory testing procedures and the laboratory test results. Appendix IV contains a document titled "Important Information About Your Geotechnical Engineering Report".

2.0 SITE AND PROJECT DESCRIPTION

Our understanding of the project is based on project information provided to us by Mr. Moorehead in the form of preliminary drawings C5.03, C5.05, C5.09, C5.10, C5.12, and a CAD file depicting the sewer main alignment. In addition, we visited the project site with Mr. Moorehead to review existing site conditions.

2.1 Site Description

The ground surface of the planned alignment of the gravity sewer main begins at an elevation of about 677 feet and gently slopes upward to an elevation of about 705 feet over a run of about 8,000 feet. The force main begins at an elevation of about 705 feet and climbs to an elevation of about 778 feet before dropping back down to an elevation of about 715 feet.

The terrain along the gravity fed portion of the sewer line is varied and begins in a marshy area near Standifer Gap Road and then heads northeast along a grass covered field. The alignment then heads north, across a railroad and along Bonnyshire Drive behind several commercial businesses before crossing Bonny Oaks Drive. The alignment then heads north through a heavily wooded area operated by the Hamilton County Railroad Authority and terminates near Station 85+00. The force main begins at this point, turning east across the ESIP rail yard and heading southeast along the north side of Discovery Drive before terminating near Station 51+73. Discovery Drive is occupied on both sides by several industries and a fire house.

2.2 Project Description

S&ME, Inc. has reviewed the preliminary drawings C5.03, C5.05, C5.09, C5.10, C5.12, and a CAD file depicting the sewer main alignment. We understand the proposed project will consist of about 8,500 feet of gravity fed sewer main and about 5,200 feet of force sewer main. Several drives, railroads and utility crossings will be intersected by the planned alignment. We understand that existing drives and railroads will be crossed utilizing horizontal drilling and steel casings. The remaining alignment will be constructed by excavating trenches with sloped sides and benches and backfilling over the newly placed sewer main with the excavated soil. The depth of the excavation required to construct the sewer main ranges from about 20 feet to less than 10 feet below the existing ground surface.

3.0 REGIONAL GEOLOGY

Chattanooga, Tennessee is located in the Valley and Ridge Physiographic Province. Elongated ridges that trend in a northeast-southwest direction characterize this province. The ridges are typically formed on highly resistant sandstones and shales, while the valleys and rolling hills are on less resistant limestone, dolomite, and shales.

Based on our review of the Geologic Map of the East Chattanooga Quadrangle, dated 1989, and prepared by the State of Tennessee Department of Conservation Division of Geology, the area is underlain by three geologic formations, two belonging to the Conasauga Group and one belonging to the Knox Group. In addition, much of the alignment is underlain by alluvial soil deposited by the flooding of the Tennessee River and South Chickamauga Creek. The geology beneath the alluvial deposits is not mapped. The following paragraphs provide the approximate sewer alignment station numbers of the mapped contacts between the geologic formations and alluvial deposits. These contact locations can also be found on the Subsurface Profile Plans found in Appendix I.

From Station 0+00 to Station 73+00 of the gravity flow portion of the sewer main, alluvial deposits consisting of yellow-brown and red-brown clay, silt, sand and gravel are mapped to underlie the alignment. The alluvial deposits are associated with the Tennessee River and the South Chickamauga Creek flood plains.

From Station 73+00 of the gravity flow portion of the sewer main to Station 2+75 of the force main, and from Station 44+00 to the end of the force main alignment near Station 51+73, the site is mapped to be underlain by the bedrock of the Conasauga Shale. The Conasauga Shale is composed of light brown and green shales as well as zones of medium gray dolomitic limestone. Residual soils derived from the Conasauga Shale are typically brown to yellow-brown clayey silts and silty clays. The strata of the Conasauga Shale weather to form a thin overburden typically less than 20 feet thick.

From Station 2+75 to Station 8+50 and from Station 41+25 to 44+00 of the force main, the alignment is mapped to be underlain by the Maynardville Limestone. Maynardville Limestone consists of medium to dark bluish gray, nodular limestone with a faint asphaltic odor when broken. The strata of the Maynardville Limestone weathers to form a silty clay overburden typically less than 20 feet thick.

From Station 8+50 to Station 41+25 of the force main, the alignment is mapped to be underlain by the Cambrian-age Copper Ridge Dolomite formation. At about 1000 feet thick, the Copper Ridge is a relatively thick formation of medium- to dark-gray, fine- to coarsely-crystalline dolomite. It is relatively well-bedded with medium to thick beds. The formation typically contains dark masses of chert in layers or thin nodules. During weathering, the Copper Ridge produces large quantities of tough, irregularly shaped, dark chert fragments and nodules and layers. The chert masses may form hills or ridges and are frequently layered. The strata of the Knox formations weather to form a thick cherty overburden typically in excess of 40 feet thick.

Limestone and dolomite, such as the strata underlying this site, are of great geologic age and have been subject to solution weathering over geologic time. Rainwater falling onto the surface and percolating downward through the soil and into cracks and fissures gradually dissolves the rock, producing insoluble impurities such as chert and clay. Since limestone and dolomite vary greatly in their resistance to weathering, the soil/bedrock contact may be extremely irregular. More soluble bedrock develops a thicker soil cover and a more irregular bedrock surface with pinnacles and slots, and less soluble bedrock usually develops a thinner soil cover and a less irregular soil-bedrock surface.

These large variations in bedrock depth are greatly enhanced by the presence of fractures, bedding planes, and faults, which provide an increased opportunity for a greater influx of percolating water. The weaknesses may form clay-filled cavities or enlarge into caves and may be connected by a network of passageways. If a cave forms close to the bedrock surface, its roof may collapse and the overlying soils may erode into the cave. Once the weight of the overlying soil exceeds the soil's arching strength, the soil collapses and an open hole or depression may appear at the ground surface. Such a feature is termed a sinkhole.

There is always some risk associated with developing any site underlain by carbonate bedrock. However, the test borings drilled along the sewer main alignment did not encounter open voids or other signs of incipient sinkhole conditions. We have reviewed the USGS quadrangle map for this area. The map does not show a pattern of closed depressions that would indicate past sinkhole activity in near proximity to the site. However, we have personal knowledge of the formation and repair of three sinkholes in near proximity to the sewer alignment. It is our opinion this project does present an increased risk for sinkhole development, particularly in the vicinity of Bonny Oaks Drive.

4.0 SUBSURFACE CONDITIONS

4.1 Field Exploration Procedures

The procedures used by S&ME, Inc. for field sampling and testing are in general accordance with ASTM procedures and established engineering practice in the State of Tennessee. Appendix II contains brief descriptions of the procedures used in this exploration.

S&ME, Inc. drilled 29 soil test borings to obtain subsurface information along the project alignment. We proposed to drill 33 borings, but an access agreement to four of the boring location could not be obtained. Members of our engineering staff established the boring locations in the field using a hand held GPS unit (Trimble GeoExplorer 2008 Series – GeoXT) with the Boring Location Plan georeferenced onto the visual display. Boring elevations were obtained by superimposing boring locations onto the provided alignment profiles. The boring locations shown on Figure 2 – Boring Location Plan in Appendix I, and the elevations shown on the Test Boring Records in Appendix II, should be considered approximate.

The borings were advanced using hollow-stem augering techniques coupled with Standard Penetration Test (SPT) sampling. An undisturbed soil sample was also collected from a select depth and location in conjunction with the drilling for subsequent laboratory testing. After each boring was completed, we measured the groundwater level, if present. The borings were then backfilled with auger cuttings before leaving the site.

Our field representative packaged the soil samples in sealed containers, labeled them for identification, and returned them to the Chattanooga office where a geotechnical engineer further examined them. We visually classified the soils according to the Unified Soil Classification System (ASTM D 2488). The resulting soil descriptions are shown on the Test Boring Records in Appendix II. Samples were then selected for laboratory testing. A general description of the subsurface conditions encountered at the test boring locations is provided in the following report sections.

4.2 Soil Stratification

The results of our field testing program are summarized in the following paragraphs, and are shown on the Test Boring Records in Appendix II. These records present our interpretation of the subsurface conditions at specific boring locations at the time of our exploration. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

SURFACE MATERIALS

Surface material consisting of topsoil was encountered in each of the borings with the exception of borings drilled near Station 68+04 of the gravity sewer, borings between Stations 1+37 and 9+90 which were all drilled around the ESIP rail yard, and the boring drilled near Station 20+54. These borings encountered either gravel or asphalt surface materials ranging from about ½ to 1 foot thick. The depth of the topsoil encountered in the borings was generally 2 to 3 inches thick.

FILL

Below the ground cover, existing fill was encountered at each of the borings drilled along the gravity flow portion of the alignment with the exception of the borings drilled near Stations 6+00, 31+00, 65+28, 75+00 and 80+00, and Station 35+00 of the force main portion. The fill along the gravity sewer alignment was encountered to depths ranging from about 3 to 8 feet below the ground surface. The fill along the force main alignment was encountered to depths ranging from about 3 to 12 feet. The fill interval encountered along the entire length of the sewer alignment was typically less than 6 feet thick.

Fill is material that has been transported to its present location by man. The existing fill generally consisted of red-brown to yellow-brown silty clay (CL) with rock fragments and some wood fragments and other organic debris. Standard Penetration Test (SPT) N values in the fill ranged from 4 to 30 blows per foot, indicating a soft to very stiff soil consistency; however, the soil consistency in the fill was typically firm to stiff.

ALLUVIUM

Alluvial soils were encountered in each of the borings drilled along the gravity sewer alignment between Stations 1+75 and 49+67. Alluvial soil has been transported to its present location by flowing water. The alluvial soils encountered at the site typically consisted of red-brown, yellow-brown, olive or gray silty clay (CL) or sandy silt (ML). Standard Penetration Test (SPT) N values in the alluvium ranged from the drilling tools advancing under their own weight to greater than 50 blows per foot, but were typically less than 10 blows per foot, indicating a soft to stiff soil consistency.

RESIDUUM

Residual soils were encountered below the surface materials, fill or alluvial soils in each of the test borings except at Station 35+20 to auger refusal or boring termination. Boring 35+20 did not penetrate the fill before encountering auger refusal at a depth of 12.8 feet. Residual soil forms from the in-place weathering of the underlying bedrock. The residual soils encountered at the site typically consisted of red-brown to yellow-brown silty clay with chert fragments. Standard Penetration Test (SPT) N values in the residuum ranged from 4 to 17 blows per foot, indicating a soft to very stiff soil consistency.

AUGER REFUSAL OR BORING TERMINATION

Auger refusal was encountered in borings drilled near the beginning of the gravity sewer alignment at Stations 1+75, 11+00, 16+00, 26+00, 31+00 and 35+20. The depth of auger refusal ranged from about 7.8 to 12.8 feet below the existing ground surface. The remaining borings were terminated at a predetermined depth of either 10 or 15 feet.

4.3 Water Levels

The boreholes were observed for the presence of groundwater at the termination of boring. Groundwater was encountered in the borings drilled between Stations 1+75 and 75+00 of the gravity flow portion of the sewer main at depths ranging from about 1.6 to 8.2 feet below the existing ground surface at the time of drilling. Groundwater was encountered at Station 40+55 of the force main at a depth of about 11.2 feet below the existing ground surface at the time of drilling. We backfilled the boreholes shortly after completion due to safety concerns, and therefore delayed groundwater level measurements were not obtained. It should be noted that groundwater levels can fluctuate with seasonal, climatic, and environmental changes. Further, groundwater may be encountered at depths different from those identified in our borings at some future time.

5.0 LABORATORY TESTING

Laboratory tests were performed on representative split-spoon samples obtained during the field exploration phase of this project. We conducted moisture content and Atterberg Limits tests on selected samples to aid our classification and to evaluate the relative volume change potential of on-site soils. The resulting soil descriptions are shown on the Test Boring Records in Appendix II.

In addition to the index property testing, an unconfined compressive strength test was performed on an undisturbed sample obtained in conjunction with the drilling. The laboratory test results and a brief description of the laboratory test procedures are presented in Appendix III.

6.0 ASSESSMENT

On the basis of this geotechnical exploration, we conclude that this site is suitable for the proposed construction. In order to develop and adapt this site, a few items should be addressed during the planning, design, and construction phases of the project.

Planning should anticipate the need for difficult excavation techniques in the gravity flow portion of the sewer alignment. Boring refusal was encountered in borings drilled south of the railroad tracks prior to about Station 35+20 at an elevation above the bottom of the sewer main. In general, we estimate about one to five feet of rock excavation will be required to achieve the design slope. We recommend the rock be undercut to a depth of at least ½ foot below the pipe invert elevation to allow for the placement of pipe bedding material. In addition, the area south of the railroad tracks is characterized by a shallow water table which will cause some construction difficulties. Dewatering by pumping from sumps will be required.

