

GEOTECHNICAL STUDY

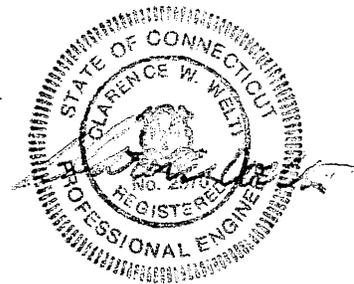
**CONSTRUCTION OF THE
NEW BRITAIN - HARTFORD BUSWAY
ConnDOT Project 171-305**

**Proposed Retaining Wall #102
Busway Sta 141+55 to Sta 145+68 (Left)**

**Prepared for:
Close, Jensen & Miller, P.C.**

**Prepared by:
Dr. Clarence Welti, P. E., P. C.**

April, 2011



GEOTECHNICAL STUDY

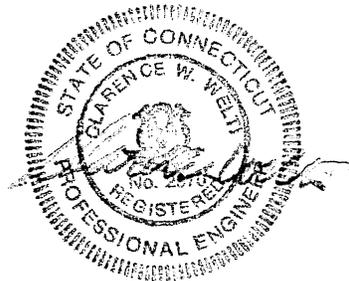
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1.0 Introduction and Background:

1.1 This study addresses the geotechnical requirements for the design of Retaining Wall #102 to be constructed as part of the New Britain to Hartford Busway project. The subject wall will be located along the left (westerly) shoulder of the Multi-Use Trail beginning at Sta 141+55 and terminating at Sta 145+68. The wall will mitigate rights of way impacts.

1.2 Retaining Wall #102 will be a proprietary system to be approved by the Connecticut DOT. The wall will be aligned with the Busway on a horizontal tangent and offset 28.5 feet left of the Busway Baseline. The wall will predominantly support the soils at the cut limits along the Multi-Use Trail. The soil retention will be up to about 8 feet high and the total wall height from the foundation bottom would be about 10± feet. The foundations will bear on soil. In general, there do not appear to be any unusual construction requirements for Wall #102 based on the test borings and topographic information. One issue that may require careful attention backfilling and any reinforcing grids would be located at Sta 145+25 where a catch basin will be installed within the backfill zone of the wall and a 24" r.c. pipe will be carried beneath the wall.

1.3 Regarding Temporary Shoring of excavations for this wall, the inside face of the wall falls within about 5 feet laterally off the ConnDOT highway line. It is possible that shoring would be required if construction and/or permanent easements cannot be obtained. Such shoring if required, should fall within the scope of the Standard Specifications Form 816. The groundwater will probably be intercepted at some of the foundations excavations. Temporary Sheet Piling and Cofferdam & Pumping are contractor provided items.

1.4 The design of the wall will be completed in U.S. Customary Units and in accordance with the LRFD method. It is presumed that the designs for temporary shoring can be completed with other methods such as Allowable Stress Design (ASD) or Load Factor Design (LFD).

1.5 Field exploration for the proposed wall included four test borings, RW-103-1, RW103-2, R-7 and R-8 drilled by Associated Borings Company, Inc. in August, 2007. Four supplemental borings, RW-102-X-1 through RW-102-X-4, were drilled in March, 2011 by Associated Borings Company. The supplemental borings were required because the retaining wall was relocated substantially from the preliminary design alignment. The borings were drilled with a 2½" hollow stem auger to a maximum depth of 25 feet below the existing grades. Standard penetration tests and soil sampling were performed with a standard 2" split spoon sampler using a 140 pound hammer and hammer fall 30 inches. Clarence Welti Associates provided inspection services during the 2007 drilling program. Pilot boring RB-12 drilled by Seaboard Drilling, Inc. in March of 2003 for the pilot subsurface investigation is included herein. Baker Engineering of NY performed the inspection services for the pilot program.

2.0 Geology and Soils Cross Section + Soil Properties:

2.1 The Geologic Origin of the natural soils (beneath the fills) at the site and environs consist predominantly of glacial lake deposits atop the bedrock or possibly overlying a stratum of glacial moraine atop the rock. The glacial lake deposits consist generally of silt and clayey silt. The bedrock from geologic mapping is Portland Arkose (Sandstone or Siltstone).

2.2 The Soils/Rock Cross Sections from the borings are generally as follows:

Boring R-7 (Sta 142+0; Elev. 86.7), RW103-2 (Sta 147+0; Elev. 82.52), R-8 (Sta 144+0; Elev. 84.7), RW103-1 (Sta 146+0; Elev. 83.3):

FILL: Fine to medium SAND, some to and Gravel, trace Silt to 2 to 4 feet, loose to medium compact

At RW103-2 FILL: fine to medium SAND and GRAVEL, some Cobbles to 11 feet, medium compact

Clayey SILT to 15+ feet in R-7 and R-8 and to 25+ feet in RW103-1 and RW103-2, medium compact

The water table was observed at 9 feet below grade in R-7 (Elev. 77.7) and at 2 feet in R-8 after 24 hours (Elev. 82.7), and at 2 feet below grade in RW-103-1 after 0 hours (Elev. 81.3)

Boring RW-102-X-1 (Sta 142+0; Elev. 86.7), RW-102-X-2 (Sta 143+0; Elev. 88.5), RW-102-X-3 (Sta 145+0; Elev. 88.3), RW-102-X-4 (Sta 145+50; Elev. 88.5):

FILL: Fine to medium SAND, trace to some Gravel, Silt, Brick and Wood to 3.5 to 9 feet, loose to medium compact

