

***Final Foundation Report
for Retaining Walls
Rehabilitation of I-40 Bridges***

***Charlotte Avenue, Jo Johnston Avenue, Clinton Street
& Herman Street***

Nashville, Davidson County, Tennessee

TTL Project No. 100814105

TDOT Project No. 19005-1161-44

Federal Project No. BH-I-40-4(86)

Pin No. 117847.00

Prepared for:



Prepared by:

TTL

geotechnical • analytical • materials • environmental





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January 15, 2015

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**RE: Final Foundation Report for Retaining Walls
Rehabilitation of I-40 Bridges
Charlotte Avenue, Jo Johnston Avenue, Clinton Street, & Herman Street
Nashville, Davidson County, Tennessee
TTL Project No. 100814105
State Project No. 19005-1161-44
Federal Project No. BH-I-40-4(86)
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Dear Robert and Frank:

TTL, Inc. has completed the requested geotechnical exploration for the proposed I-40 Bridge Rehabilitation project in Nashville, Davidson County, Tennessee. The exploration was conducted in accordance with our proposal, dated November 21, 2014 and as modified based on TDOT's request. This report includes a description of the general site conditions, discussions relative to the site geology, scope of work, results of the exploration, and our conclusions and recommendations relative to the design and construction of the planned improvements. The appendices provide a plan of the boring locations, logs of the borings, results of laboratory testing, and other pertinent geotechnical information. The scope of this geotechnical exploration did not include environmental assessment of the site. Consequently, this report does not provide any information regarding the presence or absence of toxic or hazardous substances.

We appreciate the opportunity to have been of service in support of the design and look forward to working with the project team throughout the design and construction process. If you have any questions concerning this report, please do not hesitate to contact our office.

Sincerely,
TTL, Inc.

Matt Bullard
Project Manager

Oscar M. Gay, PE
Principal Engineer

Distribution: Addressee (pdf); File (1)



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**FINAL FOUNDATION REPORT FOR RETAINING WALLS
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVENUE, JO JOHNSTON AVENUE, CLINTON STREET
& HERMAN STREET
NASHVILLE, DAVIDSON COUNTY, TENNESSEE
TTL PROJECT NO. 100814105
TDOT PROJECT NO. 19005-1161-44
PIN NO. 117847.00**

1.0 GENERAL PROJECT AND SITE DESCRIPTION

The Tennessee Department of Transportation (TDOT) is proposing bridge rehabilitation for four bridges within the I-40 corridor of downtown Nashville, Tennessee. The proposed rehabilitation will consist of deck replacements and incorporation of mechanically stabilized earth (MSE) retaining wall systems at the bridges spanning Charlotte Avenue, Jo Johnston Avenue, and Clinton Street. Originally, the bridge spanning Herman Street was included in TTL's scope, but was withdrawn from consideration by TDOT after the MSE wall option was eliminated at that location. We understand the bridge deck at Herman Street will be replaced.

The planned bridge improvements will consist of replacing select existing bridge spans with MSE retaining walls to reduce the area of bridge deck, minimizing current and future repairs, while still providing access for automotive, railway, and pedestrian traffic below I-40. The MSE retaining wall backfill will serve as a subgrade for Interstate 40. Final wall heights have not been provided at this time, but based on final designs provided by Gresham Smith & Partners (GS&P), we anticipate the MSE walls to approach a maximum vertical dimension of 35 feet. The wall designer, Reinforced Earth Inc., has estimated nominal (unfactored) wall loads will approach 5 ksf.

CSX Railway has made the design team aware that MSE walls are prohibited adjacent to the railway. In order to meet these requirements, the design team plans to construct a vertical-faced reinforced soil slope with a cast-in-place concrete veneer in the areas adjacent to the CSX railway (Walls No. 1 & 2).

In all, the improvements consist of six walls at the aforementioned bridge abutments and two walls that will encapsulate the area within the three interior bents of the Clinton Street Bridge. The proposed wall locations and numbering system was provided by GS&P and are appended.

2.0 TOPOGRAPHY, GEOLOGY, AND SOILS

The project site is located in downtown Nashville within the Central Basin of middle Tennessee. The Central Basin is a nearly elliptical-shaped area underlain by sedimentary rocks (primarily limestones) of the Ordovician Geologic Age, characterized by gently rolling to hilly terrain, with some nearly level areas, and by meandering, low-gradient streams. Topography within the vicinity of the proposed improvements is relatively flat terrain with the higher elevations to the north near the Clinton Street bridge. Topographic relief within the project corridor, excluding the embankments associated with I-40, is on the order of 20 feet, occurring between the southern border of the Charlotte Street bridge right of way (approximate elevation 422 feet) and the northern border of the Clinton Street bridge right of way (approximate elevation 442 feet). Much of the western portion of downtown Nashville was previously utilized as a rail yard before redevelopment and, therefore, exhibits minimal topographic relief.

Available geologic mapping, Geologic Map of the Nashville West Quadrangle, Tennessee, Tennessee Department of Conservation, Division of Geology, 1966, indicates that the project area is underlain by the Bigby-Cannon Formation. These bedrock units are primarily composed of limestone and known for the development of karst features. The contact between the Bigby-Cannon and Hermitage Formations is mapped near the south abutment of the Jo Johnston Avenue bridge. The geologic mapping describes the Bigby-Cannon Formation as consisting of medium to light gray, coarse-grained, medium-bedded limestone with occasional shale partings and brown phosphate pellets. The Hermitage Formation is a medium to dark blue-gray, thin-bedded limestone with interbedded thin shale layers and sandy limestone with coquina facies near the top. Both rock formations can exhibit an irregular soil/bedrock interface with soil-filled slots extending up to 30-feet into the rock mass and rock pinnacles protruding into the soil overburden.

Topographic and geologic mapping of the Nashville West Quadrangle depicts numerous drainage basins and other potential karst features to the east and northeast of the proposed project site. Site reconnaissance did not reveal the presence of any unmapped surface depressions. However, the field exploration encountered an open cavity within the bedrock matrix on the east side of the south abutment at the Jo Johnston Avenue Bridge (B-49). A detailed discussion of subsurface conditions can be found in Section 4 of this report.

Further evidence of karst activity within the project area is provided by the State of Tennessee Department of Environmental and Conservation Division of Geology Bulletin 64, Caves of Tennessee, by

Thomas C. Barr, Jr., published in 1961, and reprinted in 2001. This publication describes 15 caves in Davidson County with one of these developing within the Hermitage Formation. However, the referenced bulletin does not indicate that caves are present within or near the project site. Additionally, no faults or other geologic structures that could have a detrimental effect on the project are noted on the geologic mapping.

3.0 EXPLORATION AND TESTING

The subsurface exploration program consisted of two phases to provide geotechnical data for design and construction of the planned MSE walls. The first phase involved drilling and sampling to develop a general understanding of subsurface stratigraphy; thicknesses and consistency of the soil overburden; groundwater conditions; and character of the bedrock mass. The second phase included laboratory testing of select specimens obtained during the drilling and sampling program to provide quantifiable data for development of recommendations for design and construction.

3.1 Drilling and Sampling Program

TTL developed a boring plan for the proposed structure after a review of final wall location plans developed by GS&P. The subsurface exploration included the advancement of 51 borings associated with the four bridges identified in our original scope. Eight of these borings were advanced in the area of Pier 3 of the Herman Street Bridge, which was eliminated from the scope of this project as identified in Section 1.0. A boring location plan is provided in Appendix A. Rock coring was performed at 15 locations to provide data relative to bedrock conditions. A summary of the 15 borings advanced in the underlying bedrock as part of this exploration is provided in Table 1 on the following page. All measurements are expressed in feet.

Table 1. Summary of Borings Extended into Bedrock

Hole No.	Surface Elev.	Auger Refusal and/or Start of Rock Core		Length of Rock Core	Bottom of Hole	
		Depth	Elev.		Depth	Elev.
Clinton St. Bridge						
B-10	431.1	4.2	426.9	10.0	14.2	416.9
B-14	438.0	13.6	424.4	10.0	23.6	414.4
B-17	437.1	7.7	429.4	11.1	18.8	418.3
B-20	437.0	4.4	432.6	10.2	14.6	422.4
B-27	438.3	10.1	428.2	10.0	20.1	418.2
B-30	439.8	8.4	431.4	10.4	18.8	421.0
B-33	438.9	3.2	435.7	10.0	13.2	425.7
B-36	440.8	8.5	432.3	10.0	18.5	422.3
Jo Johnston Ave. Bridge						
B-41	428.6	5.5	423.1	10.0	15.5	413.1
B-49	429.1	4.3	424.8	20.0	24.3	404.8
B-52	435.8	4.5	431.3	10.0	14.5	421.3
Charlotte Ave. Bridge						
B-57	431.9	4.5	427.4	10.0	14.5	417.4
B-60	430.7	7.0	423.7	12.0	19.0	411.7
B-65	431.9	4.5	427.4	10.0	14.5	417.4
B-68	431.0	3.5	427.5	10.0	13.5	417.5

The field exploration, including drilling and *in-situ* testing operations, was executed from November 22 to November 25, 2014. Due to the aggressive schedule associated with this project, TTL utilized three drill rigs, a track-mounted rig, ATV rig and truck-mounted rig, each equipped with hollow-stem augers and wire-line rock coring tools. Two members of TTL’s geotechnical staff monitored the field operations and adjusted the boring program as field and/or subsurface conditions warranted. Several of the borings were offset from the planned locations to avoid overhead obstructions, underground utilities, and to facilitate equipment access and setup. Additionally, several of the originally planned borings were eliminated due to limited access and low vertical clearance under the bridges.

The as-drilled boring locations were surveyed by TDOT subsequent to the completion of the drilling program. The as-drilled boring locations are shown on the Boring Location Plan in Appendix A. Typed boring logs are provided in Appendix B.

The drill crews performed Standard Penetration Testing (SPT) in general accordance with ASTM D1586 “Penetration Test and Split-Barrel Sampling of Soils” at 1.5-foot intervals of depth in all the borings to provide *in situ* strength/consistency measurements and disturbed samples for subsequent natural

moisture and engineering classification testing. Additionally, undisturbed, thin wall Shelby tube sampling was performed in borings B-02, B-07, B-18, B-28, and B-61 to provide specimens for subsequent unconfined compressive strength testing and one-dimensional consolidation testing. Upon completion of advancement through the soil overburden, each boring was checked for the presence of groundwater.

As noted previously in this report, rock coring was performed in 15 of the borings as part of this exploration. The drill crews utilized NQ and HQ-sized rock coring tools and advanced 3.2 to 24.3 feet into bedrock to obtain 1.875-inch and 2.5-inch diameter cores, respectively. In general, rock coring operations were advanced to a minimum depth of 10 feet into bedrock near the proposed MSE wall foundation limits. Photos of the recovered rock cores are provided in Appendix D. The recovered rock core samples were placed in core boxes and transported to TTL's Nashville office for storage and testing.

Upon completion of drilling, each hole was backfilled with auger cuttings and staked for subsequent surveying. Detailed discussions of the observed subsurface soil, rock, and groundwater conditions are provided in Section 4 of this report.

The drill rigs utilized for sampling operations were equipped with automatic hammers to perform Standard Penetration Testing. The use of automatic hammers provides for a more efficient and consistent transfer of energy than traditional Standard Penetration Testing with a safety hammer/rope/cat-head system. Thus, blowcounts observed from automatic hammers are lower than those observed with the safety hammer system. Typical correlations for Standard Penetration Testing results used in geotechnical engineering are based on the safety hammer system and require that blow counts from Standard Penetration Testing using an automatic hammer be corrected for efficiency. The N-values shown on the boring logs in Appendix B have not been corrected for hammer efficiency.

3.2. Laboratory Testing Program

Due to the aggressive schedule of this project, TTL utilized two of its laboratories (Nashville and Tuscaloosa), as well as a sub-consultant (AMEC). Upon completion of the drilling program, select soil specimens were transported to TTL laboratories for testing, including natural moisture content, index properties, classification, unconfined compressive strength and one-dimensional consolidation testing.

Additionally, rock specimens were transported to AMEC's Nashville laboratory for unconfined compressive strength testing. The results of the laboratory testing are discussed in further detail in Section 5 of this report, and individual test reports are provided in Appendix C.

4.0 SUBSURFACE CONDITIONS

The drilling and sampling operations performed for the planned bridge improvements indicate that overburden materials generally consist of a surficial layer of gravel or topsoil underlain by rock and/or soil fill followed by clay residuum. In general, overburden thickness encountered for all the borings in the northern portion of the site (Herman & Clinton Streets) ranged from 3.2 to 37.5 feet with the top of rock being less than 7 feet below the ground surface in 14 of the 31 holes drilled. The overburden thickness observed in the southern portion of the site (Jo Johnston & Charlotte Avenues) ranged from 2.0 to 11 feet with all but one of 20 borings exhibiting fill/residual soil thickness greater than 7 feet before encountering refusal. The following paragraphs provide more detailed discussions of the observed subsurface conditions. Additionally, detailed subsurface information is presented on the boring logs in Appendix B.

4.1. Herman Street Bridge

The subsurface near the Herman Street Bridge was characterized by advancing eight soil borings (B-01 through B-08). The surficial cover observed at the Herman Street bridge consists of mixed gravel and/or clay soil fill varying from 2 to 3 inches in thickness. Beneath the surface materials, rock and/or soil fill materials were observed in all eight of the Herman Street borings, varying from 5 to 7 feet in thickness. The rock fill consists of gravel to cobble-size crushed limestone while the soil fill generally consists of silty to sandy, low to moderately plastic clay with little to some construction debris. Fine to coarse-grained sand-sized coal dust was observed throughout the entirety of the overburden fill in all the borings. Refusal was not encountered in any of the borings with termination depths ranging from 21 to 43 feet below the existing ground surface.

4.2. Clinton Street Bridge

The subsurface near the Clinton Street Bridge was characterized by advancing 23 soil borings (B-10 through B-38). The surficial cover observed at the Clinton Street bridge consists of light to sometimes

heavy vegetation in areas adjacent to the north and south abutments with gravel fill varying from 2 to 3 inches in thickness in the areas between Piers 2 and 4 and bordering the CSX railway. Beneath the surface materials, rock and/or soil fill materials were observed in all 23 of the Clinton Street borings, varying from 1.0 to 9.6 feet in thickness. The rock fill consists of gravel to cobble-size crushed limestone while the soil fill generally consists of silty to sandy low to moderately plastic clay with little to some construction debris. Fine to coarse-grained sand-sized coal dust was observed throughout the entirety of the fill in all the borings.

Eight of the Clinton Street borings were advanced into the underlying bedrock by means of rock coring between 3.2 to 23.6 feet. Coring operations indicate the top of rock elevations at the locations explored vary from approximate elevation 435.7 feet in boring B-33 at the south abutment, to approximate elevation 424.4 feet in boring B-14 at the north abutment adjacent to the CSX right of way.

The rock cores obtained within the borings drilled for the subject structure correlate well with the geologic mapping, consisting predominately of limestone representative of the Bigby Limestone, a member of the Bigby-Cannon Formation. RQD values determined from coring operations ranged from approximately 25-to 100 percent. The lower RQD values corresponded with weathered zones near top of rock in boring B-10. Detailed descriptions of the recovered rock cores are presented on the typed Boring Logs in Appendix B.

4.3. Jo Johnston Avenue Bridge

The subsurface near the Jo Johnston Avenue Bridge was characterized by advancing eight soil borings (B-39 through B-53). The surficial cover observed at the Jo Johnston Avenue bridge consists of light vegetation in areas west of the north and south abutments with generally grassy areas east of the abutments. Beneath the surface materials, rock and/or soil fill materials were observed in all eight of the Jo Johnston Avenue borings, varying from 2.0 to 5.5 feet in thickness. The rock fill consists of gravel to cobble-size crushed limestone while the soil fill generally consists of silty to sandy, low to moderately plastic clay with little to some construction debris. Fine to coarse-grained sand-sized coal dust was observed throughout the entirety of the fill in all borings.

Three of the Jo Johnston Avenue borings were advanced into the underlying bedrock by means of rock coring. Coring operations indicate the top of rock elevations at the locations explored vary from

approximate elevation 431.3 feet in boring B-52 at the south abutment, to approximate elevation 423.1 feet in boring B-41 at the north abutment.

The rock core drilled for the east end of the south abutment indicates an irregular soil/bedrock interface in boring B-49. During coring operations at B-49, the drillers encountered open voids in the bedrock ranging from 2.0 to 12.6 feet in thickness.

RQD values determined from coring operations ranged from approximately 33 to 90 percent. The lower RQD values corresponded with the weathered rock and voids in boring B-49. Detailed descriptions of the recovered rock cores are presented on the typed Boring Logs in Appendix B.

4.4. Charlotte Avenue Bridge

The subsurface near the Charlotte Avenue Bridge was characterized by advancing 12 soil borings (B-55 through B-70). The surficial cover observed at the Charlotte Avenue bridge consists of generally grassy areas adjacent to the north and south abutments. Beneath the surface materials, rock and/or soil fill materials were observed in all 12 of the Charlotte Avenue borings, varying from 3 to 7 feet in thickness. The rock fill consists of gravel to cobble-size crushed limestone while the soil fill generally consists of silty to sandy, low to moderately plastic clay with little to some construction debris. Fine to coarse-grained sand-sized material that appeared to be coal or a coal byproduct was observed throughout the entirety of the fill in all the borings.

Four of the Charlotte Avenue bridge borings were advanced into the underlying bedrock by means of rock coring. Coring operations indicate the top of rock elevations at the locations explored vary from approximate elevation 427.5 feet in boring B-68 at the south abutment, to approximate elevation 423.7 feet in boring B-60 at the north abutment. The subsurface information provided by the borings drilled at these locations indicates the top of bedrock profile generally mimics the ground surface.

The rock core obtained within the borings drilled for the subject bridge structure correlates well with the geologic mapping, consisting predominately of limestone representative of the Bigby Limestone member of the Bigby-Cannon Formation. RQD values determined from coring operations ranged from approximately 82 to 93 percent. Detailed descriptions of the recovered rock core are presented on the typed Boring Logs in Appendix B.

4.5. Subsurface Water Conditions

Upon reaching auger refusal, each boring was observed to be dry. Drill water measured holes in which rock coring was performed indicated water levels between 4.2 and 8.4 feet below grade on completion of the coring operations. Subsequently, borings were backfilled; therefore, no long term water levels were obtained. The water levels observed were likely due to the introduction of water into the subgrade to support rock coring operations. However, “perched” or “trapped” water may be encountered in isolated zones during excavation, particularly where rock fill has been placed, at the soil-bedrock interface, and/or within weathered zones or seams in the bedrock matrix. “Perched” or “trapped” water should be anticipated within the above described zones during construction, particularly during the wetter months of the year or following periods of heavy precipitation. Generally, perched water volumes are manageable with temporary sumps and conventional pumps.

5.0 LABORATORY TESTING AND RESULTS

Selected soil samples recovered from Shelby tubes and Standard Penetration Testing operations obtained from holes advanced for the four bridges were subjected to natural moisture content, soil classification, unconfined compressive strength, and one-dimensional consolidation testing. Additionally, select bedrock specimens were subjected to unconfined compressive strength testing to provide data for evaluation of bedrock bearing capacity. The following sections provide detailed discussions of the laboratory test results.

5.1. Engineering Classification Testing

TTL performed engineering classification testing on select Shelby tube and split-spoon specimens samples recovered from Standard Penetration Testing. Table 2 (on the following page) summarizes the data obtained from this testing, and individual test reports are presented in Appendix C.

Table 2. Summary of Classification Testing

Hole No.	Sample Depth (feet)	Moisture Content (%)	USCS Classification	ASSHTO Classification	Liquid Limit (LL)	Plasticity Index (PI)
B-02	2.0-4.0	29	CL	A-6(10)	36	16
	6.0-7.5	25		A-6(11)	35	12
	8.0-10	29		A-6(14)	44	18
B-04	6.0-7.5	26	CL	A-6(14)	37	15
B-07	2.0-4.0	13	CL	A-6(10)	35	15
	6.0-7.5	22		A-6(13)	35	14
	8.0-10	14		A-6(11)	42	18
B-13	3.5-5.0	20	CL	A-6(13)	36	14
B-17	6.0-7.5	16	CL-ML	A-6(10)	35	11
B-18	3.0-5.0	30	ML	A-4(11)	38	10
B-27	8.5-10	23	CL	A-6(14)	36	16
B-28	6.0-7.5	29	CL-ML	A-6(10)	31	8
B-32	3.5-5.0	22	CL	A-6(13)	35	15
B-36	6.0-7.5	21	CL-ML	A-4(6)	28	8
B-41	3.5-5.0	22	CL	A-6(15)	37	17
B-47	3.5-5.0	26	CL	A-6(17)	39	18
B-56	1.0-2.5	21.2	CL	A-6(11)	33	12
B-60	3.5-5.0	25.1	CL	A-7-6(20)	44	20
B-61	2.0-4.0	22	CL	A-6(10)	33	13

5.2. Unconfined Compressive Strength Testing of Soils

TTL performed unconfined compressive strength testing on five relatively undisturbed specimens from select depths at borings B-02, B-07, and B-28 to aid the design team in establishing shear strength parameters of the soil materials. Table 3 summarizes the data obtained from testing, and individual test reports are presented in Appendix C.

Table 3. Summary of Unconfined Compressive Strength of Soils Testing Results

Hole No.	USCS Classification	Sample Interval (ft)	Unit Weight		Moisture Content (%)	Undrained Shear Strength	
			Dry (pcf)	Wet (pcf)		(tsf)	(psf)
B-02	CL	2.0-4.0	89.1	114.3	28.3	0.27	543.4
		8.0-10.0	86.0	112.6	30.9	0.30	594.7
B-07	CL	2.0-4.0	93.3	108.6	16.4	0.20	404.6
		8.0-10.0	91.3	116.4	27.5	0.96	1928.1
B-28	CL	6.0-7.5	89.6	113.9	27.2	0.22	430.3

5.3. One-Dimensional Consolidation Testing

One-dimensional consolidation testing was performed on two Shelby tube specimens obtained from selected depths in borings B-02 and B-07 to provide data relative to the pre-consolidation pressure of the soils and assist the design team in selecting shear strengths for design purposes. Table 4 summarizes the consolidation parameters derived from the laboratory testing.

Table 4. Summary of One-Dimensional Consolidation Testing

Hole No.	Sample Interval (ft)	Initial Void Ratio (e_0)	Compression Index (C_c)	Recompression Index (C_r)	Preconsolidation Pressure (P_c) (psf)
B-02	8.0-10.0	0.7806	0.2	0.075	4,000
B-07	8.0-10.0	0.7979	0.5	0.021	3,500

5.4. Unconfined Compressive Strength Testing of Intact Rock Core Specimens

TTL performed eight unconfined compressive strength tests on intact rock core specimens to provide information for estimating strength and stiffness parameters for intact limestone bedrock. A member of TTL's Geotechnical Staff selected samples from core obtained from rock coring operations performed at the bridge foundation locations. Table 5 summarizes the data obtained from this testing, and individual test reports are presented in Appendix C.

