REPORT ON
NEW BRITAIN – HARTFORD BUSWAY OVER NEW BRITAIN AVENUE
STATE PROJECT NO. 171-305
NEWINGTON TO WEST HARTFORD, CONNECTICUT

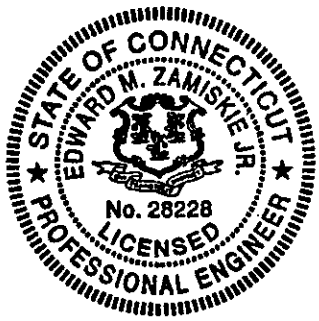
by

Haley & Aldrich, Inc.
Parsippany, New Jersey

for

Ammann & Whitney Consulting Engineers
New York, New York

File No. 32669-000
06 August 2010



Edward M. Zamiskie, Jr., P.E.

HALEY
ALDRICH

Haley & Aldrich, Inc.
299 Cherry Hill Rd.
Suite 105
Parsippany, NJ 07054-1124

Tel: 973.263.3900
Fax: 973.263.2580
HaleyAldrich.com

06 August 2010
File No. 32669-000

Ammann & Whitney Consulting Engineers
96 Morton Street
Floor 8
New York, New York 10014-3326

Attention: Samia Abdou, P.E.

Subject: Revised Final Report
New Britain - Hartford Busway over New Britain Avenue
State Project No. 171-305
Newington to West Hartford, Connecticut

Ladies and Gentlemen:

This revised report presents our foundation design recommendations for the Proposed Busway Bridge over New Britain Avenue, part of the New Britain-Hartford Busway in Newington and West Hartford, Connecticut. The bridge will carry the Busway over New Britain Avenue and will be constructed adjacent to Amtrak Bridge No. 32.90. This report was revised to incorporate comments from the Connecticut Department of Transportation dated 22 January 2010. The bridge location is shown on the Project Locus, Figure 1.

Recommendations in this report have been formulated based on our observations of the site, recent subsurface explorations, the results of laboratory soil testing, and the design information you provided. Design recommendations herein conform to the Connecticut Department of Transportation, Geotechnical Engineering Manual, 2005 Edition, Rev. Feb 2009, and AASHTO LRFD Bridge Design Specifications, 2007, 4th Edition, 2008 Interim Revision.

SUMMARY

Subsurface soils generally consist of fill overlying soft glaciolacustrine deposits over bedrock. We recommend that abutments and wingwalls be supported on steel H-piles driven to bedrock.

The project consists of partial removal of the existing Amtrak Bridge No. 32.90 substructure and spanning New Britain Avenue with a longer, independent bridge to accommodate the proposed Busway.

The approach embankments for the south and north abutments will be 2 to 6 feet (ft) higher than the existing railroad embankment, in an area underlain by glaciolacustrine deposits. Lightweight fill, Expanded Shale, Clay & Slate (ESCS) (rather than normal-weight embankment fill) will be used to construct the new approach embankments to reduce ground settlements to acceptable levels and reduce the lateral loads on the walls (thus reducing pile requirements). By using this fill type there will be a reduced net stress increase in the foundation soils and a reduced unbalanced load. Global stability is satisfied for the pile-supported abutments.

PROPOSED CONSTRUCTION

Proposed construction will consist of the partial removal of the western portion of Amtrak Bridge No. 32.90. The existing abutments will remain in place but will be shortened and remain as retaining walls. This will allow the new bridge superstructure to span over the old abutments to new integral abutments as shown on the drawings in Appendix E.

The proposed bridge over New Britain Avenue will carry the Busway on a new single-span steel plate girder bridge with integral abutments. The Bridge is a 35.83-ft wide structure with an approximately 115-ft span. It will carry two (2) 12-ft travel lanes and two (2) 4-ft shoulders. The height of the fill at the approaches is about 10 to 15 ft. The Busway will approach the New Britain Avenue crossing from south to north at about El. 72 and ramp down to the Elmwood Station at about El. 70. The new bridge provides minimum 16.25-ft of vertical clearance over New Britain Avenue. The proposed bridge layout is shown in Appendix E. Proposed Retaining Walls 105 and 106 terminate at the south end of the bridge wingwall and Retaining Walls 107 and 108 starts at the north end of the bridge wingwall.

Elevations are in feet and refer to National Geodetic Vertical Datum of 1929 (NGVD 29). Coordinates are in feet and based on the Connecticut Coordinate System, North American Datum of 1983 (NAD83).

SITE CONDITIONS

Amtrak Bridge No. 32.90 presently spans New Britain Avenue. The bridge is 78.75 ft long and consists of three (3) riveted steel plate through girders with center to center spacing of 28.0 ft on the east bay and 14.75 ft on the west bay. The substructure consists of reinforced concrete abutments and wingwalls supported on steel H-piles. The bridge provides minimum 14.42-ft of vertical clearance over New Britain Avenue.

Ground surface consists of railroad tracks and ballast with two (2) active tracks on the eastern portion of the site and an abandoned track toward the western side. The abandoned track has been removed including rails and ties. The area west of the abandoned track is covered in vegetation and slopes down from about El. 70 to El. 56. The railroad tracks approach the New Britain Avenue Bridge from south to north at approximately El. 70 and crosses New Britain Avenue at El. 69. New Britain Avenue slopes down from west to east from about El. 52 to El. 49. Existing conditions are shown in Appendix E.

SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Recent Test Borings

Four (4) test borings (NBA-101, NBA-102(OW), RW-115, and RW-116) were drilled in the vicinity of the New Britain Avenue Bridge by General Borings, Inc., of Prospect, Connecticut during the period from 22 October 2007 through 17 March 2008. Test borings were advanced with a truck-mounted B52 drill rig using 3- to 4-in. NW casing or 4¼-in. hollow stem augers. Boring depths ranged from 40 to 57 ft below the ground surface. Soil samples were obtained at maximum 5-ft intervals using a standard split spoon sampler (2-in. O.D., 13/8-in. I.D.) advanced with a 140 pound hammer in general accordance with ASTM Method D1586. Borings were terminated in glaciolacustrine deposits or on bedrock. Eight feet of bedrock was cored using an NW core barrel in NBA-101 and a monitoring well was installed in the completed borehole of NBA-102(OW).

Boring locations and elevations were surveyed by the Connecticut Department of Transportation. Test boring locations are shown on Figure 2 and logs are included in Appendix A.

Recent Laboratory Testing

Geotesting Services, Inc. of Totowa, NJ performed one (1) grain size analysis, five (5) water contents, one set of Atterberg Limits tests, a series of consolidated undrained triaxial compression tests, and two (2) one-dimensional consolidation tests to aid in soil classification and to determine engineering properties on representative samples. Laboratory test results are summarized in Table II and presented in Appendix C.

Previous Borings

Four (4) test borings (Nos. 1 through 4) were conducted on New Britain Avenue for the construction of the existing bridge. One (1) test boring (SB-46) was conducted during the Pilot Program for the proposed Busway. Previous borings locations are shown on Figure 2 and logs are included in Appendix B.

Previous Laboratory Testing

Two (2) grain size analyses, eight (8) water contents, two (2) sets of Atterberg Limits tests, a torvane test, and a one-dimensional consolidation test were performed on representative samples from SB-46 to aid in classification and to determine engineering properties. Previous laboratory test results are presented in Appendix D.

SUBSURFACE CONDITIONS

Borings generally encountered fill underlain by glaciolacustrine deposits over bedrock. Generalized descriptions of soil strata in order of increasing depth below ground surface follow. A profile showing subsurface stratigraphy is presented on Figure 2.

Thickness (ft)	Generalized Description
3.5 to 5.0	**Fill** –Medium Dense brown, coarse to fine SAND, some medium to fine gravel, trace silt
37.0 to 40.5	**Glaciolacustrine Deposits –** Very soft to stiff brown to red brown CLAY varved with gray brown clayey SILT, trace fine sand. Varved couplets approximately 0.5 to 1.0 in. thick on average with occasional clay layers over two in. thick; clay dominant.

Bedrock – Weathered bedrock was encountered at about 38.8 ft below the ground surface in NBA-101 and about 44 ft in NBA-102(OW). Bedrock was encountered and cored at about 42 ft (auger refusal) in NBA-101 and auger refusal was encountered at 51.5 ft below the ground surface in NBA-102(OW). Recovered cores consist of hard, fresh SILTSTONE with good recovery and an RQD of 45%, typical of the Portland Arkose Formation.

Groundwater was measured in NBA-102 about 3 days after the monitoring well was installed. Groundwater is about 7.7 ft below the ground surface, corresponding to El. 46.1. Groundwater levels will fluctuate with season, precipitation, and construction activity and is expected to vary.

ENGINEERING PROPERTIES OF SOILS

For purposes of construction, the glaciolacustrine deposit is important since this stratum is thick, of relatively low strength, relatively compressible and slow to drain. This section describes the

recommended values for engineering soil properties applicable to the design of the bridge foundation system. The recommended engineering properties for design were developed based on the results of laboratory tests conducted by GeoTesting and others, which were primarily focused on the glaciolacustrine deposit at the site.

Index Properties and Compressibility of the Glaciolacustrine Deposit

Based on the laboratory test results from the samples collected near New Britain Avenue, the glaciolacustrine deposit is predominately lean to fat CLAY and SILT with moisture contents generally near the liquid limits. Although not typical, based on the consolidation testing near New Britain Ave, the compressibility of the glaciolacustrine deposit appears to generally decrease with the depth of the stratum. The test results also indicate that the glaciolacustrine in the area of New Britain Avenue has an over-consolidation ratio (OCR) of about 3.3.

Seismicity

Since the Busway is not a critical structure or major interstate, the seismicity was not evaluated.

GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Bridge Foundation Type

Based on the design drawings, dated 5/25/2010, included in Appendix E, the bottom of the integral abutment and the wingwall footings/pile cap range between El. 49 and El. 63. The top of weathered rock was encountered at approximately El. 15 and El. 10 in test borings NBA-101 (South Abutment) and NBA-102 (North Abutment), respectively. The existing fill and glaciolacustrine deposits are not suitable for convention spread footing foundation support. Therefore, we recommend that abutments and wingwalls be supported on steel H-piles driven to end bearing criteria.

A. Axial Capacity

The axial capacities of steel H-piles (HP10x42, HP12x53, HP12x74, HP14x73 and HP14x89) were estimated using the computer program DRIVEN. We recommend using an HP12x74, driven to rock with an estimated Factored Bearing Resistance of 245 kips, assuming the pile will be driven to refusal on weathered rock. This is based on a static capacity analysis.

The capacity should be verified with PDA as described in Section F. The resistance factor for an end bearing pile on rock, per Connecticut Department of Transportation Geotechnical Engineering Manual 2005 Ed, Section 6.2.2, is 0.65, when the pile capacity is verified by PDA and CAPWAP at a minimum of one test pile per substructure.

B. Pile Spacing

Piles should have a minimum center-to-center spacing of 2.5 times the pile width or 2.5 ft; whichever is greater in accordance with AASHTO requirements.

For frost protection, the bottom of pile caps should be at least 4 ft below the lowest proposed adjacent grade.

C. Settlement

It is anticipated that piles will settle approximately ½ in. due to elastic compression of the pile. Settlement will occur during construction as bridge loads are applied. Post-construction settlement of the piles will be negligible. Post-construction differential settlement of the approach embankment relative to the abutment is estimated to be on the order of ½ to 1 in. Design the bridge with approach slabs to provide a smooth transition between pile supported abutments and approach embankments.

D. Downdrag

Glaciolacustrine deposits were encountered below the abutments. We estimate placement of approach embankment lightweight fill will result in approximately 1.5-inch (in.) settlement due to primary consolidation and secondary compression of the glaciolacustrine deposits. Therefore, piles supporting the south and north abutments will experience approximately 35 kips downdrag load.

E. Pile Installation

The steel H-piles will be driven to refusal on bedrock and the bearing elevation (pile tip) will be at approximately El. 10.

The test pile and production pile order lengths should be as follows:

Abutments 1 and 2
- Production Pile length - 60 ft
- Test pile length - 65 ft

Wingwalls 1A and 2A
- Production pile length - 50 ft

Wingwalls 1B and 2B
- Production pile length - 60 ft

Existing abutment extensions; North and South Wingwalls
- Production pile length - 50 ft

Based on the design pile loads provided by Ammann & Whitney for the following structures and the Consulting Engineers General Memorandum 09-07 by the Connecticut Department of Transportation, Bureau of Engineering and Highway Operations, Office of Engineering as a revision to Bridge Design Standard Practices, Ultimate Pile Capacities for each substructure is listed below. A resistance factor of 0.65 has been used.

Abutment 1 and 2-	366 kips
Wingwall 1A-	366 kips
Wingwall 2A-	366 kips
Wingwall 1B and 2B-	366 kips
Existing wingwall extension at North and South Abutments-	366 kips

The wingwall piles should be installed to the same capacity as the abutments even though their load demand is less.

Drive a total of two (2) test piles, one (1) at each abutment, to confirm lengths. We recommend that high strain dynamic load testing be performed on 2 to 5 percent of the production piles. A Pile Driving Analyzer (PDA) should be used to confirm that the piles have been installed to the required ultimate resistance. CAPWAP should also be performed to verify the PDA results.

Approach Embankment Considerations

Lightweight Fill

Use of lightweight fill consisting of Expanded Shale, Clay & Slate (ESCS) is recommended to build up the approach embankments for both the north and south abutments and related wingwalls.

Properties
The following properties can be used for the ESCS:
Compacted in-place moist unit weight - 65 pcf
Friction angle - 35°
Active lateral Earth pressure coefficient (k_a) - 0.245
At-rest lateral Earth pressure coefficient (k_o) - 0.426 Passive lateral Earth pressure coefficient (k_p) – 4.08

Settlement

It is estimated that placement of the approach embankment lightweight fill will result in maximum primary consolidation of the glaciolacustrine deposits of 1.6 in. and 1.4 in. at the south and north approaches respectively. The glaciolacustrine deposit in this area is over-consolidated and a recompression ratio of 0.045 was used for the consolidation settlement analysis. It is recommended that a waiting period be provided after placement of the approach embankment fill to allow substantial consolidation to take place prior to constructing the final roadway pavement. About 3 months will be needed to limit post-construction settlement to less than 1 in. The actual waiting period should be controlled by a settlement monitoring program.

Lateral Earth Pressures

The wingwalls should be designed for active earth pressures if the walls can rotate (move laterally at the top), and for at-rest earth pressures if restrained from lateral movement. Integral abutments should be designed for passive earth pressures.

Drainage

The abutment and wingwalls should be drained by 4 in. dia. weep holes installed according to CONNDOT specifications. Maximum spacing between weep holes should be 10 ft.

Reuse of Excavated Material

The existing fill is not suitable for reuse as pervious structure backfill or granular fill, but will generally be suitable for embankment fill after removal of deleterious materials.

Glaciolacustrine deposits consist primarily of silt and clay that are highly sensitive to disturbance and fluctuation in moisture content. Therefore, these soils will be very difficult to reuse as compacted fill on-site. In areas where glaciolacustrine deposits are excavated, we recommend this material be properly disposed of at an off-site location.

CONSTRUCTION CONSIDERATIONS

This section provides comments related to foundation construction and other geotechnical aspects of the project. It will aid those responsible for preparation of contract plans and specifications and those involved with construction monitoring. Contractors should evaluate potential construction problems on the basis of their own knowledge and experience in the area and on the basis of similar localities, taking into account their own proposed construction methods and procedures.

Excavation and Temporary Lateral Support

Excavations for abutments and wingwalls will be in existing fill or glaciolacustrine deposits. Conventional heavy construction equipment appears practical for excavation.

Areas of temporary lateral support for excavations will be required because of the partial demolition of the existing bridges and wingwalls. We anticipate that steel sheet piling or soldier piles and lagging will be feasible temporary lateral support systems.

Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR Part 1926, latest edition. Temporary soil slopes above groundwater of 1V:1.5H (Soil Profile Type C), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Dewatering

Excavations for north and south abutments will be about 2 ft above the highest groundwater levels observed in the borings at those locations. Therefore, we anticipate that excavation dewatering will not be necessary. However, perched water in glaciolacustrine deposits and the possibility of deeper excavations should be anticipated. If required, a temporary dewatering system may likely consist of pumping from sumps within the excavation.

The contractor should configure excavations and surrounding areas to prevent surface water from entering excavations.

Pile Installation

Piles will be installed to bedrock. Piles for this project will be driven to a pile driving resistance. The maximum hammer energy should be determined by a wave equation analysis by the contractor based on specific hammer characteristics.

Stress wave measurements and Pile Driving Analyzer (PDA) testing should be conducted on two percent of piles (test piles and production piles), consistent with field verification factor assumed in pile design.

Settlement Monitoring

We recommend settlement monitoring of the railroad tracks during excavation, temporary excavation support installation, and pile driving. Amtrak should be involved in determining an action level, we recommend ½ in. If at any point the action level is reached construction should be stopped to reevaluate the installation process to minimize additional settlement.

CLOSING

This report has been prepared for specific application to the New Britain - Hartford Busway Over New Britain Avenue Bridge, as understood at this time, in accordance with generally accepted geotechnical engineering practice common to the local area. In the event that changes in the nature, design or location of the project elements are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed by Haley & Aldrich, Inc. and the conclusions of this report modified or verified in writing.

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

We appreciate the opportunity to provide engineering services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

STATE OF CONNECTICUT
EDWARD M. ZAMISKIE JR.
No. 28228
LICENSED
PROFESSIONAL ENGINEER

Edward M. Zamiskie, Jr., P.E.
Vice President

Enclosures:

- Table I - Summary of Subsurface Data
- Table II - Summary of Laboratory Data
- Figure 1 - Project Locus
- Figure 2 - Subsurface Exploration Plan and Profile
- Figure 3 - Recommended Lateral Loads
- Appendix A - Recent Test Boring Logs
- Appendix B - Previous Test Boring Logs
- Appendix C - Recent Laboratory Test Data
- Appendix D - Previous Laboratory Test Data
- Appendix E - Design Drawings Showing Existing and Proposed Construction

G:\32669-CT BUSWAY\010\2010 JUNE Rev Final Report\New Britain Ave Bridge\Final Report\2010_0806_HAI_New Britain Ave Report_F.docx

REFERENCES

1. American Association of State Highway Transportation Officials (AASHTO) LRFD Bridge Design Specifications,(2007), 4th Edition with 2008 Interim Revision

2. American Society for Testing and Materials (1994). Volume 04.08 Soil and Rock (I): D 420 – D 4914.

3. Baker Engineering NY, Inc. (2002). "Connecticut Busway Design Manual," prepared for the Connecticut Department of Transportation.

4. Baker Engineering NY, Inc. (2006). "Report on Settlement due to the Glacial Lake Deposits," prepared for the Connecticut Department of Transportation.

5. Connecticut Department of Transportation, Geotechnical Engineering Manual, 2005 Edition, Rev. February 2009.

6. Ensoft, Inc. (2004). "LPILE Plus 5.0 for Windows," Austin, Texas, July.

7. Federal Highway Administration (1998). "DRIVEN 1.0, A Microsoft Windows Based Program for Determining Ultimate Vertical Static Pile Capacity," FHWA-SA-98-074, Washington, D.C., May.

8. Holtz, R.D. and Kovacs, W.D. (1981). An Introduction to Geotechnical Engineering, Prentice Hall, Englewood Cliffs, New Jersey.

G:\32669-CT BUSWAY\010\2010 JUNE Rev Final Report\New Britain Ave Bridge\Final Report\2010_0806_HAI_New Britain Ave Report_F.docx

TABLES

TABLE I
SUMMARY OF SUBSURFACE DATA
NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE
STATE PROJECT NO. 171-305
NEWINGTON - WEST HARTFORD, CONNECTICUT

EXPLOR. NUMBER	ELEV. (ft)	DEPTH (ft)		THICKNESS OF SOIL STRATA (ft)						BEDROCK (ft)		WATER LEVEL (ft)	
				FILL	LACUSTRINE	ALLUVIAL DEPOSITS	GLACIOLACUSTRINE DEPOSITS	GLACIOFLUVIAL DEPOSITS	GLACIAL TILL	DEPTH	ELEV.	DEPTH	ELEV.
Retaining Walls (RW)													
RW115	55.81	40.0		13.5	--	--	> 26.5	--	--	--	--	--	--
RW116	67.82	57.0		2.5	--	--	> 54.5	--	--	--	--	10.0	57.82
New Britain Avenue Bridge (NBA)													
NBA101	51.84	50.0	C	5.0	--	--	32.8	--	--	37.8	14.04	5.0	46.84
NBA102	53.82	51.5	R	3.5	--	--	40.5	--	--	44.0	9.82	7.7	46.12

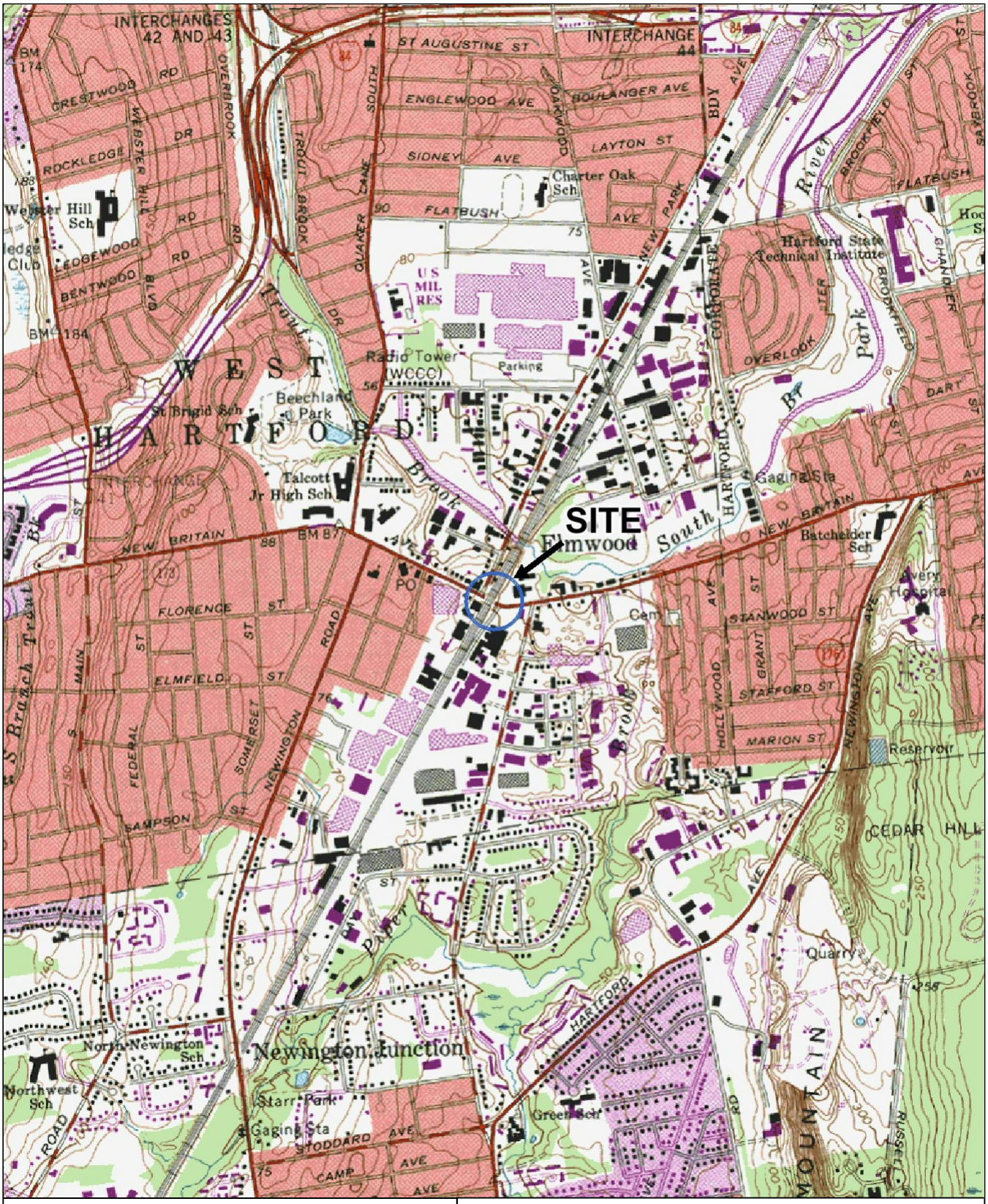
Notes:
1. "--" indicates not encountered or unknown.
2. ">" indicates stratum thickness is greater than number indicated since the boring was terminated within the stratum.
3. Elevations are in feet and refer to the NGVD 1929.
4. Refer to boring logs for detailed soil and rock descriptions.
5. Water levels were measured shortly after drilling and may not represent stabilized groundwater.
6. "(C)" indicates bedrock core sample, "(R)" indicates auger refusal.

TABLE II
SUMMARY OF LABORATORY DATA
NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE
STATE PROJECT NO. 171-305
NEWINGTON - WEST HARTFORD, CONNECTICUT

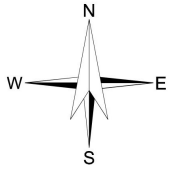
Boring Number	Sample No.	Depth of sample	USCS Classification	Moisture Content	Organic Content	Atterberg Limits			Dry Unit Weight	Total Unit Weight	Grain Size Analysis						Consolidated Undrained Triaxial Compression				Lab Vane			Consolidation Tests				
						Liquid Limit	Plastic Limit	Plasticity Index			Gravel (%)		Sand (%)			% Finer than #200	Confining Stress	Peak Shear Stress	Axial Strain @ Peak Stress	Results	Peak Shear Stress	Residual Shear Stress	Sensitivity	Initial Void Ratio	CR	RR	Maximum Past Pressure	Estimated OCR
		(ft bgs)		(%)	(%)	(%)	(%)	(%)	(pcf)	(pcf)	Coarse	Fine	Coarse	Medium	Fine		(ksf)	(ksf)	(%)		(ksf)	(ksf)					(tsf)	
NBA-101	S-2	3.0 - 5.0	SP-SM	5.7							14	27.5	8.8	23.9	17.7	8.1												
NBA-101	U-3	35.0 - 37.0	--	--						124.5																		
NBA-101	U-3A	35.65	CL	29.1					98	126.6							2.2	12.3	19.9	Total Stress								
NBA-101	U-3B	36.15	CL&ML	27.6					95.4	121.7							4.3	6.2	21.3	ϕ = 38º, c = 0 ksf								
NBA-101	U-3C	36.65	CL-ML	24.5					103.7	129.1							8.6	5.2	20.4	Effective Stress ϕ' = 35.1º, c = 0 ksf								
NBA-101	U-3D	37.1	CL	22.4		28	18	10	107.2	131.3														0.624	0.055	0.007	3.6	3.26
NBA-101	U-3D	37.1	--	22																	0.76	0.1	7.5					
RW-116	A	18.25	CH	63.7					64	104.8							1.4	0.7	4.9	Total Stress								
RW-116	B	18.75	CH	60.7					65.2	104.8							2.9	1.1	2.6	ϕ = 8.8º, c = 0.39 ksf								
RW-116	C	19.25	CH	60.5					65	104.4							5.8	1.5	2.6	Effective Stress ϕ' = 19.3º, c = 0.32 ksf								
RW-116	D	19.75	CH	60.7		69	29	40	65.1	104.6														1.706	0.279	0.055	2.3	3.30
RW-116	D	19.75		65.3																	0.68	0.18	3.7					
RW-116		18.0 - 20.0								105.1																		

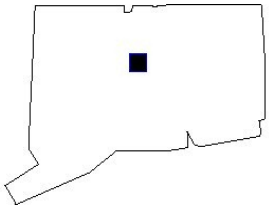
Notes:
1. All soil laboratory tests were performed in general conformance with applicable ASTM standards.

FIGURES



SITE COORDINATES:41°43'48"N 72°43'30"W





U.S.G.S. QUADRANGLE: HARTFORD SOUTH, CT

HALEY & ALDRICH

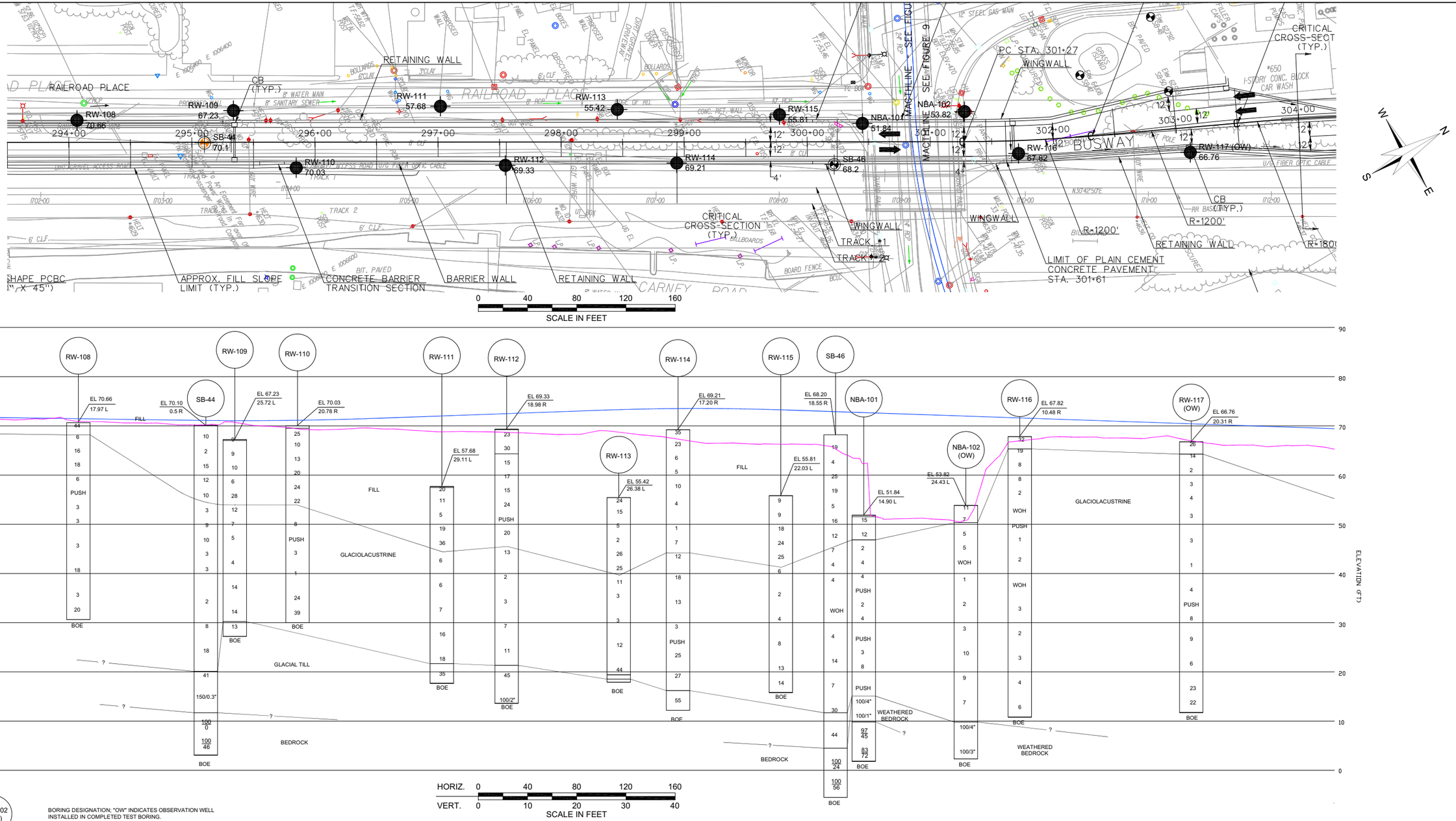
NEW BRITAIN - HARTFORD BUSWAY
OVER NEW BRITAIN AVENUE
NEWINGTON - WEST HARTFORD, CONNECTICUT

PROJECT LOCUS

SCALE: 1:24,000
JULY 2008

FIGURE 1

32669-005 1.PDF



NBA-102 (OW) — BORING DESIGNATION; "OW" INDICATES OBSERVATION WELL INSTALLED IN COMPLETED TEST BORING.

