Geotechnical Engineering Structure Report
Structure Layout for Design (SL for D) Submission

Work Authorization No. 27
Utility Relocations at Flatbush Ave.
42-in Water Main

Connecticut DOT Project No. 155-H025
West Hartford/Hartford, Connecticut

Prepared for:

URS Corporation
500 Enterprise Drive
Suite 3B
Rocky Hill, CT 06067

Prepared by:

Geo**Design**, Inc.
984 Southford Road
Middlebury, CT 06762

July 30, 2010

STATE OF CONNECTICUT
ULRICH F. LA FOSSE
No. 14435
LICENSED
PROFESSIONAL ENGINEER

Table of Contents

1.0 GENERAL INFORMATION 1
- 1.1 General 1
- 1.2 Datum 1
- 1.3 Existing Conditions 1
- 1.4 Design Criteria 2
- 1.5 Proposed 42-inch Water Main 2
- 1.6 Proposed Approach Embankments 2

2.0 GEOLOGICAL SETTING 3

3.0 PREVIOUS GEOTECHNICAL INFORMATION 3
- 3.1 Previous Subsurface Data 3
- 3.2 Previous Laboratory Test Data 4

4.0 SUPPLEMENTAL EXPLORATIONS and LABORATORY TESTING 4
- 4.1 Test Borings 4
- 4.2 Observation Wells 4
- 4.3 Sieve Analyses 5

5.0 SUBSURFACE CONDITIONS 5
- 5.1 Subsurface Profile 5
- 5.2 Groundwater 6

6.0 EVALUATION AND RECOMMENDATIONS 7
- 6.1 General 7
- 6.2 Settlements 42-inch Water Main 7
- 6.3 42-inch Main Bedding Recommendations 8
- 6.4 Pipe Jacking 8
- 6.5 Empty Pipe Buoyancy 8

7.0 CONSTRUCTION CONSIDERATIONS 9
- 7.1 Pipe Jacking and Temporary Earth Support 9
  - 7.2.1 Jacking/Receiving Pit Design and Temporary Earth Support Parameters 9
  - 7.2.2 Vibration Monitoring 10
  - 7.3.3 Monitoring of Utilities 10
- 7.2 Dewatering 10
- 7.3 Material Requirements 10
- 7.4 Reuse of Excavated Material 10
- 7.5 Empty Pipe Buoyancy 11

8.0 LIMITATIONS 11

Appendices

Appendix 1 **Figures**

Appendix 2 **Supplemental Boring Logs**

Appendix 3 **Supplemental Laboratory Testing**

Appendix 4 **Previous Boring Logs**

Appendix 5 **Selected Previous Laboratory Data**

Appendix 6 **American Ductile Iron Pipe Cut Sheet**

Appendix 7 **Limitations**

1.0 GENERAL INFORMATION

1.1 General

This report summarizes geotechnical findings and recommendations for the relocation of Flatbush Avenue Water Main. This work is part of Busway Project No. 155-H025. This report describes the subsurface exploration program, inferred subsurface conditions, and geotechnical analyses along with geotechnical engineering discussions and recommendations for utility support and pipe jacking beneath existing Amtrak railroad tracks. The project area is depicted on the site map shown on Figure 1 (Appendix 1).

The 155-H025 section of the Busway includes the redesign of Flatbush Avenue from about Flatbush Station 12+00 to about Flatbush Station 23+00 and includes portions of New Park and Newfield Avenues in Hartford, Connecticut. This redesign consists of changing the Flatbush Avenue railroad crossing from an at-grade crossing to an grade separated crossing. The project also requires the relocation and replacement of two MDC water mains, which will be combined into one new 42-inch water main. The proposed 42-inch main location is as shown on Figure 2 (Appendix 1). The existing water mains will remain in service until installation of the new 42-inch main is complete, which will occur before any construction for Flatbush Avenue begins.

Flatbush Avenue embankment construction will result in the consolidation of clayey soils that underlay the project vicinity, including the proposed 42-inch main. A primary objective of this study was to evaluate the magnitude of these consolidation settlements and their effect on the newly installed water main.

URS Corporation is the Prime Designer for this section of the Busway. Geo**Design**, Inc. (Geo**Design**) is the Geotechnical Subconsultant to URS.

1.2 Datum

All elevations referenced in this report are in feet and are based on NGVD 1929. The coordinates are based on Connecticut Coordinate System, NAD 1983.

1.3 Existing Conditions

Flatbush Ave. (east-west direction) intersects the proposed Busway alignment and Amtrak rail lines (north-south direction) at a 70-degree skew angle between intersections of New Park Ave./Flatbush Ave. and the Newfield Ave./Flatbush Ave, as depicted on Figure 1.

Flatbush Ave. currently intersects the two Amtrak railroad tracks at an at-grade crossing. The existing grade gradually slopes downward from Elev. 76 to Elev. 60 from west to east.

Existing utilities, including water, gas and sewer, exist under and/or near Flatbush and Newfield Avenues. Since these utilities will be affected by proposed embankment fill up to 26 feet in height, they will only remain in service until relocated utilities are installed.

1.4 Design Criteria

Recommendations are based on State of Connecticut Department of Transportation (ConnDOT) Standard Specifications for Roads, Bridges, and Incidental Construction, Form 816 (2004); and ConnDOT Geotechnical Engineering Manual, 2005 Edition. American Society for Testing and Materials (ASTM) publications were followed as the reference standards for applicable field and laboratory tests. We have also consulted "Design of Ductile Iron Pipe" by the Ductile Iron Pipe Research Association (DIPRA).

1.5 Proposed 42-inch Water Main

A 42-inch diameter ductile iron water transmission main with flexible joints (up to 2-degrees) will be installed to replace two existing water mains (12-inch and 30-inch) currently located beneath the existing Flatbush Avenue. The portion of main discussed herein begins at about Water Main Station 11+00 (or Flatbush Station 12+00) and extends to the southeast, running parallel to the proposed Flatbush alignment at about an 80 foot offset to the south, and ends at about Water Main Station 24+00 (or Flatbush Station 23+00). Unless otherwise stated, stationing sited in the remainder of this report will be in reference to the Water Main Stationing.

The main will extend under the existing Amtrak railroad tracks through a 60-inch steel casing pipe. The 60-inch casing will be jacked from the west side of the tracks at approximate Station 14+75, and received on the east side of the tracks at approximate Station 16+25. We understand that the joints of the 60-inch casing will be welded (i.e. ridged). We further understand that the annulus will be filled with sand and allowed to fill with groundwater. The 60-inch pipe invert in the jacking pit is proposed at Elev. 57.5, and the pipe invert in the receiving pit is proposed at Elev. 57. Stainless steel pipe spacers will guide the 42-inch main within the center of the 60 inch casing pipe.

The main will also extend under Newfield Avenue where a 60-inch steel casing pipe will be installed by trenching between approximate Stations 18+50 and 19+40. We understand the joints of the 60-inch casing will be welded and that the annulus will be filled with sand and allowed to fill with groundwater. The 60-inch pipe invert at about Station 18+50 is about Elev. 57.0 and at about Station 19+40 is about Elev. 56.5. Stainless steel pipe spacers will guide the 42-inch main within the center of the 60 inch casing pipe.

We understand that four 3,500-pound valves are associated with the main. Two valves are located at the beginning and end of the section discussed herein, and two valves are located at each of the jacking pits. We further understand that a full flowing pipe will weigh approximately 1,000 lbs per linear foot, restrained joints will be used rather than thrust blocks to resist thrust forces at pipe bends, and pipe cover typically ranges from 7 to 9 feet over the top of proposed pipe.

1.6 Proposed Approach Embankments

To accommodate the grade changes required by the new railroad crossing, approach fills will be constructed along the Flatbush Ave. alignment. The fill will extend under portions of Newfield

and New Park Avenues. Due to the presence of varved clay with delayed settlements, these fills will impact the proposed 42-inch main. The embankment loading will impose stress on the underlying clays up to a distance of about 150 feet from the edge of the greatest fills.

Proposed fill thickness are about 1 to 2 feet at the intersection of Newpark and Flatbush Avenues; 17 and 26 feet west and east of railroad tracks, respectively; and 15 feet at the intersection of Newfield and Flatbush Avenues. Embankments will be retained by retaining walls.

2.0 GEOLOGICAL SETTING

Published geologic data and Geo**Design**'s experience in the site vicinity indicates that the subsurface profile is dominated by a thick (on the order of 100 feet) stratum of Glaciolacustrine Deposits (silt and clay sediments) that were deposited in Glacial Lake Hitchcock following the last great continental glaciation about fifteen thousand (15,000) years ago. These sediments were deposited above relatively thin layers of various Glaciofluvial (meltwater) deposits and Glacial Till materials deposited directly from glacial ice which, overlie sedimentary Bedrock of the Portland Arkose Formation. Surficial materials overlying the Glaciolacustrine Deposits consist of geologically recent Alluvial deposits from present day streams under artificially placed miscellaneous fill materials to the surface.

As is typical for Glacial Lake sediments, glaciolacustrine deposit in the region features thin alternating layers of clay and silt. A pair of a clayey and silty layer is called a "varve", and corresponds to an annual deposit of sediments. During the summer, the lake waters were more turbulent and the colloidal clay particles remained in suspension and did not settle out to the lake bottom. With lesser meltwater inflow and a frozen lake surface in the winter, the lake waters were less turbulent and the clay particles were able to settle out of suspension. The Glaciolacustrine Deposits in the site vicinity contain literally hundreds of these successive annual varves. Although the deposits contain significant amounts of Silt, the literature typically refers to the Glaciolacustrine deposit in this area as Varved Clay. Conforming to tradition, the term "Varved Clay" will be used in this report.

3.0 PREVIOUS GEOTECHNICAL INFORMATION

During the preliminary design phase for the Busway (in 2003) and final design (in 2008) several borings and laboratory tests were performed in the vicinity of the proposed water main.

3.1 Previous Subsurface Data

Pilot Borings SB-56 and SB-57 were drilled to depths of 112 and 117 feet, respectively in 2003. These pilot borings were located a distance of about 200 feet south of the proposed main at approximate southbound Busway Station 348+00. In 2008, fifteen Busway final design borings were drilled to depths of 17 to 145 feet, within up to a distance of about 70 feet of the proposed main. Previous boring logs are presented in Appendix 4 and discussed below in Section 6.0 of this report.

3.2 Previous Laboratory Test Data

Laboratory testing was performed on soil and/or rock samples retrieved from the nearby existing boring locations for the Busway Final Design. Testing included: Moisture Contents, Atterberg Limits, Sieve Analyses, Hydrometer Analyses, Incremental Load Consolidation Tests, Direct Simple Shear Tests, Triaxial Tests, and Corrosivity Tests. Selected lab data are included in Appendix 5.

Detailed discussion of these tests and interpretations may be found in Geo**Design**'s previously submitted "Final Geotechnical Engineering Structure Report, Final Plans For Review (FPFR) Submission, Flatbush Ave. over Busway, State Project 63-643", dated December 23, 2009.

The following Varved Clay parameters were adopted for this study from the analyses performed for Flatbush Ave:

- Unit Weight: 105 pcf
- Saturated Unit Weight: 108 pcf
- Modified Recompression Index, Cre: 0.04
- Modifield Compression Index, Cce: 0.4
- Over Consolidation Ratio, OCR: 4.2

4.0 SUPPLEMENTAL EXPLORATIONS and LABORATORY TESTING

Geo**Design** conducted additional subsurface explorations in critical locations along the proposed water main alignment as part of this study. Details of these explorations are described in this section.

4.1 Test Borings

In September of 2009, Geo**Design** coordinated the services of New England Boring Contractors of CT, Inc. (NEBC) to perform Standard Penetration Test (SPT, ASTM D1586) borings at the site. Four 22-foot and one 139.5-foot deep borings were performed in locations of proposed pipe bends; and two 42-foot deep borings were performed at proposed pipe jacking pit locations. Borings are designated B-1 through B-6. Boring locations were located by Connecticut Department of Transportation (ConnDOT) survey crews and are shown on Figure 2 (Appendix 1). Ground surface elevations were estimated from topography shown on Figure 2. Logs are included in Appendix 2.

4.2 Observation Wells

Observation wells were installed in Borings B-2, B-3, and B-6. The well installation information is shown on the boring logs (Appendix 2). Stabilized groundwater well readings are indicated on their respective boring logs. To confirm accurate water levels, wells were purged and allowed to recharge two to three days following well installations.

4.3 Sieve Analyses

In May of 2010, four sieve analyses were performed by Geo**Design** on fill samples from 3 to 9 feet deep. Samples were retrieved from Borings B-2 and B-3, in each of the proposed jacking pit locations. These analyses were performed to confirm field classifications, obtain design parameters to be used for jacking pits, and determine suitability for soil reuse. Test results indicate 56 to 98 percent silt and clay sized particles (material passing the No. 200 sieve.) Test results are attached in Appendix 3.

5.0 SUBSURFACE CONDITIONS

5.1 Subsurface Profile

The subsurface profile along the proposed 42-inch main alignment is shown on Figure Nos. 3 through 5 (Appendix 1). These profiles depict the generalized subsurface conditions based on the pre-existing and recent subsurface exploration data. The legend for the subsurface profiles is included as Figure No. 6.

The profile along the proposed 42-inch main depicts a fairly consistent Varved Clay layer with partial desiccation of the upper portion of this layer. The soil and rock profile can be summarized as follows:

- **Top Soil/Asphalt** - 0 to 0.5 foot thick;
- **Fill -** 0 to 18 feet thick;
- **Silt/Fine Sand (Alluvium Deposit)-** 0 to 9 feet thick;
- **Varved Clay (Glaciolacustrine Deposit)**- 85 to 95 feet thick;
- **Silt/Fine Sand (Glaciofluvial Deposit)** - 23 to 33 feet thick;
- **Glacial Till**- 10 to 15 feet thick;
- **Bedrock (Siltstone/Shale).**

Fill

The **Fill** consists of very loose to very dense, poorly graded (fine to coarse) Sand, trace to some Silt, with (where present) some fine to coarse Gravel, little Asphalt fragments, trace Ash, trace Cinders, trace Brick/Concrete fragments, and/or trace Organic Fibers.

Most of the soil samples indicate that the Fill layer is medium dense, poorly graded and widespread. Only one out of twenty-three borings (RW-2) showed no indication of Fill in the samples. Densities in Boring B-1, from 7 to 17 feet were very loose, with SPT N-Values of 1 and 2.

Silt/Fine Sand

Consistent with the nature of alluvial deposits, the **Silt/Fine Sand** layer is erratic through the area of the proposed 42-inch water main. It is present in fifteen out of twenty-three borings. The layer typically consisted of loose to dense Silt and/or fine Sand.

Varved Clay

The **Varved Clay** layer was encountered in all borings except R-102 and B-1, which were not extend deep enough to penetrate the layer. The top and bottom eight to fifteen feet of this layer consisted of stiff to very stiff Clay and Silt. The stiffness decreases toward the middle of the layer (about 20 to 100 feet deep), where the SPT "N" values typically range from Weight of Rod (WOR) or Weight of Hammer (WOH) to 2, indicating a very soft consistency within this zone of the deposit.