At RW-102-X-3 FILL: PEAT layer from 8 feet to 9 feet

SILT to 25+ feet, medium compact to locally loose

Pilot Boring RB-12 by Seaboard Drilling (Sta 142+40; Elev. 86.5):

FILL; medium to coarse GRAVEL, Silt and Sand to 2.3 feet, dense

Possible FILL; SILT, some fine to medium Gravel, little Sand to 4.5 feet, dense

Clayey SILT to 10.5 feet, very stiff

Strata of SILT to Clayey SILT, or fine SAND with some Silt to 22.5 feet

Glacial Moraine (TILL); fine to coarse Gravel and SILT, little Sand to 26+ feet, very dense

2.3 The **Water Table** was evident in the bore holes at 2 to 9 feet below grade. The variation is largely due to the changes in topography. It should be assumed that the groundwater will be near the base of the fills beneath the rail bed and within 2 feet of existing grades in the lower areas outside the rail bed.

2.4 Regarding the **Soil Properties** the following will apply:

New Backfill (Material of Section 3.3 below):

Unit Weight (moist)	125 pcf
Water Content	6 to 8%
Angle of Internal Friction	34°

Existing Fills:

Unit Weight	120 to 125 pcf
Submerged Unit Weight:	62 to 65 pcf
Angle of Internal Friction	32° to 34°
Stiffness Modulus	400+ Tons/sf

Natural Clayey Silt Deposits:

Unit Weight	110 pcf
Submerged Unit Weight	55 pcf
Angle of Internal Friction	30+°
Stiffness Modulus	100 to 200+ Tons/sf

Glacial Moraine, Till:

Unit Weight	130 pcf
Submerged Unit Weight	70 pcf
Angle of Internal Friction	36° to 38°
Typical Stiffness Modulus	>1,000 tons/sf

Notes:

The above soil parameters can be used for the design of temporary shoring.

The values of internal friction angle cited are estimated from SPT data

2.5 The natural soils will be sensitive to remolding under equipment when wet from ground water or stormwater onto the exposed subgrades.

3.0 Foundations and Design Considerations:

3.1 Regarding **Design of the Wall**, the soil bearing, overturning and sliding must be addressed in

the foundations. The **Criteria for Foundation Type and Loading** are assumed as follows:

1. The maximum total settlement shall not exceed 1" and the maximum differential settlement shall not exceed ½" in 20 feet of length.
2. The seismic section of the ConnDOT and AASHTO bridge design specifications will not apply to the subject walls with height less than 25 feet.

3.2 The recommended **Foundation Type** is with spread footings. The footings shall be at least 3 feet below existing grades to be below any frost disturbed soils. The subgrades will largely fall on, or just above the natural silt or clayey silt deposits, which will be saturated or close to saturation. Regarding establishment of an ultimate bearing capacity, the ultimate loading is based on the internal friction angle, which is related to the soil density, overburden weight and depth to groundwater. Based on the sample blow counts in the natural soils, the angle of internal friction is at least 29°, which indicates an ultimate capacity of at least (10 ksf). The AASHTO LRFD resistance factor based on friction angle estimated from SPT data would be $\phi_R = 0.35$. This indicates a design bearing resistance of about 3 ksf. Based on review of LRFD programs, particularly as relates to reduction for inclined loading, a significant reduction from ultimate bearing capacity is indicated, based on the ratio of lateral loading to vertical loading. This reduction is almost double the reduction for the ASD procedure. **To address this reduction it is suggested that the more appropriate LRFD value for ϕ be 0.50.** Based on the estimated minimum stiffness modulus of 100 to 200 Tons/sf, the recommended design bearing resistance for footings on the natural soils is 3 ksf to maintain settlements within the design criteria.

3.2.1 The subgrades will probably be in wet clayey silt deposits as cited above. The underlay for this condition shall be with an 8" layer of No. 8 crushed stone on a subgrade stabilization geotextile (ConnDOT approved) atop a minimum 2" thick concrete mud mat ($f'_c = 2,000+$ psi compression strength). The crushed stone layer does not have to be compacted. Where footing subgrades fall on dry soils the underlay can be with at least 8" of compacted granular fill conforming to Form 816, section. The granular fill shall be compacted to at least 95% of modified optimum density. The above underlay requirements will provide uniformly stiff surfaces to receive the footings.

3.3 The required backfill for the walls shall be **Pervious Structure Backfill** in conforming to ConnDOT Form 816, M.02.05. This material will have a unit weight of 125 pcf and internal friction angle of 34°.

3.4 The ultimate friction angle between the concrete and soil beneath the footings will be at least 28°. This would result in ultimate sliding factor of **0.53**, based on AASHTO criteria. The applicable resistance factor for sliding of pre-cast concrete on the soil can be $\phi_R = 0.90$ and for cast in place concrete the factor is $\phi_R = 0.80$.

3.5 Regarding **Lateral Earth Pressure**, design of free standing walls can be based on active earth pressure using the active pressure coefficient $K_A = 0.28$ (level backfill).