EL 53.82 / 22.32 R — APPROXIMATE GROUND SURFACE ELEVATION; BORING OFFSET FROM CENTERLINE .

4 — APPROXIMATE LOCATION OF SOIL SAMPLE AND STANDARD PENETRATION RESISTANCE, "N"

WOH — WEIGHT OF HAMMER

PUSH — APPROXIMATE LOCATION OF SHELBY TUBE SAMPLE

INTERPRETED GEOLOGIC STRATUM INTERFACE

INFERRED GEOLOGIC STRATUM INTERFACE

100 / 40 — % RECOVERY / % RQD

BOE — BOTTOM OF EXPLORATION

LEGEND

RB-101 69.35 — LOCATION, DESIGNATION AND ELEVATION OF RECENT TEST BORINGS DRILLED BY GENERAL BORINGS, INC., OF PROSPECT, CONNECTICUT DURING THE PERIODS BETWEEN 18 AND 22 OCTOBER 2007 AND 9 AND 29 APRIL 2008.

SB-46 68.2 — LOCATION, DESIGNATION AND ELEVATION OF PREVIOUS PILOT BORINGS BY OTHERS.

EXISTING GROUND SURFACE ALONG CENTERLINE

PROPOSED ROADWAY ELEVATION ALONG CENTERLINE

NOTES:

1. COORDINATE SYSTEM IS IN FEET AND REFERS TO THE CONNECTICUT COORDINATE SYSTEM BASED ON NAD 83.
2. ELEVATIONS ARE IN FEET AND REFER TO NGVD 1929.
3. REFER TO THE REPORT APPENDICES FOR TEST BORING LOGS.
4. THE STANDARD PENETRATION RESISTANCE, "N", IS DEFINED AS THE NUMBER OF BLOWS OF A 140-LB HAMMER FALLING THROUGH A VERTICAL DISTANCE OF 30 INCHES REQUIRED TO DRIVE A 2-INCH O.D., 1-3/8-INCH I.D. SPLITS POON SAMPLER 12 INCHES.
5. THE ROCK QUALTIY DESIGNATION (RQD) IS DEFINED AS THE SUM OF ALL PIECES OF ROCK CORE, 4 INCHES IN LENGTH OR LONGER, DIVIDED BY THE TOTAL LENGTH IN INCHES OF THE CORE DRILLED IN THE GIVEN RUN, EXPRESSED AS A PERCENTAGE. IF THE CORE IS BROKEN BY HANDLING OR DRILLING PROCEDURES, THE PIECES OF THE CORE ARE FITTED TOGETHER AND COUNTED AS ONE PIECE, PROVIDED THEY CONSTITUTE THE REQUIRED 4-INCH LENGTH.
6. REFER TO THE REPORT TEXT FOR MORE DETAILED SOIL STRATUM DESCRIPTIONS AND THE TEST BORING LOGS FOR DETAILED SAMPLE DESCRIPTIONS.
7. SUBSURFACE PROFILES DEPICT THE GENERAL GEOLOGIC CONDITIONS AT THE SITE AND ARE BASED ON INTERPRETATION OF DATA ENCOUNTERED IN THE EXPLORATIONS. LINES REPRESENTING INTERFACES BETWEEN STRATA ON THE PROFILE ARE BASED ON ADJACENT BORINGS. THE BORING STICKS SHOW THE INTERPRETED SEQUENCE OF STRATA ENCOUNTERED AT THAT LOCATION. ACTUAL SOIL CONDITIONS AND INTERFACES BETWEEN EXPLORATIONS MAY VARY FROM THOSE INDICATED ON THE PROFILE.

HALEY & ALDRICH

NEW BRITAIN - HARTFORD BUSWAY
OVER NEW BRITAIN AVENUE
NEWINGTON - WEST HARTFORD, CONNECTICUT

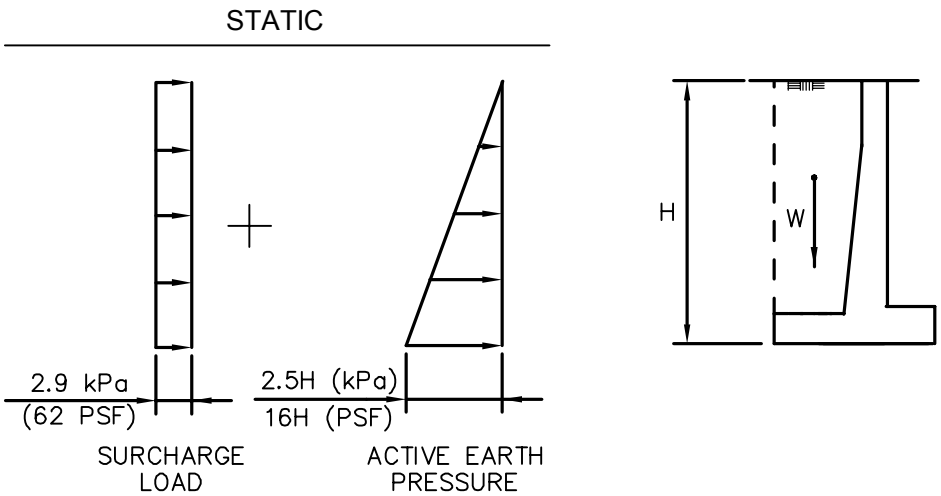
SUBSURFACE EXPLORATION PLAN AND PROFILE

SCALE: AS SHOWN
JULY 2008

FIGURE 2

G:\32669-CT BUSWAY\004\CAD\DRAWINGS\32669-000-0D03-SEP.DWG

G:\32669-CT BUSWAY\004\CAD\DRAWINGS\32669-000-0A04-LATLOADS.DWG



NOTES:

1. H IS IN METERS FOR S.I. CALCULATIONS AND FT. FOR ENGLISH CALCULATIONS.
2. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL AND A STRUCTURE UNDERDRAIN OR WEEPHOLES, THEREFORE A HYDROSTATIC PRESSURE DIAGRAM IS OMITTED FROM THIS FIGURE.
3. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
4. ASSUME 2 FT. THICK REGULAR GRANULAR FILL (BULK DENSITY = 125 PCF) FOR SURCHARGE LOAD

HALEY & ALDRICH

NEW BRITAIN - HARTFORD BUSWAY
NEWINGTON - WEST HARTFORD, CONNECTICUT

RECOMMENDED ACTIVE LATERAL EARTH PRESSURE LOADS ON ESCS BACKFILLED RETAINING WALLS AND ABUTMENTS

SCALE: NOT TO SCALE
NOVEMBER 2009

FIGURE 3

APPENDIX A

Recent Test Boring Logs

Driller:	T. McGovern	**Connecticut DOT Boring Report**		Hole No.:	NBA-101\NBA1
Inspector:	S. Poff	Town:	Newington to West Hartford	Stat./Offset:	
Engineer:	Haley & Aldrich, Inc.	Project No.:	171-305	Northing:	826726.358885
Start Date:	4-28-08	Route No.:		Easting:	1006714.527666
Finish Date:	4-28-08	Bridge No.:		Surface Elevation:	51.84

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 3; NW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: NW
Hammer Wt.: 300 lb Fall: 24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 5.0 ft b.g.s

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Core Times per 12"	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0							BITUMINOUS PAVEMENT		
	S-1	3 5 10 14	2	4			FILL	Medium dense brown coarse to fine SAND, some medium to fine gravel, trace silt, no odor, dry	50
	S-2	7 7 5 7	2	5				Medium dense brown coarse to fine SAND and medium to fine GRAVEL, trace silt, no odor, dry	
5	S-3	2 1 1 2	2	20			GLACIO-LACUSTRINE DEPOSITS	Very soft brown to red-brown CLAY varved with gray-brown SILT, no odor, wet; varve couplets approximately 0.5 to 1.0 in. thick on average, with occasional clay layers up to 3 in. thick, gravel dropstones	
	S-4	2 2 2 2	2	2				Similar to S3, except soft, with a thick clay layer from approximately 8.2 to 8.7 ft	45
10	S-5	2 2 2 2	2	18				Similar to S4	40
15	UP-1	p u s h	2	24				Note: Piston tube sample from 15.0 to 17.0 ft	
	S-6	1 1 1 1	2	16				Very soft brown to red-brown CLAY varved with gray-brown clayey SILT, no odor, wet; clay and silt layers approximately 1.0 in. thick each on average	35
20	S-7	1 1 3 4	2	20				Similar to S6, except soft	30

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 42.0 ft Rock: 8.0 ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 11 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: T. McGovern	**Connecticut DOT Boring Report**	Hole No.: NBA-101\NBA1
Inspector: S. Poff	Town: Newington to West Hartford	Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305	Northing: 826726.358885
Start Date: 4-28-08	Route No.:	Easting: 1006714.527666
Finish Date: 4-28-08	Bridge No.:	Surface Elevation: 51.84

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 3; NW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: NW
Hammer Wt.: 300 lb Fall: 24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 5.0 ft b.g.s

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Core Times per 12"	Generalized Strata Description	Material Description and Notes	Elevation (ft)
							GLACIO-LACUSTRINE DEPOSITS *(con't)*		
25	UP-2	p u s h	2	24				Note: Piston tube sample from 25.0 to 27.0 ft	
	S-8	1 1 2 3	2	20				Soft brown to red-brown laminated clayey SILT with frequent clay layers, no odor, wet; silt layers approximately 2.0 to 3.0 in. thick on average, clay layers approximately 1 in. thick on average	25
30	S-9	1 3 5 5	2	12				Similar to S8, except medium stiff	
									20
35	UP-3	p u s h	2	24				Note: Piston tube sample from 35.0 to 37.0 ft	
	S-10	10 100/4	0.8	10				Medium dense red-brown SILT, little coarse to fine gravel, trace coarse to fine sand, clay, no odor, moist; compact, massive, well-bonded in-situ, angular to subrounded gravel	15
							WEATHERED BEDROCK	Note: Spoon refusal at 37.8 ft on probable top of bedrock	
40	S-11	100/1	0.1	1				Red-brown shale fragments, spoon refusal at 40.1 ft	
								Note: Roller bit refusal at approximately 42.0 ft, began rock core at 42.0 ft	
	C-1		5	58	45	2	BEDROCK	Hard, fresh, brown , aphanitic SILTSTONE. Bedding is low angle, extremely thin to thin, often cross-bedded. Primary joints low angle (generally along bedding planes), extremely close to close, smooth, planar to slightly undulating, slightly disintegrated to fresh, open. Secondary joints are high angle, moderately spaced (or wider), smooth to	10
						2			
						2			
45						2			

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet 2 of 3
Earth: 42.0 ft Rock: 8.0 ft		
No. of Soil Samples: 11 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: T. McGovern	**Connecticut DOT Boring Report**	Hole No.: NBA-101\NBA1
Inspector: S. Poff	Town: Newington to West Hartford	Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305	Northing: 826726.358885
Start Date: 4-28-08	Route No.:	Easting: 1006714.527666
Finish Date: 4-28-08	Bridge No.:	Surface Elevation: 51.84

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 3; NW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: NW
Hammer Wt.: 300 lb Fall: 24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 5.0 ft b.g.s

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Core Times per 12"	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						2	BEDROCK *(con't)*	rough, planar to slightly undulating, slightly disintegrated to fresh, open; occasional calcite in-filling in joints	5
	C-2		3	30	72			Similar to C1, except primary joints are very close to moderately spaced -PORTLAND ARKOSE FORMATION-	
50								END OF BORING 50 ft	0
55									-5
60									-10
65									-15

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 42.0 ft Rock: 8.0 ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 11 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: E. DelPriore	**Connecticut DOT Boring Report**		Hole No.: NBA-102(OW)
Inspector: S. Poff	Town: Newington to West Hartford		Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305		Northing: 826802.55494
Start Date: 4-28-08	Route No.:		Easting: 1006748.698956
Finish Date: 4-28-08	Bridge No.:		Surface Elevation: 53.82
Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000			
Casing Size(in.)/Type: 4.25/4; HSA/HW	Sampler Type/Size: SS; 1 3/8 in.		Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.		
Groundwater Observations: @ approximately 7.7 ft b.g.s after 3 days			

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S-1	3 5 6 4	2	10		TOPSOIL FILL	Medium dense brown coarse to fine SAND, some coarse to fine gravel, trace silt, no odor, dry	
	S-2	5 4 3 3	2	13			Similar to S1, except loose	
						GLACIO-LACUSTRINE DEPOSITS	Medium stiff brown CLAY varved with gray-brown clayey SILT, no odor, moist	50
5	S-3	2 2 3 4	2	24			Medium stiff brown to red-brown CLAY varved with gray-brown clayey SILT, trace fine sand, no odor, wet; varve couplets approximately 0.5 to 1.0 in. thick on average, with occasional clay layers over 2 in. thick; clay dominant, occasional gravel-sized dropstones	
	S-4	2 2 3 3	2	24			Similar to S3	
							Note: Switch to HW casing at 10.0 ft	45
10	S-5	woh/18 - - 2	2	24			Similar to S4, except very soft	
								40
15	S-6	woh/12 - 1 2	2	24			Similar to S5	
								35
20	S-7	woh/12 - 2 2	2	24			Similar to S6	

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 51.5 ft Rock: - ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 13 No. of Core Runs: -		SM-001-M REV. 1/02

Driller: E. DelPriore	**Connecticut DOT Boring Report**	Hole No.: NBA-102(OW)
Inspector: S. Poff	Town: Newington to West Hartford	Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305	Northing: 826802.55494
Start Date: 4-28-08	Route No.:	Easting: 1006748.698956
Finish Date: 4-28-08	Bridge No.:	Surface Elevation: 53.82

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 4.25/4; HSA/HW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 7.7 ft b.g.s after 3 days

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						GLACIO-LACUSTRINE DEPOSITS *(con't)*		30
25	S-8	woh 1 2 4	2	18			Similar to S7	
						GLACIO-LACUSTRINE DEPOSITS		25
30	S-9	4 6 4 4	2	20			Stiff brown to red-brown laminated clayey SILT with frequent layers of clay (up to 1.5 in. thick on average), no odor, wet; frequent layers of SILT, some fine sand	
								20
35	S-10	4 5 4 4	2	24			Similar to S9	
								15
40	S-11	2 4 3 5	2	20			Similar to S10, except medium stiff	
							Note: Drill action suggests stratum change at approximately 44.0 ft	10
45	S-12	100/4	0.3	3		WEATHERED SHALE BEDROCK	Very dense red-brown coarse to fine GRAVEL, some coarse to fine sand, little silt, no odor, wet; composed of shale fragments	

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 51.5 ft Rock: - ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 13 No. of Core Runs: -		SM-001-M REV. 1/02

Driller: E. DelPriore	**Connecticut DOT Boring Report**	Hole No.: NBA-102(OW)
Inspector: S. Poff	Town: Newington to West Hartford	Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305	Northing: 826802.55494
Start Date: 4-28-08	Route No.:	Easting: 1006748.698956
Finish Date: 4-28-08	Bridge No.:	Surface Elevation: 53.82

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 4.25/4; HSA/HW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 7.7 ft b.g.s after 3 days

Depth (ft)	SAMPLES: Sample Type/No.	SAMPLES: Blows on Sampler per 6 inches	SAMPLES: Pen. (ft.)	SAMPLES: Rec. (in.)	SAMPLES: RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						WEATHERED SHALE BEDROCK *(con't)*		5
50	S-13	100/3	0.3	2			Similar to S11 Note: Roller bit refusal at 51.5 ft	
							Note: Well installed in completed borehole END OF BORING 51.5 ft	0
55								-5
60								-10
65								-15

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 51.5 ft Rock: - ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 13 No. of Core Runs: -		SM-001-M REV. 1/02

OBSERVATION WELL INSTALLATION REPORT

HALEY & ALDRICH

Well No.	Boring No.
NBA-102(OW)	NBA-102(OW)

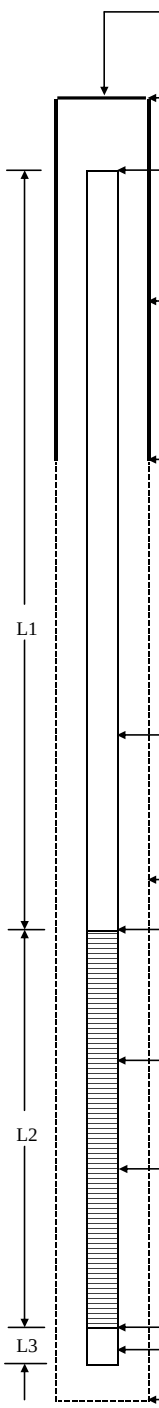
PROJECT	Connecticut DOT Busway	**H&A FILE NO.**	32669-000
LOCATION	Newington/West Hartford, Connecticut	**PROJECT MGR.**	J. Salsgiver
CLIENT	Ammann & Whitney, Inc.	**FIELD REP.**	S. Poff
CONTRACTOR	General Borings, Inc.	**DATE INSTALLED**	4/28/2008
DRILLER	E. DelPriore	**WATER LEVEL**	7.7 ft after 3 days

Ground El.	ft	**Location**	See Plan	☐ **Guard Pipe**
El. Datum				☑ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
TOPSOIL	PIPE & CONCRETE
0.5	1
FILL	
3.5	
	PIPE & CUTTINGS
	11
GLACIOLACUSTRINE DEPOSITS	PIPE & SEAL
	13
	PIPE & SAND
	15
	SCREEN & SAND
44	
WEATHERED SHALE BEDROCK	
	25
	SAND
51.1	**51.1**

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Roadway Box	
Height of top of roadway box above ground surface	0.0	ft
Depth of top of riser pipe below ground surface	0.28	ft
Type of protective casing:	Roadway Box	
Length	0.8	ft
Inside Diameter	6.0	in
Depth of bottom of roadway box	0.8	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Bentonite Seal	11.0	2.0

Type of riser pipe:	Schedule 40 PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Cuttings/Bentonite/Sand	
Diameter of borehole	6.0	in
Depth to top of well screen	15.0	ft
Type of screen	Schedule 40 PVC	
Screen gauge or size of openings	0.010	in
Diameter of screen	2.0	in
Type of backfill around screen	Filter Sand	
Depth of bottom of well screen	25.0	ft
Bottom of Silt trap	35.0	ft
Depth of bottom of borehole	51.1	ft

COMMENTS:

Form 2007

Driller: E. DelPriore	**Connecticut DOT Boring Report**		Hole No.: RB-115
Inspector: S. Poff	Town: Newington to West Hartford		Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305		Northing: 823931.779774
Start Date: 4-14-08	Route No.:		Easting: 1005076.442735
Finish Date: 4-14-08	Bridge No.:		Surface Elevation: 74.55
Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000			
Casing Size(in.)/Type: 4.25/3; HSA/NW	Sampler Type/Size: SS; 1 3/8 in.		Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.		
Groundwater Observations: @ approximately 12.0 ft b.g.s			

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S-1	8 11 15 18	2	8		TOPSOIL FILL FILL	Medium dense black to dark brown coarse to fine SAND and COAL CINDERS, little coarse to fine gravel, trace silt, no odor, dry Dense dark brown coarse to fine SAND, trace gravel, silt, no odor, moist	
	S-2	10 6 2 2	2	4		FILL	Similar to S1 (below 1.0 ft) Medium stiff brown CLAY and coarse to fine SAND, little gravel, no odor, moist	70
5	S-3	1 2 2 2	2	10		GLACIO-LACUSTRINE DEPOSITS	Soft brown to red-brown silty CLAY, no odor, wet	
	S-4	3 2 2 3	2	16			Similar to S3 Note: Switched to NW casing at 10.0 ft	65
10	S-5	2 1 2 2	2	24			Soft brown laminated CLAY and clayey SILT, no odor, wet	
15	S-6	8 10 10 11	2	24			Very stiff brown varved SILT and CLAY, no odor, wet	60

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 25.0 ft Rock: - ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 8 No. of Core Runs: -		SM-001-M REV. 1/02

Driller: E. DelPriore	**Connecticut DOT Boring Report**	Hole No.: RB-115
Inspector: S. Poff	Town: Newington to West Hartford	Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305	Northing: 823931.779774
Start Date: 4-14-08	Route No.:	Easting: 1005076.442735
Finish Date: 4-14-08	Bridge No.:	Surface Elevation: 74.55

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 4.25/3; HSA/NW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 12.0 ft b.g.s

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						GLACIO-LACUSTRINE DEPOSITS *(con't)*		55
20	S-7	4 4 5 7	2	13			Similar to S6, except stiff	
	S-8	6 7 7 8	2	11			Similar to S7	50
25							END OF BORING 25 ft	45
30								40
35								

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in	NOTES:	Sheet 2 of 2
Earth: 25.0 ft Rock: - ft		
No. of Soil Samples: 8 No. of Core Runs: -		SM-001-M REV. 1/02

Driller: E. DelPriore	**Connecticut DOT Boring Report**		Hole No.: RB-116
Inspector: S. Poff	Town: Newington to West Hartford		Stat./Offset:
Engineer: Haley & Aldrich, Inc.	Project No.: 171-305		Northing: 824443.130572
Start Date: 4-14-08	Route No.:		Easting: 1005379.884476
Finish Date: 4-14-08	Bridge No.:		Surface Elevation: 75.69
Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000			
Casing Size(in.)/Type: 4.25/3; HSA/NW	Sampler Type/Size: SS; 1 3/8 in.		Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.		
Groundwater Observations: @ approximately 5.0 ft b.g.s			

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						RAILROAD BALLAST		75
	S-1	7 5 6 5	2	14		FILL	Medium dense black to dark gray-brown coarse to fine SAND and COAL CINDERS, trace gravel, silt	
						GLACIO-LACUSTRINE DEPOSITS	Stiff yellow-brown to red-brown clayey SILT, no odor, dry; trace mottling, appears disturbed previously	
	S-2	6 4 6 7	2	0			No recovery	
5	S-3	3 5 5 7	2	24			Stiff brown laminated CLAY and silty CLAY, no odor, wet	70
	S-4	5 6 6 7	2	16			Similar to S3	
						GLACIO-LACUSTRINE DEPOSITS	Stiff red-brown CLAY, varved with gray-brown SILT, no odor, wet	
							Note: Switched to NW casing at 10.0 ft	
10	S-5	3 3 3 3	2	17			Medium stiff brown silty CLAY, with occasional fine gravel to coarse sand-sized dropstones, no odor, wet	65
15	S-6	5 5 8 7	2	19			Stiff brown CLAY, varved with SILT, no odor, wet	60

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 25.0 ft Rock: - ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 8 No. of Core Runs: -		SM-001-M REV. 1/02

Driller:	E. DelPriore	**Connecticut DOT Boring Report**		Hole No.:	RB-116
Inspector:	S. Poff	Town:	Newington to West Hartford	Stat./Offset:	
Engineer:	Haley & Aldrich, Inc.	Project No.:	171-305	Northing:	824443.130572
Start Date:	4-14-08	Route No.:		Easting:	1005379.884476
Finish Date:	4-14-08	Bridge No.:		Surface Elevation:	75.69

Project Description: Connecticut DOT Busway Final Design - Haley & Aldrich Project No. 32669-000

Casing Size(in.)/Type: 4.25/3; HSA/NW	Sampler Type/Size: SS; 1 3/8 in.	Core Barrel Type: None
Hammer Wt.: -/300 lb Fall: -/24 in.	Hammer Wt.: 140 lb Fall: 30 in.	

Groundwater Observations: @ approximately 5.0 ft b.g.s

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (ft.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						GLACIO-LACUSTRINE DEPOSITS *(con't)*		
20	S-7	6 4 4 5	2	24			Similar to S6, except medium stiff	55
	S-8	7 9 9 11	2	24			Similar to S7	
						GLACIO-LACUSTRINE DEPOSITS	Medium dense brown fine SAND and SILT, occasional seams of silt and clay below approximately 24.8 ft	
25							END OF BORING 25 ft	50
30								45
35								40

Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 25.0 ft Rock: - ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 8 No. of Core Runs: -		SM-001-M REV. 1/02

APPENDIX B

Previous Test Boring Logs

Driller: Seth Murkette/GZA	Connecticut DOT Boring Report	Hole No.: SB-46
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 826689.6
Start Date: 7-8-03	Route No.:	Easting: 1006731.6
Finish Date: 7-11-03	Bridge No.:	Surface Elevation: 68.2

Project Description: New Britain to Hartford Busway

Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 22.0 after: 0 hours, @ after: hours, @21.8 after: 48 hours

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	A-N		1.5					68
2	S-1	4 8 11	1.5	0.6			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - tan to brown fine sand, some silt, some angular medium gravel; dry, medium dense, NP; (FILL).	67
3								66
4	A-N		1.5					65
5	S-2	2 2 2	1.5	0.3			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - tan to brown fine sand, some silt, some angular medium gravel; moist, loose, NP; (FILL).	64
6								63
7	W-N		1.5					62
8	S-3	13 14 11	1.5	0.4			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - tan to brown fine sand, some silt, some angular medium gravel; dry, medium dense, NP; (FILL).	61
9								60
10	W-N		1.0					59
11	S-4	15 11 8	1.5	0.0			NO RECOVERY ON S-4.	58
12								57
13	W-N		2.0					56
14	S-5	4 2 3	1.5	0.1			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - tan to brown fine sand, some silt, some angular medium gravel; dry, loose, NP; (FILL).	55
15								54
16	W-N		1.5					53
17	S-6	5 6 10	1.5	0.3			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - tan to brown fine sand, some silt, some angular medium gravel; dry, medium dense, NP; (FILL).	52
18								51
19	W-N		1.5					50
		4				19.5'	ELEV. 48.7	49

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: 63.7' Rock: 10.0'

NOTES:

Driller: Seth Murkette/GZA	Connecticut DOT Boring Report	Hole No.: SB-46
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 826689.6
Start Date: 7-8-03	Route No.:	Easting: 1006731.6
Finish Date: 7-11-03	Bridge No.:	Surface Elevation: 68.2
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 22.0 after: 0 hours, @ after: hours, @21.8 after: 48 hours		

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: northern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	5 7	1.5	1.4			SILT WITH CLAY (ML) -red to brown silt, some clay; moist, stiff, -PL; (GLACIAL LAKE DEPOSIT).	48
21								
22	W-N		1.5					47
						22.5'	ELEV. 45.7	46
23	S-8	3 3 4	1.5	1.0			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	45
24	W-N		1.0					44
25	S-9	3 2 2	1.5	1.4			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	43
26								42
27	W-N		2.0					41
28								40
29	S-10	1 2 2	1.5	1.5			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	39
30								38
31	UP-1		2.0	1.7				37
32								36
33	W-N		3.0					35
34								34
35	S-11	WOH WOH WOH	1.5	1.5			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, very soft, +PL; (GLACIAL LAKE DEPOSIT).	33
36								32
37	W-N		3.5					31
38								30
39								29

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: 63.7' Rock: 10.0'

NOTES:

Driller: Seth Murkette/GZA	Connecticut DOT Boring Report	Hole No.: SB-46
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 826689.6
Start Date: 7-8-03	Route No.:	Easting: 1006731.6
Finish Date: 7-11-03	Bridge No.:	Surface Elevation: 68.2

Project Description: New Britain to Hartford Busway

Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 22.0 after: 0 hours, @ after: hours, @21.8 after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: northern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40–41	S-12	2 3 1	1.5	1.5			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, soft, +PL; (GLACIAL LAKE DEPOSIT).	28–27
42–44	W-N		3.5					26–24
45–46	S-13	1 7 7	1.5	1.5			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	23–22
47–49	W-N		3.5					21–19
50–51	S-14	2 3 4	1.5	1.3			CLAY WITH SILT (CL) - tan to brown clay, little silt; moist, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	18–17
52–54	W-N		3.5					16–14
55–56	S-15	4 10 20	1.5	1.5		55.0'	ELEV. 13.2 SILTY CLAY (CL-ML) - red to brown clay, some silt, trace of fine gravel (in spoon tip); moist, stiff, -PL.	13–12
57–59	W-N		3.5			56.5'	ELEV. 11.7	11–9

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: 63.7' Rock: 10.0' No. of Samples: 16	NOTES:	Sheet 3 of 4

Driller: Seth Murkette/GZA	Connecticut DOT Boring Report	Hole No.: SB-46
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 826689.6
Start Date: 7-8-03	Route No.:	Easting: 1006731.6
Finish Date: 7-11-03	Bridge No.:	Surface Elevation: 68.2
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 22.0 after: 0 hours, @ after: hours, @21.8 after: 48 hours

Baker Info: S.O. Number: B25624LPDSOIL41802/42002 File: northern Template: CDOT_E (LD4 1/03)