Glaciofluvial Deposit

The **Silt/Fine Sand (Glaciofluvial Deposit)** was encountered underling the Varved Clay in most borings that fully penetrated the Varved Clay layer. This stratum consists of medium dense to very dense fine Sand and/or Silt and with a thickness of up to 25 feet.

Glacial Till

Glacial Till was encountered in all borings that fully penetrated the Silt/Fine sand layer. Its thickness varies from eight to fifteen feet. SPT "N" values indicate the density of this layer is very dense.

Decomposed Bedrock

Decomposed Bedrock, where present, was encountered below the Glacial Till. This very dense layer was found to be up to about five feet thick.

Bedrock

Bedrock (Siltstone and Shale) was encountered between depths of 130 and 140 feet below the existing ground surface to approximate Elev. -65. Rock cores were obtained in Borings B-4, SB-01-01, and SB-01-03. Rock Quality Designation (RQD) values were 41, 7, and 58, respectively, indicating very poor to fair quality.

5.2 Groundwater

In 2008, stabilized water readings were obtained in observation wells in previous Borings SB-01-3 and RW-2. In 2009 and 2010, stabilized readings were made in observation wells in supplemental Borings B-2, B-3, and B-6. Groundwater observations are as provided in the following table. Groundwater conditions will vary depending on factors such as temperature,

season, precipitation, construction activity and other conditions, which may be different from those at the time of these readings.

Boring	Oct 2008		Sept 2009		July 2010	
	Elev. (ft)	Feet Below Grade	Elev. (ft)	Feet Below Grade	Elev. (ft)	Feet Below Grade
B-2-OW	-	-	70.5	4.5	70.3	4.7
B-3-OW	-	-	68.6	1.4	67.3	2.7
B-6-OW	-	-	53.5	6.5	54.0	6.0
SB-01-3	2.3	67.3	-	-	67.3	2.5
RW-2	4.2	705	-	-	70.4	4.3

6.0 EVALUATION AND RECOMMENDATIONS

6.1 General

Our analysis and recommendations are based on our understanding that American Ductile Iron Pipe with Flex-Ring Joints as manufactured by the American Cast Iron Pipe Company will be used along the proposed 42-inch main (cut sheet provided in Appendix 6). These joints allow up to 2-degrees of movement at joints between the typical 20 ft long pipe segments. Exception to this spacing is where valves will be rigidly attached to adjoining 20 foot lengths of pipe. Our analyses and recommendations are also based on a full pipe weighing 1,000 pounds per linear foot of pipe with valves weighing 3,500 pounds each.

6.2 Settlements 42-inch Water Main

Based on Varved Clay properties used in our previous Flatbush Ave. analyses and using the RocScience software package SETTLE 3D, total settlements (immediate and delayed consolidation settlements) were predicted along the 42-inch main. Settlements are due to Flatbush embankment loading over thick compressible Varved Clays, as well as the weight of the water main and its components (full flow and valves). Predicted settlements, depicted on Figures 6 and 7 (Appendix 1), include settlement created by the embankment fill stresses and the weight of the fully filled water main. On these figures, Fill areas are shown by blue hatching, and total settlements are shown by a color key and in rectangular boxes. On Figure 6, the values shown in blue indicate maximum values along a query line, and values in red indicate minimum values along a query line. Figure 7 shows the estimated settlements under Newfield Avenue. These predicted settlements include pipe settlement that occurs before the embankments are fully constructed.

The greatest settlements will occur around Newfield Avenue as depicted on Figure 7. The predicted settlements will be gradual (forming a shallow dish-shaped pattern) with the maximum occurring under the center of Newfield Avenue and then gradually decreasing with distance away from Newfield Avenue. We estimate a maximum settlement of 3.5 inches, and maximum differential settlement of about 0.68 inches over 9 feet; this is equivalent to 0.08-in/ft or 0.36

degrees. Therefore, use of Flex-Ring Joints for the 42-inch main with maximum joint movement of 2-degrees can readily accommodate the predicted differential settlement.

The impact of the Newfield Avenue Settlements on the 60-inch welded steel pipe casing is expected to be insignificant. Whether the 60-inch pipe acts as a flexible unit (following the settlement of the clay), or as a rigid unit (spanning the settlement of the clay), we estimate differential settlements will result in joint movement less than the predicted maximum of 0.36 degrees as discussed above.

We estimate consolidation settlements will be essentially complete after approximately 16 months.

6.3 42-inch Main Bedding Recommendations

Based on the boring data, it appears that the trench for the 42-inch main will "bottom out" in the upper partially desiccated portion of the Varved Clay stratum. For the expected depth of cover over the pipe (7 to 9 feet) and the in consideration of the expected trench conditions, a Type 5 "Laying Condition" per ANSI/AWWA C600, *"Standard for Installation of Ductile Iron Water Mains and Their Appurtenances,"* should be provided. Requirements for a Type 5 Laying Condition are that the pipe is bedded to its centerline in compacted granular material with a minimum of 4 inches compacted granular material below the pipe. Backfill above the centerline is to be compacted granular or select material to the top of the pipe. The compaction requirement is at least 90 percent of maximum dry density as determined by AASHTO T-99 ("Standard Proctor").

Material meeting ConnDOT Standard Specifications for Granular Fill – Grading "C" (Article M.02.06 of Form 816) is recommended as "granular material" for pipe bedding and backfill.

6.4 Pipe Jacking

Based on the soil conditions at the proposed jacking and receiving pit locations (Borings B-2 and B-3), we anticipate pipe jacking of the 60-inch steel casing pipe to occur below the Fill Stratum, within the Silt/Fine Sand and Varved Clay strata. Borings did not encounter cobbles, boulders, or SPT N-values that indicate potentially difficult jacking conditions.

Refer to Section 8.1 herein under Construction Considerations for recommendations on temporary earth support systems required to construct the jacking and receiving pits.

6.5 Empty Pipe Buoyancy

An empty 42-inch Pressure Class 350 Flex-Ring pipe with a standard cement lining immersed in water will produce an upward pressure of 359 lbs/LF. At minimum, a 7 foot cover of soil is anticipated over the 42-inch main, which will provide at least twice the downward pressure to resist the uplift pressure of an empty pipe submerged in groundwater.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Pipe Jacking and Temporary Earth Support

Due to the silty nature of the soils to be jacked through, set or freeze of the pipe could occur if operations are stopped for a period of time. To limit set from occurring, lubricants, oversized jacks, and/or continuous jacking should be used.

Although borings do not indicate cobbles or boulders, the contractor should prepare a plan on how to work around potential obstructions, if encountered.

The jacking and receiving pits (Stations 14+75 and 16+25) will require temporary lateral support, since the side walls are normally cut vertical to conserve space. The jacking pits should be large enough to accommodate jacking backstop and equipment, with minimal working room on each side of the jacking equipment.

The contractor should submit a pipe jacking plan prepared by a Connecticut license professional Engineer.

7.2.1 Jacking/Receiving Pit Design and Temporary Earth Support Parameters

We recommend the contractor utilize the following parameters for pit design:

Soil Type/Strata/Depth*	Drained/Undrained		Drained		
	Unit Weight (pcf)	OCR	Phi	Ka	Kp
Silt/Fine Sand 0 to 10 feet deep	110	n/a	32	0.31	3.25
Varved Clay (Drained Desiccated Zone) 10 to 20 feet deep	115	4	30	0.33	3.0
Varved Clay (Drained Soft Zone) 20+ feet deep	110	2	28	0.36	2.76

*soil depths are approximate

For undrained conditions, we recommend the following SHANSEP equation be used to determine undrained shear strength, where OCR equals the values provided in the preceding table and $\sigma'vo$ represents the effective stress at a given depth: $Su = 0.15 * (OCR)^{1.0} * (\sigma'vo)$.

Observed groundwater at Boring B-2-OW (Station 14+60) was about Elev. 70.5 feet, and at Boring B-3-OW (Station 16+60) was about Elev. 69 feet. Therefore, jacking and receiving pits, which extend to Elev. 57 and 56, respectively, will be up to 13 feet below observed groundwater

levels. Groundwater will need to be kept below bottom of the pits throughout pipe jacking. Refer to Section 7.4 for discussion on buoyancy of an empty pipe under groundwater levels.

Contractor means and methods for dewatering outside of the pit, improving the soil materials in the reaction zone, or designing the temporary earth support (sheeting) to bear some of the jacking loads may provide greater reaction forces.

7.2.2 Vibration Monitoring

Vibrations caused from sheeting installation may impact the RR tracks. We recommend the contractor be required to develop means and methods in accordance with Amtrak requirements, and that the RR tracks be monitored for vibrations and settlement.

7.3.3 Monitoring of Utilities

We recommend that monitoring points be established on the 42-inch main at approximately 50 to 75-foot intervals, using steel rods and steel pipe installed to the crown of the buried utility. The monitoring points should be monitored using survey equipment during construction.

7.2 Dewatering

On average, groundwater was observed about 10 feet above bottom of pipe elevations and will therefore be encountered during pipe installation. We recommend the contractor take extra precaution to dewater in areas where bottom of pipe bedding is over the Varved Clay. We recommend non-woven filter fabric be placed over the Varved Clay and under the Granular Fill to reduce disturbance of the Varved Clay stratum when water is present. If the Varved Clay stratum is disturbed, the disturbed portions must be removed and replaced with 1-in (minus) Crushed Stone over filter fabric.

7.3 Material Requirements

We recommend the following material and fill compaction specifications for this project:

Granular Fill: for use as pipe bedding and backfill. Material should be consistent with Form 816 Section M.02.06 for Grading C.

Crushed Stone: for use where dewatering for pipe placement is difficult. Stone should be consistent with Form 816 Section M.01.01 for 1-inch (minus) Crushed Stone.

The excavation and granular fill placement should be monitored and documented in the field by a qualified geotechnical engineer or his/her representative.

7.4 Reuse of Excavated Material

Excavated materials are not expected to be suitable for reuse as Granular Fill. Topsoil and subsoil may be stockpiled and reused to dress proposed slopes.

Existing fill is a possible corrosion concern and should not be reused in areas in contact with the pipe. Outside of about 24-inch from the pipe, existing fill that is free of deleterious materials may be reused as trench backfill (ConnDOT Form 816 Section 10.01). Form 816 does not indicate an acceptable percentage of fines, however, soils which contain more than about 25 to 30 percent Silt will be difficult to place and compact. Visual classifications and gradation testing indicates that the top 10 feet of soil mostly contains at least 50-percent Silt.

7.5 Empty Pipe Buoyancy

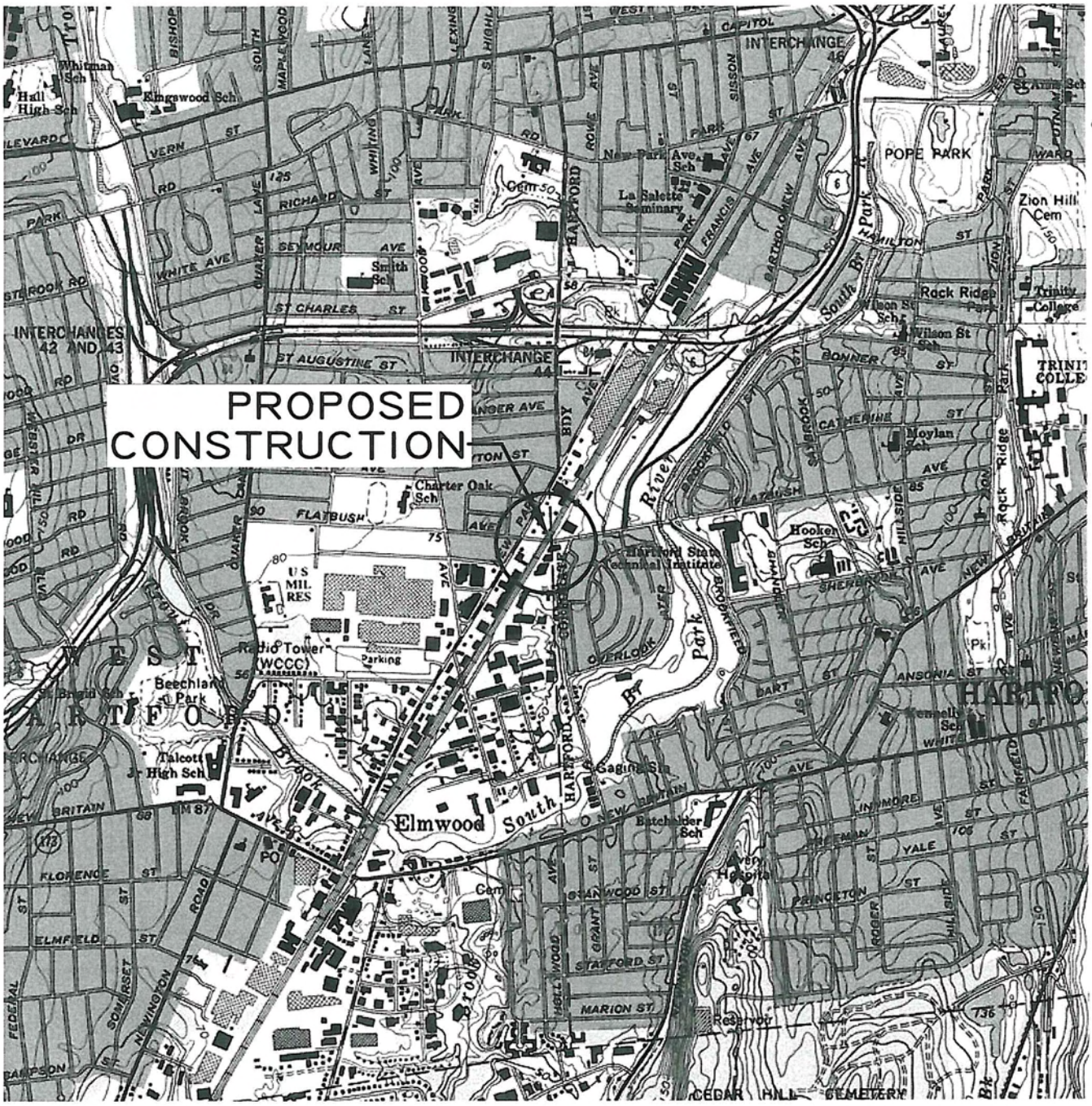
In order to resist uplift pressures, the ground water levels must be kept below the bottom of the installed 42-inch main until at least 5 feet of cover is placed, or the main is filled with water.

8.0 LIMITATIONS

This report is subject to the limitations attached in Appendix 7.