Table 5. Summary of Unconfined Compressive Strength Testing of Intact Rock Core

Hole No.	Approximate Sample Depth (ft)	Geologic Formation (Formation, Member)	Unconfined Compressive Strength	
			(psi)	(ksf)
B-14	13.8	Bigby-Cannon, Bigby limestone member	16,480	2,373
B-20	4.5	Bigby-Cannon, Bigby limestone member	15,533	2,237
B-27	10.3	Bigby-Cannon, Bigby limestone member	15,846	2,282
B-30	9.0	Bigby-Cannon, Bigby limestone member	15,962	2,299
B-41	5.5	Bigby-Cannon, Bigby limestone member	9,063	1,305
B-52	4.5	Bigby-Cannon, Bigby limestone member	7,918	1,140
B-57	4.5	Bigby-Cannon, Bigby limestone member	14,202	2,045
B-60	7.0	Bigby-Cannon, Bigby limestone member	9,743	1,403

6.0 GENERAL RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The purpose of this report is to document the scope of the subsurface exploration; present data generated from the drilling, sampling and laboratory testing; and to provide general recommendations for foundation design and construction. The design of the proposed foundation elements or determination of axial or lateral capacity of such elements is beyond the scope of TTL's services, and therefore, should be performed by the wall designer using the geotechnical information and requirements presented herein, current TDOT design approaches and criteria, and standard of care at the time of the design services. TTL will remain available as a resource for geotechnical aspects of the project throughout the design process.

It is TTL's understanding that all of the reinforced backfill associated with the MSE wall and reinforced earth backfill will be aggregate (Select Backfill) conforming to specifications provided in TDOT's *Special Provision 624 Regarding Retaining Walls*. No soil embankments or fills will be constructed as part of this project. Excavations impacting existing slopes must comply with TDOT specifications and Section 6.1.2 Temporary Slope Inclinations, Sheeting, and Shoring, below.

The following general recommendations are presented in separate sections for clarity and were derived based on the above described understanding of the project. If the wall locations, alignments, or design configurations are revised subsequent to the submittal of this report, then this information should be provided to TTL so that such changes/additions can be reviewed and the recommendations amended as necessary.

6.1. Site Preparation

The forthcoming recommendations are general in nature and not meant to supersede or limit the requirements set forth in TDOT's *Standard Specifications for Roadway and Bridge Construction* or the CMGC requirements. Initially, site preparation should include stripping of all vegetation, topsoil, and any otherwise unsuitable materials extending at least 10 feet beyond the limits of the proposed construction area, where feasible. Waste materials, including stripped vegetation and other objectionable materials should be disposed of at an off-site location. Additionally, removal of trees should include the associated root mass. In order to remove the topsoil and associated root mass, stripping depths are expected to approach 12 inches in the vegetated portions of the site. It should be noted that thicker or thinner intervals of topsoil or root mass will likely be encountered between explored locations due to the

variability of the surficial fill. Topsoil can be stockpiled on site for later use within landscaped areas, but any debris or other unsuitable materials should be hauled from the site to prevent their incorporation into any fill.

While final grades have not been established at this time, we estimate site preparation will require excavations on the order of 20 feet at the existing abutment locations to achieve desired grades before MSE wall construction begins. It is our understanding that the contractor plans to maintain stability of the existing abutments during excavation by utilizing temporary soil-nail walls.

6.1.1. GENERAL SITE PREPARATION

6.1.1.1. All phases of the site preparation involving earthwork and foundation construction should be performed in the presence of an experienced engineering technician working under the direct supervision of a geotechnical engineer.

6.1.1.2. Based on the observed subsurface conditions at the boring locations, stripping depths on the order of 12 inches are expected in order to remove existing gravel, concrete, and topsoil within the limits of the proposed structure foundations. However, as the site has been subjected to historic development, areas of thicker deposits of deleterious materials may be present between boring locations. As such, TTL recommends the owner include a contingency for additional excavation of deleterious materials within the limits of the proposed structures. Where possible, stripping operations should extend at least 10 feet beyond the limits of the proposed structures. Waste materials should be hauled off-site.

6.1.1.3. Any buried structures associated with previous construction (i.e. foundation elements, above or below grade walls, etc.) should be removed and all existing utilities located within the proposed structure foundation limits should be abandoned, removed, and relocated. Because the project area has experienced previous development, particularly the rail yard and adjacent parcels of property, other buried structures or utilities may exist that are not apparent from the surface or discovered during the subject subsurface exploration.

6.1.1.4. The design team should be aware that fill materials were encountered in all the borings advanced as part of the subject subsurface exploration.

6.1.2. *TEMPORARY SLOPE INCLINATIONS, SHEETING, AND SHORING*

6.1.2.1. All temporary shoring is the sole responsibility of the contractor. Designs shall be completed by a Professional Engineer licensed in the state of Tennessee. All designs shall be reviewed by the design engineer.

6.1.2.2. Stability of the adjacent ground surface shall be maintained during site grading and excavations. Inclinations of the sides of excavations should comply with OSHA 29 CFR Part 1926. Space will be limited in some areas; therefore, shoring of portions of the excavation may be required where lateral space does not allow for inclination to the above stated OSHA requirements.

6.1.2.3. Where the presence of utilities, structures, right of way, or construction easement limits prohibits the installation of anchors/tie-backs, internal bracing may be required or shoring may have to be designed as a soil-nail wall or similar.

6.1.2.4. Project specifications should clearly detail that maintaining the stability of adjacent areas and structures is the responsibility of the Contractor.

6.1.3. *EXCAVATION DE-WATERING*

6.1.3.1. TTL personnel observed all of the borings within the project corridor as part of the subject exploration to be dry prior to initiating rock coring operations or backfilling borings in which rock coring was not performed. Additionally, no observation wells were installed for long-term water level measurements because of the heavily traversed, public nature of the project area. The water levels shown on the boring logs are those observed after rock coring operations were completed and are believed to result from the use of water for coring operations, not an indicator of groundwater levels. However, "perched" or "trapped" water may be encountered in isolated zones during excavation, particularly where rock fill has been placed, at the soil-bedrock interface, and/or within weathered zones or seams in the bedrock matrix. "Perched" or "trapped" water should be anticipated during construction, particularly during the wetter months of the year and/or following periods of heavy precipitation.

6.1.3.2. Temporary construction de-watering should be able to be accomplished with conventional pumps from a collection point constructed at the base of the excavation or bottom of the

excavation. Therefore, it will be advantageous to temporarily grade the bottom level of the excavation in order to drain surface water to the collection point.

6.1.3.3. Final design of the structures with below-grade facilities should include systems for permanent de-watering as needed based on maintenance and handling of anticipated stormwater inflows. Where a permanent de-watering system cannot be maintained, is not cost effective, or is not desired for any other reason, the below grade portion of the wall should be designed for full hydrostatic pressure.

6.2. Subgrade Improvement (Undercut and Replace)

Provided that the site is prepared as described above, it is our opinion that the proposed wall system will require subgrade improvement to perform as designed. MSE walls and associated reinforced zones, as well as reinforced earth slopes (associated with Walls No. 1 & 2) may bear on a properly placed and compacted Graded Solid Rock (GSR) fill layer measuring 6 feet in thickness or extending to competent bedrock, whichever occurs first. We recommend that the foundation elements supported on GSR fill be sized for a nominal bearing capacity of 12,500 pounds per square foot. We recommend that the foundation elements supported directly on competent bedrock be sized for a nominal bearing capacity of 80,000 pounds per square foot.

TDOT's *Standard Specifications for Road and Bridge Construction 2015* provides the following specification:

Graded Solid Rock should consist of sound, non-degradable rock having the following characteristics:

- a) *Maximum particle size of 3 feet in any direction.*
- b) *Particle size distribution in which at least 50% of the rock is uniformly distributed between 1-foot and 3 feet in diameter, and no more than 10% is less than 2 inches in diameter.*
- c) *Roughly equi-dimensional in shape*
- d) *No thin, slabby material*

Process the material using an acceptable method that produces the required gradation. When the material is subjected to five alternations of sodium sulfate soundness test according to AASHTO T

104, the weighted percentage of loss shall be not more than 12. Obtain the Engineer's Approval before using the material.

The rock fill is to be placed in horizontal lifts not more than 36 inches thick and subsequently compacted to produce a stable, unyielding mass with essentially no voids. Compaction of the rock fill should be performed with a heavy (10 ton), vibratory roller. The compaction of the fill must be visually monitored by the geotechnical engineer and should entail at least 7 complete passes with the compaction equipment over each lift of fill.

Per TDOT's request, Select Backfill, as specified in TDOT's *Special Provision 624 Regarding Retaining Walls*, may be substituted for GSR as suitable backfill material.

General Recommendations for Reinforced Zones:

- 6.2.1. Excavations for reinforced zones should exhibit level surfaces prior to placement of stone backfill or concrete. This may require that elements be "stepped" down to provide horizontal bearing surfaces.
- 6.2.2. The bearing surface of reinforced zones should be level, and any loose, water-softened compressible materials should be removed prior to placement of stone backfill or concrete. In no case should stone fill or concrete be placed upon compressible or water-softened materials.
- 6.2.3. Shale seams within the bedrock underlying the site will decompose rapidly when exposed to air and water. The accumulation of water or extended exposure to other climatic conditions as such exposure will tend to soften and weaken the foundation material.
- 6.2.4. Thin clay seams, weathered zones, and open voids were encountered within portions of the bedrock mass in several borings advanced as part of this exploration. As such, the bearing surface of the entire reinforced zone should be evaluated in the field during construction by an experienced technician working under the direct supervision of a geotechnical engineer. This evaluation should include the advancement of 5-foot deep percussion test holes drilled on intervals of at least one per 50 square feet of the reinforced zone. Each test hole should be evaluated by the technician using a "hooked" probe to detect the presence of any voids, clay seams, or loose zones which may affect foundation support. If significant voids, clay seams, or

otherwise deleterious features are encountered at or near the bearing surface, the bearing elevation should be deepened incrementally with continued inspection until acceptable bedrock conditions are encountered. In addition, if a void or clay-filled feature is exposed in any vertical face during excavation, it should be evaluated by the technician and geotechnical engineer to determine its magnitude and relationship to the bearing surface. If such features are encountered and the geotechnical engineer determines them to be of sufficient magnitude, then the bearing elevation should be lowered to the bottom of the feature(s) or remedial measures proposed by the geotechnical engineer be taken.

6.3. Aggregate Piers

As an alternative, the walls can be founded on a system of aggregate piers. Aggregate piers are typically 24 to 36 inches in diameter. Due to the proximity of the bedrock surface, we recommend that the piers extend to the bedrock surface or a maximum depth of 20 feet, whichever occurs first. The design and installation of an aggregate pier system will require a specialty engineer and contractor. We recommend that the specialty contractor have an opportunity to review the geotechnical data presented herein.

Subsequently, an MSE or reinforced earth system can be designed to bear on the installed aggregate pier composite system based on a bearing capacity provided by the system designer.

6.4. Seismic Design Recommendations

Based on the guidance in the 2009 edition of the **International Building Code (IBC)**, the site would be classified as Site Class C to D. Using the site's coordinates obtained from mapping software and U.S. Seismic Design Maps created by the United States Geological Survey, the following site coefficients and design spectral accelerations were obtained. Table 6 (on the following page) outlines the applicable site coefficients and design spectral accelerations for each of the project areas based on guidance provided in the 2009 IBC.

Table 6. Site Coefficient and Design Accelerations

Location	Seismic Site Class	Site Coefficients		Design Accelerations	
		F _a	F _v	S _{DS}	S _{D1}
Clinton St.	D	1.522	2.265	0.348	0.134
Jo Johnston Ave.	C	1.200	1.666	0.348	0.134
Charlotte Ave.	C	1.200	1.666	0.347	0.134

The “As” values will be provided by TDOT Structures on the RETAINING WALL DESIGN NOTES sheet in the final construction plan set. The above values are based on the design spectral accelerations for short periods as depicted on published data. If requested, on-site shear wave velocity testing may be performed in an attempt to improve the site class. Additionally, a site-specific seismic study may be performed to possibly reduce the given design spectral acceleration. We can provide these services and are available to discuss these options if necessary.

7.0 CONSTRUCTION MONITORING AND TESTING

The long-term performance of the foundation systems and other site features will be dependent upon workmanship during construction and the contractor’s compliance with project specifications. As the Geotechnical Engineer of Record for this project, we should be retained to observe the foundation installation, earthwork activities, and building and pavement construction. Our technical overview and on-site testing and observations during these activities is essential to check that the intent of the design is met.

8.0 CLOSING

The foregoing recommendations were developed based on observations of *in situ* conditions from a limited number of borings and with the assumption that the materials exposed therein represent conditions existing across the site. It is possible that different conditions could exist between the explored locations, and such unknown conditions could have an impact on design and construction. Should conditions at variance with this report be encountered during construction, this office should be notified immediately so further studies can be made and supplemental recommendations can be provided.

The observed water levels and/or conditions indicated on the boring logs are as recorded at the time of the exploration. These water levels and/or conditions may vary considerably with time, according to the prevailing climate, rainfall, or other factors and are otherwise dependent on the duration of, and methods used, in the exploration program.

Recommendations have been provided in the various sections of this report. The report shall, therefore, be used in its entirety.

TTL exercised engineering judgment using the degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession in preparing the subsurface information presented herein. The information was prepared and is intended for design purposes. Its presentation on the plans or elsewhere is for the purpose of providing intended users with a basis for general design purposes. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques, construction quantities, and methods each chooses to use. This subsurface information interpretation is presented in good faith and is not intended as a substitute for personal investigations, independent interpretations, or judgments of the reader.

No warranties, expressed or implied, are made or intended. All information (written or electronic) from TTL concerning TTL's work is for the sole use and reliance of TTL's Client. TTL intends no third party beneficiaries (expressed or implied), and copies of such information received by any third parties are NOT for reliance unless TTL first receives a signed Secondary Client Agreement from the third party.

*Final Foundation Report for Retaining Walls
Rehabilitation of I-40 Bridges
Charlotte Avenue, Jo Johnston Avenue, Clinton
Street
& Herman Street
Nashville, Davidson County, Tennessee
TTL Project No. 100814105
TDOT Project No. 19005-1161-44 5*

APPENDIX A:

Retaining Wall Plans

RETAINING WALL DESIGN NOTES

Unless specifically stated otherwise in the contract plans, the bidding for, the design of and the construction of retaining walls shown in the plans shall be governed by the *Tennessee Department of Transportation Special Provision 624 Regarding Retaining Walls*. This Special Provision shall be considered as one of those documents which the Bidder/Contractor has examined and made himself familiar with as described in *Section 102.04 – Examination of the Site, the Work, the Plans, and the Specifications in the TDOT Standard Specifications for Road and Bridge Construction*.

Excavation for the wall and/or its footing shall not be accomplished until the Contractor has submitted wall designs and calculations and has been issued an approved set of wall plans and has labor and material resources available to begin and continue wall construction immediately after excavation.

This wall shall be designed in accordance with LRFD design procedures and requirements as described in 1) AASHTO LRFD Bridge Design Specifications, 2012 and Interims and 2) Publication FHWA-NHI-10-024/FHWA GEC 011, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, November 2009* for MSE walls.

For proprietary wall systems that have been approved as shown in Special Provision 624, the Wall Designer shall be responsible for providing wall designs incorporating materials and components (i.e. reinforcement connection devices, specific manufacturer and properties of geogrid) as was originally submitted and approved by TDOT. If a material and/or component of the wall system have been modified from the originally approved system, a wall design and set of plans and calculations for this wall system cannot be submitted for review and approval until the Wall System Designer who originally submitted the wall system for approval by TDOT submits a request for re-approval utilizing the modified elements of the wall. This submittal does not guarantee approval of the modified system. If this re-approval process does not meet the Contractor's schedule or if the modified system is not approved, the Contractor/Wall Designer shall provide a wall design for one of the approved systems at no change in contract price for the retaining wall and no change in project schedule requirements will be allowed.

The Wall Designer shall provide retaining wall plans, details and calculations as required by Special Provision 624 and as required herein.

- The Wall Designer shall utilize the Geotechnical Parameters and Resistance Factors as provided for each project retaining wall on the Wall Concept Sheet and related Retaining Wall Sheets to prepare and submit design calculations. Load Factors and other pertinent design requirements provided in AASHTO LRFD Bridge Design Specifications, 2012 and Interims shall be used for non-MSE walls and in Publication FHWA-NHI-10-024/FHWA GEC 011, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, November 2009* for MSE walls.

- Calculations for both internal and external stability (sliding, eccentricity, and bearing capacity-global stability and settlement being the exceptions) shall be provided for each critical wall section which demonstrates the required Capacity to Demand Ratio of 1.0 is met utilizing the design parameters provided. For MSE walls, the Wall Designer must adjust the reinforcement lengths beyond those minimum required lengths, if required, to meet both internal and external requirements. The Wall Designer/Contractor plans must include any foundation improvements as required herein on the Wall Designer/Contractor's wall elevation views and any cross-sectional detail drawings.

- Unless otherwise stated, the Wall Designer can assume that minimum global stability and settlement criteria is achieved with a wall design meeting other minimum external stability requirements and assuming wall foundation conditions are met. While the Wall Designer's design must demonstrate compliance with external stability requirements as discussed above, the Wall Designer may provide certification (by signing and stamping by Professional Engineer registered in State of Tennessee) of the wall plans and calculations **for internal stability only**.

- Load Combinations Strength I, Extreme Event I, and Extreme Event II as given in Table 4-1 of Publication FHWA-NHI-10-024/FHWA GEC 011, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, November 2009* for MSE walls shall be evaluated for MSE walls. Load Combinations for other wall types shall be as given in AASHTO LRFD Bridge Design Specifications, 2012 and Interims.

Note Regarding Construction Slopes

The Contractor shall be responsible for making the excavation in accordance with OSHA and other applicable state and local regulations regarding construction slopes and trenches. In addition to following applicable regulatory requirements, as a minimum requirement, all temporary construction slopes shall be placed at a maximum of a 1:1 slope in soil and shall not be left open without shoring for any longer than absolutely necessary. The Contractor building the wall shall ensure that these temporary back slopes are not and do not become unstable. If slope is unstable, becomes unstable, is cut steeper than a 1:1 slope or is unacceptable for another reason, then temporary shoring shall be used. Any unusual soil conditions other than those assumed should be reported to the Project Engineer.

TABLE 1 - DESIGN REQUIREMENTS AND PARAMETERS

Description	Value-MSE Walls	Note *
Design Life	75 Years	
Seismic Acceleration Coefficient, As	0.089	
Effective (Drained) Friction Angle		
Retained Backfill-Unclassified site or borrow soil	26°	
Retained Backfill-Select Backfill	34° to max 40°	1
Reinforced Backfill	34° to max 40°	1
Unit Weight		
Unclassified site or borrow soil	120 pounds per cubic foot	
Select Backfill Material	Varies	1A
Minimum Length of soil reinforcement, B	Greater of 0.7H min or 8-ft or as specified on the plans	2,2A
Limiting eccentricity	B/4 (soil) / 3/8B (rock)	
Coefficient of Sliding Friction	See Table 2	3
Nominal Bearing Capacity	See Table 2	3
Resistance Factors		
Sliding-Static	1.0	4
Sliding-Combined Static+Earthquake	0.9	4
Bearing-Static	0.65	5
Bearing- Combined Static+Earthquake	0.9	
Pullout resistance		
Static	0.90	6
Combined static/earthquake	1.20	6
Tensile resistance of metallic reinforcements and connectors		
Static		
-Strip reinforcement	0.75	7
-Grid reinforcement	0.65	7,8
Combined static/earthquake		
-Strip reinforcement	1.00	7
- Grid reinforcement	0.85	7,8
Tensile resistance of geosynthetic reinforcements and connectors		
Static	0.90	
Combined static/earthquake	1.20	

TABLE 1.1	
NOTES FOR TABLE 1	
#	Note
1	A minimum friction angle of 34 degrees can be assumed for material meeting specifications in Section F, Part 1, and Item e of <i>Tennessee Department of Transportation Special Provision 624 Regarding Retaining Walls</i> . A higher friction angle can be utilized if the Contractor submits independent testing and it is verified by TDOT. However, in no case shall the friction angle for analysis exceed 40-degrees.
1A	Select Backfill unit weight to be determined by Contractor/Designer depending on actual backfill material used. Select backfill is defined as material meeting specifications in Section F, Part 1, and Item e of <i>Tennessee Department of Transportation Special Provision 624 Regarding Retaining Walls</i> . In order to utilize ϕ for select backfill design, select backfill must be placed for a minimum zone formed by a 1:1 slope from 2 feet behind the bottom of back of wall footing or reinforced soil zone for MSE walls up to finished grade.
2	H is the design height of the wall and is defined as the difference in elevation between the finished grade at the top of the wall and the top of leveling pad or bottom of footing for non-MSE walls. The top of the leveling pad shall always be below the minimum embedment reference line as indicated on the plans for that location. The length of the soil reinforcement, B, is measured from the backface of the wall facing unit. In case of grid type reinforcements the length of the soil reinforcement is measured from the backface of the wall facing unit to the last full transverse member. For modular block facing units, the total length of the reinforcement, Br as measured from the front face of the wall is the length B as defined above plus the width of the modular block unit (the horizontal dimension of the block unit measured perpendicular to the wall face).
2A	Wall Designer must adjust the reinforcement lengths beyond those minimum required lengths, if required, to meet both internal and external (global stability being the exception) stability requirements.
3	These values will be provided in Tables 2 and/or 3
4	Passive resistance shall NOT be considered in evaluation of sliding resistance.
5	For all limit states, the design loading for the MSE retaining wall system shall not exceed the factored general and local bearing resistance specified in Tables 2 or 3.
6	Live load due to vehicular traffic shall be included in the computations to determine the maximum tensile forces in reinforcement layers, but shall be neglected in the computations for pullout resistance.
7	Apply to gross cross-section less sacrificial area. For sections with holes, reduce gross area in accordance with Article 6.8.3 of AASHTO (2012) and apply to net section less sacrificial area.
8	Applies to grid reinforcements connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.
Unless otherwise specified, all resistance factors shall be taken as 1.0 when investigating an extreme event limit state.	