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
60–61	S-16	35 21 23	1.5	1.3		63.7'	ELEV. 8.2 WELL-GRADED SAND WITH SILT (SW-SM) - red to brown fine to medium sand, some silt, trace fine gravel; moist, medium dense, NP; (TILL).	8–7
62–63	W-N		2.2					6–5
64–68	C-1		5.0	5.0 100%	1.2 24%		ELEV. 4.5 SILTSTONE; red to brown; medium hard, fresh; calcite inclusions throughout.	4–0
69–73	C-2		5.0	5.0 100%	2.8 56%		SILTSTONE; red to brown; medium hard, fresh; calcite inclusions throughout.	-1–-5
74							ELEV. -5.5 END OF BORING AT 73.7'	-6
75–79								-7–-11

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: 63.7' Rock: 10.0'

NOTES:

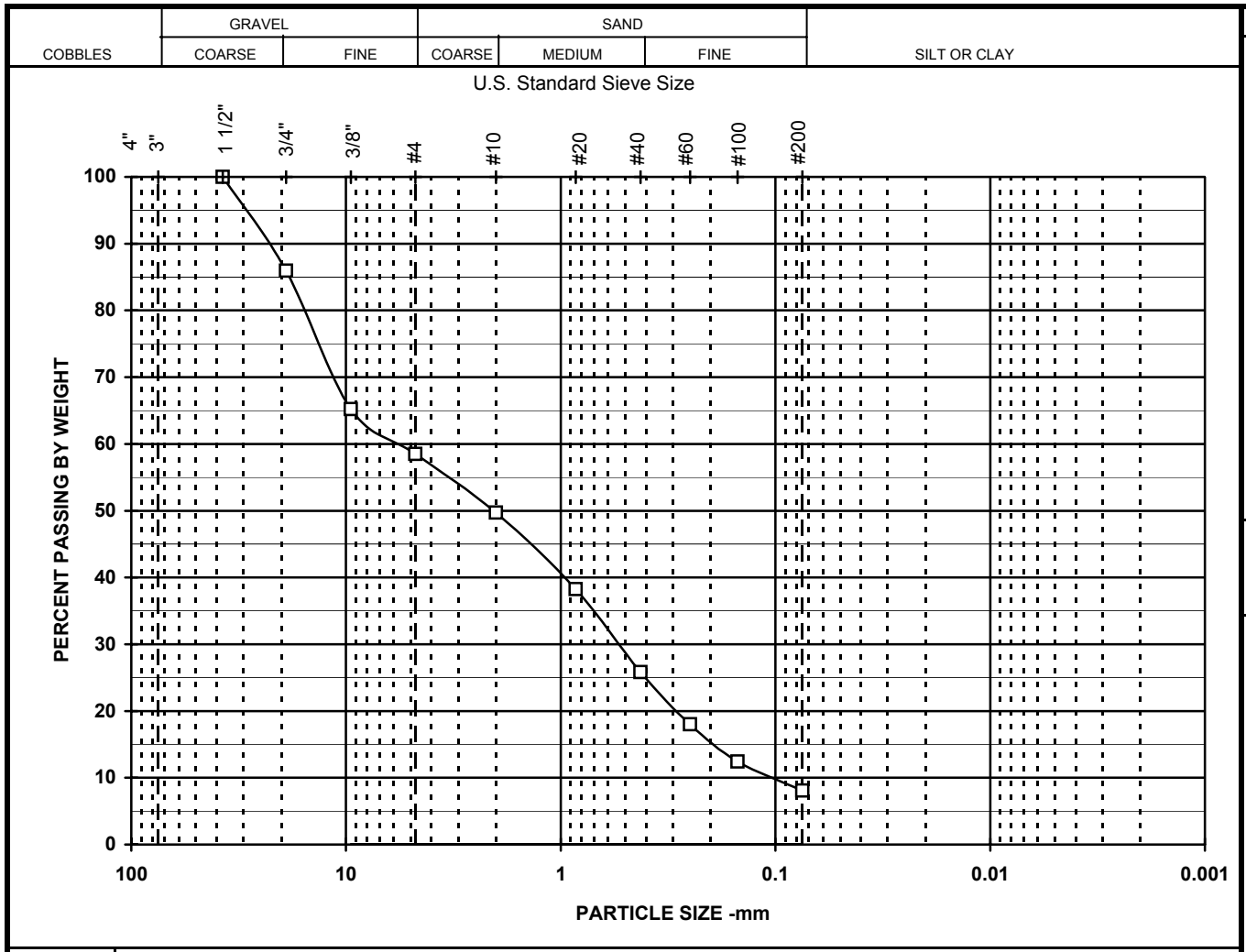
APPENDIX C

Recent Laboratory Test Data

Haley & Aldrich - #32669-000
Connecticut Busway
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	ORGANIC CONTENT (burnoff) (%)	
CB-101	S-4	7-9	26.5				SC	41.1		
CB-103	S-3	5-7	8.1				SM	17.3		
NBA-101	S-2	3-5	5.7				SP-SM	8.1		
RB-101	S-4	7-9	25.8				SM	14.4		
RB-102	S-2	2-4	9.8				SM	17.8		
RB-103	S-4	6-8	14.9				SW-SM	8.2		
RB-104	S-1	1-3	11.9				SC	24.1		
RB-105	S-4	7-9	16.6				SC	25.0		
RB-107	S-1	0-2	4.9				SP-SM	5.8		
RB-107	S-4	7-9	12.9				SM	20.7		
RB-110	S-2	2-4	11.7				SM	28.4		
RB-120	S-1	0-2	6.8				SM	44.7		
RB-122	S-2	2-4	11.9				SM	14.4		
RB-124	S-3	5-7	202.5	271	137	134	PT		50.5	
RB-124	S-4	7-9	146.0	181	108	73	OH		23.9	
RB-124	S-5	10-12	61.4	66	42	24	OH		5.2	
RW-101	S-3	5-7	9.6				SC	36.2		
RW-105	S-1	0-2	7.7				SM	27.8		
RW-110	S-1	1-2	13.3				SM	14.1		
RW-112	S-2	3-5	9.2				SM	21.0		
RW-114	S-3	5-7	11.6				SM	13.2		
RW-114	S-6	15-17	27.9	29	23	6	ML		2.3	
RW-114	S-7	20-22	56.1	54	39	15	OH		8.9	
RW-118	S-1	0-2	2.5				SP	2.8		
RW-118	S-6	15-17	28.8	35	20	15	CL		3.1	
RW-118	S-7	20-22	25.0	29	18	11	CL		2.5	
RW-119	S-6	16-17								missing
RW-119	S-7	20-22	23.0	30	20	10	CL			
RW-119	S-8	25-27	30.7	36	21	15	CL		2.4	
RW-119	S-9	30-31.2	31.5	48	24	24	CL			
RW-119	S-5	10-12	21.1				CL	56.4		
RW-120	S-4	7-9	4.2				SP	3.1		
RW-124	S-5	10-12	18.5				SM	20.8		
TB-101	S-2	2-4	2.9				SP-SM	7.3		
TB-101	S-7	20-22	6.5				SP-SM	8.9		
TB-102	S-6	15-17	6.7				SP-SM	5.9		

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Symbol	□	■	○
Boring	NBA-101		
Sample	S-2		
Spec			
Depth	3-5		
% +3"			
% Gravel	41.5		
% SAND	50.4		
% FINES	8.1		
% -2μ			
Cc	0.5		
Cu	53.8		
LL			
PL			
PI			
USCS	SP-SM		
w (%)	5.7		

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"	100.0		
3/4"	86.0		
3/8"	65.2		
4	58.5		
10	49.7		
20	38.2		
40	25.8		
60	18.0		
100	12.4		
200	8.1		

SYMBOL	DESCRIPTION AND REMARKS
□	brown gravelly c-f SAND, trace silt.
■	
○	

PARTICLE SIZE DISTRIBUTION

H&A #32669-000 - Connecticut Busway

Project No.		Figure
31737788-805	May 2008	

Geotesting Services, Inc.

sievj02.xls 5/19/2008

Haley & Aldrich - #32669-000
Connecticut Busway
LABORATORY TESTING DATA SUMMARY

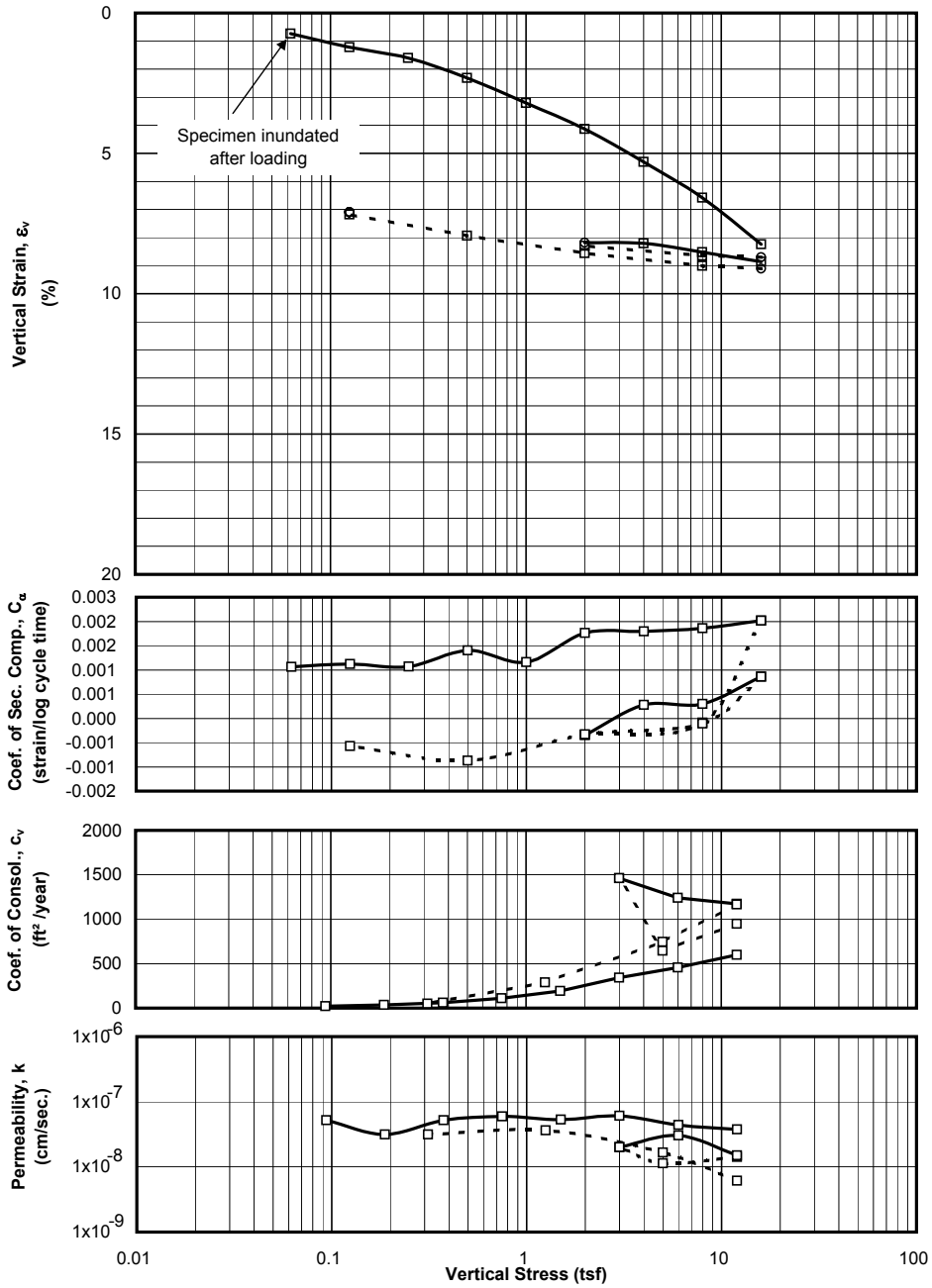
BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							STRENGTH					CONSOLIDATION INITIAL CONDITIONS		REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	Test Type @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	RESIDUAL SHEAR STRESS (ksf)	SENSITIVITY	VOID RATIO (-)	SATUR-ATION (%)	
CB-103	U-1	38-40						124.1									
CB-103	U-1B	38.65	28.1	25	20	5	CL-ML	122.6	97.7	CIU'@2.7	8.5	20.6					T2882
NBA-101	U-3	35-37						124.5									
NBA-101	U-3A	35.65	29.1				ML	126.6	98.0	CIU'@2.2	12.3	19.9					T2879
NBA-101	U-3B	36.15	27.6				CL&ML	121.7	95.4	CIU'@4.3	6.2	21.3					T2880
NBA-101	U-3C	36.65	24.5				CL-ML	129.1	103.7	CIU'@8.6	5.2	20.4					T2881
NBA-101	U-3D	37.1	22.4	28	18	10	CL	131.3	107.2						0.624	100	C08054
NBA-101	U-3D	37.1	22.0							LV	0.76		0.10	7.5			
RB-112	U-1	18-20						116.8									
RB-112	U-1A	18.2	17.1							LV	0.26		0.02	10.3			
RB-112	U-1B	18.45	21.6				CL-ML	135.3	111.2	CIU'@1.4	4.9	20.3					T2870
RB-112	U-1C	18.95	30.9				CL	121.9	93.1	CIU'@2.9	1.6	4.7					T2871
RB-112	U-1D	19.45	38.0				CL	118.7	86.0	CIU'@5.8	1.7	7.2					T2872
RB-112	U-1E	19.85	40.7	43	21	22	CL	114.5	81.4						1.132	100	C08051
RB-118	U-2	23-25						116.6									
RB-118	U-2	23.2	41.5							LV	0.22		0.04	5.4			
RB-118	U-2	23.65	32.5				ML	120.3	90.8	CIU'@1.7	6.2	19.2					T2864
RB-118	U-2	24.15	29.6				CL-ML	125.1	96.5	CIU'@3.5	8.9	10.1					T2865
RB-118	U-2	24.65	29.8				CL-ML	123.6	95.2	CIU'@6.9	13.4	12.5					T2866
RB-118	U-2	25.1	23.0	np	np	np	ML	128.1	104.2						0.648	98	C08048
RW-110	U-1	23-25						108.0									
RW-110	U-1A	23.45	51.6				CL	109.4	72.2	CIU'@2.9	0.8	6.9					T2876
RW-110	U-1B	23.95	46.9				CL	112.1	76.3	CIU'@5.8	1.7	17.2					T2877
RW-110	U-1C	24.45	49.7				CL	110.5	73.8	CIU'@11.5	3.1	17.7					T2878
RW-110	U-1D	24.9	61.1	49	28	21	ML	103.2	64.1						1.709	99	C08053
RW-110	U-1D	24.9	61.7							LV	0.34		0.10	3.7			bottom

Prepared by: JR Reviewed by: GET Date: 5/28/2008

Haley & Aldrich - #32669-000
Connecticut Busway
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							STRENGTH					CONSOLIDATION		REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	Test Type @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	RESIDUAL SHEAR STRESS (ksf)	SENSITIVITY	INITIAL CONDITIONS VOID RATIO (-)	SATUR-ATION (%)	
RW-116		18-20						105.1									
RW-116	A	18.25	63.7				CH	104.8	64.0	CIU'@1.4	0.7	4.9					T2873
RW-116	B	18.75	60.7				CH	104.8	65.2	CIU'@2.9	1.1	2.6					T2874
RW-116	C	19.25	60.5				CH	104.4	65.0	CIU'@5.8	1.5	2.6					T2875
RW-116	D	19.75	60.7	69	29	40	CH	104.6	65.1						1.706	100	C08052
RW-116	D	19.75	65.3							LV	0.68		0.18	3.7			bottom
RW-121	U-1	43-45						108.5									
RW-121	U-1A	43.15	41.8							LV	0.32		0.08	4.10			
RW-121	U-1B	43.55	52.2				CL	109.4	71.9	CIU'@3.3	1.0	11.9					T2867
RW-121	U-1C	44.05	47.9				CL	109.9	74.3	CIU'@6.6	1.9	18.1					T2868
RW-121	U-1D	44.5	49.3				CL	110.4	73.9	CIU'@13.3	3.1	5.0					T2869
RW-121	U-1E	45.05	52.5	41	25	16	CL	107.1	70.3						1.444	100	C08049
TB-102	U-3	55-57						110.3									
TB-102	U-3A	55.1															disturbed
TB-102	U-3B	55.45															disturbed
TB-102	U-3C	55.95															disturbed
TB-102	U-3D	56.45	48.8				ML	111.7	75.1	CIU'@4.3	1.6	16.8					T2883
TB-102	U-3E	56.85	45.3	37	25	12	ML	114.3	78.7						1.317	100^{+}	C08050
TB-102	U-3E	56.85	66.0							LV	0.32		0.08	4.1			

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



SAMPLE INFORMATION

Boring: NBA-101
Sample: U3-D
Depth: 37.10 feet
Elevation:
Type: 3-inch thin wall tube
Description: CL, reddish brown VARVED silty CLAY, trace f. sand.
LL = 28, PL = 18, PI = 10

SPECIMEN INFORMATION

(NOTE: Initial and final states refer to beginning and end of test)

Initial height: 0.61 inch
Diameter: 2.50 inch

Initial water content:	22.4	%
Initial total unit weight:	131.3	pcf
Initial dry unit weight:	107.2	pcf
Initial void ratio:	0.624	
Initial degree of saturation:	100	%
Final water content:	18.9	%
Final total unit weight:	135.7	pcf
Final dry unit weight:	114.1	pcf
Final void ratio:	0.527	
Final degree of saturation:	100	% (assumed specific gravity = 2.79)

TEST SUMMARY

Construction Method:	Casagrande (Log)
Estimated preconsolidation stress (tsf):	3.6 (Range: 1.4 to 4.3)
Estimated in situ effective overburden stress (tsf):	
Compression Ratio (strain per log cycle stress):	0.055
Compression Index (void ratio per log cycle stress):	0.089
Swell Ratio (strain per log cycle stress):	0.006
Swell Index (void ratio per log cycle stress):	0.010
Recompression Ratio (strain per log cycle stress):	0.007
Recompression Index (void ratio per log cycle stress):	0.011
Remarks:	

LEGEND: ☐ End of primary o End of Stage ——— Loading - - - - - - - Unloading

Test Date: 5/8/08 Tested By: CMJ Checked By: GET

Haley & Aldrich	H&A #32669-000 Connecticut Busway	ONE DIMENSIONAL CONSOLIDATION TEST Boring: NBA-101 Depth: 37.10 feet
Geotesting Services, Inc.	Project No. 31737788-805	May 2008

PROJECT:	CT Busway				
PROJECT NO.:	31737788-805	Initial height:	0.611 inch	Final height:	0.574 inch
BORING:	NBA-101	Initial water content:	22.4 %	Final water content:	18.9 %
SAMPLE:	U3-D	Initial dry density:	107.2 pcf	Final dry density:	114.1 pcf
TEST:	C08054	Initial total density:	131.3 pcf	Final total density:	135.7 pcf
DEPTH, feet:	37.1	Initial saturation:	100 %	Final saturation:	100 %
BY:	CMJ	Initial void ratio:	0.624	Final void ratio:	0.527
TEST DATE:	5/8/08			Final strain:	6.1 %

EQUIPMENT:
Load Frame No.: 3
Ring Diameter: 2.5 inch

SPECIMEN DESCRIPTION: CL, reddish brown VARVED silty CLAY, trace f. sand.

G	LL	PL	PI
2.79	28	18	10

Load No.	Load (tsf)	d_{100} (inch)	t_{100} Strain (%)	t_{100} Void Ratio (-)	Final Strain (%)	Final Void Ratio (-)	c_v (ft²/year)	C_α (strain/logt)	Constrained Modulus (tsf)	Permeability (cm/sec)
1	0.063	0.0045	0.733	0.612	0.808	0.611	30.40	0.0011	8.53	1.07E-07
2	0.125	0.0074	1.218	0.604	1.183	0.605	22.11	0.0011	12.87	5.18E-08
3	0.250	0.0098	1.602	0.598	1.720	0.596	34.03	0.0011	32.59	3.15E-08
4	0.500	0.0141	2.309	0.587	2.495	0.584	61.10	0.0014	35.34	5.22E-08
5	1.00	0.0196	3.204	0.572	3.480	0.568	109.75	0.0012	55.87	5.93E-08
6	2.00	0.0252	4.129	0.557	4.610	0.549	191.10	0.0018	108.06	5.34E-08
7	4.00	0.0324	5.305	0.538	5.710	0.531	343.70	0.0018	170.17	6.09E-08
8	8.00	0.0403	6.583	0.517	6.981	0.511	456.04	0.0019	312.81	4.40E-08
9	16.0	0.0504	8.242	0.490	8.701	0.483	600.70	0.0020	482.19	3.76E-08
10	8.00	0.0528	8.641	0.484	8.625	0.484	949.83	-0.0001	2007.11	1.43E-08
11	2.00	0.0507	8.291	0.489	8.179	0.491	646.60	-0.0003	1714.58	1.14E-08
12	4.00	0.0501	8.200	0.491	8.278	0.490	1462.42	0.0003	2199.32	2.01E-08
13	8.00	0.0521	8.525	0.486	8.608	0.484	1240.88	0.0003	1230.30	3.04E-08
14	16.0	0.0542	8.865	0.480	9.107	0.476	1171.92	0.0009	2351.89	1.50E-08
15	8.00	0.0551	9.006	0.478	8.974	0.478	1166.13	-0.0001	5713.15	6.16E-09
16	2.00	0.0523	8.561	0.485	8.484	0.486	745.23	-0.0003	1349.12	1.67E-08
17	0.500	0.0485	7.935	0.495	7.676	0.499	290.38	-0.0009	239.87	3.65E-08
18	0.125	0.0439	7.173	0.508	7.101	0.509	51.45	-0.0006	49.17	3.16E-08

SUMMARY FOR STATIC CIU' TRIAXIAL TESTS SPECIMENS

Test No	Boring No	Sample Section No	Depth / Elev (ft)	USCS Group Symbol / Gs	w_o / w_c (%)	$\gamma_{t,o}$ / $\gamma_{t,c}$ (pcf)	$\gamma_{d,o}$ / $\gamma_{d,c}$ (pcf)	$\sigma'_{c,max}$ (ksf) / OCR	$\sigma'_{v,c}$ (ksf) / $K_c = \sigma'_{v,c} / \sigma'_{h,c}$	$\varepsilon_{a,c}$ / $\varepsilon_{v,c}$ (%)	B factor (%) / ε_{rate} (%/hr)	at Peak Deviator Stress: ε_a (%)	at Peak Obliquity: $(\sigma_1 - \sigma_3)/2$ (ksf)	$(\sigma'_1 + \sigma'_3)/2$ (ksf)	σ'_1 / σ'_3	A factor	ϕ' for c'=0
T-2879	NBA-101	U-3A	35.65	ML	29.1	126.6	98.0	2.16	2.16	0.9	97.2	19.9	12.27	20.61	3.94	-0.252	36.5
				(2.90)	24.2	132.2	106.5	1.0	1.00	7.9	1.2	4.5	3.22	5.05	4.54	0.052	39.7
T-2880	NBA-101	U-3B	36.15	CL & ML	27.6	121.7	95.4	4.32	4.32	1.7	96.8	21.3	6.24	11.45	3.40	-0.071	33.0
				(2.75)	27.0	125.2	98.6	1.0	1.00	3.3	1.2	13.8	4.59	8.26	3.51	0.071	33.8
T-2881	NBA-101	U-3C	36.65	CL-ML	24.5	129.1	103.7	8.64	8.64	1.7	96.4	20.4	5.15	9.80	3.22	0.388	31.7
				(2.81)	20.7	133.8	110.9	1.0	1.00	6.5	1.3	8.8	4.34	7.98	3.39	0.577	33.0

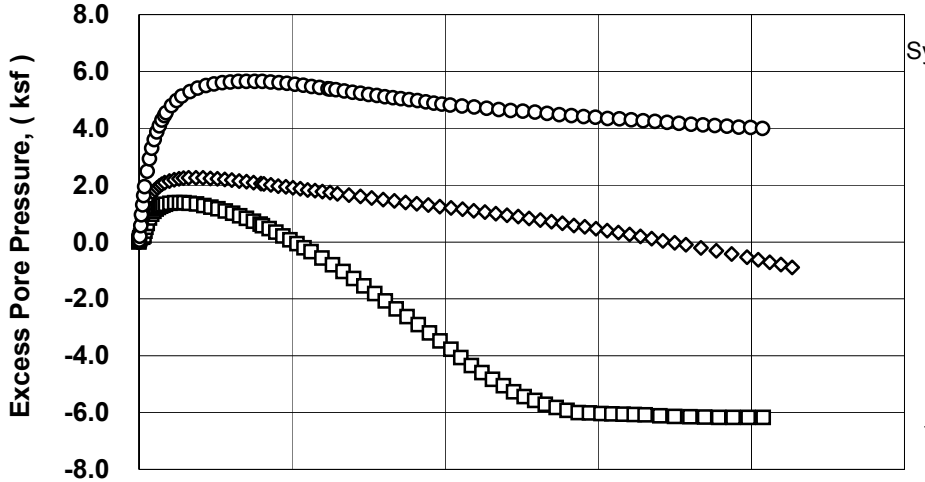
Test No	Description of Material Tested and Remarks
T-2879	ML, reddish brown SILT, trace f. sand.
T-2880	CL & ML, reddish brown silty CLAY, trace f. sand; bottom ML.
T-2881	CL-ML, reddish brown silty CLAY; top 1" ML.

Strength Envelope Summary

Test Series	Failure Criteria	ϕ' (deg)	c' (ksf)	α' (deg)	a' (ksf)	Correlation Coefficient
1	1	35.1	0.000	29.9	0.000	--
	2	24.1	1.271	22.2	1.161	0.995

Failure Criteria: 1 - Peak Deviator Stress; 2 - Peak Obliquity

Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements NBA-101 SUMMARY	May 2008
	Geotesting Services, Inc.		

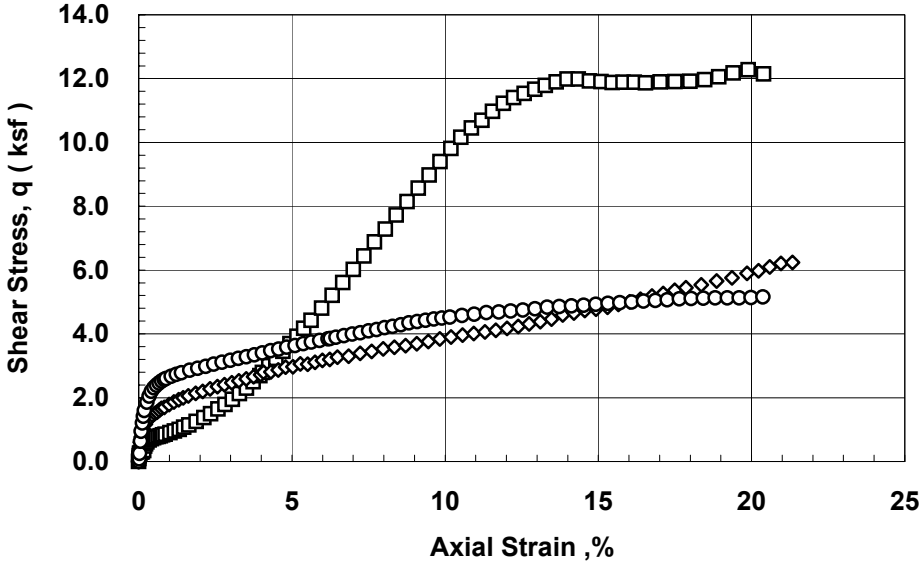


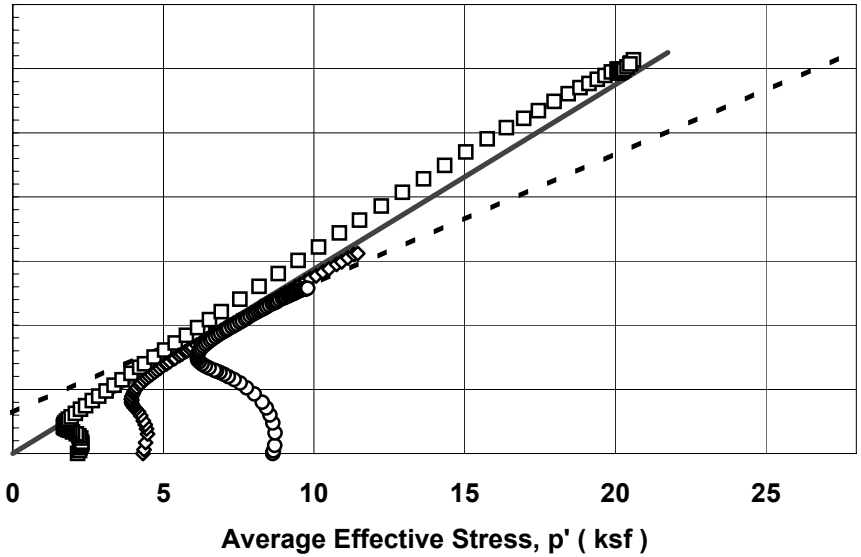
LEGEND AND SUMMARY INFORMATION

Symbol	Test	Boring	Sample	Depth (ft)	w_o (%)	γ_{to} (pcf)	σ'_c (ksf)
□	T-2879	NBA-101	U-3A	35.7	29.1	126.6	2.16
◊	T-2880	NBA-101	U-3B	36.2	27.6	121.7	4.32
○	T-2881	NBA-101	U-3C	36.7	24.5	129.1	8.64