Appendix 1

Figures



GEODESIGN INCORPORATED

GEOTECHNICAL ENGINEERS • ENVIRONMENTAL CONSULTANTS
984 SOUTHFORD ROAD • MIDDLEBURY CONNECTICUT 06762
TELEPHONE: (203)758-8836 FACSIMILE: (203)758-8842

DRAWN BY: SMC | REVIEWED BY: CZ

CONNECTICUT

QUADRANGLE LOCATION

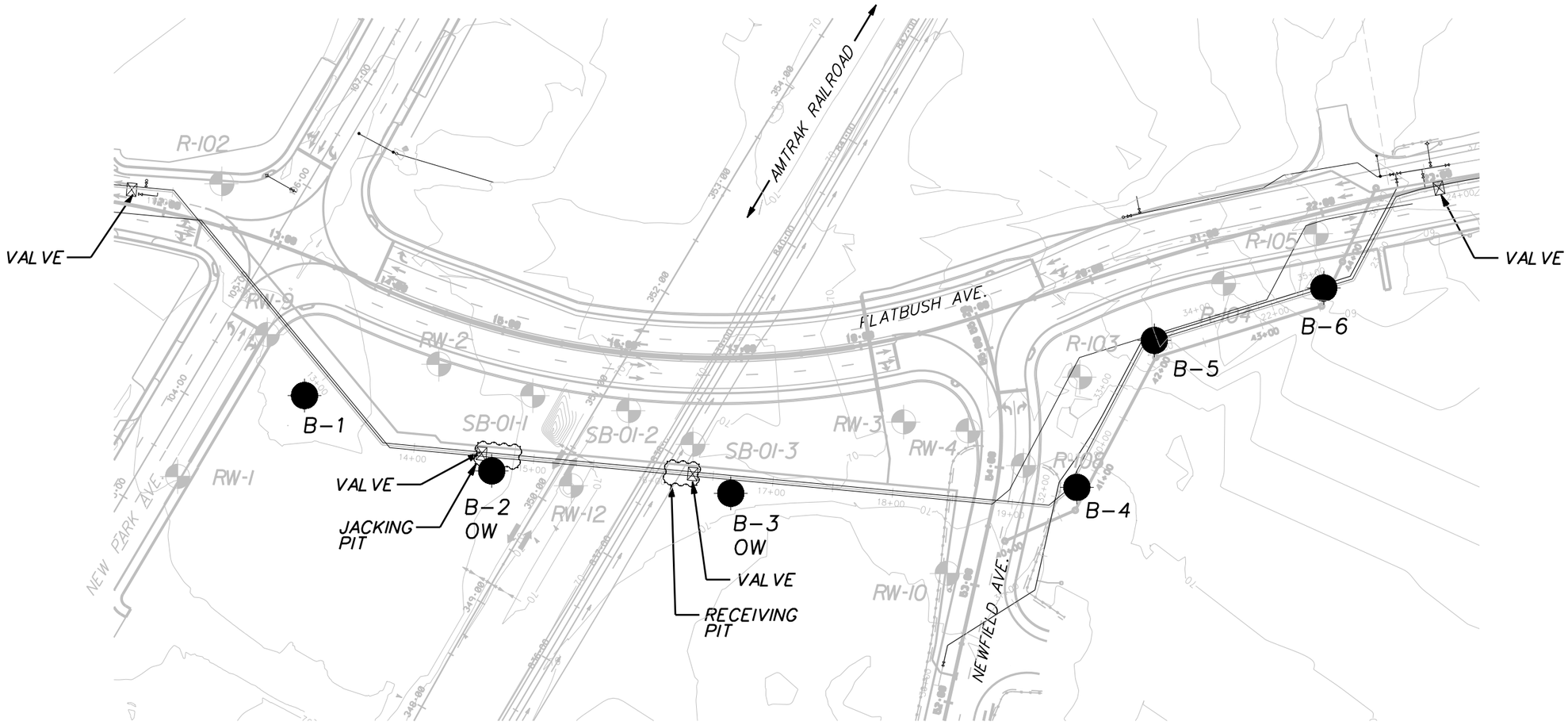
PROJECT LOCATION PLAN
FLATBUSH AVENUE OVER BUSWAY
NEW BRITAIN-HARTFORD BUSWAY
STATE PROJECT NO. 155-H025

REFERENCE:
U.S.G.S. 7.5 MINUTE QUADRANGLE: HARTFORD, CT.
Figure was created using TOPO! 2003 software

SCALE IN FEET
0 1000 2000 4000

PROJECT NO. 380-04.1
DATE: 10-28-08
FIGURE NO. 1

ACAD FILE No. M:\CIL\380\04\FD_REPORTS\STRUCTURES\STRUCTURE1 - FLATBUSH OVER BUSWAY\Area Map - Flatbush over Busway.dwg



LEGEND

B-	2009 TEST BORING
SB-01- R- RW-	2008 TEST BORING
SB-	PILOT BORING

NOTES:
1) BASE MAP PROVIDED BY URS.
2) SEE FIGURES NO. 3 THROUGH 7 FOR PROFILES.

DESIGNED BY CZ							
DRAWN BY SMC							
CHECKED BY ULF							
APPROVED BY ULF		NO.	DATE		DRWN.	CHKD	APPVD
		REVISIONS					

BORINGS LOCATED BY CT DOT SURVEY.

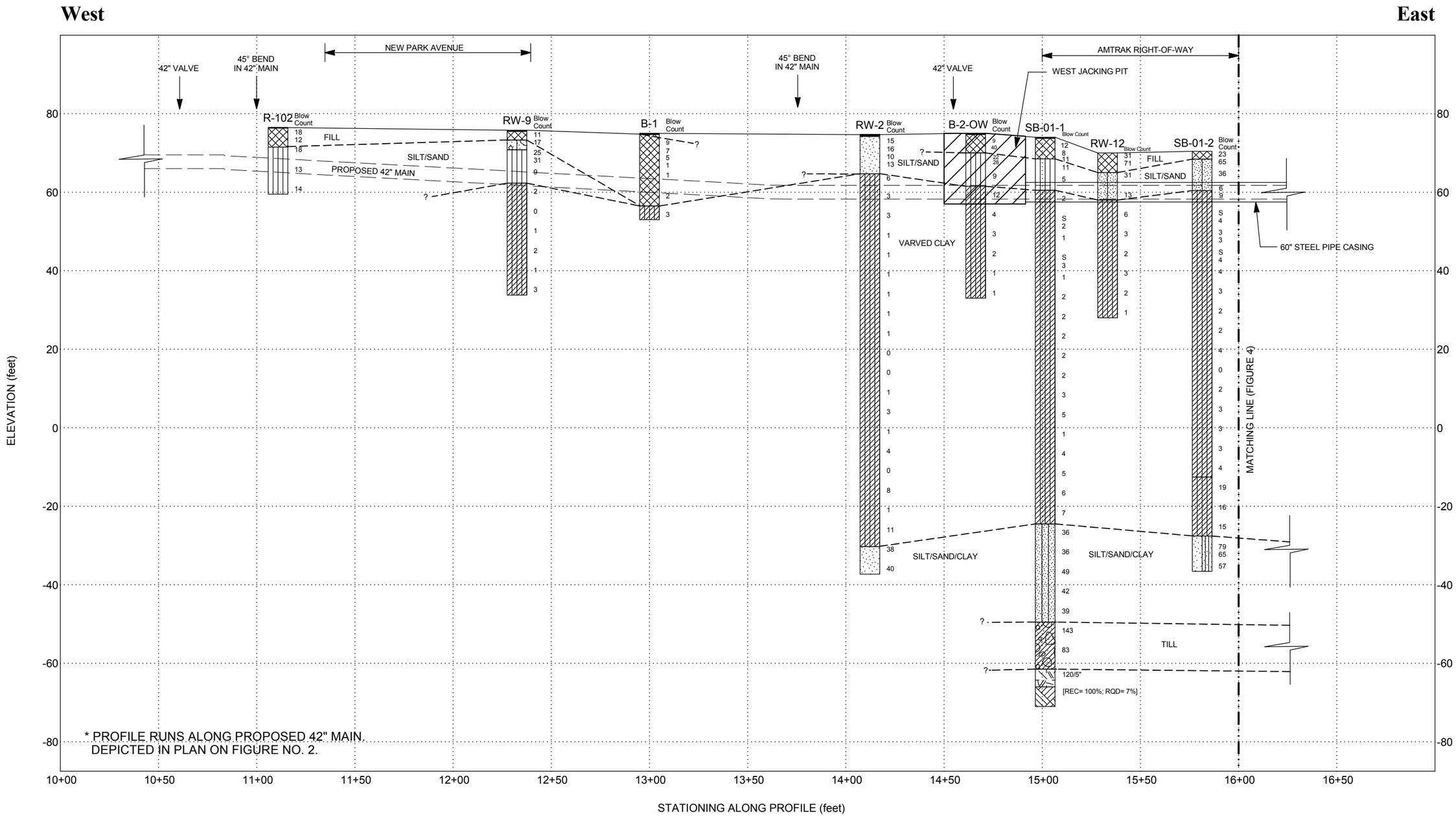
PRIME DESIGNER:
URS Corporation
500 Enterprise Dr.
Suite 3B
Rocky Hill, Ct.

GEODESIGN INCORPORATED
GEOTECHNICAL ENGINEERS · ENVIRONMENTAL CONSULTANTS
984 SOUTHFORD ROAD · MIDDLEBURY CONNECTICUT 06762
TELEPHONE: (203)758-8836 FACSIMILE: (203)758-8842

DWG. TITLE
FLATBUSH AVE. OVER BUSWAY
AS-DRILLED EXPLORATION
LOCATION PLAN

PROJECT
NEW BRITAIN – HARTFORD BUSWAY
STATE PROJECT NO. 155-H025

FILE NO. 380-04
SCALE 1" = 100'
DATE 7/13/10
FIGURE NO. 2



GEODESIGN INCORPORATED
Geotechnical | Construction | Environmental
Engineers & Scientists
984 Southford Road - Middlebury, Connecticut 06762
Telephone: 203.758.8836 Fax: 203.758.8842

0 50
Horizontal Scale (feet)
Vertical Exaggeration: 2x

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values and PID readings corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.
4. Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector. The Meter was calibrated relative to a benzene in air standard. N.D. = None Detected.

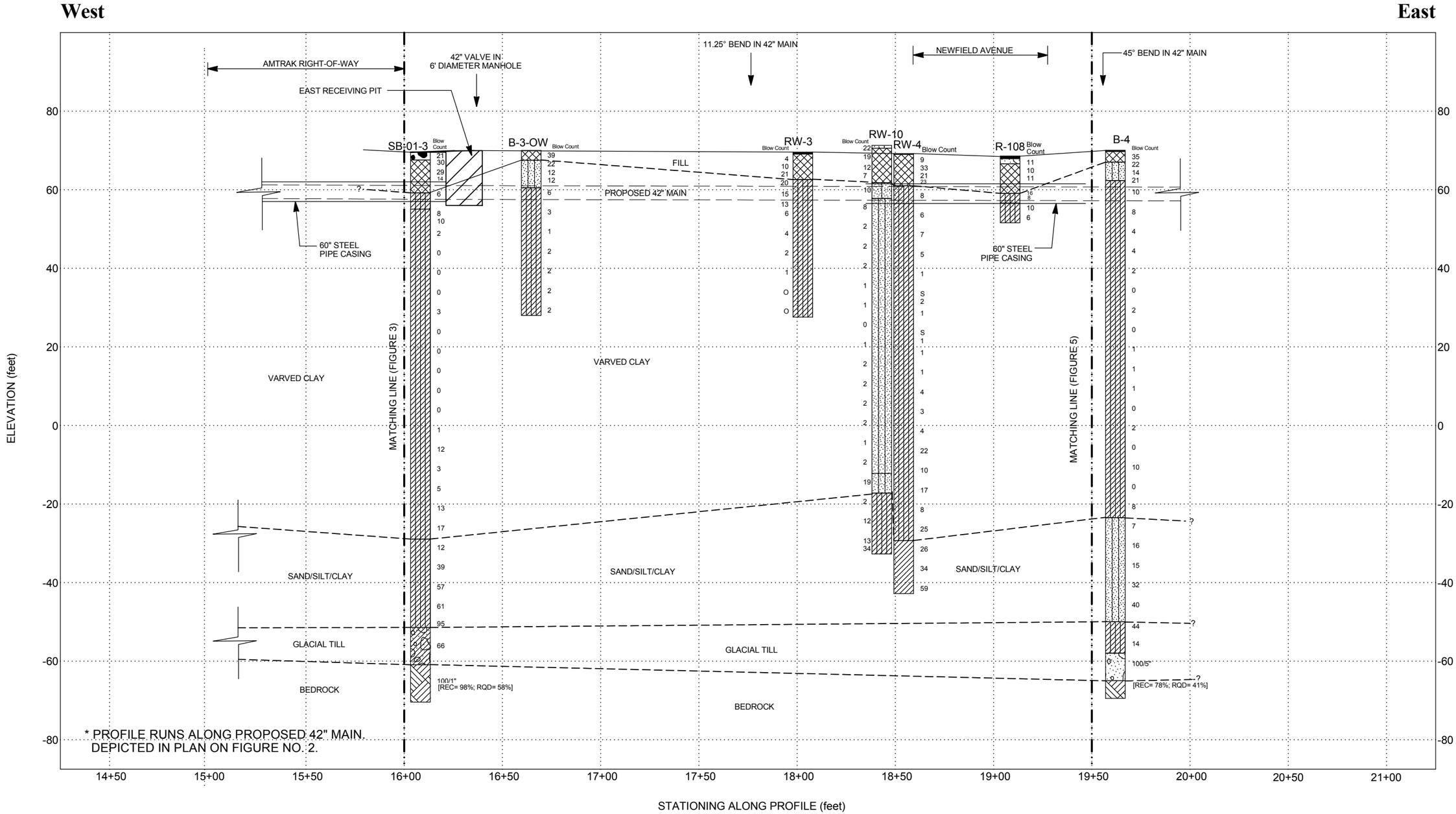
Date: 7/6/2010 | Drawn By: DSF | Reviewed By: MGB

SUBSURFACE PROFILE
Along 42-inch Water Main

Flatbush Avenue Water Main

File No.: 0380-004.01 | Figure No.: 3

GEO STANDARD PID 11 X 17 (2/25/04) COMBINED WITH OLDER BORINGS 2010 - 9-10-09 CT DOT FORMAT.GPJ FBNWNL01.GDT 7/2/10



GEODESIGN INCORPORATED
Geotechnical | Construction | Environmental
Engineers & Scientists
984 Southford Road - Middlebury, Connecticut 06762
Telephone: 203.758.8836 Fax: 203.758.8842

0 50
Horizontal Scale (feet)
Vertical Exaggeration: 2x

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values and PID readings corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.
4. Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector. The Meter was calibrated relative to a benzene in air standard. N.D. = None Detected.

