BRIDGE FOUNDATION INVESTIGATION REPORT
SR 316 Over Colonial Pipeline

GDOT Project No. MSL00-0004-00(086); PI No. 0004086
Gwinnett County, Georgia

WILLMER ENGINEERING INC.
Project No. 71.3852

Prepared for

Atkins North America, Inc.
Atlanta, Georgia

Prepared By

WILLMER ENGINEERING INC.
3772 Pleasantdale Road
Suite 165
Atlanta, Georgia 30340-4270

770.939.0089

WILLMER ENGINEERING INC. | WE

October 24, 2012

VIA EMAIL / HAND DELIVERY

Michael R. Moseley Jr., PE
Project Manager
Transportation Design
Atkins North America, Inc.
1600 RiverEdge Parkway, NW Suite 600
Atlanta, GA 30328-4612

SUBJECT: **Bridge Foundation Investigation Report**
SR 316 Over Colonial Pipeline
GDOT Project No. MSL00-0004-00(086); PI No. 0004086
Gwinnett County, Georgia
Willmer Project No. 71.3852

Dear Mr. Moseley:

Willmer Engineering Inc. (Willmer) is pleased to provide this Bridge Foundation Investigation (BFI) report for the proposed bridge replacement of SR 316 over Colonial Pipeline in Gwinnett County, Georgia. The BFI was performed in general accordance with our Subcontract for Professional Services dated September 17, 2012 and Georgia Department of Transportation (GDOT) guidance documents for bridge foundation investigation.

The attached summary presents the site and subsurface conditions along the proposed bridge alignment and our geotechnical recommendations related to bridge foundation design and construction.

We appreciate the opportunity to be of service to you on this project and look forward to a continuing relationship. Please contact us if you have any questions concerning this report or require further assistance.

Sincerely,

WILLMER ENGINEERING INC.

Bradford Drew, EIT
Staff Geotechnical Engineer

Thomas E. Scruggs, PE
Principal Engineer

James L. Willmer, PE
Executive Vice President/Principal Consultant

The original of this document was signed and sealed by James L. Willmer, PE, Registration No. 10780 on October 24, 2012.
THIS REPRODUCTION IS NOT A CERTIFIED DOCUMENT

BD/TES/JLW:bw
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Attachments: **Bridge Foundation Investigation**

Figures

Figure 1 – Project Location Map
Figure 2 – Boring Location Plan (Sheets 1 and 2)
Figure 3A – Generalized Subsurface Profile A-A
Figure 3B – Generalized Subsurface Profile B-B
Figure 3C – Generalized Subsurface Profile C-C
Figure 3D – Generalized Subsurface Profile D-D

Appendix I

Boring Record Legend
Unified Soil Classification System Reference Sheet
Boring Records

Appendix II

Table AII-1 – Summary of Laboratory Test Results

Appendix III

General Site Photographs

BRIDGE FOUNDATION INVESTIGATION	
Willmer Project No.	71.3852
GDOT Project No.	MSL00-0004-00(086)
PI No.	0004086
Location	SR 316 Over Colonial Pipeline Gwinnett County, Georgia

GENERAL INFORMATION	
Project Description	This project involves replacement of the two SR 316 bridges over the Colonial Pipeline easement in Gwinnett County, Georgia. The eastbound and westbound bridges will have single-spans (i.e., two bents) and have lengths of approximately 114 and 184.5 feet, respectively. The bridges will be located about 2000 feet west of the Collins Hill Road intersection.
Geologic Information	The project is geologically sited within the Piedmont physiographic province of Georgia and is underlain by the Mica Schist / Amphibolite Formation.
Subsurface Features	**Eastbound:** The subsurface profile is comprised of fill soil underlain by alluvial and residual soil, partially weathered rock (PWR), and auger refusal material. Fill soil consisting mostly of loose to medium dense silty/clayey sand (SM/SC) was encountered in boring B-4 and soft to stiff sandy elastic silt (MH) was encountered in borings B-5, B-6, and B-7. Alluvial soil consisting of firm to stiff sandy silt (MH) was encountered in borings B-4 and B-6. Residual soil consisting of very loose to very dense silty sand (SM), PWR, and auger refusal material were encountered at all eastbound bridge borings (B-4 through B-7). PWR was encountered at elevations ranging between 992 and 1005 feet and the thickness ranged from 0.5 to 4.5 feet. Auger refusal was encountered at elevations ranging between 990 and 1004.5 feet. Groundwater was encountered in borings B-6 and B-7 at elevations 1005.5 and 1007 feet at the time of boring completion, respectively. Groundwater was encountered in borings B-4 and B-5 at elevations 1003 and 1005.5 at 24 hours after boring completion.

Subsurface Features (cont'd)	**Westbound:** The subsurface profile is comprised of fill soil underlain by alluvial and residual soil, partially weathered rock (PWR), and auger refusal material. Fill soil consisting mostly of loose to medium dense silty sand (SM) was encountered in all westbound bridge borings (B-1, B-2, B-3, and B-5) and stiff sandy elastic silt (MH) was encountered in boring B-5. Alluvial soil consisting of firm sandy silt (MH) was encountered in boring B-3. Residual soil consisting of medium dense silty sand (SM) was encountered in borings B-2, B-3, and B-5 and stiff sandy silt (MH) was encountered in boring B-1. PWR was encountered in borings B-2, B-3, and B-5 at elevations ranging between 997.5 and 1010 feet and the thickness ranged from 1 to 5.5 feet. Auger refusal was encountered at elevations ranging between 993.5 and 1004.5 feet. Groundwater was encountered in borings B-3 and B-5 at elevations 999 and 1005.5 feet at 24 hours after boring completion.

PWR AND AUGER REFUSAL ELEVATIONS

Location	Bent	Reference Boring No.	Elevations (feet)	
			Top of PWR	Auger Refusal
WB	1 LT	B-1	--	999
	1 RT	B-3	997	996
	2 LT	B-2	1010	1005
	2 RT	B-5	998	993
EB	1 LT	B-4	999	998
	1 RT	B-6	1005	1004
	2 LT	B-5	998	993
	2 RT	B-7	992	990

MAXIMUM PILE DESIGN LOADS

Pile Type	Load Transfer (%)		Design Load (50 ksi loading)
	Friction	End Bearing	
H-Piles	10	90	HP 10x42 = 77 Tons
			HP 12x53 = 97 Tons
			HP 14x73 = 134 Tons
			HP 14x89 = 164 Tons
			HP 14x102 = 187 Tons
			HP 14x117 = 215 Tons

FOUNDATION RECOMMENDATIONS					
Location	**Bent**	**Drilled Shaft** (Bearing Pressure)	**Spread Footing** (Bearing Pressure)	**Pile Footing** (Type)	**Pile Bent** (Type)
WB	1				H
	2				H
EB	1				H
	2				H

PILE TIP ELEVATIONS (feet)						
Location	**Bent**	**Reference Boring No.**	**Bottom of Drilled Shaft**	**Bottom of Spread Footing**	**H-Pile Tip Elevations**	
					Minimum Tip	**Estimated Tip**
WB	1 LT	B-1			985*	985
	1 RT	B-3			996*	996
	2 LT	B-2			1007*	1007
	2 RT	B-5			998	995
EB	1 LT	B-4			999	998
	1 RT	B-6			1005	1004
	2 LT	B-5			998	995
	2 RT	B-7			992	990

*The minimum tip elevations at Bent 1, westbound bridge, reflect an embedment of five feet below the proposed bottom of wall elevations at this bent. Pilot holes will be required to achieve these elevations. If hard rock is verified in the field near elevation 997-999 above the bottom of the wall elevation as indicated by our borings B-1 and B-3, the bottom of the wall may be raised to the top of rock and the minimum tip elevations raised to provide the 5-foot embedment below the bottom of the wall.