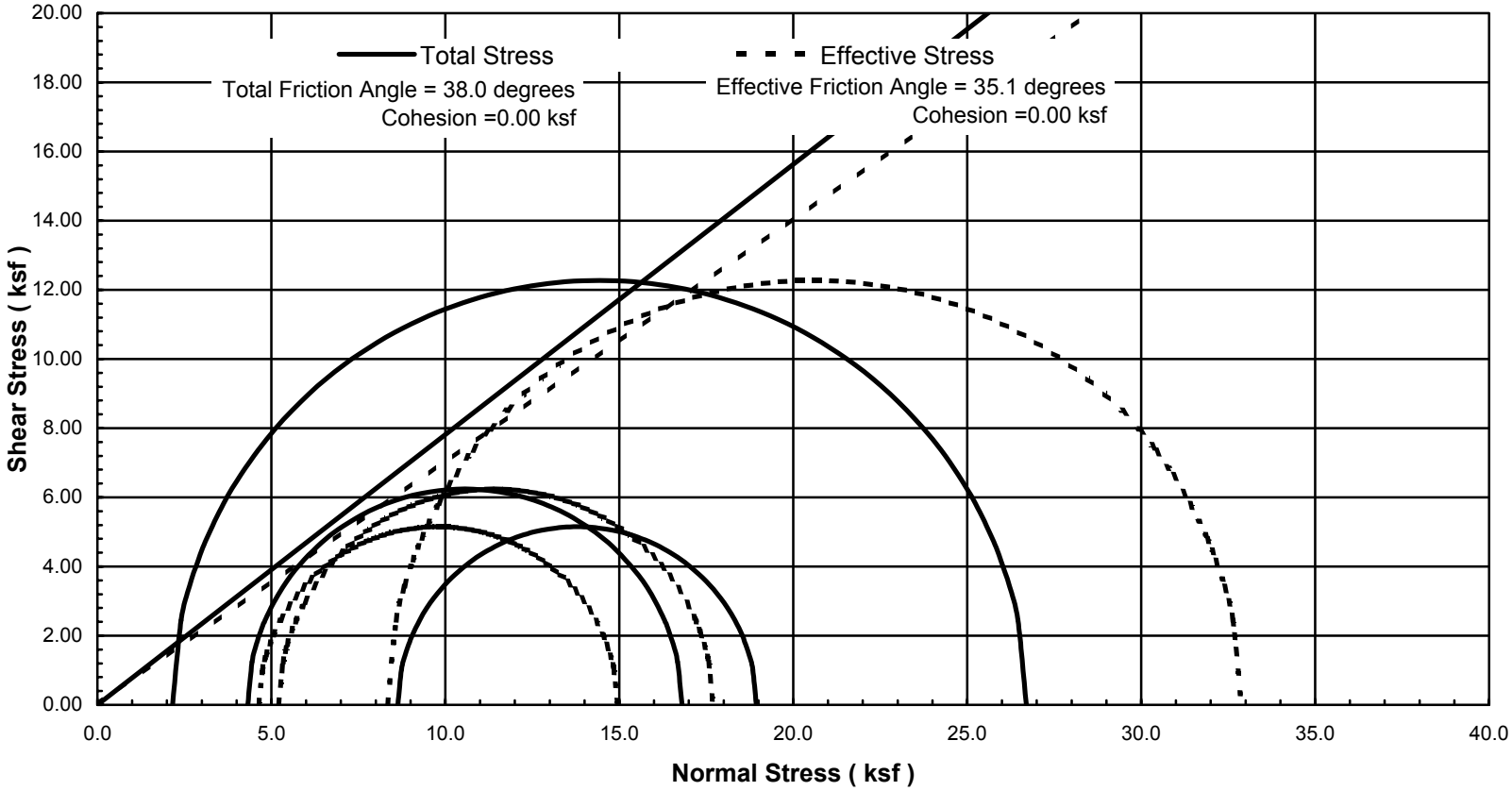
SERIES SUMMARY

Notation	Failure Criteria	c' (ksf)	Φ' (degrees)
———	Peak Deviator Stress	0.00	35.1
·····	Peak Obliquity	1.27	24.1

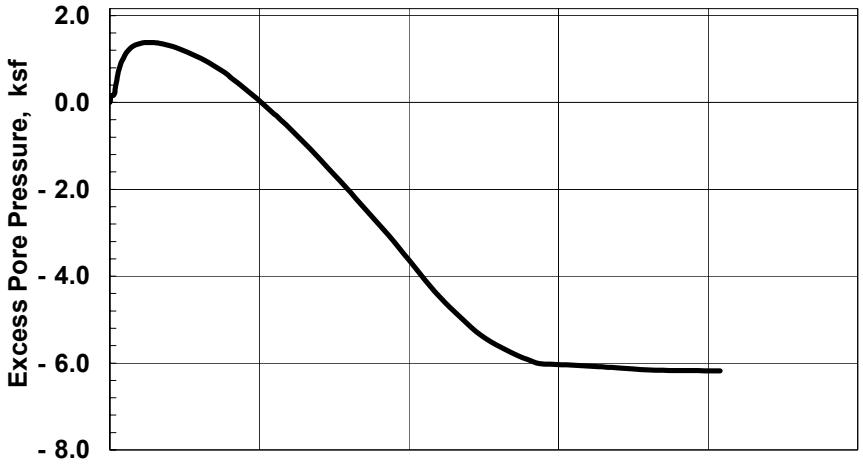




Project No. 31737788-805	**Haley & Aldrich - #32669-000** **Connecticut Busway**	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements NBA-101 SUMMARY	Figure 1
Prepared by: C. Jordan Checked by: G. Thomas	**Geotesting Services, Inc.**		May 2008



Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	Mohr Circles of Total and Effective Stresses at Peak CIU' Triaxial Test	Figure 2
Geotesting Services, Inc.		NBA-101 SUMMARY	May 2008



SAMPLE INFORMATION

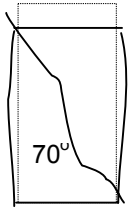
Boring: NBA-101 Sample: U-3A Depth: 35.65 ft
Type: Intact
Description: ML, reddish brown SILT, trace f. sand.

SPECIMEN INFORMATION (Initial)

Height: 6.01 inch Diameter: 2.84 inch Area: 6.35 in²
Water Content: 29.1 % Total Unit Weight: 126.6 pcf

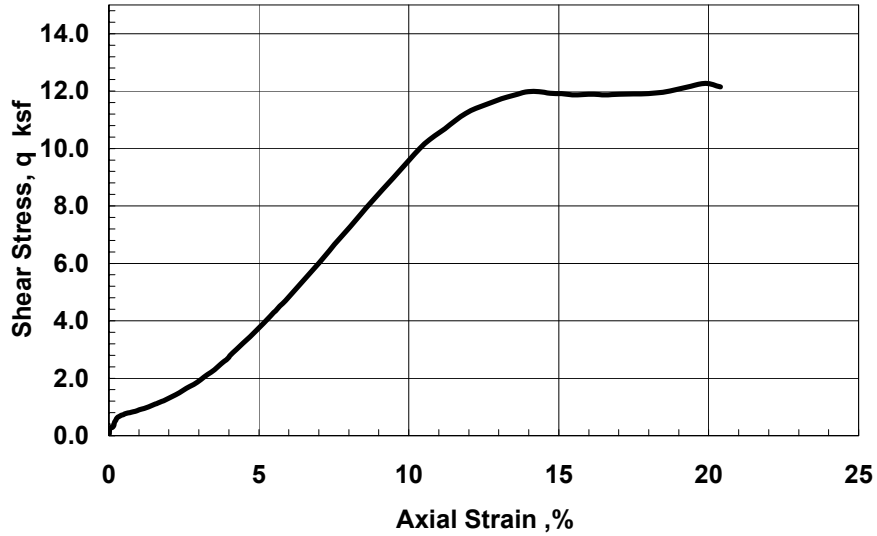
TEST SUMMARY

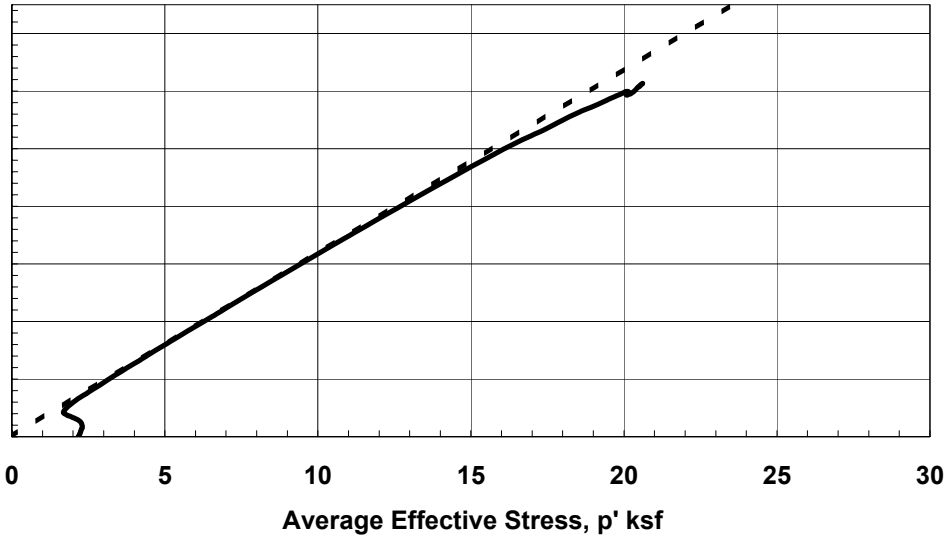
Consolidation Stresses: 2.16 ksf vertical, 2.16 ksf lateral
Water Content: 24.2 % Total Unit Weight: 132.2 pcf
B Coefficient: 97.2 Strain Rate: 0.019 %/min
Peak Shear Strength: 12.27 ksf @ 19.9 % Strain
Peak Effective Friction Angle: 39.7°



Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring NBA-101 Sample U-3A @ 35.65 ft
			May-08

SAMPLE INFORMATION

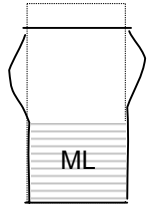
Boring: NBA-101 Sample: U-3B Depth: 36.15 ft
Type: Intact
Description: CL & ML, reddish brown silty CLAY, trace f. sand; bottom ML.

SPECIMEN INFORMATION (Initial)

Height: 6.00 inch Diameter: 2.87 inch Area: 6.48 in²
Water Content: 27.6 % Total Unit Weight: 121.7 pcf

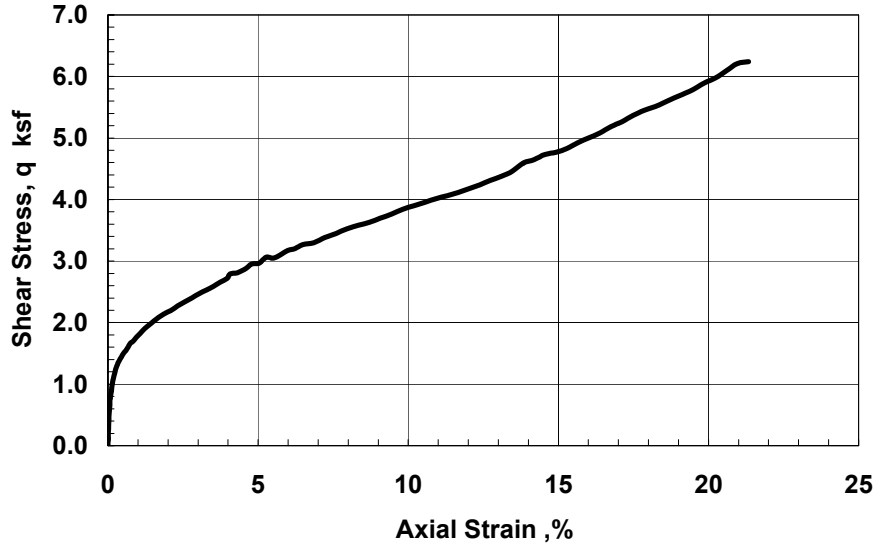
TEST SUMMARY

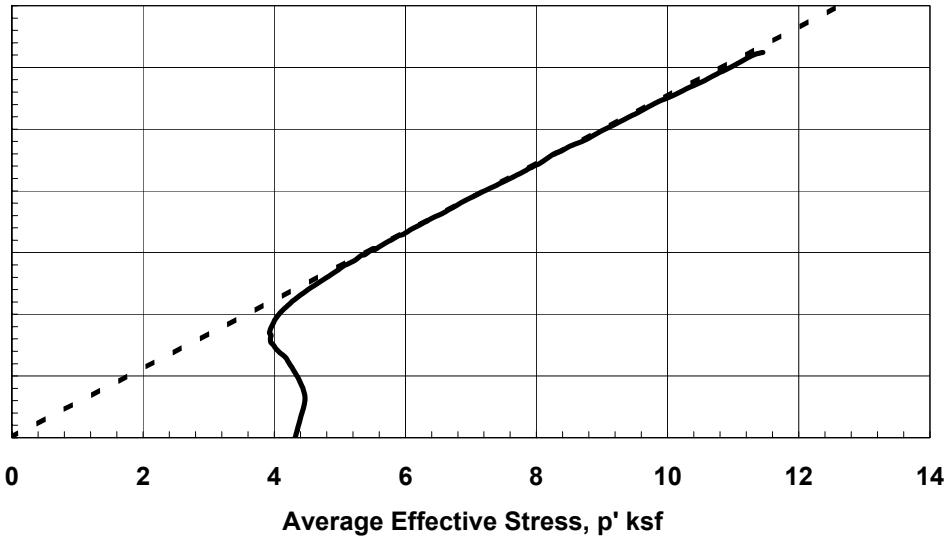
Consolidation Stresses: 4.32 ksf vertical, 4.32 ksf lateral
Water Content: 27.0 % Total Unit Weight: 125.2 pcf
B Coefficient: 96.8 Strain Rate: 0.020 %/min
Peak Shear Strength: 6.24 ksf @ 21.3 % Strain
Peak Effective Friction Angle: 33.8°



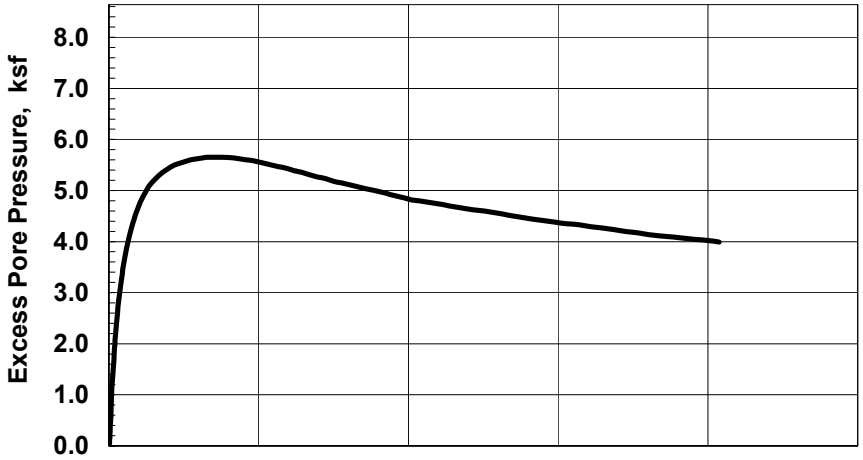
Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring NBA-101 Sample U-3B @ 36.15 ft
			May-08



SAMPLE INFORMATION

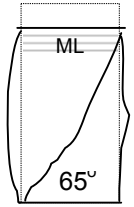
Boring: NBA-101 Sample: U-3C Depth: 36.65 ft
Type: Intact
Description: CL-ML, reddish brown silty CLAY; top 1" ML.

SPECIMEN INFORMATION (Initial)

Height: 5.98 inch Diameter: 2.87 inch Area: 6.47 in²
Water Content: 24.5 % Total Unit Weight: 129.1 pcf

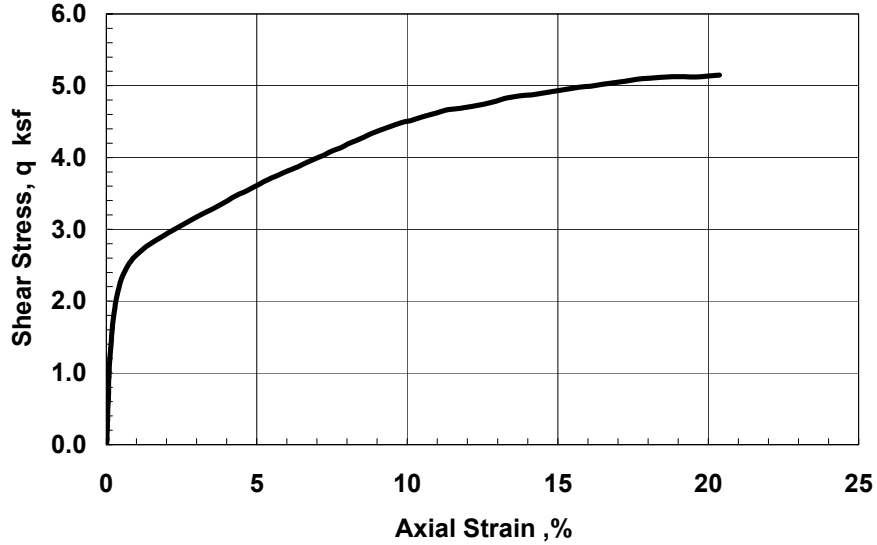
TEST SUMMARY

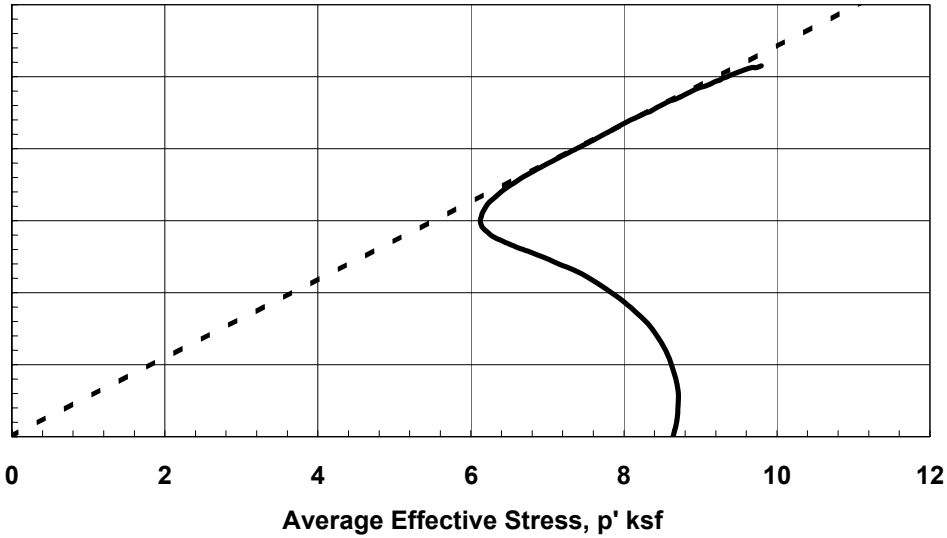
Consolidation Stresses: 8.64 ksf vertical, 8.64 ksf lateral
Water Content: 20.7 % Total Unit Weight: 133.8 pcf
B Coefficient: 96.4 Strain Rate: 0.022 %/min
Peak Shear Strength: 5.15 ksf @ 20.4 % Strain
Peak Effective Friction Angle: 33.0°



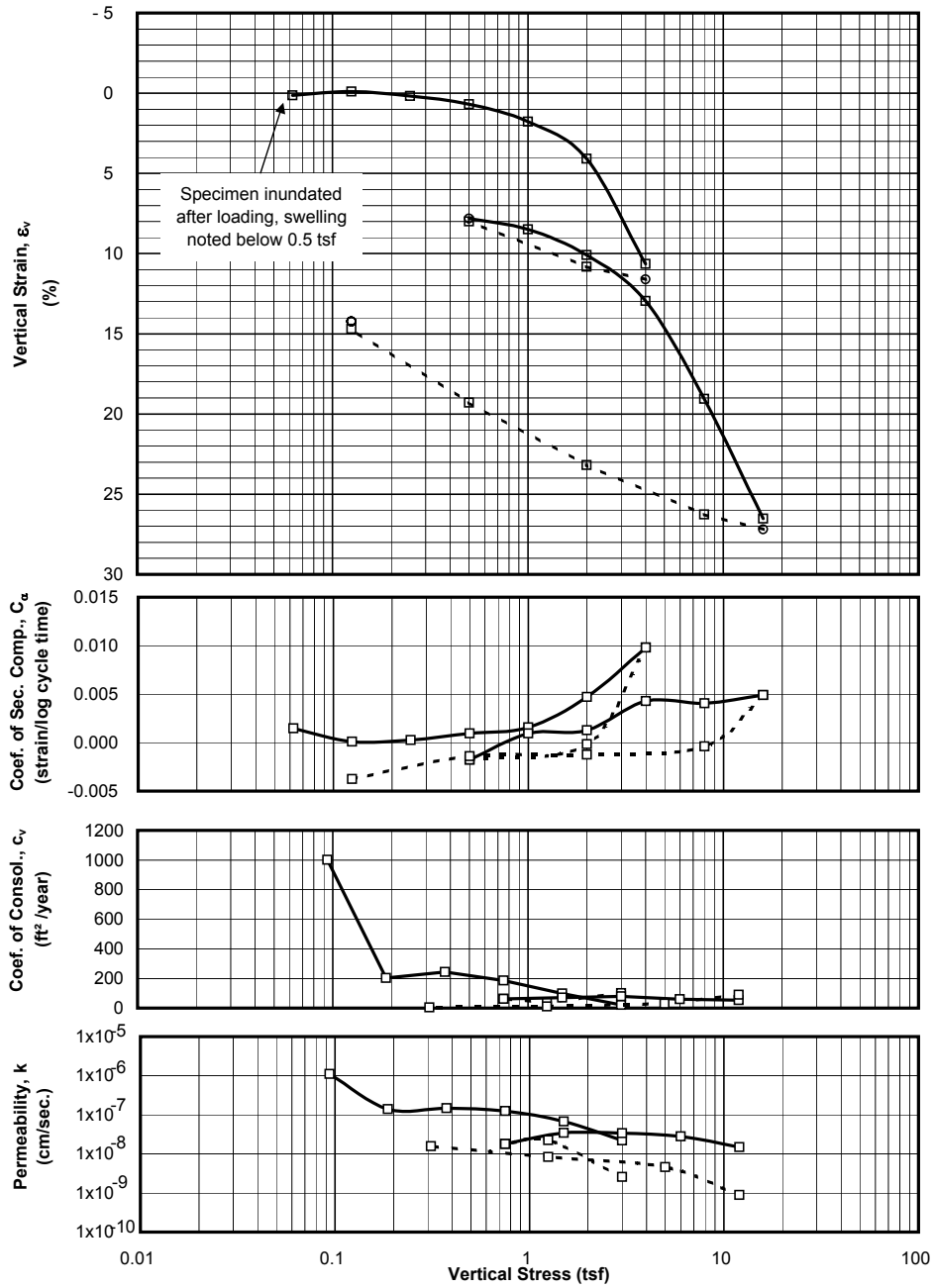
Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring NBA-101 Sample U-3C @ 36.65 ft
			May-08



SAMPLE INFORMATION

Boring: RW-116
Sample: D
Depth: 19.75 feet
Elevation:
Type: 3-inch thin wall tube
Description: CH, reddish brown VARVED CLAY, trace f. sand.

LL = 69, PL = 29, PI = 40

SPECIMEN INFORMATION

(NOTE: Initial and final states refer to beginning and end of test)

Initial height: 0.61 inch
Diameter: 2.50 inch

Initial water content:	60.7	%
Initial total unit weight:	104.6	pcf
Initial dry unit weight:	65.1	pcf
Initial void ratio:	1.706	
Initial degree of saturation:	100	%
Final water content:	56.7	%
Final total unit weight:	106.3	pcf
Final dry unit weight:	67.9	pcf
Final void ratio:	1.594	
Final degree of saturation:	100	% (assumed specific gravity = 2.82)

TEST SUMMARY

Construction Method:	Casagrande (Log)
Estimated preconsolidation stress (tsf):	2.3 (Range: 2.2 to 2.4)
Estimated in situ effective overburden stress (tsf):	
Compression Ratio (strain per log cycle stress):	0.279
Compression Index (void ratio per log cycle stress):	0.755
Swell Ratio (strain per log cycle stress):	0.047
Swell Index (void ratio per log cycle stress):	0.127
Recompression Ratio (strain per log cycle stress):	0.055
Recompression Index (void ratio per log cycle stress):	0.149
Remarks:	

LEGEND: ☐ End of primary o End of Stage ——— Loading - - - - - - - Unloading

Test Date: 5/6/08 Tested By: CMJ Checked By: GET

Haley & Aldrich	H&A #32669-000 Connecticut Busway	ONE DIMENSIONAL CONSOLIDATION TEST Boring: RW-116 Depth: 19.75 feet
Geotesting Services, Inc.	Project No. 31737788-805	May 2008

PROJECT:	H&A				
PROJECT NO.:	31737788-805	Initial height:	0.610 inch	Final height:	0.544 inch
BORING:	RW-116	Initial water content:	60.7 %	Final water content:	56.7 %
SAMPLE:	D	Initial dry density:	65.1 pcf	Final dry density:	67.9 pcf
TEST:	C08052	Initial total density:	104.6 pcf	Final total density:	106.3 pcf
DEPTH, feet:	19.75	Initial saturation:	100 %	Final saturation:	100 %
BY:	CMJ	Initial void ratio:	1.706	Final void ratio:	1.594
TEST DATE:	5/6/2008			Final strain:	10.9 %

EQUIPMENT: SPECIMEN DESCRIPTION: CH, reddish brown VARVED CLAY, trace f. sand.

Load Frame No.: 1

Ring Diameter: 2.5 inch

G	LL	PL	PI
2.82	69	29	40

Load No.	Load (tsf)	d_{100} (inch)	t_{100} Strain (%)	t_{100} Void Ratio (-)	Final Strain (%)	Final Void Ratio (-)	c_v (ft²/year)	C_α (strain/logt)	Constrained Modulus (tsf)	Permeability (cm/sec)
1	0.063	0.0008	0.126	1.703	-0.073	1.708	366.40	0.0015	49.56	2.23E-07
2	0.125	-0.0006	-0.102	1.709	-0.099	1.709	1001.42	0.0001	27.36	1.10E-06
3	0.250	0.0011	0.182	1.701	0.210	1.700	204.25	0.0003	43.92	1.40E-07
4	0.500	0.0042	0.683	1.688	0.835	1.683	243.65	0.0010	49.94	1.47E-07
5	1.00	0.0109	1.781	1.658	1.991	1.652	186.73	0.0016	45.53	1.24E-07
6	2.00	0.0249	4.087	1.595	4.622	1.581	97.66	0.0047	43.36	6.80E-08
7	4.00	0.0649	10.643	1.418	11.620	1.392	22.21	0.0098	30.51	2.20E-08
8	2.00	0.0659	10.814	1.413	10.777	1.414	100.68	-0.0002	1170.67	2.59E-09
9	0.500	0.0488	7.996	1.490	7.814	1.495	39.30	-0.0017	53.24	2.23E-08
10	1.00	0.0517	8.481	1.477	8.589	1.474	61.20	0.0009	103.27	1.79E-08
11	2.00	0.0616	10.097	1.433	10.247	1.429	70.67	0.0013	61.87	3.45E-08
12	4.00	0.0790	12.948	1.356	13.582	1.338	78.50	0.0043	70.15	3.38E-08
13	8.00	0.1162	19.056	1.190	19.941	1.166	60.40	0.0040	65.49	2.78E-08
14	16.0	0.1618	26.533	0.988	27.192	0.970	52.70	0.0049	106.99	1.49E-08
15	8.00	0.1602	26.272	0.995	26.228	0.996	89.81	-0.0004	3063.29	8.84E-10
16	2.00	0.1414	23.193	1.078	23.046	1.082	29.36	-0.0013	194.86	4.55E-09
17	0.500	0.1177	19.296	1.184	19.100	1.189	10.56	-0.0014	38.49	8.28E-09
18	0.125	0.0896	14.694	1.308	14.247	1.321	4.21	-0.0038	8.15	1.56E-08

SUMMARY FOR STATIC CIU' TRIAXIAL TESTS SPECIMENS

Test No	Boring No	Sample Section No	Depth / Elev (ft)	USCS Group Symbol / Gs	w_o / w_c (%)	$\gamma_{t,o}$ / $\gamma_{t,c}$ (pcf)	$\gamma_{d,o}$ / $\gamma_{d,c}$ (pcf)	$\sigma'_{c,max}$ (ksf) / OCR	$\sigma'_{v,c}$ (ksf) / $K_c = \frac{\sigma'_{v,c}}{\sigma'_{h,c}}$	$\varepsilon_{a,c}$ / $\varepsilon_{v,c}$ (%)	B factor (%) / ε_{rate} (%/hr)	at Peak Deviator Stress: ε_a (%)	at Peak Obliquity: $\frac{\sigma_1 - \sigma_3}{2}$ (ksf)	$\frac{\sigma'_1 + \sigma'_3}{2}$ (ksf)	σ'_1 / σ'_3	A factor	ϕ' for c'=0
T-2873	RW-116	A	18.25	CH	63.7	104.8	64.0	1.44	1.44	3.2	97.3	4.9	0.65	1.12	3.77	0.746	35.5
				(2.90)	58.9	106.2	66.8	1.0	1.00	4.2	1.2	3.7	0.64	1.08	3.90	0.782	36.3
T-2874	RW-116	B	18.75	CH	60.7	104.8	65.2	2.88	2.88	1.5	97.6	2.6	1.07	2.23	2.83	0.806	28.6
				(2.86)	55.8	107.2	68.8	1.0	1.00	5.3	1.3	3.7	1.02	2.10	2.88	0.882	29.0
T-2875	RW-116	C	19.25	CH	60.5	104.4	65.0	5.76	5.76	4.4	96.7	2.6	1.46	3.56	2.39	1.254	24.2
				(2.88)	53.4	108.7	70.9	1.0	1.00	8.3	1.4	13.0	1.19	2.32	3.09	1.948	30.7

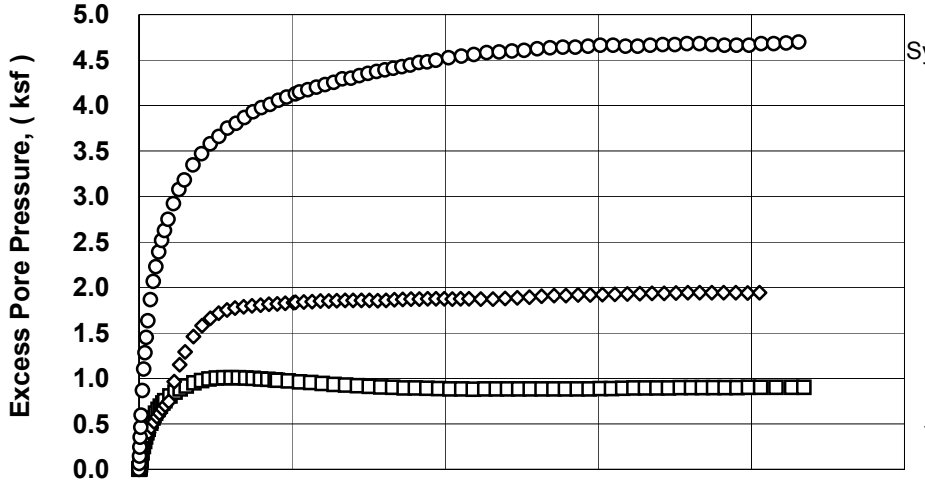
Test No	Description of Material Tested and Remarks
T-2873	CH, reddish brown VARVED CLAY, trace f. sand.
T-2874	CH, reddish brown VARVED CLAY, trace f. sand.
T-2875	CH, reddish brown VARVED CLAY, trace f. sand.