3.6 Regarding **groundwater mitigation**, there shall be 6" structure under drains placed behind the entire wall.

3.7 Summary of Preliminary Foundation Design Parameters for Wall #102:

PARAMETER	LRFD DESIGN VALUE	ULTIMATE RESISTANCE	COMMENTS
Design Bearing Resistance	3 ksf (based on settlement)	12 ksf	Resistance factor $\phi_R = 0.35$
Backfill Unit Weight *	125 pcf	–	ConnDOT Form 816 M.02.05
Angle of Internal Friction ϕ_1 (Backfill) *	34°	–	Compacted Pervious Backfill 95% of MOD
Sliding Factor, pre-cast concrete on soil	0.48	0.53	Resistance factor $\phi_R = 0.90$
Sliding Factor, cast in place concrete on soil	0.42	0.53	Resistance factor $\phi_R = 0.80$
Interface Friction Angle Concrete to Backfill, δ	21°	30°	Value from AASHTO LRFD Manual
Active Pressure Coefficient, K_A (Backfill)	0.28	–	
Frost Protection Depth	4 feet	–	ConnDOT Bridge Design Guide

* For Backfill conforming to Pervious Structure backfill (section M.02.05)

4.0 Report Conditions: This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other

warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

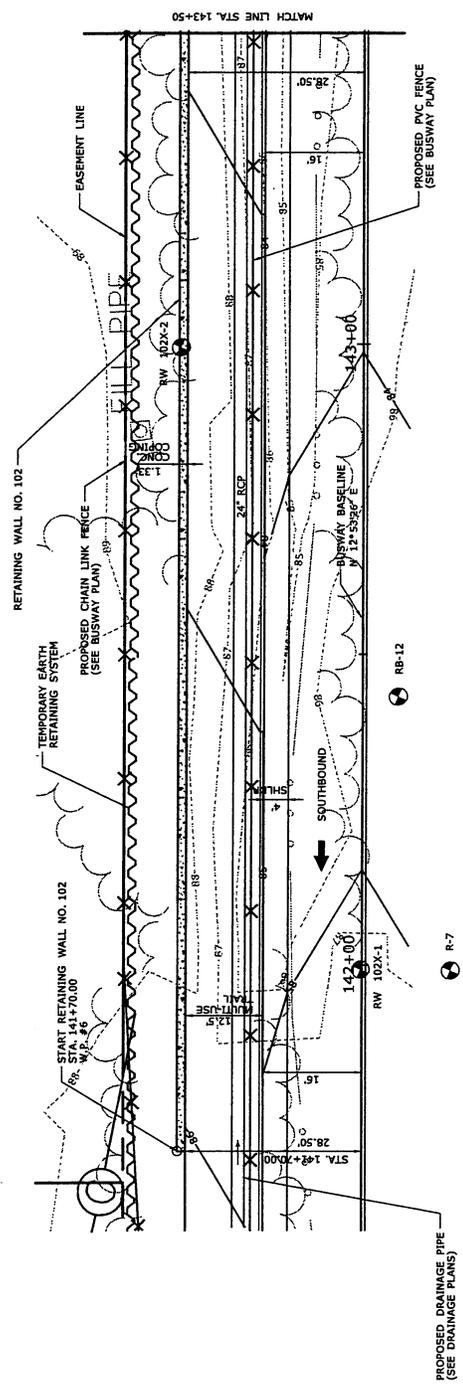
The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Clarence Welti, P.E., P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