P.E. NO.			
CONST. NO.			
PROJECT NO.	YEAR	SHEET NO.	
BH-1-40-4(86)	2015	2K1	
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION

Acceptable Wall Types

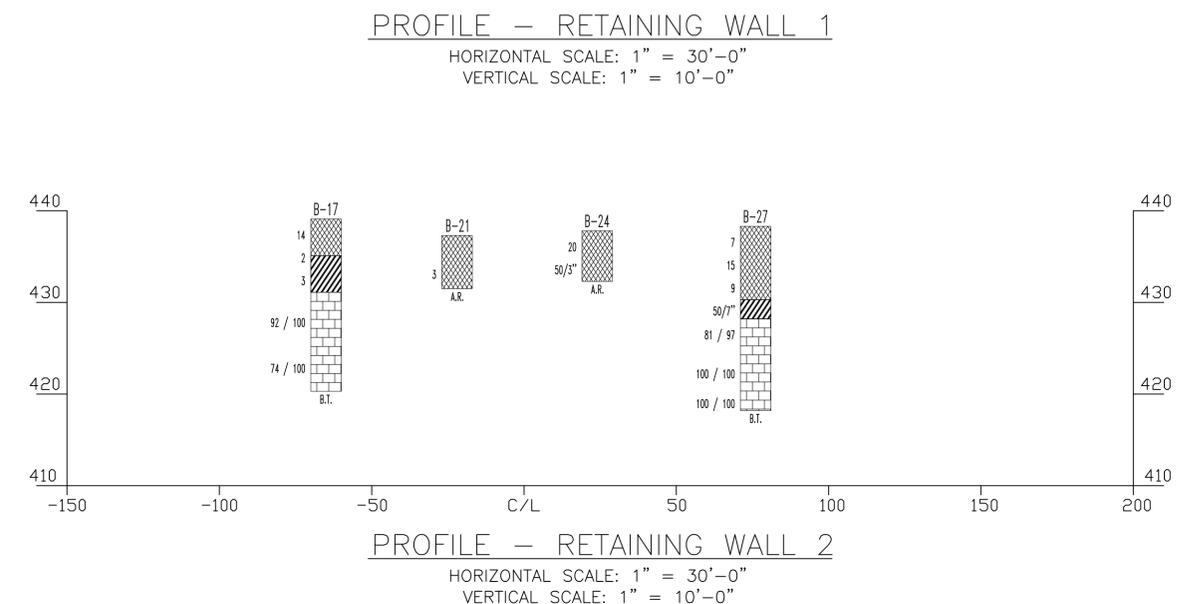
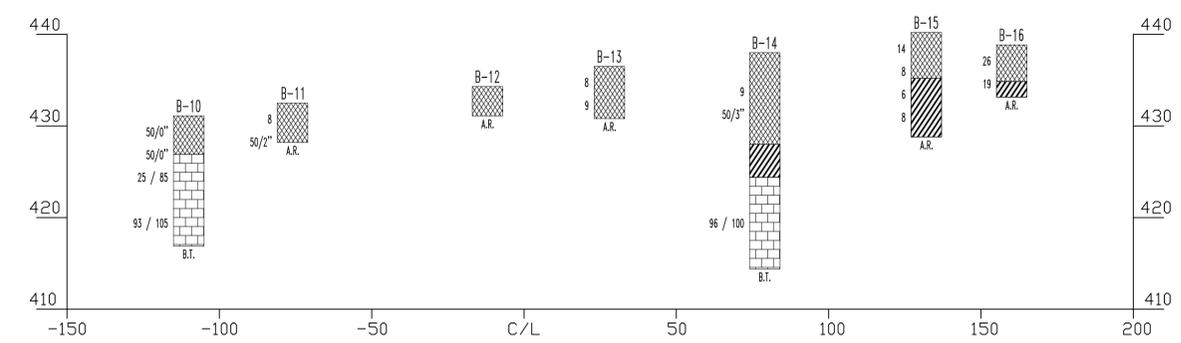
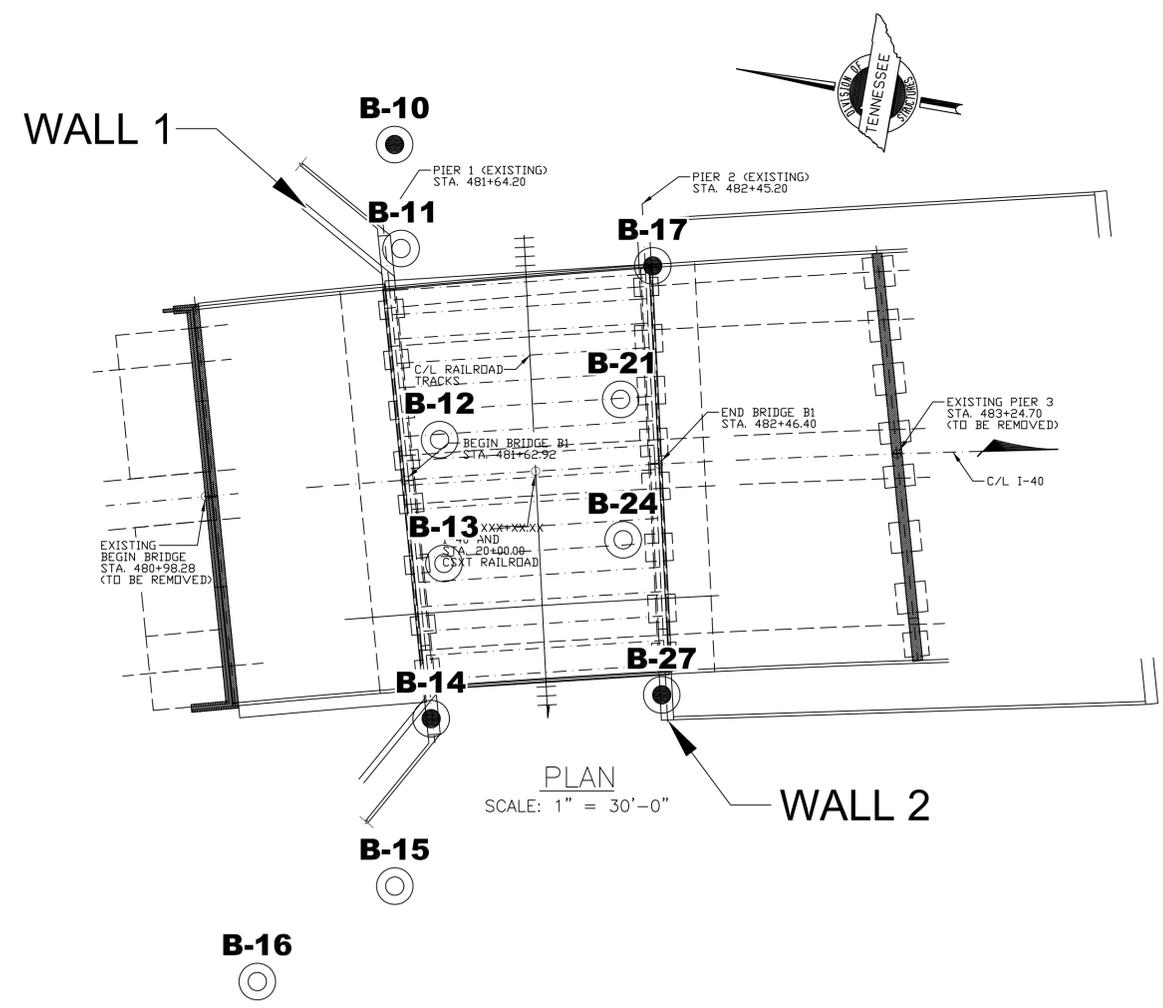
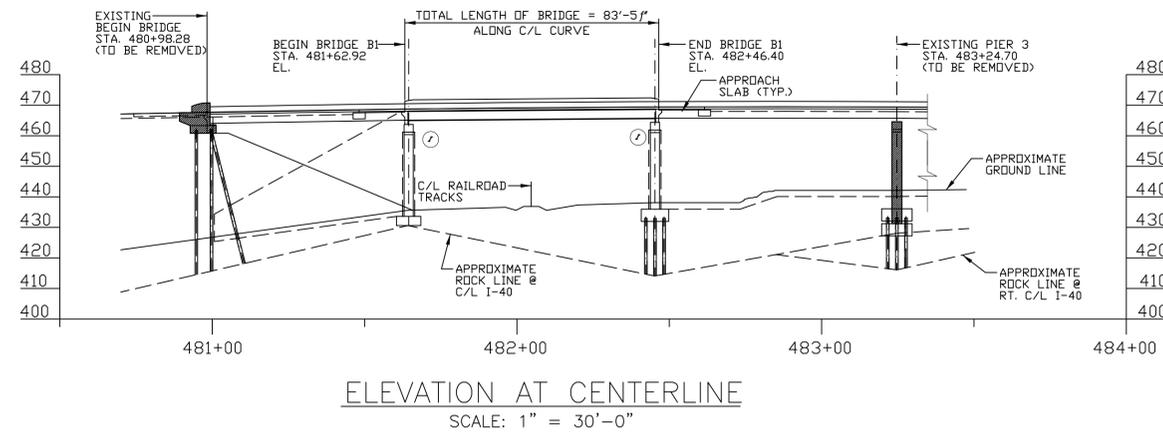
The retaining wall shall be one of the wall types listed below. For retaining wall systems listed as Bin Wall, Crib Wall, MSE (either segmental panel or Modular Block) and Ground Anchor Wall, the specific Wall System Supplier/Installer shall be one of those listed as Pre-approved in the Special Provision 624.

- Mechanically Stabilized Earth (MSE) Wall – Segmental Precast
- Mechanically Stabilized Earth (MSE) Wall – Modular Block

Other Design Requirements

Details of drainage features shall be provided in Wall Designer/Contractor's wall design plans. If a Concrete Cantilever Wall is used, the wall designer must provide for a drainage layer behind the wall stem with adequate drainage provided via weep holes.

NOTE: SEE "GEOTECHNICAL DESIGN NOTES AND REQUIREMENTS" SHEET FOR DESIGN REQUIREMENTS AND PARAMETERS



P.E. NO. _____
 CONST. NO. _____

PROJECT NO.	YEAR	SHEET NO.
BH-1-40-4(86)	2015	2L1

REVISIONS

NO.	DATE	BY	BRIEF DESCRIPTION

- Existing Ground at Centerline
- B-70** Soil Boring Location and Identifier
- B-68** Soil Boring with Rock Coring Location and Identifier

BORING LEGEND

- BORING NO.
- N (BPF)
- RQD/REQ
- MATERIAL SYMBOL
- ▽ Water level at time of boring
 - ▼ Delayed water level
 - ☒ Cave-in depth
 - AR = Auger Refusal BT = Boring Terminated
 - Low Plasticity Clay
 - High Plasticity Clay
 - Limestone
 - Weathered Limestone
 - Open Void
 - Fill

TABLE 2-FOUNDATION PARAMETERS AND REQUIREMENTS FOR MSE WALLS OR RSS SLOPES

RETAINING WALL 1 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 4+00.39	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 4+00.39	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 4+00.39	COMPETENT BEDROCK	80,000	0.60

RETAINING WALL 2 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 2+51.69	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 2+51.69	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 2+51.69	COMPETENT BEDROCK	80,000	0.60

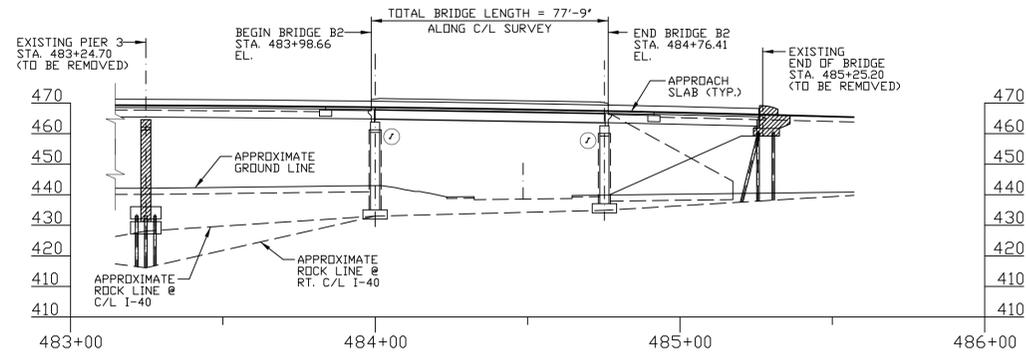
* GRADED SOLID ROCK DEFINED IN TDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
 SELECT BACKFILL DEFINED IN TDOT SPECIAL PROVISION 624 REGARDING RETAINING WALLS.

STATE OF TENNESSEE
 DEPARTMENT OF TRANSPORTATION
 LAYOUT OF BRIDGE
 TO BE REPAIRED
 I-40
 OVER
 CSX RAILROAD
 BR. NO. 19-10040-16.75
 DAVIDSON COUNTY
 2015

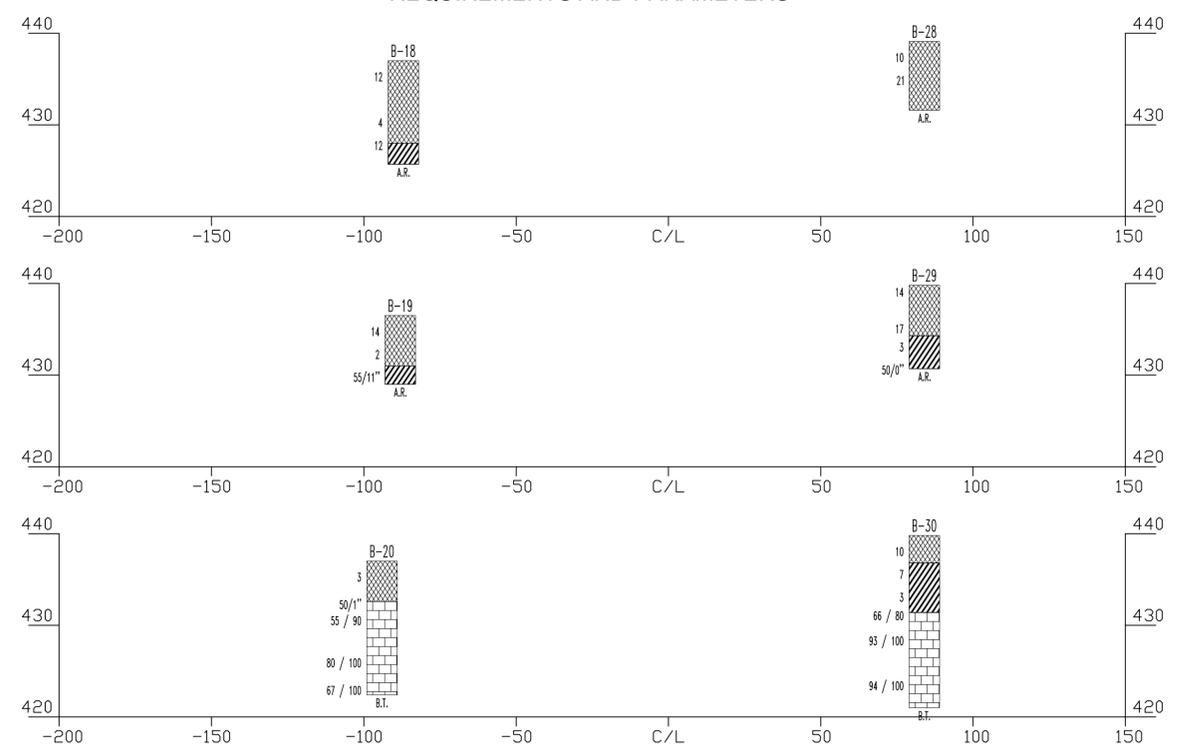
DESIGNED BY _____ DATE _____
 DRAWN BY _____ DATE _____
 SUPERVISED BY _____ DATE _____
 CHECKED BY _____ DATE _____

NOTE: SEE "GEOTECHNICAL DESIGN NOTES AND REQUIREMENTS" SHEET FOR DESIGN REQUIREMENTS AND PARAMETERS

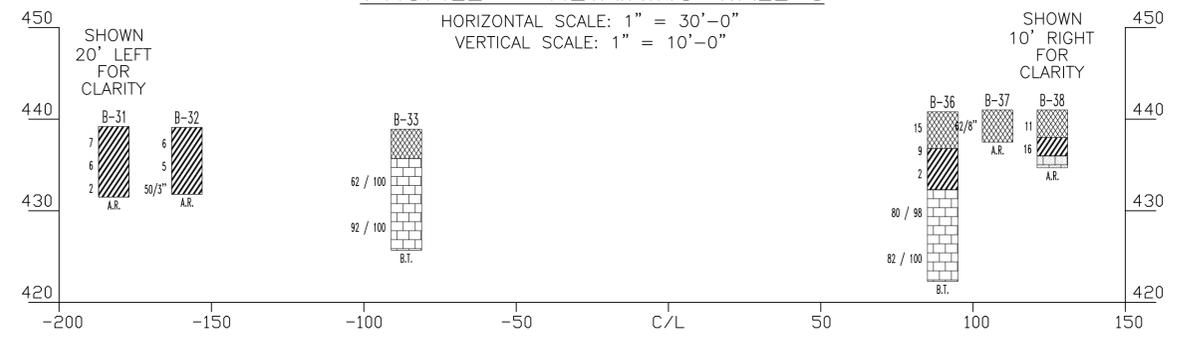
P.E. NO. _____			
CONST. NO. _____			
PROJECT NO.	YEAR	SHEET NO.	
BH-1-40-4(86)	2015	2M1	
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



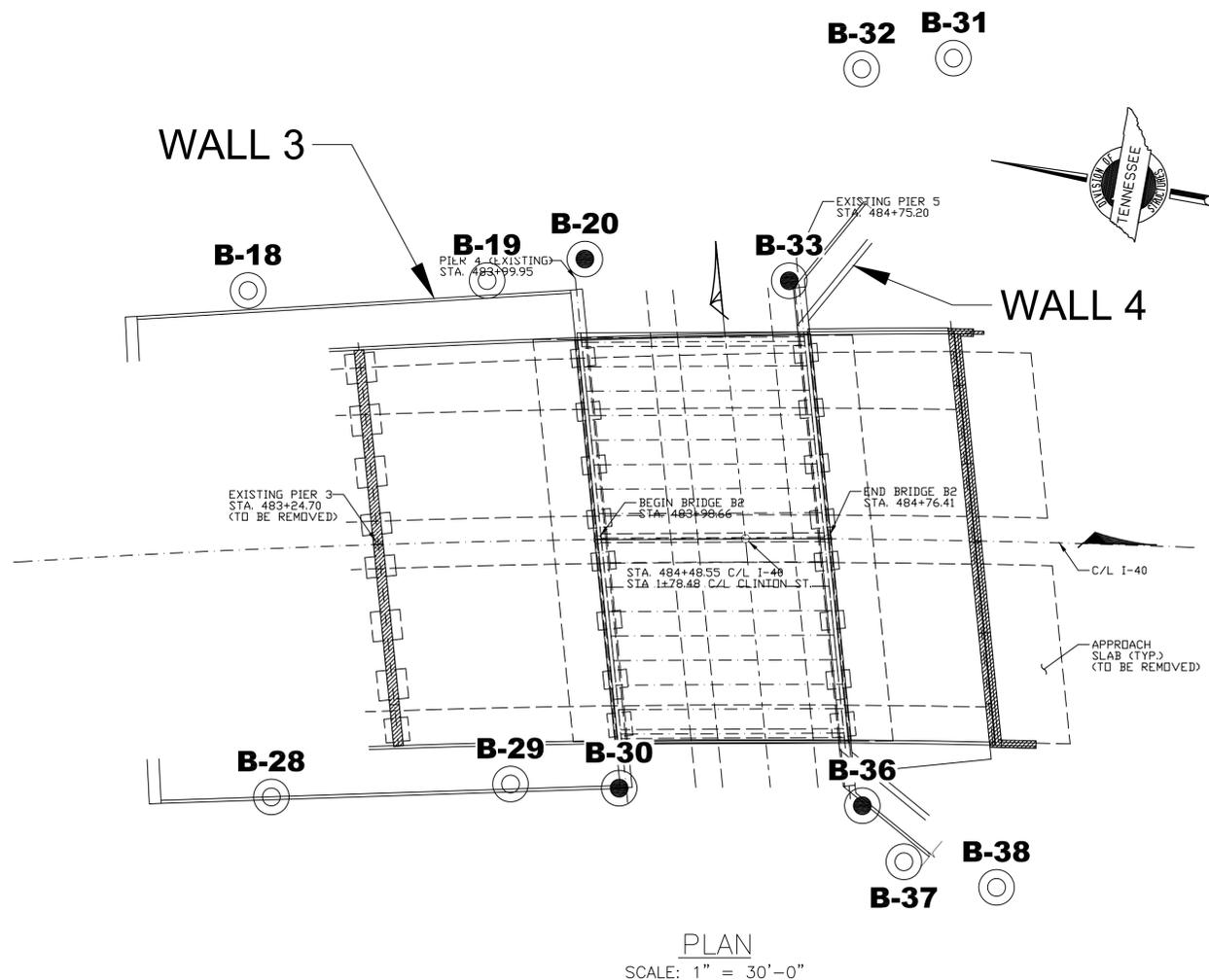
ELEVATION AT CENTERLINE
SCALE: 1" = 30'-0"



PROFILE - RETAINING WALL 3
HORIZONTAL SCALE: 1" = 30'-0"
VERTICAL SCALE: 1" = 10'-0"



PROFILE - RETAINING WALL 4
HORIZONTAL SCALE: 1" = 30'-0"
VERTICAL SCALE: 1" = 10'-0"



PLAN
SCALE: 1" = 30'-0"

- Existing Ground at Centerline
- B-70** Soil Boring Location and Identifier
- B-68** Soil Boring with Rock Coring Location and Identifier
- BORING LEGEND**
- BORING NO.**
- N (BPF)
- RQD/REQ
- Water level at time of boring
- Delayed water level
- Cave-in depth
- AR = Auger Refusal BT = Boring Terminated
- Low Plasticity Clay
- High Plasticity Clay
- Limestone
- Weathered Limestone
- Open Void
- Fill

TABLE 2-FOUNDATION PARAMETERS AND REQUIREMENTS FOR MSE WALLS

RETAINING WALL 3 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 5+72.05	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 5+72.05	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 5+72.05	COMPETENT BEDROCK	80,000	0.60

RETAINING WALL 4 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 4+57.95	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 4+57.95	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 4+57.95	COMPETENT BEDROCK	80,000	0.60