Soft soils were encountered in several of the borings at the probable bearing elevation. Undercutting of soft soils or widening of the trench in some areas should be expected based on the pipe manufacturer's requirements.

It is our opinion sinkhole activity, particularly in the vicinity of Bonny Oaks, is a project concern. We recommend thorough review of the trench bottom and side walls for the presence of voids or drop-out that could indicate sinkhole activity. Based on this review, a course of action can be developed to evaluate and repair the sinkhole should conditions dictate.

7.0 DESIGN RECOMMENDATIONS

7.1 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based on applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and recommendations submitted herein are based, in part, on the data obtained from the subsurface exploration. The nature and the extent of variations between the widely-spaced borings will not become evident until the time of construction. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event any changes in the nature, overall design, or finished floor elevations, grades, structural loads, or location of the building or parking areas are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions verified or modified in writing.

We recommend S&ME be provided the opportunity to review the final design plans and specifications in order that earthwork and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME, Inc.'s observation and monitoring of grading and construction activities.

7.2 Groundwater

Based on the test boring results, we expect that groundwater will present significant site development difficulties, particularly for the gravity flow portion of the sewer alignment. Groundwater was encountered from the beginning of the gravity flow alignment to Station 75+00 at depths ranging from about 1.6 to 8.2 feet below the ground surface at the time of drilling. Pumping from sumps and discharging the water downhill from the excavation should be effective in dewatering the excavation during construction. We recommend the gravity portion of the sewer line be constructed from the south to the north end. By constructing the trench in this manner, the contractor will only have to contend with the groundwater associated with the specific excavation, not the groundwater flowing from higher ground through the pipe backfill.

7.3 Temporary Excavation Slopes

Based on laboratory test results, OSHA requires that a maximum slope of 1.5H:1V be used during excavations. We recommend that this slope be used to estimate excavation quantities. However, due to the soft soils and the shallow water table encountered from the beginning of the gravity sewer alignment to about Station 75+00, we expect sloughing of the benched or sloped side walls of the excavation. Therefore, we recommend that a trench boxes be used at all times in the area between Station 0+00 and 75+00 of the gravity sewer while personnel are required to be in an open excavation.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 Site Preparation

The test boring data indicated that the probable bearing elevation at some of the boring locations consists of soft, saturated soils. Therefore, it may be necessary to undercut soft soils and backfill with 57 stone or flowable fill. The amount of undercut required at specific locations should be based on the pipe manufacturer's requirements and determined by the geotechnical engineer at the time of trench excavation.

8.2 Difficult Excavation

Based on the boring data obtained during the exploration, we expect material requiring difficult excavation techniques will be encountered during construction. In trench excavations, removal of weathered rock typically requires the use of large backhoes, pneumatic spades, or blasting. The difficulty of excavation will depend on the composition of the rock, the location and orientation of discontinuities and bedding, and the skill of the equipment operator. Given the quantity of rock that will likely need to be excavated for this project, we believe the most cost effective method for rock excavation will be to use a large backhoe equipped with a hoe ram.

The rocky material resulting from the excavation may be used in the deeper areas as backfill. Rock or weathered rock placed in non-structural areas should be well-choked with soil fill and compacted. Soil/rock fill should be capped with a minimum of 3 feet of clean compacted soil fill.

8.3 Fill Placement

MATERIALS

Fill soils should have a standard Proctor maximum dry density greater than 90 pounds per cubic foot. The fill should contain no rock fragments larger than 4 inches in any dimension, and no organic matter. The on-site soils are generally acceptable for use as trench backfill provided they are not too wet to compact.

Soil fill operations should not begin until representative samples of proposed fill soils are collected and tested. The test results will be used to assess whether the proposed fill material meets the previously discussed criteria. Please allow at least 3 to 5 days for testing before the fill operations begin.

We recommend compacted aggregate such as ASTM D 448 No. 57 or No. 67 stone can be used as backfill to the pipe spring line. We recommend this particular aggregate be used as backfill because it is relatively easy to compact, durable, and can be placed in the presence of water. We recommend observation of compacted aggregate placement by our engineering technician to determine the maximum lift thickness and compaction method necessary to obtain suitable compaction.

COMPACTION

Fill should be placed in thin lifts with a maximum loose thickness of 4 inches, then compacted to 95 percent of the standard Proctor maximum dry density, with a moisture content within 3 percent of the optimum moisture content, depending on the shape of the Proctor curve. Wetting or drying of these soils may be required depending on the time of year construction is performed. A representative of S&ME should test the density and moisture content of each lift before placing additional lifts.

We recommend that fill placements be observed by one of S&ME's qualified soils technicians on a full time basis. Frequent fill density and moisture tests should be performed to evaluate that the specified degree of compaction is being achieved. However, the actual testing frequency should be determined by the geotechnical engineer based on the type of soil being placed, the equipment being used, and the time of year the fill is being placed. More frequent testing should be performed in confined areas. Any areas that do not meet the compaction specification should be re-compacted to achieve compliance.

8.4 Drainage and Runoff Concerns

In the Tennessee Valley Region, frequent and sometimes substantial rainfalls occur from November through May. These rainy months can greatly influence the cost and schedule of construction projects, particularly earthwork and work in confined excavations. The clay soils present at the site will be difficult to work in periods of wet weather.

The contractor should be prepared to provide adequate methods to control the infiltration of surface water into open excavations. We recommend grading surrounding areas where runoff may enter the excavation to divert surface runoff away. Water that collects in excavations should be removed as soon as possible to prevent softening the subgrade soils. Excavated areas should be sloped toward one point to facilitate removal of any collected rainwater or surface runoff.

9.0 FOLLOW-UP SERVICES

Our services should not end with the submission of this geotechnical report. S&ME should be kept involved throughout the design and construction process to maintain continuity and to determine if our recommendations are properly interpreted and implemented. To achieve this, we should review project plans and specifications with the designers to see that our recommendations are fully incorporated and have not been misinterpreted. We also should be retained by the owner to monitor and test soil backfill during construction and to evaluate the excavation for the presence of sinkholes or sinkhole associated soil conditions.

S&ME's familiarity with the site makes us a valuable part of your construction quality assurance team. S&ME recommends that we be retained by the owner on a full time basis to observe earthwork. Our personnel are uniquely qualified to recognize unanticipated ground conditions and can offer responsive remedial recommendations should these unanticipated conditions occur.

APPENDIX I

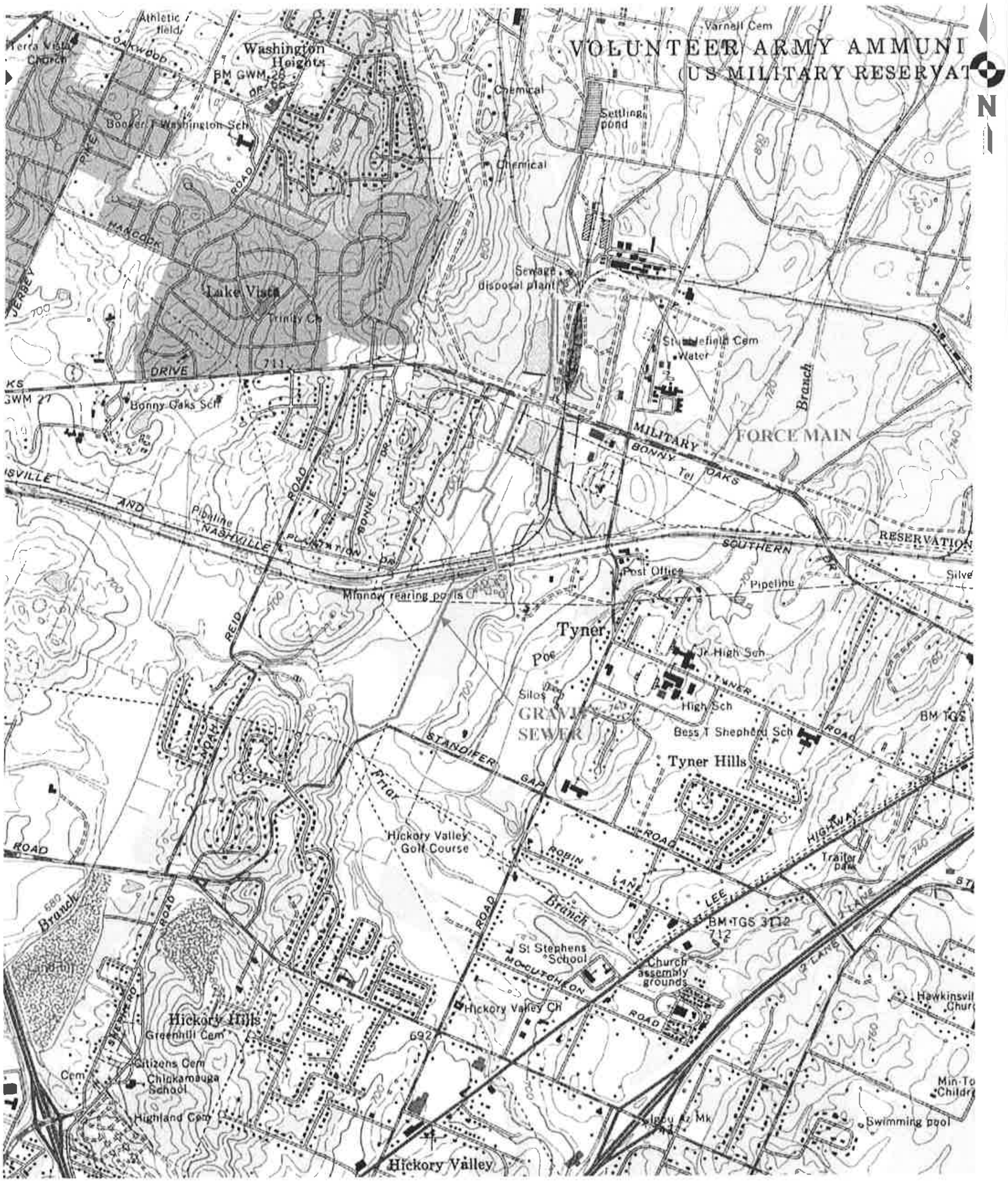
Figure 1 - Site Location Plan

Figure 2 - Boring Location Plan - Gravity Sewer Main

Figure 3 - Boring Location Plan - Force Main

Figure 4 – Subsurface Profile - Gravity Sewer Main

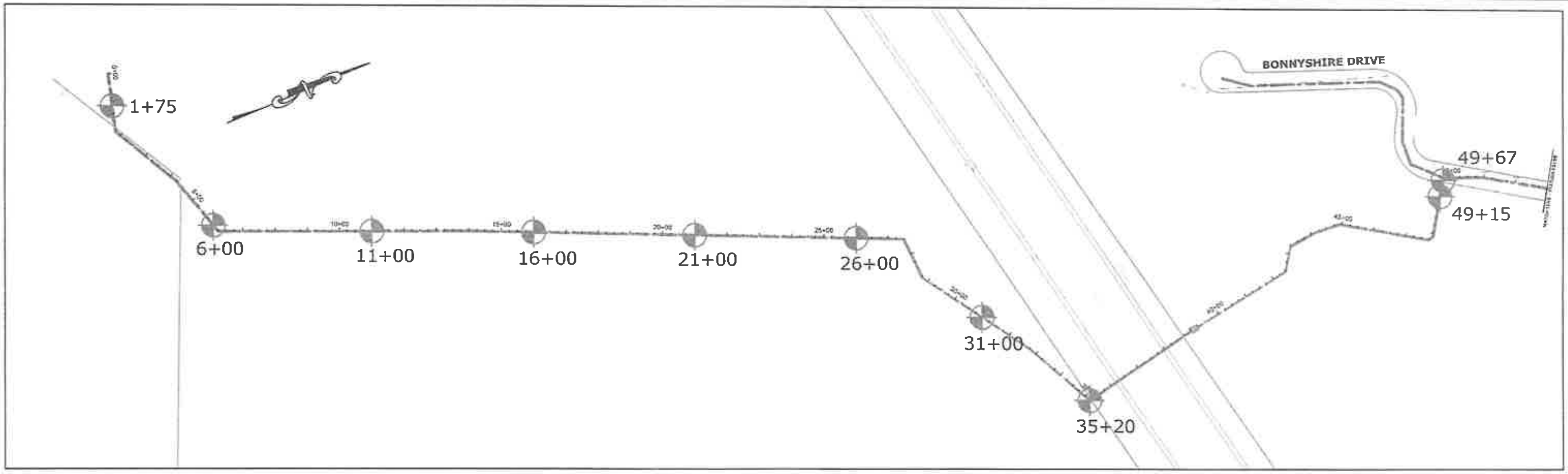
Figure 5 – Subsurface Profile - Force Main

