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STRUCTURE RECOMMENDATIONS

W.B.S. NO. 50231 DESCRIPTION Segmental Gravity Retaining Wall #1
 T.I.P. NO. U-5840
 COUNTY Henderson
 STATION 10+00.00 to 10+79.75
-W1-

	INITIALS	DATE
DESIGN	PDM	3/9/2018
CHECKED	DJC	3/9/2018
FINAL	DJC	3/9/2018



COMMENTS & NOTES

Note on Plans:

1. FOR SEGMENTAL GRAVITY RETAINING WALLS, SEE SEGMENTAL GRAVITY RETAINING WALLS PROVISION.
2. FREEZE-THAW DURABLE SRW UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS ARE REQUIRED.
3. A DRAIN PIPE IS REQUIRED FOR RETAINING WALL NO. 1.
4. DESIGN RETAINING WALL NO. 1 FOR WALL HEIGHTS EQUAL TO THE DESIGN HEIGHT PLUS DEPTH TO TOP OF FOOTING (DIFFERENCE BETWEEN GRADE ELEVATION AND TOP OF FOOTING ELEVATION).
5. DESIGN RETAINING WALL NO. 1 FOR THE FOLLOWING:
 - 1) MAXIMUM FACTORED VERTICAL STRESS ON FOUNDATION MATERIAL = 2,000 LB/SF. THIS ASSUMES ANY FILL OR SOFT SOILS, IF ENCOUNTERED, WILL BE UNDERCUT AND REPLACED.
 - 2) MAXIMUM COEFFICIENT OF FRICTION = 0.35
 - 3) GROUNDWATER WAS NOT ENCOUNTERED IN THE BORING TERMINATION DEPTHS.
 - 4) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	120	28	0

6. DESIGN RETAINING WALL NO. 1 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.
7. IGNORE PASSIVE EARTH PRESSURES IN THE UPPER 18 INCHES.

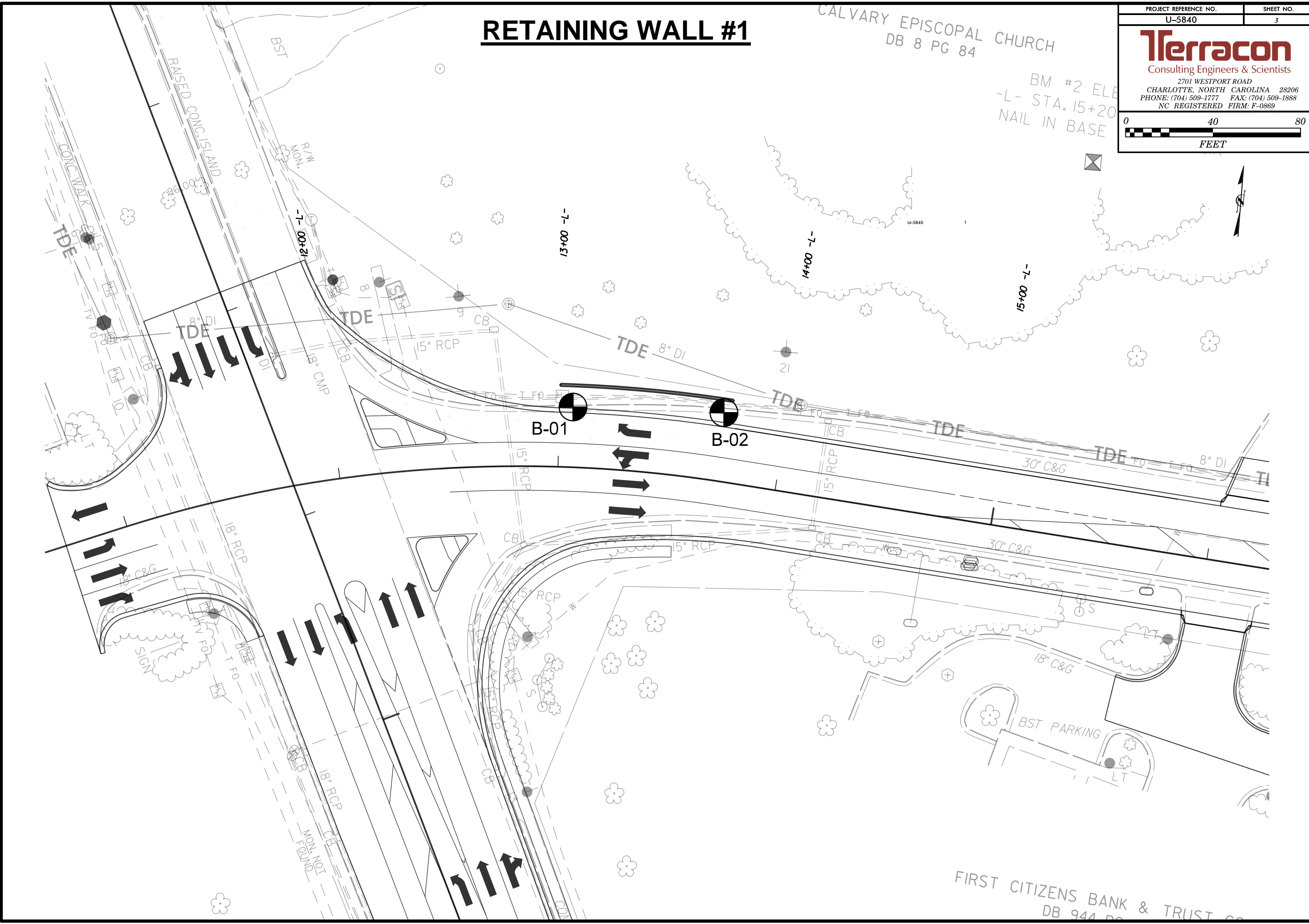
STRUCTURE RECOMMENDATION NOTES ON PLANS AND COMMENTS

PROJECT No.: U-5840 WALL NO: 1 COUNTY: Henderson
STATION: 10+00.00 to 10+79.75 -W1- DESCRIPTION: SR1547 FROM US 25 TO SR1551

