Bridge Foundation Report

City of Huntsville Project No. 71-19-SP08
Old Highway 20 Bridge over Beaverdam Creek
Phase III-A
Huntsville, Limestone County, Alabama

August 4, 2020
Terracon Project E1185324

Prepared for:
Garver, LLC
Huntsville, Alabama

Prepared by:
Terracon Consultants, Inc.
Birmingham, Alabama

August 4, 2020

Garver, LLC
5125A Research Dr NW
Huntsville, AL 35805-5908

Attn: Mr. Scott Leach, P.E.
E: scleach@garverusa.com

Re: Bridge Foundation Report
City of Huntsville Project No. 71-19-SP08
Old Highway 20 Bridge over Beaverdam Creek
Phase III-A
Huntsville, Limestone County, Alabama
Terracon Project No. E1175064

Dear Scott:

Terracon Consultants, Inc. (Terracon) is pleased to present to Garver, LLC this bridge foundation report for the planned Old Highway 20 bridge over Beaverdam Creek in Huntsville, Limestone County, Alabama. Our scope for this project was performed in general accordance with our proposal number PE1185324-Revision 4, dated September 10, 2019.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Matthew S. McCullough, P.E.
Senior Engineer
Alabama PE 31978

Jerome A. Smith, P.E.
Manager, Geotechnical Services
Alabama PE 20478

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BRIDGE FOUNDATION REPORT
CITY OF HUNTSVILLE PROJECT NO. 71-19-SP08
OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK
PHASE III-A
HUNTSVILLE, LIMESTONE COUNTY, ALABAMA

Terracon Project No. E1185324
August 4, 2020

1.0 INTRODUCTION

This geotechnical engineering evaluation has been completed for the planned bridge over Beaverdam Creek along Old Highway 20 in Huntsville, Limestone County, Alabama. A total of eight (8) SPT and Rock Core borings have been performed to depths ranging from about 29 feet to about 58 feet below the existing surface grades. Logs of the borings and a boring location plan are included in Appendix C.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to construction of the new bridge foundations.

2.0 PROJECT INFORMATION

The overall project will consist of the realignment and improvements to Old Highway 20 near the existing at-grade railroad crossing and bridge over Beaver Dam Creek in Huntsville, Limestone County, Alabama. This project will be associated with the new industrial development (MTMUS) being constructed north of the existing Old Highway 20. The overall realignment will be a little over 1 mile in length and will require two new bridges over Norfolk Southern Railroad and Beaver Dam Creek, respectively.

The proposed new bridge over Beaverdam Creek will be located approximately 250 feet south of the existing bridge alignment. The new bridge will contain 3 spans of 85 feet, utilizing AASHTO Type III girders. Fills of around 15 feet will be required at the abutment locations to achieve the profile grade.

3.0 FIELD PROCEDURE

Drilling crews subcontracted by Terracon conducted soil boring and sampling operations at designated locations on the project site using ATV-mounted Mobile B47 drill rigs fitted with

manual hammers (AASHTO T-206). A total of eight (8) test borings were performed between the dates of May 14 and May 20, 2020.

The boring locations are indicated on the boring location plan sheet in Appendix C. The borings were extended to auger refusal depths and into the underlying bedrock using rock coring techniques (ASTM D-2113).

A Terracon engineer evaluated the recovered soil and rock samples and logged the probable site stratigraphy. Selected soil samples were tested at the Terracon laboratories in Birmingham, Alabama and Chattanooga, Tennessee. The laboratory results can be seen on the boring logs in Appendix C as well as on the soil classification summary and individual reporting sheets in Appendix D.

4.0 SUBSURFACE CONDITIONS

4.1 Geology

Maps published by the Geological Survey of Alabama indicate that the project is underlain by the Fort Payne Chert and Maury Formation undifferentiated. The Fort Payne Chert contains interbedded olive-gray to tan bedded chert locally containing molds of large crinoid stems, light olive-gray very fine-grained variably cherty dolomitic limestone, very light-gray fine to coarse-grained bioclastic limestone, locally composed entirely of large crinoid columnals and thin lenses of chert at top of fining upward units; and light-greenish-gray to light-olive-gray variably cherty dolomite. The Maury Formation contains light greenish-gray and dark brownish-gray fissile shale and yellowish to greenish-gray fine-grained calcareous sandstone. A Geologic Map of the site vicinity is included with this report (refer to Exhibit A-2 in Appendix A).

The limestone that underlies the site is carbonate rock and therefore susceptible to sinkhole development. A sinkhole susceptibility map is included with this report as Exhibit A-3 in Appendix A. No evidence of sinkhole activity (i.e., surface depressions) was noted during our site reconnaissance.

4.2 Typical Profile

Based on the results of the test borings, subsurface conditions at the project can be generalized as follows:

Topsoil was noted at boring B-6, having a thickness of 7 inches. None of the other borings had a distinguishable topsoil interval. The borings encountered native soils consisting of silt (ML), elastic silt (MH), lean clay (CL), or fat clay (CH). The native soils were typically very soft to medium stiff

(SPT N-values of 0 to 8) in the upper 3 to 8 feet. Stiff to very stiff and/or hard soils (SPT N-values of 9 to 32) were generally noted below the very soft to medium stiff soils prior to auger refusal. However, the very soft to medium stiff soils were encountered at greater depths in borings BD-4 and BD-7 prior to auger refusal. All borings reached refusal on limestone bedrock at depths ranging from 7 to 32 feet below existing grades.

Below auger refusal, rock coring operations encountered limestone bedrock. The limestone was noted as mostly light gray, thin-bedded, and hard. Recovery for the rock core samples retrieved was mostly greater than 90 percent and Rock Quality Designation (RQD) was mostly greater than 80 percent. Mud-filled voids were noted within the bedrock at boring BD-6 between 23 and 28 feet deep, and at boring BD-8 between 26 and 33 feet deep. The borings were terminated within the limestone bedrock at depths ranging from about 29 to about 58 feet below the existing grades.

Details for each of the individual borings can be found on the test boring record sheets and boring log profiles in Appendix C.

4.3 Groundwater

The boreholes were observed during drilling and after completion for the presence and level of groundwater. Groundwater was observed during drilling at Boring BD-5 at a depth of 4 feet. No groundwater was observed in any of the other borings during drilling or during the short period of time the holes remained open prior to initiation of rock coring procedures. The introduction of water as drilling fluid during rock coring precluded the measurement of groundwater levels at drilling completion. We anticipate that the groundwater levels in most borings would not have had time to fully stabilize prior to initiation of rock coring.

Fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time the measurement was made and reported herein. Groundwater should generally be anticipated during construction near the flowline elevation of Beaverdam Creek.

5.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

5.1 Embankment Settlement and Stability

Fills on the order of 12 to 15 feet will be required to achieve the new profile grades at the bridge abutments. Plans indicate that the new abutment slope at Abutment No. 1 will be graded no steeper than 2.0(H):1.0(V). Our stability analysis indicates that the new abutment slope will have a minimum factor of safety of 1.6. The slope stability model output for the abutment slopes has been included in Appendix A. Please refer to the Slope Study Report prepared by

Terracon (to be submitted under a separate cover) for slope considerations in other areas of the project.

Undercutting of very soft to soft soils and backfilling with underwater embankment is anticipated over a significant portion of the bridge approach embankments. Please refer to the Materials Report and Slope Study Report (to be submitted under separate covers) for further discussion of the recommended undercutting for this project. Provided that the undercutting and replacement of very soft to soft soils is performed, it is our opinion that total settlements for Abutment No. 1 will be within tolerable limits (less than about 1 inch). However, settlements of up to 2.5 inches may still be anticipated at Abutment No. 4. Our analysis indicates that about 90% of the settlement should occur within 25 days of fill placement. Therefore, should embankment construction occur prior to drilled shaft construction a 25-day waiting period is recommended at Abutment No.4.

Should foundation construction occur prior to the end of the recommended waiting period, the drilled shafts at Abutment No. 4 will likely be subjected to additional downdrag loads. Further discussion of downdrag is included in Section 5.3.1 and 5.3.2.

5.2 Corrosion Indicators

Chemical analysis was conducted on two composite soil samples from abutment borings BD-1 and BD-8, and on a water sample from Beaverdam Creek. A copy of the results of the chemical analyses performed on these samples is included in Appendix D for general use and information. The results are summarized below.

Location(s)	pH	Sulfates	Chlorides	Resistivity (ohm-cm)
Boring BD-1	4.9	178 ppm	Below Detection Limit of 4 ppm	15,400
Boring BD-8	6.0	Below Detection Limit of 10 ppm	Below Detection Limit of 4 ppm	5,490
Beaverdam Creek	7.0	1.84 ppm	3.64 ppm	7,030

In our opinion, the test results presented above are indicative of soils with a moderate to high corrosive potential (based on the low pH and elevated sulfate content for the boring BD-1 sample, and the low resistivity for the boring BD-8 sample). DS-2 concrete is recommended for drilled shaft construction at the site.

5.3 Scour Potential

A scour report has not been provided at this time. Therefore, for foundation design purposes it has been assumed that all material above the rock line (auger refusal material) is scourable and will not be considered for support in the substructure design at interior bent locations. Terracon recommends that the limestone bedrock disclosed below auger refusal depths be considered scour resistant. We also assume that all soils at the abutment locations would be scour-resistant based on the expected use of riprap slope protection. Terracon can further evaluate scour considerations at interior bent locations if a scour report is provided.

5.4 Foundations

It is our understanding that foundation support for the new bridge will consist of drilled shafts at all locations. Exhibit B-1 in Appendix B includes capacities and tip elevations for drilled shafts with diameters of 36, 42, 48, 54, and 60 inches. The drilled shaft capacities presented on Exhibit B-1 were calculated for static axial capacity using the computer program SHAFT, considering both shaft friction and end-bearing in limestone bedrock. Axial loads were provided by Garver and are presented in the table below:

Location	Limit State	Axial Load (tons)
Abutment No. 1 Abutment No. 4	Strength I	220
	Service I	165
Bent No. 2 Bent No. 3	Strength I	450
	Service I	330

The capacities shown on Exhibit B-1 were determined using the following nominal geotechnical resistance factors.

Limit State	Geomaterial	Geotechnical Resistance Factor (φ)[1] (side resistance)	Geotechnical Resistance Factor (φ)[1] (base resistance)
Strength I	Cohesive Soil	0.40	0.40
	Rock	0.55	0.50

Limit State	Geomaterial	Geotechnical Resistance Factor (φ)[1] (side resistance)	Geotechnical Resistance Factor (φ)[1] (base resistance)
Service I	Cohesive Soil	1.0	1.0
	Rock	1.0	1.0

1. From Table 10-5, FHWA-NHI-10-016 Drilled Shafts Manual

It is recommended that a project engineer be on-site during drilled shaft installation to monitor drilling procedures and adequacy of the bearing material. Contractors should be prepared to dewater the shafts prior to placement of concrete. We anticipate that the casing will be seated into the bedrock and groundwater removed from the casing using a system of sump pumps. However, should it not be possible to remove groundwater from the casing, the contractors should be prepared to install the shafts using a wet method of construction outlined in Section 506.03(b)2 of the ALDOT Standard Specifications for Highway Construction. Furthermore, should a wet method of construction be implemented, the drilled shafts should be subjected to nondestructive testing in the form of cross-hole sonic logging (CSL) as outlined in Section 506.10(a) of the ALDOT Standard Specifications for Highway Construction.

Due to the potential for encountering mud-filled cavities within the shaft excavation, permanent casing is recommended at Bent No. 3 (right of centerline, casing tip Elevation 538) and Abutment No. 4 (right of centerline, casing tip Elevation 532).

Additional exploratory shaft excavations (i.e. probe holes) are recommended at the bottom of each drilled shaft. Probe holes shall be performed in accordance with Section 506 of the ALDOT Standard Specifications for Highway Construction. One probe hole should be performed per shaft and should extend a minimum of 10 feet below the shaft bottom.

The shafts should be socketed a minimum depth of 2 shaft diameter into the underlying limestone bedrock to provide the axial capacities indicated. Recommended lateral resistance design values are shown on Exhibit B-2 in Appendix B.