APPENDIX 1

TEST BORING LOGS

BORING LOCATION PLAN

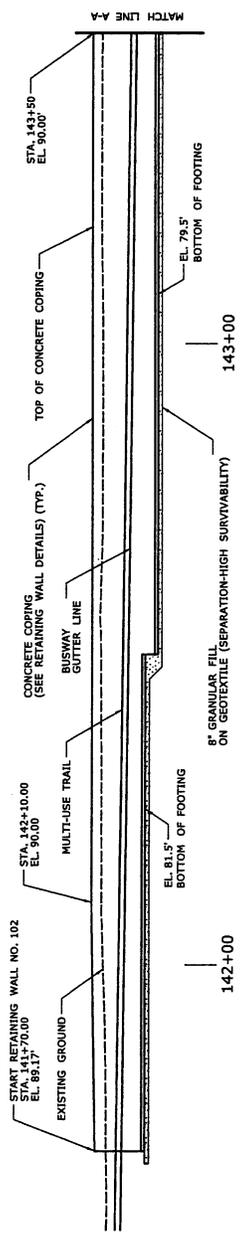


LEGEND

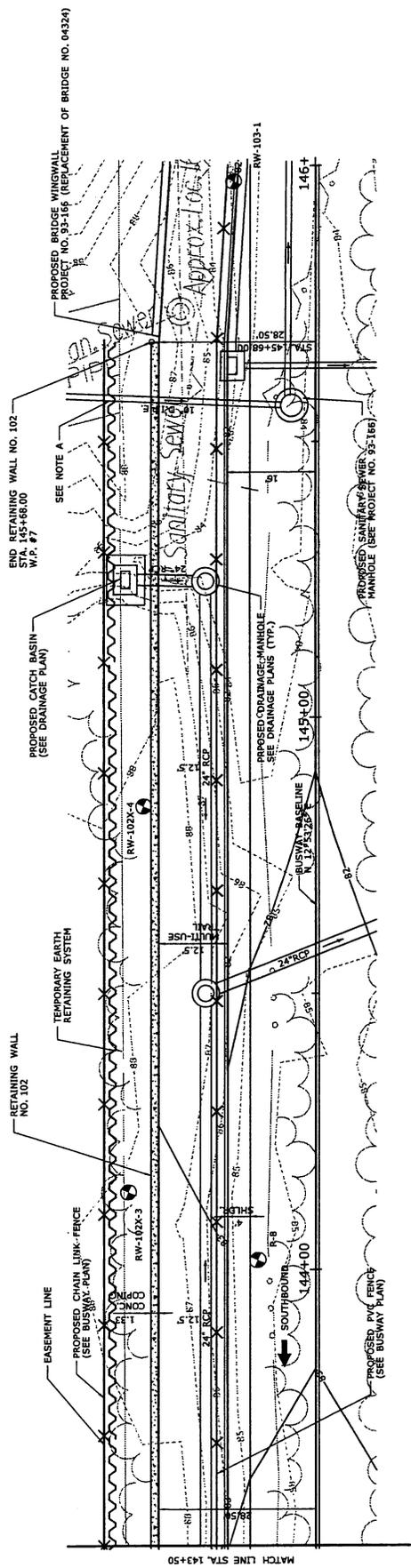


BORING SYMBOL

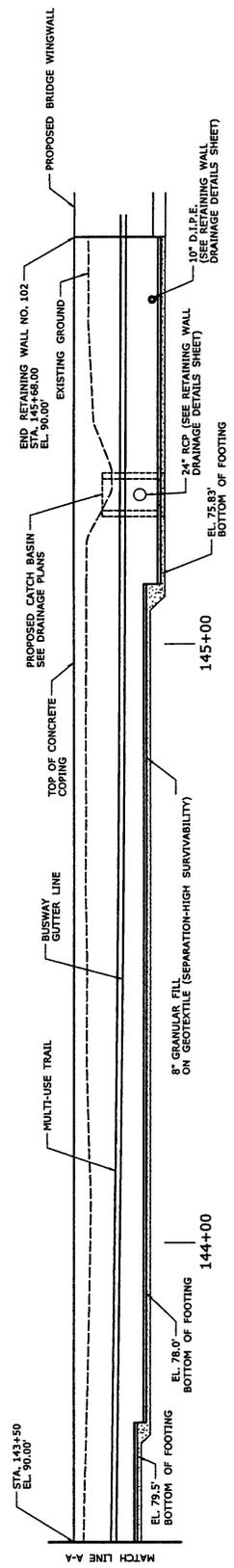
PLAN



ELEVATION



PLAN



ELEVATION

Thomas Lloret		SM-001 REV. 10/92		BORING REPORT		SHEET 1 OF 1						
DRILLER Matt Stark		STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION				Associated Borings Co., Inc.						
INSPECTOR Welti & Associates, P.C.		TOWN: New Britain/Newington, CT		BORING CONTRACTOR Close Jensen & Miller, P.C.								
SOILS ENGINEER		PROJECT NAME: Hartford-New Britain Busway		DESIGN ENGINEER								
Surface Elevation: 86.7		PROJECT NUMBER: 171-305		LOCATION:								
Date Started: 3/15/2011		Auger		Casing		Hole No. RW-102X-1						
Date Finished: 3/15/2011		Type		HSA		Line & Station 141+99						
Groundwater Observations		Size I. D. 2 1/4 in		2 in		Offset 0'						
AT 2 'AFTER 0 HRS		Hammer		140 lb		N Coordinate 813170.76						
AT 'AFTER HRS		Fall		30 in		E. Coordinate 998728.16						
DEPTH	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0 - 6	6 - 12	12-18	18-24		
5		0.0 - 2.0	1	24	10	D	1	5	12	23	3.5	Blk. M-F Sand and M-F Gravel, Tr. Silt (Fill)
		2.0 - 4.0	2	24	8	D	16	17	7	7		
		4.0 - 6.0	3	24	12	D	4	8	8	10		
10		6.0 - 8.0	4	24	10	D	4	7	4	7		
		10.0 - 12.0	5	24	14	D	5	6	7	7		
15												
		15.0 - 17.0	6	24	20	D	6	9	13	11		
20												
		20.0 - 22.0	7	24	20	D	7	19	28	36		
25												
		23.0 - 24.0	8	12	8	D	42	50	X	X		
30												
35												
40												
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet				
Footage in Earth 24.0		Footage in Rock 0.0		No. of Samples 8		Hole No. RW-102X-1						
SAMPLE TYPE CODING: D = DRIVEN		C = CORE		A = AUGER		UP = UNDISTURBED PISTON						
PROPORTIONS USED: TRACE = 1-10%		LITTLE = 10-20%		SOME = 20-35%		AND = 35-50%						

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DRILLER Matt Stark		STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION				Associated Borings Co., Inc.						
INSPECTOR Welti & Associates, P.C.		TOWN: New Britain/Newington, CT		BORING CONTRACTOR Close Jensen & Miller, P.C.		DESIGN ENGINEER						
SOILS ENGINEER		PROJECT NAME: Hartford-New Britain Busway		PROJECT NUMBER: 171-305								
Surface Elevation: 88.5		LOCATION:										
Date Started: 3/17/2011		Auger		Casing		Sampler		Core Bar		Hole No. RW-102X-2		
Date Finished: 3/17/2011		Type		HSA						Line & Station 143+00		
Groundwater Observations		Size I. D.		2 1/4 in		2 in				Offset 30' LT		
AT 4 'AFTER 0 HRS		Hammer				140 lb		Bit		N Coordinate 813275.00		
AT 'AFTER HRS		Fall				30 in				E. Coordinate 998721.90		
DEPTH	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0-6	6-12	12-18	18-24		
5		0.0 - 2.0	1	24	2	D	1	1	3	1	8	Dk. Red Br. Silty Sand, Brick, Wood (Fill)
		2.0 - 4.0	2	24	0	D	1	1	W	1		
		4.0 - 6.0	3	24	3	D	W	W	1	1		
		6.0 - 8.0	4	24	4	D	1	1	2	2		
		8.0 - 10.0	5	24	14	D	2	2	W	4		
10		10.0 - 12.0	6	24	16	D	W	4	8	9	25	Red Br. F. Silty Sand, Tr. Clay
15		15.0 - 17.0	7	24	14	D	4	4	4	4		End of Boring - 25.0
20		20.0 - 22.0	8	24	18	D	3	4	4	4		
25		23.0 - 25.0	9	24	16	D	7	8	12	16		
30												
35												
40												
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet				
Footage in Earth 25.0		Footage in Rock 0.0		No. of Samples 9		Hole No. RW-102X-2						
SAMPLE TYPE CODING: D = DRIVEN C = CORE A = AUGER UP = UNDISTURBED PISTON		PROPORTIONS USED: TRACE = 1-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%										