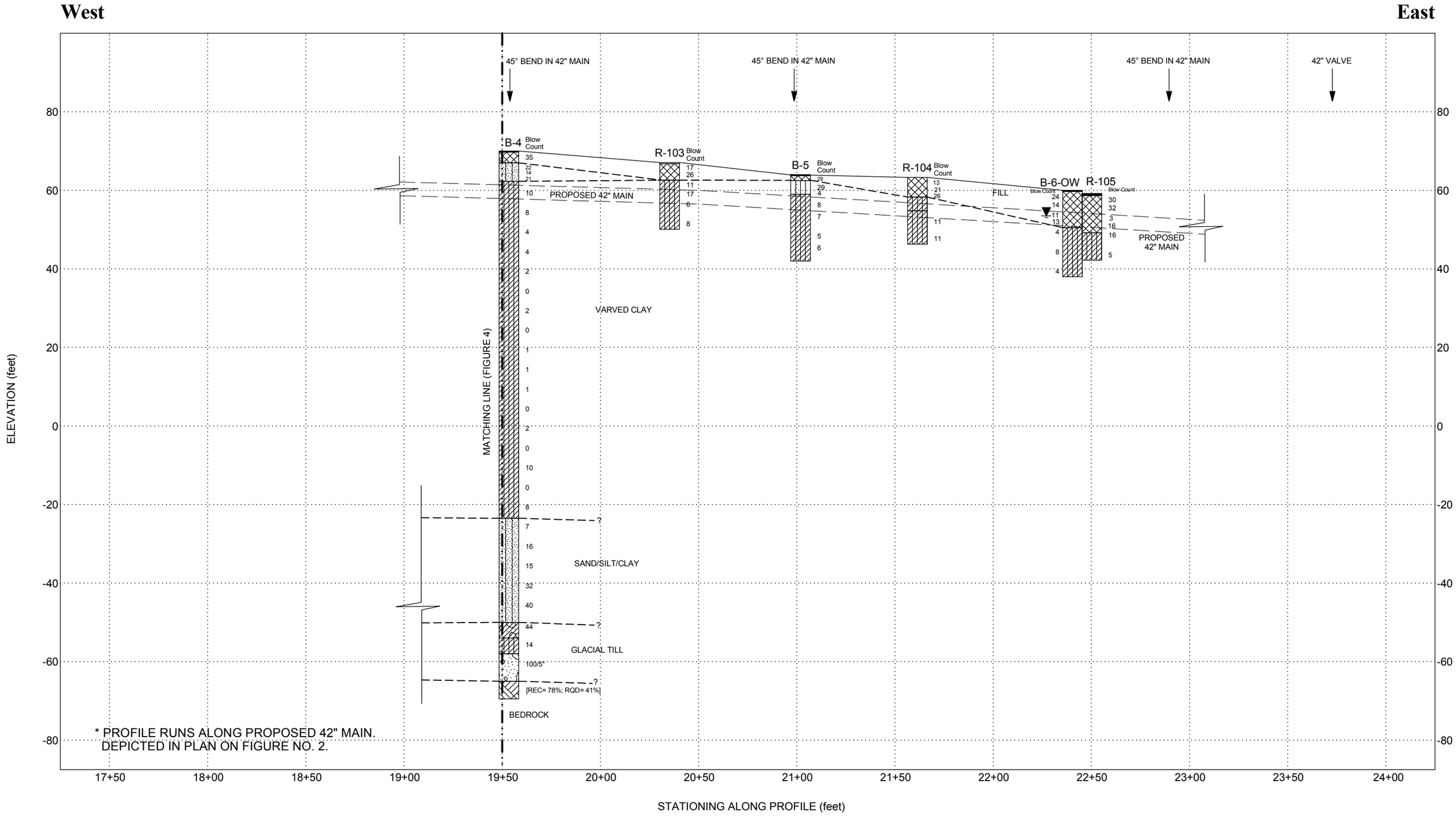
Date: 7/6/2010 | Drawn By: DSF | Reviewed By: MGB

SUBSURFACE PROFILE Along 42-inch Water Main

Flatbush Avenue Water Main

File No.: 0380-004.01 | Figure No.: 4

GEO STANDARD PID 11 X 17 (2/25/04) COMBINED WITH OLDER BORINGS 2010 - 9-10-09 CT DOT FORMAT.GPJ FBNWNL01.GDT 7/1/10



GEO STANDARD PID 11 X 17 (2/25/04) COMBINED WITH OLDER BORINGS 2010 - 9-10-09 CT DOT FORMAT.GPJ FBNWNL01.GDT 7/6/10

GEODESIGN INCORPORATED
Geotechnical | Construction | Environmental
Engineers & Scientists
984 Southford Road - Middlebury, Connecticut 06762
Telephone: 203.758.8836 Fax: 203.758.8842

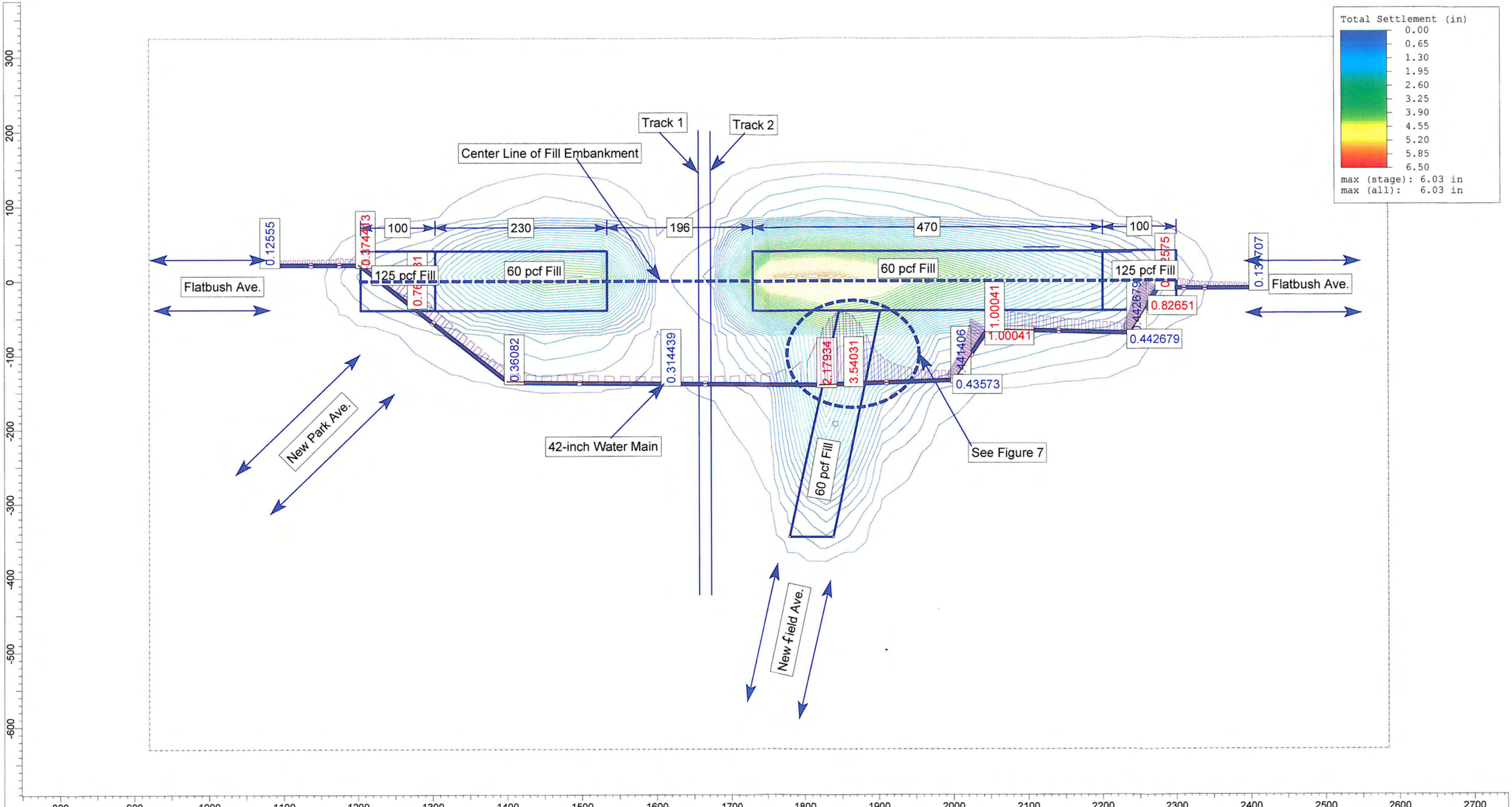
0 50
Horizontal Scale (feet)
Vertical Exaggeration: 2x

Notes:
1. Data concerning the various strata have been interpreted at boring locations only. The stratigraphy between borings may vary from that shown.
2. Refer to plan view for subsurface profile location. For strata details and symbol legend, see Subsurface Profile Legend and boring logs appended to this report.
3. Numbers displayed beside boring(s) represent SPT "N" values and PID readings corresponding to their respective sampling interval. Where coring was performed, numbers represent Recovery and RQD values.
4. Soil Samples screened in the field using a Thermal Environmental Systems Model 580S Photoionization Detector. The Meter was calibrated relative to a benzene in air standard. N.D. = None Detected.

SUBSURFACE PROFILE
Along 42-inch Water Main

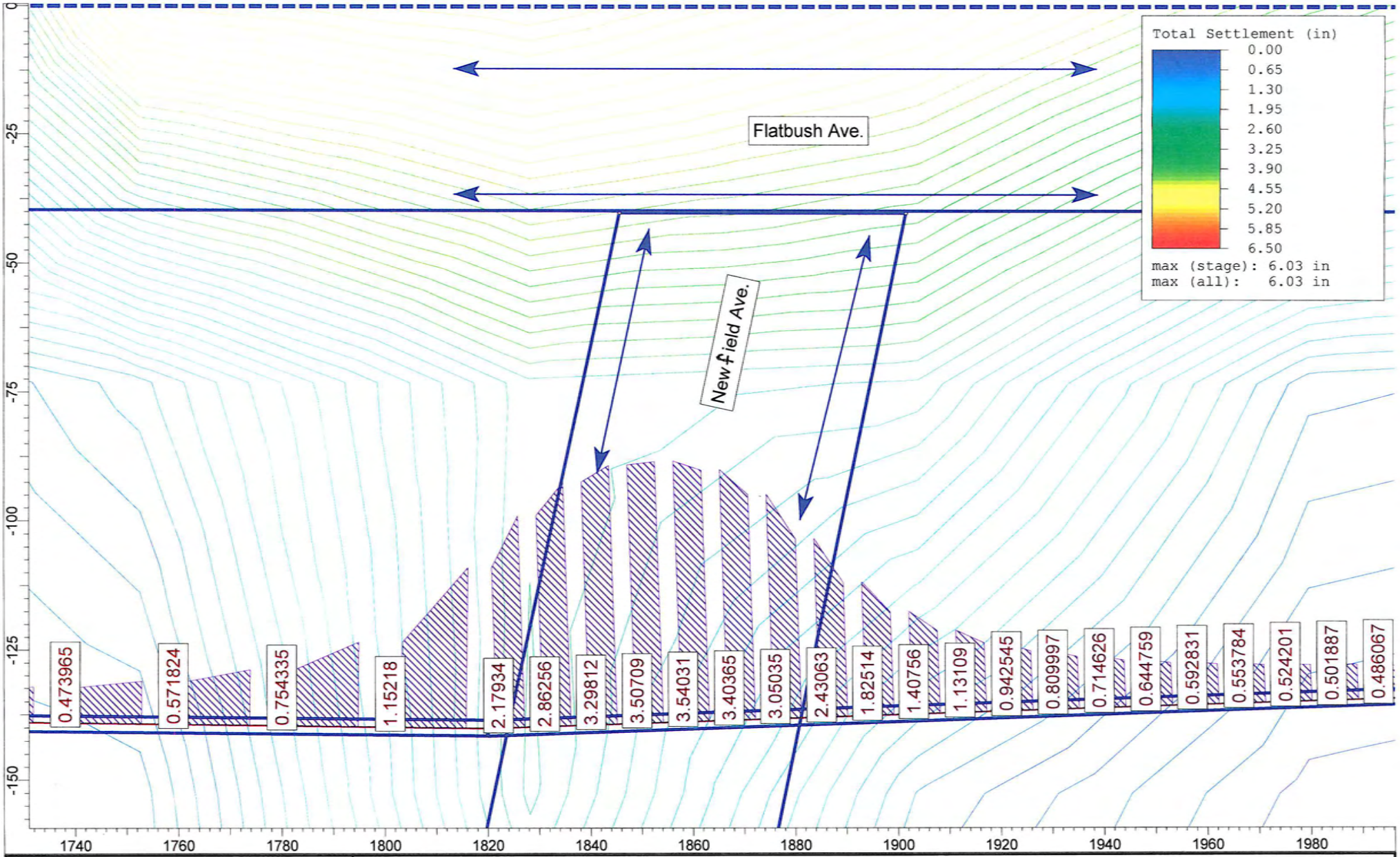
Flatbush Avenue Water Main

Date: 7/6/2010	Drawn By: DSF	Reviewed By: MGB	File No.: 0380-004.01	Figure No.: 5



Project	Flatbush Ave. Water Main		Figure 6
Analysis Description	Settlement		
Drawn By	Daniel LaMesa	Company	GeoDesign, Inc.
Date	7/12/2010	File Name	42 inch main at Flatbush Revised 7-12-10.s3z

SETTLE3D 1.013



rocscience	Project: Flatbush Ave. Water Main at Newfield Ave.		Figure 7
	Analysis Description: Settlement		
	Drawn By: Daniel LaMesa	Company: GeoDesign, Inc.	
SETTLE3D 1.013	Date: 7/12/2010	File Name: 42 inch main at Flatbush Revised 7-12-10 Figure 7.s3z	

Appendix 2

Supplemental Boring Logs

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-1
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-9-09	Route No.:	Northing: 831066.42
Finish Date: 9-9-09	Bridge No.:	Easting: 1009053.27
		Surface Elevation: 75.0

Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @7 ft. after 0 hours, @6.8 ft after 0.5 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	3" Asphalt over base course	75
						Fill		
	S-1	7 6 3 2	24	6			Loose, brown fine to coarse SAND, little fine to coarse Gravel, little Silt, (dry)	
	S-2	6 5 2 5	24	0			Loose, no recovery	
5								70
	S-3	4 2 3 3	24	5			Loose, brown fine to coarse SAND, some (-) fine Gravel, little Silt, little Brick fragments, trace Organics, (moist)	
	S-4	2 1 0 0	24	2			Very loose, brown fine to coarse SAND, some(-) fine Gravel, little (+) Silt, trace Brick fragments	
10								65
	S-5	1 0 1 0	24	3			Very loose, dark brown fine to medium SAND, some fine to coarse Gravel, some Silt, trace Organic fibers	
15								60
	S-6	1 1 1 1	24	6			Very loose, brown fine to medium SAND, some Silt, trace fine Gravel, trace Silty Clay	
						Varved Clay & Silt		
20								55
	S-7	2 1 2 3	24	10			Soft, gray SILT and CLAY, trace (-) fine Gravel	
							END OF BORING 22ft	
25								50
30								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: 22ft Rock: 0ft	NOTES: 1) Boring advanced with augers to end of exploration.	Sheet 1 of 1
No. of Soil Samples: 7 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-2-OW
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-8-09	Route No.:	Northing: 831003.74
Finish Date: 9-8-09	Bridge No.:	Easting: 1009208.1
		Surface Elevation: 75.0

Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @10 ft after 0 hours, @4.5 ft 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	3" Asphalt over Base Course	75
	S-1	4 4 5 7	24	6		Fill	Loose, brown fine SAND, some Silt, some fine to coarse Gravel, interbedded with brown Clayey Silt, trace Organics	
	S-2	14 20 20 16	24	22			Dense, Top 8": brown Clayey SILT, some fine to coarse Sand, little fine to coarse Gravel	
5	S-3	10 9 13 11	24	20		SILT	Bottom: 14": gray fine to coarse SAND, little fine to coarse Gravel, little wood, trace Silt, (moist)	70
	S-4	16 14 14 13	24	20			Medium Dense, gray SILT, trace fine Sand Medium Dense, stratified gray SILT, slight plasticity, trace (-) fine Sand, (dry)	
10	S-5	4 4 5 5	24	12			Loose, brown Clayey SILT, little fine Sand, trace coarse Gravel, (wet)	65
						Varved Clay & Silt		
15	S-6	6 6 6 8	24	18			Stiff, brown Clay and SILT, trace fine Sand	60
20	S-7	2 2 2 3	24	18			Medium, gray CLAY and SILT layers to 1/4" thick varved with SILT and CLAY layers to 1/4" thick	55
25	S-8	1 1 2 2	24	24			Soft, gray Silty CLAY layers to 1/4" varved with gray SILT and CLAY layers to 1/8" thick, occasional fine Sand partings	50
30								45

Well Construction

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: 42ft Rock: 0ft

No. of Soil Samples: 11 No. of Core Runs: 0

NOTES: 1) Boring advanced to 10' with augers then switched to 4" flush joint casing
2) 2" ID PVC observation well was installed upon completion of boring with 10' slotted screen set at 20 ft, filter sand 42' to 8', bentonite seal 8' to 5', filter sand 5' to surface with curb box and concrete collar.

SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-2-OW
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-8-09	Route No.:	Northing: 831003.74
Finish Date: 9-8-09	Bridge No.:	Easting: 1009208.1
		Surface Elevation: 75.0

Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @10 ft after 0 hours, @4.5 ft 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	Well Construction	Elevation (ft)
30	S-9	0 1 1 1	24	24		Varved Clay & Silt *(con't)*	Soft, gray Silty CLAY layers to 1/4" thick varved with SILT and CLAY layers to 1/8" thick		45
35	S-10	1 0 1 1	24	24			Very soft, gray Silty CLAY layers to 3/8" varved with SILT and CLAY layers to 1/2" thick		40
40	S-11	0 0 1 2	24	24			Very soft, gray Silty CLAY layers to 3/8" varved with SILT & CLAY layers to 1/2" thick		35
							END OF BORING 42ft		
45									30
50									25
55									20
60									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: 42ft Rock: 0ft

No. of Soil Samples: 11 No. of Core Runs: 0

NOTES: 1) Boring advanced to 10' with augers then switched to 4" flush joint casing
2) 2" ID PVC observation well was installed upon completion of boring with 10' slotted screen set at 20 ft, filter sand 42' to 8', bentonite seal 8' to 5', filter sand 5' to surface with curb box and concrete collar.

SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-3-OW
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-8-09	Route No.:	Northing: 830985.49
Finish Date: 9-8-09	Bridge No.:	Easting: 1009408.17
		Surface Elevation: 70.0

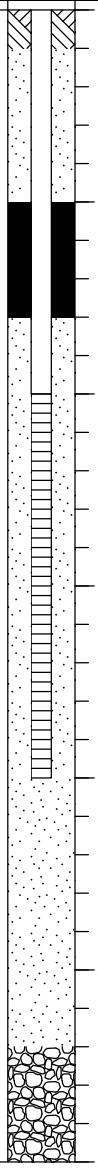
Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @2 ft after 0 hours, @1.4 ft 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	S-1	22 16 23 24	24	4		Fill	Dense, black and brown, fine to medium SAND, little fine to coarse Gravel (Asphalt pieces), trace Brick fragments, trace Silt	70
	S-2	12 11 11 9	24	20		Silty Sand	Medium dense, dark gray and red Top 2": fine to coarse SAND, little Brick fragments, trace Silt, (moist)	
5	S-3	8 6 6 5	24	18			Bottom 18": SILT and fine SAND, (wet) Medium dense, brown fine SAND, little Silt	65
	S-4	5 6 6 7	24	22			Medium dense, brown SILT and fine SAND	
10	S-5	3 3 3 4	24	16		Varved Clay & Silt	Medium stiff, gray Clayey SILT	60
15	S-6	2 1 2 2	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick	55
20	S-7	1 0 1 1	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick	50
25	S-8	0 1 1 1	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick	45
30								40

Well Construction



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: 42ft Rock: 0ft	NOTES: 1) Boring advanced to 10' with augers then switched to 4" flush joint casing 2) 2" ID PVC observation well was installed upon completion of boring with pea stone 42' to 27', 10' slotted screen set at 20', filter sand 27' to 8', bentonite seal 8' to 5', filter sand 5' to surface with curb box and concrete collar.	Sheet 1 of 2
No. of Soil Samples: 11 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-3-OW
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-8-09	Route No.:	Northing: 830985.49
Finish Date: 9-8-09	Bridge No.:	Easting: 1009408.17
		Surface Elevation: 70.0

Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @2 ft after 0 hours, @1.4 ft 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	Well Construction	Elevation (ft)
30	S-9	1 1 1 1	24	24		Varved Clay & Silt *(con't)*	Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick		40
35	S-10	1 1 1 1	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick		35
40	S-11	0 1 1 1	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/16" thick		30
							END OF BORING 42ft		
45									25
50									20
55									15
60									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: 42ft Rock: 0ft

No. of Soil Samples: 11 No. of Core Runs: 0

NOTES: 1) Boring advanced to 10' with augers then switched to 4" flush joint casing
2) 2" ID PVC observation well was installed upon completion of boring with pea stone 42' to 27', 10' slotted screen set at 20', filter sand 27' to 8', bentonite seal 8' to 5', filter sand 5' to surface with curb box and concrete collar.

SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-4
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 8-31-09	Route No.:	Northing: 830990.01
Finish Date: 9-3-09	Bridge No.:	Easting: 1009696.32
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 70.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type: Nx
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	
Groundwater Observations: @7 ft after 0 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	3" Asphalt over Base course	70
	S-1	24 22 13 7	24	17		Fill	Dense, brown fine to coarse GRAVEL, some Silt, little coarse Sand, trace Wood	
	S-2	7 12 10 12	24	16		Sandy Silt	Medium dense, brown SILT, little fine Sand	
5	S-3	12 8 6 8	24	18			Medium dense, brown SILT, little fine to medium Sand, (dry)	65
	S-4	7 10 11 12	24	24		Varved Clay & Silt	Top 8": Medium dense, brown fine SAND, little Silt, (wet) Bottom 16": Very stiff, brown CLAY and SILT	
10	S-5	3 4 6 8	24	24			Stiff, gray CLAY and SILT layers to 3/16" thick varved with SILT and CLAY layers to 1/8" thick	60
15	S-6	3 4 4 4	24	14			Medium stiff, gray CLAY and SILT, occasional Silt partings	55
20	S-7	1 2 2 3	24	21			Soft, gray CLAY and SILT, occasional Silt partings	50
25	S-8	2 2 2 2	24	24			Soft, gray CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick	45
30								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: 135ft Rock: 4.5ft	NOTES: 1) Boring advanced to 10' with augers, then switched to 4" ID flush joint casing 2) Auger chattered between 122' and 124', 128' and 130', 132' and 134'	Sheet 1 of 5
No. of Soil Samples: 29 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-4
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 8-31-09	Route No.:	Northing: 830990.01
Finish Date: 9-3-09	Bridge No.:	Easting: 1009696.32
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 70.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type: Nx
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	
Groundwater Observations: @7 ft after 0 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)
30	S-9	0 1 1 1	24	24		Varved Clay & Silt *(con't)*	Very soft, gray CLAY and SILT layers to 1/2" thick varved with brown Silt layers to 1/8" thick	40
35	S-10	0 0 0 2	24	24			Very soft, gray CLAY and SILT layers to 1/2" thick varved with brown Silt layers to 1/8" thick	35
40	S-11	0 0 2 1	24	24			Very soft, gray and brown Silty CLAY, occasional Silt partings	30
45	S-12	0 0 0 2	24	24			Very soft, brown CLAY layers to 1/2" thick varved with gray CLAY and SILT layers to 3/8" thick, occasional Silt partings	25
50	S-13	0 0 1 2	24	24			Very soft, brown CLAY layers to 1/2" thick varved with gray CLAY and SILT layers to 3/8" thick, occasional Silt partings	20
55	S-14	0 0 1 1	24	24			Very soft, brown CLAY layers to 1/2" thick varved with gray CLAY and SILT layers to 3/8" thick, occasional Silt partings	15
60								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: 135ft Rock: 4.5ft	NOTES: 1) Boring advanced to 10' with augers, then switched to 4" ID flush joint casing 2) Auger chattered between 122' and 124', 128' and 130', 132' and 134'	Sheet 2 of 5
No. of Soil Samples: 29 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-4
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 8-31-09	Route No.:	Northing: 830990.01
Finish Date: 9-3-09	Bridge No.:	Easting: 1009696.32
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 70.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type: Nx
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	
Groundwater Observations: @7 ft after 0 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)
60	S-15	0 0 1 2	24	24		Varved Clay & Silt *(con't)*	Very soft, brown CLAY layers to 1/2" varved with gray CLAY and SILT layers to 1/4"	10
65	S-16	0 0 0 1	24	24			Very soft, brown CLAY layers to 1/2" varved with gray CLAY and SILT layers to 1/4"	5
70	S-17	0 0 2 1	24	24			Very soft, brown CLAY layers to 2" thick varved with gray CLAY and SILT layers to 1/4"	0
75	S-18	0 0 0 0	24	24			Very soft, brown CLAY and SILT	-5
80	S-19	0 5 5 4	24	12			Stiff, brown and gray CLAY and SILT layers to 2" thick varved with SILT and CLAY layers to 4" thick	-10
85	S-20	0 0 0 0	24	24			Very soft, brown SILT and CLAY	-15
90								-20

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: 135ft Rock: 4.5ft	NOTES: 1) Boring advanced to 10' with augers, then switched to 4" ID flush joint casing 2) Auger chattered between 122' and 124', 128' and 130', 132' and 134'	Sheet 3 of 5
No. of Soil Samples: 29 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-4
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 8-31-09	Route No.:	Northing: 830990.01
Finish Date: 9-3-09	Bridge No.:	Easting: 1009696.32
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 70.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type: Nx
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	
Groundwater Observations: @7 ft after 0 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)
90	S-21	0 4 4 7	24	18		Varved Clay & Silt *(con't)*	Medium stiff, brown SILT and CLAY	-20
						Sandy Silt		
95	S-22	2 4 3 1	24	19			Loose, brown SILT	-25
100	S-23	5 6 10 19	24	14			Medium dense, brown SILT, little fine Sand	-30
105	S-24	6 7 8 7	24	13			Medium dense, brown SILT, trace fine Sand	-35
110	S-25	21 17 15 19	24	11			Dense, brown SILT, little fine Sand	-40
115	S-26	17 18 22 25	24	8			Dense, brown SILT and fine SAND	-45
120								-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: 135ft Rock: 4.5ft	NOTES: 1) Boring advanced to 10' with augers, then switched to 4" ID flush joint casing 2) Auger chattered between 122' and 124', 128' and 130', 132' and 134'	Sheet 4 of 5
No. of Soil Samples: 29 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-4
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 8-31-09	Route No.:	Northing: 830990.01
Finish Date: 9-3-09	Bridge No.:	Easting: 1009696.32
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 70.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type: Nx
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @7 ft after 0 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)
120	S-27	17 19 25 33	24	2		Silt & Clay	Hard, brown Clayey SILT, little fine Gravel	-50
125	S-28	5 6 8 11	24	21			Stiff, brown SILT and CLAY	-55
130	S-29	33 100/5"	11	11		Gravelly Sand	Very dense, Top 6": brown fine SAND, trace Silt, trace fine Gravel Bottom 5": brown fine to coarse SAND, some fine Gravel, trace Silt	-60
135	C-1		54	42	41	Bedrock	Poor Quality, Moderately Hard, Slightly Weathered, brown, SILTSTONE	-65
140							END OF BORING 139.5ft	-70
145								-75
150								-80

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: 135ft Rock: 4.5ft	NOTES: 1) Boring advanced to 10' with augers, then switched to 4" ID flush joint casing 2) Auger chattered between 122' and 124', 128' and 130', 132' and 134'	Sheet 5 of 5
No. of Soil Samples: 29 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-5
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-3-09	Route No.:	Northing: 831112.3
Finish Date: 9-3-09	Bridge No.:	Easting: 1009760.8
Project Description: Extra work - Flatbush Utilities		Surface Elevation: 64.0
Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	
Groundwater Observations: @5 ft after 0 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	3" Asphalt over Base course	
						Fill	Medium dense, brown	
	S-1	22 16 13 13	24	13		Silt	Top 5": fine to coarse SAND, some fine to coarse Gravel, little Silt	
	S-2	15 15 14 14	24	14			Bottom 8": SILT, little fine Sand Medium dense, brown SILT, little fine Sand, (dry)	60
5						Varved Clay & Silt		
	S-3	2 2 2 3	24	22			Soft, gray Silty CLAY, little fine Sand, (wet)	
	S-4	3 4 4 5	24	22			Medium stiff, gray CLAY and SILT	
								55
10	S-5	3 3 4 5	24	24			Medium stiff, gray Silty CLAY layers to 1/4" thick varved with SILT layers to 3/16" thick	
								50
15	S-6	2 3 2 4	24	24			Medium stiff, gray Silty CLAY layers to 1/4" thick varved with SILT layers to 3/16" thick	
	S-7	2 3 3 4	24	24			Medium stiff, gray Silty CLAY layers to 3/16" thick varved with SILT layers to 1/8" thick	45
20								
							END OF BORING 22ft	
								40
25								
								35
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: 22ft Rock: 0ft	NOTES: 1) Boring advanced with augers to end of exploration.	Sheet 1 of 1
No. of Soil Samples: 7 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Dongsheng Lu	Town: West Hartford	Hole No.: B-6-OW
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:
Start Date: 9-7-09	Route No.:	Northing: 831155.96
Finish Date: 9-7-09	Bridge No.:	Easting: 1009901.84
		Surface Elevation: 60.0

Project Description: Extra work - Flatbush Utilities

Casing Size/Type: 2.25"/HSA	Sampler Type/Size: SS/1.375"	Core Barrel Type:
Hammer Wt.: 300 lb. Fall: 18in.	Hammer Wt.: 140 lb. Fall: 30 in.	