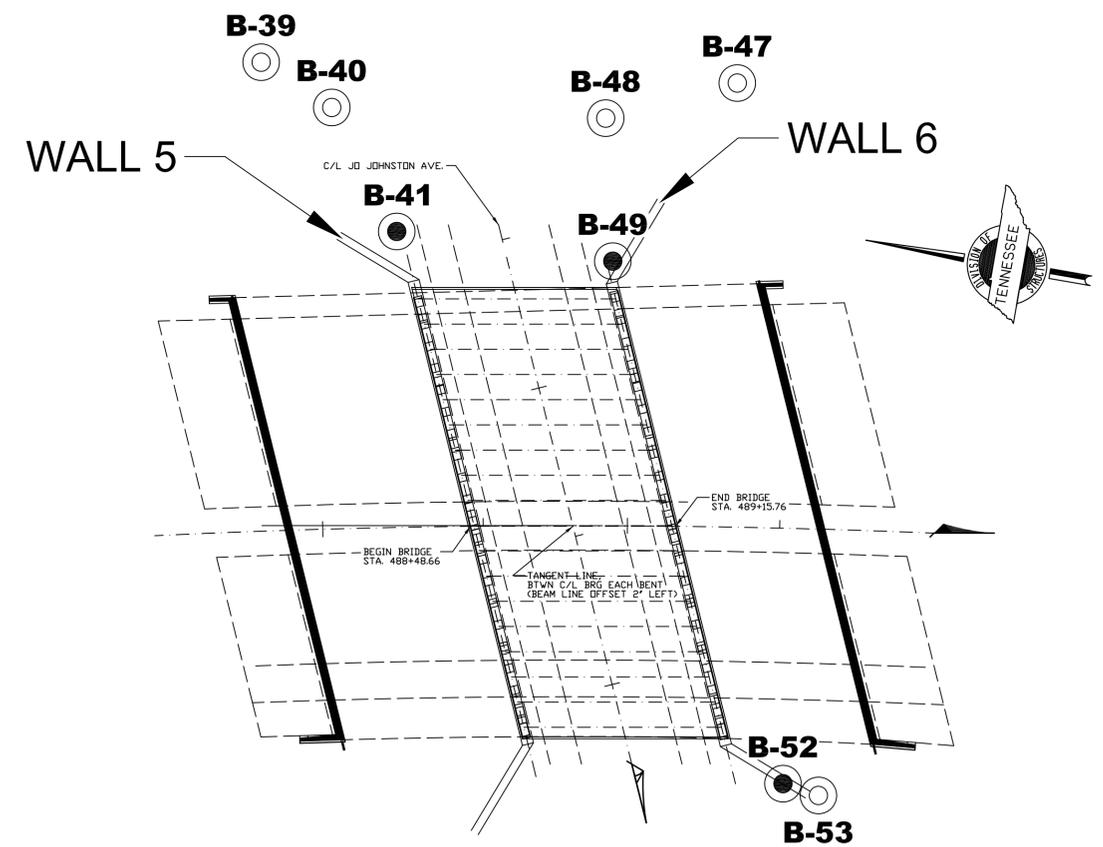
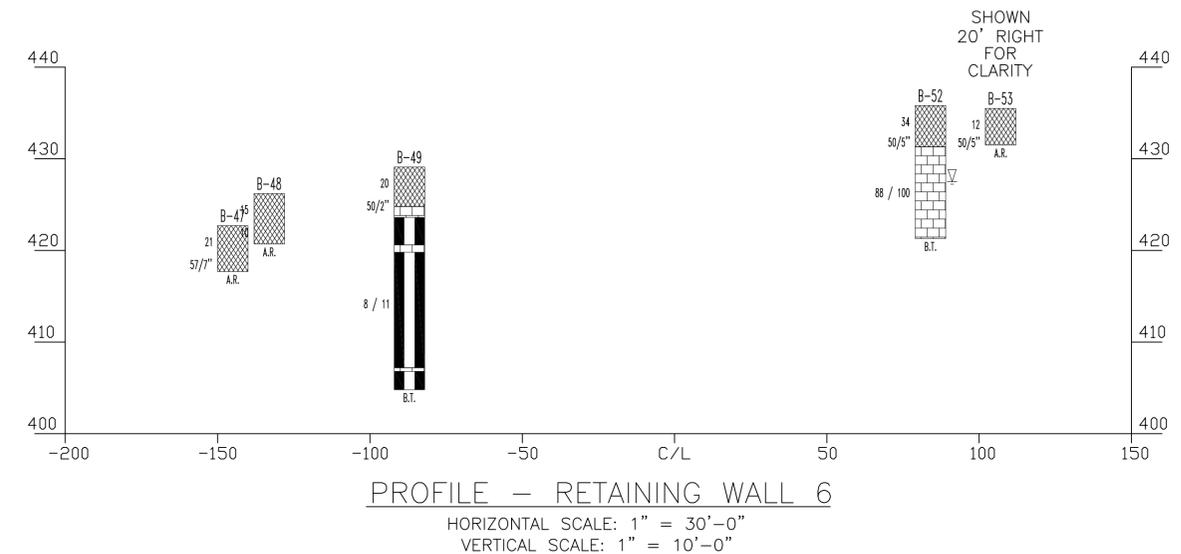
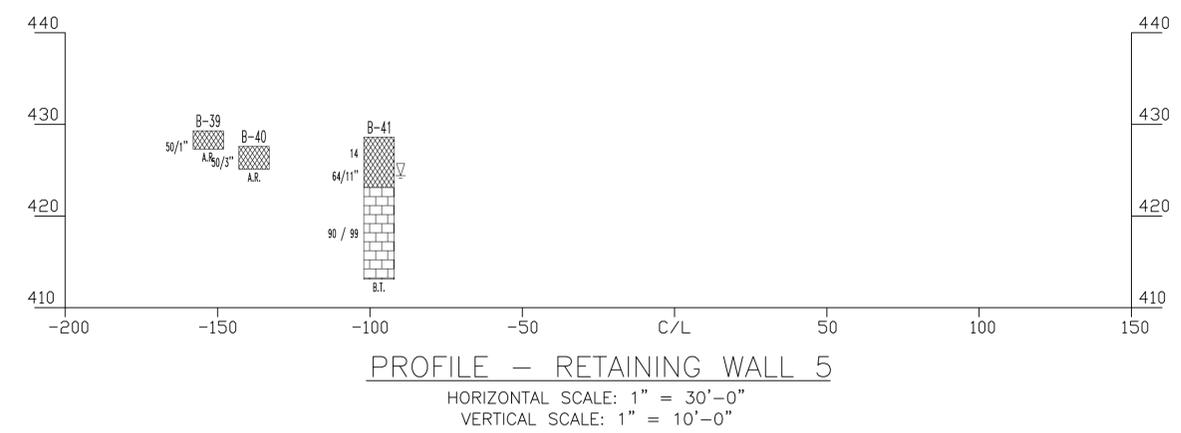
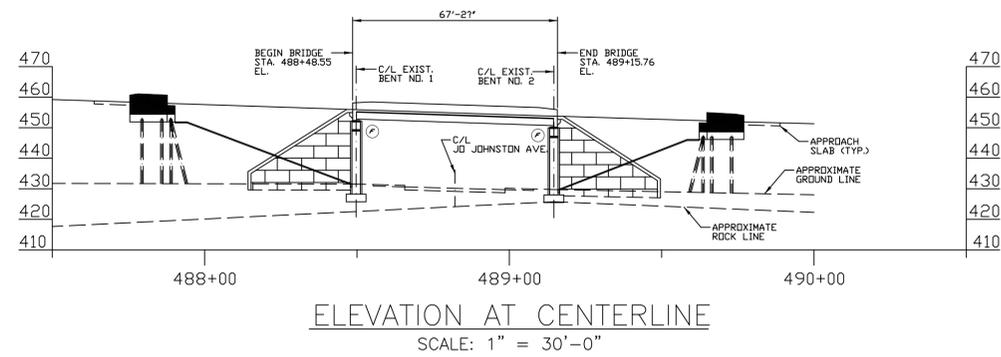
* GRADED SOLID ROCK MAY BE SUBSTITUTED WITH SELECT BACKFILL AS SPECIFIED IN TENNESSEE DEPARTMENT OF TRANSPORTATION SPECIAL PROVISIONS 624 REGARDING RETAINING WALLS.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
LAYOUT OF BRIDGE
TO BE REPAIRED
I-40
OVER
CLINTON STREET
BR. NO. 19-10040-16.75
DAVIDSON COUNTY
2015

DESIGNED BY _____ DATE _____
DRAWN BY _____ DATE _____
SUPERVISED BY _____ DATE _____
CHECKED BY _____ DATE _____

NOTE: SEE "GEOTECHNICAL DESIGN NOTES AND REQUIREMENTS" SHEET FOR DESIGN REQUIREMENTS AND PARAMETERS

P.E. NO. _____			
CONST. NO. _____			
PROJECT NO.	YEAR	SHEET NO.	
BH-1-40-4(86)	2015	2N1	
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



--- Existing Ground at Centerline

B-70 Soil Boring Location and Identifier
 Soil Boring Location and Identifier

B-68 Soil Boring with Rock Coring Location and Identifier
 Soil Boring with Rock Coring Location and Identifier

BORING LEGEND

BORING NO.

N (BPF) MATERIAL SYMBOL

RQD/REQ MATERIAL SYMBOL

Water level at time of boring

Delayed water level

Cave-in depth

AR = Auger Refusal BT = Boring Terminated

Low Plasticity Clay High Plasticity Clay

Limestone Weathered Limestone

Open Void Fill

TABLE 2-FOUNDATION PARAMETERS AND REQUIREMENTS FOR MSE WALLS

RETAINING WALL 5 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 4+31.14	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 4+31.14	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 4+31.14	COMPETENT BEDROCK	80,000	0.60

RETAINING WALL 6 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 5+21.46	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 5+21.46	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 5+21.46	COMPETENT BEDROCK	80,000	0.60

* GRADED SOLID ROCK MAY BE SUBSTITUTED WITH SELECT BACKFILL AS SPECIFIED IN TENNESSEE DEPARTMENT OF TRANSPORTATION SPECIAL PROVISIONS 624 REGARDING RETAINING WALLS.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
LAYOUT OF BRIDGE
TO BE REPAIRED
1-40
OVER
JO JOHNSTON AVE.
BR. NO. 19-10040-16.88
DAVIDSON COUNTY
2015

DESIGNED BY _____ DATE _____
 DRAWN BY _____ DATE _____
 SUPERVISED BY _____ DATE _____
 CHECKED BY _____ DATE _____

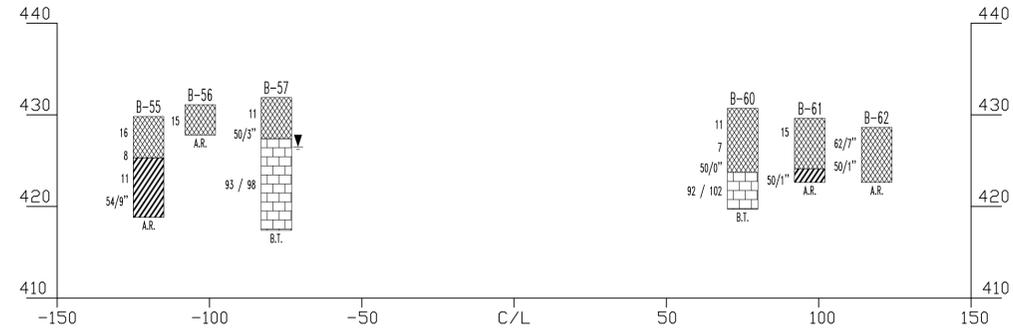
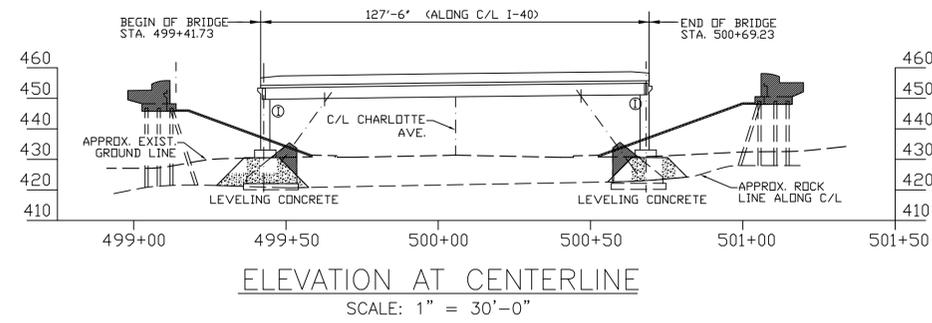
NOTE: SEE "GEOTECHNICAL DESIGN NOTES AND REQUIREMENTS" SHEET FOR DESIGN REQUIREMENTS AND PARAMETERS

P.E. NO. _____
 CONST. NO. _____

PROJECT NO.	YEAR	SHEET NO.
BH-1-40-4(86)	2015	201

REVISIONS

NO.	DATE	BY	BRIEF DESCRIPTION



- Existing Ground at Centerline
- B-70** Soil Boring Location and Identifier
- B-68** Soil Boring with Rock Coring Location and Identifier

BORING LEGEND

- BORING NO.
- N (BPF) [Symbol]
- RQD/REQ [Symbol]
- ▽ Water level at time of boring
- ▼ Delayed water level
- ☒ Cave-in depth
- AR = Auger Refusal BT = Boring Terminated
- [Symbol] Low Plasticity Clay
 - [Symbol] High Plasticity Clay
 - [Symbol] Limestone
 - [Symbol] Weathered Limestone
 - [Symbol] Open Void
 - [Symbol] Fill

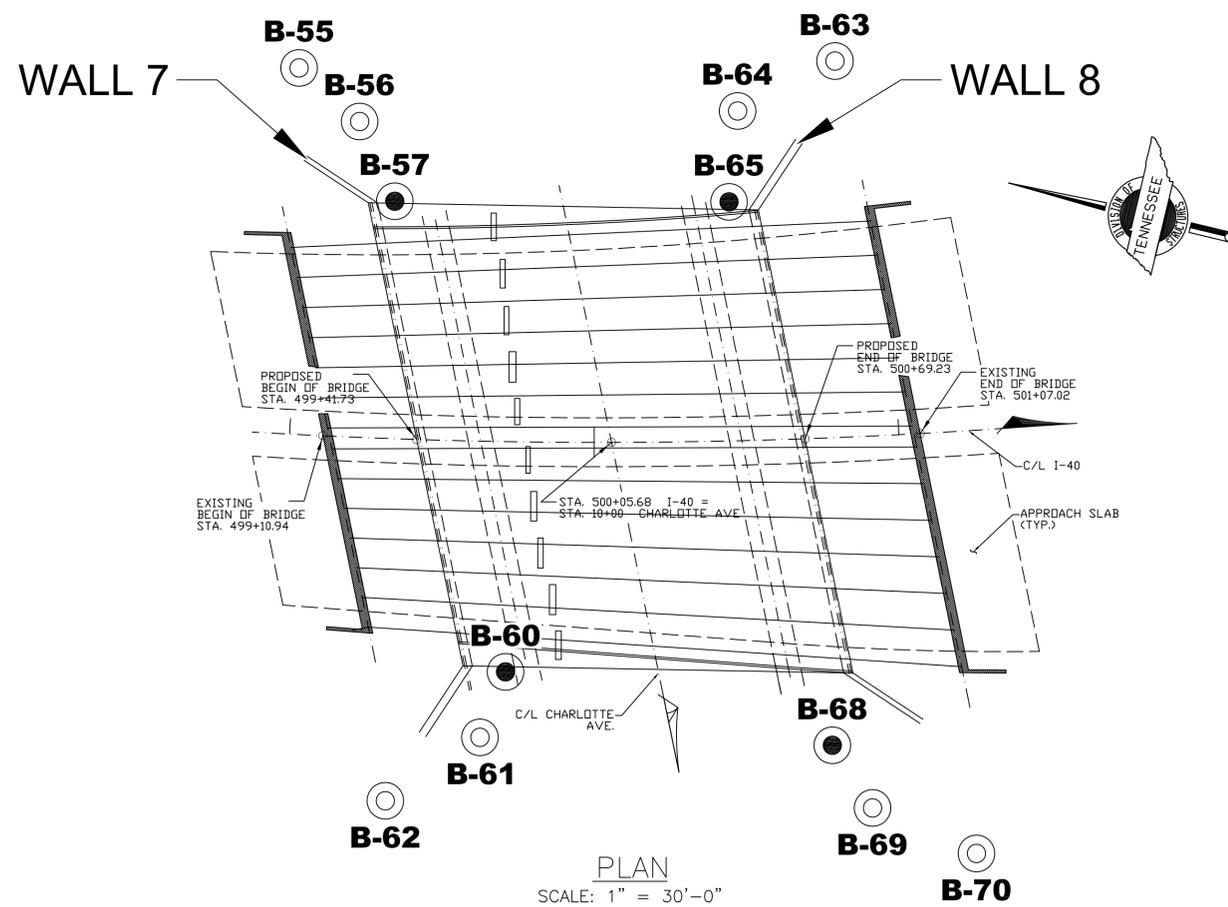
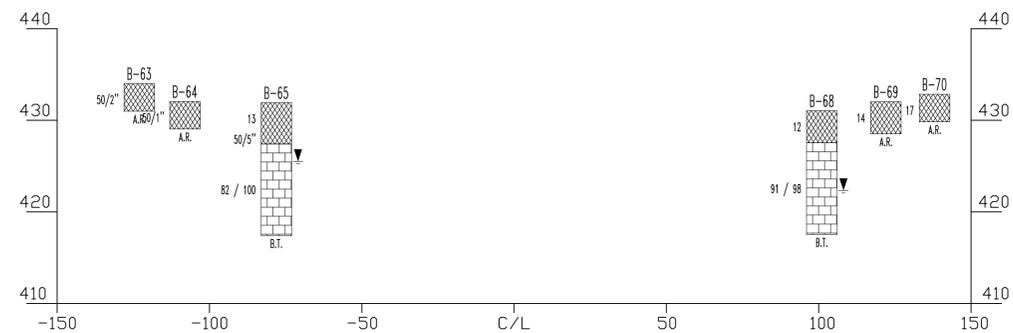


TABLE 2-FOUNDATION PARAMETERS AND REQUIREMENTS FOR MSE WALLS

RETAINING WALL 7 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 5+02.11	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 5+02.11	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 5+02.11	COMPETENT BEDROCK	80,000	0.60

RETAINING WALL 8 LOCATION (WALL STATION)	FOUNDATION (REINFORCED ZONE) BEARING CONDITION	NOMINAL (ULTIMATE) BEARING RESISTANCE(psf)	COEFFICIENT OF SLIDING FRICTION
1+00 TO 5+08.33	UNDERCUT 6 FEET BELOW PROPOSED FOOTING ELEVATION OR TO SOUND BEDROCK (WHICHEVER OCCURS FIRST) AND REPLACE WITH GRADED SOLID ROCK OR SELECT BACKFILL*	12,500	0.60
1+00 TO 5+08.33	AGGREGATE PIERS	MINIMUM VALUE OF 12,500 REQUIRED	0.40
1+00 TO 5+08.33	COMPETENT BEDROCK	80,000	0.60

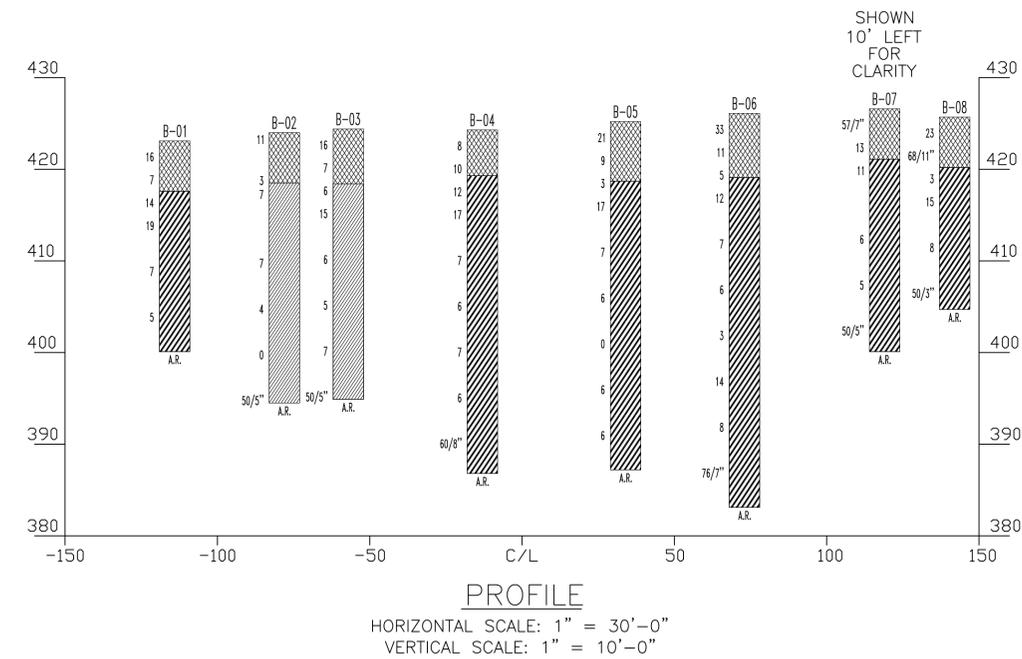
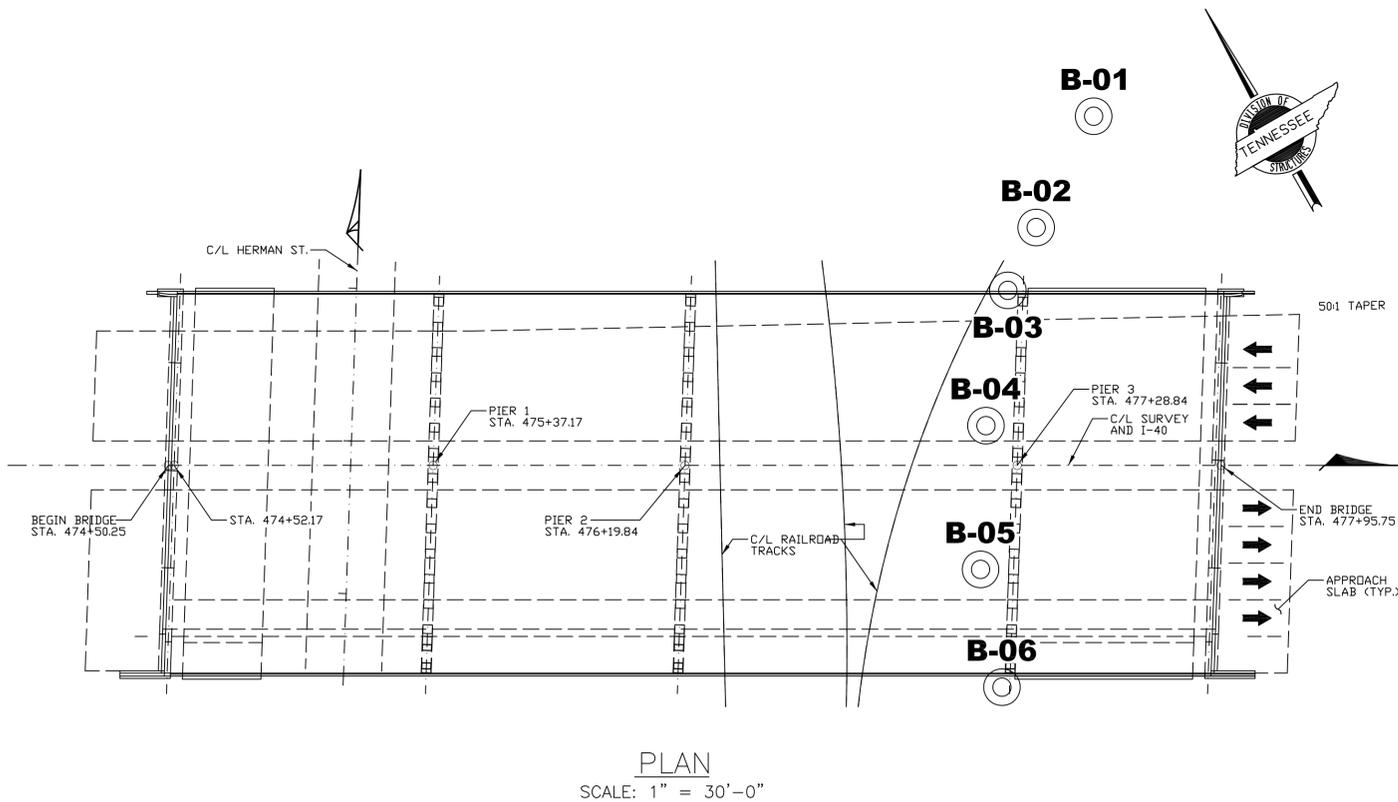
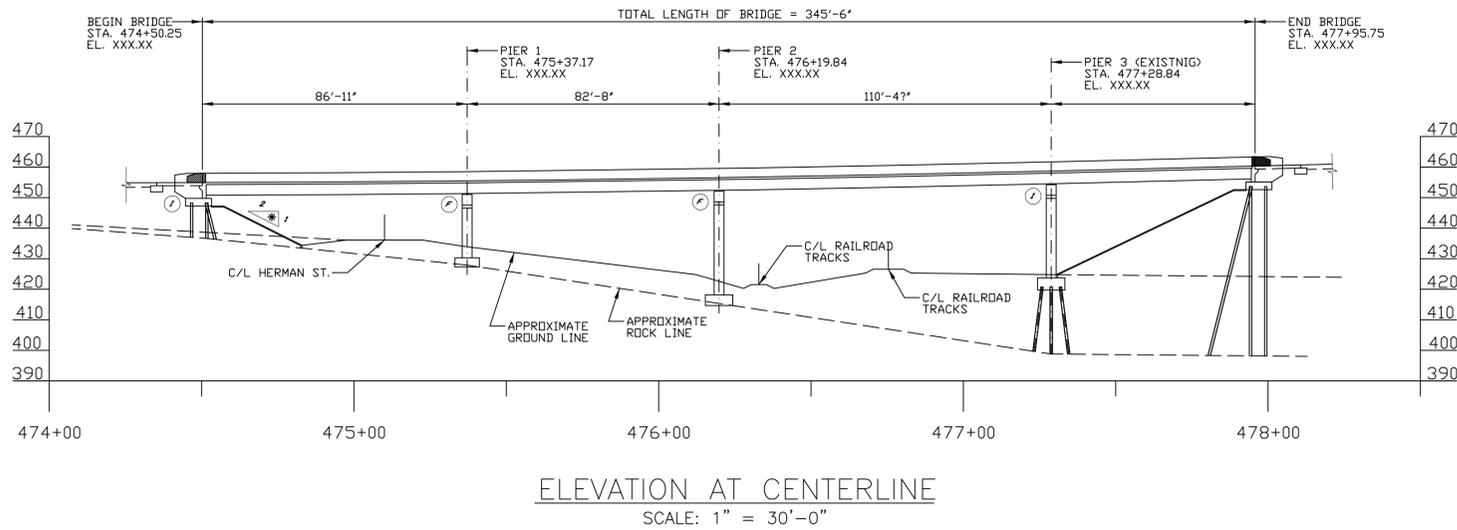
* GRADED SOLID ROCK MAY BE SUBSTITUTED WITH SELECT BACKFILL AS SPECIFIED IN TENNESSEE DEPARTMENT OF TRANSPORTATION SPECIAL PROVISIONS 624 REGARDING RETAINING WALLS.