The minimum tip elevation at Bent 2 Left, westbound bridge, reflects an embedment of five feet below the proposed bottom of wall elevation at this location. Pile points will be required to achieve this elevation.

GENERAL NOTES	
Elevations	All elevations referenced in this report are based on a benchmark designated as BM-218 (Station 1250+19.73, 9.43 feet right, elevation 1029.45 feet).
As-Built Information	As-built information should be forwarded to the Geotechnical Engineering Bureau upon completion of the foundation system.

NOTES: PILE BENTS/FOOTINGS	
PDO	Driving resistance after Minimum Tip Elevations are achieved.
Waiting Period	No waiting period is required.
Pilot Holes	Pilot holes should be set up for Bent 1, westbound bridge to a depth of five feet below the bottom of wall elevation. The holes should be filled with concrete to the top of rock after the piles are driven in accordance with Special Provision Section 520.
Pile Points	We recommend that pile points be set up for the piles at Bent 2 Left, westbound bridge, to ensure adequate penetration into very dense partially weathered rock.
Down-Drag Protection	To avoid inducing down-drag loads onto the piles from potential settlement of loose soil layers during construction of the MSE walls, we recommend that piles at Bent 2, westbound bridge, and Bents 1 and 2, eastbound bridge, be protected from down-drag by using jackets or other approved measures.
Special Problems	Erratic pile lengths can be expected.
Prepared By	Bradford Drew, EIT / Thomas Scruggs, PE
Senior Review By	James L. Willmer, PE

Revised: January 24, 2008

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT NO. MSL000-0004-00 (086), Gwinnett County
P.I. NO. 0004086

SECTION 520—PILING

Delete Sub-Section 520.3.05.B and substitute the following:

520.3.05.B. Drill Pilot Holes

When pilot holes are required, drill them to the diameter and approximate depth specified on the Plans.

Backfill voids and holes with Class A or better concrete. Furnishing and placing backfill concrete is an incidental part of the work.

The following are not considered pilot holes:

- Holes created by spudding (punching)
- Holes dug to drive piling that is too long to fit leads
- Holes dug to replace a template (if permitted)

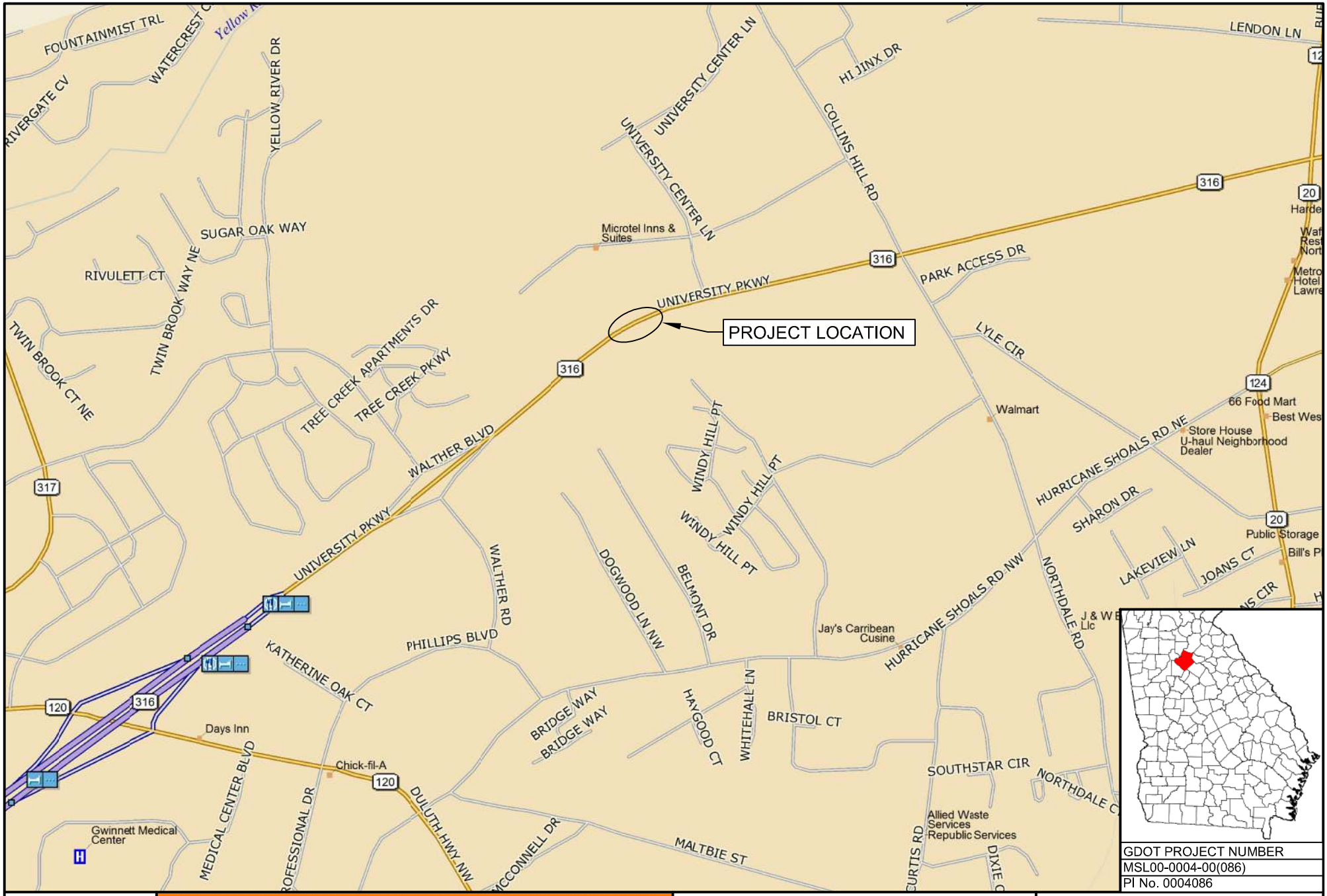
Where pilot holes are required in granular material and the material cannot be sealed off using "mudding" drilling methods, drill the pilot hole as follows:

1. Place a casing pipe with a large enough diameter around the boring device.
2. Hold the casing in position until the pilot hole is completed and the pile driving progresses deep enough into the hard material to keep loose material out of the pilot hole.

The use of casing is incidental to the work.