8. DO NOT PLACE NO. 57 STONE FOR FOOTINGS FOR RETAINING WALL NO. 1 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

RETAINING WALL #1

PROJECT REFERENCE NO. U-5840	SHEET NO. 3
Terracon Consulting Engineers & Scientists 2701 WESTPORT ROAD CHARLOTTE, NORTH CAROLINA 28206 PHONE: (704) 509-1777 FAX: (704) 509-1888 NC REGISTERED FIRM: F-0869	
0 40 80 F E E T	



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231	TIP U-5840	COUNTY HENDERSON	GEOLOGIST McCloud, P.D.
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)			GROUND WTR (ft)
BORING NO. B-01	STATION 10+06	OFFSET 10 ft RT	ALIGNMENT -W1-
COLLAR ELEV. 2,224.2 ft	TOTAL DEPTH 15.0 ft	NORTHING 634,362	EASTING 956,146
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Odom, C.J.	START DATE 05/17/17	COMP. DATE 05/17/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2225																	
															2,224.2	GROUND SURFACE	0.0
	2,223.0	1.3	3	4	4										2,223.0	9" Asphalt over 6" Stone Base	1.3
2220	2,220.7	3.5	2	3	4						SS-1	M		2,221.2	ROADWAY EMBANKMENT Stiff, brown, tan, and gray, SILT with sand (A-4)	3.0	
	2,218.2	6.0	4	3	4						SS-2	M			Medium stiff, gray to gray and tan, SILT with sand (A-4)		
2215	2,215.7	8.5	5	5	6						SS-3	M		2,216.2	RESIDUAL Stiff to very stiff, tan and gray to tan, gray, and red, SILT with sand (A-4)	8.0	
											SS-4	M					
2210	2,210.7	13.5	6	10	17						SS-5	M		2,209.2	Boring Terminated at Elevation 2,209.2 ft in Silt with Sand	15.0	

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231		TIP U-5840		COUNTY HENDERSON		GEOLOGIST McCloud, P.D.											
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)							GROUND WTR (ft)										
BORING NO. B-02		STATION 10+76		OFFSET 7 ft RT		ALIGNMENT -W1-											
COLLAR ELEV. 2,225.1 ft		TOTAL DEPTH 15.0 ft		NORTHING 634,365		EASTING 956,215											
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Odom, C.J.		START DATE 05/17/17		COMP. DATE 05/17/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2230																	
2225																	
	2,223.9	1.3													2,225.1	GROUND SURFACE	0.0
	2,221.6	3.5	3	7	8						SS-6	M		2,223.9	9" Asphalt over 6" Stone Base	1.3	
	2,219.1	6.0	2	3	4						SS-7	M		2,222.1	ROADWAY EMBANKMENT Medium dense, tan, red, and gray, clayey SAND, little gravel (A-4 (2))	3.0	
	2,216.6	8.5	4	5	9						SS-8	M		2,219.6	Medium stiff, tan, SILT with sand (A-4)	5.5	
	2,211.6	13.5	5	7	14						SS-9	M			RESIDUAL Stiff to very stiff, tan and gray, SILT with sand (A-4)		
	2,210.1		3	5	6						SS-10	M		2,210.1	Boring Terminated at Elevation 2,210.1 ft in Silt with Sand	15.0	

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

STRUCTURE RECOMMENDATIONS

W.B.S. NO. 50231 DESCRIPTION Segmental Gravity Retaining Wall #2

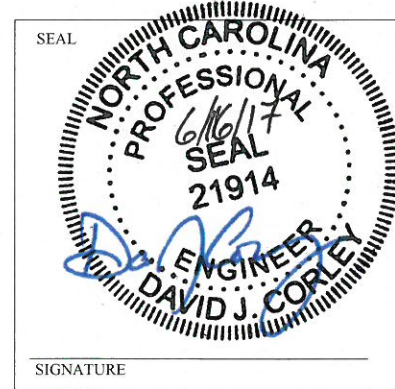
T.I.P. NO. U-5840

COUNTY Henderson

STATION 10+00.00 to 11+01.73

-W2-

	INITIALS	DATE
DESIGN	PDM	6/16/2017
CHECKED	DJC	6/16/2017
FINAL	DJC	6/16/2017



COMMENTS & NOTES


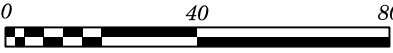
Note on Plans:

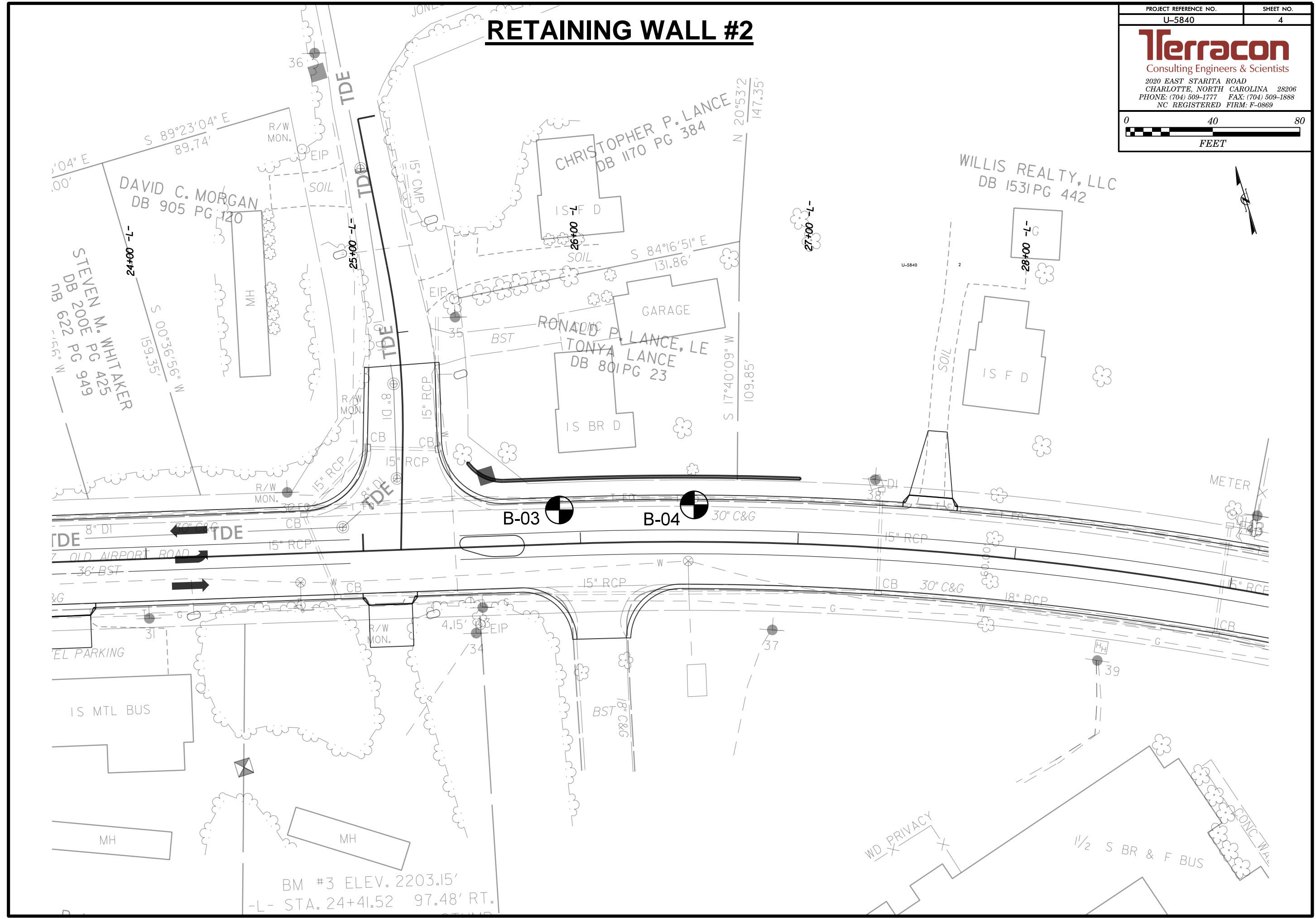
1. FOR SEGMENTAL GRAVITY RETAINING WALLS, SEE SEGMENTAL GRAVITY RETAINING WALLS PROVISION.
2. A DRAIN PIPE IS REQUIRED FOR RETAINING WALL NO. 2
3. DESIGN RETAINING WALL NO. 2 FOR WALL HEIGHTS EQUAL TO THE DESIGN HEIGHT PLUS DEPTH TO TOP OF FOOTING (DIFFERENCE BETWEEN GRADE ELEVATION AND TOP OF FOOTING ELEVATION).
4. DESIGN RETAINING WALL NO. 2 FOR THE FOLLOWING:
 - 1) MAXIMUM FACTORED VERTICAL STRESS ON FOUNDATION MATERIAL = 2,500 LB/SF. THIS ASSUMES ANY FILL OR SOFT SOILS, IF ENCOUNTERED, WILL BE UNDERCUT AND REPLACED.
 - 2) MAXIMUM COEFFICIENT OF SLIDING FRICTION = 0.35
 - 3) GROUNDWATER WAS NOT ENCOUNTERED IN THE BORING TERMINATION DEPTHS.
 - 4) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) LB/CF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) LB/SF	ACTIVE EARTH PRESSURE (K_a)	PASSIVE EARTH PRESSURE (K_p)
BACKFILL	120	30	0	0.33	3.00
FOUNDATION	120	28	0	0.36	2.77

5. IGNORE PASSIVE EARTH PRESSURES IN THE UPPER 18 INCHES.

RETAINING WALL #2

PROJECT REFERENCE NO. U-5840	SHEET NO. 4
	
Consulting Engineers & Scientists 2020 EAST STARITA ROAD CHARLOTTE, NORTH CAROLINA 28206 PHONE: (704) 509-1777 FAX: (704) 509-1888 NC REGISTERED FIRM: F-0869	
	



GEOTECHNICAL BORING REPORT BORE LOG

WBS U-5840			TIP U-5840			COUNTY HENDERSON			GEOLOGIST McCloud, P.D.							
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)										GROUND WTR (ft)						
BORING NO. B-03			STATION 10+45			OFFSET 14 ft RT			ALIGNMENT -W2-							
COLLAR ELEV. 2,203.9 ft			TOTAL DEPTH 15.0 ft			NORTHING 634,129			EASTING 957,412							
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Odom, C.J.			START DATE 05/17/17			COMP. DATE 05/17/17			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)
2205																
	2,202.9	1.0													2,203.9	0.0
			5	13	15										2,202.9	1.0
2200	2,200.4	3.5													2,200.9	3.0
			9	10	16											
	2,197.9	6.0														
			13	18	16											
2195	2,195.4	8.5														
			14	17	21											
	2,190.4	13.5														
2190			6	7	10											
															2,188.9	15.0
															Boring Terminated at Elevation 2,188.9 ft in Silt with Sand	

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS U-5840		TIP U-5840		COUNTY HENDERSON		GEOLOGIST McCloud, P.D.											
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)							GROUND WTR (ft)										
BORING NO. B-04		STATION 11+08		OFFSET 13 ft RT		ALIGNMENT -W2-											
COLLAR ELEV. 2,201.7 ft		TOTAL DEPTH 15.0 ft		NORTHING 634,113		EASTING 957,472											
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Odom, C.J.		START DATE 05/17/17		COMP. DATE 05/17/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2205																	
															2,201.7	GROUND SURFACE	0.0
2200	2,200.2	1.5	9	14	12										2,200.2	6" Asphalt over 12" Stone Base	1.5
	2,198.2	3.5	9	11	11						SS-16	M				RESIDUAL Very stiff, gray and tan, clayey SAND (A-2-4 (0))	
2195	2,195.7	6.0	8	9	13						SS-17	M			2,196.2	Very stiff to hard, dark gray and tan, SILT with sand (A-4)	5.5
	2,193.2	8.5	16	19	20						SS-18	M					
2190											SS-19	M					
	2,189.7														2,189.7	Very stiff, gray and tan, SILT with sand (A-4)	12.0
	2,188.2	13.5	13	13	10						SS-20	M			2,186.7	Boring Terminated at Elevation 2,186.7 ft in Silt with Sand	15.0