STATE OF TENNESSEE
 DEPARTMENT OF TRANSPORTATION
 LAYOUT OF BRIDGE
 TO BE REPAIRED
 I-40
 OVER
 CHARLOTTE AVE.
 BR. NO. 19-10040-17.09
 DAVIDSON COUNTY
 2015

DESIGNED BY _____ DATE _____
 DRAWN BY _____ DATE _____
 SUPERVISED BY _____ DATE _____
 CHECKED BY _____ DATE _____

NOTE: HERMAN STREET AND NWRR RETAINING WALL REMOVED FROM PROJECT SCOPE DURING FIELD EXPLORATION PHASE

P.E. NO. _____			
CONST. NO. _____			
PROJECT NO.	YEAR	SHEET NO.	
BH-1-40-4(86)	2015	2P1	
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



--- Existing Ground at Centerline

- B-70** Soil Boring Location and Identifier
- B-68** Soil Boring with Rock Coring Location and Identifier

BORING LEGEND

BORING NO.	
N (BPF)	MATERIAL SYMBOL
RQD/REQ	

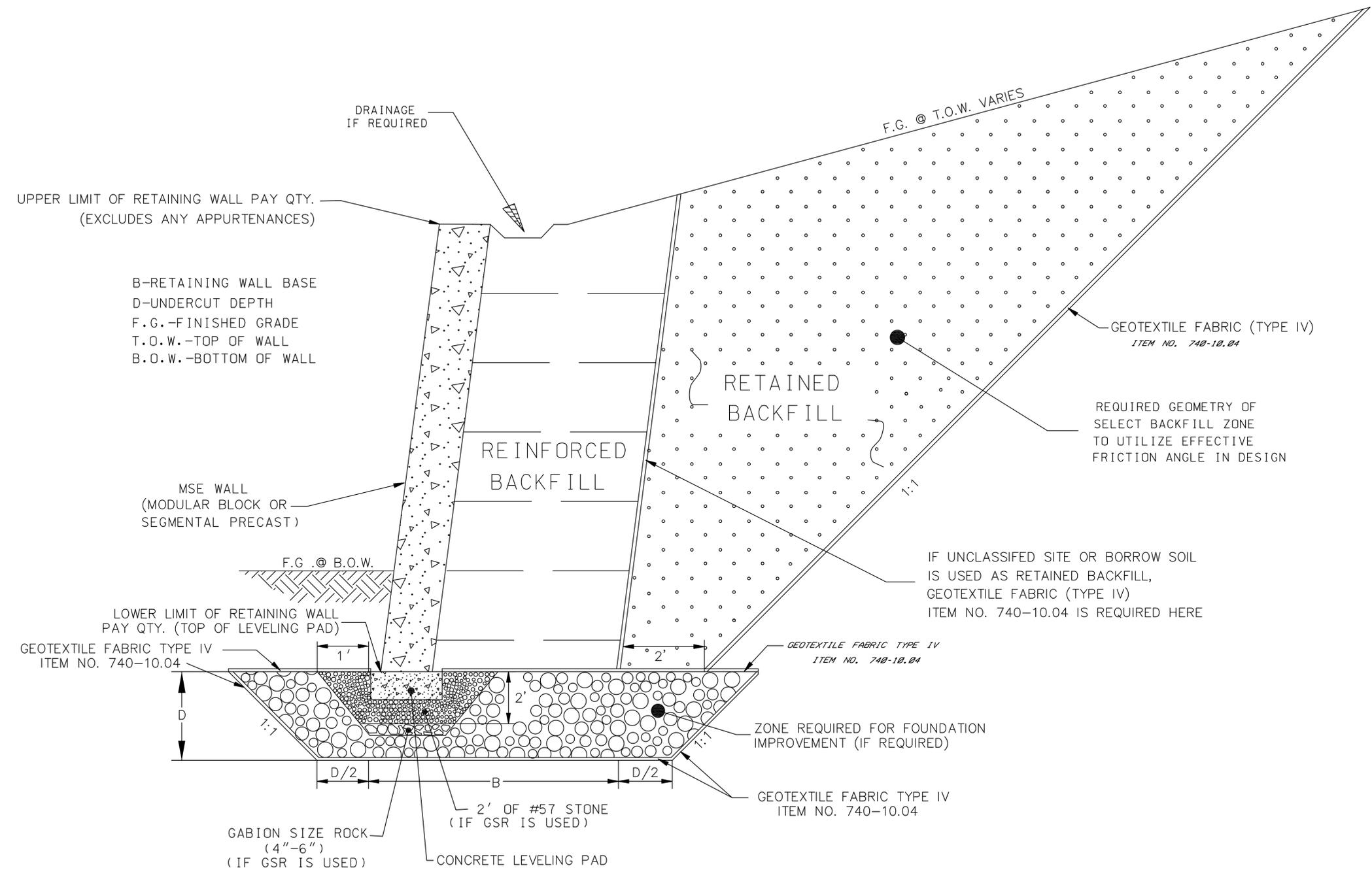
- ▽ Water level at time of boring
- ▼ Delayed water level
- ☒ Cave-in depth
- AR = Auger Refusal BT = Boring Terminated

- Low Plasticity Clay
- High Plasticity Clay
- Limestone
- Weathered Limestone
- Open Void
- Fill

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
LAYOUT OF BRIDGE
TO BE REPAIRED
I-40
OVER
HERMAN STREET AND NWRR
BR. NO. 19-10040-16.62
DAVIDSON COUNTY
2015

DESIGNED BY _____ DATE _____
DRAWN BY _____ DATE _____
SUPERVISED BY _____ DATE _____
CHECKED BY _____ DATE _____

P.E. NO. _____			
CONST. NO. _____			
PROJECT NO.	YEAR	SHEET NO.	
BH-1-40-4(86)	2015	2Q1	
REVISIONS			
NO.	DATE	BY	BRIEF DESCRIPTION



TYPICAL DETAIL
MSE WALL – MODULAR BLOCK \ SEGMANTAL PRECAST

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
TYPICAL DETAIL
MSE MODULAR BLOCK
MSE SEGMENTAL PRECAST

DESIGNED BY _____ DATE _____
DRAWN BY _____ DATE _____
SUPERVISED BY _____ DATE _____
CHECKED BY _____ DATE _____

*Final Foundation Report for Retaining Walls
Rehabilitation of I-40 Bridges
Charlotte Avenue, Jo Johnston Avenue, Clinton
Street
& Herman Street
Nashville, Davidson County, Tennessee
TTL Project No. 100814105
TDOT Project No. 19005-1161-44*

APPENDIX B:

Boring Logs



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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-01**

Page 1 of 1

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R.Bell	Date Drilled: 11/24/2014	
Logged by: C.Walker	Boring Depth: 23 feet	
Equipment: CME 55 ATV	Boring Elevation: 423.059 feet	
Hammer Type: Automatic	Coordinates: N: 668458 E: 1733929	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

N:\SERVER\PROJECTS\2014 PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DOT I-40 BRIDGE REMOVAL.GPJ 12/15/14 Report:2010 GEOTECH W/SPT (LSW SPECIAL)

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
5	420	[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	5 - 5 - 11 N = 16										
5	415	[Diagonal lines pattern]	CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	7 - 4 - 3 N = 7										
10	410	[Diagonal lines pattern]					X	4 - 5 - 9 N = 14										
10	405	[Diagonal lines pattern]					X	7 - 9 - 10 N = 19										
15	400	[Diagonal lines pattern]					X	3 - 3 - 4 N = 7										
20	400	[Diagonal lines pattern]					X	2 - 2 - 3 N = 5										
25	400			Auger refusal at 23 feet.														
30	395																	
35	390																	
40	385																	
40	380																	

This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-02**

Page 1 of 1

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/24/2014
Logged by: C. Walker	Boring Depth: 29.5 feet
Equipment: CME 55 ATV	Boring Elevation: 424.000 feet
Hammer Type: Automatic	Coordinates: N: 668457 E: 1733888
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)						
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50	
								ROD % REC								
	420			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	26			4 - 5 - 6 N = 11								
5			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	30			2 - 1 - 2 N = 3								
	415				25			3 - 3 - 4 N = 7								
10																
	410				26			3 - 3 - 4 N = 7								
15																
	405				29			2 - 2 - 2 N = 4								
20																
	400				29			woh - woh - woh N = 0								0
25																
	395			Auger refusal at 29.5 feet.	27			50/5 N = 50/5"								
30																
	390															
35																
	385															
40																
	380															

N:\SERVER\PROJECTS\2014 PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DATA\DOT I-40 BRIDGE REMOVAL.GPJ 12/15/14 Report:2010 GEOTECH W/SPT (LSW SPECIAL)

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-03**

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/23/2014
Logged by: C. Walker	Boring Depth: 29.5 feet
Equipment: CME 55 ATV	Boring Elevation: 424.421 feet
Hammer Type: Automatic	Coordinates: N: 668455 E: 1733865
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
5	420	[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	6 - 8 - 8 N = 16										
			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	9 - 4 - 3 N = 7										
10	415	[Diagonal lines pattern]					X	2 - 4 - 2 N = 6										
							X	4 - 6 - 9 N = 15										
15	410						X	3 - 2 - 4 N = 6										
							X	2 - 2 - 3 N = 5										
20	405						X	3 - 4 - 3 N = 7										
							X	50/5 N = 50/5"										
25	400						X											
30	395			Auger refusal at 29.5 feet.														
35	390																	
40	385																	
	380																	

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-05**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/23/2014	
Logged by: C. Walker	Boring Depth: 38 feet	
Equipment: CME 55 ATV	Boring Elevation: 425.232 feet	
Hammer Type: Automatic	Coordinates: N: 668418 E: 1733781	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
								ROD % REC									
425				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	7 - 7 - 14 N = 21									
5	420						X	5 - 4 - 5 N = 9									
			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	2 - 1 - 2 N = 3									
10	415						X	5 - 6 - 11 N = 17									
15	410						X	2 - 3 - 4 N = 7									
20	405						X	2 - 3 - 3 N = 6									
25	400						X	woh - woh - woh N = 0									0
30	395						X	3 - 2 - 4 N = 6									
35	390						X	1 - 4 - 2 N = 6									
40	385			Auger refusal at 38 feet.													

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-06**

Page 1 of 1

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/21/2014
Logged by: C. Walker	Boring Depth: 43 feet
Equipment: CME 55 ATV	Boring Elevation: 426.056 feet
Hammer Type: Automatic	Coordinates: N: 668393 E: 1733751
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)									
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50				
								ROD % REC											
	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	5 - 15 - 18 N = 33											
5	420						X	15 - 5 - 6 N = 11											
			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	4 - 2 - 3 N = 5											
10	415						X	4 - 5 - 7 N = 12											
15	410						X	3 - 3 - 4 N = 7											
20	405						X	2 - 3 - 3 N = 6											
25	400						X	woh - woh - 3 N = 3											
30	395						X	6 - 10 - 4 N = 14											
35	390						X	3 - woh - 8 N = 8											
40	385						X	22 - 26 - 50/1 N = 76/7"											
				Auger refusal at 43 feet.															

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-07**

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/21/2014
Logged by: C. Walker	Boring Depth: 26.5 feet
Equipment: CME 55 ATV	Boring Elevation: 426.609 feet
Hammer Type: Automatic	Coordinates: N: 668340 E: 1733716
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA									
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)						
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris				6 - 7 - 50/1 N = 57/7"									
5	420		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	22			8 - 4 - 9 N = 13									
10	415							4 - 4 - 7 N = 11									
15	410				28			3 - 2 - 4 N = 6									
20	405				28			3 - 3 - 2 N = 5									
25	400				28			13 - 50/5 N = 50/5"									
	400			Auger refusal at 26.5 feet.													
30	395																
35	390																
40	385																

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This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
 Nashville, Davidson County, Tennessee

LOG OF BORING
B-08

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/24/2014	
Logged by: C. Walker	Boring Depth: 21 feet	
Equipment: CME 55 ATV	Boring Elevation: 425.664 feet	
Hammer Type: Automatic	Coordinates: N: 668315 E: 1733715	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50				
	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	9 - 11 - 12 N = 23											
5	420		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	21 - 18 - 50/5 N = 68/11"											
10	415						X	2 - 1 - 2 N = 3											
15	410						X	5 - 6 - 9 N = 15											
20	405						X	2 - 4 - 4 N = 8											
				Auger refusal at 21 feet.			X	2 - 50/3 N = 50/3"											
25	400																		
30	395																		
35	390																		
40	385																		

N:\SERVER\PROJECTS\2014 PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DATA\DOT I-40 BRIDGE REMOVAL.GPJ 12/15/14 Report:2010 GEOTECH W/SPT (LSW SPECIAL)

This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-10**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks: 100% loss of water
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>14.2 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>431.059 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668091 E: 1734127</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
430				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris				50/0 N = 50/0"										
425				LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				50/0 N = 50/0"										
420								RQD=25 REC=85										
415				Boring terminated at 14.2 feet.				RQD=93 REC=105										
410																		
405																		
400																		
395																		
390																		

**Auger refusal at 4.2 feet.
Begin NQ coring.**

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-11**

Page 1 of 1

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>4.3 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>432.468 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668076 E: 1734096</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50		
	430			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	3 - 4 - 4 N = 8										
5				Auger refusal at 4.3 feet.			X	4 - 50/2 N = 50/2"										
	425																	
10																		
	420																	
15																		
	415																	
20																		
	410																	
25																		
	405																	
30																		
	400																	
35																		
	395																	
40																		
	390																	

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**TDOT
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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-12**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>3.2 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>434.276 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668039 E: 1734044</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
		[Cross-hatched box]		FILL: abundant aggregate and construction debris			X											
5	430			Auger refusal at 3.2 feet.														
10	425																	
15	420																	
20	415																	
25	410																	
30	405																	
35	400																	
40	395																	
	390																	

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-13**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>5.7 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>436.455 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668022 E: 1734007</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"					
								ROD % REC			10	20	30	40	50
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	18		X	8 - 3 - 5 N = 8	●						
5					20		X	4 - 5 - 4 N = 9	●						
	430			Auger refusal at 5.7 feet.											
10	425														
15	420														
20	415														
25	410														
30	405														
35	400														
40	395														

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks: 100% loss of water
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>23.6 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>438.047 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668006 E: 1733959</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA												
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)									
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50				
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗													
5								2 - 2 - 7 N = 9												
	430						⊗	50/3 N = 50/3"												
10			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments																
	425																			
15				LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained																
	420							RQD=96 REC=100												
20																				
	415																			
25				Boring terminated at 23.6 feet.																
	410																			
30																				
	405																			
35																				
	400																			
40																				
	395																			

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-15**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>11.4 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>440.173 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667995 E: 1733904</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
								ROD % REC									
	440			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	13 - 10 - 4 N = 14									
5	435		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	3 - 5 - 3 N = 8									
10	430						X	3 - 3 - 3 N = 6									
				Auger refusal at 11.4 feet.			X	3 - 4 - 4 N = 8									
15	425																
20	420																
25	415																
30	410																
35	405																
40	400																

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-16**

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>5.7 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>438.085 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 668024 E: 1733857</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA									
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)						
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50	
	435	[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	2 - 8 - 18 N = 26									
5		[Diagonal lines pattern]	CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments Auger refusal at 5.7 feet.			X	11 - 10 - 9 N = 19			●						
	430																
10																	
	425																
15																	
	420																
20																	
	415																
25																	
	410																
30																	
	405																
35																	
	400																
40																	
	395																

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>18.8 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>437.089 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667998 E: 1734124</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and HQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	2		X	6 - 8 - 6 N = 14							
5	430		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	17		X	1 - 1 - 1 N = 2							
	430				16		X	1 - 2 - 1 N = 3							
10	425			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				RQD=92 REC=100							
15	420							RQD=74 REC=100							
20	415			Boring terminated at 18.8 feet.											
25	410														
30	405														
35	400														
40	395														

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>11.3 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>436.980 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667970 E: 1734157</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	21		X	5 - 6 - 6 N = 12	●						
5	430				21		X	1 - 2 - 2 N = 4	●						
10	425		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	19		X	4 - 5 - 7 N = 12	●						
	425			Auger refusal at 11.3 feet.											
15	420														
20	415														
25	410														
30	405														
35	400														
40	395														

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C. Cutter</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>7.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>436.481 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667896 E: 1734191</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50			
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	3 - 5 - 9 N = 14											
5	430		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	2 - 1 - 1 N = 2											
				Auger refusal at 7.5 feet.			X	5 - 5 - 50/5 N = 55/11"											
10	425																		
15	420																		
20	415																		
25	410																		
30	405																		
35	400																		
40	395																		

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-20**

Page 1 of 1

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>14.6 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>436.980 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667868 E: 1734210</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50			
								RQD % REC										
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	1 - 1 - 2 N = 3										
5	430			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				50/1 N = 50/1"										50/1"
10	425							RQD=55 REC=90										
15	420							RQD=80 REC=100										
20	415							RQD=67 REC=100										
25	410																	
30	405																	
35	400																	
40	395																	
				Boring terminated at 14.6 feet.														

Auger refusal at 4.4 feet.
Begin NQ coring.



**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-21**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K.Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>5.8 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>437.301 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667990 E: 1734079</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA									
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)						
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50	
435				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	4 - 1 - 2 N = 3	•								
5				Auger refusal at 5.8 feet.													
430																	
10																	
425																	
15																	
420																	
20																	
415																	
25																	
410																	
30																	
405																	
35																	
400																	
40																	
395																	

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-24**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K.Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>5.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>437.841 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667971 E: 1734038</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50				
5	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris				8 - 9 - 11 N = 20											
				Auger refusal at 5.5 feet.				50/3 N = 50/3"											

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-27**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>20.1 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>438.330 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667939 E: 1733998</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and HQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
								RQD % REC									
	435	[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	21		X	8 - 4 - 3 N = 7									
5					18		X	1 - 11 - 4 N = 15									
	430	[Diagonal hatched pattern]	CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	14		X	2 - 6 - 3 N = 9									
10					23		X	woh - woh - 50/1 N = 50/7"									
	425	[Brick pattern]		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				RQD=81 REC=100									
15								RQD=100 REC=100									
	420	[Brick pattern]						RQD=100 REC=100									
20				Boring terminated at 20.1 feet.													
	415																
25																	
	410																
30																	
	405																
35																	
	400																
40																	
	395																

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-28**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>7.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>439.120 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667898 E: 1734002</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50		
				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	4 - 5 - 5 N = 10										
5	435						X	7 - 10 - 11 N = 21										
				Auger refusal at 7.5 feet.			■											
10	430																	
15	425																	
20	420																	
25	415																	
30	410																	
35	405																	
40	400																	
40	400																	
395	395																	

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>9.1 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>439.790 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667825 E: 1734037</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40
				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	5 - 7 - 7 N = 14		●					
5	435		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	7 - 8 - 9 N = 17		●					
10	430			Auger refusal at 9.1 feet.			X	1 - 1 - 2 N = 3		●					
							X	2 - 50/0 N = 50/0"		●					
15	425						X								
20	420						X								
25	415						X								
30	410						X								
35	405						X								
40	400						X								

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>C.Cutter</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>18.8 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>439.834 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667790 E: 1734049</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and HQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
		[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	4 - 6 - 4 N = 10										
5	435	[Diagonal lines pattern]	CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	4 - 6 - 1 N = 7										
		[Brick pattern]		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained			X	2 - 1 - 2 N = 3										
10	430						[Thick vertical bar]	ROD=66 REC=100										
15	425						[Thick vertical bar]	ROD=93 REC=100										
20	420			Boring terminated at 18.8 feet.			[Thick vertical bar]	ROD=94 REC=100										
25	415																	
30	410																	
35	405																	
40	400																	

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-31**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>7.7 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>439.168 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667779 E: 1734319</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
				FILL: Abundant cobble sized limestone aggregate															
			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments				2 - 3 - 4 N = 7											
5	435							2 - 3 - 3 N = 6											
10	430			Auger refusal at 7.7 feet.				1 - 1 - 1 N = 2											
15	425																		
20	420																		
25	415																		
30	410																		
35	405																		
40	400																		
40	400																		
395	395																		

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-32**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>7.3 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>439.091 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667806 E: 1734304</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
				FILL: Abundant gravel sized limestone aggregate	20		X	2 - 3 - 3 N = 6											
5	435		CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	22		X	2 - 2 - 3 N = 5											
				Auger refusal at 7.3 feet.			X	3 - 50/3 N = 50/3"											
10	430																		
15	425																		
20	420																		
25	415																		
30	410																		
35	405																		
40	400																		
	395																		

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-33**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks: 100% water return
Driller: <i>K. Roberts</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C. Walker</i>	Boring Depth: <i>13.2 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>438.852 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667801 E: 1734229</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA													
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)										
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50						
		[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris																	
5	435	[Brick pattern]		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained			█	RQD=62 REC=100												Auger refusal at 3.2 feet. Begin NQ coring.	
10	430	[Brick pattern]					█	RQD=92 REC=100													
15	425			Boring terminated at 13.2 feet.																	
20	420																				
25	415																				
30	410																				
35	405																				
40	400																				
40	400																				
395	395																				

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks: 100% loss of wter
Driller: <i>K.Roberts</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>18.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>440.773 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667712 E: 1734075</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
								RQD % REC									
	440			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	19		X	11 - 8 - 7 N = 15									
5	435		CL-ML	Clay, silty, light brown to dark brown, with some to abundant rock fragments	20		X	3 - 4 - 5 N = 9									
					21		X	1 - 1 - 1 N = 2									
10	430			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				RQD=80 REC=98									
15	425							RQD=82 REC=100									
20	420			Boring terminated at 18.5 feet.													
25	415																
30	410																
35	405																
40	400																

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-37**

Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K.Roberts</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>3.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>440.959 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667692 E: 1734062</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40
	440			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	12 - 12 - 50/2 N = 62/8"							62/8"
5	435			Auger refusal at 3.5 feet.											
10	430														
15	425														
20	420														
25	415														
30	410														
35	405														
40	400														

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-38**

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Drilling Co.: <i>Tristate</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>K.Roberts</i>	Date Drilled: <i>11/25/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>6.3 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>441.020 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667660 E: 1734066</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
	440			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	7 - 6 - 5											
5			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments			X	5 - 7 - 9											
	435			WEATHERED LIMESTONE															
				Auger refusal at 6.3 feet.															
10	430																		
15	425																		
20	420																		
25	415																		
30	410																		
35	405																		
40	400																		

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-39**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/24/2014	
Logged by: C. Walker	Boring Depth: 2 feet	
Equipment: CME 55 ATV	Boring Elevation: 429.254 feet	
Hammer Type: Automatic	Coordinates: N: 667508 E: 1734401	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
		[Cross-hatched box]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris Auger refusal at 2 feet.				50/1 N = 50/1"											50/1"
5	425																		
10	420																		
15	415																		
20	410																		
25	405																		
30	400																		
35	395																		
40	390																		
	385																		

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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-40**

Drilling Co.: <i>TTL</i>	TTL Project No.: 100814105	Remarks:
Driller: <i>R.Bell</i>	Date Drilled: 11/24/2014	
Logged by: <i>C.Walker</i>	Boring Depth: 2.5 feet	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: 427.626 feet	
Hammer Type: <i>Automatic</i>	Coordinates: N: 667482 E: 1734392	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
425				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris Auger refusal at 2.5 feet.			X	3 - 50/3 N = 50/3"										
5																		
420																		
10																		
415																		
15																		
410																		
20																		
405																		
25																		
400																		
30																		
395																		
35																		
390																		
40																		
385																		

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**TDOT
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CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-41**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks: 100% water return
Driller: R.Bell	Date Drilled: 11/24/2014	
Logged by: C.Walker	Boring Depth: 15.5 feet	
Equipment: CME 55 ATV	Boring Elevation: 428.623 feet	
Hammer Type: Automatic	Coordinates: N: 667451 E: 1734358	
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring		▽ Water level at time of boring.

