LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

Geotechnical Report
Ramp I-91 NB to Route 5/15 NB over Route 5&15 SB
State Project No. 63-703
Hartford, Connecticut

December 12, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
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East Hartford, CT 06108

Prepared by:

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Vice President of Geotechnical Services

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1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for the proposed new bridge, I-91 NB to Route 5/15 NB Ramp over Route 5/15 SB, located in Hartford, Connecticut. The bridge will be an 880-foot-long, 5-span, trapezoidal box steel girder bridge, supported on two abutments and four piers. Abutments will be concrete cantilever with U-type wingwalls. Up to 36 feet of fill will be placed behind Abutment 1 and up to 22 feet of fill will be placed behind Abutment 2. No fill will be place in pier areas.

We recommend that abutments and piers be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the abutments and wingwalls will result in settlement of subgrade soils and downdrag loads on piles supporting abutments will occur. We recommend that bitumen coatings be applied to piles supporting the abutments to reduce downdrag loads, or alternatively piles may be oversized to accommodate downdrag loads. Coated piles should be preaugered to the top of the lacustrine deposits to protect the coatings during installation.

Total settlement of fills placed behind abutments and wingwalls is expected to be approximately 2 inches. We recommend that abutments and wingwalls be backfilled with lightweight fill consisting of expanded shale aggregate to reduce settlement to less than 1 inch.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions.
- Conducted settlement evaluations.
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

A new two-lane bridge will carry the I-91 NB to Route 5/15 NB Ramp over Route 5/15 SB, as shown on Figure 1, Site Location Map, and Figure 2, Subsurface Exploration Location Plan. Proposed bridge elements are as follows:

Bridge Type:	5-span trapezoidal box steel girder	
Length:	880 feet	
Abutments:	Two concrete cantilever abutments with U-type wingwalls	
	Bottom of Pile Cap:	
	Abutment 1:	El. 14.0
	Abutment 2:	El. 31.4
Piers:	Four Piers:	
	Piers 1, 3, 4: reinforced concrete hammer head piers	
	Pier 2: straddle bent cap supported by two reinforced concrete columns	
	Bottom of Pile Cap:	
	Pier 1:	El. 9.5
	Pier 2:	El. 15.8 (West support); El. 14 (East support)
	Pier 3:	El. 20.0
	Pier 4:	El. 25.2

2.2 Site Description

Abutment 1 and Pier 1 will be located on the west side of Route 5/15 SB, south of the off ramp to I-91 SB. The area is grass-covered with some trees. The existing ground surface elevation is about El. 15.

Pier 2 will straddle Route 5/15 SB and the off-ramp to I-91 SB. The east side support will be located between the paved Route 5/15 NB and SB travel lanes and the west side support will be located in the grassy divide between Route 5/15 SB and the I-91 SB off ramp (ground surface approximately El. 21). The existing ground surface elevation is approximately El. 21).

Piers 3 and 4 and Abutment 2 will be located between the paved Route 5/15 NB and SB travel lanes. Ground surface elevations are approximately El. 27 (Pier 3), El. 33 (Pier 4), and El. 38 (Abutment 2).

3.0 EXPLORATIONS

3.1 Recent Explorations

Twelve test borings (S1-1 through S1-12) were drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut, near the proposed abutments and piers to depths ranging from 64 to 100 feet below ground surface. Standard Penetration Tests were completed at maximum 5 foot intervals within the test borings. Ten-foot-long NX-size rock cores were obtained from each boring. Explorations were backfilled with drill cuttings and a pavement patch was placed at ground surface.

A Freeman Companies engineer monitored the drilling, classified the soil samples, and prepared the test boring logs included in Appendix A, Recent Boring Logs. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

A number of previous test borings were drilled in the vicinity of the new bridge and are considered applicable, including B-158, B-159, and B-188 to B-191. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan, and logs are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- 12 moisture content tests
- Three pH, electrical resistivity, and soluble sulfate tests
- Nine grain size analyses
- Three Constant Rate of Strain (CRS) Consolidation Tests
- Six Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3, Summary of Varved Clay Properties, West of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine Deposits, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. Subsurface profiles at the abutments and piers are provided on Figures 4A through 4F, Subsurface Profile.

Thickness Range (ft.)	Stratum	Generalized Description
10 to 28	Fill	Very loose to very dense brown, c-f SAND, little m-f gravel, little to trace silt; to brown clayey SILT, little to some f sand, with wood, rubber, asphalt, and occasional obstructions (refusals) and voids. Occasional rock fragments, glass, and brick were noted in previous borings. Standard Penetration Test (SPT) N-Values ranged from 1 to more than 100 blows per foot (bpf).
22 to 37	Alluvium	Very loose to medium dense SILT, trace fine sand; to gray f SAND, trace to some silt, trace m-f gravel. SPT N-values ranged from 1 to 44 bpf.

Thickness Range (ft.)	Stratum	Generalized Description
12 to 20	Lacustrine	Varved red-brown CLAY and SILTY CLAY, in regular layers typically ¼ to ½ inch thick and up to 3 inches thick at some locations. Previous field and laboratory vanes indicate the deposit is medium stiff to stiff. The varved clay is typically less than about 15 feet thick south of Abutment 1, and more than about 20 feet thick at Abutment 2.
2 to 12	Glacial Till	Medium dense to very dense red-brown coarse to fine SAND, some silt, with coarse to fine gravel and clay. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values ranged from 16 to more than 100 bpf.
	Bedrock	Bedrock was described as brown ARKOSE, thinly to thickly layered at about 15 degrees, medium strong to strong with fractured zones. The top 0.5 to 5 feet of bedrock was typically weathered.

Groundwater – Water was encountered in the borings at depths ranging from 7 to 20 feet (El 3 to El 22). Groundwater levels were measured during drilling activities and may not represent static levels. Water levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S1-2 (Abutment 1), S1-5 (Pier 2), and S1-12 (Abutment 2). Results are summarized below:

Test parameter	S1-2	S1-5	S1-12
pH	7.1	7.4	8.1
Electrical Resistivity (ohm-cm)	4,442	3,099	1,963
Sulfates (ppm)	<30	57	<50

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – The threshold settlement for downdrag loads on piles is commonly considered to be about 0.4 inches. Settlement evaluations were conducted at the proposed abutments to evaluate the magnitude of total settlement, and whether downdrag loads would occur on piles supporting the abutments due to settlement. Predicted total settlements calculated using the computer program Settle 3D (by RocScience) using normal and lightweight fill are as follows:

Normal Weight Fill:	1.5 inches south of abutment; 0.9 inches at abutment
Expanded Shale:	0.9 inches south of the abutment; 0.5 inches at the abutment
Geofoam:	3/4 inch south of the abutment; 0.2 inch at the abutment

Considering the uncertainties in assumptions and parameters, the significant height of fill, and the closeness of estimated geofoam settlement with the threshold settlement for downdrag, use of geofoam for downdrag mitigation is not considered appropriate. We recommend that coatings be applied to piles to reduce downdrag loads, or that piles be oversized to provide additional capacity for downdrag. A 90 percent reduction in downdrag loads is considered feasible using bitumen coatings, whereas a 33 percent reduction in downdrag has been reported for an epoxy coating referred to as *Slickcoat*. We recommend that bitumen coatings be considered for this project. We recommend that backfill at the abutments consist of expanded shale aggregate.

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Corrosion – AASHTO Section 10.7.5 indicates that soils are considered corrosive if pH is less than 5.5, resistivity is less than 2,000 ohm-cm, and sulfate concentration is greater than 1,000 ppm. Based on these criteria, soils at the north abutment (S1-12) are marginally corrosive, and soils in other areas are not corrosive. Corrosion mitigation methods include designing piles with sacrificial steel to allow corrosion to occur, providing a protective coating, and other measures (AASHTO C10.7.5). The NCHRP report titled *"Design and Construction Guidelines for Downdrag on Uncoated and Bitumen Coated Piles",* Briaud and Tucker (1996, pg. 10) indicates that bitumen coatings provide corrosion resistance. We recommend the use of bitumen coating at the north bridge abutment to provide both corrosion protection and downdrag mitigation.

Pile Design

- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils. Assume peak ground acceleration (PGA) of 0.061g, a short-term acceleration coefficient S_s= 0.132g and long-term acceleration coefficient S_1 = 0.037g, respectively.
- Pile Type: HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- Service Limit: 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Subtract an appropriate allowance for downdrag for piles supporting the abutments, as indicated below.
- Strength Limit: For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.
- Downdrag: Estimated downdrag loads are listed below:
  - Abutment 1:
    - 50 tons (single piles, uncoated) or 5 tons (single pile with bitumen coating)
    - 4.5 tons (corner pile in a group with bitumen coating)
    - 4 tons (side pile in a group with bitumen coating)
    - 2.5 tons (inside pile in a group with bitumen coating)
  - Abutment 2:
    - 115 tons (single piles, uncoated), or 11.5 tons (single pile with bitumen coating)
    - 10.5 tons (corner pile in a group with bitumen coating)
    - 9 tons (side pile in a group with bitumen coating)
    - 6 tons (inside pile in a group with bitumen coating)
- Load Tests: Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- Test Piles: Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- Minimum Spacing: Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- Lateral Resistance: Use the pile capacity in batter. Lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- Subgrade Preparation Below Pile Cap: Minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- Bottom of Structure and Estimated Pile Length:

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation
Abutment 1	14.0	-40
Pier 1	9.5	-38
Pier 2	15.8 (west support) 14 (east support)	-39
Pier 3	20	-45
Pier 4	25.2	-43
Abutment 2	31.4	-47

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Abutment Design

- Backfill Material: Expanded Shale Aggregate within 200 feet of Abutment 1
  Expanded Shale Aggregate for filling between Abutment 2 and Charter Oak Bridge
  12-inch thick layer of compacted granular fill between top of Expanded Shale and Roadway Base
  24-inch thick pavement section
- Est. Settlement: Less than 1-in. total settlement at Abutments 1 and 2
- Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- Lateral Pressures: Refer to Figure 5 – Active Earth Pressures

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Proposed bottom of pile caps will be within the Fill and Alluvium strata. The alluvium and portions of the fill are highly susceptible to disturbance by construction equipment, and are expected to be wet due to shallow groundwater. Excavation to footing subgrade should be made using a smooth-bladed backhoe bucket. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Pile Cap Subgrade Preparation

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. We anticipate that working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment. A draft special provision is provided in Appendix D.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Where bitumen coats are required, coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat. A draft special provision for bitumen coatings is provided in Appendix D.

Piles with bitumen coatings should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. Additionally, the alluvium is expected to be susceptible to settlement from pile driving, and settlement of the alluvial deposits could effect nearby structures and utilities. The top of lacustrine deposits is typically about El -20. Sand should be placed in the casing as the casing is extracted.

6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations on the order of 5 to 8 feet deep will be required to reach pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumptions, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

2014-1001
New Bridge - Route 5/15 over I-91 NB
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
Hartford, Connecticut

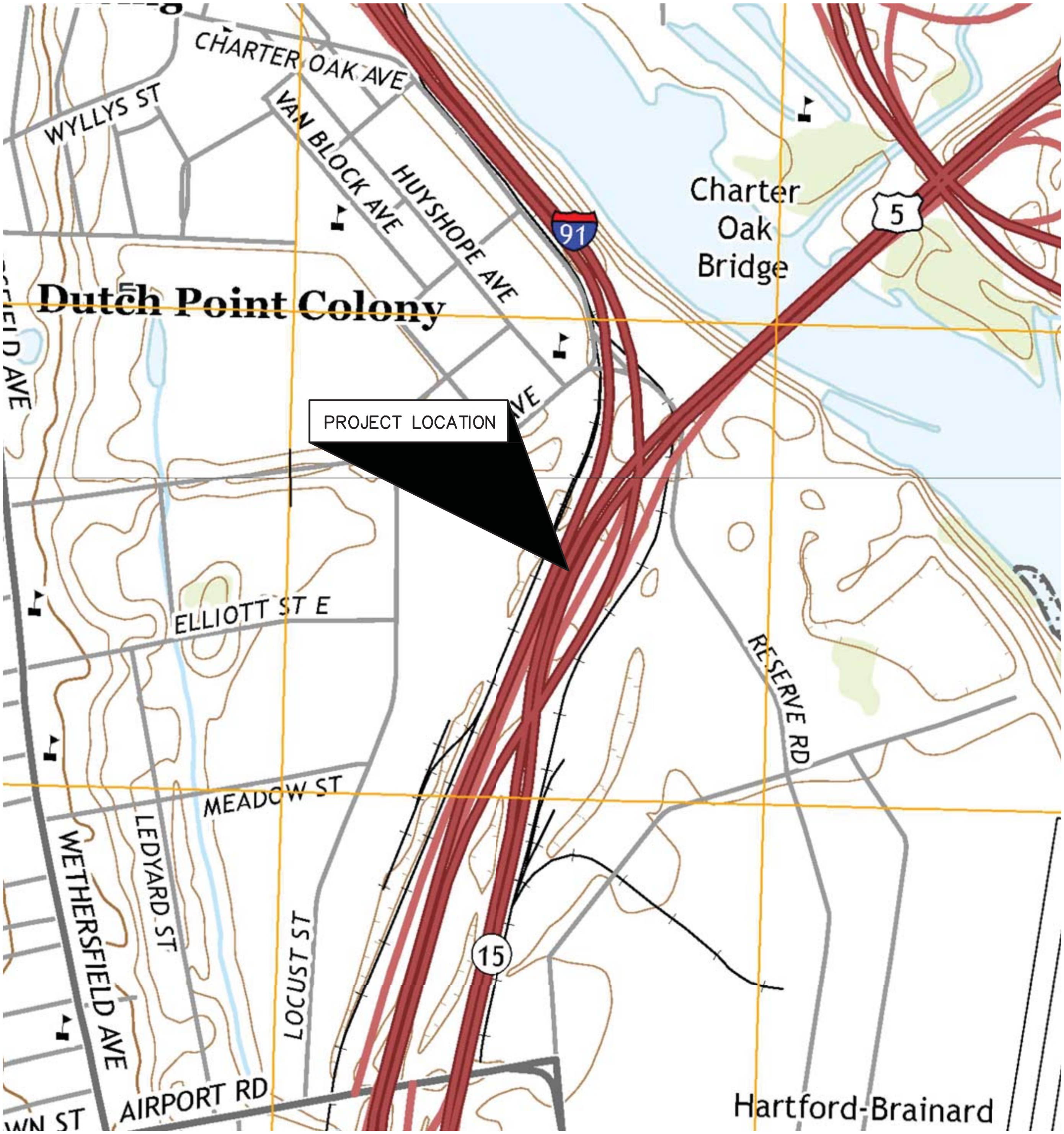
Table 1
Subsurface Data

Boring No.	Ground Surface El.	Depth (ft.)	Thickness (ft.)						Groundwater		Bedrock	
			Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Borings												
S1-1	16.5	65 C	0.3	9.7	28	12	3	3	10	6.5	52	-35.5
S1-2	14.7	64 C	0.4	13.6	24	12	3	1	7.1	7.6	53	-38.3
S1-3	16.8	64 C	0.5	9.5	29	12.5	1.5	1	9	7.8	53	-36.2
S1-4	22.1	66 C	1	14	22	16.5	2	0.5	19	3.1	55.5	-33.4
S1-5	21.8	69 C	1	14	29	12	1.5	2.5	18.5	3.3	57.5	-35.7
S1-6	25.6	72 C	1	12.5	27	12.5	9	---	NM	NM	62	-36.4
S1-7	27.5	80 C	1	12	37	13	3	4	15	12.5	66	-38.5
S1-8	26.6	81 C	1.2	18.8	28	16	7	---	18.2	8.4	71	-44.4
S1-9	38.7	85 C	1	24	28	15.5	4.5	2	20	18.7	73	-34.3
S1-10	37.5	90 C	1	24	26.5	16.5	7	5	17.5	20	75	-37.5
S1-11	37.7	89.5 C	1	25	32	15	11.5	---	18.5	19.2	84.5	-46.8
S1-12	40.7	95 C	1	27	27	19.5	6	4.5	19	21.7	80.5	-39.8
Previous Test Borings												
B-158		69 C	0.5	4.3	33.2	18	5	3	2		61	
B-159		65C	0.5	5.5	32	14	7	1	7.5		59	
B-188		67 C	0.7	12.3	30	11	4	4	6.5		58	
B-189		68 C	1	20	22	13	4	3	5.8		60	
B-190		72 C	0.3	3.2	34.5	19.5	7.5	2	7.5		65	
B-191		69 C	1	7	30	11.5	13.5	1	11.5		63	

Notes:

1. Ground surface elevations are at recent test borings were surveyed by CME Associates, Inc. Elevations at previous borings were shown on the logs and converted to NAVD-88.
2. Groundwater levels are approximate
3. Top of bedrock depth is inclusive of weathered bedrock.
4. ">" - Greater Than "--" - Not Encountered (C) - Bedrock Core Taken "NM" - Not Measured

FIGURES



USGS QUADRANGLE MAP
HARTFORD NORTH, CONNECTICUT
HARTFORD SOUTH, CONNECTICUT
DATE 2015

FREEMAN COMPANIES
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ELEVATE YOUR EXPECTATIONS

SITE LOCATION MAP

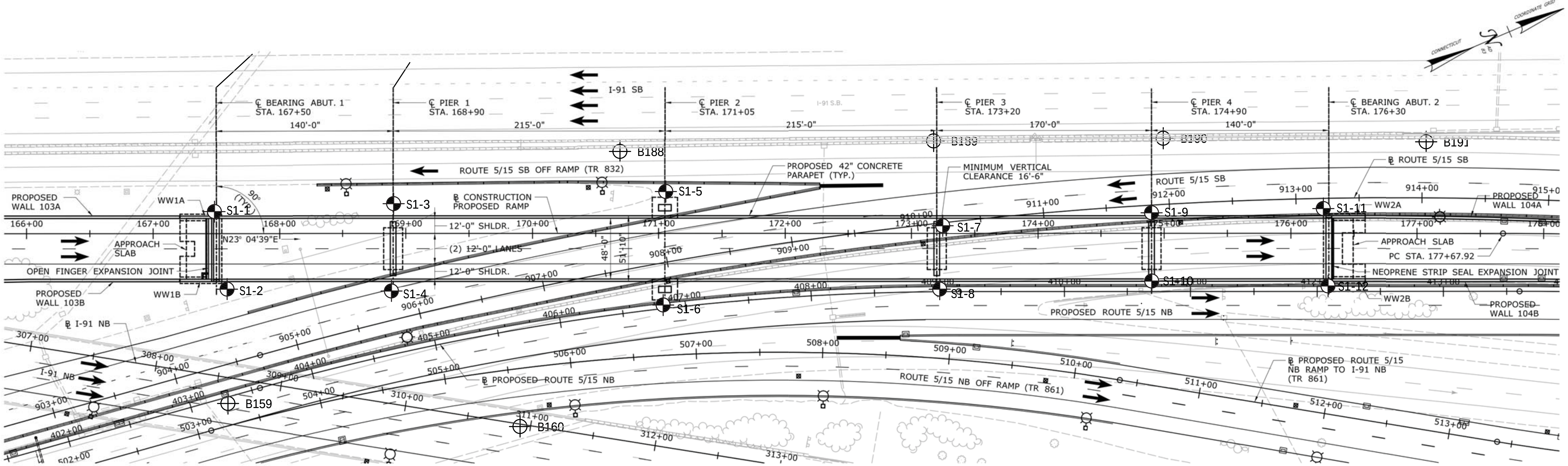
PROPOSED BRIDGE I-91 NB TO ROUTE 5/15 NB
OVER ROUTE 5/15 SB
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	1"=1000'
PROJECT NO.:	2014-1001
DATE:	10/21/2016

SHEET NO.

FIGURE 1

Freeman Companies, LLC . Y:\2014\2014-1001 ConnDot CSO 2232 CME\DWG\Figure 1 LOCUS.dwg Oct 24, 2016-12:46pm Plotted By: mkwok



GENERAL PLAN

LEGEND:

- RECENT BORINGS
- PREVIOUS BORINGS

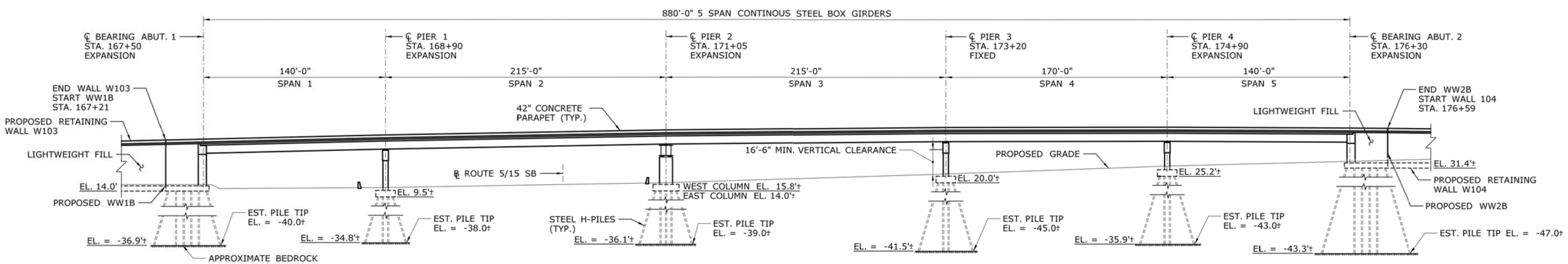
NOTES:

1. RECENT EXPLORATION LOCATIONS WERE SURVEYED BY CME ASSOCIATES, INC., AND PREVIOUS BORING LOCATIONS WERE ESTIMATED FROM RECORD INFORATION AND ARE APPROXIMATE.
2. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION
3. BASE PLAN PROVIDED BY CME ASSOCIATES, INC.

GRAPHIC SCALE

80 40 0 80

SCALE IN FEET



EAST ELEVATION

SUBSURFACE EXPLORATION LOCATION PLAN

PROPOSED BRIDGE I-91 NB TO ROUTE 5/15 NB OVER ROUTE 5/15 SB

STATE PROJECT NO. 63-703

HARTFORD, CONNECTICUT

FREEMAN COMPANIES

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ELEVATE YOUR EXPECTATIONS

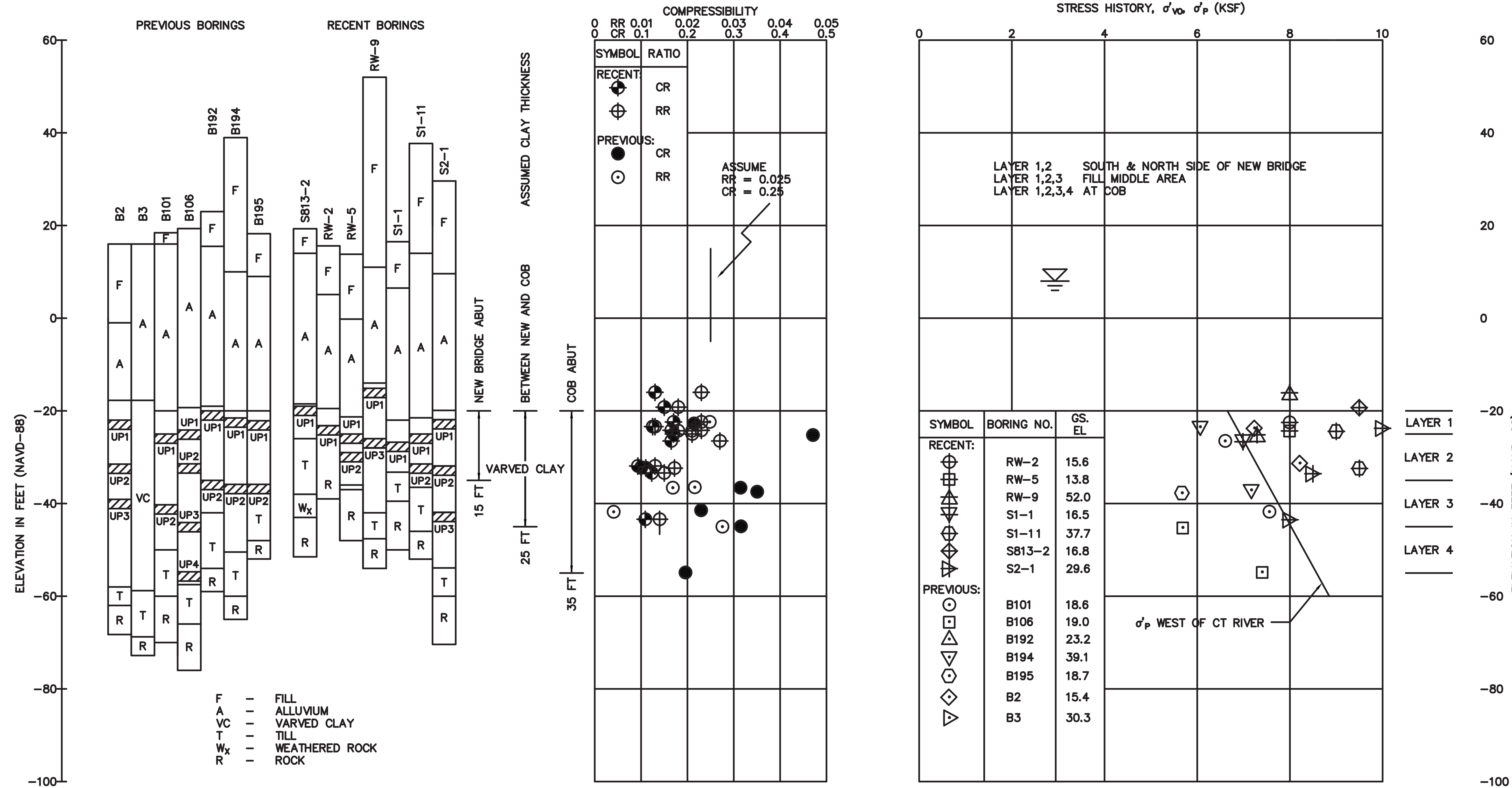
No.	Date	Description
–	–	–

REVISIONS

DRAWN:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALE:	1"=80'
PROJECT NO.:	2014–1001
DATE:	12/06/2016

SHEET NO.

FIGURE 2



NOTES

1. PREVIOUS DATA WAS OBTAINED FROM THE REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD-EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
2. ELEVATIONS REFER TO NAVD-88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD-29.

DEFINITIONS

CR – COMPRESSION RATIO ($=\Delta\varepsilon/\Delta LOG\sigma'_V$) DURING VIRGIN COMPRESSION

RR – RECOMPRESSION RATIO ($=\Delta\varepsilon/LOG\sigma'_V$) DURING RECOMPRESSION

σ'_{VO} – IN SITU VERTICAL EFFECTIVE STRESS

σ'_P – PRECONSOLIDATION STRESS

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SUMMARY OF VARVED CLAY PROPERTIES
WEST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3A

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

SUBSURFACE DIAGRAM

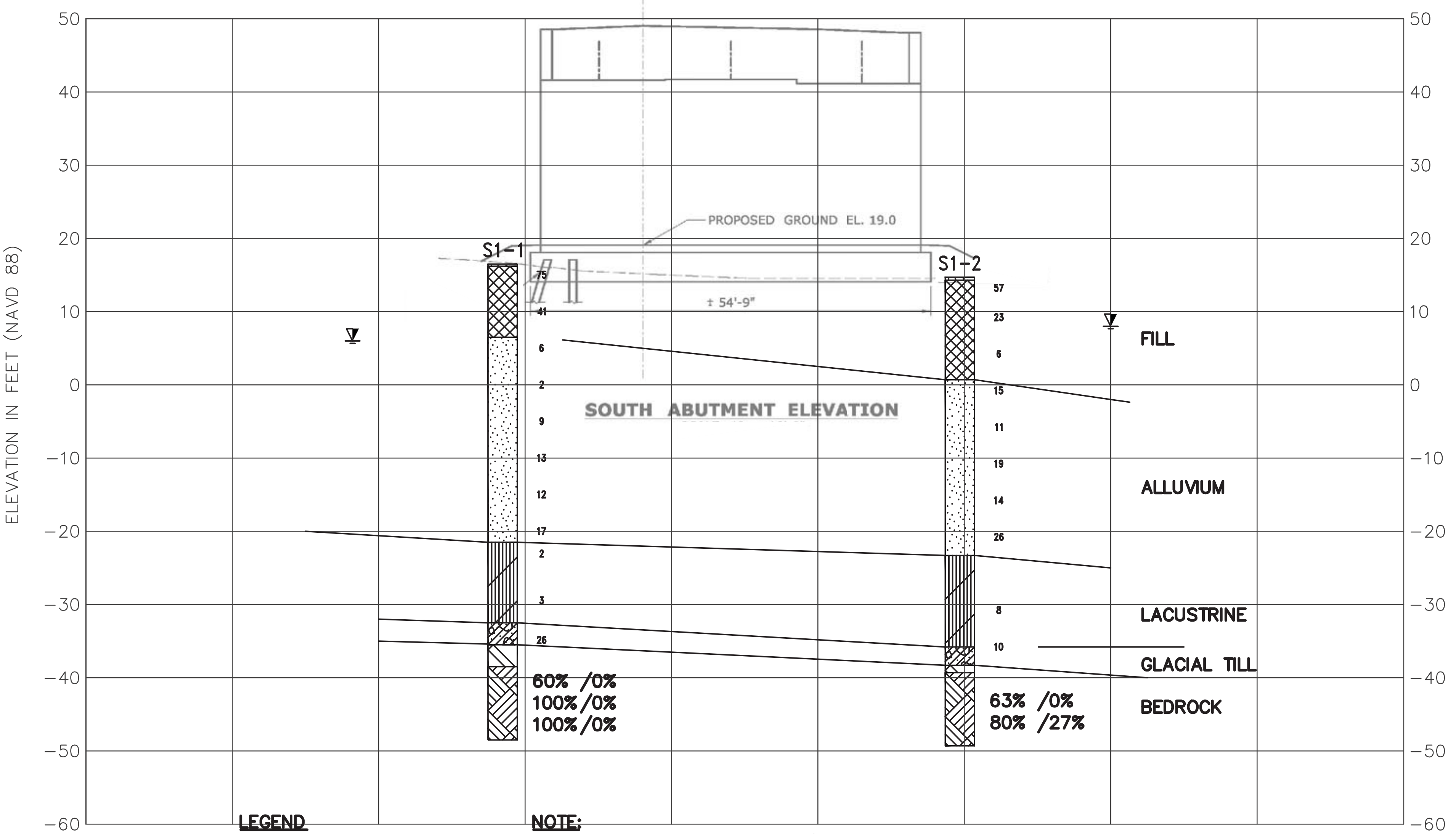
PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'



LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4A

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

SUBSURFACE DIAGRAM

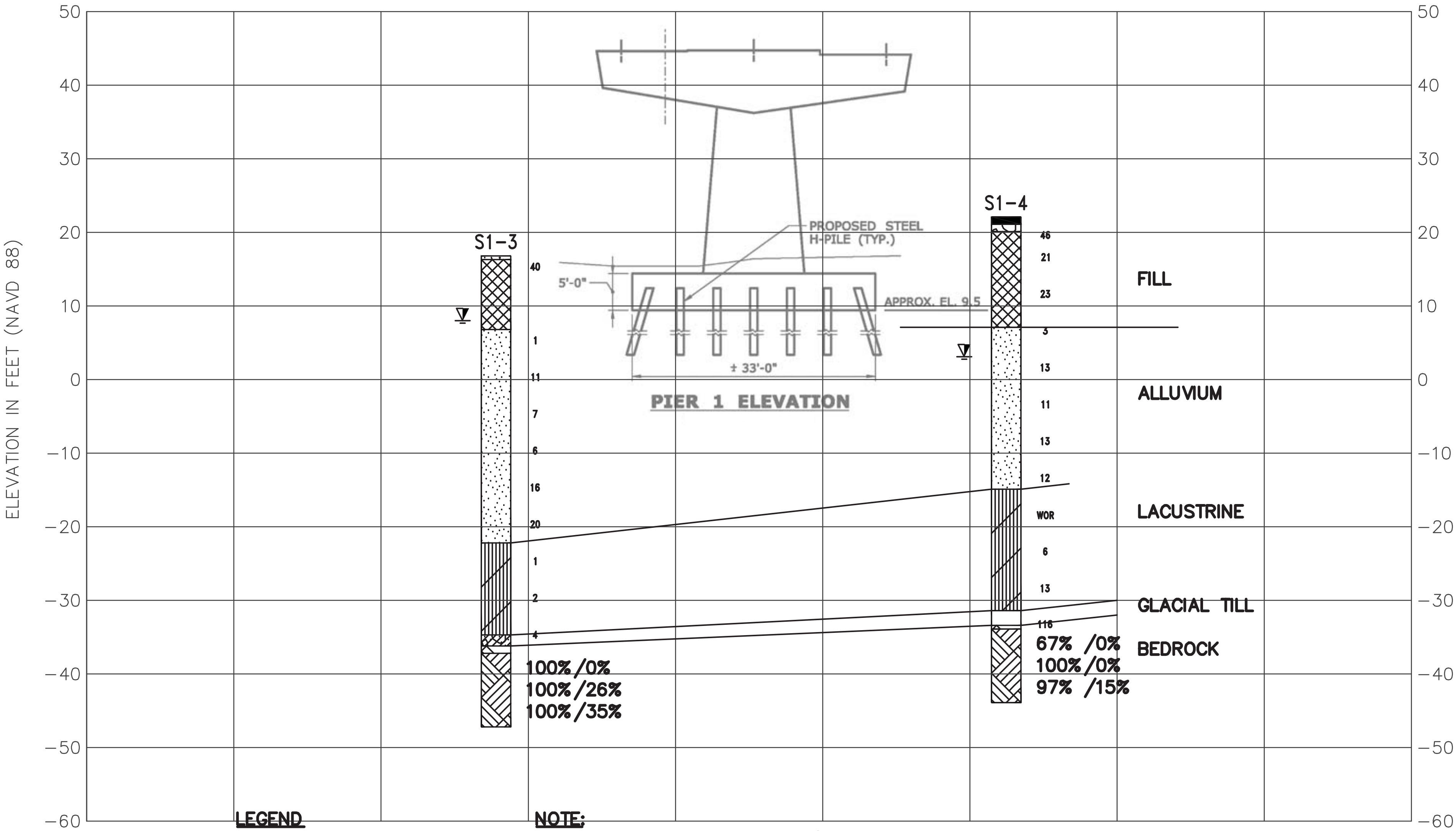
PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'



LEGEND
13 SPT N−VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4B

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CMEVGEOT\GINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

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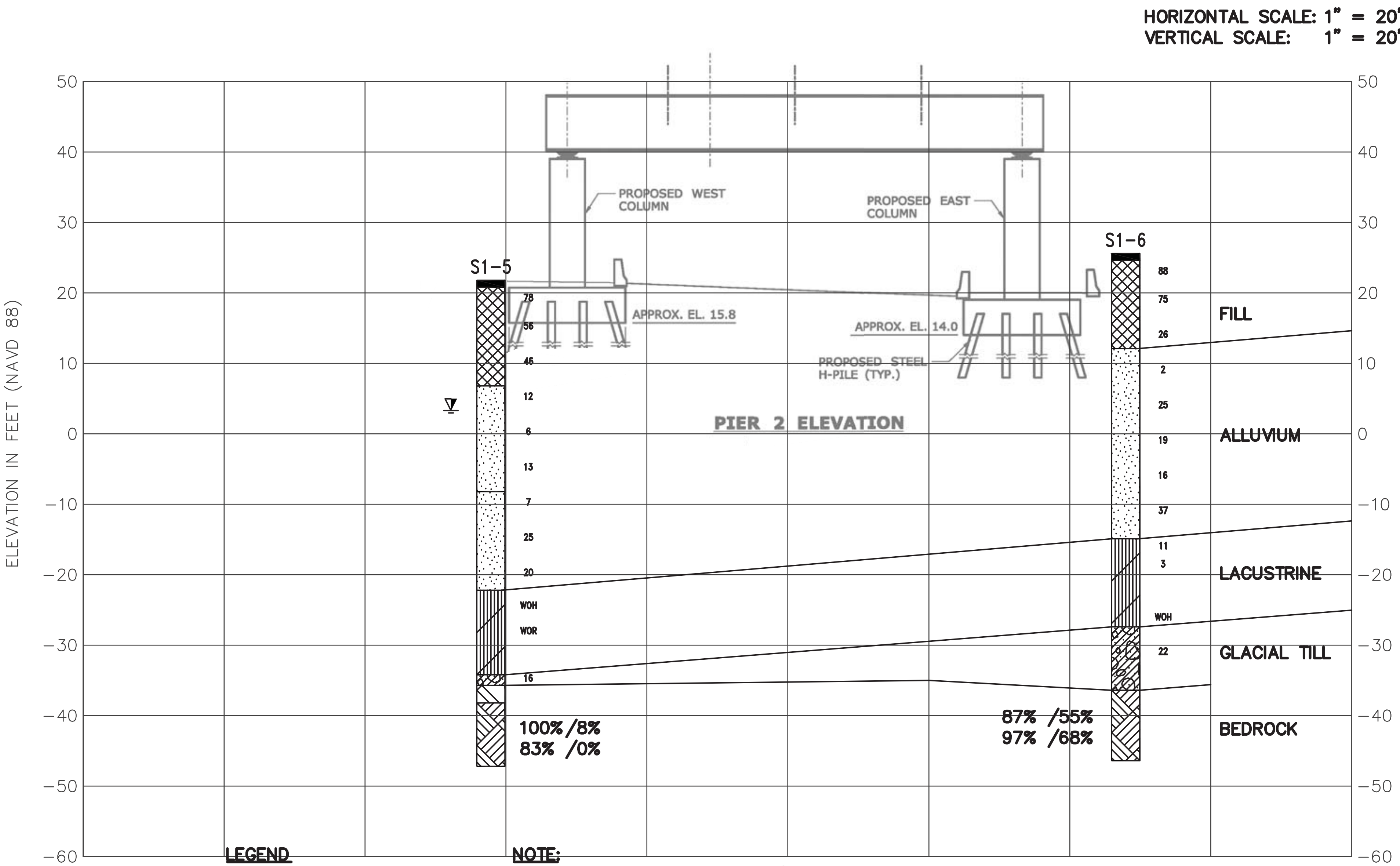
PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford



LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4C

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

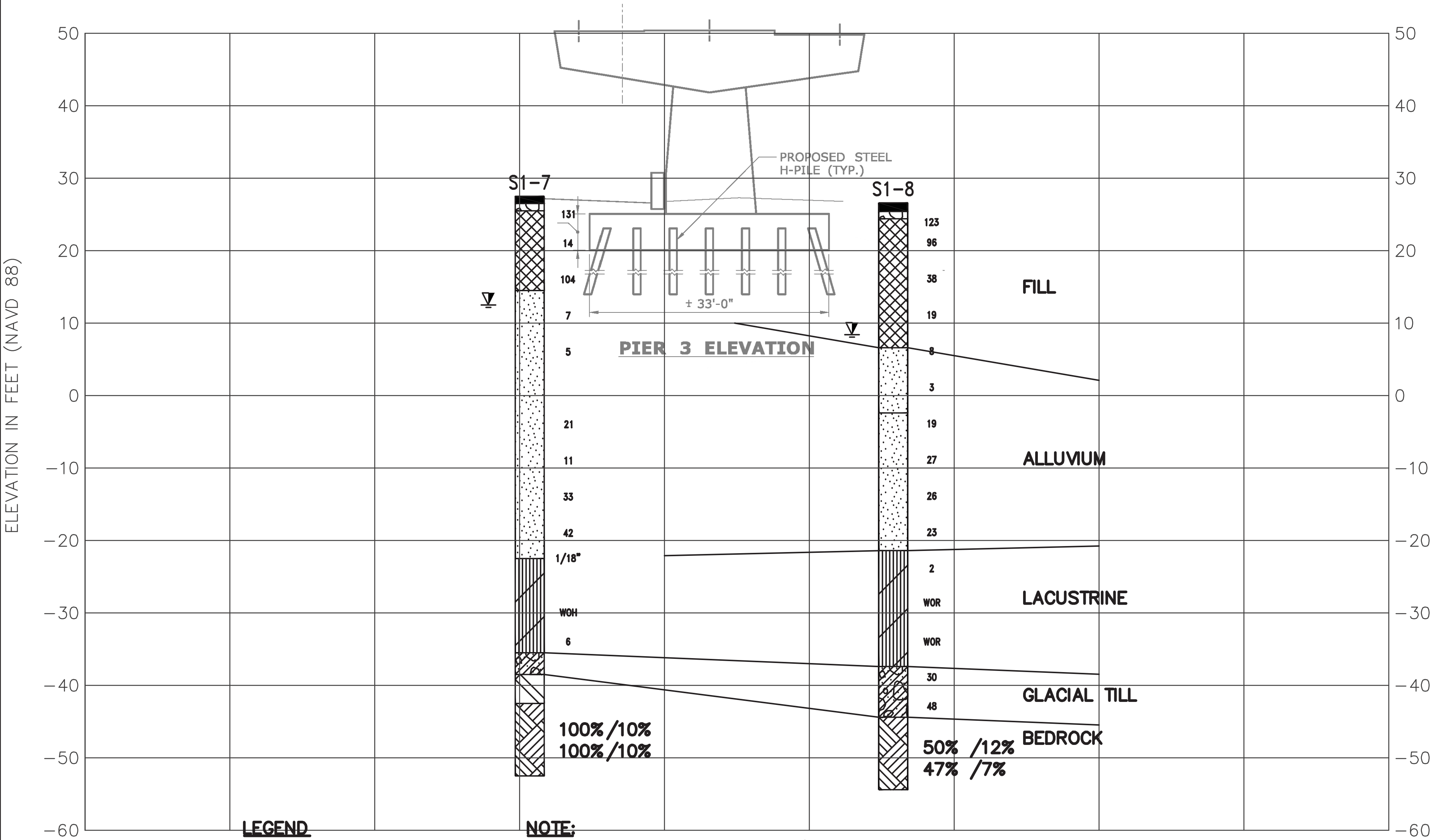
PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'



LEGEND
13 SPT N−VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4D

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CME\GEOT\GINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

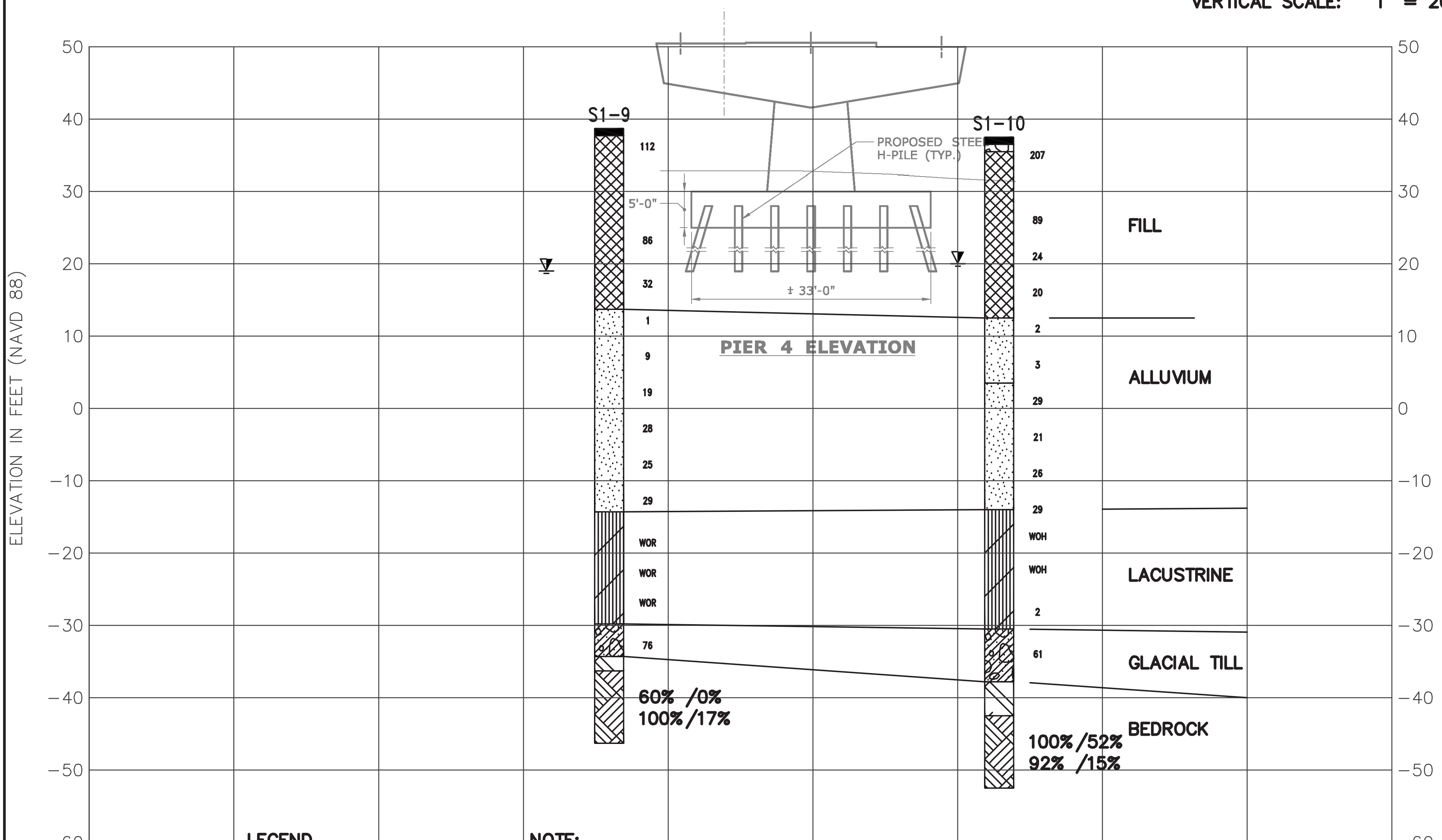
PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'



LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4E

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

SUBSURFACE DIAGRAM

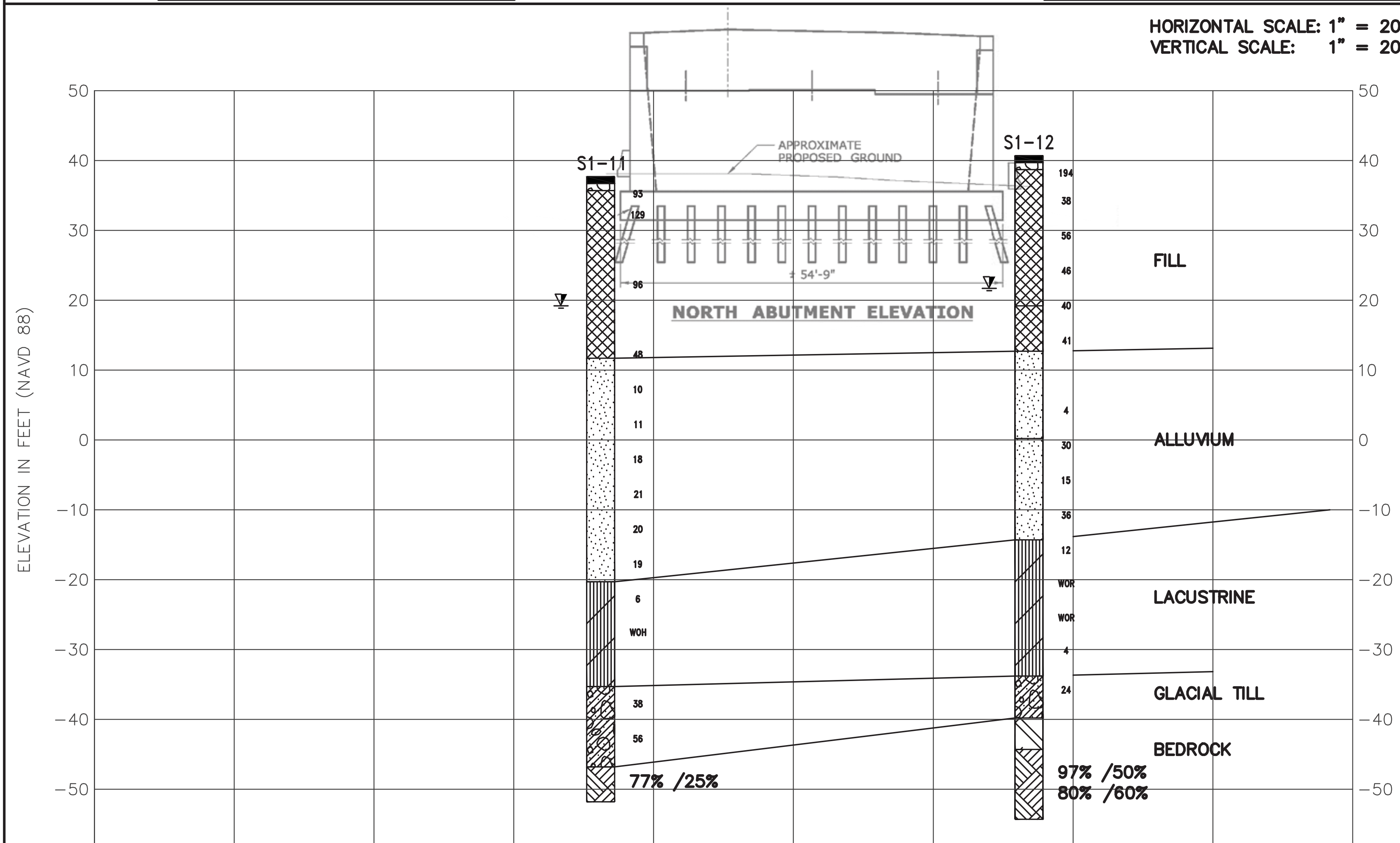
PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'

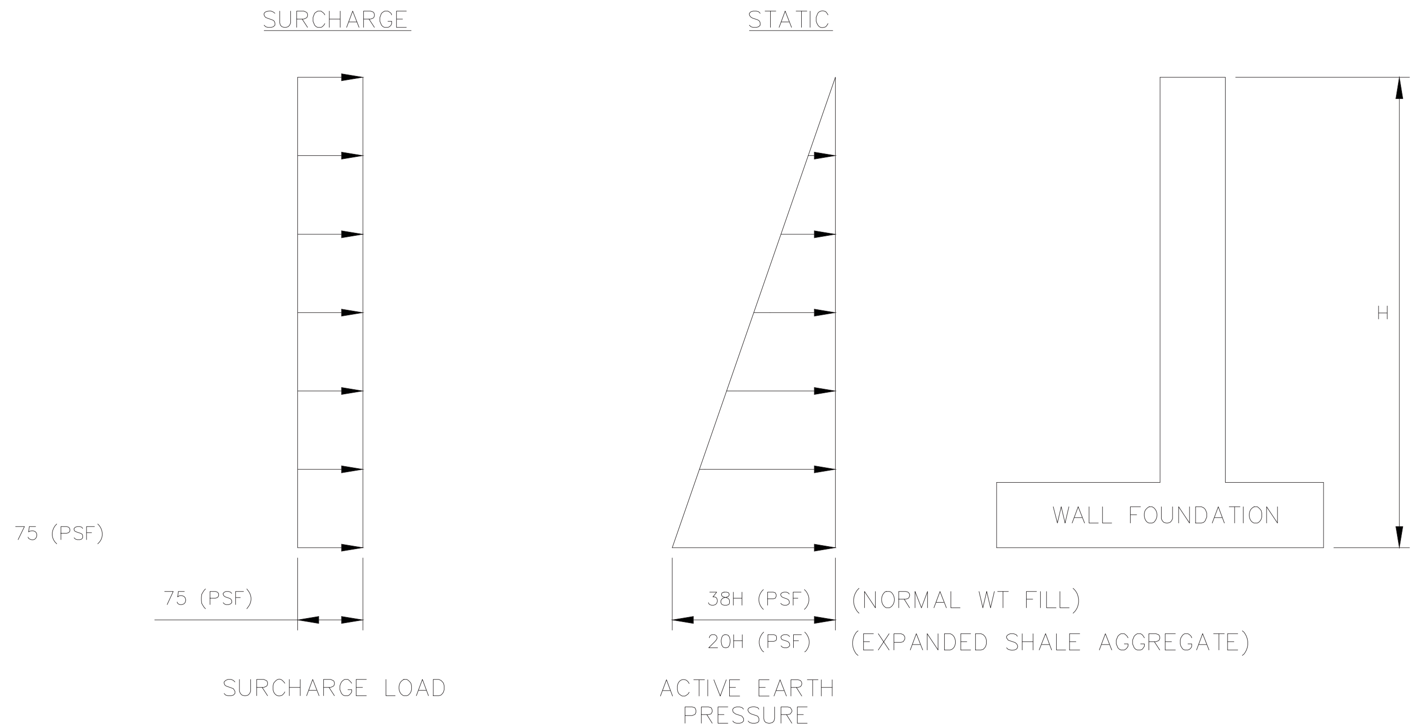


LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

FIGURE 4F

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CME\GEOT\GINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ



NOTES:

1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
2. H IS MEASURED IN FEET
3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
5. SLIDING:
   COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3–1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

FREEMAN COMPANIES
LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES
36 JOHN STREET
HARTFORD, CT 06106
WWW.FREEMANCOS.COM
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ELEVATE YOUR EXPECTATIONS

LATERAL EARTH PRESSURES
ACTIVE EARTH PRESSURES

PROPOSED BRIDGE I-91 NB TO ROUTE 5/15 NB OVER ROUTE 5/15 SB
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014–1001
DATE:	10/21/2016

FIG.

FIGURE 5

APPENDIX A

RECENT TEST BORING LOGS

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-1
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832451.18
Start Date:	5-23-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024244.72
Finish Date:	5-24-16	Bridge No.:		Surface Elevation:	16.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.0' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	10 31 44 56	24	16		Topsoil	TOPSOIL (4")	
						Fill	Brown c-f SAND, little m-f gravel, little silt	15
5	S2	11 16 25 26	24	12			Brown c-f SAND, little m-f gravel, trace silt	10
10	S3	3 3 3 5	24	18		Alluvium	Gray SILT, trace f sand	5
15	S4	1 1 1 2	24	22			Gray f SAND, some silt	
							Gray f SAND, little silt	0
20	S5	7 5 4 7	24	12			Gray c-f SAND, trace silt	-5
25	S6	3 4 9 9	24	10			Gray c-f SAND, trace f gravel	-10
30	S7	4 4 8 11	24	16			Gray c-f SAND, trace silt	-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: 55ft Rock: 10ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 13 No. of Core Runs: 3		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-1
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832451.18
Start Date:	5-23-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024244.72
Finish Date:	5-24-16	Bridge No.:		Surface Elevation:	16.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.0' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35						Alluvium *(con't)*		
	S8	4 7 10 15	24	10			Gray c-f SAND, trace f gravel, trace silt	-20
						Lacustrine		
40	S9	wor wor 2 2	24	24			Brown SILTY CLAY	-25
	UP-1		30	30				
45	S10	wor woh 3 5	24	24			Brown SILTY CLAY	-30
	UP-2		30	12			No recovery in tube at bottom 6", tip of tube bent indicating glacial till	
						Glacial Till		
50	S11	15 11 15 100/3''	21	10			Brown c-f SAND, some silt, little c-f gravel	-35
						Weathered Rock	WEATHERED BEDROCK	
55						Bedrock		-40
	C-1		60	36	0		Brown ARKOSE, highly fractured, medium strong	
60	C-2		24	24	0		Brown ARKOSE, highly fractured, medium strong	-45
	C-3		36	36	0		Brown SANDSTONE, thickly banded, highly fractured, medium strong	
65							END OF BORING 65ft	-50

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: 55ft Rock: 10ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 13 No. of Core Runs: 3		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: G. Twombly		Hole No.: S1-2
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832436.06
Start Date: 5-10-16	Route No.: 15 SB / Exit 86 Off Ramp	Easting: 1024305.33
Finish Date: 5-10-16	Bridge No.:	Surface Elevation: 14.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @9.0' ATD, @7.1 (24 hrs)

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	5 25 32 28	24	22		Topsoil / Fill	TOPSOIL (5") Brown c-f SAND, some c-f gravel, little silt	
5	S2	8 8 15 14	24	14			Brown c-f SAND, little silt, trace m-f gravel	10
10	S3	6 3 3 4	24	0			Brown to olive SILT, little f SAND, trace f gravel, 12" recovery on second attempt using a 3" spoon	5
15	S4	9 8 7 7	24	15		Alluvium	Brown to gray c SAND, trace silt	0
20	S5	7 6 5 6	24	11			Gray c-f SAND, trace silt	-5
25	S6	9 10 9 8	24	12			Gray c-f SAND, trace silt	-10
30	S7	7 6 8 13	24	8			Gray c-f SAND, trace m-f gravel, trace silt	-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: 53ft Rock: 11ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 11 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	G. Twombly			Hole No.:	S1-2
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832436.06
Start Date:	5-10-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024305.33
Finish Date:	5-10-16	Bridge No.:		Surface Elevation:	14.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @9.0' ATD, @7.1 (24 hrs)

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	16 15 11 14	24	7		Alluvium *(con't)*	Gray c-f SAND, trace silt	-20
						Lacustrine		
40	S9	woh woh woh 4	24	24			Brown SILTY CLAY	-25
45	S10	3 4 4 4	24	24			Brown SILTY CLAY	-30
50	S11	5 5 5 10	24	2		Glacial Till	Brown CLAYEY SILT, trace f gravel Brown CLAYEY SILT, little f gravel (change in stratum at bottom 6 inches of spoon)	-35
						Weathered Rock		
55						Bedrock		-40
	C-1		60	38	0		Brown SANDY ARKOSE, highly fractured, 2" recovery with 1" being arkose and the other similar to sandstone, strong	
60								-45
	C-2		60	48	27		Brown SANDY ARKOSE, with highly fractured zones, one high angle fracture, strong	
65							END OF BORING 64ft	-50

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: 53ft Rock: 11ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 11 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	C. Dupis			Hole No.:	S1-3
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832583.96
Start Date:	5-23-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024294.25
Finish Date:	5-24-16	Bridge No.:		Surface Elevation:	16.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @9.0' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	3	18	22	21	24	18		Topsoil Fill	TOPSOIL (6") Brown to tan c-f SAND, little m-f gravel, little silt	15
5	S2	1/12"	0	1/12"	0	24	2			Brown c-f SAND, little c-f gravel, little silt, little wood and rubber	10
10	S3	1/12"	0	1	2	24	14		Alluvium	Gray SILT, some f sand	5
15	S4	3	5	6	10	24	8			Gray f SAND, little silt, trace fine gravel Gray c-f SAND, trace f gravel, trace silt	0
20	S5	3	3	4	6	24	6			Gray c-f SAND, trace silt	-5
25	S6	3	2	4	2	24	3			Gray c-f SAND, trace f gravel, trace silt	-10
30	S7	5	6	10	11	24	10			Gray c-f SAND, trace m-f gravel, trace silt	-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: 54ft Rock: 10ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 11 No. of Core Runs: 3		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	C. Dupis			Hole No.:	S1-3
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832583.96
Start Date:	5-23-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024294.25
Finish Date:	5-24-16	Bridge No.:		Surface Elevation:	16.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @9.0' ATD

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35						Alluvium *(con't)*		
	S8	6 9 11 14	24	6			Gray c-f SAND, little m-f gravel, trace silt	-20
40						Lacustrine		
	S9	woh/12" 0 1 2	24	24			Brown SILTY CLAY	-25
45								
	S10	wor 1 1 2	24	24			Brown SILTY CLAY	-30
50							Brown SILTY CLAY	
	S11	1 1 3 15	24	4		Glacial Till	Brown CLAYEY SILT, little c-f sand, trace m-f gravel	-35
						Weathered Rock	WEATHERED BEDROCK	
55	C-1		12	12	0	Bedrock	Brown ARKOSE, highly weathered, highly fractured, very weak	
	C-2		48	48	26		Brown ARKOSE, moderately weathered, highly fractured, medium strrong	-40
60	C-3		60	60	35		Brown SANDY ARKOSE, moderately weathered, thinly banded, moderately fractured, medium strong	-45
65							END OF BORING 64ft	-50

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: 54ft Rock: 10ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 11 No. of Core Runs: 3		SM-001-M REV. 1/02

Driller: G. Twombly	**Connecticut DOT Boring Report**	Hole No.: S1-4
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832555.23
Start Date: 5-9-16	Route No.: 15 SB	Easting: 1024357.32
Finish Date: 5-10-16	Bridge No.:	Surface Elevation: 22.1
Project Description: Relocation of I-91 NB Interchange 29 & Widening		
Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	
Groundwater Observations: @19.0 after 24 hours		

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
						Base	GRAVEL BASE (12")	
	S1	25 25 21 24	24	13		Fill	Brown c-f SAND, trace silt	20
5	S2	9 11 10 15	24	12			Brown c-f SAND, trace silt	
								15
10	S3	14 12 11 11	24	13			Brown c-f SAND, little silt	
								10
15	S4	6 2 1 1	24	6		Alluvium	Brown f SAND and SILT	
								5
20	S5	4 7 6 8	24	6			Brown c-f SAND, little m-f gravel, trace silt	
								0
25	S6	4 6 5 7	24	15			Gray c-f SAND, trace silt	
								-5
30	S7	5 5 8 7	24	18			Gray c-f SAND, some f gravel	
								-10

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: 55.5ft Rock: 10.5ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 12 No. of Core Runs: 3		SM-001-M REV. 1/02

Driller: G. Twombly	**Connecticut DOT Boring Report**	Hole No.: S1-4
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832555.23
Start Date: 5-9-16	Route No.: 15 SB	Easting: 1024357.32
Finish Date: 5-10-16	Bridge No.:	Surface Elevation: 22.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @19.0 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	7 6 6 9	24	6		Alluvium *(con't)*	Gray c-f SAND, some m-f gravel	
						Lacustrine		-15
40	S9	wor woh woh woh	24	21			Brown SILTY CLAY, trace f sand	
								-20
45	S10	wor 3 3 3	24	24			Brown SILTY CLAY	
								-25
50	S11	6 6 7 7	24	0			No Recovery	
							Pushed second spoon sample from 51' to 53', Brown SILTY CLAY (Recovery = 16")	-30
55	S12	38 61 55 120/3''	21	8		Glacial Till	Brown c-f SAND, some m-f gravel, some silt, trace weathered bedrock	
	C-1		12	8	0	Weathered Rock	WEATHERED BEDROCK Brown ARKOSE, highly fractured, medium strong, loss of water	-35
	C-2		48	48	0	Bedrock	Brown ARKOSE, highly fractured, medium strong, loss of water	
60								-40
	C-3		60	58	15		Brown ARKOSE, highly fractured, medium strong, loss of water	
65								
							END OF BORING 66ft	-45

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: 55.5ft Rock: 10.5ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 12 No. of Core Runs: 3		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-5
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832785.82
Start Date:	5-9-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024369.56
Finish Date:	5-10-16	Bridge No.:		Surface Elevation:	21.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
	S1	52 43 35 38	24	14		Fill	Brown c-f SAND, some silt, little m-f gravel	20
5	S2	28 28 28 37	24	18			Brown c-f SAND, little m-f gravel, little silt	15
10	S3	25 26 20 16	24	12			Brown to red c-f SAND, little m-f gravel, little silt	10
15	S4	5 4 8 5	24	12		Alluvium	Brown to red c-f SAND, some m-f gravel, some silt	5
20	S5	1 2 4 4	24	18			Brown to gray f SAND, some silt	0
25	S6	5 5 8 9	24	14			Gray f SAND and SILT	-5
30	S7	2 3 4 7	24	22		Alluvium	Gray c-f SAND, little silt, 12" recovery of wood in spoon	-10
35	S8	11 11 14 21	24	16			Gray c SAND, trace silt	-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: 57.5ft Rock: 9ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 12 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-5
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832785.82
Start Date:	5-9-16	Route No.:	15 SB / Exit 86 Off Ramp	Easting:	1024369.56
Finish Date:	5-10-16	Bridge No.:		Surface Elevation:	21.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.5 after 24 hours

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
40	S9	7 9 11 10	24	8		Alluvium *(con't)*	Brown c SAND, trace silt	-20
45	S10	wor woh woh 3	24	24		Lacustrine	Brown SILTY CLAY, little f sand	-25
50	S11	wor wor wor wor	24	24			Brown SILTY CLAY	-30
55	S12	wor 12 4 39	24	24		Glacial Till	Brown SILTY CLAY, trace f gravel Brown SILT, some f sand, trace f gravel	-35
						Weathered Rock	WEATHERED BEDROCK	
60	C-1		48	48	8	Bedrock	Brown ARKOSE, highly fractured, medium strong, loss of water	-40
65	C-2		60	50	0		Brown ARKOSE, highly fractured, medium strong, loss of water	-45
70							END OF BORING 69ft	-50
75								-55

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: 57.5ft Rock: 9ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 12 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-6
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832748.47
Start Date:	6-15-16	Route No.:	15 NB	Easting:	1024451.53
Finish Date:	6-16-16	Bridge No.:		Surface Elevation:	25.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	12" Asphalt	25
	S-1	35 40 48 50	24	14		Fill	Brown c-f SAND and c-f GRAVEL, trace silt	
5	S-2	27 34 41 40	24	18			Brown c-f SAND, trace silt	20
10	S-3	11 12 14 14	24	8			Red brown c-f SAND, some c-f gravel, trace silt	15
						Alluvium		
15	S-4	1 1 1 1	24	22			Brown to gray f SAND, some silt	10
20	S-5	9 13 12 11	24	12			Gray c-f SAND, trace silt	5
25	S-6	7 8 11 8	24	12			Gray c-f SAND, trace silt	0
30	S-7	7 8 8 15	24	14			Gray f SAND, trace silt	-5

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: 62ft Rock: 10ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 13 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S1-6	
Inspector: N. Whetten	Town: Hartford	Stat./Offset:	
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832748.47	
Start Date: 6-15-16	Route No.: 15 NB	Easting: 1024451.53	
Finish Date: 6-16-16	Bridge No.:	Surface Elevation: 25.6	

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S-8	10 17 20 20	24	12		Alluvium *(con't)*	Gray c-f SAND, some c-f gravel, trace silt	-10
40	S-9	9 8 3 6	24	14		Lacustrine	Gray c-f SAND, some c-f gravel, trace silt Red brown SILTY CLAY, varved	-15
45	S-10	wor woh 3 1	24	24			Red brown SILTY CLAY, varved	-20
50	S-11	woh woh woh woh	24	24			Red brown SILTY CLAY, varved	-25
55	S-12	14 14 8 5	24	12		Glacial Till	Red brown c-f SAND and c-f GRAVEL, some silt	-30
60	S-13	22 33 100/5"	17	10			Red brown c-f SAND and SILT, little c-f gravel	-35
65	C-1		60	52	55	Bedrock	Brown ARKOSE, highly fractured, medium strong	-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: 62ft Rock: 10ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 13 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S1-6
Inspector: N. Whetten	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832748.47
Start Date: 6-15-16	Route No.: 15 NB	Easting: 1024451.53
Finish Date: 6-16-16	Bridge No.:	Surface Elevation: 25.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
70	C-2		60	58	68	Bedrock *(con't)*	Brown ARKOSE, highly fractured, medium strong	-45
75							END OF BORING 72ft	-50
80								-55
85								-60
90								-65
95								-70
100								-75

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: 62ft Rock: 10ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 13 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S1-7
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832976.78
Start Date: 5-4-16	Route No.: 15 SB	Easting: 1024480.59
Finish Date: 5-4-16	Bridge No.:	Surface Elevation: 27.5
Project Description: Relocation of I-91 NB Interchange 29 & Widening		
Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	
Groundwater Observations: @15.0 after 24 hours		

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
						Base	GRAVEL BASE (12")	
	S1	61 71 60 81	24	18		Fill	Brown c-f SAND, some c-f gravel, little silt	25
5	S2	4 4 10 75	24	12			Brown to red c-f SAND, some silt, little c-f gravel	
							Asphalt observed in wash cuttings	20
10	S3	33 55 49 46	24	16			Brown c-f SAND, some c-f gravel, little silt	
						Alluvium		15
15	S4	6 3 4 5	24	12			Gray SILT, little f sand	
								10
20	S5	2 2 3 4	24	22			Gray SILT, some f sand	
								5
25	S6	1/12" 1 6	24	24			Gray to brown SILT, little f sand Gray to brown f SAND, some silt	
								0
30	S7	6 8 13 18	24	12			Gray f SAND, trace silt, faint organic smell	
								-5

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: 66ft Rock: 10ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 14 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-7
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832976.78
Start Date:	5-4-16	Route No.:	15 SB	Easting:	1024480.59
Finish Date:	5-4-16	Bridge No.:		Surface Elevation:	27.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @15.0 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35						Alluvium *(con't)*		
	S8	5 6 5 7	24	14			Gray f SAND, trace silt	-10
40	S9	8 13 20 20	24	10			Gray c-f SAND, trace silt	-15
45	S10	11 20 22 23	24	12			Gray c-f SAND, trace silt	-20
50	S11	1/18" 3	24	24		Lacustrine	Brown SILTY CLAY	-25
55	S12	woh woh woh 4	24	24			Brown SILTY CLAY	-30
60	S13	wor 2 4 4	24	24			Brown SILTY CLAY	-35
						Glacial Till	Higher casing blows	
65	S14	9 100/5"	11	8			Brown c-f SAND, some c-f gravel, some silt	
						Weathered Rock	WEATHERED BEDROCK	-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: 66ft Rock: 10ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 14 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-7
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832976.78
Start Date:	5-4-16	Route No.:	15 SB	Easting:	1024480.59
Finish Date:	5-4-16	Bridge No.:		Surface Elevation:	27.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @15.0 after 24 hours

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
70						Weathered Rock *(con't)* / Bedrock		
	C-1		60	60	10		Brown ARKOSE, highly fractured, medium strong	-45
75								
	C-2		60	60	10		Brown ARKOSE, highly fractured, medium strong	-50
80							END OF BORING 80ft	
								-55
85								
								-60
90								
								-65
95								
								-70
100								

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: 66ft Rock: 10ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 14 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	G. Twombly			Hole No.:	S1-8
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	832954.99
Start Date:	5-15-16	Route No.:	15 NB	Easting:	1024525.91
Finish Date:	5-16-16	Bridge No.:		Surface Elevation:	26.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.2 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0									Asphalt	ASPHALT (14")	
	S1	41	68	55	90	24	3		Base	GRAVEL BASE (12")	25
									Fill	Brown c-f SAND, some silt, little c-f gravel	
5	S2	52	51	45	38	24	12			Brown c-f SAND, some silt, little m-f gravel	20
10	S3	21	17	21	17	24	21			Brown CLAYEY SILT, some f sand	15
15	S4	10	9	10	16	24	15			Gray f SAND and SILT	10
20	S5	3	4	4	3	24	18		Alluvium	Gray f SAND and SILT	5
25	S6	1	1	2	1	24	23			Olive f SAND and SILT	0
30	S7	11	9	10	8	24	12		Alluvium	Brown c SAND, trace silt	-5

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: 71ft Rock: 10ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: G. Twombly			Hole No.: S1-8
Inspector: T. Ta	Town: Hartford		Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703		Northing: 832954.99
Start Date: 5-15-16	Route No.: 15 NB		Easting: 1024525.91
Finish Date: 5-16-16	Bridge No.:		Surface Elevation: 26.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.2 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	16 15 12 11	24	11		Alluvium *(con't)*	Gray c-f SAND, trace f gravel, trace silt	-10
40	S9	12 14 12 13	24	13			Gray c-f SAND, trace f gravel, trace silt	-15
45	S10	24 11 12 15	24	3			Gray c SAND, little m-f gravel, trace silt	-20
50	S11	1 1 1 1	24	24		Lacustrine	Brown SILTY CLAY, 4" seam of orange coarse sand within the center portion of the spoon	-25
55	S12	wor wor woh woh	24	22			Brown SILTY CLAY	-30
60	S13	wor wor wor wor	24	24			Brown SILTY CLAY	-35
65	S14	18 16 14 35	24	6		Glacial Till	Brown c-f SAND, some silt, little m-f gravel	-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: 71ft Rock: 10ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: G. Twombly	Connecticut DOT Boring Report	Hole No.: S1-8
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 832954.99
Start Date: 5-15-16	Route No.: 15 NB	Easting: 1024525.91
Finish Date: 5-16-16	Bridge No.:	Surface Elevation: 26.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.2 after 24 hours

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
70	S15	21 23 25 21	24	11		Glacial Till *(con't)*	Brown c-f SAND, some m-f gravel, some silt	
						Bedrock		-45
75	C-1		60	30	12		Brown ARKOSE, moderately weathered, highly fractured, medium strong.	
80	C-2		60	28	7		ARKOSE, moderately weathered, highly fractured, medium strrong.	-50
							END OF BORING 81ft	-55
85								-60
90								-65
95								-70
100								-75

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: 71ft Rock: 10ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S1-9
Inspector: N. Whetten	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833132.71
Start Date: 6-16-16	Route No.: 15 SB	Easting: 1024536.09
Finish Date: 6-16-16	Bridge No.:	Surface Elevation: 38.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @20.0' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
	S1	36 57 55 50	24	12		Fill	Brown c-f SAND, little m-f gravel, little silt	
								35
5	S2	100/4"	4	4			Brown c-f SAND, some m-f gravel, some silt	
								30
10	S3	79 100/2"	8	0			No Recovery. Wash consists of brown c-f SAND, little gravel, little silt	
							Encountered void from 13' to 14'	25
15	S4	31 43 43 39	24	16			Brown c-f SAND, little m-f gravel, little silt	
								20
20	S5	23 18 14 14	24	14			Brown SILT, some f sand	
								15
25	S6	wor wor 1 1	24	20		Alluvium	Brown to gray f SAND and SILT	
								10
30	S7	6 5 4 7	24	10			Brown to gray f SAND, some silt	
								5

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: 75ft Rock: 10ft	NOTES: Broke roller bit tooth, moved boring 4' south to clear obstruction	Sheet 1 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-9
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833132.71
Start Date:	6-16-16	Route No.:	15 SB	Easting:	1024536.09
Finish Date:	6-16-16	Bridge No.:		Surface Elevation:	38.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @20.0' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	6	8	11	17	24	12		Alluvium *(con't)*	Gray f SAND, little silt	
											0
40	S9	9	12	16	16	24	12			Gray c SAND, little m-f gravel, trace silt	
											-5
45	S10	5	9	16	20	24	10			Gray c-f SAND, trace silt	
											-10
50	S11	11	15	14	17	24	10			Gray c-f SAND, trace silt	
									Lacustrine		-15
55	S12	wor	wor	wor	wor	24	24			Brown SILTY CLAY	
											-20
60	S13	wor	wor	wor	4	24	24			Brown SILTY CLAY	
											-25
65	S14	wor	wor	wor	wor	24	24			Brown SILTY CLAY	

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: 75ft Rock: 10ft	NOTES: Broke roller bit tooth, moved boring 4' south to clear obstruction	Sheet 2 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-9
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833132.71
Start Date:	6-16-16	Route No.:	15 SB	Easting:	1024536.09
Finish Date:	6-16-16	Bridge No.:		Surface Elevation:	38.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @20.0' ATD

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Glacial Till		-30
70	S15	40 46 30 63	24	14			Brown c-f SAND and SILT, some c-f gravel	
						Weathered Rock		-35
75	C-1		60	36	0	Bedrock	ARKOSE, fine, thinly bedded, moderately fractured to highly fractured, medium strong, 15° bedding angle, Extremely weathered at 79.5 ft	-40
80	C-2		60	60	17		ARKOSE, fine, thinly bedded, moderately fractured to highly fractured, medium strong, 15° bedding angle	-45
85							END OF BORING 85ft	
								-50
90								
								-55
95								
								-60
100								

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: 75ft Rock: 10ft	NOTES: Broke roller bit tooth, moved boring 4' south to clear obstruction	Sheet 3 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier			Hole No.: S1-10
Inspector: T. Ta	Town: Hartford		Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703		Northing: 833111.71
Start Date: 5-15-16	Route No.: 15 NB		Easting: 1024585.74
Finish Date: 5-16-16	Bridge No.:		Surface Elevation: 37.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @17.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
						Base	GRAVEL BASE	
	S1	76 100 107 58	24	16		Fill	Brown c-f SAND, little c-f gravel, little silt	35
5	S2	60 100	12	10			Brown c-f SAND, some silt, little m-f gravel	
								30
10	S3	37 44 45 55	24	18			Brown c-f SAND, some silt, little m-f gravel	
							Obstruction at 13', possible former road	25
15	S4	15 12 12 8	24	12			Brown to gray c-f SAND, some silt, little c-f gravel	
								20
20	S5	24 11 9 11	24	0			Brown c-f SAND, some silt, little c-f gravel	
								15
25	S6	woh 1 1 1	24	18		Alluvium	Gray f SAND and SILT	
								10
30	S7	1 2 1 1	24	24			Brown to gray f SAND and SILT	
								5

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: 75.3ft Rock: 14.7ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S1-10
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833111.71
Start Date: 5-15-16	Route No.: 15 NB	Easting: 1024585.74
Finish Date: 5-16-16	Bridge No.:	Surface Elevation: 37.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @17.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	16 15 14 17	24	12		Alluvium	Brown c SAND, little m-f gravel, trace silt	0
40	S9	13 9 12 12	24	12			Gray c-f SAND, trace silt, trace wood	-5
45	S10	10 10 16 19	24	12			Brown c-f SAND, trace silt	-10
50	S11	15 17 12 7	24	14			Brown c-f SAND, trace silt	
						Lacustrine	Brown SILTY CLAY, trace f sand	-15
55	S12	wor woh woh 3	24	24			Brown SILTY CLAY, 0.1" silt varve between the silty clay	-20
60	S13	wor woh woh 4	24	24			Brown SILTY CLAY	-25
65	S14	wor wor 2 2	24	24			Brown SILTY CLAY	-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: 75.3ft Rock: 14.7ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-10
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833111.71
Start Date:	5-15-16	Route No.:	15 NB	Easting:	1024585.74
Finish Date:	5-16-16	Bridge No.:		Surface Elevation:	37.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @17.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Glacial Till	Change in drilling action - dense material	
70	S15	25 29 32 33	24	12			Brown c-f SAND, some silt, little m-f gravel	-35
75	S16	100/4"	4	4		Weathered Rock	Brown c-f SAND, some m-f gravel, some silt	-40
80						Bedrock		
	C-1		60	60	52		Brown ARKOSE, moderately weathered, moderately fractured, medium strong	-45
85	C-2		60	54	15		Brown ARKOSE, moderately weathered, highly fractured, medium strong	-50
90							END OF BORING 90ft	-55
95								-60
100								

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: 75.3ft Rock: 14.7ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	G. Twombly			Hole No.:	S1-11
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833258.98
Start Date:	5-2-16	Route No.:	15 SB	Easting:	1024586.35
Finish Date:	5-5-16	Bridge No.:		Surface Elevation:	37.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 3-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
						Base	GRAVEL BASE (12")	
	S1	31 38 55 51	24	16		Fill	Brown c-f SAND, little c-f gravel, little silt	35
5	S2	38 48 81 99	24	10			Brown c-f SAND, some c-f gravel, little silt	
								30
10	S3	120/5"	5	4			Brown c-f SAND, some c-f gravel, little silt	
								25
15	S4	37 41 55 53	24	8			Brown m-f GRAVEL, little c-f sand, trace silt	
								20
20	S5	12 120/3"	9	4			Brown c-f SAND and m-f GRAVEL, trace silt Casing encountered obstruction at 20.5'. Difficult to advance.	
								15
25	S6	7 21 27 21	24	7			Brown c-f SAND, little c-f gravel, trace silt	
						Alluvium		10
30	S7	6 5 5 9	24	14			Gray f SAND, little silt	
								5

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: 84.5ft Rock: 5ft	NOTES: Core barrel jammed up three different attempts. Water would not flow out of the core barrel bottom preventing furthur coring. Boring Terminated at 89.5 feet.	Sheet 1 of 3
No. of Soil Samples: 20 No. of Core Runs: 1		SM-001-M REV. 1/02

Driller: G. Twombly	**Connecticut DOT Boring Report**	Hole No.: S1-11
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833258.98
Start Date: 5-2-16	Route No.: 15 SB	Easting: 1024586.35
Finish Date: 5-5-16	Bridge No.:	Surface Elevation: 37.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 3-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	6	6	5	6	24	15		Alluvium *(con't)*	Gray f SAND, trace silt	
											0
40	S9	6	7	11	11	24	18			Brown to gray c-f SAND, trace silt	
											-5
45	S10	6	9	12	12	24	12			Brown to gray c-f SAND, trace silt	
											-10
50	S11	10	10	10	10	24	8			Gray c-f SAND, trace silt	
											-15
55	S12	10	7	12	13	24	8			Gray c-f SAND, trace silt	
									Lacustrine		-20
60	S13	3	3	3	4	24	8			Brown SILTY CLAY	
	UP-1					30	30			Brown SILTY CLAY (TV = 0.2 tsf, PP = 0.25 tsf)	-25
65	S13	woh	woh	woh	4	24	24			Brown SILTY CLAY	
	UP-2					30	30			Brown SILTY CLAY (TV = 0.275 tsf, PP = 0.5 tsf)	-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: 84.5ft Rock: 5ft	NOTES: Core barrel jammed up three different attempts. Water would not flow out of the core barrel bottom preventing furthur coring. Boring Terminated at 89.5 feet.	Sheet 2 of 3
No. of Soil Samples: 20 No. of Core Runs: 1		SM-001-M REV. 1/02

Driller: G. Twombly	**Connecticut DOT Boring Report**		Hole No.: S1-11
Inspector: T. Ta	Town: Hartford		Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703		Northing: 833258.98
Start Date: 5-2-16	Route No.: 15 SB		Easting: 1024586.35
Finish Date: 5-5-16	Bridge No.:		Surface Elevation: 37.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 3-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @18.5 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
70	UP-3		30	30			Brown SILTY CLAY (TV = 0.3 tsf, PP = 0.75 tsf)	
						Glacial Till		-35
75	S14	14 17 21 16	24	5			Brown c-f SAND, some c-f gravel, some silt	
								-40
80	S15	51 32 24 31	24	21			Brown c-f SAND, some silt, little m-f gravel	
								-45
	S16	120/0"	6	4			Brown c-f SAND, some c-f gravel, little silt	
85						Bedrock		
	C-1		60	46	25		Brown ARKOSE, moderately weathered, moderately fractured, medium strong	-50
90							END OF BORING 89.5ft	
								-55
95								
								-60
100								

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: 84.5ft Rock: 5ft	NOTES: Core barrel jammed up three different attempts. Water would not flow out of the core barrel bottom preventing furthur coring. Boring Terminated at 89.5 feet.	Sheet 3 of 3
No. of Soil Samples: 20 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-12
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833238.29
Start Date:	5-16-16	Route No.:	15 NB	Easting:	1024644.04
Finish Date:	5-17-16	Bridge No.:		Surface Elevation:	40.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @19.0 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	40
						Base	GRAVEL BASE (12")	
	S1	57 85 109 25	24	18		Fill	Brown c-f SAND, little c-f gravel, little silt	
5	S2	17 18 20 16	24	18			Brown c-f SAND, some m-f gravel, little silt Wood observed in wash water	35
10	S3	20 29 27 29	24	16			Brown c-f SAND, little m-f gravel, little silt	30
15	S4	24 24 22 22	24	12			Brown to gray c-f SAND, little f gravel, little silt 1' void from 17' to 18'	25
20	S5	13 15 25 28	24	18		Fill	Brown c-f SAND, some f gravel, little silt Gray f SAND, some silt	20
25	S6	14 19 22 18	24	14			Gray f SAND, some silt, trace wood	15
						Alluvium		
30	S7	wor woh 5 5	24	22			Brown to gray f SAND and SILT	10

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: 80.5ft Rock: 14.5ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S1-12
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833238.29
Start Date:	5-16-16	Route No.:	15 NB	Easting:	1024644.04
Finish Date:	5-17-16	Bridge No.:		Surface Elevation:	40.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @19.0 after 24 hours

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	5	2	2	6	24			Alluvium *(con't)*	Brown to gray f SAND and SILT	5
40	S9	8	15	15	19	24	16		Alluvium	Gray f SAND and SILT Gray c SAND, trace silt	0
45	S10	8	6	9	11	24	10			Gray c-f SAND, trace silt	-5
50	S11	10	18	18	17	24	12			Gray f SAND, trace silt, 4" seam of orange coarse sand	-10
55	S12	7	5	7	8	24	4		Lacustrine	Brown c-f SAND and m-f GRAVEL, gravel from wash pushed down on clay layer	-15
60	S13	wor	wor	woh	0	24	24			Brown SILTY CLAY	-20
65	S14	wor	wor	woh	3	24	24			Brown SILTY CLAY	-25

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: 80.5ft Rock: 14.5ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S1-12
Inspector: T. Ta	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833238.29
Start Date: 5-16-16	Route No.: 15 NB	Easting: 1024644.04
Finish Date: 5-17-16	Bridge No.:	Surface Elevation: 40.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @19.0 after 24 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
70	S15	wor woh 4 4	24	24			Brown SILTY CLAY	-30
75	S16	15 11 13 35	24	4		Glacial Till	Brown c-f SAND and SILT, little m-f gravel	-35
80	S17	66 100/2''	8	4		Weathered Rock	Brown c-f SAND, some m-f gravel, little silt, trace rock fragments	-40
85						Bedrock		-45
	C-1		60	58	50		Brown ARKOSE, Moderately weathered, moderately fractured, medium strong	
90	C-2		60	48	60		Brown ARKOSE, moderately weathered, slightly fractured, medium strong	-50
95							END OF BORING 95ft	-55
100								-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: 80.5ft Rock: 14.5ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

APPENDIX B

PREVIOUS TEST BORING LOGS

Al. Mason	BORING CREW LEADER
C. Harriman	INSPECTOR
HALEY & ALDRICH, INC.	SOILS ENGINEER

FORM SM-1 REV. 8/83
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

TOWN HARTFORD-EAST HARTFORD, CT.
PROJECT NAME CHARTER OAK BRIDGE
PROJECT NO. 63-384

SHEET 1 OF 2
LOCATION Structure No. 3
GUILD DRILLING CO., INC. — BORING CONTRACTOR
STEINMAN ~~[illegible]~~ — DESIGN ENGINEER

LOCATION HARTFORD
SURFACE ELEV.
DATE FINISHED 3 DEC 86
GROUND WATER OBSERVATIONS
AT 2 FT. AFTER 0 HRS.
AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW, NW	SS	NV-2
SIZE I.D.		4", 3"	1 3/8	2
HAMMER WT.		300 lb	140 lb	BIT
HAMMER FALL		24"	30"	DIA

HOLE NO. B 158
LINE & STATION
OFFSET
N. COORDINATE
E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		0 - 1.5'	1	18	16	D	1	7	19	0.5	N. dense, Dark brn f. SAND and Silt, tr. org. matter -TOPSOIL-
	60										MED. DENSE REDDISH BRN m-f SAND + silt, TRACE GRAVEL
	100										-ALLUVIUM-
	45									4.75	
5	23	4 - 5.5	2	18	14	D	6	11	13		VERY STIFF GREY SILT + fine SAND
	58										
	48										
	34										
	26										
10	20	9 - 10.5	3	18	14	D	1	2	2		Soft grayish brown, SILT, little fine sand, trace clay.
	21										
	20										
	24										
	24										
15	P	14 - 15.5	4	18	16	D	1	1	1		VERY SOFT, grayish brown, SILT, LITTLE fine sand.
	U S										-ALLUVIUM-
	H										
	D									18.0'	
	42										
20	35	19 - 20.5	5	18	14	D	6	8	8		MED. DENSE, brown, fine SAND, LITTLE SILT, tr. medium sand and med.-fine gravel
	50										
	55										
	46										
	60										
25	28	24 - 25.5	6	18	12	D	3	5	5		Medium dense, brown medium to fine SAND, trace coarse sand and silt
	36										
	56										
	58										
	59										
30	55	29 - 29.5	7	18	16	D	8	16	14		MED dense to dense, gray brown, Med to fine SAND LITTLE COARSE SAND.
	55										-ALLUVIUM-
	69										
	81										
	95										
35	63	34 - 35.5	8	18	15	D	14	15	12		MED DENSE, gray brown, Med to fine SAND, LITTLE COARSE SAND, TRACE GRAVEL
	60										
	69										
	85									38.0	
	71										Soft, red brown VARVED CLAY and SILTY CLAY.
	PUSH	39.0 - 40.5	9	18	18	D	2	2	3		

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 25 FEET

FOOTAGE IN EARTH 61 FOOTAGE IN ROCK 8 NO. OF SAMPLES 13 HOLE NO. B 158

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

Al Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 2 OF 2 LOCATION Structure No. 3
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	GUILD DRILLING CO., INC. BORING CONTRACTOR
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	STEINMAN ~~[illegible]~~ DESIGN ENGINEER

		AUGER	CASING	SAMPLER	CORE BAR	
LOCATION HARTFORD						HOLE NO. B 158
SURFACE ELEV.	TYPE		HW, NW	SS	NVII	LINE & STATION
DATE FINISHED 12-3-86	SIZE I.D.		4", 3"	1 3/8	2	OFFSET
GROUND WATER OBSERVATIONS AT 2 FT. AFTER 0 HRS.	HAMMER WT.		300 lb	140 lb	BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL		24"	30"	DIA	E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
40	*										* CASING BLOWS NOT OBTAINED, WASHING AHEAD OF CASING IN CLAY STRATA.
		44 - 46'	UP1	24	0	UP					NOTE: UP1 - 0" RECOVERY, FAILED O.R.
45		44.5 - 46.5'	UP1	24	24	UP					UP1 (SECOND ATTEMPT)
		48.5	V1			V					(SEE VANE SHEAR REPORT V-1)
50		51 - 52.5	10	24	18	D	1	1	1		V. SOFT RED BROWN VARVED CLAY AND SILTY CLAY
		55.0 - 56.0	11A	*1	14	UP					(Same as D10)
		56.0 - 57.0	11B	*1	14	UP				56.0'	DENSE TO VERY DENSE RED ~~FINE SAND AND SILT~~, SOME MEDIUM TO FINE GRAVEL
60		59 - 60.5'	12	18	14	D	20	20	23	61.0'	HARD RED BROWN SILT AND FINE SAND, LITTLE CLAY, TRACE MED. TO FINE GRAVEL — GLACIAL TILL —
										64.0	Decomposed Bedrock
		64.0 - 69.0	1	60	58	C					Med to moderately hard, red brown, fine sandy SILTSTONE, joints very close to close, joints moderately fractured, slightly weathered.
				(RQD = ~~37%~~ 64%)							Bottom of Exploration @ 69.0 ft.
											*1 Samples 11A and 11B taken from a failed tube sample.

GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 25 FEET

FOOTAGE IN EARTH 61	FOOTAGE IN ROCK 8	NO. OF SAMPLES 13	HOLE NO. B 158

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. MASON **BORING CREW LEADER**	**FORM SM-1 REV. 8/83** **STATE OF CONNECTICUT** **DEPARTMENT OF TRANSPORTATION** **BUREAU OF HIGHWAYS** **BORING REPORT**	**SHEET** 1 **OF** 2
C. HARRIMAN **INSPECTOR**	**TOWN** HARTFORD-EAST HARTFORD, CT.	**LOCATION** STRUCTURE #3
ALEY & ALDRICH, INC. **SOILS ENGINEER**	**PROJECT NAME** CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. **BORING CONTRACTOR**
	PROJECT NO. 63-384	STEINMAN ~~B.C.&D.~~ **DESIGN ENGINEER**

LOCATION ~~STRUCTURE #3~~ Hartford, CT

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						**HOLE NO.** B 159
DATE FINISHED 10 Dec 86	**TYPE**		HW, NW	SS	NV-II	**LINE & STATION**
GROUND WATER OBSERVATIONS	**SIZE I.D.**		4", 3"	1 3/8	2"	**OFFSET**
AT 7.5 **FT.** after 18 **HRS.**	**HAMMER WT.**		300 lb	140 lb	**BIT**	**N. COORDINATE**
AT 5.1 **FT.** after 0 **HRS.**	**HAMMER FALL**		24	30"	~~DIA~~	**E. COORDINATE**

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	11	0.5 - 2.0'	1	18	12	D	3	16	13	0.5	BITUMINOUS
	35										MED. DENSE RED BROWN MED TO
	36										FINE SAND, little gravel, silt, TRACE
	39										COARSE SAND.
5	PUSH	4.0 - 5.5'	2	18	16	D	17	16	6		MED DENSE, RED BRN, Coarse TO
	29									6.0	FINE SAND, Some SILT,
	7										LITTLE MED TO
	4										FINE GRAVEL. - FILL -
	4										
10	↑	9.0 - 10.5'	3	18	16	D	2	3	2		MED. STIFF, GREEN GRAY SILT,
											LITTLE FINE SAND
											- ALLUVIUM -
	PUSH										
										14.0'	
15		14.0 - 15.5'	4	18	14	D	4	6	6		MED. DENSE, BRN GREY, COARSE TO
	↓										SAND, SOME SILT AND MED TO
	20										FINE GRAVEL.
	22										- ALLUVIUM -
	28									19.0	
20	14	19.0 - 20.5'	5	18	15	D	4	5	5		LOOSE, GREY, MED TO FINE SAND
	20										trace c. sand, SILT
	19										
	23										
	23										
25	46	24 - 25.5	6	18	12	D	3	5	6		MED DENSE, GREY, MED TO FINE SAND,
	29										trace SILT
	46										
	58										
	66										
30	34	29.0 - 30.5	7	18	16	D	5	7	10		MED DENSE, GREY, Coarse TO FINE SAND,
	47										
	55										TRACE FINE GRAVEL, Silt.
	70										
	81										
35	PUSH	34.0 - 35.5'	8	18	12	D	14	16	17		DENSE, GREY, COARSE TO FINE SAND
	43										LITTLE FINE GRAVEL, TRACE SILT
	67										- ALLUVIUM -
	82									38.0'	
	71										

FROM GROUND SURFACE TO 39 **FEET USED** 4 **INCH CASING THEN** 3 **INCH CASING FOR** 60.0 **FEET**

FOOTAGE IN EARTH 60.0 **FOOTAGE IN ROCK** 5.0 **NO. OF SAMPLES** 12 **HOLE NO.** B 159

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. MASON **BORING CREW LEADER** C. HARRIMAN **INSPECTOR** HALEY & ALDRICH, INC. **SOILS ENGINEER**	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT **TOWN** HARTFORD-EAST HARTFORD, CT. **PROJECT NAME** CHARTER OAK BRIDGE **PROJECT NO.** 63-384	**SHEET** 2 **OF** 2 **LOCATION** STRUCTURE #3 GUILD DRILLING CO., INC. **BORING CONTRACTOR** STEINMAN [redacted] **DESIGN ENGINEER**

LOCATION Hartford, CT

SURFACE ELEV.

DATE FINISHED 10 Dec 86

GROUND WATER OBSERVATIONS

AT 7.5 FT. AFTER 18 HRS.