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

STRUCTURE RECOMMENDATIONS

W.B.S. NO. 50231 DESCRIPTION Mechanically Stabilized Earth Retaining Wall #3
T.I.P. NO. U-5840
COUNTY Henderson
STATION 10+00.00 to 12+19.00
-W3-

	INITIALS	DATE
DESIGN	PDM	3/9/2018
CHECKED	DJC	3/9/2018
FINAL	DJC	3/9/2018



COMMENTS & NOTES

Note on Plans:

1. FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.
2. USE AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARDSPECIFICATIONS FOR RETAINING WALL NO. 3.
3. WHEN USING AN MSE WALL SYSTEM WITH SRW UNITS FOR RETAINING WALL NO. 3, FREEZE-THAW DURABLE SRW UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS ARE REQUIRED.
4. AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 3.
5. A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 3.
6. A DRAIN IS REQUIRED FOR RETAINING WALL NO. 3.
7. DESIGN RETAINING WALL NO. 3 FOR THE FOLLOWING:
 - 1) $H = \text{DESIGN HEIGHT} + \text{EMBEDMENT}$.
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 2,000 PSF. THIS ASSUMES ANY FILL OR SOFT SOILS, IF ENCOUNTERED, WILL BE UNDERCUT AND REPLACED.
 - 4) MINIMUM REINFORCEMENT LENGTH (L) = $0.8 \times H$ OR 6 FT, WHICHEVER IS LONGER

STRUCTURE RECOMMENDATION NOTES ON PLANS AND COMMENTS

PROJECT No.: U-5840 WALL NO: 3 COUNTY: Henderson
STATION: 10+00.00 to 12+19.00 -W3- DESCRIPTION: SR1547 FROM US 25 TO SR1551

5) REINFORCED ZONE AGGREGATE PARAMETERS:

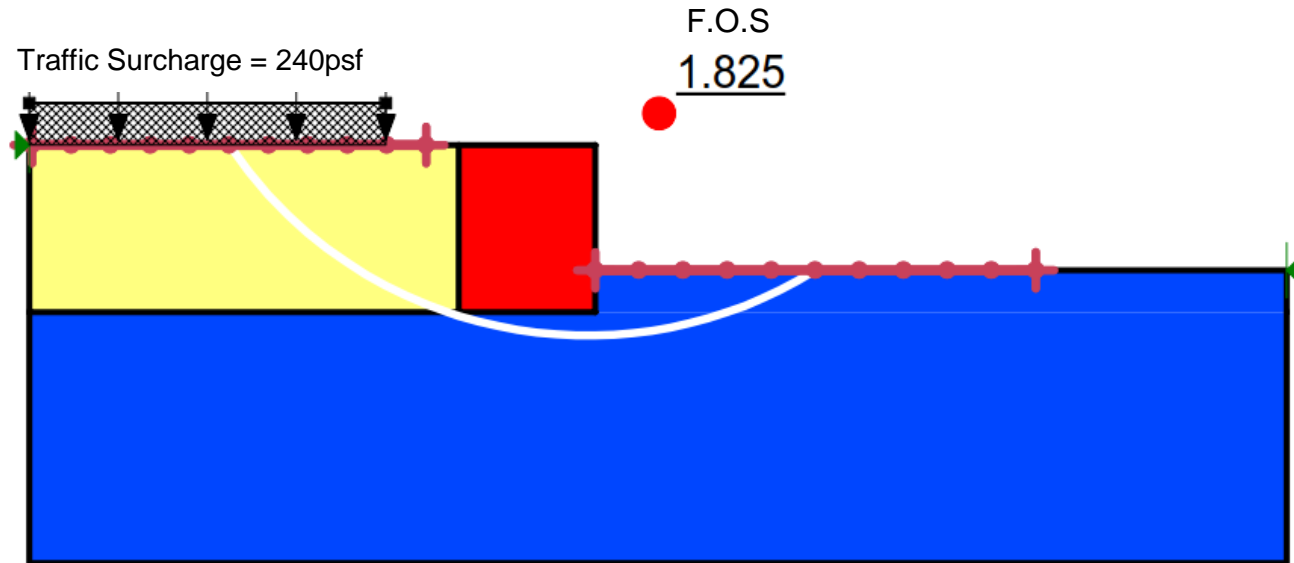
AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) PSF
COURSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	120	28	0

8. DESIGN RETAINING WALL NO. 3 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.
9. DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 3 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.
10. IGNORE PASSIVE EARTH PRESSURES IN THE UPPER 18 INCHES.



LEGEND:

- = Backfill Soil ($\gamma=120$ pcf, $\Phi=30^\circ$, $c=0$)
- = Foundation Soil ($\gamma=120$ pcf, $\Phi=28^\circ$, $c=0$)

Project Manager: PDM	Project No. 71175059
Drawn by: PDM	Scale: AS SHOWN
Checked by: DJC	File Name: Wall 3
Approved by: DJC	Date: MARCH 2018