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INSPECTOR Welti & Associates, P.C.		TOWN: New Britain/Newington, CT				BORING CONTRACTOR Close Jensen & Miller, P.C.						
SOILS ENGINEER		PROJECT NAME: Hartford-New Britain Busway				DESIGN ENGINEER						
Surface Elevation: 88.3		PROJECT NUMBER: 171-305										
Date Started: 3/17/2011		Auger		Casing		Sampler		Core Bar		Hole No. RW-102X-3		
Date Finished: 3/17/2011		Type		HSA						Line & Station 144+14		
Groundwater Observations		Size I. D.		2 1/4 in		2 in				Offset 34' LT		
AT 4 'AFTER 0 HRS		Hammer				140 lb		Bit		N Coordinate 813387.64		
AT 'AFTER HRS		Fall				30 in				E. Coordinate 998743.12		
D E P T H	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0 - 6	6 - 12	12-18	18-24		
5		0.0 - 2.0	1	24	11	D	3	4	6	6	8	Dk. Red Br. M-F Silty Sand, Brick, Wood (Fill)
		2.0 - 4.0	2	24	3	D	6	7	6	6		
		4.0 - 6.0	3	24	8	D	2	4	6	6		
		6.0 - 8.0	4	24	4	D	4	4	4	4		
		8.0 - 10.0	5	24	14	D	5	7	7	6		
10		10.0 - 12.0	6	24	20	D	7	8	7	7	9	Blk. Peat
												Red Br. Silt
15		15.0 - 17.0	7	24	20	D	4	6	9	10	25	End of Boring - 25.0
20		20.0 - 22.0	8	24	20	D	2	4	4	4		
25		23.0 - 25.0	9	24	18	D	2	2	2	6		
30												
35												
40												
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet				
Footage in Earth 25.0		Footage in Rock 0.0		No. of Samples 9		Hole No. RW-102X-3						
SAMPLE TYPE CODING: D = DRIVEN		C = CORE		A = AUGER		UP = UNDISTURBED PISTON						
PROPORTIONS USED: TRACE = 1-10%		LITTLE = 10-20%		SOME = 20-35%		AND = 35-50%						

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INSPECTOR Welti & Associates, P.C.		TOWN: New Britain/Newington, CT				BORING CONTRACTOR Close Jensen & Miller, P.C.								
SOILS ENGINEER		PROJECT NAME: Hartford-New Britain Busway				DESIGN ENGINEER								
Surface Elevation: 88.5		LOCATION:												
Date Started: 3/17/2011		Auger	Casing	Sampler	Core Bar	Hole No.	RW-102X-4							
Date Finished: 3/17/2011		Type	HSA			Line & Station	144+84							
Groundwater Observations		Size I. D.	2 1/4 in		2 in	Offset	31' LT							
AT 4	'AFTER 0 HRS	Hammer			140 lb	Bit	N Coordinate 813455.14							
AT	'AFTER HRS	Fall			30 in		E. Coordinate 998761.46							
DEPTH	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)		
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0-6	6-12	12-18	18-24				
5		0.0 - 2.0	1	24	3	D	2	2	3	5	9	Dk. Red Br. M-F Silty Sand, Brick, Wood (Fill)		
		2.0 - 4.0	2	24	4	D	5	3	2	4				
		4.0 - 6.0	3	24	6	D	1	1	1	7				
10		6.0 - 8.0	4	24	12	D	5	7	7	9		25	Red Br. Silt	
		8.0 - 10.0	5	24	6	D	7	7	12	14				
		10.0 - 12.0	6	24	10	D	5	7	7	9				
15		15.0 - 17.0	7	24	14	D	4	7	10	10			End of Boring - 25.0	
		20.0 - 22.0	8	24	12	D	4	7	7	9				
		23.0 - 25.0	9	24	12	D	5	11	10	9				
20														
25														
30														
35														
40														
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet						
Footage in Earth 25.0		Footage in Rock 0.0		No. of Samples 9		Hole No. RW-102X-4								
SAMPLE TYPE CODING: D = DRIVEN		C = CORE		A = AUGER		UP = UNDISTURBED PISTON								
PROPORTIONS USED: TRACE = 1-10%		LITTLE = 10-20%		SOME = 20-35%		AND = 35-50%								