AT 5.1 FT. AFTER 0 HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW, NW	SS	NW II
SIZE I.D.		4" 3"	1 3/8"	2"
HAMMER WT.		300 lb	140 lb	BIT
HAMMER FALL		24"	30"	~~Dia~~

HOLE NO. B 159

LINE & STATION

OFFSET

N. COORDINATE

E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
40		39.0 - 40.5'	9	18	18	D	1	1	1		V. SOFT RED BRN VARVED CLAY AND SILTY CLAY
45		44.0 - 45.5'	10	18	18	D	W.O ROD	1	1		(Same as D9)
50		49.0 - 50.5	11	18	18	D	1	1	2	52.0'	SOFT RED BRN VARVED CLAY AND SILTY CLAY
		54.0 - 55.5	12	18	18	D	40	50	69		Hard, red brown SILT and Coarse to fine SAND, some gravel.
							Drill Rate min/Ft			59.0	— GLACIAL TILL —
60		60.0 - 65.0	1	60	57	C				60.0	Decomposed Bedrock
		(RQD = 95%)						9			Hard to moderately hard, red brown, fine grained Sandy SILTSTONE. Joints close, occasionally very close. Bedding very thin. Rock Moderately to slightly fractured, slightly weathered.
								7			
								7			
								7			
								9			
65											Bottom of Exploration at 65.0 ft.
70											
75											

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 60.0 FEET

HOLE NO. B 159

FOOTAGE IN EARTH 60.0 FOOTAGE IN ROCK 5.0 NO. OF SAMPLES 12

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CREW LEADER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	LOCATION RET WALL #102
C. HARRIMAN	TOWN HARTFORD-EAST HARTFORD, CT.	GUILD DRILLING CO., INC.
INSPECTOR		BORING CONTRACTOR
HALEY & ALDRICH, INC.	PROJECT NAME CHARTER OAK BRIDGE	STEINMAN ~~BAR~~
SOILS ENGINEER	PROJECT NO. 63-384	DESIGN ENGINEER

LOCATION RET. WALL 102

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B188
DATE FINISHED 1-13-87	TYPE		HW, NW	SS	NX II	LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.		4", 3"	1 3/8"	2"	OFFSET
AT 6.5 FT. AFTER 0 HRS.	HAMMER WT.		300lb	140lb	BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL		24"	30"	DIA	E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	PUSH	0 - 1.5'	1	18	15	D	1	3	9	0.7	MED. DENSE BLK F. SAND, SOME ORGANIC ~~MATTER~~ material, TRACE SILT -TOPSOIL-
	PUSH										
	9										
	12										
5	14	4 - 5.5'	2	18	14	D	12	17	15		MED. DENSE RED BRN C-F SAND ~~TRACE~~ little, M-F GRAVEL, SILT, TRACE CLAY
	21										
	26										
	38										-FILL-
	37										
10	PUSH	9 - 10.5'	3	18	12	D	8	10	13		MED DENSE C-F GRAVEL, SOME SILT & F. SAND, TRACE C-M SAND
										13.0'	
		14 - 15.5'	4	18	12	D	3	5	5		MED DENSE OLIVE BRN TO GRAY FINE SAND AND SILT
20		19 - 20.5'	5	18	12	D	4	4	5		LOOSE OLIVE BRN TO GRAY FINE SAND & SILT, TRACE C. SAND
										24.0'	-ALLUVIUM-
25	11	24 - 25.5'	6	18	12	D	6	6	8		MED DENSE GRAY M-F SAND, ~~TRACE~~ little SILT
	17										
	20										
	21										
	23										
30	33	29 - 30.5'	7	18	15	D	7	9	12		MED DENSE GRAY M-F. SAND, trace C. SAND, TRACE SILT
	57										
	62										-ALLUVIUM-
	75										
	80										
35	82	34 - 35.5'	8	18	14	D	8	13	16		MED DENSE GRAY C-F SAND, ~~LITTLE SILT~~, TRACE M-F GRAVEL & ORGANIC ~~MATTER~~ material (WOOD CHIPS), trace silt
	50										
	59										
	65										
	73										
	40										

FROM GROUND SURFACE TO 44 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 62 FEET

FOOTAGE IN EARTH 62 FOOTAGE IN ROCK 5 NO. OF SAMPLES 12 HOLE NO. B188

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C Harriman INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/80 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 2 LOCATION Ret. Wall No. 102 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN ~~B.B.&S.~~ DESIGN ENGINEER

		AUGER	CASING	SAMPLER	CORE BAR	
LOCATION						HOLE NO. B 188
SURFACE ELEV.						LINE & STATION
DATE FINISHED	TYPE					OFFSET
GROUND WATER OBSERVATIONS	SIZE I.D.					
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	61	39 - 40.5'	9	18	14	D	7	9	11	✓	MED. DENSE GRAY C-F SAND, TRACE SILT
	63										- ALLUVIUM -
	51									43.0'	
	65										
45	A.S.H	44 - 45.5'	10	18	18	D	2	2	2	✓	SOFT RED BRN VARVED CLAY AND SILTY CLAY
50		49 - 50.5'	11	18	18	D	1	1	1	✓	SAME AS D#10
										54.0'	
		54 - 55.5'	12	18	12	D	29	63	100/0	✓	HARD RED BRN SILT, SOME C-F SAND, TRACE CLAY, LITTLE ~~C-F~~ GRAVEL -GLACIAL TILL-
										58.0'	
60		59'	-	0	0	D	100/0"				Decomposed Bedrock Note: Roller Bit from 59.0-62.0 ft.
							DRILL RATE (MIN/FT)			62.0	
		62 - 67' (RQD = 0%)	1	60	53	C		8			MOD HARD RED BRN F. GRAINED sandy SILTSTONE, with intermittent fine sandstone beds. Joints very close to close, shallow dipping, occas high angle joint, Bedding very thin. Rock slightly weathered, extremely to moderately fractured.
								8			
65								9			
								10			
								10			62.5 ft - 2 inch clay & gravel seam
70											Bottom of Exploration at 67.0 ft
75											
80											

FROM GROUND SURFACE TO 44 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 62 FEET

FOOTAGE IN EARTH 62 FOOTAGE IN ROCK 5 NO. OF SAMPLES 12 HOLE NO. B 188

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CREW LEADER	HB MASON
INSPECTOR	C. HARRIMAN
SOILS ENGINEER	HALEY & ALDRICH, INC.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

TOWN HARTFORD-EAST HARTFORD, CT.
PROJECT NAME CHARTER OAK BRIDGE
PROJECT NO. 63-384

LOCATION Retaining Wall 102
BORING CONTRACTOR: GUILD DRILLING CO., INC.
DESIGN ENGINEER: STEINMAN[redacted]

LOCATION Retaining Wall 102
SURFACE ELEV.
DATE FINISHED 30 DEC 86

GROUND WATER OBSERVATIONS
AT 5.83 FT. after 16 HRS.
AT 4.67 FT. after 0 HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW, NW	SS	NX II
SIZE I.D.		4", 3"	1 3/8"	2"
HAMMER WT.		300 lb	140 lb	BIT
HAMMER FALL		24"	30"	DIA

HOLE NO. B 189
LINE & STATION
OFFSET
N. COORDINATE
E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS 0-6	BLOWS 6-12	BLOWS 12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	7									1.0	8" BLK TOP, 2" TAMP ROCK, C-F SAND TRACE SILT
	17	1.0-2.5	1	18	17	D	7	9	13		MED DENSE, RED BRN, C TO FINE SAND, little silt, trace med to fine gravel
	18										
	16										
5	28	4.0-5.5	2	18	17	D	20	28	28		VERY DENSE, RED BRN, C-FINE SAND, little silt, trace gravel
	38										
	40										
	35										- ~~FILL~~ -
	27										
10	19	9.0-10.5	3	18	14	D	4	6	6		MED DENSE RED BRN C. to FINE SAND, LITTLE SILT
	21										
	28										
	27										- ALLUVIUM -
	30									11.0	
	17	14.0-15.5	4	18	13	D	6	6	7		MED DENSE RED BRN MED. TO FINE SAND, Trace silt,
	12										
	24										- FILL -
	28										
	30										
20	16	19.0-20.5	5	18	15	D	5	7	5		SAME AS D#4
	22									21.0	
	29										
	31										
	36										
25	31	24.0-25.5	6	18	14	D	3	5	7	✓	MED DENSE LIGHT BRN FINE SAND, and SILT.
	47										
	56										- ALLUVIUM -
	67									28.0	
	80										
30	45	29.0-30.5	7	18	14	D	5	9	11	✓	MED. DENSE GRAY TO BRN COARSE TO FINE SAND, TRACE SILT. - ALLUVIUM -
	65										
	75									32.0	
	87										
	99										
35	32	34.0-35.5	8	18	18	D	6	8	10	✓	MED DENSE GRAY COARSE TO FINE SAND, TRACE fine gravel, silt.
	57										
	61										
	68										- ALLUVIUM -
	27										
	42										

FROM GROUND SURFACE TO 44 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 63 FEET

FOOTAGE IN EARTH 63 FOOTAGE IN ROCK 5.0 NO. OF SAMPLES 13 HOLE NO. B 189

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. MASON BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 2 OF 2	
C. HARRIMAN INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION RET. WALL 103	
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR	
	PROJECT NO. 63-384	STEINMAN [redacted] DESIGN ENGINEER	

LOCATION RET. WALL 103		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 129
SURFACE ELEV.						LINE & STATION
DATE FINISHED 30 DEC. 86	TYPE		HW, NW	SS	NX II	OFFSET
GROUND WATER OBSERVATIONS	SIZE I.D.		4", 3"	1 3/8"	2"	N. COORDINATE
AT 5 FT. 6" AFTER 15 HRS.	HAMMER WT.		300 lb	140 lb	BIT	E. COORDINATE
AT 5 FT. 8" AFTER 10 HRS.	HAMMER FALL		24"	30"	DIA	

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
40		39-40.5'	9	18	16	D	7	16	11	43.0'	MED DENSE GRAY COARSE TO FINE SAND TRACE SILT, F. GRAVEL AND organic material (woodchips) -ALLUVIUM-
45		44-45.5'	10	18	18	D	4	1	2		SOFT RED BRN VARVED CLAY AND SILTY CLAY
50		49-50.5'	11	18	18	D	1	1	1		(SAME AS D-10)
		54-55.5'	12	18	18	D	1	1	2	56.0'	(SAME AS D-10)
55											HARD RED BRN SILT, SOME C-F SAND TRACE CLAY AND FINE GRAVEL -GLACIAL TILL-
60		59-60.0'	13	12	12	D	35	64	125/0"	60.0'	Very dense RED BRN C. GRAVEL, SOME SILT
								CORE RATE MIN/FT			~~HIGHLY WEATHERED ROCK~~
		63.0-68.0	1	60	30	C		5		63.0	Decomposed Bedrock note; Roller bit 60.0-63.0'
		(RQD=0%)						7			Med Hard, red brown, finegrained Sandy SILTSTONE, Joints v. close to close, shallow dipping, occ ~~steeply~~ dipping. Bedding very thin, Rock slightly weathered moderately fractured.
65								8			NOTE: 1) LOST HALF OF RETURN WATER WHILE CORING
								8			2) ONLY 30" RETURN DUE TO BAD CORE LIFTER (3 ATTEMPTS WERE MADE)
								8			
70											
75											Bottom of Exploration at 68 ft.

FROM GROUND SURFACE TO 44 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 63 FEET

FOOTAGE IN EARTH 63 FOOTAGE IN ROCK 5 NO. OF SAMPLES 13 HOLE NO. B 129

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

AL. MASON
BORING CREW LEADER

C. HARRIMAN
INSPECTOR

HALEY & ALDRICH, INC.
SOILS ENGINEER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

TOWN HARTFORD-EAST HARTFORD, CT.
PROJECT NAME CHARTER OAK BRIDGE
PROJECT NO. 63-384

LOCATION RET. WALL #102
GUILD DRILLING CO., INC.
BORING CONTRACTOR
STEINMAN B/H/W/B.
DESIGN ENGINEER

LOCATION RETAINING WALL 102
SURFACE ELEV.
DATE FINISHED 1-7-87
GROUND WATER OBSERVATIONS
AT 7.5 FT. after 0 HRS.
AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW, NW	SS	NVII
SIZE I.D.		4", 3"	1 3/8"	2"
HAMMER WT.		300lb	140lb	BIT
HAMMER FALL		24"	30"	DIA

HOLE NO. B 190
LINE & STATION
OFFSET
N. COORDINATE
E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	29										4" BLACK TOP
	33	1.0-2.5	1	18	13	D	12	17	24	✓	DENSE RED BRN COARSE TO FINE SAND,
	11									3.5	TRACE SILT, little fine gravel. -FILL-
	10										
5	8	4.0-5.5	2	18	14	D	6	7	6		MED DENSE RED BRN FINE SAND,
	17									✓	little SILT, trace MED SAND, clay
	28										
	40										
	48										
10	34	9.0-10.5	3	18	14	D	8	13	13	✓	MED DENSE Red Br. Coarse TO FINE SAND
	46										trace gravel, silt
	54										-ALLUVIUM-
	60									13.0	
	38										
	30	14.0-15.5	4	18	16	D	5	7	8	✓	M. DENSE gray BRN FINE SAND,
	56										some SILT
	50										
	53										
	42										
20	28	19.0-20.5'	5	18	18	D	6	8	9	✓	(SAME AS D#4)
	26										
	26										-ALLUVIUM-
	30									23.0'	
	33										
25	43	24.0-25.5	6	18	12	D	14	12	14	✓	M. DENSE GRAY BRN FINE SAND,
	49										SOME SILT AND CLAY, LITTLE
	47										C-M sand
	49										-ALLUVIUM-
	49									29.0	
30	50	29.0-30.5	7	18	14	D	8	9	9	✓	MED DENSE GRAY MED TO FINE SAND,
	46										TRACE SILT, c. sand.
	51										
	57										
	61										
35	40	34.0-35.5	8	18	16	D	7	10	14	✓	MED. DENSE GRAY MED TO FINE
	53										SAND, Trace gravel, c. sand, and
	65									38.0	silt. -ALLUVIUM-
	70										
	75										

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 67 FEET

FOOTAGE IN EARTH 67 FOOTAGE IN ROCK 5 NO. OF SAMPLES 14 HOLE NO. B 190

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

FORM SM-1 REV. 8/83
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

A. Mason — BORING CREW LEADER
C. Hammon — INSPECTOR
HALEY & ALDRICH, INC. — SOILS ENGINEER

TOWN: HARTFORD-EAST HARTFORD, CT.
PROJECT NAME: CHARTER OAK BRIDGE
PROJECT NO.: 63-384

SHEET 2 OF 2
LOCATION: Ret. Wall No. 102
GUILD DRILLING CO., INC. — BORING CONTRACTOR
STEINMAN [illegible] — DESIGN ENGINEER

LOCATION:
SURFACE ELEV.:
DATE FINISHED: 1-7-87
GROUND WATER OBSERVATIONS
AT FT. AFTER HRS.
AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE				
SIZE I.D.				
HAMMER WT.				BIT
HAMMER FALL				

HOLE NO.: B 190
LINE & STATION:
OFFSET:
N. COORDINATE:
E. COORDINATE:

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
40		39.0-41.0	9	18	18	D	2	2	2		SOFT RED BRN VARVED SILTY CLAY TRACE FINE SAND AND F. GRAVEL
										44.0	
45		44.0-45.5	10	18	18	D	1	1	2		SOFT RED BRN VARVED CLAY AND SILTY CLAY
50		49.0-50.5	11	18	18	D	W.O. ROD	1	1		(SAME AS D#10)
55		54.0-55.5	12	18	18	D	W.O.	ROD	1		Very soft, red brown, VARVED CLAY and SILTY CLAY.
										57.5	
60		59.0-60.5	13	18	16	D	18	27	38		HARD RED BRN SILT, SOME C-F SAND, LITTLE M-F GRAVEL, TRACE CLAY. - GLACIAL TILL -
65		64.0-65.5	14	12	12	D	27	38	100	65.0	SAME AS D-13
											Note: Rollerbit from 65.0-67.0 ft. Decomposed Bedrock
							Drill RATE (min/ft)			67.0	
		67.0-72.0 (RQD=22%)	1	60	58	C		8			Mod Hard, red brown, fine grained sandy SILTSTONE with occas. fine sandstone bedding. Joints very close to close, shallow dipping, occas. steeply dipping. Bedding very thin. Rock slightly weathered, moderately fractured.
								8			
70								7			
								8			
								8			
75											
											Bottom of Exploration at 72.0 ft

ON GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 67 FEET

FOOTAGE IN EARTH 67 — FOOTAGE IN ROCK 5 — NO. OF SAMPLES 14 — HOLE NO. B 190

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D.C. HOLLEY
BORING CREW LEADER
C. HARRIMAN
INSPECTOR
HALEY & ALDRICH, INC.
SOILS ENGINEER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT
TOWN HARTFORD-EAST HARTFORD, CT.
PROJECT NAME CHARTER OAK BRIDGE
PROJECT NO. 63-384

LOCATION RET. WALL No. 102
GUILD DRILLING CO., INC.
BORING CONTRACTOR
STEINMAN B.B. & B.
DESIGN ENGINEER

LOCATION [illegible]
SURFACE ELEV.
DATE FINISHED 1-7-87
GROUND WATER OBSERVATIONS
AT 11.5 FT. AFTER 0 HRS.
AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW NW	SS	NW II
SIZE I.D.		4", 3"	1 3/8"	2"
HAMMER WT.		300 lb	140 lb	BIT
HAMMER FALL		24"	30"	DIA

HOLE NO. B 191
LINE & STATION
OFFSET
N. COORDINATE
E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	*									1.0'	1.0' BLACK TOP
		1.0-2.5	1	24	19	D	6	9	12 / 14		MED DENSE RED BRN ~~fine~~ SAND, TRACE C-F SAND AND FINE GRAVEL
5		4.0-6.0	2	24	24	D	9	11	13 / 16		(SAME AS D-1) - FILL -
										8.0'	
10		9.0-11.0	3	24	24	D	6	4	5 / 4		LOOSE, GRAY BRN, FINE SAND; SOME SILT.
		14.0-16.0	4	24	24	D	2	3	2 / 3		(SAME AS D-3)
20		19.0-21.0	5	24	24	D	3	4	4 / 5		(SAME AS D-3) - ALLUVIUM - * CASING PUSHED ENTIRE DEPTH OF BORE HOLE
										23.0'	
25		24.0-26.0	6	24	20	D	9	11	11 / 16		MED. DENSE GRAY, MED TO FINE SAND, trace silt
30		29.0-31.0	7	24	14	D	9	11	13 / 12		(SAME AS D-6) - ALLUVIUM -
35		34.0-36.0	8	24	12	D	10	13	15 / 16		Medium ~~dense~~, GRAY MED TO FINE SAND, little C SAND, ~~trace~~ FINE GRAVEL
										38.0'	

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 64 FEET

FOOTAGE IN EARTH 64 FOOTAGE IN ROCK 5 NO. OF SAMPLES 13 HOLE NO. B 191

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley BORING CREW LEADER	FORM 594-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384

SHEET 2 OF 2
LOCATION RET WALL NO. 102
GUILD DRILLING CO., INC.
BORING CONTRACTOR
STEINMAN B.G. & B.
DESIGN ENGINEER

LOCATION		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. R 191
SURFACE ELEV.						LINE & STATION
DATE FINISHED	TYPE					OFFSET
GROUND WATER OBSERVATIONS	SIZE I.D.					
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		39.0-41.0	9	24	24	D	1	1	1 / 1		V. SOFT RED BRN VARVED CLAY AND SILTY CLAY
45		44.0-46.0	10	24	24	D	W.	O.	HAM. / —		SAME AS D-9
										49.5'	
50		49.0-51.0	11	24	24	D	4	8	37 / 48		HARD RED BRN SILT AND CLAY, ~~little~~ C-F SAND, trace gravel
		54.0-56.0	12	24	24	D	12	31	37 / 101		HARD RED BRN SILT, SOME C-F SAND, LITTLE ~~M~~-F GRAVEL, TRACE CLAY
60		59.0-61.0	13	24	24	D	37	41	67 / 78		HARD RED BRN SILT, SOME C-F SAND AND C-F GRAVEL, TRACE CLAY - GLACIAL TILL -
										59.0'	
							DRILL RATE			64.0	Decomposed Bedrock
65		64.0	—	0	0	D	100%	MIN/FT			
		64.0-69.0	1	60	60	C		4.5			MOD HARD RED BRN FINE GRAINED sandy SILTSTONE, joints close, occasionally very close, shallow dipping. occasionally steeply dipping. Bedding very thin. Rock slightly weathered, moderate to slightly fractured.
		(RQD = 45%)	1					4.5			
								4.5			
								4.5			
70								4.5			
75											Bottom of Exploration at 69.0 ft.
80											

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 64 FEET

FOOTAGE IN EARTH 64 FOOTAGE IN ROCK 5 NO. OF SAMPLES 13 HOLE NO. R 191

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

APPENDIX C

RESULTS OF LABORATORY TESTING

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	07/01/16	Checked By:	emm
Depth :	---	Test Id:	382158		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content, %
RW-9	UP- 1 - Top	67-69	Moist, reddish brown clay	52.9
RW-9	UP- 1 - Top middle	67-69	Moist, reddish brown clay	47.4
RW-9	UP- 1 - Bottom middle	67-69	Moist, reddish brown clay	45.9
RW-9	UP- 1 - Bottom	67-69	Moist, reddish brown clay	50.8
S1-11	UP- 1 - Top	61-63	Moist, reddish brown clay	40.4
S1-11	UP- 1 - Top middle	61-63	Moist, reddish brown clay	46.0
S1-11	UP- 1 - Bottom middle	61-63	Moist, reddish brown clay	62.6
S1-11	UP- 1 - Bottom	61-63	Moist, reddish brown clay	57.1

Notes: Temperature of Drying : 110° Celsius

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Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/01/16	Checked By:	emm
Depth :	---	Test Id:	382146		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content, %
S1-1	UP- 1 - Top	42-44	Moist, reddish brown clay	44.5
S1-1	UP- 1 - Top middle	42-44	Moist, reddish brown clay	39.4
S1-1	UP- 1 - Bottom middle	42-44	Moist, reddish brown clay	37.2
S1-1	UP- 1 - Bottom	42-44	Wet, reddish brown clay	47.0
RW-2	UP- 1 - Top	37-39	Moist, reddish brown clay	45.4
RW-2	UP- 1 - Top middle	37-39	Moist, reddish brown clay	51.1
RW-2	UP- 1 - Bottom middle	37-39	Moist, reddish brown clay	55.4
RW-2	UP- 1 - Bottom	37-39	Moist, reddish brown clay	49.5

Notes: Temperature of Drying : 110° Celsius

GeoTesting EXPRESS

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	07/01/16	Checked By:	emm
Depth :	---	Test Id:	382102		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
RW-9	UP- 3 - Top	76-78	Moist, reddish brown clay	68.9
RW-9	UP- 3 - Top middle	76-78	Moist, reddish brown clay	46.2
RW-9	UP- 3 - Bottom middle	76-78	Moist, reddish brown clay	46.8
RW-9	UP- 3 - Bottom	76-78	Wet, reddish brown clay	53.8
S1-11	UP- 3 - Top	69-71	Moist, reddish brown clay	44.9
S1-11	UP- 3 - Top middle	69-71	Moist, red clay	45.8
S1-11	UP- 3 - Bottom middle	69-71	Moist, reddish brown clay	36.6
S1-11	UP- 3 - Bottom	69-71	Moist, reddish brown clay	36.5

Notes: Temperature of Drying : 110° Celsius

GeoTesting EXPRESS

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: ---	Sample Type: ---	Tested By:	jbr
Sample ID: ---	Test Date: 07/26/16	Checked By:	emm
Depth : ---	Test Id: 384878		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

Client:	Freeman Companies, LLC
Project:	Reconstruction of Exit Charter Oak Bridge
Location:	Hartford, CT
GTX#:	304831
Test Date:	07/26/16
Tested By:	jbr
Checked By:	emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(\text{ohm-cm})^{-1}$
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE (GTX 304831)

FOR: GEOTESTING EXPRESS, INC.
125 NAGOG PARK ACTION, MA 01720

REPORTED TO: ETHAN MARRO

REPORT DATE: 08-01-16
CLIENT NUMBER:
JOB NUMBER: 04.1115-0003
REPORT NUMBER:
DATE SAMPLED:
TIME SAMPLED:
SAMPLED BY: CLIENT
DATE RECEIVED:
TIME RECEIVED:
RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6’	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12’	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7’	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17’	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7’	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16’	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11’	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7’	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

SD

** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

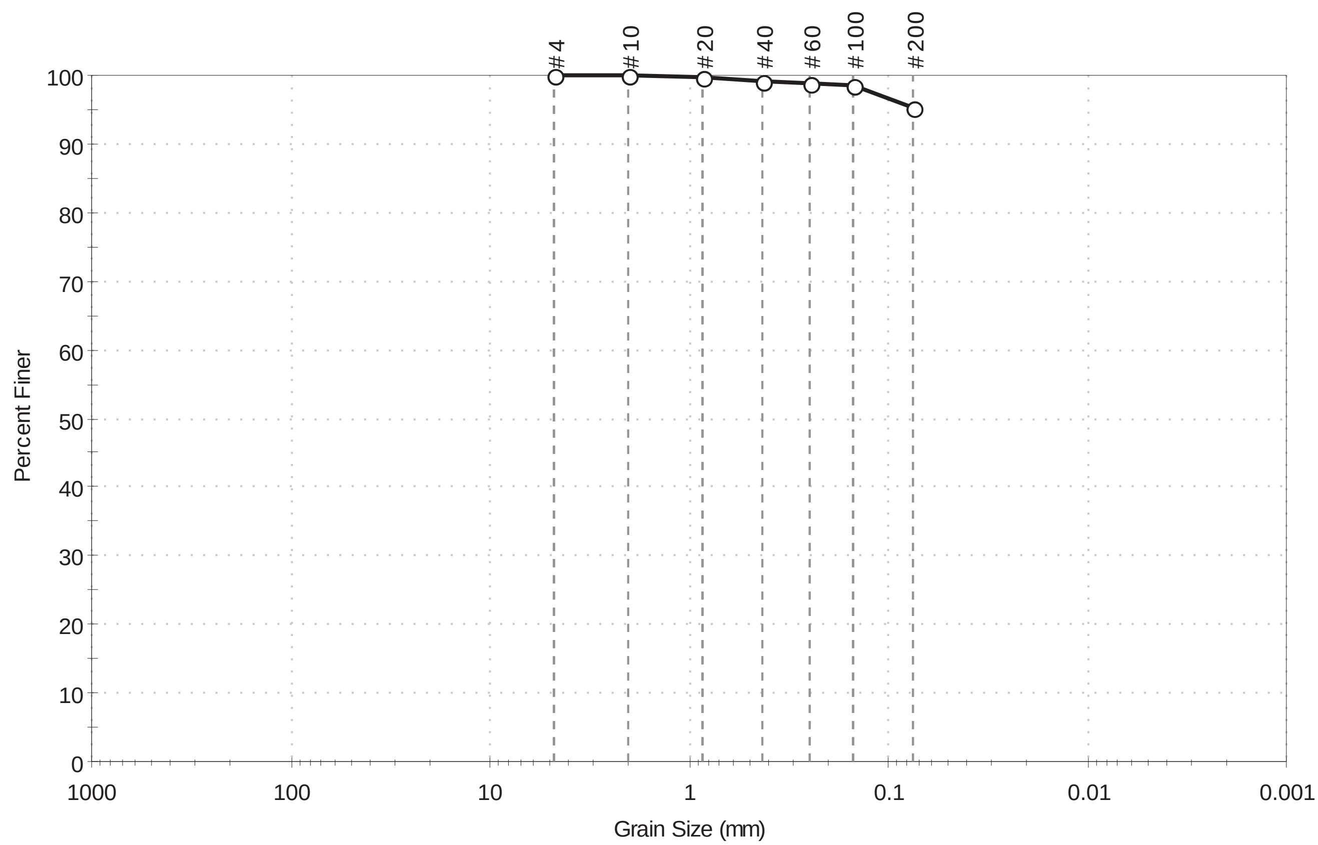
END OF REPORT

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S1-1	Sample Type:	jar	Tested By:	GA
Sample ID:	S-3	Test Date:	08/03/16	Checked By:	emm
Depth :	10-12 ft	Test Id:	384947		

Test Comment: ---
Visual Description: Moist, olive gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	4.7	95.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	98		
#200	0.075	95		

Coefficients

D_{85} = N/A	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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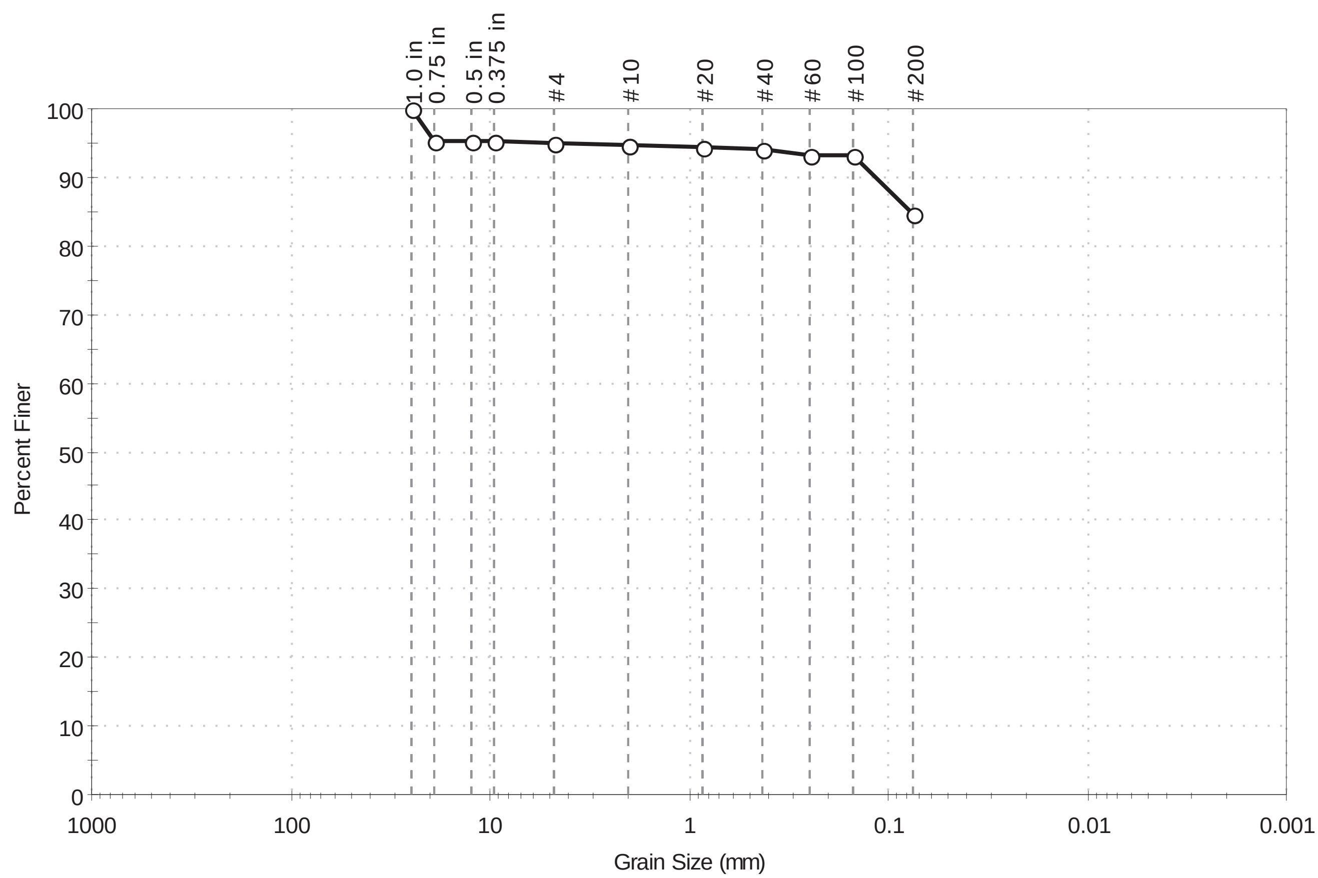
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S1-2	Sample Type:	jar	Tested By:	GA
Sample ID:	S-3	Test Date:	08/03/16	Checked By:	emm
Depth :	9-11 ft	Test Id:	384936		
Test Comment:	---				
Visual Description:	Moist, olive silt with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	5.0	10.3	84.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.0 in	25.00	100		
0.75 in	19.00	95		
0.5 in	12.50	95		
0.375 in	9.50	95		
#4	4.75	95		
#10	2.00	95		
#20	0.85	94		
#40	0.42	94		
#60	0.25	93		
#100	0.15	93		
#200	0.075	85		

Coefficients

D_{85} = 0.0764 mm　　D_{30} = N/A

D_{60} = N/A　　D_{15} = N/A

D_{50} = N/A　　D_{10} = N/A

C_u = N/A　　C_c = N/A

Classification

ASTM　N/A

AASHTO　Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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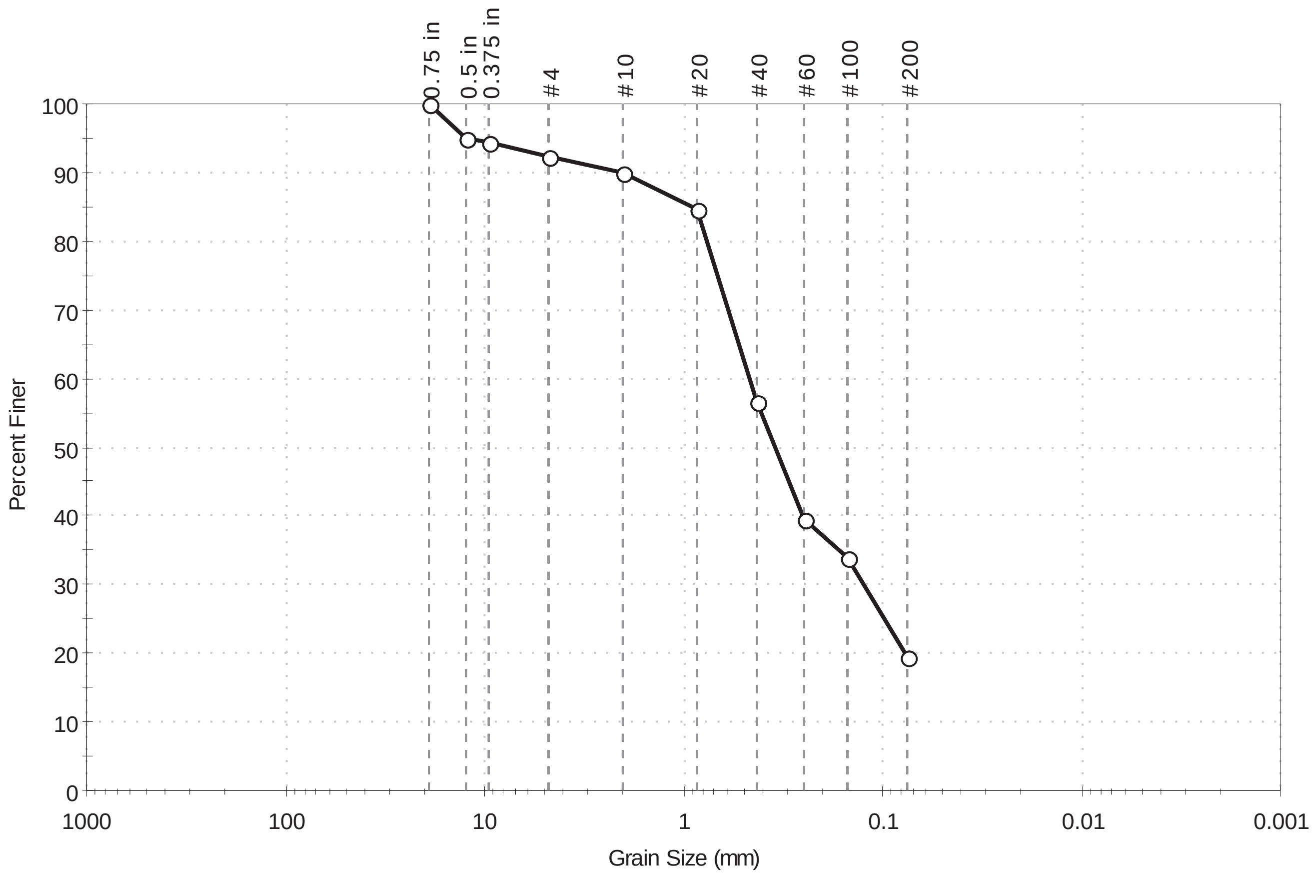
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-3	Sample Type: jar	Tested By:	GA
Sample ID: S-4	Test Date: 08/02/16	Checked By:	emm
Depth : 15-17 ft	Test Id: 384948		
Test Comment:	---		
Visual Description:	Moist, dark olive gray clayey sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	7.7	72.8	19.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	95		
0.375 in	9.50	94		
#4	4.75	92		
#10	2.00	90		
#20	0.85	85		
#40	0.42	57		
#60	0.25	40		
#100	0.15	34		
#200	0.075	20		

Coefficients

D_{85} =0.8815 mm | D_{30} =0.1246 mm

D_{60} =0.4623 mm | D_{15} =N/A

D_{50} =0.3464 mm | D_{10} =N/A

C_u =N/A | C_c =N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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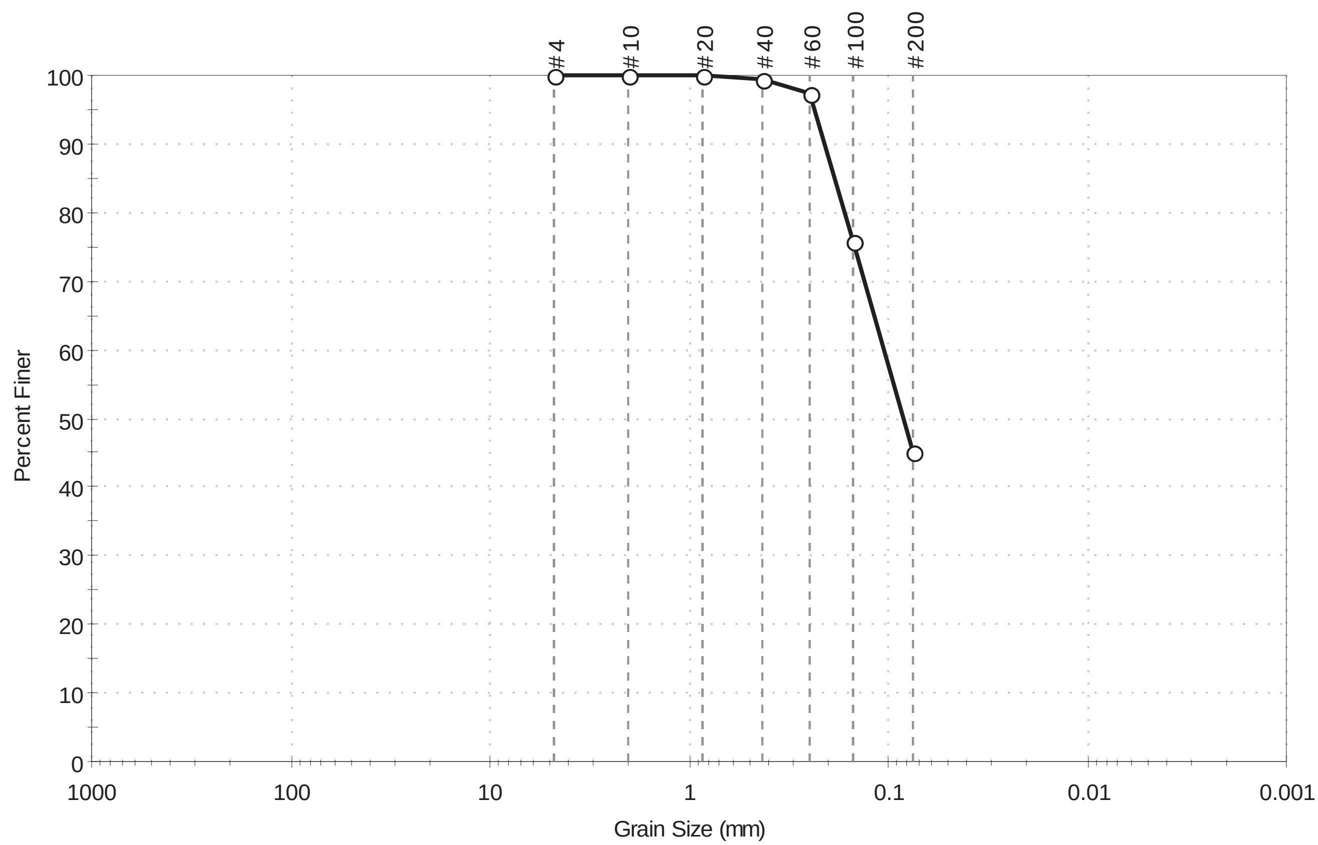
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-5	Sample Type: jar	Tested By:	GA
Sample ID: S-6	Test Date: 08/02/16	Checked By:	emm
Depth : 25-27 ft	Test Id: 384949		
Test Comment:	---		
Visual Description:	Moist, very dark gray clayey sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	54.9	45.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	97		
#100	0.15	76		
#200	0.075	45		

Coefficients

D_{85} = 0.1870 mm D_{30} = N/A
D_{60} = 0.1051 mm D_{15} = N/A
D_{50} = 0.0838 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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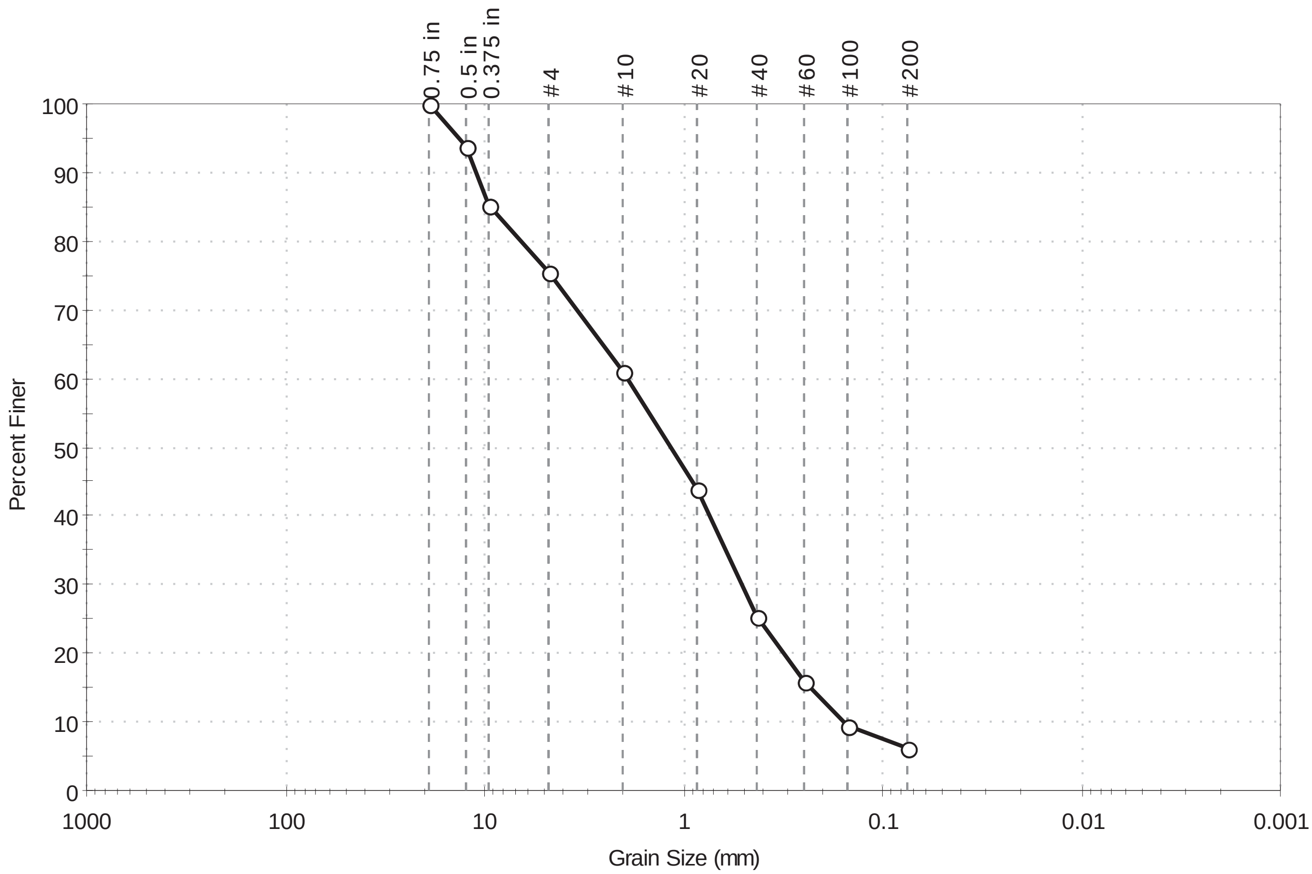
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-6	Sample Type: jar	Tested By:	GA
Sample ID: S-3	Test Date: 08/02/16	Checked By:	emm
Depth : 10-12 ft	Test Id: 384937		
Test Comment:	---		
Visual Description:	Moist, reddish brown sand with silt and gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	24.4	69.5	6.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	94		
0.375 in	9.50	85		
#4	4.75	76		
#10	2.00	61		
#20	0.85	44		
#40	0.42	25		
#60	0.25	16		
#100	0.15	9		
#200	0.075	6.1		

Coefficients

D_{85} = 9.2613 mm D_{30} = 0.5060 mm

D_{60} = 1.9037 mm D_{15} = 0.2346 mm

D_{50} = 1.1486 mm D_{10} = 0.1580 mm

C_u = 12.049 C_c = 0.851

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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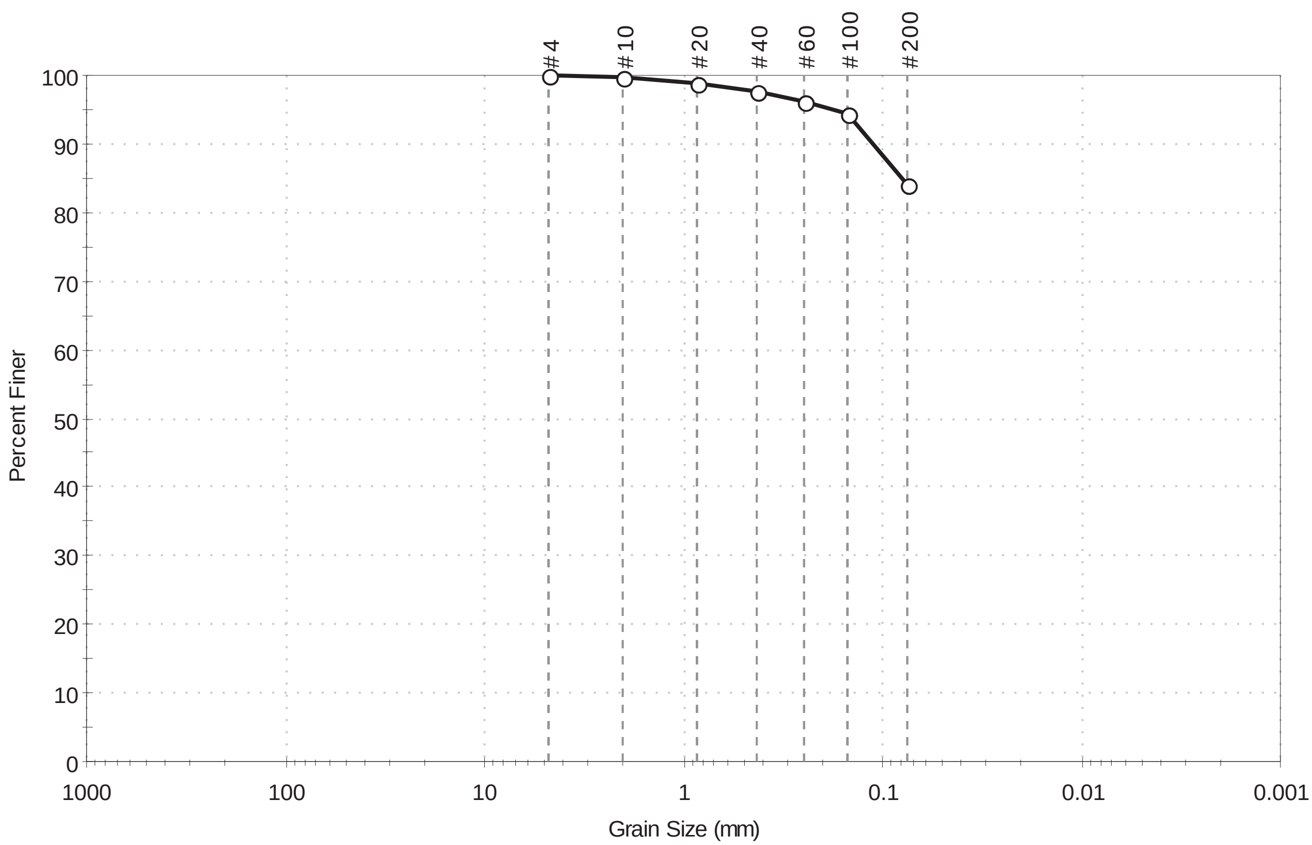
GeoTesting EXPRESS

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S1-7	Sample Type:	jar	Tested By:	GA
Sample ID:	S-4	Test Date:	08/02/16	Checked By:	emm
Depth :	15-17 ft	Test Id:	384950		
Test Comment:	---				
Visual Description:	Moist, dark gray clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	16.1	83.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	96		
#100	0.15	94		
#200	0.075	84		

Coefficients

D_{85} = 0.0805 mm | D_{30} = N/A

D_{60} = N/A | D_{15} = N/A

D_{50} = N/A | D_{10} = N/A

C_u = N/A | C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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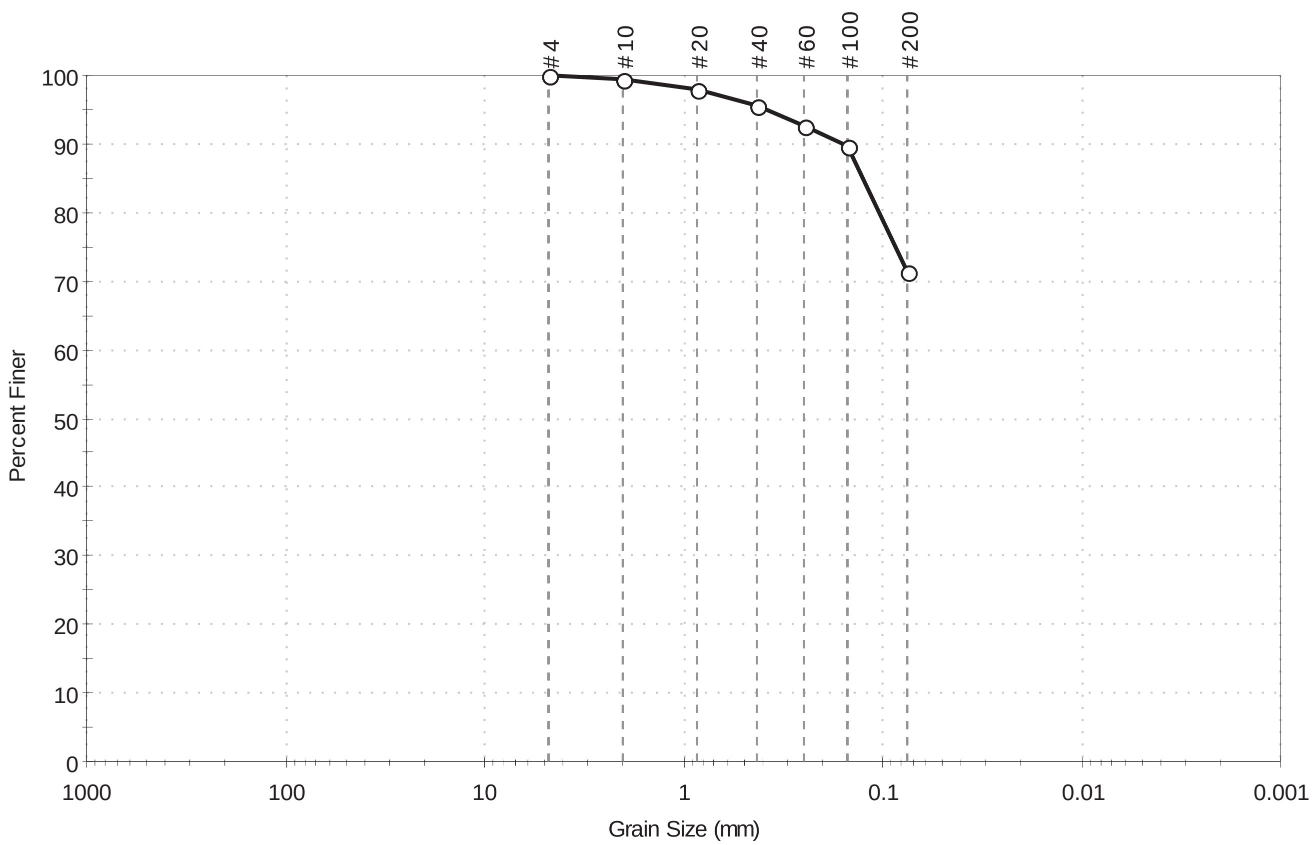
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S1-9	Sample Type:	jar	Tested By:	GA
Sample ID:	S-5	Test Date:	08/03/16	Checked By:	emm
Depth :	20-22 ft	Test Id:	384938		

Test Comment: ---

Visual Description: Moist, dark gray silt with sand

Sample Comment: ---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	28.6	71.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	98		
#40	0.42	95		
#60	0.25	93		
#100	0.15	90		
#200	0.075	71		

Coefficients

D_{85} = 0.1262 mm D_{30} = N/A

D_{60} = N/A D_{15} = N/A

D_{50} = N/A D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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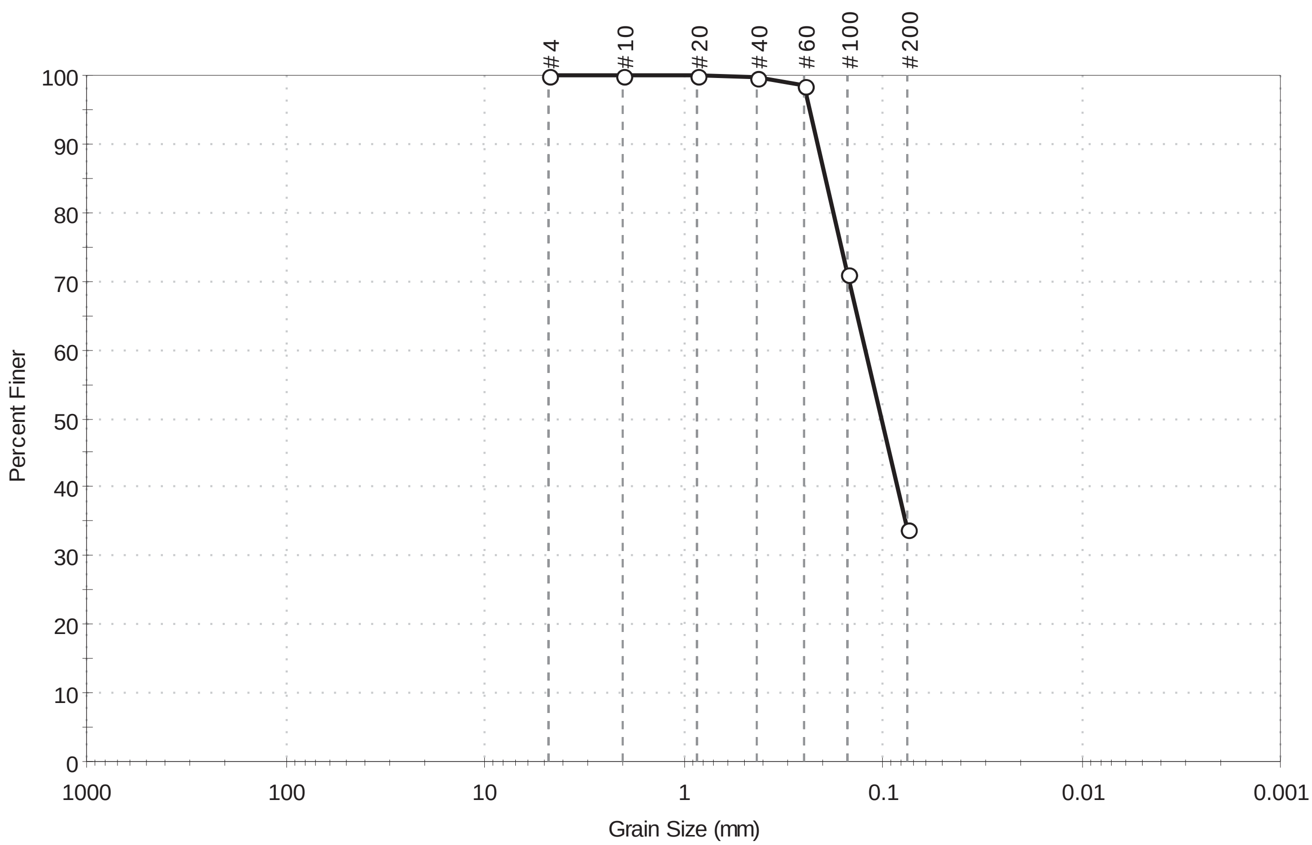
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S1-9	Sample Type:	jar	Tested By:	GA
Sample ID:	S-7	Test Date:	08/02/16	Checked By:	emm
Depth :	30-32 ft	Test Id:	384951		

Test Comment:	---
Visual Description:	Moist, olive silty sand
Sample Comment:	---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	66.1	33.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	98		
#100	0.15	71		
#200	0.075	34		

Coefficients

D_{85} = 0.1946 mm D_{30} = N/A

D_{60} = 0.1220 mm D_{15} = N/A

D_{50} = 0.1012 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM   N/A

AASHTO   Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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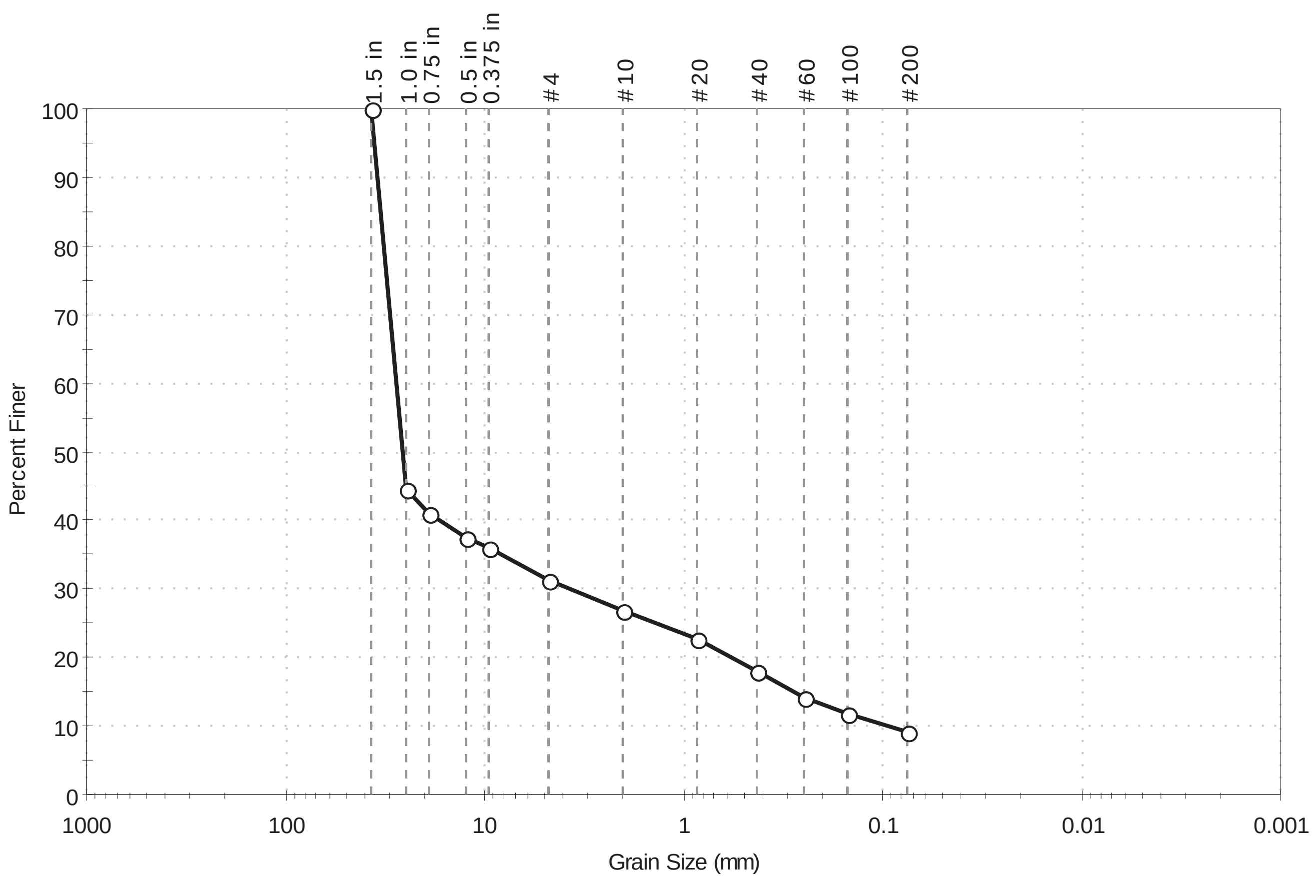
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-11	Sample Type: jar	Tested By:	GA
Sample ID: S-4	Test Date: 08/03/16	Checked By:	emm
Depth : 14-16 ft	Test Id: 384939		
Test Comment:	---		
Visual Description:	Moist, reddish brown gravel with clay and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	68.6	22.2	9.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	45		
0.75 in	19.00	41		
0.5 in	12.50	38		
0.375 in	9.50	36		
#4	4.75	31		
#10	2.00	27		
#20	0.85	23		
#40	0.42	18		
#60	0.25	14		
#100	0.15	12		
#200	0.075	9.2		

Coefficients

D_{85} = 33.6033 mm　　D_{30} = 3.6264 mm

D_{60} = 27.9877 mm　　D_{15} = 0.2793 mm

D_{50} = 26.0136 mm　　D_{10} = 0.0945 mm

C_u = 296.166　　C_c = 4.972

Classification

ASTM　N/A

AASHTO　Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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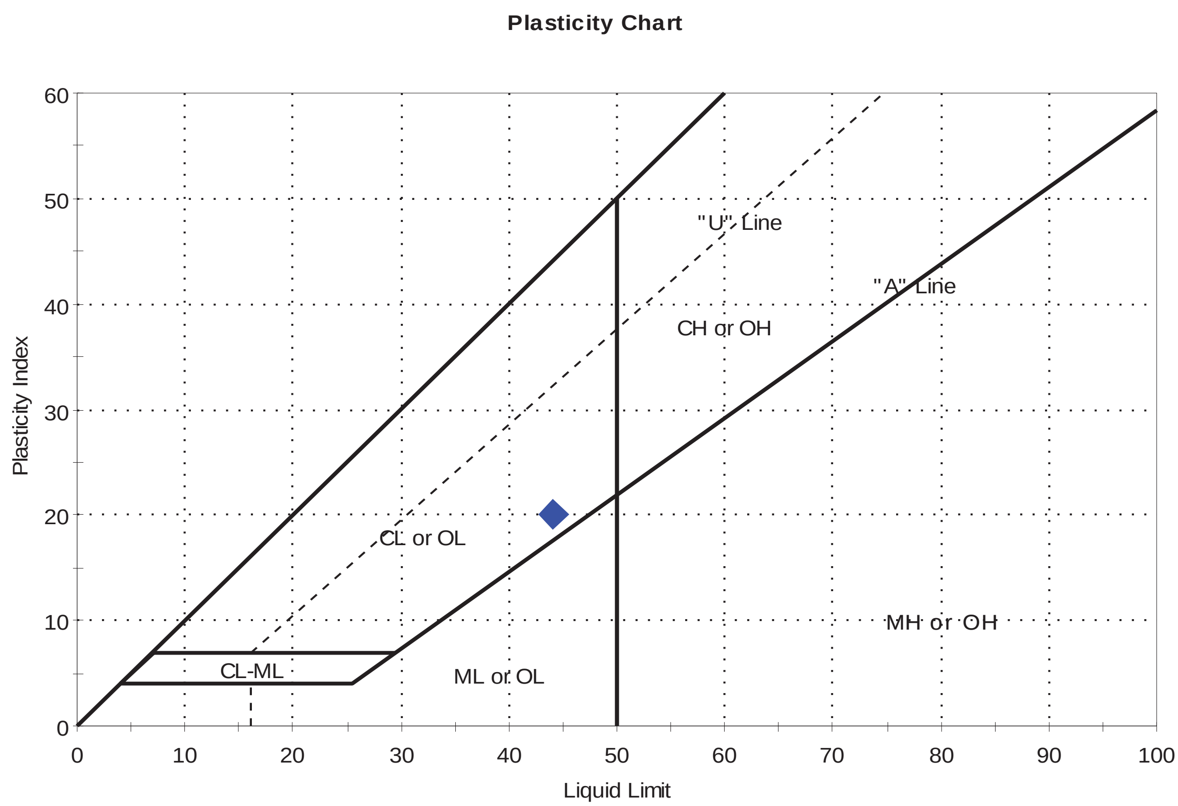
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S1-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-1 - Top middle	Test Date:	07/14/16	Checked By:	emm
Depth :	42-44	Test Id:	382153		
Test Comment:	---				
Visual Description:	Moist, reddish brown clay				
Sample Comment:	----				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Top middle	S1-1	42-44	39	44	24	20	0.8	

Sample Prepared using the WET method

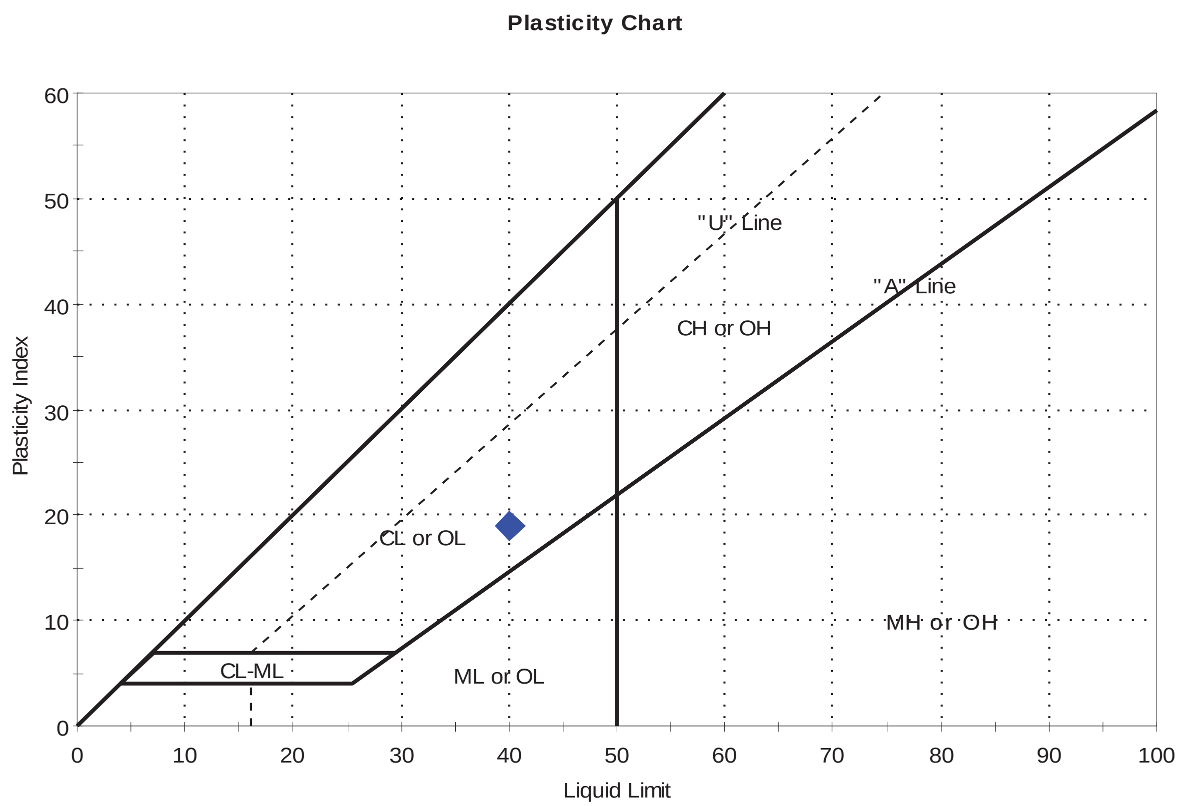
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-1	Sample Type: tube	Tested By:	GA
Sample ID: UP-1 - Bottom	Test Date: 07/13/16	Checked By:	emm
Depth : 42-44	Test Id: 382151		
Test Comment:	---		
Visual Description:	Wet, reddish brown clay		
Sample Comment:	---		

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Bottom	S1-1	42-44	47	40	21	19	1.4	

Sample Prepared using the WET method

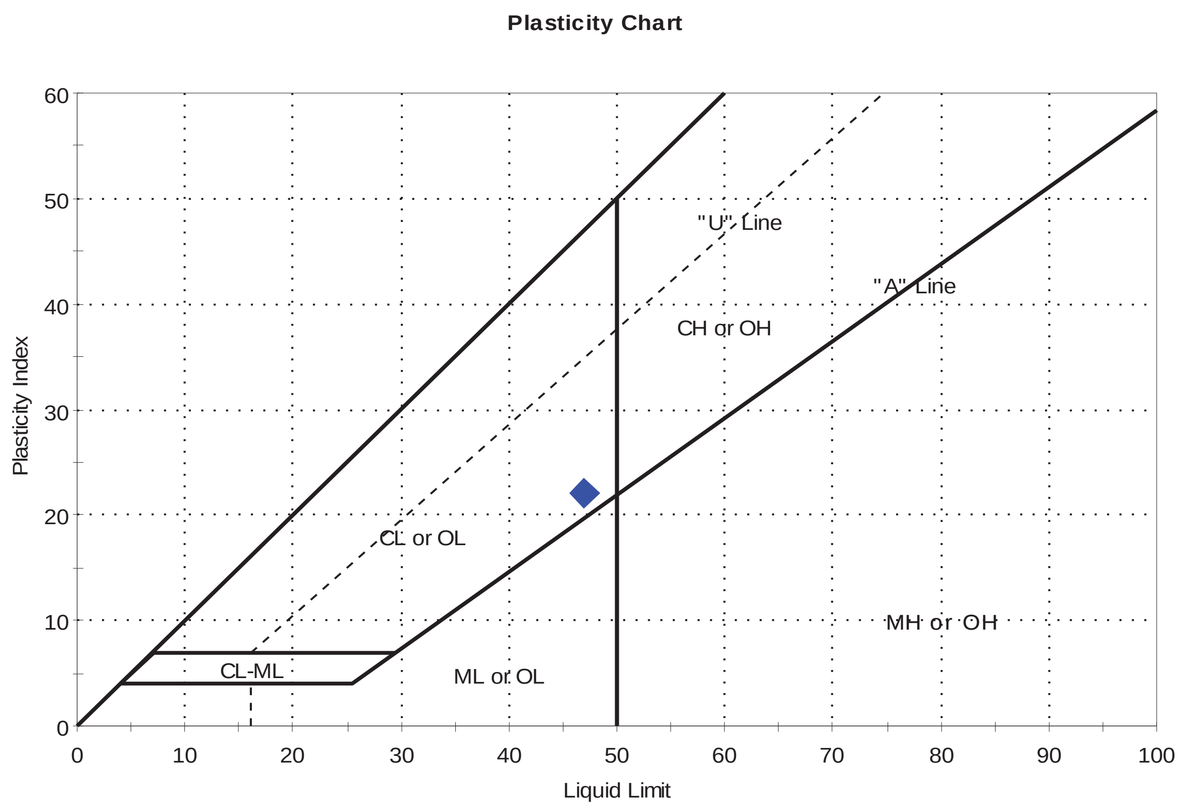
Dry Strength: HIGH

Dilatancy: NONE

Toughness: MEDIUM

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S1-11	Sample Type: tube	Tested By:	GA
Sample ID: UP-1 - Top middle	Test Date: 07/14/16	Checked By:	emm
Depth : 61-63	Test Id: 382159		
Test Comment:	---		
Visual Description:	Moist, reddish brown clay		
Sample Comment:	---		

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Top middle	S1-11	61-63	46	47	25	22	1	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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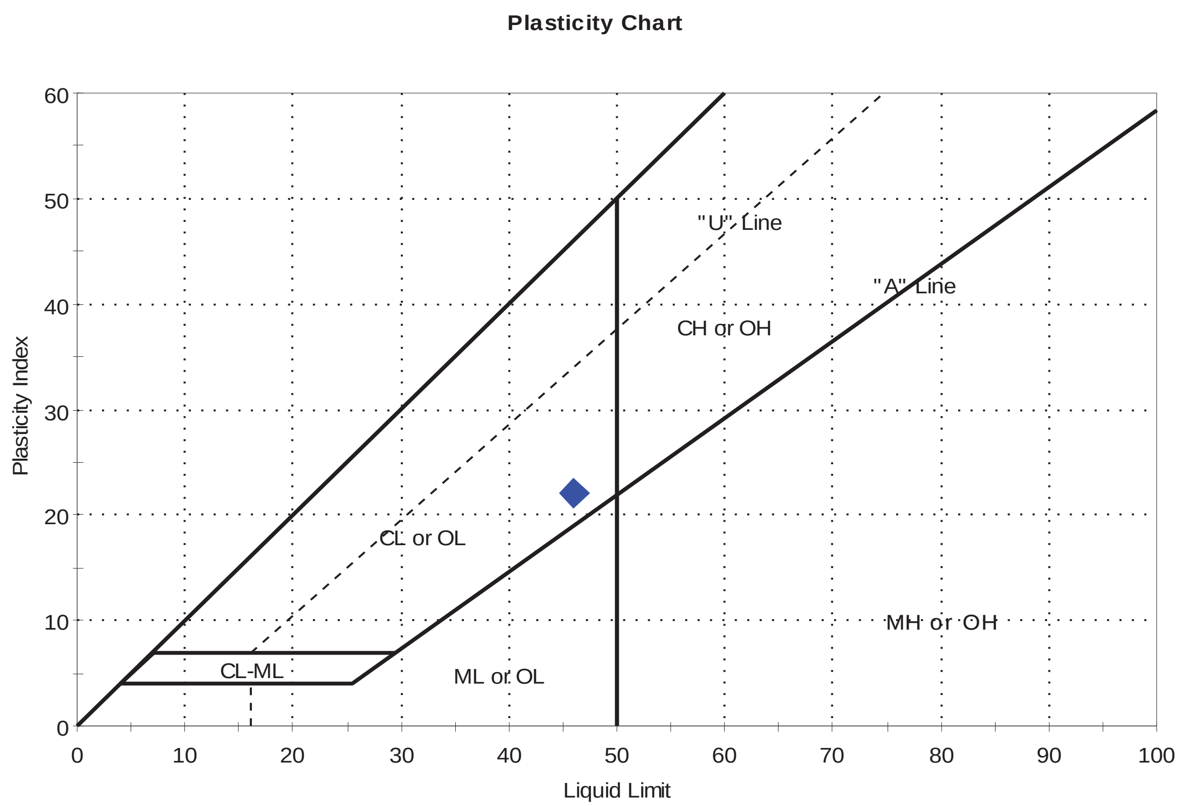
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S1-11	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-1 - Bottom	Test Date:	07/13/16	Checked By:	emm
Depth :	61-63	Test Id:	382157		

Test Comment: ---
Visual Description: Moist, reddish brown clay
Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Bottom	S1-11	61-63	57	46	24	22	1.5	

Sample Prepared using the WET method

Dry Strength: HIGH
Dilatancy: NONE
Toughness: MEDIUM

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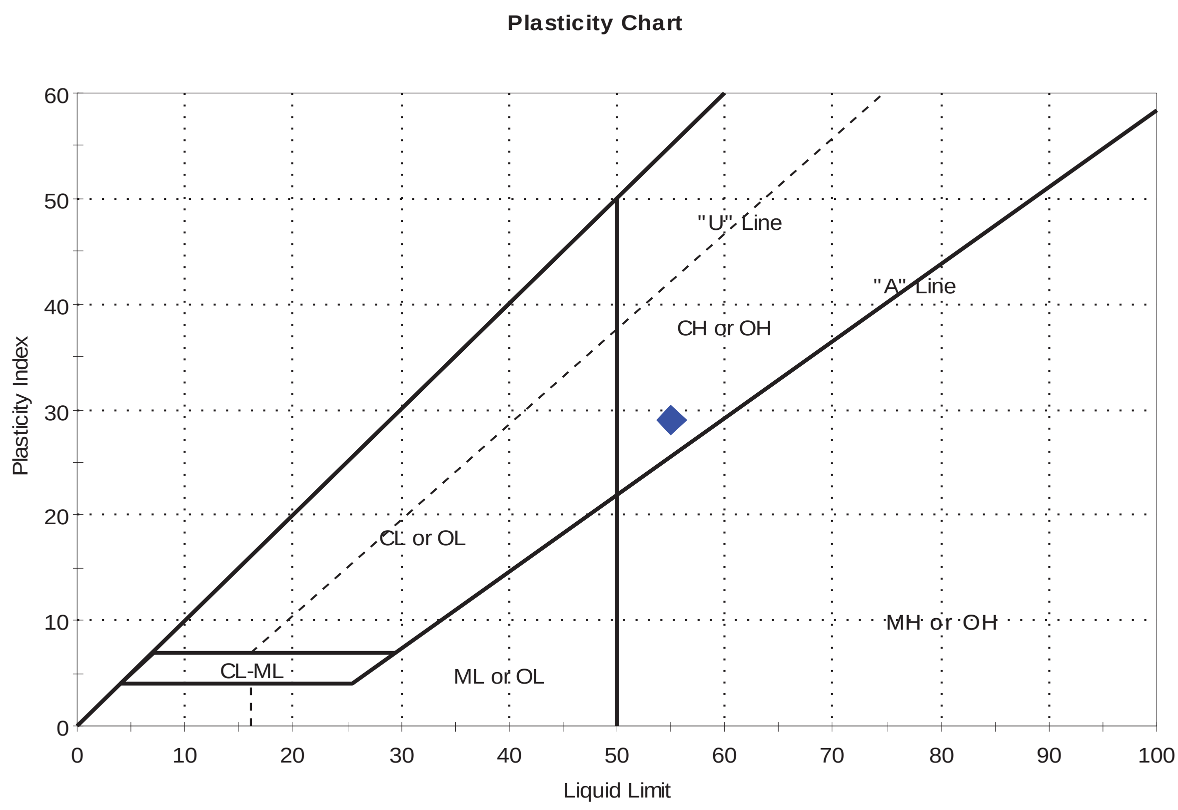
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S1-11	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-3 - Top middle	Test Date:	07/14/16	Checked By:	emm
Depth :	69-71	Test Id:	382105		
Test Comment:	---				
Visual Description:	Moist, red clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-3 - Top middle	S1-11	69-71	46	55	26	29	0.7	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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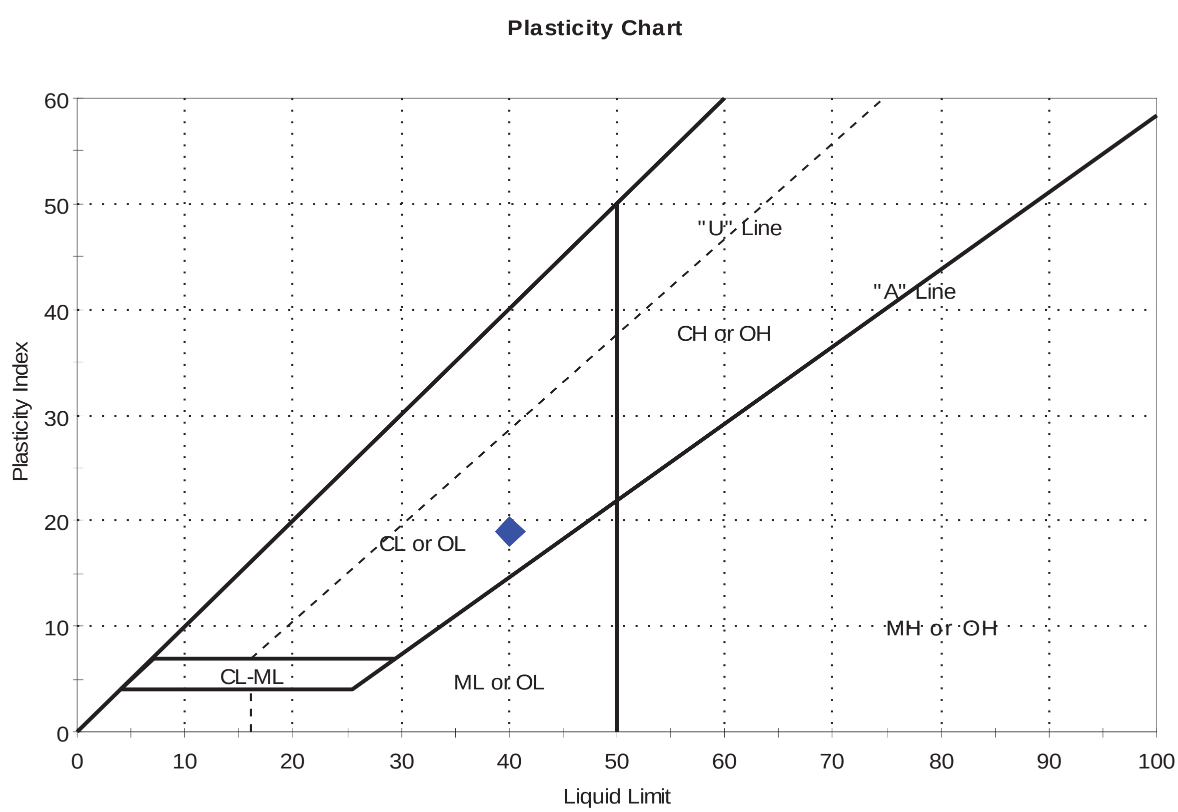
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S1-11	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-3 - Bottom	Test Date:	07/13/16	Checked By:	emm
Depth :	69-71	Test Id:	382101		

Test Comment: ---
Visual Description: Moist, reddish brown clay
Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-3 - Bottom	S1-11	69-71	37	40	21	19	0.8	

Sample Prepared using the WET method

Dry Strength: HIGH
Dilatancy: NONE
Toughness: MEDIUM

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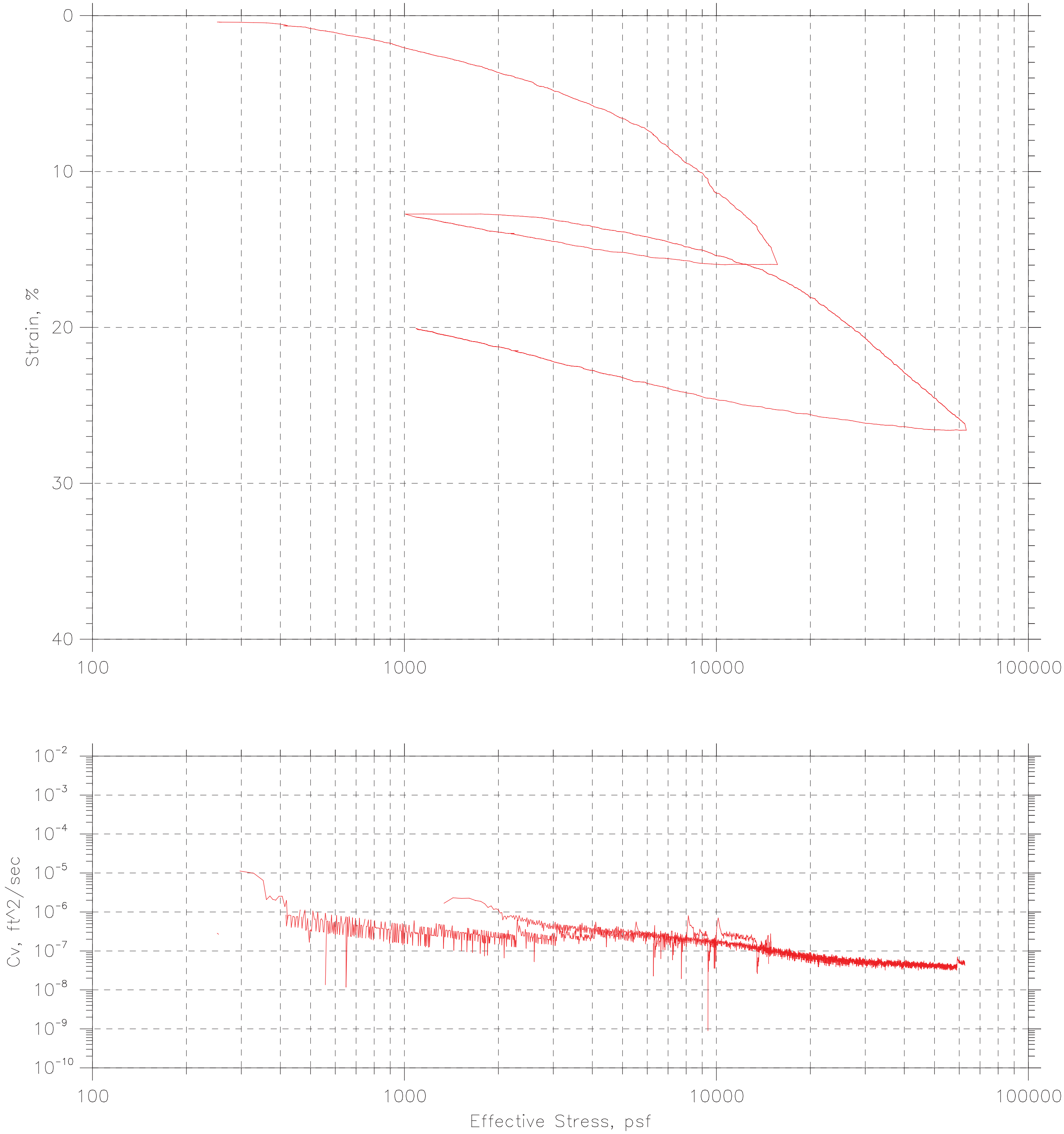
Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 42-44 ft
Test No.: CRC-6	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System X		
		Page 1 of 3

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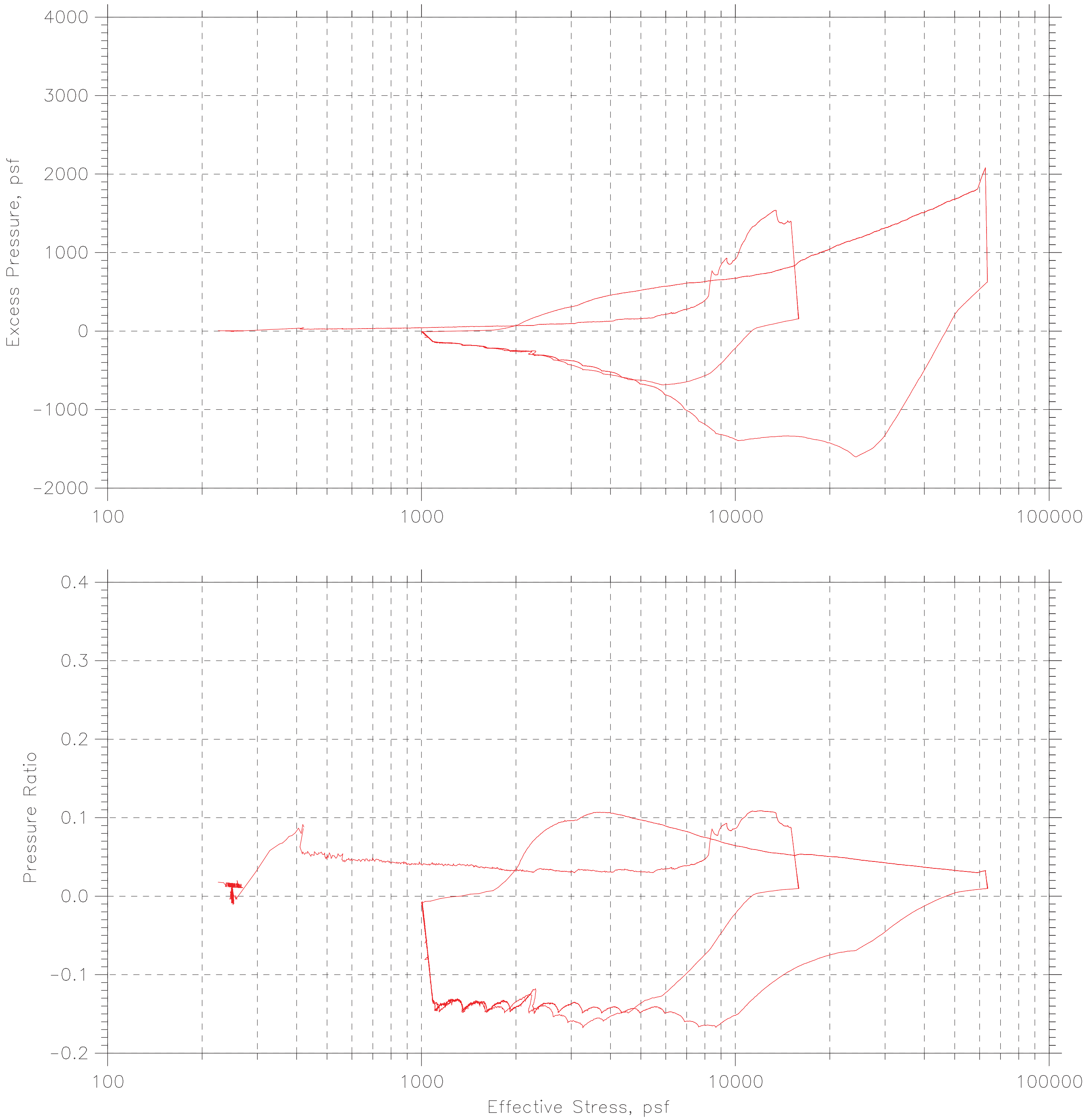
Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 42-44 ft
Test No.: CRC-6	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System X		
		Page 2 of 3

CRC TEST DATA

Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 42-44 ft
Test No.: CRC-6	Sample Type: intact	Elevation: ---

Soil Description: Moist, reddish brown clay
Remarks: System X

Estimated Specific Gravity: 2.82	Liquid Limit: 40	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.34	Plastic Limit: 21	Initial Height: 1.00 in
Final Void Ratio: 0.897	Plasticity Index: 19	Final Height: 0.81 in

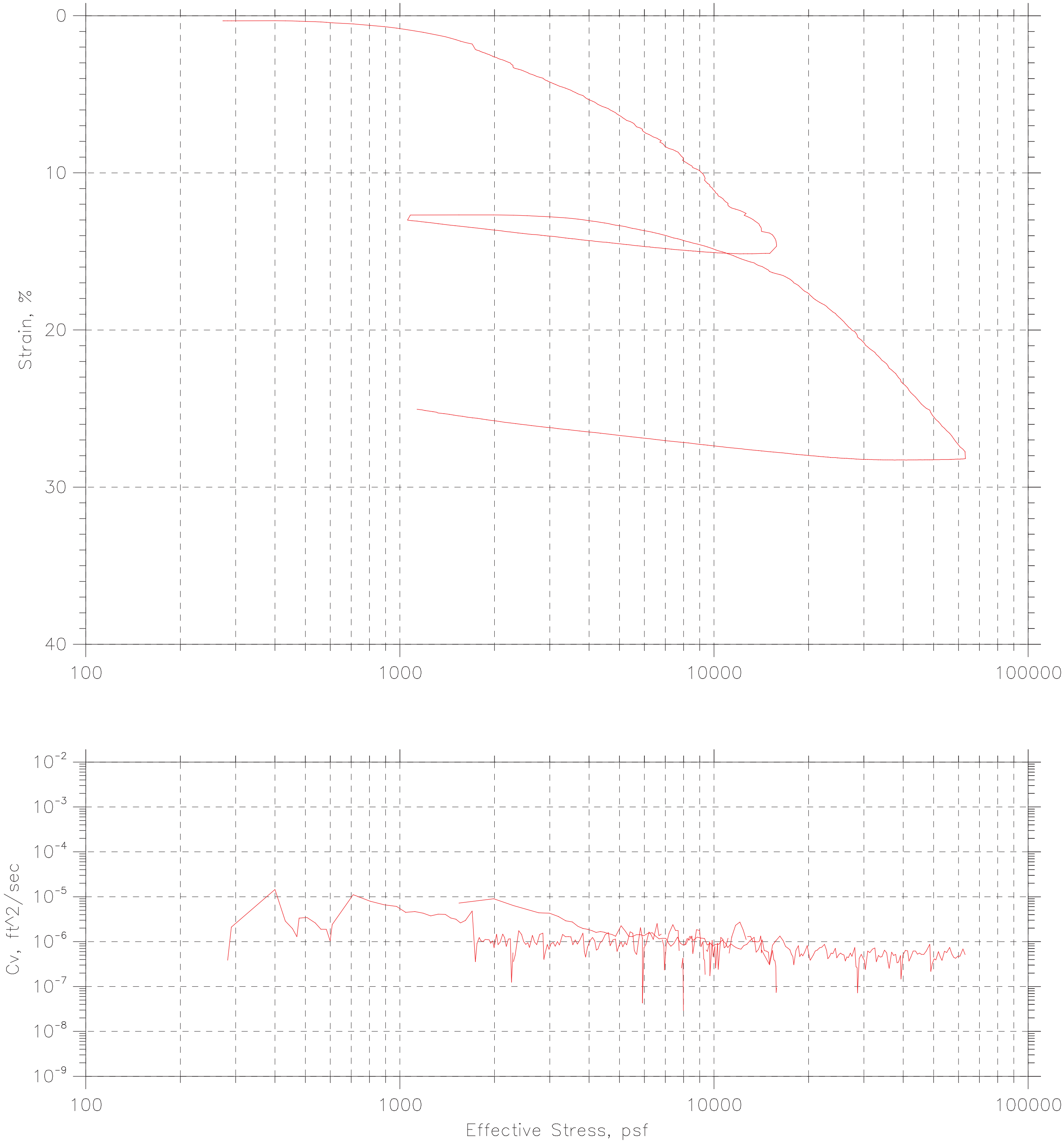
	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	B-205	RING		a400
Wt. Container + Wet Soil, gm	362.36	251.18	236.65	136.74
Wt. Container + Dry Soil, gm	249.29	205.84	205.84	105.76
Wt. Container, gm	8.4700	109.10	109.10	8.4900
Wt. Dry Soil, gm	240.82	96.739	96.739	97.270
Water Content, %	46.95	46.87	31.85	31.85
Void Ratio	---	1.34	0.897	---
Degree of Saturation, %	---	98.37	100.00	---
Dry Unit Weight, pcf	---	75.078	92.688	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report