Strength Envelope Summary

Test Series	Failure Criteria	ϕ' (deg)	c' (ksf)	α' (deg)	a' (ksf)	Correlation Coefficient
1	1	19.3	0.316	18.3	0.298	0.998
	2	24.8	0.197	22.7	0.179	0.991

Failure Criteria: 1 - Peak Deviator Stress
2 - Peak Obliquity

Project No. 31737788-805	**Haley & Aldrich - #32669-000** **Connecticut Busway**	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements RW-116 SUMMARY	May 2008
Geotesting Services, Inc.			

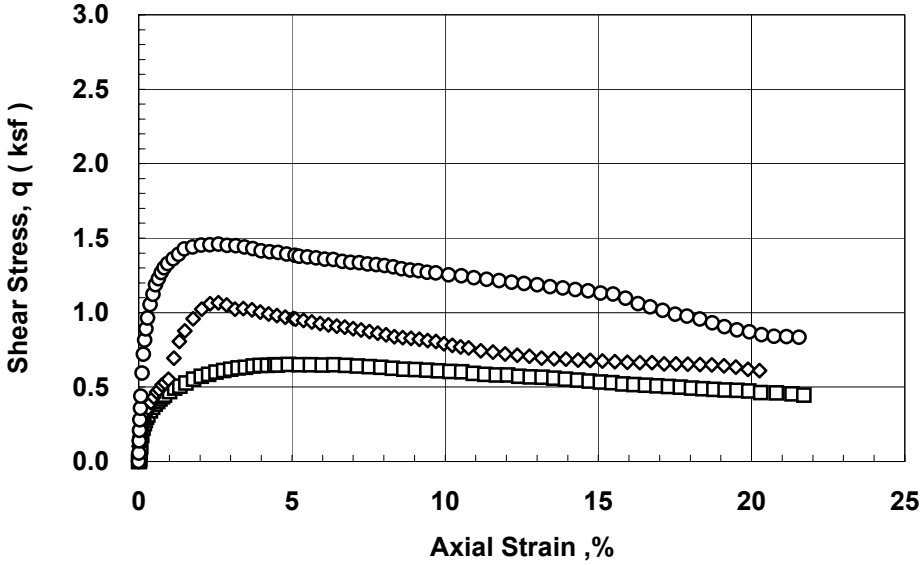


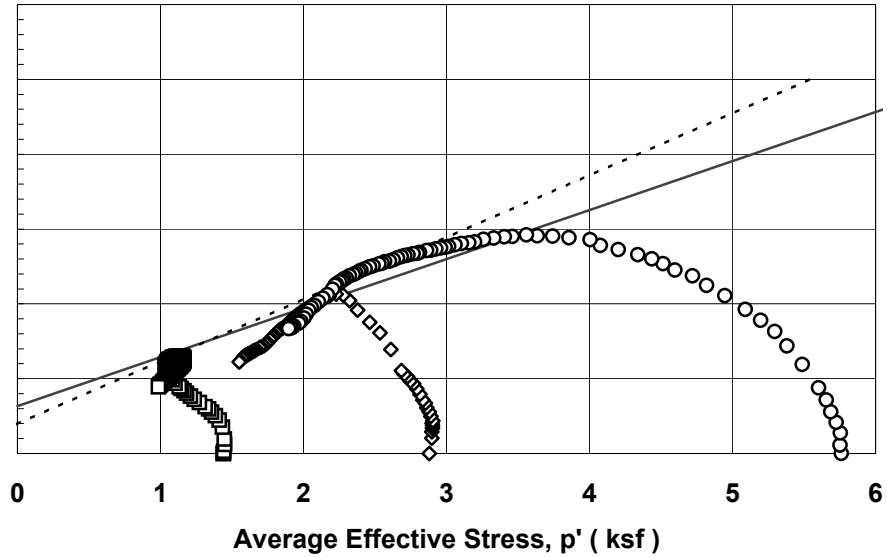
LEGEND AND SUMMARY INFORMATION

Symbol	Test	Boring	Sample	Depth (ft)	w_o (%)	γ_{to} (pcf)	σ'_c (ksf)
□	T-2873	RW-116	A	18.3	63.7	104.8	1.44
◊	T-2874	RW-116	B	18.8	60.7	104.8	2.88
○	T-2875	RW-116	C	19.3	60.5	104.4	5.76

SERIES SUMMARY

Notation	Failure Criteria	c' (ksf)	Φ' (degrees)
———	Peak Deviator Stress	0.32	19.3
·····	Peak Obliquity	0.20	24.8

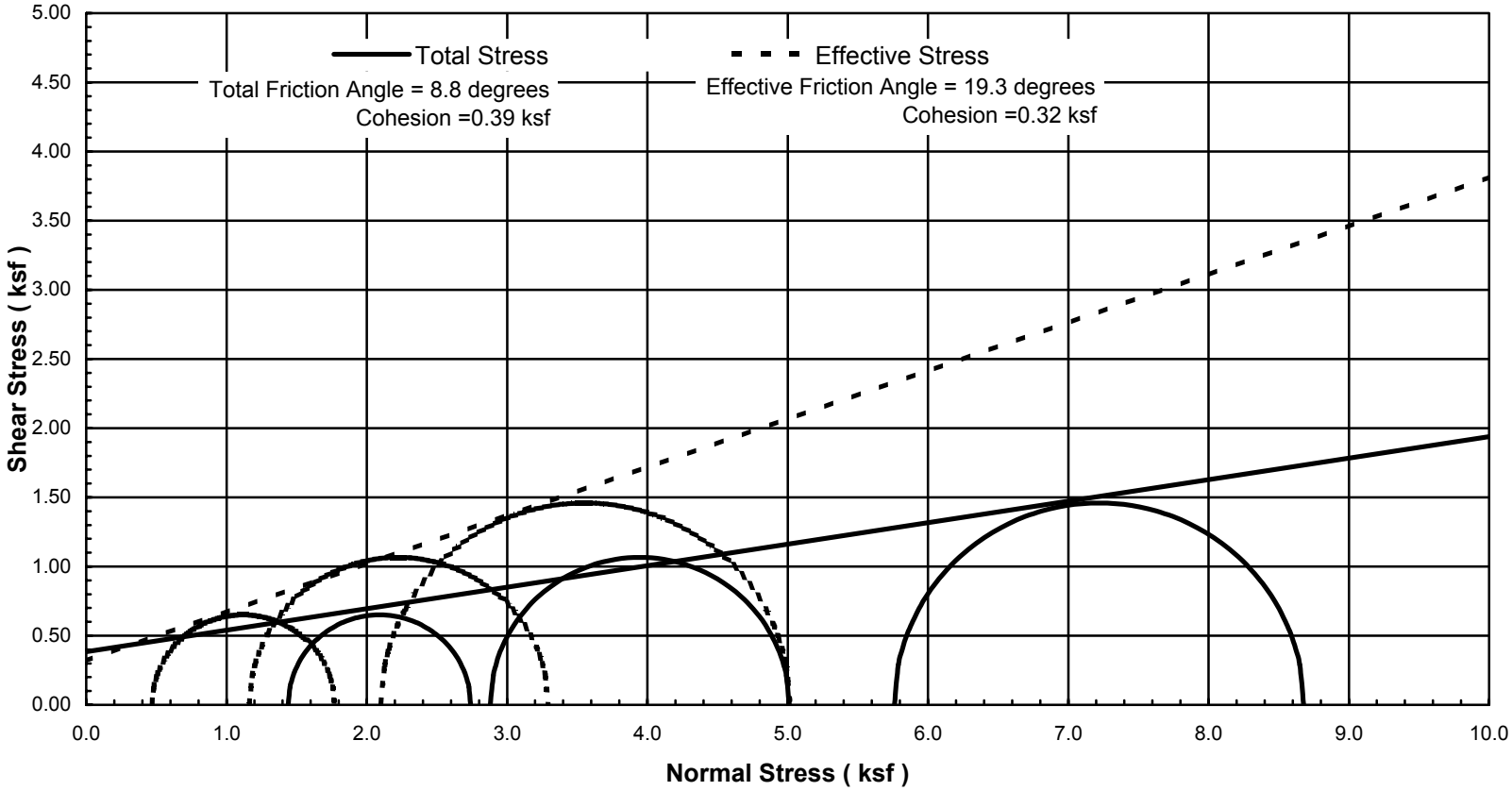




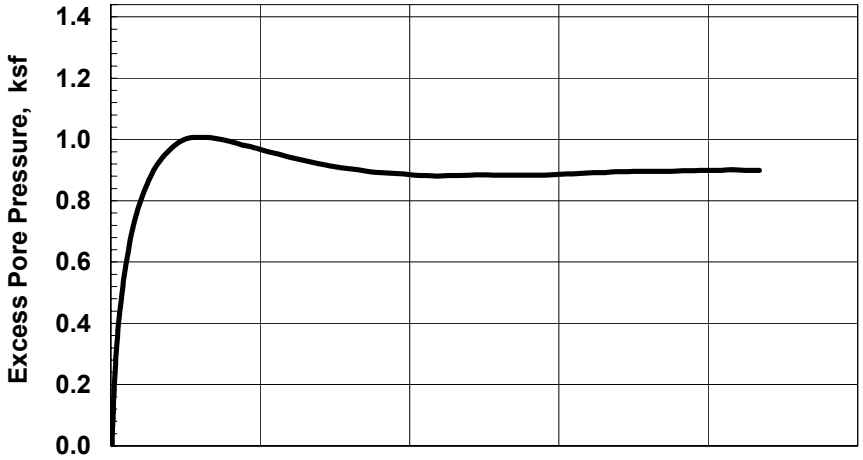
Project No. 31737788-805	**Haley & Aldrich - #32669-000** **Connecticut Busway**	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements RW-116 SUMMARY	Figure 1
Prepared by: C. Jordan Checked by: G. Thomas	**Geotesting Services, Inc.**		May 2008

GSI Analysis File: Cu'sum3v4

5/27/2008 Test: Cu'sum1_rw116.xls



Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	Mohr Circles of Total and Effective Stresses at Peak CIU' Triaxial Test	Figure 2
Geotesting Services, Inc.		RW-116 SUMMARY	May 2008



SAMPLE INFORMATION

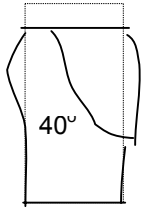
Boring: RW-116 Sample: A Depth: 18.25ft
Type: Intact
Description: CH, reddish brown VARVED CLAY, trace f. sand.

SPECIMEN INFORMATION (Initial)

Height: 5.99 inch Diameter: 2.84 inch Area: 6.35 in²
Water Content: 63.7 % Total Unit Weight: 104.8 pcf

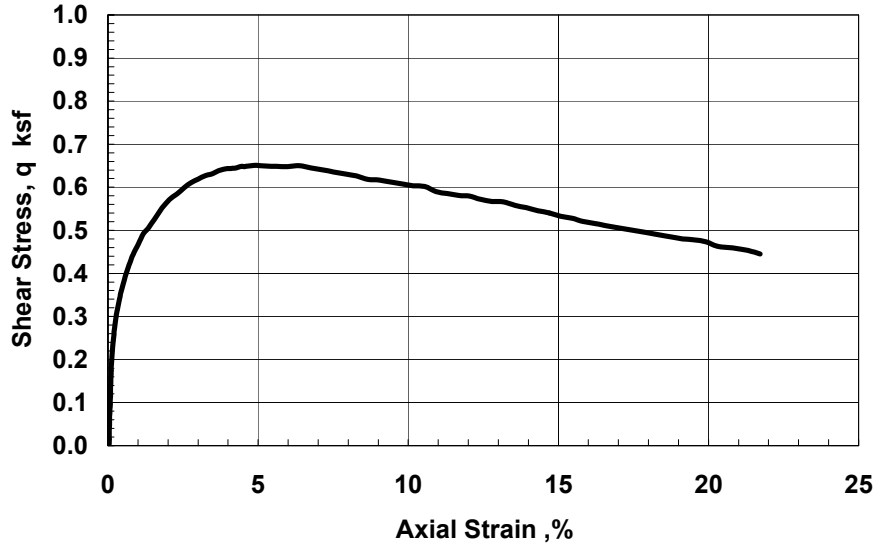
TEST SUMMARY

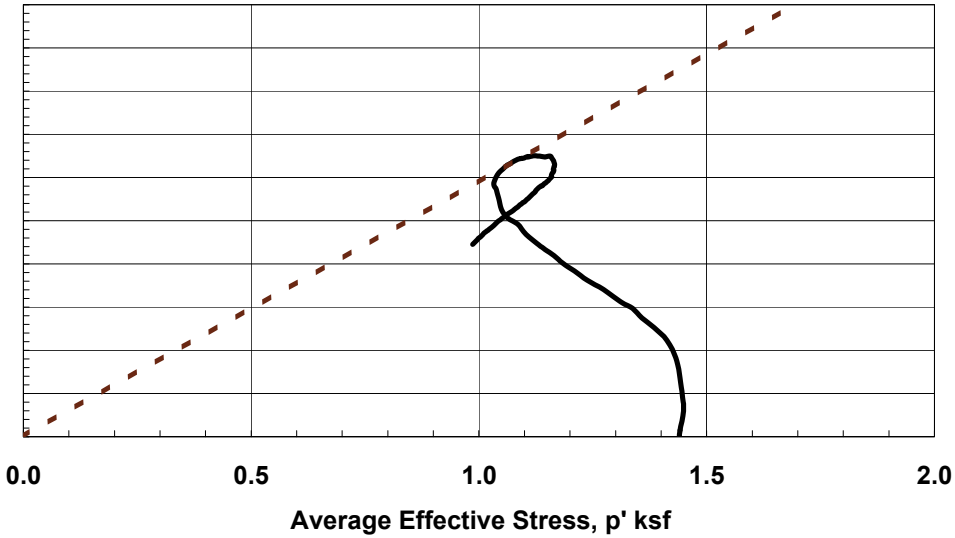
Consolidation Stresses: 1.44 ksf vertical, 1.44 ksf lateral
Water Content: 58.9 % Total Unit Weight: 106.2 pcf
B Coefficient: 97.3 Strain Rate: 0.021 %/min
Peak Shear Strength: 0.65 ksf @ 4.9 % Strain
Peak Effective Friction Angle: 36.3°



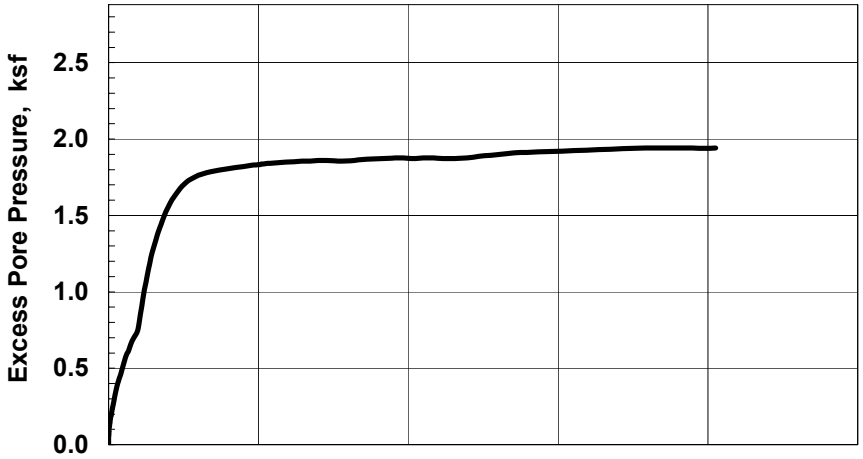
Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring RW-116 Sample A
			May-08



SAMPLE INFORMATION

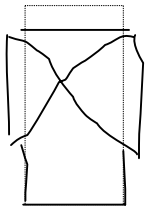
Boring: RW-116 Sample: B Depth: 18.75ft
Type: Intact
Description: CH, reddish brown VARVED CLAY, trace f. sand.

SPECIMEN INFORMATION (Initial)

Height: 6.00 inch Diameter: 2.86 inch Area: 6.41 in²
Water Content: 60.7 % Total Unit Weight: 104.8 pcf

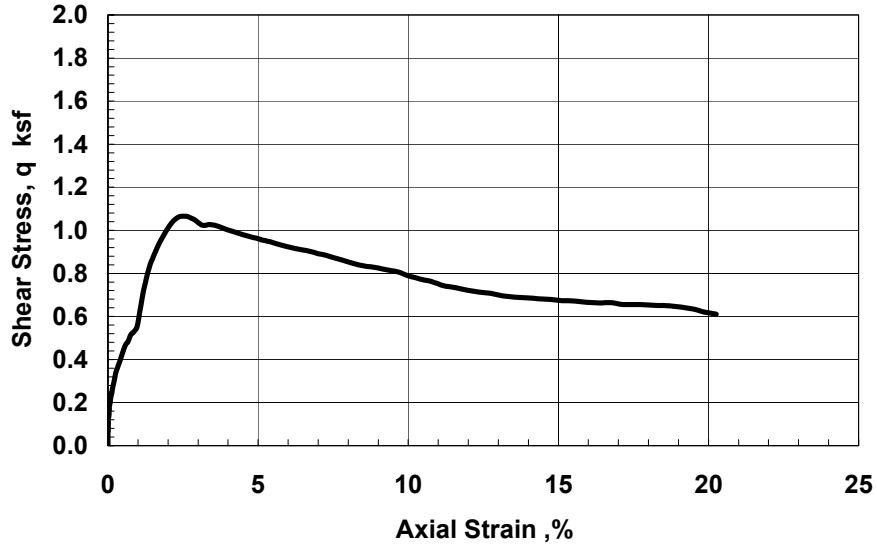
TEST SUMMARY

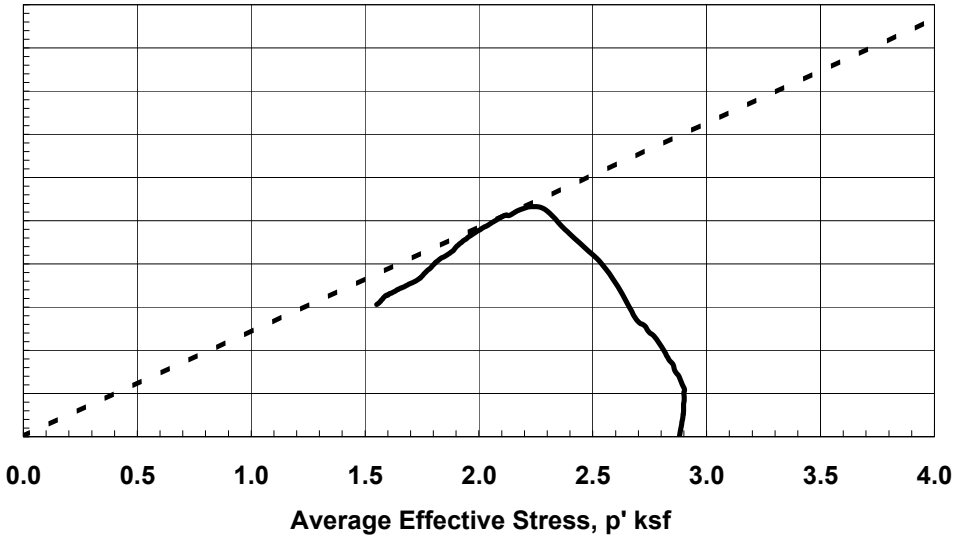
Consolidation Stresses: 2.88 ksf vertical, 2.88 ksf lateral
Water Content: 55.8 % Total Unit Weight: 107.2 pcf
B Coefficient: 97.6 Strain Rate: 0.022 %/min
Peak Shear Strength: 1.07 ksf @ 2.6 % Strain
Peak Effective Friction Angle: 29.0°



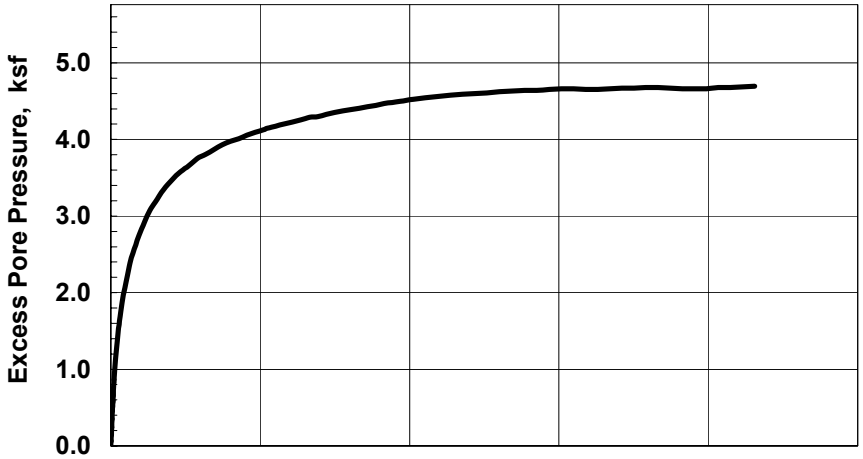
Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring RW-116 Sample B
			May-08



SAMPLE INFORMATION

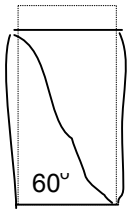
Boring: RW-116 Sample: C Depth: 19.25ft
Type: Intact
Description: CH, reddish brown VARVED CLAY, trace f. sand.

SPECIMEN INFORMATION (Initial)

Height: 6.00 inch Diameter: 2.84 inch Area: 6.34 in²
Water Content: 60.5 % Total Unit Weight: 104.4 pcf

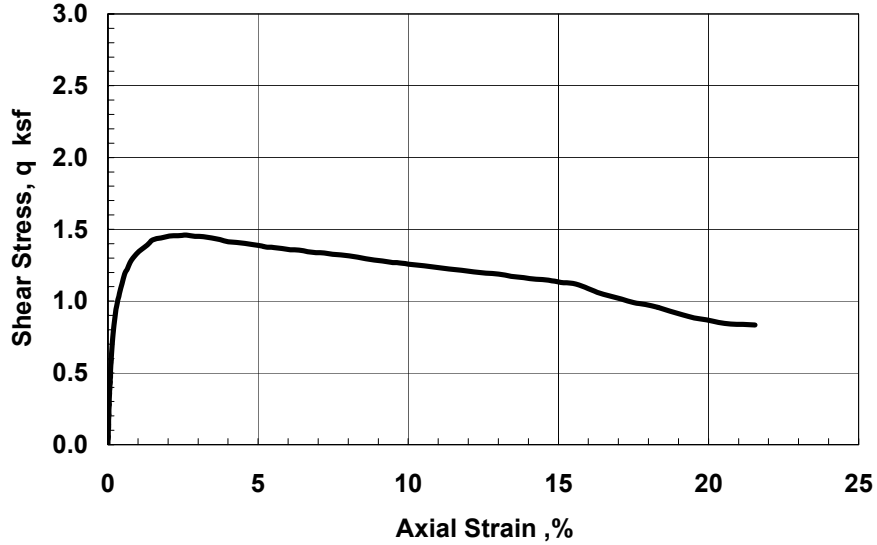
TEST SUMMARY

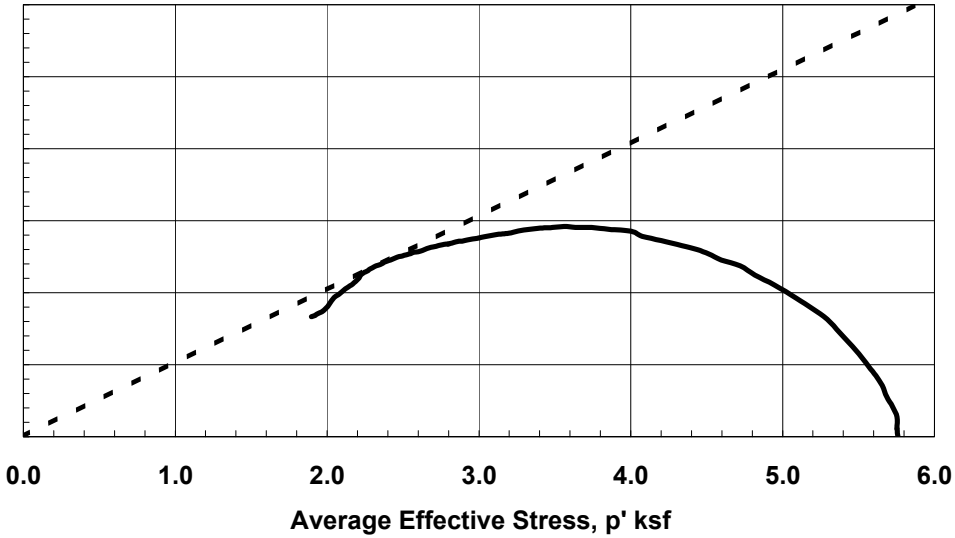
Consolidation Stresses: 5.76 ksf vertical, 5.76 ksf lateral
Water Content: 53.4 % Total Unit Weight: 108.7 pcf
B Coefficient: 96.7 Strain Rate: 0.023 %/min
Peak Shear Strength: 1.46 ksf @ 2.6 % Strain
Peak Effective Friction Angle: 30.7°



Failure Sketch

REMARKS:





Test by: DT	Project No. 31737788-805	Haley & Aldrich - #32669-000 Connecticut Busway	CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION with Pore Pressure Measurements
Checked by: GET	**Geotesting Services, Inc.**		Boring RW-116 Sample C
			May-08

APPENDIX D

Previous Laboratory Test Data

LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

Project No.: L17828 | Assigned By: D. GAFFNEY | Reviewed By: [signature]

Project Engineer: D. SCHULZE | Date: NOV.03 | Date Reviewed: 11/4/03

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. $\frac{\Delta e}{1 + e_0}$	Laboratory Log and Soil Description
SB-40	S-3	7.5-9.0	275	21.1																
SB-40	S-11	35.0-36.5	276	29.9																
SB-40	S-13	45.0-46.5	277	30.4																
SB-41	S-2	4.5-6.0	278	21.3																
SB-42	S-3	7.5-9.0	279	26.8																
SB-42	S-9	25.5-26.2	280	10.8																
SB-43	S-2	4.5-6.0	281	25.4																
SB-44	S-9	25.0-26.5	282	47.6																
SB-46	S-11	35.0-36.5	283	48.7																
SB-46	S-15	55.0-56.5	284	18.8																
SB-47	S-4	10.0-11.5	285	48.5																
SB-47	S-14	50.0-51.5	286	11.7																
SB-48	S-3	7.5-9.0	287	55.5																
SB-49	S-5	13.5-15.0	288	35.4																

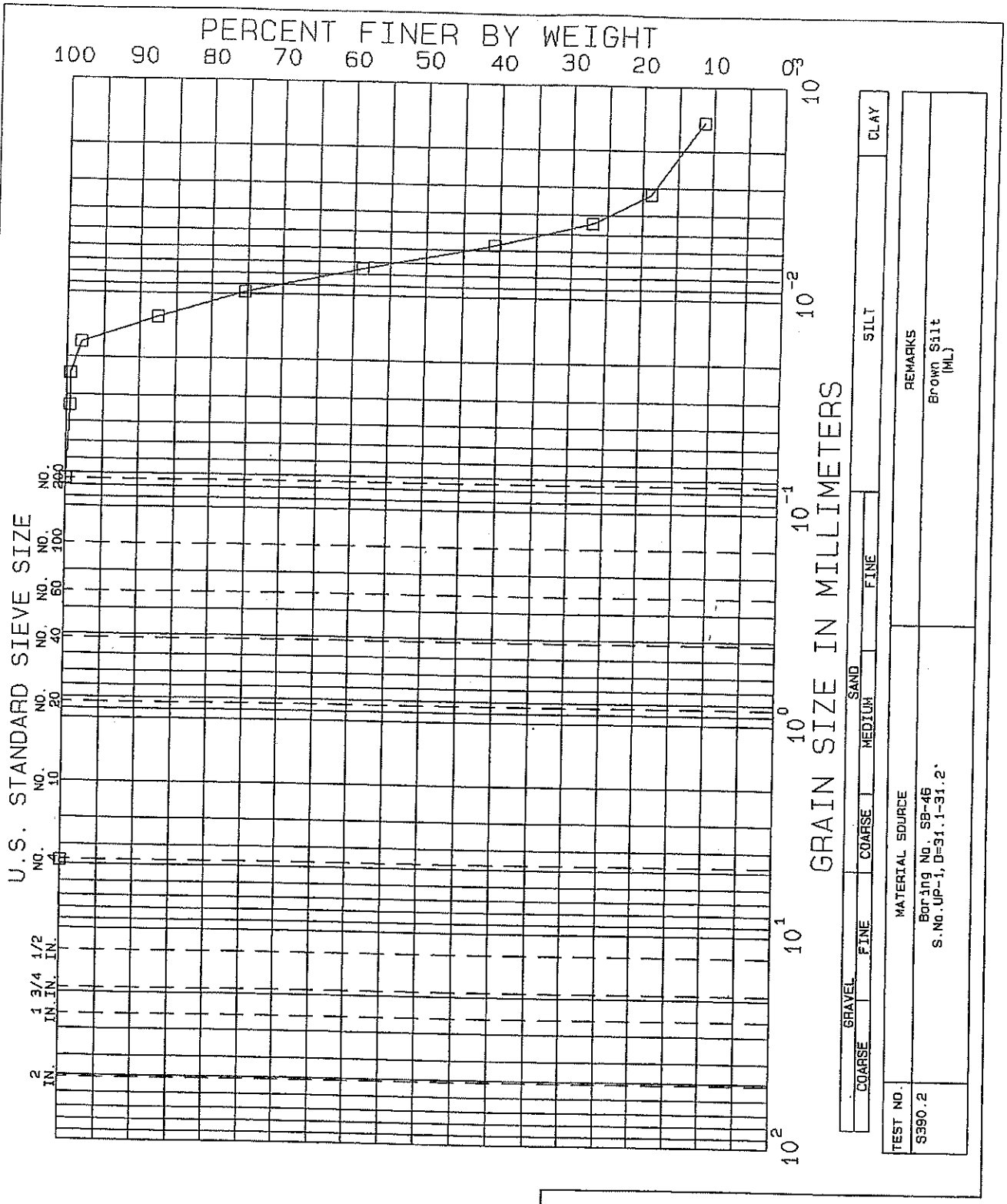
LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828 — Assigned By: D. Gaffney — Reviewed By: Doy Schulze
Project Engineer: D. SCHULZE — Date: Nov.03 — Date Reviewed: 11/24/03