As discussed in Section 5.1, should drilled shaft construction occur prior to the recommended 25-day waiting period, the drilled shafts at Abutment No. 4 will likely be subjected to additional downdrag loads due to settlement of the new embankment and existing fill soils. Based on our analyses, these downdrag loads will be on the order of 95 tons per shaft for a shaft size of 42 inches, 105 tons per shaft for a shaft size of 48 inches, 125 tons for a shaft size of 54 inches,

and 140 tons per shaft for a shaft size of 60 inches. Since the shafts will utilize end bearing on bedrock, the estimated tip elevations will not be affected by the downdrag loads.

5.4 Recommended Plan Notes

The items listed below may be used to develop ***Plan Notes*** to bring attention to specific geotechnical recommendations and requirements. These notes are not intended to cover all recommendations and requirements that should be developed through engineering judgment and review of this report in its entirety.

5.4.1 Construction Notes

Drilled Shafts

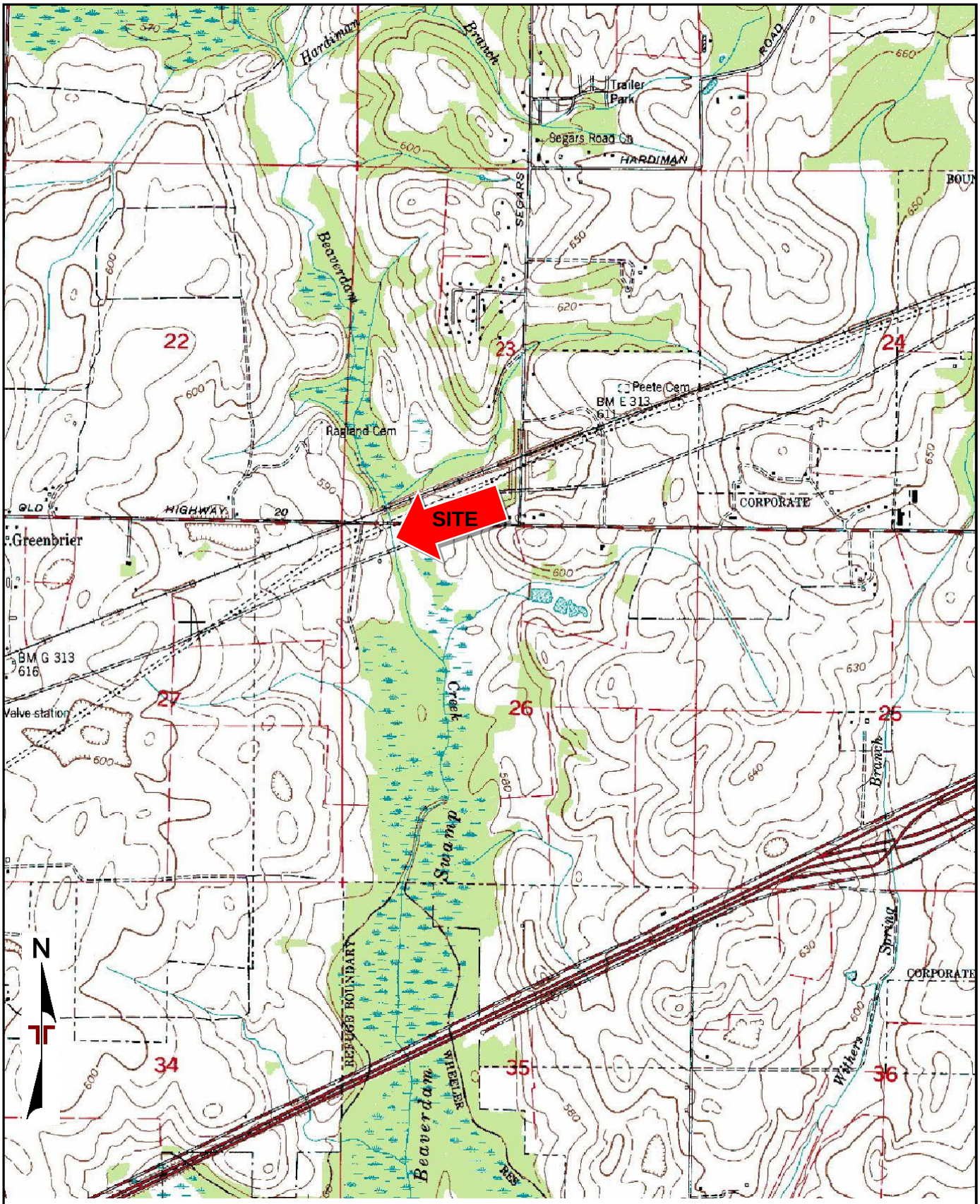
- Dewatering is anticipated for all shaft excavations
- Should a wet method of construction be implemented, the drilled shafts should be subjected to nondestructive testing in the form of cross-hole sonic logging (CSL) as outlined in Section 506.10(a) of the ALDOT Standard Specifications for Highway Construction
- Additional exploratory shaft excavations (i.e. probe holes) shall be performed in accordance with Section 506 of the ALDOT Standard Specifications for Highway Construction.
- Permanent casing is recommended at Bent No. 3, right of centerline (casing tip Elevation 538).
- Permanent casing is recommended at Abutment No. 4, right of centerline (casing tip Elevation 532).
- A 25-day waiting period is recommended after abutment embankment construction at Abutment No. 4 prior to foundation construction.

5.4.2 General Notes

- A plan note is recommended advising potential contractors of the existence of a Foundation Report and core borings pertaining to this project. Access to the report and core borings can be arranged by contacting the Engineer of Record.

APPENDIX A

FIGURES



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: GREENBRIER, AL (1/1/1992).

Project Manager: MSM	Project No. E1185324	Terracon 2147 Riverchase Office Rd Hoover, AL 35244-1836	SITE LOCATION MAP	Exhibit
Drawn by: MSM	Scale: 1"=2,000'		Old Highway 20 Bridge Over Beaverdam Creek Phase III-A Huntsville, Limestone County, AL	A-1
Checked by: JAS	File Name:			
Approved by: JAS	Date: 6/23/2020			

Qal	**Alluvium in bottomlands.** Unconsolidated clay, silt, sand, and rounded gravel.
Qtl	**Terrace deposits.** Rounded to subrounded dark-reddish-brown iron-stained chert gravel, generally in dark-reddish-brown soil on the tops of low hills. Remnants of terraces are developed along major streams in the quadrangle. Most remnants are too thin to map.
Mt	**Tuscumbia Limestone.** Light-bluish-gray to very light-gray, fine- to coarse-grained, medium- to thick-bedded bioclastic limestone, locally containing light-gray to bluish-gray chert nodules and lenses. The upper part is locally characterized by dark fine-grained limestone containing colonial rugosan corals and chert nodules. The Tuscumbia is generally represented by weathered to cherty residuum in most of the quadrangle.
Mfpm	**Fort Payne Chert and Maury Formation undifferentiated.** Fort Payne Chert: interbedded olive-gray to tan bedded chert locally containing molds of large crinoid stems (greater than 0.75 inch in diameter); light-olive-gray very fine-grained variably cherty dolomitic limestone; very light-gray fine- to coarse-grained bioclastic limestone, locally composed entirely of large crinoid columnals and thin lenses of chert at top of fining upward units; light-greenish-gray to light-olive-gray variably cherty dolomite. Maury Formation (basal 3 - 10 feet): light-greenish-gray and dark-brownish-gray fissile shale and yellowish- to greenish-gray fine-grained calcareous sandstone (in cuttings).