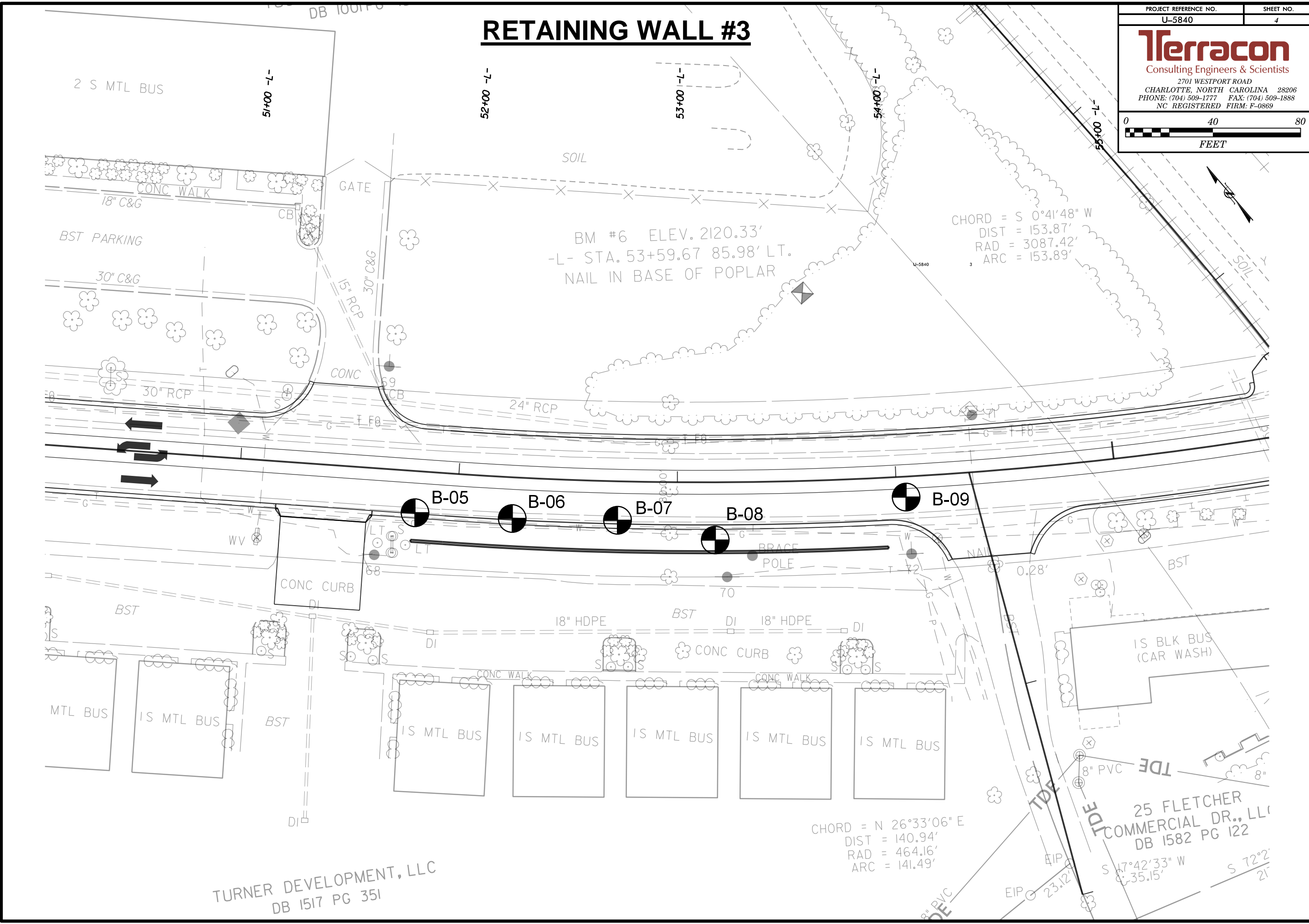
Terracon
2701 Westport Road
Charlotte, NC 28208

GLOBAL STABILITY ANALYSIS
Mechanically Stabilized Earth Retaining Wall #3 State Project No. U-5840 Henderson County, North Carolina

Page
3

RETAINING WALL #3

PROJECT REFERENCE NO. U-5840	SHEET NO. 4
Terracon	
Consulting Engineers & Scientists	
2701 WESTPORT ROAD CHARLOTTE, NORTH CAROLINA 28206 PHONE: (704) 509-1777 FAX: (704) 509-1888 NC REGISTERED FIRM: F-0869	
 0 40 80 FEET	



BM #6 ELEV. 2120.33'
 -L- STA. 53+59.67 85.98' LT.
 NAIL IN BASE OF POPLAR

CHORD = S 0°41'48" W
 DIST = 153.87'
 RAD = 3087.42'
 ARC = 153.89'

CHORD = N 26°33'06" E
 DIST = 140.94'
 RAD = 464.16'
 ARC = 141.49'

TURNER DEVELOPMENT, LLC
 DB 1517 PG 351

25 FLETCHER
 COMMERCIAL DR., LL
 DB 1582 PG 122

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231			TIP U-5840			COUNTY HENDERSON			GEOLOGIST McCloud, P.D.							
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)									GROUND WTR (ft)							
BORING NO. B-05			STATION 10+01			OFFSET 13 ft LT			ALIGNMENT -W3-							
COLLAR ELEV. 2,121.4 ft			TOTAL DEPTH 15.0 ft			NORTHING 632,480			EASTING 959,384							
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Odom, C.J.			START DATE 05/17/17			COMP. DATE 05/17/17			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2125																
2120	2,120.4	1.0	3	5	3									GROUND SURFACE	0.0	
														3" Topsoil		
	2,117.9	3.5	2	3	3						SS-22	M		RESIDUAL		
														Medium stiff, reddish tan, SILT with sand (A-4)		
2115	2,115.4	6.0	3	6	10						SS-23	M			5.5	
														Stiff to very stiff, red with gray, SILT with sand (A-4)		
	2,112.9	8.5	6	5	7						SS-24	M				
2110											SS-25	M				
	2,107.9	13.5	5	7	8						SS-26	M			15.0	
														Boring Terminated at Elevation 2,106.4 ft in Silt with Sand		