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
5	425	[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	19		X	4 - 7 - 7 N = 14											
					22		X	12 - 14 - 50/5 N = 64/11"											
	420	[Brick pattern]		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained															
	415	[Brick pattern]						RQD=90 REC=99											
				Boring terminated at 15.5 feet.															
	410																		
	405																		
	400																		
	395																		
	390																		
	385																		

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-47**

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Drilling Co.: <i>TTL</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>R.Bell</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>422.668 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667355 E: 1734432</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA								
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)					
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50
420				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	12		X	5 - 9 - 12 N = 21		●						
5				Auger refusal at 5 feet.	26		X	5 - 7 - 50/1 N = 57/7"		●						
415																
10																
410																
15																
405																
20																
400																
25																
395																
30																
390																
35																
385																
40																
380																

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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-48**

Page 1 of 1

Drilling Co.: <i>TTL</i>	TTL Project No.: <i>100814105</i>	Remarks:
Driller: <i>R.Bell</i>	Date Drilled: <i>11/24/2014</i>	
Logged by: <i>C.Walker</i>	Boring Depth: <i>5.5 feet</i>	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>426.176 feet</i>	
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 667394 E: 1734411</i>	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50			
	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	7 - 8 - 7 N = 15											
5	420			Auger refusal at 5.5 feet.			X	28 - 5 - 5 N = 10											
10	415																		
15	410																		
20	405																		
25	400																		
30	395																		
35	390																		
40	385																		

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Drilling Co.: TTL	TTL Project No.: 100814105	Remarks: 100% loss of water at 5.5 feet
Driller: R.Bell	Date Drilled: 11/25/2014	
Logged by: C.Walker	Boring Depth: 24.3 feet	
Equipment: CME 55 ATV	Boring Elevation: 429.085 feet	
Hammer Type: Automatic	Coordinates: N: 667380 E: 1734366	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50				
				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	6 - 7 - 13											
5	425	█		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained Open Void			█	50/2 N = 50/2"											●
10	420	█		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained Open Void			█												
15	415	█					█												
20	410	█					█												
25	405	█		LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained Open Void Boring terminated at 24.3 feet.			█	RQD=8 REC=11											
30	400	█					█												
35	395	█					█												
40	390	█					█												
	385	█					█												

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-52**

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/25/2014
Logged by: C. Walker	Boring Depth: 14.5 feet
Equipment: CME 55 ATV	Boring Elevation: 435.824 feet
Hammer Type: Automatic	Coordinates: N: 667284 E: 1734214
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring	

Remarks:
100% loss of water at 8.3 feet

▽ Water level at time of boring.

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	10	20	30	40	50				
								ROD % REC										
4.5	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	11 - 14 - 20 N = 34										
5	430			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained			⊗	50/5 N = 50/5"										
10	425							RQD=88 REC=100										
15	420			Boring terminated at 14.5 feet.														
20	415																	
25	410																	
30	405																	
35	400																	
40	395																	

Auger refusal at 4.5 feet. Begin NQ coring.



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**LOG OF BORING
B-53**

Drilling Co.: <i>TTL</i>	TTL Project No.: 100814105	Remarks:
Driller: <i>R. Bell</i>	Date Drilled: 11/25/2014	
Logged by: <i>C. Walker</i>	Boring Depth: 4 feet	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: 435.490 feet	
Hammer Type: <i>Automatic</i>	Coordinates: N: 667272 E: 1734213	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
	435			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	4 - 6 - 6 N = 12											
5	430			Auger refusal at 4 feet.			X	50/5 N = 50/5"											
10	425																		
15	420																		
20	415																		
25	410																		
30	405																		
35	400																		
40	395																		

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-55**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/23/2014	
Logged by: C. Walker	Boring Depth: 11 feet	
Equipment: CME 55 ATV	Boring Elevation: 429.815 feet	
Hammer Type: Automatic	Coordinates: N: 666401 E: 1734559	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	N-COUNT		STANDARD PENETRATION TEST DATA (blows per foot)					
								1st 6"	2nd 6"	10	20	30	40	50	
								ROD % REC							
		[Cross-hatched pattern]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	11		X								
5	425	[Diagonal lines]	CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments	22		X	5 - 5 - 11 N = 16		15					
					25		X	3 - 4 - 7 N = 11		15					
10	420				8		X	3 - 4 - 50/3 N = 54/9"						45	
				Auger refusal at 11 feet.											
15	415														
20	410														
25	405														
30	400														
35	395														
40	390														

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-56**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/23/2014	
Logged by: C. Walker	Boring Depth: 3.3 feet	
Equipment: CME 55 ATV	Boring Elevation: 431.099 feet	
Hammer Type: Automatic	Coordinates: N: 666377 E: 1734548	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40
	430			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	21		X	2 - 5 - 10 N = 15		•					
5	425			Auger refusal at 3.3 feet.											
10	420														
15	415														
20	410														
25	405														
30	400														
35	395														
40	390														

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-57**

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/23/2014
Logged by: C. Walker	Boring Depth: 14.5 feet
Equipment: CME 55 ATV	Boring Elevation: 431.893 feet
Hammer Type: Automatic	Coordinates: N: 666358 E: 1734526
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring	

Remarks:

▼ Delayed water level.

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50			
430				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	3 - 4 - 7 N = 11										
425				LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained	▼			6 - 50/3 N = 50/3"										
420								RQD=93 REC=98										
15				Boring terminated at 14.5 feet.														
415																		
20																		
410																		
25																		
405																		
30																		
400																		
35																		
395																		
40																		
390																		

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-60**

Page 1 of 1

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/22/2014
Logged by: C. Walker	Boring Depth: 11 feet
Equipment: CME 55 ATV	Boring Elevation: 430.713 feet
Hammer Type: Automatic	Coordinates: N: 666278 E: 1734389
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring	

Remarks:
Boring offset 5 feet to the west

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
430				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris	28		X	3 - 5 - 6 N = 11											
425					25		X	3 - 4 - 3 N = 7											
420				LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				50/0 N = 50/0"											
				Boring terminated at 11 feet.				RQD=92 REC=102											
415																			
410																			
405																			
400																			
395																			
390																			

**Auger refusal at 7 feet.
Begin NQ coring.**



**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-60A**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/22/2014	
Logged by: C. Walker	Boring Depth: 19 feet	
Equipment: CME 55 ATV	Boring Elevation: 430.713 feet	
Hammer Type: Automatic	Coordinates: N: 666278 E: 1734389	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring</i>		▼ Delayed water level.

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50				
	430				▼														
5	425			Boring offset from B-60 five feet to west															
10	420			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained				RQD=93 REC=100											
15	415																		
20	410			Boring terminated at 19 feet.															
25	405																		
30	400																		
35	395																		
40	390																		

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-61**

Page 1 of 1

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/22/2014
Logged by: C. Walker	Boring Depth: 7 feet
Equipment: CME 55 ATV	Boring Elevation: 429.620 feet
Hammer Type: Automatic	Coordinates: N: 666280 E: 1734366
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

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DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50		
5	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	3 - 6 - 9 N = 15										
			CL	Clay, slightly silty, light brown to dark brown, with some to abundant rock fragments Auger refusal at 7 feet.			⊗	6 - 50/1 N = 50/1"										50/1"
10	420																	
15	415																	
20	410																	
25	405																	
30	400																	
35	395																	
40	390																	
	385																	

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-62**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/22/2014	
Logged by: C. Walker	Boring Depth: 6 feet	
Equipment: CME 55 ATV	Boring Elevation: 428.627 feet	
Hammer Type: Automatic	Coordinates: N: 666304 E: 1734337	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA											
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)								
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40	50			
5	425			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	14 - 12 - 50/1 N = 62/7"											50/1"
				Auger refusal at 6 feet.															

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-63**

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/23/2014	
Logged by: C. Walker	Boring Depth: 3 feet	
Equipment: CME 55 ATV	Boring Elevation: 433.995 feet	
Hammer Type: Automatic	Coordinates: N: 666233 E: 1734612	
Drilling Method: Hollow Stem Auger w/SPT Sampling		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA									
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)						
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50		
		[Cross-hatched box]		FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris Auger refusal at 3 feet.				50/2 N = 50/2"									
5	430																
10	425																
15	420																
20	415																
25	410																
30	405																
35	400																
40	395																
	390																

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Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-64**

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Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/22/2014
Logged by: C. Walker	Boring Depth: 3 feet
Equipment: CME 55 ATV	Boring Elevation: 432.045 feet
Hammer Type: Automatic	Coordinates: N: 666259 E: 1734587
Drilling Method: Hollow Stem Auger w/SPT Sampling	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50
	430			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris Auger refusal at 3 feet.			⊗	3 - 50/1 N = 50/1"						50/1"	
5	425														
10	420														
15	415														
20	410														
25	405														
30	400														
35	395														
40	390														

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Nashville, Davidson County, Tennessee

**LOG OF BORING
B-65**

Drilling Co.: TTL	TTL Project No.: 100814105
Driller: R. Bell	Date Drilled: 11/22/2014
Logged by: C. Walker	Boring Depth: 14.5 feet
Equipment: CME 55 ATV	Boring Elevation: 431.910 feet
Hammer Type: Automatic	Coordinates: N: 666253 E: 1734558
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring	

Remarks:

▼ Delayed water level.

N:\SERVER\PROJECTS\2014 PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DATA\DOT I-40 BRIDGE REMOVAL.GPJ 12/15/14 Report:2010 GEOTECH W/SPT (L-SW SPECIAL)

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA										
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)							
								1st 6"	2nd 6"	3rd 6"	10	20	30	40	50			
430				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	8 - 8 - 5 N = 13										
425				LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained	▼			38 - 50/5 N = 50/5"										
420								RQD=82 REC=100										
15				Boring terminated at 14.5 feet.														
415																		
20																		
410																		
25																		
405																		
30																		
400																		
35																		
395																		
40																		
390																		

This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.

Drilling Co.: TTL	TTL Project No.: 100814105	Remarks:
Driller: R. Bell	Date Drilled: 11/22/2014	
Logged by: C. Walker	Boring Depth: 13.5 feet	
Equipment: CME 55 ATV	Boring Elevation: 431.034 feet	
Hammer Type: Automatic	Coordinates: N: 666169 E: 1734397	
Drilling Method: Hollow Stem Auger w/SPT Sampling and NQ Wireline Coring		

▼ Delayed water level.

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA													
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)										
								1st 6"	2nd 6"	3rd 6"	ROD	10	20	30	40	50					
	430			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			⊗	9 - 6 - 6													
5	425			LIMESTONE: Bigby-Cannon Formation, Bigby Limestone Member, gray with dark gray banding, hard, medium-bedded, fine grained																	
10	420				▼			RQD=91 REC=98													
15	415			Boring terminated at 13.5 feet.																	
20	410																				
25	405																				
30	400																				
35	395																				
40	390																				

N:\SERVER\PROJECTS\2014 PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DATA\DOT I-40 BRIDGE REMOVAL.GPJ 12/15/14 Report:2010 GEOTECH W/SPT (LSW SPECIAL)

This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



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**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.
Nashville, Davidson County, Tennessee**

**LOG OF BORING
B-69**

Drilling Co.: <i>TTL</i>	TTL Project No.: <i>100814105</i>
Driller: <i>R. Bell</i>	Date Drilled: <i>11/22/2014</i>
Logged by: <i>C. Walker</i>	Boring Depth: <i>3.5 feet</i>
Equipment: <i>CME 55 ATV</i>	Boring Elevation: <i>432.019 feet</i>
Hammer Type: <i>Automatic</i>	Coordinates: <i>N: 666150 E: 1734382</i>
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>	

Remarks:

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40
	430			FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris			X	3 - 4 - 10 N = 14		•					
5	425			Auger refusal at 3.5 feet.											
10	420														
15	415														
20	410														
25	405														
30	400														
35	395														
40	390														

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This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



**TDOT
REHABILITATION OF I-40 BRIDGES
CHARLOTTE AVE, JO JOHNSTON AVE, CLINTON ST, & HERMAN ST.**
Nashville, Davidson County, Tennessee

**LOG OF BORING
B-70**

Drilling Co.: <i>TTL</i>	TTL Project No.: 100814105	Remarks:
Driller: <i>R. Bell</i>	Date Drilled: 11/22/2014	
Logged by: <i>C. Walker</i>	Boring Depth: 3 feet	
Equipment: <i>CME 55 ATV</i>	Boring Elevation: 432.836 feet	
Hammer Type: <i>Automatic</i>	Coordinates: N: 666116 E: 1734378	
Drilling Method: <i>Hollow Stem Auger w/SPT Sampling</i>		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS CLASSIFICATION	MATERIALS DESCRIPTION	MOISTURE (%)	PPV (tsf)	TYPE	SAMPLE DATA							
								N-COUNT			STANDARD PENETRATION TEST DATA (blows per foot)				
								1st 6"	2nd 6"	3rd 6"	ROD % REC	10	20	30	40
430				FILL: Clay with abundant incendiary by-product type particles, dark brown to black with little to some aggregate and construction debris Auger refusal at 3 feet.			X	5 - 8 - 9 N = 17		•					
5															
425															
10															
420															
15															
415															
20															
410															
25															
405															
30															
400															
35															
395															
40															
390															

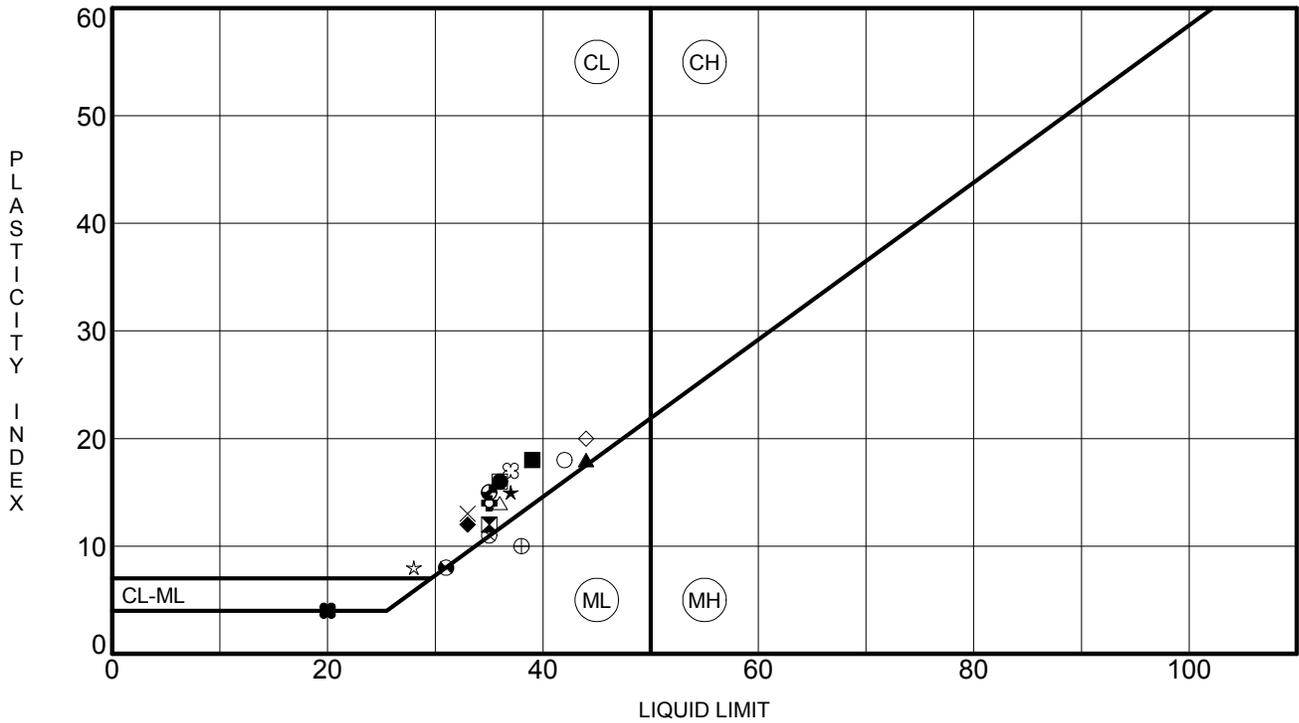
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*Final Foundation Report for Retaining Walls
Rehabilitation of I-40 Bridges
Charlotte Avenue, Jo Johnston Avenue, Clinton
Street
& Herman Street
Nashville, Davidson County, Tennessee
TTL Project No. 100814105
TDOT Project No. 19005-1161-44*

APPENDIX C:

Laboratory Data

N:\SERVER\PROJECTS\2014\PROJECTS\GEO (1008)\100814105 TDOT BRIDGE REMOVAL\DATA\DOT_L40 BRIDGE REMOVAL.GPJ 1/9/15 Report:ATTERBERG LIMITS GRAPH (MANUAL)



Sample ID	Depth (ft)	Date Sampled	WC	LL	PL	PI	Fines	Classification
● B-02	2 - 4	11/24/2014	29	36	20	16		Lean Clay - Dark Brown (CL), A-6(10)
☒ B-02	6 - 7.5	11/24/2014	25	35	23	12		Lean Clay - Dark Brown (CL), A-6(11)
▲ B-02	8 - 10	11/24/2014	29	44	26	18		Lean Clay - Dark Brown (CL), A-7-6(12)
★ B-04	6 - 7.5	11/23/2014	26	37	22	15		Lean Clay - Dark Brown (CL), A-6(14)
⊙ B-07	2 - 4	11/21/2014	13	35	20	15		Lean Clay - Dark Brown (CL), A-6(10)
⊕ B-07	6 - 7.5	11/21/2014	22	35	21	14		Lean Clay - Dark Brown (CL), A-6(13)
○ B-07	8 - 10	11/21/2014	14	42	24	18		Lean Clay - Dark Brown (CL), A-7-6(11)
△ B-13	3.5 - 5	11/24/2014	20	36	22	14		Lean Clay - Dark Brown (CL), A-6(13)
⊗ B-17	6 - 7.5	11/25/2014	16	35	24	11		Silty Clay - Dark Yellowish Brown (CL-ML), A-6(10)
⊕ B-18	3 - 5	11/24/2014	29	38	28	10		Silt - Dark Brown (ML), A-4(11)
□ B-27	8.5 - 10	11/24/2014	23	36	20	16		Lean Clay - Dark Brown (CL), A-6(14)
⊕ B-28	6 - 7.5	11/24/2014	29	31	23	8		Silty Clay - Dark Brown (CL-ML), A-4(8)
⊕ B-32	3.5 - 5	11/25/2014	22	35	20	15		Lean Clay - Yellowish Brown (CL), A-6(13)
☆ B-36	6 - 7.5	11/25/2014	21	28	20	8		Silty Clay - Dark Yellowish Brown (CL-ML), A-4(6)
⊗ B-41	3.5 - 5	11/24/2014	22	37	20	17		Lean Clay - Dark Olive Brown (CL), A-6(15)
■ B-47	3.5 - 5	11/24/2014	26	39	21	18		Lean Clay - Dark Olive Brown (CL), A-6(17)
◆ B-56	1 - 2.5	11/23/2014	21	33	21	12		Lean Clay - Brown (CL), A-6(11)
◇ B-60	3.5 - 5	11/22/2014	25	44	24	20		Lean Clay - Dark Yellowish Brown (CL), A-7-6(20)
× B-61	2 - 4	11/22/2014	22	33	20	13		Lean Clay - Dark Brown (CL), A-6(10)
⊗ B-61	4 - 6	11/22/2014	22	20	16	4		Silty Clay - Brown (CL-ML), A-4(7)