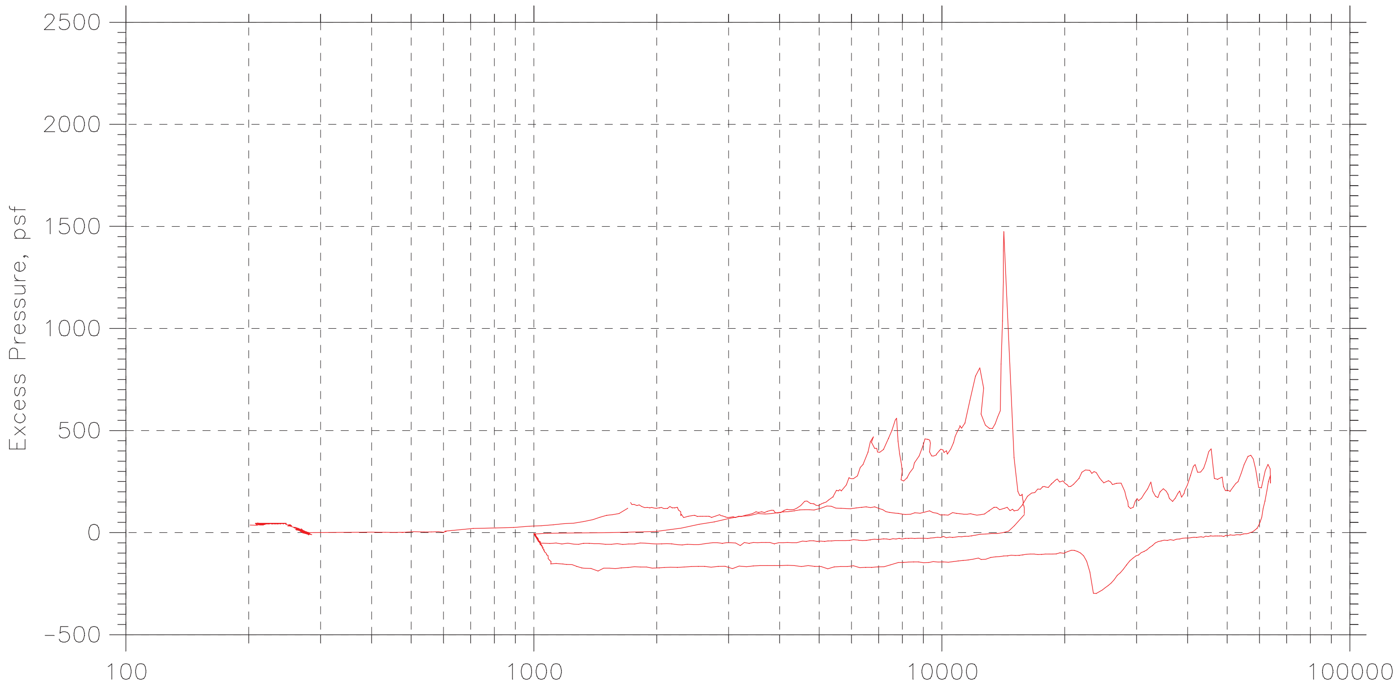


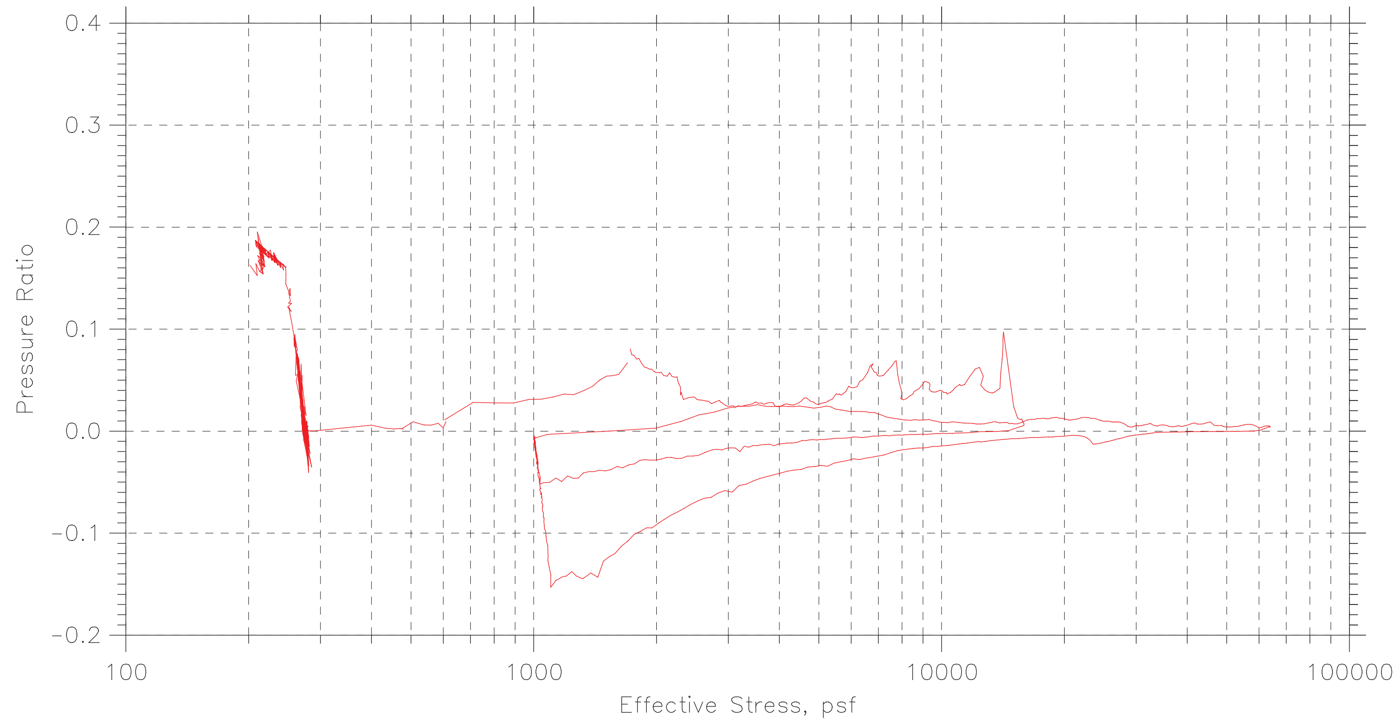
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 07/13/16	Depth: 61-63 ft
Test No.: CRC-12B	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 1 of 3

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 07/13/16	Depth: 61-63 ft
Test No.: CRC-12B	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 2 of 3

CRC TEST DATA

Project: Reconstruction of Exit
Location: Hartford, CT
Project No.: GTX-304831
Boring No.: S1-11
Tested By: md
Checked By: njh
Sample No.: UP-1
Test Date: 07/13/16
Depth: 61-63 ft
Test No.: CRC-12B
Sample Type: intact
Elevation: ---

Soil Description: Moist, reddish brown clay
Remarks: System F

Estimated Specific Gravity: 2.78
Liquid Limit: 46
Specimen Diameter: 2.50 in
Initial Void Ratio: 1.22
Plastic Limit: 24
Initial Height: 1.00 in
Final Void Ratio: 0.731
Plasticity Index: 22
Final Height: 0.78 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	C-1289	RING		B-591
Wt. Container + Wet Soil, gm	176.32	254.92	237.24	127.03
Wt. Container + Dry Soil, gm	115.26	210.74	210.74	102.25
Wt. Container, gm	8.3700	109.85	109.85	7.9000
Wt. Dry Soil, gm	106.89	100.89	100.89	94.350
Water Content, %	57.12	43.79	26.26	26.26
Void Ratio	---	1.22	0.731	---
Degree of Saturation, %	---	99.96	100.00	---
Dry Unit Weight, pcf	---	78.300	100.39	---

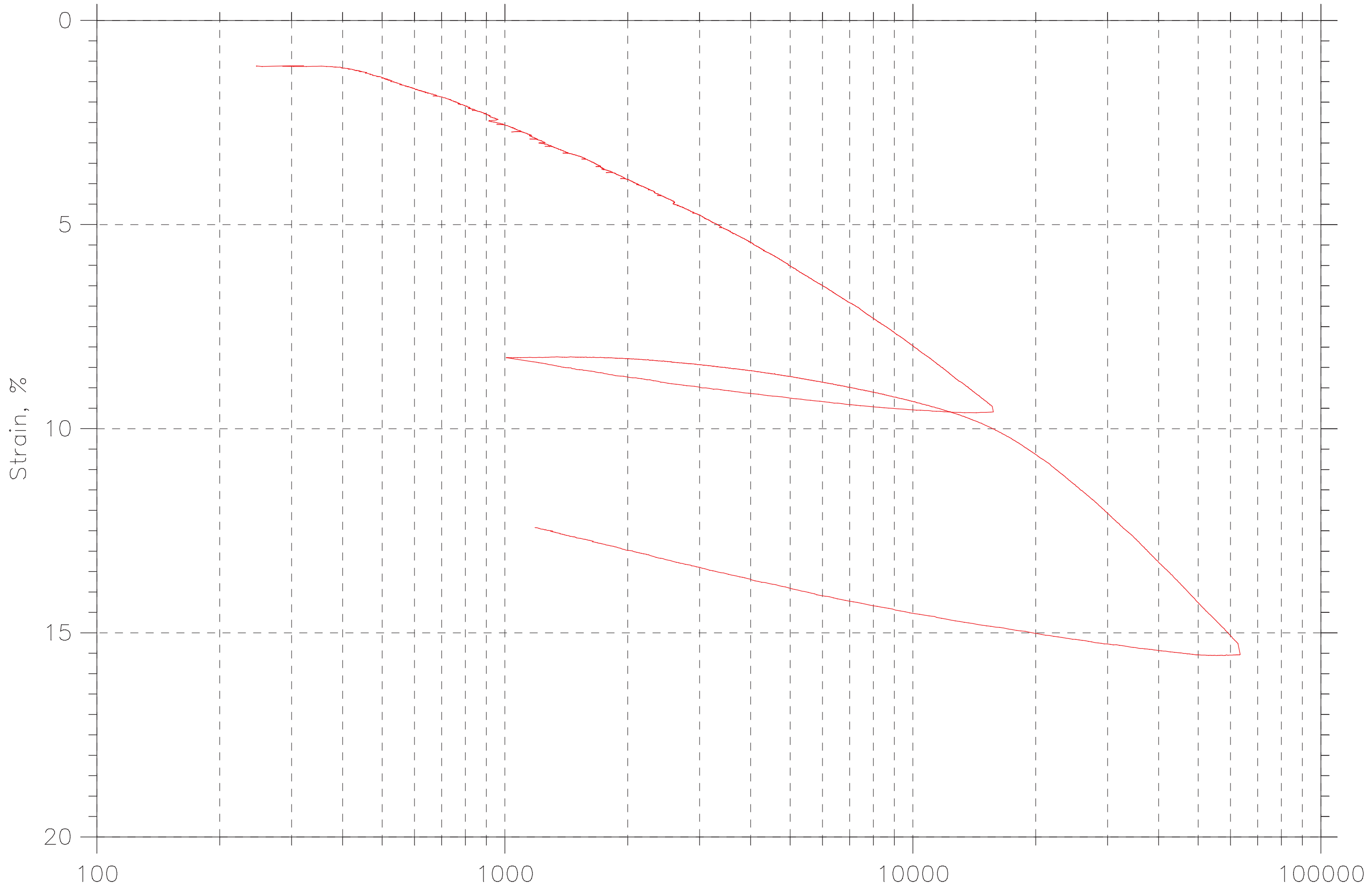
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

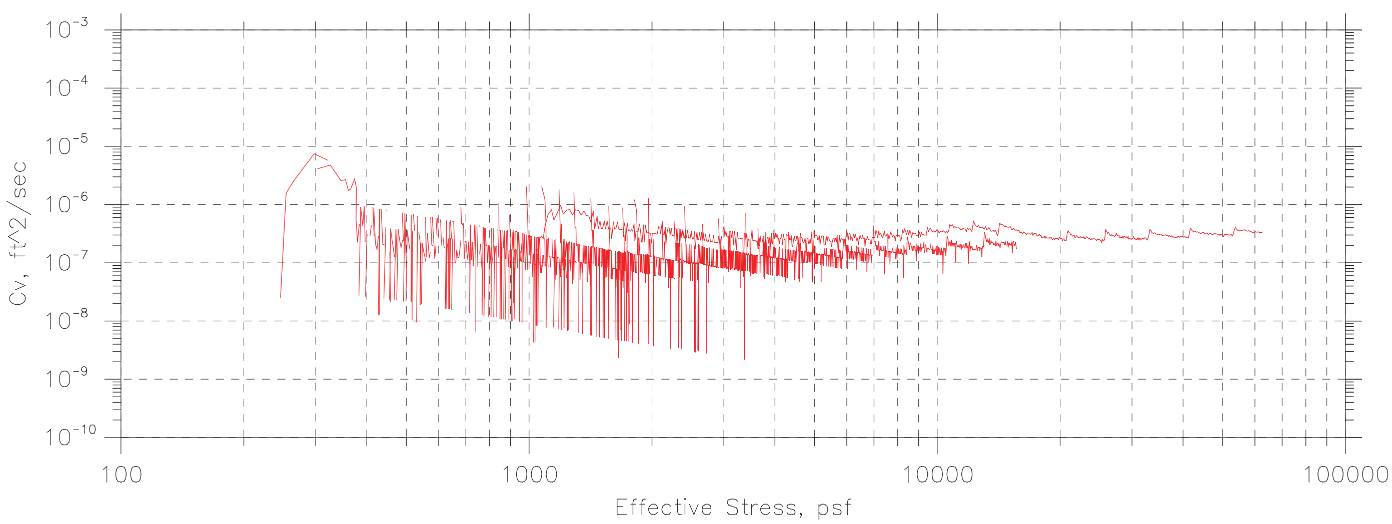
GeoTesting EXPRESS

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report



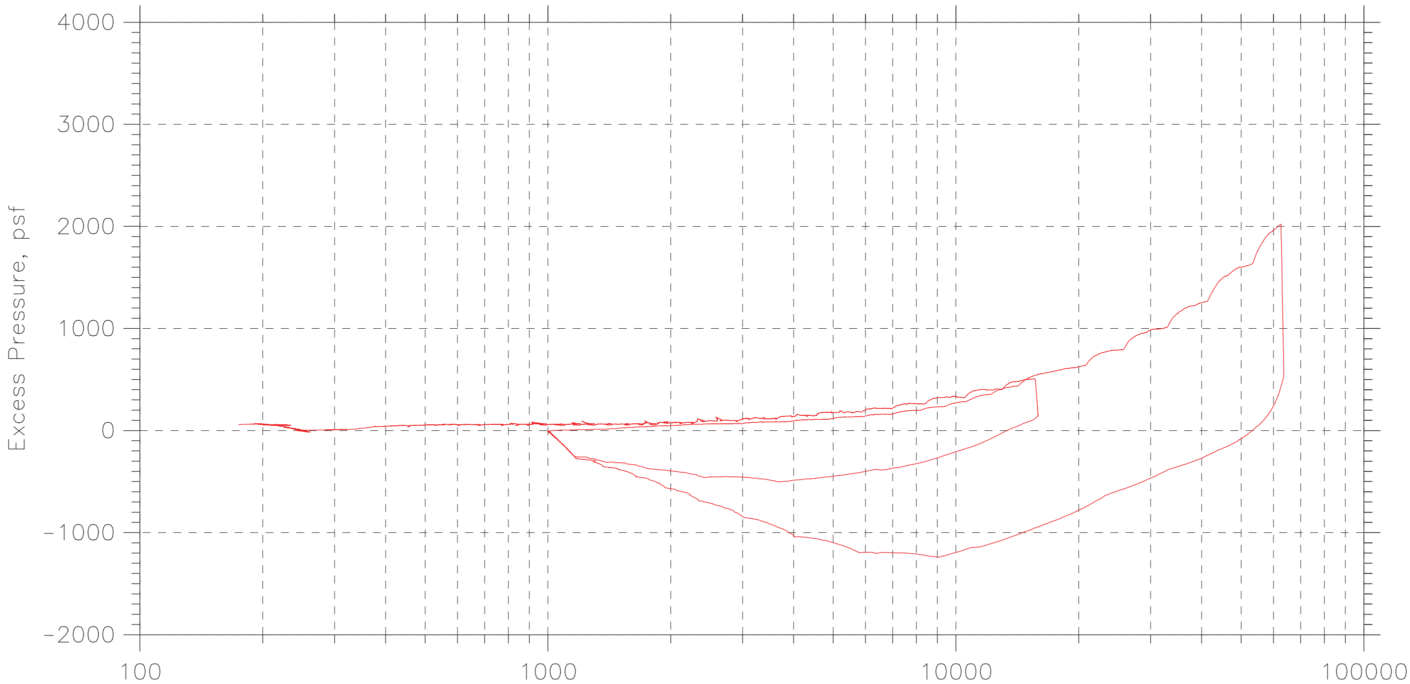


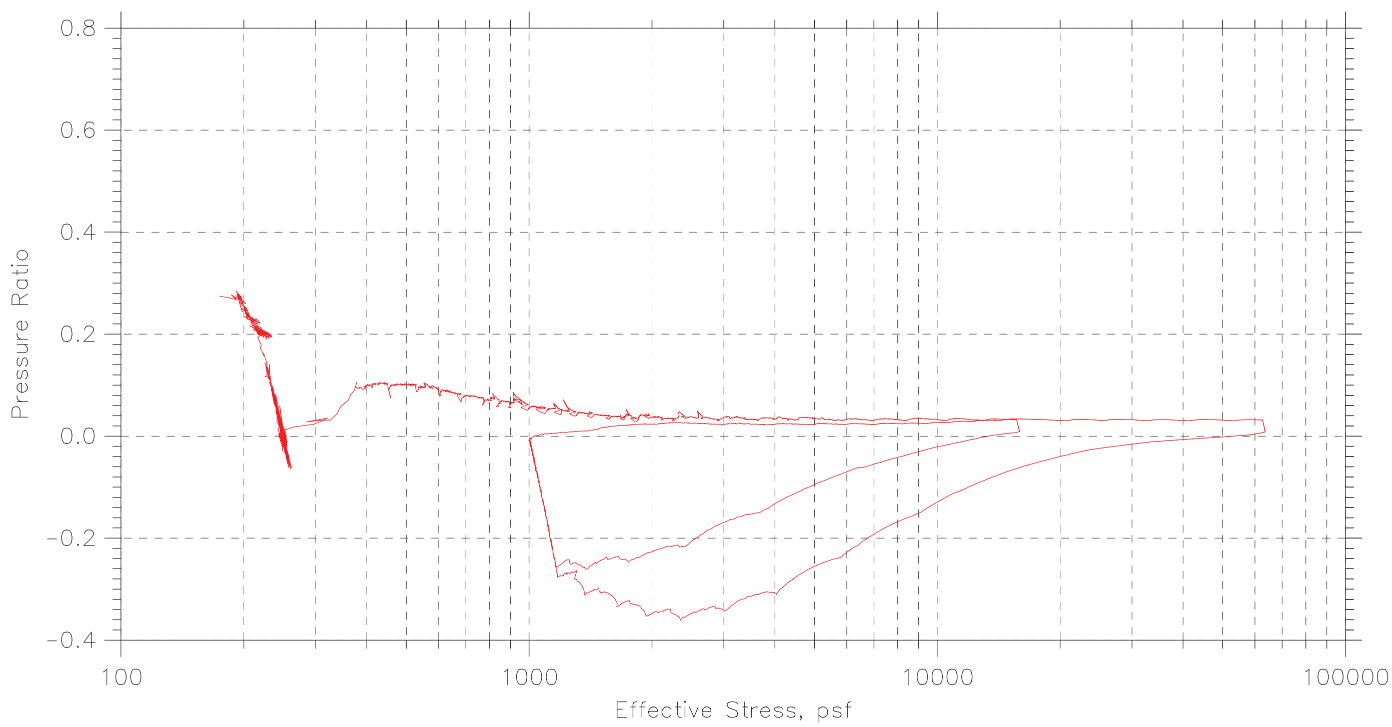
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/06/16	Depth: 69-71 ft
Test No.: CRC-3	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 1 of 3

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S1-11	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/06/16	Depth: 69-71 ft
Test No.: CRC-3	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System F		
		Page 2 of 3

Thu, 23-JUN-2016 15:52:48

CRC TEST DATA

Project: Reconstruction of Exit
Location: Hartford, CT
Project No.: GTX-304831
Boring No.: S1-11
Tested By: md
Checked By: njh
Sample No.: UP-3
Test Date: 06/06/16
Depth: 69-71 ft
Test No.: CRC-3
Sample Type: intact
Elevation: ---

Soil Description: Moist, reddish brown clay
Remarks: System F

Estimated Specific Gravity: 2.86
Liquid Limit: 40
Specimen Diameter: 2.50 in
Initial Void Ratio: 1.02
Plastic Limit: 21
Initial Height: 1.00 in
Final Void Ratio: 0.834
Plasticity Index: 19
Final Height: 0.91 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A-583	RING		B572
Wt. Container + Wet Soil, gm	171.15	263.65	256.58	156.03
Wt. Container + Dry Soil, gm	127.59	223.28	223.28	122.78
Wt. Container, gm	8.3600	109.19	109.19	8.8500
Wt. Dry Soil, gm	119.23	114.09	114.09	113.93
Water Content, %	36.53	35.38	29.18	29.18
Void Ratio	---	1.02	0.834	---
Degree of Saturation, %	---	99.58	100.00	---
Dry Unit Weight, pcf	---	88.545	97.302	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	daa
Sample ID:	---	Test Date:	06/27/16	Checked By:	jsc
Depth :	---	Test Id:	381989		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	---
S2-1	C2	98.5-99 ft	164	7103	3	Yes	---
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S1-12		
Sample ID:	C1		
Depth:	112.5-113 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average	
Specimen Length, in:	4.47	4.47	4.47	
Specimen Diameter, in:	1.98	1.99	1.99	
Specimen Mass, g:	598.58			
Bulk Density, lb/ft^3	165	**Minimum Diameter Tolerence Met?**	**YES**	
Length to Diameter Ratio:	2.3	**Length to Diameter Ratio Tolerance Met?**	**YES**	

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **YES**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00240	0.00240	0.00240	0.00240	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00050	0.00250	0.00270	0.00280
Diameter 2, in (rotated 90^o)	0.00150	0.00110	0.00080	0.00050	0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00050	0.00030	0.00020	0.00010

Difference between max and min readings, in:

0° = 0.00290 90° = 0.00150

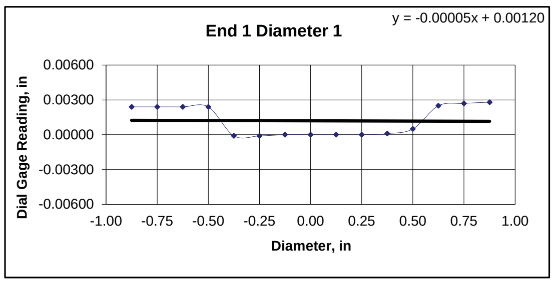
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00060	-0.00040	-0.00030	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00020	-0.00020	-0.00020	-0.00020	-0.00020	-0.00020	0.00020
Diameter 2, in (rotated 90^o)	-0.00230	-0.00240	-0.00200	-0.00130	-0.00040	-0.00070	-0.00060	0.00000	-0.00030	0.00020	0.00030	0.00060	0.00080	0.00130	0.00270

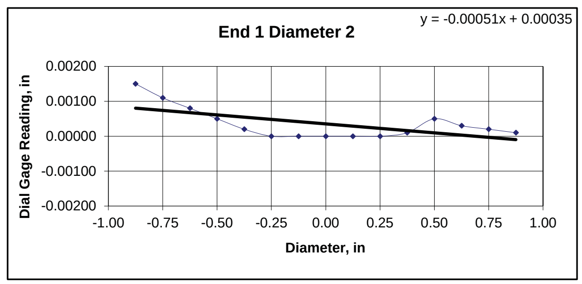
Difference between max and min readings, in:

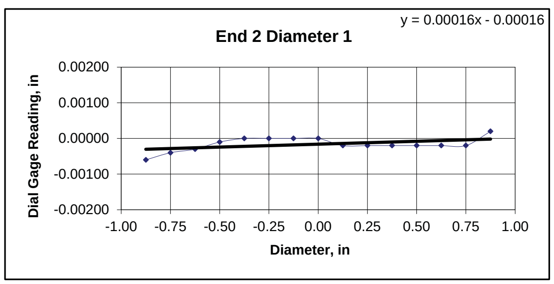
0° = 0.0008 90° = 0.0051

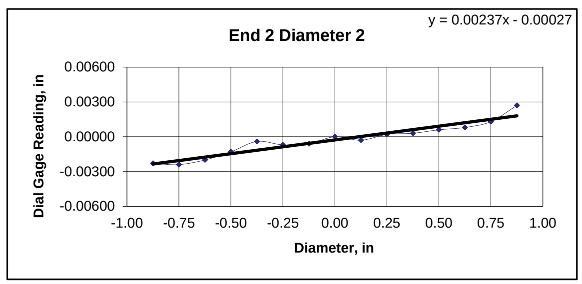
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00255

Flatness Tolerance Met? **NO**









DIAMETER 1

End 1:

Slope of Best Fit Line	0.00005
Angle of Best Fit Line:	0.00286

End 2:

Slope of Best Fit Line	0.00051
Angle of Best Fit Line:	0.02922

Maximum Angular Difference: 0.02636

Parallelism Tolerance Met? **NO**

Spherically Seated

DIAMETER 2

End 1:

Slope of Best Fit Line	0.00016
Angle of Best Fit Line:	0.00917

End 2:

Slope of Best Fit Line	0.00237
Angle of Best Fit Line:	0.13579

Maximum Angular Difference: 0.12662

Parallelism Tolerance Met? **NO**

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00290	1.985	0.00146	0.084	YES
Diameter 2, in (rotated 90^o)	0.00150	1.985	0.00076	0.043	YES
END 2					
Diameter 1, in	0.00080	1.985	0.00040	0.023	YES
Diameter 2, in (rotated 90^o)	0.00510	1.985	0.00257	0.147	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? **YES**

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S1-12	Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	C1		
Depth:	112.5-113 ft		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Freeman Companies, LLC
Project Name:	Reconstruction of Exit Charter Oak Bridge
Project Location:	Hartford, CT
GTX #:	304831
Test Date:	6/25/2016
Tested By:	daa
Checked By:	jsc
Boring ID:	S1-12
Sample ID:	C1
Depth, ft:	112.5-113

After cutting and grinding

After break

APPENDIX D

DRAFT SPECIAL PROVISIONS

ITEM #0203xxxA – EQUIPMENT WORKING PAD

Description:

Form 817, Section 203, Structure Excavation shall apply with the following amendments:

Article 2.03.03 – Construction Methods: Insert the following provisions at the end of Item 2, Preparation of Foundations:

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. Working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment.

ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
D. The average coating thickness shall be 1/16".
E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight
1 inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 - 15

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

Pay Item	Pay Unit
Lightweight Fill	c.y.

Geotechnical Report
Bridge 00480, I-91 over Airport Road
Relocation of I-91 NB Interchange 29 and Widening of I-91 NB and Rt. 15 and I-84 EB
State Project No. 63-703
Hartford, Connecticut

December 28, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME
333 East River Drive
Suite 400
East Hartford, CT 06108

Prepared by:

Freeman Companies, LLC
36 John Street
Hartford, CT 06106

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Vice President of Geotechnical Services

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2. Subsurface Exploration Location Plan
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B. Previous Test Boring Logs
C. Results of Laboratory Testing
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1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for the proposed improvements to Bridge 00480. The bridge carries Interstate 91 over Airport Road in Hartford, Connecticut.

The proposed improvements include widening the bridge on the northbound (east) side by 14 feet. We recommend that the bridge be supported on drilled micropiles socketed into bedrock to avoid critical utilities located within the proposed widening. Our detailed foundation design recommendations follow.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions and prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88. Contract documents for the existing bridge reference NGVD-29. To convert elevations in NGVD-29 to NAVD-88, subtract 0.86 feet.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Description

Bridge 00480 carries I-91 over Airport Road. I-91 Northbound has three travel lanes with breakdown lanes on each side. I-91 Southbound has three travel lanes, a right side off-ramp, and breakdown lanes on each side. Airport Road has two travel lanes in each direction. Bridge grade is about El. 31; Airport Road grade is about El. 14.

Several utilities are located close to the bridge. Two 68-inch by 106-inch elliptical RCP pipes extend southwest toward the bridge from a drainage ditch (wetland) located northeast of the bridge, and are carried beneath the bridge above a water line in a junction box. A 36-inch diameter water main runs beneath the bridge parallel to Airport Road. Telephone and electrical utilities are also present.

FREEMAN COMPANIES

2.2 Existing Bridge

Existing bridge parameters are as follows:

Type:	Single span composite steel bridge
Length/Width:	109 feet long, 139 feet wide
Support:	Two abutments with U-type wingwalls
Bottom of Structure:	North Abutment El. 4.8 (west side) to 7.7 (east side) South Abutment El. 2.7 (west side) to 6.3 (east side)
Foundations:	12BP53 Steel H-Piles, approximately 50% battered 1H:3V

2.3 Proposed Modifications

Bridge 00480 will be widened by 14 feet on the Northbound (east) side. The proposed widening will provide a fourth travel lane. Abutments will be extended on the Northbound side to support the widened bridge. The proposed widening must avoid the various utilities that run beneath the bridge.

The proposed widening will require approach embankment fills on the Northbound side. Proposed slopes range from 2 horizontal to 1 vertical (2H:1V) in areas where there is sufficient space to place embankment fill, to 1.5H:1V due to wetlands at the toe of slope or limited Right-of-Way. Embankment slopes are discussed in a separate report.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included two test borings (S-480-1, S-480-2) and one Cone Penetrometer Test (CPT480-1) conducted May 9 to 10, 2016, and on June 13, 2016, respectively. The test borings were drilled by New England Boring Contractors, Inc., of Glastonbury, Connecticut, and the Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey. Test borings were drilled adjacent to the north and south abutments on the east side; the CPT was drilled in the median of Airport Road on the east side of the bridge. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

Test borings S-480-1 and S-480-2-OW were drilled to depths of 59 to 59.5 feet below ground surface. Standard Penetration Tests were conducted at maximum 5 foot intervals and two five-foot-long NX-size rock core samples were recovered from each boring. Boring S-480-1 was backfilled with drill cuttings. Boring S-480-2 OW was backfilled with well materials and a roadway box was placed at ground surface to protect the installation.

CPT-480-1 was drilled to a depth of 42.5 feet below ground surface. The CPT was advanced using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A.

FREEMAN COMPANIES

3.2 Previous Subsurface Explorations

Several previous test borings, B-22 through B-25 were drilled for Bridge 00480, and are applicable to the proposed widening. Boring logs are shown in profile on the contact drawings in Appendix B, Previous Explorations.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Two pH tests, two electrical resistivity tests, and two soluble sulfate tests
- One grain size analysis
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Results of Laboratory Testing.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered generally consist of sand and silt, Varved Clay, and Glacial Till overlying bedrock as described below. A subsurface profile along the proposed structure is shown on Figure 3, Subsurface Profile. Subsurface data are summarized on Table I included at the end of the report.

THICKNESS (FT)	STRATUM	GENERALIZED DESCRIPTION
7 to 14	Fill	Loose to very dense, brown to gray c-f SAND, some silt, little c-f gravel, trace brick and wood. Standard Penetration Test N-Values typically ranged from 9 to 63 blows per foot (bpf).
6 to 12	Alluvium	Very loose to medium dense gray clayey SILT, to gray f SAND, some silt, trace f gravel. SPT N-Values ranged from about 1 to 20 bpf.
4 to 7	Lacustrine	Soft to medium stiff brown CLAY, trace fine sand. SPT N-Values ranged from 3 to 4 bpf.
4 to 17	Glacial Till	Very dense, red to brown, SILT and f GRAVEL, some f sand, some silt, with rock fragments. Red-brown, c-f SAND, some clayey silt, some c-f gravel. SPT N-Values ranged from 56 to more than 100 bpf.
	Bedrock	Red-brown, fresh to slightly weathered, strong ARKOSE, with low angle bedding joints and occasional fractured zones. Results of an unconfined compression test indicated an unconfined compression strength of 8,063 pounds per square inch.

Groundwater – Water was encountered in the borings at depths ranging from 0 to 13 feet, corresponding to El 2 to El. 10. However, groundwater levels were measured during drilling activities and may not represent static levels. Observation well S-480-2 OW was dry at 13.7 feet (El. 1.1) five months after the well was installed. This measurement was made following a period of relatively dry weather. Water levels will vary with season, water levels in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S-480-1 (Abutment 1) and S-480-2 OW (Abutment 2). Results are summarized below:

Test parameter	S-480-1, 14'-16'	S-480-2 OW, 9'-11'
Ph	4.5	6.3
Electrical Resistivity (ohm-cm)	3,099	1,892
Sulfates (ppm)	543	355

Soil with a pH value lower than 5.5, or soil with electrical resistivity less than 2,000 ohm-cm, or sulfates greater than 1,000 ppm is considered to be a "potential pile deterioration or corrosion situation" per AASHTO 10.7.5.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Recommended Soil Properties

STRATUM	TOTAL UNIT WEIGHT (PCF)	DRAINED STRENGTH PARAMETERS		UNDRAINED STRENGTH PARAMETERS	
		Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)
New Fill – Pervious Structure Backfill or Pavement Section	125	34	0	---	---
Existing Fill	115	30	0	---	---
Alluvium	115	30	0	---	---
Varved Clay	115	---	---	0	Triaxial: Su = 0.21 x OCR^0.7 x Eff Stress (1) DSS: Su = 0.16 x OCR^0.7 x Eff Stress (1) 1,000 (minimum)
Glacial Till	130	35	0	---	---

(1) Undrained strength relationships were determined by laboratory testing in a previous report prepared by Haley & Aldrich titled *"Geotechnical Laboratory Data Report, Charter Oak Bridge and Approaches, Hartford-East Hartford, Connecticut, State Project No. 63-384"*, dated May 1987.

Bedrock is assumed to have a total unit weight of 160 pounds per cubic foot and an unconfined compression strength of 8,000 pounds per square inch based on the results of laboratory testing.

5.2 Foundation Design Recommendations

The existing bridge is supported on Steel H-Piles. Considering the various utilities in the vicinity of the proposed widening, we recommend that the bridge widening be supported on micropiles drilled into bedrock. Design recommendations are provided below:

- Footings or Pile Cap Foundation Depth: Minimum of 4 feet below the lowest adjacent ground surface.
- Backfill Material: Pervious Structure Backfill (CTDOT Form 817 M.02.05) behind the abutments and abutment wingwalls. Place above a line defined by a 1V:1.5H slope extending up from the heel of the footing to grade.
- Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- Lateral Earth Pressures: Refer to Figure 4 – Active Earth Pressures
- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils.
- Micropile Design: Design micropiles with a 10-inch diameter bonded zone socketed into bedrock. Design Micropiles as Type A.
- Corrosion Protection: Soils are considered corrosive per AASHTO 10.7.5. Provide double corrosion protection (bar surrounded by grout covered by plastic sheath surrounded by grout).
- Strength Limit Axial Compression: 576 kips assuming a grout-to-rock bond strength of 11 ksf, and a 20-foot-long bonded length in rock. The low estimated bond strength reflects the low RQD values in the rock cores. Other capacities can be obtained by shortening or lengthening the bonded length
- Service Limit (Allowable) Axial Compression: 290 kips, assuming a grout-to-rock bond strength of 11 ksf, a 20-foot-long bonded length in rock, and a resistance factor of 0.5 (AASHTO Table 10.5.5.2.5-1)
- Minimum Spacing: Minimum 30 inches or 3 times the pile diameter, whichever is greater (AASHTO 10.9.1.2)
- Settlement: Maximum total settlement of micropile is estimated at less than ¼ inch. This settlement will occur during construction. Settlement due to filling behind the widened abutment is also expected to result in less than ¼ inch. This settlement is not sufficient to trigger downdrag loads on piles.
- Load Tests: We recommend that a minimum of two load tests be required for this project, one at each abutment.
- Lateral Resistance: Install micropiles in batter where needed to resist lateral loads. Additional lateral loading in bending will be provided once pile loading has been established. For a micropile with a 9.625-inch O.D. outer casing and a No. 28 central rebar, the following lateral loads and deflections were calculated using the computer program L-Pile. Results are presented in Appendix D.

Head Condition	Lateral Load (kips)	Deflection At Top (Inch)
Fixed Head	24	1
Fixed Head	15	1/2
Free Head	7	1

- Drilling: Use casing through soil.
- Subgrade Preparation Below Pile Cap: Recommend minimum 12-inch thick layer of crushed stone overlying separation fabric over the subgrade.
- Approach Slab: Recommended to reduce abrupt transition from earth to pile support.
- Estimated Pile Length: Estimated lengths are provided in the table below:

Substructure	Bottom of Structure El.	Estimated Pile Length* (Ft.)
North Abutment	7.7	60
East Wingwall	7.7 to 20.6	60 to 73
South Abutment	6.3	61
East Wingwall	6.3 to 22.3	61 to 77

* Includes 20-foot-long bonded length in rock.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Micropile Installation

We recommend that micropiles be drilled with a temporary casing. Micropile drilling equipment must be capable of drilling through the overburden which includes glacial till, and be capable of penetrating through fractured and intact bedrock. Drilling techniques should limit loss of ground. During casing removal, the casing should remain full of grout to limit the potential for drill hole collapse. Contractors should expect that tremie placement of grout will be required.

6.3 Pile Cap Bearing Surface Preparation

Excavated subgrades for the pile cap should be covered with separation fabric and crushed stone placed over the fabric, and then proofrolled with a vibratory plate compactor. If the subgrade beneath the crushed stone is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional crushed stone over fabric. If vibratory proof compaction of the subgrade proves detrimental due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.4 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.5 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.6 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However, the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

FIGURES

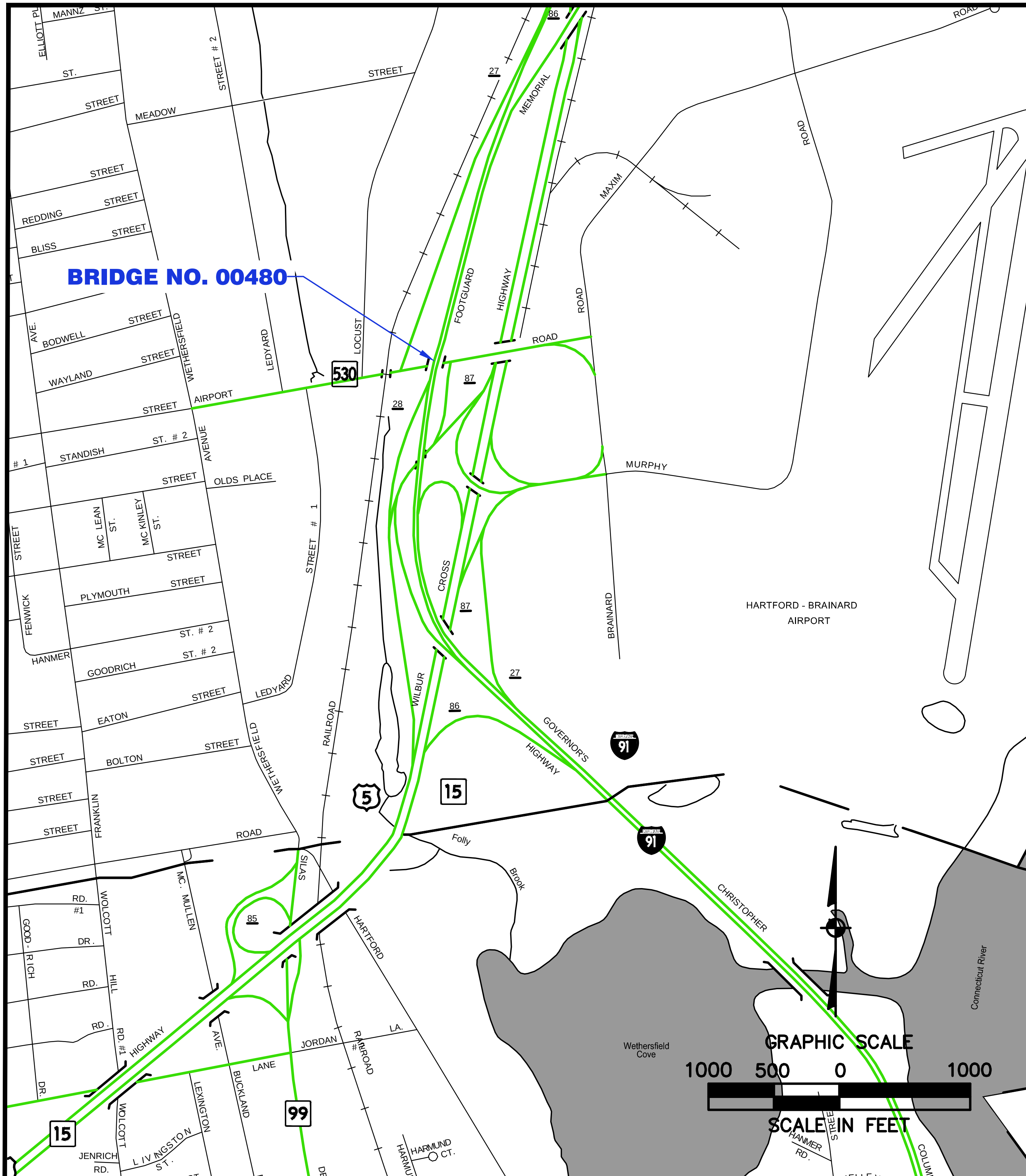
2014-1001
Rehabilitation of Bridge 00480, I-91 over Airport Road
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
Hartford, Connecticut

Table 1
Subsurface Data

Boring No.	Ground Surface El.	Depth (ft.)	Thickness (ft.)						Groundwater		Bedrock		
			Pavement/Topsoil	Fill	Alluvium	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation	
Recent Test Borings													
S480-1	15.4	59.5 C	0.5	7.5	20	5	16.5	0.5	NM	---	49.5	-34.1	
S480-2 OW	14.9	59 C		14	15	4	14	2	Dry at 13.75'	Below 1..1	47	-32.1	
Recent Cone Penetration Test													
CPT480-1	14.6	40.5	---	9	21	7	4		13	1.6	---	---	
Previous Test Borings													
B-20	10.2	27.5	---	13	7	3	4.5	---	0	10.2	---	---	
B-21	10.1	35	---	9.5	12	3.5	4	---	4	6.1	29	-18.9	
B-22	11.1	55	---	4.5	20.5	4	16	---	4.5	6.6	45	-31.9	
B-23	10.1	41	---	12	6	---	9	---	3.5	6.6	27	-15.9	14
B-24	10.6	43	---	12	12	---	13	---	0.5	10.1	37	-26.4	
B-25	9.1	53	---	12	11	---	20	---	2.5	6.6	43	-33.9	
B-260		17	---	7	10	---	---	---	7				
B-264		17	---	17	---	---	---	---	NE	NE	---	---	
B-265		17	---	17	---	---	---	---	NE	NE	---	---	

Notes:

1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
2. Groundwater levels are approximate.
3. Top of bedrock depth is inclusive of weathered bedrock.
4. ">" - Greater Than "--" - Not Encountered (C) - Bedrock Core Taken (R) - Terminated at Refusal "NM" - Not Measured



FREEMAN COMPANIES
LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES
36 JOHN STREET
HARTFORD, CT 06106
WWW.FREEMANCOS.COM
TEL:(860)251-9550
FAX:(860)986-7161
ELEVATE YOUR EXPECTATIONS

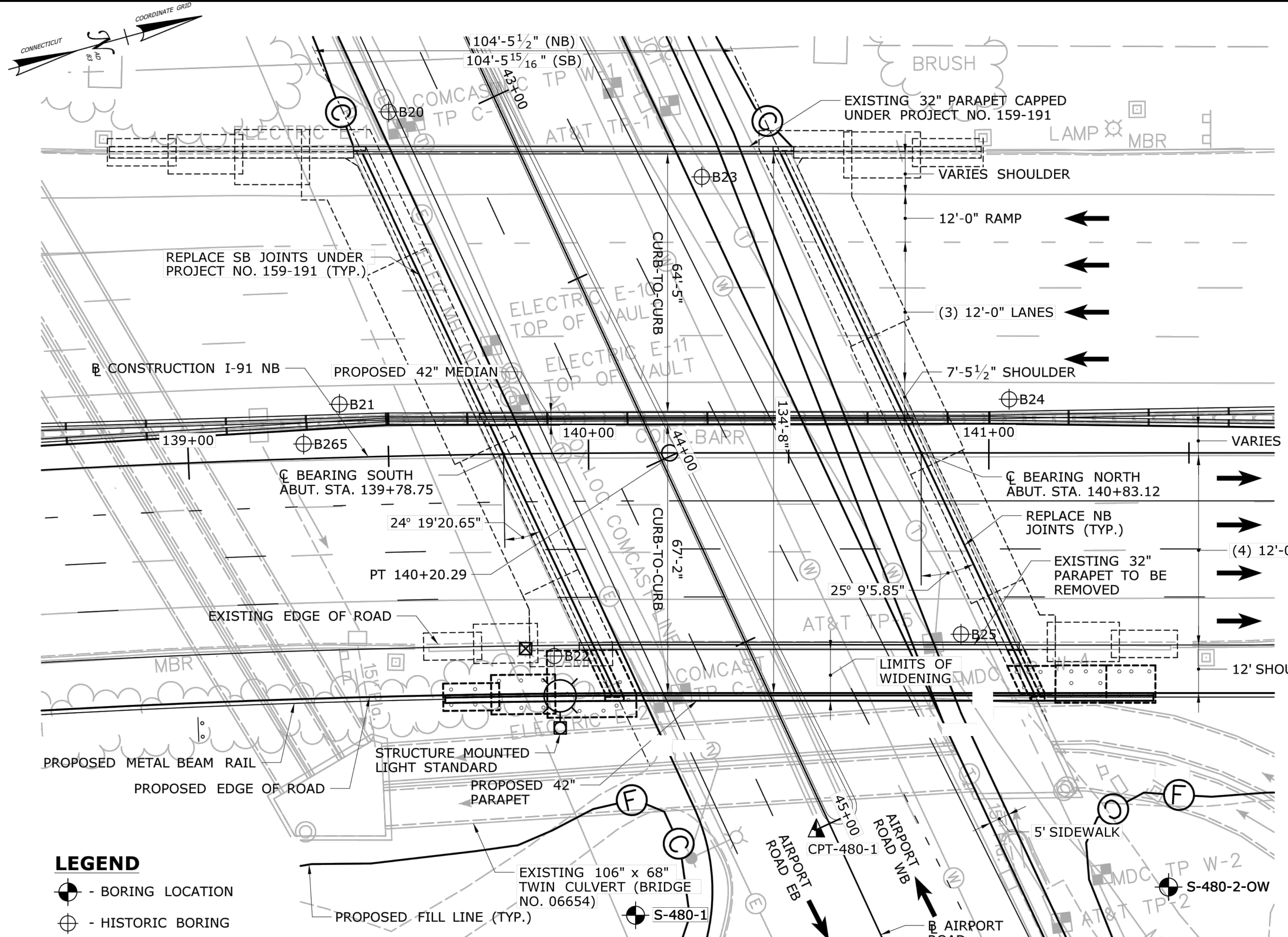
SUBSURFACE EXPLORATION LOCATION PLAN

BRIDGE NO. 00480
I-91 OVER AIRPORT ROAD
STATE PROJECT No. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	T.T
CHECKED:	A.M.
APPROVED:	A.M.
SCALED:	1"=1000'
PROJECT NO.:	2014-1001
DATE:	11/9/2016

SHEET NO.

FIGURE 1



NOTES:

1. BASE PLAN PREPARED BY CME ASSOCIATES, INC.
2. EXPLORATION LOCATIONS WERE PROVIDED BY CME ASSOCIATES, INC.
3. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION

LEGEND

- BORING LOCATION
- HISTORIC BORING
- CONE PENETRATION TEST

GENERAL PLAN

GRAPHIC SCALE

30 15 0 30

SCALE IN FEET

SUBSURFACE EXPLORATION LOCATION PLAN

STRUCTURE 00480

STATE PROJECT No. 63-703

HARTFORD, CONNECTICUT

FREEMAN COMPANIES

LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

FREEMAN COMPANIES, LLC

36 JOHN STREET
HARTFORD, CT 06106
WWW.FREEMANCOS.COM
TEL:(860)251-9550
TOLL FREE:(800)604-5141
FAX:(860)986-7161

ELEVATE YOUR EXPECTATIONS

No.	Date	Description
1	12/29/16	UPDATED BASE PLAN

REVISIONS

DRAWN:	T.T.
CHECKED:	A.M.
APPROVED:	N.W.
SCALE:	1"=30'
PROJECT NO.:	2014-1001
DATE:	09/08/2016

SHEET NO.

FIGURE 2

SUBSURFACE DIAGRAM

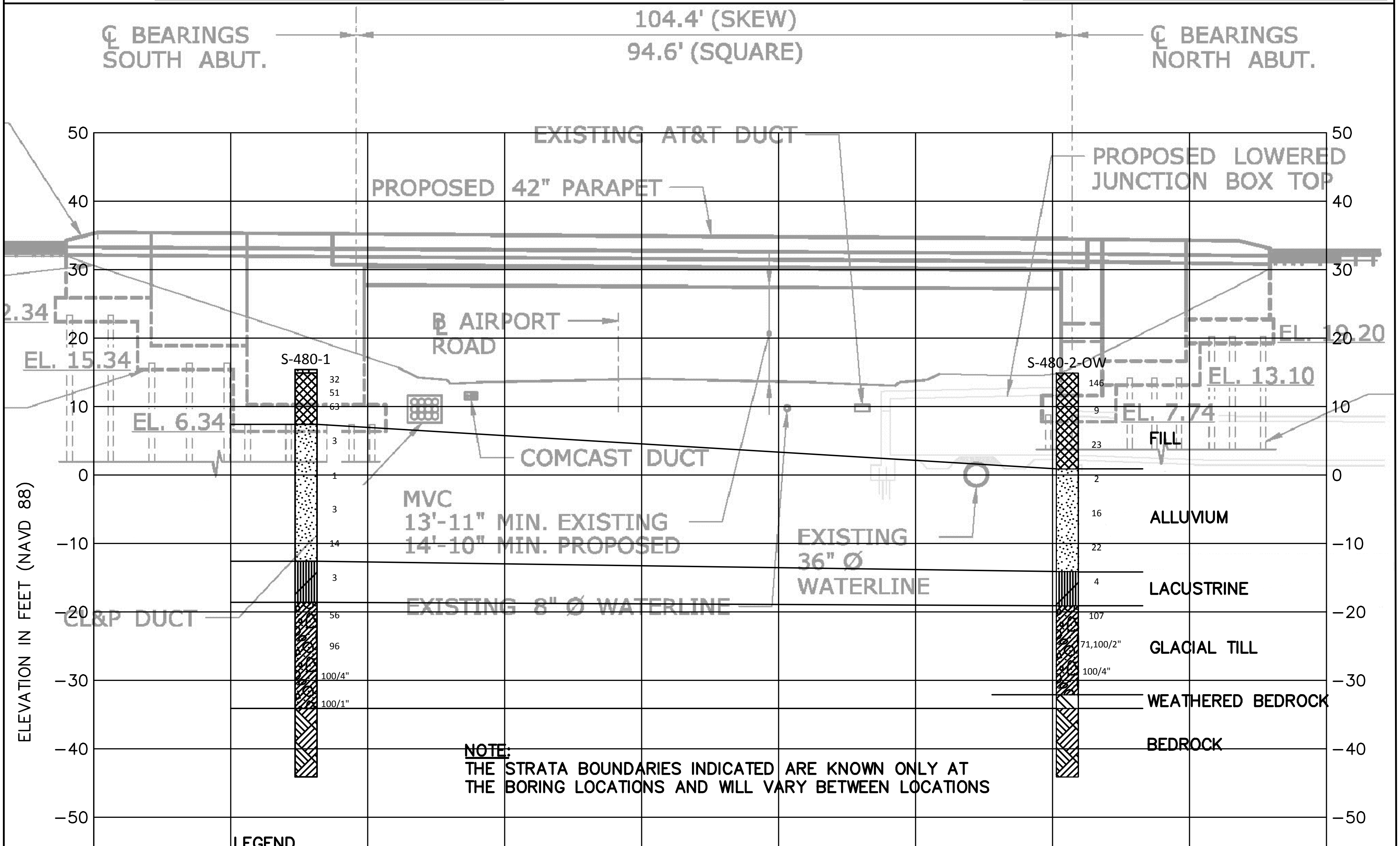
Freeman Companies, LLC
36 John Street
Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Rehabilitation of Bridge 00480

PROJECT LOCATION Hartford

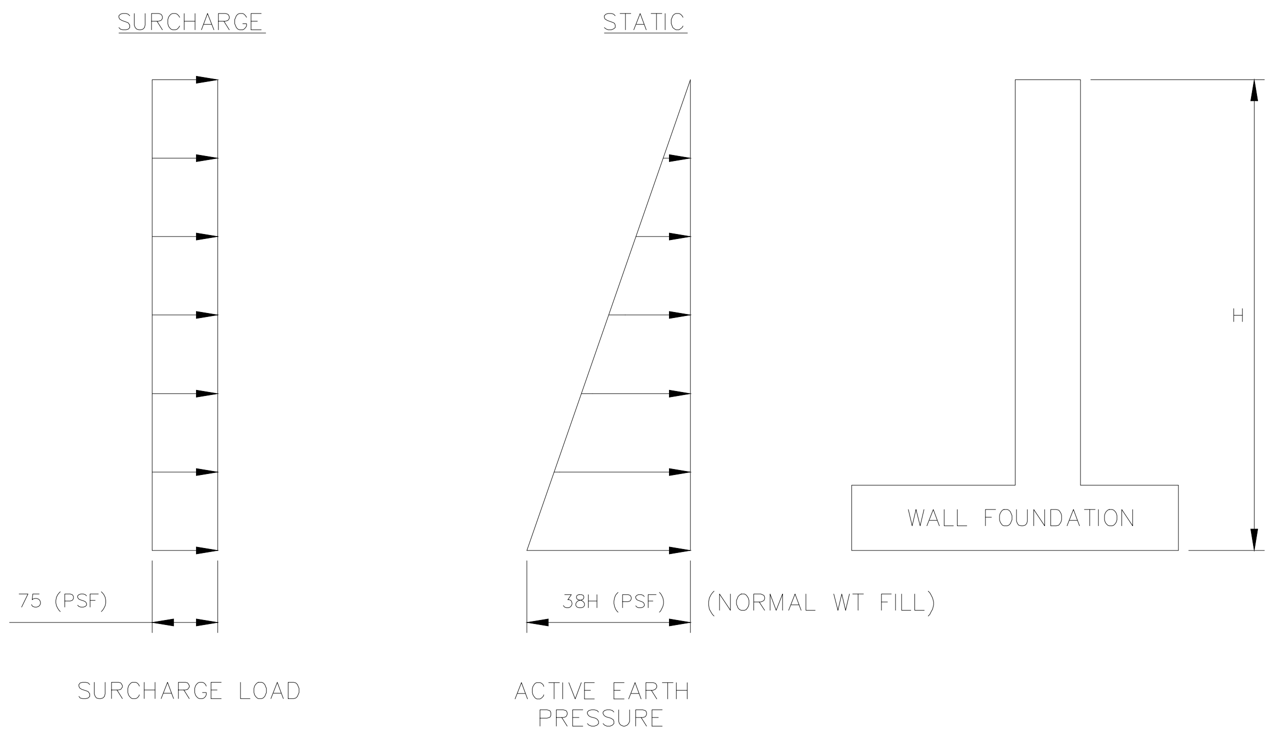


LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'

FIGURE 3

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CMEGEOT\GINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ



NOTES:

1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
2. H IS MEASURED IN FEET
3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
5. SLIDING:
   COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3–1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

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ELEVATE YOUR EXPECTATIONS

LATERAL EARTH PRESSURES
ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 00480
I-91 OVER AIRPORT ROAD
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014–1001
DATE:	11/07/2016

FIG.

FIGURE 4

APPENDIX A

RECENT EXPLORATION LOGS

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S-480-1
Inspector: J. Herpich	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 829822.82
Start Date: 5-9-16	Route No.: I-91 NB over Airport Road	Easting: 1023472.02
Finish Date: 5-10-16	Bridge No.: 00480	Surface Elevation: 15.4
Project Description: Relocation of I-91 NB Interchange 29 & Widening		
Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 140lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	
Groundwater Observations:		

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0									Topsoil	TOPSOIL (6")	15
	S1	3	14	18	21	24	14		Fill	Brown c-f SAND, some silt, little f gravel	
	S2	16	27	24	31	24	14			Brown to gray c-f SAND, some silt, little c-f gravel	
5	S3	44	39	24	13	24	12			Brown to gray c-f SAND, some silt, little c-f gravel	10
									Alluvium		
10	S4	1	1	2	2	24	12			Gray CLAY, some f sand	5
15	S5	wor	wor	1	1	24	24			Gray SILT and f SAND	0
20	S6	1	1	2	3	24	22			Gray SILT and f SAND	-5
25	S7	7	6	8	7	24	12			Gray c-f SAND, little silt	-10
									Lacustrine		
30	S8	wor	1	2	2	24	24			Brown CLAY, trace f sand	-15
									Glacial Till		

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: 49.5ft Rock: 10ft	NOTES:	Sheet 1 of 2
No. of Soil Samples: 12 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**		Hole No.: S-480-1
Inspector: J. Herpich	Town: Hartford		Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703		Northing: 829822.82
Start Date: 5-9-16	Route No.: I-91 NB over Airport Road		Easting: 1023472.02
Finish Date: 5-10-16	Bridge No.: 00480		Surface Elevation: 15.4
Project Description: Relocation of I-91 NB Interchange 29 & Widening			
Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID		Core Barrel Type: NX
Hammer Wt.: 140lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.		
Groundwater Observations:			

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S9	10 16 40 55	24	24		Glacial Till *(con't)*	Brown SILT and f GRAVEL, some c-f sand	-20
40	S10	38 54 42 41	24	14			Brown to red c-f SAND and f GRAVEL, some silt	-25
45	S11	41 100/4"	10	8			Brown to red c-f SAND and SILT, some f gravel	-30
50	S12	100/1"	1	1		Bedrock		-35
	C-1		60	58	17		Red-brown, fresh to slightly weathered, strong ARKOSE, numerous fractured zones that appear to be a combination of low angle bedding joints and high angle joints.	
55	C-2		60	60	38		Red-brown, fresh to slightly weathered, strong ARKOSE, numerous fractured zones that appear to be a combination of low angle bedding joints and high angle joints.	-40
60							END OF BORING 59.5ft	-45
65								-50

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: 49.5ft Rock: 10ft	NOTES:	Sheet 2 of 2
No. of Soil Samples: 12 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S-480-2 OW
Inspector: J. Herpich	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 829934.23
Start Date: 5-10-16	Route No.: I-91 NB over Airport Road	Easting: 1023486.2
Finish Date: 5-10-16	Bridge No.: 00480	Surface Elevation: 14.9

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @dry at 13.75 ft 10/17/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	39	100	46	29	24	12		Fill	4" Compressed black tar mixed with gravel, some sand Gray to red c-f SAND and c-f GRAVEL	
5	S2	5	5	4	4	24	5			Brown to red c-f SAND, little silt, trace f gravel	10
10	S3	11	13	10	7	24	6			Gray SILT, some c-f gravel, some c-f sand, trace brick and wood	5
15	S4	wor	1	1	2	24	24		Alluvium	Gray CLAYEY SILT, trace f sand	0
20	S5	9	9	7	8	24	10			Gray f SAND, some silt, trace f gravel	-5
25	S6	9	9	13	17	24	11			Gray f SAND, some silt	-10
30	S7	12	2	2	4	24	18		Lacustrine	Red CLAY, some f sand	-15
									Glacial Till		

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: 49.5ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 1 of 2
No. of Soil Samples: 10 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S-480-2 OW
Inspector: J. Herpich	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 829934.23
Start Date: 5-10-16	Route No.: I-91 NB over Airport Road	Easting: 1023486.2
Finish Date: 5-10-16	Bridge No.: 00480	Surface Elevation: 14.9

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @dry at 13.75 ft 10/17/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	6 32 75 60	24	5		Glacial Till *(con't)*	Red CLAY, some c-f sand, some c-f gravel, some silt	-20
40	S9	100 71 100/2"	14	8			Red CLAY and c-f GRAVEL, some f sand, some silt, trace rock	-25
45	S10	100/4"	4	3			Brown c-f GRAVEL, some silt, some c-f sand	-30
						Weathered Rock		
50	C-1		60	56	28	Bedrock	Red-brown, fresh to slightly weathered, strong, ARKOSE, mostly low angle joints parallel to bedding, with occasional fractured zones and moderately dipping (45 degree) joints.	-35
55	C-2		60	57	48		Red-brown, fresh to slightly weathered, strong, ARKOSE, mostly low angle joints parallel to bedding, with occasional fractured zones and moderately dipping (45 degree), stained joints.	-40
60							END OF BORING 59ft	-45
65								-50

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%

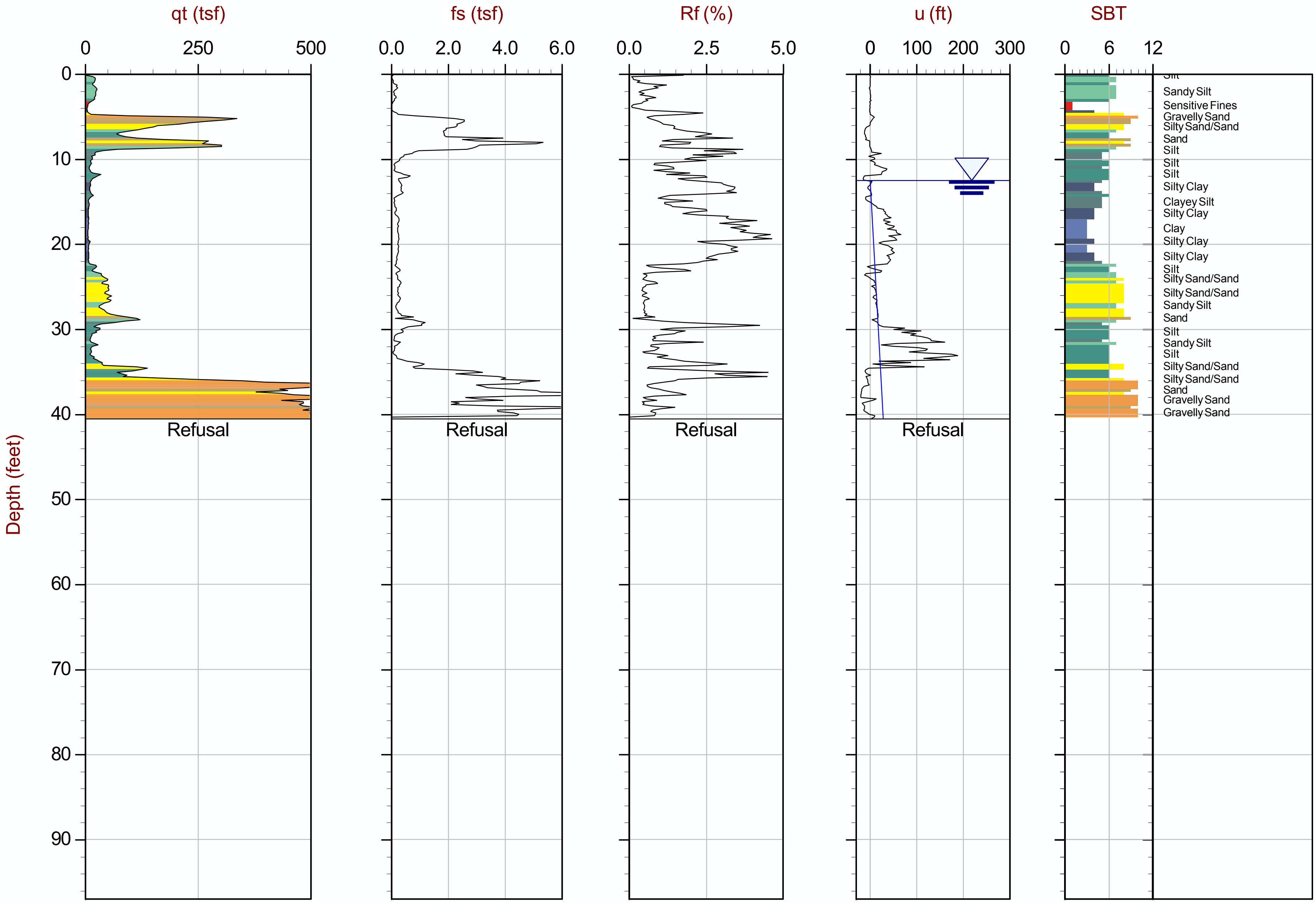
Total Penetration in Earth: 49.5ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 2 of 2
No. of Soil Samples: 10 No. of Core Runs: 2		SM-001-M REV. 1/02

ConeTec

Freeman Companies

Job No: 16-53057
Date: 06:13:16 21:08
Site: I-91 Interchange 29, Hartford, CT

Sounding: CPT16-480-1
Cone: 419:T1500F15U500



Max Depth: 12.350 m / 40.52 ft
Depth Inc: 0.050 m / 0.164 ft

File: 16-53057_CP480-1.DRF

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 18 N: 4623396m E: 694269m

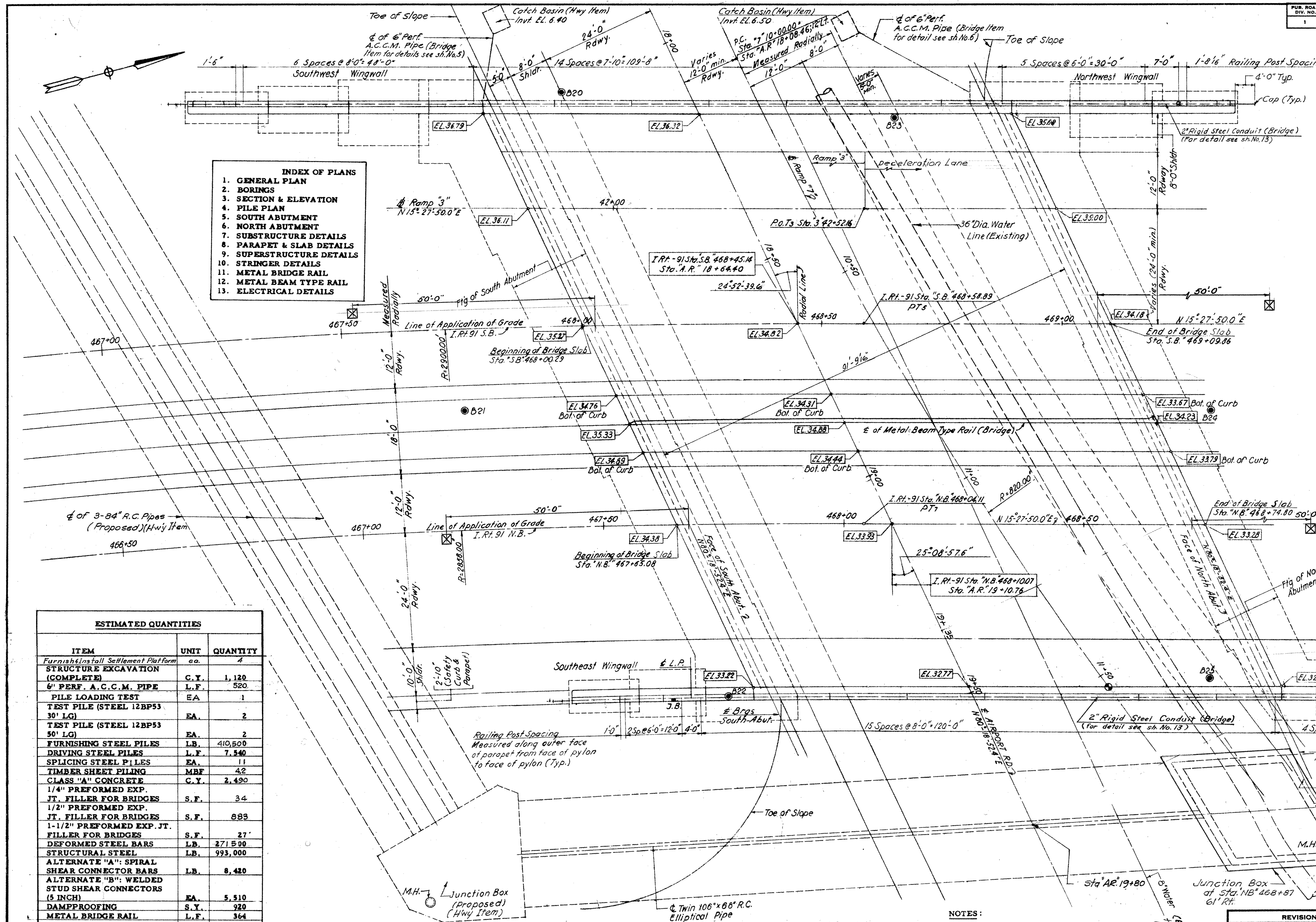
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

APPENDIX B

PREVIOUS TEST BORING LOGS

PUB. ROAD DIV. NO.	STATE	TOWN	FED. AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONN.	HARTFORD	I-91-3(39)34	63-166	1961	I-91	127	343



INDEX OF PLANS

GENERAL NOTES

SPECIFICATIONS: CONN. STATE HIGHWAY DEPARTMENT FORM 808 (JAN. 1955) AND SPECIAL PROVISIONS.

DESIGN SPECIFICATIONS: STD. SPEC. FOR HWY. BRIDGES (AASHO-1957) EXCEPT AS MODIFIED BY THE BUREAU OF PUBLIC ROADS "POLICY ON INTERSTATE SYSTEM PROJECTS" (AUG. 1956) AND AS SUPPLEMENTED BY THE CONN. STATE HWY. DEPT. BRIDGE MANUAL FEB. 1956. SLAB DESIGN - TENTATIVE AASHO T8 (1959)

LIVE LOAD: H20-S16-44. ALT. 24000# DUAL AXLE AT 4'-0" O.C.

FUTURE PAVING ALLOWANCE: 25# P.S.F.

COMPOSITE CONSTRUCTION: NO TEMPORARY INTERMEDIATE SUPPORTS SHALL BE USED DURING CONSTRUCTION. SUPERIMPOSED LOADS SHALL BE PLACED WHEN DIRECTED BY THE ENGINEER, BUT NOT LESS THAN 10 DAYS AFTER THE SLAB HAS BEEN POURED.

CLASS "A" CONCRETE: CLASS "A" CONCRETE SHALL BE USED THROUGHOUT. SEE SPECIAL PROVISIONS.

DEFORMED STEEL BARS: FOR GRADES OF DEFORMED STEEL BARS, SEE SPECIAL PROVISIONS.

EXPOSED EDGES: EXPOSED EDGES SHALL BE BEVELED 1" x 1" UNLESS DIMENSIONED OTHERWISE.

STRUCTURAL STEEL: ALL MATERIAL FOR PLATED ROLLED BEAMS SHALL CONFORM TO ASTM A-373. ALL OTHER STEEL SHALL CONFORM TO ASTM A-7 UNLESS NOTED OTHERWISE.

PAINTING: FOR SHOP AND FIELD PAINTING OF STRUCTURAL STEEL AND METAL BRIDGE RAIL, SEE SPECIAL PROVISIONS.

JOINT SEAL: JOINT SEAL SHALL BE INCLUDED IN THE ITEM FOR CLASS "A" CONCRETE. SEE SPECIAL PROVISIONS.

FELT: THE COST OF FURNISHING AND PLACING 2 LAYERS OF 15# ROOFING FELT ON TOP OF BACKWALLS SHALL BE INCLUDED IN THE ITEM FOR CLASS "A" CONCRETE.

SHEET NUMBERS: WHEREVER REFERENCE IS MADE TO A SHEET NUMBER PERTAINING TO THE STRUCTURE, IT WILL REFER TO THE BRIDGE SHEET NUMBER SHOWN IN THE BOTTOM TITLE BOX.

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 TRUE CONDITIONS OR ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Furnish & Install Settlement Platform	ea.	4
STRUCTURE EXCAVATION (COMPLETE)	C.Y.	1,120
6" PERF. A.C.C.M. PIPE	L.F.	520
PILE LOADING TEST	EA	1
TEST PILE (STEEL 12BP53 30' LG)	EA.	2
TEST PILE (STEEL 12BP53 50' LG)	EA.	2
FURNISHING STEEL PILES	LB.	410,500
DRIVING STEEL PILES	L.F.	7,540
SPLICING STEEL PILES	EA.	11
TIMBER SHEET PILING	MBF	4.2
CLASS "A" CONCRETE	C.Y.	2,490
1/4" PREFORMED EXP. JT. FILLER FOR BRIDGES	S.F.	34
1/2" PREFORMED EXP. JT. FILLER FOR BRIDGES	S.F.	883
1-1/2" PREFORMED EXP. JT. FILLER FOR BRIDGES	S.F.	27
DEFORMED STEEL BARS	LB.	271 500
STRUCTURAL STEEL	LB.	993,000
ALTERNATE "A": SPIRAL SHEAR CONNECTOR BARS	LB.	8,420
ALTERNATE "B": WELDED STUD SHEAR CONNECTORS (5 INCH)	EA.	5,510
DAMPPROOFING	S.Y.	920
METAL BRIDGE RAIL	L.F.	364
PERVIOUS STRUCTURE BACKFILL	C.Y.	6,300
2" RIGID STEEL CONDUIT (BRIDGE)	L.F.	420
CAST IRON JUNCTION BOX (18"x18"x10")	EA.	1
POINT REINFORCEMENT FOR STEEL PILES	EA.	11
METAL BEAM TYPE RAIL (BRIDGE)	L.F.	109

CONCRETE DISTRIBUTION:

SUPERSTRUCTURE	430	CY
SUBSTRUCTURE	870	CY
FOOTINGS	1190	CY
TOTAL	2490	CY

- ● Location of Boring
- EL.... Top of Pavement Elevation
- Point of Min. Vertical Clearance
- ☒ Settlement Platform
- J.B. Cast Iron Junction Box 18"x18"x10"
- ℄ L.P. Center Line of Lighting Std.

PLAN

Scale 1" = 10'-0"

NOTES:

FOR JUNCTION BOX AND RIGID STEEL CONDUIT DETAILS SEE SH. NO. 13

FOR DETAILS OF BRIDGE RAIL SEE SH. NO. 11

ELEVATIONS ARE BASED ON U.S.C. & G.S. DATUM.

REVISIONS

NO.	DATE	DESCRIPTION

00480

CONNECTICUT
STATE HIGHWAY DEPARTMENT

TOWN OF HARTFORD
INTERSTATE ROUTE 91
OVER
AIRPORT ROAD
GENERAL PLAN

DESIGNED BY LEONARD S. WEGMAN CO., CONTRACTING ENGINEER

SCALES AS SHOWN

MADE BY AK DATE 1-16-61

CHECKED BY LK DATE 1-16-61

APPROVED Herbert Mandelbaum DATE 1-16-61

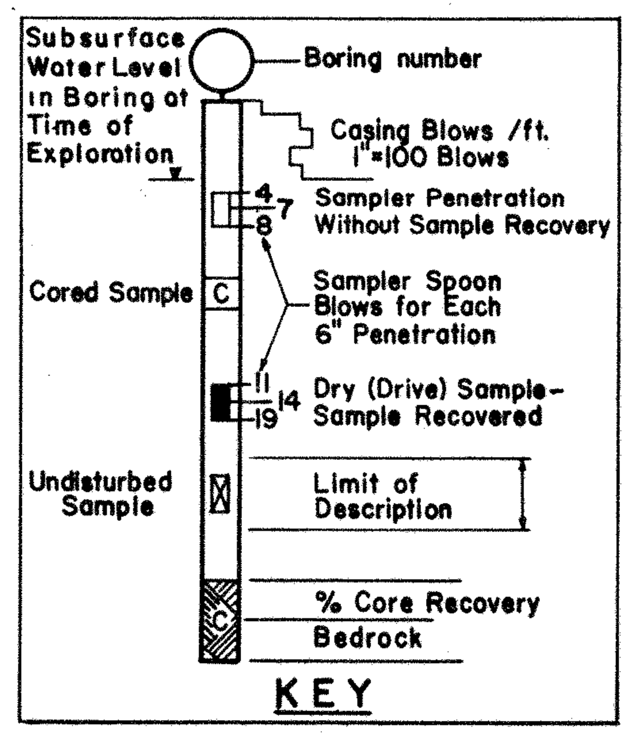
PROJECT NO. 63-166

BRIDGE SHEET NO. 1 OF 13

FORM NO. ENG. 15 ED. 11-52

PUB. ROAD DIV. NO.	STATE	TOWN	FED. AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONN.	HARTFORD	I-91-3(59)36	63-166	1961	I-91	128	343

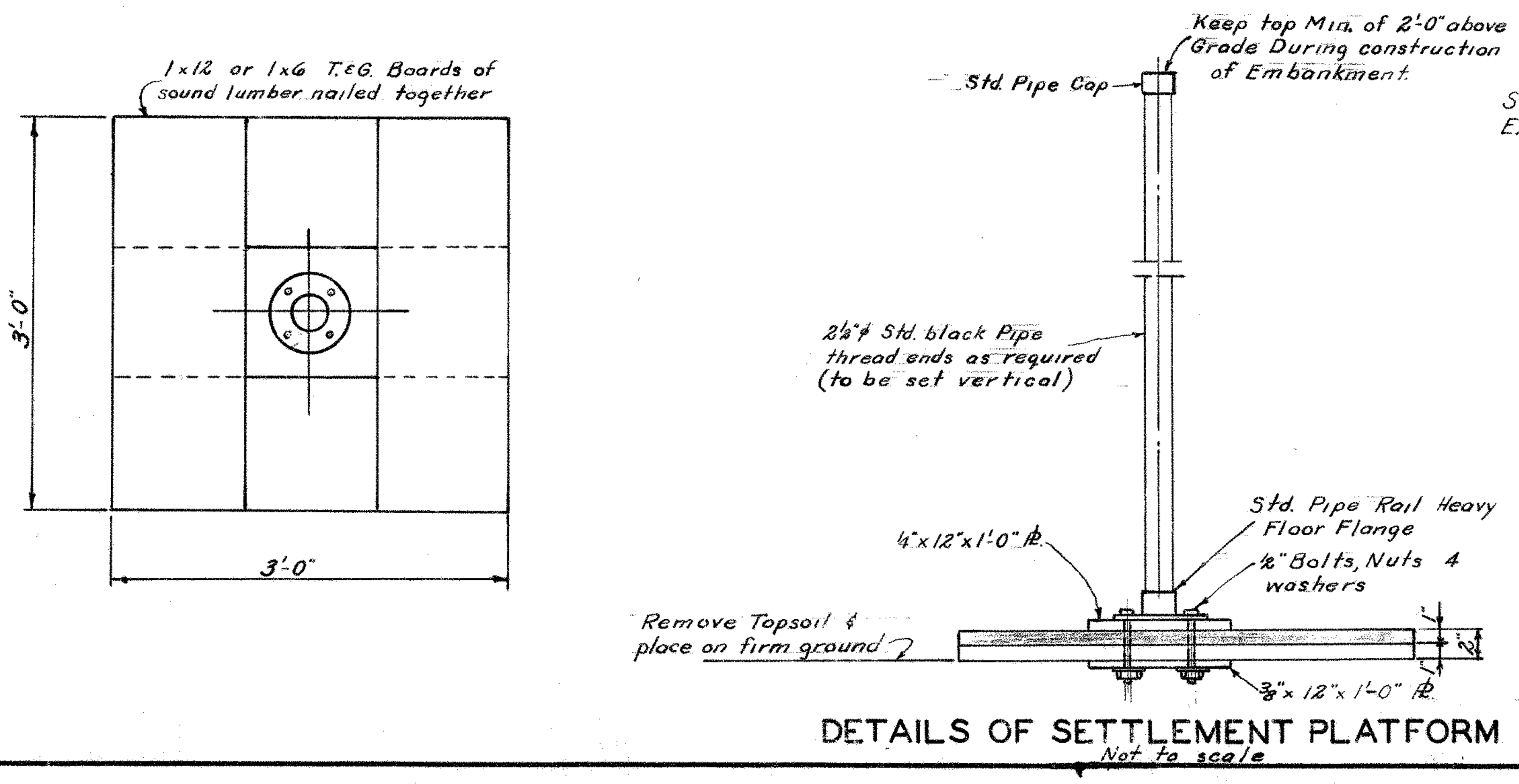
BORINGS



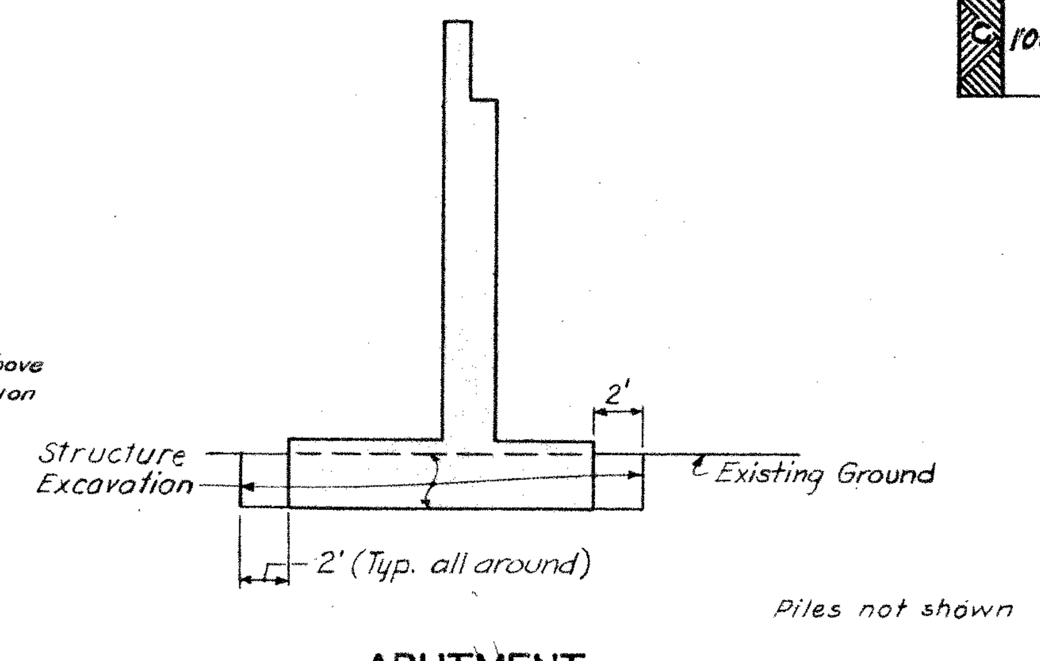
KEY

ABBREVIATIONS

C.	Coarse
F.	Fine
M.	Medium
G.	Gravel
S.	Sand
Boul.	Boulders
Cobb.	Cobbles
lit.	little
Tr.	Trace
Misc.	Miscellaneous
Org.	Organic



DETAILS OF SETTLEMENT PLATFORM
Not to scale



ABUTMENT EXCAVATION LIMITS
Not to Scale

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 TRUE CONDITIONS OR ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.

REVISIONS		
NO.	DATE	DESCRIPTION

CONNECTICUT
STATE HIGHWAY DEPARTMENT
TOWN OF HARTFORD
INTERSTATE ROUTE 91
OVER
AIRPORT ROAD
BORINGS

DESIGNED BY LEONARD S. WEGMAN CO., CONTRACTING ENGINEER
SCALES AS NOTED
PROJECT NO. 63-166
MADE BY ERC DATE 1-16-61
CHECKED BY LK DATE 1-16-61
APPROVED Herbert Mandelbaum DATE 1-16-61
BRIDGE SHEET NO. 2 OF 13

TRIANGLE LITHO PRINT CO., INC.

159 92, 63-166-171

M262-01

S. Ramsdell BORING CREW LEADER G. Ozark INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD, CT PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 1 LOCATION RAMP 5S-A GENERAL BORINGS, INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

PRELIMINARY

LOCATION U.S. ROUTE 5 & 15 S TO AIRPORT ROAD (RAMP 5S-A)

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B260
DATE FINISHED 2/17/87	TYPE	HSA		SS		LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.	4-1/4"		1-3/8"		OFFSET
AT 7.0 FT. AFTER 0 HRS.	HAMMER WT.			140 lbs.	BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL			30"		E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		0.0 - 2.0	1	24	18	D	6	7	9		
									10		Medium dense, red-brown coarse-fine SAND, some silt, trace gravel.
		2.0 - 4.0	2	24	13	D	8	6	7		
									3		(Same as D1), trace cinder. - FILL-
5		4.0 - 6.0	3	24	10	D	3	2	2		Red-brown to gray SILT, some fine sand, little coarse-medium sand.
									2		
		6.0 - 8.0	4	24	20	D	4	4	4	7.0'	
									4		Medium stiff, gray SILT, trace fine sand.
		8.0 - 10.0	5	24	22	D	2	3	4		
10									3		(Same as D4.)
15											
		15.0 - 17.0	6	24	24	D	1	1	1		Soft, gray SILT and fine SAND.
									2		- ALLUVIUM -
											Bottom of Exploration at 17.0 Feet
20											
25											
30											
35											
40											

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH 17.0' FOOTAGE IN ROCK NO. OF SAMPLES 6 HOLE NO. B260

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

S. Ramsdell BORING CREW LEADER G. Ozark INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD, CT PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 1 LOCATION I-91 NB GENERAL BORINGS, INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

PRELIMINARY

LOCATION I-91 NB

SURFACE ELEV.

DATE FINISHED 2/18/87

GROUND WATER OBSERVATIONS

AT NE FT. AFTER 0 HRS.

AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE	HSA		SS	
SIZE I.D.	4"		1-3/8"	
HAMMER WT.			140 lb	BIT
HAMMER FALL			30"	

HOLE NO. B264

LINE & STATION

OFFSET

N. COORDINATE

E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
											0.5 feet ASPHALT
		0.5 - 2.5	1	24	11	D	19	40	34		Very dense red-brown, coarse-fine SAND, some gravel, little silt.
									24		
		2.5 - 4.5	2	24	16	D	17	12	12		Medium dense, red-brown, fine SAND and SILT, trace coarse-medium sand.
5									17		
		4.5 - 6.5	3	24	20	D	6	7	9		Medium dense, red-brown fine SAND, some silt, trace coarse-medium sand.
									9		
		6.5 - 8.5	4	24	20	D	13	19	17		Dense, red-brown medium-fine SAND, trace gravel, trace silt.
									17		
10		8.5 - 10.5	5	24	11	D	13	13	14		Medium dense, (Same as D4.)
									18		
											- FILL -
15											
		15.0 - 17.0	6	24	16	D	1	3	4		Loose, red-brown medium-fine SAND, trace coarse sand, silt.
									3		
											Bottom of Exploration at 17.0 Feet
20											
25											
30											
35											

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH 17.0' FOOTAGE IN ROCK 0' NO. OF SAMPLES 6 HOLE NO. B264

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

S. Ramsdell BORING CREW LEADER G. Ozark INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD, CT PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 1 LOCATION I-91 NB GENERAL BORINGS, INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION I-91 NB

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B265
DATE FINISHED 2/18/87	TYPE	HSA		SS		LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.	4¼"		1-3/8"		OFFSET
AT NE FT. AFTER 0 HRS.	HAMMER WT.			140 lb	BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL			30"		E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
											0.5 feet ASPHALT
		0.5 - 2.5	1	24	16	D	12	43	20		Very dense, red-brown coarse-fine
									13		SAND, little silt, gravel.
		2.5 - 4.5	2	24	14	D	14	10	11		- FILL -
5									12		Medium dense, (Same as D1.)
		4.5 - 6.5	3	24	14	D	3	3	5		Loose, red-brown medium-fine SAND,
									4		little silt.
		6.5 - 8.5	4	24	18	D	3	3	5		Loose, red-brown medium-fine SAND,
									10		trace gravel, silt.
10		8.5 - 10.5	5	24	15	D	14	16	15		Dense, red-brown, medium-fine SAND,
									18		trace gravel, silt.
15											
		15.0 - 17.0	6	24	15	D	10	20	25		Dense, red-brown medium-fine SAND,
									32		little fine gravel, trace
											coarse sand, silt.
											Bottom of Exploration at 17.0 Feet
20											
25											
30											
35											

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH 17.0 FOOTAGE IN ROCK 0 NO. OF SAMPLES 6 HOLE NO. B265

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

APPENDIX C

RESULTS OF LABORATORY TESTING

Client:	Freeman Companies, LLC
Project:	Reconstruction of Exit Charter Oak Bridge
Location:	Hartford, CT
GTX#:	304831
Test Date:	07/26/16
Tested By:	jbr
Checked By:	emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(ohm\text{-}cm)^{-1}$
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE (GTX 304831)

FOR: GEOTESTING EXPRESS, INC.
125 NAGOG PARK ACTION, MA 01720

REPORTED TO: ETHAN MARRO

REPORT DATE: 08-01-16
CLIENT NUMBER:
JOB NUMBER: 04.1115-0003
REPORT NUMBER:
DATE SAMPLED:
TIME SAMPLED:
SAMPLED BY: CLIENT
DATE RECEIVED:
TIME RECEIVED:
RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6’	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12’	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7’	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17’	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7’	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16’	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11’	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7’	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

SD

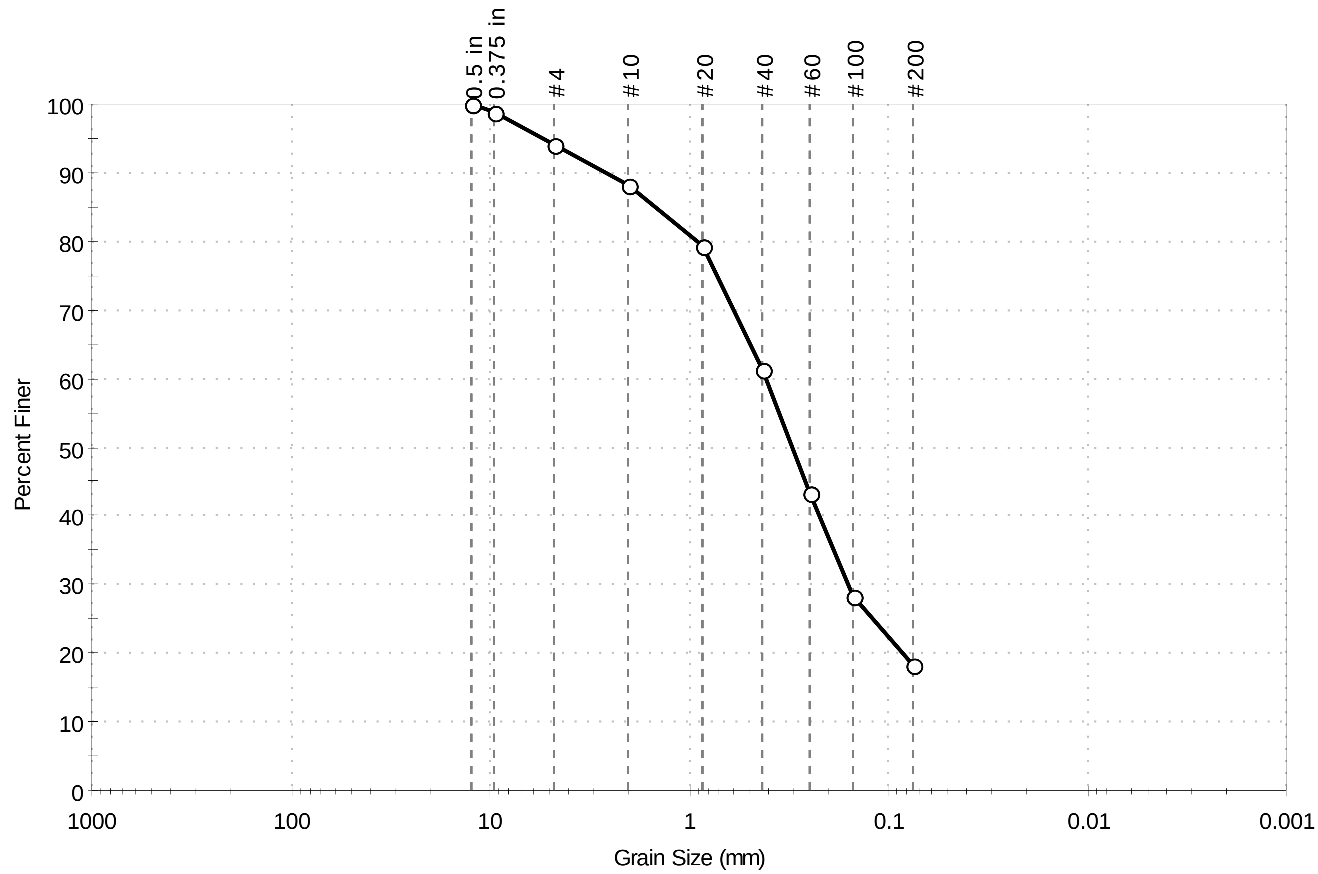
** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

END OF REPORT

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID:	S-480-2	Sample Type: jar	Tested By: GA
Sample ID:	S-2	Test Date: 08/02/16	Checked By: emm
Depth :	4-6 ft	Test Id: 384941	
Test Comment:	---		
Visual Description:	Moist, reddish brown silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	6.0	75.6	18.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	94		
#10	2.00	88		
#20	0.85	79		
#40	0.42	61		
#60	0.25	43		
#100	0.15	28		
#200	0.075	18		

Coefficients

D_{85} = 1.4847 mm　　D_{30} = 0.1587 mm

D_{60} = 0.4095 mm　　D_{15} = N/A

D_{50} = 0.3044 mm　　D_{10} = N/A

C_u = N/A　　C_c = N/A

Classification

ASTM　N/A

AASHTO　Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	daa
Sample ID:	---	Test Date:	06/27/16	Checked By:	jsc
Depth :	---	Test Id:	381989		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	---
S2-1	C2	98.5-99 ft	164	7103	3	Yes	---
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S480-1		
Sample ID:	C2		
Depth:	54.5-55 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.37	4.38	4.38		
Specimen Diameter, in:	1.97	1.97	1.97		
Specimen Mass, g:	575.14				
Bulk Density, lb/ft^3	164			**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2			**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00180	-0.00180	-0.00150	-0.00100	-0.00050	-0.00050	-0.00030	0.00000	0.00000	0.00030	0.00040	0.00100	0.00110	0.00110	0.00120
Diameter 2, in (rotated 90°)	0.00180	0.00130	0.00110	0.00100	0.00100	0.00090	0.00040	0.00000	-0.00050	-0.00070	-0.00090	-0.00130	-0.00180	-0.00220	-0.00260

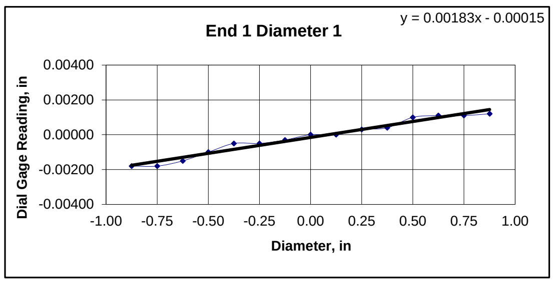
Difference between max and min readings, in:
0° = 0.00300 90° = 0.00440

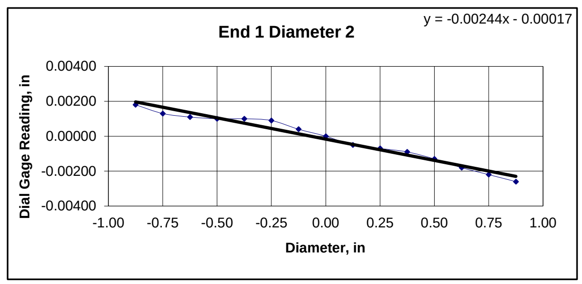
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00090	-0.00100	-0.00100	-0.00090	-0.00080	-0.00070	-0.00030	0.00000	0.00030	0.00080	0.00130	0.00140	0.00180	0.00200	0.00210
Diameter 2, in (rotated 90°)	-0.00190	-0.00240	-0.00180	-0.00110	-0.00070	-0.00040	-0.00030	0.00000	0.00020	0.00040	0.00060	0.00080	0.00120	0.00150	0.00180

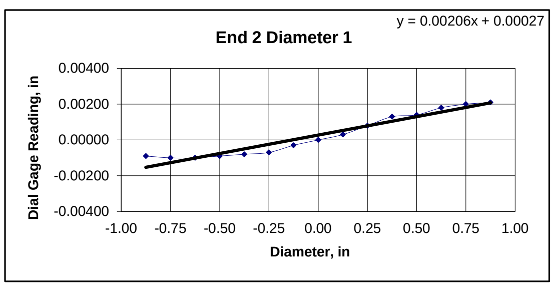
Difference between max and min readings, in:
0° = 0.0031 90° = 0.0042

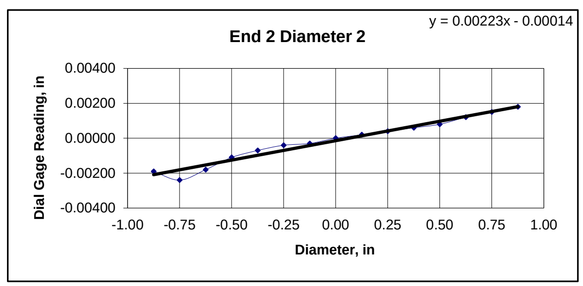
Maximum difference must be < 0.0020 in. Difference = ± 0.00220

Flatness Tolerance Met? NO









DIAMETER 1

End 1:

Slope of Best Fit Line	0.00183
Angle of Best Fit Line:	0.10485

End 2:

Slope of Best Fit Line	0.00206
Angle of Best Fit Line:	0.11803

Maximum Angular Difference: 0.01318

Parallelism Tolerance Met? NO
Spherically Seated

DIAMETER 2

End 1:

Slope of Best Fit Line	0.00244
Angle of Best Fit Line:	0.13980

End 2:

Slope of Best Fit Line	0.00223
Angle of Best Fit Line:	0.12777

Maximum Angular Difference: 0.01203

Parallelism Tolerance Met? NO
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00300	1.970	0.00152	0.087	YES
Diameter 2, in (rotated 90°)	0.00440	1.970	0.00223	0.128	YES
END 2					
Diameter 1, in	0.00310	1.970	0.00157	0.090	YES
Diameter 2, in (rotated 90°)	0.00420	1.970	0.00213	0.122	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S480-1	Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	C2		
Depth:	54.5-55 ft		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^{o})	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Freeman Companies, LLC
Project Name:	Reconstruction of Exit Charter Oak Bridge
Project Location:	Hartford, CT
GTX #:	304831
Test Date:	6/27/2016
Tested By:	daa
Checked By:	jsc
Boring ID:	S480-1
Sample ID:	C2
Depth, ft:	54.5-55

After cutting and grinding

After break

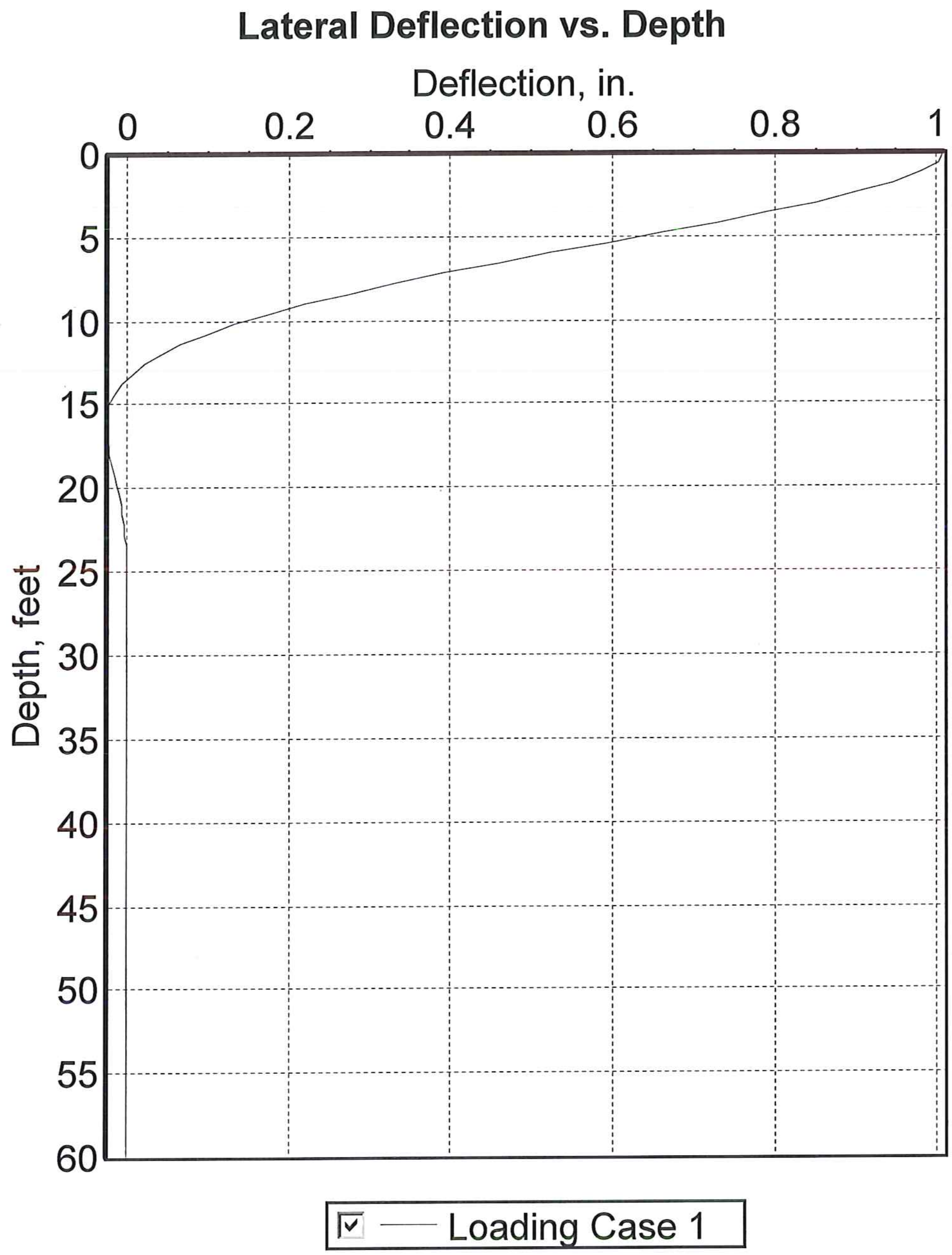
APPENDIX D

RESULTS OF L-PILE ANALYSES

9.625 in O.D. CASING
0.545 in THICK

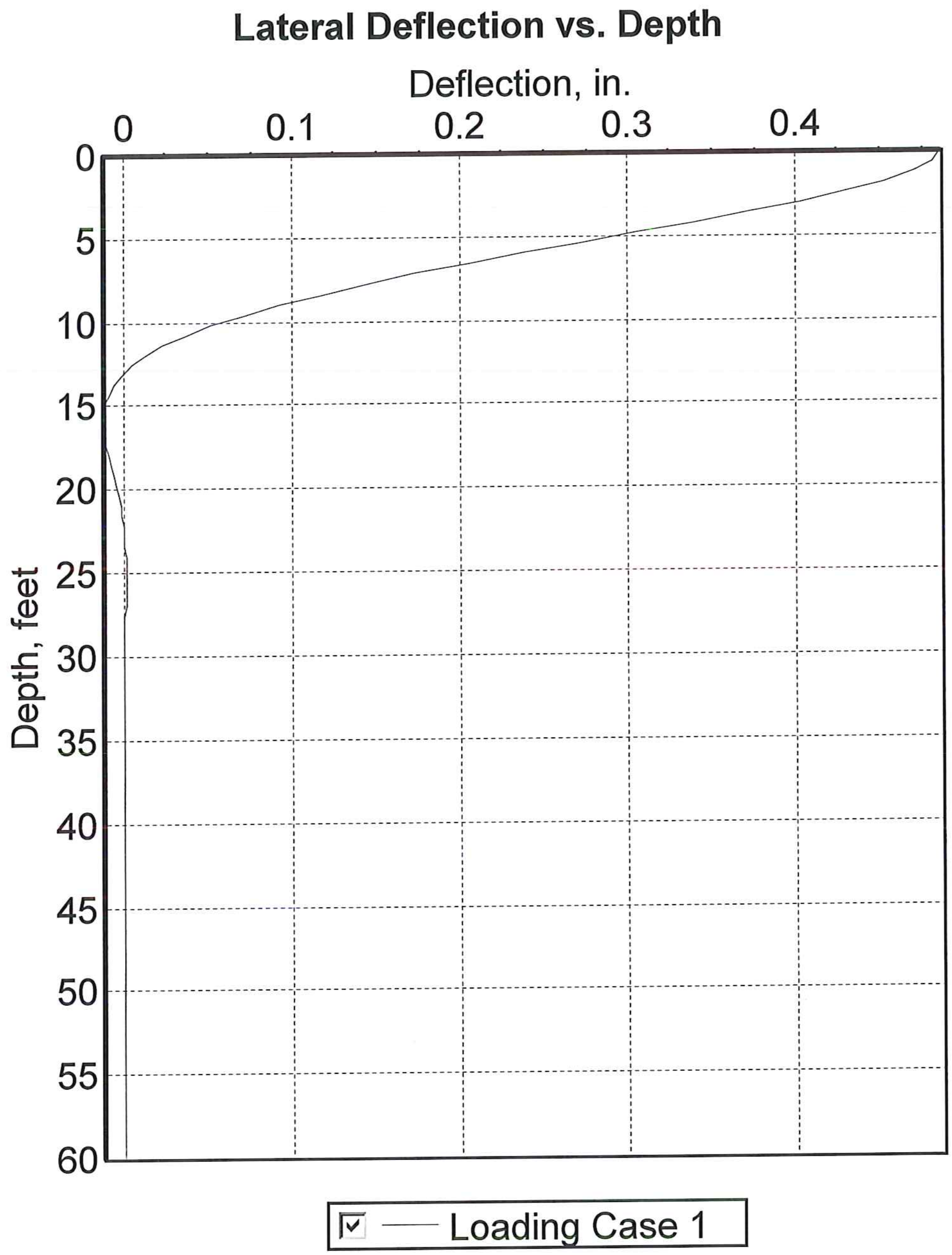
2/0 28 REBAR

FIXED HEAD
24 KIPS LATERAL
300 KIPS VERTICAL



LPile 2012.6.30, © 2012 by Ensoft, Inc.

9.625 in OD CASING
0.545in THICK
No 28 REBAR
FIXED HEAD
15 KIPS LATERAL
300 KIPS VERTICAL



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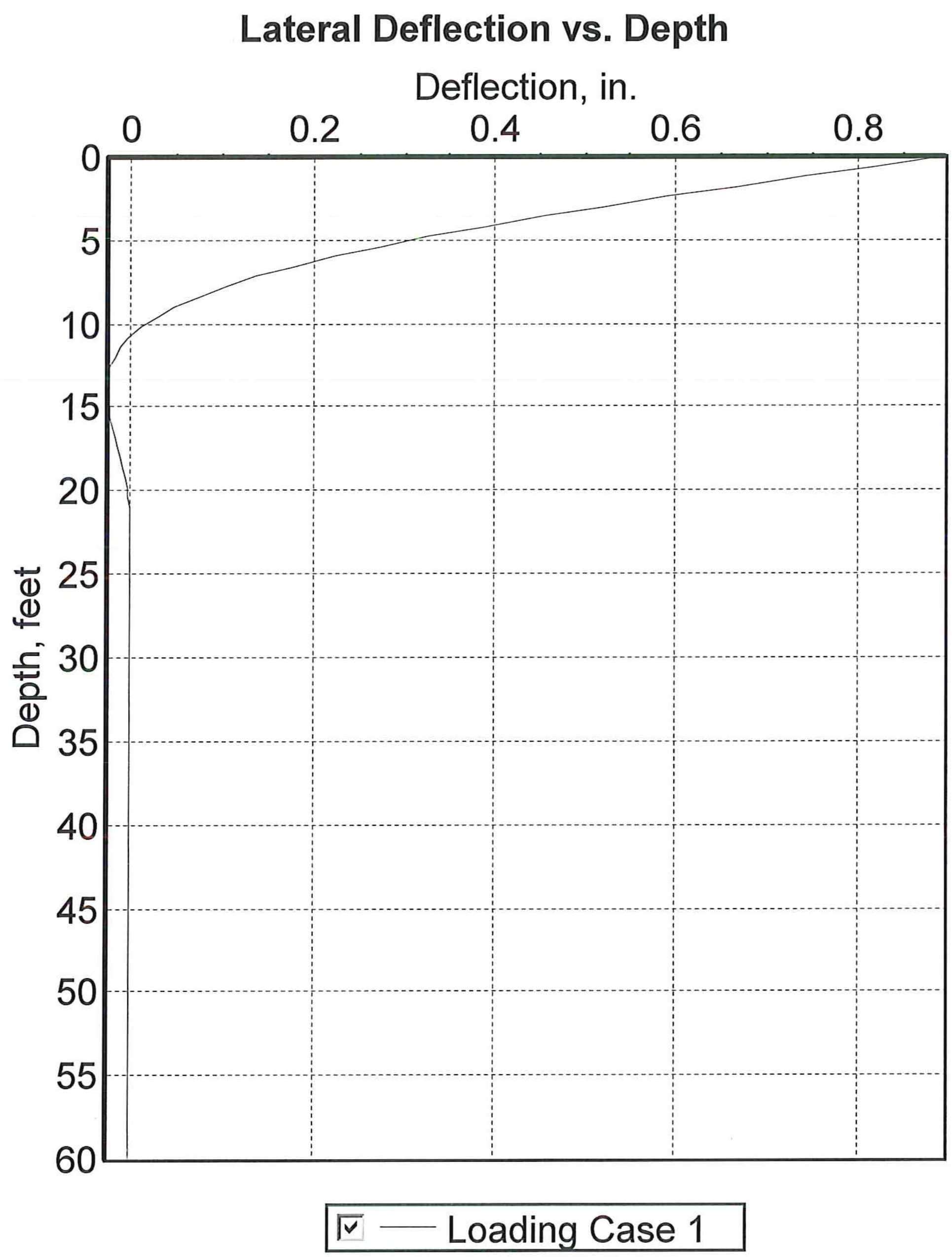
9.625 in OD CASING
0.545 in thick
No 28 Rebar

FREE HEAD
7 KIPS LATERAL
300 KIPS VERTICAL



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FREEMAN COMPANIES

LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

Geotechnical Report
Rehabilitation of Bridge 05796
Route 15 NB over Silver Lane
State Project No. 63-703
East Hartford, Connecticut

December 12, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

Freeman Companies, LLC
36 John Street
Hartford, CT 06106

Nathan L. Whetten, P.E., D.GE.
Vice President of Geotechnical Services

FREEMAN COMPANIES

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Appendices

1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 05796, Route 15 over Silver Lane in East Hartford. Rehabilitation consists of widening the northbound (south) side of the bridge by 12 feet to accommodate an additional travel lane. The existing bridge is a single-span bridge supported on two full height abutments, which will be extended to the east. New U-type wingwalls will be provided.

We recommend that the widened portion of the abutments be supported on spread footings bearing on a layer of compacted granular fill placed over the native alluvial deposits. Bridge abutment loading will result in up to about 1.4 inches of settlement.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions.
- Conducted settlement evaluations.
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

The bridge will be widened by 12 feet by extending Abutments 1 and 2 on the east side. New U-type wingwalls will be provided.

2.2 Site Description

The site is located on the south side of the Route 15 NB Bridge over Silver Lane, as shown on Figure 1, Site Location Map. The bridge is a single-span bridge supported on two full-height abutments. Silver Lane has two westbound travel lanes and one eastbound lane, and sidewalks on each side. Ground surface south of the wingwalls consists of grass and shrubs.

Bridge grade is about El. 58 and Silver Lane grade below the bridge is about El. 33. The bridge abutments (existing and proposed) bear at El. 30; existing grade at the abutments is about El. 34.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included one Cone Penetrometer Test (CPT-5796-1) and one test boring (S-5796-1) conducted on June 14, 2016 and from May 9 to 13, 2016, respectively. The Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey, and the test boring was drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. CPT-5796-1 was located southeast of Abutment 1 and S-5796-1 was located southeast of Abutment 2.

CPT-5796-1 was drilled to a depth of 222.3 feet below ground surface using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip. The CPT was terminated at the maximum push capacity of the rig, referred to on the log as “refusal”. This refusal indicates that friction on the cone exceeded the capacity to push, and does not reflect the presence of a hard soil stratum.

Test boring S5796-1 was drilled to a depth of 319 feet below ground surface and was terminated at refusal. Standard Penetration Tests were conducted at maximum 5-foot-intervals and undisturbed tube samples of the lacustrine deposits were recovered from the boring. The completed borehole was backfilled with drill cuttings.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

Six previous test borings were drilled for the bridge, including B-10, and B-164 to B-168. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan. Previous exploration logs and cross-sections of the previous explorations are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Eight moisture content tests,
- One grain size analysis,
- Two Constant Rate of Strain (CRS) Consolidation Tests,
- Four Atterberg Limit Determinations.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, East of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. A subsurface profile through Abutment 2 is provided on Figure 4.

Thickness Range (ft.)	Stratum	Generalized Description
4 to 20	Fill	Very dense c-f SAND, some silt, trace c-f gravel. The Standard Penetration Test (SPT) N-Value was 54 blows per foot (bpf).
32 to 56	Alluvium	Medium dense to very dense, brown c-f SAND, some to trace c-f gravel, little to some silt. SPT N-values ranged from 13 to 77 bpf.
228	Lacustrine	Soft to medium stiff varved red-brown CLAY and SILT, with regular 1/8 to 1/16-inch gray and reddish gray silt varves.
31	Glacial Till	Very dense red-brown c-f SAND, some silt and gravel. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values were typically more than 100 bpf

Groundwater – Water was encountered in boring S5796-1 at a depth of 8 feet and in CPT5796-1 at a depth of 15 feet, corresponding to El. 28 and El. 21, respectively. However, these measurements were made during or shortly after drilling, and may not reflect stabilized groundwater. Groundwater levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Settlement - The proposed bridge widening will consist of extending the existing abutments, which are supported on spread footings. Settlement evaluations were conducted to determine the magnitude of anticipated settlement of the alluvial deposits and consolidation of the thick lacustrine deposits. The top of the lacustrine deposits is at approximately El. -24 (60 feet below ground surface), and the bottom is at El. -252 (288 feet below ground surface). Consolidation settlement is estimated to be about 1.4 inches in 50 years.

The compressible soils at a depth of 60 feet allows the consolidation settlement to be relatively uniform. Settlement will occur beneath both the new and existing portions of the bridge and approach embankments. Some of the settlement is ongoing settlement from the original construction.

This magnitude of settlement is more than the customary one inch of settlement commonly considered for design. However, we believe it is acceptable for this application. Other options to further mitigate settlement are either ineffective (e.g., use of lightweight fill does not significantly reduce settlement due to the depth of the clay), or too costly and difficult (e.g., pile foundations driven to refusal (319 feet in S5796-1)).

We recommend that the proposed abutments be supported on conventional spread footing foundations.

Foundation Design Criteria

- Footings Foundation Depth: Minimum of 4 feet below the lowest adjacent ground surface.
- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D.
- Backfill Material: Place Pervious Structure Backfill (CTDOT Form 817 M.02.05) behind the abutments and abutment wingwalls above a line defined by a 1V:1.5H slope extending up from the heel of the footing to grade.
- Weep Holes: 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- Lateral Earth Pressures: Refer to Figure 5 – Active Earth Pressures
- Subgrade Preparation Below Abutments: Minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- Service Limit Bearing: 6,000 pounds per square foot (psf).
- Strength Limit Bearing: Nominal Bearing Resistance 20,000 psf, calculated using AASHTO Equation 10.6.3.1.3.
- Settlement at Recommended Bearing Pressure: Estimated total settlement approximately 1.4 inches; differential less than ¾- inch. Place a control joint at the connection between the existing and new portions of the abutments.
- **Coefficient of Friction (tan δ) Along Bottom:** 0.50 (AASHTO Table 3.11.5.3-1); Resistance factor 0.8 (AASHTO Table 10.5.5.2.2-1).
- Global Stability: We estimate a maximum resistance factor of 0.58 for the abutments for global stability (minimum factor of safety of 1.7). This is consistent with a load factor of 1.0 and a maximum resistance of 0.65 (AASHTO 11.6.2.3).

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Abutment Bearing Surface Preparation

Excavated subgrades for the abutments should be covered with geotextile separation fabric and crushed stone placed over the fabric, and then proofrolled with a vibratory plate compactor. If the subgrade beneath the crushed stone is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional crushed stone over fabric.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Temporary Lateral Support

Temporary lateral support of excavations will be required to maintain and protect traffic flow and nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.4 Excavation Dewatering

Excavation dewatering will be required to permit construction in-the-dry. Pumping from sumps located at the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.5 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces.
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, expressed or implied, is made.

2014-1001
Rehabilitation of Route 15 over Silver Lane
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
East Hartford, Connecticut

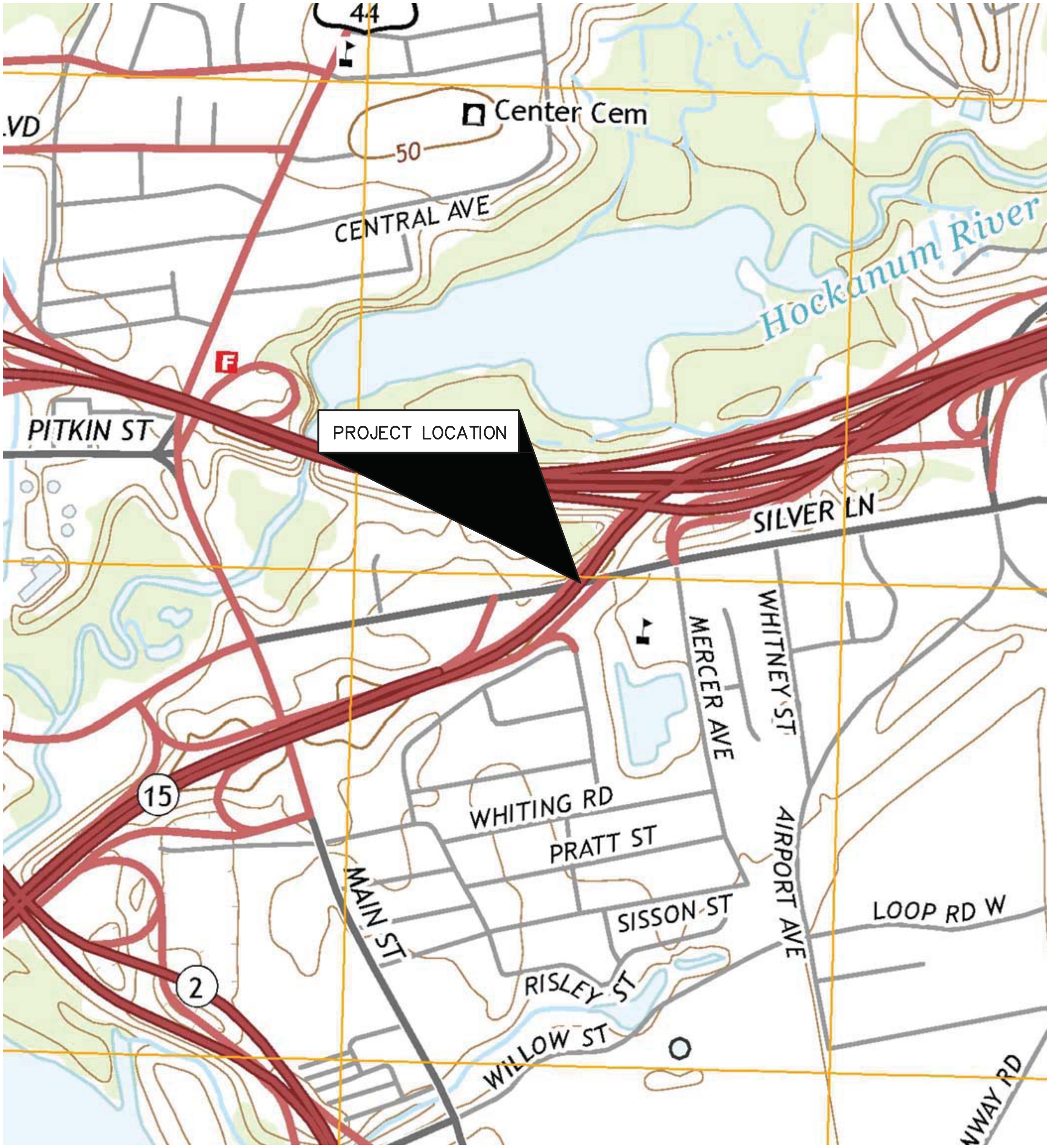
Table 1
Subsurface Data

Boring No.	Ground Surface El.	Depth (ft.)	Thickness (ft.)					Groundwater		Bedrock	
			Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Borings											
S5796-1	36.1	319 R	0.5	3.5	56	228	31	8	28.1	319	-282.9
Recent Cone Penetration Test											
CPT5796-1	35.8	222.3	---	19.5	31.5	>171.3	---	15	20.8	---	---
Previous Test Borings											
B-15	56.4	91.5	---	50.5	13.5	>27.5	---	36	20.4	---	---
B-16	36.7	260	---	13	33.5*	>213.5	---	14	22.7	---	---
L-501	57.1	76.5	---	44	19	>13.5	---	25	32.1	---	---
L-502	38.3	56.5	---	43.5	4.5	>8.5	---	19.2	19.1	---	---
L-506	54.6	56.5	---	49	1*	6.5	---	33	21.6	---	---

Notes:

1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
2. Groundwater levels are approximate.
3. ">" - Greater Than "--" - Not Encountered (C) - Bedrock Core Taken (R) - Terminated at Refusal "NM" - Not Measured

FIGURES



USGS QUADRANGLE MAP
HARTFORD NORTH, CONNECTICUT
HARTFORD SOUTH, CONNECTICUT
DATE 2015

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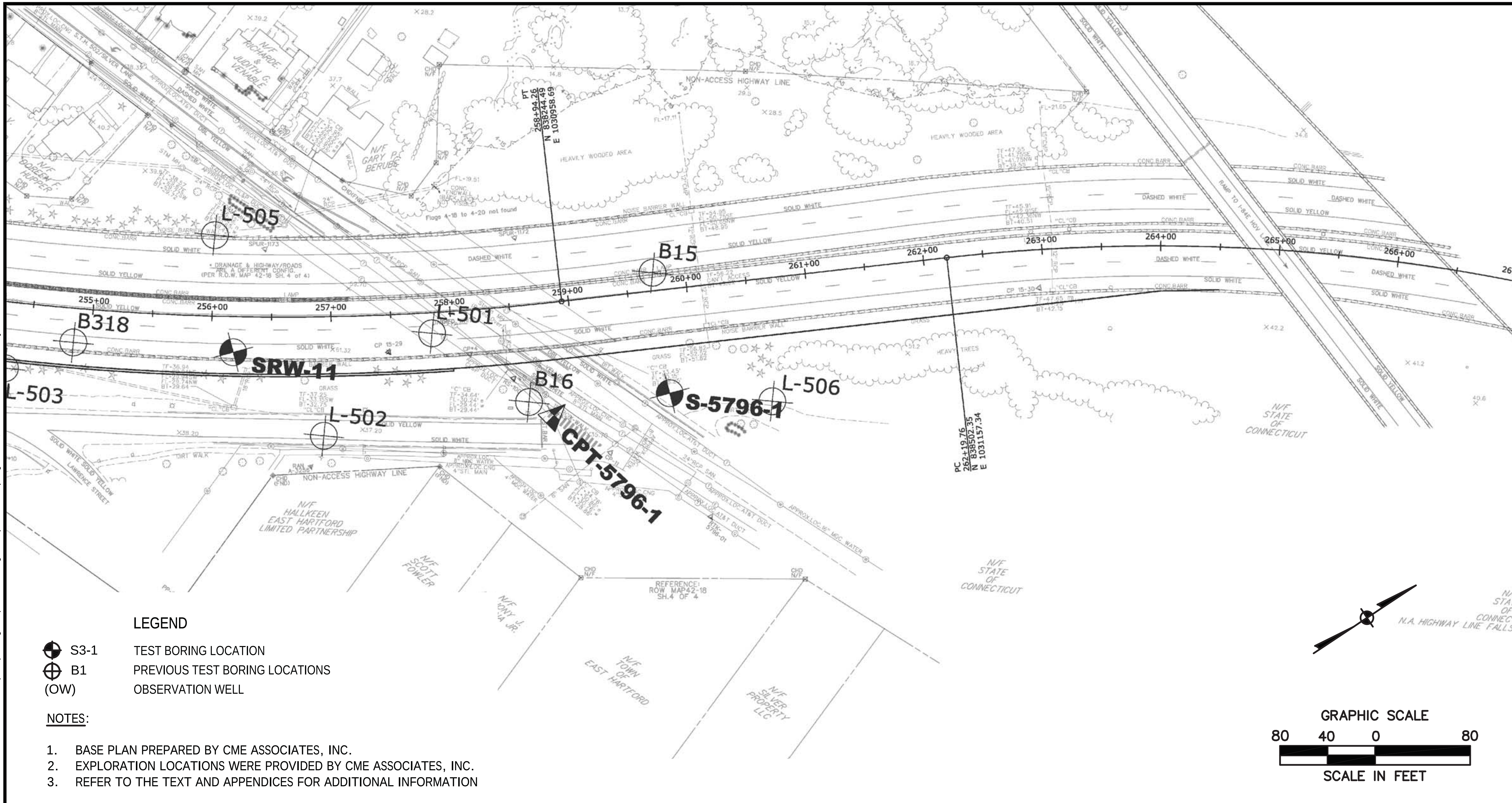
SITE LOCATION MAP

REHABILITATION OF BRIDGE 05796
ROUTE 15 NB OVER SILVER LANE
STATE PROJECT NO. 63-703
EAST HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	1"=1000'
PROJECT NO.:	2014-1001
DATE:	10/27/2016

SHEET NO.

FIGURE 1



LEGEND

S3-1	TEST BORING LOCATION
B1	PREVIOUS TEST BORING LOCATIONS
(OW)	OBSERVATION WELL

NOTES:

1. BASE PLAN PREPARED BY CME ASSOCIATES, INC.
2. EXPLORATION LOCATIONS WERE PROVIDED BY CME ASSOCIATES, INC.
3. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION

SUBSURFACE EXPLORATION LOCATION PLAN

REHABILITATION OF BRIDGE 05796
ROUTE 15 NB OVER SILVER LANE
STATE PROJECT No. 63-703
EAST HARTFORD, CONNECTICUT

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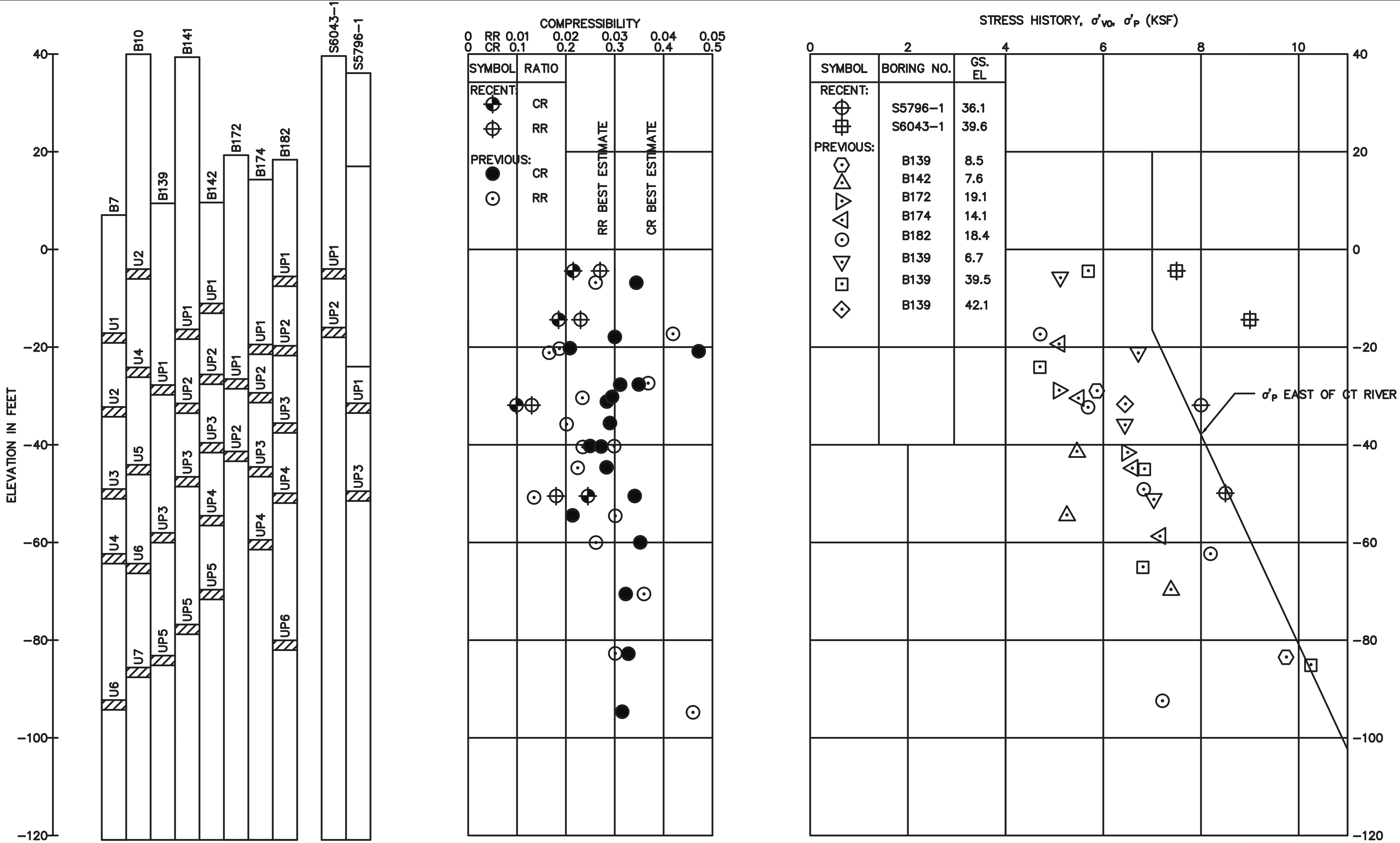
No.	Date	Description
–	–	–

REVISIONS

DRAWN:	T.T.
CHECKED:	A.M.
APPROVED:	A.M.
SCALE:	1"=80'
PROJECT NO.:	2014–1001
DATE:	10/28/2016

SHEET NO.

FIGURE 2



NOTES

1. PREVIOUS DATA WAS OBTAINED FROM THE RECORD REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD–EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
2. ELEVATIONS REFER TO NAVD–88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD–29.

DEFINITIONS

CR – COMPRESSION RATIO ($=\Delta\varepsilon/\Delta \mathrm{LOG}\sigma'_V$) DURING VIRGIN COMPRESSION

RR – RECOMPRESSION RATIO ($=\Delta\varepsilon/\mathrm{LOG}\sigma'_V$) DURING RECOMPRESSION

σ'_{VO} – IN SITU VERTICAL EFFECTIVE STRESS

σ'_P – PRECONSOLIDATION STRESS

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SUMMARY OF VARVED CLAY PROPERTIES
EAST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3B

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

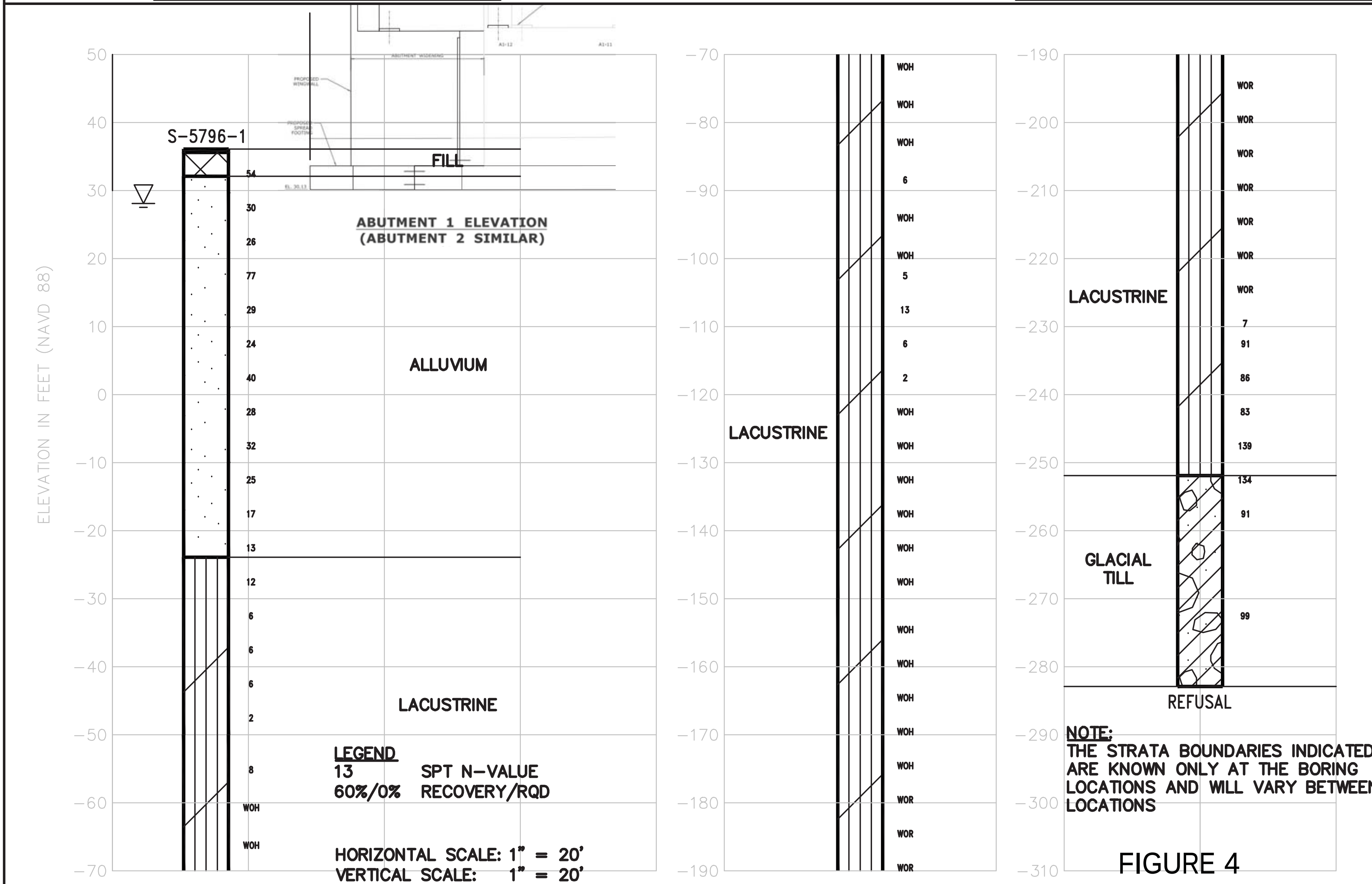
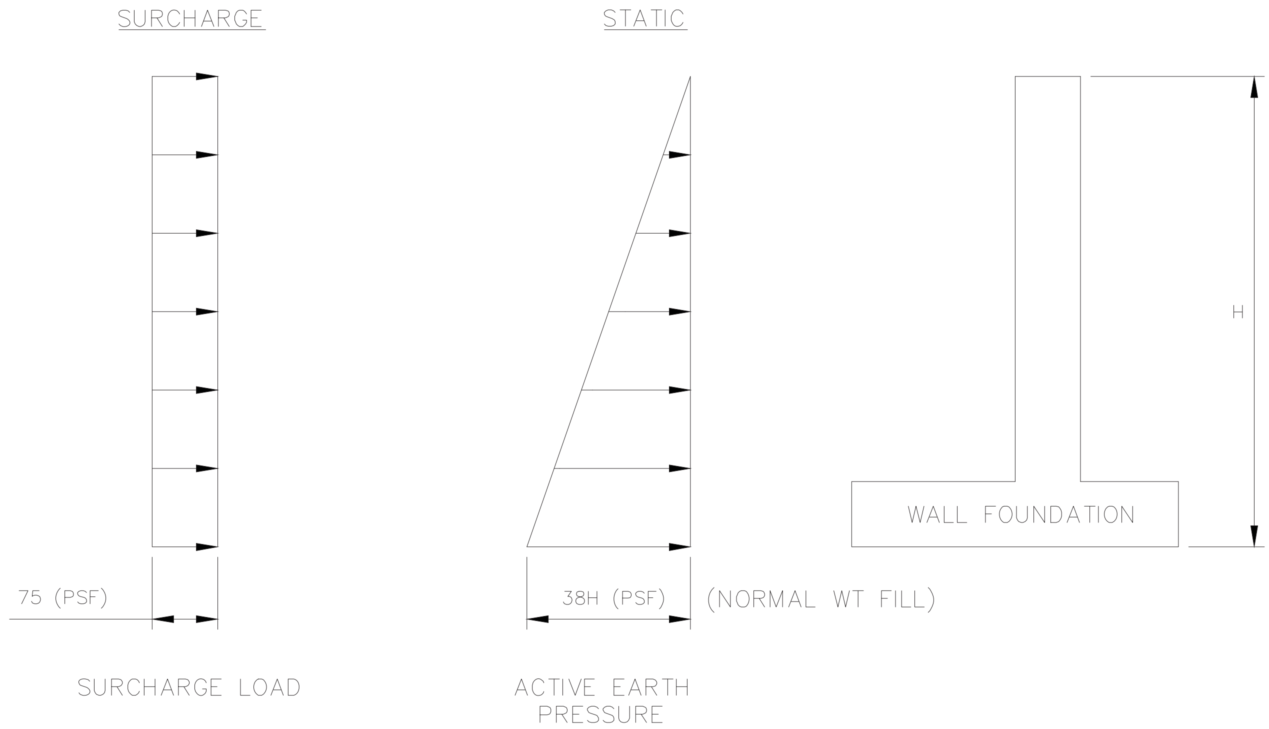


FIGURE 4



NOTES:

1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
2. H IS MEASURED IN FEET
3. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL (FORM 817 M.02.05) WITH A UNIT WEIGHT OF 125 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
5. SLIDING:
   COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3-1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

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ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 05796
ROUTE 15 NB OVER SILVER LANE
STATE PROJECT NO. 63-703
EAST HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014-1001
DATE:	10/27/2016

FIG.

FIGURE 5

APPENDIX A

RECENT EXPLORATION LOGS

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0									Topsoil		
	S1	8	26	28	16	24	24		Fill	Brown c-f SAND, some silt, trace c-f gravel, moist	35
									Alluvium		
5	S2	31	16	14	21	24	24			Brown c-f SAND, some silt, some c-f gravel, moist	30
10	S3	18	13	13	14	24	10			Brown c-f SAND, some c-f gravel, little silt, wet	25
15	S4	28	34	43	32	24	12			Brown c-f SAND, some silt, little c-f gravel	20
20	S5	12	13	16	17	24	11			Brown c-f SAND, little silt, trace f gravel	15
25	S6	8	9	15	17	24	16			Brown c-f SAND, some silt, trace f gravel	10
30	S7	19	19	21	27	24	18			Gray f SAND and SILT	5

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: 319ft Rock: 0ft	NOTES:	Sheet 1 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	16 12 16 15	24	12		Alluvium *(con't)*	Gray f SAND and SILT	0
40	S9	14 15 17 24	24	18			Gray f SAND, some silt	-5
45	S10	9 11 14 17	24	18			Gray f SAND and SILT	-10
50	S11	13 9 8 11	24	24			Gray SILT, some f sand	-15
55	S12	7 6 7 8	24	18			Gray SILT, little f sand	-20
60	S13	5 6 6 5	24	24		Lacustrine	Gray SILT and CLAY, little f sand	-25
65	S14	3 3 3 3	24	24			Gray silty CLAY, trace f sand	-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: 319ft Rock: 0ft	NOTES:	Sheet 2 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S-5796-1
Inspector: B. Cote	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 838256.16
Start Date: 5-9-16	Route No.: SIlver Lane	Easting: 1031077.32
Finish Date: 5-13-16	Bridge No.: 05796	Surface Elevation: 36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
	UP-1		24	24		Lacustrine *(con't)*	Gray silty CLAY	
70	S15	woh 3 3 3	24	24			Gray silty CLAY, trace f sand	-35
75	S16	woh 3 3 3	24	24			Gray silty CLAY, trace f sand	-40
	UP-2		24	24			Gray silty CLAY	
80	S17	woh 1 1 2	24	24			Gray silty CLAY, trace f sand, with red lenses	-45
85	UP-3		24	24			Gray silty CLAY	-50
	S18	woh woh 8 5	24	24			Gray silty CLAY, trace f sand	
90								-55
95	S19	woh woh woh 2	24	24			Gray silty CLAY, trace f sand	-60
100	S20	woh woh woh 3	24	24			Gray silty CLAY, trace f sand	-65

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: 319ft Rock: 0ft	NOTES:	Sheet 3 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
105	S21	woh woh woh woh	24	24			Gray silty CLAY, trace f sand	-70
110	S22	woh woh woh 1	24	24			Gray silty CLAY, trace f sand	-75
115	S23	woh woh woh 2	24	24			Gray silty CLAY, trace f sand	-80
120	S24	woh 3 3 4	24	24			Gray silty CLAY, trace f sand	-85
125	S25	woh woh woh 4	24	24			Gray silty CLAY, trace f sand	-90
130	S26	woh woh woh 2	24	24			Gray and red silty CLAY, varved	-95
135								

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: 319ft Rock: 0ft	NOTES:	Sheet 4 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
	S27	woh 2 3 3	24	24		Lacustrine *(con't)*	Gray and red silty CLAY, varved	-100
140	S28	woh 6 7 8	24	24			No Recovery	-105
145	S29	woh 3 3 4	24	24			Gray and red silty CLAY, varved	-110
150	S30	woh woh 2 3	24	24			Gray and red silty CLAY, little c gravel, varved	-115
155	S31	woh woh 2 2	24	24			Gray and red silty CLAY, varved	-120
160	S32	woh woh woh 4	24	24			Gray and red silty CLAY, varved	-125
165	S33	woh woh woh 5	24	24			Gray and red silty CLAY, varved	-130
170								

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: 319ft Rock: 0ft	NOTES:	Sheet 5 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
170	S34	woh woh woh 2	24	24		Lacustrine *(con't)*	Gray and red silty CLAY, varved	-135
175	S35	woh woh woh 5	24	24			Gray and red silty CLAY, varved	-140
180	S36	woh woh woh 4	24	24			Gray and red silty CLAY, varved	-145
185	S37	woh woh woh 4	24	24			Gray and red silty CLAY, varved	-150
190	S38	woh woh woh 3	24	24			Red brown silty CLAY, varved	-155
195	S39	woh woh woh 4	24	24			Red brown silty CLAY, varved	-160
200	S40	woh woh woh 3	24	24			Red brown silty CLAY, varved	-165

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: 319ft Rock: 0ft	NOTES:	Sheet 6 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
205	S41	woh woh woh 2	24	24		Lacustrine *(con't)*	Red brown silty CLAY, varved	-170
210	S42	wor wor wor wor	24	24			Red brown silty CLAY, varved, TV 0.2 tsf PP 0.5 tsf	-175
215	S43	wor wor wor wor	24	24			Red brown silty CLAY, varved	-180
220	S44	wor wor wor wor	24	24			Red brown silty CLAY, varved	-185
225	S45	wor wor wor wor	24	24			Red brown clayey SILT, varved	-190
230	S46	wor wor wor wor	24	24			Red brown clayey SILT, varved	-195
235	S47	wor wor wor wor	24	24			Brown to red clayey SILT, varved	-200

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: 319ft Rock: 0ft	NOTES:	Sheet 7 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
240	S48	wor wor wor wor	24	24			Brown to red clayey SILT, varved	-205
245	S49	wor wor wor wor	24	24			Brown to red clayey SILT, varved	-210
250	S50	wor wor wor wor	24	24			Brown to red clayey SILT, varved	-215
255	S51	wor wor wor wor	24	24			Brown to red clayey SILT, varved, PP 0.75 tsf TV 0.3tsf	-220
260	S52	wor wor 7 10	24	24			Red silty CLAY	-225
265	S53	wor 35 56 70	24	20			Red clayey SILT, varved	-230
270	S54	wor 40 46 61	24	15			Red clayey SILT, varved	-235

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: 319ft Rock: 0ft	NOTES:	Sheet 8 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
275	S55	35 38 45 56	24	18			Red clayey SILT, varved	-240
280	S56	60 61 78 97	24	18			Red SILT	-245
285	S57	58 63 71 91	24	16			Red SILT	-250
						Glacial Till		
290	S58	40 42 49 68	24	16			Red c-f SAND, little silt	-255
295								-260
300								-265
305								

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: 319ft Rock: 0ft	NOTES:	Sheet 9 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-5796-1
Inspector:	B. Cote	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	838256.16
Start Date:	5-9-16	Route No.:	SIlver Lane	Easting:	1031077.32
Finish Date:	5-13-16	Bridge No.:	05796	Surface Elevation:	36.1

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type:
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @8.0 after ADT hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
	S59	56 45 54 59	24	16		Glacial Till *(con't)*	Red c-f SAND, little silt	-270
310								-275
315							Rig chatter at 315 ft, roller bit to 319 ft	-280
320							Assumed bedrock at 319' based on rollar bit action END OF BORING 319ft	-285
325								-290
330								-295
335								-300
340								

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%

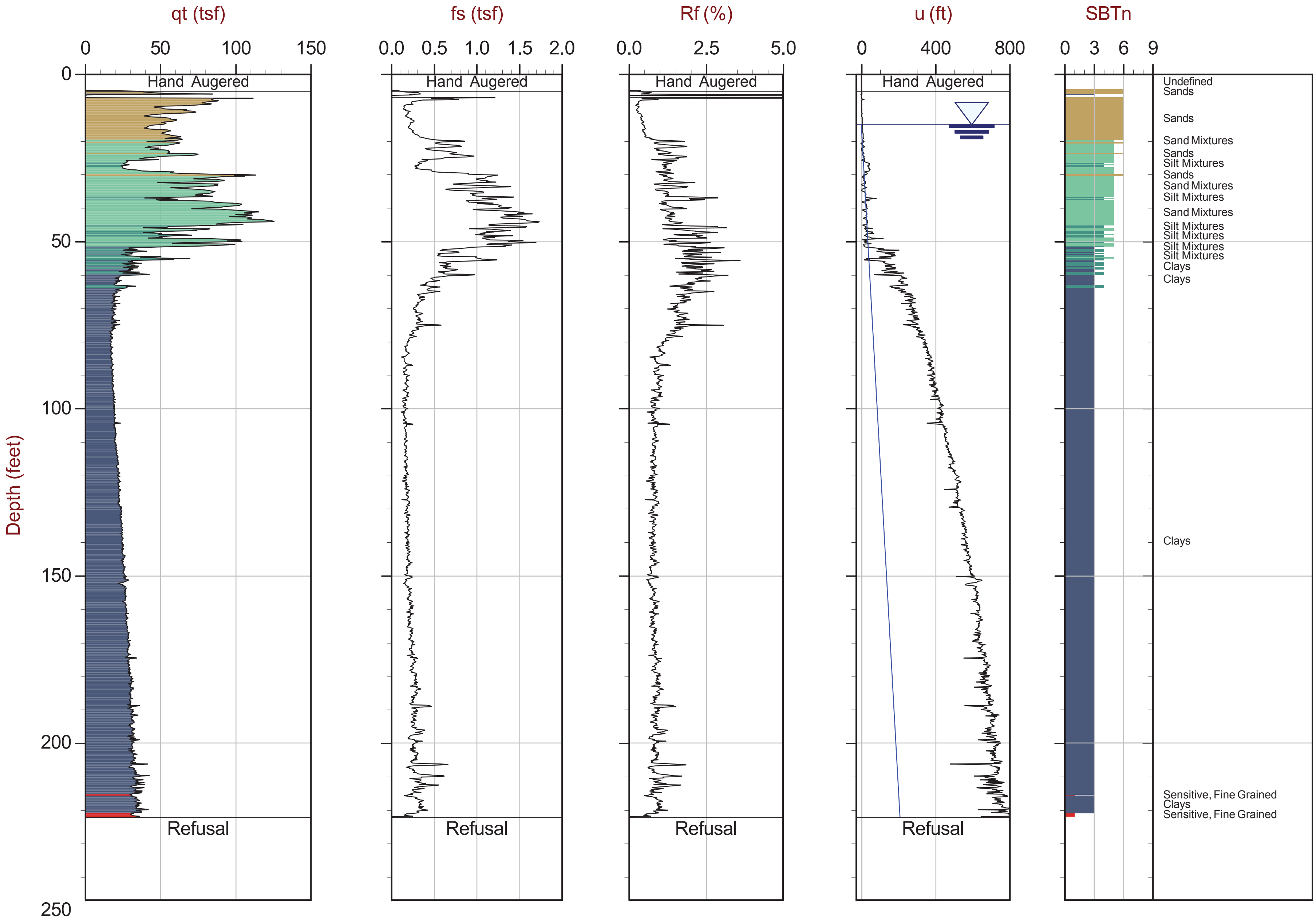
Total Penetration in Earth: 319ft Rock: 0ft	NOTES:	Sheet 10 of 10
No. of Soil Samples: 59 No. of Core Runs: 0		SM-001-M REV. 1/02

ConeTec

Freeman Companies

Job No: 16-53057
Date: 06:14:16 21:29
Site: I-91 Interchange 29, Hartford, CT

Sounding: CPT16-5796-1
Cone: 419:T1500F15U500



Max Depth: 67.750 m / 222.27 ft
Depth Inc: 0.050 m / 0.164 ft

File: 16-53057_CP5796-1.DRF

SBT: Robertson, 1990
Coords: UTM Zone 18 N: 4625982m E: 696494m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

APPENDIX B

PREVIOUS TEST BORING LOGS

F.H.W.A. REGION	STATE	TOWN	FED. AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONN.	EAST HARTFORD	I-84-4(91)63	42-216	1983	I-84,15	502	807

(22)

	N	E	STATION
PCC	337814.899	630416.865	88+21.933
PI	337988.586	630650.794	
PT	338219.397	630828.601	94+00.953
Δ 15°-47'-52.06"	T 291.358'		
D 2°-43'-42.13"	L 579.019'		
R 2100.000'			

(24)

	N	E	STATION
PC	337565.257	629963.780	83+03.049
PI	337659.290	630207.286	
PCC	337814.899	630416.865	88+21.933
Δ 15°-28'-41.78"	T 261.032'		
D 2°-58'-58.76"	L 518.884'		
R 1920.750'			

(25)

	N	E	STATION
PC	338234.984	630808.367	94+00.953
PI	338246.073	630816.909	
PT	338257.275	630825.300	94+28.946
Δ 00°-46'-23.39"	T 13.997'		
D 02°-45'-43.07"	L 27.993'		
R 2074.458'			

(96)

	N	E	STATION
PCC	337828.987	630417.268	88+30.896
PI	337915.658	630528.838	
PCC	338014.820	630629.468	91+14.637
Δ 6°-44'-15.98"	T 141.278'		
D 2°-23'-14.37"	L 282.231'		
R 2400.000'			

(99)

	N	E	STATION
PC	337561.333	629971.662	83+03.966
PI	337742.773	630441.514	
PCC	338125.108	630769.387	92+90.781
Δ 28°-16'-12.59"	T 503.667		
D 02°-51'-53.24"	L 986.815		
R 2000.000'			

INSPECTION OF FIELD WELDS	BRIDGE 42-216-4	
METHOD	UNIT	QUANTITY
Radiographic or Ultrasonic	in.	0
Magnetic Particle	L.F.	0
Ultrasonic	in.	0

CONCRETE DISTRIBUTION	BRIDGE 42-216-4	
	UNIT	QUANTITY
Superstructure	C.Y.	465
Substructure	C.Y.	1840
Footings	C.Y.	1140
TOTAL	C.Y.	3445

QUANTITIES	BRIDGE 42-216-4	
ITEM	UNIT	QUANTITY
STRUCTURE EXCAVATION EARTH (COMPLETE)	C.Y.	6,100
GRAVEL FILL	C.Y.	34
PERVIOUS STRUCTURE BACKFILL	C.Y.	9,440
CALCIUM CHLORIDE STABILIZED BASE	TON	152
BITUMINOUS CONCRETE CLASS 1	TON	134
BITUMINOUS CONCRETE CLASS 12	TON	90
SHEAR CONNECTORS	L.S.	1
1 1/2" POLYVINYL CHLORIDE PLASTIC PIPE	L.F.	26
ELASTOMERIC BEARING PADS	C.I.	22,680
CLASS "A" CONCRETE	C.Y.	2,980
CLASS "F" CONCRETE	C.Y.	465
1/2" PREFORMED EXP. JOINT FILLER FOR BRIDGES	S.F.	970
REMOVAL OF SUPERSTRUCTURE SILVER LANE BRIDGE	L.S.	
DEFORMED STEEL BARS (EPOXY COATED)	Lbs.	62,800
DEFORMED STEEL BARS	Lbs.	318,000
STRUCTURAL STEEL BRIDGE NO. 42-216-4	LS.	1
CONCRETE CYLINDER CURING BOX	EA.	1
6" C.C.M. OUTLETS FOR UNDERDRAIN	L.F.	200
MEMBRANE WATERPROOFING (SHEET)	S.Y.	1,560
DAMPPROOFING	S.Y.	1,970
BAGGED STONE	C.F.	144
CONCRETE BLOCK SLOPE PROTECTION	S.Y.	635
8"X 16" SLOPED GRANITE STONE CURBING FOR BRIDGES	L.F.	1,046
PROTECTIVE COMPOUND FOR BRIDGES	S.Y.	530
37"X 34 1/2" SPLIT CONCRETE MEDIAN CURB (BRIDGE)	L.F.	153
METAL BRIDGE RAIL (TRAFFIC)	L.F.	522
2" RIGID METAL CONDUIT IN BRIDGE	L.F.	885
18" X 12" X 8" C.I. JUNCTION BOX	EA.	7
STRUCT. MOUNTED NOISE BARRIER (ACOUSTIC)	S.F.	12,650
STAIN PROTECTION BRIDGE 42-216-4	L.S.	1
1 INCH CLOSED CELL ELASTOMER	C.I.	39,670
1 1/2 INCH CLOSED CELL ELASTOMER	C.I.	1,170

GENERAL NOTES

SPECIFICATIONS
Connecticut Department of Transportation Form 812(1980), and Special Provisions.

DESIGN SPECIFICATIONS
Standard Specifications for Highway Bridges (AASHTO 1977), with the interim specifications up to and including (1980), as supplemented by the Connecticut Department of Transportation Bridge Manual (1964).

ALLOWABLE DESIGN STRESSES
Class "A" and Class "F" Concrete based on f'c = 3000 psi
Reinforcement (ASTM A615 GRADE 60). fs(tensile) = 24,000 psi
Structural Steel
ASTM A588 Weathering Ft. = 27,000 psi All thicknesses to 4" inclusive

LIVE LOAD
HS 20-44 24,000 # Dual axles at 4'-0" O.C.

FUTURE PAVING ALLOWANCE
None

COMPOSITE CONSTRUCTION
No temporary intermediate supports shall be used during the placing and setting of the concrete deck slab. Temporary supports may be used for structural steel erection only. Live and superimposed dead loads will be permitted when directed by the Engineer but not less than 10 days after the final portion of the deck slab has been placed.

CLASS "A" CONCRETE
Class "A" Concrete shall be used for the entire substructure and parapets of the U-Type Wings.

CLASS "F" CONCRETE
Class "F" Concrete shall be used for bridge decks including parapets.

JOINT SEAL
See Special Provisions.

PARAFFIN
The cost of furnishing and applying paraffin is included in the item for Class "F" Concrete.

EXPOSED EDGES
Exposed edges shall be beveled 1"x 1" unless dimensioned otherwise.

STRUCTURAL STEEL
See Structure Sheet No. 14 of 24 for ASTM designations.

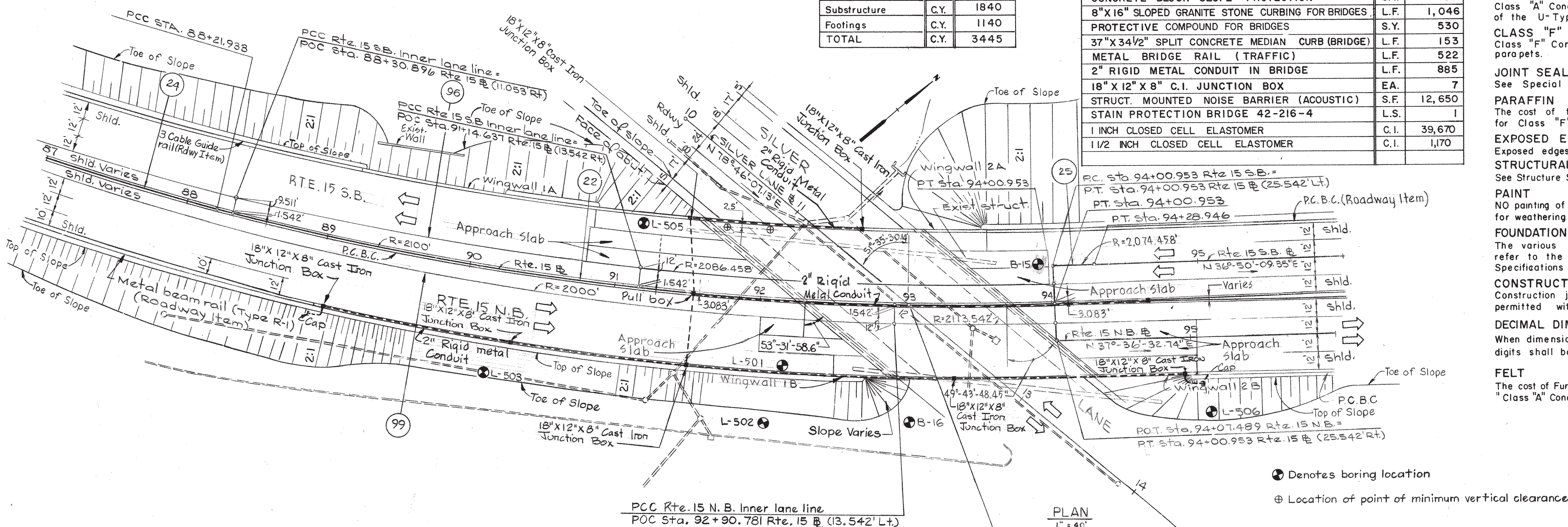
PAINT
NO painting of structural Steel required. Steel surfaces to be prepared for weathering in accordance to the specifications.

FOUNDATION PRESSURES
The various Group Loadings noted on the substructure plan sheets refer to the Group Loads as given in the AASHTO Standard Specifications for Highway Bridges.

CONSTRUCTION JOINTS
Construction joints, other than those shown on the plans, will not be permitted without prior approval of the Engineer.

DECIMAL DIMENSIONS
When dimensions are given to less than three decimal places, the omitted digits shall be assumed to be zeros.

FELT
The cost of Furnishing and placing 15 lb. felt is included in the item for "Class "A" Concrete".

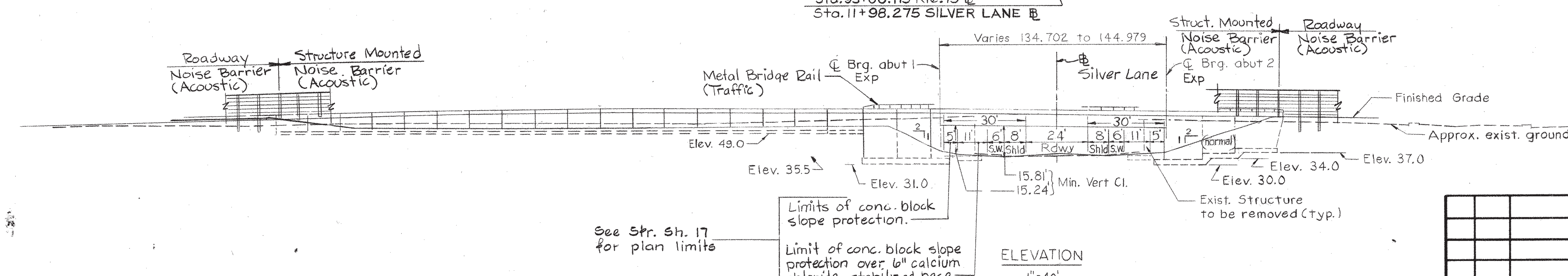


Denotes boring location

⊕ Location of point of minimum vertical clearance

PLAN
1" = 40'

THIS SHEET NOT CORRECTED



ELEVATION
1" = 40'

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

NO.	DATE	DESCRIPTION
REVISIONS		

CONNECTICUT DEPARTMENT OF TRANSPORTATION

EAST HARTFORD

RECONSTRUCTION OF INTERSTATE ROUTE 84
ROUTE 15 N.B. AND ROUTE 15 S.B.
OVER
SILVER LANE

GENERAL PLAN

ENGINEER	HAYDEN, HARDING AND BUCHANAN INC.		
DESIGNER MAK	DRAFTER H.B.	CHECKER RHC	
APPROVED J.L. Hayden		DATE 9-8-81	
STRUCTURE NO. 42-216-4		BRIDGE LOG NO.	STRUCTURE SHEET NO. 1 of 24

42-216 42-225 383-01 502

F.H.W.A. REGION	STATE	TOWN	FED AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONN.	EAST HARTFORD	I-84-4-(91)63	42-216	1983	I-84,15	504	807

NOTE: L-503
Uncased boring from EL. 3.0

NOTE: L-502
Uncased boring from EL. -5.8

CASING I.D.= 2.5"
HAMMER WT.=300 LBS.
HAMMER FALL=24"

SAMPLER I.D.=1 3/8"
HAMMER WT.=140 LBS.
HAMMER FALL=30"

ABBREVIATIONS

C.	COARSE
F.	FINE
M.	MEDIUM
LIT.	LITTLE
TR.	TRACE
BOUL.	BOULDERS
COBB.	COBBLES
MISC.	MISCELLANEOUS
BR.	BROWN

SCALE: 1"=6'

THIS SHEET NOT CORRECTED

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 TRUE CONDITIONS OR ACTUAL QUANTITIES OR DISTRIBUTION OF QUANTITIES OF WORK WHICH WILL BE REQUIRED.

NO.	DATE	DESCRIPTION
REVISIONS		

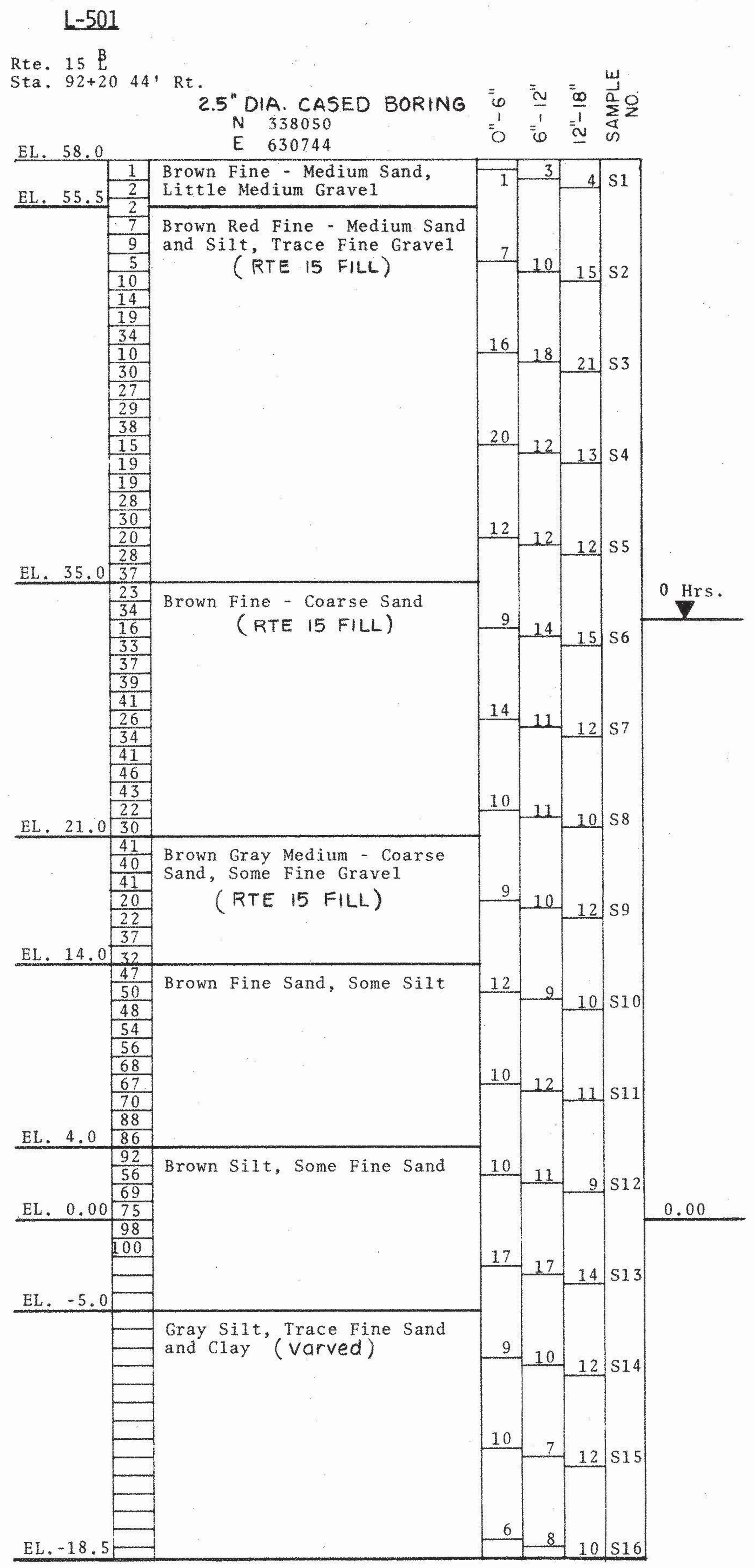
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
EAST HARTFORD
RECONSTRUCTION OF INTERSTATE ROUTE 84
ROUTE 15 N.B. AND ROUTE 15 S.B.
OVER
SILVER LANE

BORINGS SHEET 1 OF 3

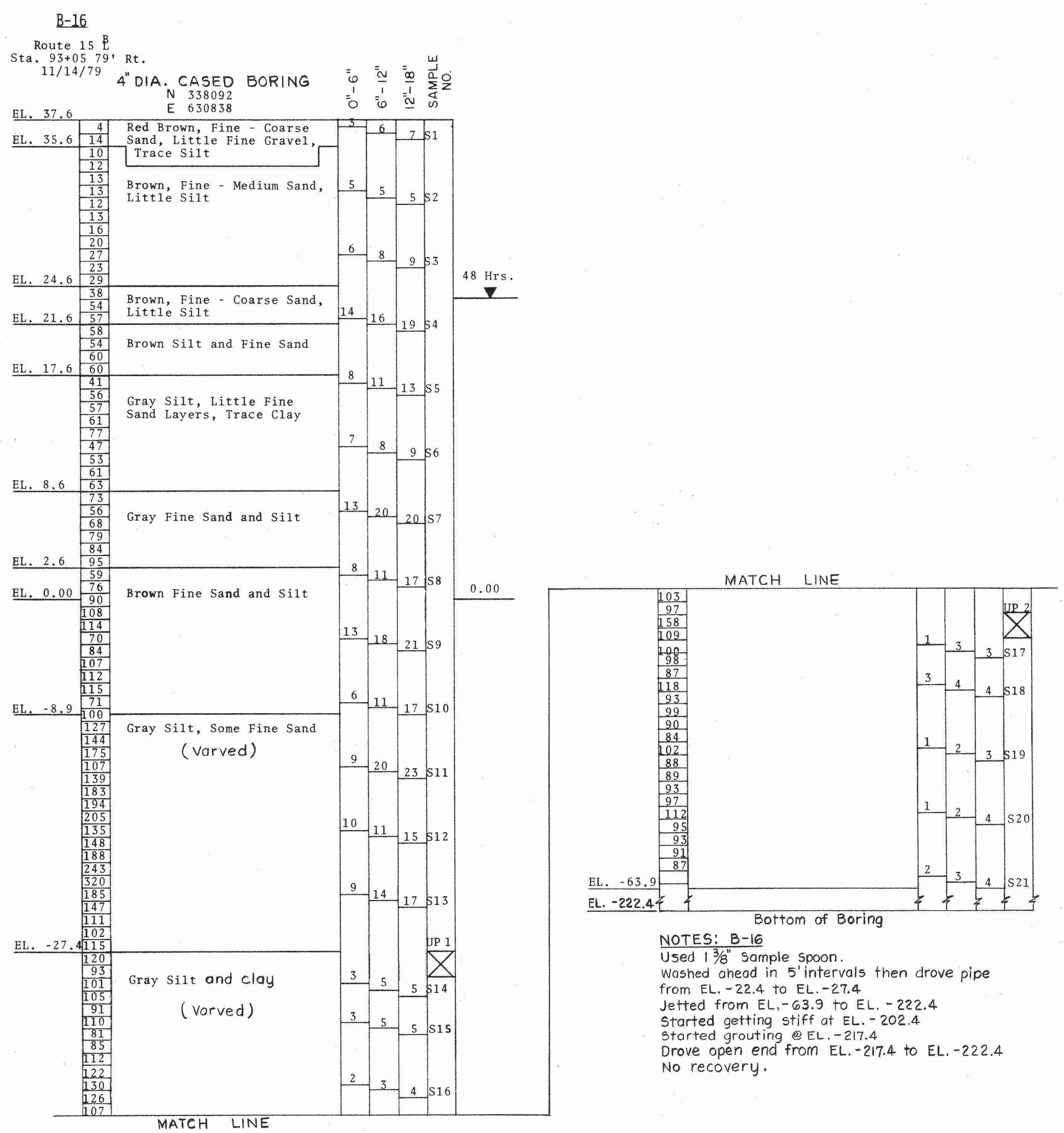
ENGINEER HAYDEN, HARDING & BUCHANAN INC.
DESIGNER DBV | DRAFTSMAN GAF | CHECKER DBV
APPROVED | DATE Dec. 26 1979
STRUCTURE NO. 42-216-4 | STRUCTURE SHEET NO. 3 of 24

42-216 42-225 383-01 504

F.H.W.A. REGION	STATE	TOWN	FED. AID PROJ. NO.	PROJ. NO.	YEAR	ROUTE NO.	SHEET NO.	TOTAL SHEETS
1	CONN	EAST HARTFORD	I-84-4-(91)63	42-216	1983	I-84,15	505	807

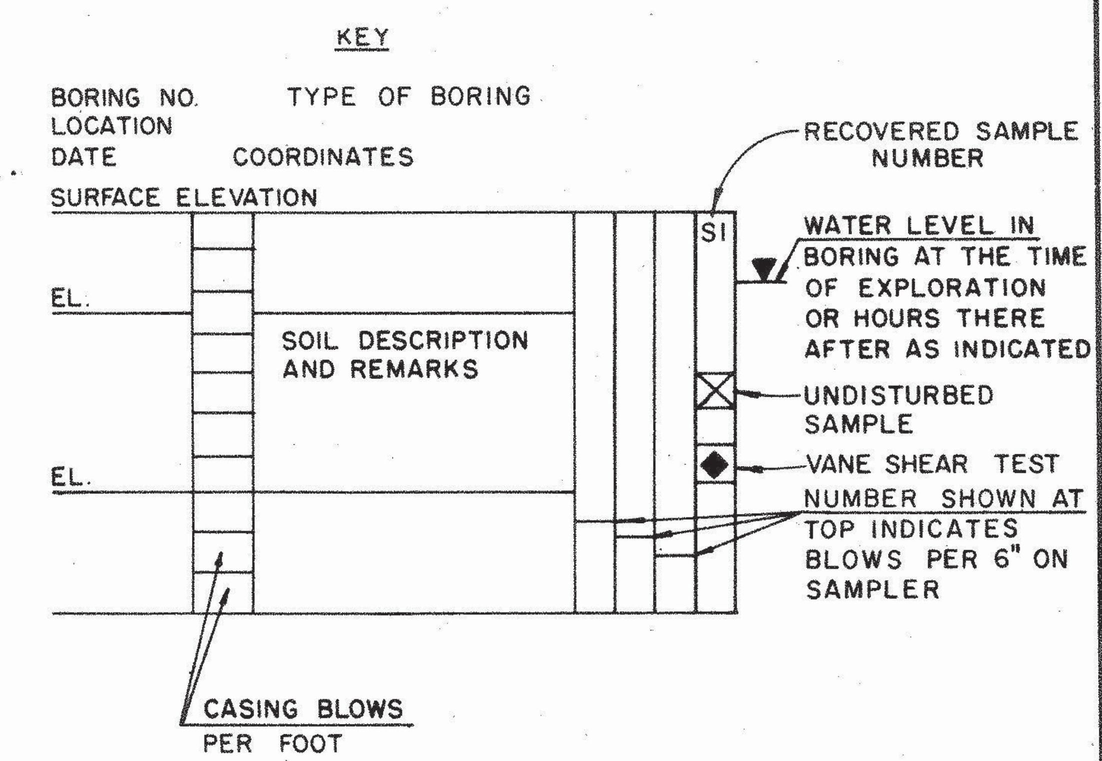


NOTE: L-501
Uncased boring from EL. -2.0



NOTES: B-16
Used 1 3/8" Sample Spoon.
Washed ahead in 5' intervals then drove pipe from EL. -22.4 to EL. -27.4
Jetted from EL. -63.9 to EL. -222.4
Started getting stiff at EL. -202.4
Started grouting @ EL. -217.4
Drove open end from EL. -217.4 to EL. -222.4
No recovery.

KEY



CASING I.D. = 2.5" or 4.0"
HAMMER WT. = 300 LBS.
HAMMER FALL = 24"

SAMPLER I.D. = 1 3/8"
HAMMER WT. = 140 LBS.
HAMMER FALL = 30"

ABBREVIATIONS

C.	COARSE
F.	FINE
M.	MEDIUM
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TR.	TRACE
BOUL.	BOULDERS
COBB.	COBBLES
MISC.	MISCELLANEOUS
BR.	BROWN

SCALE: 1" = 6'

THIS SHEET NOT CORRECTED

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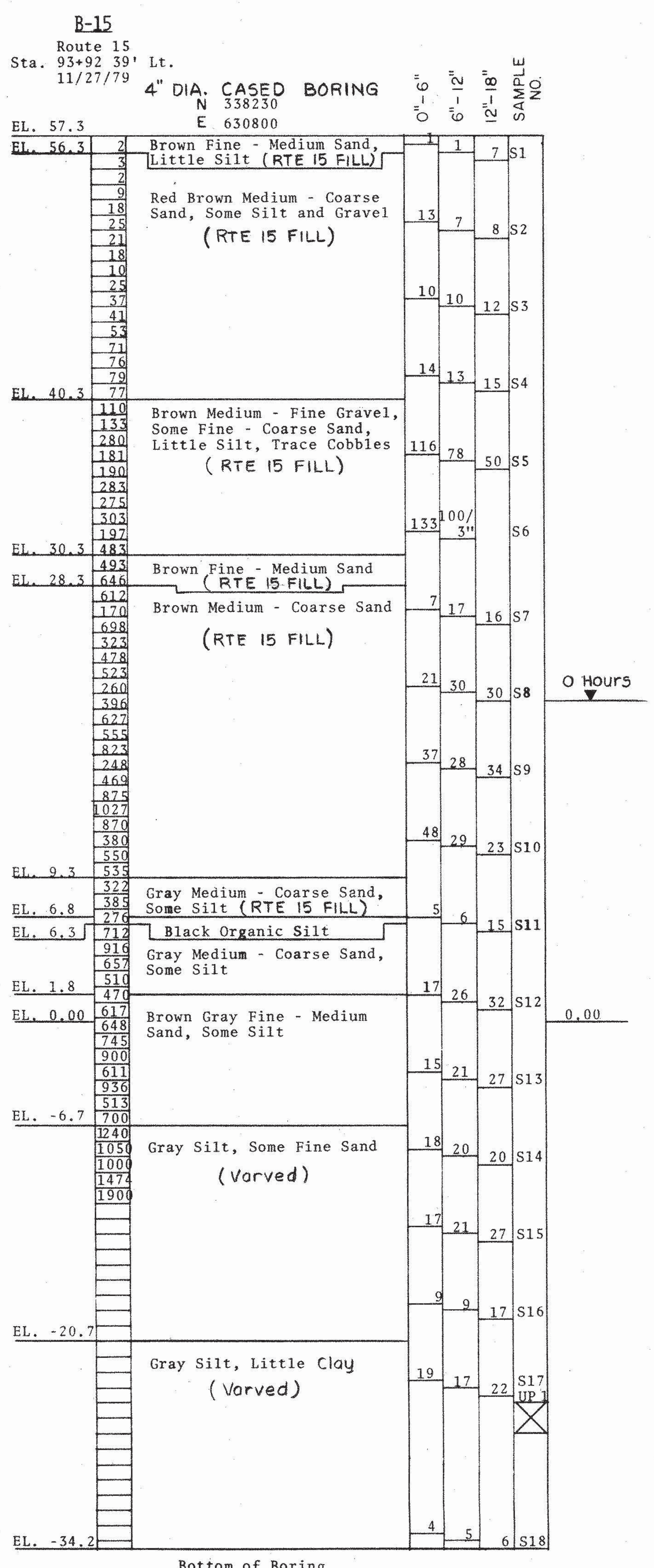
NO.	DATE	DESCRIPTION
REVISIONS		

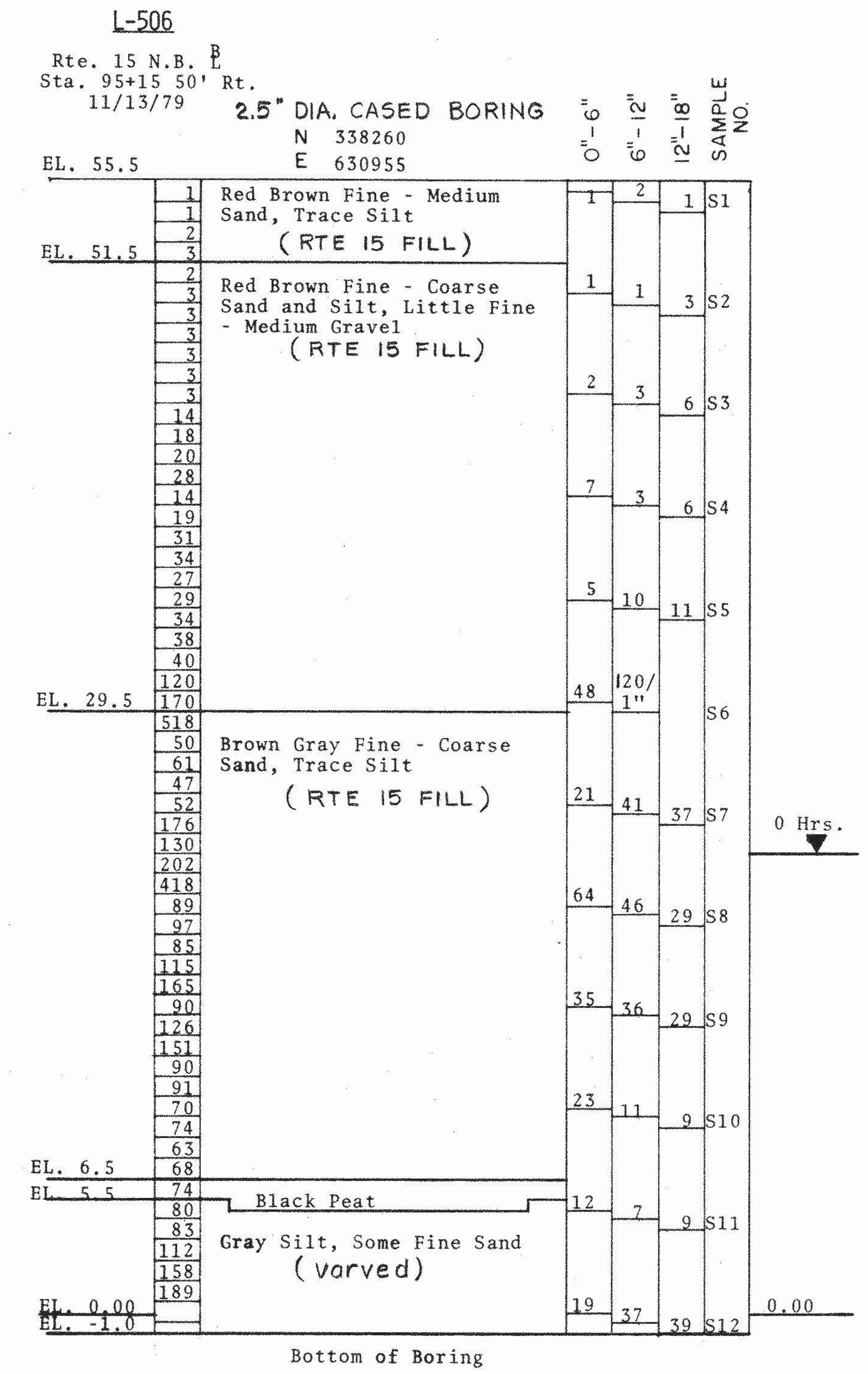
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
EAST HARTFORD
RECONSTRUCTION OF INTERSTATE ROUTE 84
ROUTE 15 N.B. AND ROUTE 15 S.B.
OVER
SILVER LANE
BORINGS SHEET 2 OF 3

ENGINEER HAYDEN, HARDING & BUCHANAN INC.
DESIGNER DBV | DRAFTSMAN GAF | CHECKER DBV
APPROVED | DATE Dec. 26 1979
STRUCTURE NO. 42-216-4 | STRUCTURE SHEET NO. 4 of 24

FHWA REGION	STATE	TOWN	FED AID PROJ. NO	PROJ. NO	YEAR	ROUTE NO	SHEET NO	TOTAL SHEETS
1	CONN.	EAST HARTFORD	I-84-4-(9)063	42-216	1983	I-84,15	506	807



NOTES: B-15
Used 1 3/8" Sample spoon
Uncased boring from EL. -11.7
Washed ahead in 5' intervals then drove pipe from EL. 32.3 to bottom of hole.