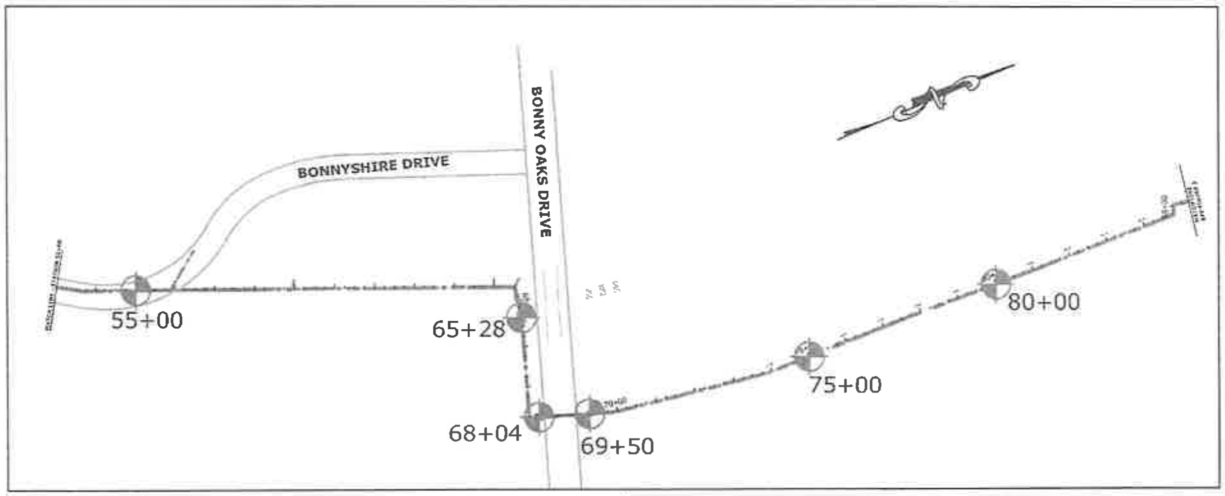


—— - Gravity Sewer
- Force Main

SOURCE: USGS 7.5 Minute Topographic Map — EAST CHATTANOOGA, TENNESSEE (1976)
DRAWING FOR ILLUSTRATION PURPOSES ONLY

S&ME	SITE LOCATION PLAN ESIP GRAVITY SEWER AND FORCE MAIN CHATTANOOGA, TENNESSEE	**HORIZONTAL SCALE:**	1"=2000'	**VERTICAL SCALE:**	NA
		DRAWN BY:	DR	**CHECKED BY:**	JPM
	JOB NUMBER: 1811-11-210	**DATE:**	1/6/2012	**FIGURE:**	1



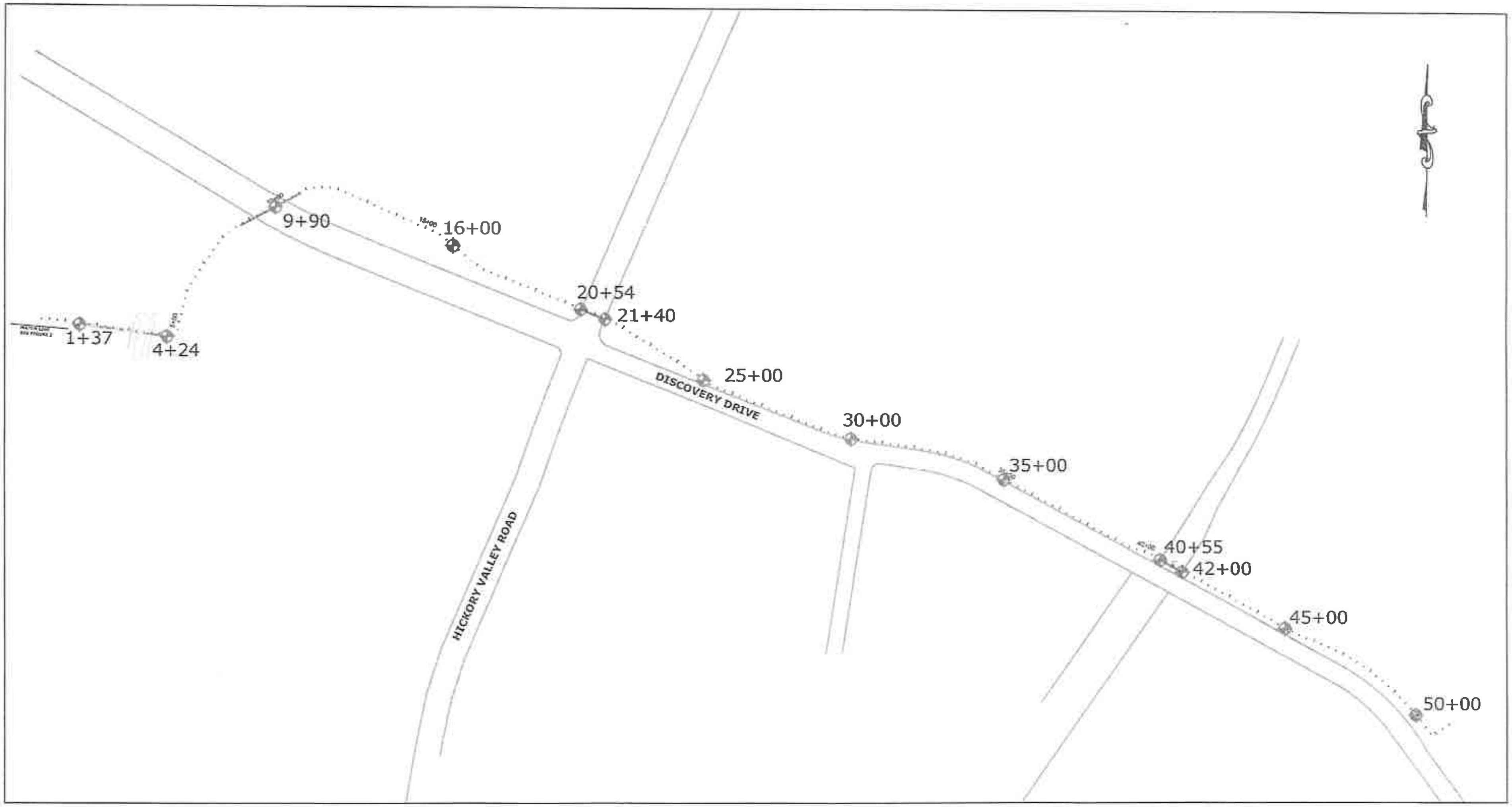


LEGEND

- APPROXIMATE BORING LOCATION

S&ME

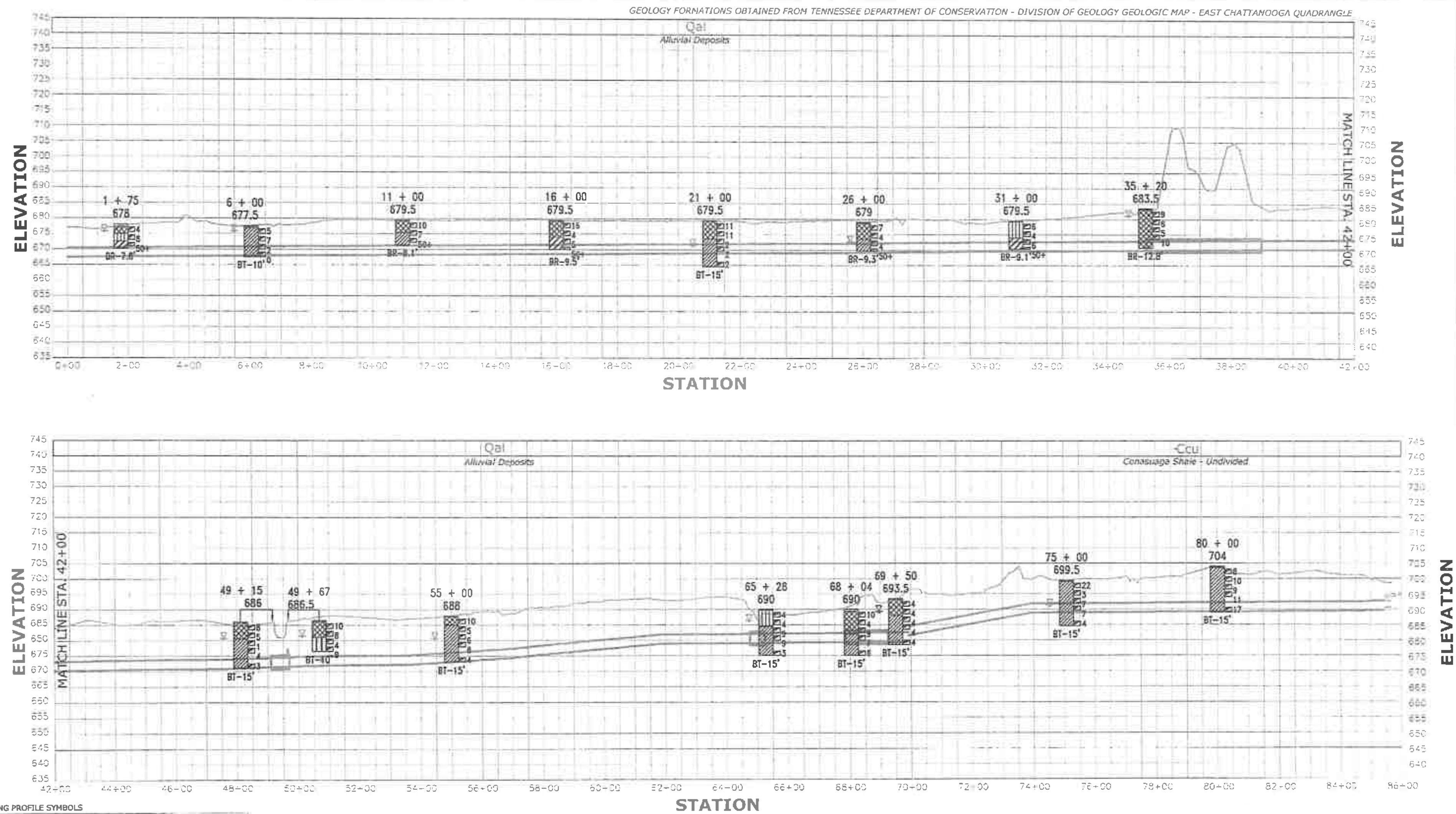
BORING LOCATION PLAN - GRAVITY FLOW **ESIP GRAVITY & FORCE SEWER MAIN** **CHATTANOOGA, TENNESSEE**	**HORIZONTAL SCALE:** 1"=300'	**VERTICAL SCALE:** NA
	DRAWN BY: DR	**CHECKED BY:** JPM
JOB NUMBER: 1811-11-210	**DATE:** 1/5/2012	**FIGURE:** 2