Groundwater Observations: @7 ft after 0 hours, @6.5 after 24 hours, @6.5 after 72 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	3" Asphalt over Base course	60
						Fill		
	S-1	17 15 9 9	24	8			Medium dense, brown fine to coarse SAND, some fine to coarse Gravel	
	S-2	8 8 6 5	24	0			Medium dense, no recovery	
5								55
	S-3	6 5 6 5	24	14			Medium dense, brown fine SAND, little fine Gravel, trace Wood, little Silt, (dry)	
	S-4	5 6 7 6	24	24			Medium dense, brown Top 6": fine SAND, little Silt, trace Organics, (wet) Bottom 18": fine SAND, some Silt, trace fine Gravel	
10						Varved Clay & Silt		50
	S-5	1 2 2 2	24	10			Soft, brown Silty CLAY	
15								45
	S-6	3 3 5 6	24	24			Medium stiff, brown CLAY and SILT layers to 3/8" thick varved with SILT layers to 1/8" thick	
20								40
	S-7	0 0 4 4	24	24			Soft, Gray Silty CLAY layers to 3/16" thick varved with SILT layers to 1/16" thick	
							END OF BORING 22ft	
25								35
30								30

Well Construction

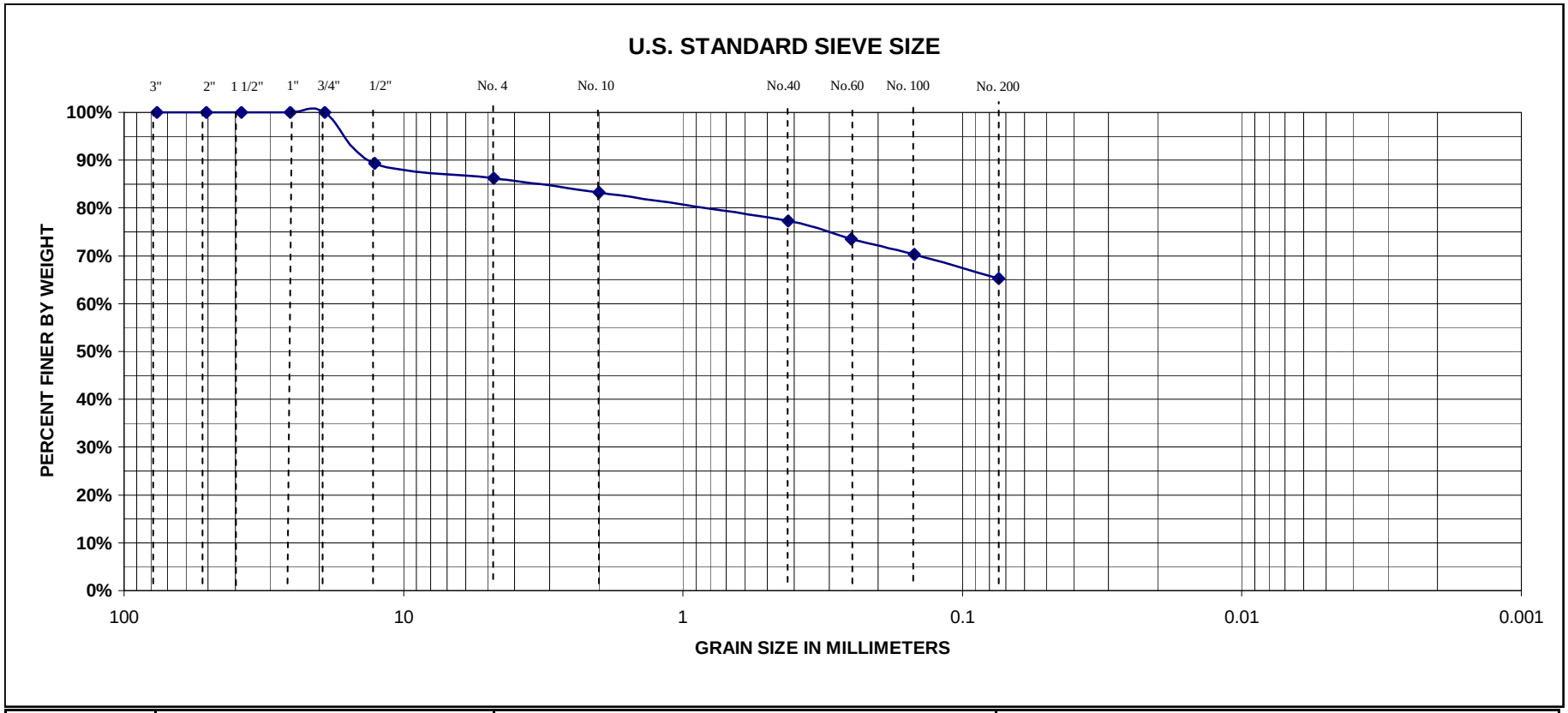
Sample Type: S = Split Spoon C = Core UP = Undisturbed Piston V = Vane Shear Test

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

Total Penetration in Earth: 22ft Rock: 0ft	NOTES: 1) Boring advanced with augers to end of exploration. 2) 2" ID PVC observation well was installed upon completion of boring with 10' slotted screen set at 20 ft, filter sand 22' to 8', bentonite seal 8' to 5', filter sand 5' to surface with curb box and concrete collar.	Sheet 1 of 1
No. of Soil Samples: 7 No. of Core Runs: 0		SM-001-M REV. 1/02

Appendix 3

Supplemental Laboratory Testing



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

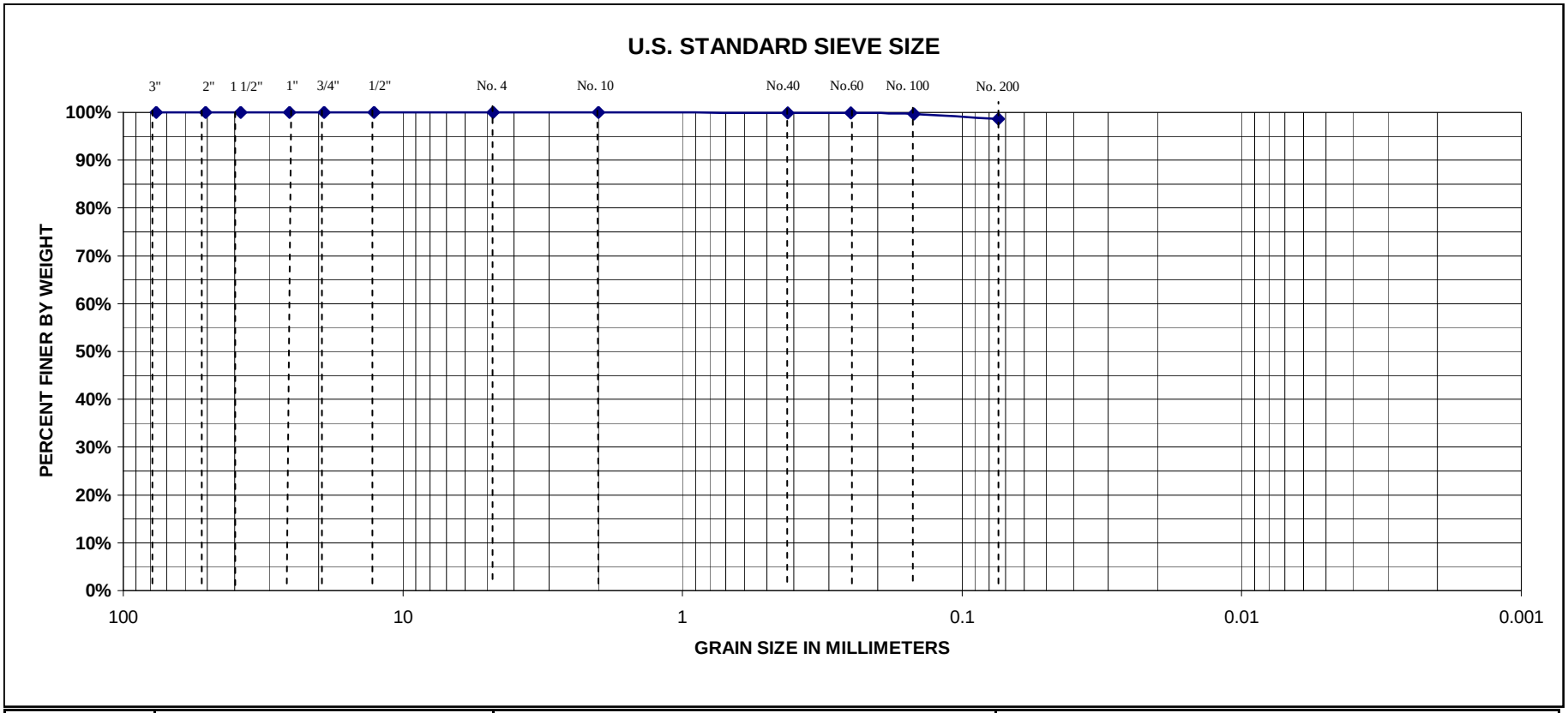
Busway Utilities at Flatbush

BORING NO.	B-2
SAMPLE NO.	S-2
DEPTH	3-5ft
TECH.	RJM/JPM
REVIEWER	MGB
DATE	01/20/04
FILE NO.	380-4.1

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
1 of 4		SILT, some f/c Sand, little fine Gravel

GEODESIGN INCORPORATED
984 Southford Road • Middlebury, Connecticut 06762
Phone: 203.758.8836 • Fax: 203.758.8842 • www.geodesign.net



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

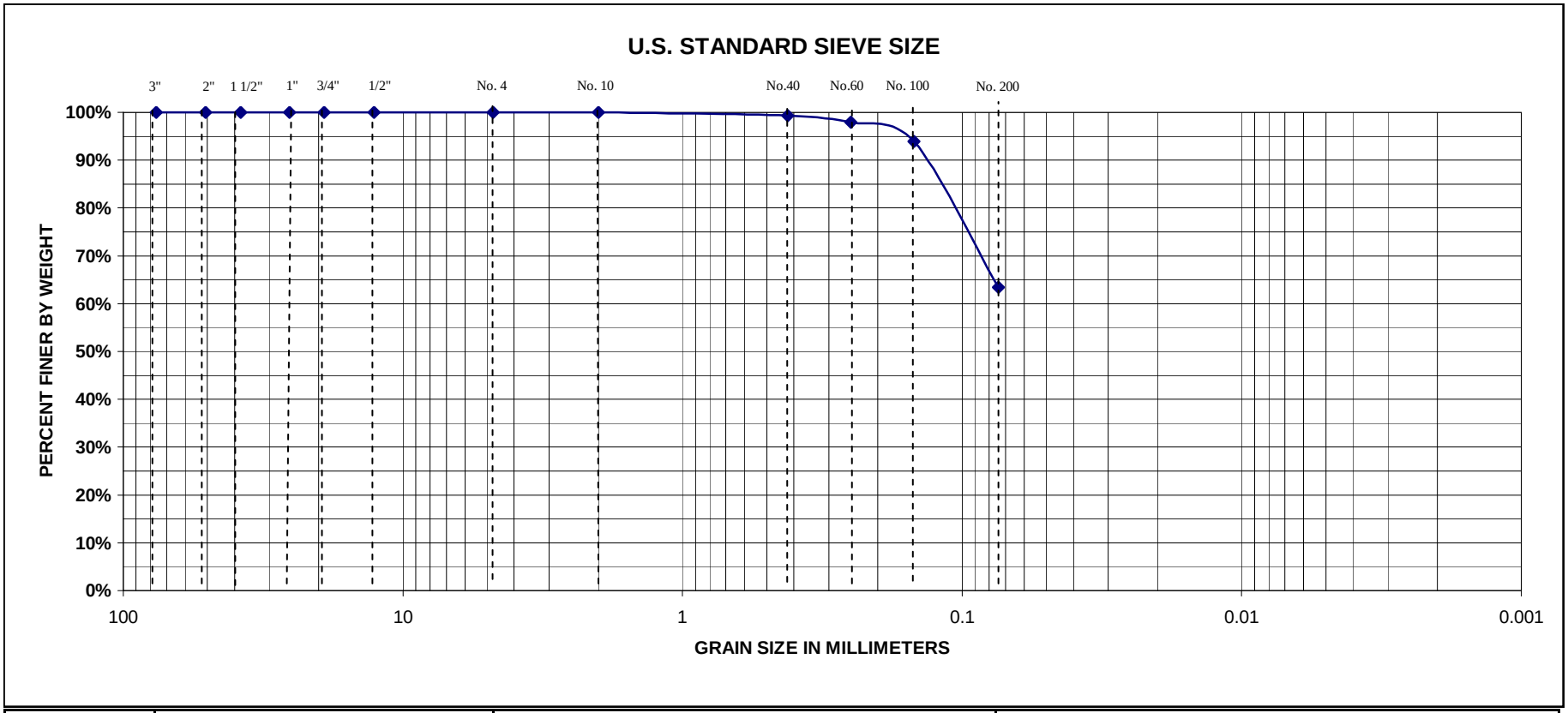
Busway Utilities at Flatbush

BORING NO.	B-2
SAMPLE NO.	S-4
DEPTH	7-9ft
TECH.	RJM/JPM
REVIEWER	MGB
DATE	01/20/04
FILE NO.	380-4.1

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
2 of 4		Fines (Silt and/or Clay), trace(-) fine Sand

GEODESIGN INCORPORATED
984 Southford Road • Middlebury, Connecticut 06762
Phone: 203.758.8836 • Fax: 203.758.8842 • www.geodesign.net



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

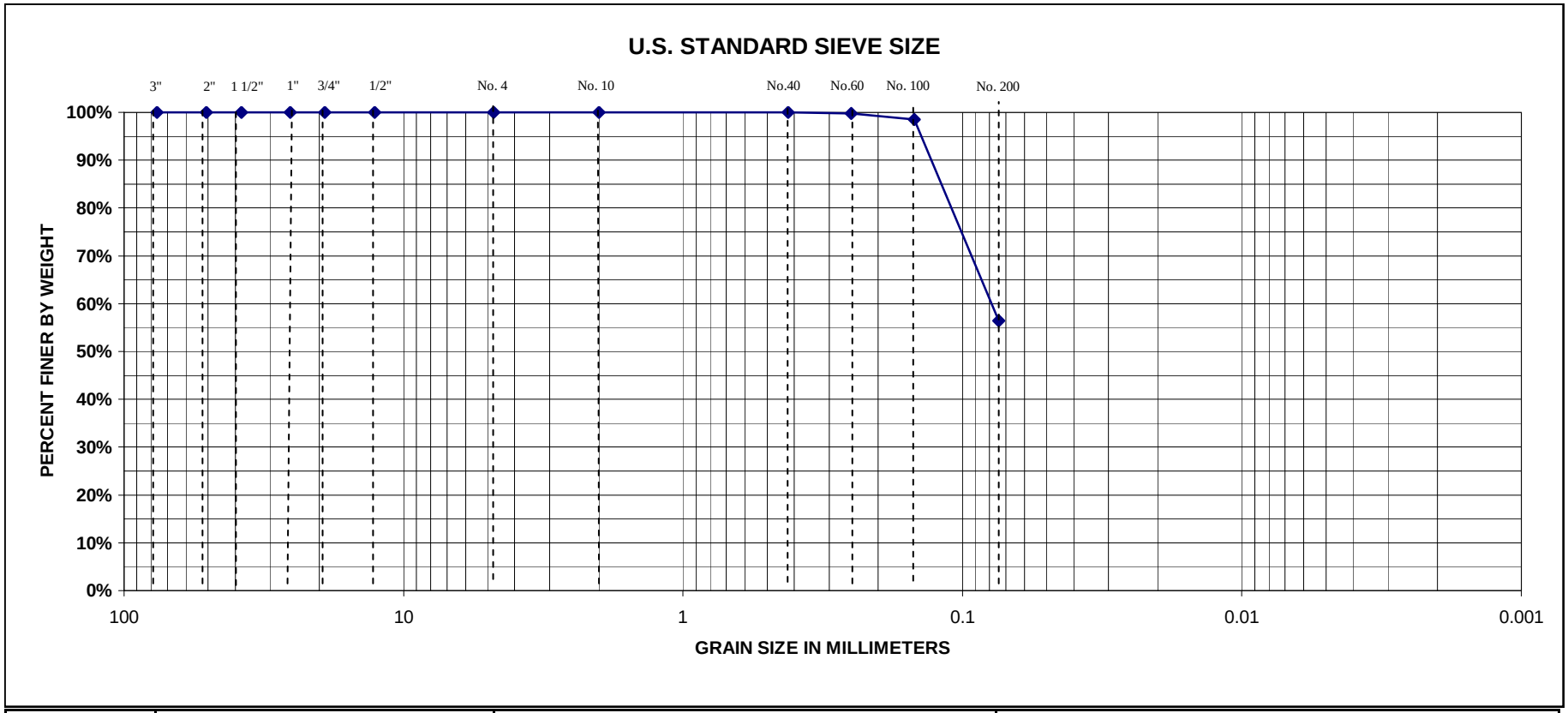
Busway Utilities at Flatbush

BORING NO.	B-3
SAMPLE NO.	S-2 Bottom
DEPTH	3-4ft
TECH.	RJM/JPM
REVIEWER	MGB
DATE	01/20/04
FILE NO.	380-4.1

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
3 of 4		Silt, and fine Sand