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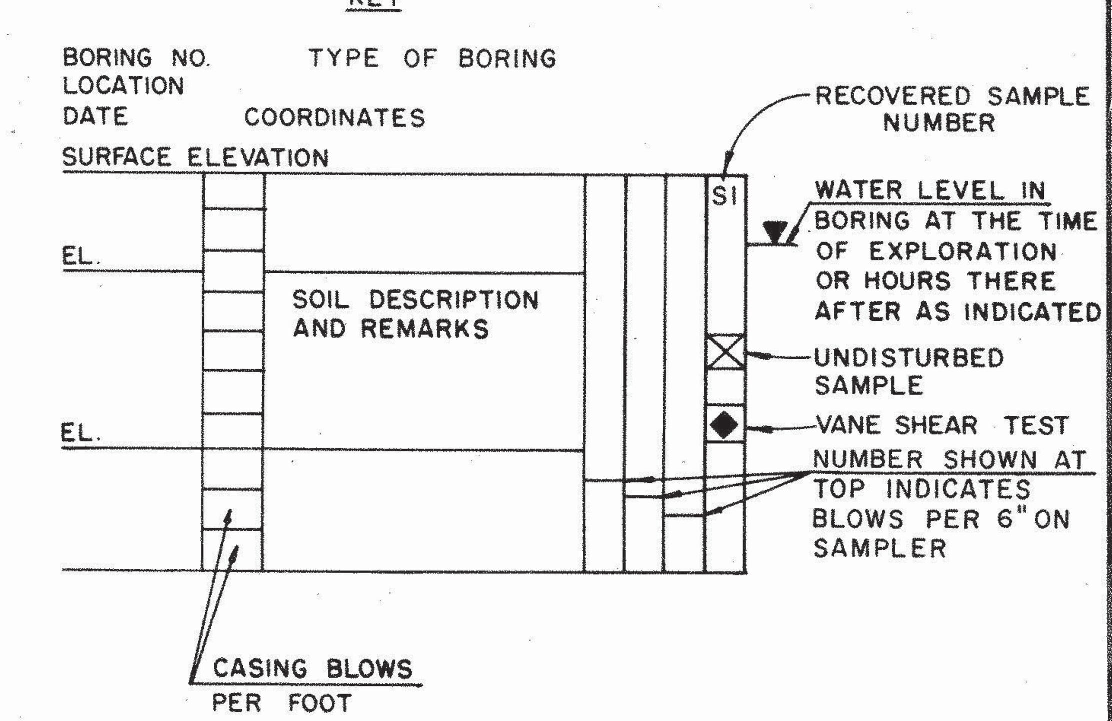

CASING I.D. = 2.5" or 4.0"
HAMMER WT. = 300 LBS.
HAMMER FALL = 24"

SAMPLER I.D. = 1 3/8"
HAMMER WT. = 140 LBS.
HAMMER FALL = 30"

ABBREVIATIONS

C.	COARSE
F.	FINE
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COBB.	COBBLES
MISC.	MISCELLANEOUS
BR.	BROWN

SCALE: 1" = 6'

THIS SHEET NOT CORRECTED

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NO.	DATE	DESCRIPTION
REVISIONS		

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
EAST HARTFORD
RECONSTRUCTION OF INTERSTATE ROUTE 84
ROUTE 15 N.B. AND ROUTE 15 S.B.
OVER
SILVER LANE

BORINGS SHEET 3 OF 3

ENGINEER HAYDEN, HARDING & BUCHANAN INC.
DESIGNER DBV | DRAFTSMAN GAF | CHECKER DBV
APPROVED J. L. Hayden | DATE DEC. 26 1979
STRUCTURE NO. 42-216-4 | STRUCTURE SHEET NO. 5 of 24

42-216 42-225 383-01 506

APPENDIX C

RESULTS OF LABORATORY TESTING

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/01/16	Checked By:	emm
Depth :	---	Test Id:	382122		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content, %
S5796-1	UP- 1 - Top	67-69	Moist, gray clay	45.6
S5796-1	UP- 1 - Top middle	67-69	Wet, gray clay	40.1
S5796-1	UP- 1 - Bottom middle	67-69	Moist, greenish gray clay	43.3
S5796-1	UP- 1 - Bottom	67-69	Wet, greenish gray clay	43.4
S6043-1	UP- 2 - Top	53-55	Moist, gray clay	58.9
S6043-1	UP- 2 - Top middle	53-55	Moist, gray clay	51.3
S6043-1	UP- 2 - Bottom middle	53-55	Moist, greenish gray clay	52.2
S6043-1	UP- 2 - Bottom	53-55	Moist, greenish gray clay	53.3

Notes: Temperature of Drying : 110° Celsius

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	06/24/16	Checked By:	emm
Depth :	---	Test Id:	382024		

Moisture Content of Soil and Rock - AASHTO T 265

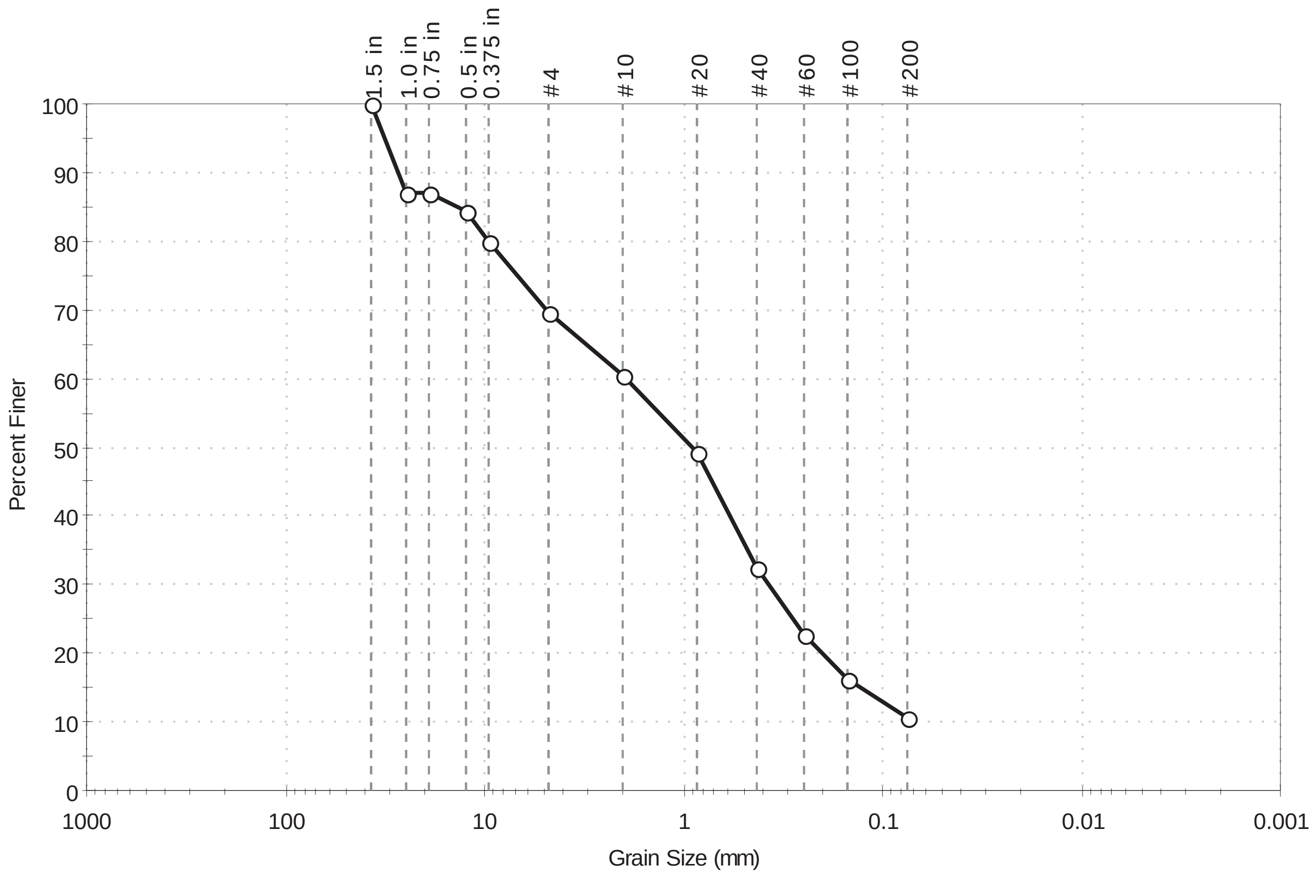
Boring ID	Sample ID	Depth	Description	Moisture Content, %
S5796-1	UP- 3 - Top	85-87	Moist, greenish gray clay	51.3
S5796-1	UP- 3 - Top middle	85-87	Moist, greenish gray clay	51.8
S5796-1	UP- 3 - Bottom middle	85-87	Moist, gray clay	42.9
S5796-1	UP- 3 - Bottom	85-87	Moist, gray clay	53.4
S-8132	Tube 1 - Top	35-37	Moist, reddish brown clay	36.9
S-8132	Tube 1 - Top middle	35-37	Wet, reddish brown clay	43.5
S-8132	Tube 1 - Bottom middle	35-37	Moist, dark reddish brown silt	31.9
S-8132	Tube 1 - Bottom	35-37	Wet, dark reddish brown silt	44.6

Notes: Temperature of Drying : 110° Celsius

GeoTesting EXPRESS

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S-5796-1	Sample Type:	jar	Tested By:	GA
Sample ID:	S-3	Test Date:	08/02/16	Checked By:	emm
Depth :	10-12 ft	Test Id:	384944		
Test Comment:	---				
Visual Description:	Moist, red sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	30.5	58.9	10.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	87		
0.75 in	19.00	87		
0.5 in	12.50	84		
0.375 in	9.50	80		
#4	4.75	70		
#10	2.00	60		
#20	0.85	49		
#40	0.42	32		
#60	0.25	23		
#100	0.15	16		
#200	0.075	11		

Coefficients

D_{85} = 13.9597 mm D_{30} = 0.3715 mm

D_{60} = 1.9405 mm D_{15} = 0.1303 mm

D_{50} = 0.9090 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM   N/A

AASHTO   Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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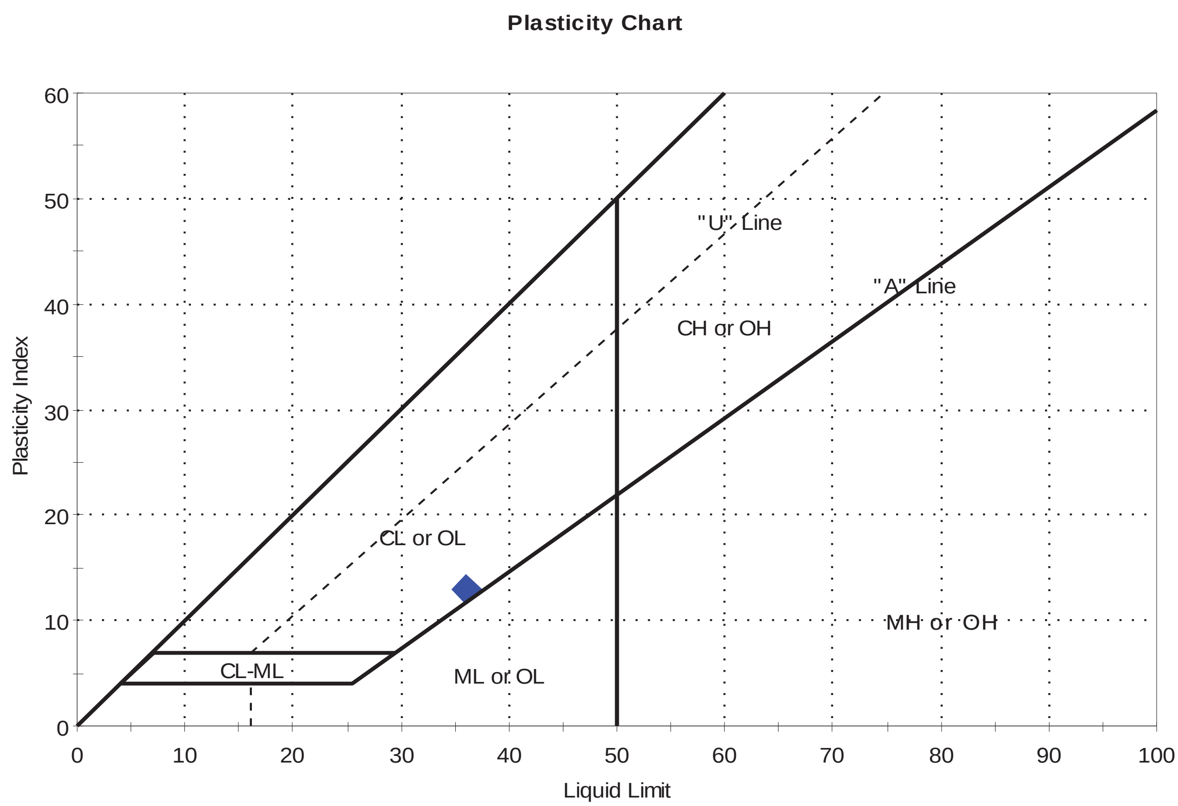
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S5796-1	Sample Type: tube	Tested By:	GA
Sample ID: UP-1 - Top middle	Test Date: 07/13/16	Checked By:	emm
Depth : 67-69	Test Id: 382132		
Test Comment:	---		
Visual Description:	Wet, gray clay		
Sample Comment:	---		

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Top middle	S5796-1	67-69	40	36	23	13	1.3	

Sample Prepared using the WET method

Dry Strength: MEDIUM

Dilatancy: RAPID

Toughness: MEDIUM

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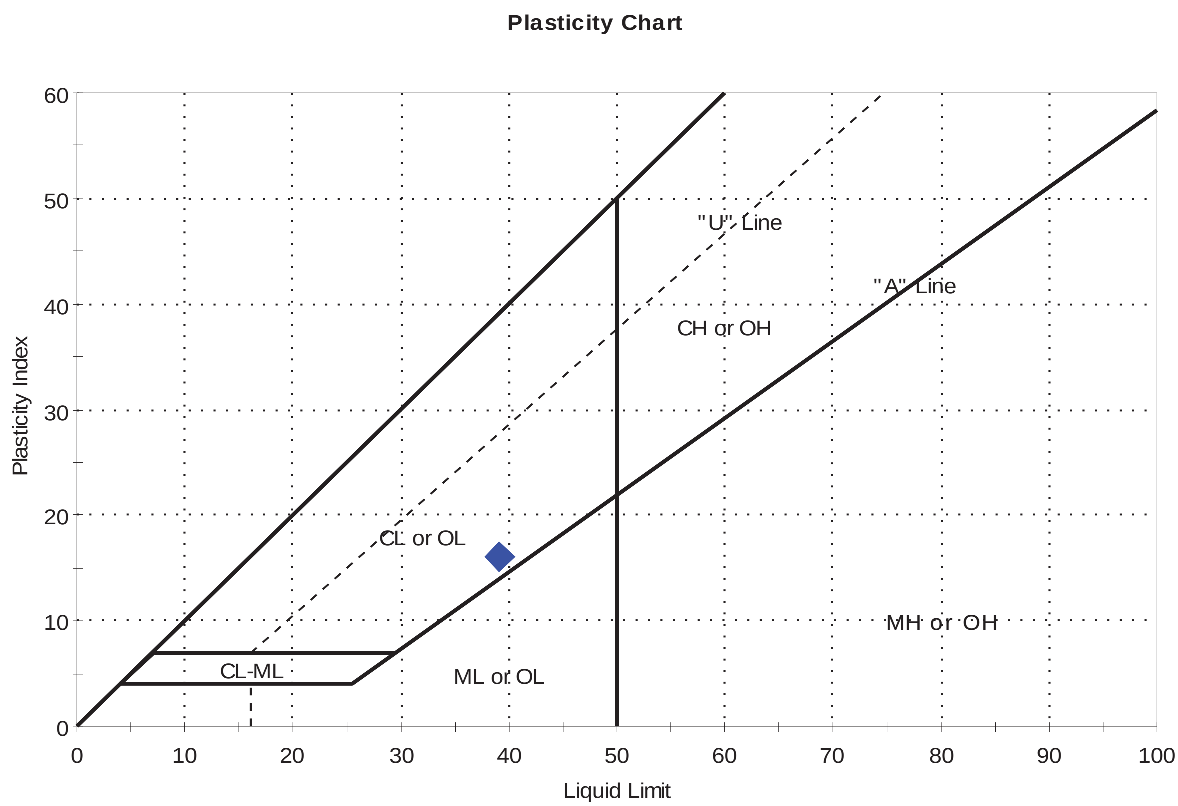
Client: Freeman Companies, LLC			
Project: Reconstruction of Exit Charter Oak Bridge			
Location: Hartford, CT		Project No:	GTX-304831
Boring ID: S5796-1	Sample Type: tube	Tested By:	GA
Sample ID: UP-1 - Bottom	Test Date: 07/13/16	Checked By:	emm
Depth : 67-69	Test Id: 382127		
Test Comment: ---			
Visual Description: Wet, greenish gray clay			
Sample Comment: ---			

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Bottom	S5796-1	67-69	43	39	23	16	1.3	

Sample Prepared using the WET method

Dry Strength: HIGH
Dilatancy: NONE
Toughness: MEDIUM

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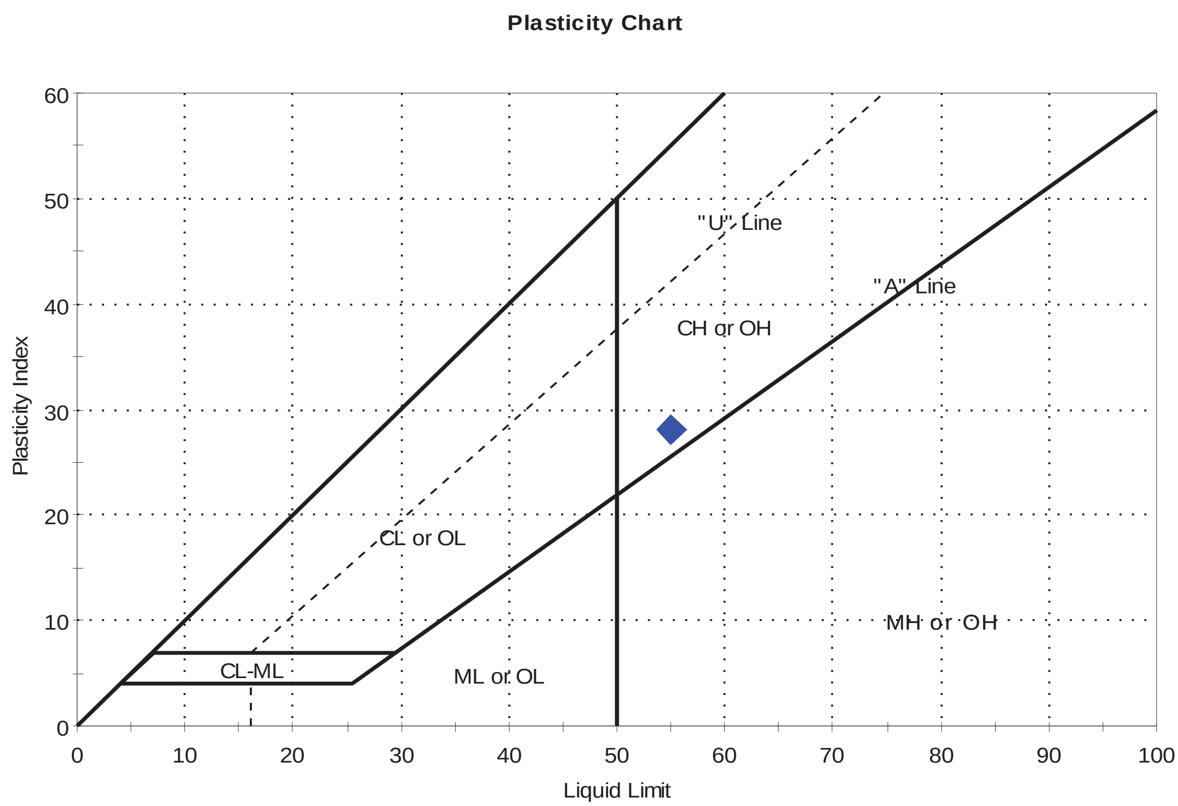
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S5796-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-3 - Top middle	Test Date:	07/14/16	Checked By:	emm
Depth :	85-87	Test Id:	382094		

Test Comment: ---
Visual Description: Moist, greenish gray clay
Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-3 - Top middle	S5796-1	85-87	52	55	27	28	0.9	

Sample Prepared using the WET method

Dry Strength: HIGH
Dilatancy: SLOW
Toughness: MEDIUM

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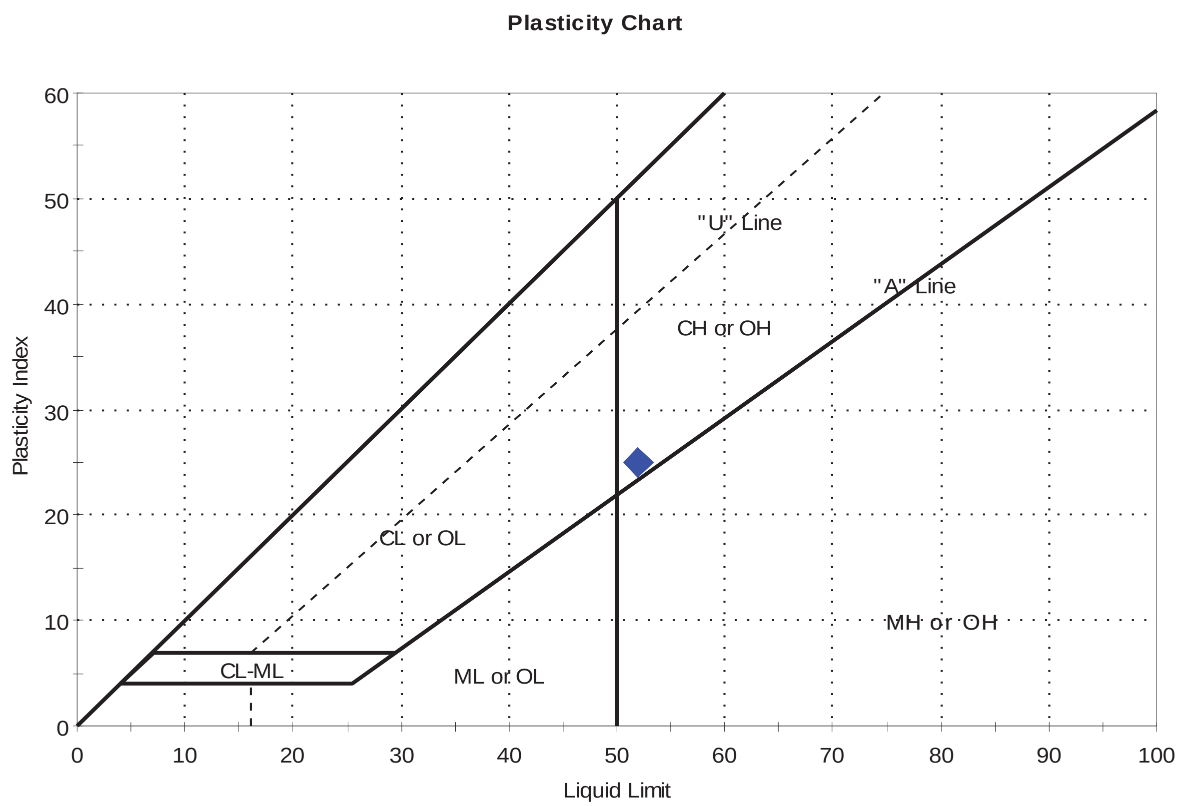
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S5796-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-3 - Bottom	Test Date:	07/13/16	Checked By:	emm
Depth :	85-87	Test Id:	382089		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-3 - Bottom	S5796-1	85-87	53	52	27	25	1.1	

Sample Prepared using the WET method

Dry Strength: MEDIUM

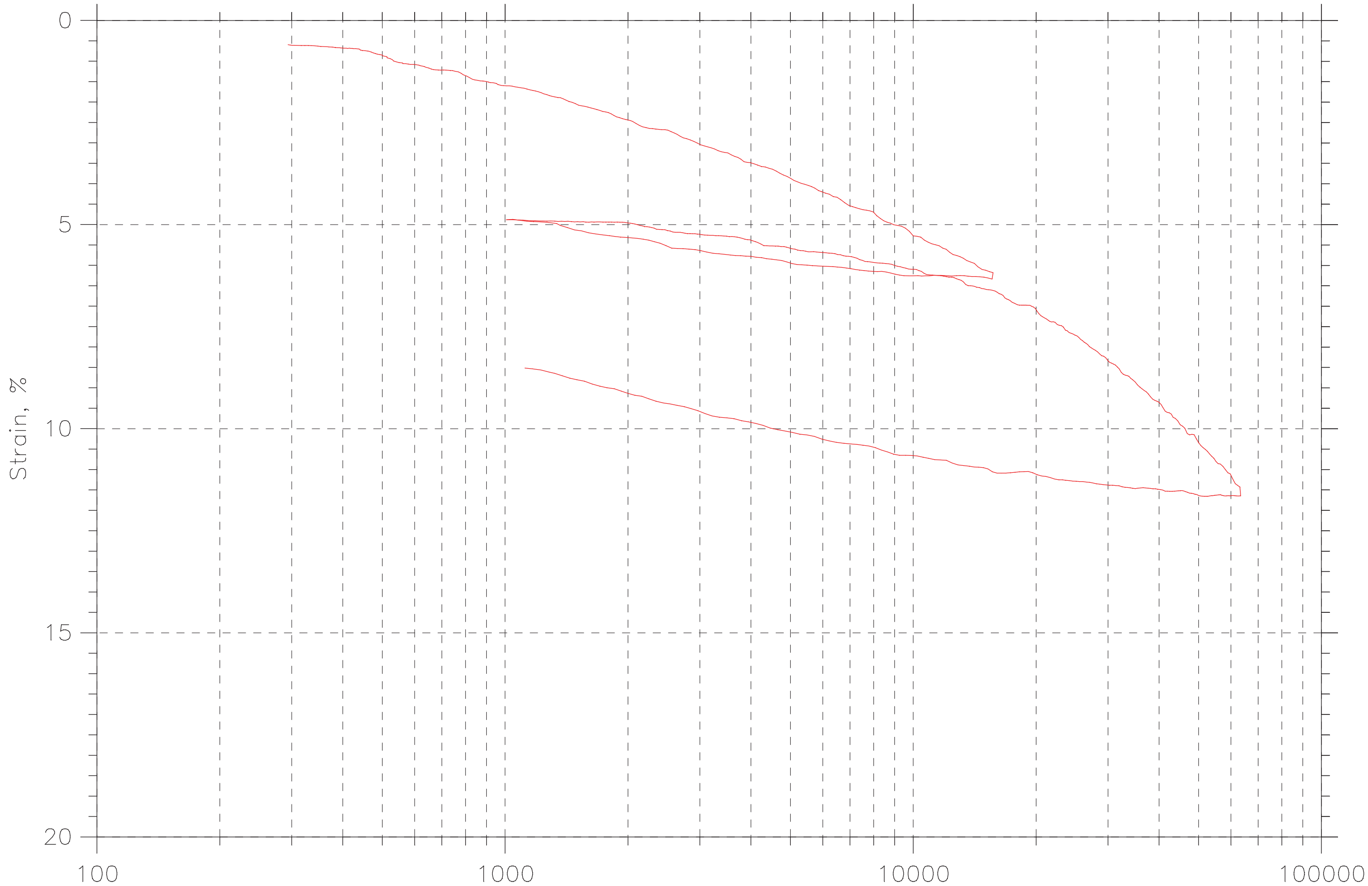
Dilatancy: NONE

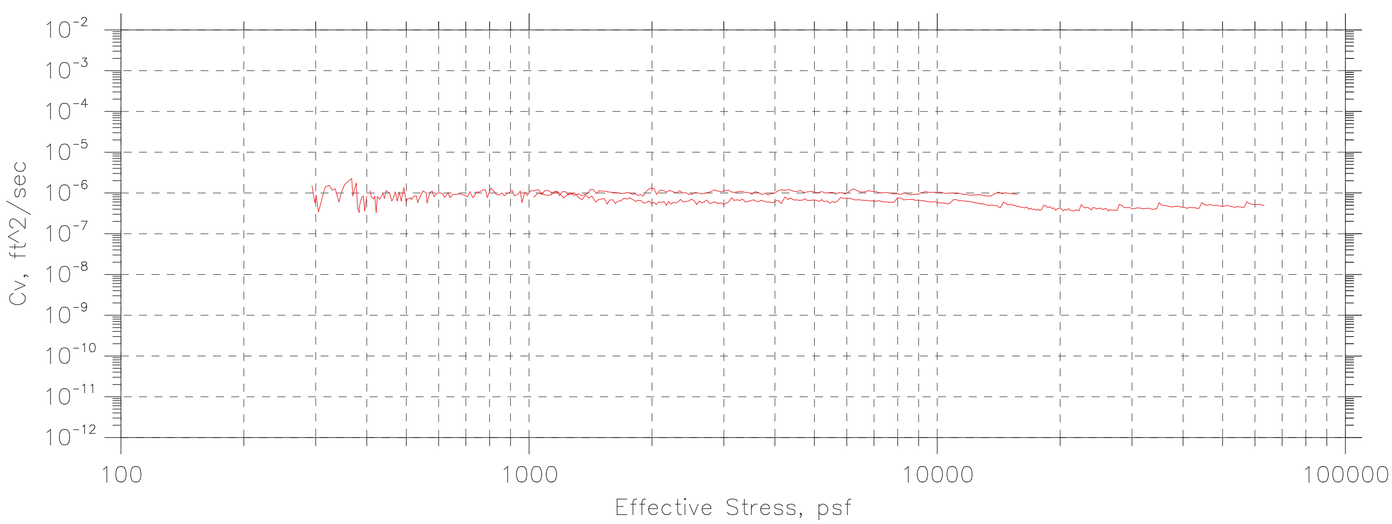
Toughness: MEDIUM

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/09/16	Depth: 67-69 ft
Test No.: CRC-11	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System v		
		Page 1 of 3

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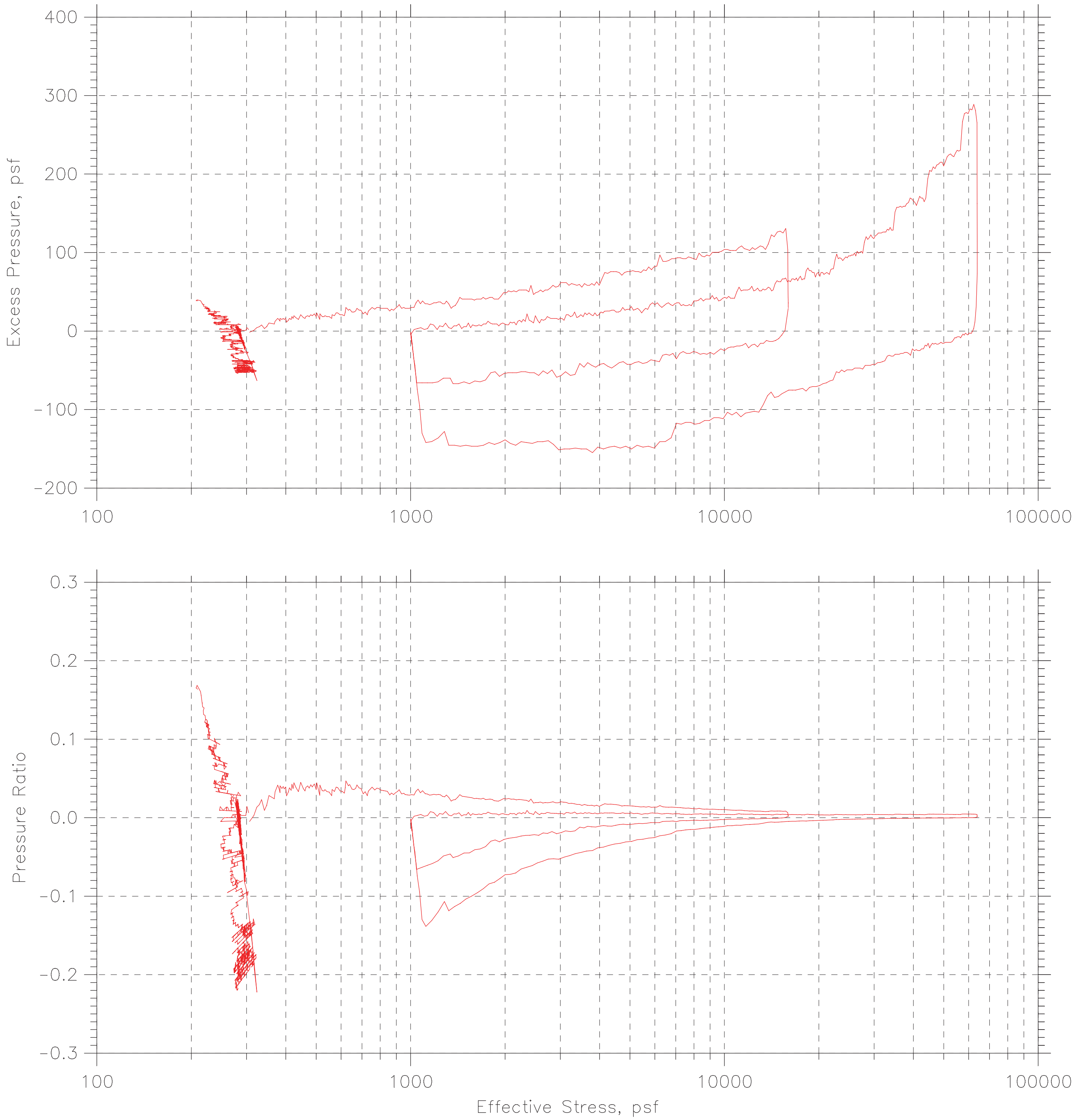
GeoTesting EXPRESS

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/09/16	Depth: 67-69 ft
Test No.: CRC-11	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System v		
		Page 2 of 3

CRC TEST DATA

Project: Reconstruction of Exit
Boring No.: S5796-1
Sample No.: UP-1
Test No.: CRC-11

Location: Hartford, CT
Tested By: md
Test Date: 06/09/16
Sample Type: intact

Project No.: GTX-304831
Checked By: njh
Depth: 67-69 ft
Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System v

Estimated Specific Gravity: 2.82
Initial Void Ratio: 1.03
Final Void Ratio: 0.847

Liquid Limit: 39
Plastic Limit: 23
Plasticity Index: 16

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.91 in

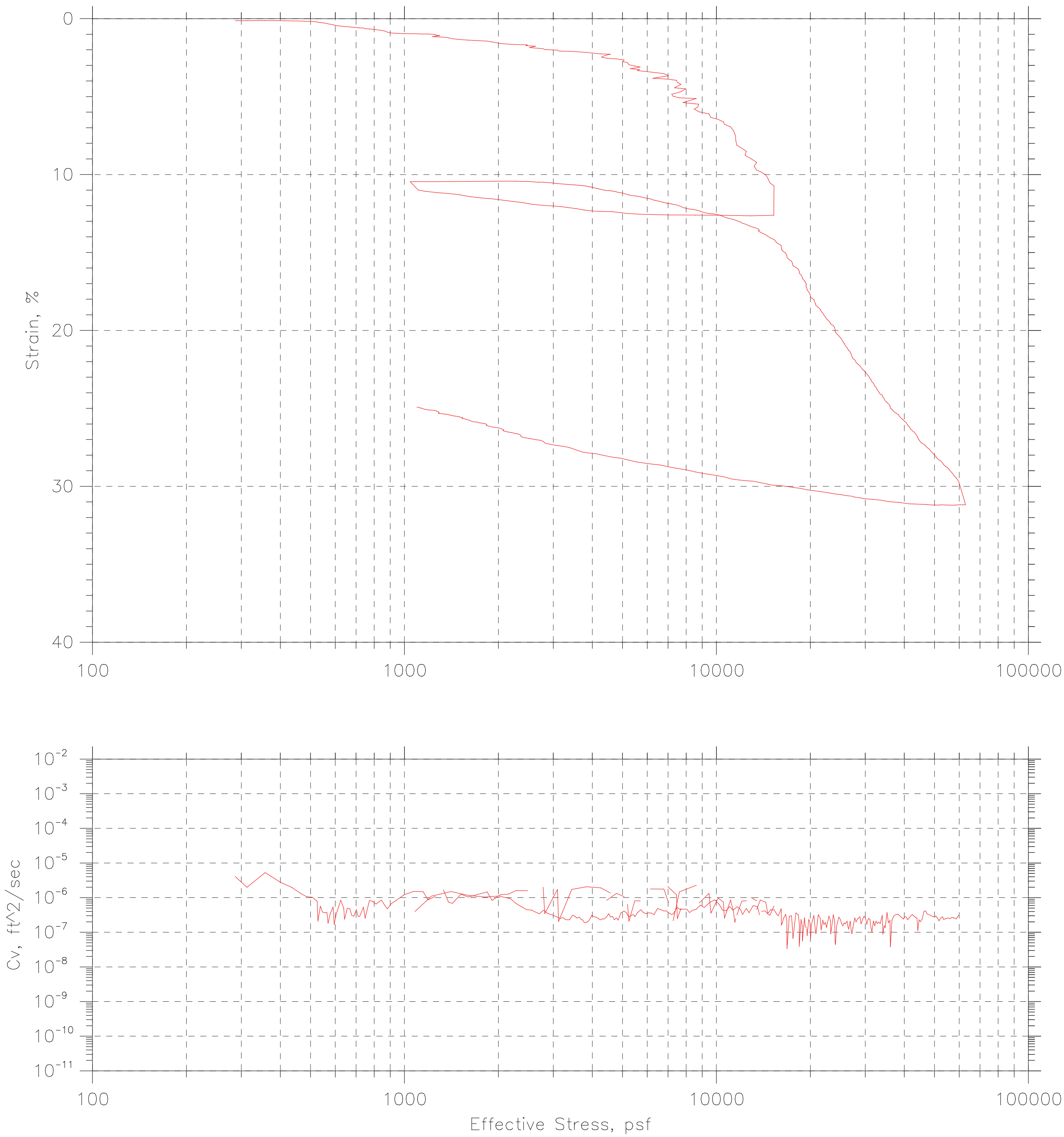
	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	C-1254	RING		16941
Wt. Container + Wet Soil, gm	215.83	261.53	254.34	156.75
Wt. Container + Dry Soil, gm	152.99	220.78	220.78	122.57
Wt. Container, gm	8.3600	109.11	109.11	8.8300
Wt. Dry Soil, gm	144.63	111.67	111.67	113.74
Water Content, %	43.45	36.49	30.05	30.05
Void Ratio	---	1.03	0.847	---
Degree of Saturation, %	---	99.88	100.00	---
Dry Unit Weight, pcf	---	86.666	95.238	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report



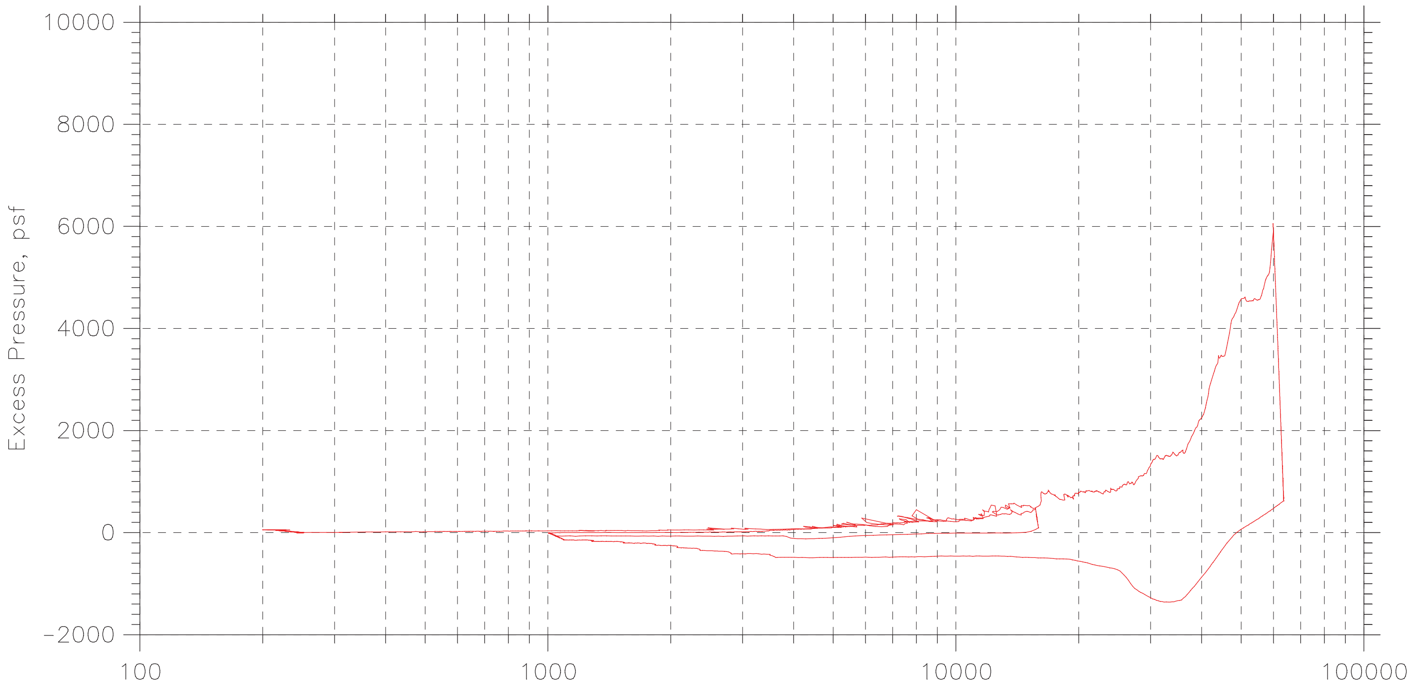
Project: reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/28/16	Depth: 85-87 ft
Test No.: CRC-4A	Sample Type: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System O		
		Page 1 of 3Page 1 of 3

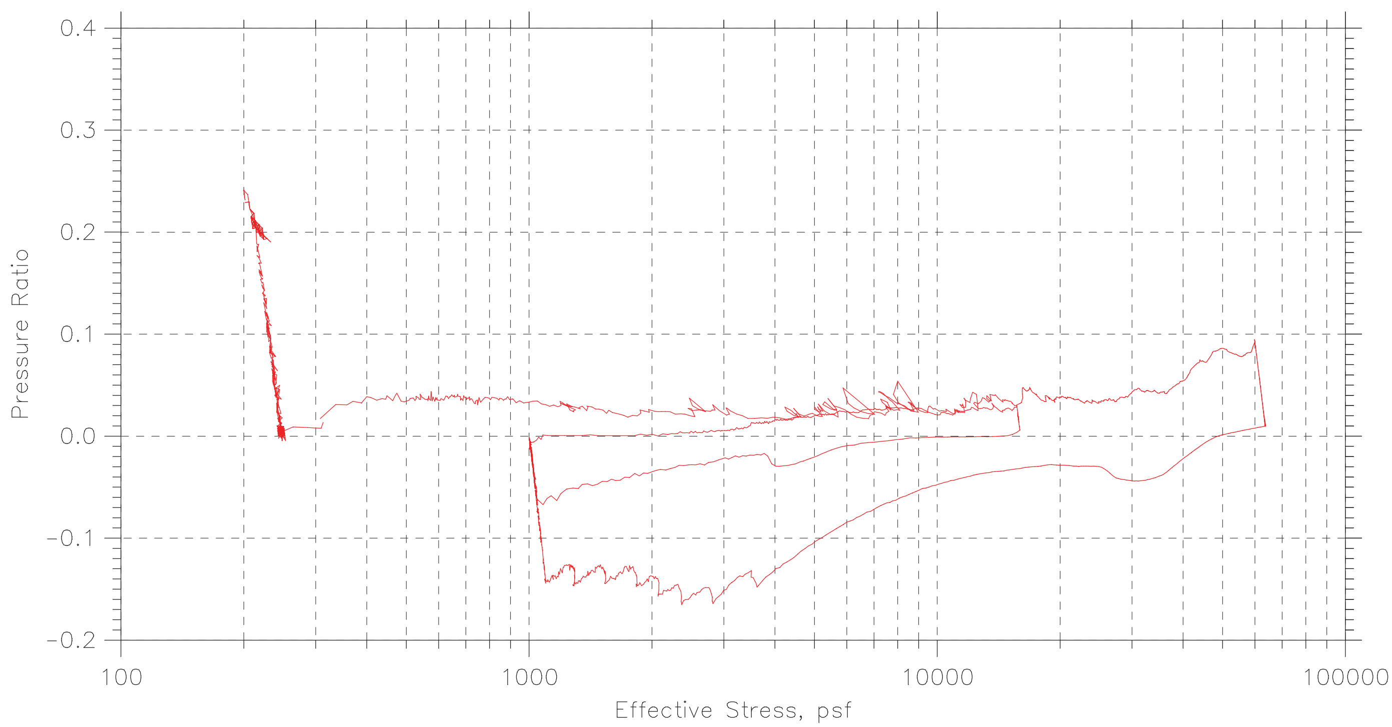
GeoTesting EXPRESS

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S5796-1	Tested By: md	Checked By: njh
Sample No.: UP-3	Test Date: 06/28/16	Depth: 85-87 ft
Test No.: CRC-4A	Sample Type: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System O		
		Page 2 of 3

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GeoTesting EXPRESS

CRC TEST DATA

Project: reconstruction of Exit
Boring No.: S5796-1
Sample No.: UP-3
Test No.: CRC-4A

Location: Hartford, CT
Tested By: md
Test Date: 06/28/16
Sample Type: intact

Project No.: GTX-304831
Checked By: njh
Depth: 85-87 ft
Elevation: ---

Soil Description: Moist, gray clay
Remarks: System O

Estimated Specific Gravity: 2.75
Initial Void Ratio: 1.44
Final Void Ratio: 0.882

Liquid Limit: 52
Plastic Limit: 27
Plasticity Index: 25

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.77 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	C-1428	RING		B-453
Wt. Container + Wet Soil, gm	111.98	247.53	229.51	126.48
Wt. Container + Dry Soil, gm	75.790	200.49	200.49	97.840
Wt. Container, gm	8.0300	109.81	109.81	8.3600
Wt. Dry Soil, gm	67.760	90.677	90.677	89.480
Water Content, %	53.41	51.88	32.01	32.01
Void Ratio	---	1.44	0.882	---
Degree of Saturation, %	---	98.99	100.00	---
Dry Unit Weight, pcf	---	70.373	91.393	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Geotechnical Report
Rehabilitation of Bridge 06000A
Route 5/15 NB over I-91 NB, Reserve Road, Route 2, CT River and Railroad
State Project No. 63-703
Hartford and East Hartford, Connecticut

February 14, 2017

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

Freeman Companies, LLC
36 John Street
Hartford, CT 06106

Nathan L. Whetten, P.E., D.GE.
Vice President of Geotechnical Services

FREEMAN COMPANIES

TABLE OF CONTENTS

ATTACHMENTS

Table

Figures

Appendices

1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 06000A, Route 5/15 NB over I-91 NB, Reserve Road, Route 2, CT River, and Railroad. Abutment 1 and Piers 1, 2, and 3 will be widened to accommodate two additional travel lanes.

We recommend that the widened abutments and piers be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the Abutment 1 and wingwall will result in settlement of subgrade soils and downdrag loads on abutment piles will occur. Additionally, soils at Abutment 1 and at the piers were found to be corrosive. We recommend that bitumen coatings be applied to piles supporting Abutment 1 and the piers to provide protection against corrosion, and to reduce downdrag at Abutment 1. Preaugering will be required to protect the coatings.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions
- Conducted settlement evaluations
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

Abutment 1 will be widened by 33 feet on the east side, and Piers 1, 2, and 3 will be widened by an average of about 21 feet to accommodate the additional travel lanes. The pile cap supporting Abutment 1 will be enlarged to support the widened abutment. The widened portions of Piers 1, 2, and 3 will be supported on new pile cap foundations constructed adjacent to the existing foundations.

2.2 Site Description

Abutment 1 will be widened on the southeast side, between the existing abutment and the on-ramp from Route 5/15 to I-91 NB. The area slopes downward to the southeast to the on-ramp, and is grass-covered with some trees. Ground surface is about El. 67 at bridge grade, and slopes from approximately El. 46 to 34 in the area of the abutment widening.

Piers 1 and 2 are located north of I-91 NB and south of Reserve Road and railroad tracks. Pier 3 is located north of Reserve Road. Ground surface is gravel covered and at about El. 48 at Pier 1, El. 36 at Pier 2, and El. 35 at Pier 3.

3.0 EXPLORATIONS

3.1 Recent Explorations

Four test borings (S2-1 through S2-4) were drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. Boring S2-1 was drilled Abutment 1, and borings S2-2, S2-3, and S2-4 were drilled near Piers 1, 2, and 3. Borings were drilled to depths ranging from 64 to 100 feet below ground surface. Standard Penetration Tests were completed at maximum 5 foot intervals within the test borings. Ten-foot-long NX-size rock cores were obtained from each boring. Explorations were backfilled with drill cuttings. A groundwater monitoring well was installed in boring S2-3 OW to measure groundwater levels. A roadway box was placed at ground surface to protect the installation.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Boring Logs. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

Several previous test borings were drilled in the vicinity of the new bridge and are considered applicable, including B-103, B-104, B-107, B-109, B-111, B-114, and B117A. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan, and logs are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Twelve moisture content tests
- Two pH tests, two electrical resistivity tests, and two soluble sulfate tests
- Five grain size analyses
- Three Constant Rate of Strain (CRS) Consolidation Tests
- Six Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, West of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. Subsurface profiles at the abutments and piers are provided on Figures 4A through 4D, Subsurface Profiles.

Thickness Range (ft.)	Stratum	Generalized Description
2 to 19	Fill	Loose to dense brown, c-f SAND, trace to some c-f gravel, trace to some silt, trace brick, wood, glass, rubble, cement, organic material, petroleum-like odor noted in S2-3, strong odor detected in S2-4. Standard Penetration Test (SPT) N-Values ranged from 5 to 55 blows per foot (bpf).
25 to 42	Alluvium	Very loose to medium dense gray SILT and f SAND; to gray c-f SAND, trace f gravel, trace silt. SPT N-values ranged from 1 to 44 bpf.
12.5 to 38	Lacustrine	Varved red-brown CLAY and SILTY CLAY, in regular layers typically ¼ to ½ inch thick and up to 3 inches thick at some locations. SPT N-values typically range from 0 to 4 bpf, however the deposit is typically medium stiff.
1.5 to 14.5	Glacial Till	Medium dense to very dense red-brown c-f SAND, some coarse to fine gravel, some silt. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values ranged from 15 to more than 100 bpf.
	Bedrock	Bedrock was described as brown ARKOSE, medium strong to strong with fractured zones. The top 0 to 5.5 feet of bedrock was weathered.

Groundwater – Water was encountered in the borings at depths ranging from 6 to 18 feet (El 4 to El 18). Groundwater was measured in the observation well S2-3 (OW) at El. 7.6, nine months after the well was installed. Groundwater levels were measured during drilling activities and may not represent static levels, except at observation wells. Water levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – Corrosion testing was conducted on samples recovered from test borings S1-2 (Abutment 1), S1-5 (Pier 2), and S1-12 (Abutment 2). Results are summarized below:

Test parameter	S2-1, 15’-17’ (Abut 1)	S2-3, 5’-7’ (Pier 2)
pH	6.8	7.5
Electrical Resistivity (ohm-cm)	1,343	486
Sulfates (ppm)	<50	297

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – The threshold settlement for downdrag loads on piles is commonly considered to be 0.4 inches. Settlement evaluations were conducted at the proposed abutments to estimate the magnitude of total settlement, and whether settlement would cause downdrag at the existing and proposed piles. Predicted total settlement calculated using the computer program Settle 3D (by RocScience) is as follows:

Normal Weight Fill:	2½ inches south of abutment; 1¼ inches at abutment (incl. ½ inch on-going secondary)
Expanded Shale:	1½ inches south of the abutment; 1 inch at the abutment (incl. ½ inch secondary)
Geofoam:	3/4 inch south of the abutment; ½ inch at the abutment (incl. 0.4 inch secondary)

These settlements will result in downdrag loads on the abutment piles. We recommend that coatings be applied to piles to reduce downdrag loads at the abutments, or that piles be oversized to allow for downdrag. A 90 percent reduction in downdrag loads is considered feasible using bitumen coatings, whereas a 33 percent reduction in downdrag has been reported for an epoxy coating referred to as *Slickcoat*. We recommend that bitumen coatings be considered for this project. We recommend that backfill consist of expanded shale aggregate.

Corrosion – AASHTO Section 10.7.5 indicates that soils are corrosive if pH is less than 5.5, resistivity is less than 2,000 ohm-cm, or sulfate concentration is greater than 1,000 ppm. Based on these criteria, soils at the Abutment 1 and the piers are considered corrosive. Corrosion mitigation methods typically include providing a protective coating (AASHTO C10.7.5). The NCHRP report titled *"Design and Construction Guidelines for Downdrag on Uncoated and Bitumen Coated Piles",* Briaud and Tucker, 1996, pg. 10, indicates that bitumen coatings provide corrosion resistance.

We recommend that bitumen coatings be applied to piles at Abutment 1, to provide both corrosion protection and downdrag mitigation. Bitumen coating should also be applied to piles at the piers to provide corrosion resistance. Alternatively, epoxy-coated piles may be considered for corrosion protection at the piers.

Pile Design

- Seismic Design: Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class E. Assume peak ground acceleration (PGA) of 0.061g, a short-term acceleration coefficient S_s= 0.132g and long-term acceleration coefficient S_1 = 0.037g, respectively.
- Pile Type: HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- Service Limit: 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Subtract an appropriate allowance for downdrag for piles supporting the abutments, as indicated below.
- Strength Limit: For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.

- **Downdrag:** Estimated downdrag loads are listed below:
  - Abutment 1:
    - 160 tons (single piles, uncoated) or 16 tons (single pile with bitumen coating)
    - 14.5 tons (corner pile in a group with bitumen coating)
    - 13 tons (side pile in a group with bitumen coating)
    - 8 tons (inside pile in a group with bitumen coating)
- **Load Tests:** Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- **Test Piles:** Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- **Minimum Spacing:** Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- **Lateral Resistance:** Use the pile capacity in batter. Additional lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- **Subgrade Preparation Below Pile Cap:** Pile cap subgrades are expected to occur within silty soils that can easily be disturbed and become unstable. We recommend a minimum 12-inch thick layer of crushed stone (CTDOT Form 817 M.01.01 No. 6) overlying separation fabric (CTDOT Form 817 Sec. 7.55 M8.01-26) over the subgrade.
- **Bottom of Structure and Estimated Pile Length:**

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation
Abutment 1	26.1	-61
Pier 1	9.5	-62
Pier 2	15.8 (west support) 14 (east support)	-56
Pier 3	20	-51

Abutment Design

- **Backfill Material:**
  Expanded Shale Aggregate between Abutment 1 and Abutment 2 of New Bridge
  Provide a 12-inch thick layer of compacted granular fill between top of Expanded Shale and Roadway Base
  Assumes a 24-inch thick pavement section
- **Est. Settlement:** Up to 1-in. total settlement at Abutment 1
- **Weep Holes:** 4 inch dia. weep holes at max 10 foot spacing, installed according to CTDOT specifications.
- **Lateral Pressures:** Refer to Figure 5 – Active Earth Pressures

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Proposed bottom of pile caps will be within the Fill and Alluvium strata. The alluvium and portions of the fill are highly susceptible to disturbance by construction equipment, and are expected to be wet due to shallow groundwater. Excavation to footing subgrade should be made using a smooth-bladed backhoe bucket. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Pile Cap Subgrade Preparation

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. We anticipate that working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment. A draft special provision is provided in Appendix D.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.3 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat.

Piles with bitumen or epoxy coatings should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. Additionally, the alluvium is expected to be susceptible to settlement from pile driving, and settlement of the alluvial deposits could affect nearby structures and utilities. The top of lacustrine deposits is typically about El -20. Sand should be placed in the casing as the casing is extracted.

Draft special provisions are provided in Appendix D.

6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces
- Pile installation and load tests
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

2014-1001
Bridge 06000A Rt 15 SB over I-91 NB Rt. 2 & CT River & RR
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
Hartford, Connecticut

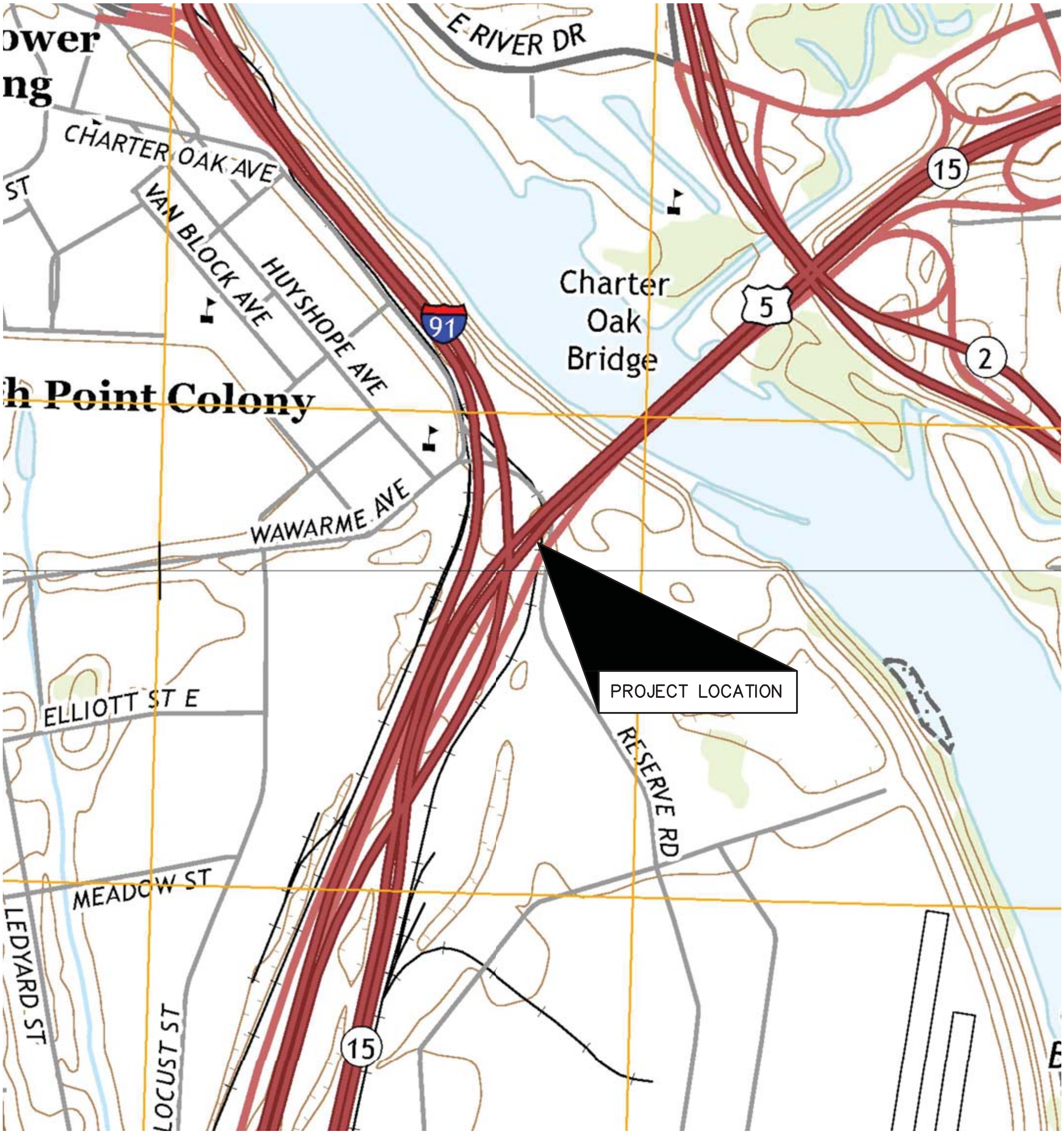
Table 1
Subsurface Data

Boring No.	Ground Surface El.	Depth (ft.)	Thickness (ft.)						Groundwater		Bedrock	
			Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Borings												
S2-1	29.6	100 C	1	19	29	35	3	3	11.5	18.1	87	-57.4
S2-2	17.5	89.5 C	0.2	8.8	25	30	10	5.5	NM	NM	74	-56.5
S2-3 (OW)	22.8	64 C	0.5	9.5	29	12.5	1.5	1	15.2	7.6	53	-30.2
S2-4	22.8	85 C	0.5	8	35	20	8.5	3	19	3.8	72	-49.2
Previous Test Borings												
B-104	25.6	84 C	0	6	42	10.5	14.5	1	17.5	8.1	73	-47.4
B-107	15.2	86 C	0	4	30	38	4	0	8.5	6.7	76	-60.8
B-111	19.5	95 C	0	3	36	30	12	4	NM	NM	81	-61.5
B-114	17.4	84 C	0	3.5	33.5	27	9	1	6.2	11.2	73	-55.6
B-117A	29.5	90 C	0	13	36.5	23.5	7	0	NM	NM	80	-50.5

Notes:

1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevations at previous borings were shown on the logs and corrected to NAVD-88 in this table.
2. Groundwater levels are approximate
3. Top of bedrock is inclusive of weathered rock
4. ">" - Greater Than "--" - Not Encountered (C) - Bedrock Core Taken "NM" - Not Measured

FIGURES



USGS QUADRANGLE MAP
HARTFORD NORTH, CONNECTICUT
HARTFORD SOUTH, CONNECTICUT
DATE 2015

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SITE LOCATION MAP

REHABILITATION OF BRIDGE 06000A

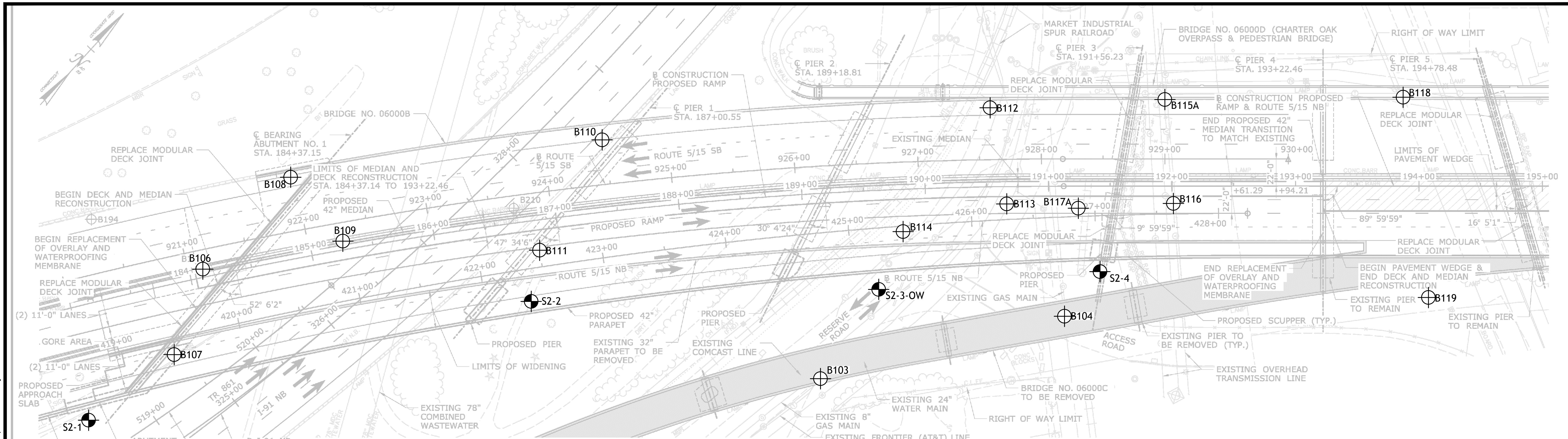
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	1"=1000'
PROJECT NO.:	2014-1001
DATE:	10/21/2016

SHEET NO.

FIGURE 1

Freeman Companies, LLC . Y:\2014\2014-1001 ConnDot CSO 2232 CME\DWG\Figure 1 LOCUS -- COB.dwg Oct 26, 2016-9:37am Plotted By: mkwok



GENERAL PLAN

LEGEND:

- RECENT BORINGS
- PREVIOUS BORINGS

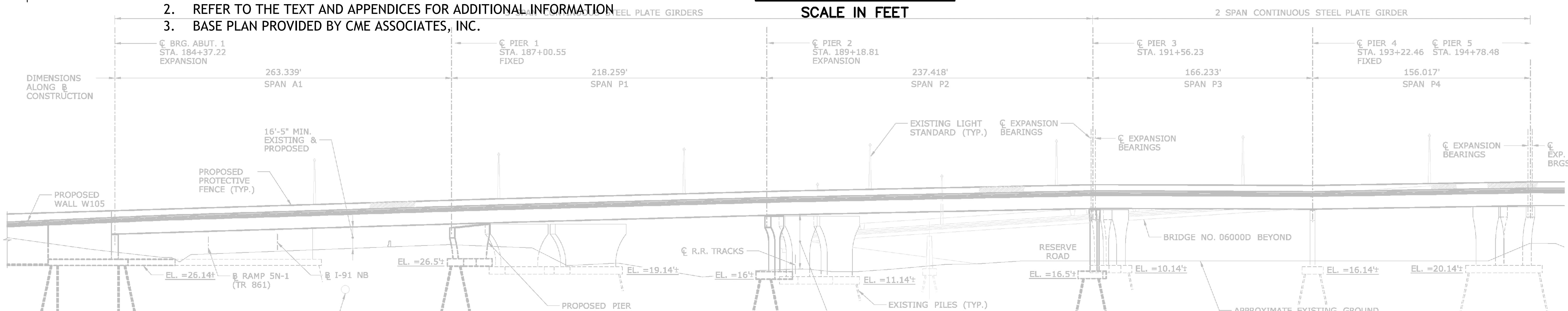
NOTES:

1. RECENT EXPLORATION LOCATIONS WERE SURVEYED BY CME ASSOCIATES, INC., AND PREVIOUS BORING LOCATIONS WERE ESTIMATED FROM RECORD INFORATION AND ARE APPROXIMATE.
2. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION
3. BASE PLAN PROVIDED BY CME ASSOCIATES, INC.

GRAPHIC SCALE

80 40 0 80

SCALE IN FEET



SUBSURFACE EXPLORATION LOCATION PLAN

REHABILITATION OF BRIDGE 06000A

STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

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TOLL FREE:(800)604-5141
FAX:(860)986-7161

ELEVATE YOUR EXPECTATIONS

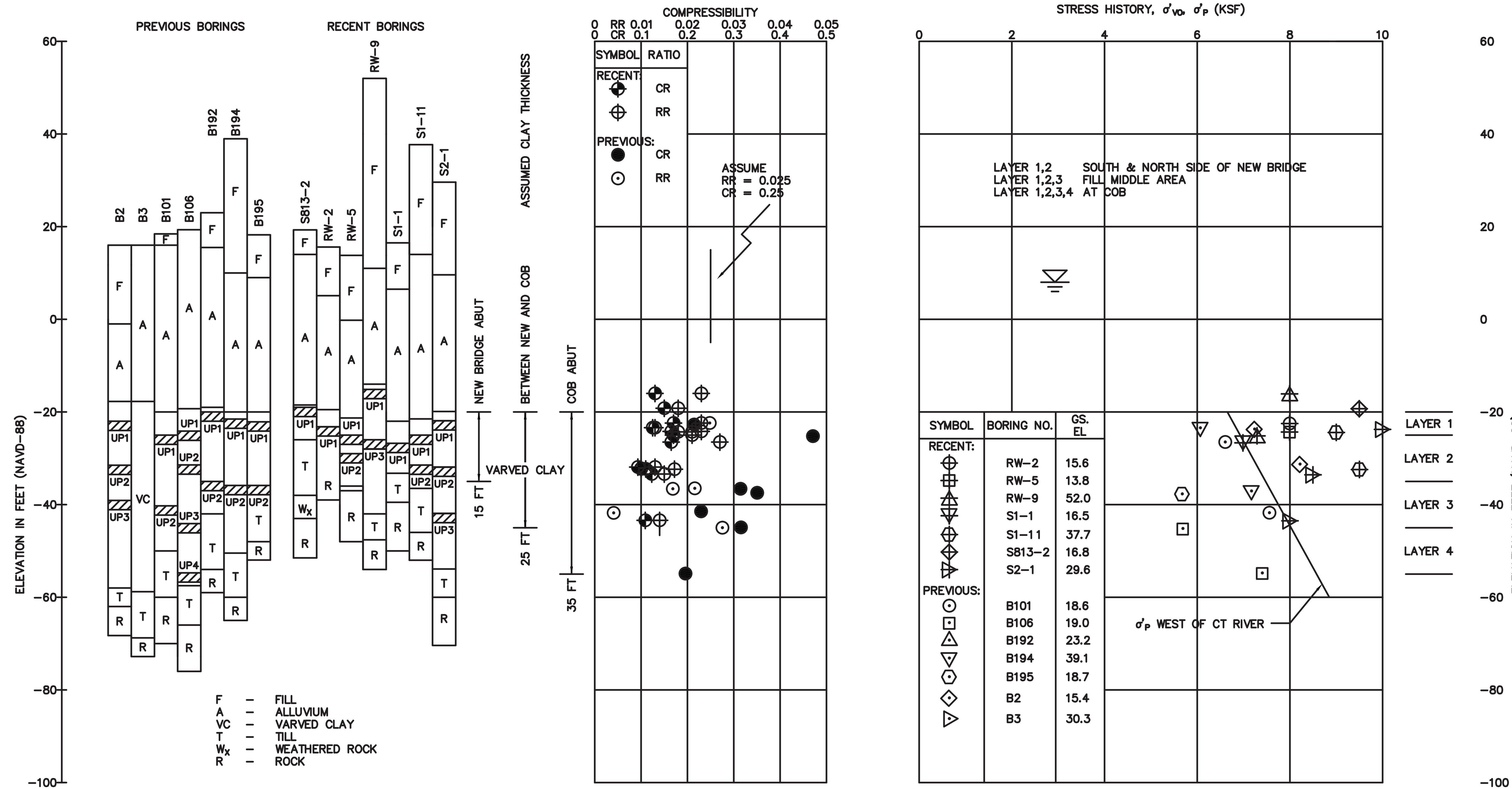
No.	Date	Description
–	–	–

REVISIONS

DRAWN:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALE:	1"=80'
PROJECT NO.:	2014–1001
DATE:	12/15/2017

SHEET NO.

FIGURE 2



NOTES

1. PREVIOUS DATA WAS OBTAINED FROM THE REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD–EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
2. ELEVATIONS REFER TO NAVD–88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD–29.

DEFINITIONS

CR – COMPRESSION RATIO ($=\Delta\varepsilon/\Delta LOG\sigma'_V$) DURING VIRGIN COMPRESSION

RR – RECOMPRESSION RATIO ($=\Delta\varepsilon/LOG\sigma'_V$) DURING RECOMPRESSION

σ'_{VO} – IN SITU VERTICAL EFFECTIVE STRESS

σ'_P – PRECONSOLIDATION STRESS

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SUMMARY OF VARVED CLAY PROPERTIES
WEST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3A

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

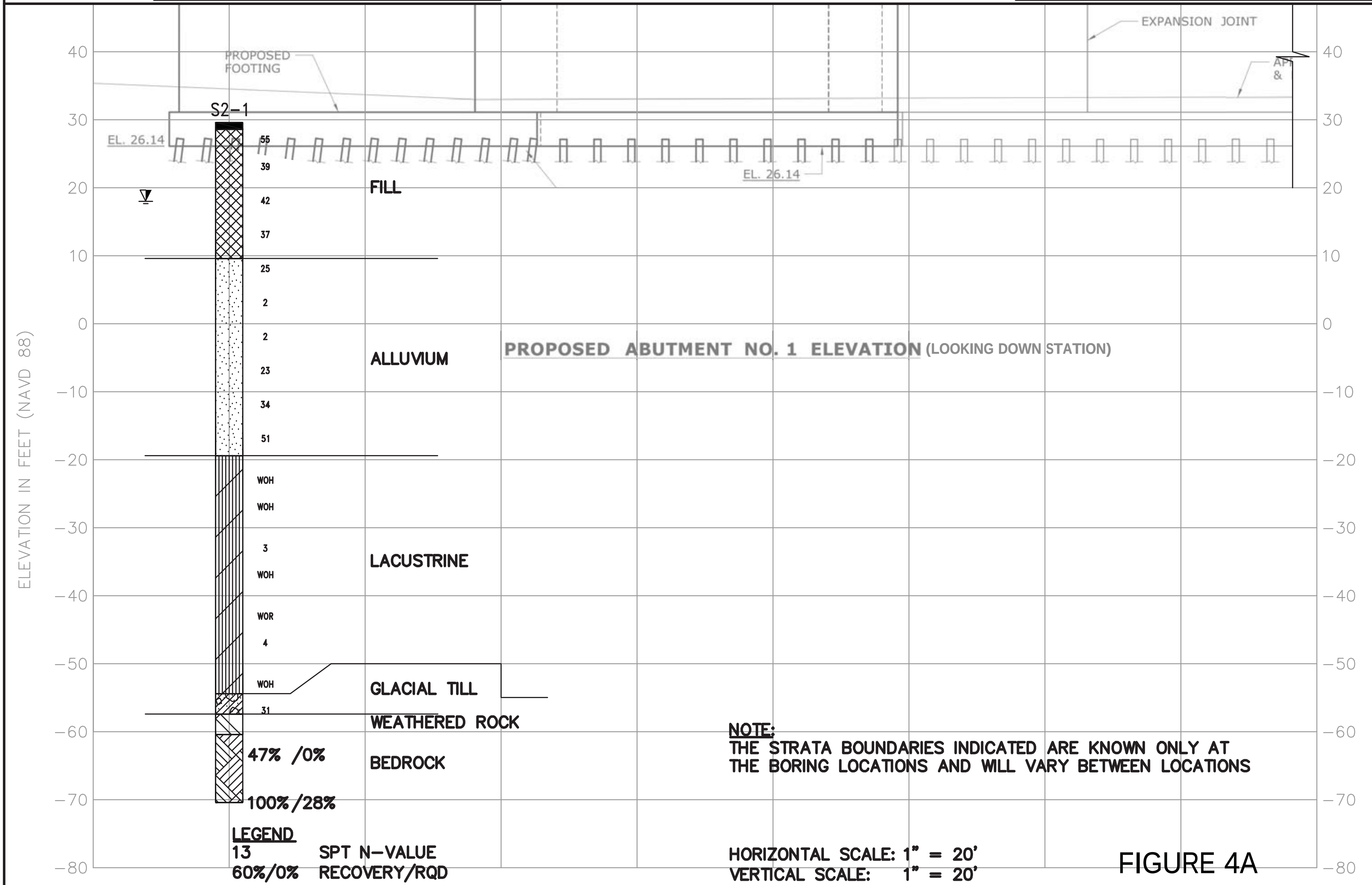


FIGURE 4A

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CME\GEOT\GINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

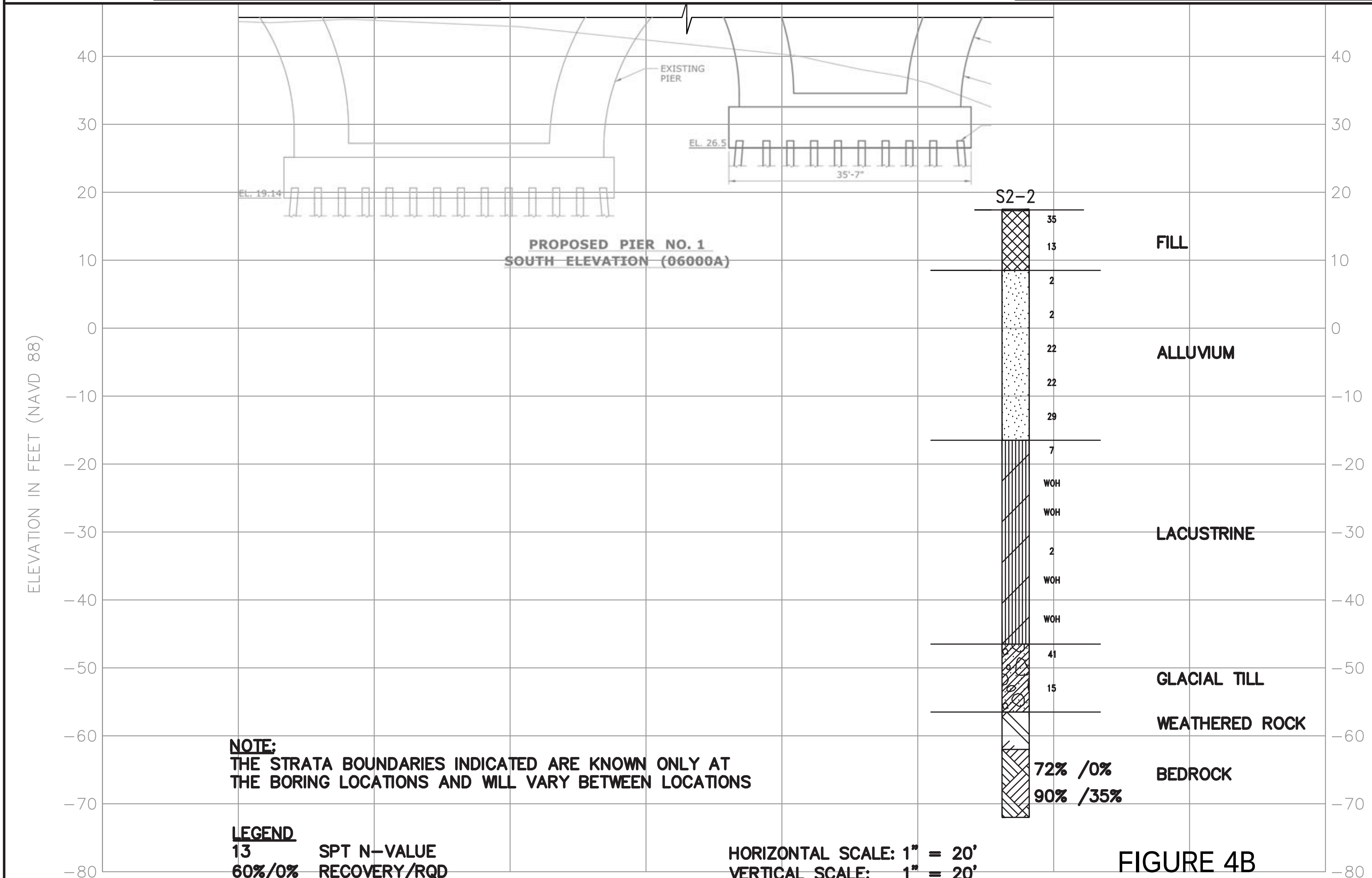
SUBSURFACE DIAGRAM

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford



NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'

FIGURE 4B

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CMEIGEOTIGINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

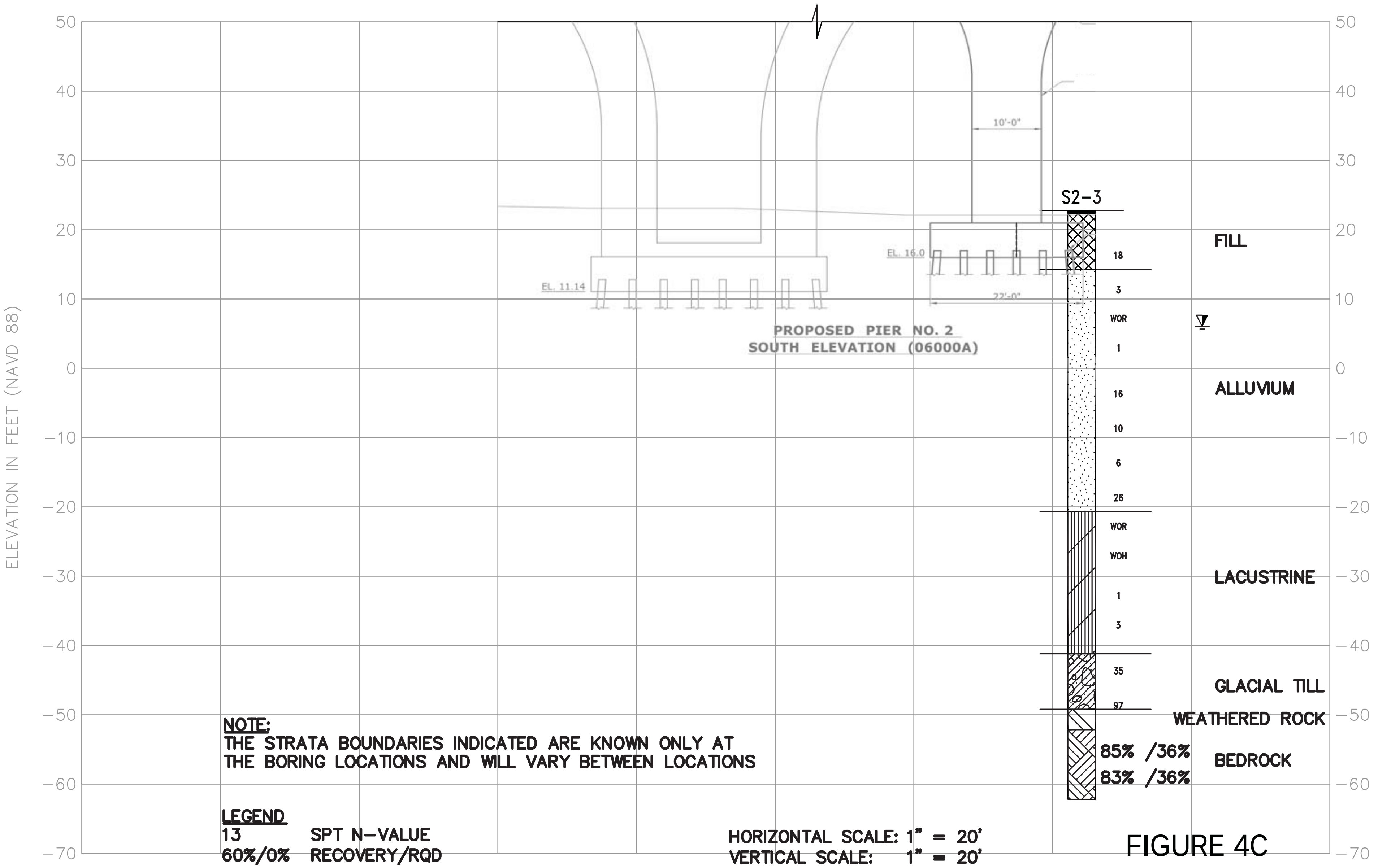
SUBSURFACE DIAGRAM

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford



NOTE:
THE STRATA BOUNDARIES INDICATED ARE KNOWN ONLY AT THE BORING LOCATIONS AND WILL VARY BETWEEN LOCATIONS

LEGEND
13 SPT N-VALUE
60%/0% RECOVERY/RQD

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 20'

FIGURE 4C

STRATIGRAPHY & GW - A SIZE - GINT STD US.GDT - 10/21/16 15:07 - Y:\2014\2014-1001 CONNDOT CSO 2232 CME\GEOTIGINT\2014-1001 - CHARTER OAK BRIDGE LOGS (TKT).GPJ

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

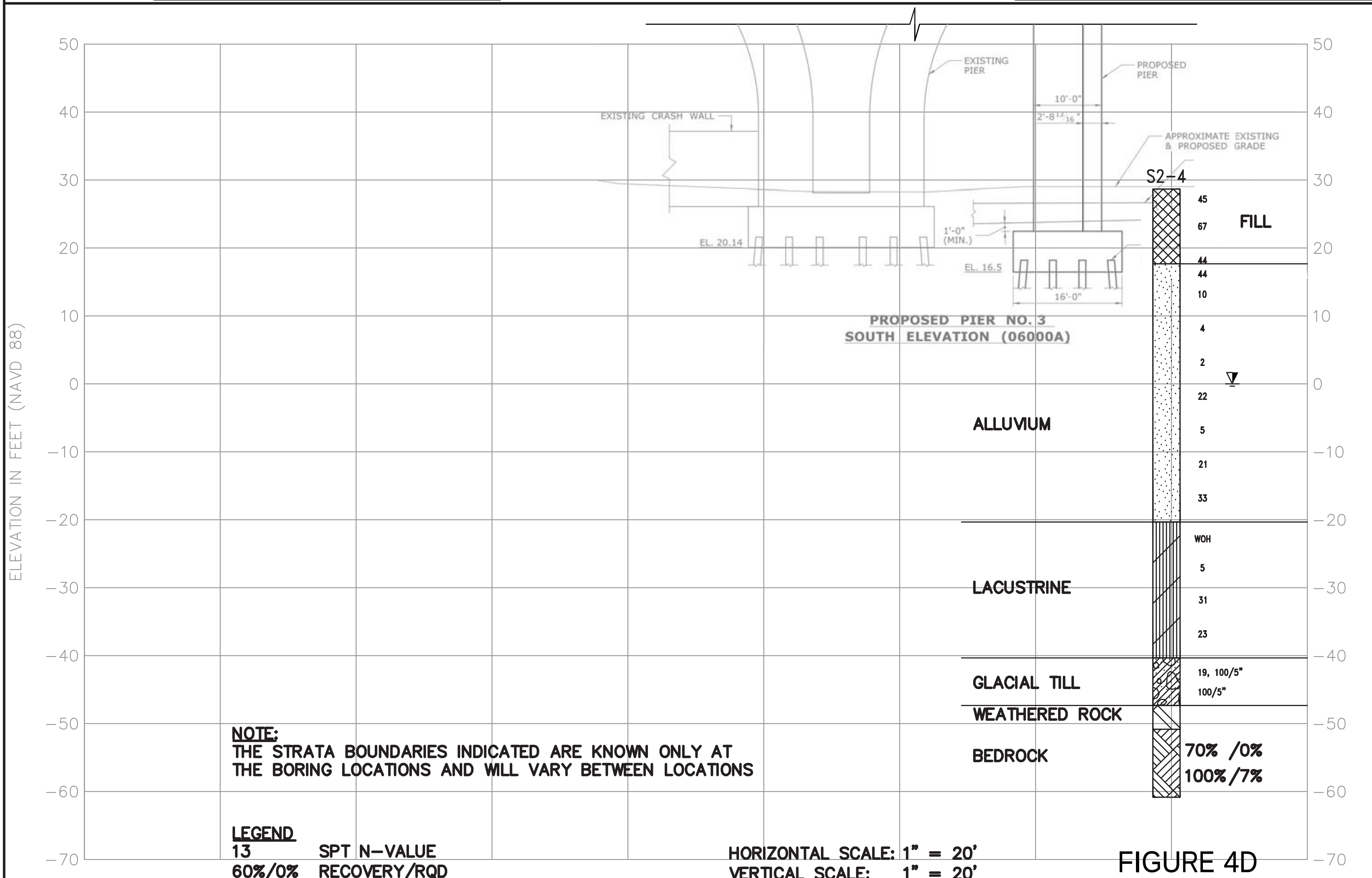
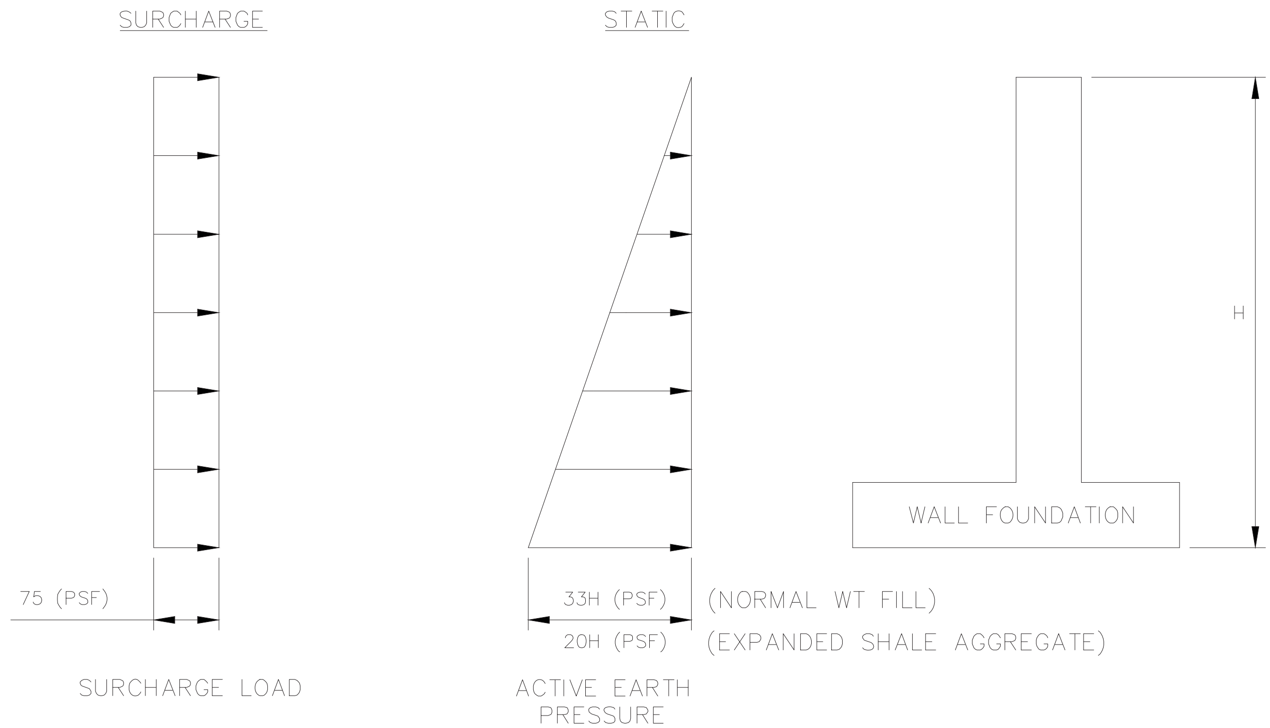


FIGURE 4D



NOTES:

1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
2. H IS MEASURED IN FEET
3. THE WALL SHOULD BE DRAINED BY EXPANDED SHALE AGGREGATE WITH A UNIT WEIGHT OF 65 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
5. SLIDING:
   COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3–1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

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ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 06000A
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014–1001
DATE:	02/13/2017

FIG.

FIGURE 5

APPENDIX A

RECENT TEST BORING LOGS

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-1
Inspector:	T. Ta	Town:	Hartford	Stat./Offset:	182+91.50/91.43 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833791.48
Start Date:	6-1-16	Route No.:	US 5 / RTE 15 NB	Easting:	1024985.35
Finish Date:	6-6-16	Bridge No.:	06000A	Surface Elevation:	29.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @11.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0						Asphalt	ASPHALT (12")	
	S1	23 24 31 33	24	16		Fill	Brown c-f SAND, little m-f gravel, little silt	
5	S2	9 19 20 14	24	10			Brown c-f SAND, some silt, little m-f gravel	25
10	S3	13 23 19 11	24	12			Brown c-f SAND and m-f GRAVEL, some silt	20
15	S4	28 19 18 16	24	16			Brown c-f SAND, little m-f gravel, little silt	15
20	S5	10 12 13 12	24	16		Alluvium	Gray f SAND and SILT	10
25	S6	3 1 1 2	24	18			Brown to gray f SAND, some silt	5
30	S7	1 1 1 4	24	22			Brown SILT and f SAND	0

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: 90ft Rock: 10ft	NOTES: 4" casing to 55', telescoped 3"	Sheet 1 of 3
No. of Soil Samples: 21 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S2-1
Inspector: T. Ta	Town: Hartford	Stat./Offset: 182+91.50/91.43 RT
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833791.48
Start Date: 6-1-16	Route No.: US 5 / RTE 15 NB	Easting: 1024985.35
Finish Date: 6-6-16	Bridge No.: 06000A	Surface Elevation: 29.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @11.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S8	9 10 13 14	24	12		Alluvium *(con't)*	Gray c-f SAND, trace silt	-5
40	S9	12 15 19 17	24	8			Gray c-f SAND, trace f gravel, trace silt	-10
45	S10	16 25 26 26	24	12			Gray c-f SAND, trace silt	-15
50	S11	woh woh woh 4	24	24		Lacustrine	Brown SILTY CLAY	-20
	UP-1		30	30			Brown SILTY CLAY (unable to get Torvane and Pocket Pen. measurments)	
55	S12	wor wor woh woh	24	24			Brown SILTY CLAY	-25
60	S13	wor wor 3 2	24	24			Brown SILTY CLAY	-30
	UP-2		30	28			Brown SILTY CLAY (Torvane = 0.25 tsf and Pocket Pen. = 0.75 tsf)	
65	S14	wor wor woh woh	24	24			Brown SILTY CLAY	-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 Earth: 90ft Rock: 10ft	NOTES: 4" casing to 55', telescoped 3"	Sheet 2 of 3
No. of Soil Samples: 21 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S2-1
Inspector: T. Ta	Town: Hartford	Stat./Offset: 182+91.50/91.43 RT
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 833791.48
Start Date: 6-1-16	Route No.: US 5 / RTE 15 NB	Easting: 1024985.35
Finish Date: 6-6-16	Bridge No.: 06000A	Surface Elevation: 29.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @11.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		
70								-40
	S15	wor wor wor wor	24	24			Brown SILTY CLAY	
	UP-3		30	30			Brown SILTY CLAY (Torvane = 0.275 tsf and Pocket Pen. = 0.9 tsf)	
75								-45
	S16	wor wor 4 6	24	24			Brown SILTY CLAY	
80								-50
	S17	wor wor woh 2	24	24			Brown SILTY CLAY	
						Glacial Till		
85								-55
	S18	7 19 12 43	24	8			Brown c-f SAND, some c-f gravel, some silt	
						Weathered Rock	WEATHERED BEDROCK	
90						Bedrock		-60
	C-1		60	28	0		Brown ARKOSE, highly weathered, medium banded, highly fractured, medium strong.	
95								-65
	C-2		60	60	28		Brown ARKOSE, medium banded, moderately fractured, medium strong.	
100								-70
							END OF BORING 100ft	

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: 90ft Rock: 10ft	NOTES: 4" casing to 55', telescoped 3"	Sheet 3 of 3
No. of Soil Samples: 21 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-2
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	186+70.98/64.84 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833972.97
Start Date:	5-19-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025134.84
Finish Date:	5-19-16	Bridge No.:	06000A	Surface Elevation:	17.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	7 18 17 16	24	12		Topsoil / Fill	TOPSOIL (2") Brown c-f SAND, little gravel, little silt	
								15
5	S2	5 7 6 4	24	6			Brown f SAND and SILT	
								10
10	S3	2 1 1 3	24	24		Alluvium	Brown SILT and f SAND	
								5
15	S4	woh 1 1 1	24	24			Brown SILT and f SAND	
								0
20	S5	10 10 12 11	24	10			Brown to gray c-f SAND, trace silt	
								-5
25	S6	8 9 13 13	24	24			Gray c-f SAND, trace silt	
								-10
30	S7	8 13 16 22	24	12			Gray c-f SAND, trace silt	
								-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: 79.5ft Rock: 10ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**		Hole No.: S2-2
Inspector: J. Herpich	Town: Hartford		Stat./Offset: 186+70.98/64.84 RT
Engineer: N. Whetten	Project No.: DOT Project No. 63-703		Northing: 833972.97
Start Date: 5-19-16	Route No.: US 5 / RTE 15 NB		Easting: 1025134.84
Finish Date: 5-19-16	Bridge No.: 06000A		Surface Elevation: 17.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine		
35	S8	3 4 3 4	24	24			Brown CLAY	
								-20
40	S9	woh woh woh 3	24	24			Brown CLAY, 1/16" silt varves	
								-25
45	S10	woh woh woh 2	24	24			Brown CLAY, Silt varves less than 1/32"	
								-30
50	S11	wor woh 2 4	24	24			Brown SILTY CLAY	
								-35
55	S12	woh woh woh woh	24	24			Brown SILTY CLAY	
								-40
60	S13	woh woh woh woh	24	24			Brown SILTY CLAY	
								-45
						Glacial Till		
65	S14	4 11 30 28	24	24			Brown CLAYEY SILT, little gravel	
								-50

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: 79.5ft Rock: 10ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-2
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	186+70.98/64.84 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	833972.97
Start Date:	5-19-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025134.84
Finish Date:	5-19-16	Bridge No.:	06000A	Surface Elevation:	17.5

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations:

Depth (ft)	SAMPLES: Sample Type/No.	SAMPLES: Blows on Sampler per 6 inches	SAMPLES: Pen. (in.)	SAMPLES: Rec. (in.)	SAMPLES: RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Glacial Till *(con't)*		
70	S15	8 10 5 9	24	12			Brown to red SILT, some f sand, little f gravel	
								-55
	S16	73 100/2"	8	3		Weathered Rock	Rock fragments, likely weathered bedrock	
75								
							WEATHERED BEDROCK	-60
80						Bedrock		
	C-1		60	43	0		Red-brown, fresh to slightly weathered, strong, ARKOSE, open near-horizontal joints parallel to bedding, infilled.	-65
85								
	C-2		60	54	35		Red-brown, fresh to slightly weathered, strong, ARKOSE, open near-horizontal joints parallel to bedding, infilled, one open near-vertical joint.	-70
90							END OF BORING 89.5ft	
								-75
95								
								-80
100								

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: 79.5ft Rock: 10ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 16 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-3-OW
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	189+58.56/80.09 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	834301.21
Start Date:	6-21-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025386.89
Finish Date:	6-23-16	Bridge No.:	06000A	Surface Elevation:	22.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @14.6' ATD, @16.7' on 9/20/2016, @15.2' on 2/13/2017

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S-1	50/0"				0	0		Asphalt	ASPHALT (6")	
									Fill	Gray c GRAVEL, and cobbles, 3 to 4 inch stone beneath pavement Petroleum odor in wash	20
5	S-2	16	11	7	6	24	18			Brown to black c-f SAND, some silt, little c-f gravel, trace brick, Petroleum-like odor	15
									Alluvium		
10	S-3	4	2	1	1	24	18			Gray SILT, little f sand, with black specs	10
15	S-4	wor	wor	wor	wor	24	20			Gray SILT, some f sand	5
20	S-5	1/12"		1	2	24	20			Brown to gray SILT, little f sand	0
25	S-6	5	8	8	8	24	16			Gray SILT, little f sand	-5
30	S-7	5	4	6	7	24	12			Gray c-f SAND, trace f gravel, trace silt	-10

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: 72ft Rock: 13ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 1 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller:	P. Labossier	**Connecticut DOT Boring Report**		Hole No.:	S2-3-OW
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	189+58.56/80.09 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	834301.21
Start Date:	6-21-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025386.89
Finish Date:	6-23-16	Bridge No.:	06000A	Surface Elevation:	22.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @14.6' ATD, @16.7' on 9/20/2016, @15.2' on 2/13/2017

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S-8	3	3	3	5	24	8		Alluvium *(con't)*	Brown c-f SAND, little c-f gravel, trace silt	-15
40	S-9	11	13	13	18	24	14			Gray to brown c-f SAND, little c-f gravel, trace silt	-20
45	S-10	wor	wor	wor	2	24	24		Lacustrine	Brown SILTY CLAY, varved, 1/2" red silty clay and 1/2" gray silt varves	-25
50	S-11	wor	wor	woh	woh	24	24			Red-brown, SILTY CLAY, Clay varves 1/4" and gray silt varves 1/4"	-30
55	S-12	wor	wor	1	2	24	24			Red-brown, SILTY CLAY, Clay varves 1/8" and gray silt varves 1/8"	-35
60	S-13	wor	woh	3	6	24	10			Red-brown, SILT and fine SAND, trace fine gravel	-40
65	S-14	8	15	20	39	24	12		Glacial Till	Change in drill action noted at 64 feet Red-brown, clayey SILT, some fine sand, little fine gravel	-45

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: 72ft Rock: 13ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 2 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-3-OW
Inspector:	N. Whetten	Town:	Hartford	Stat./Offset:	189+58.56/80.09 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	834301.21
Start Date:	6-21-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025386.89
Finish Date:	6-23-16	Bridge No.:	06000A	Surface Elevation:	22.8

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/8 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @14.6' ATD, @16.7' on 9/20/2016, @15.2' on 2/13/2017

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Glacial Till *(con't)*		
70	S-15	15 36 61 87	24	18			Red-brown, SILT and fine SAND, little fine to medium gravel (angular)	
						Weathered Bedrock	Change in drill action noted at 72 feet	-50
75						Bedrock		
	C-1		60	51	36		Red, slightly to moderately fractured, fresh, strong, ARKOSE	-55
80	C-2		60	49.5	36		Red, slightly to moderately fractured, fresh, strong, ARKOSE. Transition from siltstone to sandstone at 83.6 feet	-60
85							END OF BORING 85ft	
								-65
90								
								-70
95								
								-75
100								

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: 72ft Rock: 13ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 3 of 3
No. of Soil Samples: 15 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-4
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	191+41.78/69.08 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	834432.89
Start Date:	5-12-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025509.68
Finish Date:	5-16-16	Bridge No.:	06000A	Surface Elevation:	28.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @28.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0	S1	9	22	23	20	24	24		Fill	Brown SILT, and c-f sand, trace asphalt	
											25
5	S2	4	20	47	8	24	5			Brown SILT, trace wood and glass, detected strong odor	
											20
10	S3	20	24	20	15	24	0			No recovery	
	S4	20	24	20	15	24	24		Alluvium	Gray SILT and f SAND, little f gravel	
											15
15	S5	8	7	3	5	24	12			Gray SILT and f SAND	
											10
20	S6	1	2	2	1	24	9			Gray SILT and f SAND	
											5
25	S7	2	1	1	1	24	24			Brown to gray f SAND and SILT	
											0
30	S8	8	11	11	14	24	12			Brown c-f SAND, little f gravel	
											-5

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: 79.5ft Rock: 10ft	NOTES:	Sheet 1 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier		Hole No.: S2-4
Inspector: J. Herpich	Town: Hartford	Stat./Offset: 191+41.78/69.08 RT
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 834432.89
Start Date: 5-12-16	Route No.: US 5 / RTE 15 NB	Easting: 1025509.68
Finish Date: 5-16-16	Bridge No.: 06000A	Surface Elevation: 28.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @28.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35	S9	3 2 3 5	24	6		Alluvium *(con't)*	Gray c-f SAND, little m-f gravel, little silt	
								-10
40	S10	8 10 11 7	24	8			Gray c-f SAND, some m-f gravel, little silt	
								-15
45	S11	17 14 19 21	24	8			Gray c-f SAND, some silt, little f gravel	
								-20
50	S12	wor woh woh 4	24	24		Lacustrine	Brown SILTY CLAY	
								-25
55	S13	woh woh 5 6	24	24			Red SILTY CLAY	
								-30
60	S14	14 16 15 21	24	1			Red SILTY CLAY	
								-35
65	S15	12 11 12 15	24	12			Red SILTY CLAY	

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: 79.5ft Rock: 10ft	NOTES:	Sheet 2 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S2-4
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	191+41.78/69.08 RT
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	834432.89
Start Date:	5-12-16	Route No.:	US 5 / RTE 15 NB	Easting:	1025509.68
Finish Date:	5-16-16	Bridge No.:	06000A	Surface Elevation:	28.7

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @28.5' ATD

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						Lacustrine *(con't)*		-40
70	S16	9 19 100/5''	17	10		Glacial Till	Red CLAYEY SILT, some c-f gravel, little c-f sand	
75	S17	35 100/5''	11	8			Red CLAYEY SILT and c-f GRAVEL, some c-f sand	-45
						Weathered Rock	WEATHERED BEDROCK	
80						Bedrock		-50
	C-1		60	42	0		Red-brown, fresh, strong, ARKOSE, with numerous open low-angle bedding joints, occasional fractured zones.	-55
85	C-2		60	60	7		Red-brown, fresh, strong, ARKOSE, with numerous open low-angle bedding joints.	-60
90							END OF BORING 89.5ft	
95								-65
100								-70

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: 79.5ft Rock: 10ft	NOTES:	Sheet 3 of 3
No. of Soil Samples: 17 No. of Core Runs: 2		SM-001-M REV. 1/02

APPENDIX B

PREVIOUS TEST BORING LOGS

A. Mason BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 3 LOCATION Pier 3 R GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION West Side of Conn. River - Hartford, Ct.