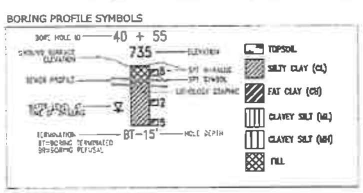


LEGEND

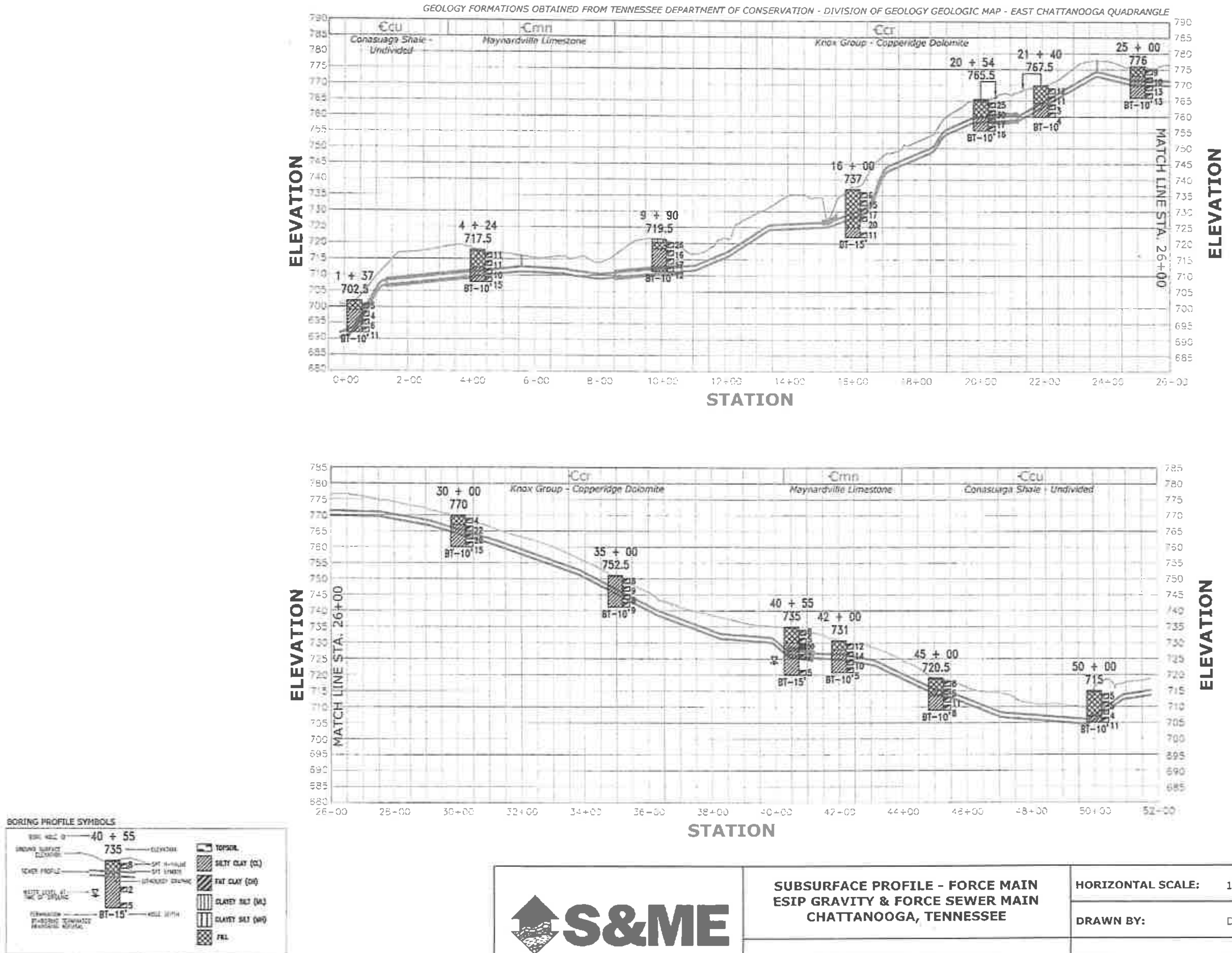
- APPROXIMATE BORING LOCATION

S&ME	BORING LOCATION PLAN - FORCE MAIN ESIP GRAVITY & FORCE SEWER MAIN CHATTANOOGA, TENNESSEE	HORIZONTAL SCALE:	1"=300'	VERTICAL SCALE:	NA
		DRAWN BY:	DR	CHECKED BY:	JPM
	JOB NUMBER: 1811-11-210	DATE:	1/5/2012	FIGURE:	3





S&ME	SUBSURFACE PROFILE - GRAVITY FLOW ESIP GRAVITY & FORCE SEWER MAIN CHATTANOOGA, TENNESSEE	HORIZONTAL SCALE: 1"=300'	VERTICAL SCALE: 1"=30'
		DRAWN BY: DR	CHECKED BY: JPM
	JOB NUMBER: 1811-11-210	DATE: 1/5/2012	FIGURE: 4



SUBSURFACE PROFILE - FORCE MAIN ESIP GRAVITY & FORCE SEWER MAIN CHATTANOOGA, TENNESSEE	HORIZONTAL SCALE: 1"=300'	VERTICAL SCALE: 1"=30'
S&ME	DRAWN BY: DR	CHECKED BY: JPM
JOB NUMBER: 1811-11-210	DATE: 1/5/2012	FIGURE: 5

APPENDIX II

Field Exploration Procedures

Test Boring Record Legend

Test Boring Records

LABORATORY EXPLORATIONPROCEDURES

HOLLOW STEM AUGERING PROCEDURES
WITH STANDARD PENETRATION RESISTANCE TESTING
ASTM D 1586

The borings were advanced using auger drilling techniques. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-tube sampler. The sampler was initially seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the standard penetration resistance. Standard penetration resistance, when properly evaluated, is an index to the soil's strength and density. The criteria used during this exploration are presented on the Test Boring Record Legend.

Representative portions of the soil samples, thus obtained, were placed in sealed containers and transported to the laboratory. The engineer selected samples for laboratory testing. The Test Boring Records in this Appendix provide the soil descriptions and penetration resistances.

Soil drilling and sampling equipment may not be capable of penetrating hard cemented soils, thin rock seams, large boulders, waste materials, weathered rock, or sound continuous rock. Refusal is the term applied to materials that cannot be penetrated with soil drilling equipment or where the standard penetration resistance exceeds 100 blows per foot. Core drilling is needed to determine the character and continuity of the refusal materials.

UNDISTURBED SAMPLING PROCEDURES
ASTM D 1587

Relatively undisturbed samples were obtained for laboratory testing. A 3-inch O.D., 16-gauge, steel tube was slowly and uniformly pushed into the soil at the desired sampling level. The tube was then removed from the ground and the encased soil was sealed at the ends to prevent loss of moisture. The depth at which undisturbed samples were taken is indicated on the Test Boring Records.

TEST BORING/PIT RECORD LEGEND

FINE AND COARSE GRAINED SOIL INFORMATION

COARSE GRAINED SOILS (SANDS & GRAVELS)

N	Relative Density
0-4	Very Loose
5-10	Loose
11-20	Firm
21-30	Very Firm
31-50	Dense
Over 50	Very Dense

FINE GRAINED SOILS (SILTS & CLAYS)

N	Consistency	Qu, KSF Estimated
0-1	Very Soft	0-0.5
2-4	Soft	0.5-1
5-8	Firm	1-2
9-15	Stiff	2-4
16-30	Very Stiff	4-8
Over 31	Hard	8+

PARTICLE SIZE

Boulders	Greater than 300 mm (12 in)
Cobbles	75 mm to 300 mm (3 to 12 in)
Gravel	4.74 mm to 75 mm (3/16 to 3 in)
Coarse Sand	2 mm to 4.75 mm
Medium Sand	0.425 mm to 2 mm
Fine Sand	0.075 mm to 0.425 mm
Silts & Clays	Less than 0.075 mm

The **STANDARD PENETRATION TEST** as defined by ASTM D 1586 is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments with a 140 lb. hammer falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The blow counts required to drive the sampler the final two increments are added together and designate the N-value defined in the above tables.

ROCK PROPERTIES

ROCK QUALITY DESIGNATION (RQD)

Percent RQD	Quality
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

ROCK HARDNESS

Very Hard:	Rock can be broken by heavy hammer blows
Hard:	Rock cannot be broken by thumb pressure, but can be broken by moderate hammer blows.
Moderately Hard:	Small pieces can be broken off along sharp edges by considerable hard thumb pressure; can be broken with light hammer blows.
Soft:	Rock is coherent but breaks very easily with thumb pressure at sharp edges and crumbles with firm hand pressure.
Very Soft:	Rock disintegrates or easily compresses when touched; can be hard to very hard soil.

RQD = $\frac{\text{Sum of 4 in. and longer Rock Pieces Recovered}}{\text{Length of Core Run}}$ X100

Recovery = $\frac{\text{Length of Rock Core Recovered}}{\text{Length of Core Run}}$ X100

43 RQD
NQ
63 REC

Core Diameter	Inches
BQ	1-7/16
NQ	1-7/8
HQ	2-1/2

SYMBOLS

KEY TO MATERIAL TYPES

- Topsoil
- Asphalt
- Crushed Limestone
- Fill Material
- Shot-rock Fill
- Low Plasticity Inorganic Silt
- High Plasticity Inorganic Silt
- Low Plasticity Inorganic Clay
- High Plasticity Inorganic Clay
- Low Plasticity Inorganic Silt or Clay
- High Plasticity Inorganic Silt or Clay
- Organic Silts/Clays
- Well-Graded Gravel
- Poorly-Graded Gravel
- Silty Gravel
- Clayey Gravel
- Well-Graded Sand
- Poorly-Graded Sand
- Silty Sand
- Clayey Sand
- Peat
- Limestone
- Sandstone
- Siltstone
- Shale
- Claystone
- Weathered Rock
- Dolomite
- Granite
- Gneiss
- Schist
- Amphibolite
- Metagraywacke
- Phylite

SOIL PROPERTY SYMBOLS

N:	Standard Penetration, BPF
M:	Moisture Content, %
LL:	Liquid Limit, %
PI:	Plasticity Index, %
Qp:	Pocket Penetrometer Value, TSF
Qu:	Unconfined Compressive Strength Estimated Qu, TSF
γ_D:	Dry Unit Weight, PCF
F:	Fines Content

SAMPLING SYMBOLS

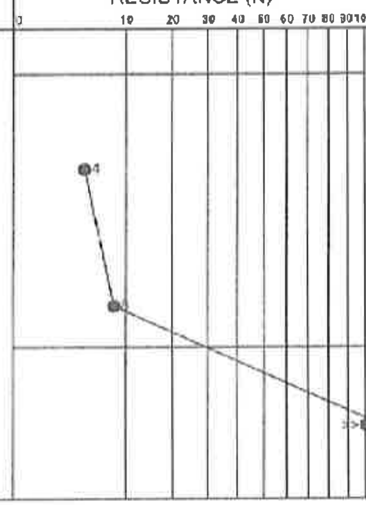
- Undisturbed Sample
- No Sample Recovery
- Split-Spoon Sample
- Water Level After Drilling
- Rock Core Sample
- Extended Time Reading
- Auger or Bag Sample

S&ME TEST BORING RECORD

Station: Grav. 1 + 75

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2216924	EAST: 265230
ELEVATION: 678 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼
GROUNDWATER: ▽ 2.2 feet ATD	Remarks:		

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
678.0	0	TOPSOIL		
677.2	0.8'	SILTY CLAY (CL) with rock fragments, brown, soft	FILL	2 - 2 - 2 (4)
675.0	3'	SANDY SILT (ML) with some rounded rock fragments, olive, firm	ALLUVIUM	2 - 3 - 5 (8)
672.5	5.5'	SILTY CLAY (CH) with rock fragments and sand, gray, hard (SPT value amplified by rock fragments in the sample interval.)		6 - 50/4 (50+)
670.2		*Auger refusal at 7.8 feet, boring terminated*		

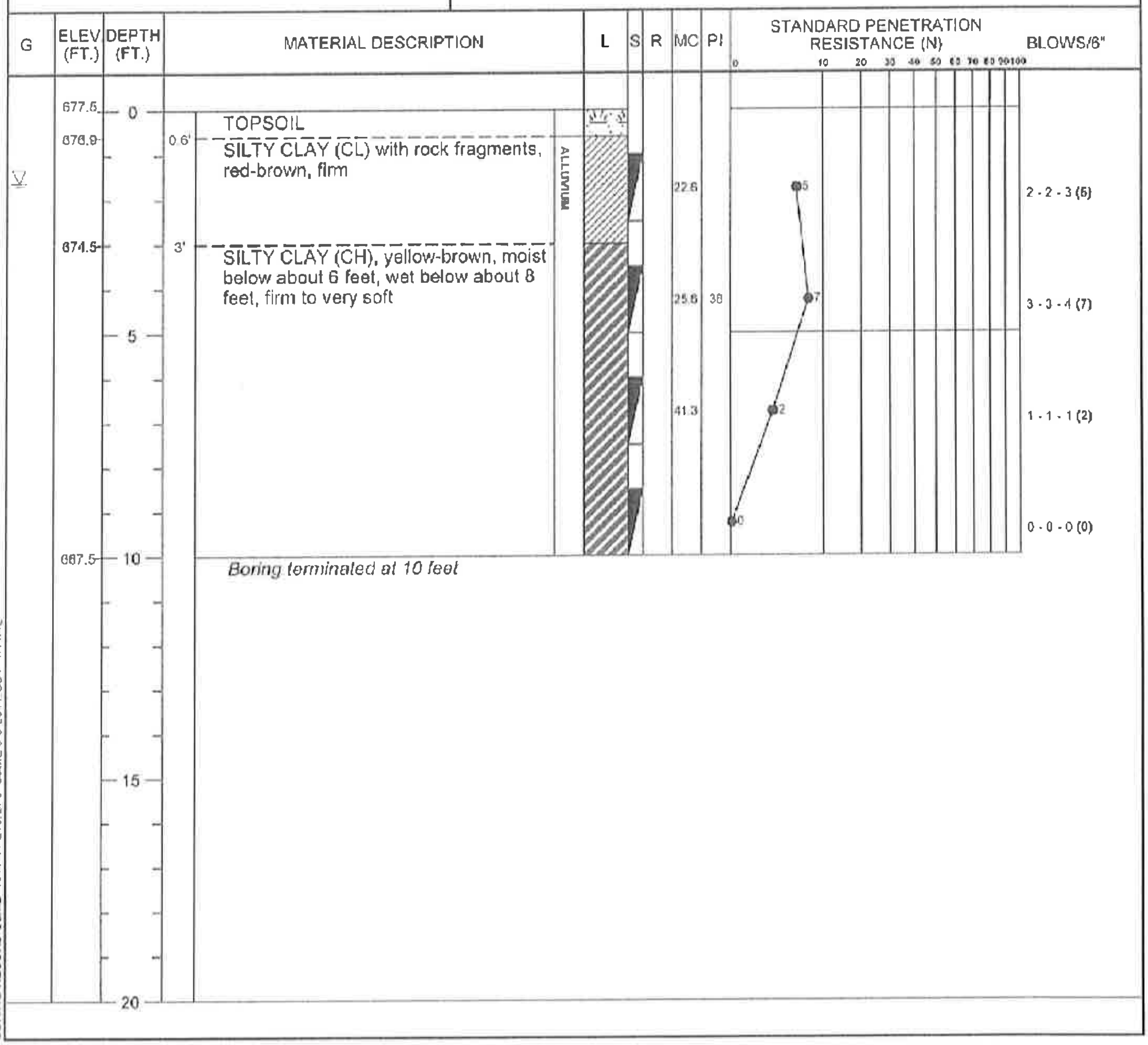


BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME TEST BORING RECORD

Station: Grav. 6 + 00

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2217384	EAST: 265374
ELEVATION: 678 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic; AUGER DIA. (IN): 6¼
GROUNDWATER: ▽ 1.6 feet ATD	Remarks:	