Office of Materials and Research

FIGURES



GDOT PROJECT NUMBER	
MSL00-0004-00(086)	
PI No. 0004086	

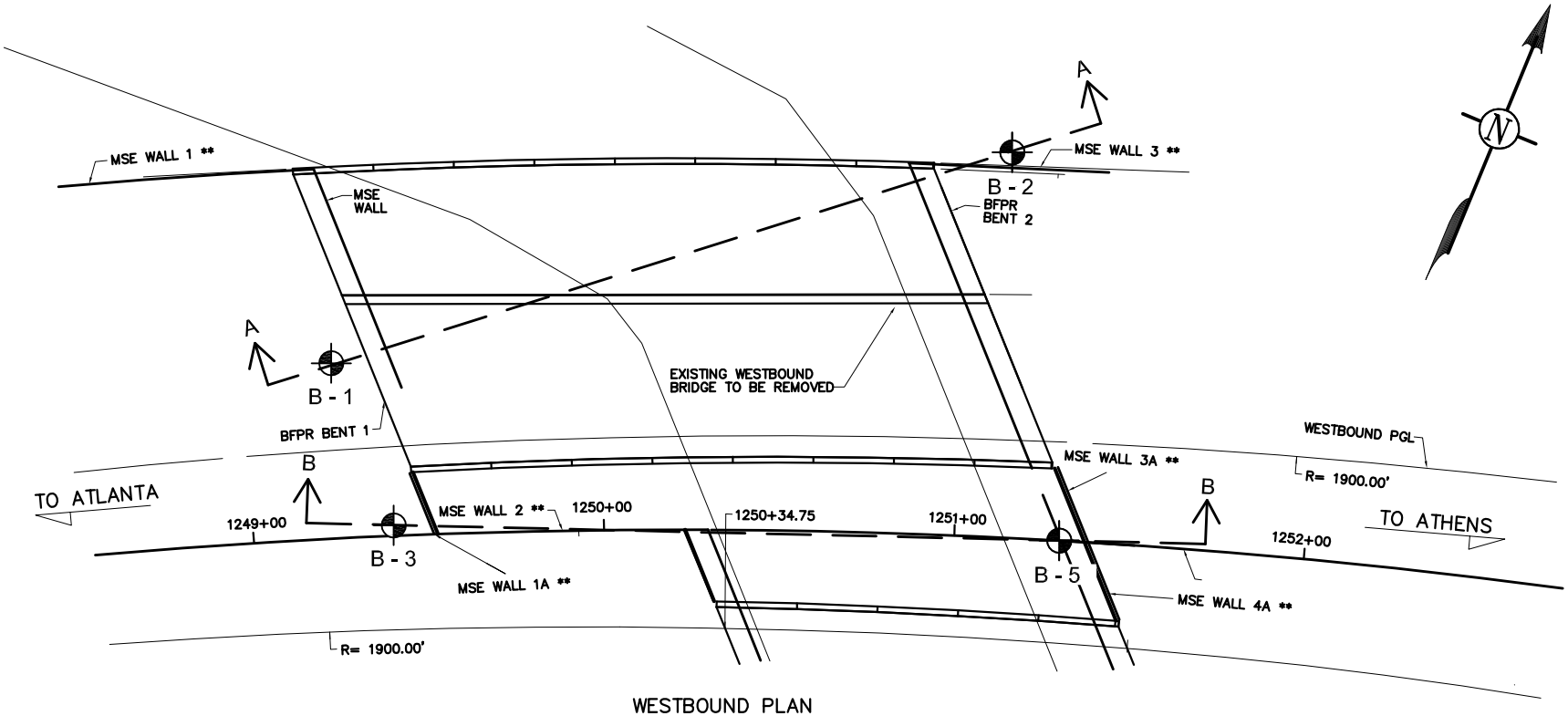
SCALE: 1" = 1000'	
DATE: 10/12/2012	
DRAWN BY: ZMH	
REVIEWED BY: BD	

WILLMER ENGINEERING INC.

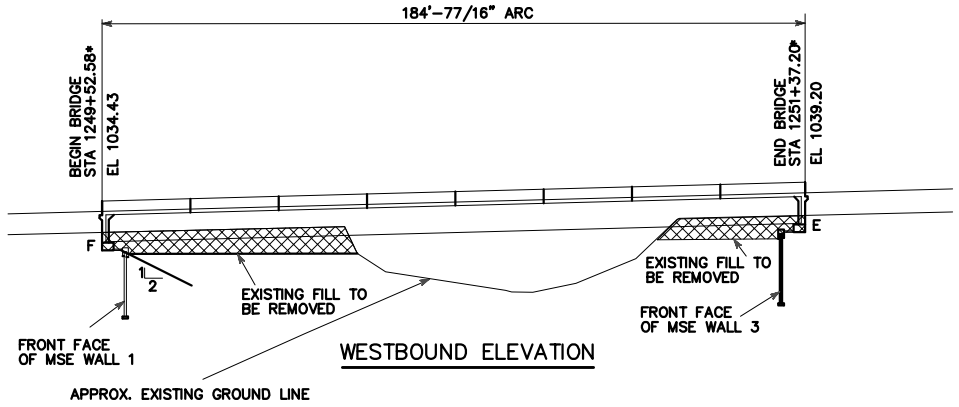
GEOTECHNICAL ENGINEERING ▫ CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 1
PROJECT LOCATION MAP
BRIDGE FOUNDATION INVESTIGATION
SR 316 OVER COLONIAL PIPELINE
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No.71.3852

P:\3852 SR 316 Over Colonial Pipeline\CADD\PROJECT LOCATION MAP.dwg



WESTBOUND PLAN



WESTBOUND ELEVATION

LEGEND:

B - 1 = STANDARD PENETRATION TEST BORING

BASE DRAWING PROVIDED TO US BY ATKINS

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1" = 50'
DATE: 10/8/2012
DRAWN BY: ZMH
REVIEWED BY: BD