GEODESIGN INCORPORATED
984 Southford Road • Middlebury, Connecticut 06762
Phone: 203.758.8836 • Fax: 203.758.8842 • www.geodesign.net



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

Busway Utilities at Flatbush

BORING NO.	B-3
SAMPLE NO.	S-4
DEPTH	7-9ft
TECH.	RJM/JPM
REVIEWER	MGB
DATE	01/20/04
FILE NO.	380-4.1

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
4 of 4		Silt, and fine Sand

GEODESIGN INCORPORATED
984 Southford Road • Middlebury, Connecticut 06762
Phone: 203.758.8836 • Fax: 203.758.8842 • www.geodesign.net

Appendix 4

Previous Boring Logs

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	SB-01-1
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-13-08	Route No.:		Northing:	831066.2
Finish Date:	6-18-08	Bridge No.:		Easting:	1009243.3
				Surface Elevation:	74

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type: NX(st)
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 5.7' after 15 minutes

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		
	S-1	5 6 6 5	24	0		Fill	Medium dense, no recovery	
	S-2	3 4 4 3	24	1			Loose, brown fine to medium SAND, little Silt, trace Asphalt fragments	70
5								
	S-3	5 5 6 7	24	12		Silt	Medium dense, gray brown to orange brown fine SAND and SILT	
	S-4	7 5 6 6	24	20			Medium dense, gray brown to orange brown SILT, little fine Sand	65
10								
	S-5	2 2 3 3	24	18			Loose, gray SILT, little fine Sand	
						Clay & Silt (varved)		60
15								
	S-6	1 1 1 2	24	24			Soft, gray CLAY and SILT with occasional red brown fine Sand partings	
								55
20								
	UP-1	P U S H	24	24				
	S-7	1 1 1 1	24	24			Soft, gray CLAY and SILT with occasional red brown fine Sand partings	
								50
25								
	S-8	1 0 1 1	24	24			Very soft, gray Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick	
								45
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: 140ft Rock: 5ft	NOTES: Pilot hole to 10' with 4" SSA then switched to casing. Open hole after 30ft. Drillers mud used to maintain open hole. Loss of drilling mud below 120 ft. Auger chatter below 122 feet with continued loss of drilling mud. Roller bit advanced approximately 4.5 feet into inferred decomposed bedrock based on increased difficult rate of advance, prior to core run from 140 to 145 feet.	Sheet 1 of 5
No. of Soil Samples: 30 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: SB-01-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-13-08	Route No.:	Northing: 831066.2	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009243.3	
		Surface Elevation: 74	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type: NX(st)
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 5.7' after 15 minutes

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)
30	UP-2	P U S H	24	24		Clay & Silt (varved) *(con't)*		
	S-9	1 1 2 2	24	24			Soft, gray Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red brown fine Sand partings	40
35	S-10	WOR 0 1 2	24	24			Very soft, gray Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red brown fine Sand partings	35
40	S-11	WOR 0 2 2	24	24			Soft, gray Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red brown fine Sand partings	30
45	S-12	WOR 0 2 3	24	24			Soft, gray brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red brown fine Sand partings	25
50	S-13	WOR 0 2 2	24	24			Soft, gray brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red brown fine Sand partings	20
55	S-14	WOR 0 2 2	24	24			Soft, red brown Silty CLAY layers to 3/4" thick varved with gray brown CLAY and SILT layers to 1-1/2" thick	15
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: 140ft Rock: 5ft	NOTES: Pilot hole to 10' with 4" SSA then switched to casing. Open hole after 30ft. Drillers mud used to maintain open hole. Loss of drilling mud below 120 ft. Auger chatter below 122 feet with continued loss of drilling mud. Roller bit advanced approximately 4.5 feet into inferred decomposed bedrock based on increased difficult rate of advance, prior to core run from 140 to 145 feet.	Sheet 2 of 5
No. of Soil Samples: 30 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: SB-01-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-13-08	Route No.:	Northing: 831066.2	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009243.3	
		Surface Elevation: 74	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type: NX(st)
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 5.7' after 15 minutes

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)
60	S-15	WOR 0 2 2	24	24		Clay & Silt (varved) *(con't)*	Soft, red brown Silty CLAY layers to 1" thick varved with gray brown CLAY and SILT layers to 3/4" thick	
								10
65	S-16	WOR 1 2 2	24	24			Soft, red brown Silty CLAY layers to 2" thick varved with gray CLAY and SILT layers to 2" thick	
								5
70	S-17	WOR 3 2 2	24	24			Medium, red brown Silty CLAY layers to 2-1/2" thick varved with gray SILT and CLAY layers to 2" thick	
								0
75	S-18	WORWOH 1 1	24	24			Very soft, red brown Silty CLAY layers to 2-1/2" thick varved with gray SILT and CLAY layers to 3" thick	
								-5
80	S-19	WOR 2 2 7	24	24			Medium, red brown Silty CLAY layers to 3" thick varved with gray SILT and CLAY layers to 2" thick	
								-10
85	S-20	2 2 3 5	24	20			Medium, red brown Silty CLAY layers to 1-1/2" thick varved with gray SILT and CLAY layers to 3/4" thick	
								-15
90								

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: 140ft Rock: 5ft	NOTES: Pilot hole to 10' with 4" SSA then switched to casing. Open hole after 30ft. Drillers mud used to maintain open hole. Loss of drilling mud below 120 ft. Auger chatter below 122 feet with continued loss of drilling mud. Roller bit advanced approximately 4.5 feet into inferred decomposed bedrock based on increased difficult rate of advance, prior to core run from 140 to 145 feet.	Sheet 3 of 5
No. of Soil Samples: 30 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: SB-01-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-13-08	Route No.:	Northing: 831066.2	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009243.3	
		Surface Elevation: 74	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type: NX(st)
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 5.7' after 15 minutes

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)
90	S-21	3 3 3 4	24	24		Clay & Silt (varved) *(con't)*	Medium, red brown Clayey SILT	
								-20
95	S-22	3 3 4 5	24	24			Medium, red brown Clayey SILT	
						Silty Sand		-25
100	S-23	11 16 20 22	24	20			Dense, red brown fine SAND, some Silt	
								-30
105	S-24	20 18 18 40	24	15			Dense, red brown fine SAND, little Silt	
								-35
110	S-25	22 24 25 34	24	16			Dense, red brown Top 12": fine SAND, little Silt Bottom 4": fine to coarse SAND, little fine Gravel, trace Silt	
								-40
115	S-26	34 25 17 18	24	18			Dense, red brown Top 6": fine to coarse SAND, little fine Gravel, trace Silt Bottom 12": fine to medium SAND, trace Silt	
								-45
120								

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: 140ft Rock: 5ft	NOTES: Pilot hole to 10' with 4" SSA then switched to casing. Open hole after 30ft. Drillers mud used to maintain open hole. Loss of drilling mud below 120 ft. Auger chatter below 122 feet with continued loss of drilling mud. Roller bit advanced approximately 4.5 feet into inferred decomposed bedrock based on increased difficult rate of advance, prior to core run from 140 to 145 feet.	Sheet 4 of 5
No. of Soil Samples: 30 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: SB-01-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-13-08	Route No.:	Northing: 831066.2	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009243.3	
		Surface Elevation: 74	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type: NX(st)
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 5.7' after 15 minutes

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)
120	S-27	22 18 21 32	24	18		Silty Sand *(con't)*	Dense, red brown fine to coarse SAND, some Silt, trace fine to coarse Gravel	
						Glacial Till		-50
125	S-28	35 51 92 90	24	12			Very dense red brown fine to medium SAND, some Silt, trace fine to coarse Gravel	
								-55
130	S-29	62 45 38 49	24	16			Very dense red brown fine to medium SAND, some Silt, trace fine to coarse Gravel	
								-60
135	S-30	120/5"	5	3			Red brown fine to medium SAND, some Silt, some fine Gravel	
						Decomposed Bedrock		-65
140						Bedrock		
	C-1		60	60	7		Very Poor Quality, Soft to Moderately Hard, Moderately Weathered, red brown, SILTSTONE/SHALE	-70
145							END OF BORING 145ft	
								-75
150								

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: 140ft Rock: 5ft	NOTES: Pilot hole to 10' with 4" SSA then switched to casing. Open hole after 30ft. Drillers mud used to maintain open hole. Loss of drilling mud below 120 ft. Auger chatter below 122 feet with continued loss of drilling mud. Roller bit advanced approximately 4.5 feet into inferred decomposed bedrock based on increased difficult rate of advance, prior to core run from 140 to 145 feet.	Sheet 5 of 5
No. of Soil Samples: 30 No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Patty Kral	Town:	Hartford / West Hartford	Hole No.:	SB-01-2
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	5-12-08	Route No.:		Northing:	831053.6
Finish Date:	5-13-08	Bridge No.:		Easting:	1009323.2
				Surface Elevation:	70.4

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4"/ FJ	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' after 0 hours, @3' after 12 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	S-1	8 11 12 14	24	13		Fill	Medium dense, dark brown fine to medium SAND, little Silt, trace Brick fragments, little coarse Gravel	70
	S-2	19 27 38 55	24	16		Sand & Silt	Very dense, red brown fine to medium SAND, some fine Gravel, little Silt	
5	S-3	17 16 20 22	24	15			Dense, brown gray varved fine SAND and SILT	65
10	S-4	4 3 3 2	24	12		Clay & Silt (varved)	Medium, gray Silty CLAY, little fine Sand	60
	S-5	1 5 4 3	24	15			Stiff, gray CLAY	
15	UP-1	P U S H	24	24				55
	S-6	2 2 2 2	24	2			Soft, gray Silty CLAY and coarse GRAVEL	
20	S-7	1 1 2 2	24	0			No recovery	50
	S-8	1 2 1 2	24	24			Loose, varved gray SILT	
25	UP-2	P U S H	24	24				45
	S-9	2 2 2 3	24	22			Loose, varved gray SILT	
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: 107ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 1 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Patty Kral	Town: Hartford / West Hartford	Hole No.: SB-01-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 5-12-08	Route No.:	Northing: 831053.6	
Finish Date: 5-13-08	Bridge No.:	Easting: 1009323.2	
		Surface Elevation: 70.4	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4"/ FJ	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' after 0 hours, @3' after 12 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)
30	S-10	2 2 2 3	24	24		Clay & Silt (varved) *(con't)*	Loose, varved gray SILT with occasional red brown fine SAND partings	40
35	S-11	1 1 2 2	24	24			Loose, gray varved SILT with occasional red brown fine SAND partings	35
40	S-12	WOR 1 1 2	24	24			Very soft, gray varved CLAY and SILT with occasional red brown fine SAND partings	30
45	S-13	WOR 1 1 2	24	24			Very soft, gray varved CLAY and SILT with occasional red brown fine SAND partings	25
50	S-14	WOR 2 2 3	24	24			Soft, gray varved Silty CLAY to 1/4" thick with occasional red brown fine SAND partings to 1/16" thick	20
55	S-15	WOR 0 0 3	24	24			Very soft, gray Silty CLAY to 1" thick varved with red gray Clayey SILT to 1" thick	15
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: 107ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 2 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Patty Kral	Town: Hartford / West Hartford	Hole No.: SB-01-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
		Northing: 831053.6	
Start Date: 5-12-08	Route No.:	Easting: 1009323.2	
Finish Date: 5-13-08	Bridge No.:	Surface Elevation: 70.4	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4"/ FJ	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' after 0 hours, @3' after 12 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)
60	S-16	WOR 1 1 2	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray Silty CLAY to 1" thick varved with red gray Clayey SILT to 1" thick	10
65	S-17	1 1 2 2	24	23			Soft, gray CLAY to 1" thick varved with red gray Clayey SILT to 1/2" thick	5
70	S-18	1 1 2 2	24	24			Soft, gray Silty CLAY to 1" thick varved with red gray Clayey SILT to 1/2" thick	0
75	S-19	1 1 2 2	24	24			Soft, gray Silty CLAY to 1" thick varved with red gray Clayey SILT to 1/2" thick	-5
80	S-20	2 2 2 3	24	20			Medium, Top 16": red brown CLAY and SILT Bottom 4": red brown SILT and fine SAND	-10
						Clay & Silt		
85	S-21	WOR 5 14 17	24	24			Very stiff, red brown Silty CLAY	-15
90								

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: 107ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 3 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Patty Kral	Town: Hartford / West Hartford	Hole No.: SB-01-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 5-12-08	Route No.:	Northing: 831053.6	
Finish Date: 5-13-08	Bridge No.:	Easting: 1009323.2	
		Surface Elevation: 70.4	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4"/ FJ	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' after 0 hours, @3' after 12 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)
90	S-22	6 7 9 4	24	20		Clay & Silt *(con't)*	Very stiff, red brown CLAY and SILT	-20
95	S-23	4 4 11 13	24	14			Very stiff, red brown CLAY and SILT	-25
						Sand & Silt		
100	S-24	34 44 35 23	24	2			Very dense, red brown fine SAND and coarse GRAVEL, little Silt	-30
	S-25	35 33 32 34	24	12			Very dense, red brown fine SAND and SILT	
105	S-26	21 27 30 31	24	7			Very dense, red brown fine SAND and SILT	-35
							END OF BORING 107ft	
110								-40
115								-45
120								

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: 107ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 4 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	SB-01-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	10' Southwest
Start Date:	6-9-08	Route No.:		Northing:	831030.3
Finish Date:	6-12-08	Bridge No.:		Easting:	1009378.3
				Surface Elevation:	69.6

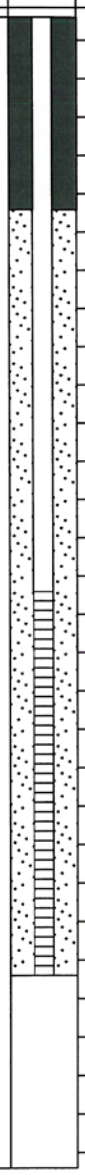
Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" ID/ FJ	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, @2.6' after 4 hours, @2.4' after 6 hours