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME

TEST BORING RECORD

Station: Grav. 11 + 00

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2217595	EAST: 265818

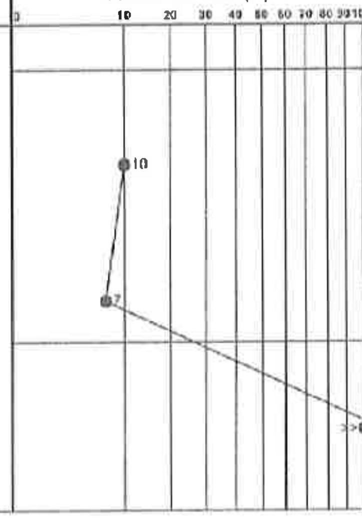
ELEVATION: 680 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	MC	PI	BLOWS/6"
	679.5 / 679.3	0 / 0.2'	TOPSOIL						
			SILTY CLAY (CL) with rock fragments, red-brown, stiff to firm	FILL					3 - 4 - 6 (10)
	675.5	4'	SILTY CLAY (CL), dark gray, firm to hard (SPT value amplified by rock fragments in the sample interval.)	ALLUVIUM					2 - 2 - 5 (7)
									2 - 3 - 50/2 (50+)
	671.4		*Auger refusal at 8.1 feet, boring terminated*						

STANDARD PENETRATION RESISTANCE (N)

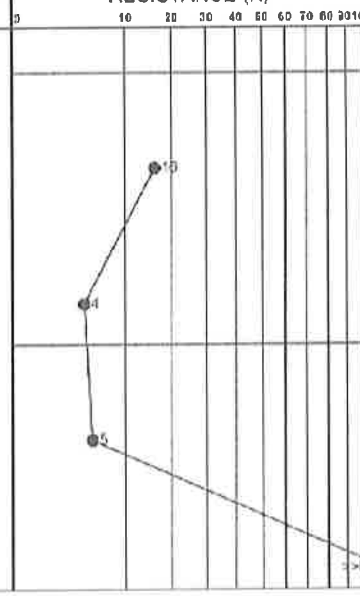


S&ME TEST BORING RECORD

Station: Grav. 16 + 00

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2217795	EAST: 266276
ELEVATION: 680 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic / AUGER DIA. (IN): 6¼
GROUNDWATER: Dry ATD	Remarks:	

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
679.5 / 679.3	0 / 0.2'	TOPSOIL		
		SILTY CLAY (CL) with rock fragments, red-brown, very stiff to soft	FILL	4 - 7 - 9 (16); 1 - 2 - 2 (4)
674.0	5.5'	SILTY CLAY (CH), gray and olive, firm to hard (SPT value amplified by refusal material in sample interval.)	ALLUVIUM	2 - 2 - 3 (5); 0 - 50/3 (60+)
670.0		*Auger refusal at 9.5 feet, boring terminated*		



S&ME

TEST BORING RECORD

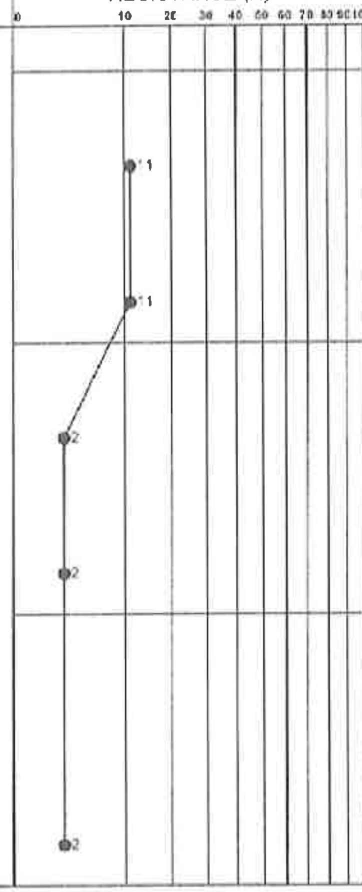
Station: Grav. 21 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2218002	EAST: 266732
ELEVATION: 680 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 8.1 feet ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	679.5	0										
	679.2		0.3'	TOPSOIL								
				SILTY CLAY (CL) with rock fragments, red-brown, stiff	FILL						11	4 - 5 - 6 (11)
											11	4 - 4 - 7 (11)
		5										
	673.5		6'	SILTY CLAY (CL) with rock fragments, moist to wet, soft	ALLUVIUM						2	1 - 1 - 1 (2)
▽												
											2	1 - 1 - 1 (2)
		10										
											2	0 - 1 - 1 (2)
	664.5	15		*Boring terminated at 15 feet*								
		20										



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME TEST BORING RECORD

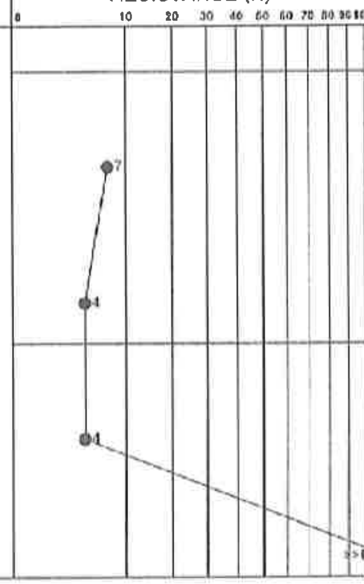
Station: Grav. 26 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO. 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2218208	EAST: 267187
ELEVATION: 679 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 6.3 feet ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	679.0	0										
	678.8		0.2'	TOPSOIL	FILL							
				SILTY CLAY (CL) with rock fragments, orange-brown and brown, firm	FILL						7	3 - 3 - 4 (7)
	676.0		3'	SILTY CLAY (CL) with wood fragments and organics, organic odor, dark gray and olive, soft	FILL						4	1 - 2 - 2 (4)
		5										
▽	673.5		5.5'	SILTY CLAY (CL), gray and yellow-brown, soft to hard (SPT value amplified by refusal material in sample interval.)	ALLUVIUM						4	2 - 2 - 2 (4)
											50+	0 - 50/2 (50+)
	669.7			*Auger refusal at 9.3 feet, boring terminated*								
		10										
		15										
		20										



S&ME TEST BORING RECORD

Station: Grav. 31 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2218584	EAST: 287448
ELEVATION: 680 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
679.5	0			
679.2	0.3'	TOPSOIL		
		CLAYEY SILT (ML), dark gray, moist, firm to soft (ALLUVIUM)	6	4 - 3 - 3 (6)
			4	1 - 2 - 2 (4)
674.0	5.5'	SILTY CLAY (CH), mottled gray and olive, limestone fragments, encountered at about 9 feet, firm to hard	6	3 - 3 - 3 (6)
			>>50+	2 - 50/1 (50+)
670.4		*Auger refusal at 9.1 feet, boring terminated*		

Columns: G, ELEV (FT.), DEPTH (FT.), MATERIAL DESCRIPTION, L, S, R, MC, PI, STANDARD PENETRATION RESISTANCE (N) (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100), BLOWS/6"

Depth scale: 0, 5, 10, 15, 20

BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME

TEST BORING RECORD

Station: Grav. 35 + 20

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2218950	EAST: 267653

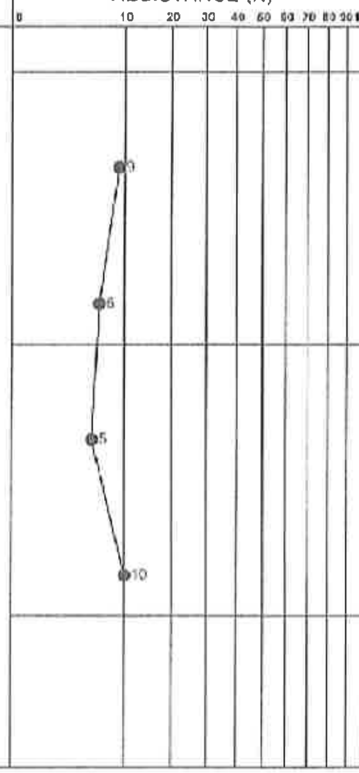
ELEVATION: 684 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 2.3 feet ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
683.5 / 683.2	0 / 0.3'	TOPSOIL		
		SILTY CLAY (CL) with small rock fragments, dark red-brown, stiff to firm	FILL	3 - 4 - 5 (9)
				2 - 3 - 3 (6)
678.0	5.5'	SILTY CLAY (CL) with roots, orange-brown and yellow-brown, moist, firm	ALLUVIUM	2 - 2 - 3 (5)
675.5	8'	SILTY CLAY (CL) with rock fragments, brown, stiff		3 - 4 - 6 (10)
670.7		*Auger refusal at 12.8 feet, boring terminated*		

G | ELEV (FT.) | DEPTH (FT.) | MATERIAL DESCRIPTION | L | S | R | MC | PI | STANDARD PENETRATION RESISTANCE (N) | BLOWS/6"



S&ME

TEST BORING RECORD

Station: Grav. 49 + 15

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2218804	EAST: 268899
ELEVATION: 686 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼
GROUNDWATER: ∇ 5.2 feet ATD	Remarks:		

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	686.0	0						
	685.8	0.2'	TOPSOIL	FILL				
			SILTY CLAY (CL) with rock fragments, red-brown, firm	FILL	24.5		8	2 - 3 - 5 (8)
					23.4		5	3 - 2 - 3 (5)
∇		5						
	680.5	5.5'	SILTY CLAY (CL), yellow-brown, wet, very soft	ALLUVIUM	22.9	12	1	0 - 0 - 1 (1)
	678.0	8'	SILTY CLAY (CL) with rock fragments, yellow-brown, soft	ALLUVIUM	21.9		4	1 - 1 - 3 (4)
		10						
					35.7		3	2 - 2 - 1 (3)
	671.0	15	*Boring terminated at 15 feet*					
		20						

S&ME

TEST BORING RECORD

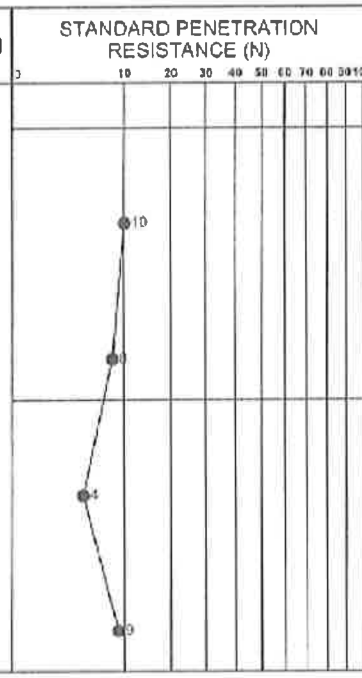
Station: Grav. 49 + 67

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2218761	EAST: 268927
ELEVATION: 687 feet ±	BORING STARTED: 12/13/2011	RIG TYPE: CME-550
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/13/2011	HAMMER: Automatic; AUGER DIA. (IN): 6¼