Thomas Lloret		SM-001 REV. 10/92		BORING REPORT		SHEET 1 OF 1						
DRILLER		STATE OF CONNECTICUT										
Don Moodie		DEPARTMENT OF TRANSPORTATION				Associated Borings Co., Inc.						
INSPECTOR		TOWN:		New Britain/Newington, CT		BORING CONTRACTOR						
Welti & Associates, P.C.		PROJECT NAME:		Hartford-New Britain Busway		Close Jensen & Miller, P.C.						
SOILS ENGINEER		PROJECT NUMBER:		171-305		DESIGN ENGINEER						
Surface Elevation: 83.28		LOCATION:										
Date Started: 8/27/2007		Auger		Casing		Sampler						
Date Finished: 8/27/2007		Type		HSA		SS						
Groundwater Observations		Size I. D.		2 1/4 in		2 in						
AT 2 'AFTER 0 HRS		Hammer				140 lb Bit						
AT 'AFTER HRS		Fall				30 in						
Hole No.		RW-103-1										
Line & Station		146+0										
Offset		17' LT										
N Coordinate		813561.87										
E. Coordinate		998802.58										
DEPTH	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0-6	6-12	12-18	18-24		
5		0.0 - 2.0	1	24	3	D	W	W	1	1	2	Blk. M-F Sand and C-F Gravel, (Fill) Red Br. Clayey Silt
		2.0 - 4.0	2	24	7	D	1	3	3	3		
		4.0 - 6.0	3	24	11	D	7	7	10	9		
		6.0 - 8.0	4	24	10	D	10	9	9	9		
10		10.0 - 12.0	5	24	20	D	10	10	11	11	25	End of Boring - 25.0
		15.0 - 17.0	6	24	20	D	5	6	6	7		
		20.0 - 22.0	7	24	20	D	5	6	6	7		
		23.0 - 25.0	8	24	20	D	4	4	4	6		
25											25	End of Boring - 25.0
30											25	End of Boring - 25.0
35											25	End of Boring - 25.0
40											25	End of Boring - 25.0
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet				
Footage in Earth		25.0		Footage in Rock		0.0		No. of Samples		8 Hole No. RW-103-1		
SAMPLE TYPE CODING:		D = DRIVEN		C = CORE		A = AUGER		UP = UNDISTURBED PISTON				
PROPORTIONS USED:		TRACE = 1-10%		LITTLE = 10-20%		SOME = 20-35%		AND = 35-50%				

Thomas Lloret		SM-001 REV. 10/92		BORING REPORT		SHEET 1 OF 1						
DRILLER Don Moodie		STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION				Associated Borings Co., Inc.						
INSPECTOR Welti & Associates, P.C.		TOWN: New Britain/Newington, CT				BORING CONTRACTOR Close Jensen & Miller, P.C.						
SOILS ENGINEER		PROJECT NAME: Hartford-New Britain Busway				DESIGN ENGINEER						
Surface Elevation: 82.52		PROJECT NUMBER: 171-305										
Date Started: 8/27/2007		Auger		Casing		Hole No. RW-103-2						
Date Finished: 8/27/2007		Type		SS		Line & Station 147+0						
Groundwater Observations		Size I. D. 2 1/4 in		2 in		Offset 20' LT						
AT 14 'AFTER 0 HRS		Hammer		140 lb		N Coordinate 813662.83						
AT 7 'AFTER 24 HRS		Fall		30 in		E. Coordinate 998822.52						
DEPTH	Casing blows per foot	SAMPLE					BLOWS PER 6 INCHES ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		DEPTH IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	0-6	6-12	12-18	18-24		
5		0.0 - 2.0	1	24	7	D	4	4	7	5	11	Dk. Br. M-F Sand and C-F Gravel, Cobbles, (Fill)
		2.0 - 4.0	2	24	9	D	5	4	4	4		
		4.0 - 6.0	3	24	11	D	6	6	7	6		
		6.0 - 8.0	4	24	9	D	5	7	7	7		
		8.0 - 10.0	5	24	14	D	3	3	4	4		
10		10.0 - 12.0	6	24	11	D	3	5	7	7		
		12.0 - 14.0	7	24	16	D	7	7	7	10		
15		15.0 - 17.0	8	24	17	D	8	8	8	8		
20		20.0 - 22.0	9	24	10	D	5	7	8	8		
25		23.0 - 25.0	10	24	14	D	9	13	11	40		
30												
35												
40												
From Ground Surface to		Feet Used		Inch Casing Then		Inch Casing For		Feet				
Footage in Earth 25.0		Footage in Rock 0.0		No. of Samples 10		Hole No. RW-103-2						
SAMPLE TYPE CODING: D = DRIVEN		C = CORE		A = AUGER		UP = UNDISTURBED PISTON						
PROPORTIONS USED: TRACE = 1-10%		LITTLE = 10-20%		SOME = 20-35%		AND = 35-50%						

Driller: Harrington/Seaboard	Connecticut DOT Boring Report	Hole No.: RB-12
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 813212.3
Start Date: 03/12/03	Route No.:	Easting: 998743.7
Finish Date: 03/12/03	Bridge No.:	Surface Elevation: 86.5