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{\Delta e}{1 + e_0}$	Laboratory Log and Soil Description
SB-46	UP-1	30-32	390		Average Total Unit Weight (30.0-31.9') = 108.94 Pcf															Brown Varved Soil as follows:
		30.6		66.1	(Clay Portion)									Tv= 0.27 tsf						Fat Clay (CH) grading to Silt (ML)
		30.7		35.7	(Silt Portion)															
		30.8-30.9		48.6	(entire varve)															Varve thickness varies from 1-2.5"
		31.0-31.1		60.5							65.7								0.26	Clay portion varies from 0.375-0.875" in thickness and comprises approx. 25-40% of total varve
		31.1-31.2		39.6	34	29														
		31.1 31.2					100	15												
		31.2-31.3		68.0	88	30														
		31.4-31.5					100	87		2.89										

GZA GeoEnvironmental, Inc.
Q:\NEWTON\LAB\LABFORM7.XLS

labform1.xls



NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

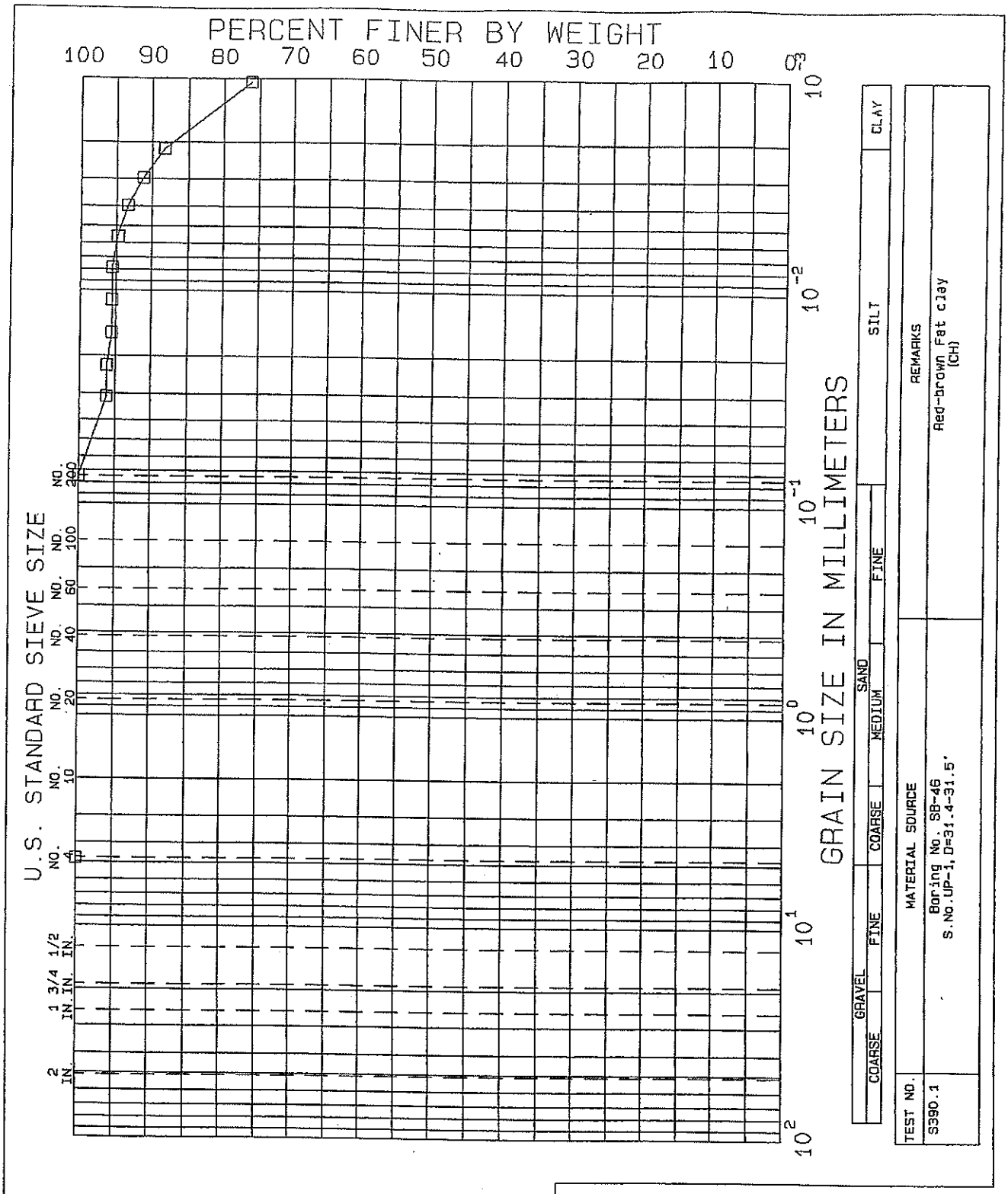
GRADATION TESTS

BORING NO. SB-46
SAMPLE UP-1
DEPTH 31.1-31.2'
TECH. PEC
REVIEWER MBP

TEST SERIES
NO. 390
DATE Nov.03

FILE L17828

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

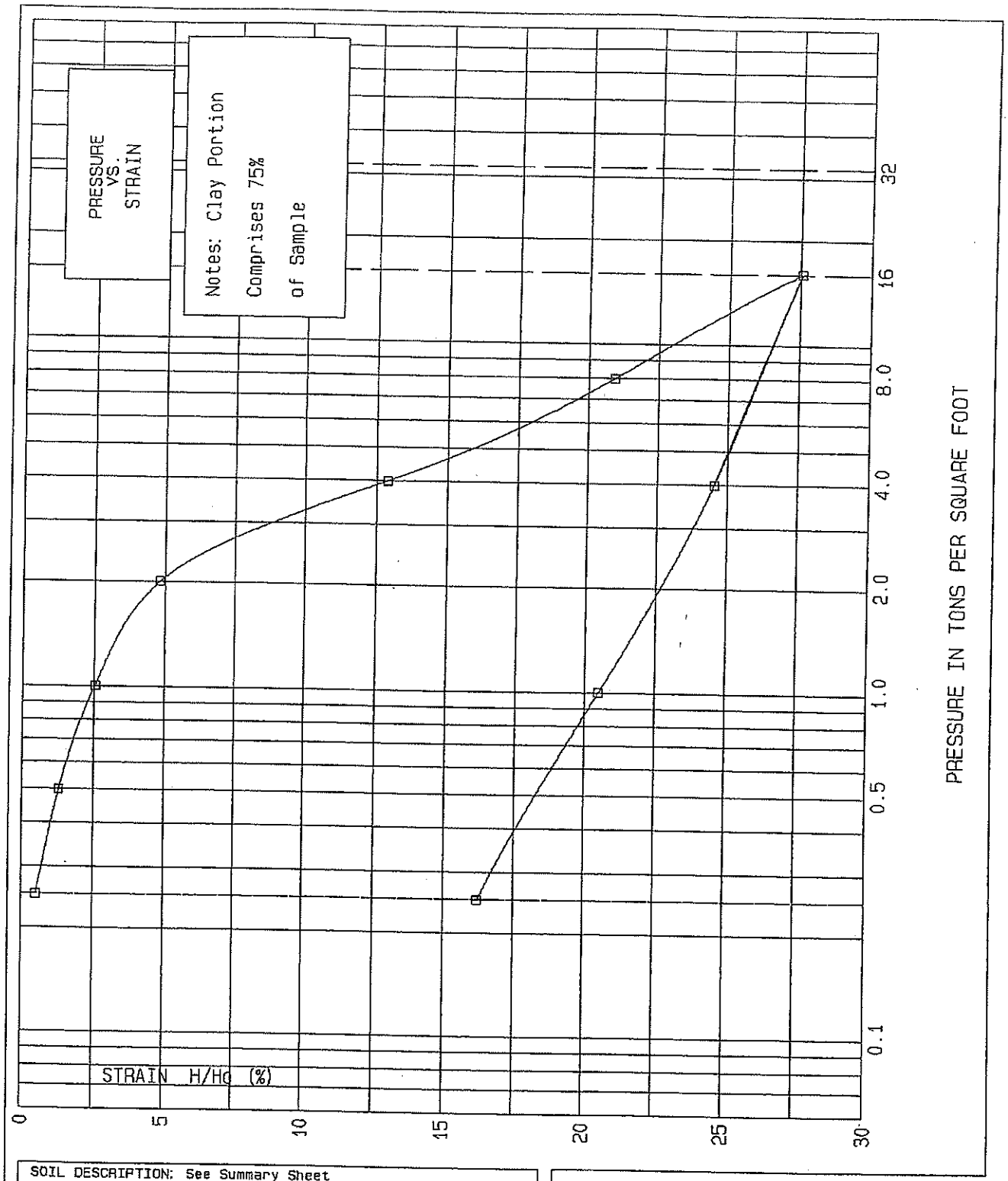
GRADATION TESTS

BORING NO. SB-46
SAMPLE UP-1
DEPTH 31.4-31.5'
TECH. pec
REVIEWER MBP

TEST SERIES'
NO. 390
DATE Nov.03

FILE L17828

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



SOIL DESCRIPTION: See Summary Sheet

SAMPLE DIAM. 2.5 IN.	LIQUID LIMIT 0 %	PLASTIC LIMIT 0 %	SPECIFIC GRAVITY 2.89

	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	VOID RATIO	SATURATION, %	SAMPLE HEIGHT, INCH
INITIAL	60.50	65.71			0.80
FINAL	46.80	78.58			0.67

NEW BRITAIN-HARTFORD BUSWAY

CONSOLIDATION TEST

FIGURE ____

BORING NO. SB-46
SAMPLE UP-1
DEPTH 31.0-31.1'
TECH MST
REVIEWER DAS

TEST SERIES NO. 390.1
DATE 11/19/03
FILE L17828

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

Job Number L17828
Project Name ..... NEW BRITAIN-HARTFORD BUSWAY
Test Number 390.1
Sample Description .. See Summary Sheet
Boring Number SB-46
Sample Number UP-1
Depth ..... 31.0-31.1'

Technician ..... MST
Reviewer ..... DAS

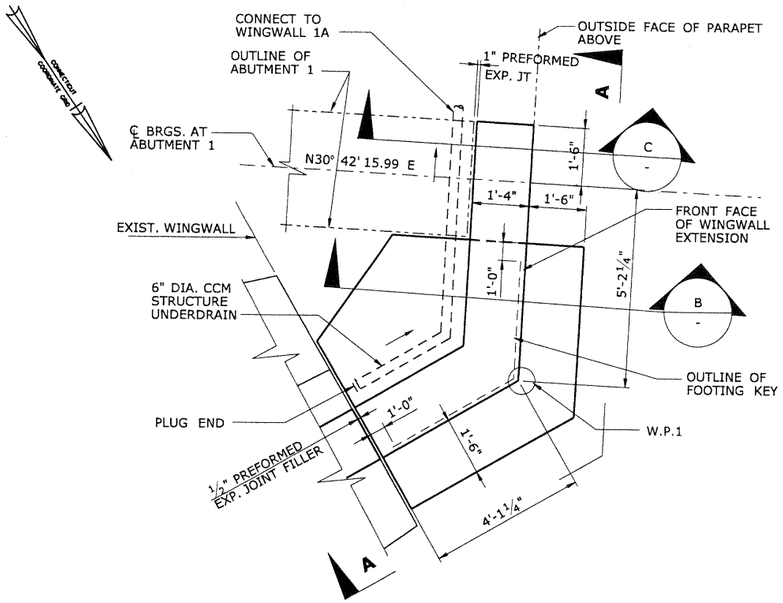
NOTES: Clay Portion
Comprises 75%
of Sample

Specific Gravity ..... 2.8900E+00
Sample Dry Weight ..... 6.7740E+01
Sample Diameter ..... 2.5000E+00
Initial Void Ratio ..... 0.0000E+00
Initial Sample Height 8.0000E-01
Final Sample Height 6.6900E-01
Initial Water Content .... 6.0500E+01
Final Water Content ..... 4.6800E+01
Liquid Limit ..... 0.0000E+00
Plastic Limit ..... 0.0000E+00
Initial Saturation ..... 0.0000E+00
Final Saturation ..... 0.0000E+00
T50 data excluded
T90 data included

Increment umber	Pressure (TSF)	Final Dial	Percent Strain	Void Ratio	T90 (min)	Cv (T90) (/10000) cm²/sec	C_α
1	0.125	17.0	0.00	1.744			
2	0.250	57.0	0.50	1.730	2.6	55.83	
3	0.500	121.0	1.30	1.709	6.3	22.74	0.0006
4	1.000	221.0	2.55	1.674	6.3	22.27	
5	2.000	402.0	4.81	1.612	6.3	21.48	
6	4.000	1049.0	12.90	1.390	23.0	5.27	
7	8.000	1689.0	20.90	1.171	13.0	7.75	0.007
8	16.000	2222.0	27.56	0.988	9.0	9.31	
9	4.000	1981.0	24.55	1.071			
10	1.000	1656.0	20.49	1.182			
11	0.250	1314.0	16.21	1.299			

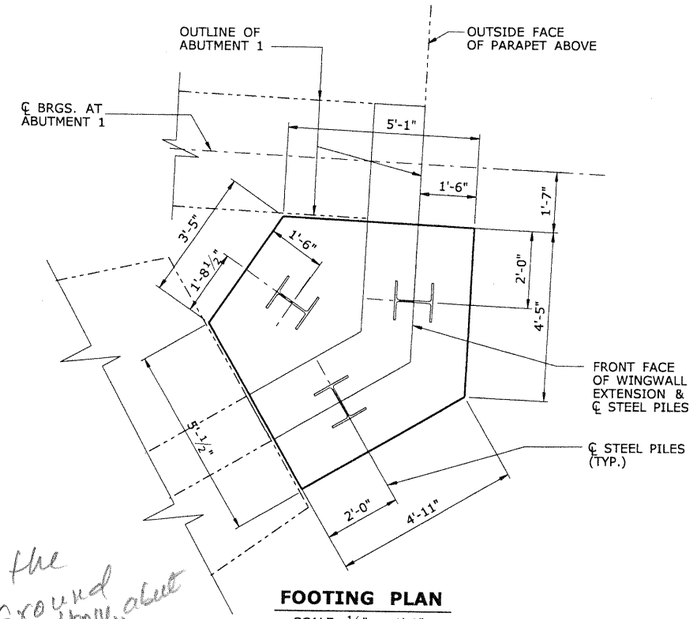
APPENDIX E

Design Drawings showing Existing and Proposed Construction



WINGWALL EXTENSION - PLAN (EXISTING SOUTH ABUTMENT)

SCALE: ½" = 1'-0"



FOOTING PLAN

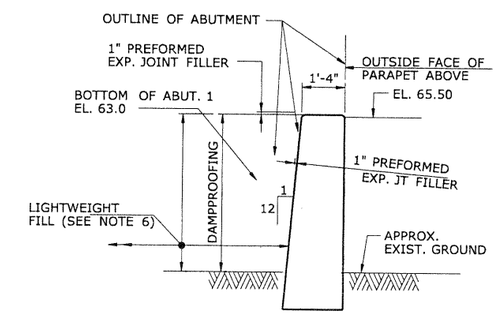
SCALE: ½" = 1'-0"

STEEL PILE NOTES:

1. ALL PILES SHALL BE HP 12x74 (ASTM A709 GRADE 50) END BEARING PILES.
2. THE ESTIMATED LENGTH OF PILES IS 50.0 FT. THE ESTIMATED PILE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH
3. PRIOR TO THE PILE DRIVING THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL HIS METHOD AND SEQUENCE OF PILE DRIVING.
4. ALL PILES SHALL BE POINT REINFORCED.
5. PILE POINT REINFORCEMENT AND SPLICE SHALL BE PREFABRICATED. THE CONTRACTOR SHALL SUBMIT PILE POINT REINFORCEMENT AND SPLICE DETAILS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. PILES SHALL BE DRIVEN TO REFUSAL ON BEDROCK.

LEGEND:

DENOTES VERTICAL PILE



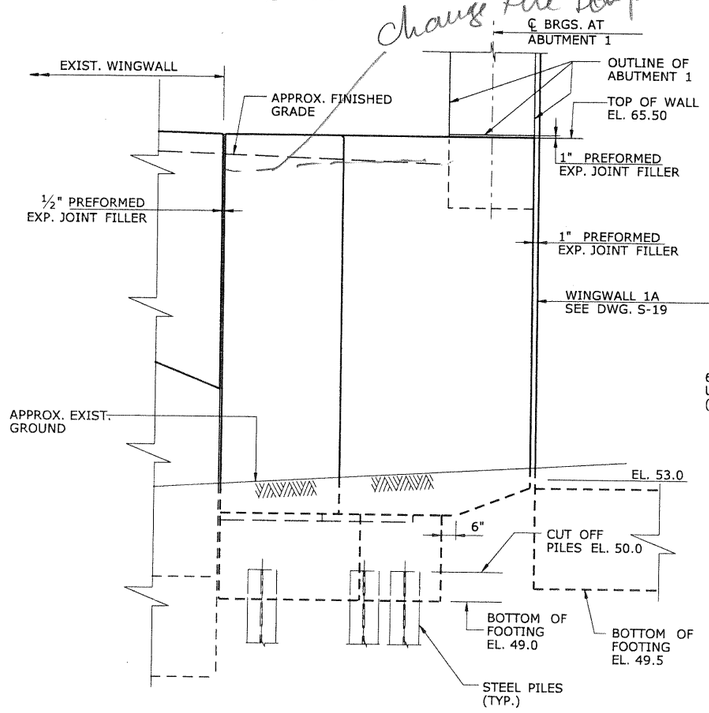
SECTION C

SCALE: ⅜" = 1'-0"

NOTES:

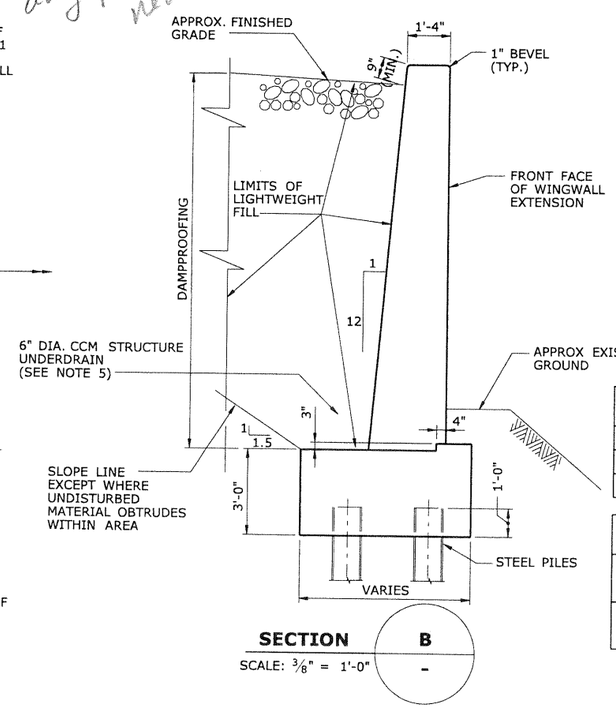
1. THE CONTRACTOR SHALL FIELD VERIFY ALL REQUIRED DIMENSIONS PRIOR CONSTRUCTING THE FOOTING AND WALL.
2. FOR EXISTING WINGWALL RECONSTRUCTION DETAILS SEE DWG. NO. S-10
3. FOR ABUTMENT 1 DETAILS SEE DWG. NO. S-16 THRU S-18
4. FOR REINFORCING DETAILS SEE DWG. NO. S-14
5. THE 6" DIA. CCM STRUCTURE UNDERDRAIN TO BE CONNECTED TO THE STRUCTURE UNDERDRAIN AT WINGWALL 1A
6. FOR LIMTS OF LIGHTWEIGHT FILL SEE DWG. NO. S-16 & S-17

Change the slope of the ground away from abut new



WINGWALL EXTENSION - ELEVATION (VIEW A)

SCALE: ⅜" = 1'-0"



SECTION B

SCALE: ⅜" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	80 KIPS
SERVICE I	60 KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
EXIST. WINGWALL EXTENSION	KIPS

EXISTING SOUTH ABUTMENT - WINGWALL EXTENSION

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted: 5/25/2010
Border Version: 5/31/07
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.
Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

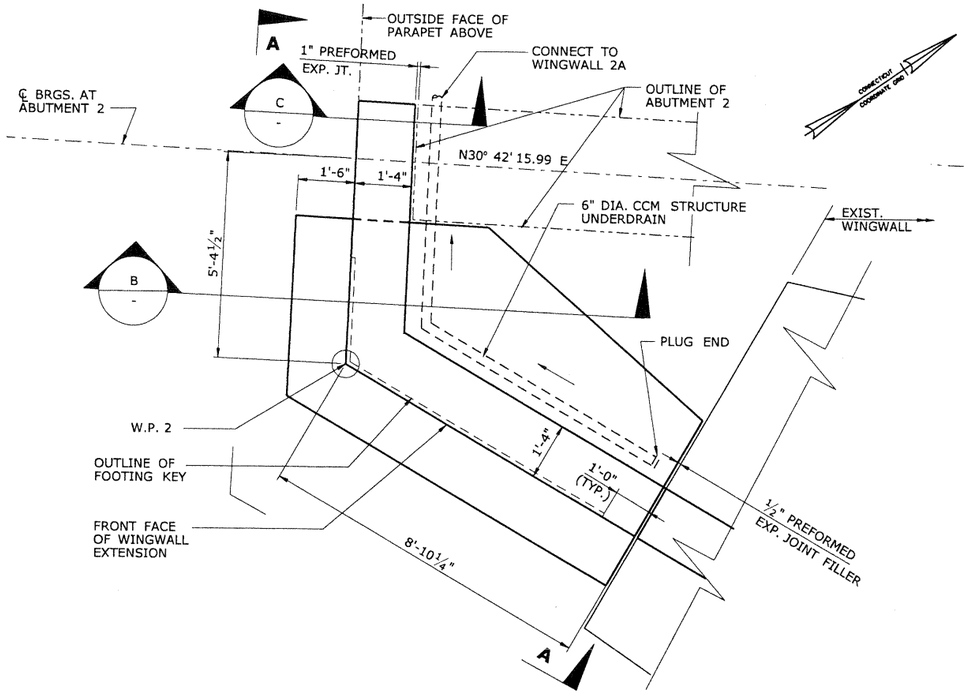
ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

TOWN: WEST HARTFORD
DRAWING TITLE: EXIST. SOUTH ABUTMENT WINGWALL EXTENSION-DET.

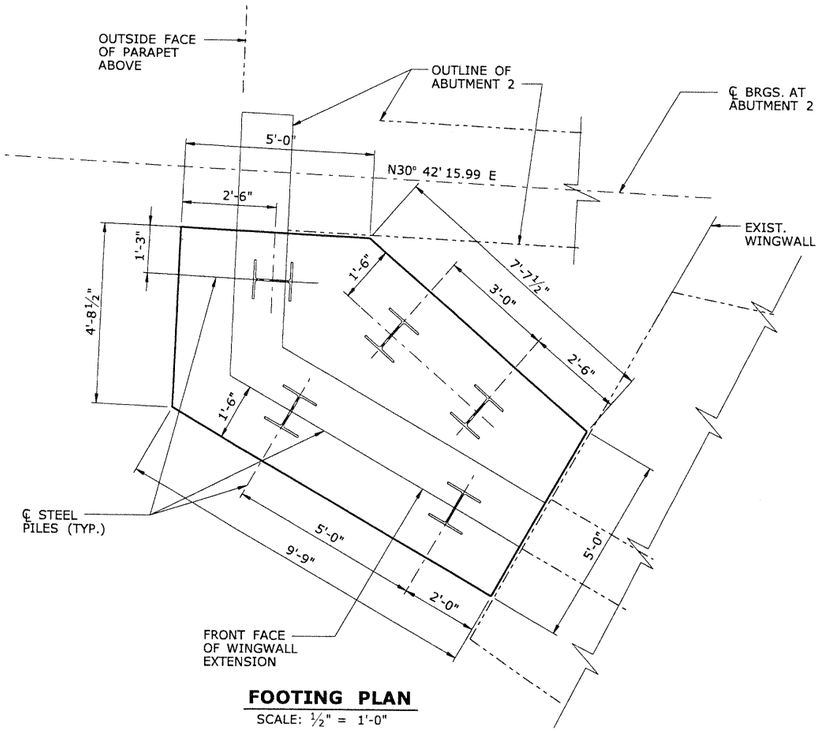
PROJECT NO. 93-H046
DRAWING NO. S-12
SHEET NO. 170

Filename: h:\cadd\ctdot\1728\093_h046\struct_bridge\new_britain_ave\SB_MSH_0093_0046_NB_ABT1R_03.dgn



WINGWALL EXTENSION - PLAN (EXISTING NORTH ABUTMENT)

SCALE: ½" = 1'-0"



FOOTING PLAN

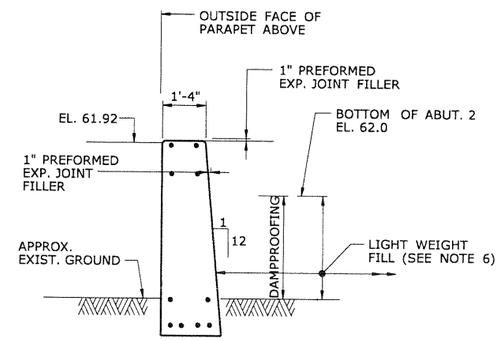
SCALE: ½" = 1'-0"

STEEL PILE NOTES:

1. ALL PILES SHALL BE HP 12x74 (ASTM A709 GRADE 50) END BEARING PILES.
2. THE ESTIMATED LENGTH OF PILES IS 50.0 FT. THE ESTIMATED PILE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH
3. PRIOR TO THE PILE DRIVING THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL HIS METHOD AND SEQUENCE OF PILE DRIVING.
4. ALL PILES SHALL BE POINT REINFORCED.
5. PILE POINT REINFORCEMENT AND SPLICE SHALL BE PREFABRICATED. THE CONTRACTOR SHALL SUBMIT PILE POINT REINFORCEMENT AND SPLICE DETAILS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. PILES SHALL BE DRIVEN TO REFUSAL ON BEDROCK.