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT BORE LOG

WBS 50231	TIP U-5840	COUNTY HENDERSON	GEOLOGIST McCloud, P.D.
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)			GROUND WTR (ft)
BORING NO. B-06	STATION 10+46	OFFSET 14 ft LT	ALIGNMENT -W3-
COLLAR ELEV. 2,120.5 ft	TOTAL DEPTH 15.0 ft	NORTHING 632,449	EASTING 959,416
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Odom, C.J.	START DATE 05/17/17	COMP. DATE 05/17/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
2125																
2120	2,119.5	1.0												2,120.5	0.0	GROUND SURFACE 4" Topsoil
2115	2,117.0	3.5	2	2	7	·	·	·	·	·	SS-27	M	ROADWAY EMBANKMENT Stiff, reddish tan and gray, SILT with sand (A-4)	2,115.0	5.5	RESIDUAL Medium stiff to stiff, red, tan, and gray, SILT with sand (A-4)
	2,114.5	6.0	3	2	5	·	·	·	·	·	SS-28	M				
	2,112.0	8.5	5	7	7	·	·	·	·	·	SS-29	M				
	2,107.0	13.5	4	6	8	·	·	·	·	·	SS-30	M				
2110													Boring Terminated at Elevation 2,105.5 ft in Silt with Sand			
	2,107.0	13.5	3	5	5	·	·	·	·	·	SS-31	M		2,105.5	15.0	

NCDOT BORE SINGLE 71175069 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231			TIP U-5840			COUNTY HENDERSON			GEOLOGIST McCloud, P.D.							
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)									GROUND WTR (ft)							
BORING NO. B-07			STATION 10+95			OFFSET 15 ft LT			ALIGNMENT -W3-							
COLLAR ELEV. 2,119.6 ft			TOTAL DEPTH 15.0 ft			NORTHING 632,417			EASTING 959,452							
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Odom, C.J.			START DATE 05/17/17			COMP. DATE 05/17/17			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2120																
	2,118.6	1.0	2	4	5											
	2,116.1	3.5	3	4	5											
	2,113.6	6.0	3	4	7											
	2,111.1	8.5	8	13	16											
	2,106.1	13.5	9	15	24											
2105																

NCDOT BORE SINGLE 71175069 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231	TIP U-5840	COUNTY HENDERSON	GEOLOGIST McCloud, P.D.
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)			GROUND WTR (ft)
BORING NO. B-08	STATION 11+40	OFFSET 6 ft LT	ALIGNMENT -W3-
0 HR. Dry			24 HR. FIAD
COLLAR ELEV. 2,117.9 ft	TOTAL DEPTH 15.0 ft	NORTHING 632,381	EASTING 959,480
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Odom, C.J.	START DATE 05/17/17	COMP. DATE 05/17/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2120																
	2,116.9	1.0	3	4	5									GROUND SURFACE	0.0	
2115	2,114.4	3.5	4	5	5						SS-37	M		4" Topsoil		
	2,111.9	6.0	6	6	6						SS-38	M		RESIDUAL		
	2,109.4	8.5	3	5	7						SS-39	M		Stiff, tan, SILT with sand (A-4)		
2110	2,109.4	8.5	3	5	7						SS-40	M		Stiff to very stiff, reddish tan, SILT with sand (A-4)	8.0	
2105	2,104.4	13.5	6	5	12						SS-41	M			15.0	
														Boring Terminated at Elevation 2,102.9 ft in Silt with Sand		

NCDOT BORE SINGLE 71175069 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231		TIP U-5840		COUNTY HENDERSON		GEOLOGIST McCloud, P.D.											
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)							GROUND WTR (ft)										
BORING NO. B-09		STATION 54+04		OFFSET 9 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 2,117.1 ft		TOTAL DEPTH 15.0 ft		NORTHING 632,339		EASTING 959,559											
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER Odom, C.J.		START DATE 05/17/17		COMP. DATE 05/17/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2120																	
	2,116.1	1.0													2,117.1	GROUND SURFACE	0.0
2115			5	9	7										2,116.0	8" Asphalt over 6" Stone Base	1.1
	2,113.6	3.5	3	4	4											ROADWAY EMBANKMENT	
	2,111.1	6.0	2	4	4											Medium stiff to very stiff, reddish tan and gray, SILT with sand (A-4)	
2110			2	4	4												
	2,108.6	8.5	3	2	3												
2105															2,105.1		12.0
	2,103.6	13.5	6	9	11											RESIDUAL	
															2,102.1	Stiff to very stiff, reddish tan, SILT with sand (A-4)	15.0
																Boring Terminated at Elevation 2,102.1 ft in Silt with Sand	

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

STRUCTURE RECOMMENDATIONS

W.B.S. NO. 50231 DESCRIPTION Mechanically Stabilized Earth Retaining Wall #4
T.I.P. NO. U-5840
COUNTY Henderson
STATION 10+00.00 to 11+27.67
-W4-

	INITIALS	DATE
DESIGN	PDM	3/9/2018
CHECKED	DJC	3/9/2018
FINAL	DJC	3/9/2018



COMMENTS & NOTES

Note on Plans:

1. FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.
2. USE AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. 4.
3. WHEN USING AN MSE WALL SYSTEM WITH SRW UNITS FOR RETAINING WALL NO. 4, FREEZE-THAW DURABLE SRW UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS ARE REQUIRED.
4. AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 4.
5. A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 4.
6. A DRAIN IS REQUIRED FOR RETAINING WALL NO. 4.
7. DESIGN RETAINING WALL NO. 4 FOR THE FOLLOWING:
 - 1) $H = \text{DESIGN HEIGHT} + \text{EMBEDMENT}$.
 - 2) DESIGN LIFE = 75 YEARS
 - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 2,000 PSF. THIS ASSUMES ANY FILL OR SOFT SOILS, IF ENCOUNTERED, WILL BE UNDERCUT AND REPLACED.
 - 4) MINIMUM REINFORCEMENT LENGTH (L) = $0.9 \times H$ OR 6 FT, WHICHEVER IS LONGER

STRUCTURE RECOMMENDATION NOTES ON PLANS AND COMMENTS

PROJECT No.: U-5840 WALL NO: 4 COUNTY: Henderson
STATION: 10+00.00 to 11+27.67 -W4- DESCRIPTION: SR1547 FROM US 25 TO SR1551