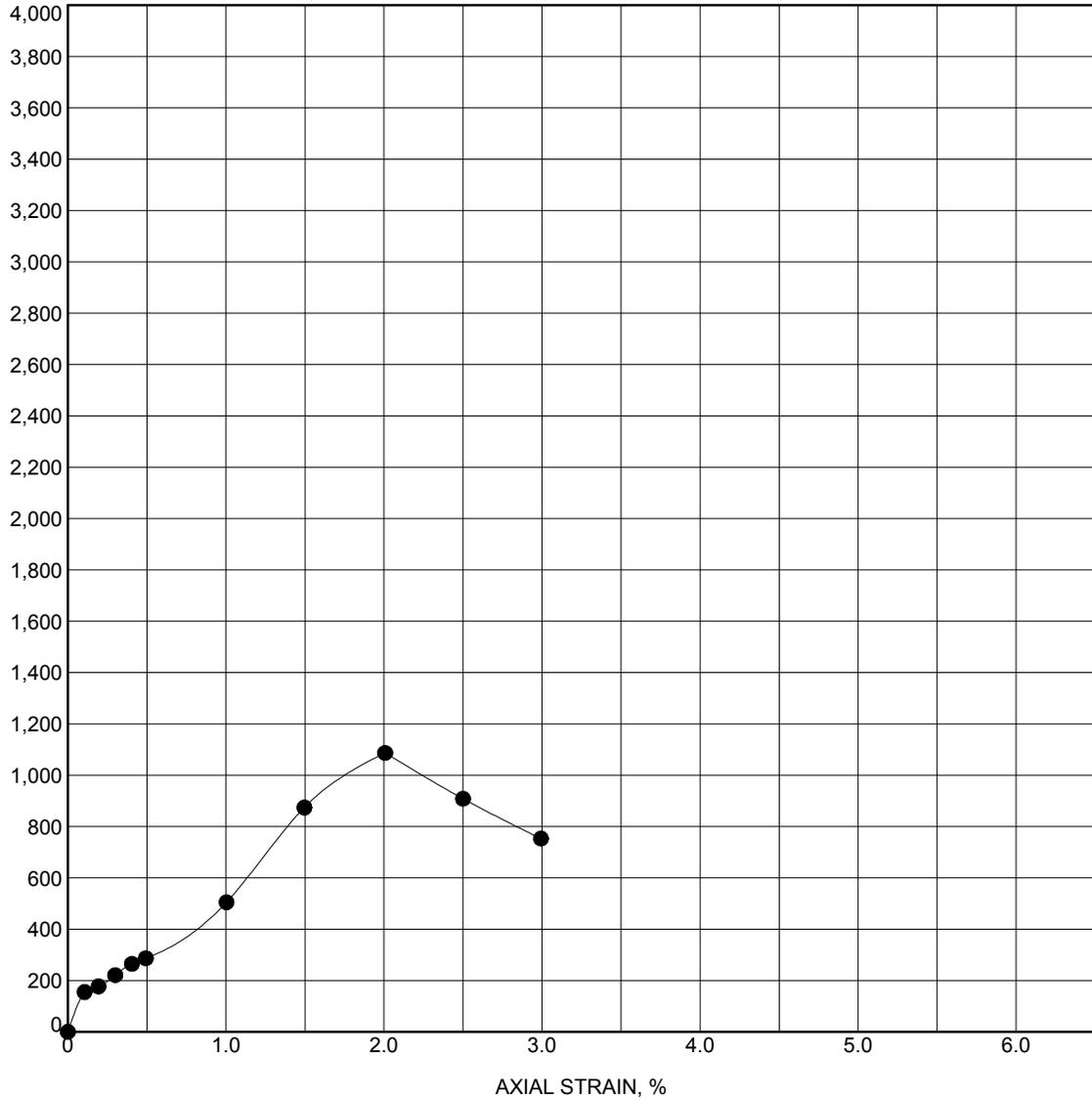


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ATTERBERG LIMITS RESULTS

Client: TDOT
 Project: Rehabilitation of I-40 Bridges
 Location: Nashville, Davidson County, Tennessee
 Project Number: 100814105

COMPRESSIVE STRESS, psf



Boring ID	Sample Depth		Date Sampled	Date Tested			
B-02	2 - 4 ft of 29.5 ft boring		11/24/2014	12/10/2014			
Unconfined Strength (psf)	Undrained Shear Strength (psf)	Failure Strain (%)	Strain Rate (in./min.)	Test Method			
1086.8	543.4	2.0	0.050	ASTM D 2166			
USCS Classification		Liquid Limit	Plastic Limit	Plastic Index	Specific Gravity	Type	
Lean Clay (CL)		---	---	---		Undisturbed	
Water Content %	Wet Density (pcf)	Dry Density (pcf)	Saturation %	Void Ratio	Specimen Diameter (in.)	Specimen Height (in.)	Height/Diameter Ratio
28.3	114.3	89.1			2.875	5.680	1.98

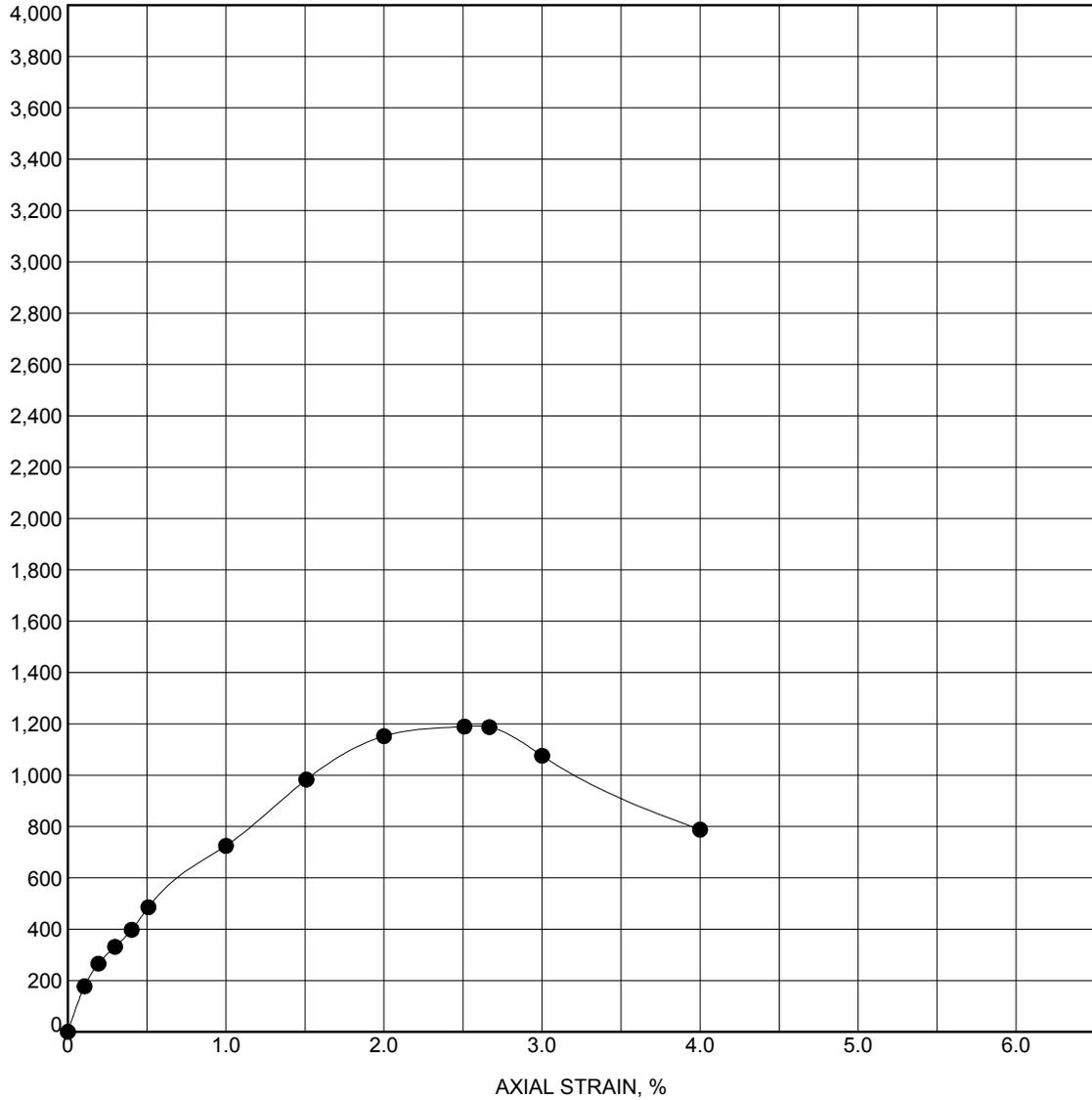


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UNCONFINED COMPRESSION TEST

Client: TDOT
 Project: Rehabilitation of I-40 Bridges
 Location: Nashville, Davidson County, Tennessee
 Project Number: 100814105

COMPRESSIVE STRESS, psf



Boring ID	Sample Depth		Date Sampled	Date Tested			
B-02	8 - 10 ft of 29.5 ft boring		11/24/2014	12/10/2014			
Unconfined Strength (psf)	Undrained Shear Strength (psf)	Failure Strain (%)	Strain Rate (in./min.)	Test Method			
1189.4	594.7	2.5	0.060	ASTM D 2166			
USCS Classification		Liquid Limit	Plastic Limit	Plastic Index	Specific Gravity	Type	
Lean Clay (CL)		---	---	---		Undisturbed	
Water Content %	Wet Density (pcf)	Dry Density (pcf)	Saturation %	Void Ratio	Specimen Diameter (in.)	Specimen Height (in.)	Height/Diameter Ratio
30.9	112.6	86.0			2.875	5.700	1.98

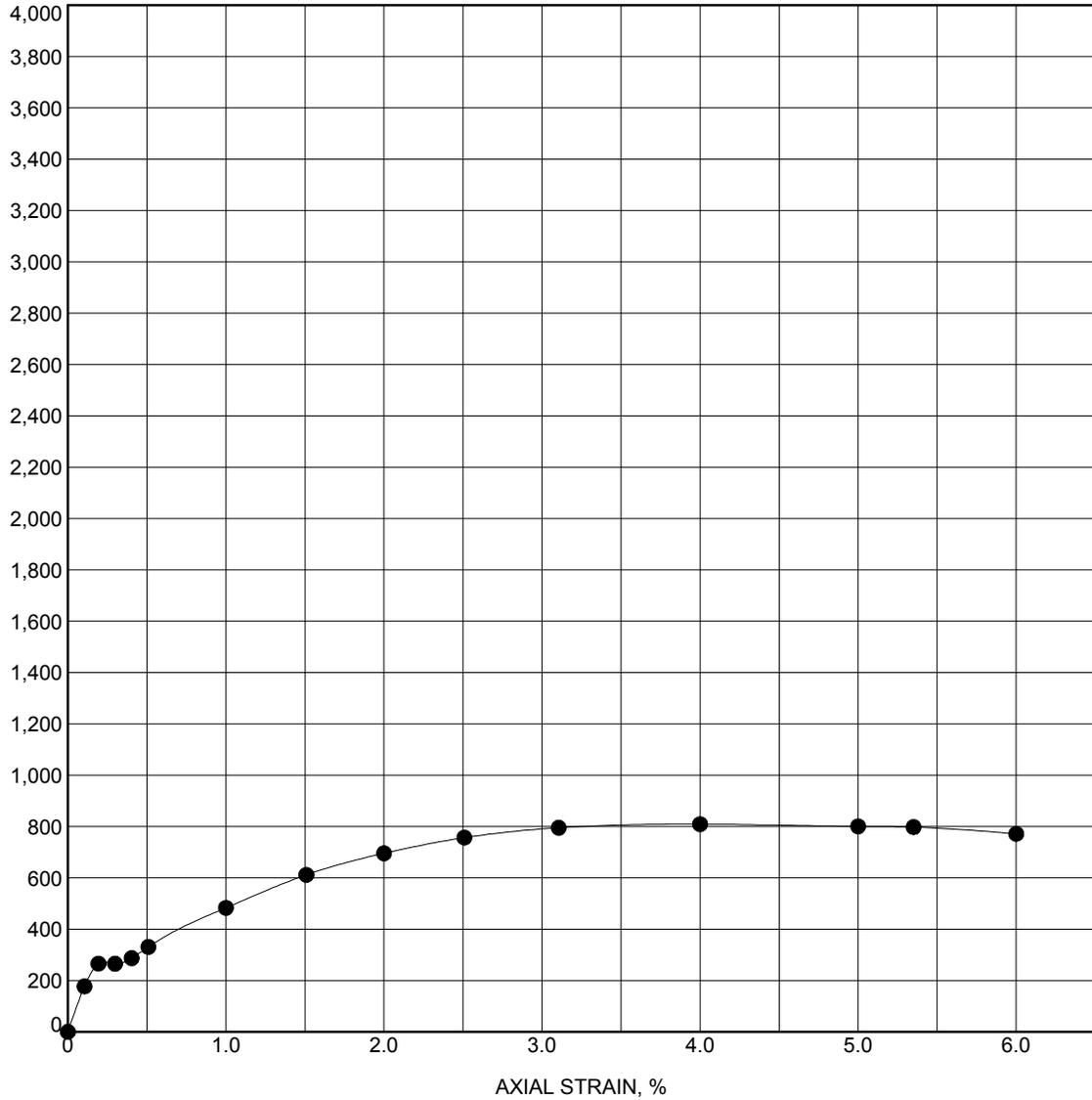


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UNCONFINED COMPRESSION TEST

Client: TDOT
 Project: Rehabilitation of I-40 Bridges
 Location: Nashville, Davidson County, Tennessee
 Project Number: 100814105

COMPRESSION STRESS, psf



Boring ID		Sample Depth		Date Sampled	Date Tested		
B-07		2 - 4 ft of 26.5 ft boring		11/21/2014	12/10/2014		
Unconfined Strength (psf)	Undrained Shear Strength (psf)	Failure Strain (%)		Strain Rate (in./min.)	Test Method		
809.2	404.6	4.0		0.050	ASTM D 2166		
USCS Classification			Liquid Limit	Plastic Limit	Plastic Index	Specific Gravity	Type
Lean Clay - Dark Brown (CL)			---	---	---		Undisturbed
Water Content %	Wet Density (pcf)	Dry Density (pcf)	Saturation %	Void Ratio	Specimen Diameter (in.)	Specimen Height (in.)	Height/Diameter Ratio
16.4	108.6	93.3			2.875	5.700	1.98

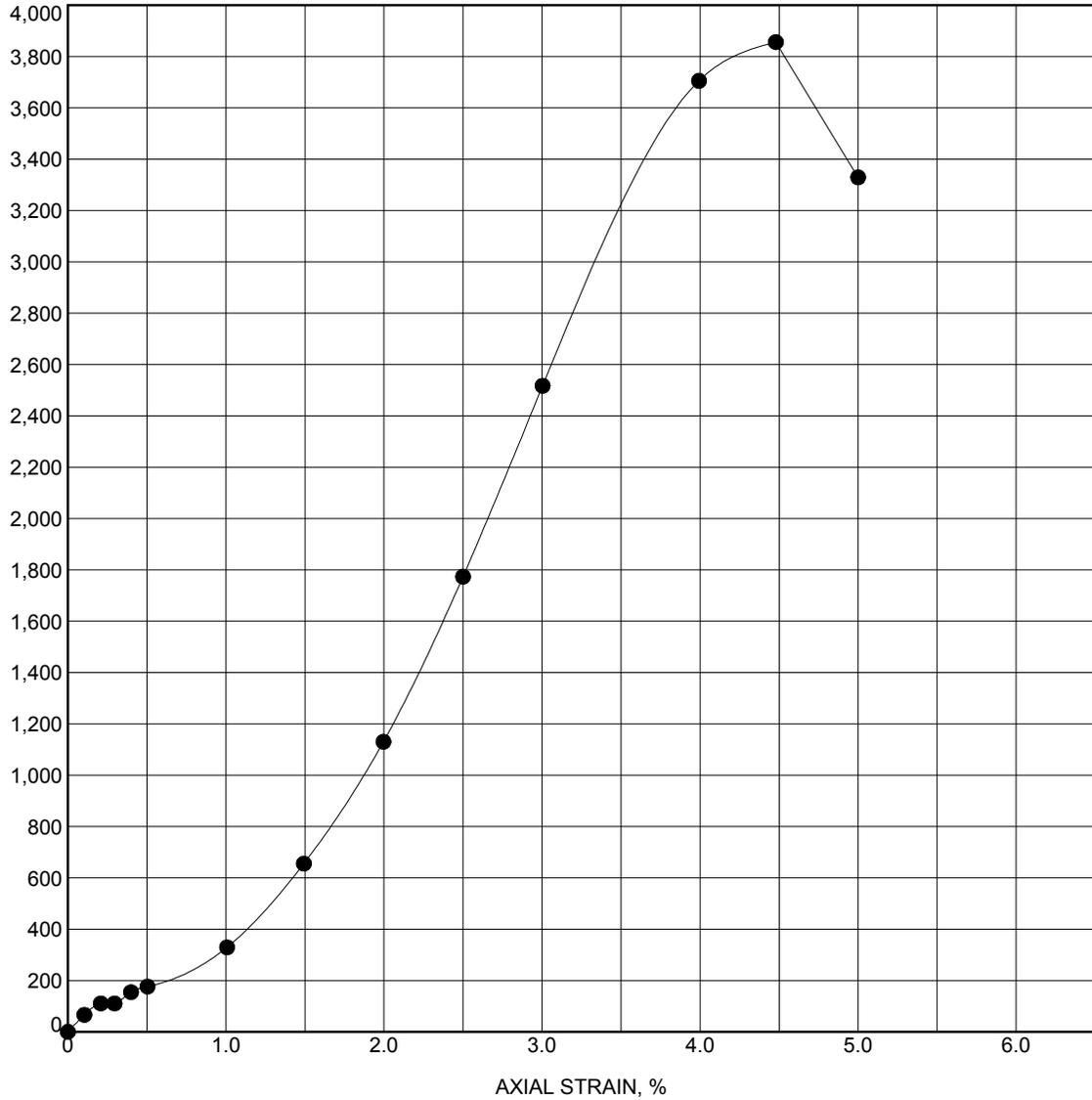


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UNCONFINED COMPRESSION TEST

Client: TDOT
 Project: Rehabilitation of I-40 Bridges
 Location: Nashville, Davidson County, Tennessee
 Project Number: 100814105

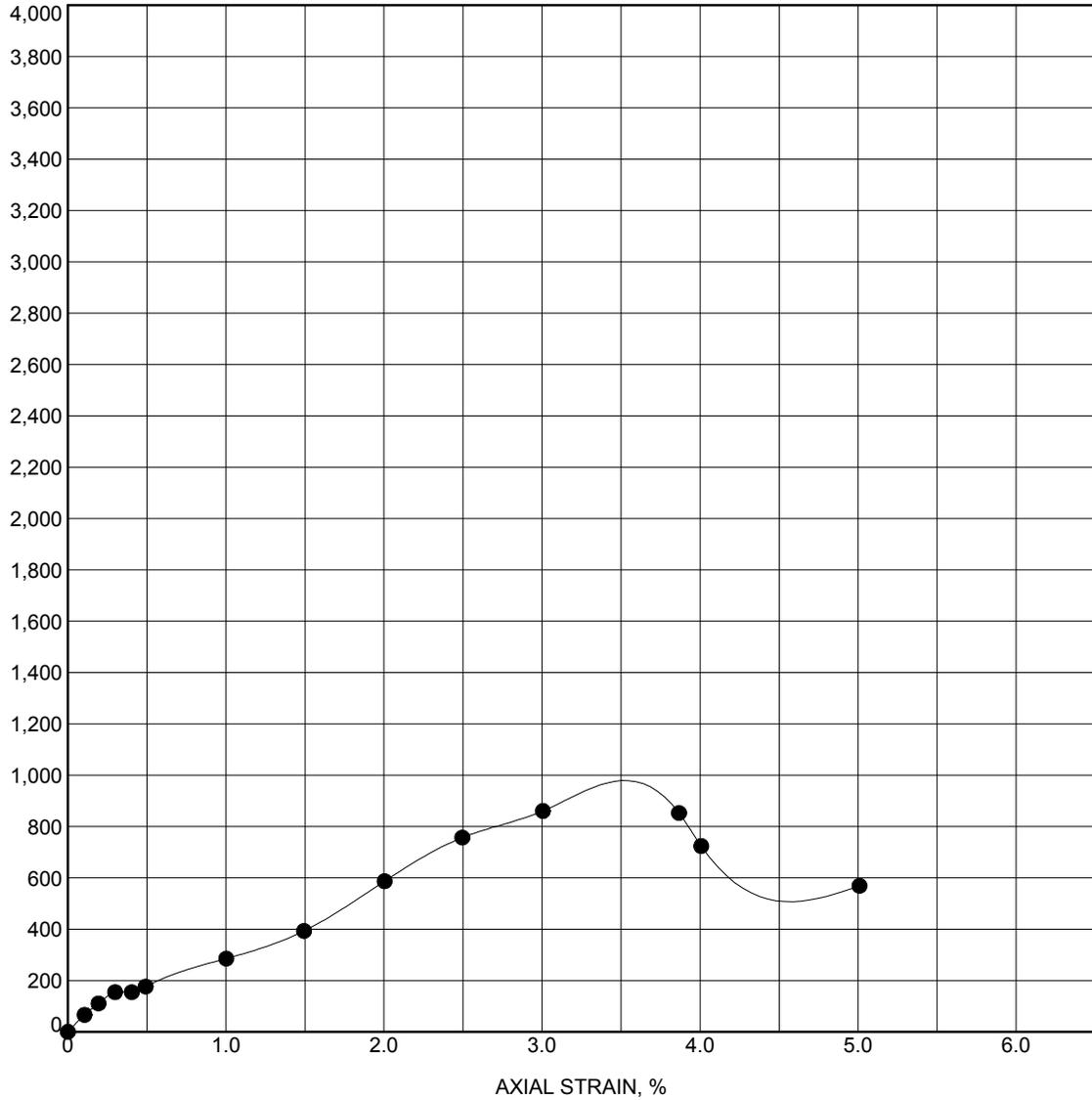
COMPRESSIVE STRESS, psf



Boring ID	Sample Depth		Date Sampled	Date Tested			
B-07	8 - 10 ft of 26.5 ft boring		11/21/2014	12/10/2014			
Unconfined Strength (psf)	Undrained Shear Strength (psf)	Failure Strain (%)	Strain Rate (in./min.)	Test Method			
3856.3	1928.1	4.5	0.050	ASTM D 2166			
USCS Classification		Liquid Limit	Plastic Limit	Plastic Index	Specific Gravity	Type	
Lean Clay - Dark Brown (CL)		---	---	---		Undisturbed	
Water Content %	Wet Density (pcf)	Dry Density (pcf)	Saturation %	Void Ratio	Specimen Diameter (in.)	Specimen Height (in.)	Height/Diameter Ratio
27.5	116.4	91.3			2.875	5.760	2.00

 geotechnical • analytical • materials • environmental	UNCONFINED COMPRESSION TEST	
	Client: TDOT Project: Rehabilitation of I-40 Bridges Location: Nashville, Davidson County, Tennessee Project Number: 100814105	

COMPRESSIVE STRESS, psf



Boring ID	Sample Depth		Date Sampled	Date Tested			
B-28	6 - 7.5 ft of 7.5 ft boring		11/24/2014	12/10/2014			
Unconfined Strength (psf)	Undrained Shear Strength (psf)	Failure Strain (%)	Strain Rate (in./min.)	Test Method			
860.6	430.3	3.0	0.050	ASTM D 2166			
USCS Classification		Liquid Limit	Plastic Limit	Plastic Index	Specific Gravity	Type	
Lean Clay - Dark Brown (CL)		---	---	---		Undisturbed	
Water Content %	Wet Density (pcf)	Dry Density (pcf)	Saturation %	Void Ratio	Specimen Diameter (in.)	Specimen Height (in.)	Height/Diameter Ratio
27.2	113.9	89.6			2.875	5.690	1.98