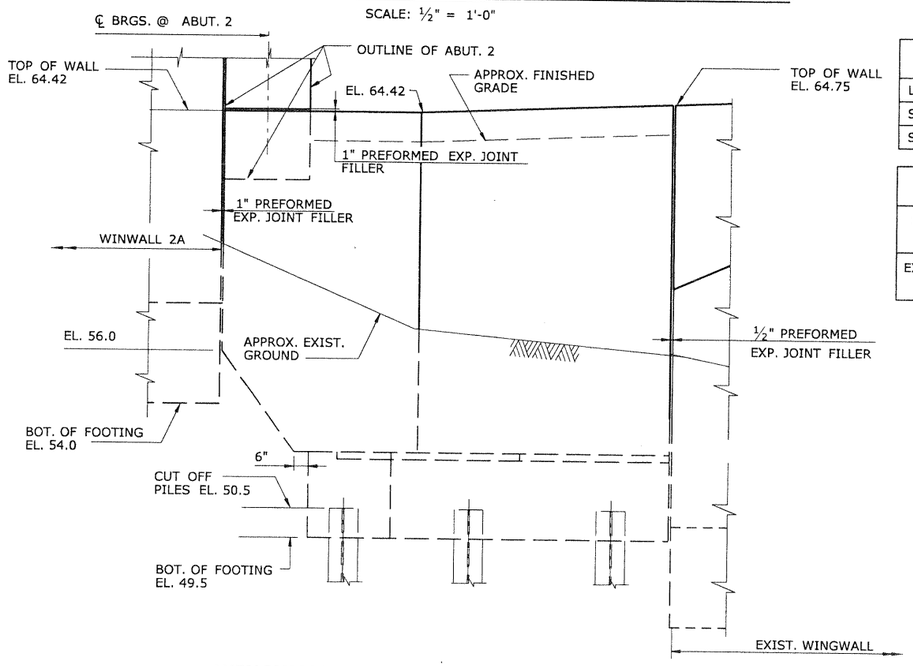
LEGEND:

DENOTES VERTICAL PILE



SECTION C

SCALE: ⅜" = 1'-0"

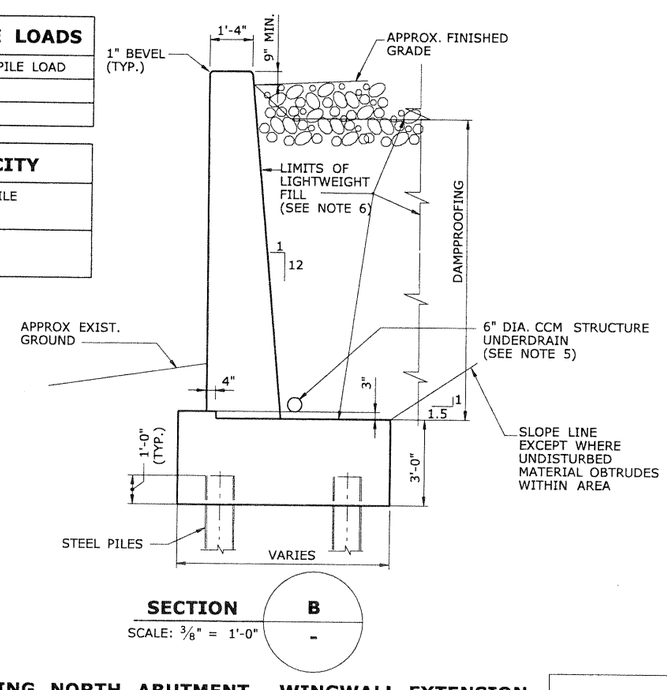


WINGWALL EXTENSION - ELEVATION (VIEW A)

SCALE: ⅜" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	80 KIPS
SERVICE I	60 KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
EXIST. WINGWALL EXTENSION	KIPS



SECTION B

SCALE: ⅜" = 1'-0"

NOTES:

1. THE CONTRACTOR SHALL FIELD VERIFY ALL REQUIRED DIMENSIONS PRIOR CONSTRUCTING THE FOOTING AND WALL.
2. FOR EXISTING WINGWALL RECONSTRUCTION DETAILS SEE DWG. NO. S-11
3. FOR ABUTMENT 2 DETAILS SEE DWG. NO. S-21 THRU S-23
4. FOR REINFORCING DETAILS SEE DWG. NO. S-15
5. THE 6" DIA. CCM STRUCTURE UNDERDRAIN TO BE CONNECTED TO THE STRUCTURE UNDERDRAIN AT WINGWALL 2A
6. FOR LIMITS OF LIGHTWEIGHT FILL SEE DWG. NO. S-21 & S-22

EXISTING NORTH ABUTMENT - WINGWALL EXTENSION

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Filename: h:\cadd\ctdot\1728\093_h046\struct_bridge\new_britain_ave\SB_MSH_0093_0046_NB_ABTIR_04.dgn

Plotted: 5/25/2010
Border Version: 5/31/07
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.
Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

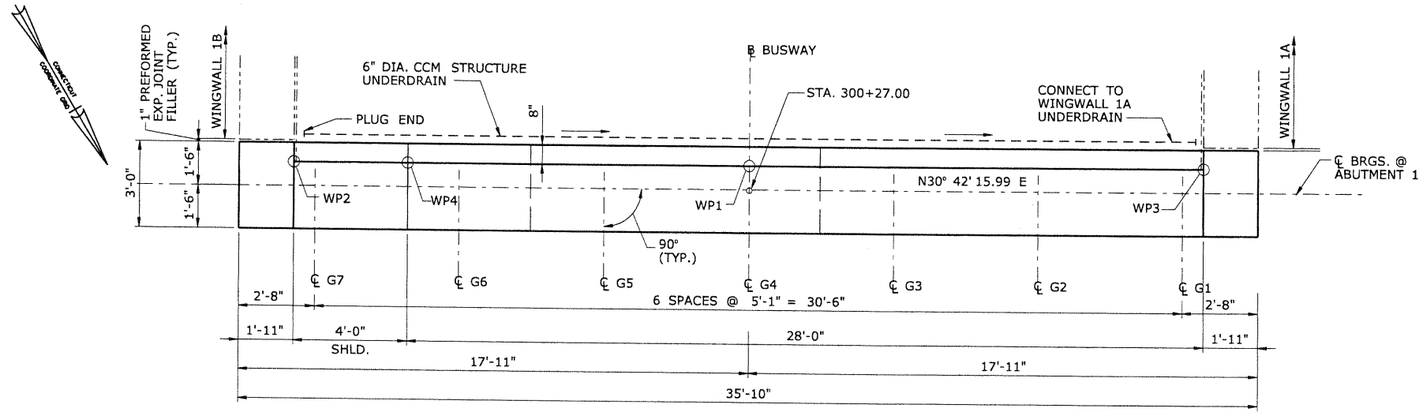
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

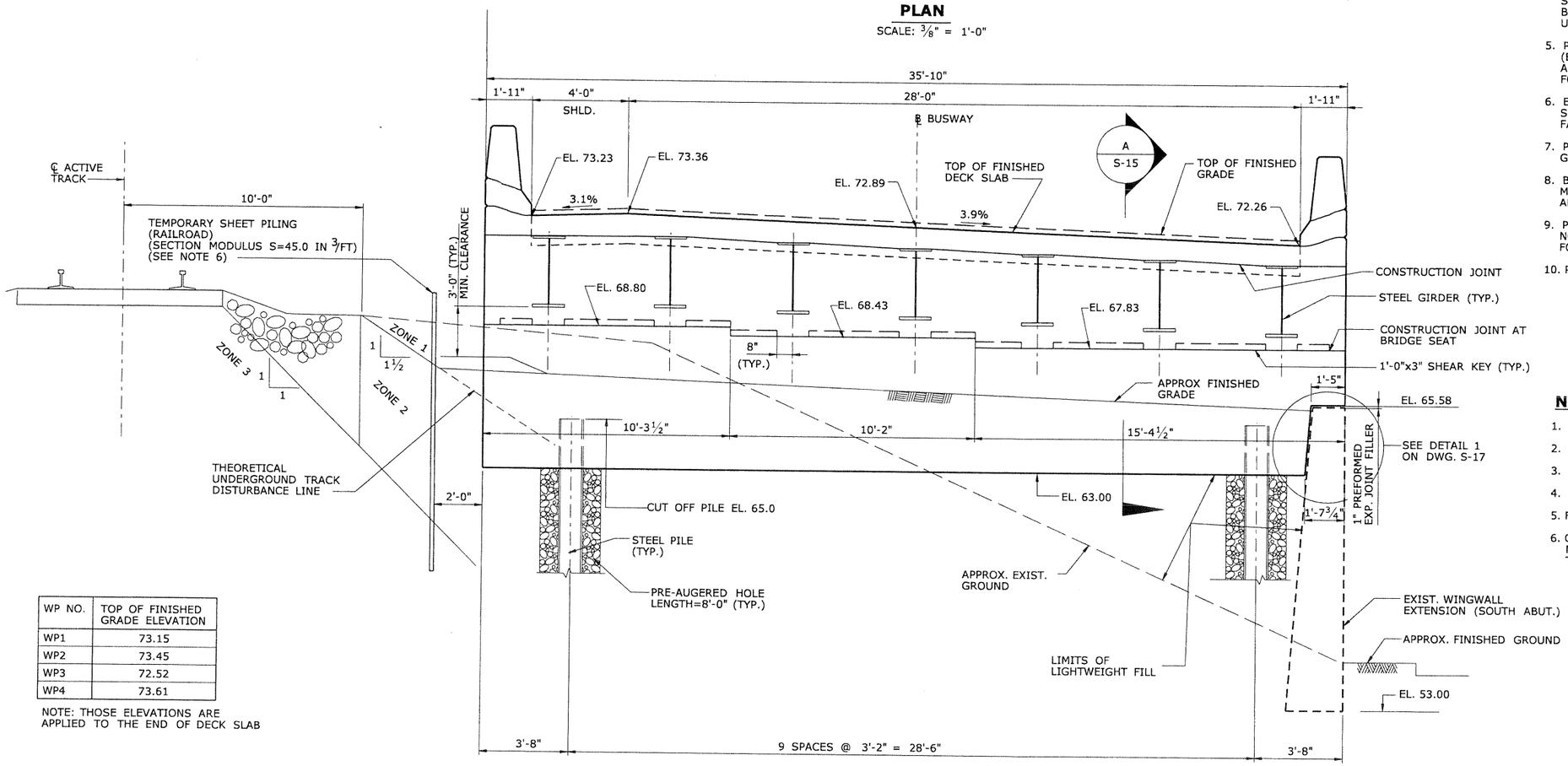
TOWN: WEST HARTFORD
DRAWING TITLE: EXIST. NORTH ABUT. WINGWALL EXTENSION-DET.

PROJECT NO. 93-H046
DRAWING NO. S-13
SHEET NO. 171



PLAN

SCALE: 3/8" = 1'-0"



WP NO.	TOP OF FINISHED GRADE ELEVATION
WP1	73.15
WP2	73.45
WP3	72.52
WP4	73.61

NOTE: THOSE ELEVATIONS ARE APPLIED TO THE END OF DECK SLAB

ELEVATION

SCALE: 3/8" = 1'-0"

ABUTMENT 1

SUGGESTED INTERGRAL ABUTMENTS CONSTRUCTION PROCEDURE

1. EXCAVATE EXISTING SOIL AT ELEVATION SHOWN ON PLAN.
2. DRIVE PILES AND CUT OFF PILES AT ELEVATION SHOW ON PLAN.
3. PLACE ABUTMENT STEM CONCRETE TO BRIDGE SEAT ELEVATION.
4. BACKFILL WITH LIGHT WEIGHT MATERIAL, ABUTMENT STEM TO 6" BELOW THE BRIDGE SEAT ELEVATION. NO BACKFILL OF THE ABUTMENT STEMS ALLOWED UNTIL THE ABUTMENTS HAVE CURED FOR 7 DAYS.
5. PLACE LIGHT WEIGHT FILL IN FRONT OF THE ABUTMENT (BETWEEN NEW INTEGRAL ABUT. AND EXIST. WINGWALL) AS SHOWN ON DWG. NO. S-17 FOR ABUT. 1 OR S-22 FOR ABUT. 2.
6. ERECT GIRDERS AND INSTALL ALL DIAPHRAGMS. GIRDERS SHALL BE ERECTED PLUMB AND THE DIAPHRAGMS FABRICATED FOR THE STEEL DEAD LOAD POSITION.
7. PLACE ABUTMENT BACKWALL CONCRETE TO TOP OF GIRDERS.
8. BACKFILL ABUTMENT BACKWALL WITH LIGHT WEIGHT MATERIAL. NO BACKFILLING OF THE ABUTMENT IS ALLOWED UNTIL BACKWALL HAVE CURED FOR 7 DAYS.
9. PLACE CONCRETE FOR DECK SLAB. DECK SLAB SHALL NOT BE PLACED UNTIL BACKWALLS HAVE CURED FOR 7 DAYS.
10. PLACE CONCRETE FOR APPROACH SLABS.

NOTES:

1. ELEVATIONS SHOWN AT TOP OF DECK SLAB ARE AT ℄ BRGS.
2. WORK THIS DWG. WITH DWG. NO. S-17
3. FOR REINFORCING DETAILS SEE DWG. NO. S-18
4. FOR SHEAR KEY DETAIL SEE DWG. NO. S-17
5. FOR EXIST. WINGWALL EXTENSION DETAIL, SEE DWG. NO. S-12
6. CONTRACTOR SHALL SUBMIT SHOP DRAWING DETAILS, MEMBER SIZES AND CALCULATIONS FOR ALL RAILROAD TEMPORARY SHEETING WORK TO THE ENGINEER FOR REVIEW.

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted: 5/25/2010
Border Version: 5/31/07

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Filename: H:\CADD\CTDOT\1728\093-H046\Struct.Bridge\New.Britain.Ave\SB.MSH.0093.0046.NB.ABT1.01.dgn
Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

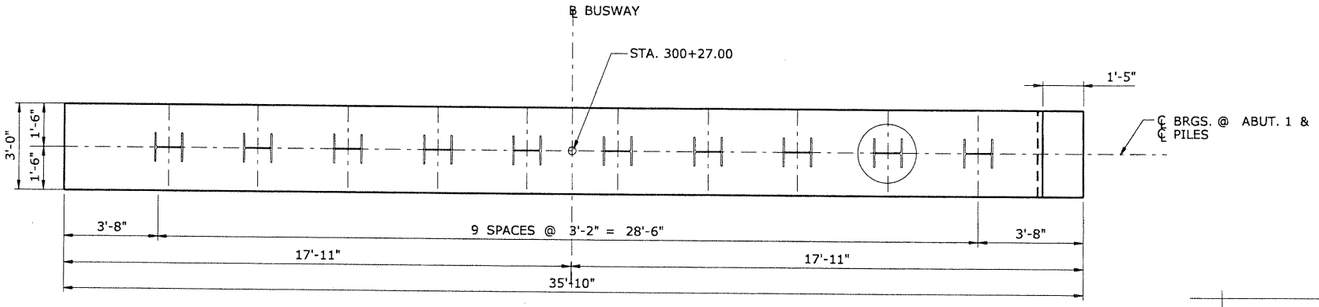
ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

TOWN: WEST HARTFORD

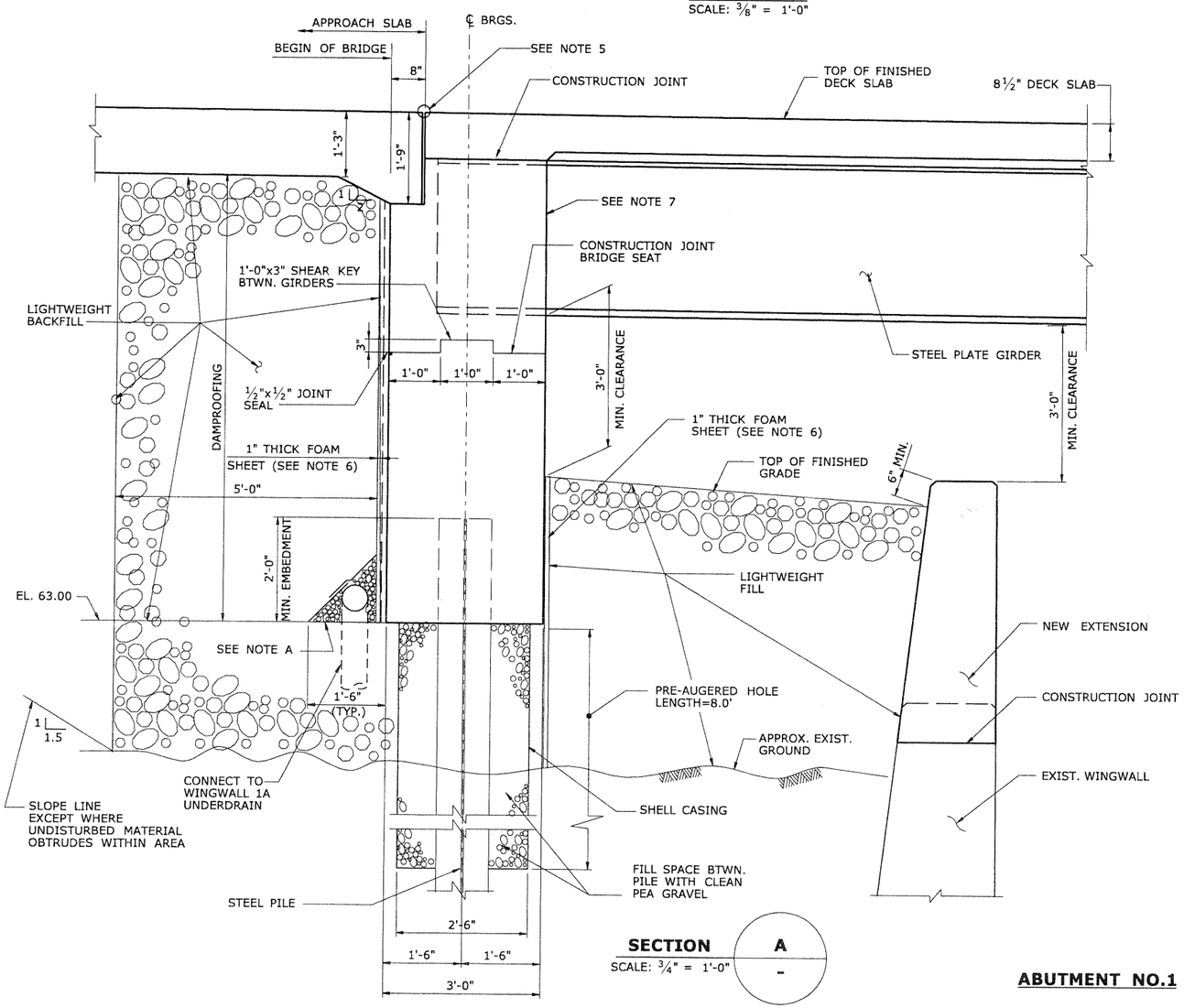
DRAWING TITLE: ABUTMENT 1 PLAN AND ELEVATION

PROJECT NO. 93-H046
DRAWING NO. S-16
SHEET NO. 174



PILE PLAN

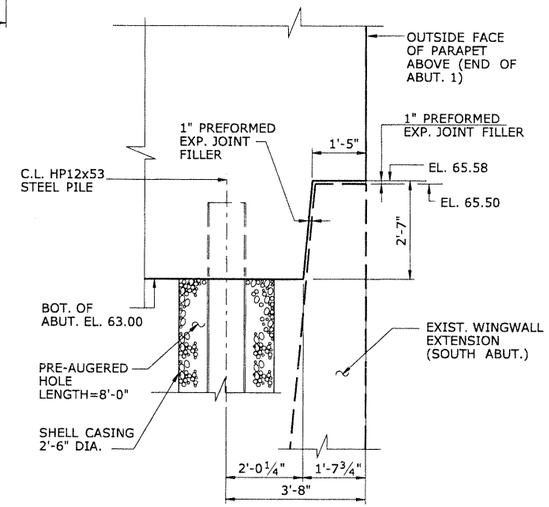
SCALE: 3/8" = 1'-0"



SECTION A

SCALE: 3/4" = 1'-0"

ABUTMENT NO.1



DETAIL 1

SCALE: ½" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	215 KIPS
SERVICE I	154 KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
ABUTMENT 1	KIPS

STEEL PILE NOTES:

1. ALL PILES SHALL BE HP 12x74 (ASTM A709 GRADE 50) END BEARING PILES.
2. THE ESTIMATED LENGTH OF PILES IS 63.0 FT. EXCEPT FOR TEST PILE. THE ESTIMATED LENGTH OF TEST PILE IS 68.0 FT. THE ESTIMATE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH.
3. PRIOR TO THE DRIVING PILES, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL HIS METHOD AND SEQUENCE OF PILE DRIVING.
4. ALL PILES SHALL BE POINT REINFORCED.
5. PILE POINT REINFORCEMENT AND SPLICE SHALL BE PREFABRICATED. PRIOR TO THE PILE DRIVING THE CONTRACTOR SHALL SUBMIT PILE POINT REINFORCEMENT AND SPLICE DETAILS TO THE ENGINEER FOR REVIEW AND APPROVAL.
6. PILES SHALL BE DRIVEN TO REFUSAL ON BEDROCK.

LEGEND:

DENOTES VERTICAL PILE

DENOTES TEST PILE

NOTE A:

1. 6" STRUCTURE UNDERDRAIN CONSISTING OF 6" DIA. CCM PERFORATED PIPE, NO. 6 CRUSHED STONE AND GEOTEXTILE (SUBSURFACE DRAINAGE, CLASS A) COVER. THE GEOTEXTILE COVER SHALL SURROUND THE CRUSHED STONE ON ALL SIDES.

NOTES:

1. WORK THIS DWG. WITH DWG. NO. S-16
2. FOR EXIST. WINGWALL EXTENSION DETAILS, SEE DWG. NO. S-12
3. FOR APPROACH SLAB DETAILS SEE DWG. NO. S-32
4. FOR INTEGRAL ABUTMENT CONSTRUCTION PROCEDURE, SEE DWG. NO. S-16
5. FOR ASPHALTIC PLUG EXPANSION JOINT SYSTEM DETAIL SEE DWG. NO. S-30
6. 1" THICK FOAM SHEET TO BE PAID UNDER CLASS "A" CONCRETE.
7. ALL STEEL PLATE GIRDERS SHALL HAVE CAULK INSTALLED AROUND GIRDER AT THE FRONT FACE OF ABUTMENT. TO BE PAID UNDER STRUCTURAL STEEL (SITE 1) ITEM

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted: 5/25/2010
Border Version: 5/31/07

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE:

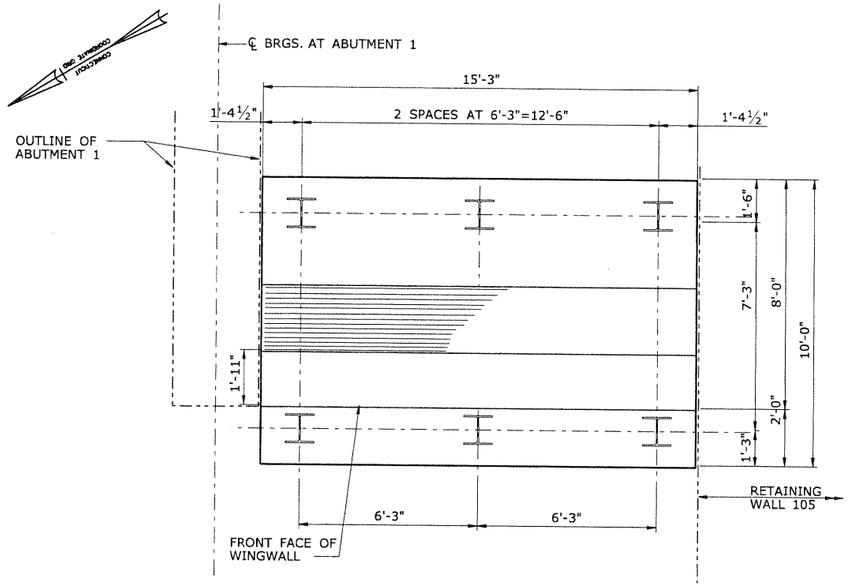
PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

TOWN: WEST HARTFORD

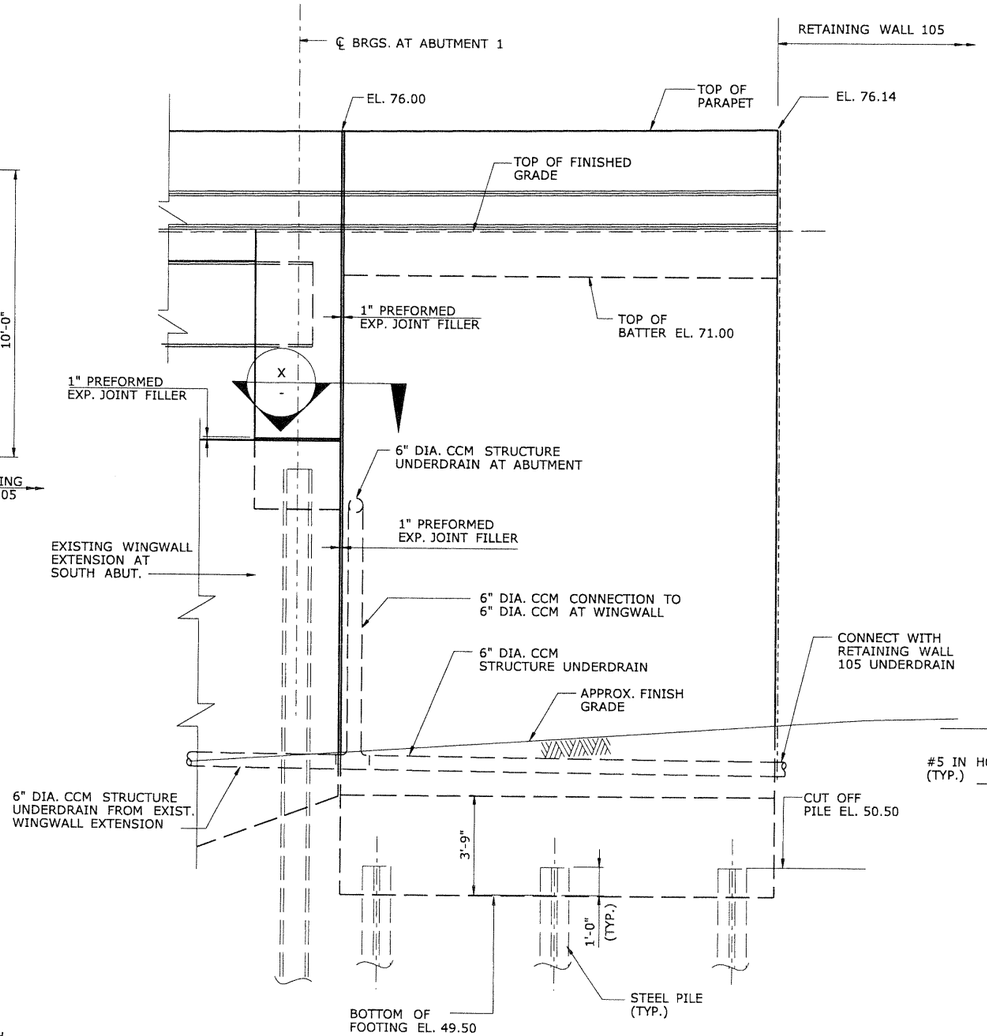
DRAWING TITLE: ABUTMENT 1 PILE PLAN & SECTION A

PROJECT NO. 93-H046
DRAWING NO. S-17
SHEET NO. 175

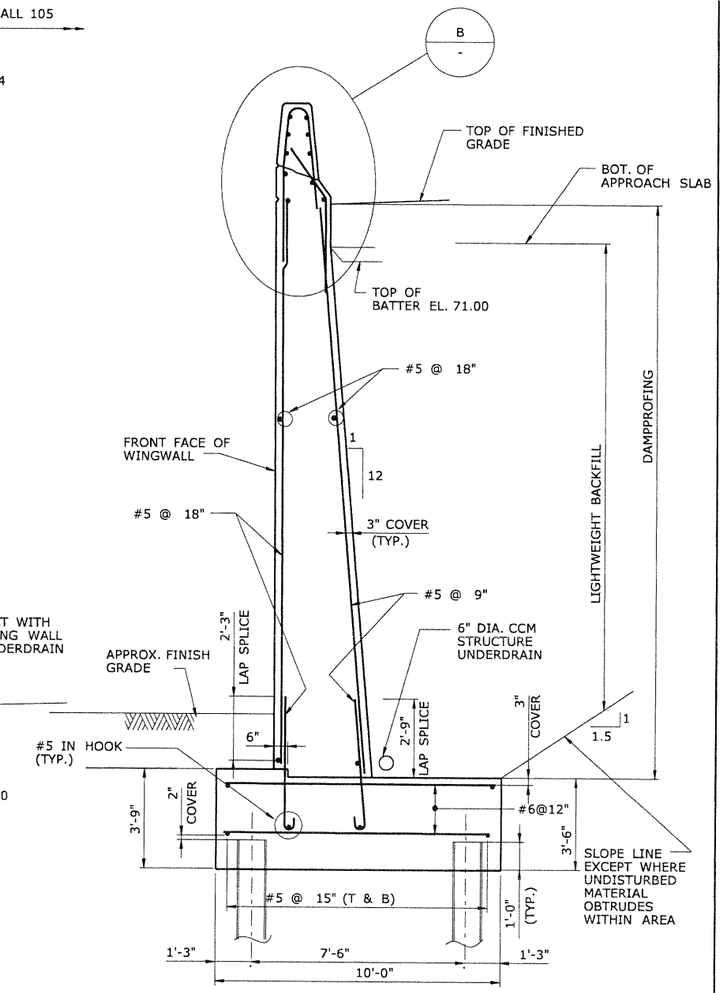
Filename: h:\cadd\ctdot\1728\093_h046\struct_bridge\new_britain_ave\SB_MSH_0093_0046_NB_ABT1_03.dgn
Date Plotted: 5/25/2010



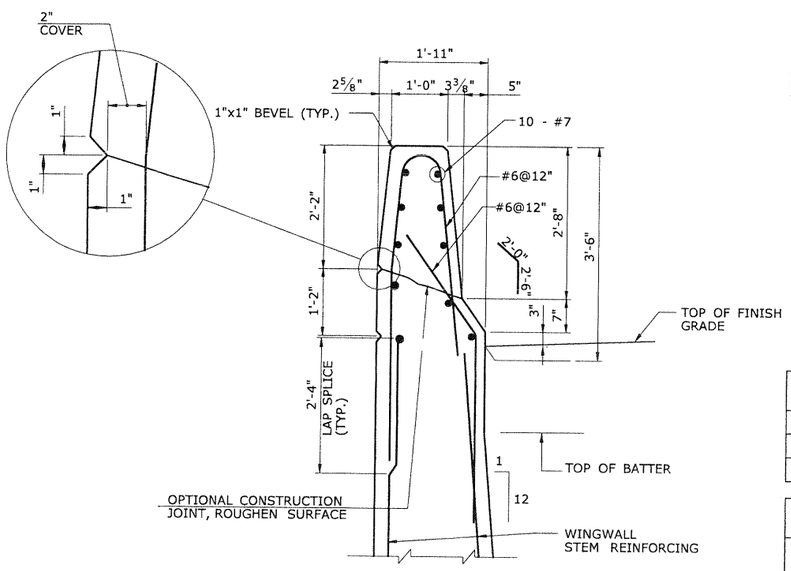
PILE PLAN
SCALE: ⅜" = 1'-0"



ELEVATION
SCALE: ⅜" = 1'-0"



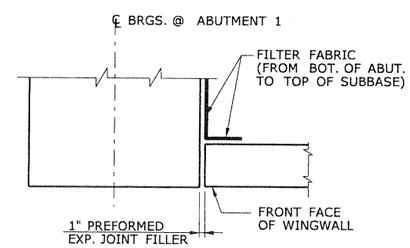
SECTION A
SCALE: ⅜" = 1'-0"



DETAIL B
SCALE: ¾" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	135.2 KIPS
SERVICE I	KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
WINGWALLS	



SECTION X
SCALE: ½" = 1'-0"

NOTES:

1. FOR STEEL PILES NOTES AND LEGEND SEE DWG. NO. S-17
2. THE ESTIMATED LENGTH OF PILES IS 50.0 FT. THE ESTIMATED PILE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH.
3. FOR ABUTMENT DETAILS SEE DWG. NO. S-16 AND S-17
4. FOR APPROACH SLAB DETAILS SEE DWG. NO. S-32
5. FOR EXISTING WINGWALL EXTENSION DETAILS SEE DWG. NO. S-12

WINGWALL 1A

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Filename: h:\cadd\ctdot\1728\093.h046\struct.bridge\new.britain.ave\SB.MSH.0093.0046.NB.WW.01.dgn

Plotted: 5/25/2010
Border Version: 5/31/07
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.
Date Plotted: 5/25/2010

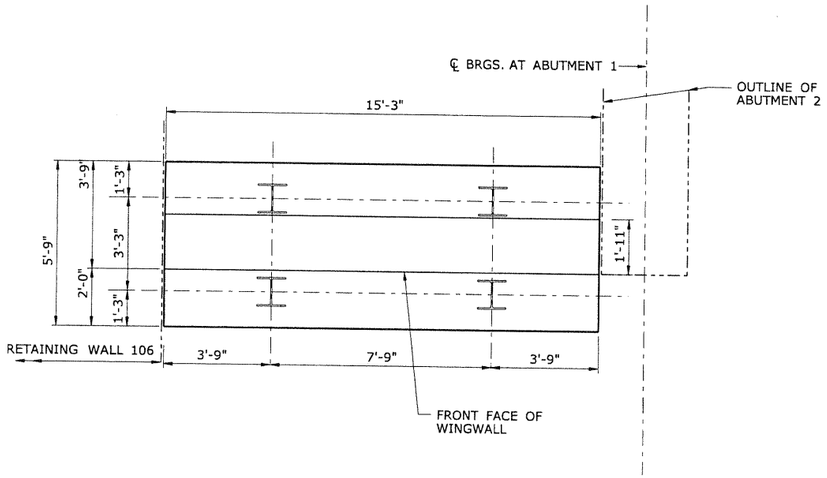
DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