5) REINFORCED ZONE AGGREGATE PARAMETERS:

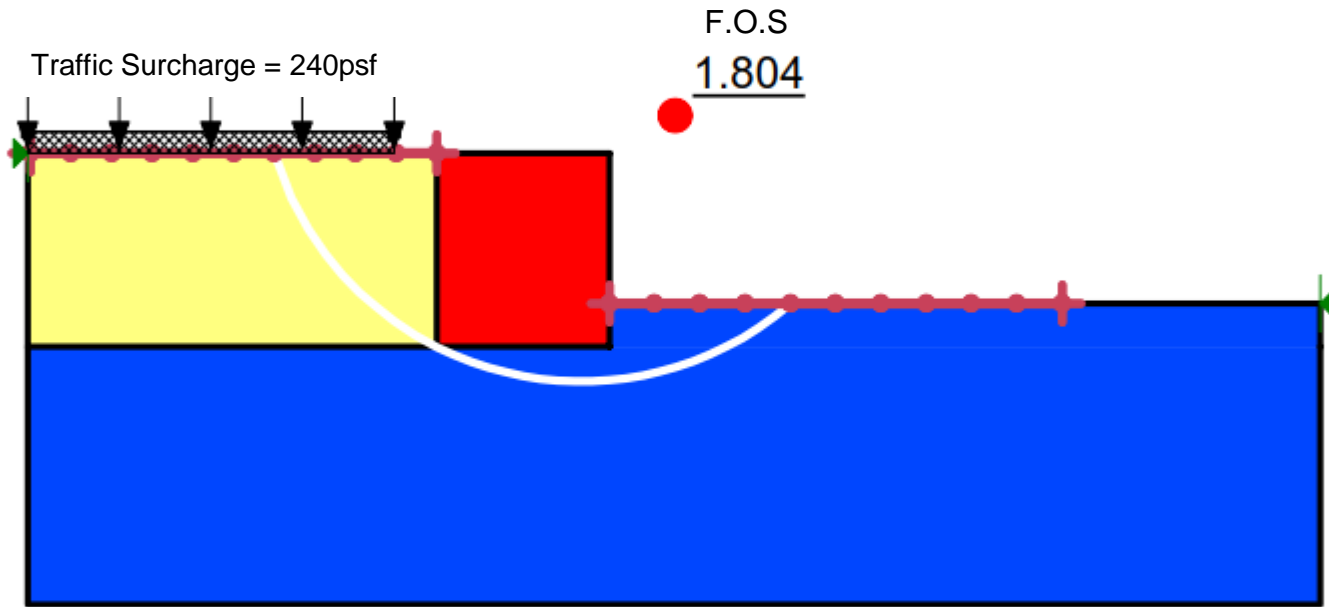
AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) PSF
COURSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (Φ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	110	26	0

8. DESIGN RETAINING WALL NO. 4 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.
9. DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 4 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.
10. IGNORE PASSIVE EARTH PRESSURES IN THE UPPER 18 INCHES.



LEGEND:

- = Backfill Soil ($\gamma=120$ pcf, $\Phi=30^\circ$, $c=0$)
- = Foundation Soil ($\gamma=110$ pcf, $\Phi=26^\circ$, $c=0$)

Project Manager: PDM	Project No. 71175059
Drawn by: PDM	Scale: AS SHOWN
Checked by: DJC	File Name: Wall 4
Approved by: DJC	Date: MARCH 2018

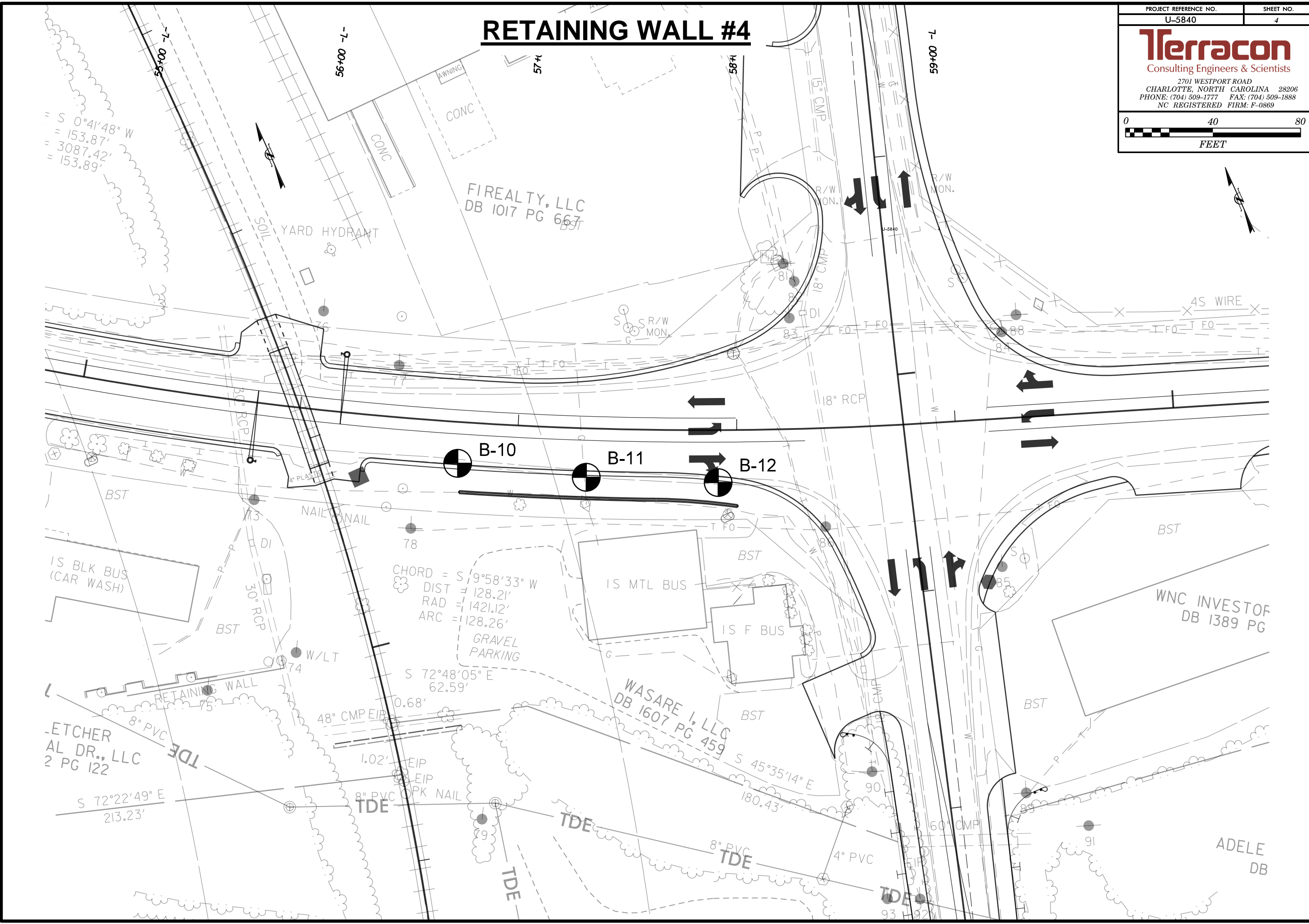
Terracon
2701 Westport Road
Charlotte, NC 28208