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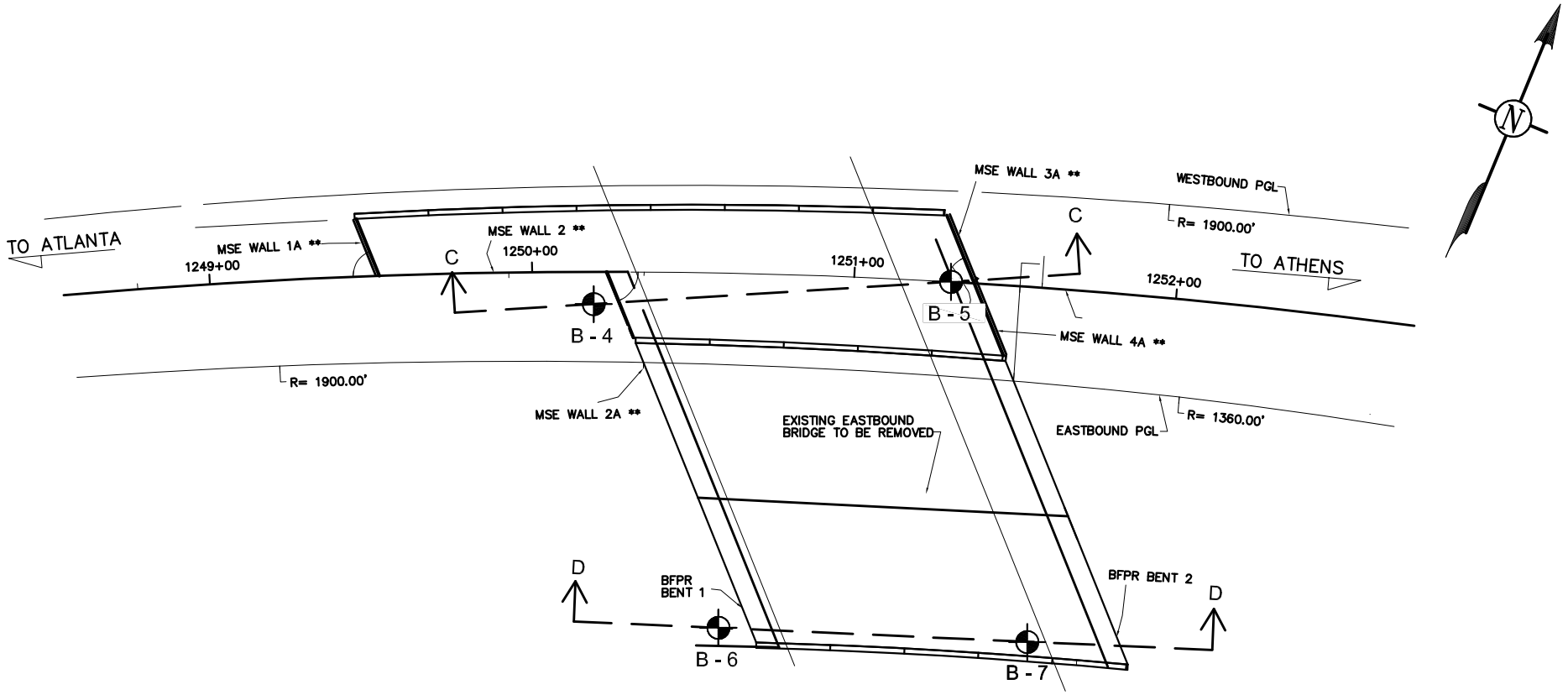
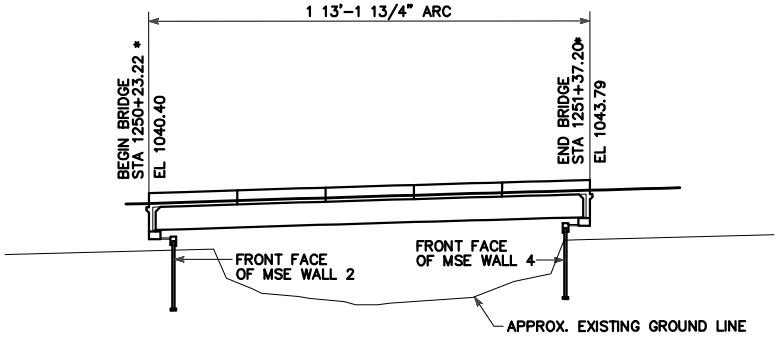
FIGURE 2 - SHEET 1 OF 2
BORING LOCATION PLAN
BRIDGE FOUNDATION INVESTIGATION
SR 316 OVER COLONIAL PIPELINE
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. 71.3852

P:\3852 SR 316 Over Colonial Pipeline\CADD\BORING LOCATION PLAN.dwg



EASTBOUND PLAN



EASTBOUND ELEVATION

LEGEND:

= STANDARD PENETRATION TEST BORING

B - 1

BASE DRAWING PROVIDED TO US BY ATKINS

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1" = 50'
DATE: 10/8/2012
DRAWN BY: ZMH
REVIEWED BY: BD

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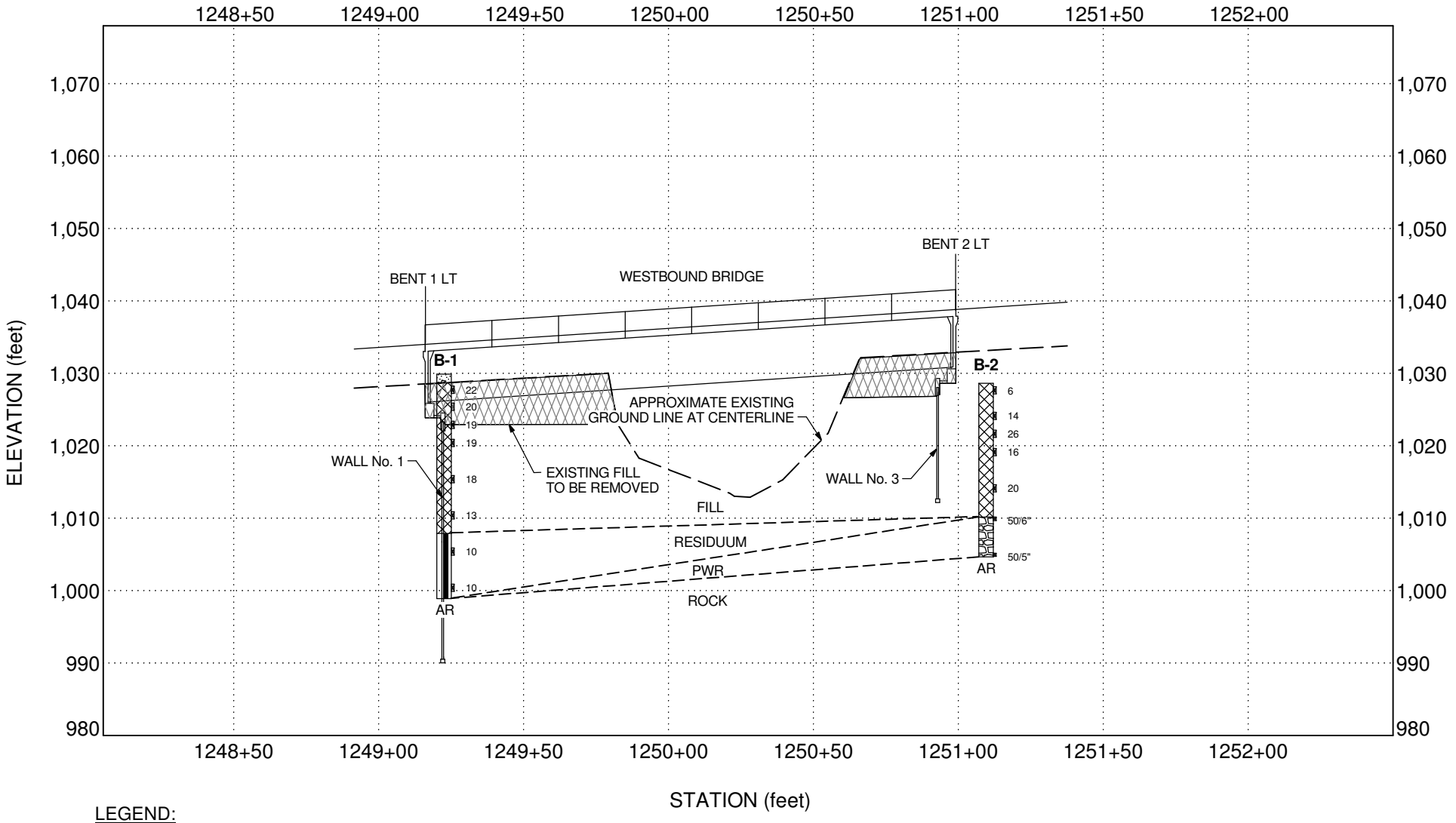
FIGURE 2 - SHEET 2 OF 2
BORING LOCATION PLAN
BRIDGE FOUNDATION INVESTIGATION
SR 316 OVER COLONIAL PIPELINE
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. 71.3852