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV. 26.5						HOLE NO.	B 104
DATE FINISHED 11/24/86	TYPE		HW-NW	S/S	NV II	LINE & STATION	IN-5 21+81.0
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET	7.7L
AT 17.5 FT. AFTER 0 HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE	334276.36
AT FT. AFTER HRS.	HAMMER FALL		24"	30"		E. COORDINATE	625315.83

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	P	0'-1.5'	1	18	14	D	1	1	1		Very soft, Brown SILT, little fine sand, roots, trace of coarse sand, fine gravel, rubble
	U										
	S										
	H										
5	E	4'-5.5'	2	18	14	D	3	2	3		Soft, Brown SILT, little medium to fine sand, trace of gravel -FILL-
	D									6'	
10		9'-10.5'	3	18	18	D	1	2	2		Soft, Gray-Brown fine SAND and SILT, trace medium sand.
15		14'-15.5'	4	18	18	D	1	1	1		Soft to very soft, Gray Green SILT, trace of fine sand -ALLUVIUM-
										19'	
20		19'-20.5'	5	18	18	D	2	2	4		Loose, Gray fine SAND, some silt -ALLUVIUM-
25		24'-25.5'	6	18	18	D	2	6	4		Stiff, Gray SILT, little fine sand, several wood chips
										27'	
	85										
	85										
30	57	29'-30.5'	7	18	16	D	11	17	20		Dense, Gray medium to fine SAND, trace of coarse sand and gravel, silt
	68										
	65										
	61										
	65										
35	59	34'-35.5'	8	18	14	D	3	5	4		Loose, Dark Gray, medium to fine SAND, trace of coarse sand, silt -ALLUVIUM-
	61										
	63										
	64										
	75										
	47	39'-40.5'	9	18	15	D	12	18	19		Dense, Gray medium to fine SAND, trace of fine sand and gravel, silt

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 104

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 2 OF 3	
E. Henderson INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Pier 3 R	
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR	
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER	

LOCATION West Side of Conn. River - Hartford, Ct.

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV.						HOLE NO.	B 104
DATE FINISHED	TYPE					LINE & STATION	
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET	
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE	
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE	

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	80										
	83										
	90										
	90										Medium dense, Gray medium to fine
5	49	44'-45.5'	10	18	17	D	10	11	14		SAND, trace of coarse sand, silt
	55										-ALLUVIUM-
	68										
	72									48'	
	75										
50		49'-50.5'	11	18	18	D	1	1	1		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
5		54'-55.5'	12	18	18	D	1	1	2		Soft, Red-Brown VARVED CLAY and SILTY CLAY
										58.5'	
60		59'-60.5'	13	18	14	D	24	36	29		Hard, Red-Brown SILT, some medium to fine sand, trace of coarse sand and fine gravel
5		64'-65.5'	14	18	12	D	18	22	32		Hard, Red-Brown fine SAND, some silt, little coarse to medium sand and medium to fine gravel
70		69'-70'	15	12	12	D	27	51			Hard, Red-Brown SILT, some coarse to
		@ 70'	-	0	0	D	100/0"				medium sand, little medium to fine
											gravel -GLACIAL TILL-
							Drill Rate			73'	
							Min/Ft			74'	Decomposed Bedrock
5		74'-79'	1	60	56	C		3			Moderately hard, Red-Brown fine sandy
				(RQD=46%)				4			SILTSTONE. Joints very close to
								5			close, thin to very thinly bedded,
								5			slightly weathered
								6			
								6			

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 104

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C. Harriman INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 3 OF 3 LOCATION Pier 3 R - GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION West Side of Conn. River - Hartford, Ct.

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 104
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		79'-84'	2	60	60	C		6			Run 2 same as Run 1; rock slightly more sound than Run 1.
				(RQD=35%)				6			
								6			
								6			Bottom of Exploration @ 84'
85											
90											
95											
00											
05											
10											
15											

FROM GROUND SURFACE TO 50 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 74 FEET

FOOTAGE IN EARTH 74 FOOTAGE IN ROCK 10 NO. OF SAMPLES 15 HOLE NO. B 104

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

M. McDonough BORING CREW LEADER M. Germano INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 3 LOCATION West Abutment 3,E.S. GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION West Bank of Conn. River - Hartford, Ct.

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV. 16.1						HOLE NO.	B 107
DATE FINISHED 11/7/86	TYPE		HW-NW	S/S	NV II	LINE & STATION	RT15 541+68.8
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET	57.8R
8.5 FT. AFTER 48 HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE	333857.56
FT. AFTER HRS.	HAMMER FALL		24"	30"		E. COORDINATE	624884.12

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	14	0'-1.5'	1A	18	18	D	6	13	15	0.5'	Loose, Brown fine SAND, trace of coarse to medium sand, roots, wood, silt -FILL-
	43		1B								Medium dense, Brown fine SAND, little silt, trace of coarse to medium sand, fine gravel -FILL-
	44										
	55									4'	
5	33	4'-5.5'	2	18	18	D	5	5	7		Stiff, Gray Brown SILT and fine SAND, trace of medium sand -ALLUVIUM-
	23										
	18									7'	
	15										
	14										
10	20	9'-10.5'	3	18	18	D	1	1	2		Very loose, Brown fine SAND, some silt
	18										
	18										
	18										
	17										
15	37	14'-15.5'	4	18	18	D	1	2	2		Very loose, Gray fine SAND, some silt, trace of wood fibers -ALLUVIUM-
	30										
	31										
	39									18'	
	45										
20	44	19'-20.5'	5	18	18	D	1	2	2		Very loose, Gray medium to fine SAND, trace of coarse sand, fine gravel, silt -ALLUVIUM-
	40										
	43										
	53										
	54									24'	
25	28	24'-25.5'	6	18	18	D	2	2	5		Loose, Gray fine SAND, little silt, trace of medium sand and wood
	34										
	36										
	50										
	65										
30	48	29'-30.5'	7	18	18	D	5	12	16		Medium dense, Gray fine SAND, trace of medium sand, silt, wood -ALLUVIUM-
	58										
	85										
	67										
	80									34'	
35		34'-35.5'	8	18	18	D	Wt.	of	Ham.		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
											Medium stiff, Red-Brown VARVED CLAY and SILTY CLAY
		39'-40.5'	9	18	18	D	2	2	3		

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 107

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

M. McDonough BORING CREW LEADER M. Germano INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 3 LOCATION West Abutment 3, E.S GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 107
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	P										
	U										
	S										
	H										
45	E	44'-45.5'	10	18	18	D	2	2	3		Medium stiff, Red-Brown VARVED CLAY and SILTY CLAY
	D										
50		49'-50.5'	11	18	18	D	Wt.	of Ham.			Very soft, (same as D10)
55		54'-55.5'	12	18	18	D	2	2	2		Very soft, (same as D10)
60		59'-60.5'	13	18	18	D	2	2	2		Soft, (same as D10)
65		64'-65.5'	14	18	18	D	2	2	3		Medium stiff, (same as D10)
70		69'-70.5'	15	18	18	D	3	3	3		Medium stiff, (same as D10)
										72'	
75		74'-75.5'	16	18	18	D	65	100/4"			Very dense, Red-Brown SILT and fine SAND, little coarse sand, fine gravel, trace of clay -GLACIAL TILL-
							50/2"*		75*	76'	
		76'-81'	1	60	34	C		10		Drill Rate Min/Ft	Moderately hard, Brown-Red fine grained SILTSTONE, slightly weathered, very closely to closely jointed. Rock very thinly bedded.
				(RQD=35%)				10			
								8			
								7			

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

* denotes 300# Weight on Spoon

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 107

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

M. McDonough BORING CREW LEADER M. Germano INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 3 OF 3 LOCATION West Abutment 3, E.S. GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

		AUGER	CASING	SAMPLER	CORE BAR	
LOCATION						HOLE NO. B 107
SURFACE ELEV.	TYPE					LINE & STATION
DATE FINISHED	SIZE I.D.					OFFSET
GROUND WATER OBSERVATIONS	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS. / AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
								8			
		81'-83'	2	24	24	C		9			(Runs 2 and 3 - same description
				(RQD=50%)				8			as Run 1)
		83'-86'	3	36	36	C		8			
85				(RQD=39%)				10			
								8			
											Bottom of Exploration at 86'
90											
95											
100											
105											
110											
115											

FROM GROUND SURFACE TO 34 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 76 FEET

FOOTAGE IN EARTH 76 FOOTAGE IN ROCK 10 NO. OF SAMPLES 16 HOLE NO. B 107

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 3 LOCATION Pier No.1 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

SURFACE ELEV. 20.4		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO.	B 111
DATE FINISHED 12/1/86	TYPE		HW-NW	S/S	NV II	LINE & STATION	RT15 544+52.8
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET	26.9R
AT FT. AFTER HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE	334098.16
AT FT. AFTER HRS.	HAMMER FALL		24"	30"		E. COORDINATE	625031.26

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		0'-2'	1	24	19	D	PUSHED				Very loose, Brown medium to fine SAND, trace of gravel, silt, occasional brick and etc. -FILL-
										3'	
5		4'-6'	2	24	24	D	6	8	7		Stiff, Green Brown SILT, some fine sand
									6		
10		9'-11'	3	24	24	D	5	4	4		Medium stiff, Green Brown SILT, some fine sand
									5		
15		14'-16'	4	24	24	D	1	1	1		Very soft to soft, Brown SILT, some fine sand
									1		
20		19'-21'	5	24	20	D	1	1	1		Very soft to soft, Green Brown SILT, some fine sand
									1		
25		24'-26'	6	24	18	D	Wt.	of	Ham.		Very soft, Brown SILT, some fine sand -ALLUVIUM-
										27'	———
30		29'-31'	7	24	16	D	5	6	7		Medium dense, Gray medium to fine SAND, trace of coarse sand and gravel, trace of silt -ALLUVIUM-
									10		
35		34'-36'	8	24	12	D	6	10	12		Medium dense, Gray fine to medium SAND, little coarse sand, trace of fine gravel, trace of silt -ALLUVIUM-
									10		
										39'	Medium stiff, Red-Brown VARVED CLAY and SILTY CLAY
		39'-41'	9	24	24	D	2	3	3	2	

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 111

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 3 LOCATION Pier No. 1 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION					
SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 111
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-46'	10	24	24	D	1	1	1 1		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
50		49'-51'	11	24	24	D	Wt.	of	Rods		(same as D10)
55		54'-56'	12	24	24	D	Wt.	of	Rods		(same as D10)
60		59'-61'	13	24	24	D	Wt.	of	Rods		(same as D10)
65		64'-66'	14	24	24	D	Wt.	of	Rods		(same as D10)
										69'	
70		69'-71'	15	24	17	D	8	12	16 21		Medium stiff, Red-Brown SILT, little coarse to fine sand, trace of gravel, clay
75		74'-76'	16	24	12*	D	30	43	59 70		* Pushed Cobble, Very dense, Red Brown SAND, trace of gravel, silt -GLACIAL TILL-
		79'-81'	17	24	13	D	43	66	94	122	Hard, Red-Brown SILT, little coarse to fine sand, trace of gravel

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 111

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 3 OF 3 LOCATION Pier No. 1 - GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 111
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
										81'	
											(Note: Roller Bit through to 85') Decomposed Bedrock
85		85'-88.5'	1	42	17	C				85'	Hard to moderately hard, Red-Brown fine sandy SILTSTONE and interbedded medium SANDSTONE. Joints close. Rock slightly weathered, moderately fractured
				(ROD=0%)							
90		88.5'-93.5'	2	60	56	C					Hard to moderately hard, Red Brown fine sandy SILTSTONE. Joints very close to close. Rock slightly weathered, moderately to slightly fractured, 89' to 89.5', 91.5' to 92.2' and 93.6' to 94' extremely fractured (Run 3 same as Run 2)
				(ROD=10%)							
95		93.5'-95'	3	18	15	C					
				(ROD=0%)							Bottom of Exploration at 95'
100											
105											
110											
115											

FROM GROUND SURFACE TO 39 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 81 FEET

FOOTAGE IN EARTH 81 FOOTAGE IN ROCK 10 NO. OF SAMPLES 17 HOLE NO. B 111

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 3 LOCATION Pier No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION Pier No. 16
SURFACE ELEV. 18.3
DATE FINISHED 11/18/86

GROUND WATER OBSERVATIONS
6.2 FT. AFTER 20 Days
8.5 FT. AFTER 0 HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE		HW-NW	S/S	NV II
SIZE I.D.		4" 3"	1-3/8"	
HAMMER WT.		300#	140#	BIT
HAMMER FALL		24"	30"	

HOLE NO. B 114
LINE & STATION RT15 546+51.6
OFFSET 32.2R
N. COORDINATE 334240.60
E. COORDINATE 625167.39

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	*	0'-2'	1	24	24	D	PUSHED			3.5'	Very loose, Brown fine SAND, little silt, trace organic material -TOPSOIL- (* Driller sampled ahead of casing)
5		4'-6'	2	24	24	D	3	4	4 5		Stiff, Green-Brown SILT, little fine sand
10		9'-11'	3	24	24	D	2	2	1 2		Soft, Gray-Brown SILT, little fine sand
15		14'-16'	4	24	19	D	2	1	1 2	19'	(same as D3) -ALLUVIUM-
20		19'-21'	5	24	16	D	5	7	8 10		Medium dense, Gray-Brown fine SAND, little silt, trace of medium sand
25		24'-26'	6	24	15	D	7	11	14 13		Medium dense, Gray medium to fine SAND trace of coarse sand, fine gravel and silt
30		29'-31'	7	24	14	D	6	9	12 15		Medium dense, Gray medium to fine SAND, trace of coarse sand, silt
35		34'-36'	8	24	14	D	8	10	16 14	37'	(same as D7) -ALLUVIUM-
		39'-41'	9	24	24	D	1	1	1	1	Very soft, Red-Brown VARVED CLAY and SILTY CLAY

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 114

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 3 LOCATION Pier No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

SURFACE ELEV.

DATE FINISHED

GROUND WATER OBSERVATIONS

AT FT. AFTER HRS.

AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE				
SIZE I.D.				
HAMMER WT.				BIT
HAMMER FALL				

HOLE NO. B 114

LINE & STATION

OFFSET

N. COORDINATE

E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-46'	10	24	24	D	Wt.	Rods	1		Very soft, Red-Brown VARVED CLAY
									1		and SILTY CLAY
50		49'-51'	11	24	24	D	Wt.	of Rods			(same as D10)
									2		
55		54'-56'	12	24	24	D	Wt.	of Rods			(same as D10)
									2		
60		59'-61'	13	24	24	D	1	2	2		Soft, Red-Brown VARVED CLAY and
									2		SILTY CLAY
										64'	
65		64'-66'	14	24	16	D	29	50	86		Hard, Red-Brown SILT, some coarse to
									105		fine sand, trace of fine gravel, clay
70		69'-70.5'	15	18	13	D	84	132	48		(same as D14)
									(300#)		
											-GLACIAL TILL-
										73'	
										74'	Decomposed Bedrock
75		74'-79'	1	60	60	C					Moderately hard, Red-Brown fine sandy
				(RQD=20%)							SILTSTONE. Joints very close to close,
											shallow dipping, occasional steeply
											dipping. Bedding very thin, Weathering
											slight
		79'-84'	2	60	60	C					74.9'-75' Severe weathering silt seam

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 114

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER E. Henderson	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 3	
INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	LOCATION Pier No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER	

LOCATION					
SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR
DATE FINISHED	TYPE				
GROUND WATER OBSERVATIONS	SIZE I.D.				
AT FT. AFTER HRS.	HAMMER WT.				BIT
AT FT. AFTER HRS.	HAMMER FALL				

HOLE NO.	B 114
LINE & STATION	
OFFSET	
N. COORDINATE	
E. COORDINATE	

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
				(RQD=45%)							76.3'-78' Extremely to moderately fractured
											77'-77.5' Very severe weathering
											78.5'-79' Very severe weathering
85											C2 same as C1 except moderately to slightly fractured
											Bottom of Exploration at 84'
90											
95											
100											
105											
110											
115											

FROM GROUND SURFACE TO 40 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 74 FEET

FOOTAGE IN EARTH 74 FOOTAGE IN ROCK 10 NO. OF SAMPLES 15 HOLE NO. B 114

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

K. Allen BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 1 OF 3 LOCATION Pier No. 3 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV. 30.4						HOLE NO.	B 117A
DATE FINISHED 11/18/86	TYPE		HW-NW	S/S	NV II	LINE & STATION	RT15 548+61.2
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET	13.9R
AT FT. AFTER HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE	334400.45
AT FT. AFTER HRS.	HAMMER FALL		24"	30"		E. COORDINATE	625302.05

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	P	0'-1.5'	1	18	12	D	2	1	3		Soft, Brown SILT, trace of coarse to fine SAND, Gravel, some organic material -TOPSOIL and FILL-
	U										
	S										
	H										
5	E	4'-5.5'	2	18	12	D	7	12	1		Medium dense, Brown SILT, trace of coarse to fine sand, little gravel, glass chips, organic material
	D										
10		9'-10.5'	3	18	12	D	10	4	1		Loose, Brown coarse to fine SAND, little gravel, trace of silt, cement, glass, organic material -FILL-
	10										
	16										
	17									13'	
	30										
15	35	14'-15.5'	4	18	15	D	15	13	8		Medium dense, Brown-Gray fine SAND and SILT, trace of fine gravel
	P										
	U										
	S										
20	H	19'-20.5'	5	18	18	D	2	1	1		Very soft, Gray-Green SILT, little fine sand
	E										-ALLUVIUM-
	D										
25		24'-25.5'	6	18	12	D	5	2	2	25'	Soft to medium stiff, Gray-Green SILT, little fine sand
											Very loose, Green-Brown fine SAND, little silt
30		29'-30.5'	7	18	18	D	3	1	2		(same as D6) -ALLUVIUM-
	40										
35	42	34'-35.5'	8	18	14	D	9	14	20		Dense, Gray fine SAND, little silt, trace of medium sand
	38										
	33									37'	
	28										Medium dense, Medium to fine SAND, trace of coarse sand, silt
	38										
	41	39'-40.5'	9	18	12	D	9	9	7		-ALLUVIUM-

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 117A

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

K. Allen BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 3 LOCATION Pier No. 3 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION
SURFACE ELEV.
DATE FINISHED
GROUND WATER OBSERVATIONS
AT FT. AFTER HRS.
AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE				
SIZE I.D.				
HAMMER WT.				BIT
HAMMER FALL				

HOLE NO. B 117A
LINE & STATION
OFFSET
N. COORDINATE
E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-45.5'	10	18	12	D	7	9	11		Medium dense, Brown-Gray medium to fine SAND, trace of gravel, coarse sand, silt -ALLUVIUM- Loose, Brown-Gray medium to fine SAND, trace of gravel, coarse sand, silt, grades into silty clay
50		49'-49.5'	11A	6	6	D	8			49.5'	
		49.5'-50.5'	11B	12	8	D		5	4		Medium stiff, Red-Brown VARVED CLAY and SILTY CLAY
55		55'-56.5'	12	18	12	D	2	3	2		(same as D11B)
60		59'-60.5'	13	18	18	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
65		64'-65.5'	14	18	18	D	Wt.	of	Rods		(same as D13)
70		69'-70.5'	15	18	18	D	Wt.	of	Rods		(same as D13)
										73'	
75		74'-75.5'	16	18	14	D	17	32	25		Hard, Red-Brown SILT, some coarse to fine sand, little coarse to fine gravel, trace of clay -GLACIAL TILL- Hard, Red-Brown SILT, some coarse to fine sand, trace of gravel, weathered bedrock
		79'-80'	17	12	10	D	40	105/3"	60/3"		

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 117A

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

K. Allen BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 3 OF 3 LOCATION Pier No. 3 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

SURFACE ELEV.

DATE FINISHED

GROUND WATER OBSERVATIONS

AT FT. AFTER HRS.

AT FT. AFTER HRS.

	AUGER	CASING	SAMPLER	CORE BAR
TYPE				
SIZE I.D.				
HAMMER WT.				BIT
HAMMER FALL				

HOLE NO. B 117A

LINE & STATION

OFFSET

N. COORDINATE

E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		80'-85'	1	60	58	C		9		Drill Rate Min/Ft	Moderately hard, Red-Brown fine sandy SILTSTONE. Joints very close to close, bedding very thin, rock slightly weathered.
				(RQD=0%)				9			
								9			
								9			80.2'-80.5' extremely fractured
								9			82.0'-82.2' weathering pits
85		85'-90'	2	60	58	C		7			87.5'-87.7' extremely fractured
				(RQD=0%)				7			87.7'-90.0' becomes sandier (medium to fine)
								7			
								7			
								7			
90											Bottom of Exploration at 90'
95											
100											
105											
110											
115											

FROM GROUND SURFACE TO 50 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 80 FEET

FOOTAGE IN EARTH 80 FOOTAGE IN ROCK 10 NO. OF SAMPLES 17 HOLE NO. B 117A

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

APPENDIX C

RESULTS OF LABORATORY TESTING

Client:	Freeman Companies, LLC			
Project:	Reconstruction of Exit Charter Oak Bridge			
Location:	Hartford, CT		Project No:	GTX-304831
Boring ID:	---	Sample Type: ---	Tested By:	md
Sample ID:	---	Test Date: 06/24/16	Checked By:	emm
Depth :	---	Test Id: 382021		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content, %
RW-5	UP- 3 - Top	45-47	Moist, reddish brown clay	55.2
RW-5	UP- 3 - Top middle	45-47	Moist, reddish brown clay	40.9
RW-5	UP- 3 - Bottom middle	45-47	Moist, reddish brown silt	36.1
RW-5	UP- 3 - Bottom	45-47	Wet, reddish brown silt	40.4
S2-1	Tube 1 - Top	52-54	Moist, dark reddish gray clay	44.4
S2-1	Tube 1 - Top middle	52-54	Moist, dark reddish gray clay	52.7
S2-1	Tube 1 - Bottom middle	52-54	Moist, dark reddish brown clay	39.2
S2-1	Tube 1 - Bottom	52-54	Moist, dark reddish brown clay	38.8

Notes: Temperature of Drying : 110° Celsius

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: ---	Sample Type: ---	Tested By:	md
Sample ID: ---	Test Date: 06/24/16	Checked By:	emm
Depth : ---	Test Id: 382023		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content, %
S2-1	Tube 2 - Top	62-64	Moist, dark reddish brown clay	43.8
S2-1	Tube 2 - Top middle	62-64	Moist, dark reddish brown clay	51.0
S2-1	Tube 2 - Bottom middle	62-64	Moist, dark reddish brown clay	44.0
S2-1	Tube 2 - Bottom	62-64	Moist, dark reddish brown clay	41.9
S2-1	Tube 3 - Top	72-74	Moist, dark reddish brown clay	38.5
S2-1	Tube 3 - Top middle	72-74	Moist, dark reddish brown clay	47.4
S2-1	Tube 3 - Bottom middle	72-74	Moist, reddish brown clay	39.4
S2-1	Tube 3 - Bottom	72-74	Moist, reddish brown clay	45.3

Notes: Temperature of Drying : 110° Celsius

GeoTesting EXPRESS

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	07/26/16	Checked By:	emm
Depth :	---	Test Id:	384878		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8

Notes: Sample Preparation: screened through #10 sieve
Method A, pH meter used

Client:	Freeman Companies, LLC
Project:	Reconstruction of Exit Charter Oak Bridge
Location:	Hartford, CT
GTX#:	304831
Test Date:	07/26/16
Tested By:	jbr
Checked By:	emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(\text{ohm-cm})^{-1}$
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT:	RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE (GTX 304831)	REPORT DATE:	08-01-16
		CLIENT NUMBER:	
		JOB NUMBER:	04.1115-0003
FOR:	GEOTESTING EXPRESS, INC. 125 NAGOG PARK ACTION, MA 01720	REPORT NUMBER:	
		DATE SAMPLED:	
		TIME SAMPLED:	
REPORTED TO:	ETHAN MARRO	SAMPLED BY:	CLIENT
		DATE RECEIVED:	
		TIME RECEIVED:	
		RECEIVED BY:	

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6’	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12’	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7’	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17’	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7’	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16’	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11’	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7’	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

SD

** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

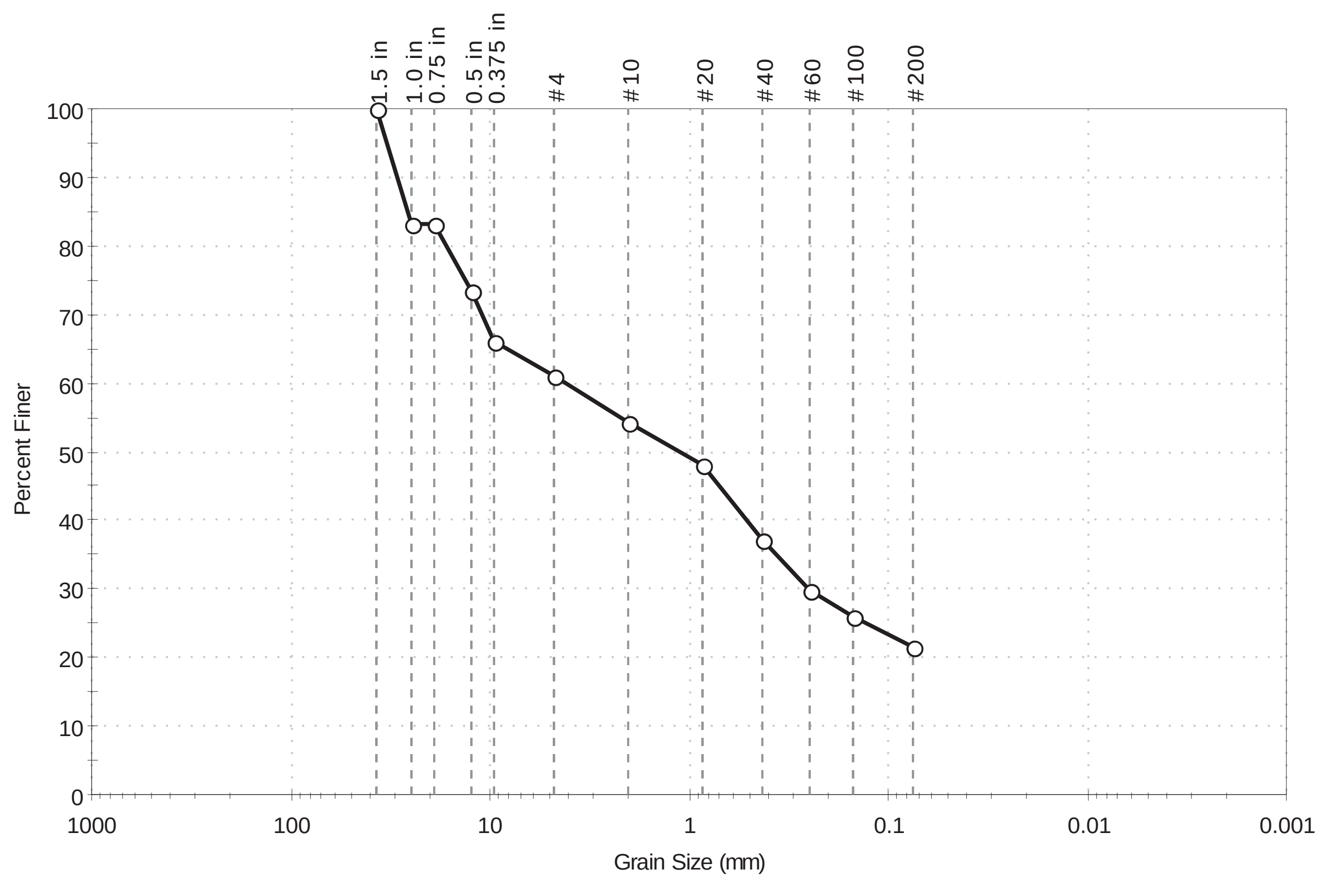
THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

END OF REPORT

GeoTesting EXPRESS

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S2-1	Sample Type: jar	Tested By:	GA
Sample ID: S-3	Test Date: 08/02/16	Checked By:	emm
Depth : 10-12 ft	Test Id: 384940		
Test Comment:	---		
Visual Description:	Moist, dark reddish brown clayey sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	38.8	39.6	21.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1.0 in	25.00	83		
0.75 in	19.00	83		
0.5 in	12.50	73		
0.375 in	9.50	66		
#4	4.75	61		
#10	2.00	54		
#20	0.85	48		
#40	0.42	37		
#60	0.25	30		
#100	0.15	26		
#200	0.075	22		

Coefficients

D_{85} = 26.1716 mm | D_{30} = 0.2527 mm

D_{60} = 4.1015 mm | D_{15} = N/A

D_{50} = 1.0976 mm | D_{10} = N/A

C_u = N/A | C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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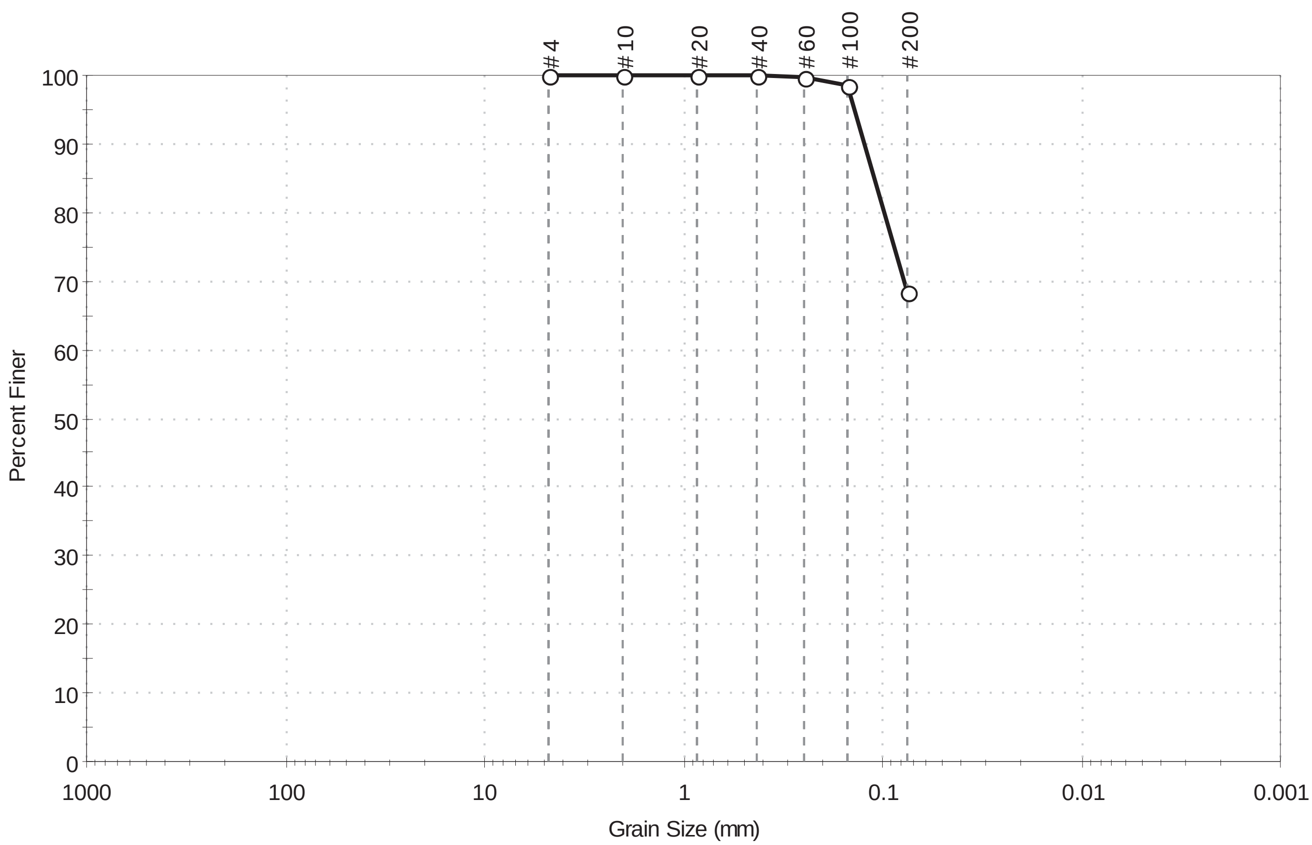
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S2-3	Sample Type:	jar	Tested By:	GA
Sample ID:	S-4	Test Date:	08/02/16	Checked By:	emm
Depth :	15-17 ft	Test Id:	384952		

Test Comment: ---
Visual Description: Moist, olive gray sandy silt
Sample Comment: ---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	31.6	68.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	98		
#200	0.075	68		

Coefficients

D_{85} = 0.1101 mm	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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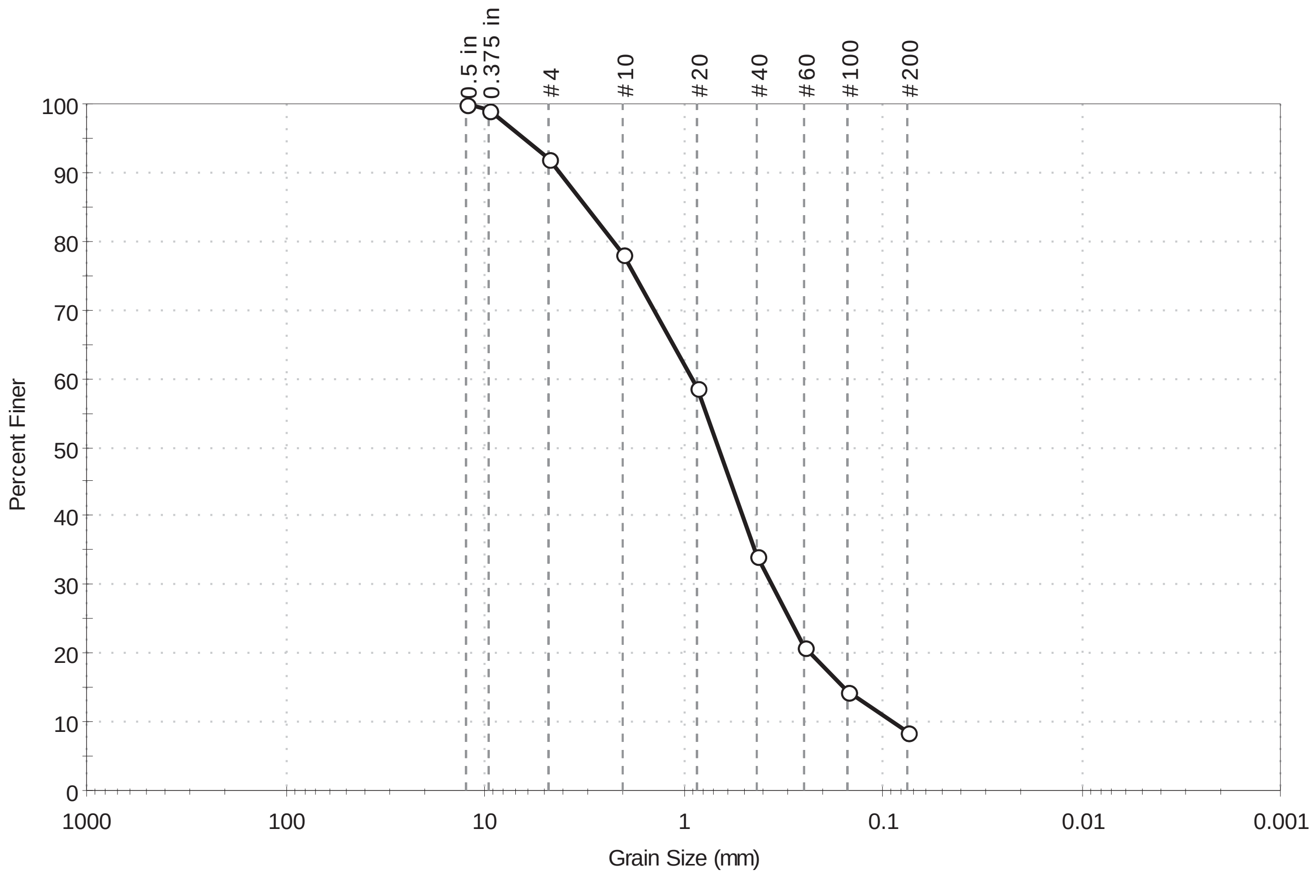
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S2-3	Sample Type: jar	Tested By:	GA
Sample ID: S-7	Test Date: 08/02/16	Checked By:	emm
Depth : 30-32 ft	Test Id: 384953		
Test Comment:	---		
Visual Description:	Moist, dark gray sand with silt		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	8.0	83.5	8.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	92		
#10	2.00	78		
#20	0.85	59		
#40	0.42	34		
#60	0.25	21		
#100	0.15	14		
#200	0.075	8.5		

Coefficients

D_{85} = 3.0762 mm D_{30} = 0.3585 mm

D_{60} = 0.8990 mm D_{15} = 0.1567 mm

D_{50} = 0.6639 mm D_{10} = 0.0895 mm

C_u = 10.045 C_c = 1.597

Classification

ASTM   N/A

AASHTO   Stone Fragments, Gravel and Sand (A-1-b (1))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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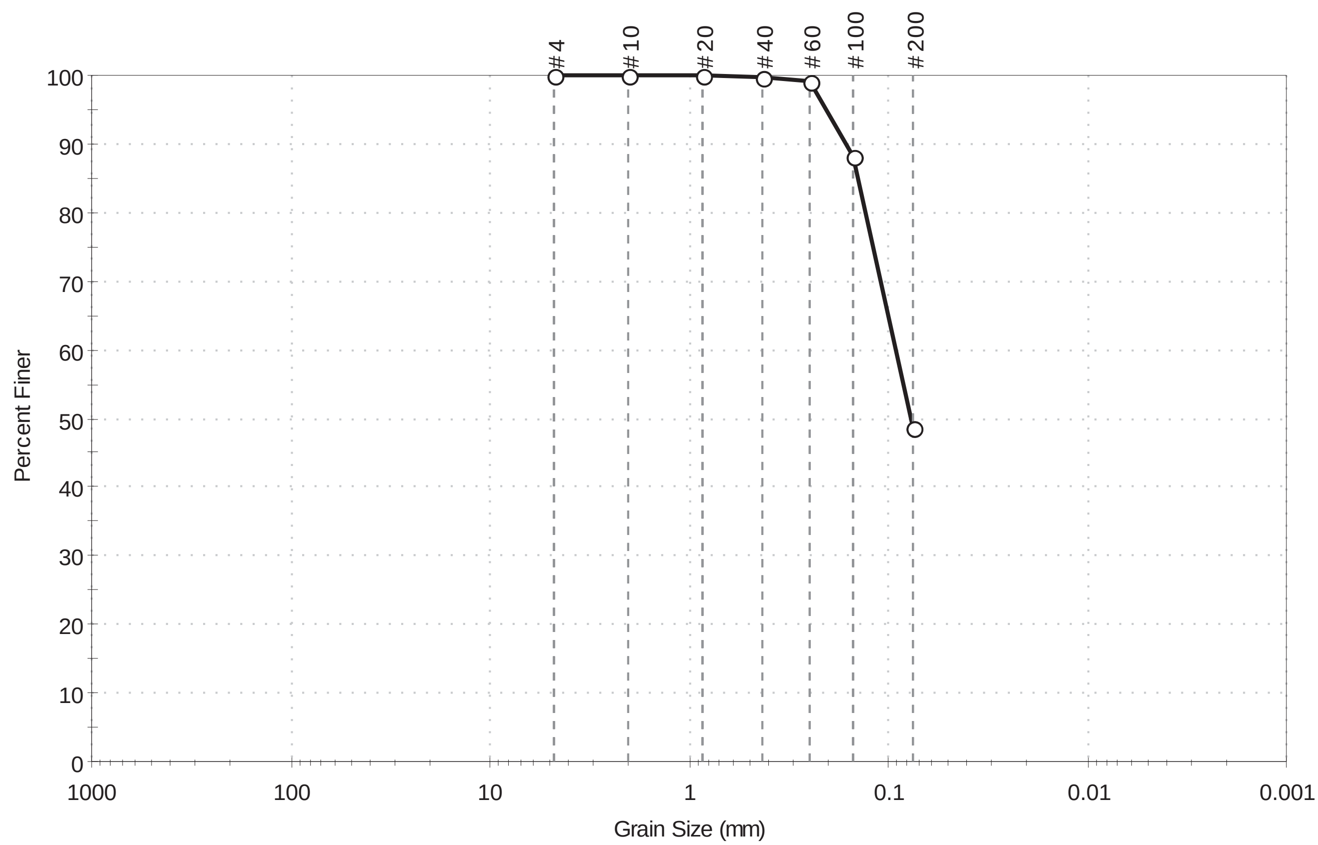
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S2-4	Sample Type:	jar	Tested By:	GA
Sample ID:	S-7	Test Date:	08/03/16	Checked By:	emm
Depth :	24-26 ft	Test Id:	384954		
Test Comment:	---				
Visual Description:	Moist, olive brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	51.3	48.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	88		
#200	0.075	49		

Coefficients

D_{85} = 0.1420 mm D_{30} = N/A

D_{60} = 0.0915 mm D_{15} = N/A

D_{50} = 0.0767 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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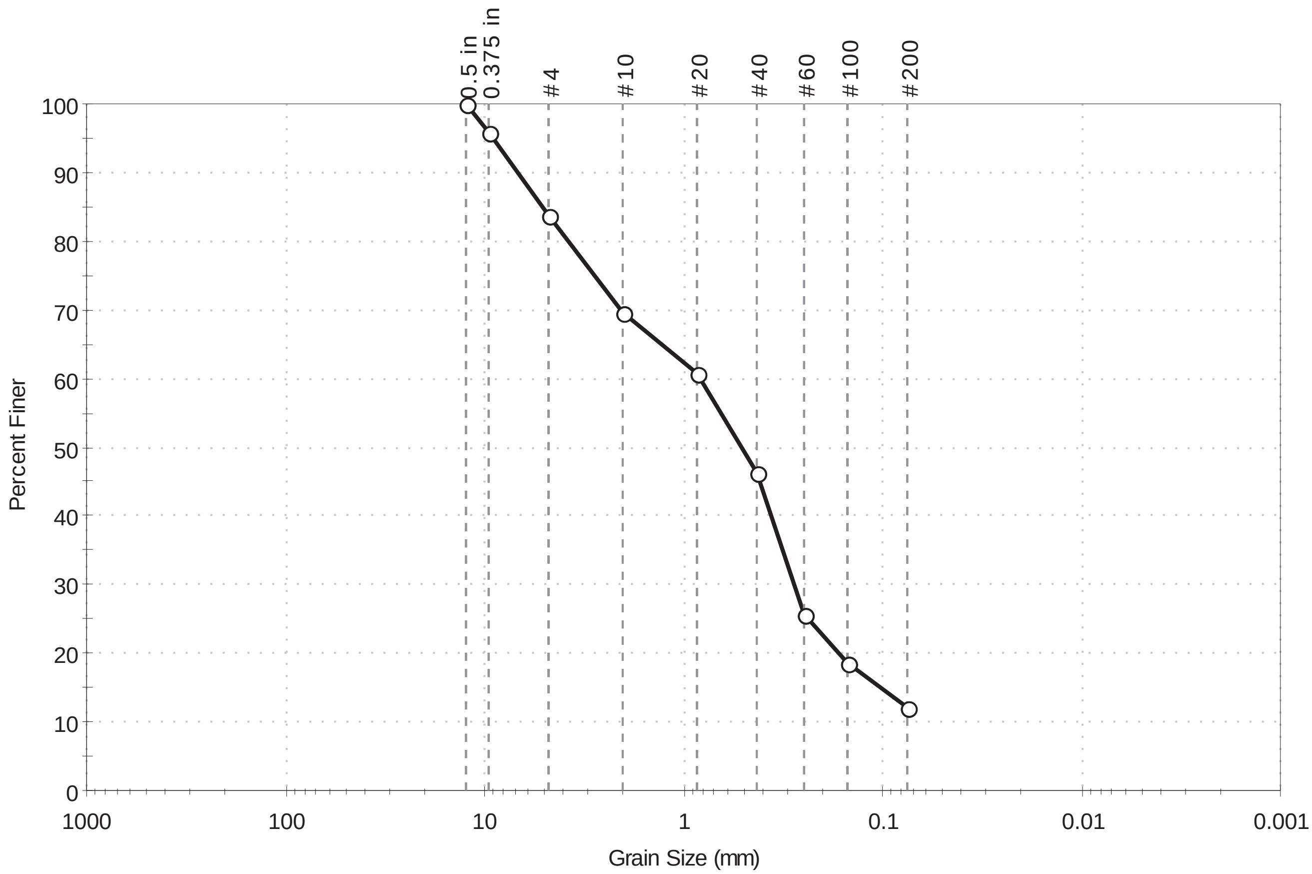
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S2-4	Sample Type: jar	Tested By:	GA
Sample ID: S-9	Test Date: 08/03/16	Checked By:	emm
Depth : 34-36 ft	Test Id: 384955		
Test Comment:	---		
Visual Description:	Moist, dark gray sand with silt and gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	16.3	71.7	12.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	96		
#4	4.75	84		
#10	2.00	70		
#20	0.85	61		
#40	0.42	46		
#60	0.25	26		
#100	0.15	19		
#200	0.075	12		

Coefficients

D_{85} = 5.1349 mm D_{30} = 0.2802 mm
D_{60} = 0.8209 mm D_{15} = 0.1028 mm
D_{50} = 0.5069 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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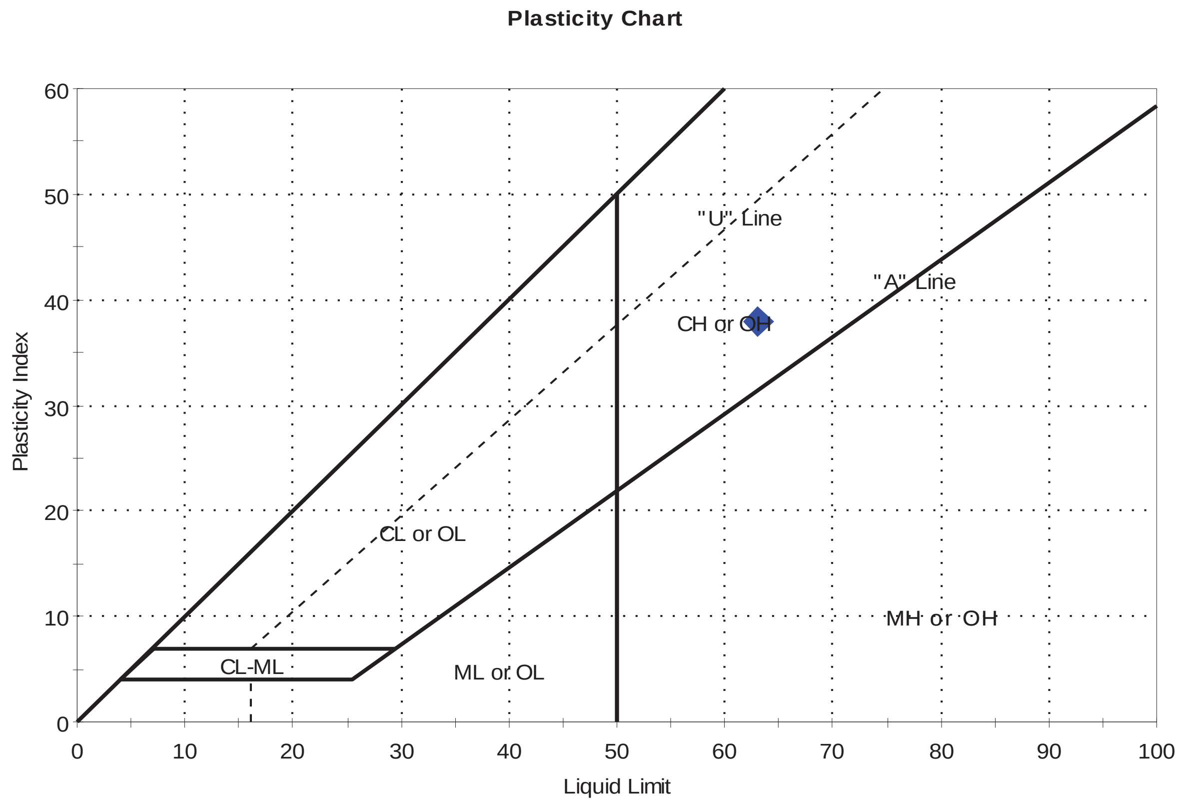
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S2-1	Sample Type:	tube	Tested By:	cam
Sample ID:	Tube 1 - Top middle	Test Date:	06/28/16	Checked By:	emm
Depth :	52-54	Test Id:	382075		

Test Comment:	---
Visual Description:	Moist, dark reddish gray clay
Sample Comment:	---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 1 - Top middle	S2-1	52-54	53	63	25	38	0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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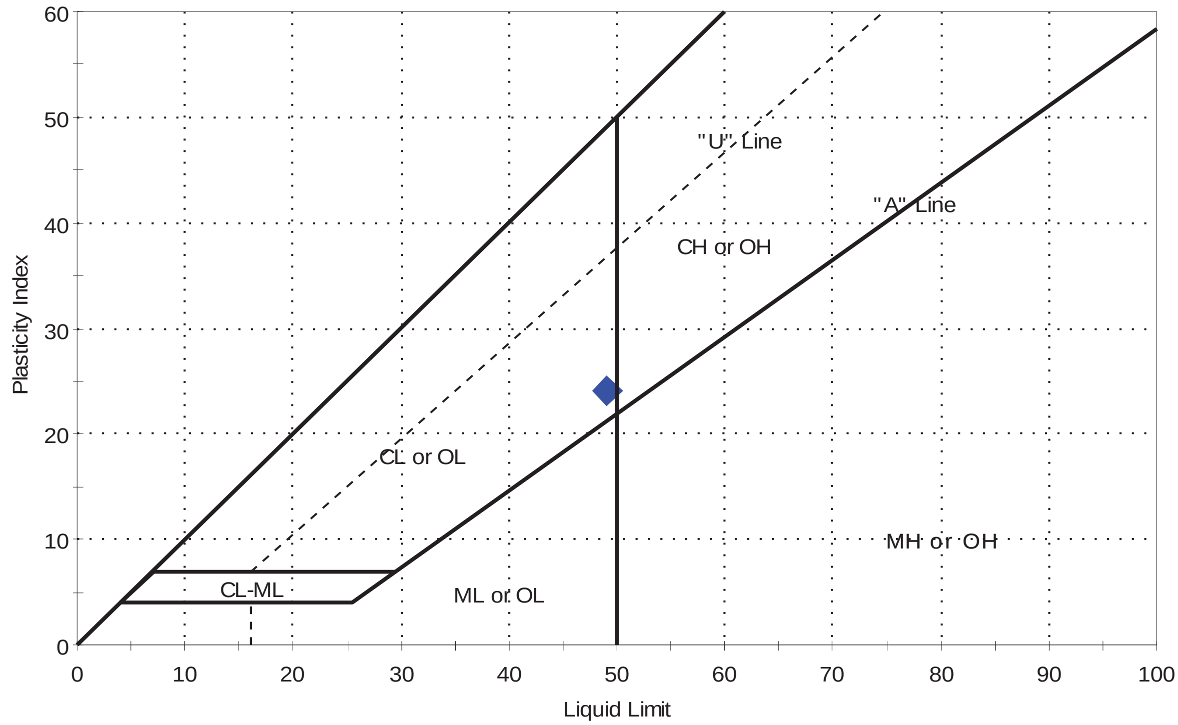
Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S2-1	Sample Type:	tube	Tested By:	cam
Sample ID:	Tube 1 - Bottom	Test Date:	06/29/16	Checked By:	emm
Depth :	52-54	Test Id:	382001		

Test Comment: ---
Visual Description: Moist, dark reddish brown clay
Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 1 - Bottom	S2-1	52-54	39	49	25	24	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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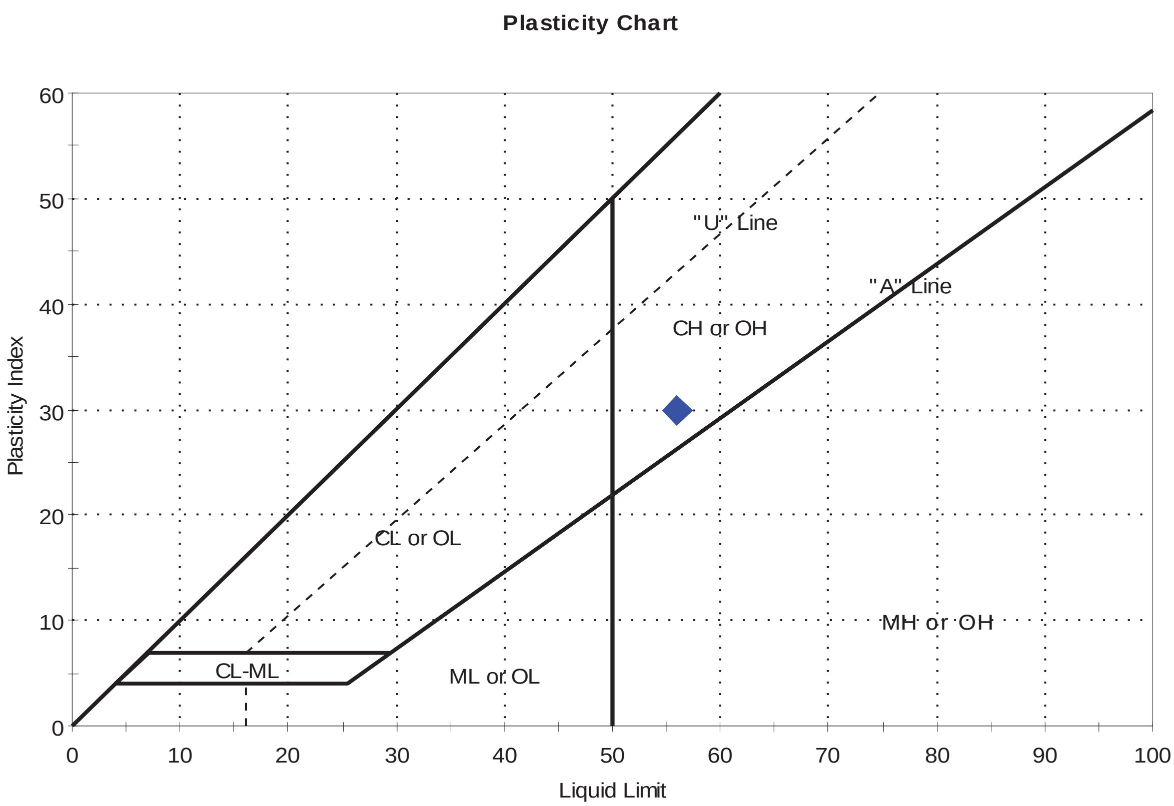
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S2-1	Sample Type:	tube	Tested By:	cam
Sample ID:	Tube 2 - Top middle	Test Date:	06/28/16	Checked By:	emm
Depth :	62-64	Test Id:	382076		
Test Comment:	---				
Visual Description:	Moist, dark reddish brown clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 2 - Top middle	S2-1	62-64	51	56	26	30	0.8	

Sample Prepared using the WET method

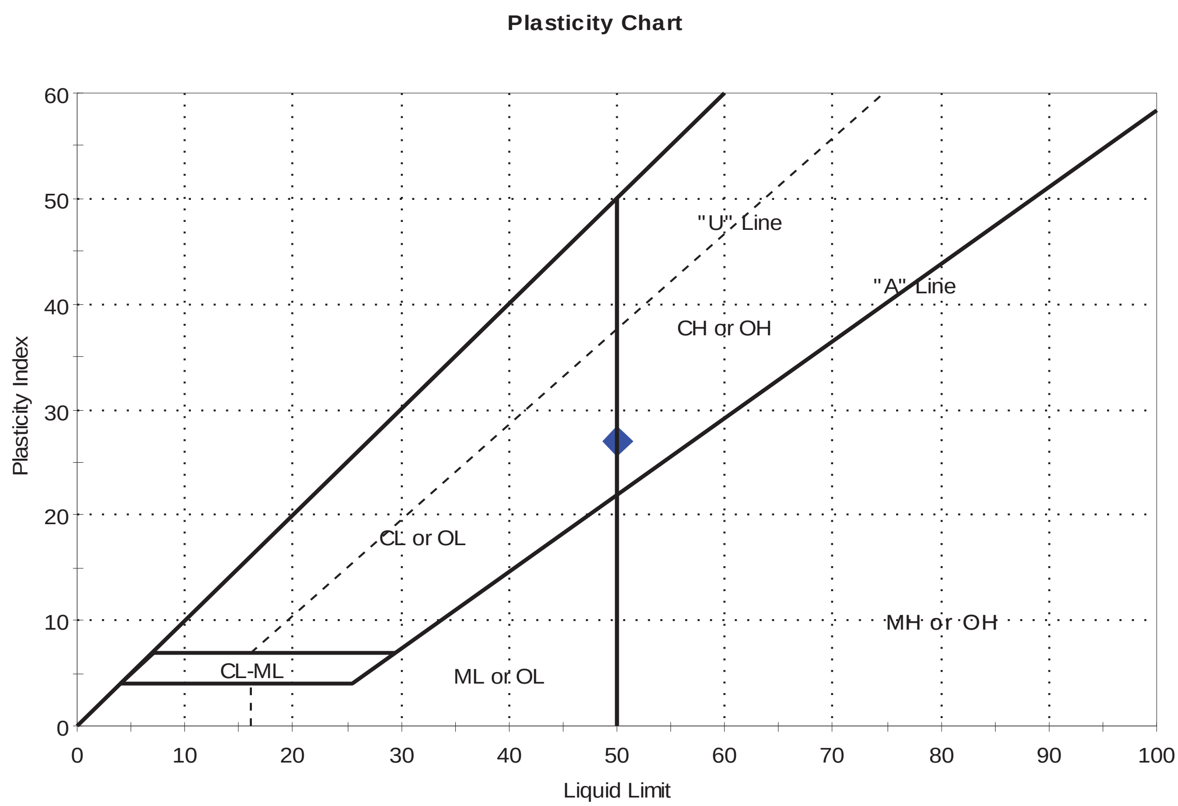
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client: Freeman Companies, LLC			
Project: Reconstruction of Exit Charter Oak Bridge			
Location: Hartford, CT		Project No:	GTX-304831
Boring ID: S2-1	Sample Type: tube	Tested By:	cam
Sample ID: Tube 2 - Bottom	Test Date: 06/28/16	Checked By:	emm
Depth : 62-64	Test Id: 382002		
Test Comment: ---			
Visual Description: Moist, dark reddish brown clay			
Sample Comment: ---			

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 2 - Bottom	S2-1	62-64	42	50	23	27	0.7	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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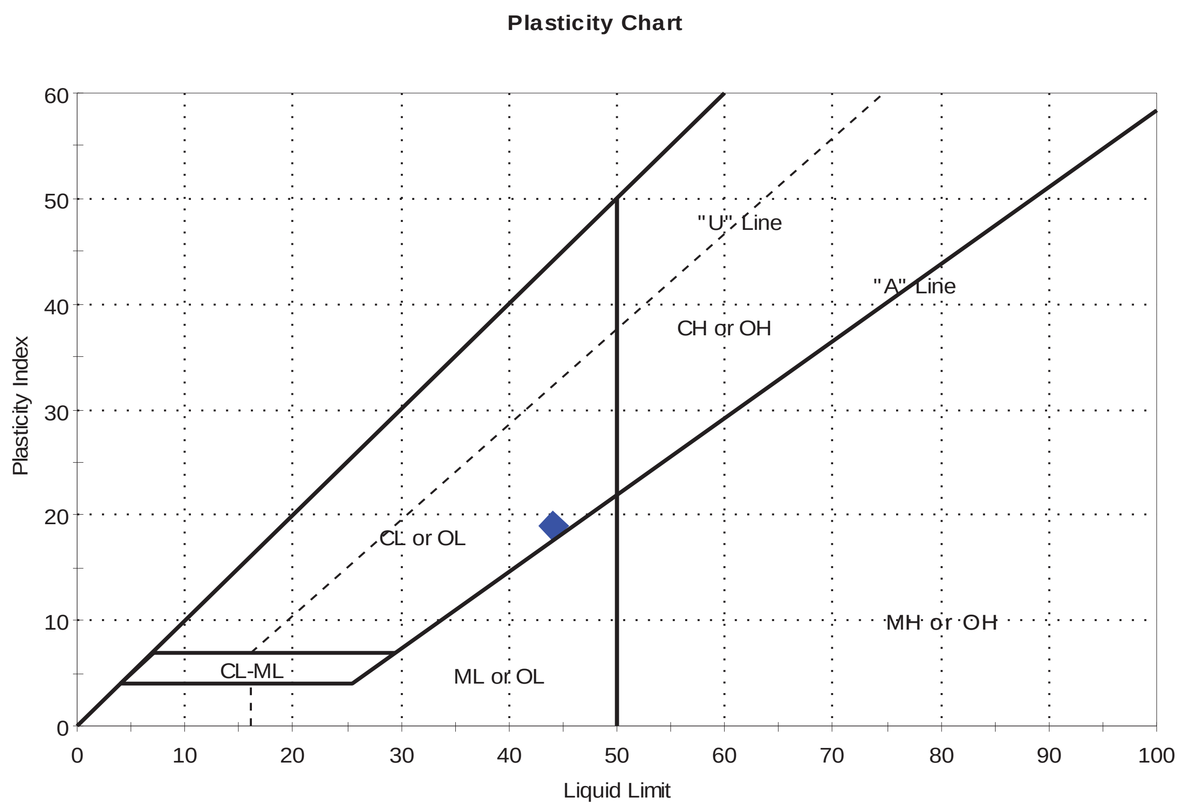
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S2-1	Sample Type:	tube	Tested By:	cam
Sample ID:	Tube 3 - Top middle	Test Date:	06/28/16	Checked By:	emm
Depth :	72-74	Test Id:	382080		
Test Comment:	---				
Visual Description:	Moist, dark reddish brown clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 3 - Top middle	S2-1	72-74	47	44	25	19	1.2	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

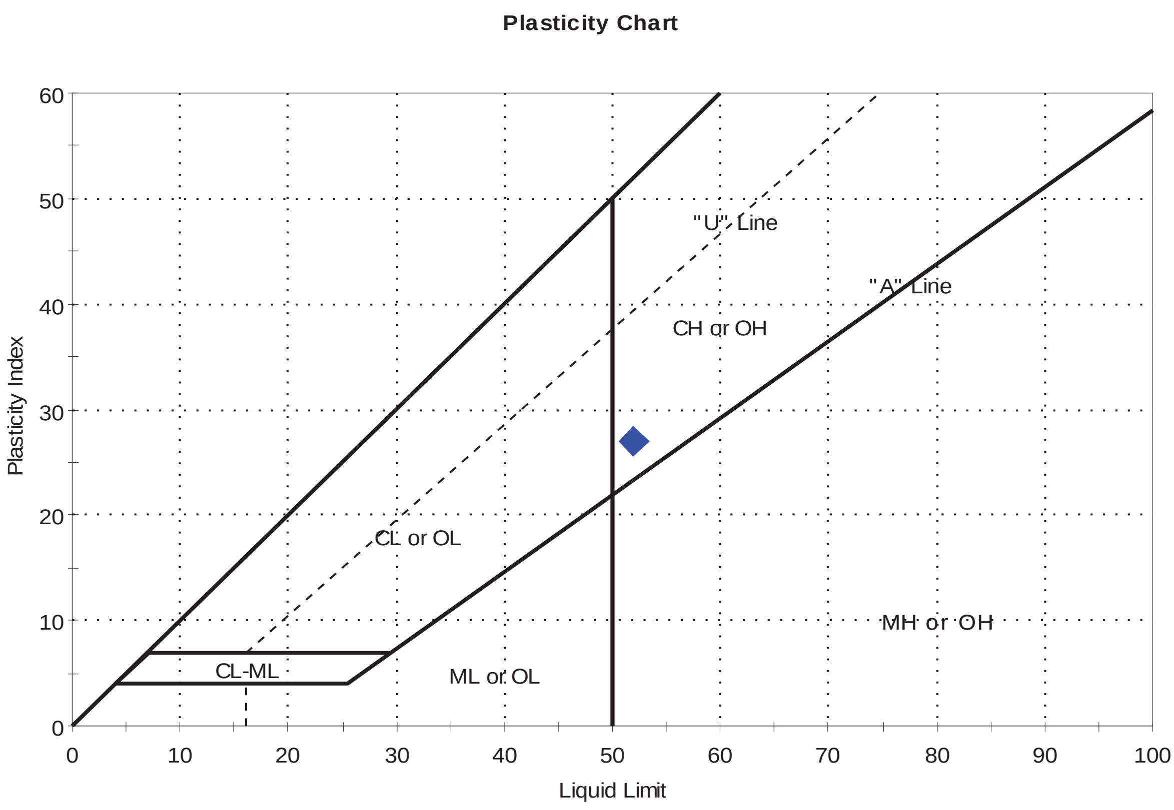
Toughness: LOW

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	S2-1	Sample Type:	tube	Tested By:	cam
Sample ID:	Tube 3 - Bottom	Test Date:	06/28/16	Checked By:	emm
Depth :	72-74	Test Id:	382003		

Test Comment: ---
Visual Description: Moist, reddish brown clay
Sample Comment: ---

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	Tube 3 - Bottom	S2-1	72-74	45	52	25	27	0.8	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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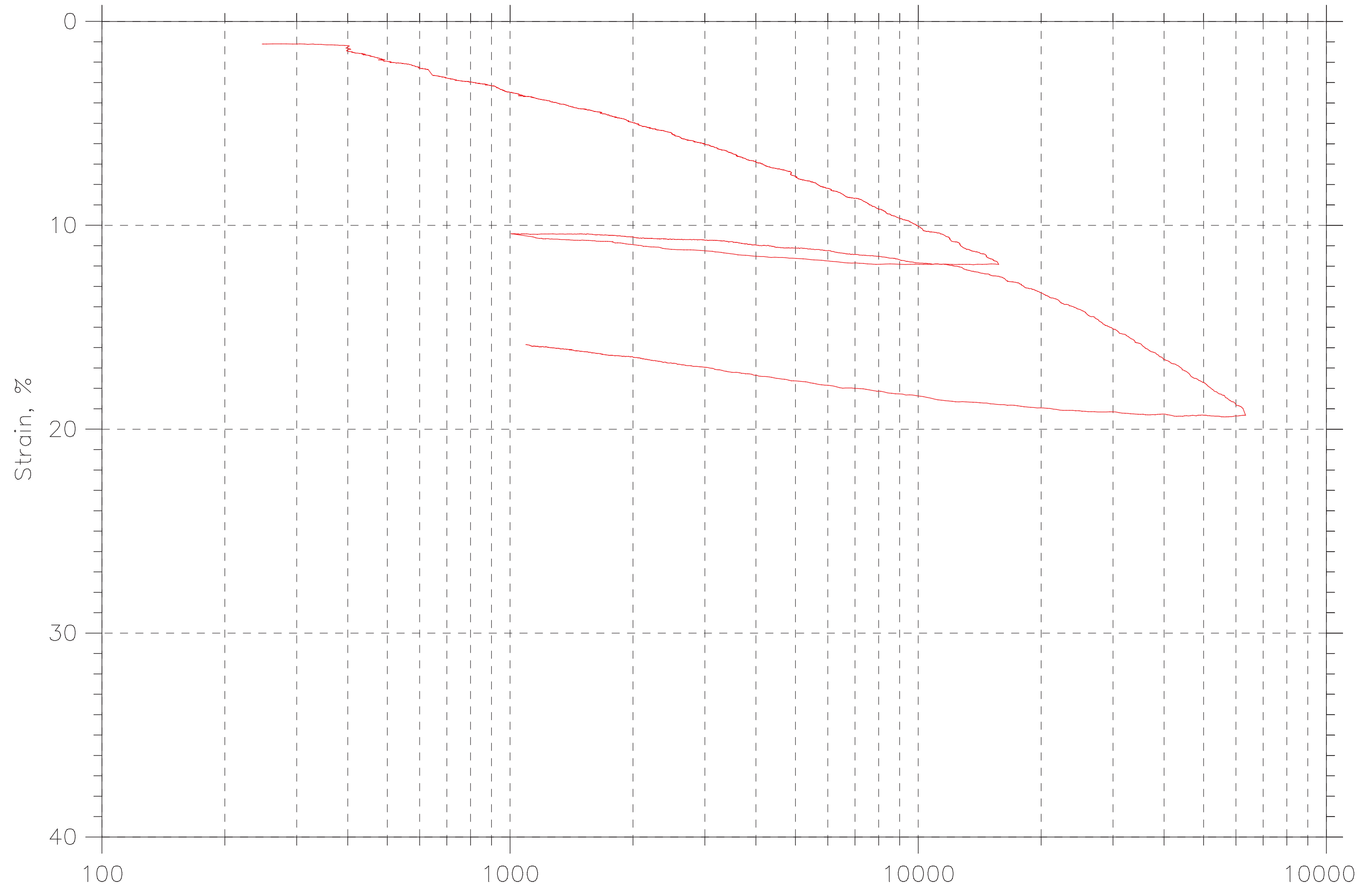
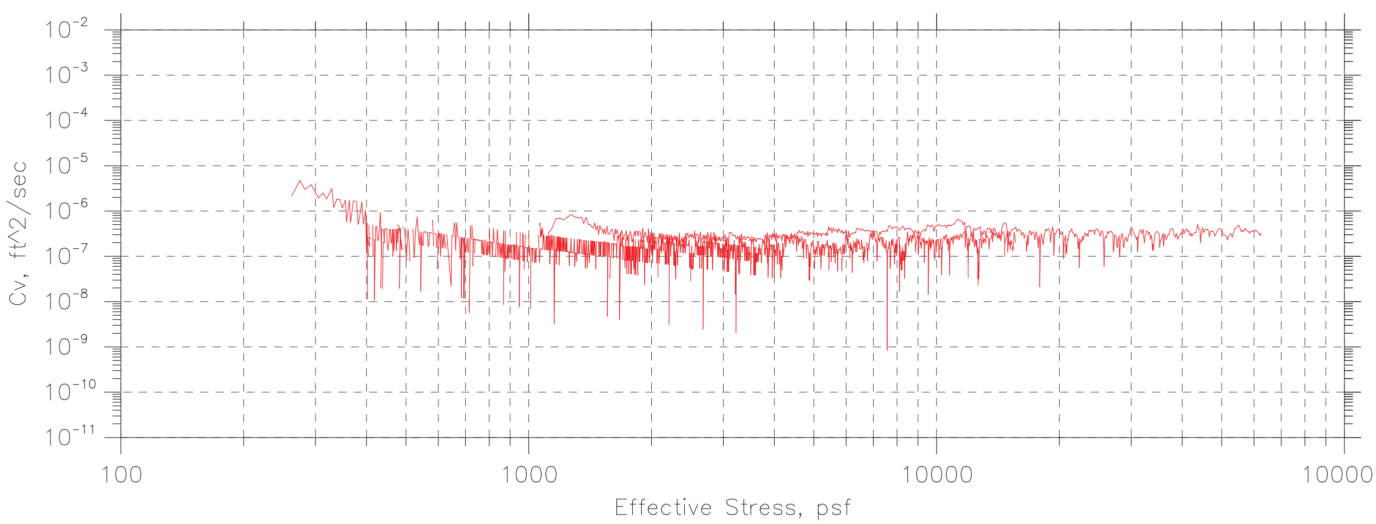
Constant Rate of Consolidation
Constant Strain Rate by ASTM D4186
Summary Report





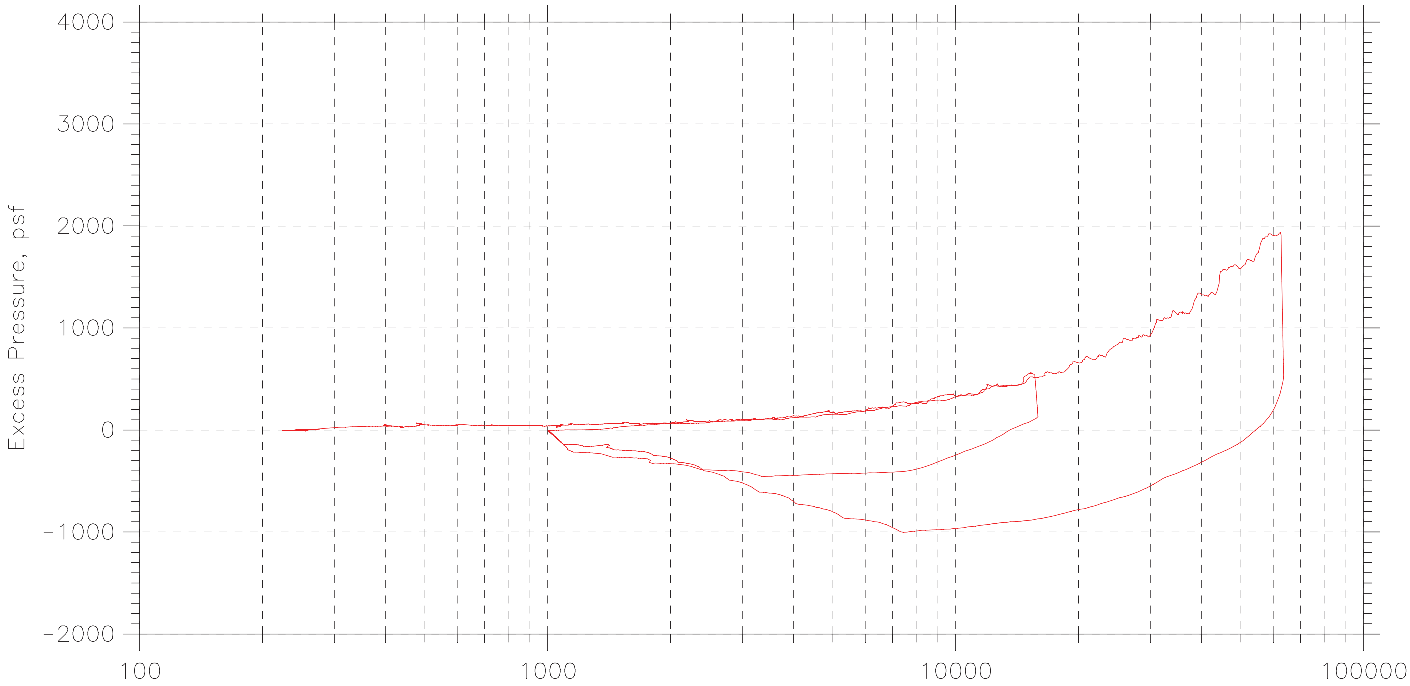
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-1 Bott	Test Date: 06/27/16	Depth: 52-54 ft
Test No.: CRC-14	Sample Type: intact	Elevation: ---
Description: Moist, dark reddish brown clay		
Remarks: System Y		
		Page 1 of 3

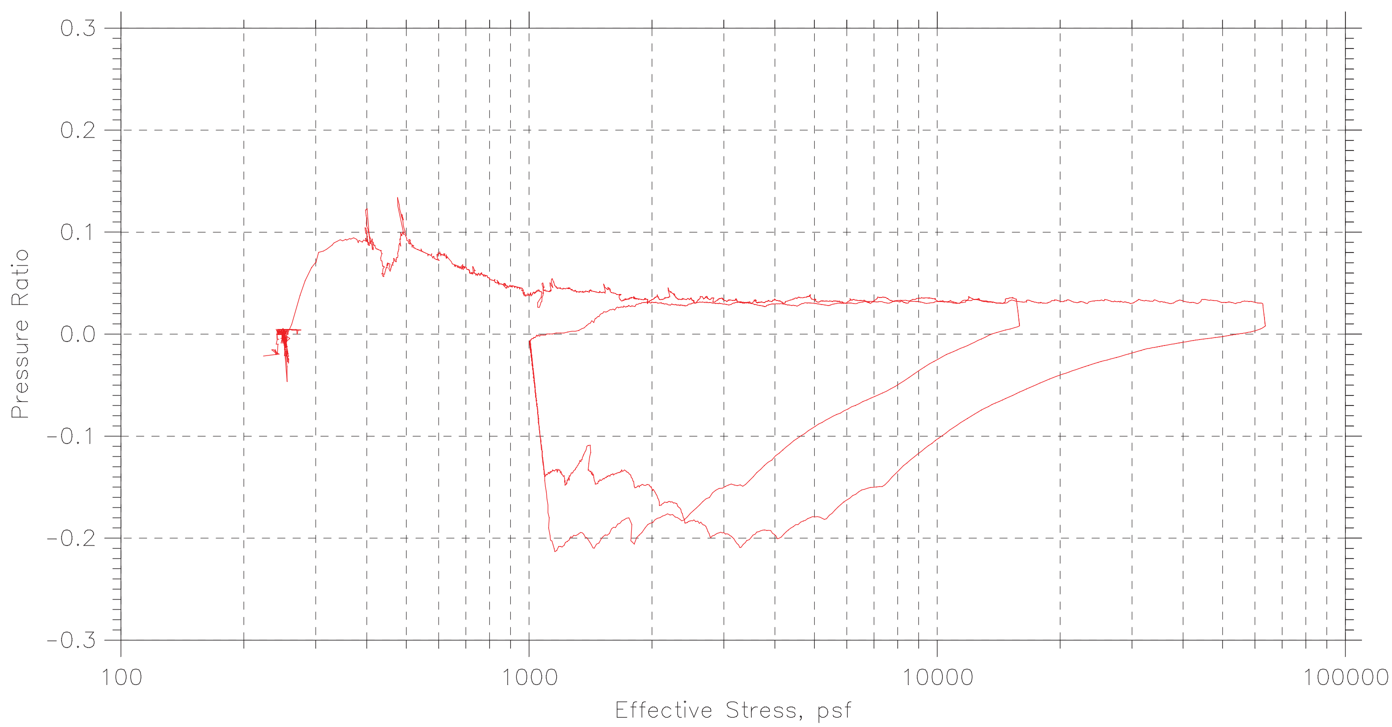
Tue, 12-JUL-2016 12:53:27

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-1 Bott	Test Date: 06/27/16	Depth: 52-54 ft
Test No.: CRC-14	Sample Type: intact	Elevation: ---
Description: Moist, dark reddish brown clay		
Remarks: System Y		

Tue, 12-JUL-2016 12:53:27

CRC TEST DATA

Project: Reconstruction of Exit
Boring No.: S2-1
Sample No.: Tube-1 Bott
Test No.: CRC-14

Location: Hartford, CT
Tested By: md
Test Date: 06/27/16
Sample Type: intact

Project No.: GTX-304831
Checked By: njh
Depth: 52-54 ft
Elevation: ---

Soil Description: Moist, dark reddish brown clay
Remarks: System Y

Estimated Specific Gravity: 2.83
Initial Void Ratio: 1.12
Final Void Ratio: 0.927

Liquid Limit: 49
Plastic Limit: 25
Plasticity Index: 24

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.91 in

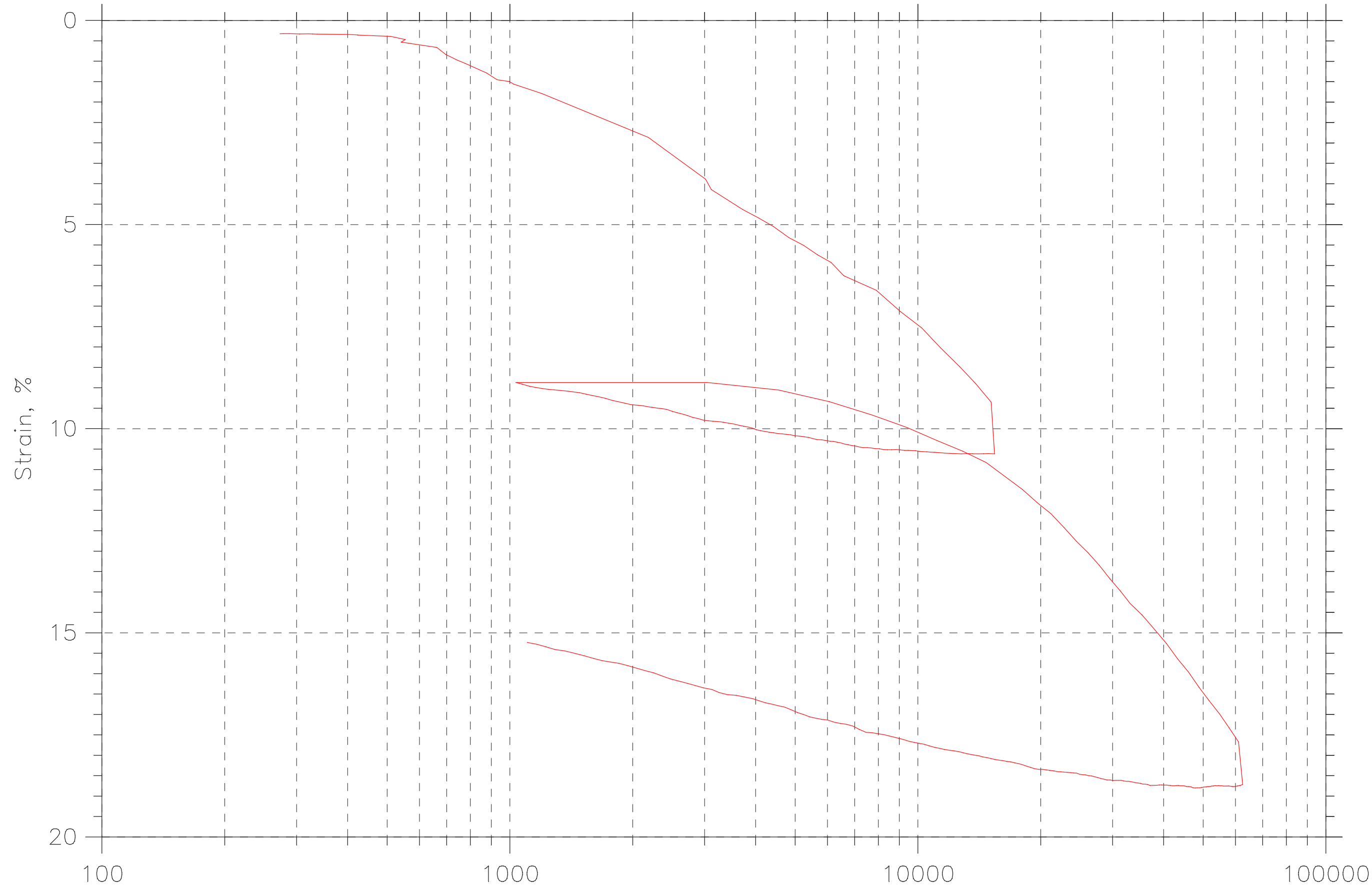
	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	16961	RING		c1561
Wt. Container + Wet Soil, gm	117.49	259.01	252.04	149.79
Wt. Container + Dry Soil, gm	86.960	216.82	216.82	114.93
Wt. Container, gm	8.3300	109.18	109.18	8.3800
Wt. Dry Soil, gm	78.630	107.64	107.64	106.55
Water Content, %	38.83	39.19	32.72	32.72
Void Ratio	---	1.12	0.927	---
Degree of Saturation, %	---	99.37	100.00	---
Dry Unit Weight, pcf	---	83.540	91.802	---

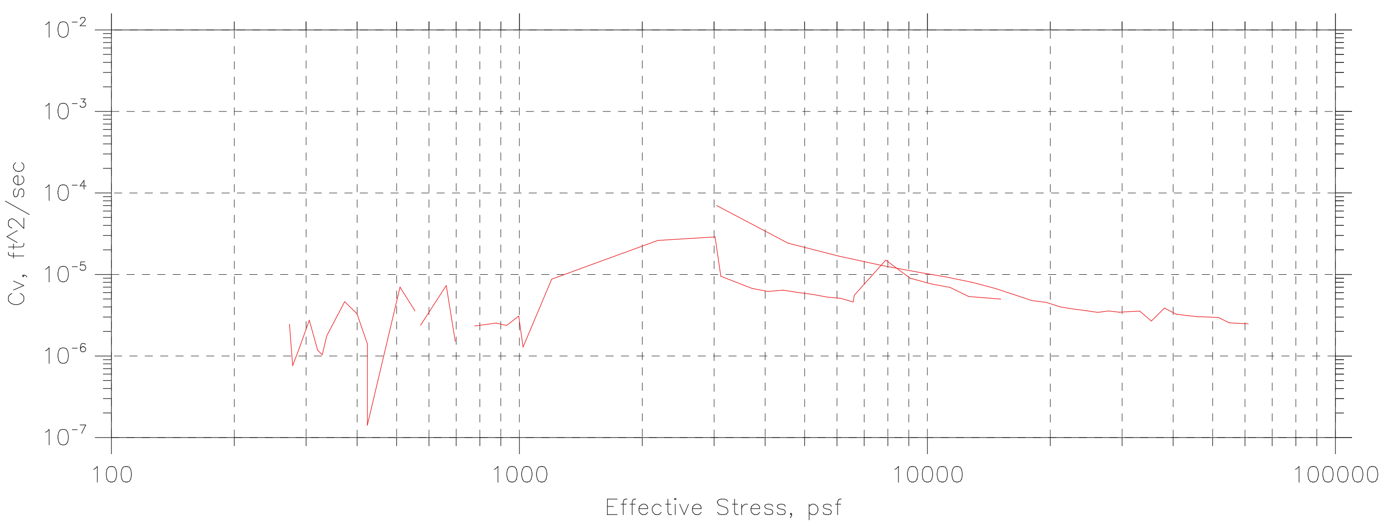
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-2 Bott	Test Date: 06/27/16	Depth: 62-64 ft
Test No.: CRC-16	Sample Type: intact	Elevation: ---
Description: Moist, dark reddish brown clay		
Remarks: System O		

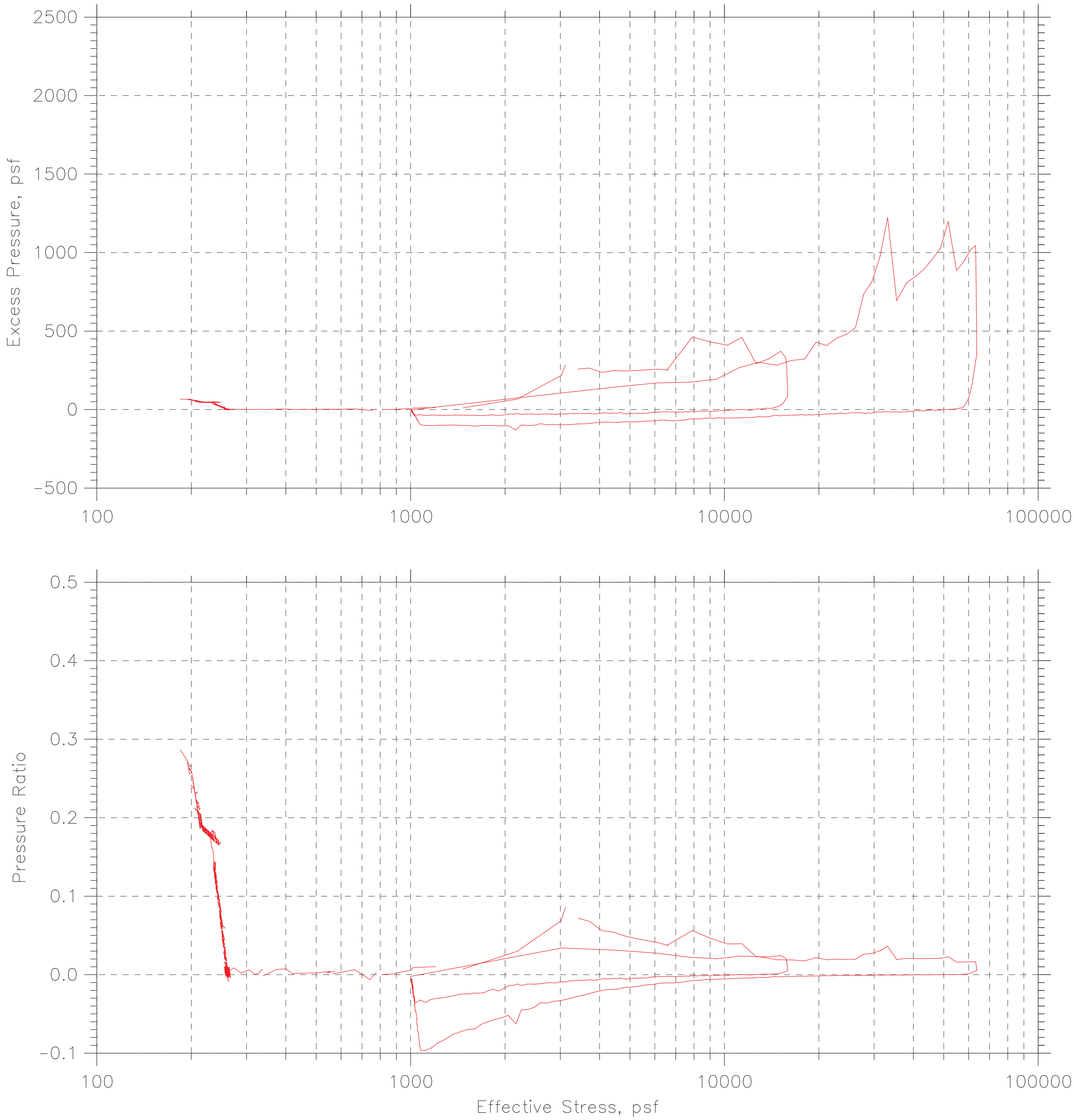
Tue, 12-JUL-2016 13:56:38

GeoTesting EXPRESS

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves



Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-2 Bott	Test Date: 06/27/16	Depth: 62-64 ft
Test No.: CRC-16	Sample Type: intact	Elevation: ---
Description: Moist, dark reddish brown clay		
Remarks: System O		
		Page 2 of 3

CRC TEST DATA

Project: Reconstruction of Exit
Location: Hartford, CT
Project No.: GTX-304831
Boring No.: S2-1
Tested By: md
Checked By: njh
Sample No.: Tube-2 Bott
Test Date: 06/27/16
Depth: 62-64 ft
Test No.: CRC-16
Sample Type: intact
Elevation: ---

Soil Description: Moist, dark reddish brown clay
Remarks: System O

Estimated Specific Gravity: 2.85
Liquid Limit: 50
Specimen Diameter: 2.50 in
Initial Void Ratio: 1.18
Plastic Limit: 23
Initial Height: 1.00 in
Final Void Ratio: 0.859
Plasticity Index: 27
Final Height: 0.85 in

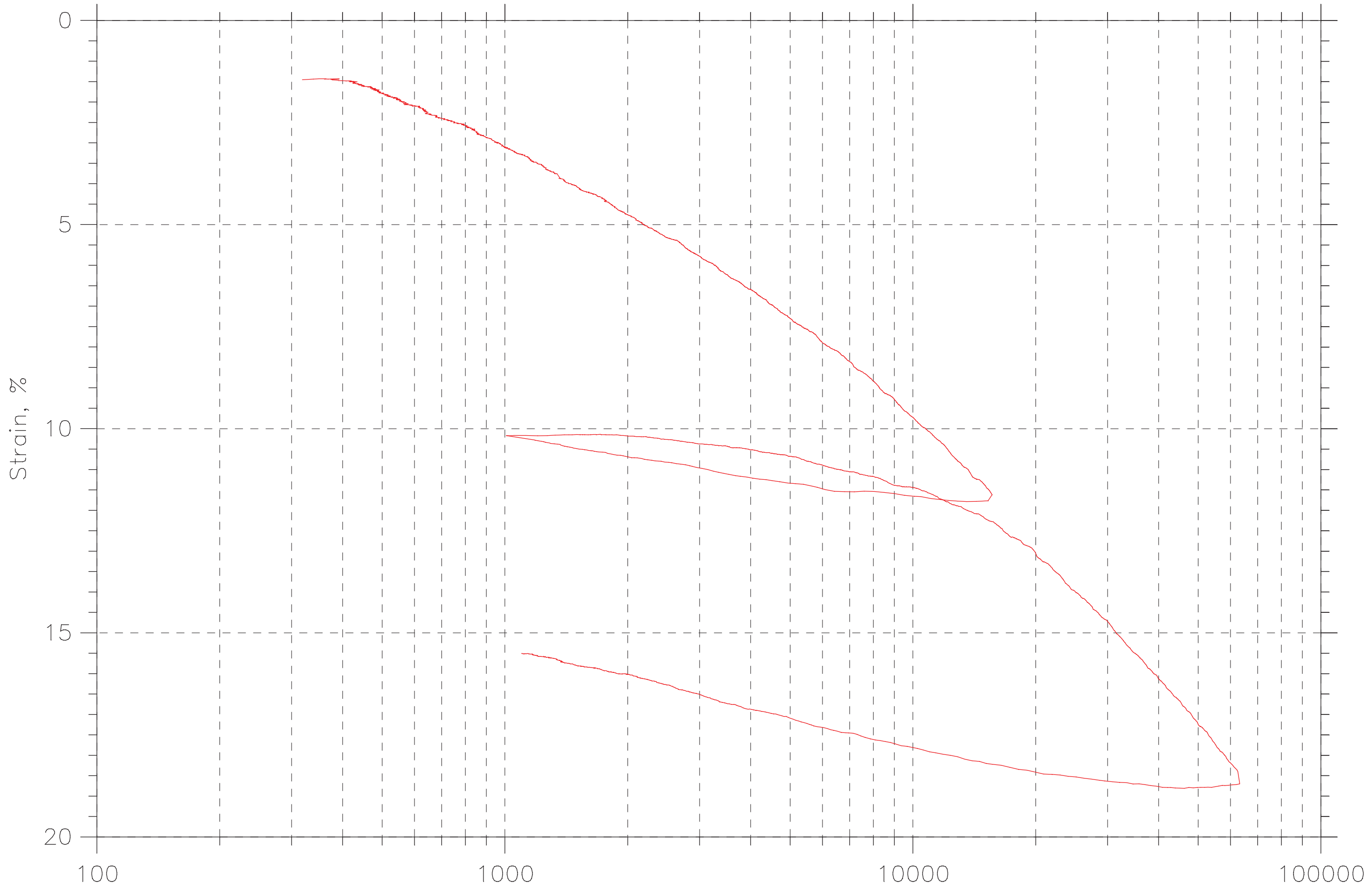
	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A-828	RING		b505
Wt. Container + Wet Soil, gm	130.43	257.90	246.74	145.38
Wt. Container + Dry Soil, gm	94.470	215.01	215.01	113.52
Wt. Container, gm	8.5800	109.85	109.85	7.9300
Wt. Dry Soil, gm	85.890	105.16	105.16	105.59
Water Content, %	41.87	40.79	30.17	30.17
Void Ratio	---	1.18	0.859	---
Degree of Saturation, %	---	98.61	100.00	---
Dry Unit Weight, pcf	---	81.613	95.592	---