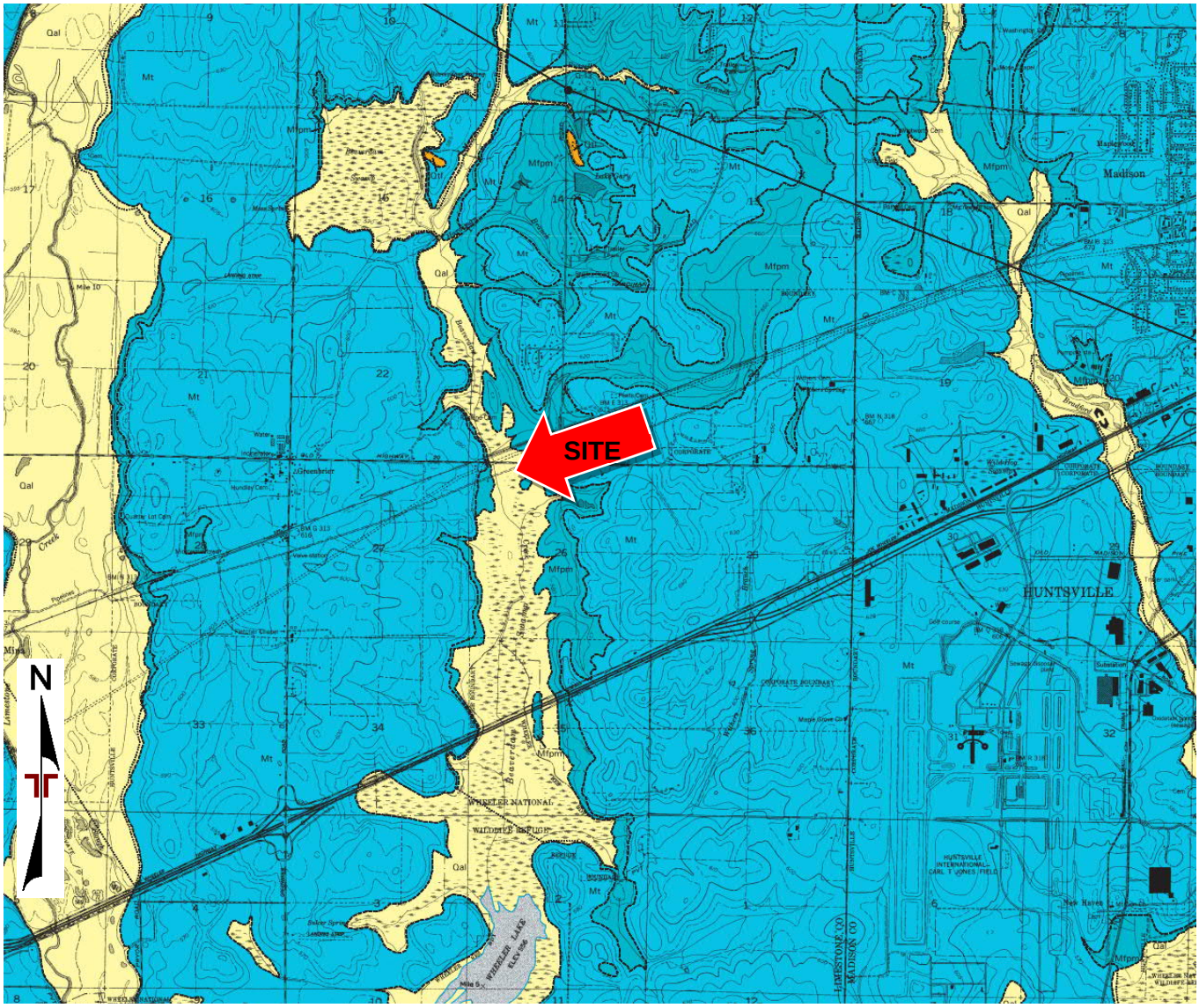


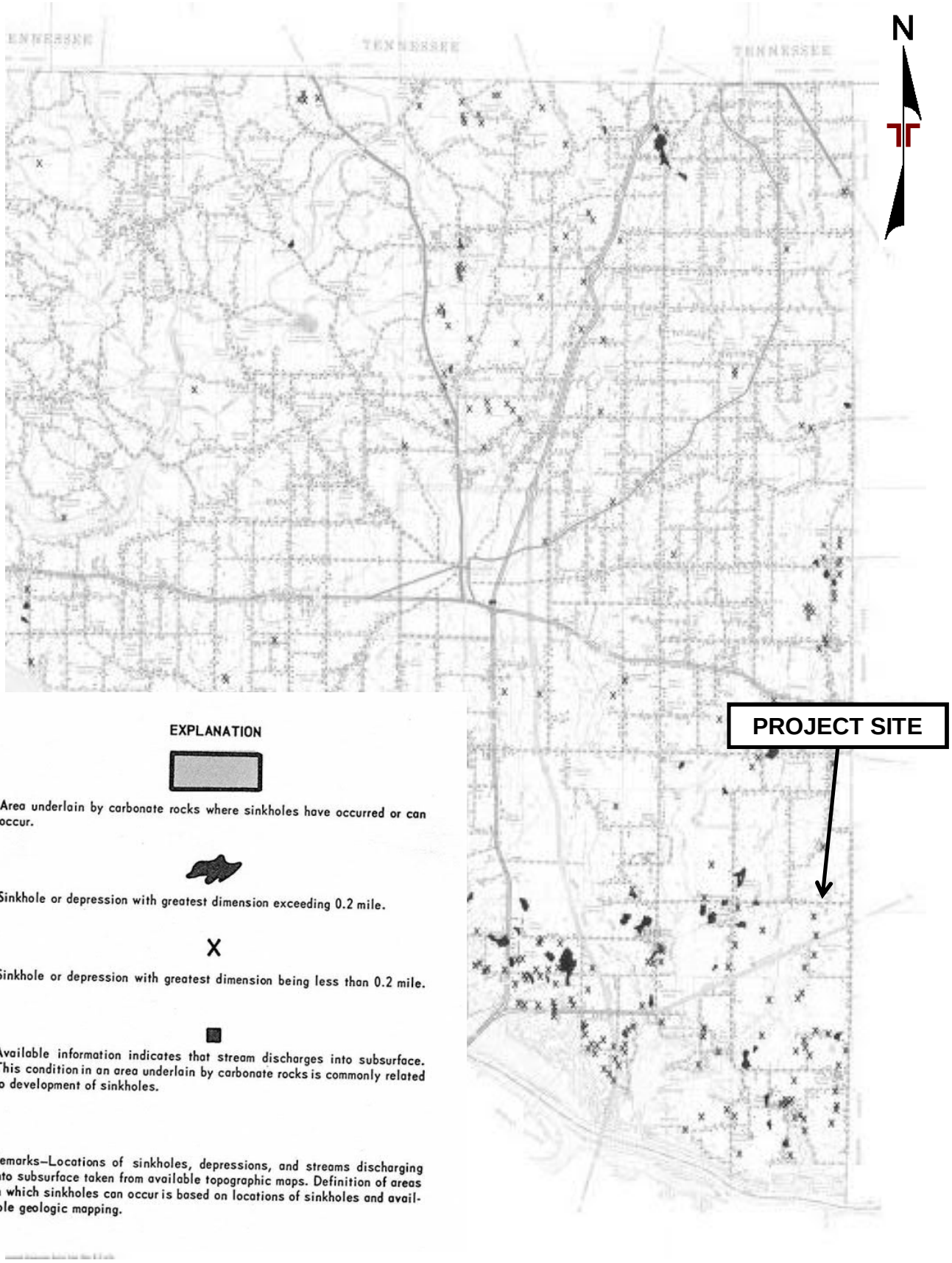
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY GEOLOGICAL SURVEY OF ALABAMA

Project Manager: MSM	Project No. E1185324	Terracon	GEOLOGIC MAP
Drawn by: MSM	Scale: AS SHOWN	2147 Riverchase Office Rd	Old Highway 20 Bridge Over Beaverdam Creek
Checked by: JAS	File Name:	Hoover, AL 35244-1836	Phase III-A
Approved by: JAS	Date: 6/23/2020		Huntsville, Limestone County, AL

Exhibit

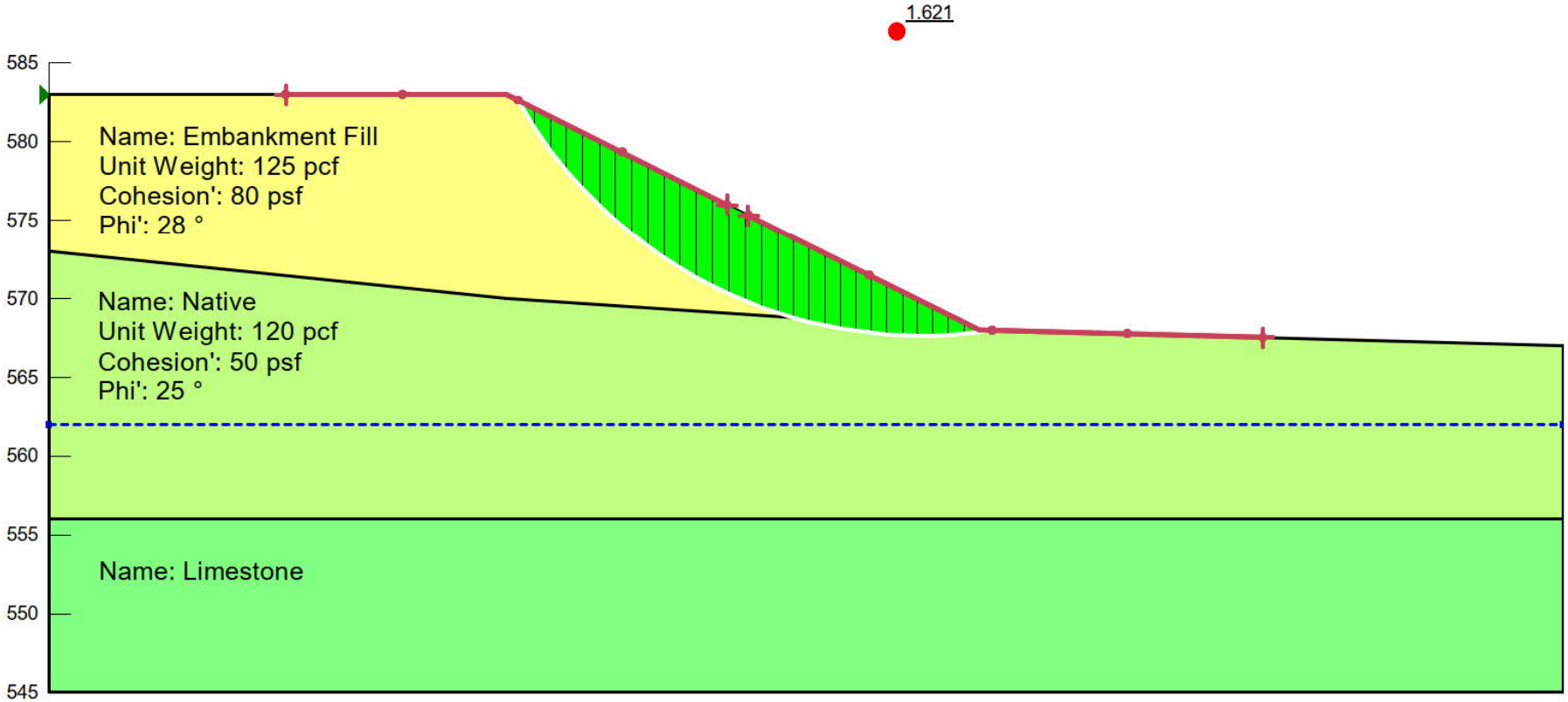
A-2



Project Manager: MSM	Project No. E1185324	Terracon Consulting Engineers & Scientists	SINKHOLE SUSCEPTIBILITY MAP	EXHIBIT
Drawn by: MSM	Scale: NTS'	2147 Riverchase Office Road Birmingham, Alabama 35244	Old Highway 20 Bridge Replacement	A-3
Checked by:	File Name:	PH. (205) 942-1289 FAX. (205) 443-5302	Over Beaverdam Creek	
Approved by:	Date: 6/23/2020		Phase III-A	
			Huntsville, Limestone County, AL	

Old Highway 20 Bridge

F of S: 1.621



Project Manager: MSM	Project No. E1185324	Terracon	SLOPE STABILITY MODEL OUTPUT	Exhibit
Drawn by: MSM	Scale: NTS		Old Highway 20 Bridge Over Beaverdam Creek Phase III-A Huntsville, Limestone County, AL	A-4
Checked by:	File Name:	2147 Riverchase Office Road Birmingham, Alabama 35244		
Approved by:	Date: 6-23-2020	PH. (205) 942-1289 FAX. (205) 443-5302		

APPENDIX B

FOUNDATION DESIGN

Exhibit B-1: Summary of Drilled Shaft Foundation Recommendations

LOCATION	STATION	BORINGS	SHAFT DIAMETER (INCHES)	LRFD RESISTANCE (TONS)	ESTIMATED FINAL GROUND ELEVATION (FT)	ESTIMATED BOTTOM OF SHAFT ELEVATION (FT)	
						LEFT	RIGHT
Abutment No. 1	118+12.50	BD-1 BD-2	36	550	583	554	550
			42	750		553	549
			48	1,000		552	548
			54	1,250		551	547
			60	1,500		550	546
Bent No. 2	118+97.50	BD-3 BD-4	36	550	565	548	546
			42	750		547	545
			48	1,000		546	544
			54	1,250		545	543
			60	1,500		544	542
Bent No. 3	119+82.50	BD-5 BD-6	36	550	566	550	538
			42	750		549	538
			48	1,000		548	538
			54	1,250		547	538
			60	1,500		546	538
Abutment No. 4	120+67.50	BD-7 BD-8	36	550	580	527	526
			42	750		526	525
			48	1,000		525	524
			54	1,250		524	523
			60	1,500		523	522

Notes/Recommendations for Drilled Shafts:

A minimum embedment of 2 shaft diameters into the limestone bedrock is recommended.

Should a wet method of construction be implemented, the drilled shafts should be subjected to nondestructive testing in the form of cross-hole sonic logging (CSL) as outlined in Section 506.10(a) of the ALDOT Standard Specifications for Highway Construction.

Permanent casing is recommended at Bent No. 3, right of centerline (casing tip Elevation 538).

Permanent casing is recommended at Abutment No. 4, right of centerline (casing tip Elevation 532).

Exhibit B-2: Lateral Resistance Design Values

STRATA	COHESION c (ksf)	FRICTION ANGLE ϕ (degrees)	HORIZONTAL SUBGRADE MODULUS k (pci)	STRAIN AT 50 PERCENT ε_{50} (in/in)	MOIST UNIT WEIGHT γ' (pcf)
LEAN CLAY / FAT CLAY (very soft to soft)	0.25	---	60	0.02	115 (52.6)
LEAN CLAY / FAT CLAY (medium stiff to stiff)	0.8	---	200	0.007	120 (57.6)
LEAN CLAY / FAT CLAY (very stiff to hard)	2.0	---	400	0.005	125 (62.6)
SILT / ELASTIC SILT (very soft to soft)	0.25	---	60	0.02	115 (52.6)
SILT / ELASTIC SILT (medium stiff to stiff)	0.8	---	200	0.007	120 (57.6)
SILT / ELASTIC SILT (very stiff to hard)	2.0	---	400	0.005	125 (62.6)
CLAYEY SAND (loose)	---	28	20	---	125 (62.6)
LIMESTONE BEDROCK	5.0	36	800	0.0005	135 (72.6)