P:\3852 SR 316 Over Colonial Pipeline\CADD\BORING LOCATION PLAN.dwg



LEGEND:
AR - Auger Refusal

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1"=20' (VERT.)
1"=50' (HOR.)
DATE: 10/5/2012
DRAWN BY: BD
REVIEWED BY: SKB

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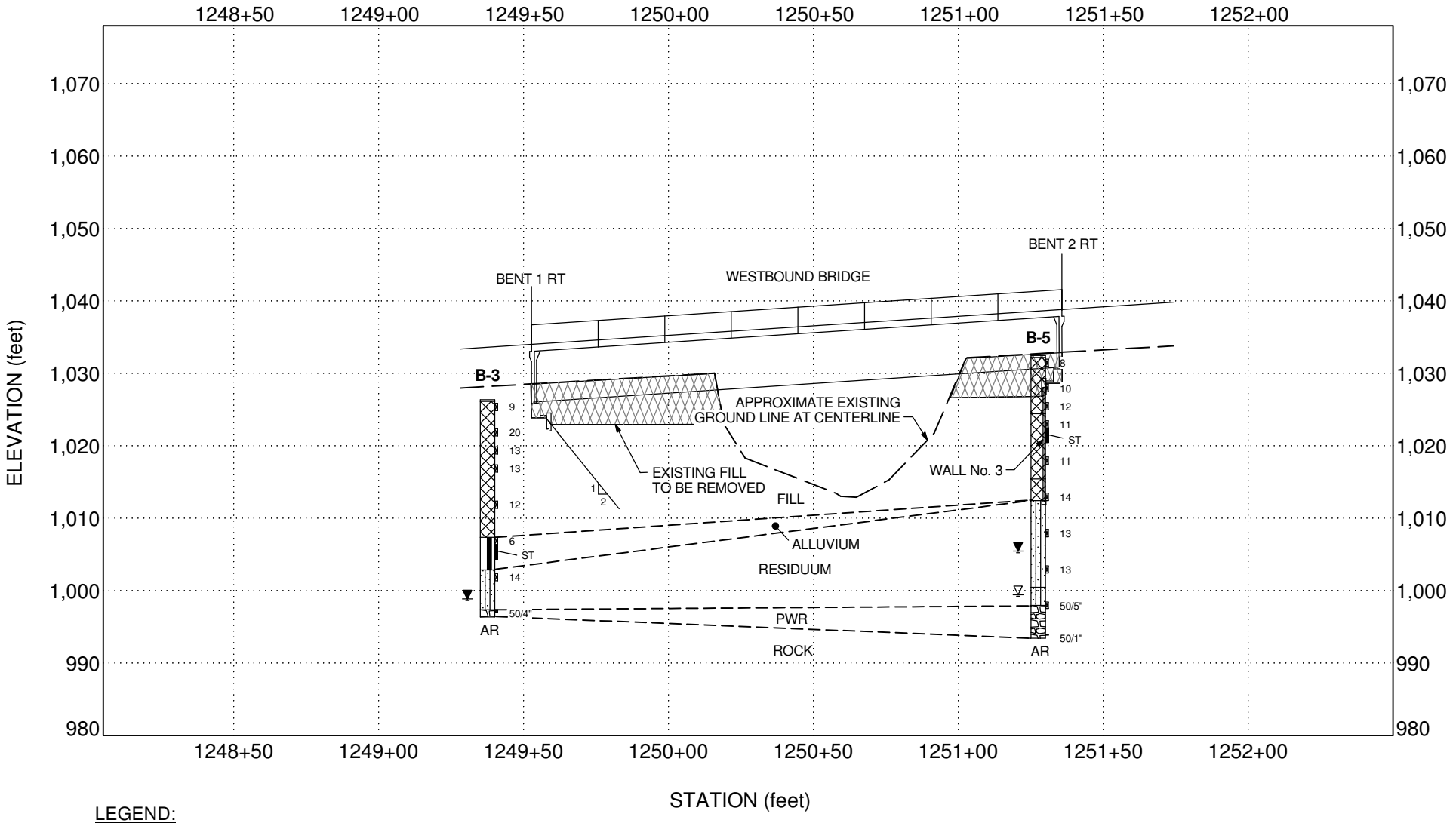
FIGURE 3A
SUBSURFACE PROFILE A-A
BRIDGE FOUNDATION INVESTIGATION
SR 316 OVER COLONIAL PIPELINE
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. 71.3852