GROUNDWATER:
∇ 4.9 feet ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
686.5	0			
686.3	0.2'	TOPSOIL	FILL	
686.1	0.4'	GRAVEL	FILL	
		SILTY CLAY (CL) with rock fragments, red-brown and brown, stiff to firm	FILL	3 - 4 - 6 (10)
				2 - 3 - 5 (8)
681.0	5.5'	SILTY CLAY (MH), yellow-brown, red-brown and gray, wet, soft to stiff	ALLUVIUM	1 - 2 - 2 (4)
				1 - 2 - 7 (9)
676.5	10	*Boring terminated at 10 feet*		



S&ME — TEST BORING RECORD

Station: Grav. 55 + 00

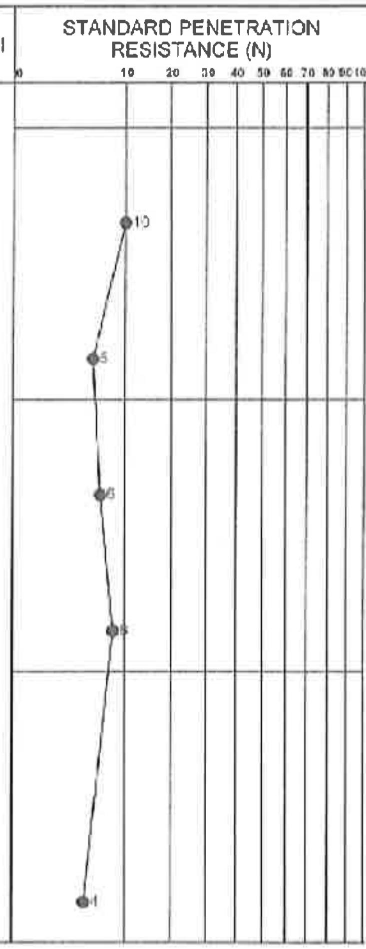
PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2219000	EAST: 269394
ELEVATION: 688 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic; AUGER DIA. (IN): 6¼

GROUNDWATER:
∇ 7.3 fee: ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
688.0	0			
687.7	0.3'	TOPSOIL		
		SILTY CLAY (CL) with rock fragments, brown and yellow-brown, stiff	FILL	2 - 5 - 5 (10)
685.0	3'	SILTY CLAY (CL) with trace rock fragments, dark red-brown, firm	RESIDUUM	2 - 2 - 3 (5)
682.5	5.5'	SILTY CLAY (CL), orange-brown and yellow-brown, firm		2 - 2 - 4 (6)
				2 - 3 - 5 (8)
676.0	12'	SILTY CLAY (CL) with shale fragments, orange-brown, wet, soft		1 - 2 - 2 (4)
673.0	15	*Boring terminated at 15 feet*		

Columns: G | ELEV (FT.) | DEPTH (FT.) | MATERIAL DESCRIPTION | L | S | R | MC | PI | STANDARD PENETRATION RESISTANCE (N) | BLOWS/6"



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME — TEST BORING RECORD

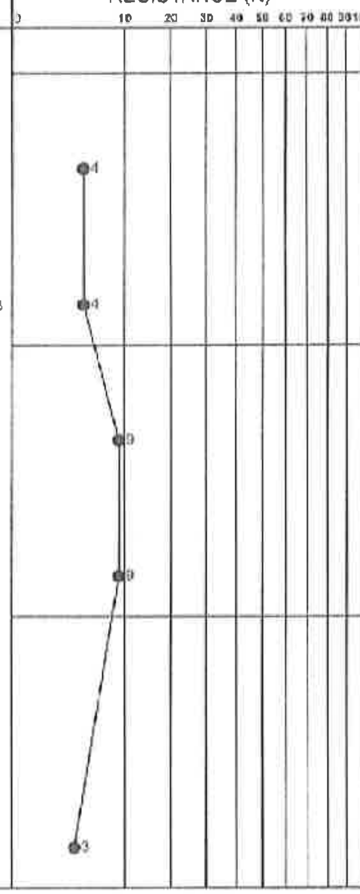
Station: Grav. 65 + 28

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2219447	EAST: 270254
ELEVATION: 690 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 3.6 feet ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	690.0	0								
	689.7	0.3'	TOPSOIL							
			SILTY CLAY (CL), yellow-brown, moist, soft (RESIDUUM)				24.1		4	1 - 2 - 2 (4)
▽							22.2	13	4	1 - 2 - 2 (4)
	684.5	5.5'	SILTY CLAY (CL) with some rock fragments, red-brown and yellow-brown, moist below about 8 feet, stiff to soft				35.0		9	3 - 4 - 5 (9)
							34.1		9	4 - 5 - 4 (9)
							39.4		3	1 - 2 - 1 (3)
	675.0	15	*Boring terminated at 15 feet*							



S&ME

TEST BORING RECORD

Station: Grav. 68 + 04

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO. 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2219692	EAST: 270195
ELEVATION: 690 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
690.0	0	GRAVEL			
689.4	0.6'	SILTY CLAY (CL) with rock fragments, dark red-brown, stiff and soft	FILL	10	3 - 4 - 6 (10)
				4	2 - 2 - 2 (4)
				9	2 - 4 - 5 (9)
682.0	8'	SILTY CLAY (CL), red-brown, firm	RESIDUUM	7	3 - 3 - 4 (7)
				6	2 - 3 - 3 (6)
675.0	15	*Boring terminated at 15 feet*			

S&ME

TEST BORING RECORD

Station: Grav. 69 + 50

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2219734	EAST: 270314
ELEVATION: 694 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 4.2 feet ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	693.5	0									
	693.2	0.3'	TOPSOIL								
			SILTY CLAY (CL) with rock fragments, brown, soft	FILL						4	2 - 2 - 2 (4)
▽										4	2 - 2 - 2 (4)
	688.0	5.5'	SILTY CLAY (CL), red-brown and yellow-brown, moist, soft	RESIDUUM						4	1 - 2 - 2 (4)
										4	1 - 2 - 2 (4)
										4	2 - 2 - 2 (4)
	678.5	15	*Boring terminated at 15 feet*								

S&ME

TEST BORING RECORD

Station: Grav. 75 + 00

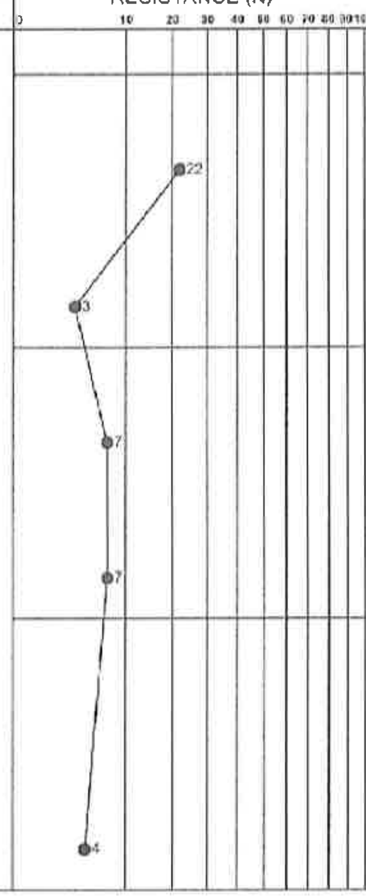
PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2219821	EAST: 270875

ELEVATION: 700 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
▽ 8.2 feet ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
699.5	0	TOPSOIL		
699.1	0.4'	SILTY CLAY (CL) with rock fragments, brown, very stiff (RESIDUUM)	22	7 - 11 - 11 (22)
696.5	3'	SILTY CLAY (CL), orange-brown, soft	3	2 - 2 - 1 (3)
694.0	5.5'	SILTY CLAY (CL), olive, orange-brown and dark brown, moist below about 13 feet, firm to soft	7	2 - 3 - 4 (7)
			7	3 - 3 - 4 (7)
			4	1 - 2 - 2 (4)
684.5	15	*Boring terminated at 15 feet*		



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME TEST BORING RECORD

Station: Grav. 80 + 00

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2219843	EAST: 271374

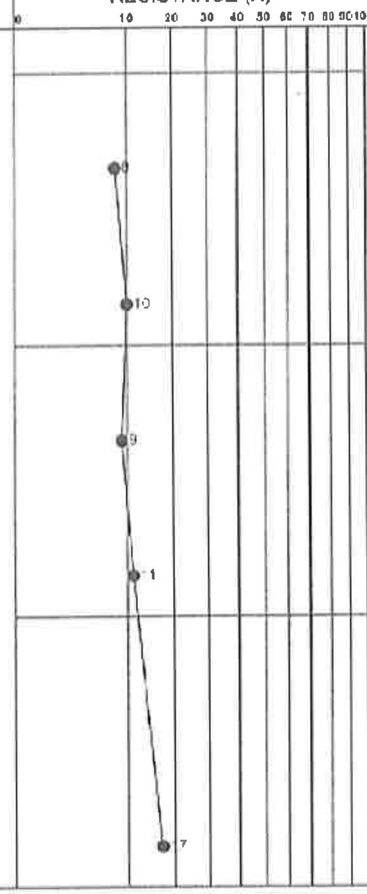
ELEVATION: 704 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	BLOWS/6"
704.0	0	TOPSOIL	
703.6	0.4'	SILTY CLAY (CL) with chert fragments, dark red-brown, firm to very stiff (RESIDUUM)	2 - 3 - 5 (8)
			3 - 5 - 5 (10)
			3 - 4 - 5 (9)
			3 - 4 - 7 (11)
			4 - 7 - 10 (17)
689.0	15	*Boring terminated at 15 feet*	

STANDARD PENETRATION RESISTANCE (N)



S&ME

TEST BORING RECORD

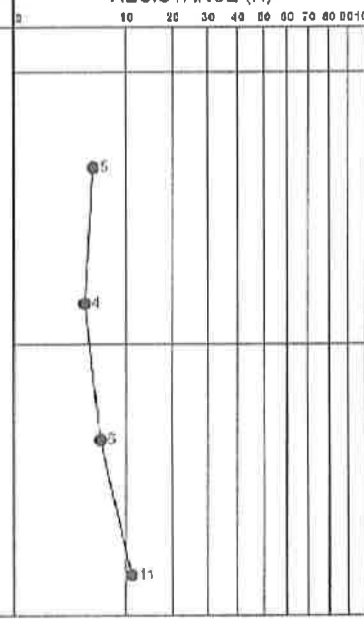
Station: Force 1 + 37

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2219991	EAST: 271861
ELEVATION: 703 feet ±	BORING STARTED: 12/14/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/14/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	702.5	0	SILTY CLAY (CL) with rock fragments, dark red-brown, firm	FILL						5	3 - 3 - 2 (5)
	699.5	3'	SILTY CLAY (CL) with some rock fragments, dark red-brown, soft to stiff	RESIDUUM						4	2 - 2 - 2 (4)
		5								6	2 - 2 - 4 (6)
										11	4 - 5 - 6 (11)
	692.5	10	*Boring terminated at 10 feet*								
		15									
		20									



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME TEST BORING RECORD

Station: Force 4 + 24

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2220267	EAST: 271824
ELEVATION: 718 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic / AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
717.5	0				
717.1	0.4'	GRAVEL			
		SILTY CLAY (CL) with rock and wood fragments, red-brown and brown, stiff	FILL	11	3 - 4 - 7 (11)
				11	10 - 4 - 7 (11)
712.0	5.5'	SILTY CLAY (CL) with chert fragments, dark red-brown, stiff	RESIDUUM	10	7 - 3 - 7 (10)
				15	4 - 7 - 8 (15)
707.5	10	*Boring terminated at 10 feet*			

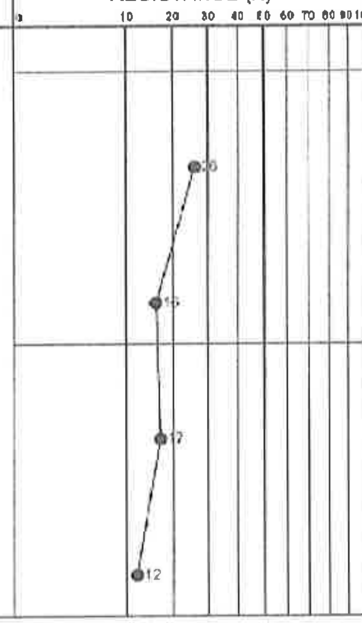
S&ME TEST BORING RECORD

Station: Force 9 + 90

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2220818	EAST: 272233
ELEVATION: 720 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼
GROUNDWATER: Dry ATD	Remarks:		

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
719.5	0	GRAVEL		
718.5	1'	SILTY CLAY (CL) with rock fragments, orange-brown and yellow-brown, very stiff	FILL	11 - 11 - 15 (26)
716.5	3'	SILTY CLAY (CL) with chert fragments, orange-brown and yellow-brown, very stiff to stiff	RESIDUUM	5 - 6 - 10 (16)
				5 - 7 - 10 (17)
				3 - 5 - 7 (12)
709.5	10	*Boring terminated at 10 feet*		