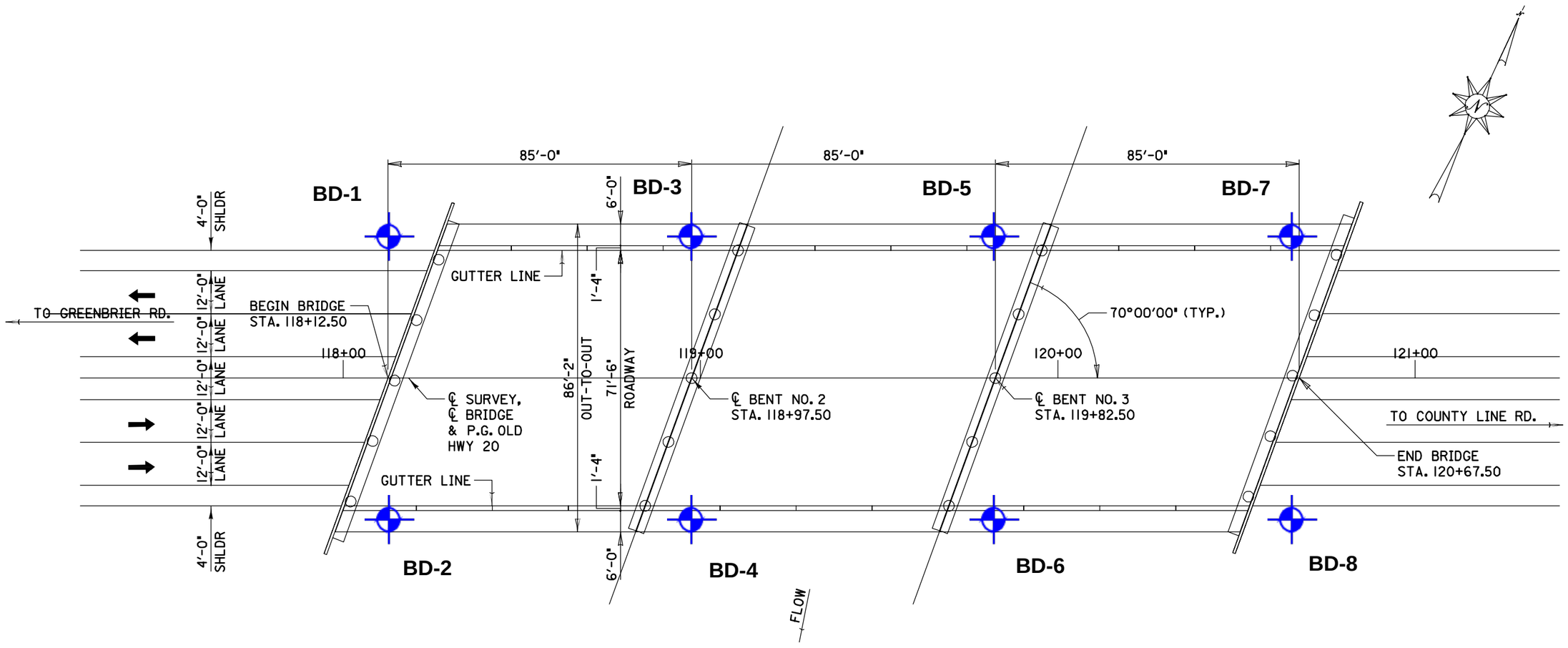
Notes/Recommendations:

( ) Indicates buoyant unit weight, use below water table.

APPENDIX C

SOIL BORING DATA

PROJECT NO.	FISCAL YEAR	SHEET NO.
71-19-SP08		



BORING LOCATION

BRIDGE SHEET NO. of	CITY OF HUNTSVILLE
Terracon APPROVED: MATTHEW MCCULLOUGH, P.E.	PROJECT NO. 71-19-SP08 OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK PHASE III-A LIMESTONE COUNTY
GEOTECHNICAL ENGINEER	PRELIMINARY PROJ. NO. 71-19-SP08
DATE: JUNE 11, 2020	BORING LOCATION PLAN – NOT TO SCALE

PROJECT NO.	FISCAL YEAR	SHEET NO.
71-19-SP08		

BORING LOG NO. BD-1; STA 118+12.50 / 40 FT LT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518577.1 Easting: 358472.76 Surface Elev.: 570.68 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
		SANDY SILT WITH GRAVEL (ML), brown to tan, medium stiff to stiff
6.0	564.5	
7.0	563.5	SANDY LEAN CLAY (CL), some limestone and chert fragments, brown to tan, hard
		Auger refusal at 7' – begin rock coring
10.0	560.5	LIMESTONE, light gray, hard, thin-bedded, highly-fractured
		LIMESTONE, light gray, hard, thin-bedded
		20' – 21': Unconfined Compressive Strength = 9,633 psi
33.0	537.5	

Boring Terminated at 33 Feet

Sample	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
SS	1-2-3 N=5			25		
SS	4-5-8 N=13			26	45-32-13	51
	50/1" N=50+					
		7	0			
		89	89			
		100	100			
		98	98			
		100	100			
		91	91			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: 05-20-2020 | Boring Completed: 05-20-2020
Drill Rig: Mobile B-47 | Driller: Earth Core, LLC
Project No.: E1185324

BORING LOG NO. BD-2; STA 118+12.50 / 40 FT RT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518503.47 Easting: 358504.22 Surface Elev.: 567.55 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
		SANDY LEAN CLAY (CL), trace limestone fragments, brown to tan, soft
		medium stiff
6.0	561.5	
		FAT CLAY WITH SAND (CH), some chert fragments, brown to tan, stiff
11.0	556.5	soft
		Auger refusal at 11' – begin rock coring
		LIMESTONE, light gray, hard, thin-bedded
29.0	538.5	

Boring Terminated at 29 Feet

Sample	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
SS	1-1-1 N=2					
SS	3-4-4 N=8					
SS	5-4-5 N=9					
SS	5-2-2 N=4			28	58-26-32	54
		96	96			
		100	98			
		90	76			
		100	94			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: 05-19-2020 | Boring Completed: 05-19-2020
Drill Rig: Mobile B-47 | Driller: Earth Core, LLC
Project No.: E1185324

BORING LOG NO. BD-3; STA 118+97.50 / 40 FT LT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518610.21 Easting: 358550.83 Surface Elev.: 565.06 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
		LEAN CLAY (CL), brown, very soft to soft
		trace limestone fragments
8.0	557	
		FAT CLAY (CH), some limestone fragments, brown, hard
11.0	554	Auger refusal at 11' – begin rock coring
		LIMESTONE, light gray, hard, thin-bedded
31.0	534	

Boring Terminated at 31 Feet

Sample	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
SS	WOH			30	37-21-16	97
SS	WOH			44		
SS	4-3-1 N=4					
SS	32-50/1" N=50+					
		100	100			
		100	100			
		100	95			
		96	96			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: 05-18-2020 | Boring Completed: 05-18-2020
Drill Rig: Mobile B-47 | Driller: Earth Core, LLC
Project No.: E1185324

LEGEND

- LEAN CLAY
- SANDY LEAN CLAY
- FAT CLAY
- MUD-FILLED VOID
- LIMESTONE
- SILT WITH SAND
- SANDY SILT WITH GRAVEL
- ELASTIC SILT
- CLAYEY SAND

BRIDGE SHEET NO. of	CITY OF HUNTSVILLE
Terracon	PROJECT NO. 71-19-SP08 OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK PHASE III-A LIMESTONE COUNTY
APPROVED: MATTHEW MCCULLOUGH, P.E.	
GEOTECHNICAL ENGINEER	PRELIMINARY PROJ. NO. 71-19-SP08
DATE: JUNE 11, 2020	TEST BORING RECORD SHEET 1 of 4

PROJECT NO.	FISCAL YEAR	SHEET NO.
71-19-SP08		

BORING LOG NO. BD-4; STA 118+97.50 / 40 FT RT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment, Huntsville, AL

CLIENT: Garver LLC, Huntsville, AL

Northing: 1518537.79 Easting: 358582.77 Surface Elev.: 564.91 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Field Test Results	Recovery %	RQD %
		ELASTIC SILT (MH), brown, very soft to medium stiff	WOH		
		becomes dark brown	WOH		
		becomes gray to brown, some limestone fragments	3-3-4 N=7		
			1-1-1 N=2		
13.0	552	Auger refusal at 13' – begin rock coring			
		LIMESTONE, light gray, hard, thin-bedded	50/0" N=50+	100	100
				90	86
				100	100
				88	86
		30' – 31': Unconfined Compressive Strength = 9,055 psi		100	100
33.0	532	Boring Terminated at 33 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS: *Water not observed during drilling*

Boring Started: 05-19-2020 | Boring Completed: 05-19-2020

Drill Rig: Mobile B-47 | Driller: Earth Core, LLC

Project No.: E1185324

BORING LOG NO. BD-5; STA 119+82.50 / 40 FT LT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment, Huntsville, AL

CLIENT: Garver LLC, Huntsville, AL

Northing: 1518643.6 Easting: 358628.77 Surface Elev.: 565.46 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		SILT WITH SAND (ML), brown, soft	1-1-1 N=2					
		trace roots, brown to dark brown	1-1-1 N=2			65	40-36-4	77
6.0	559.5	ELASTIC SILT (MH), trace roots/organics, trace limestone fragments, brown to dark brown, hard	1-3-29 N=32					
9.5	556	Auger refusal at 9.5' – begin rock coring	50/0" N-50+					
		LIMESTONE, light gray, hard, thin-bedded		100	83			
		15' – 16': Unconfined Compressive Strength = 14,213 psi		100	100			
				96	90			
				86	80			
				98	98			
30.5	535	Boring Terminated at 30.5 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger / NQ coring

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS: *Water observed at 4' during drilling*

Boring Started: | Boring Completed:

Drill Rig: Mobile B-47 | Driller: Earth Core, LLC

Project No.: E1185324

BORING LOG NO. BD-6; STA 119+82.50 / 40 FT RT of CL

Page 1 of 1

PROJECT: Old Highway 20 Realignment, Huntsville, AL

CLIENT: Garver LLC, Huntsville, AL

Northing: 1518571.21 Easting: 358660.68 Surface Elev.: 565.77 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.6	565	TOPSOIL (7")						
		LEAN CLAY WITH SAND (CL), trace roots, brown, soft to very soft	1-1-3 N=4			31	34-20-14	82
			1-1-1 N=2					
6.0	560	FAT CLAY (CH), with limestone fragments, brown, very stiff	6-9-15 N=24					
			8-15-2 N=17					
13.0	553	Auger refusal at 13' – begin rock coring						
		LIMESTONE, light gray, hard, thin-bedded		100	98			
				83	83			
23.0	543	MUD FILLED VOID						
				0	0			
28.0	538	LIMESTONE, light gray, hard, thin-bedded						
				86	80			
				100	88			
				100	100			
43.0	523	Boring Terminated at 43 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow stem auger / NQ coring

Abandonment Method: Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS: *Water not observed during drilling*

Boring Started: 05-14-2020 | Boring Completed: 05-14-2020

Drill Rig: Mobile B-47 | Driller: Earth Core, LLC

Project No.: E1185324

LEGEND

- LEAN CLAY
- SANDY LEAN CLAY
- FAT CLAY
- MUD-FILLED VOID
- LIMESTONE
- SILT WITH SAND
- SANDY SILT WITH GRAVEL
- ELASTIC SILT
- CLAYEY SAND

BRIDGE SHEET NO. of	CITY OF HUNTSVILLE
Terracon	PROJECT NO. 71-19-SP08 OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK PHASE III-A LIMESTONE COUNTY
APPROVED: MATTHEW MCCULLOUGH, P.E.	
GEOTECHNICAL ENGINEER	PRELIMINARY PROJ. NO. 71-19-SP08
DATE: JUNE 11, 2020	TEST BORING RECORD SHEET 2 of 4

PROJECT NO.	FISCAL YEAR	SHEET NO.
71-19-SP08		

BORING LOG NO. BD-7; STA 120+67.50 / 40 FT LT of CL

Page 1 of 2

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518678.84 Easting: 358706.6
Surface Elev.: 565.33 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Depth (Ft.)	Field Test Results	Recovery %	RQD %	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		LEAN CLAY (CL), trace roots, brown, soft		1-2-2 N=4					
			5	2-1-3 N=4					
6.0	559.5	SANDY LEAN CLAY (CL), brown, very stiff		7-4-21 N=25			23	30-15-15	57
		with limestone fragments	10	8-7-17 N=24					
13.0	552.5	CLAYEY SAND (SC), some limestone fragments, tan, loose	15	2-2-3 N=5					
18.0	547.5	SANDY LEAN CLAY (CL), with limestone fragments, tan, stiff	20	3-4-7 N=11					
			25	6-7-5 N=12					
28.0	537.5	SANDY LEAN CLAY (CL), with limestone fragments, brown, soft	30	3-1-1 N=2					
32.0	533.5	Auger refusal at 32' – begin rock coring							
		LIMESTONE, light gray, hard, thin-bedded	35		93	93			
			40		100	95			
			45		95	85			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: 05-15-2020 Boring Completed: 05-15-2020
Drill Rig: Mobile B-47 Driller: Earth Core, LLC
Project No.: E11185324