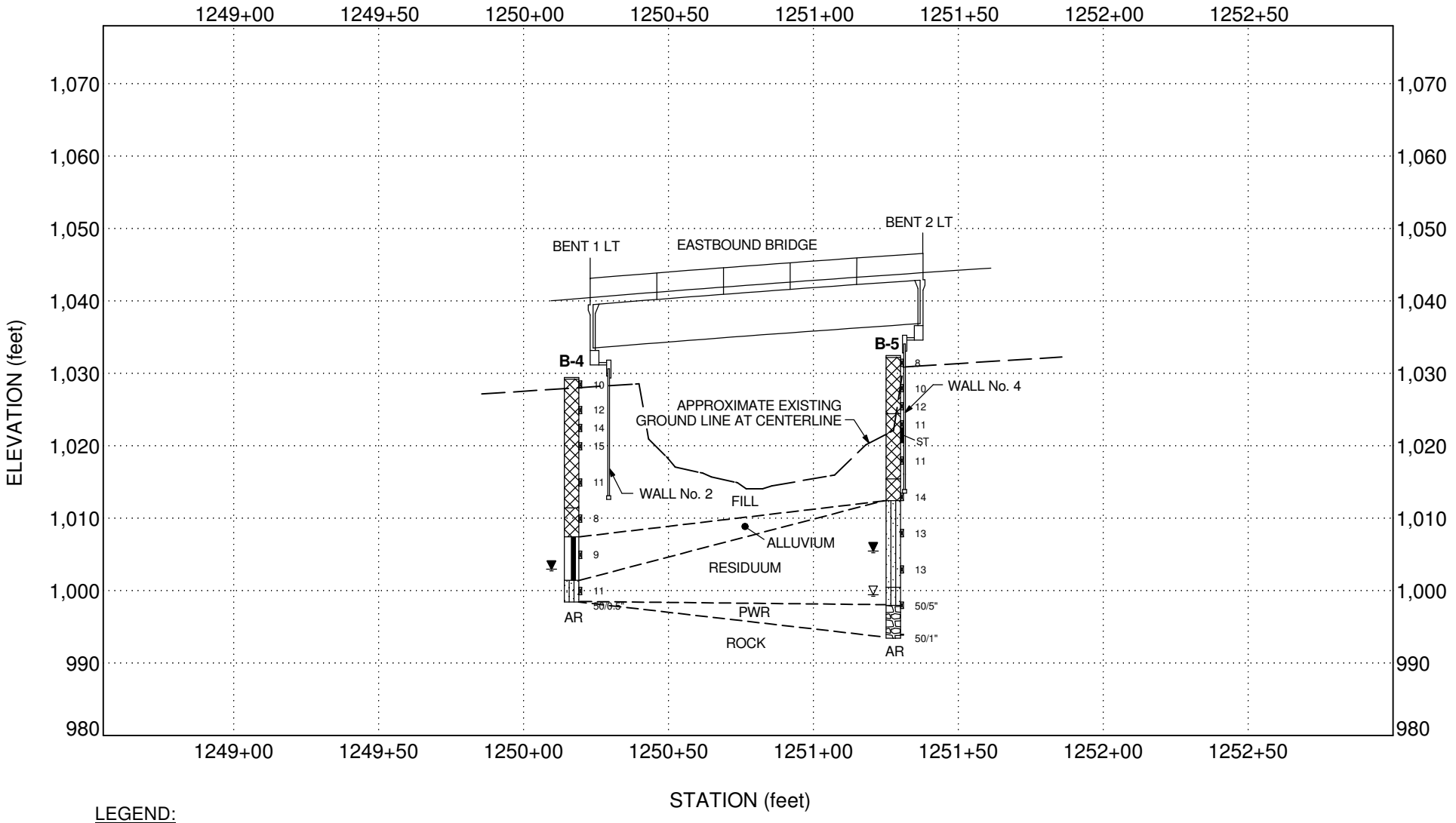


LEGEND:

- ▽ - Groundwater Table @ Time of Boring
- ▼ - Groundwater Table @ 24 Hours
- ST - Shelby Tube
- AR - Auger Refusal

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1"=20' (VERT.) 1"=50' (HOR.) DATE: 10/5/2012 DRAWN BY: BD REVIEWED BY: SKB	WILLMER ENGINEERING INC.	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 3B SUBSURFACE PROFILE B-B BRIDGE FOUNDATION INVESTIGATION SR 316 OVER COLONIAL PIPELINE GWINNETT COUNTY, GEORGIA WILLMER PROJECT No. 71.3852



LEGEND:

▽ - Groundwater Table @ Time of Boring

▼ - Groundwater Table @ 24 Hours

ST - Shelby Tube

AR - Auger Refusal

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1"=20' (VERT.)
1"=50' (HOR.)
DATE: 10/5/2012
DRAWN BY: BD
REVIEWED BY: SKB

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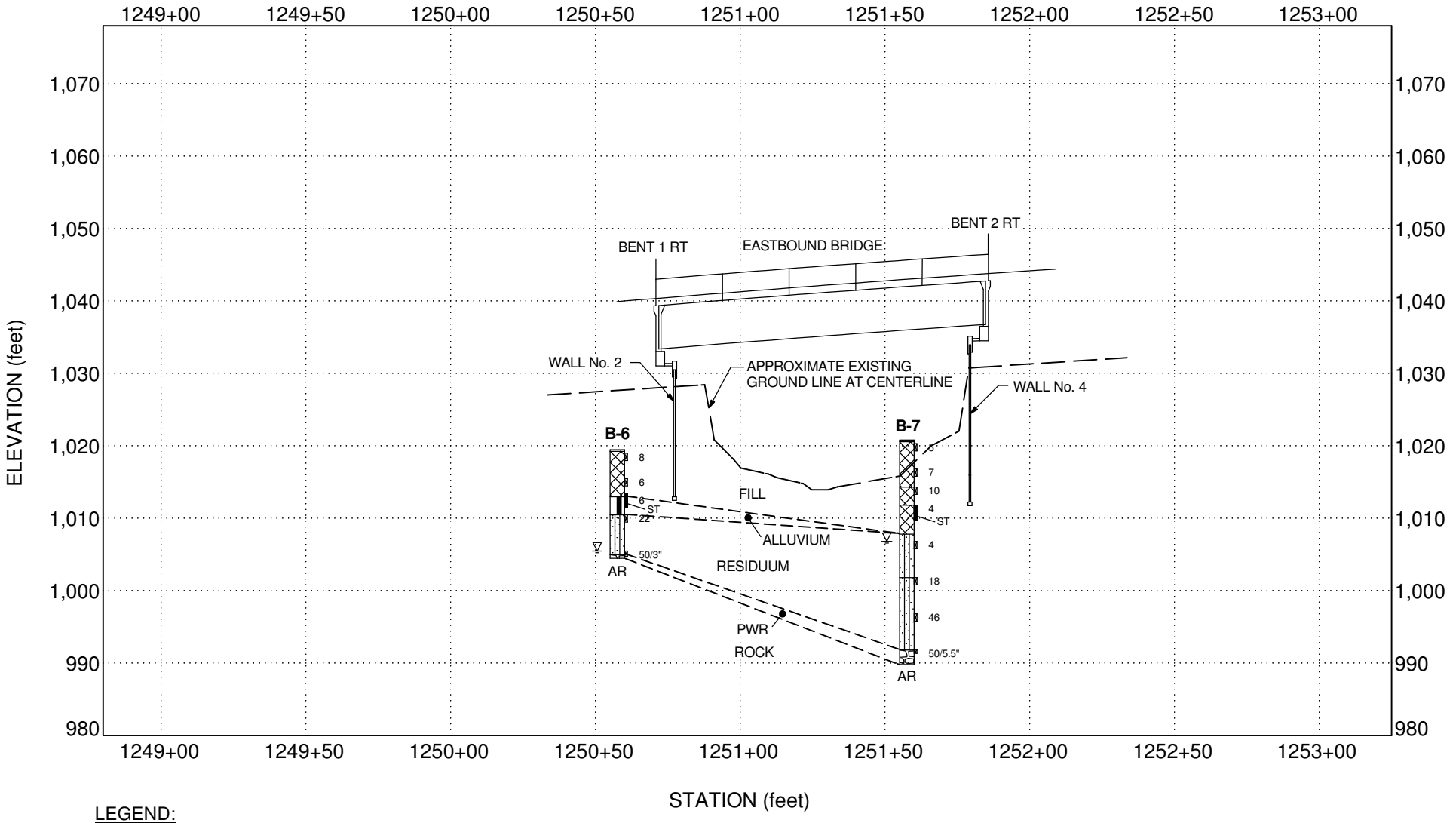
FIGURE 3C
SUBSURFACE PROFILE C-C
BRIDGE FOUNDATION INVESTIGATION
SR 316 OVER COLONIAL PIPELINE
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. 71.3852



LEGEND:

▽ - Groundwater Table @ Time of Boring
ST - Shelby Tube
AR - Auger Refusal

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1"=20' (VERT.) 1"=50' (HOR.) DATE: 10/5/2012 DRAWN BY: BD REVIEWED BY: SKB	WILLMER ENGINEERING INC.	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 3D SUBSURFACE PROFILE D-D BRIDGE FOUNDATION INVESTIGATION SR 316 OVER COLONIAL PIPELINE GWINNETT COUNTY, GEORGIA WILLMER PROJECT No. 71.3852

APPENDIX I

WILLMER ENGINEERING INC. | WE

BORING RECORD LEGEND

SM, CL, etc: - GROUP SYMBOL based on Unified Soil Classification System.
(Refer to ASTM D-2488 and Table 1 of D-2487)

N-VALUE: BLOWS PER FOOT- Standard Penetration Resistance (SPT) blow count , the sum of the second and third 6-inch increments of the SPT test.
(Refer to ASTM D-1586)

CONSISTENCY / RELATIVE DENSITY Correlated with SPT Blow Count, N:

SILTS AND CLAYS

N (blows per foot)	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
> 50	Very Hard

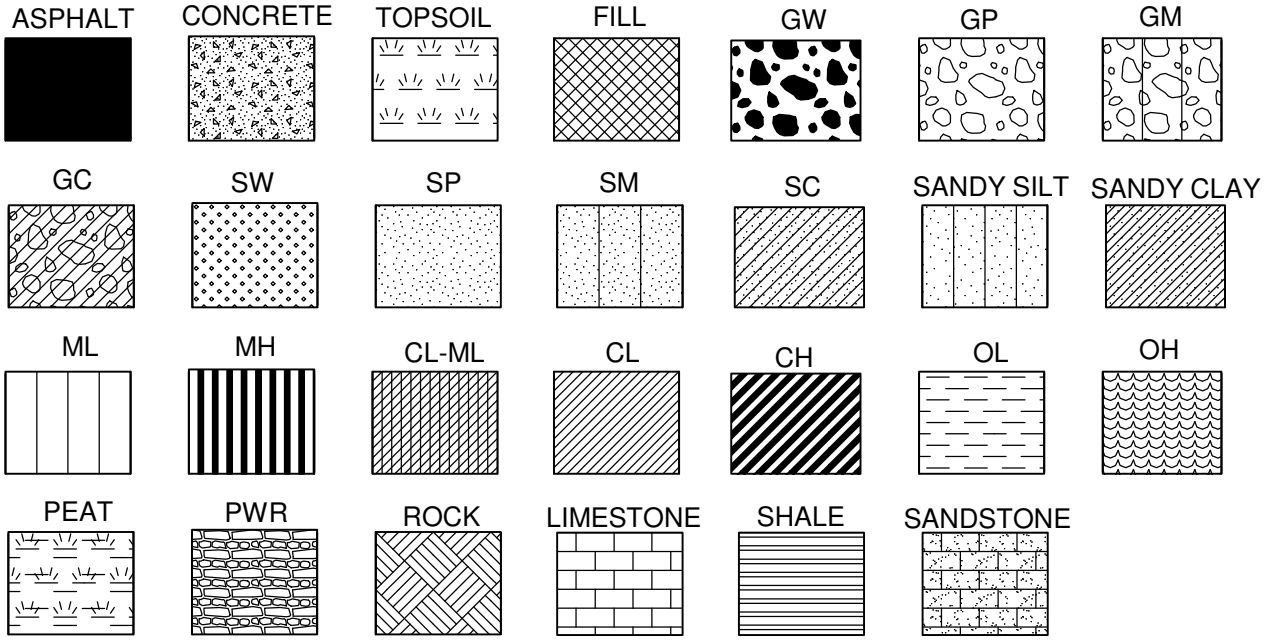
SANDS

N (blows per foot)	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

NOTES:

Groundwater Measurements:

- Water level at 24 hours
- Water level at time of boring
- Caved level at 24 hours



WILLMER ENGINEERING INC.

Willmer Engineering Inc.
3772 Pleasantdale Road, Suite 165
Atlanta, Georgia 30340

UNIFIED SOIL CLASSIFICATION SYSTEM REFERENCE SHEET

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN #200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	**(GW)**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			(GP)	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	**(GM)**	SILTY GRAVELS and GRAVEL-SAND-SILT MIXTURES
			(GC)	CLAYEY GRAVELS and GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING #4 SIEVE	CLEAN SAND LITTLE OR NO FINES	**(SW)**	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			(SP)	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	**(SM)**	SILTY SANDS and SAND-SILT MIXTURES
			(SC)	CLAYEY SANDS and SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		**(ML)**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR VERY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			(CL)	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			(OL)	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		**(MH)**	INORGANIC ELASTIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
			(CH)	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			(OH)	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			**(PT)**	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-1

Location: **WB Bent 1 LT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1029.90** Station: **1249+25, 50' LT**

Drilling Equipment: **CME 45 ATV** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **8** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **31.0**

Logged By: **BD** Date Drilled: **9/26/12**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/foot)	N-VALUE
					CONCRETE PAVEMENT = 14 inches	1029.9		
0		SS			FILL: Medium dense reddish brown medium to fine silty **SAND** — **FILL**			22
		SS				1025		20
5		SS						19
		SS				1020		19
10		SS						18
		SS				1015		
15		SS						13
		SS				1010		
20		SS			RESIDUUM: Stiff gray and tan (mottled black) medium to fine sandy elastic **SILT** (micaceous) — **MH**			10
		SS				1005		
25		SS						10
		SS				1000		
30					Auger refusal was encountered at 31 feet below the existing ground surface.			
					No groundwater was encountered at the time of boring completion.			

STANDARD PENETRATION TEST DATA (blows/foot): 5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-1**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-2

Location: **WB Bent 2 LT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1028.65** Station: **1251+12, 110' LT**

Drilling Equipment: **CME 55** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **7** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **24.0**

Logged By: **PL** Date Drilled: **9/25/12**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/foot) 5 10 20 40 60 80	N-VALUE
0		SS			FILL: Loose to medium dense reddish brown and gray clayey medium to fine **SAND** with root fragments to 5 feet	**FILL**	1028.7		6
		SS					1025		14
5		SS							26
		SS					1020		16
10		SS							20
15		SS					1015		50/6"
		SS			PARTIALLY WEATHERED ROCK: Sampled as very dense brown and gray silty medium to fine **SAND**	**PWR**	1010		50/5"
20					Auger refusal was encountered at 24 feet below the existing ground surface.		1005		
					No groundwater was encountered at the time of boring completion.				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-2**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-3

Location: **WB Bent 1 RT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1026.37** Station: **1249+40, 3' LT**

Drilling Equipment: **CME 55** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **9** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **30.0**

Logged By: **BD** Date Drilled: **9/24/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL = 3 inches — FILL	1026.4	
	SS			FILL: Loose to medium dense brown silty medium to fine **SAND** (slightly micaceous)	1025	9
5	SS					20
	SS				1020	13
10	SS			- root fragments		13
	SS				1015	12
15	SS					
	SS			ALLUVIUM: Firm gray and brown medium to fine sandy elastic **SILT** with root fragments — MH	1010	6
20	ST					
	SS			RESIDUUM: Medium dense gray and brown silty medium to fine **SAND** — SM	1005	14
25	SS				1000	
	SS			PARTIALLY WEATHERED ROCK: Sampled as very dense gray and brown silty medium to fine **SAND** (slightly micaceous) — PWR		50/4"
30				Auger refusal was encountered at 30 feet below the existing ground surface.		