GLOBAL STABILITY ANALYSIS

Mechanically Stabilized Earth Retaining Wall #4
State Project No. U-5840
Henderson County, North Carolina

Page
3

RETAINING WALL #4



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231			TIP U-5840			COUNTY HENDERSON			GEOLOGIST McCloud, P.D.							
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)										GROUND WTR (ft)						
BORING NO. B-10			STATION 56+74			OFFSET 19 ft RT			ALIGNMENT -L-							
COLLAR ELEV. 2,106.5 ft			TOTAL DEPTH 20.0 ft			NORTHING 632,184			EASTING 959,782							
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Odom, C.J.			START DATE 05/17/17			COMP. DATE 05/17/17			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)
2110																
2105	2,105.5	1.0	1	1	2	3								2,106.5	GROUND SURFACE	0.0
														2,106.1	5" Topsoil	0.2
	2,103.0	3.5	2	3	5						SS-47	M			ROADWAY EMBANKMENT Soft to medium stiff, red and tan, SILT with sand (A-4)	
	2,100.5	6.0	3	3	5						SS-48	M		2,101.0		
2100	2,098.0	8.5	2	3	3						SS-49	M			Medium stiff, tan to tan, red, and gray, SILT with sand (A-4)	
	2,098.0	8.5	2	3	3						SS-50	M				
2095	2,093.0	13.5	3	3	4									2,094.5	RESIDUAL	12.0
	2,093.0	13.5	3	3	4						SS-51	M			Medium stiff to stiff, tan, SILT with sand (A-4)	
2090	2,088.0	18.5	2	5	7									2,086.5		20.0
											SS-52	M			Boring Terminated at Elevation 2,086.5 ft in Silt with Sand	

GEOTECHNICAL BORING REPORT BORE LOG

WBS 50231	TIP U-5840	COUNTY HENDERSON	GEOLOGIST McCloud, P.D.
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)			GROUND WTR (ft)
BORING NO. B-11	STATION 10+58	OFFSET 10 ft LT	ALIGNMENT -W4-
COLLAR ELEV. 2,101.9 ft	TOTAL DEPTH 20.0 ft	NORTHING 632,154	EASTING 959,833
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Odom, C.J.	START DATE 05/17/17	COMP. DATE 05/17/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2105																
2100	2,100.9	1.0														
	2,098.4	3.5	2	1	3											
	2,095.9	6.0	2	2	3											
2095	2,095.9	6.0	3	5	6											
	2,093.4	8.5	2	1	1											
2090																
	2,088.4	13.5	2	2	4											
2085																
	2,083.4	18.5	2	5	5											

	GROUND SURFACE	2,101.9				0.0
	4" Topsoil					
	ROADWAY EMBANKMENT					
	Medium stiff, reddish tan to reddish tan and brown, CLAY with sand (A-5 (6))					
		2,095.9				6.0
	RESIDUAL					
	Very soft to stiff, gray and tan, SILT with sand (A-4)					
		2,089.9				12.0
	Medium stiff to stiff, tan, brown, and gray, SILT with sand (A-4)					
		2,081.9				20.0
	Boring Terminated at Elevation 2,081.9 ft in Silt with Sand					

NCDOT BORE SINGLE 71175069 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 50231		TIP U-5840		COUNTY HENDERSON		GEOLOGIST McCloud, P.D.										
SITE DESCRIPTION SR 1547 (Old Airport Road) from US 25 (Hendersonville Road) to SR 1551 (Mills Gap Road)							GROUND WTR (ft)									
BORING NO. B-12		STATION 11+18		OFFSET 10 ft LT		ALIGNMENT -W4-										
COLLAR ELEV. 2,098.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 632,127		EASTING 959,887										
DRILL RIG/HAMMER EFF./DATE HPC8513 CME-550 81% 06/06/2016		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic		0 HR. Dry										
DRILLER Odom, C.J.		START DATE 05/17/17		COMP. DATE 05/17/17		24 HR. FIAD										
SURFACE WATER DEPTH N/A																
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2100																
	2,097.4	1.0														
2095	2,094.9	3.5	2	2	1	3						SS-59	M			
	2,092.4	6.0	2	2	3							SS-60	M			
2090	2,089.9	8.5	2	3	4							SS-61	M			
	2,089.9		7	11	16							SS-62	M			
2085	2,084.9	13.5	8	11	11							SS-63	M			

NCDOT BORE SINGLE 71175059 - U-5840 - HENDERSON COUNTY RETAINING WALLS.GPJ NC_DOT.GDT 6/16/17