BORING LOG NO. BD-7; STA 120+67.50 / 40 FT LT of CL

Page 2 of 2

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518678.84 Easting: 358706.6
Surface Elev.: 565.33 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Depth (Ft.)	Recovery %	RQD %
		LIMESTONE, light gray, hard, thin-bedded (continued)	50	97	95
52.0	513.5	Boring Terminated at 52 Feet			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: 05-15-2020 Boring Completed: 05-15-2020
Drill Rig: Mobile B-47 Driller: Earth Core, LLC
Project No.: E11185324

LEGEND

- LEAN CLAY
- SANDY LEAN CLAY
- FAT CLAY
- MUD-FILLED VOID
- LIMESTONE
- SILT WITH SAND
- SANDY SILT WITH GRAVEL
- ELASTIC SILT
- CLAYEY SAND

BRIDGE SHEET NO. of	CITY OF HUNTSVILLE
Terracon APPROVED: MATTHEW MCCULLOUGH, P.E.	PROJECT NO. 71-19-SP08 OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK PHASE III-A LIMESTONE COUNTY
GEOTECHNICAL ENGINEER	PRELIMINARY PROJ. NO. 71-19-SP08
DATE: JUNE 11, 2020	TEST BORING RECORD SHEET 3 of 4

PROJECT NO.	FISCAL YEAR	SHEET NO.
71-19-SP08		

BORING LOG NO. BD-8; STA 120+67.50 / 40 FT RT of CL

Page 1 of 2

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518604.78 Easting: 358738.69
Surface Elev.: 565.20 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Field Test Results	Recovery %	RQD %
		ELASTIC SILT (MH), trace roots/organics, brown, very soft to medium stiff	1-1-1 N=2		
			3-4-4 N=8		
6.0	559	ELASTIC SILT (MH), trace limestone fragments, brown, stiff to very stiff	2-8-19 N=27		
			8-9-2 N=11		
13.0	552	ELASTIC SILT (MH), some limestone fragments, brown, soft to medium stiff	2-2-2 N=4		
			2-2-3 N=5		
25.0	540	Auger refusal at 25' – begin rock coring	50/0" N=50+		
26.0	539	LIMESTONE, light gray, hard, thin-bedded		11	0
		MUD FILLED VOID		0	0
33.0	532	LIMESTONE, light gray, hard, thin-bedded		35	35
		41' – 42': Unconfined Compressive Strength = 13,262 psi		99	99

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow stem auger / NQ coring

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: Boring Completed:
Drill Rig: Mobile B-47 Driller: Earth Core, LLC
Project No.: E1185324

BORING LOG NO. BD-8; STA 120+67.50 / 40 FT RT of CL

Page 2 of 2

PROJECT: Old Highway 20 Realignment
Huntsville, AL

CLIENT: Garver LLC
Huntsville, AL

Northing: 1518604.78 Easting: 358738.69
Surface Elev.: 565.20 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Recovery %	RQD %
		LIMESTONE, light gray, hard, thin-bedded (continued)	100	98
			87	74
			100	100
58.0	507	Boring Terminated at 58 Feet		

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow stem auger / NQ coring

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

Notes:

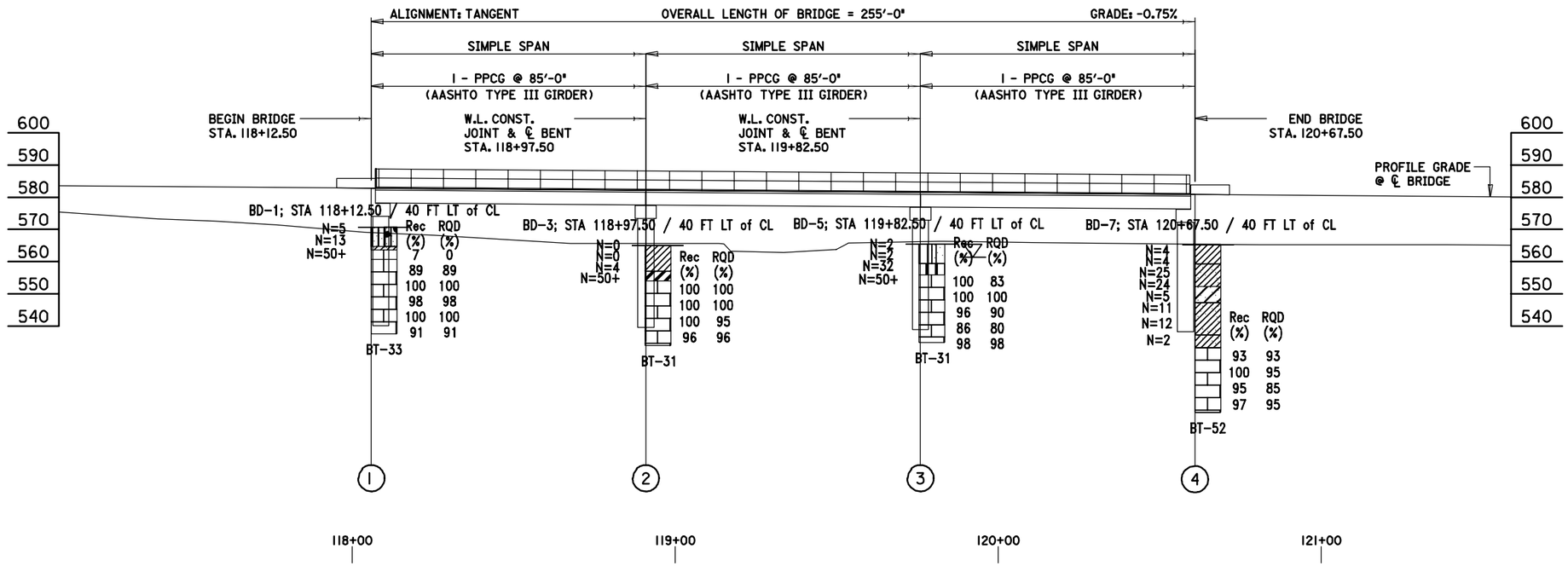
WATER LEVEL OBSERVATIONS
Water not observed during drilling

Boring Started: Boring Completed:
Drill Rig: Mobile B-47 Driller: Earth Core, LLC
Project No.: E1185324

LEGEND

- LEAN CLAY
- SANDY LEAN CLAY
- FAT CLAY
- MUD-FILLED VOID
- LIMESTONE
- SILT WITH SAND
- SANDY SILT WITH GRAVEL
- ELASTIC SILT
- CLAYEY SAND

BRIDGE SHEET NO. of	CITY OF HUNTSVILLE
Terracon APPROVED: MATTHEW MCCULLOUGH, P.E.	PROJECT NO. 71-19-SP08 OLD HIGHWAY 20 BRIDGE OVER BEAVERDAM CREEK PHASE III-A LIMESTONE COUNTY
GEOTECHNICAL ENGINEER	PRELIMINARY PROJ. NO. 71-19-SP08
DATE: JUNE 11, 2020	TEST BORING RECORD SHEET 4 of 4



Explanation

BD-2; STA 118+12.50 / 40 FT RT of CL — Borehole Number

SPT N-Value — N=4 — Borehole Lithology

AR - Auger Refusal
BT - Boring Termination

Water Level Reading at time of drilling.

Topsoil | Sandy Silt with Gravel | Sandy Lean Clay | Fat Clay | Elastic Silt | Clayey Sand

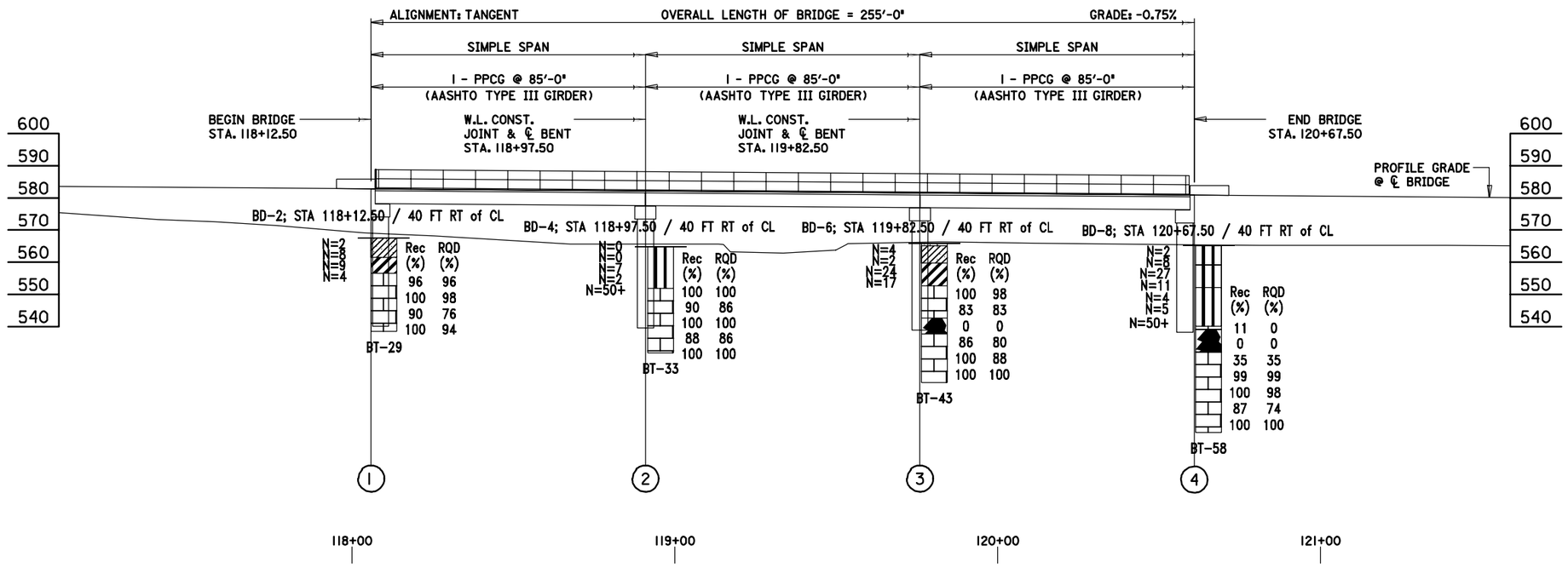
Silt with Sand | Lean Clay with Sand | Mud-Filled Void | Limestone

Project Manager:	Project No.: E1185324
Drawn by: MSM	Scale: 1"=40'
Approved by: JAS	
Date: 6/16/2020	

Terracon
2147 Riverchase Office Rd
Hoover, AL
PH. 205-942-1289 FAX. 205-443-5302

BORING LOG PROFILE - LEFT OF CENTERLINE

OLD HIGHWAY 20 BRIDGE
OVER BEAVERDAM CREEK
LIMESTONE COUNTY



Explanation

BD-2; STA 118+12.50 / 40 FT RT of CL — Borehole Number

SPT N-Value — N=4 — Borehole Lithology

AR - Auger Refusal
BT - Boring Termination

Water Level Reading at time of drilling.