STANDARD PENETRATION RESISTANCE (N)



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME

TEST BORING RECORD

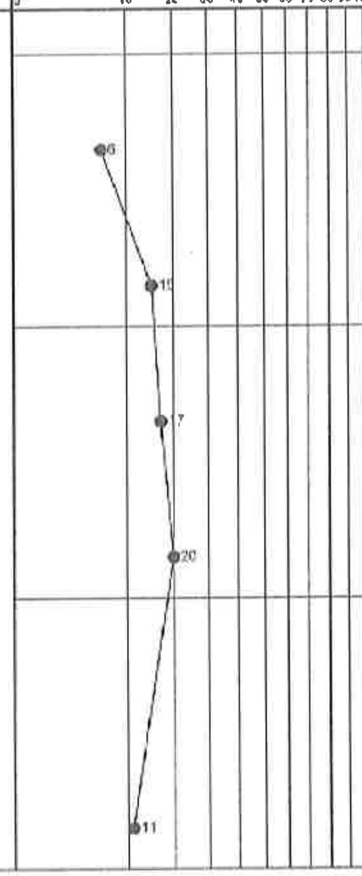
Station: Force 16 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2221081	EAST: 272162
ELEVATION: 737 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
737.0 / 736.8	0 / 0.2'	TOPSOIL			
		SILTY CLAY (CL) with rock fragments, yellow-brown, moist, firm	FILL	6	5 - 3 - 3 (6)
734.0	3'	SILTY CLAY (CL) with rock fragments, red-brown, stiff to very stiff	FILL	15	3 - 5 - 10 (15)
				17	4 - 7 - 10 (17)
				20	7 - 10 - 10 (20)
725.0	12'	SILTY CLAY (CL), red-brown and yellow-brown, stiff	RESIDUUM	11	3 - 3 - 8 (11)
722.0	15	*Boring terminated at 15 feet*			



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME

TEST BORING RECORD

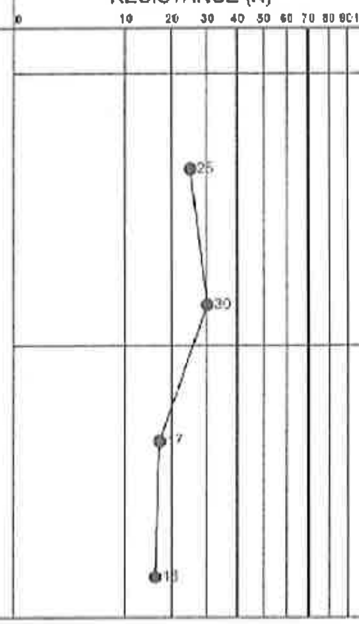
Station: Force 20 + 54

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2221570	EAST: 271914

ELEVATION: 766 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER: Dry ATD	Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	765.5	0		ASPHALT								
	764.9		0.6'	SILTY CLAY (CL) with rock fragments, red-brown, very stiff	FILL						25	5 - 12 - 13 (25)
											30	6 - 14 - 16 (30)
		5										
	760.0		5.6'	SILTY CLAY (CL), red-brown, very stiff	RESIDUUM						17	4 - 6 - 11 (17)
											16	6 - 8 - 8 (16)
	755.5	10		*Boring terminated at 10 feet*								
		15										
		20										



S&ME

TEST BORING RECORD

Station: Force 21 + 40

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2221647	EAST: 271883

ELEVATION: 768 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	767.5	0								
	767.2	0.3'	TOPSOIL							
			SILTY CLAY (CL) with rock fragments, dark red-brown to orange-brown, stiff (FILL)						12	4 - 4 - 8 (12)
									11	3 - 5 - 6 (11)
	762.0	5.5'	SILTY CLAY (CL), yellow-brown, moist soft (RESIDUUM)						3	1 - 1 - 2 (3)
									4	1 - 2 - 2 (4)
	757.5	10	*Boring terminated at 10 feet*							

S&ME

TEST BORING RECORD

Station: Force 25 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2221957	EAST: 271693
ELEVATION: 776 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
776.0	0				
775.8	0.2'	TOPSOIL	FILL		
		SILTY CLAY (CL) with rock fragments, orange-brown, stiff	FILL	9	5 - 4 - 5 (9)
773.0	3'	SILTY CLAY (CL) with rock fragments, red-brown, stiff	RESIDUUM	10	4 - 5 - 5 (10)
	5			13	6 - 6 - 7 (13)
768.0	8'	SILTY CLAY (CL) with chert fragments, orange-brown and yellow-brown, stiff	RESIDUUM	13	5 - 5 - 8 (13)
766.0	10	*Boring terminated at 10 feet*			
	15				
	20				

S&ME

TEST BORING RECORD

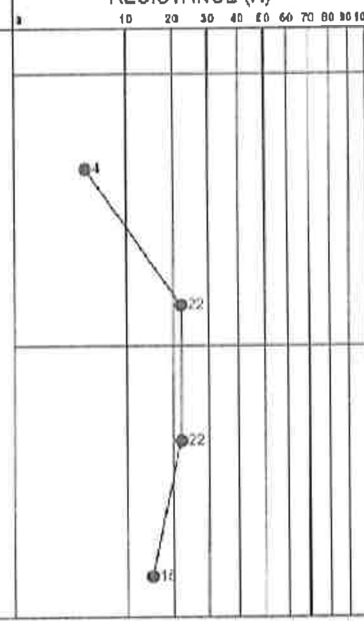
Station: Force 30 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO. 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2222420	EAST: 271511
ELEVATION: 770 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	770.0	0										
	769.8		0.2'	TOPSOIL								
				SILTY CLAY (CL) with rock fragments, red-brown, soft	FILL						4	1 - 2 - 2 (4)
	767.0		3'	SILTY CLAY (CL) with chert fragments, red-brown and orange-brown, very stiff to stiff	RESIDUUM						22	5 - 10 - 12 (22)
		5									22	6 - 8 - 14 (22)
											15	8 - 7 - 8 (15)
	760.0	10		*Boring terminated at 10 feet*								
		15										
		20										



S&ME TEST BORING RECORD

Station: Force 35 + 00

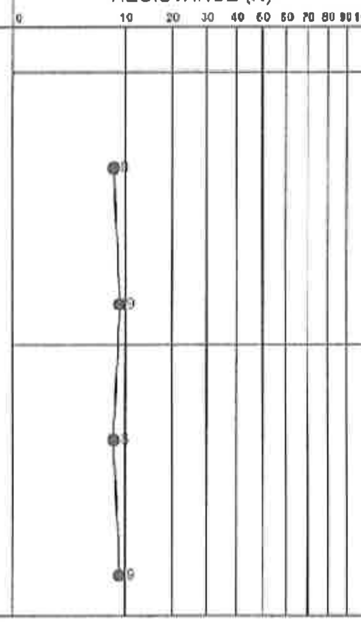
PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2222899	EAST: 271382

ELEVATION: 753 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	752.5	0										
	752.2		0.3'	TOPSOIL								
				SILTY CLAY (CL) with chert fragments, red-brown and yellow-brown, firm and stiff	RESIDUUM							3 - 3 - 5 (8)
												3 - 5 - 4 (9)
		5										
												4 - 4 - 4 (8)
	744.5		8'	SILTY CLAY (CL) with some small chert fragments, dark red-brown, moist, stiff								5 - 3 - 6 (9)
	742.5	10		*Boring terminated at 10 feet*								
		15										
		20										



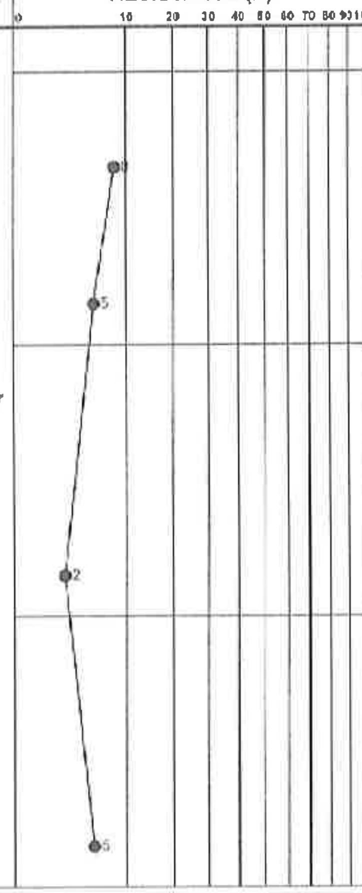
BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME TEST BORING RECORD

Station: Force 40 + 55

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH: 2223391	EAST: 271128
ELEVATION: 735 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼
GROUNDWATER: ∇ 11.2 feet ATD	Remarks:		

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
735.0	0								
734.7	0.3'	TOPSOIL							
		SILTY CLAY (CL) with rock fragments, red-brown, firm	FILL			31.6		8	3 - 3 - 5 (8)
			FILL			31.1		5	2 - 2 - 3 (5)
730.0	5'	Undisturbed sample attempt, Recovered about 1 foot	RESIDUUM		50	35.8	27		
728.0	7'	SILTY CLAY (CL) with some small chert fragments, orange-brown and yellow-brown, soft to firm	RESIDUUM			40.4		2	1 - 1 - 1 (2)
			RESIDUUM			41.0		5	2 - 2 - 3 (5)
720.0	15	*Boring terminated at 15 feet*							



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

S&ME

TEST BORING RECORD

Station: Force 42 + 00

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH 2223460	EAST: 271090

ELEVATION: 731 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER: Dry ATD	Remarks:

ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6" (N)
731.0 / 730.7	0 – 0.3'	TOPSOIL		
	0.3' – 3'	SILTY CLAY (CL) with rock fragments, red-brown, stiff	FILL	3 - 5 - 7 (12)
728.0	3' – 5.5'	SILTY CLAY (CL) with trace chert fragments, yellow-brown and red-brown, stiff	RESIDUUM	4 - 6 - 8 (14)
725.5	5.5' – 10'	SILTY CLAY (CL) with trace chert fragments, red-brown, stiff to firm	RESIDUUM	3 - 4 - 6 (10)
				2 - 2 - 3 (5)
721.0	10	*Boring terminated at 10 feet*		

Column headings: G | ELEV (FT.) | DEPTH (FT.) | MATERIAL DESCRIPTION | L | S | R | MC | PI | STANDARD PENETRATION RESISTANCE (N) (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100) | BLOWS/6"

SPT N values plotted: 12, 14, 10, 5

S&ME

TEST BORING RECORD

Station: Force 45 + 00

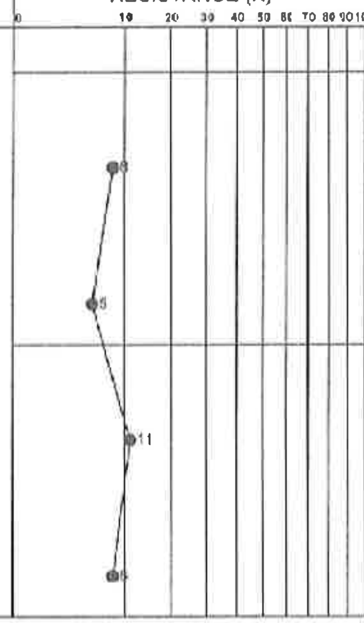
PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 2223781	EAST: 270914

ELEVATION: 721 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	720.5	0										
	720.2		0.3'	TOPSOIL								
				SILTY CLAY (CH) with rock fragments, red-brown, firm	FILL						8	2 - 3 - 5 (8)
											5	2 - 2 - 3 (5)
		5										
	715.0		5.5'	SILTY CLAY (CL) with rock fragments, red-brown and yellow-brown, stiff to firm	RESIDUUM						11	2 - 5 - 6 (11)
											8	2 - 3 - 5 (8)
	710.5	10		*Boring terminated at 10 feet*								
		15										
		20										



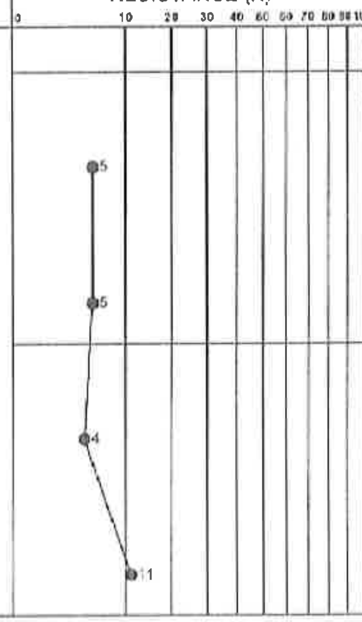
S&ME

TEST BORING RECORD

Station: Force 50 + 00

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		NORTH 2224194	EAST: 270643
ELEVATION: 715 feet ±	BORING STARTED: 12/15/2011	RIG TYPE: CME-550	
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 12/15/2011	HAMMER: Automatic	AUGER DIA. (IN): 6¼
GROUNDWATER: Dry ATD	Remarks:		

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		L	S	R	MC	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	715.0	0									
	714.7	0.3'	TOPSOIL								
			SILTY CLAY (CL) with wood and rock fragments, organic odor, brown, gray and yellow-brown, firm to soft	FILL						5	2 - 2 - 3 (5)
										5	2 - 2 - 3 (5)
		5								4	4 - 2 - 2 (4)
	707.0	8'	SILTY CLAY (CL) with rock fragments, yellow-brown, stiff	ALLUVIUM						11	3 - 5 - 6 (11)
	705.0	10	*Boring terminated at 10 feet*								
		15									
		20									



BORING RECORD S&ME 1811-11-210.GPJ S&ME 5-3-2011.GDT 1/11/12

LABORATORY TESTING PROCEDURES

UNCONFINED COMPRESSIVE STRENGTH OF SOIL
ASTM D 2166/AASHTO T208-92

The unconfined compression test is an unconsolidated-undrained triaxial shear test with no lateral confining pressure. This test is used to determine the shear strength (cohesion) of clayey soils and rock. Undisturbed samples were prepared by cutting the ends perpendicular to the applied load. The sample was placed in a testing device and incrementally increasing vertical loads were applied until it failed. The test results are provided on the Unconfined Compression Test Reports.