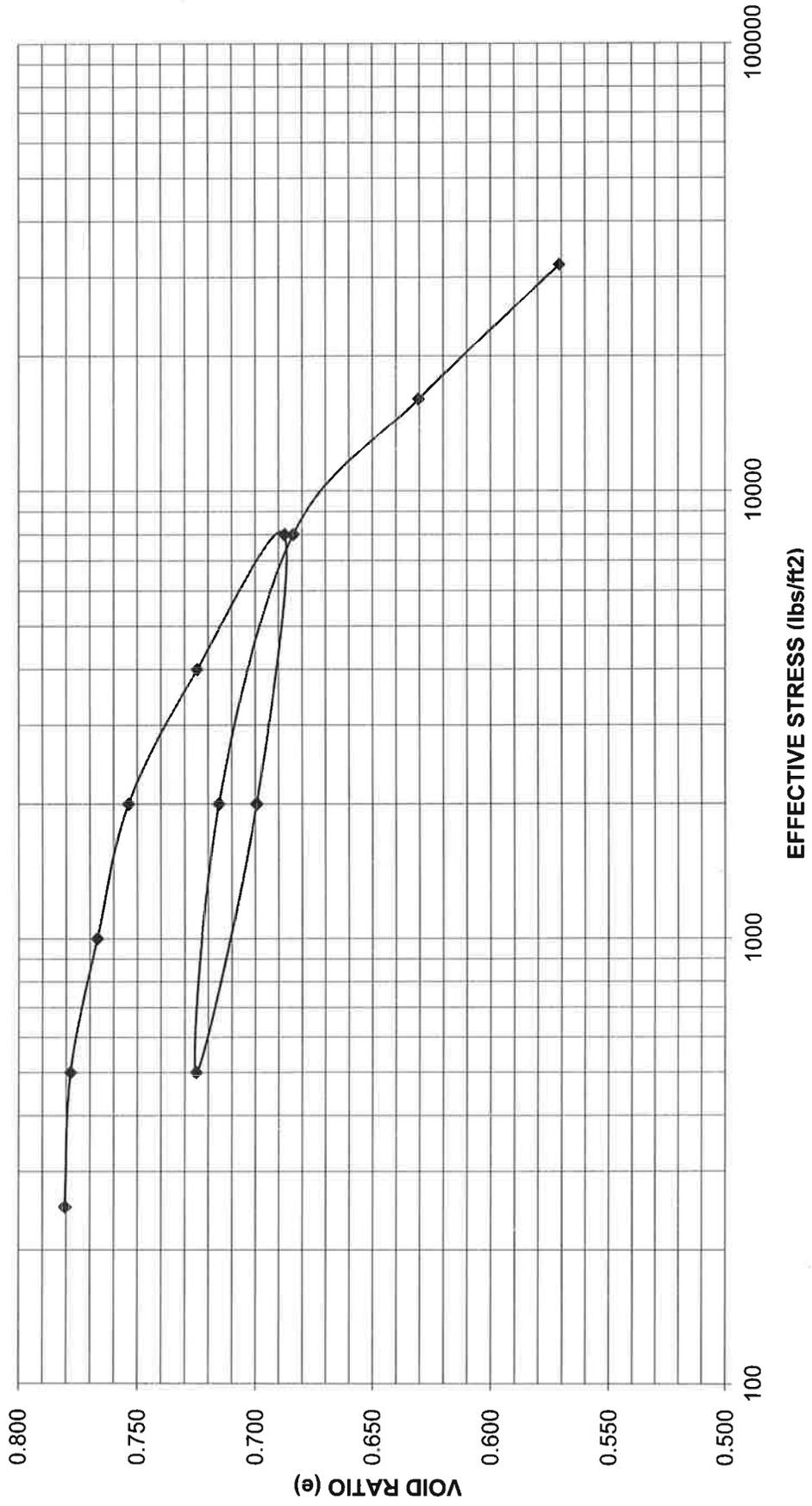


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UNCONFINED COMPRESSION TEST

Client: TDOT
 Project: Rehabilitation of I-40 Bridges
 Location: Nashville, Davidson County, Tennessee
 Project Number: 100814105

**TDOT
I-40 Retaining Walls
B-2 (8.0'-10.0')**

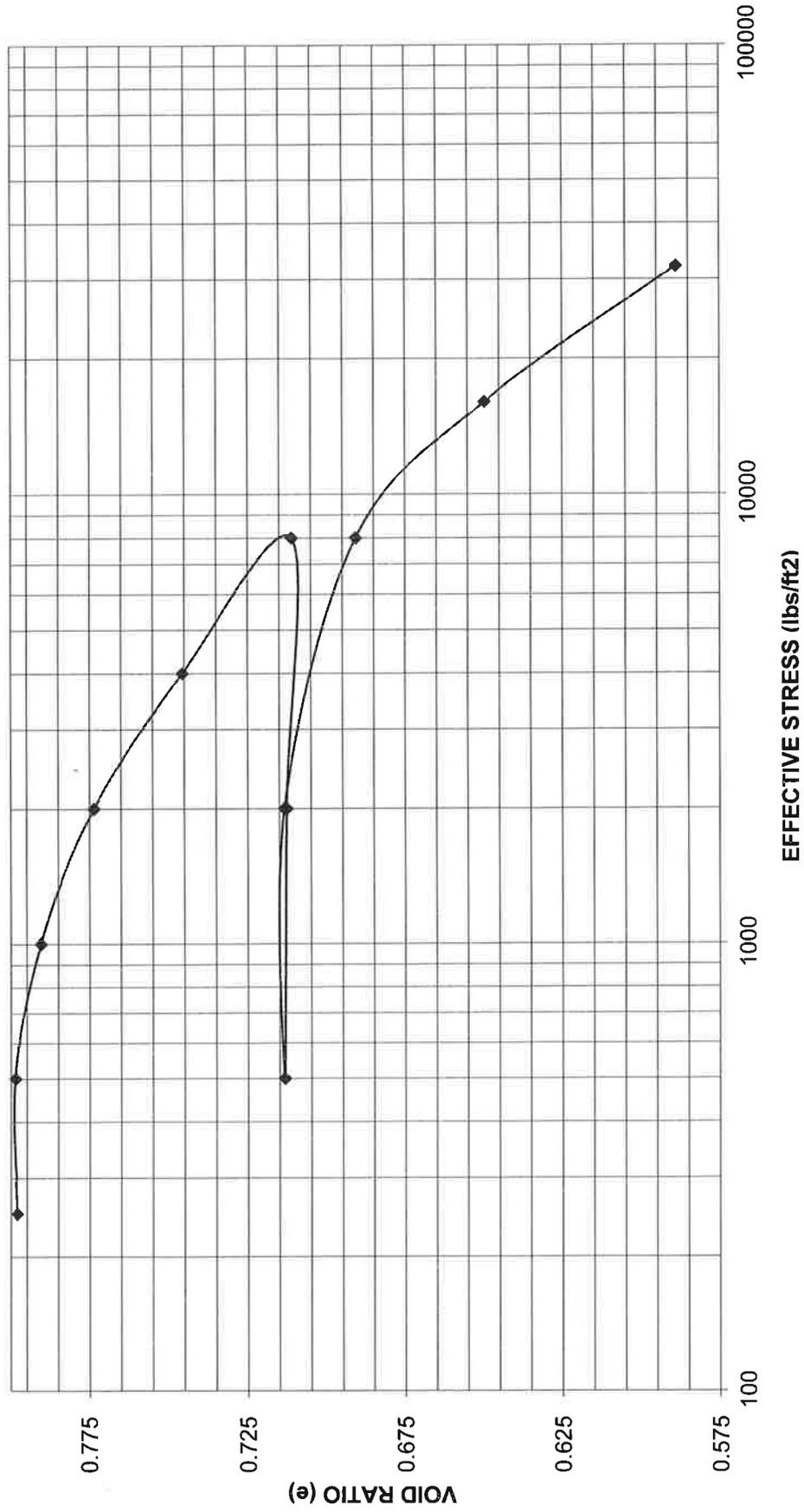


ONE DIMENSIONAL CONSOLIDATION TEST

PROJECT:	I-40 Retaining Walls	Effective Stress	Dial Readings	Delta	Sum of	Correction	Delta H	Void Ratio
CLIENT:	TDOT	Tons	Initial	H	Delta H	Factor	Corrected	e
DATE:	December-14	Pounds	Final					
LOCATION:	B-7	1/8 T 250 lb	0.0000	0.0000	0.0000	0.0000	0.0000	0.798
BORING #:	8.0-10.0	1/4 T 500 lb	0.0000	0.0000	0.0000	0.0004	-0.0004	0.799
DEPTH:		1/2 T 1000 lb	0.0000	0.0060	0.0060	0.0019	0.0041	0.791
MATERIAL DESCRIPTION:	Brown Lean Clay	1 T 2000 lb	0.0060	0.0161	0.0161	0.0026	0.0135	0.774
		2 T 4000 lb	0.0161	0.0321	0.0321	0.0030	0.0291	0.746
		4 T 8000 lb	0.0321	0.0527	0.0527	0.0044	0.0483	0.711
		1 T 2000 lb	0.0527	-0.0013	0.0514	0.0040	0.0474	0.713
		1/4 T 500 lb	0.0514	-0.0018	0.0496	0.0026	0.0470	0.713
		1 T 2000 lb	0.0496	0.0001	0.0497	0.0027	0.0470	0.691
		4 T 8000 lb	0.0497	0.0130	0.0627	0.0031	0.0596	0.650
		8 T 16000 lb	0.0627	0.0261	0.0888	0.0064	0.0824	0.589
		16 T 32000 lb	0.0888	0.0394	0.1282	0.0121	0.1161	

Sample Size= 2.5 in. x 1.0 in.
 Total Vol. (Vt) = 80.44 cu.cm.
 Area (A) = 31.67 sq.cm.
 Sample Length = 4 in.
 Specific Gravity (Gs) = 2.775
 Tube Vol. = 25.95 cu.in.
 Ring Vol.: 4.91 cu.in.
 Tube Sample Wt. = 830.9 g.
 Wet Unit Wt. in Tube: 121.96 lb/cu.ft.
 Wet Sample Wt in ring = 158.8 g.
 Moisture Content (%) = 27.9 %
 Dry Sample Weight (Ws): 124.2 g.
 Dry Unit Wt. of Sample: 96.3 lb/cu.ft.
 Vol. of Solids (Vs): 44.7422 cu.cm.
 Height of Solid (Hs): 0.5562 in.
 Height of Voids (Hv): 0.4438 in.
 Init. Void Ratio (Eo): 0.7979
 Void Ratio (E): Refer to data

**TDOT
I-40 Retaining Walls
B-7 (8.0'-10.0')**



ONE DIMENSIONAL CONSOLIDATION TEST

PROJECT: I-40 Retaining Walls
 CLIENT: TDOT
 DATE: December-14
 LOCATION: B-2
 BORING #: 8.0-10.0
 DEPTH:
 MATERIAL DESCRIPTION: Brown Lean Clay
 Sample Size= 2.5 in. x 1.0 in.
 Total Vol. (Vt) = 80.44 cu.cm.
 Area (A) = 31.67 sq.cm.
 Sample Length = 4 in.
 Specific Gravity (Gs) = 2.604
 Tube Vol. = 25.95 cu.in.
 Ring Vol.: 4.91 cu.in.
 Tube Sample Wt. = 813.4 g.
 Wet Unit Wt. in Tube: 119.39 lb/cu.ft.
 Wet Sample Wt in ring = 153.4 g.
 Moisture Content (%) = 30.4 %
 Dry Sample Weight (Ws): 117.6 g.
 Dry Unit Wt. of Sample: 91.3 lb/cu.ft.
 Vol. of Solids (Vs): 45.1759 cu.cm.
 Height of Solid (Hs): 0.5616 in.
 Height of Voids (Hv): 0.4384 in.
 Init. Void Ratio (Eo): 0.7806
 Void Ratio (E): Refer to data

Effective Stress Tons Pounds	Dial Readings Initial	Dial Readings Final	Delta H	Sum of Delta H	Correction Factor	Delta H Corrected	Void Ratio e
1/8 T 250 lb	0.0000	0.0004	0.0004	0.0004	0.0003	0.0001	0.780
1/4 T 500 lb	0.0004	0.0019	0.0015	0.0019	0.0005	0.0014	0.778
1/2 T 1000 lb	0.0018	0.0094	0.0076	0.0095	0.0018	0.0077	0.767
1 T 2000 lb	0.0094	0.0185	0.0091	0.0186	0.0035	0.0151	0.754
2 T 4000 lb	0.0185	0.0359	0.0174	0.0360	0.0046	0.0314	0.725
4 T 8000 lb	0.0359	0.0588	0.0229	0.0589	0.0066	0.0523	0.688
1 T 2000 lb	0.0588	0.0478	-0.0110	0.0479	0.0023	0.0456	0.699
1/4 T 500 lb	0.0478	0.0317	-0.0161	0.0318	0.0006	0.0312	0.725
1 T 2000 lb	0.0317	0.0392	0.0075	0.0393	0.0027	0.0366	0.715
4 T 8000 lb	0.0392	0.0612	0.0220	0.0613	0.0069	0.0544	0.684
8 T 16000 lb	0.0612	0.0923	0.0311	0.0924	0.0081	0.0843	0.631
16 T 32000 lb	0.0923	0.1278	0.0355	0.1279	0.0102	0.1177	0.571

*Final Foundation Report for Retaining Walls
Rehabilitation of I-40 Bridges
Charlotte Avenue, Jo Johnston Avenue, Clinton
Street
& Herman Street
Nashville, Davidson County, Tennessee
TTL Project No. 100814105
TDOT Project No. 19005-1161-44*

APPENDIX D:

Rock Core Photos

ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS
TDOT I-40 Bridge Removal
TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS
TDOT I-40 Bridge Removal
TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

TTL Job No. 100814105



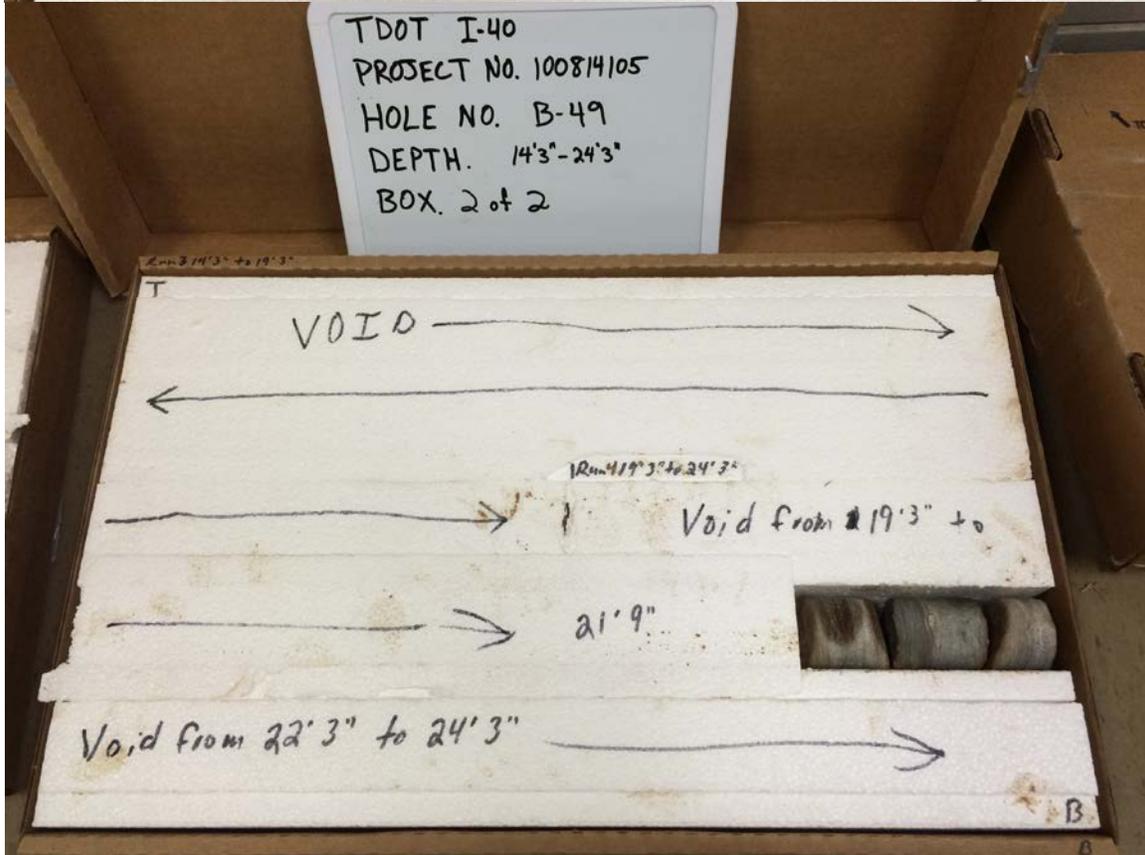
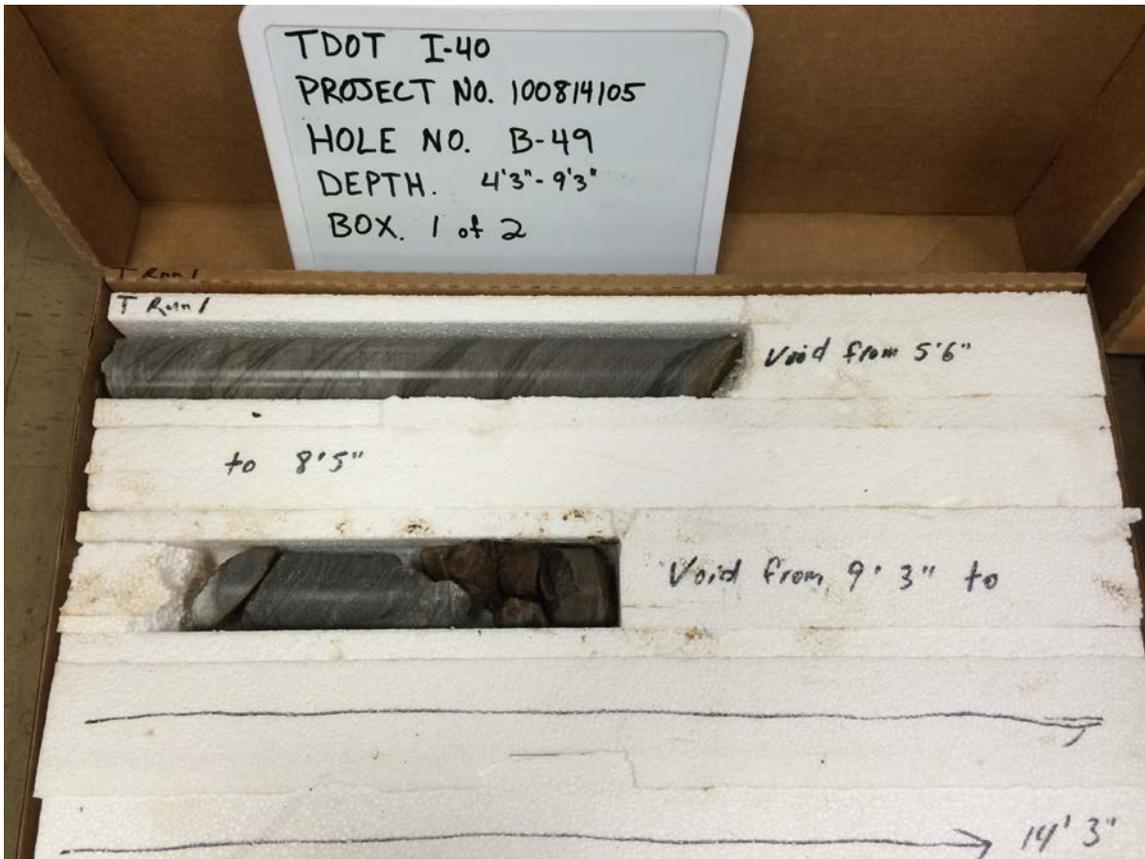
ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS
TDOT I-40 Bridge Removal
TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

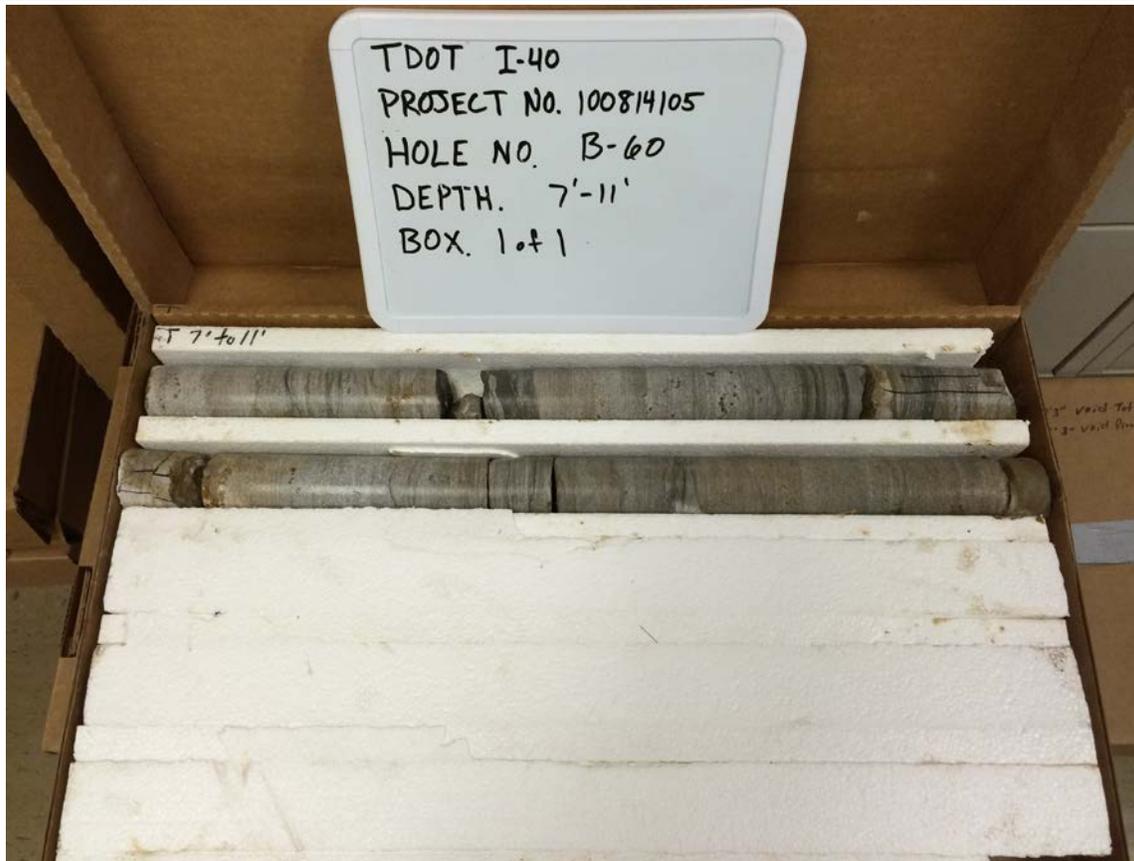
TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

TTL Job No. 100814105



ROCK CORE PHOTOGRAPHS

TDOT I-40 Bridge Removal

TTL Job No. 100814105





GEOTECHNICAL

Subsurface Investigations
Sinkhole Evaluation
Distress Studies
Engineering/Geology
Seismic Studies

ANALYTICAL

Certified Analytical Laboratory
Biotoxicity Services
NPDES Permitting and Monitoring
Source Water Assessment Plans
Sampling and Field Services

MATERIALS

Soil
Concrete
Steel
Aggregate
Pavement

ENVIRONMENTAL

Phase I & II Studies
Regulatory Permitting
Wetland Evaluations
Asbestos/Radon/Mold
Hydrogeology