Topsoil
Sandy Silt with Gravel
Sandy Lean Clay
Fat Clay
Elastic Silt
Clayey Sand
Silt with Sand
Lean Clay with Sand
Mud-Filled Void
Limestone

Project Manager:	Project No.: E1185324
Drawn by: MSM	Scale: 1"=40'
Approved by: JAS	
Date: 6/16/2020	

Terracon
2147 Riverchase Office Rd
Hoover, AL
PH. 205-942-1289 FAX. 205-443-5302

BORING LOG PROFILE - RIGHT OF CENTERLINE

OLD HIGHWAY 20 BRIDGE
OVER BEAVERDAM CREEK
LIMESTONE COUNTY

APPENDIX D

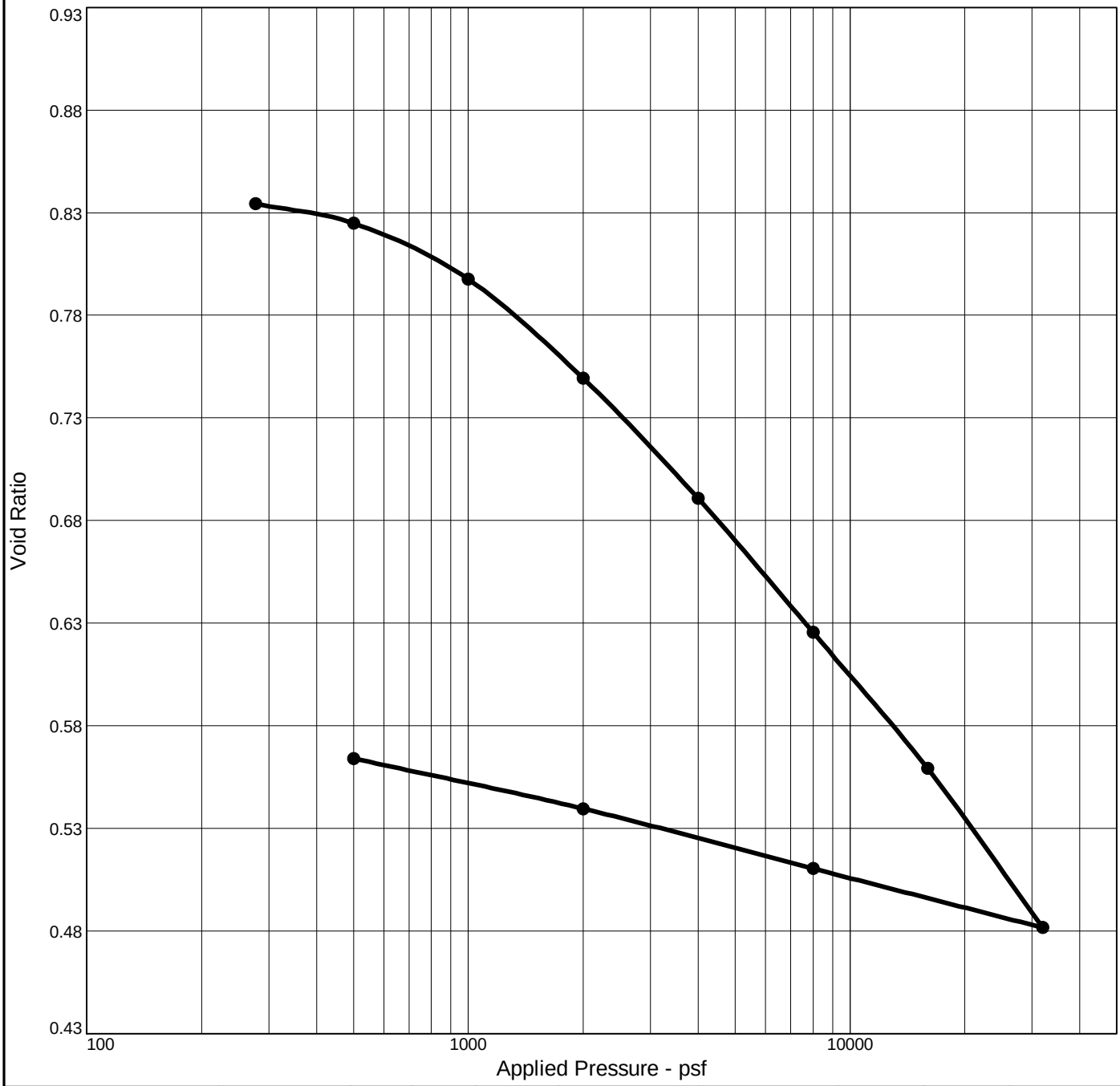
LABORATORY TESTING

Station & Offset	Boring No.	Sample ID	Depth (ft)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Pass 200	D50 (mm)	USCS	AASHTO Classification
118+12.50 / 40' LT of CL	BD-1	BD-1-2	3.5 – 5.0	26	45	32	13	19.9	28.7	51.4	---	ML	A-7-5 (5)
118+12.50 / 40' RT of CL	BD-2	BD-2-4	8.5 – 10.0	28	58	26	32	30.3	15.5	54.2	---	CH	A-7-6 (14)
118+97.50 / 40' LT of CL	BD-3	BD-3-1	1.0 – 2.5	30	37	21	16	0.0	2.7	97.3	0.0022	CL	A-6 (16)
119+82.50 / 40' LT of CL	BD-5	BD-5-2	3.5 – 5.0	65	40	36	4	0.3	22.8	77.0	---	ML	A-4 (5)
119+82.50 / 40' RT of CL	BD-6	BD-6-1	1.0 – 2.5	31	34	20	14	0.0	18.2	81.8	---	CL	A-6 (11)
120+67.50 / 40' LT of CL	BD-7	BD-7-3	6.0 – 7.5	23	30	15	15	18.8	24.1	57.1	--	CL	A-6 (5)

SOIL CLASSIFICATION SUMMARY

City of Huntsville Project No. 71-19-SP-08
Old Highway 20
Bridge Over Beaverdam Creek
Phase III-A
Limestone County

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
83.6 %	25.8 %	91.9	X	X	2.7	459.5	1465	0.22	0.05	0.835

MATERIAL DESCRIPTION	USCS	AASHTO
Gray Clay	X	X

Project No. E1185324 **Client:** Garver LLC

Project: Old Highway 20 Replacement

Source of Sample: BD-8 **Depth:** 3.0-5.0 ft **Sample Number:** N/A

Terracon Consultants, Inc.

Chattanooga, TN

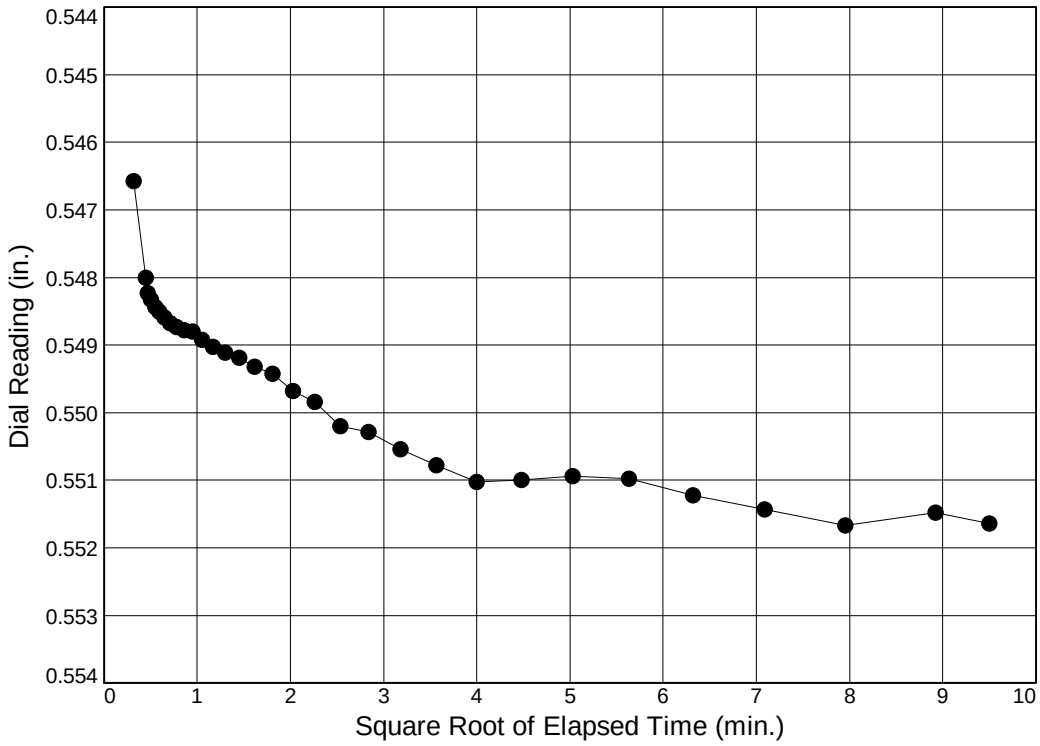
Remarks:

Swell pressure of 276.50 psf.

Dial Reading vs. Time

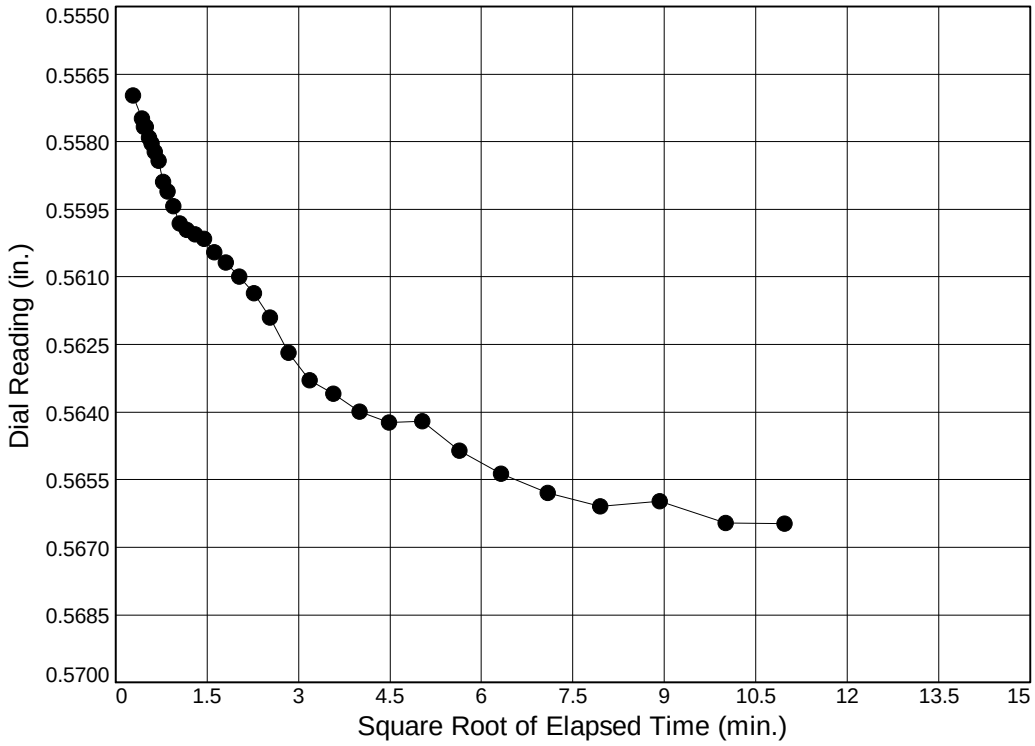
Project No.: E1185324
Project: Old Highway 20 Replacement

Source of Sample: BD-8 Depth: 3.0-5.0 ft Sample Number: N/A



Load No.= 2
Load= 500 psf
D_0 = 0.5434
D_{90} = 0.5485
D_{100} = 0.5490
T_{90} = 0.33 min.

C_v @ T_{90}
6.325 ft.^{2}/day



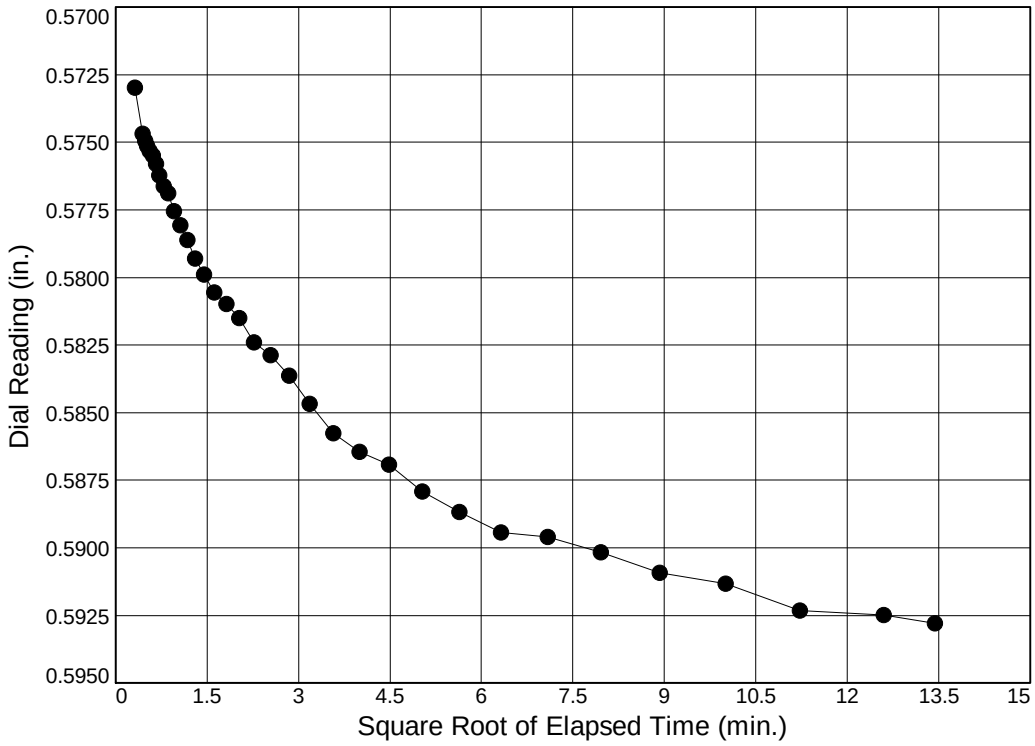
Load No.= 3
Load= 1000 psf
D_0 = 0.5559
D_{90} = 0.5600
D_{100} = 0.5605
T_{90} = 1.64 min.