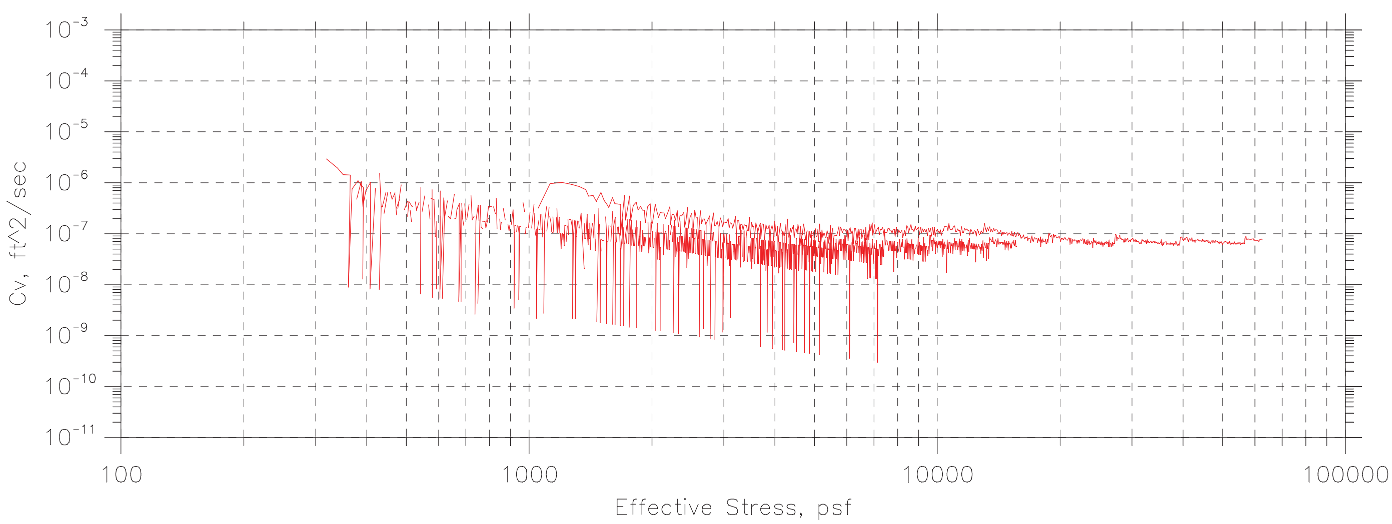
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report



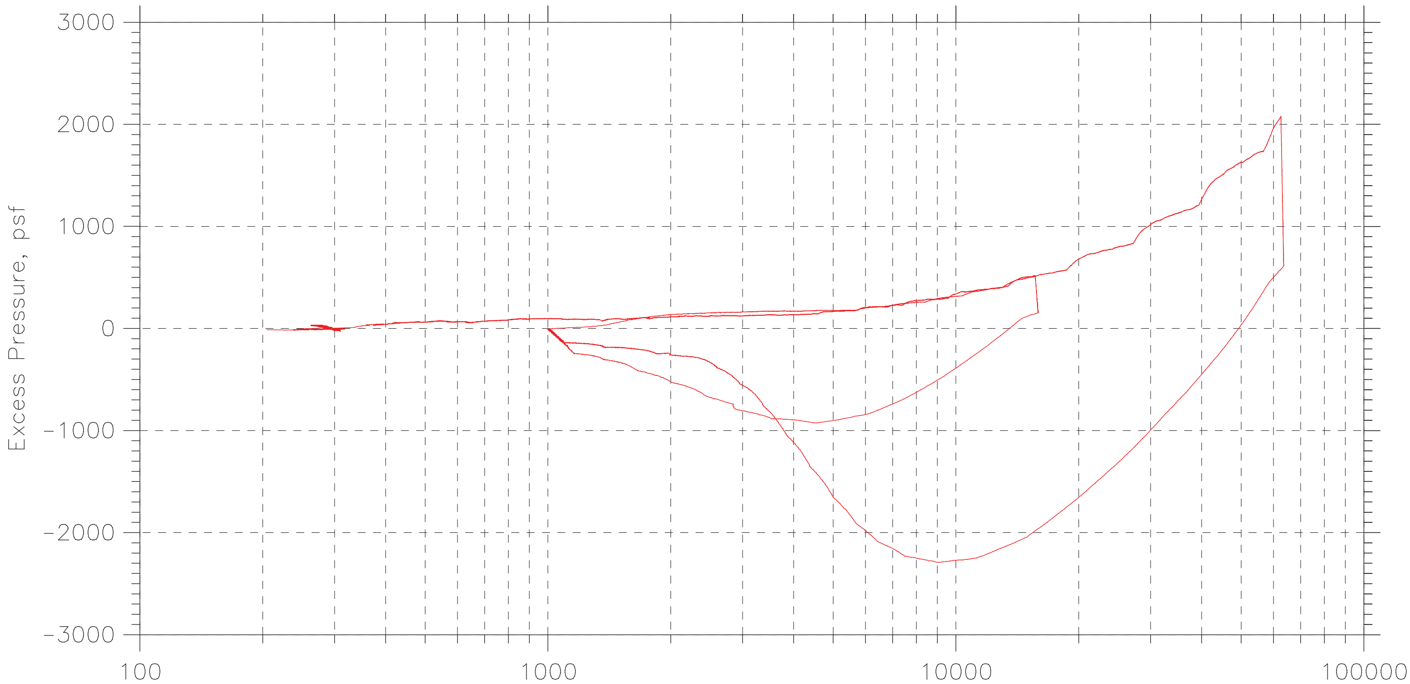


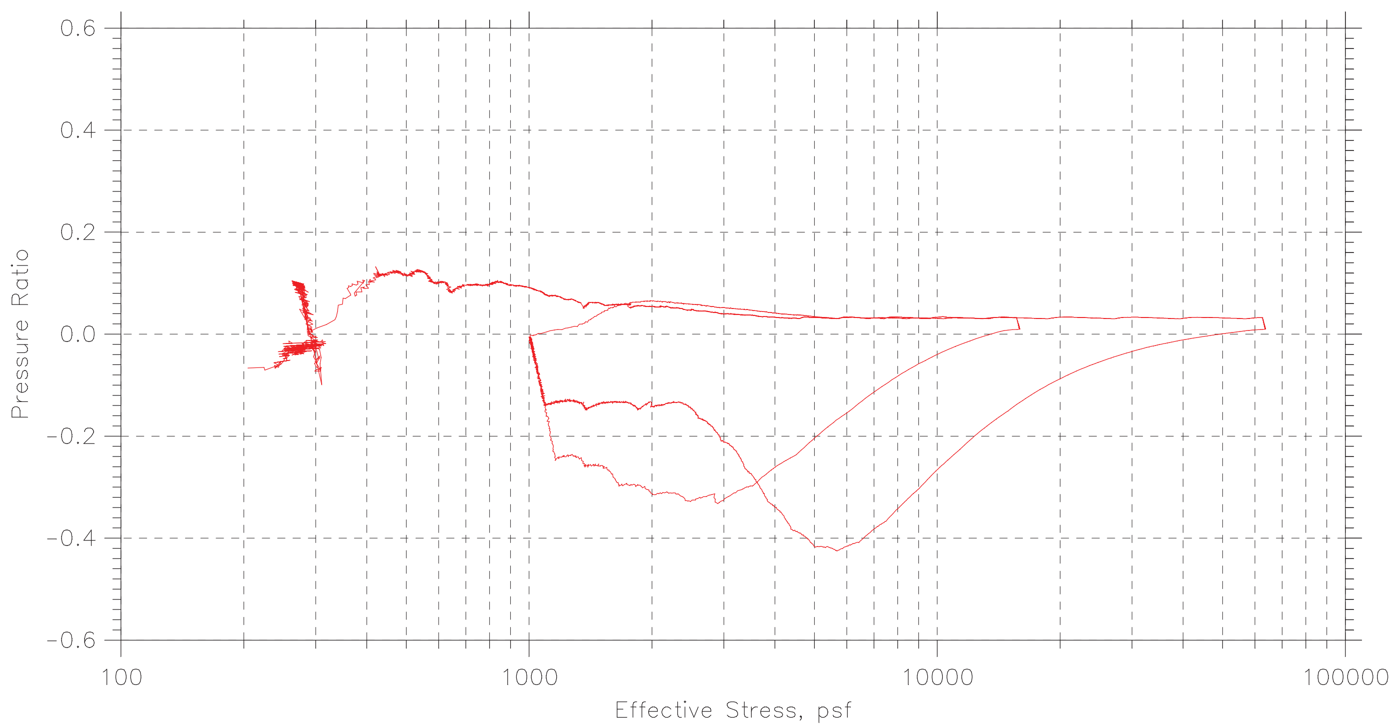
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-3 Bott	Test Date: 06/27/16	Depth: 72-74 ft
Test No.: CRC-15	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System R		

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-3 Bott	Test Date: 06/27/16	Depth: 72-74 ft
Test No.: CRC-15	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System R		
		Page 2 of 3

CRC TEST DATA

Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S2-1	Tested By: md	Checked By: njh
Sample No.: Tube-3 Bott	Test Date: 06/27/16	Depth: 72-74 ft
Test No.: CRC-15	Sample Type: intact	Elevation: ---

Soil Description: Moist, reddish brown clay
Remarks: System R

Estimated Specific Gravity: 2.81	Liquid Limit: 52	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.20	Plastic Limit: 25	Initial Height: 1.00 in
Final Void Ratio: 0.956	Plasticity Index: 27	Final Height: 0.89 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	A-844	RING		B-660
Wt. Container + Wet Soil, gm	205.53	253.92	245.71	148.46
Wt. Container + Dry Soil, gm	144.23	210.71	210.71	112.79
Wt. Container, gm	8.8000	107.92	107.92	8.0300
Wt. Dry Soil, gm	135.43	102.79	102.79	104.76
Water Content, %	45.26	42.04	34.05	34.05
Void Ratio	---	1.20	0.956	---
Degree of Saturation, %	---	98.54	100.00	---
Dry Unit Weight, pcf	---	79.774	89.634	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: ---	Sample Type: ---	Tested By:	daa
Sample ID: ---	Test Date: 06/27/16	Checked By:	jsc
Depth : ---	Test Id: 381989		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	---
S2-1	C2	98.5-99 ft	164	7103	3	Yes	---
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

GeoTesting EXPRESS

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S2-1		
Sample ID:	C2		
Depth:	98.5-99 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.47	4.47	4.47		
Specimen Diameter, in:	1.98	1.99	1.99		
Specimen Mass, g:	597.27				
Bulk Density, lb/ft^3	164			**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.3			**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00070	-0.00060	-0.00050	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00030	0.00030

Difference between max and min readings, in:

0° = 0.00030 90° = 0.00100

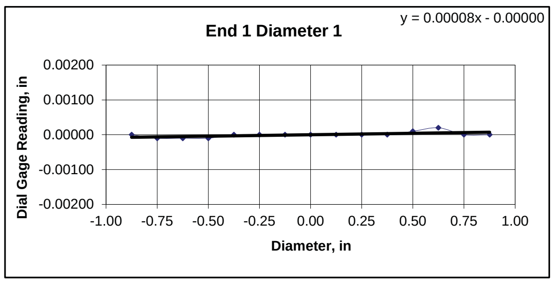
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020
Diameter 2, in (rotated 90°)	-0.00060	-0.00070	-0.00060	-0.00050	-0.00040	-0.00020	-0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

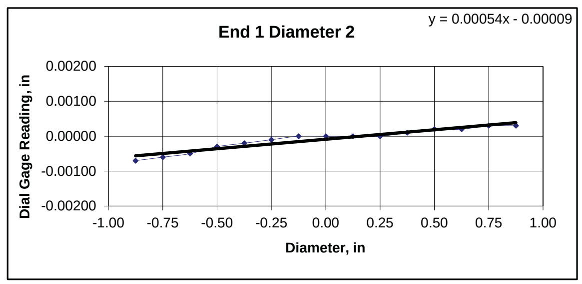
Difference between max and min readings, in:

0° = 0.0004 90° = 0.0007

Maximum difference must be < 0.0020 in. Difference = ± 0.00050

Flatness Tolerance Met? YES





DIAMETER 1

End 1:

Slope of Best Fit Line	0.00008
Angle of Best Fit Line:	0.00458

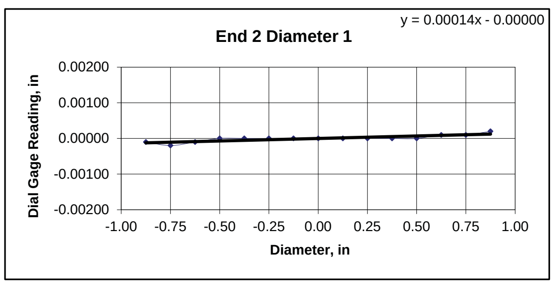
End 2:

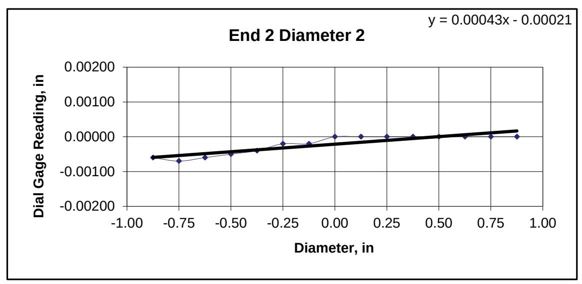
Slope of Best Fit Line	0.00014
Angle of Best Fit Line:	0.00802

Maximum Angular Difference: 0.00344

Parallelism Tolerance Met? YES

Spherically Seated





DIAMETER 2

End 1:

Slope of Best Fit Line	0.00031
Angle of Best Fit Line:	0.01776

End 2:

Slope of Best Fit Line	0.00031
Angle of Best Fit Line:	0.01776

Maximum Angular Difference: 0.00000

Parallelism Tolerance Met? YES

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

Maximum angle of departure must be ≤ 0.25°

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00030	1.985	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00100	1.985	0.00050	0.029	YES
END 2					
Diameter 1, in	0.00040	1.985	0.00020	0.012	YES
Diameter 2, in (rotated 90°)	0.00070	1.985	0.00035	0.020	YES

Perpendicularity Tolerance Met? YES

Client:	Freeman Companies, LLC
Project Name:	Reconstruction of Exit Charter Oak Bridge
Project Location:	Hartford, CT
GTX #:	304831
Test Date:	6/27/2016
Tested By:	daa
Checked By:	jsc
Boring ID:	S2-1
Sample ID:	C2
Depth, ft:	98.5-99

After cutting and grinding

After break

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S480-1		
Sample ID:	C2		
Depth:	54.5-55 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average		
Specimen Length, in:	4.37	4.38	4.38		
Specimen Diameter, in:	1.97	1.97	1.97		
Specimen Mass, g:	575.14				
Bulk Density, lb/ft^3	164			**Minimum Diameter Tolerence Met?**	**YES**
Length to Diameter Ratio:	2.2			**Length to Diameter Ratio Tolerance Met?**	**YES**

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? **YES**

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00180	-0.00180	-0.00150	-0.00100	-0.00050	-0.00050	-0.00030	0.00000	0.00000	0.00030	0.00040	0.00100	0.00110	0.00110	0.00120
Diameter 2, in (rotated 90^o)	0.00180	0.00130	0.00110	0.00100	0.00100	0.00090	0.00040	0.00000	-0.00050	-0.00070	-0.00090	-0.00130	-0.00180	-0.00220	-0.00260

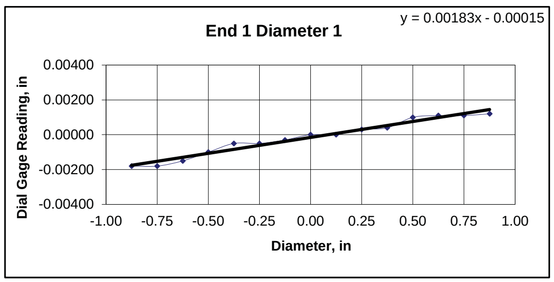
Difference between max and min readings, in:
0° = 0.00300 90° = 0.00440

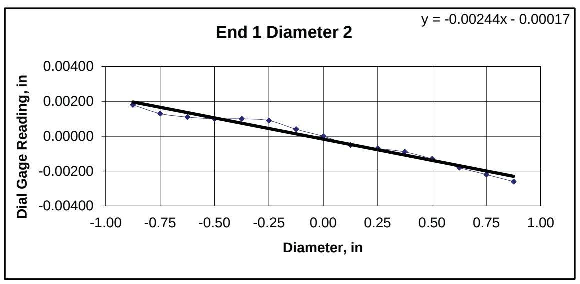
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00090	-0.00100	-0.00100	-0.00090	-0.00080	-0.00070	-0.00030	0.00000	0.00030	0.00080	0.00130	0.00140	0.00180	0.00200	0.00210
Diameter 2, in (rotated 90^o)	-0.00190	-0.00240	-0.00180	-0.00110	-0.00070	-0.00040	-0.00030	0.00000	0.00020	0.00040	0.00060	0.00080	0.00120	0.00150	0.00180

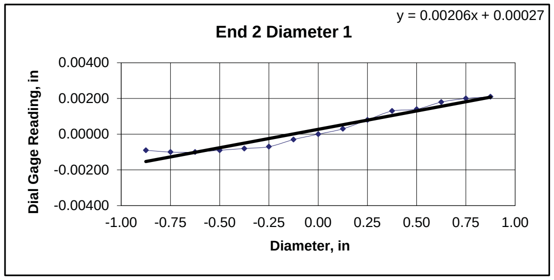
Difference between max and min readings, in:
0° = 0.0031 90° = 0.0042

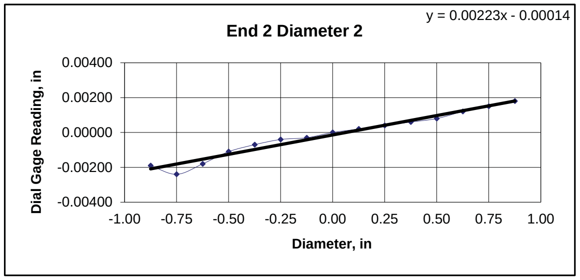
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00220

Flatness Tolerance Met? **NO**









DIAMETER 1

End 1:
Slope of Best Fit Line 0.00183
Angle of Best Fit Line: 0.10485

End 2:
Slope of Best Fit Line 0.00206
Angle of Best Fit Line: 0.11803

Maximum Angular Difference: 0.01318

Parallelism Tolerance Met? **NO**
Spherically Seated

DIAMETER 2

End 1:
Slope of Best Fit Line 0.00244
Angle of Best Fit Line: 0.13980

End 2:
Slope of Best Fit Line 0.00223
Angle of Best Fit Line: 0.12777

Maximum Angular Difference: 0.01203

Parallelism Tolerance Met? **NO**
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

Maximum angle of departure must be $\leq$ 0.25°

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00300	1.970	0.00152	0.087	YES
Diameter 2, in (rotated 90^o)	0.00440	1.970	0.00223	0.128	YES
END 2					
Diameter 1, in	0.00310	1.970	0.00157	0.090	YES
Diameter 2, in (rotated 90^o)	0.00420	1.970	0.00213	0.122	YES

Perpendicularity Tolerance Met? **YES**

APPENDIX D

DRAFT SPECIAL PROVISIONS

ITEM #0203xxxA – EQUIPMENT WORKING PAD

Description:

Form 817, Section 203, Structure Excavation shall apply with the following amendments:

Article 2.03.03 – Construction Methods: Insert the following provisions at the end of Item 2, Preparation of Foundations:

The alluvium and portions of the fill have low strength and are highly susceptible to disturbance from construction equipment and vibrations. The contractor shall anticipate that a temporary working pad will be necessary to support installation equipment. Working pads could potentially include multiple layers of geogrids, stabilization fabric, crushed stone, well-graded sand and gravel aggregate, or other materials, and the working pad may need to be on the order of three feet thick. The contractor shall be responsible for design of an appropriate working pad capable of supporting his proposed installation equipment.

ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
D. The average coating thickness shall be 1/16".
E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight
1 inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 - 15

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

Pay Item	Pay Unit
Lightweight Fill	c.y.

LAND DEVELOPMENT | ENGINEERING DESIGN | CONSTRUCTION SERVICES

Geotechnical Report
Rehabilitation of Bridge 06043
Route 15 NB over Main Street
State Project No. 63-703
East Hartford, Connecticut

December 22, 2016

Freeman Project No.: 2014-1001

Prepared for:
CME Associates, Inc.
333 East River Drive, Suite 400
East Hartford, CT 06108

Prepared by:

Freeman Companies, LLC
36 John Street
Hartford, CT 06106

Nathan L. Whetten, P.E., D.GE.
Vice President of Geotechnical Services

FREEMAN COMPANIES

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

1.1 Summary

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for rehabilitation of Bridge 06043, Route 15 over Main Steet in East Hartford. Rehabilitation consists of widening the northbound (south) side of the bridge by 12 feet to accommodate an additional travel lane. The existing bridge is a single-span bridge supported on two stub abutments, which will be extended to the south. New U-type wingwalls will be provided.

We recommend that the widened abutments be supported on steel H-Piles driven to refusal on bedrock, and pile tip reinforcement should be provided. Filling behind the abutments and new wingwalls will result in settlement of subgrade soils, and downdrag loads on abutment piles will occur. We recommend that bitumen coatings be applied to piles supporting the widened abutment to reduce downdrag loads. Preaugering will be required to protect the coatings.

Abutments should be backfilled with lightweight fill (expanded shale aggregate), consistent with backfill recommended in the original design documents against the existing bridge abutments, to reduce the magnitude of total and differential settlement.

1.2 Scope of Work

Freeman Companies, LLC performed the following tasks:

- Engaged a subsurface exploration contractor to conduct test borings at the site.
- Provided technical monitoring of the explorations.
- Arranged for a testing laboratory to conduct laboratory soil tests.
- Evaluated the subsurface conditions
- Conducted settlement evaluations
- Prepared this report containing geotechnical design recommendations and construction considerations.

1.3 Authorization

The work was completed in accordance with our agreement dated October 21, 2015.

1.4 Project Vertical Datum

Elevations in this report are in feet and reference NAVD-88.

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Description

The bridge will be widened by 12 feet by extending Abutments 1 and 2 on the south side. New U-type wingwalls will be provided.

The existing bridge is supported on steel H-piles. Design documents for the existing bridge recommended that bitumen coatings be applied to reduce downdrag. Lightweight fill was recommended within 75 feet of the abutments to limit settlement.

2.2 Site Description

The site is located on the south side of the Route 15 NB Bridge over Main Street, as shown on Figure 1, Site Location Map. The bridge is a single-span bridge supported on stub abutments. Main Street has three travel lanes in each direction and concrete sidewalks on each side. The slope between the stub abutments and sidewalks is paved with concrete pavers. Ground surface south of the wingwalls consists of grass and shrubs.

Bridge grade is about El. 61, Main Street grade below the bridge is about El. 37, and bottom of pile cap (existing and proposed) is at El. 43.

3.0 EXPLORATIONS

3.1 Recent Explorations

Recent explorations included one Cone Penetrometer Test (CPT6043-1) and one test boring (S6043-1 OW) conducted on June 15, 2016 and from May 21 to 24, 2016, respectively. The Cone Penetrometer Test (CPT) was conducted by ConeTec, of West Berlin, New Jersey, and the test boring was drilled by New England Boring Contractors, Inc., Glastonbury, Connecticut. CPT6043-1 was located south of Abutment 1 and S6043-1 was located south of Abutment 2.

CPT6043-1 was drilled to a depth of 164.4 feet (CPT6043-1) below ground surface. The CPT was advanced using standard CPT push techniques, and the subsurface data was recorded continuously by a piezocone mounted on the tip.

Test boring S6043-1 was drilled to a depth of 189 feet below ground surface. Standard Penetration Tests at maximum 5 foot intervals, undisturbed tube samples of the lacustrine deposits, and two five-foot-long NX-size rock core samples were recovered from the boring. The completed borehole was backfilled with drill cuttings. A groundwater observation well was installed in a test boring immediately adjacent to S6043-1 drilled to a depth of 20 feet. A slotted PVC screen backfilled with filter sand was placed from 10 to 20 feet. The installation was protected with a roadway box.

A Freeman Companies geologist monitored the drilling, described the soil samples, and prepared the test boring logs included in Appendix A, Recent Exploration Logs. The CPT log prepared by ConeTec is also included in Appendix A. Exploration locations were surveyed by CME Associates, and are shown on Figure 2, Subsurface Exploration Location Plan.

3.2 Previous Subsurface Explorations

Six previous test borings were drilled for the bridge, including B-10, and B-164 to B-168. Approximate locations of borings obtained from record documents are shown on Figure 2, Exploration Location Plan. Previous exploration logs and cross-sections of the previous explorations are provided in Appendix B.

3.3 Laboratory Testing

A laboratory testing program was conducted, consisting of:

- Eight moisture content tests
- One pH test, one electrical resistivity test, and one soluble sulfate test
- One grain size analysis
- Two Constant Rate of Strain (CRS) Consolidation Tests
- Four Atterberg Limit Determinations
- One unconfined compression test on a rock core sample.

Laboratory tests were conducted by Geotesting Express, of Acton, Massachusetts. Results of laboratory testing are provided in Appendix C, Laboratory Test Data. Results of previous and recent consolidation tests are plotted on Figure 3 Summary of Varved Clay Properties, East of Connecticut River.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Conditions

Subsurface conditions encountered in the explorations include Fill, Alluvium, Lacustrine, and Glacial Till overlying Bedrock as described below. A summary of subsurface data is provided in Table I. A subsurface profile through Abutment 2 is provided on Figure 4.

Thickness Range (ft.)	Stratum	Generalized Description
4 to 9	Fill	Medium dense to very dense, c-f SAND, little gravel, trace silt, brick, roots. Standard Penetration Test (SPT) N-Values ranged from 28 to 66 blows per foot (bpf).
10 to 14	Alluvium	Loose to medium dense red to brown c-f SAND, trace silt. SPT N-values ranged from 6 to 12 bpf.
139 to 151	Lacustrine	Stiff to very stiff varved red-brown CLAY and SILT, with regular 1/8 to 1/16-inch gray and reddish gray silt varves. Results of undisturbed field vane shear strengths tests conducted in previous borings ranged from 957 psf to 3038 psf (undisturbed); remolded field vane test shear strengths ranged from 188 psf to 1362 psf (remolded).
7.5	Glacial Till	Very dense red-brown c-f SAND, some silt, little clay and gravel. Cobbles and boulders are commonly present within the glacial till stratum in the region. SPT N-values in previous borings ranged from 76 to more than 100 bpf
	Bedrock	Brown ARKOSE, medium strong to strong with fractured zones. The top 0 to 3 feet of bedrock was weathered.

Groundwater – Water was encountered in the borings at depths ranging from 11 to 20 feet (El 21 to El. 29) during or shortly after drilling. Groundwater was measured in observation well S6043-1 OW at 10.6 feet (El. 29) 4 months after the well was installed, following a relatively dry period of weather. Groundwater levels will vary with season, water level in the nearby Connecticut River, precipitation, temperature, and other factors.

Corrosion – One series of corrosion tests was conducted on a sample from boring S6043-1. Results of testing are summarized below:

Test parameter	S6043-1, 5'–7'
pH (in distilled water)	7.5
Electrical Resistivity (ohm-cm)	15,496
Sulfates (ppm)	<30

Results of testing indicate the sample is non-corrosive based on guidance provided in AASHTO Section 10.7.5.

5.0 GEOTECHNICAL ENGINEERING RECOMMENDATIONS

5.1 Foundation Design Recommendations

Downdrag – Settlement evaluations were conducted at the proposed abutments to estimate the magnitude of total settlement, and whether settlement would cause downdrag at the existing and proposed piles. Estimated total settlement calculated at the abutments assuming various weights of fill, calculated using the computer program Settle 3D (by RocScience), is summarized as follows:

Normal Weight Fill:	3 inches, includes 1¼ inch secondary compression
Expanded Shale:	2½ inches, includes 1¼ inch secondary compression
Geofoam:	2 inches, includes 1¼ inch secondary compression

Results of the evaluation indicate that there is on-going settlement of the existing embankment from the original embankment fill loads, both consolidation settlement and secondary compression. Additional fill loads using either normal weight fill or a super-lightweight material such as geofoam have a limited impact on the magnitude of settlement.

The threshold settlement for downdrag loads on piles is commonly considered to be 0.4 inches. The estimated settlements will result in downdrag loads on the abutment piles. We recommend that bitumen coatings be applied to piles to reduce downdrag loads. A 90 percent reduction in downdrag loads can be achieved using bitumen coatings, provided that coatings are protected from damage during pile installation. Coated piles should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Sand should be placed around the pile as the casing is withdrawn.

Settlement evaluations indicate that there is not a significant reduction in settlement by using geofoam. The original design recommendations called for lightweight backfill (expanded shale aggregate) within 75 feet of the bridge abutment. We recommend that backfill adjacent to the widened portions of the bridge also consist of expanded shale aggregate, consistent with the original design recommendations, to reduce the magnitude of differential settlement.

FREEMAN COMPANIES

Pile Design

- **Seismic Design:** Soils are not susceptible to liquefaction. Soil conditions at the site are defined as AASHTO Site Class D, Stiff Soils.
- **Pile Type:** HP12x74 with pile tip reinforcement driven to end bearing on bedrock, Grade 50 steel. Other H-Pile sections may also be considered.
- **Service Limit:** 125 tons, assumes a HP12x74 pile area equal to 21.76 square inches. Reduce the capacity to account for downdrag loads on piles supporting the abutments, as indicated below.
- **Strength Limit:** For end bearing piles, assume a strength limit equal to the structural capacity of the pile. Settlement of piles is expected to be equal to the elastic compression of the pile.
- **Downdrag:** Estimated downdrag loads are listed below:
  - 350 tons (single piles, uncoated) or 35 tons (single pile with bitumen coating)
  - 31.5 tons (corner pile in a group with bitumen coating)
  - 28 tons (side pile in a group with bitumen coating)
  - 17.5 tons (inside pile in a group with bitumen coating)
- **Load Tests:** Minimum of 3 dynamic load tests with matching signal analysis (4 tests if 26 or more piles, and no less than 2% of the production piles, AASHTO Table 10.5.5.2.3-3).
- **Test Piles:** Recommend same piles and criteria as load tests (AASHTO 10.7.9)
- **Minimum Spacing:** Center to center spacing should be 2½ times the pile diameter (AASHTO 2012 10.7.1.2) and at least 30 inches. Minimum 9 inches to the nearest edge of the pile cap
- **Lateral Resistance:** Use the pile capacity in batter. Additional lateral load capacities in bending will be provided based on LPile analyses once pile loading is established.
- **Subgrade Preparation Below Pile Cap:** Minimum 12-inch thick layer of Granular Fill (CTDOT Form 817 M.02.01) over the subgrade.
- **Bottom of Structure and Estimated Pile Tip Elevations:**

Substructure	Bottom of Pile Cap Elevation	Estimated Pile Tip Elevation
Abutment 1	43	-139
Abutment 2	43	-139

Abutment Design

- **Backfill Material:** Expanded Shale Aggregate
  Provide a 12-inch thick layer of compacted granular fill between top of Expanded Shale and Roadway Base
  Assumes a 24-inch thick pavement section
- **Est. Settlement:** 2½ inches of total settlement, of which 1¼ inch represents secondary compression. This indicates that most of the predicted settlement is on-going from the original filling.
- **Weep Holes:** 4 inch dia. weep holes at max 10 foot spacing, per CTDOT specifications.
- **Lateral Pressures:** Refer to Figure 5 – Active Earth Pressures

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Conventional excavation equipment appears practical for excavation. Excavation geometries should conform to OSHA excavation regulations contained in 29 CFR 1926, latest edition.

6.2 Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles and dynamic load testing should be conducted as indicated above. Vibrations from pile driving should not affect the structural integrity of adjacent structures. However, vibration and noise will likely be noticeable inside buildings 300 feet away, or more.

Where bitumen coats are required, coatings should be applied to the piles prior to transportation to the site. It should include a primer coat that may be sprayed or painted onto the piles, and a final coat.

Piles with bitumen should be installed in a preaugered and cased hole to avoid damage to the piles during pile driving. Piles should be preaugered through the existing fill and alluvial deposits (granular soils) to the top of lacustrine deposits. The top of lacustrine deposits is typically about El 20. Sand should be placed inside the casing as the casing is extracted. Draft special provisions are provided in Appendix D.

6.3 Pile Cap Bearing Surface Preparation

Excavated subgrades for the pile cap should be covered with Granular Fill and then proofrolled with a vibratory plate compactor. If the subgrade beneath the Granular Fill is found to be excessively soft or yielding, it may be necessary to overexcavate the soft material and place additional Granular Fill or crushed stone over separation fabric. If vibratory proof compaction of the subgrade proves detrimental due to the presence of groundwater, static rolling may be allowed at the discretion of the Engineer.

Soil bearing surfaces should be protected against freezing both before and after concrete placement. If construction takes place during winter months, foundations should be backfilled as soon as possible following construction. Alternatively, insulating blankets or other methods may be used to protect against freezing.

6.4 Expanded Shale Aggregate

Expanded shale aggregate should be placed in layers 1.5 to 2 feet thick, and compacted with self-propelled vibratory compaction equipment with static weight less than 6,600 lbs. The minimum number of passes should be limited to two and the maximum four, to avoid particle breakdown during compaction. A draft special provision is included in Appendix D.

6.5 Temporary Lateral Support

We estimate that excavations will be required to reach the pile cap subgrade. Temporary lateral support of excavations will be required to maintain and protect traffic flow, and to protect nearby utilities. Steel sheetpiling or soldier piles and lagging with multiple levels of bracing appears feasible. Surface water should be diverted away from excavations.

6.6 Excavation Dewatering

Excavation dewatering will be required to permit construction in in-the-dry. Pumping from sumps located in the bottom of excavations appears feasible. Surface water should be diverted away from excavations. Pumping, handling, and treatment of excavation dewatering fluids should be in accordance with all applicable regulatory agency requirements.

6.7 Reuse of Existing Soils

The existing soils to be excavated will consist primarily of fill and silty sands with gravel. These soils are silty and are not expected to be suitable for reuse as Pervious Structure Backfill or Granular Fill. Excavated soils may be suitable for reuse as embankment fill. However the silty soils are difficult to properly compact when wet, and may need to be dried to achieve compaction. Drying the soils can be difficult and at times impractical, particularly during periods of cold and wet weather.

7.0 FUTURE SERVICES AND LIMITATIONS

We recommend that a qualified geotechnical engineer be engaged during construction to observe:

- Preparation of foundation bearing surfaces.
- Pile installation and load tests.
- Verify that soil conditions exposed in excavations are in general conformance with design assumption, and that the geotechnical aspects of construction are consistent with the project specifications.

This report was prepared for the exclusive use of CME Associates and the project design team. The recommendations provided herein are based on the project information provided at the time of this report and may require modification if there are any changes in the nature, design, or location of the structure.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, expressed or implied, is made.

2014-1001
Rehabilitation of Route 15 over Main Street
Contract CORE ID: 15DOT0148AA, State Project No. 63-703
East Hartford, Connecticut

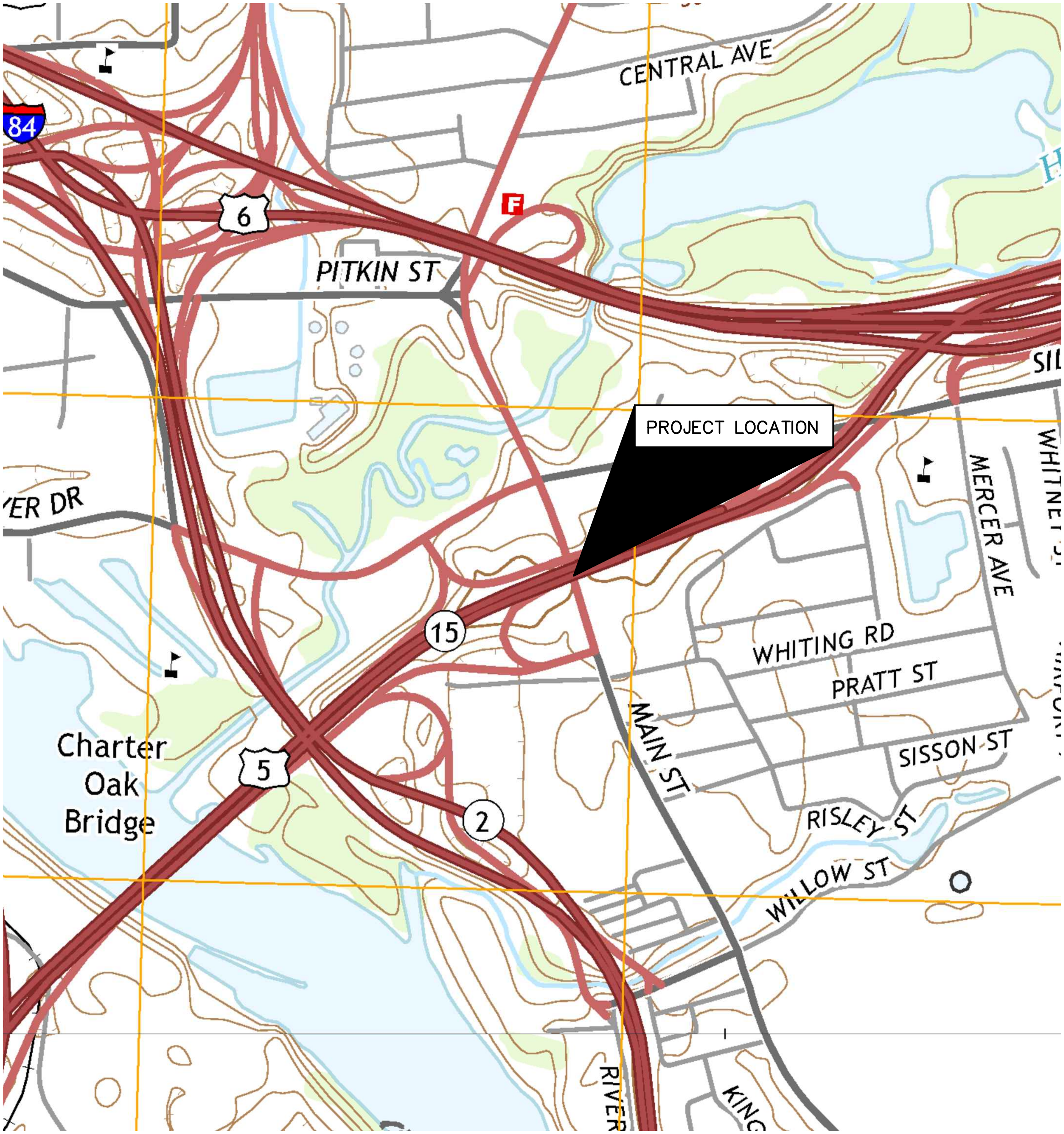
Table 1
Subsurface Data

Boring No.	Ground Surface El.	Depth (ft.)	Thickness (ft.)						Groundwater		Bedrock	
			Pavement/Topsoil	Fill	Alluvial Deposit	Lacustrine Deposit	Glacial Till	Weathered Bedrock	Depth (ft.)	Elevation	Depth (ft.)	Elevation
Recent Test Borings												
S6043-1 (OW)	39.6	189 C	0.1	8.4	10	150.5	7.5	2.5	10.6	29	176.5	-136.9
Recent Cone Penetration Test												
CPT6043-1	39.9	164.4 R	---	4	14	139	7.4	---	15	24.9	---	---
Previous Test Borings												
B-10	39.5	167 C	---	4	20	133	5	---	8.7	30.8	162	-122.5
B-164	39.5	167 C	---	11	15	137	3	1	23	16.5	166	-126.5
B-165	38.3	172 C	1	17	12	135	2	---	17.5	20.8	167	-128.7
B-166	40	167 C	---	3	19.5	139	0.5	3	19.5	20.5	162	-122
B-167	38.6	165 C	2.5	---	14.5	139	1	3	NM	NM	157	-118.4
B-168	39.5	25.5	0.9	4.6	13.5	>6.5	---	---	17	22.5	---	---

Notes:

1. Ground surface elevations at recent test borings were surveyed by CME Associates, Inc. Ground surface elevation at previous borings were shown on the logs and corrected to NAVD-88 on this table.
2. Groundwater levels are approximate. See S6043-1 OW log for date of water level measurement in observation well.
3. Top of bedrock is inclusive of weathered rock
4. ">" - Greater Than "--" - Not Encountered (C) - Bedrock Core Taken (R) - Terminated at Refusal "NM" - Not Measured

FIGURES



USGS QUADRANGLE MAP
HARTFORD NORTH, CONNECTICUT
HARTFORD SOUTH, CONNECTICUT
DATE 2015

FREEMAN COMPANIES
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HARTFORD, CT 06106
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TEL:(860)251-9550
FAX:(860)986-7161
ELEVATE YOUR EXPECTATIONS

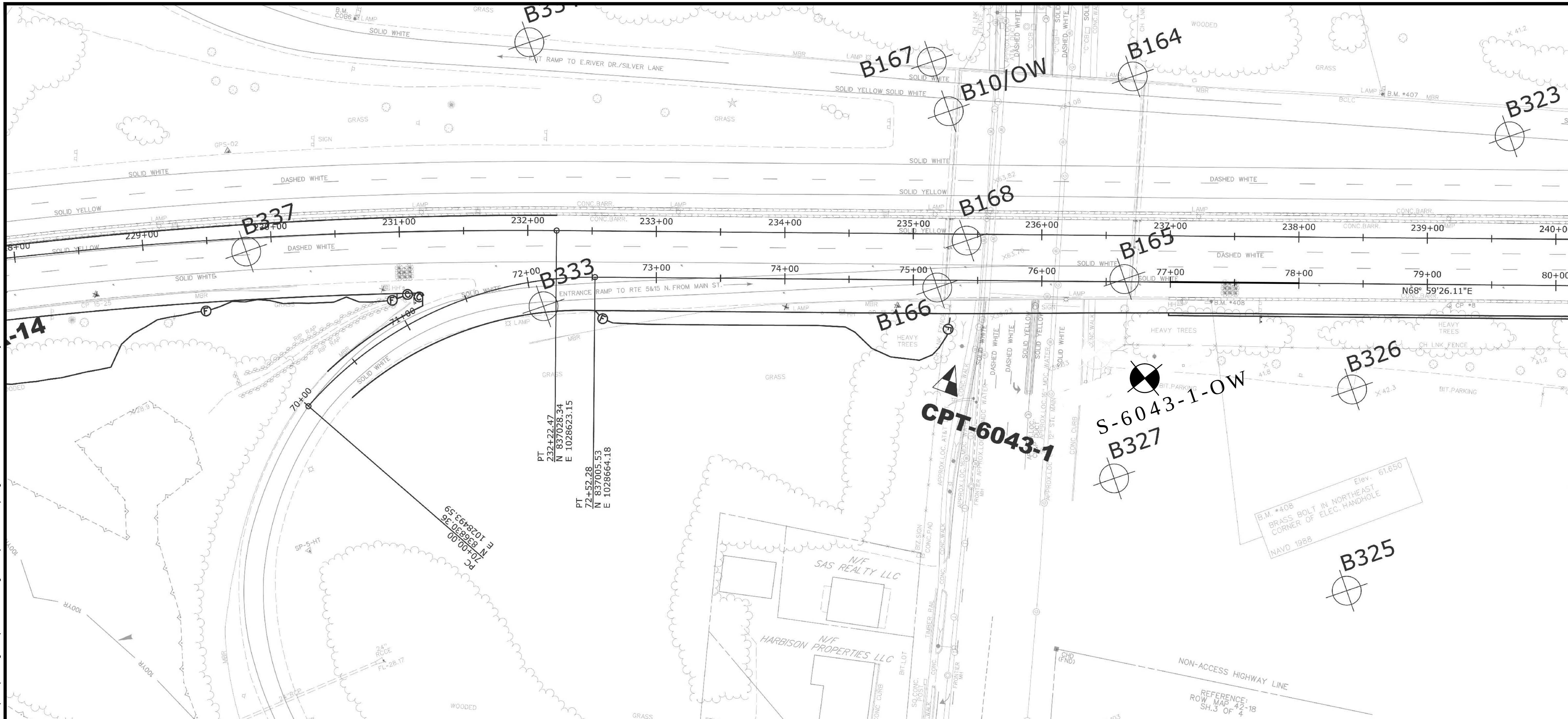
SITE LOCATION MAP

REHABILITATION OF BRIDGE 06043
ROUTE 15 NB OVER MAIN ST
STATE PROJECT NO. 63-703
EAST HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	1"=1000'
PROJECT NO.:	2014-1001
DATE:	10/27/2016

SHEET NO.

FIGURE 1



NOTES:

1. BASE PLAN PREPARED BY CME ASSOCIATES, INC.
2. EXPLORATION LOCATIONS WERE PROVIDED BY CME ASSOCIATES, INC.
3. REFER TO THE TEXT AND APPENDICES FOR ADDITIONAL INFORMATION

LEGEND

S3-1	TEST BORING LOCATION
B1	PREVIOUS TEST BORING LOCATIONS
(OW)	OBSERVATION WELL
CPT-6043-1	CONE PENETRATION TEST

GRAPHIC SCALE

80 40 0 80

SCALE IN FEET

SUBSURFACE EXPLORATION LOCATION PLAN

REHABILITATION OF BRIDGE 06043
ROUTE 15 OVER MAIN STREET
STATE PROJECT No. 63-703
EAST HARTFORD, CONNECTICUT

FREEMAN COMPANIES
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FAX:(860)986-7161
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No.	Date	Description
–	–	–

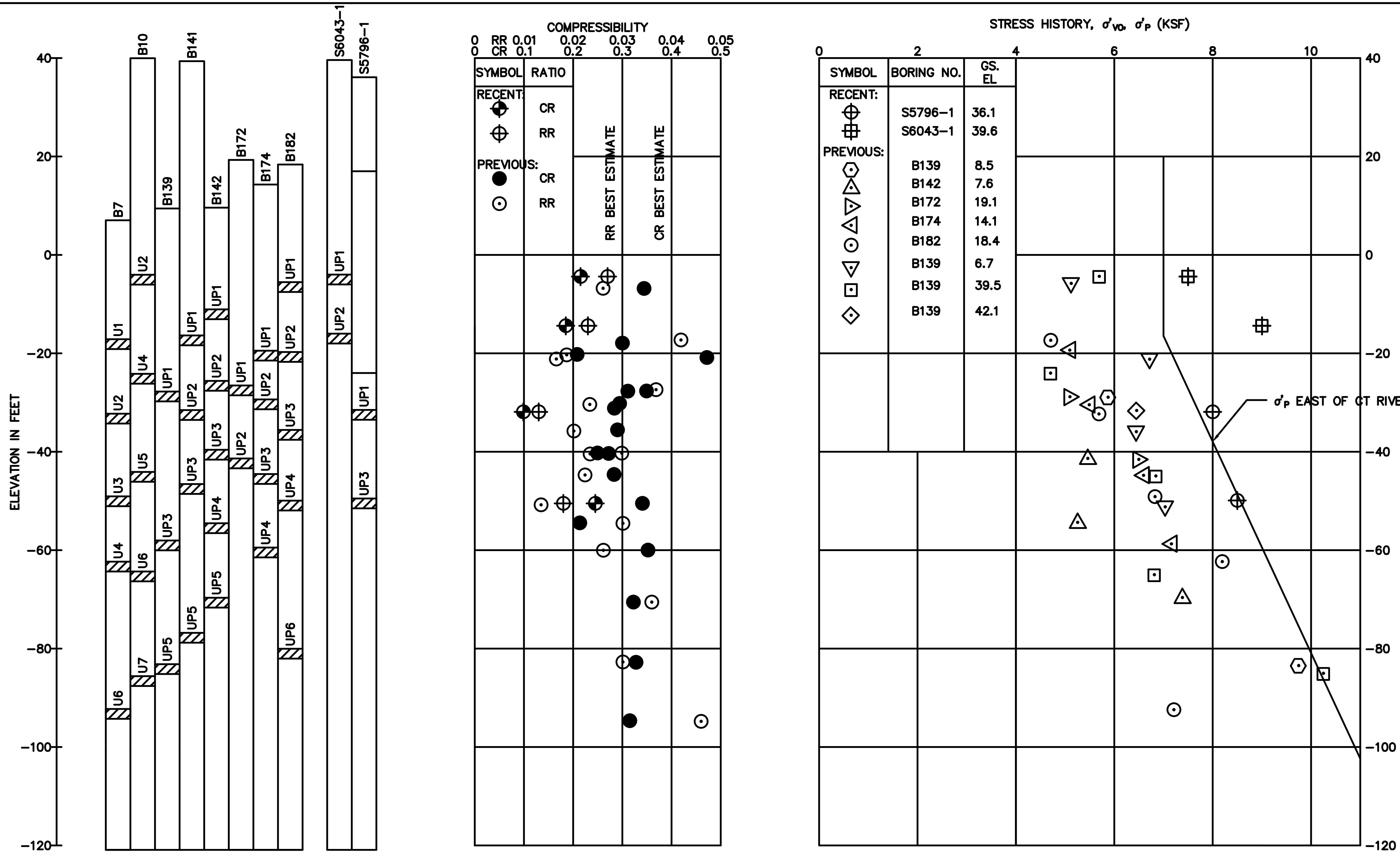
REVISIONS

DRAWN:	T.T.
CHECKED:	A.M.
APPROVED:	A.M.
SCALE:	1"=80'
PROJECT NO.:	2014–1001
DATE:	09/08/2016

SHEET NO.

FIGURE 2

Freeman Companies, LLC . Y:\2014\2014–1001 ConnDot CSO 2232 CME\DWG\TKT Figures\2014–1001 Figure 2 (Roads – All).dwg Oct 28, 2016–10:27am Plotted By: mkwok



NOTES

1. PREVIOUS DATA WAS OBTAINED FROM THE RECORD REPORT TITLED "GEOTECHNICAL LABORATORY DATA REPORT, CHARTER OAK BRIDGE AND APPROACHES, HARTFORD–EAST HARTFORD, CONNECTICUT" DATED MAY 1987.
2. ELEVATIONS REFER TO NAVD–88. PREVIOUS ELEVATIONS WERE ADJUSTED FROM NGVD–29.

DEFINITIONS

CR – COMPRESSION RATIO ($=\Delta\varepsilon/\Delta \log \sigma'_v$) DURING VIRGIN COMPRESSION

RR – RECOMPRESSION RATIO ($=\Delta\varepsilon/\log \sigma'_v$) DURING RECOMPRESSION

σ'_{vo} – IN SITU VERTICAL EFFECTIVE STRESS

σ'_p – PRECONSOLIDATION STRESS

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SUMMARY OF VARVED CLAY PROPERTIES
EAST OF CONNECTICUT RIVER
STATE PROJECT NO. 63-703
HARTFORD, CONNECTICUT
FIGURE 3B

SUBSURFACE DIAGRAM

Freeman Companies, LLC
36 John Street
Hartford, CT 06109

PRIME DESIGNER CME

PROJECT NUMBER DOT Project No. 63-703

PROJECT NAME Relocation of I-91 NB Interchange 29 & Widening

PROJECT LOCATION Hartford

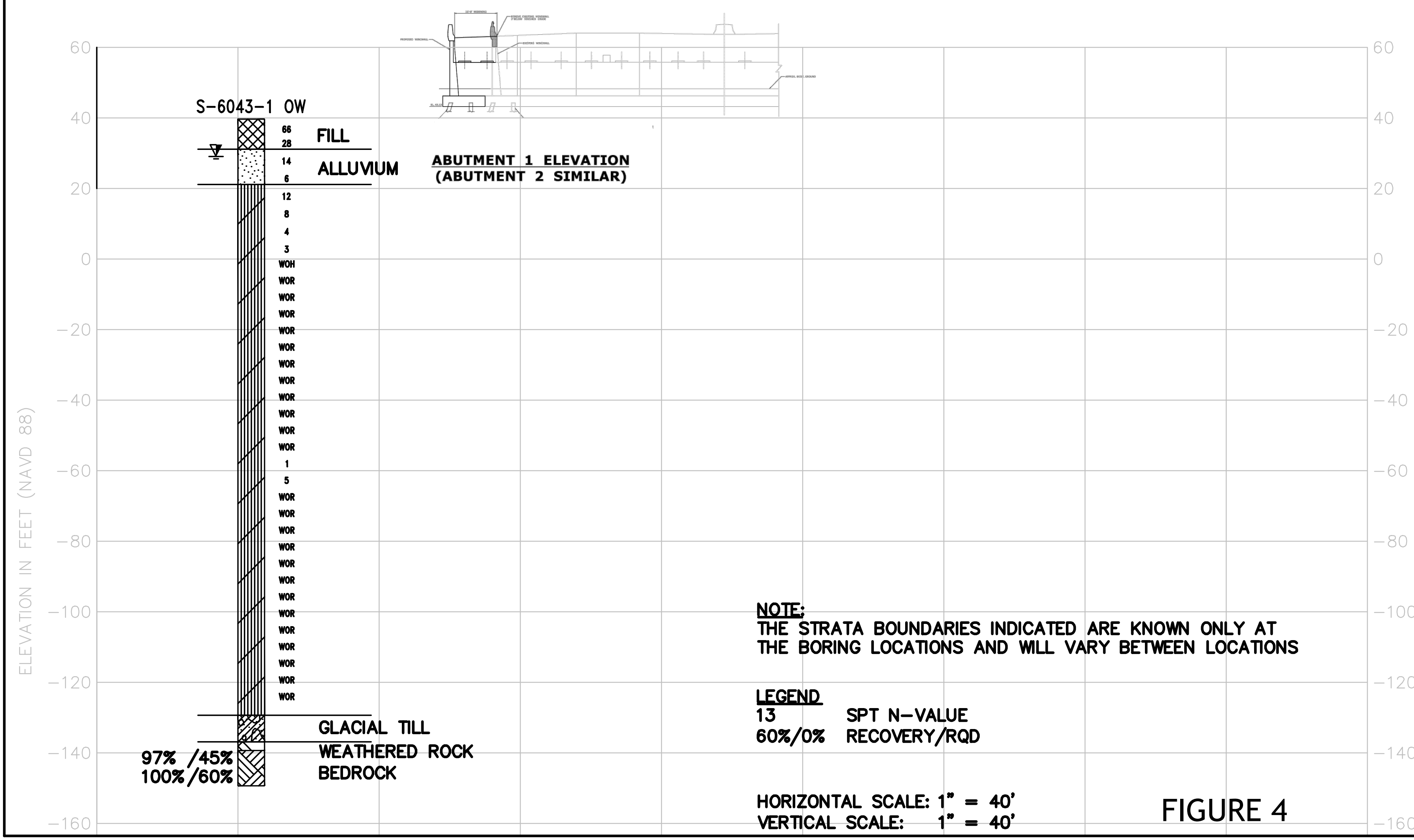
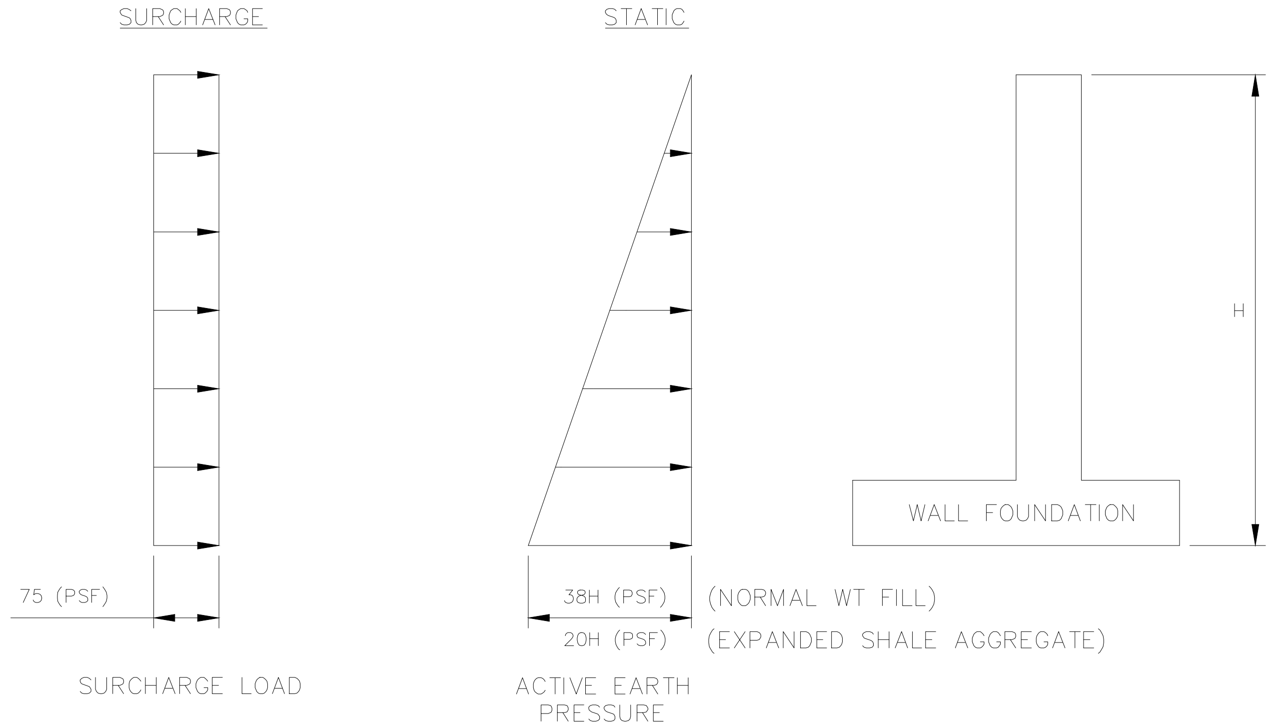


FIGURE 4



NOTES:

1. APPLIES TO WALLS THAT CAN DEFLECT AT THE TOP AND ASSUMES ACTIVE EARTH PRESSURES.
2. H IS MEASURED IN FEET
3. THE WALL SHOULD BE DRAINED BY EXPANDED SHALE AGGREGATE WITH A UNIT WEIGHT OF 65 PCF AND WEEPHOLES THROUGH THE WALL. THEREFORE, HYDROSTATIC PRESSURE IS NOT INCLUDED.
4. THESE PRESSURE DISTRIBUTIONS ASSUME HORIZONTAL BACKFILL BEHIND THE WALL.
5. SLIDING:
   COEFFICIENT OF FRICTION BETWEEN FOOTING AND BASE= 0.50 (2012 AASHTO TABLE 3.11.5.3–1) RESISTANCE FACTOR= 0.8 (2012 AASHTO TABLE 10.5.5.2.2.1).
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

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LATERAL EARTH PRESSURES
ACTIVE EARTH PRESSURES

REHABILITATION OF BRIDGE 06043
ROUTE 15 NB OVER MAIN STREET
STATE PROJECT NO. 63-703
EAST HARTFORD, CONNECTICUT

DRAFTED:	M.K.
CHECKED:	N.W.
APPROVED:	N.W.
SCALED:	N.T.S.
PROJECT NO.:	2014–1001
DATE:	10/27/2016

FIG.

FIGURE 5

APPENDIX A

RECENT EXPLORATION LOGS

Driller:	P. Labossier	**Connecticut DOT Boring Report**		Hole No.:	S-6043-1 OW
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	837092.58
Start Date:	5-21-16	Route No.:	15 NB over Rt 5	Easting:	1029049.01
Finish Date:	5-24-16	Bridge No.:	06043	Surface Elevation:	39.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.6' on 9/20/2016

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches				Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
0									FILL	ASPHALT (1") GRAVEL BASE (11")	
	S1	83	38	28	21	24	12			Red to Brown c-f SAND, little gravel, trace silt	
5											35
	S2	11	11	17	23	24	20			Red to brown c-f SAND, trace silt	
									ALLUVIUM		
10											30
	S3	10	7	7	8	24	12			Red to brown c-f SAND, trace silt	
15											25
	S4	8	3	3	2	24	18			Red to brown c-f SAND, trace silt	
									LACUSTRINE		
20											20
	S5	6	6	6	7	24	18			Gray to brown SILT and CLAY	
25											15
	S6	4	3	5	3	24	16			Gray SILT and CLAY, gray silt varves of 1/16"	
30											10
	S7	2	2	2	3	24	24			Gray SILT and CLAY, gray silt varves of 1/16"	

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: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 1 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier			Hole No.:	S-6043-1 OW
Inspector:	J. Herpich	Town:	Hartford	Stat./Offset:	
Engineer:	N. Whetten	Project No.:	DOT Project No. 63-703	Northing:	837092.58
Start Date:	5-21-16	Route No.:	15 NB over Rt 5	Easting:	1029049.01
Finish Date:	5-24-16	Bridge No.:	06043	Surface Elevation:	39.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.6' on 9/20/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
35						LACUSTRINE *(con't)*		5
	S8	wor 2 1 1	24	24			Gray SILT and CLAY, gray silt varves of 1/16"	
40								0
	S9	woh woh woh 1	24	24			Gray SILT and CLAY, gray silt varves of 1/8" to 1/16"	
	UP-1		24	24				
45								-5
	S10	wor wor wor wor	24	24			Brown SILT and CLAY, 1/16" varved gray to red silt	
50								-10
	S11	wor wor wor 3	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
	UP-2		24	24				
55								-15
	S12	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
60								-20
	S13	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
65								-25
	S14	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	

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: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 2 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller: P. Labossier	Town: Hartford	Hole No.: S-6043-1 OW
Inspector: J. Herpich		Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 837092.58
Start Date: 5-21-16	Route No.: 15 NB over Rt 5	Easting: 1029049.01
Finish Date: 5-24-16	Bridge No.: 06043	Surface Elevation: 39.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.6' on 9/20/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						LACUSTRINE *(con't)*		
70	S15	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-30
75	S16	wor wor woh woh	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-35
80	S17	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-40
85	S18	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-45
90	S19	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-50
95	S20	wor wor 1 3	24	4			Gray SILT and CLAY, 1/16" varved gray to red silt	-55
100	S21	wor wor 5 3	24	4			Gray SILT and CLAY, 1/16" varved gray to red silt	-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: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 3 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Driller:	P. Labossier	Town:	Hartford	Hole No.:	S-6043-1 OW
Inspector:	J. Herpich	Project No.:	DOT Project No. 63-703	Stat./Offset:	
Engineer:	N. Whetten	Route No.:	15 NB over Rt 5	Northing:	837092.58
Start Date:	5-21-16	Bridge No.:	06043	Easting:	1029049.01
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Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.6' on 9/20/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
						LACUSTRINE *(con't)*		
105	S22	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-65
110	S23	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-70
115	S24	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-75
120	S25	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-80
125	S26	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-85
130	S27	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	-90
135							Gray SILT and CLAY, 1/16" varved gray to red	-95

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: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 4 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	**Connecticut DOT Boring Report**	Hole No.: S-6043-1 OW
Inspector: J. Herpich	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 837092.58
Start Date: 5-21-16	Route No.: 15 NB over Rt 5	Easting: 1029049.01
Finish Date: 5-24-16	Bridge No.: 06043	Surface Elevation: 39.6
Project Description: Relocation of I-91 NB Interchange 29 & Widening		
Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	
Groundwater Observations: @10.6' on 9/20/2016		

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
	S28	wor wor wor wor	24	24		LACUSTRINE *(con't)*	silt	
140								-100
	S29	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
145								-105
	S30	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
150								-110
	S31	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
155								-115
	S32	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
160								-120
	S33	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
165								-125
	S34	wor wor wor wor	24	24			Gray SILT and CLAY, 1/16" varved gray to red silt	
170							Significant increase in drilling resistance	-130

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: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 5 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Driller: P. Labossier	Connecticut DOT Boring Report	Hole No.: S-6043-1 OW
Inspector: J. Herpich	Town: Hartford	Stat./Offset:
Engineer: N. Whetten	Project No.: DOT Project No. 63-703	Northing: 837092.58
Start Date: 5-21-16	Route No.: 15 NB over Rt 5	Easting: 1029049.01
Finish Date: 5-24-16	Bridge No.: 06043	Surface Elevation: 39.6

Project Description: Relocation of I-91 NB Interchange 29 & Widening

Casing Size/Type: 4-in. Casing	Sampler Type/Size: 1-3/4 inch ID	Core Barrel Type: NX
Hammer Wt.: 300lb Fall: 30in.	Hammer Wt.: 140lb Fall: 30in.	

Groundwater Observations: @10.6' on 9/20/2016

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Elevation (ft)
170						GLACIAL TILL *(con't)*	indicates Glacial Till	
175								-135
						WEATHERED BEDROCK	WEATHERED BEDROCK	
						BEDROCK		
180								-140
	C-1		60	58	45		Red-brown, slightly weathered, strong, ARKOSE, bedding joints parallel to bedding at 15 degrees, with occasional fractured zones	
185								-145
	C-2		60	60	60		Red-brown, slightly weathered, strong, ARKOSE, bedding joints parallel to bedding at 15 degrees, with occasional fractured zones	
190							END OF BORING 189ft	-150
195								-155
200								-160

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

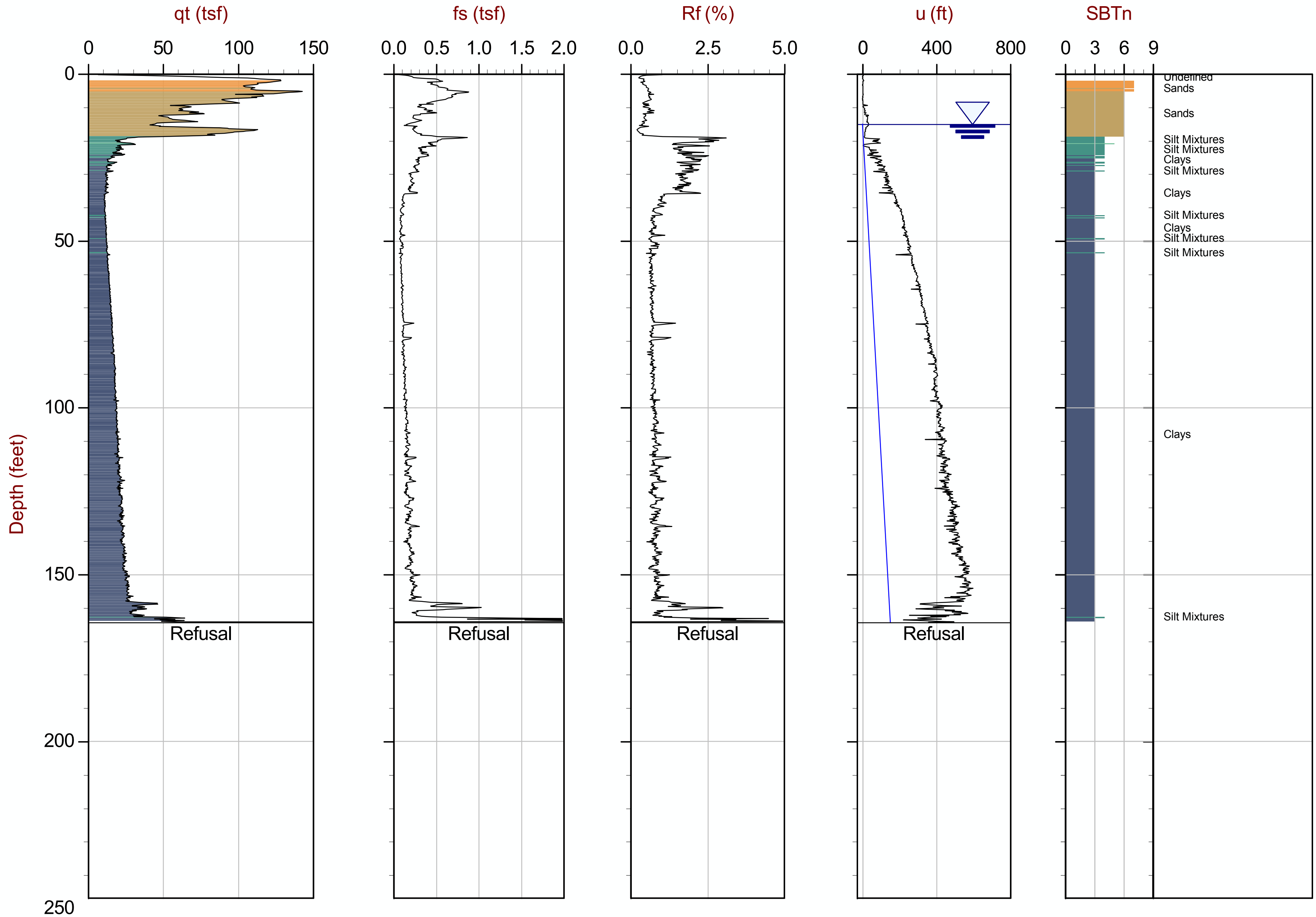
Proportions Used: Trace = 1 - 10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%

Total Penetration in Earth: 179ft Rock: 10ft	NOTES: Observation well installed. Screen from 10 to 20 feet backfilled with filter sand. Bentonite seal from 1 to 3 feet; roadway box at ground surface.	Sheet 6 of 6
No. of Soil Samples: 34 No. of Core Runs: 2		SM-001-M REV. 1/02

Freeman Companies

Job No: 16-53057
Date: 06:15:16 12:12
Site: I-91 Interchange 29, Hartford, CT

Sounding: CPT16-6043-2
Cone: 419:T1500F15U500



Max Depth: 50.100 m / 164.37 ft
Depth Inc: 0.050 m / 0.164 ft

File: 16-53057_CP6043-2.DRF

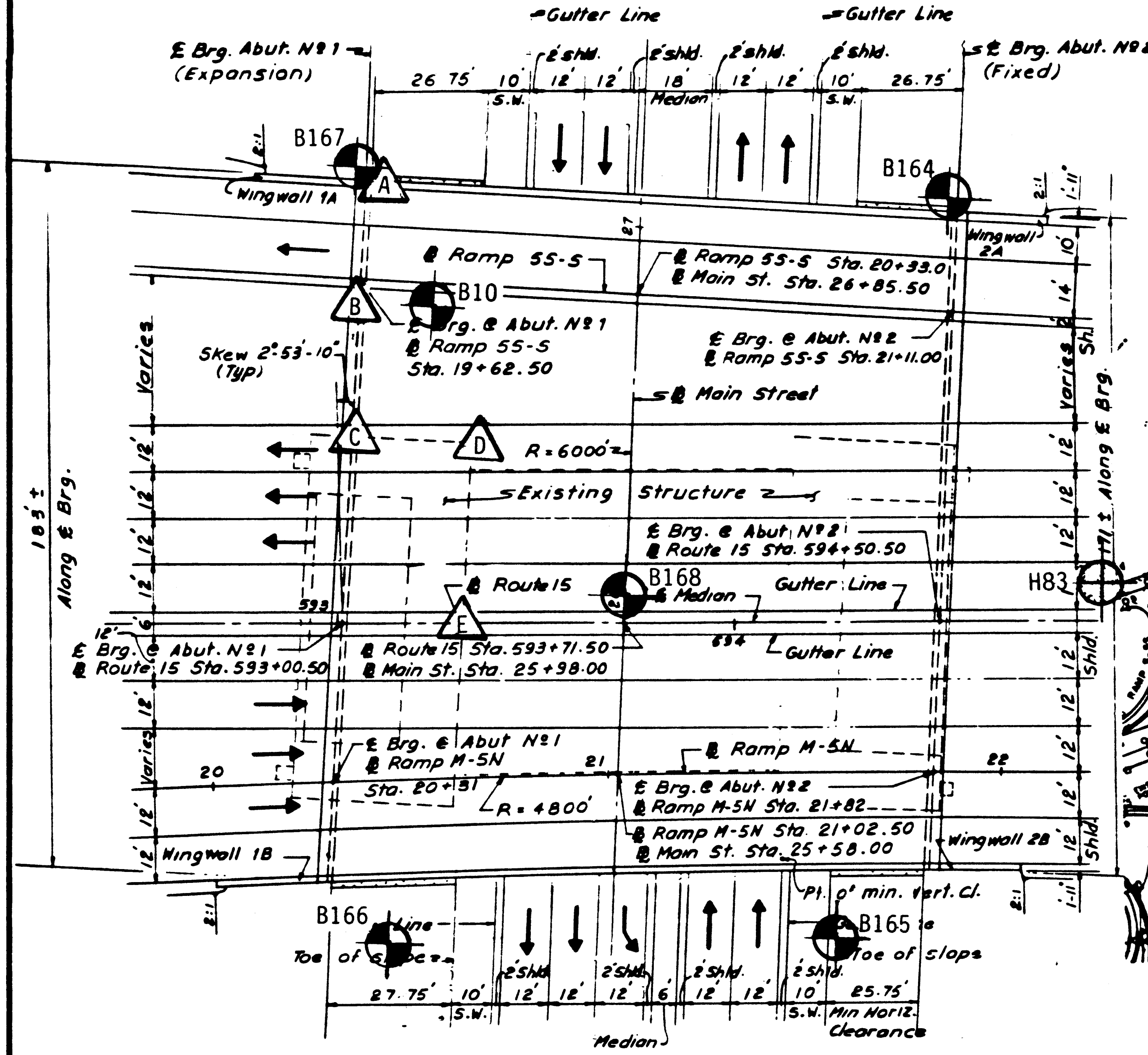
SBT: Robertson, 1990
Coords: UTM Zone 18 N: 4625625m E: 695870m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

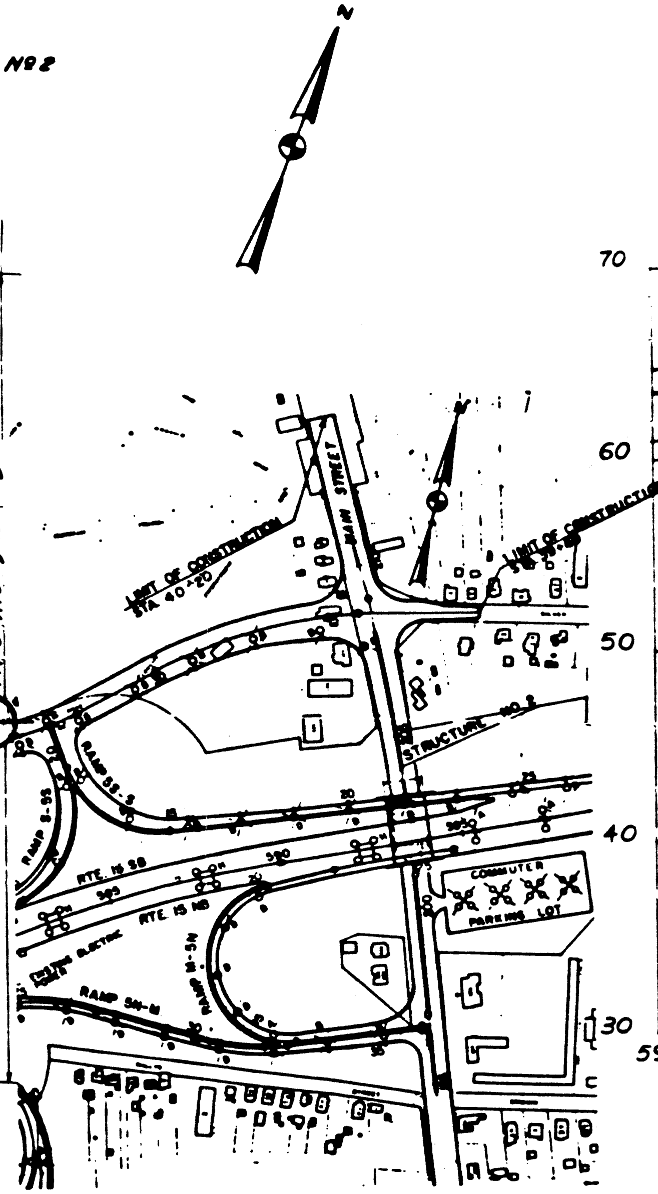
APPENDIX B

PREVIOUS TEST BORING LOGS



PLAN

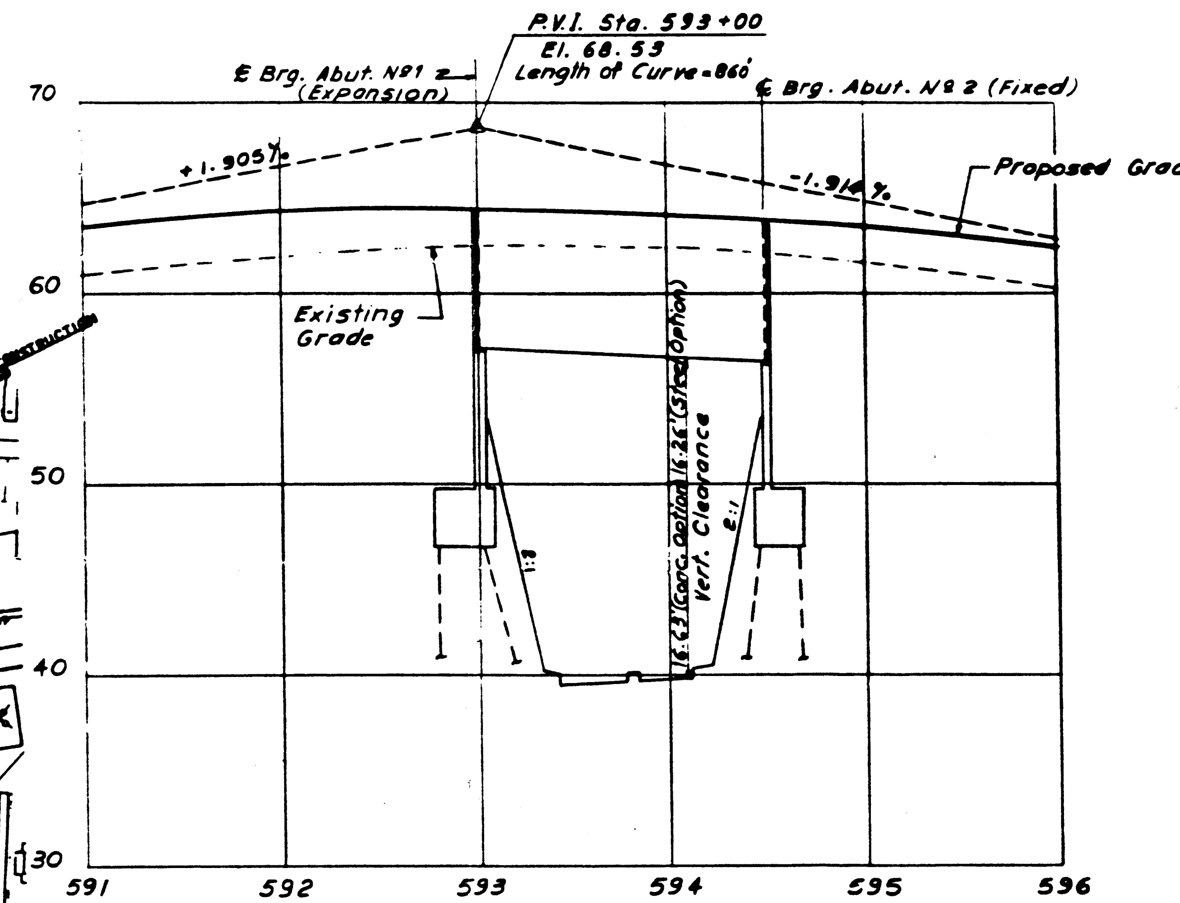
N.T.S.



LOCATION PLAN

STRUCTURE No 2

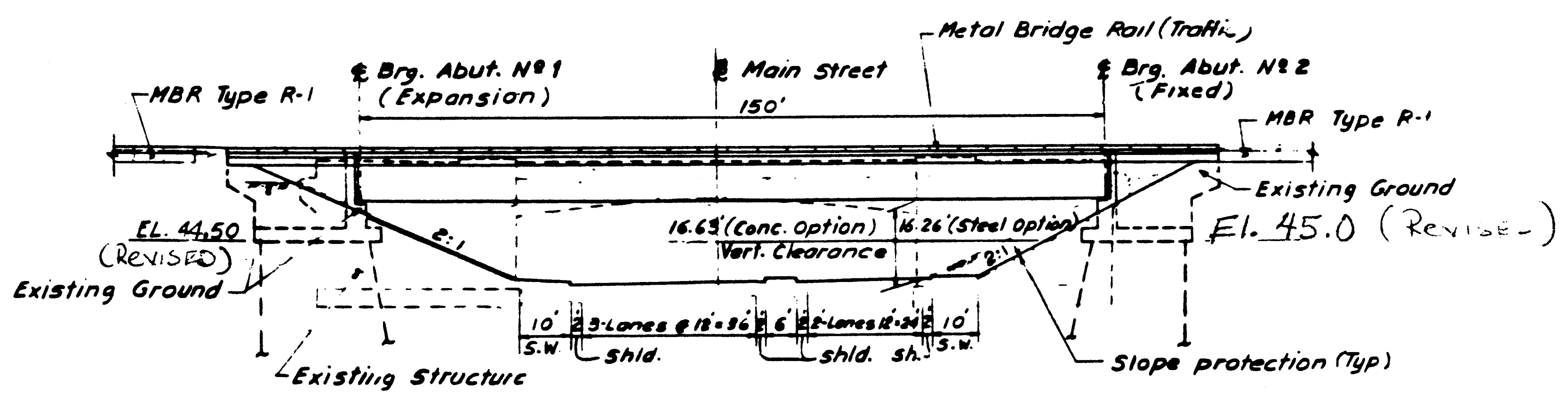
N.T.S.



PROFILE OF ROUTE 15 OVER MAIN STREET

SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'

NOTE: BASE PLAN IS A 1" = 20' SCALE
DRAWING PREPARED BY
SALMON ASSOCIATES, P.C.



SOUTH ELEVATION

N.T.S.

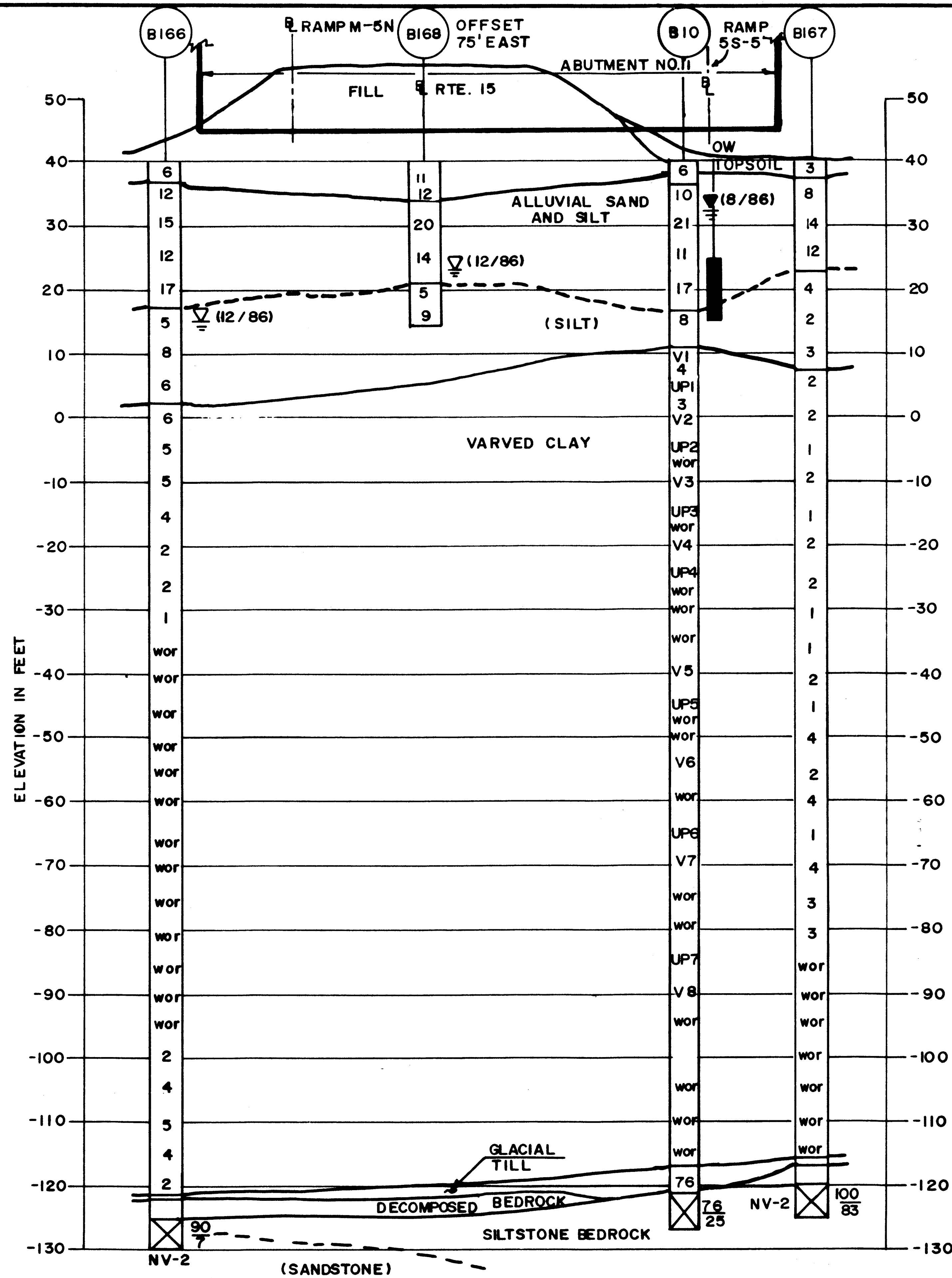
Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

ROUTE 15 OVER MAIN STREET
EAST HARTFORD, CONNECTICUT

SITE AND SUBSURFACE EXPLORATION PLAN
STRUCTURE NO. 2

SCALE: AS NOTED	DATE: MAY 1987

FIGURE 3



ABUTMENT NO. I.

STRUCTURE NO. 2

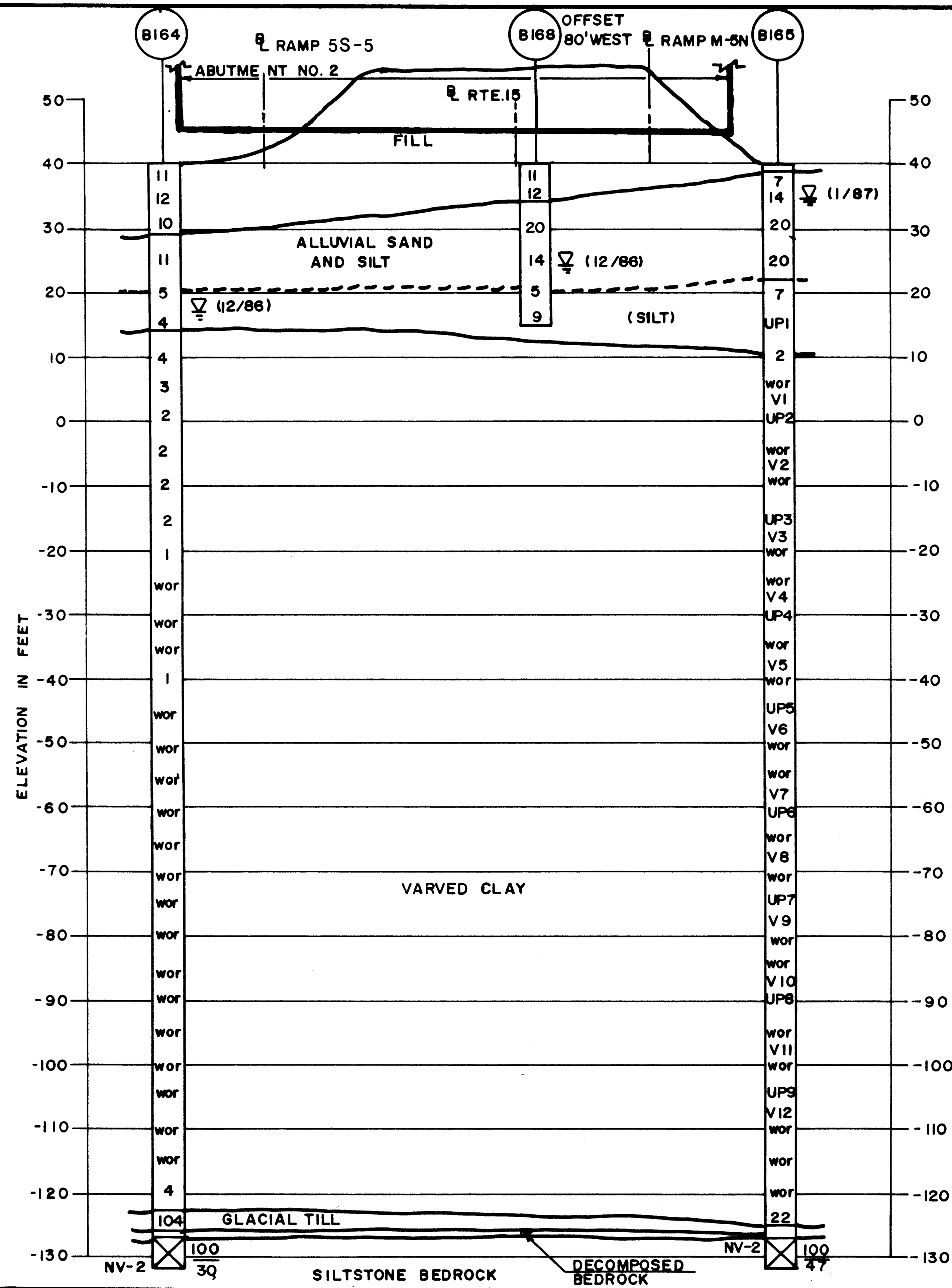
Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

ROUTE 15 OVER MAIN STREET
EAST HARTFORD, CONNECTICUT

SUBSURFACE PROFILE
ABUTMENT NO. 1

SCALE: HORIZ. 1" = 40'
VERT. 1" = 20'
DATE: MAY 1987

FIGURE 4



ABUTMENT NO. 2

STRUCTURE NO. 2

Haley & Aldrich, Inc.
Consulting Geotechnical Engineers, Geologists and Hydrogeologists

ROUTE 15 OVER MAIN STREET
EAST HARTFORD, CONNECTICUT

SUBSURFACE PROFILE
ABUTMENT NO. 2

SCALE: HORIZ. 1" = 40' VERT. 1" = 20'

DATE: MAY 1987

FIGURE 5

A. Mason	FORM SM-1 REV. 8/83	SHEET 1 OF 5
BORING CREW LEADER	STATE OF CONNECTICUT	LOCATION Structure No. 2
C. Harriman	DEPARTMENT OF TRANSPORTATION	GUILD DRILLING CO., INC.
INSPECTOR	BUREAU OF HIGHWAYS	BORING CONTRACTOR
HALEY & ALDRICH, INC.	BORING REPORT	STEINMAN
SOILS ENGINEER	TOWN HARTFORD-EAST HARTFORD, CT.	DESIGN ENGINEER
	PROJECT NAME CHARTER OAK BRIDGE	
	PROJECT NO. 63-384	

LOCATION Structure No. 2 (Rt. 15 / Main St.)

SURFACE ELEV. 40.6 Approx.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 164
DATE FINISHED 12/18/86	TYPE		HW-NW	S/S	NV II.	LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET
AT 23 FT. AFTER 18 HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE 337265.45
AT 24.5 FT. AFTER 0 HRS.	HAMMER FALL		24"	30"		E. COORDINATE 628877.57

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	P	0'-1.5'	1	18	17	D	2	7	4		Medium dense, Brown medium to fine SAND, trace of silt, brick, roots
	u										
	s										
	h										
5	e	4'-5.5'	2	18	14	D	4	6	6		Medium dense, Brown medium to fine SAND, trace of silt, brick
	d										
											-FILL-
	4"										
10	C	9'-10.5'	3	18	16	D	4	4	6		Loose, Brown medium to fine SAND,
	a									11'	trace of silt, brick
	s										
	i										
	n										
15	g	14'-15.5'	4	18	12	D	3	5	6		Medium dense, Brown medium to fine SAND, trace of silt and coarse sand
	t										-ALLUVIUM-
	o										
										19'	
20	24'	19'-20.5'	5	18	18	D	2	2	3		Medium stiff, Gray SILT, trace of clay
											-ALLUVIUM-
25		24'-25.5'	6	18	18	D	1	2	2		(same as D5)
										26'	
30		29'-30.5'	7	18	18	D	1	2	2		Medium stiff to soft, Gray SILT, some clay
35		34'-35.5'	8	18	18	D	1	1	2		Soft, Gray VARVED CLAY, some silt
										38'	

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 164

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C. Harriman INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT		SHEET 2 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER
	TOWN	HARTFORD-EAST HARTFORD, CT.	
	PROJECT NAME	CHARTER OAK BRIDGE	
	PROJECT NO.	63-384	

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 164
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		39'-40.5'	9	18	18	D	1	1	1		Very soft, Gray VARVED CLAY and SILTY CLAY
45		44'-45.5'	10	18	18	D	1	1	1		(same as D9)
50		49'-50.5'	11	18	18	D	WOR	1	1		(same as D9)
55		54'-55.5'	12	18	18	D	WOR	1	1		(same as D9)
60		59'-60.5'	13	18	18	D	Wt.	Rods	1		(same as D9)
65		64'-65.5'	14	18	18	D	Wt.	of	Rods		(same as D9)
70		69'-70.5'	15	18	18	D	Wt.	of	Rods		Very soft, Gray to Red-Brown VARVED CLAY and SILTY CLAY
75		74'-75.5'	16	18	18	D	Wt.	of	Rods		(same as D15)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 164

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 5
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 164
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		79'-80.5'	17	18	18	D	Wt.	Rods	1		Very soft, Gray to Red-Brown VARVED CLAY and SILTY CLAY
85		84'-85.5'	18	18	18	D	Wt.	of	Rods		(same as D17)
90		89'-90.5'	19	18	18	D	Wt.	of	Rods		(same as D17)
95		94'-95.5'	20	18	18	D	Wt.	of	Rods		(same as D17)
100		99'-100.5'	21	18	18	D	Wt.	of	Rods		(same as D17)
105		104'-105.5'	22	18	18	D	Wt.	of	Rods		(same as D17)
110		109'-110.5'	23	18	18	D	Wt.	of	Rods		(same as D17)
115		114'-115.5'	24	18	18	D	Wt.	of	Rods		(same as D17)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 164

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C. Harriman	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 4 OF 5 LOCATION Structure No. 2
INSPECTOR HALEY & ALDRICH, INC.	TOWN HARTFORD-EAST HARTFORD, CT.	GUILD DRILLING CO., INC. BORING CONTRACTOR
SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 164
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		119'-120.5'	25	18	18	D	Wt.	of	Rods		Very soft, Gray to Red-Brown VARVED CLAY and SILTY CLAY
125		124'-125.5'	26	18	18	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
130		129'-130.5'	27	18	18	D	Wt.	of	Rods		(same as D26)
135		134'-135.5'	28	18	18	D	Wt.	of	Rods		(same as D26)
140		139'-140.5'	29	18	18	D	Wt.	of	Rods		(same as D26)
145		144'-145.5'	30	18	18	D	Wt.	of	Rods		(same as D26)
150		149'-150.5'	31	18	18	D	Wt.	of	Rods		(same as D26)
155		154'-155.5'	32	18	18	D	Wt.	of	Rods		(same as D26)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 164

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

R. Eastwood BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 5 OF 5
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION						
SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 164
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		160'-161.5'	33	18	18	D	WOR	2	2		Soft, Red-Brown VARVED CLAY and SILTY CLAY
										163'	
165		164'-165.5'	34	18	14	D	31	46	58		Hard, Red-Brown coarse to fine SAND, some silt, little clay and gravel -GLACIAL TILL-
							Drill Rate			166'	
							Min/Ft			167'	Decomposed Bedrock
		167'-172'	1	60	60	C		8			Moderately hard, Red-Brown fine grained sandy SILTSTONE, joints very close to close, shallow dipping, Bedding very thin, rock slightly weathered, moderate from 171-172, moderately fractured
				(RQD=30%)				8			
170								8			
								9			
								9			
											Bottom of Exploration at 172'
175											

FROM GROUND SURFACE TO 24 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 167 FEET

FOOTAGE IN EARTH 167 FOOTAGE IN ROCK 5 NO. OF SAMPLES 34 HOLE NO. B 164

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 5
H. Ernst INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION Structure No. 2 (Rt. 15 / Main St.)