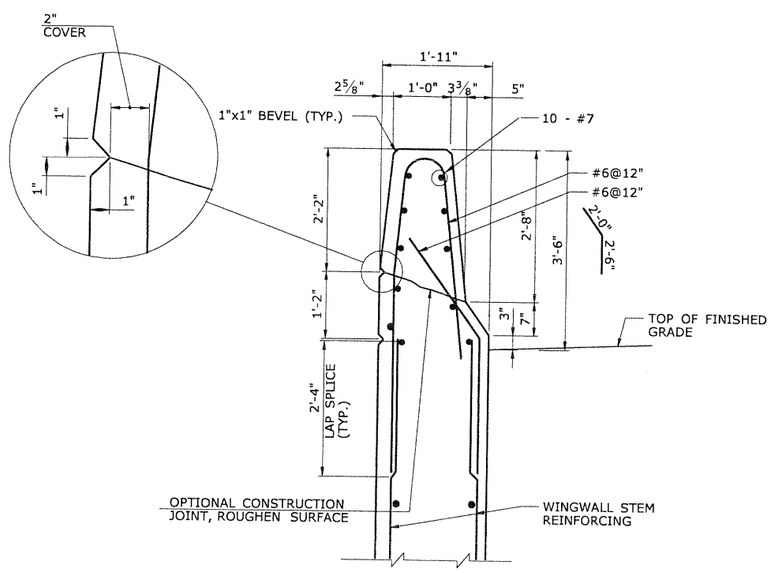
TOWN: WEST HARTFORD
DRAWING TITLE: WINGWALL 1A PLAN, ELEVATION & SECTION

PROJECT NO. 93-H046
DRAWING NO. S-19
SHEET NO. 177



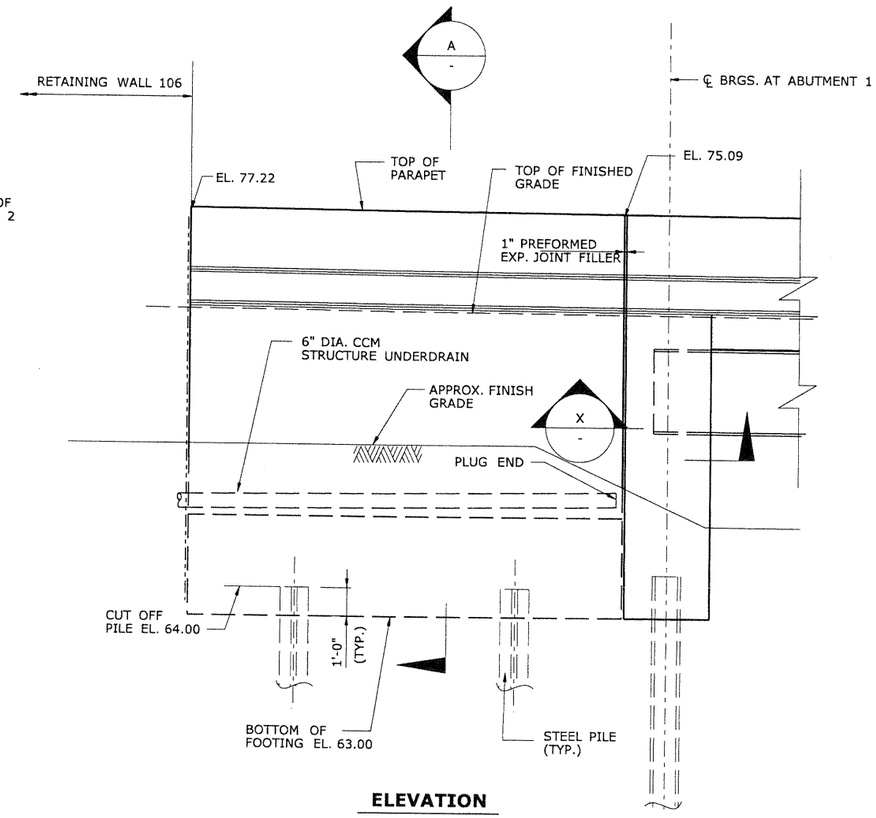
PILE PLAN

SCALE: 3/8" = 1'-0"



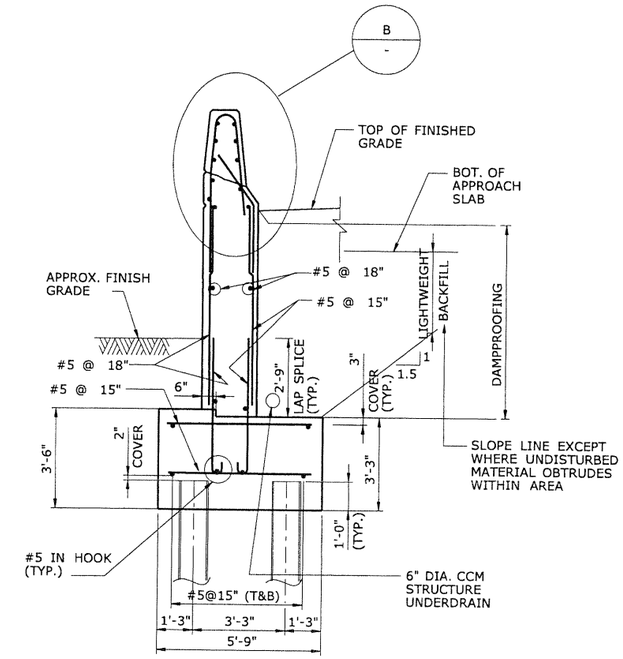
DETAIL B

SCALE: 3/4" = 1'-0"



ELEVATION

SCALE: 3/8" = 1'-0"



SECTION A

SCALE: 3/8" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	67 KIPS
SERVICE I	KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
EXIST. WINGWALLS EXTENSION	

NOTES:

1. FOR STEEL PILES NOTES AND LEGEND SEE DWG. NO. S-17
2. THE ESTIMATED LENGTH OF PILES IS 63.0 FT. ESTIMATED PILE LENGTH IS TO BE USED AS PILE ORDER LENGTH.
3. FOR ABUTMENT 1 DETAILS SEE DWG. NO. S-16 AND S-17
4. FOR APPROACH SLAB DETAILS SEE DWG. NO. S-32
5. FOR SECTION X-X DETAIL SEE DWG. NO. S-19

WINGWALL 1B

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted: 5/25/2010
Border Version: 5/31/07
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.
Date Plotted: 5/25/2010
Filename: h:\cadd\ctdot\1728\093_h046\struct_bridge\new_britain_ave\SB_MSH_0093_0046_NB_WW_04.dgn

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

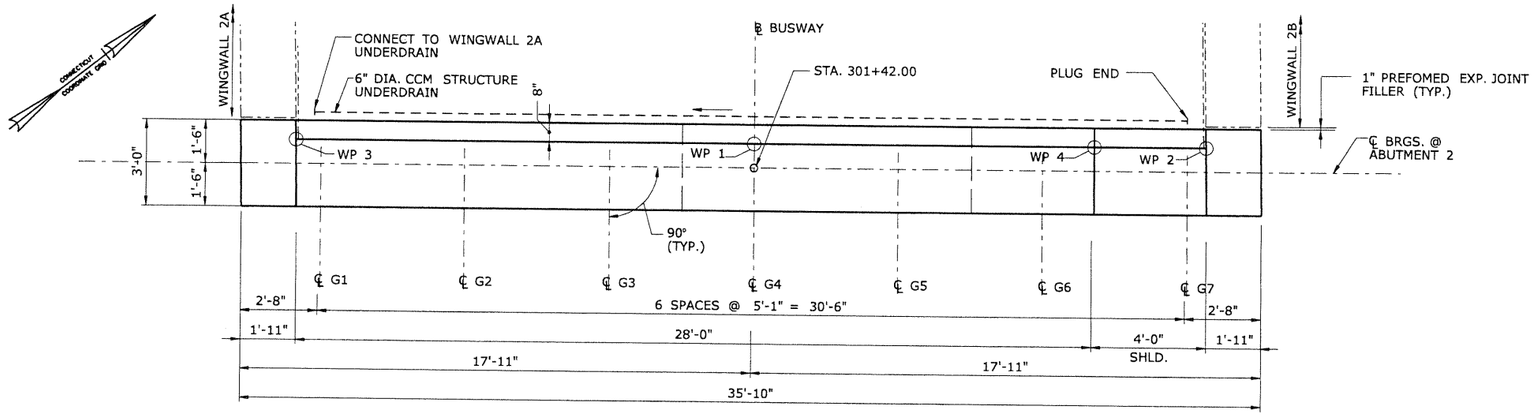
ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

TOWN: WEST HARTFORD

DRAWING TITLE: WINGWALL 1B PLAN AND ELEVATION

PROJECT NO. 93-H046
DRAWING NO. S-20
SHEET NO. 181

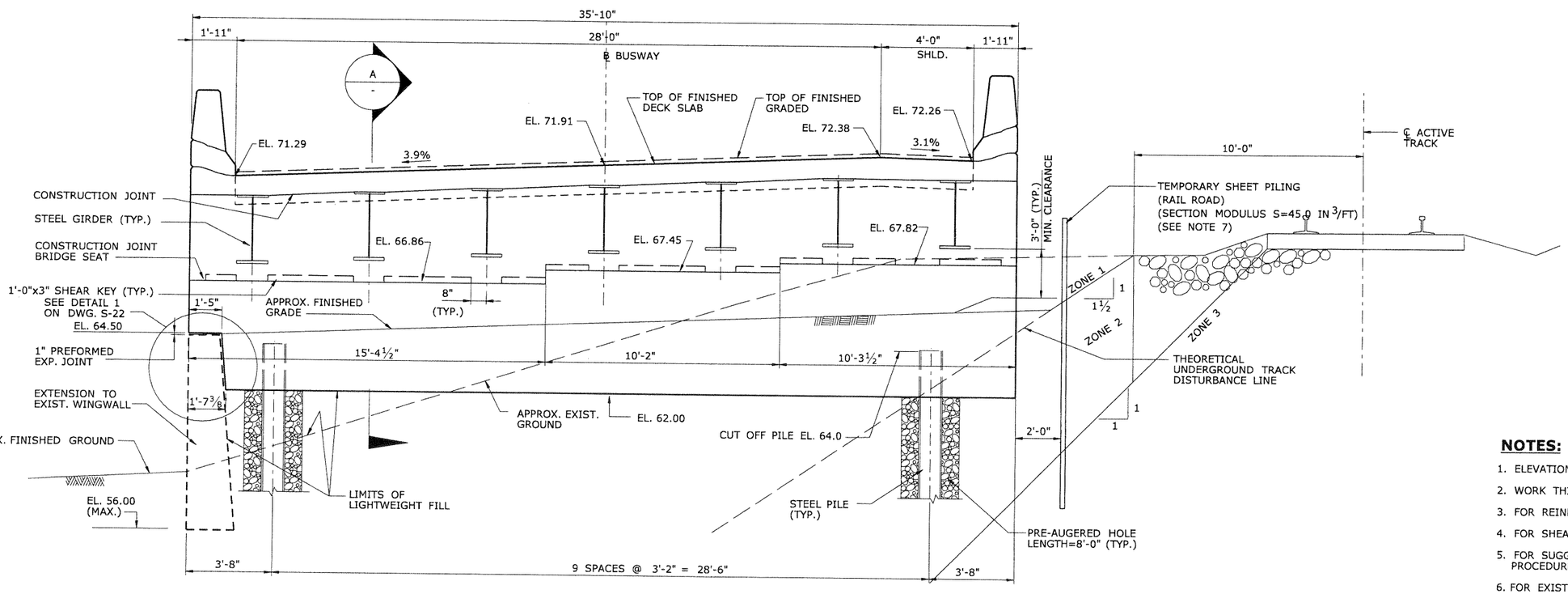


PLAN

SCALE: 3/8" = 1'-0"

WP NO.	TOP OF FINISHED GRADE ELEVATION
WP1	72.15
WP2	72.50
WP3	71.53
WP4	72.62

NOTE: THOSE ELEVATIONS ARE APPLIED AT THE END OF DECK SLAB



ELEVATION

SCALE: 3/8" = 1'-0"

ABUTMENT 2

NOTES:

1. ELEVATIONS SHOWN AT TOP OF DECK SLAB ARE AT ℄ BRGS.
2. WORK THIS DWG. WITH DWG. NO. S-22
3. FOR REINFORCING DETAILS SEE DWG. NO. S-23
4. FOR SHEAR KEY DETAIL SEE DWG. NO. S-22
5. FOR SUGGESTED INTEGRAL ABUTMENT CONSTRUCTION PROCEDURE SEE DWG. NO. S-16
6. FOR EXISTING WINGWALL EXTENSION DETAILS SEE DWG NO. S-13
7. CONTRACTOR SHALL SUBMIT SHOP DRAWING DETAILS, MEMBER SIZES AND CALCULATIONS FOR ALL RAILROAD TEMPORARY SHEETING WORK TO THE ENGINEER FOR REVIEW.

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Filename: h:\cadd\ctdot\1728\093.h046\struct.bridge\new.britain.ave\SB.MSH.0093.0046.NB.ABT2.01.dgn

Plotted: 5/25/2010
Border Version: 5/31/07

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

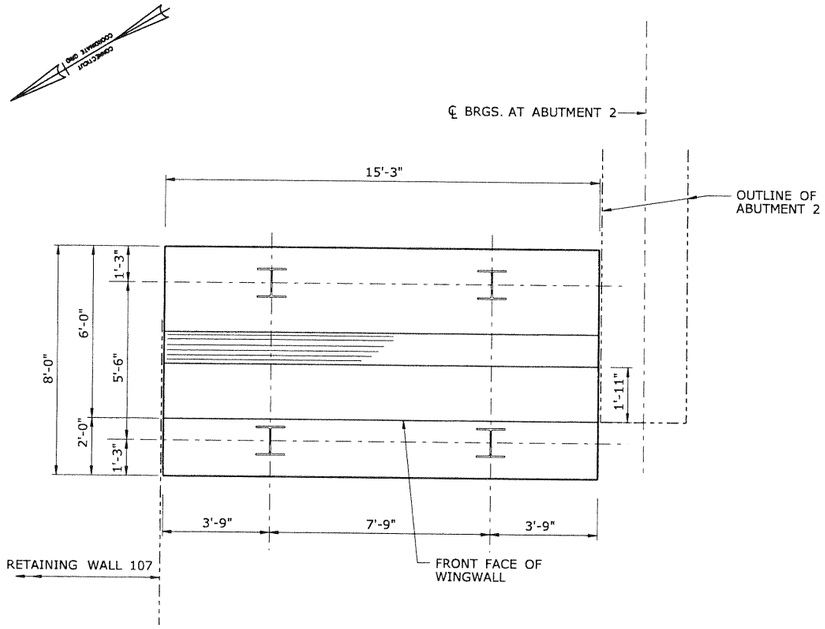
ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

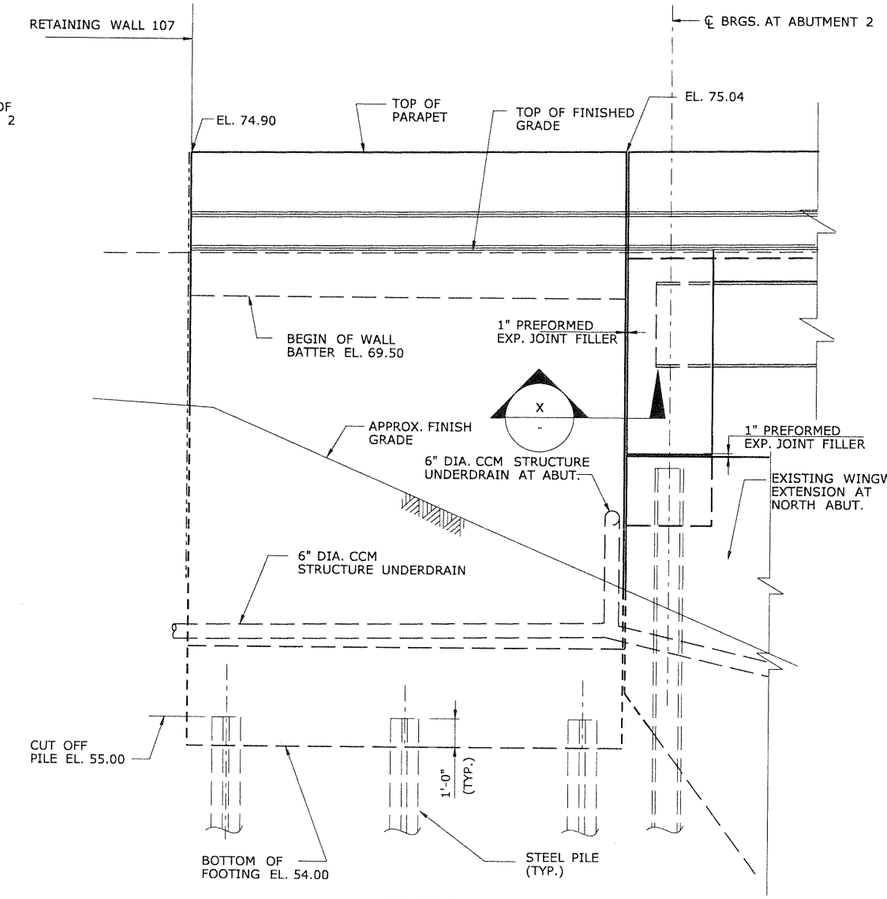
TOWN: WEST HARTFORD

DRAWING TITLE: ABUTMENT 2 PLAN AND ELEVATION

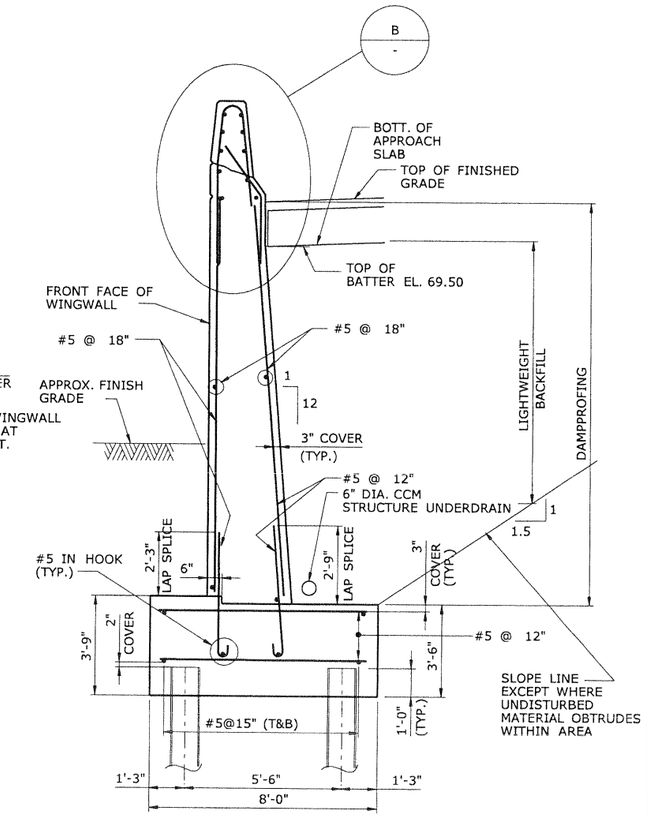
PROJECT NO. 93-H046
DRAWING NO. S-21
SHEET NO. 178



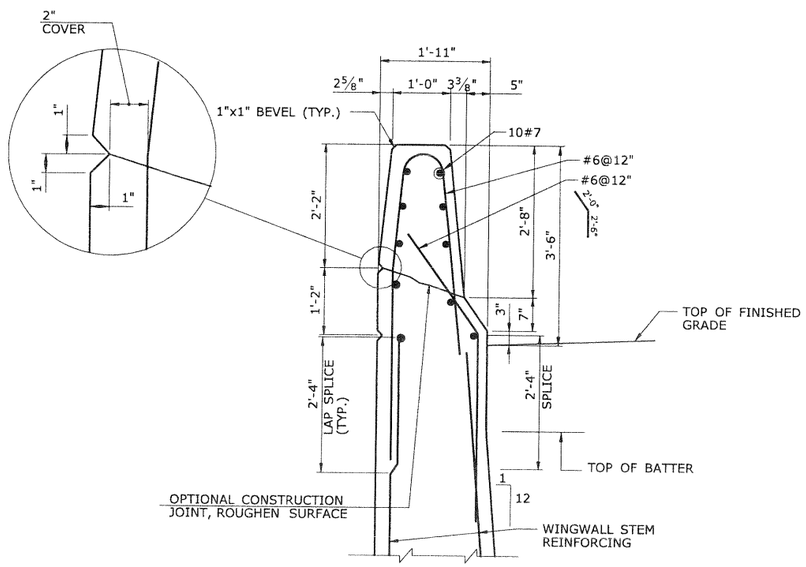
PILE PLAN
SCALE: 3/8" = 1'-0"



ELEVATION
SCALE: 3/8" = 1'-0"



SECTION A
SCALE: 3/8" = 1'-0"



DETAIL B
SCALE: 3/4" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	130 KIPS
SERVICE I	KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
WINGWALLS	

NOTES:

1. FOR STEEL PILES NOTES AND LEGEND SEE DWG. NO. S-19
2. THE ESTIMATED LENGTH OF PILES IS 52.0 FT. THE ESTIMATED PILE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH.
3. FOR ABUTMENT 2 DETAILS SEE DWG. NO. S-21 AND S-22
4. FOR APPROACH SLAB DETAILS SEE DWG. NO. S-32
5. FOR EXISTING WINGWALL EXTENSION DETAILS SEE DWG. NO. S-11
6. FOR SECTION X-X DETAIL SEE DWG. NO. S-19

WINGWALL 2A

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Filename: h:\cadd\ctdot\1728\093..h046\struct..bridge\new..britain..ave\SB..MSH..0093..0046..NB..WW..02.dgn

Plotted: 5/25/2010
Border Version: 5/31/07
THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.
Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

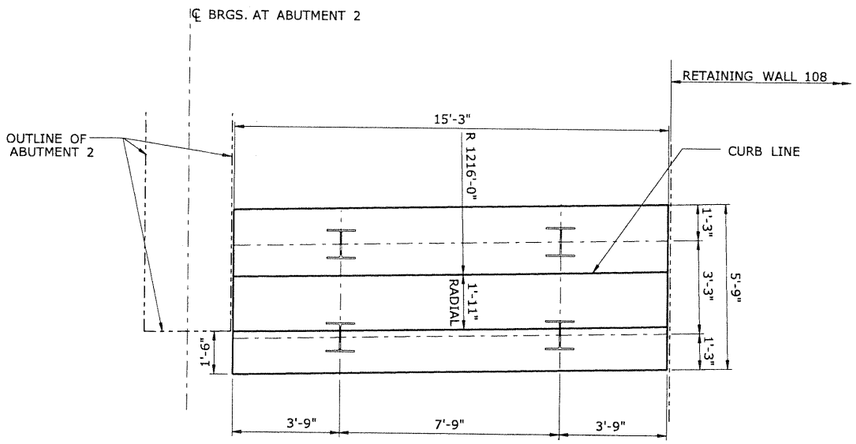
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

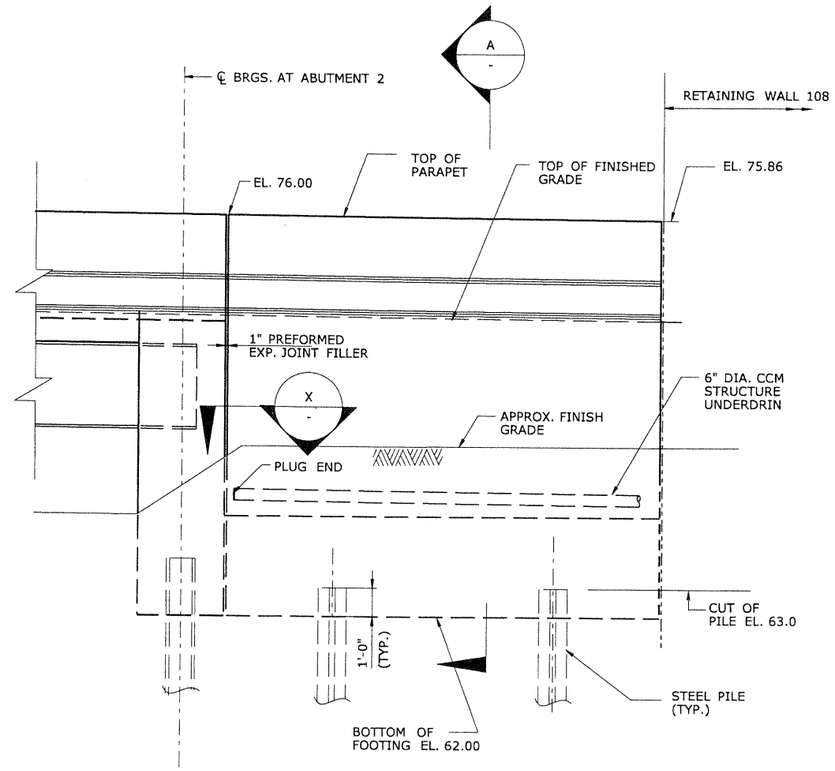
TOWN: WEST HARTFORD
DRAWING TITLE: WINGWALL 2A PLAN AND ELEVATION

PROJECT NO. 93-H046
DRAWING NO. S-24
SHEET NO. 181



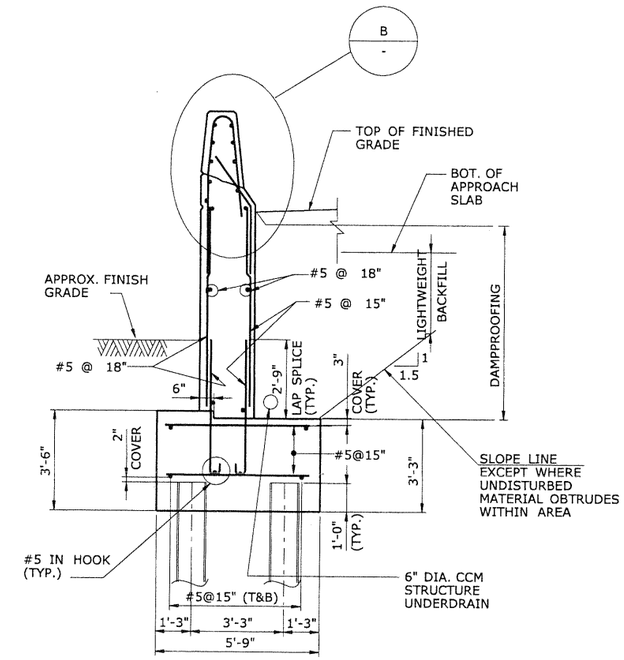
PILE PLAN

SCALE: 3/8" = 1'-0"



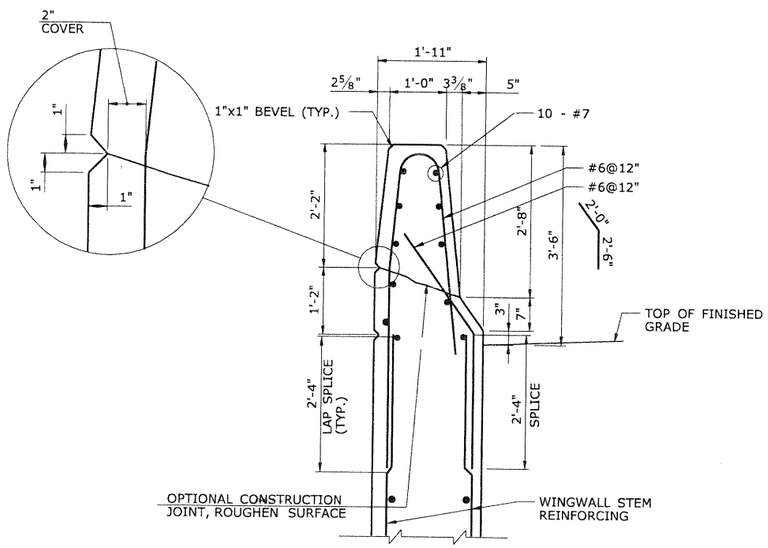
ELEVATION

SCALE: 3/8" = 1'-0"



SECTION A / -

SCALE: 3/8" = 1'-0"



DETAIL B / -

SCALE: 3/4" = 1'-0"

MAXIMUM DESIGN PILE LOADS	
LIMIT STATE	MAXIMUM DESIGN PILE LOAD
STRENGTH I	67 KIPS
SERVICE I	KIPS

ULTIMATE PILE CAPACITY	
SUBSTRUCTURE UNIT	ULTIMATE PILE CAPACITY
EXIST. WINGWALLS EXTENSION	

NOTES:

1. FOR STEEL PILES NOTES, AND LEGEND SEE DWG. NO. S-19
2. THE ESTIMATED LENGTH OF PILES IS 62.0 FT. ESTIMATED PILE LENGTH IS TO BE USED AS THE PILE ORDER LENGTH.
3. FOR ABUTMENT 2 DETAILS SEE DWG. NO. S-21 AND S-22
4. FOR APPROACH SLAB DETAILS SEE DWG. NO. S-32
5. FOR SECTION X-X DETAIL SEE DWF. NO. S-19

WINGWALL 2B

FINAL PLANS FOR REVIEW (90%)

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted: 5/25/2010
Border Version: 5/31/07

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Filename: h:\cadd\ctdot\1728\093-h046\struct.bridge\new_britain.ave\SB.MSH.0093.0046.NB.WW.03.dgn
Date Plotted: 5/25/2010

DESIGNER/DRAFTER: D.BELCASTRO
CHECKED BY: M.CARAMICHAEL
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

ENGINEER: AMMANN & WHITNEY
APPROVED BY: -
DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUSWAY OVER NEW BRITAIN AVENUE

TOWN: WEST HARTFORD

DRAWING TITLE: WINGWALL 2B PLAN ELEVATION & SECTION

PROJECT NO. 93-H046
DRAWING NO. S-25
SHEET NO. 182