C_v @ T_{90}
1.263 ft.^{2}/day

Dial Reading vs. Time

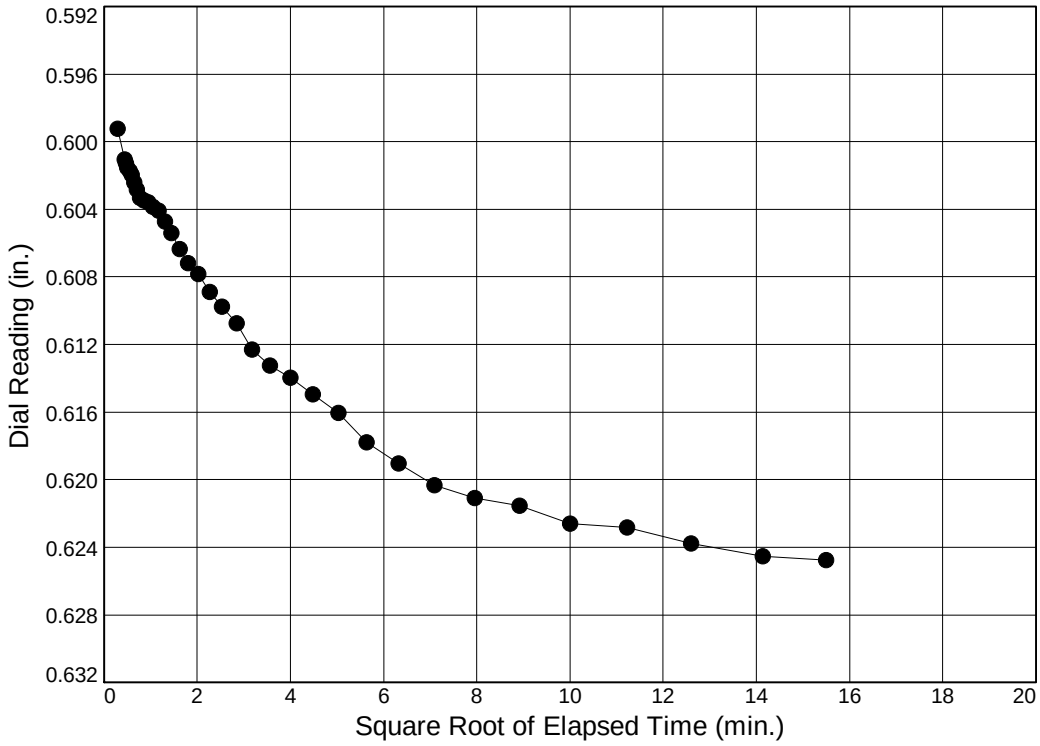
Project No.: E1185324
Project: Old Highway 20 Replacement

Source of Sample: BD-8 Depth: 3.0-5.0 ft Sample Number: N/A



Load No.= 4
Load= 2000 psf
D_0 = 0.5722
D_{90} = 0.5808
D_{100} = 0.5818
T_{90} = 3.10 min.

C_v @ T_{90}
0.640 ft.^{2}/day



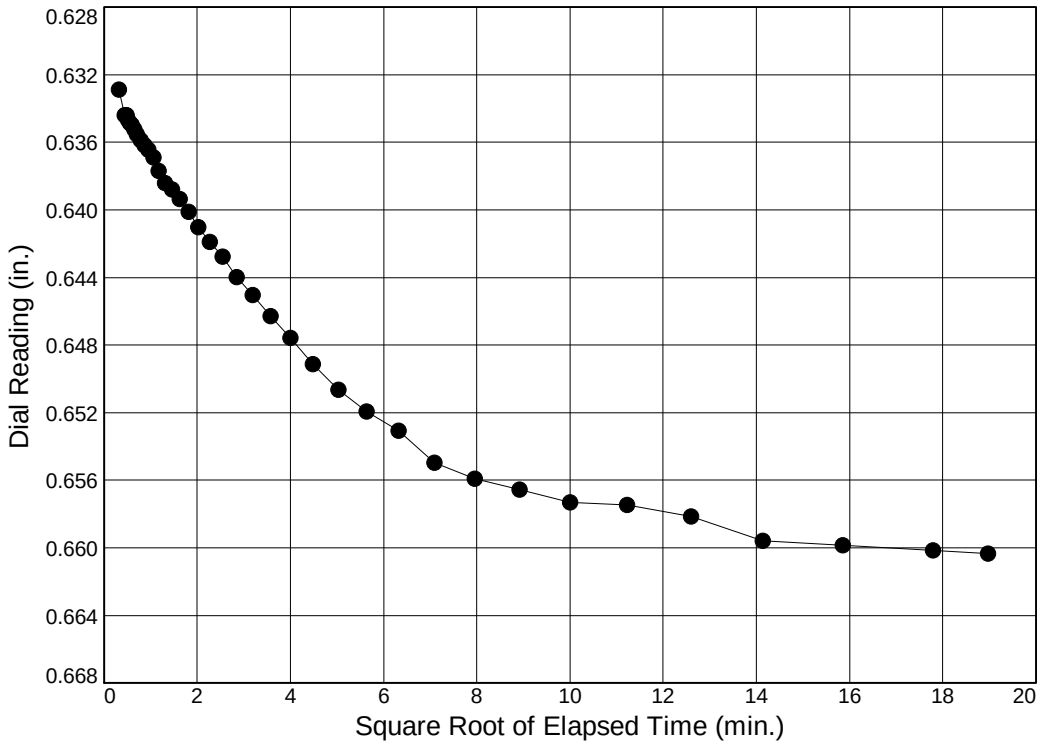
Load No.= 5
Load= 4000 psf
D_0 = 0.5978
D_{90} = 0.6036
D_{100} = 0.6043
T_{90} = 0.93 min.

C_v @ T_{90}
2.012 ft.^{2}/day

Dial Reading vs. Time

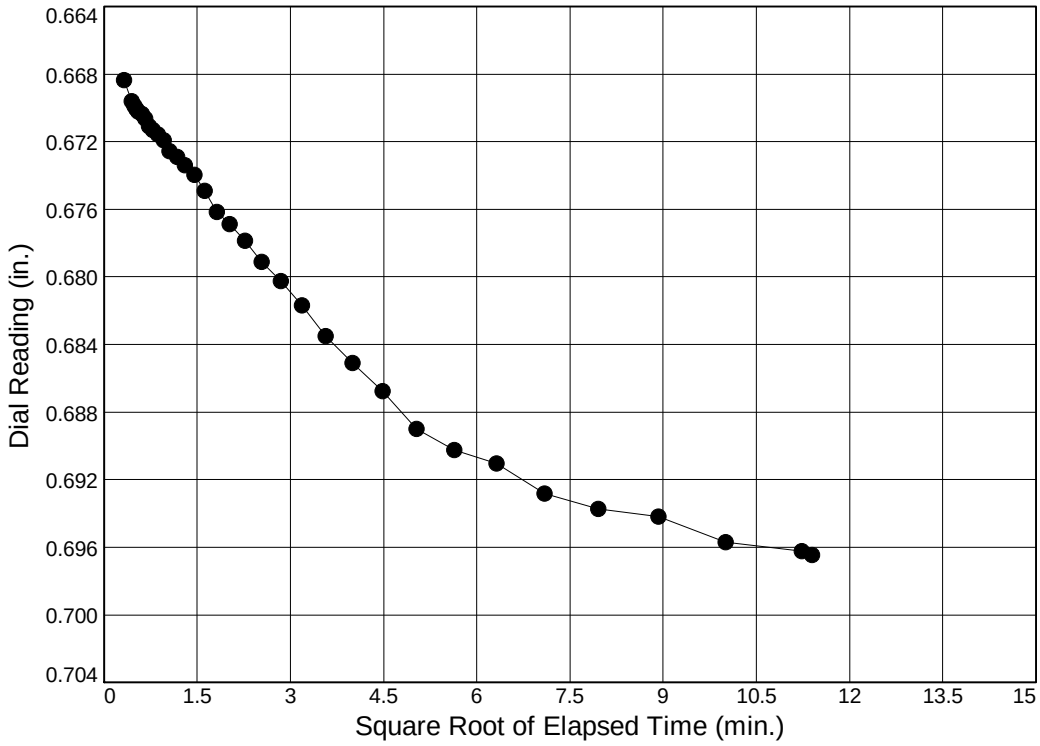
Project No.: E1185324
Project: Old Highway 20 Replacement

Source of Sample: BD-8 Depth: 3.0-5.0 ft Sample Number: N/A



Load No.= 6
Load= 8000 psf
D_0 = 0.6326
D_{90} = 0.6489
D_{100} = 0.6507
T_{90} = 19.46 min.

C_v @ T_{90}
0.089 ft.^{2}/day



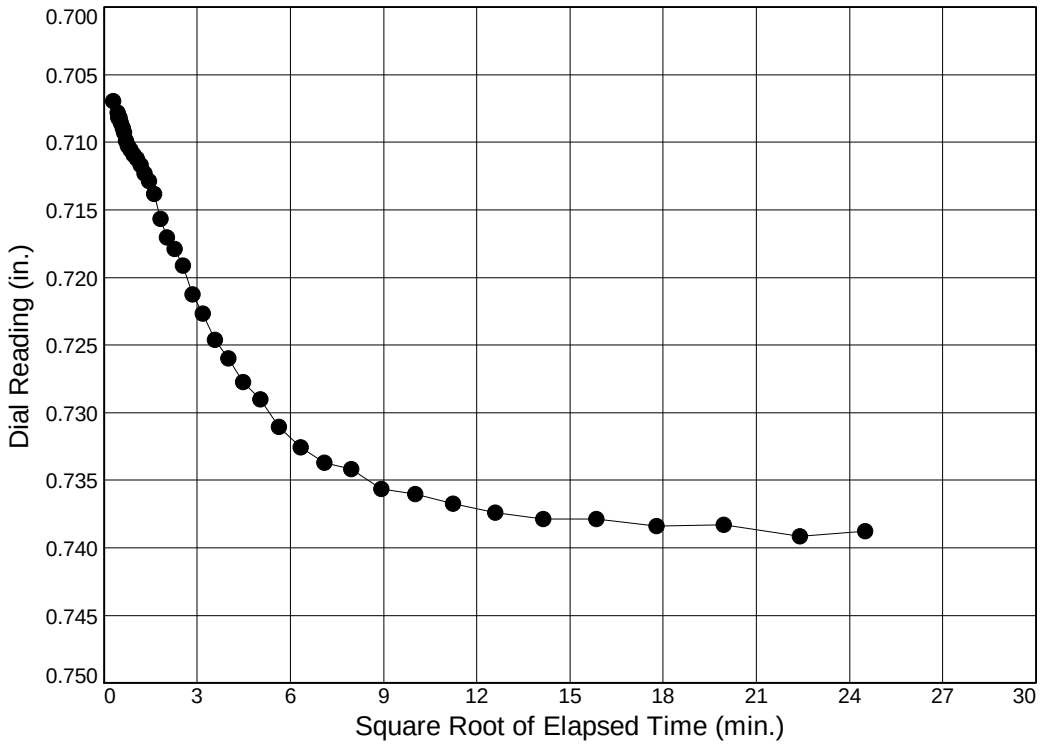
Load No.= 7
Load= 16000 psf
D_0 = 0.6678
D_{90} = 0.6908
D_{100} = 0.6933
T_{90} = 37.43 min.