SURFACE ELEV. 39.2 Approx.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO.	B 165
DATE FINISHED 1/5/87	TYPE		HW-NW	S/S	NV II	LINE & STATION	
GROUND WATER OBSERVATIONS	SIZE I.D.		4" 3"	1-3/8"		OFFSET	
AT 6 FT. AFTER 18 HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE	337080.51
AT FT. AFTER HRS.	HAMMER FALL		24"	30"		E. COORDINATE	628915.74

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		0'-2'	1	24	14	D	2	3	4	1'	-TOPSOIL-
									5		Loose, Light Brown medium to fine SAND, trace of silt, coarse sand
5		4'-6'	2	24	12	D	5	6	8		Medium dense, Light Brown medium to fine SAND, trace of silt, coarse sand
									9		
10		9'-11'	3	24	14	D	3	9	11		(same as D2)
									15		
15		14'-16'	4	24	17	D	5	8	12		(same as D2)
									15		
										18'	-ALLUVIUM-
20		19'-21'	5	24	19	D	3	3	4		Medium stiff, Brown-Gray SILT, little clay, trace of fine sand
									5		
25		24'-26'	I	24	24	UP					
30		29'-31'	6	24	24	D	1	1	1	30'	
									1		Very soft, Gray VARVED CLAY and SILTY CLAY
35		34'-36'	7	24	24	D	Wt.	of	Ham.		(same as D6)
		37.5'	V1								(See Vane Shear Report V1)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 165

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley	FORM SM-1 REV. 8/83	SHEET 2 OF 5
BORING CREW LEADER	STATE OF CONNECTICUT	LOCATION Structure No. 2
C. Harriman	DEPARTMENT OF TRANSPORTATION	GUILD DRILLING CO., INC.
INSPECTOR	BUREAU OF HIGHWAYS	BORING CONTRACTOR
HALEY & ALDRICH, INC.	BORING REPORT	STEINMAN
SOILS ENGINEER	TOWN HARTFORD-EAST HARTFORD, CT.	DESIGN ENGINEER
	PROJECT NAME CHARTER OAK BRIDGE	
	PROJECT NO. 63-384	

LOCATION

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 165
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		39'-41'	2	24	24	UP					
45		44'-46'	8	24	24	D	Wt.	of	Rods		Very soft, Gray VARVED CLAY and SILTY CLAY
		47.5' (Tip)	V2								(See Vane Shear Report V2)
50		49'-51'	9	24	24	D	Wt.	of	Rods		(same as D8)
55		54'-56'	3	24	24	UP					
		57.5' (Tip)	V3								(See Vane Shear Report V3)
60		59'-61'	10	24	24	D	Wt.	of	Rods		(same as D8)
65		64'-66'	11	24	24	D	Wt.	of	Rods		Very soft, Brown VARVED CLAY and SILTY CLAY
		67.5' (Tip)	V4								(See Vane Shear Report V4)
70		69'-71'	4	24	24	UP					
75		74'-76'	12	24	24	D	Wt.	of	Rods		Very soft, Brown to Red-Brown VARVED CLAY and SILTY CLAY
		77.5' (Tip)	V5								(See Vane Shear Report V5)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 165

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 5
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 165
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		79'-81'	13	24	24	D	Wt.	of	Rods		Very soft, Brown to Red-Brown VARVED CLAY and SILTY CLAY
85		84'-86'	5	24	24	UP					
		87.5' (Tip)	V6								(See Vane Shear Report V6)
90		89'-91'	14	24	24	D	Wt.	of	Rods		(same as D13)
95		94'-96'	15	24	24	D	Wt.	of	Rods		(same as D13)
		97.5' (Tip)	V7								(See Vane Shear Report V7)
100		99'-101'	6	24	24	UP					
105		104'-106'	16	24	24	D	Wt.	of	Rods		Very soft, Red Brown to Brown VARVED CLAY and SILTY CLAY
		107.5' (Tip)	V8								(See Vane Shear Report V8)
110		109'-111'	17	24	24	D	Wt.	of	Rods		(same as D16)
115		114'-116'	7	24	24	UP					
		117.5' (Tip)	V9								(See Vane Shear Report V9)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 165

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 4 OF 5	
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2	
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	GUILD DRILLING CO., INC. BORING CONTRACTOR	STEINMAN DESIGN ENGINEER

LOCATION

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 165
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		119'-121'	18	24	24	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
125		124'-126'	19	24	24	D	Wt.	of	Rods		(same as D18)
		127.5' (Tip)	V10								(See Vane Shear Report V10)
130		129'-131'	8	24	24	UP					
135		134'-136'	20	24	24	D	Wt.	of	Rods		(same as D18)
		137.5' (Tip)	V11								(See Vane Shear Report V11)
140		139'-141'	21	24	24	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
145		144'-146'	9	24	24	UP					
		147.5' (Tip)	V12								(See Vane Shear Report V12)
150		149'-151'	22	24	24	D	Wt.	of	Rods		(same as D21)
155		154'-156'	23	24	24	D	Wt.	of	Rods		(same as D21)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 165

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. Holley BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET	5 OF 5
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION	Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR	
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER	

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV.						HOLE NO.	B 165
DATE FINISHED	TYPE					LINE & STATION	
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET	
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE	
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE	

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		159'-161'	24	24	24	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
165		164'-166'	25	24	24	D	1	2	20	165'	Hard, Red-Brown SILT, some coarse to fine sand, trace of fine gravel and clay -GLACIAL TILL-
									142	167'	
		167'-172'	1	60	60	C					Moderately hard, Gray to Brown fine grained sandy SILTSTONE, joints very close to close, shallow dipping, bedding very thin, rock moderate to slightly weathered, moderately fractured
				(RQD=47%)							
170											
											Bottom of Exploration at 172'
175											

FROM GROUND SURFACE TO 144 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 167 FEET

FOOTAGE IN EARTH 167 FOOTAGE IN ROCK 5 NO. OF SAMPLES 25 HOLE NO. B 165

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 5
E. Henderson INSPECTOR		LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	TOWN HARTFORD-EAST HARTFORD, CT.	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NAME CHARTER OAK BRIDGE	STEINMAN DESIGN ENGINEER
	PROJECT NO. 63-384	

LOCATION Structure No. 2 (Rt. 15 / Main St.)

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV.	40.9					HOLE NO.	B 166
DATE FINISHED	12/22/86	TYPE	HW-NW	S/S	NV II	LINE & STATION	
GROUND WATER OBSERVATIONS		SIZE I.D.	4" 3"	1-3/8"		OFFSET	
AT 24.25 FT.	AFTER 65 HRS.	HAMMER WT.	300#	140#	BIT	N. COORDINATE	337036.45
AT 19.5 FT.	AFTER 0 HRS.	HAMMER FALL	24"	30"		E. COORDINATE	628813.51

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	P	0'-1.5'	1	18	15	D	1	2	4		Loose, Brown fine SAND, some silt, trace of gravel, organic material, Black Top -FILL-
	U										
	S									3'	
	H										
5		4'-5.5'	2	18	16	D	4	6	6		Medium dense; Brown medium to fine SAND, some silt
	17										
	22										
	16										
10	13	9'-10.5'	3	18	18	D	12	7	8		Medium dense, Brown medium to fine SAND, little coarse sand and fine gravel, trace of silt
	19										
	21										
	24										
	23										
15	16	14'-15.5'	4	18	12	D	6	6	6		Medium dense, Brown medium to fine SAND, trace of coarse sand, silt
	20										
	30										
	36										
	39										
20	21	19'-20.5'	5	18	14	D	7	8	9		(same as D4)
	25										-ALLUVIUM-
	27									22.5'	
	19										
	18										
25		24'-25.5'	6	18	18	D	2	3	2		Medium stiff, Gray VARVED SILT and CLAY
	P										
	U										
	S										
	H										
30	E	29'-30.5'	7	18	18	D	3	4	4		(same as D6)
	D										
35		34'-35.5'	8	18	18	D	2	3	3		(same as D6)
											Medium stiff, Gray VARVED CLAY and SILTY CLAY
		39'-40.5'	9	18	18	D	2	3	3		

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 166

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason	FORM SM-1 REV. 8/83	SHEET 2 OF 5
BORING CREW LEADER	STATE OF CONNECTICUT	LOCATION Structure No. 2
E. Henderson	DEPARTMENT OF TRANSPORTATION	GUILD DRILLING CO., INC.
INSPECTOR	BUREAU OF HIGHWAYS	BORING CONTRACTOR
	BORING REPORT	
	TOWN HARTFORD-EAST HARTFORD, CT.	STEINMAN
HALEY & ALDRICH, INC.	PROJECT NAME CHARTER OAK BRIDGE	
SOILS ENGINEER	PROJECT NO. 63-384	DESIGN ENGINEER

LOCATION

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 166
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-45.5'	10	18	18	D	2	2	3		Medium stiff, Gray VARVED CLAY and SILTY CLAY
50		49'-50.5'	11	18	18	D	2	2	3		(same as D10)
55		54'-55.5'	12	18	18	D	1	2	2		Soft, Brown Gray VARVED CLAY and SILTY CLAY
60		59'-60.5'	13	18	18	D	1	1	1		Soft, Gray VARVED CLAY and SILTY CLAY
65		64'-65.5'	14	18	18	D	WOR	1	1		(same as D13)
70		69'-70.5'	15	18	18	D	Wt.	Rods	1		Very soft, Brown-Gray CLAY and SILTY CLAY
75		74'-75.5'	16	18	18	D	Wt.	of	Rods		(same as D15)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 166

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 5	
C. Harriman INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2	
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR	
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER	

LOCATION

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 166
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		79'-80.5'	17	18	18	D	Wt.	of	Rods		Very soft, Gray to Brown VARVED CLAY and SILTY CLAY
85		84'-85.5'	18	18	18	D	Wt.	of	Rods		(same as D17)
90		89'-90.5'	19	18	18	D	Wt.	of	Rods		(same as D17)
95		94'-95.5'	20	18	18	D	Wt.	of	Rods		(same as D17)
100		99'-100.5'	21	18	18	D	Wt.	of	Rods		(same as D17)
105		104'-105.5'	22	18	18	D	Wt.	of	Rods		Very soft, Gray to Red-Brown VARVED CLAY and SILTY CLAY
110		109'-110.5'	23	18	18	D	Wt.	of	Rods		(same as D22)
115		114'-115.5'	24	18	18	D	Wt.	of	Rods		(same as D22)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 166

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C. Harriman INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 4 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 166
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		119'-120.5'	25	18	12	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
125		124'-125.5'	26	18	18	D	Wt.	of	Rods		(same as D25)
130		129'-130.5'	27	18	18	D	Wt.	of	Rods		(same as D25)
135		134'-135.5'	28	18	18	D	Wt.	of	Rods		(same as D25)
140		139'-140.5'	29	18	14	D	Wt.	Rods	2		(same as D25)
145		144'-145.5'	30	18	15	D	WOR	2	2		Soft, Red-Brown VARVED CLAY and SILTY CLAY
150		149'-150.5'	31	18	18	D	1	2	3		Medium stiff, Red-Brown VARVED CLAY and SILTY CLAY
155		154'-155.5'	32	18	18	D	1	2	2		Soft, Red-Brown VARVED CLAY and SILTY CLAY

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 166

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER C. Harriman INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 5 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

		AUGER	CASING	SAMPLER	CORE BAR	
LOCATION						HOLE NO. B 166
SURFACE ELEV.						LINE & STATION
DATE FINISHED	TYPE					OFFSET
GROUND WATER OBSERVATIONS	SIZE I.D.					N. COORDINATE
AT FT. AFTER HRS.	HAMMER WT.				BIT	
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		159'-160.5'	33	18	12	D	Wt.	of	Rods	161.5'	Soft, Red-Brown VARVED CLAY and SILTY CLAY
										162'	-GLACIAL TILL-
											Decomposed Bedrock
							Drill Rate				
							Min/Ft			165'	
165		165'-170'	1	60	54	C		8			Moderately hard, Red-Brown fine grained sandy SILTSTONE. Joints very close to close, shallow dipping, occasionally steeply dipping, bedding very thin, rock slightly weathered, moderately fractured
								8		167'	
			(ROD=7%)					8			
								9			
								9			
170											Moderately hard, Red-Brown fine grained sandy SILTSTONE and coarse to fine grained SANDSTONE, extremely fractured, moderate to slightly weathered
											Bottom of Exploration at 170'

FROM GROUND SURFACE TO 29' FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 165 FEET

FOOTAGE IN EARTH 165 FOOTAGE IN ROCK 5 NO. OF SAMPLES 33 HOLE NO. B 166

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 5
E. Henderson INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION Structure No. 2 (Rt. 15 / Main St.)

SURFACE ELEV.	39.5		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 167
DATE FINISHED	12/12/86	TYPE		HW-NW	S/S	NV II	LINE & STATION
GROUND WATER OBSERVATIONS		SIZE I.D.		4" 3"	1-3/8"		OFFSET
AT N/A FT. Collapsed	HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE 337223.09
AT FT. AFTER	HRS.	HAMMER FALL		24"	30"		E. COORDINATE 628730.23

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		0'-1.5'	1	18	16	D	1	2	1		Soft, Brown SILT, little fine sand, trace of roots -TOPSOIL-
										2.5'	
5		4'-5.5'	2	18	18	D	3	4	4		Loose, Orange-Brown medium to fine SAND, little silt, trace of coarse sand
10		9'-10.5'	3	18	17	D	4	6	8		Medium dense, Brown coarse to fine SAND, trace of silt
15		14'-15.5'	4	18	14	D	3	5	7		Medium dense, Brown medium SAND, some coarse to fine sand, trace of silt -ALLUVIUM-
										17'	
20		19'-20.5'	5	18	18	D	1	2	2		Soft, Gray SILT, some clay
25		24'-25.5'	6	18	18	D	1	1	1		Very soft, Gray SILT, some clay
30		29'-30.5'	7	18	18	D	1	1	2		(same as D5)
										33'	— — — — — —
35		34'-35.5'	8	18	18	D	1	1	1		Very soft, Gray VARVED CLAY and SILTY CLAY
											Very soft, Gray CLAY and SILTY CLAY
		39'-40.5'	9	18	18	D	WOR	1	1		

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 167

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 2 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 167
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-45.5'	10	18	18	D	WOR	1 = 12"			Very soft, Gray CLAY and SILTY CLAY
50		49'-50.5'	11	18	18	D	1	1	1		(same as D10)
55		54'-55.5'	12	18	18	D	WOR	1 = 12"			(same as D10)
60		59'-60.5'	13	18	18	D	WOR	1	1		(same as D10)
65		64'-65.5'	14	18	18	D	WOR	1	1		(same as D10)
70		69'-70.5'	15	18	18	D	Wt. Rods		1		Very soft, Brown-Gray VARVED CLAY and SILTY CLAY
75		74'-75.5'	16	18	18	D	WOR	1 = 12"			(same as D15)
		79'-80.5'	17	18	18	D	WOR	1	1		(same as D15)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 167

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 5
E. Henderson INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION

SURFACE ELEV.		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 167
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
85		84'-85.5'	18	18	18	D	Wt.	Rods	1		Very soft, Brown-Gray VARVED CLAY and SILTY CLAY
90		89'-90.5'	19	18	18	D	1	2	2		Soft, Brown-Gray VARVED CLAY and SILTY CLAY
95		94'-95.5'	20	18	18	D	WOR	1	1		(same as D18)
100		99'-100.5'	21	18	18	D	1	2	2		Soft, Gray and Red-Brown VARVED CLAY and SILTY CLAY
105		104'-105.5'	22	18	18	D	WOR	1	1		Very soft, Gray and Red-Brown VARVED CLAY and SILTY CLAY
110		109'-110.5'	23	18	18	D	1	2	2		Soft, Gray and Red-Brown VARVED SILT and CLAY
115		114'-115.5'	24	18	18	D	WOR	1	2		Soft, Red-Brown VARVED CLAY and SILTY CLAY
		119'-120.5'	25	18	18	D	WOR	1	2		(same as D24)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 167

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 4 OF 5
E. Henderson INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 167
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
125		124'-125.5'	26	18	18	D	Wt.	of	Rods		Very soft, Red-Brown VARVED CLAY and SILTY CLAY
130		129'-130.5'	27	18	18	D	Wt.	of	Rods		Very soft, Red-Brown SILT and CLAY
135		134'-135.5'	28	18	18	D	Wt.	of	Rods		(same as D26)
140		139'-140.5'	29	18	18	D	Wt.	of	Rods		(same as D26)
145		144'-145.5'	30	18	18	D	Wt.	of	Rods		(same as D26)
150		149'-150.5'	31	18	18	D	Wt.	of	Rods		(same as D26)
155		154'-155.5'	32	18	18	D	Wt.	of	Rods	156'	(same as D26)
										157'	Brown coarse to fine SAND and SILT, trace gravel -GLACIAL TILL- (observed from wash)
						Note:	Roller	Bit			
								to	160	160'	Decomposed Bedrock

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK NO. OF SAMPLES HOLE NO. B 167

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER E. Henderson INSPECTOR HALEY & ALDRICH, INC. SOILS ENGINEER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT TOWN HARTFORD-EAST HARTFORD, CT. PROJECT NAME CHARTER OAK BRIDGE PROJECT NO. 63-384	SHEET 5 OF 5 LOCATION Structure No. 2 GUILD DRILLING CO., INC. BORING CONTRACTOR STEINMAN DESIGN ENGINEER

		AUGER	CASING	SAMPLER	CORE BAR	
LOCATION						HOLE NO. B 167
SURFACE ELEV.	TYPE					LINE & STATION
DATE FINISHED	SIZE I.D.					OFFSET
GROUND WATER OBSERVATIONS	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE
AT FT. AFTER HRS.						

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
		160'-165'	1	60	60	C		9		Drill Rate Min/Ft	Moderately hard, Red-Brown fine grained sandy SILTSTONE. Joints very close to close, shallow dipping, bedding very thin, rock slightly weathered, moderately fractured
				(ROD=83%)				9			
								10			
								8			
								9			
165											Bottom of Exploration at 165'

FROM GROUND SURFACE TO 65 FEET USED 4 INCH CASING THEN 3 INCH CASING FOR 160 FEET

FOOTAGE IN EARTH 160 FOOTAGE IN ROCK 5 NO. OF SAMPLES 32 HOLE NO. B 167

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

A. Mason BORING CREW LEADER	FORM SM-1 REV. 8/83 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 1 OF 1
H. Ernst INSPECTOR	TOWN HARTFORD-EAST HARTFORD, CT.	LOCATION Structure No. 2
HALEY & ALDRICH, INC. SOILS ENGINEER	PROJECT NAME CHARTER OAK BRIDGE	GUILD DRILLING CO., INC. BORING CONTRACTOR
	PROJECT NO. 63-384	STEINMAN DESIGN ENGINEER

LOCATION Structure No. 2 (Rt. 15 / Main St.)

		AUGER	CASING	SAMPLER	CORE BAR		
SURFACE ELEV.	39.6					HOLE NO.	B 168
DATE FINISHED	12/23/86	TYPE	NW	S/S		LINE & STATION	
GROUND WATER OBSERVATIONS		SIZE I.D.	3"	1-3/8"		OFFSET	
AT 17 FT. AFTER 0 HRS.		HAMMER WT.	300#	140#	BIT	N. COORDINATE	337142.37
AT FT. AFTER HRS.		HAMMER FALL	24"	30"		E. COORDINATE	628834.30

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS IN FEET FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
										0.9'	Asphalt
		1'-2.5'	1	18	14	D	3	6	5		Medium dense, Brown medium to fine SAND, trace of silt, coarse sand, fine gravel
5		4'-5.5'	2	18	16	D	5	5	7	5.5'	(same as D1) -FILL-
10		9'-10.5'	3	18	18	D	8	9	11		Medium dense, Brown medium to fine SAND, trace of silt, coarse sand
15		14'-15.5'	4	18	18	D	5	7	7		(same as D3)
										19'	-ALLUVIUM-
20		19'-20.5'	5	18	18	D	2	2	3		Medium stiff, Green-Gray VARVED CLAY and SILTY CLAY
25		24'-25.5'	6	18	18	D	1	2	2		Soft, Gray VARVED CLAY and SILTY CLAY
											Bottom of Exploration at 25.5'
30											
35											

FROM GROUND SURFACE TO 20 FEET USED 3 INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH 25.5 FOOTAGE IN ROCK 0 NO. OF SAMPLES 6 HOLE NO. B 168

SAMPLE TYPE CODING: D=DRIVE C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST

PROPORTIONS USED: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

D. C. Holley BORING FOREMAN	FORM NO. SM-1 ED. 1/71 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT		SHEET 1 OF 5
G. R. May INSPECTOR			LOCATION See Plan
Haley & Aldrich, Inc. SOILS ENGINEER	TOWN	Hartford - East Hartford, Conn.	Guild Drilling Co., Inc. BORING CONTRACTOR
	PROJECT NAME	Charter Oak Bridge	S. B. G. & B. CONTRACTING ENGINEER
	PROJECT NO.	63-384	

LOCATION Route 15 @ Main Street - East Hartford, Conn.

SURFACE ELEV. 40.4		AUGER	CASING	SAMPLER	CORE BAR	HOLE NO. B 10
DATE FINISHED 4/4/86	TYPE		PW-HW	S/S	NX	LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.		5" 4"	1-3/8"	2"	OFFSET
AT 37 FT. AFTER 0 HRS.	HAMMER WT.		300#	140#	BIT	N. COORDINATE 337194
AT 8.7 FT. AFTER 2 HRS.	HAMMER FALL		24"	30"	Dia.	E. COORDINATE 628763

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD INDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
	3	0'-1.5'	1	18"	17"	D	2	2	4		Medium stiff Gray SILT, little fine
	6										sand, trace of roots and grass
	9										
	12									4'	
5	12									El. 36.4	
	15	5'-6.5'	2	18"	14"	D	5	5	5		Loose Red medium SAND, some silt
	20										
	37										
	40										
10	35	9'-10.5'	3	18"	16"	D	7	10	11		Medium dense Brown coarse to fine
	47										SAND, little silt
	53										
	44										
	37										
15	51	14'-15.5'	4	18"	14"	D	3	5	6		Medium dense Brown coarse to fine
	57										SAND, trace of silt
	51										
	70										
	140										
20	98	19'-20.5'	5	18"	16"	D	6	8	9		Medium dense Brown coarse to medium
	92										SAND, trace of fine sand
	108										
	111										
	83									24'	
25	80	24'-25.5'	6	18"	16"	D	4	4	4	El. 16.4	Medium stiff Gray SILT, some clay
	110										
	70										
	74										
	78									29'	
30	*									El. 11.4	
		31.5' (tip)	V1								(See Vane Shear Report)
		31.5'-33'	7	18"	18"	D	2	2	2		Soft Gray SILT and CLAY
											(Alternating ¼" to ½" seams of gray
35		34'-36'	UP1	24"	24"	UP					clay and red gray silt)
											-Varved CLAY-
		36'-37.5'	8	18"	15"	D	1	2	1		Soft Gray varved CLAY (same as S7)
											* Casing blows not obtained, washing
											ahead of casing in clay strata
		40.5' (tip)	V2								(See Vane Shear Report)

FROM GROUND SURFACE TO 29 FEET USED 5 INCH CASING THEN 4 INCH CASING FOR 115 FEET

FOOTAGE IN EARTH 162 FOOTAGE IN ROCK 5' TYPE NX NO. OF SAMPLES 23 HOLE NO. B 10

SAMPLE TYPE CODING: D = DRY C = CORE A = AUGER UP = UNDISTURBED, PISTON V = VANE TEST

PROPORTIONS USED: TRACE = 0-10% LITTLE = 10-20% SOME = 20-35% AND = 35-50%

FORM NO. SM-1 ED. 1/71
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

BORING FOREMAN	TOWN Hartford - East Hartford, Conn.	SHEET 2 OF 5
INSPECTOR	PROJECT NAME Charter Oak Bridge	LOCATION
SOILS ENGINEER	PROJECT NO. 63-384	BORING CONTRACTOR
		CONTRACTING ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 10
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD INDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
45		44'-46'	UP2	24"	22"	UP					Very soft Gray varved CLAY (same as S7)
		46'-47.5'	9	18"	14"	D	Wt.	of	Rods		
50		50.5' (tip)	V3								(See Vane Shear Report)
55		54'-56'	UP3	24"	22"	UP					
		56'-57.5'	10	18"	18"	D	Wt.	of	Rods		Very soft Gray varved CLAY (same as S7)
60		60.5'(tip)	V4								(See Vane Shear Report)
65		64'-66'	UP4	24"	22"	UP					
		66'-67.5'	11	18"	18"	D	Wt.	of	Rods		Very soft gray varved CLAY with Red Silt Laminae (Gray layers 3/4" to 1" thick, red layers less then ¼" thick)
70		69'-70.5'	12	18"	18"	D	Wt.	of	Rods		Very soft Gray varved CLAY (same as S11)
75		74'-75.5'	13	18"	18"	D	Wt.	of	Rods		(Same as S 11)
		80.5' (tip)	V5								(See Vane Shear Report)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B 10

SAMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING FOREMAN	FORM NO. SM-1 ED. 1/71 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 3 OF 5
INSPECTOR	TOWN Hartford - East Hartford, Conn.	LOCATION
	PROJECT NAME Charter Oak Bridge	BORING CONTRACTOR
SOILS ENGINEER	PROJECT NO. 63-384	CONTRACTING ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B-10
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD INDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
85		84'-86'	UP5	24"	22"	UP					
		86'-87.5'	14	18"	18"	D	Wt.	of	Rods		Very soft Gray Red varved CLAY, trace of Red fine sand laminae
90		89'-90.5'	15	18"	18"	D	Wt.	of	Rods		Very soft Red Gray varved CLAY, Red layers are stiffer
		94.5'(tip)	V6								(See Vane Shear Report)
95											
100		99'-100.5'	16	18"	18"	D	Wt.	of	Rods		Very soft Red Gray varved CLAY, trace silt laminae, varves increasing in thickness, red layers 3"
105		104'-106'	UP6	24"	24"	UP					
110		110' (tip)	V7								(See Vane Shear Report)
115		114'-115.5'	17	18"	18"	D	Wt.	of	Rods		Very soft Brown varved CLAY
		119'-120.5'	18	18"	18"	D	Wt.	of	Rods		(Same as S 17)

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B-10

SAMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

FORM NO. SM-1 ED. 1/71
STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS
BORING REPORT

SHEET 4 OF 5

BORING FOREMAN		LOCATION
INSPECTOR	TOWN Hartford - East Hartford, Conn.	BORING CONTRACTOR
	PROJECT NAME Charter Oak Bridge	
SOILS ENGINEER	PROJECT NO. 63-384	CONTRACTING ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B-10
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD INDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
115		124'-126'	UP7	24"	22"	UP					
120		130.5' (Tip)	V8								
125		134'-135.5'	19	18"	18"	D	Wt.	of	Rods		Very soft Red Brown varved CLAY (Dropped Rods, went 7' into clay)
130											
135		144'-145.5'	20	18"	18"	D	Wt.	of	Rods		Very soft Brown varved CLAY (same as S17)
140		149'-150.5'	21	18"	18"	D	Wt.	of	Rods		(same as S17)
145		154'-155.5'	22	18"	16"	D	Wt.	of	Rods		(same as S17)
										157' El.-116.6	Very dense Red GRAVEL, some silt, little coarse to fine sand -Till-
		159'-160.5'	23	18"	14"	D	17	19	57		

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B-10

SAMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING FOREMAN	FORM NO. SM-1 ED. 1/71 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS BORING REPORT	SHEET 5 OF 5
		LOCATION
INSPECTOR	TOWN Hartford - East Hartford, Conn.	BORING CONTRACTOR
	PROJECT NAME Charter Oak Bridge	
SOILS ENGINEER	PROJECT NO. 63-384	CONTRACTING ENGINEER

LOCATION

		AUGER	CASING	SAMPLER	CORE BAR	
SURFACE ELEV.						HOLE NO. B 10
DATE FINISHED	TYPE					LINE & STATION
GROUND WATER OBSERVATIONS	SIZE I.D.					OFFSET
AT FT. AFTER HRS.	HAMMER WT.				BIT	N. COORDINATE
AT FT. AFTER HRS.	HAMMER FALL					E. COORDINATE

DEPTH	CASING BLOWS PER FOOT	SAMPLE DEPTHS FROM - TO	NO.	PEN. INCH	REC. INCH	TYPE	BLOWS PER 6 INCHES ON SAMPLER 0-6	6-12	12-18	STRATA CHANGE DEPTH ELEV.	FIELD INDENTIFICATION OF SOIL. REMARKS (INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.)
										162'	
		162'-167'	C1	60"	46"	C				El.-121.6	Red SANDSTONE and SILTSTONE
165											(See Core Boring Report)
											Bottom of Exploration at 167'
170											Note: See Observation Well Report
175											
180											
185											
190											
195											

FROM GROUND SURFACE TO FEET USED INCH CASING THEN INCH CASING FOR FEET

FOOTAGE IN EARTH FOOTAGE IN ROCK TYPE NO. OF SAMPLES HOLE NO. B 10

SAMPLE TYPE CODING: D=DRY C=CORE A=AUGER UP=UNDISTURBED, PISTON V=VANE TEST
PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

STRUCTURE NO. 2
ROUTE 15 OVER MAIN STREET

TABLE I
SUMMARY OF FIELD VANE SHEAR TEST RESULTS

Test No.	(3) Vane	Ground Surface Elev. (ft.)	Depth (ft.)	Test Elev. (ft.)	(1) Undisturbed Su (psf)	(1) Disturbed Su (psf)	(2) Sensitivity
B10/2	E	40.4	40.0	0.4	957	188	5.1
B10/3	E	40.4	50.0	-9.6	1084	166	6.5
B10/4	E	40.4	60.0	-19.6	1327	232	5.7
B10/5	F	40.4	80.0	-39.6	1187	432	2.7
B10/6	F	40.4	95.0	-54.6	1500	585	2.6
B10/7	F	40.4	109.5	-69.1	1755	739	2.3
B10/8	F	40.4	130.0	-89.6	2161	940	2.3
B165/1	O	39.2	37.5	1.7	1100	175	6.3
B165/2	O	39.2	47.5	-8.3	1275	244	5.2
B165/3	O	39.2	57.5	-18.3	1432	454	3.2
B165/4	O	39.2	67.5	-28.3	1519	471	3.2
B165/5	O	39.2	77.5	-38.3	1606	419	3.8
B165/6	O	39.2	87.5	-48.3	1868	594	3.2
B165/7	O	39.2	97.5	-58.3	1571	602	2.6
B165/8	O	39.2	107.5	-68.3	2174	681	3.2
B165/9	O	39.2	117.5	-78.3	1860	367	5.1
B165/10	O	39.2	127.5	-88.3	1781	1074	1.7
B165/11	O	39.2	137.5	-98.3	2540	655	3.9
B165/12	O	39.2	147.5	-108.3	3038	1362	2.2

Notes:

(1) Su = Shear Strength
(2) Sensitivity = Undisturbed/molded shear strength
(3) See Table II for Vane Dimensions

APPENDIX C

RESULTS OF LABORATORY TESTING

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: ---	Sample Type: ---	Tested By:	md
Sample ID: ---	Test Date: 07/01/16	Checked By:	emm
Depth : ---	Test Id: 382134		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S6043-1	UP- 1 - Top	43-45	Moist, gray clay	50.1
S6043-1	UP- 1 - Top middle	43-45	Moist, gray clay	49.3
S6043-1	UP- 1 - Bottom middle	43-45	Moist, dark gray clay	51.1
S6043-1	UP- 1 - Bottom	43-45	Moist, dark gray clay	47.7
RW-5	UP- 1 - Top	37-39	Moist, reddish brown clay	44.1
RW-5	UP- 1 - Top middle	37-39	Moist, reddish brown clay	48.2
RW-5	UP- 1 - Bottom middle	37-39	Moist, reddish brown clay	52.0
RW-5	UP- 1 - Bottom	37-39	Moist, reddish brown clay	50.2

Notes: Temperature of Drying : 110° Celsius

Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	07/01/16	Checked By:	emm
Depth :	---	Test Id:	382122		

Moisture Content of Soil and Rock - AASHTO T 265

Boring ID	Sample ID	Depth	Description	Moisture Content,%
S5796-1	UP- 1 - Top	67-69	Moist, gray clay	45.6
S5796-1	UP- 1 - Top middle	67-69	Wet, gray clay	40.1
S5796-1	UP- 1 - Bottom middle	67-69	Moist, greenish gray clay	43.3
S5796-1	UP- 1 - Bottom	67-69	Wet, greenish gray clay	43.4
S6043-1	UP- 2 - Top	53-55	Moist, gray clay	58.9
S6043-1	UP- 2 - Top middle	53-55	Moist, gray clay	51.3
S6043-1	UP- 2 - Bottom middle	53-55	Moist, greenish gray clay	52.2
S6043-1	UP- 2 - Bottom	53-55	Moist, greenish gray clay	53.3

Notes: Temperature of Drying : 110° Celsius

Client:	Freeman Companies, LLC			
Project:	Reconstruction of Exit Charter Oak Bridge			
Location:	Hartford, CT		Project No:	GTX-304831
Boring ID:	---	Sample Type: ---	Tested By:	jbr
Sample ID:	---	Test Date: 07/26/16	Checked By:	emm
Depth :	---	Test Id: 384878		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
S1-2	S-2	4-6 ft	Moist, red sand with gravel	7.1	6.5
S1-5	S-3	10-12 ft	Moist, reddish brown silt with gravel	7.4	6.2
S1-S12	S-2	5-7 ft	Moist, reddish brown silt with gravel	8.1	7.2
S2-1	S-4	15-17 ft	Moist, reddish brown silt with gravel	6.8	6.6
S2-3	S-2	5-7 ft	Moist, reddish brown clay	7.5	7.3
S-0480-1	S-5	14-16 ft	Moist, olive brown silt	4.5	4.3
S-0480-2	S-3	9-11 ft	Moist, olive brown silt	6.3	6.0
S-06043-1	S-2	5-7 ft	Moist, brown sand	7.5	6.8

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

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Client:	Freeman Companies, LLC
Project:	Reconstruction of Exit Charter Oak Bridge
Location:	Hartford, CT
GTX#:	304831
Test Date:	07/26/16
Tested By:	jbr
Checked By:	emm

Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, $(\text{ohm-cm})^{-1}$
S1-2	S-2	4-6	Moist,red sand with gravel	4,442	2.25E-04
S1-5	S-3	10-12	Moist, reddish brown silt with gravel	3,099	3.23E-04
S1-S12	S-2	5-7	Moist, reddish brown silt with gravel	1,963	5.09E-04
S2-1	S-4	15-17	Moist, reddish brown silt with gravel	1,343	7.45E-04
S2-3	S-2	5-7	Moist, reddish brown clay	486	2.06E-03
S-0480-1	S-5	14-16	Moist,olive brown silt	3,099	3.23E-04
S-0480-2	S-3	9-11	Moist, olive brown silt	1,892	5.28E-04
S-06043-1	S-2	5-7	Moist, brown sand	15,496	6.45E-05

Notes: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

FUGRO CONSULTANTS, INC.

6100 HILLCROFT
PHONE (713) 369-5400

HOUSTON, TEXAS 77081
FAX (713) 369-5518

RESULTS OF TESTS

PROJECT: RECONSTRUCTOION OF EXIT CHARTER OAK BRIDGE (GTX 304831)

FOR: GEOTESTING EXPRESS, INC.
125 NAGOG PARK ACTION, MA 01720

REPORTED TO: ETHAN MARRO

REPORT DATE: 08-01-16
CLIENT NUMBER:
JOB NUMBER: 04.1115-0003
REPORT NUMBER:
DATE SAMPLED:
TIME SAMPLED:
SAMPLED BY: CLIENT
DATE RECEIVED:
TIME RECEIVED:
RECEIVED BY:

SOLUBLE SULFATE AASHTO T-290

SAMPLE ID	RESULTS	UNITS	LAB No.	TIME/DATE	ANALYST
S1-S, S-2, 4 – 6’	< 30 *	mg/kg	0726052	1100/08-01-16	SD
S1-5, S-3, 10 – 12’	57 *	mg/kg	0726053	1100/08-01-16	SD
S1-12, S-2, 5 – 7’	< 50 *	mg/kg	0726054	1100/08-01-16	SD
S2-1, S-4, 15 – 17’	< 50 *	mg/kg	0726055	1100/08-01-16	SD
S2-3, S-2, 5 – 7’	297 *	mg/kg	0726056	1100/08-01-16	SD
S-0480-1, S-5, 14 – 16’	543 *	mg/kg	0726057	1100/08-01-16	SD
S-0480-2, S-3, 9 – 11’	355 *	mg/kg	0726058	1100/08-01-16	SD
S-06043-41, S-2, 5 – 7’	< 30*	mg/kg	0726059	1100/08-01-16	SD

SO4CL 069-16

Respectfully submitted,

* Dry weight basis

Steve DeGregorio
Chemist

SD

** WATER EXTRACTION PERFORMED BY USING A 1:10 RATIO OF SAMPLE AND REAGENT WATER FOLLOWED BY CENTRIFUGE AND VACUUME FILTRATION. THE WATER EXTRACT IS THEN ANALYZED USING THE ASTM D-512 AND D-516 METHODS.

THE RESULTS RELATE AS TO THE LOCATION TESTED AND NO OTHER REFERENCE SHALL BE MADE.
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY.

END OF REPORT

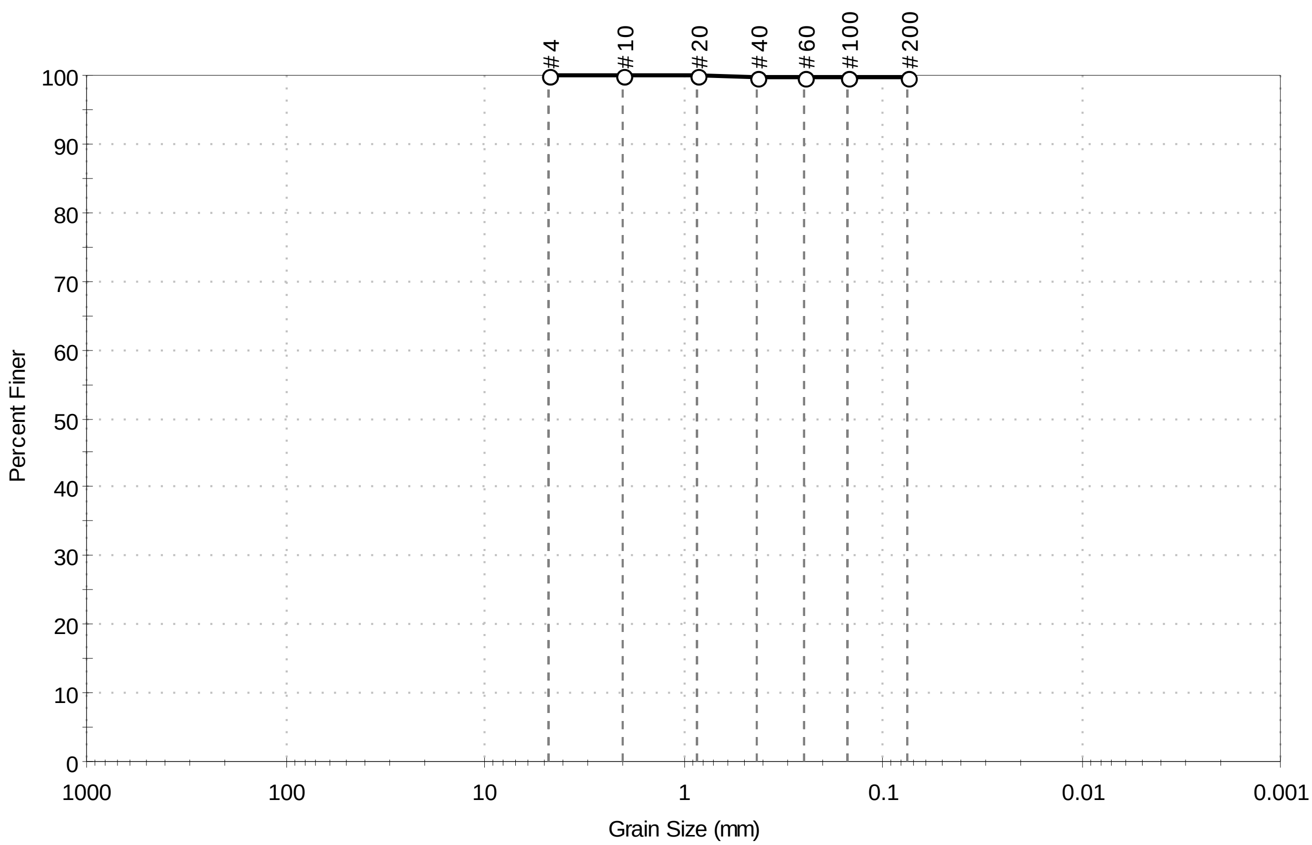
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S-6043-1	Sample Type:	jar	Tested By:	GA
Sample ID:	S-5	Test Date:	08/03/16	Checked By:	emm
Depth :	20-21 ft	Test Id:	384959		

Test Comment: ---

Visual Description: Moist, olive gray clay

Sample Comment: ---

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	0.4	99.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#200	0.075	100		

Coefficients

D_{85} = N/A	D_{30} = N/A
D_{60} = N/A	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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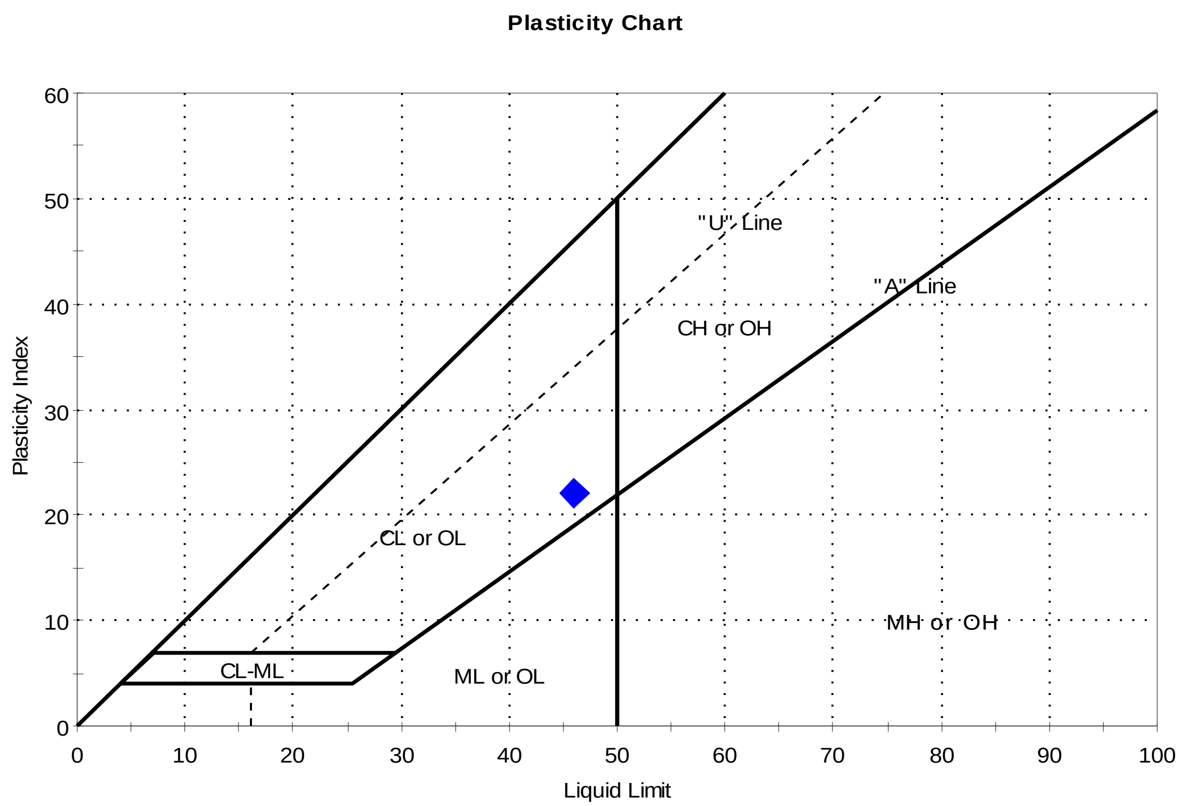
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S6043-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-1 - Top middle	Test Date:	07/12/16	Checked By:	emm
Depth :	43-45	Test Id:	382141		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Top middle	S6043-1	43-45	49	46	24	22	1.2	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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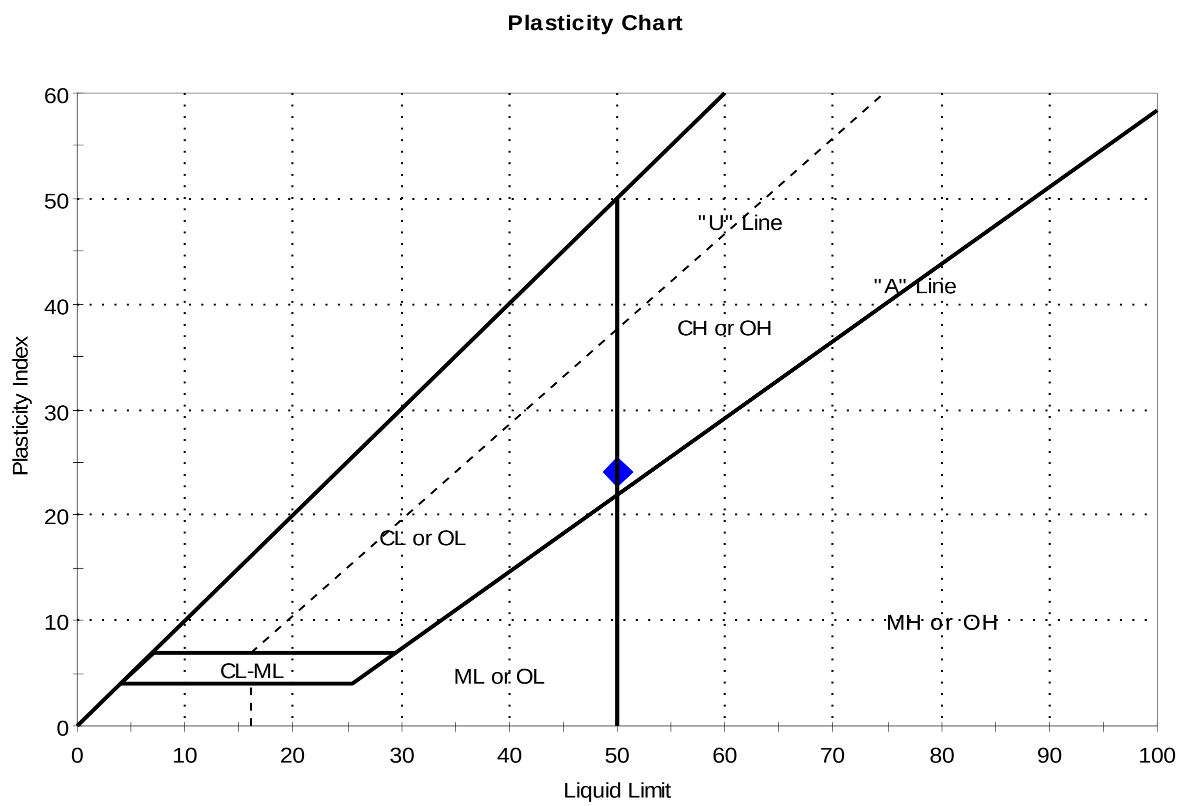
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S6043-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-1 - Bottom	Test Date:	07/12/16	Checked By:	emm
Depth :	43-45	Test Id:	382139		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-1 - Bottom	S6043-1	43-45	48	50	26	24	0.9	

Sample Prepared using the WET method

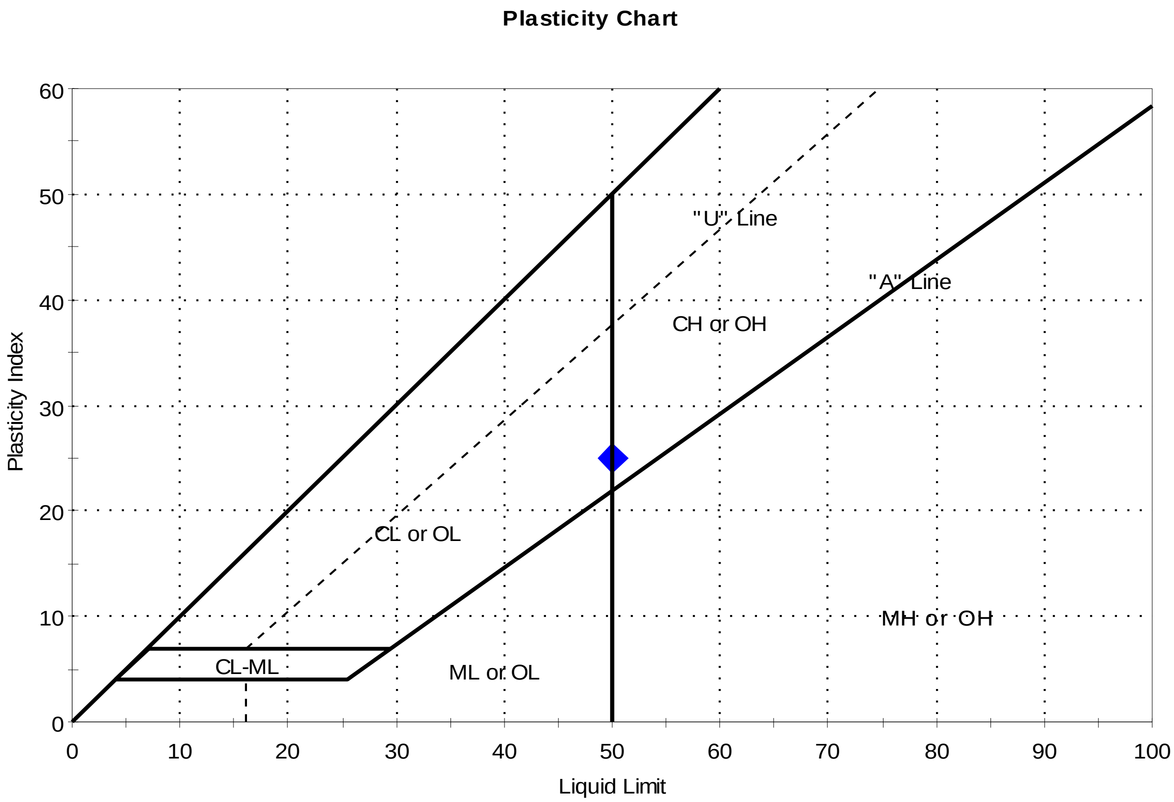
Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831
Boring ID: S6043-1	Sample Type: tube	Tested By:	GA
Sample ID: UP-2 - Top middle	Test Date: 07/11/16	Checked By:	emm
Depth : 53-55	Test Id: 382123		
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-2 - Top middle	S6043-1	53-55	51	50	25	25	1.1	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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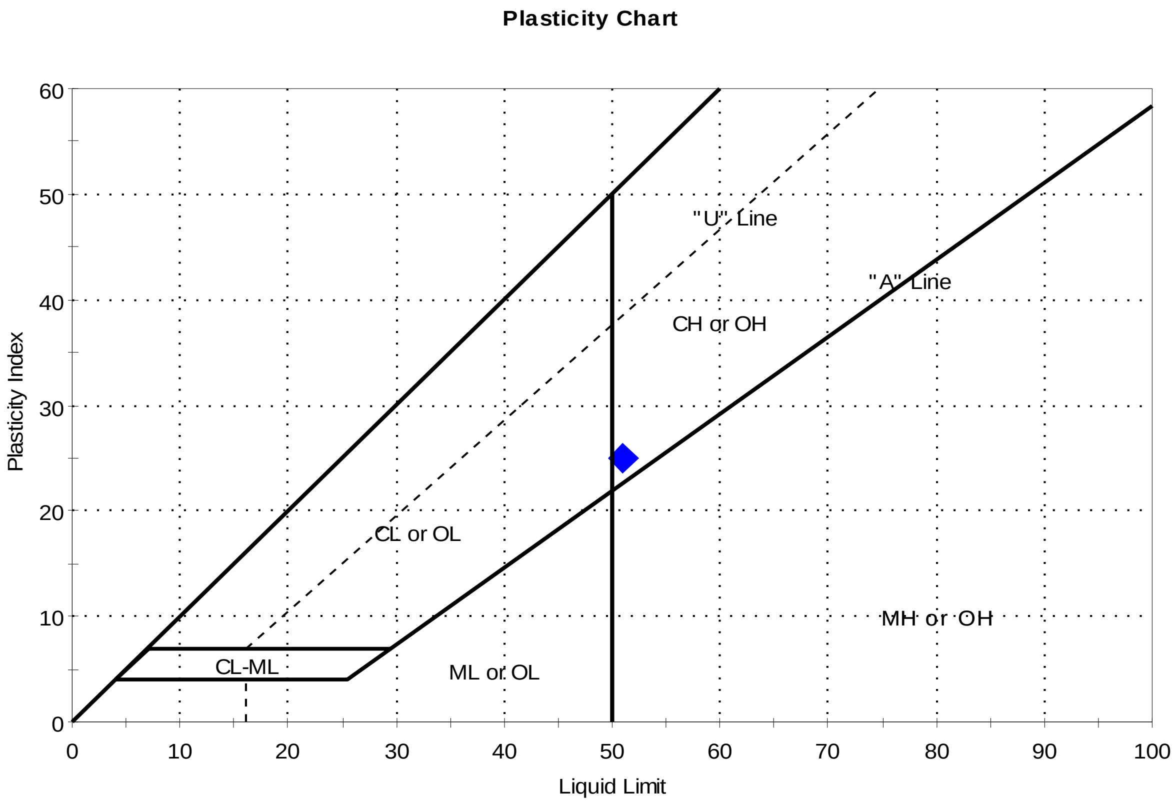
Client:	Freeman Companies, LLC				
Project:	Reconstruction of Exit Charter Oak Bridge				
Location:	Hartford, CT			Project No:	GTX-304831
Boring ID:	S6043-1	Sample Type:	tube	Tested By:	GA
Sample ID:	UP-2 - Bottom	Test Date:	07/12/16	Checked By:	emm
Depth :	53-55	Test Id:	382121		
Test Comment:	---				
Visual Description:	Moist, greenish gray clay				
Sample Comment:	---				

Atterberg Limits - AASHTO T 89 and T 90



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	UP-2 - Bottom	S6043-1	53-55	53	51	26	25	1.1	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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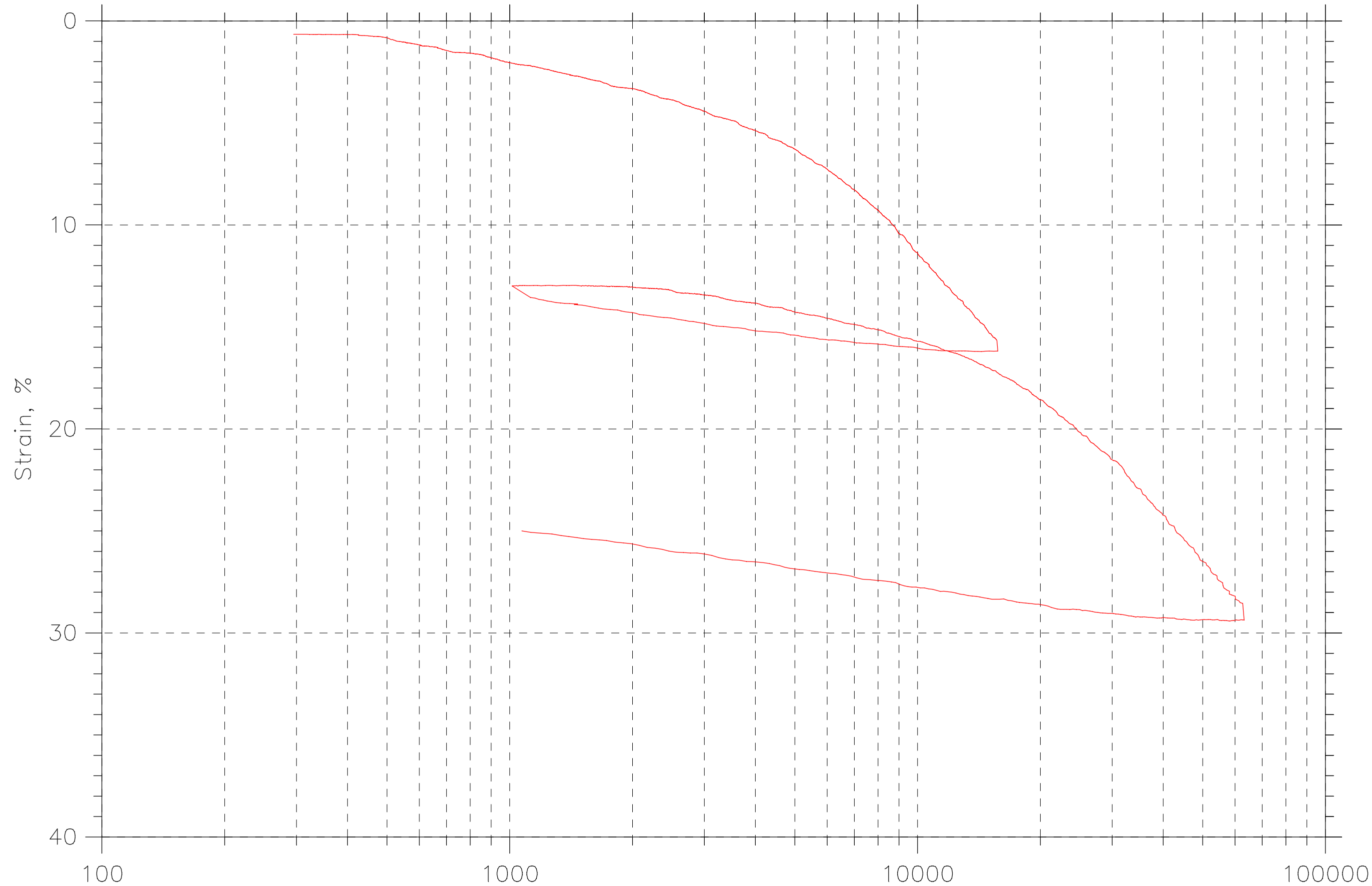
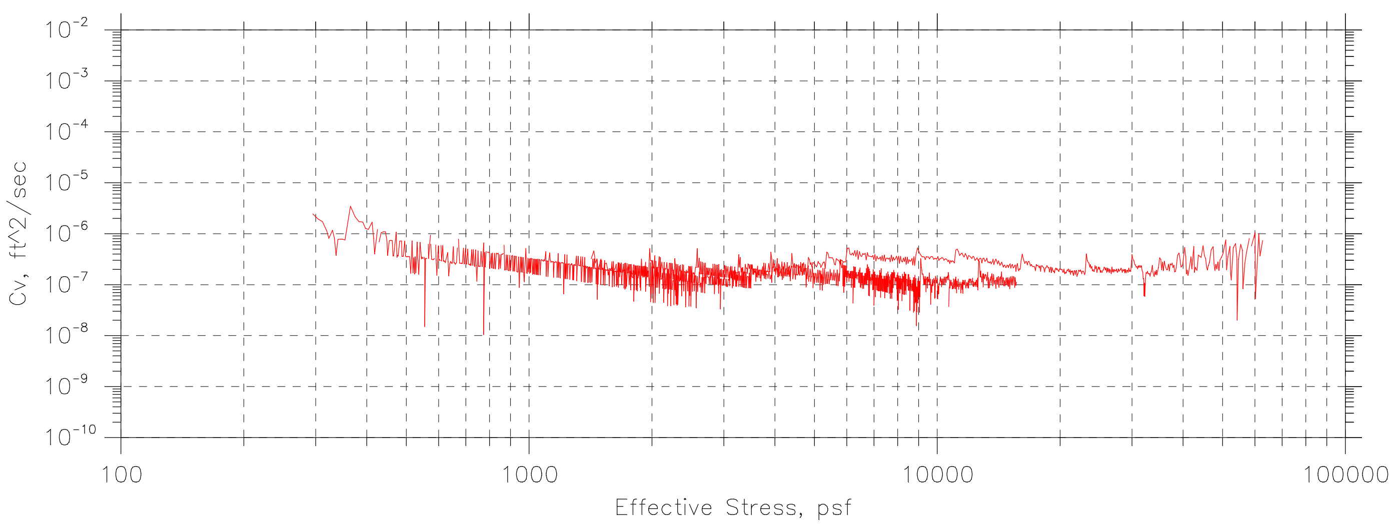
Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report



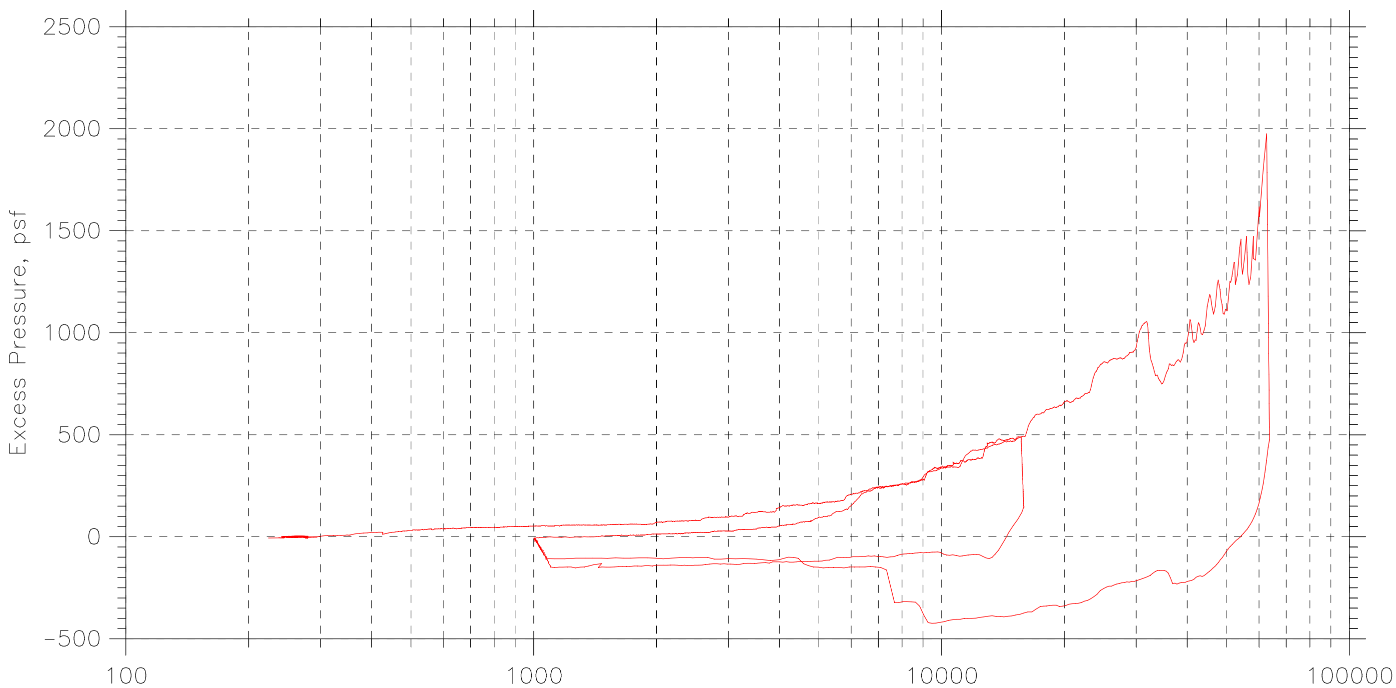


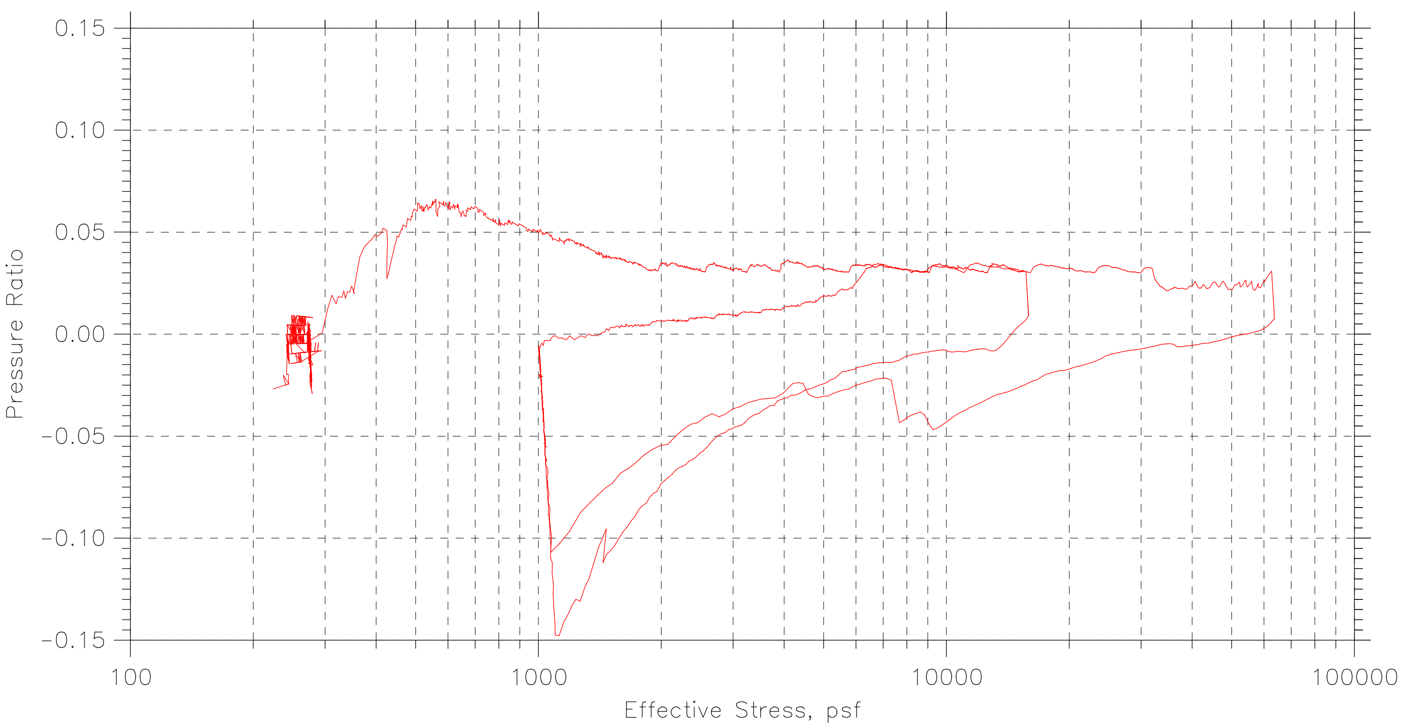
Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 43-45 ft
Test No.: CRC-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System Y		
		Page 1 of 3

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 43-45 ft
Test No.: CRC-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System Y		
		Page 2 of 3

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GeoTesting EXPRESS

CRC TEST DATA

Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-1	Test Date: 06/07/16	Depth: 43-45 ft
Test No.: CRC-7	Sample Type: intact	Elevation: ---

Soil Description: Moist, dark gray clay
Remarks: System Y

Estimated Specific Gravity: 2.76	Liquid Limit: 50	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.50	Plastic Limit: 26	Initial Height: 1.00 in
Final Void Ratio: 0.976	Plasticity Index: 24	Final Height: 0.79 in

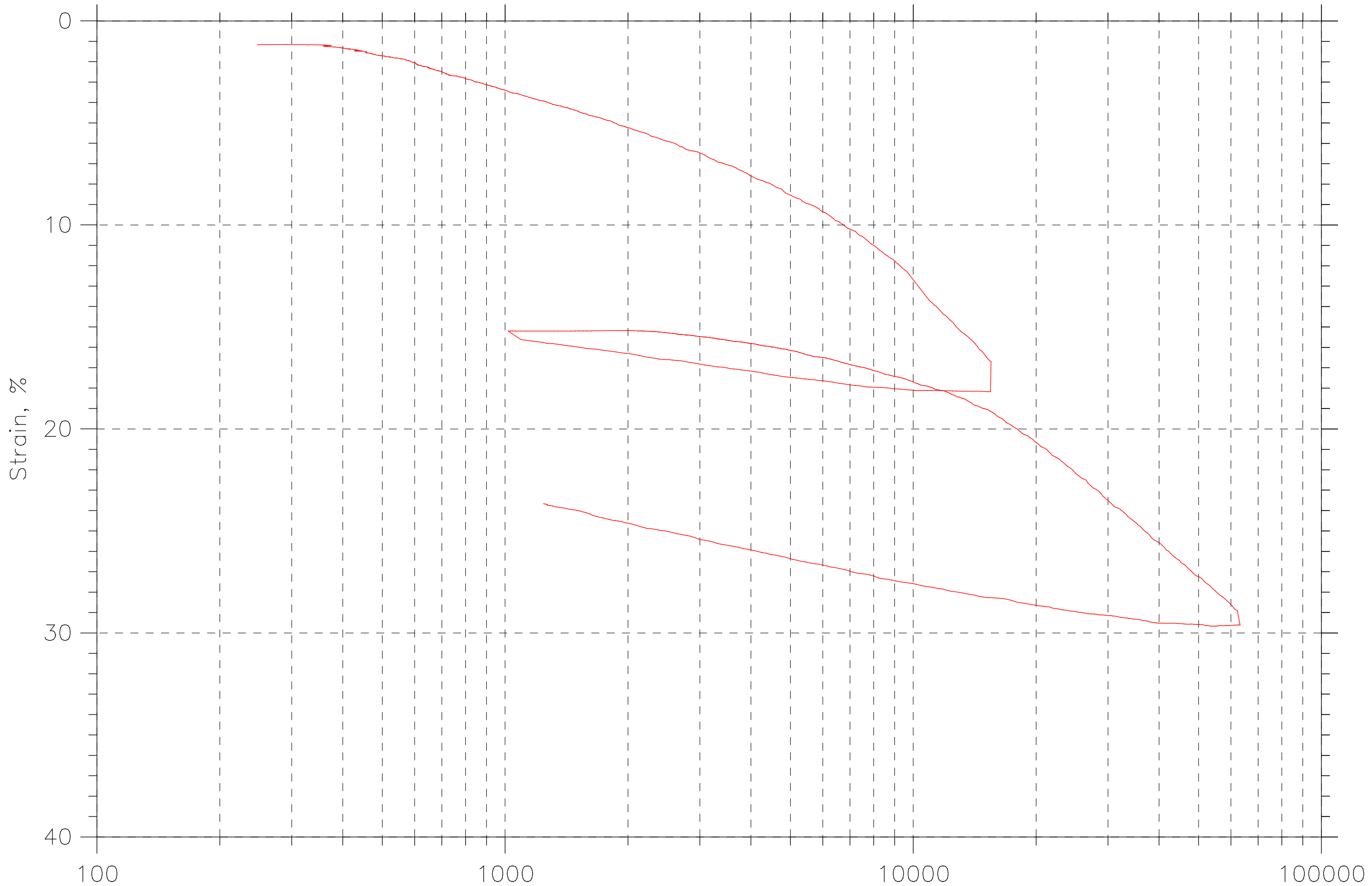
	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	16196	RING		a1070
Wt. Container + Wet Soil, gm	186.99	246.76	229.91	126.58
Wt. Container + Dry Soil, gm	129.28	198.52	198.52	95.870
Wt. Container, gm	8.3800	109.80	109.80	9.0900
Wt. Dry Soil, gm	120.90	88.715	88.715	86.780
Water Content, %	47.73	54.38	35.39	35.39
Void Ratio	---	1.50	0.976	---
Degree of Saturation, %	---	99.91	100.00	---
Dry Unit Weight, pcf	---	68.850	87.152	---

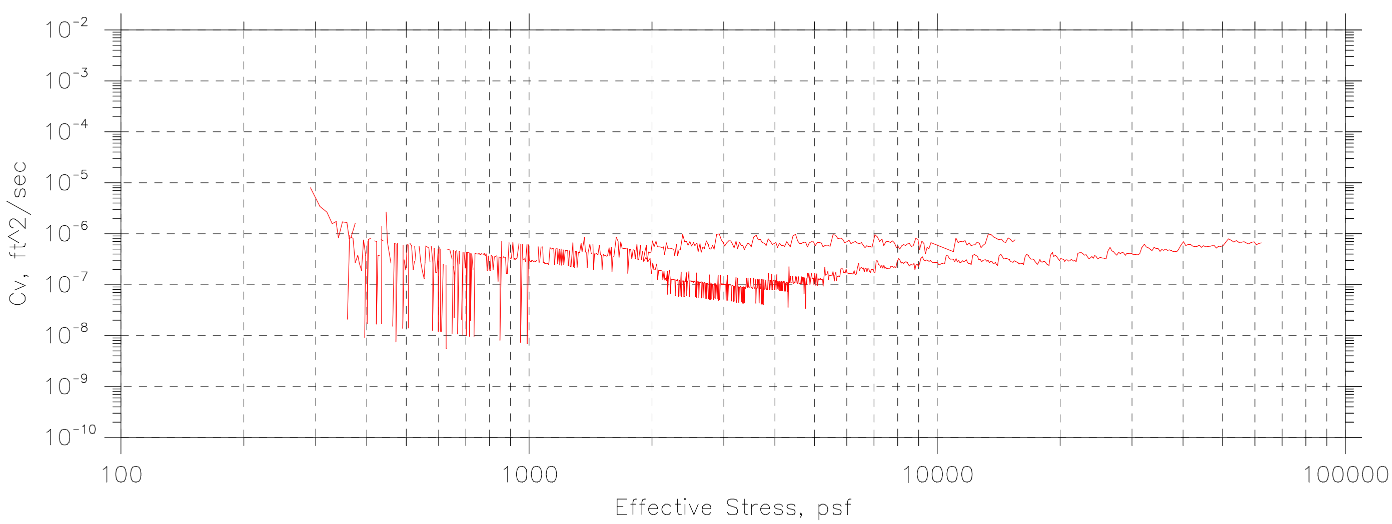
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-2	Test Date: 06/06/16	Depth: 53-55 ft
Test No.: CRC-2	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System O		
		Page 1 of 3

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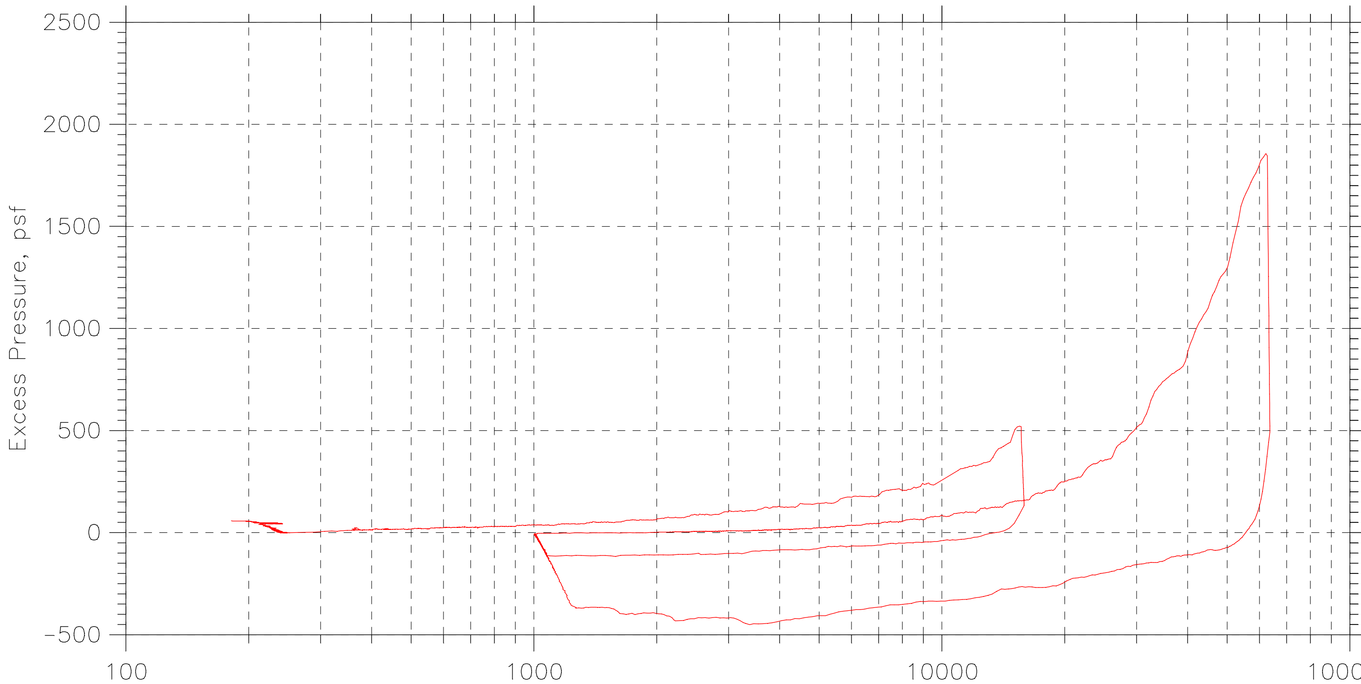
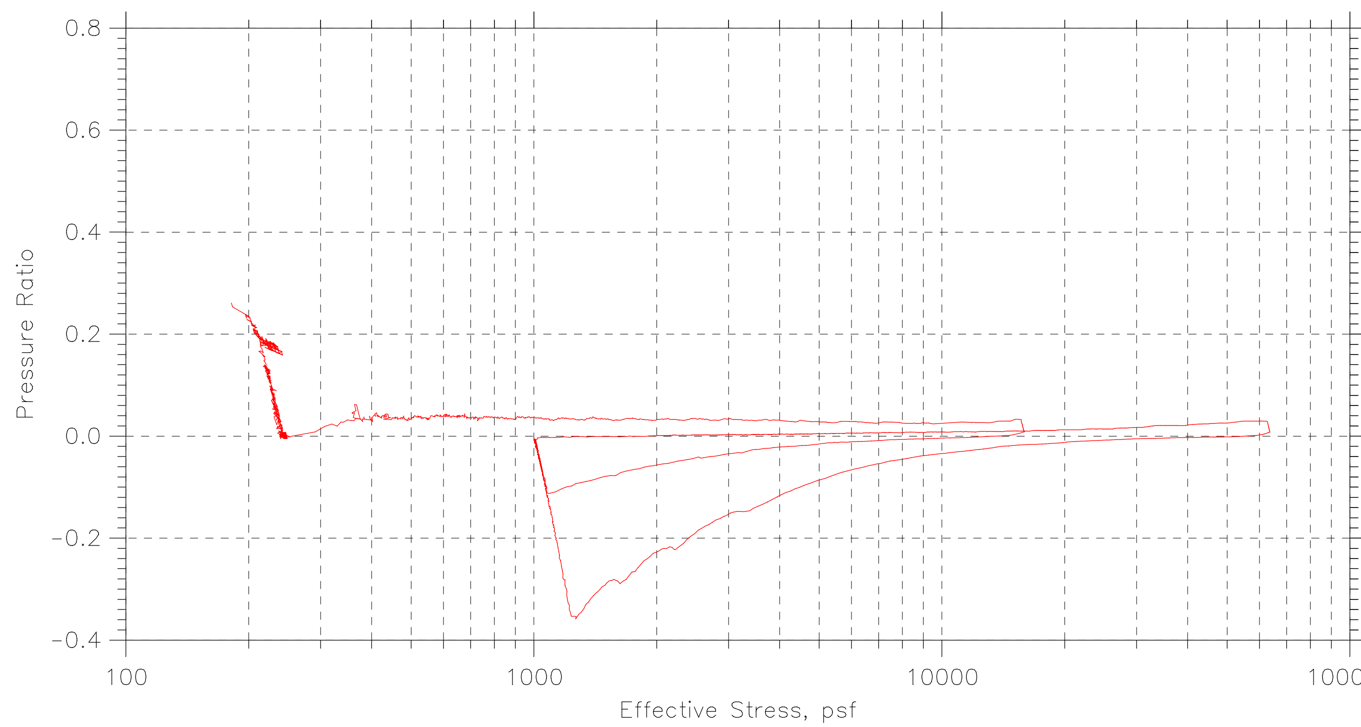
GeoTesting EXPRESS

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-2	Test Date: 06/06/16	Depth: 53-55 ft
Test No.: CRC-2	Sample Type: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System O		
		Page 2 of 3

Tue, 12-JUL-2016 12:22:38

GeoTesting EXPRESS

CRC TEST DATA

Project: Reconstruction of Exit	Location: Hartford, CT	Project No.: GTX-304831
Boring No.: S6043-1	Tested By: md	Checked By: njh
Sample No.: UP-2	Test Date: 06/06/16	Depth: 53-55 ft
Test No.: CRC-2	Sample Type: intact	Elevation: ---

Soil Description: Moist, greenish gray clay
Remarks: System O

Estimated Specific Gravity: 2.84	Liquid Limit: 51	Specimen Diameter: 2.50 in
Initial Void Ratio: 1.63	Plastic Limit: 26	Initial Height: 1.00 in
Final Void Ratio: 1.10	Plasticity Index: 25	Final Height: 0.80 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	B-613	RING		16776
Wt. Container + Wet Soil, gm	381.11	246.12	230.24	130.15
Wt. Container + Dry Soil, gm	251.42	196.53	196.53	96.240
Wt. Container, gm	7.9400	109.52	109.52	8.7100
Wt. Dry Soil, gm	243.48	87.011	87.011	87.530
Water Content, %	53.27	56.99	38.74	38.74
Void Ratio	---	1.63	1.10	---
Degree of Saturation, %	---	99.58	100.00	---
Dry Unit Weight, pcf	---	67.528	84.410	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

Client:	Freeman Companies, LLC		
Project:	Reconstruction of Exit Charter Oak Bridge		
Location:	Hartford, CT	Project No:	GTX-304831

Boring ID:	---	Sample Type:	---	Tested By:	daa
Sample ID:	---	Test Date:	06/27/16	Checked By:	jsc
Depth :	---	Test Id:	381989		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
S1-12	C1	112.5-113 ft	165	10981	3	No	1,*
S1466-1	C2	49.5-50 ft	160	8511	3	Yes	---
S2-1	C2	98.5-99 ft	164	7103	3	Yes	---
S480-1	C2	54.5-55 ft	164	8063	3	No	1,*
S6043-1	C2	184-184.5 ft	164	10588	3	No	1,*

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.

All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

1: Best effort end preparation. See Tolerance report for details.
2: The as-received core did not meet the ASTM side straightness tolerance due to irregularities in the sample as cored.
3: Specimen L/D < 2.
4: The as-received core did not meet the ASTM minimum diameter tolerance of 1.875 inches.
5: Specimen diameter is less than 10 times maximum particle size.
6: Specimen diameter is less than 6 times maximum particle size.

*Because the indicated tested specimens did not meet the ASTM D4543 standard tolerances, the results reported here may differ from those for a test specimen within tolerances.

GeoTesting EXPRESS

Client:	Freeman Companies, LLC	Test Date:	6/24/2016
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S6043-1		
Sample ID:	C2		
Depth:	184-184.5 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.24	4.25	4.25
Specimen Diameter, in:	1.99	1.99	1.99
Specimen Mass, g:	569.78		
Bulk Density, lb/ft^3	164	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.1	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00400	0.00360	0.00240	0.00210	0.00130	0.00020	0.00000	0.00000	-0.00030	-0.00060	-0.00080	-0.00120	-0.00180	-0.00220	-0.00260
Diameter 2, in (rotated 90^o)	-0.00090	-0.00100	-0.00090	-0.00070	-0.00070	-0.00060	-0.00040	0.00000	0.00020	0.00060	0.00130	0.00160	0.00210	0.00220	0.00230

Difference between max and min readings, in:

0° = 0.00660 90° = 0.00330

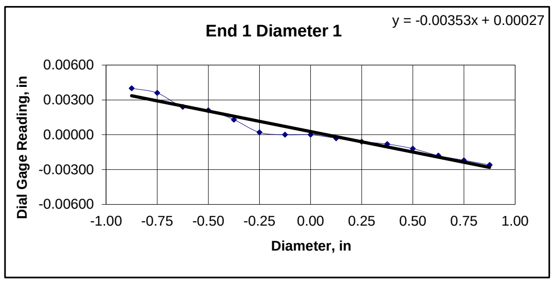
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00450	0.00430	0.00340	0.00260	0.00170	0.00080	0.00020	0.00000	-0.00030	-0.00100	-0.00120	-0.00230	-0.00410	-0.00410	-0.00410
Diameter 2, in (rotated 90^o)	0.00120	0.00110	0.00080	0.00050	0.00030	0.00030	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

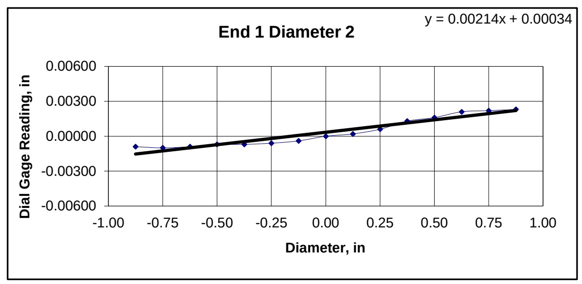
Difference between max and min readings, in:

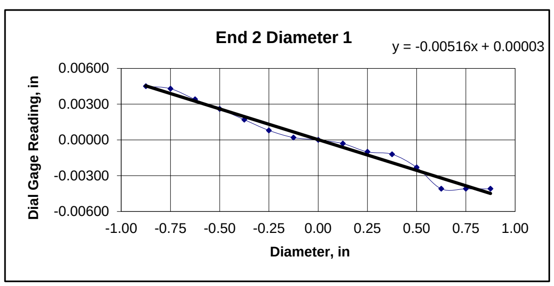
0° = 0.0086 90° = 0.0012

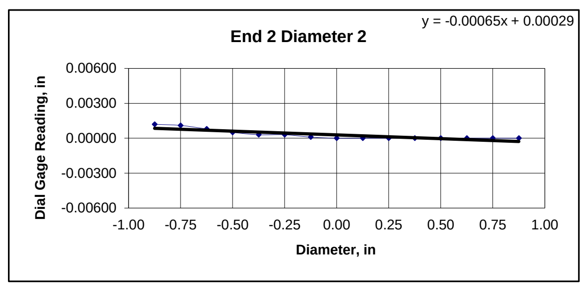
Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00430

Flatness Tolerance Met? NO









DIAMETER 1

End 1:

Slope of Best Fit Line	0.00353
Angle of Best Fit Line:	0.20225

End 2:

Slope of Best Fit Line	0.00516
Angle of Best Fit Line:	0.29564

Maximum Angular Difference: 0.09339

Parallelism Tolerance Met? NO

Spherically Seated

DIAMETER 2

End 1:

Slope of Best Fit Line	0.00214
Angle of Best Fit Line:	0.12261

End 2:

Slope of Best Fit Line	0.00065
Angle of Best Fit Line:	0.03724

Maximum Angular Difference: 0.08537

Parallelism Tolerance Met? NO

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00660	1.990	0.00332	0.190	YES
Diameter 2, in (rotated 90^o)	0.00330	1.990	0.00166	0.095	YES
END 2					
Diameter 1, in	0.00860	1.990	0.00432	0.248	YES
Diameter 2, in (rotated 90^o)	0.00120	1.990	0.00060	0.035	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? YES

Client:	Freeman Companies, LLC	Test Date:	06/24/16
Project Name:	Reconstruction of Exit Charter Oak Bridge	Tested By:	rlc
Project Location:	Hartford, CT	Checked By:	jsc
GTX #:	304831		
Boring ID:	S6043-1	Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	C2		
Depth:	184-184.5		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90^o)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Freeman Companies, LLC
Project Name:	Reconstruction of Exit Charter Oak Bridge
Project Location:	Hartford, CT
GTX #:	304831
Test Date:	6/27/2016
Tested By:	daa
Checked By:	jsc
Boring ID:	S6043-1
Sample ID:	C2
Depth, ft:	184-184.5

After cutting and grinding

After break

APPENDIX D

DRAFT SPECIAL PROVISIONS

ITEM #0702081A- BITUMINOUS COATING FOR STEELPILES

Description: Work under this item shall consist of furnishing and applying bituminous coating to steel piles. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This work shall also include field applied touch ups to coating damaged during shipping and handling.

Materials: Provide bituminous coating for all piles. Bituminous coating shall consist of canal liner bituminous in accordance with ASTM D 2521. It shall have a softening point of 190°F to 200°F a penetration of 56 to 61 at 77°F and a ductility in excess of 1.38 in. at 77°F. Primer shall be in accordance with AASHTO M 116.

Construction Methods:

A. All surfaces to be coated with bituminous shall be dry and thoroughly cleaned of dust and loose materials.
B. Primer or bituminous shall not be applied in wet weather, nor when the ambient temperature is below 65°F.
C. Application of the prime coat shall be with a brush or other approved means and in a manner which thoroughly coats the surface of the piling with a continuous film of primer. The primer shall have set thoroughly before the bituminous coating is applied. The bituminous shall be heated to 300°F and applied at a temperature between 200° and 300°F by means of one or more mop coats or other approved means.
D. The average coating thickness shall be 1/16".
E. Whitewashing of the coating may be required during hot weather as directed to prevent running or sagging of the asphalt coating prior to driving of the pile.
F. Bituminous coated piles shall be protected from sunlight or heat immediately after the coating is applied.
G. The bituminous coating shall not be exposed to damage or contamination during storage, hauling, or handling. Once the bituminous coating has been applied, dragging the piles on the ground or the use of cable wraps around the piles during handling will not be permitted. Pad eyes, or other suitable devices, shall be attached to the piles to be used for lifting and handling.
H. Where Field splices are required the bituminous coating shall be removed in the splice area. After completing the field splice, the splice area shall be brush coated or mop coated with a minimum of one coat of bituminous material as directed.

Method of Measurement: Bituminous coating will be measured per linear foot of pile coated.

Basis of Payment: Payment shall be made at the contract unit price per linear foot of pile coated. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete

ITEM #0702109A- PRE-AUGERING OF PILES

ITEM #0702111A- DRIVING STEEL PILES

Work under this item shall conform to the requirements of Section 7.02 of Form 817 as replaced by the special provision for Section 7.02 in this contract, amended as follows:

7.02.01- Description: Add the following:

Work under this Item includes pre-augering for piles as indicated on the Plans or as ordered by the Engineer.

7.02.03.2(a) - Construction Methods - Pile Driving Equipment - Hammers: Replace the second paragraph with the following:

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for hammers used shall be 26,000-foot pounds (35,000 joules) for driving steel piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

7.02.03.2(7) - Construction Methods - Pile Driving Equipment - Pre-Augering: Add the following:

The following apply when pre-auguring is done for piles with bituminous and epoxy coating:

The pre-augered hole is to continue to the top of the clay layer or to the depths shown on the plans or as directed by the Engineer. The pre-augered hole diameter shall be at least the diagonal dimension of the pile, or as directed by the Engineer. All obstructions which could interfere with the driving of piles within the depth of pre-augering are to be removed as part of the pre-auguring work.

The Contractor shall provide temporary casing to maintain the pre-augured dimension of the hole. Upon completion of pile driving, the annulus between the pile and outer hole diameter shall be filled with clean sand and any temporary casing will be removed.

7.02.05.11 - Basis of Payment - Pre-Augering of Piles: Add the following:

This work shall also include obstruction removal, casing, and sand backfill

ITEM #0207150A - LIGHTWEIGHT FILL

Description: Work shall consist of furnishing and placing lightweight fill in the formation of embankments or as backfill in front of and behind structures. This work shall be performed as hereinafter specified, to the dimensions indicated on the plans, or as directed by the Engineer. This item shall also consist of furnishing and placing crushed stone or gravel in burlap bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.

Materials: Lightweight fill shall be a rotary kiln expanded shale aggregate meeting the requirements of ASTM C 330. No by-product slags, cinders or by-products of coal combustion shall be permitted. The aggregate shall consist of tough, durable, non-corrosive particles with the following gradation:

Square Mesh Sieve	Percent Passing by Weight
1 inch	100
¾ inch	90 - 100
3/8 inch	10 - 50
No. 4	0 - 15

The dry loose unit weight shall be less than 50 pounds per cubic feet (pcf). The lightweight aggregate supplier shall submit verification of an in-place compacted total unit weight (by methods defined in AASHTO T99) of less than 65 pcf. For purposes of this specification, the total unit weight is defined as the maximum dry density multiplied by one plus the moisture content (as a decimal). For example, if the maximum dry density is 45 pcf and the moisture content is 9%, the total unit weight is 49 pcf.

The maximum soundness loss when tested with 5 cycles of magnesium sulfate shall be 10 percent (ASTM C 88). The maximum Los Angeles Abrasion loss when tested in accordance with ASTM C 131 (B grading) shall be 40 percent.

The lightweight aggregate producer shall submit verification that the angle of internal friction is equal to or greater than 40 degrees when measured in a triaxial compression test on a laboratory sample with a minimum diameter of 250mm.

The materials for bagged stone shall conform to the following requirements: the crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both; the bag shall be of burlap and shall be large enough to contain one cubic foot of loosely packed granular material.

Construction Methods: When applicable and except where noted below, lightweight fill placement shall conform to the requirements of Sections 2.02.03 and 2.16.03 of the Standard Specifications, Form 817.

The lightweight fill shall be placed in layers of a thickness of 1.5 ft to a maximum of 2.0 ft. Each layer shall be compacted by the use of self-propelled vibratory compaction equipment with static mass (weight) less than 6,600 lbs. The minimum number of passes shall be two (2) and the maximum four (4). The actual lift thickness and exact number of passes shall be determined by the Engineer depending on the type of compaction equipment. The contractor shall take all necessary precautions during construction activities in operations on or adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for compaction, shall not be operated on the exposed lightweight fill.

Where weep holes are installed within the limits of the lightweight fill, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the lightweight fill material into the weep hole. Approximately one cubic foot of crushed stone or gravel shall be enclosed in each of the burlap bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time lightweight fill material is placed around them and bags which are broken or burst prior to or during the placing of the lightweight fill material shall be replaced at the expense of the contractor.

Method of Measurement: Lightweight fill shall be measured in place after compaction, including allowances for settlement. There shall be no direct payment for bagged stone, but the cost thereof shall be considered as included in the cost of the work for "Lightweight Fill".

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Lightweight Fill", complete in place, which price shall include all materials, transportation, tools, equipment and labor incidental thereto.

Pay Item	Pay Unit
Lightweight Fill	c.y.