Project Description: New Britain - Hartford Busway

Casing Type/Size: HSA	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NA
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Hammer Wt.: NA Fall: NA	Hammer Wt.: 140 Fall: 30"
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Groundwater Obs. @ 4.0' after: 0 hours, @1.5' after: 24 hours, @NA after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES						Generalized Strata Description	Material Description and Notes	Elevation (ft.)
	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)				
0									86
1	A-N		1.5						85
2	S-1	11 18 26	1.5	1.3		2.3'	SILTY GRAVEL WITH SAND (GM) - black and dark gray medium to coarse gravel, some silt, some fine to coarse sand; moist, dense, NP; (FILL).	ELEV. 84.2	84
3	A-N		1.5						83
4	A-N		1.5						82
5	S-2	6 8 9	1.5	1.0		4.5'	GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to medium gravel, little very fine to fine sand; moist, dense, NP.	ELEV. 82.0	81
6	A-N		1.5						80
7	A-N		1.5						79
8	S-3	13 15 18	1.5	0.0					78
9	A-N		1.5						77
10	A-N		1.5						76
11	S-4	5 6 8	1.5	1.3		10.5'	SILT (ML) - reddish brown silt; wet, stiff, NPL.	ELEV. 76.0	75
12	A-N		1.5						74
13	A-N		1.5						73
14	S-5	6 7 7	1.5	1.3					72
15	A-N		1.5						71
16	A-N		1.5						70
17	S-6	3 4 5	1.5	1.0		16.5'	SILT (ML) - reddish brown silt; wet, stiff, NPL.	ELEV. 70.0	69
18	A-N		1.5						68
19	A-N		1.5						67
		4				19.5'	CLAYEY SILT WITH SAND (ML/CL) - reddish brown silt, some clay, little very fine to fine sand; wet, stiff, +PL.	ELEV. 67.0	67

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
 Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 26.2' Rock: 0.0'
 No. of Samples: 0

NOTES:

Driller: Harrington/Seaboard	Connecticut DOT Boring Report	Hole No.: RB-12
Inspector: Mark Martin	Town: New Britain / Newington, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 813212.3
Start Date: 03/12/03	Route No.:	Easting: 998743.7
Finish Date: 03/12/03	Bridge No.:	Surface Elevation: 86.5

Project Description: New Britain - Hartford Busway

Casing Type/Size: HSA	Sampler Type/Size: SS/1-3/8" I.D.	Core Barrel Type: NA
Hammer Wt.: NA Fall: NA	Hammer Wt.: 140 Fall: 30"	

Groundwater Obs. @ 4.0' after: 0 hours, @1.5' after: 24 hours, @NA after: hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: southern Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES					Generalized Strata Description	Material Description and Notes	Elevation (ft.)
	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)			
20	S-7	4	1.5	1.1			SILTY SAND (SM) - reddish brown very fine to fine sand, some silt; wet, loose, NP.	66
21		6						65
22	A-N		1.5					64
23	S-8	43 65	1.5	0.8		22.5'	GRAVELLY SILT WITH SAND (ML) - reddish brown silt, some fine to coarse gravel, little very fine to fine sand; dry, very dense, NP.	ELEV. 64.0 64
24		54						63
25	A-N		1.5					62
26	S-9	38 100/0.2	0.7	0.5		25.5'	SILTY GRAVEL WITH SAND (GM) - reddish brown fine to coarse gravel, some silt, little fine to coarse sand; dry, very dense, NP; (DECOMPOSED ROCK).	ELEV. 61.0 61
27								60
28							End of boring at 26.2'	ELEV. 60.3 59
29								58
30								57
31								56
32								55
33								54
34								53
35								52
36								51
37								50
38								49
39								48
								47

Sample Type: S=Split Spoon C=Core UP=Undisturbed Piston V=Vane Shear Test A=Auger
 Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