C_v @ T_{90}
0.043 ft.^{2}/day

Dial Reading vs. Time

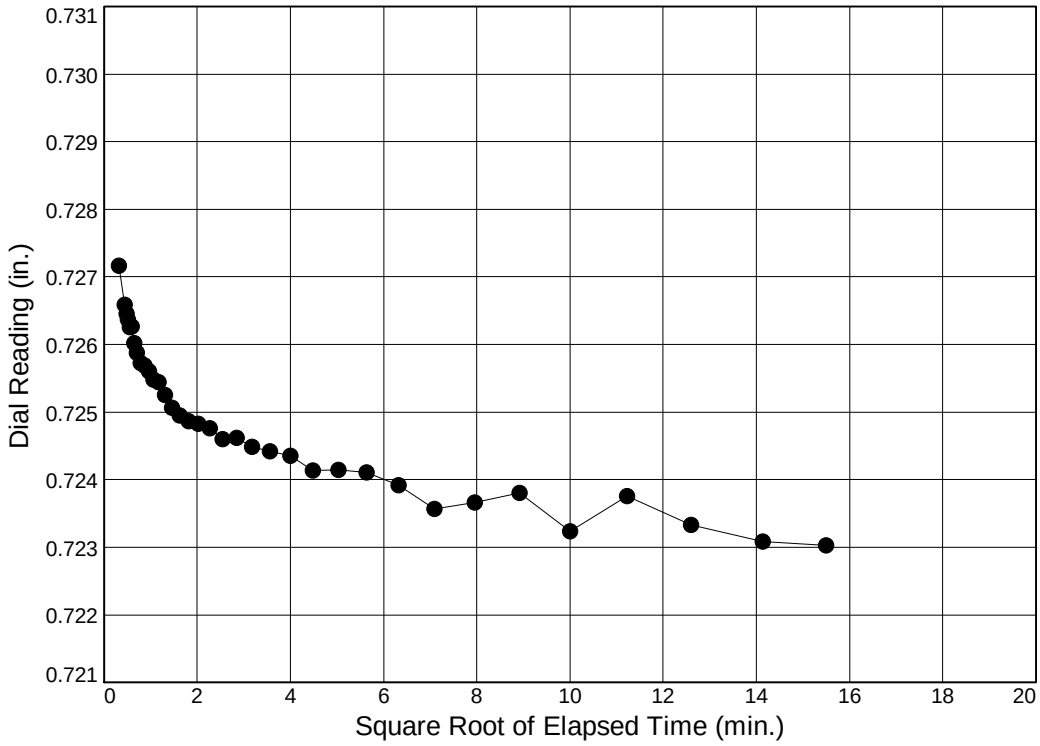
Project No.: E1185324
Project: Old Highway 20 Replacement

Source of Sample: BD-8 Depth: 3.0-5.0 ft Sample Number: N/A



Load No.= 8
Load= 32000 psf
D_0 = 0.7059
D_{90} = 0.7311
D_{100} = 0.7339
T_{90} = 31.80 min.

C_v @ T_{90}
0.046 ft.^{2}/day



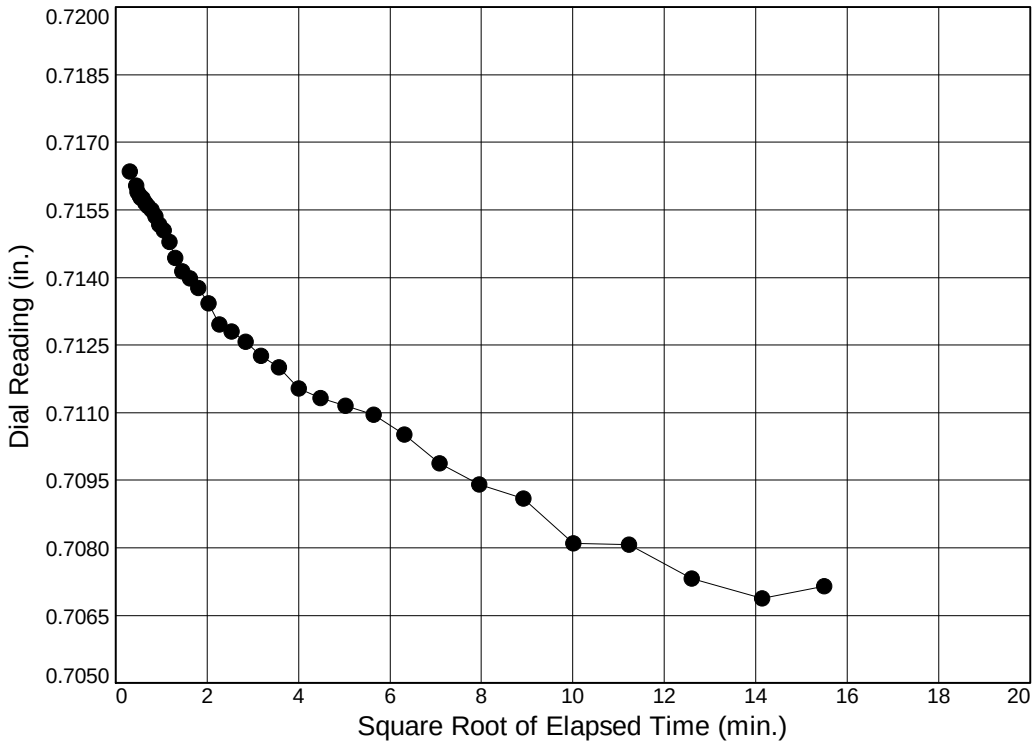
Load No.= 9
Load= 8000 psf
D_0 = 0.7280
D_{90} = 0.7257
D_{100} = 0.7254
T_{90} = 0.80 min.

C_v @ T_{90}
1.758 ft.^{2}/day

Dial Reading vs. Time

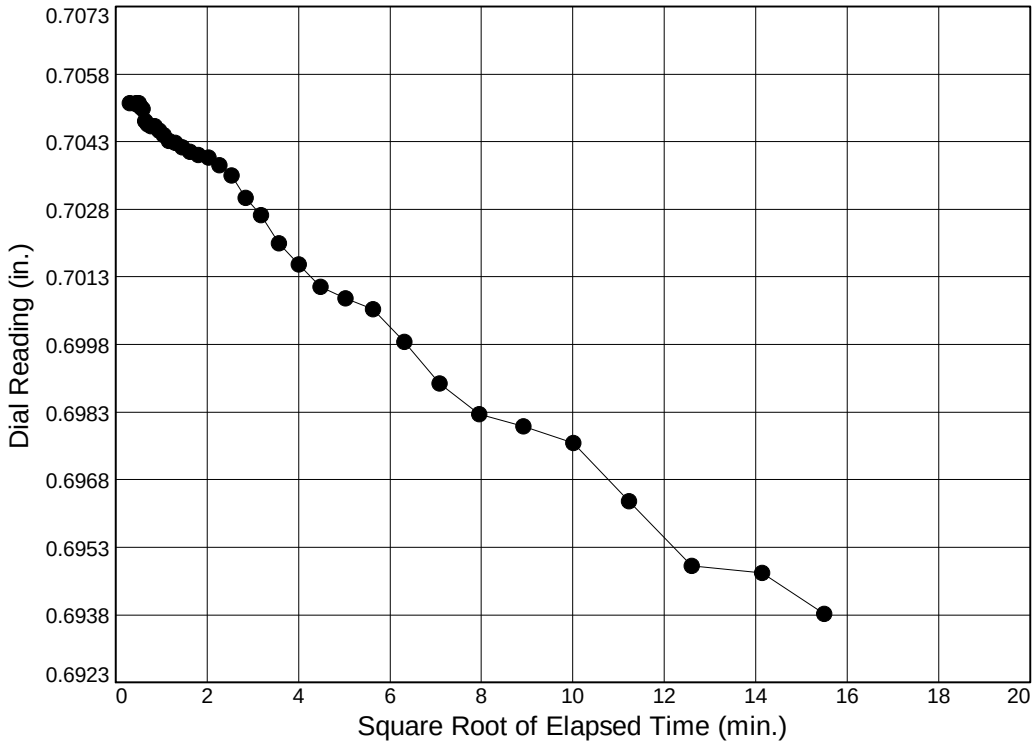
Project No.: E1185324
Project: Old Highway 20 Replacement

Source of Sample: BD-8 Depth: 3.0-5.0 ft Sample Number: N/A



Load No.= 10
Load= 2000 psf
D_0 = 0.7168
D_{90} = 0.7125
D_{100} = 0.7121
T_{90} = 8.27 min.

C_v @ T_{90}
0.177 ft.^{2}/day



Load No.= 11
Load= 500 psf
D_0 = 0.7055
D_{90} = 0.6947
D_{100} = 0.6935
T_{90} = 198.90 min.

C_v @ T_{90}
0.008 ft.^{2}/day

Waypoint ANALYTICAL

2790 Whitten Road, Memphis, TN 38133
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13793
Terracon
Mr. Matt McCullough
2147 Riverchase Office Road
Birmingham , AL 35244

Project Information : Old Hwy. 20 Over Beaverdam Creek
Huntsville, AL
Project # E1185324

Report Date : 06/03/2020
Received : 05/23/2020

Danyale Love
Project Manager

Report Number : **20-144-0025**

REPORT OF ANALYSIS

Lab No : **86281**
Sample ID : **BD-1**

Matrix: **Solids**
Sampled: **5/21/2020 5:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Chloride	<4.00	mg/Kg	4.00	1	05/28/20 02:34	CCR	9056A
pH	**4.9**	s.u.		1	06/03/20 06:53	JSL	9045D
Resistivity (soil)	**15400**	ohm-cm		1	06/02/20 11:30	PMP	ASTM-G57-95 ~
Sulfate	**178**	mg/Kg	10.0	1	05/28/20 02:34	CCR	9056A
Salinity (EC)	**0.065**	dS/m	0.100	1	06/02/20 14:30	AEH	Saturate Paste

Qualifiers/ Definitions

DF Dilution Factor
MQL Method Quantitation Limit
L Limit Exceeded

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2147 Riverchase Office Road
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Danyale Love
Project Manager

Report Number : **20-144-0025**

REPORT OF ANALYSIS

Lab No : **86282**
Sample ID : **BD-8**

Matrix: **Solids**
Sampled: **5/21/2020 5:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Chloride	<4.00	mg/Kg	4.00	1	05/28/20 02:46	CCR	9056A
pH	**6.0**	s.u.		1	06/03/20 06:53	JSL	9045D
Resistivity (soil)	**5490**	ohm-cm		1	06/02/20 11:30	PMP	ASTM-G57-95 ~
Sulfate	<10.0	mg/Kg	10.0	1	05/28/20 02:46	CCR	9056A
Salinity (EC)	**0.182**	dS/m	0.100	1	06/02/20 14:30	AEH	Saturate Paste

Qualifiers/ Definitions

DF Dilution Factor
MQL Method Quantitation Limit
L Limit Exceeded

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Terracon
Mr. Matt McCullough
2147 Riverchase Office Road
Birmingham , AL 35244

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Received : 05/23/2020

Danyale Love
Project Manager

Report Number : **20-144-0025**

REPORT OF ANALYSIS

Lab No : **86283**
Sample ID : **W-1**

Matrix: **Aqueous**
Sampled: **5/21/2020 5:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Chloride	**3.64**	mg/L	0.400	1	05/26/20 15:38	CCR	EPA-300.0
pH	**7.0**	s.u.		1	06/02/20 17:15	CMQ	4500H+B-2011
Resistivity	**7030**	ohms/cm	NA	1	05/29/20 09:49	IEW	2510B-2011
Sulfate	**1.84**	mg/L	1.00	1	05/26/20 15:38	CCR	EPA-300.0

Qualifiers/ Definitions

DF Dilution Factor
MQL Method Quantitation Limit
L Limit Exceeded