LABORATORY TESTING RESULTS

ESIP Force Main and Gravity Sewer Upgrade Project
Chattanooga, Tennessee
S&ME Project No. 1811-11-210

Laboratory Test Results Summary

Boring Number	Sample Type	Sample Depth (ft)	Moisture Content (%)	ATTERBERG LIMITS		
				Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
6+00	SPT	1-2½	22.6			
6+00	SPT	3½-5	25.6	64	26	38
6+00	SPT	6-7½	41.3			
49+15	SPT	1-2½	24.5			
49+15	SPT	3½-5	23.4			
49+15	SPT	6-7½	22.9	28	16	12
49+15	SPT	8½-10	21.9			
49+15	SPT	13½-15	36.7			
65+28	SPT	1-2½	24.1			
65+28	SPT	3½-5	22.2	30	17	13
65+28	SPT	6-7½	35.0			
65+28	SPT	8½-10	34.1			
65+28	SPT	13½-15	39.4			
40+55	SPT	1-2½	31.6			
40+55	SPT	3½-5	31.1			
40+55	UD	5-7	35.8	54	27	27
40+55	SPT	8½-10	40.4			
40+55	SPT	13½-15	41.0			

SPT – Standard Penetration Test Sample
UD – Undisturbed Sample

Form No. XX-XXXXX-NN
Revision No. : 0
Revision Date: 4/12/2011

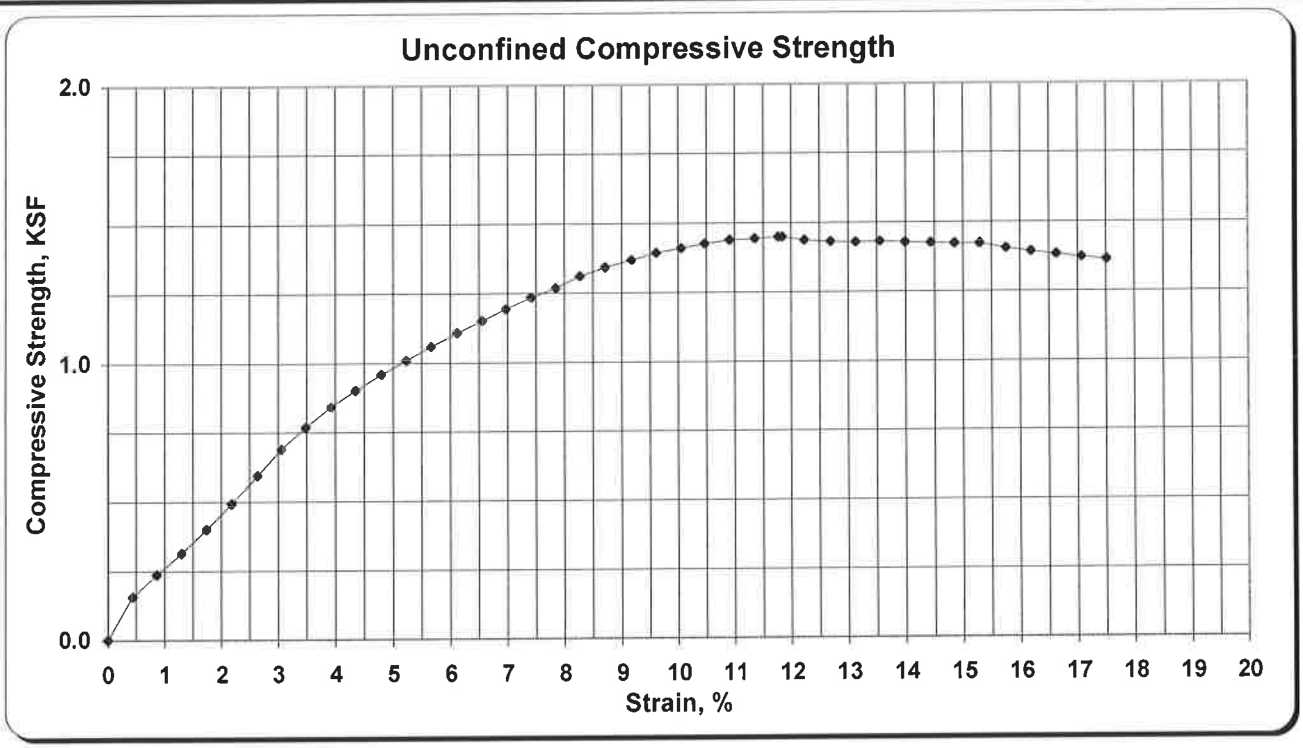
Unconfined Compressive Strenth of Cohesive Soil

ASTM D2166-06

S&ME

S&ME, Inc. - Chattanooga **4291 Hwy 58, Suite 101** **Chattanooga, TN 37416**

Project No.:	1811-11-210	**Log #: 11-188**		Report Date:	1/4/2012
Project Name:	ESIP Force Main and Gravity Sewer			Test Date(s):	1/3/2012
Client Name:	Barge, Waggoner, Sumner and Cannon, Inc.				
Client Address:	1110 Market Street, Suite 200 Chattanooga, TN 37402				
Boring #:	40+55	Sample #:	UD	Sample Date:	12/19/2011
Location:	On-Site Boring	Offset:	-	Depth:	5-7'
Sample Description:	Reddish Brown Silty Clay				



Wet Unit Weight, lbs/ft^3	**117.7**
Dry Unit Weight, lbs/ft^3	**86.7**
Moisture Content of sample, %	**35.84**
Unconfined Compressive Strenth, q_u, KSF	**1.448**
Undrained Shear Strength, s_u, KSF	**0.724**
Height to Diameter Ratio	**2.01**
Rate of Strain, in/min.	**0.05**
Strain at Failure, %	**11.84**
Liquid Limit	**54**
Plastic Limit	**27**
Plasticity Index	**27**
USCS Classification	**CH**

References / Comments / Deviations:

Drew Reed, EI		Staff Professional	1/4/2012
Technical Responsibility	*Signature*	*Position*	*Date*

APPENDIX IV

Important Information About Your Geotechnical Engineering Report

Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

Portion obtained with permission from "Important Information About Your Geotechnical Engineering Report", ASFE, 2004

STATION: 40+00

S&ME

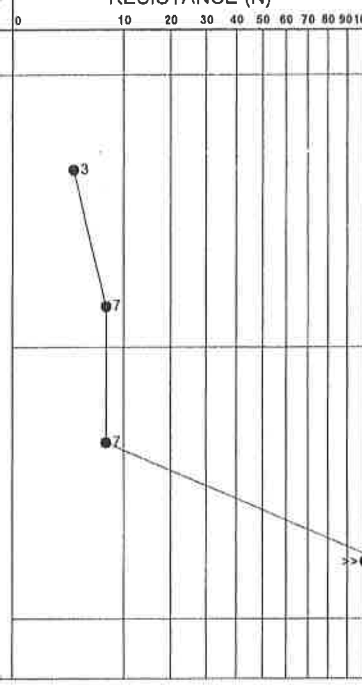
TEST BORING RECORD

PROJECT: ESIP Force Main and Gravity Sewer		JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee			
ELEVATION: Not available	BORING STARTED: 8/15/2012	RIG TYPE: Geo-Probe	AUGER DIA. (IN): 6¼
DRILLING METHOD: Hollow Stem Augers	BORING COMPLETED: 8/15/2012	HAMMER: Automatic	

GROUNDWATER:
∇ 4 feet ATD

Remarks:

G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
		0	GRAVEL - 6 inches								
		0.5'	SILTY CLAY (CL), dark brown to brown, organic odor, soft to firm	ALLUVIUM						3	1 - 1 - 2 (3)
∇										7	1 - 3 - 4 (7)
		5.5'	SILTY CLAY (CH) with chert fragments, brown, firm to hard	RESIDUUM						7	2 - 3 - 4 (7)
										>>	1 - 50/.3 (50+)
			Auger refusal at 11.1 feet, boring terminated								



STATION: 43+50

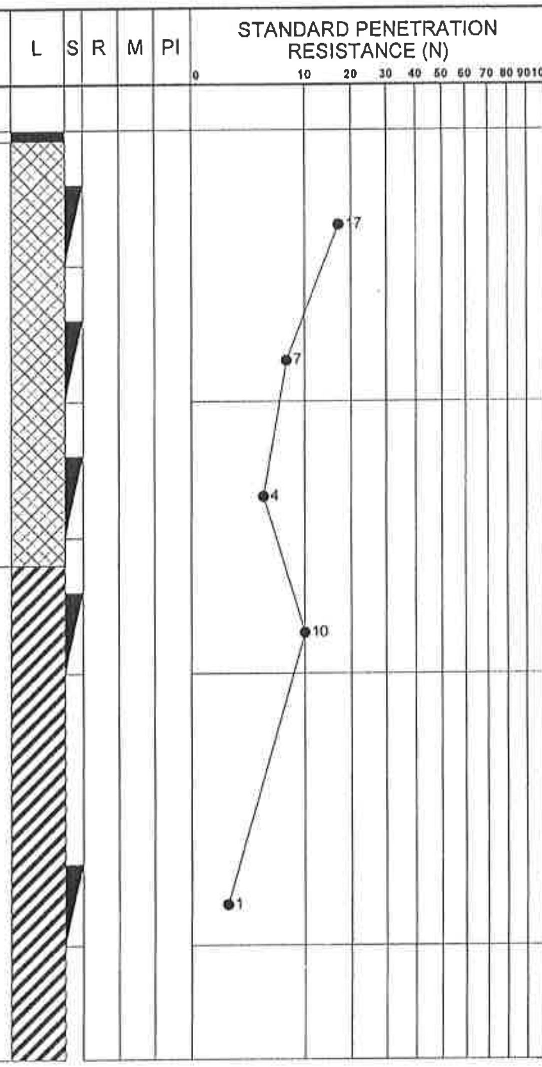
S&ME TEST BORING RECORD

PROJECT: ESIP Force Main and Gravity Sewer	JOB NO: 1811-11-210	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		
ELEVATION: Not available	BORING STARTED: 8/15/2012	RIG TYPE: Geo-Probe; AUGER DIA. (IN): 6¼
DRILLING METHOD: Hollow Stem Augers	BORING COMPLETED: 8/15/2012	HAMMER: Automatic

GROUNDWATER:
∇ 7 feet ATD

Remarks: Retaining wall backfill encountered to a depth of about 8 feet.

DEPTH (FT.)	MATERIAL DESCRIPTION	
0.2'	ASPHALT - 2 inches	FILL
	GRAVEL (GP), gray, firm	FILL
3'	GRAVEL (GP) with silty clay, gray and brown, loose	FILL
5.5'	GRAVEL (GW), gray, wet, very loose	FILL
8'	SILTY CLAY (CH), brown and yellow-brown, wet, stiff to very soft	RESIDUUM
17.1'	*Auger refusal at 17.1 feet, boring terminated*	



Column headings	G	ELEV (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"

SPT (N)	BLOWS/6"
17	11 - 9 - 8 (17)
7	4 - 4 - 3 (7)
4	3 - 2 - 2 (4)
10	3 - 4 - 6 (10)
1	1 - 0 - 1 (1)

BORING RECORD S&ME 1811-11-210 (AUG. 15, 2012).GPJ S&ME 1-18-2012.GDT 8/20/12

Borehole ID: 2