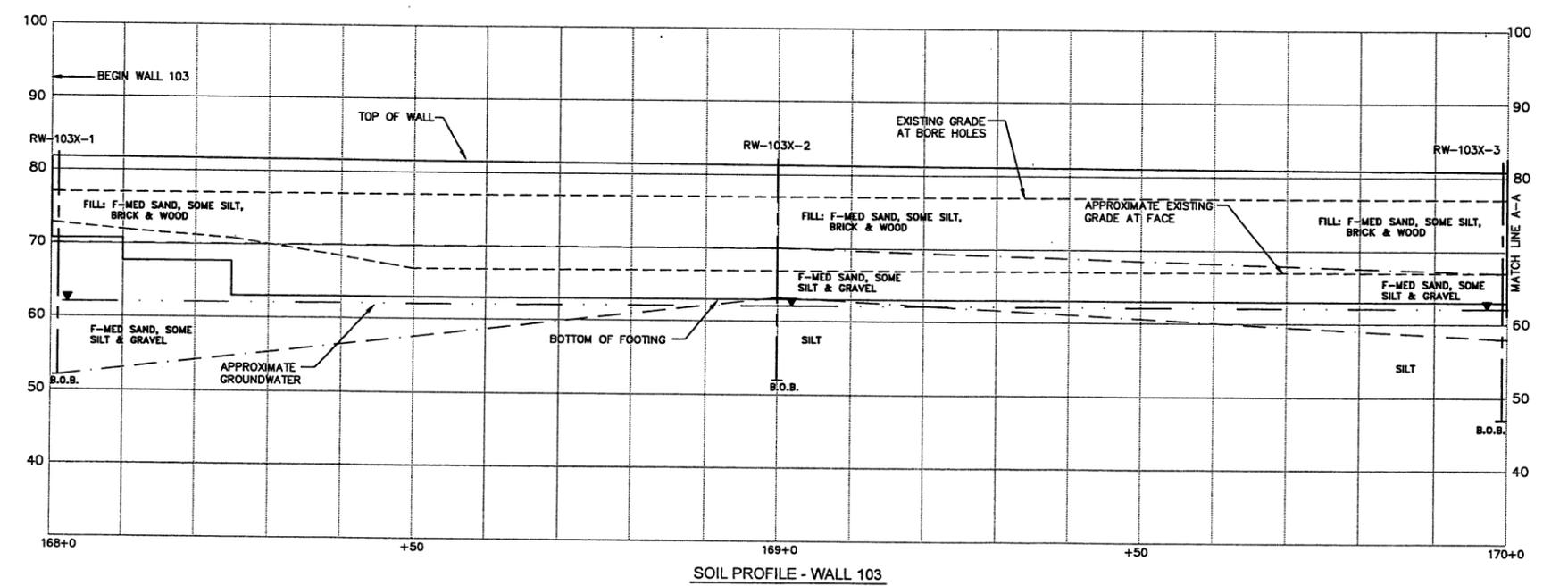
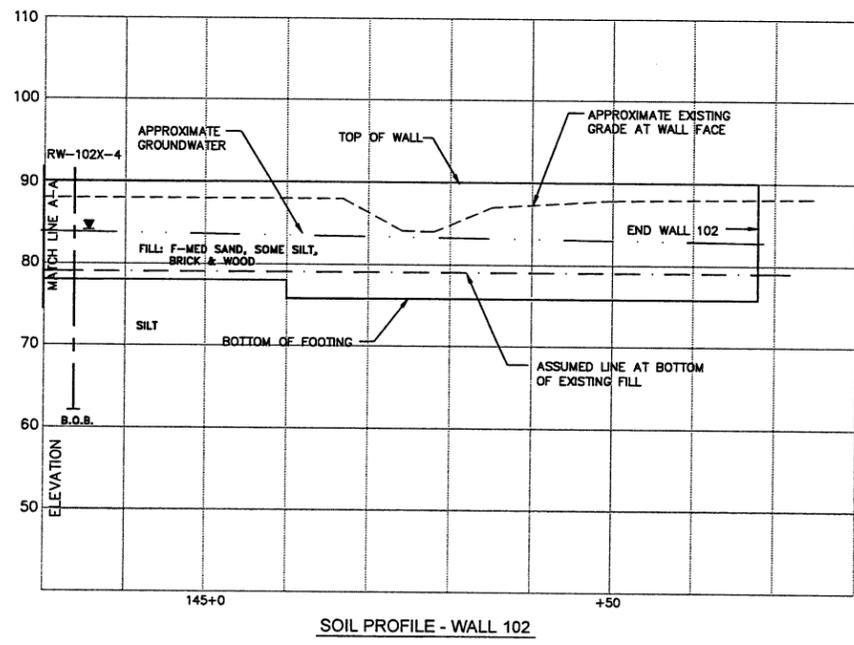
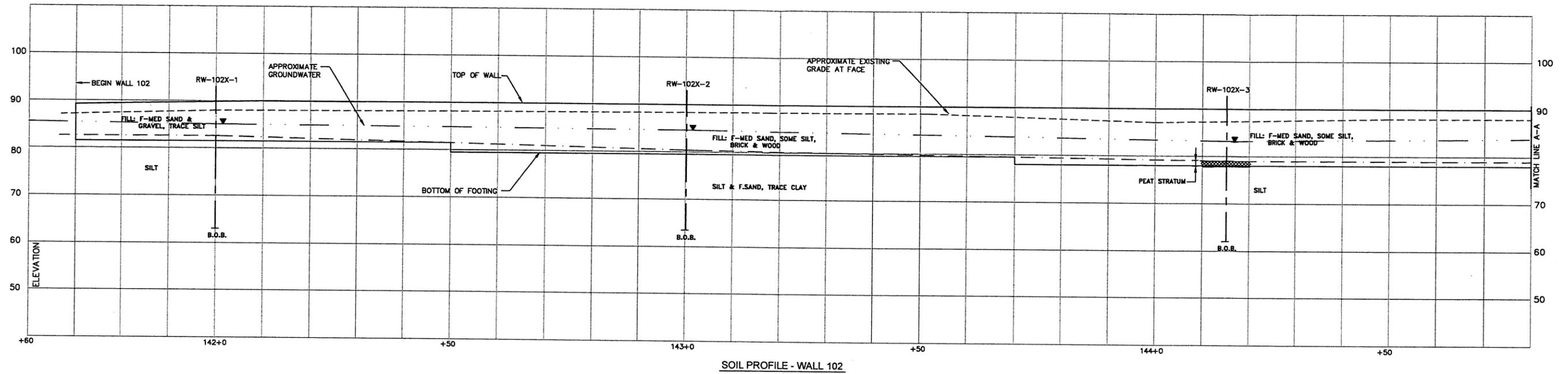
Total Penetration in Earth: 26.2' Rock: 0.0'
 No. of Samples: 9

NOTES:

Sheet 2 of 2

APPENDIX 2

Geologic Sections + Grain Size Gradations (if any)



- A. REF. = AUGER REFUSAL
- B.O.B. = BOTTOM OF BORING
- ▼ = OBSERVED GROUNDWATER LEVEL
- = ESTIMATED WATER TABLE
- = STRATUM CHANGE
- = GRADE LINE

REVISIONS		
DATE	NO.	DESCRIPTION

NEW BRITAIN - HARTFORD BUSWAY
NEWINGTON SECTIONS A & B

STRUCTURE GEOTECHNICAL SECTIONS

SCALE: 1" = 10' DATE: MARCH 30, 2011

DR. CLARENCE WELTI, P.E., P.C.
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GLASTONBURY, CONNECTICUT 06033

SHEET 3