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

Groundwater was encountered at 27.5 feet below the existing ground surface at 24 hours after boring completion.

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-3**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-4

Location: **EB Bent 1 LT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1029.45** Station: **1250+19, 10' RT**

Drilling Equipment: **CME 55** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **9** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **31.0**

Logged By: **BD** Date Drilled: **9/24/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL = 3 inches — FILL	1029.5	10
	SS			FILL: Loose to medium dense brown silty medium to fine **SAND** (micaceous)	1025	12
5	SS					14
	SS				1020	15
10	SS					
15	SS				1015	11
	SS			Loose red and brown clayey medium to fine **SAND** (micaceous) — FILL	1010	8
20	SS			ALLUVIUM: Stiff gray medium to fine sandy elastic **SILT** with root fragments — MH	1005	9
25	SS					
	SS			RESIDUUM: Medium dense gray and black silty medium to fine **SAND** (micaceous) — SM	1000	11
30	SS			Auger refusal was encountered at 31 feet below the existing ground surface.		50/0.5"

Groundwater was encountered at 26.5 feet below the existing ground surface at 24 hours after boring completion.

STANDARD PENETRATION TEST DATA (blows/foot): 5, 10, 20, 40, 60, 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-4**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-5

Location: **Bent 2 - WB RT/EB LT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1032.45** Station: **1251+30, CL**

Drilling Equipment: **CME 55** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **11** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **39.0**

Logged By: **BD** Date Drilled: **9/24/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL = 3 inches	1032.5	
				FILL: Loose to medium dense reddish brown silty/clayey medium to fine **SAND**	FILL	
5	SS				1030	8
	SS					10
	SS				1025	12
				Stiff reddish brown medium to fine sandy **SILT**	FILL	
10	SS					11
	ST				1020	
15	SS					11
				Medium dense reddish brown silty medium to fine **SAND** (slightly micaceous)	FILL	
20	SS				1015	14
				RESIDUUM: Medium dense brown and tan (mottled black) silty medium to fine **SAND** (micaceous)	SM	
25	SS				1010	13
					1005	
30	SS					13
				Medium dense grayish brown silty medium to fine **SAND**	SM	
35	SS				1000	
				PARTIALLY WEATHERED ROCK: Sampled as very dense grayish brown silty medium to fine **SAND**	PWR	50/5"
	SS				995	50/1"
				Auger refusal was encountered at 39 feet below the existing ground surface.		
				Groundwater was encountered at 33 and 27 feet below the existing ground surface at the time of boring completion and 24 hours after boring completion, respectively.		

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-5**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-6

Location: **EB Bent 1 RT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1019.47** Station: **1250+60, 110' RT**

Drilling Equipment: **CME 45 ATV** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **6** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **15.0**

Logged By: **BD** Date Drilled: **9/28/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL = 3 inches — FILL	1019.5	8
	SS			FILL: Firm reddish brown and gray medium to fine sandy **SILT** with root fragments	1015	6
5	ST			ALLUVIUM: Firm gray medium to fine sandy elastic **SILT** with root fragments — MH		6
	SS					
	SS			RESIDUUM: Medium dense brown silty medium to fine **SAND** (mottled black) (micaceous) — SM	1010	22
10						
	SS			PARTIALLY WEATHERED ROCK: Sampled as very dense brown silty medium to fine **SAND** (micaceous) — PWR	1005	50/3"
15				Auger refusal was encountered at 15 feet below the existing ground surface.		

Groundwater was encountered at 14 feet below the existing ground surface at the time of boring completion.

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-6**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

WILLMER ENGINEERING INC. | WE

Project: **SR 316 Over Colonial Pipeline - Bridge Foundation Investigation**
Location: **Gwinnett County, Georgia**
Project Number: **71.3852; GDOT Project No. MSL00-0004-00(086); PI No. 0004086**

HOLE No. B-7

Location: **EB Bent 2 RT**
See Figure 2

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **1020.80** Station: **1251+60, 110' RT**

Drilling Equipment: **CME 45 ATV** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **NA** Samples: **9** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **31.0**

Logged By: **BD** Date Drilled: **9/28/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			TOPSOIL = 3 inches	1020.8	
				FILL: Firm reddish brown and gray medium to fine sandy **SILT** with root fragments from 0 to 5 feet — **FILL**	1020	5
5	SS					7
	SS			Loose grayish brown silty medium to fine **SAND** with rock fragments — **FILL**	1015	10
	SS			Soft light gray medium to fine sandy **SILT** with rock fragments — **FILL**		4
10	ST				1010	
	SS			RESIDUUM: Very loose brown silty medium to fine **SAND** (very micaceous) — **SM**		4
15					1005	
	SS			Medium dense to dense brown, black, and gray silty medium to fine **SAND** (micaceous) — **SM**		18
20					1000	
	SS					46
25					995	
	SS			PARTIALLY WEATHERED ROCK: Sampled as very dense brown, black, and gray silty medium to fine **SAND** (micaceous) — **PWR**		50/5.5"
30					990	

Auger refusal was encountered at 31 feet below the existing ground surface.

Groundwater was encountered at 14 feet below the existing ground surface at the time of boring completion.

STANDARD PENETRATION TEST DATA (blows/foot)
5 10 20 40 60 80

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-7**

SPTN SR 316 OVER COLONIAL PIPELINE BFI.GPJ 10/5/12

APPENDIX II

Table AII-1

Summary of Laboratory Test Results
Bridge Foundation Investigation – SR 316 Over Colonial Pipeline
GDOT Project No. MSL00-0004-00(086); PI No. 0004086
Gwinnett County, Georgia
Willmer Project No. 71.3852

Sample Number	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Fines Content (%)	Void Ratio	σ_p' (psf)	C_c	C_r	C_v (ft^2/day)
B-3	22	Gray and brown medium to fine sandy elastic SILT	24.0	56	24	65.6	0.73	5500	0.14	0.01	6
B-1	25	Gray and tan (mottled black) medium to fine sandy elastic SILT (micaceous)	31.3	60	24	62.5	--	--	--	--	--
B-5	12	Reddish brown medium to fine sandy elastic SILT	25.1	63	27	69.5	--	--	--	--	--

Abbreviations: σ_p' - Preconsolidation Pressure
C_c - Compression Index
C_r - Recompression Index
C_v - Coefficient of Consolidation

APPENDIX III

Vicinity of B-6; SR 316 Eastbound; Looking North

Vicinity of B-7; SR 316 Eastbound; Looking Northwest

Vicinity of B-2; SR 316 Westbound; Looking West

Vicinity of B-4; SR 316 Median; Looking East

SR 316 Westbound; Looking West