Depth (ft)	Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes
0	S-1	3 6 15 11	24	6		Railway Subbase	Medium dense, dark gray to brown fine to coarse GRAVEL, little fine to coarse Sand, trace Asphalt (pieces to 3/4"), trace Silt
	S-2	14 8 22 16	24	16		Fill	Medium dense, yellow brown to gray brown fine to medium SAND, trace fine Gravel, trace Asphalt, trace Silt
5	S-3	14 11 18 10	24	16			Medium dense, Top 3": yellow brown to gray brown fine to medium SAND, trace fine Gravel, trace Asphalt, trace Silt Bottom 13": SILT and CLAY, some fine to medium Sand
	S-4	7 7 7 8	24	6			Stiff, brown SILT and CLAY, little fine to coarse Sand, trace fine Gravel
10	S-5	2 3 3 6	24	20		Clay & Silt	Medium, Top 4": brown SILT and CLAY, little fine to coarse Sand, trace fine Gravel Bottom 16": gray to gray brown CLAY and SILT, trace fine to medium Sand
15	S-6	4 4 4 4	24	0		Clay & Silt (varved)	No recovery
	S-7	4 5 5 6	24	18			Stiff, gray brown CLAY and SILT layers to 1/2" thick varved with Silty CLAY layers to 1/8" thick with occasional red fine Sand partings
20	S-8	2 1 1 1	24	22			Soft, gray brown CLAY and SILT layers to 3/8" thick varved with Silty CLAY layers to 3/8" thick with occasional red fine Sand partings
25	S-9	WOH 0 0 2	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings
30							

Well Construction



Elevation (ft): 65, 60, 55, 50, 45, 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: 135ft Rock: 5ft

No. of Soil Samples: --- No. of Core Runs: 1

NOTES: Pilot hole to 10' with 3 1/4" HSA then switched to 4" casing. Mobile B-53 Rig. Hydraulic safety hammer. Vane shear test at 35'. Drill chatter at 129'. Roller bit advanced through possible rock to 134'. SS sample at 134' yielded 1" penetration after 100 blows. Roller bit refusal at 135'. Core run 135' to 140'. Decomposed bedrock from 130' to 135'

SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	SB-01-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	10' Southwest
Start Date:	6-9-08	Route No.:		Northing:	831030.3
Finish Date:	6-12-08	Bridge No.:		Easting:	1009378.3
				Surface Elevation:	69.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" ID/ FJ	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, @2.6' after 4 hours, @2.4' after 6 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	Well Construction	Elevation (ft)
30	S-10	WOH 0 0 1	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray brown Silty CLAY layers to 3/4" thick varved with CLAY and SILT layers to 1/4" thick varved with occasional red fine Sand partings		
35	S-11	WORWOH 0 0	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings		35
40	S-12	WORWOH 3 3	24	24			Soft, gray brown Silty CLAY layers to 3/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings		30
45	S-13	WOH 0 0 4	24	24			Very soft, gray brown Silty CLAY layers to 3/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings, trace fine Gravel lenses		25
50	S-14	WORWOH 0 2	24	24			Very soft, gray brown Silty CLAY layers to 2 1/2" thick varved with CLAY and SILT layers to 1" thick with occasional red fine Sand partings		20
55	S-15	WOH 0 0 2	24	24			Very soft, gray brown CLAY and SILT layers to 3" thick varved with light brown Silty CLAY layers to 1" thick		15
60									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: 135ft Rock: 5ft	NOTES: Pilot hole to 10' with 3 1/4" HSA then switched to 4" casing. Mobile B-53 Rig. Hydraulic safety hammer. Vane shear test at 35'. Drill chatter at 129'. Roller bit advanced through possible rock to 134'. SS sample at 134' yielded 1" penetration after 100 blows. Roller bit refusal at 135'. Core run 135' to 140'. Decomposed bedrock from 130' to 135'	Sheet 2 of 5
No. of Soil Samples: --- No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	SB-01-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	10' Southwest
				Northing:	831030.3
Start Date:	6-9-08	Route No.:		Easting:	1009378.3
Finish Date:	6-12-08	Bridge No.:		Surface Elevation:	69.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" ID/ FJ	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, @2.6' after 4 hours, @2.4' after 6 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	Well Construction	Elevation (ft)
60	S-16	WOH 0 0 4	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with light brown Silty CLAY layers to 3/4" thick with occasional red fine Sand partings		
65	S-17	WOH 0 0 2	24	24			Very soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with light brown Silty CLAY layers to 3/4" thick with occasional red fine Sand partings, trace fine to coarse Gravel lenses		5
70	S-18	WOH 0 1 3	24	24			Very soft, gray brown CLAY and SILT layers to 1 1/4" thick varved with brown Silty CLAY layers to 3/4" thick with occasional red fine Sand partings		0
75	S-19	WOR 10 2 5	24	24			Stiff, gray brown CLAY and SILT layers to 2" thick varved with brown Silty CLAY layers to 1" thick, red fine Sand layer 4" thick 8" into sample		-5
80	S-20	1 1 2 1	24	24			Soft, gray brown varved CLAY and SILT		-10
85	S-21	WOH 3 2 4	24	24			Medium, brown Silty CLAY layers to 1" thick varved with gray brown CLAY and SILT layers to 1" thick, trace coarse Gravel lenses		-15
90									-20

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: 135ft Rock: 5ft	NOTES: Pilot hole to 10' with 3 1/4" HSA then switched to 4" casing. Mobile B-53 Rig. Hydraulic safety hammer. Vane shear test at 35'. Drill chatter at 129'. Roller bit advanced through possible rock to 134'. SS sample at 134' yielded 1" penetration after 100 blows. Roller bit refusal at 135'. Core run 135' to 140'. Decomposed bedrock from 130' to 135'	Sheet 3 of 5
No. of Soil Samples: --- No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	SB-01-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	10' Southwest
				Northing:	831030.3
Start Date:	6-9-08	Route No.:		Easting:	1009378.3
Finish Date:	6-12-08	Bridge No.:		Surface Elevation:	69.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" ID/ FJ	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, @2.6' after 4 hours, @2.4' after 6 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	Well Construction	Elevation (ft)
90	S-22	6 6 7 7	24	24		Clay & Silt (varved) *(con't)*	Stiff, gray brown CLAY and SILT layers to 3" thick varved with Silty CLAY layers to 1" thick		
									-25
95	S-23	5 8 9 8	24	15			Very stiff, gray brown CLAY and SILT layers to 4" thick varved with Silty CLAY layers to 3/4" thick, trace fine Sand		
						Clay & Silt			-30
100	S-24	7 5 7 13	24	14			Stiff, red brown SILT and CLAY, trace fine Sand		
									-35
105	S-25	10 19 20 25	24	10			Dense, red brown SILT and CLAY, some fine Sand		
									-40
110	S-26	24 28 29 35	24	14			Very dense, red brown Clayey SILT, some fine Sand		
									-45
115	S-27	26 29 32 36	24	10			Very dense, red brown Clayey SILT, some fine Sand		
							Very dense,		-50
120									

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: 135ft Rock: 5ft	NOTES: Pilot hole to 10' with 3 1/4" HSA then switched to 4" casing. Mobile B-53 Rig. Hydraulic safety hammer. Vane shear test at 35'. Drill chatter at 129'. Roller bit advanced through possible rock to 134'. SS sample at 134' yielded 1" penetration after 100 blows. Roller bit refusal at 135'. Core run 135' to 140'. Decomposed bedrock from 130' to 135'	Sheet 4 of 5
No. of Soil Samples: --- No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	SB-01-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	10' Southwest
Start Date:	6-9-08	Route No.:		Northing:	831030.3
Finish Date:	6-12-08	Bridge No.:		Easting:	1009378.3
				Surface Elevation:	69.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" ID/ FJ	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, @2.6' after 4 hours, @2.4' after 6 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	Well Construction	Elevation (ft)
120	S-28	23 32 63 46	24	18		Clay & Silt *(con't)*	Top 8": red brown Clayey SILT, some fine Sand		
						Glacial Till	Bottom 10": red brown to gray brown SILT, some fine to coarse Sand, some fine to coarse Gravel		-55
125	S-29	22 34 32 55	24	14			Very dense, red brown fine to coarse SAND, some fine Gravel, little Silt		
130									-60
						Decomposed Bedrock			
	S-30	100/1"	1	1			Very dense/spoon refusal, red brown fine to coarse SAND and fine GRAVEL, trace Silt		-65
135						Bedrock			
	C-1		60	59	58		Fair Quality, Soft, Slightly Weathered, red brown, fine grained, SILTSTONE, fracturing 20°, vertical fracture at 136' Coring time (min/ft): 3,5,7,4,7		-70
140							END OF BORING 140ft		
145									-75
150									-80

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: 135ft Rock: 5ft	NOTES: Pilot hole to 10' with 3 1/4" HSA then switched to 4" casing. Mobile B-53 Rig. Hydraulic safety hammer. Vane shear test at 35'. Drill chatter at 129'. Roller bit advanced through possible rock to 134'. SS sample at 134' yielded 1" penetration after 100 blows. Roller bit refusal at 135'. Core run 135' to 140'. Decomposed bedrock from 130' to 135'	Sheet 5 of 5
No. of Soil Samples: --- No. of Core Runs: 1		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	RW-1
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	12' South
Start Date:	6-9-08	Route No.:		Northing:	831998.7
Finish Date:	6-10-08	Bridge No.:		Easting:	1008947.6
				Surface Elevation:	73.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @6' wet sample, 21' after 10 minutes

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		
	S-1	6 9 8 8	24	14		Fill	Medium dense, gray Top 4": fine to coarse GRAVEL, little fine to coarse Sand, little Silt Bottom 10": fine SAND, little Silt	
	S-2	8 7 8 9	24	24		Silt	Medium dense, gray SILT, little fine Sand	70
5	S-3	4 4 5 6	24	18			Loose, gray SILT, trace (-) fine SAND	
	S-4	5 7 9 5	24	22			Medium dense, gray SILT	65
10	S-5	4 4 4 6	24	18			Loose, gray SILT, trace fine Sand	
						Clay & Silt (varved)		60
15	S-6	2 3 4 1	24	2			Medium, gray CLAY and SILT	
								55
20	S-7	WOR 1 1 1	24	24			Soft, gray Silty CLAY layers to 1/8" thick varved with gray SILT and CLAY layers to 1/8" thick with occasional fine Sand partings	
								50
25	S-8	WOR 1 0 1	24	24			Very soft, gray Silty CLAY layers to 1/8" thick varved with gray SILT and CLAY layers to 1/8" thick with occasional fine Sand partings	
								45
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: 102ft Rock: 0ft	NOTES: Pilot hole to 10' with 4" SSA then switched to 4" casing. Boring advanced open tube below 15' with drillers mud used to maintain open hole.	Sheet 1 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: RW-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset: 12' South	
Start Date: 6-9-08	Route No.:	Northing: 831998.7	
Finish Date: 6-10-08	Bridge No.:	Easting: 1008947.6	
		Surface Elevation: 73.6	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @6' wet sample, 21' after 10 minutes

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)
30	S-9	1 1 1 2	24	24		Clay & Silt (varved) *(con't)*	Soft, brown CLAY and SILT	
								40
35	S-10	1 1 1 1	24	24			Soft, gray brown varved CLAY and SILT	
								35
40	S-11	1 1 1 1	24	24			Soft, gray brown varved CLAY and SILT	
								30
45	S-12	WOH 0 1 3	24	24			Very soft, red brown Silty CLAY layers to 3/8" thick varved with gray brown CLAY and SILT layers to 1/8" thick	
								25
50	S-13	WOR 1 1 2	24	14			Soft, red brown Silty CLAY layers to 1/2" thick varved with gray brown CLAY and SILT layers to 1/4" thick	
								20
55	S-14	WOR 0 2 3	24	24			Soft, red brown Silty CLAY layers to 1/2" thick varved with gray brown CLAY and SILT layers to 1/4" thick	
								15
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: 102ft Rock: 0ft	NOTES: Pilot hole to 10' with 4" SSA then switched to 4" casing. Boring advanced open tube below 15' with drillers mud used to maintain open hole.	Sheet 2 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Robert Marshall	Town: Hartford / West Hartford	Hole No.: RW-1	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset: 12' South	
Start Date: 6-9-08	Route No.:	Northing: 831998.7	
Finish Date: 6-10-08	Bridge No.:	Easting: 1008947.6	
		Surface Elevation: 73.6	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @6' wet sample, 21' after 10 minutes

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)
60	S-15	WOR 2 2 3	24	24		Clay & Silt (varved) *(con't)*	Soft, red brown Silty CLAY layers to 3/4" thick varved with gray brown CLAY and SILT layers to 1/2" thick	10
65	S-16	WOR 0 0 5	24	24			Very soft, red brown Silty CLAY layers 1 3/4" thick varved with CLAY and SILT layers to 1 1/4" thick	5
70	S-17	WOR 1 1 2	24	24			Soft, red brown Silty CLAY layers to 5/8" thick varved with gray brown SILT and CLAY layers to 5/8" thick	0
75	S-18	WOR 0 3 3	24	24			Soft, red brown Silty CLAY layers to 5/8" thick varved with gray brown SILT and CLAY layers to 5/8" thick	-5
80	S-19	WOR 0 8 9	24	24			Stiff, Top 12": red brown Silty CLAY layers to 3/4" thick varved with gray brown CLAY and SILT layers to 1" thick Bottom 12": red brown Clayey SILT, little fine Sand	-10
85	S-20	WOR 9 7 10	24	24			Very stiff, red brown Silty CLAY layers to 1" thick varved with red brown SILT and CLAY layers to 1 1/2" thick	-15
90								

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: 102ft Rock: 0ft	NOTES: Pilot hole to 10' with 4" SSA then switched to 4" casing. Boring advanced open tube below 15' with drillers mud used to maintain open hole.	Sheet 3 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	RW-1
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	12' South
Start Date:	6-9-08	Route No.:		Northing:	831998.7
Finish Date:	6-10-08	Bridge No.:		Easting:	1008947.6
				Surface Elevation:	73.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @6' wet sample, 21' after 10 minutes

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)
90	S-21	2 1 3 3	24	24		Clay & Silt (varved) *(con't)*	Soft to medium, red brown SILT and CLAY with occasional red brown Silty CLAY layers to 1" thick	
						Silt		-20
95	S-22	10 8 14 25	24	24			Medium dense, red brown SILT	-25
100	S-23	9 12 17 22	24	24			Medium dense, red brown SILT	
							END OF BORING 102ft	-30
105								-35
110								-40
115								-45
120								

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: 102ft Rock: 0ft	NOTES: Pilot hole to 10' with 4" SSA then switched to 4" casing. Boring advanced open tube below 15' with drillers mud used to maintain open hole.	Sheet 4 of 4
No. of Soil Samples: 22 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Ben Brandt	Town: Hartford / West Hartford	Hole No.: RW-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-17-08	Route No.:	Northing: 831092.4	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009165.1	
		Surface Elevation: 74.7	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 4' after 10 min.

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		
						Sand		
	S-1	5 7 8 11	24	12			Medium dense, gray/red brown fine SAND, trace Silt	
	S-2	8 8 8 11	24	24			Medium dense, gray/red brown fine SAND, trace Silt	
5								70
	S-3	6 4 6 6	24	24			Medium dense, gray/red brown fine SAND, trace Silt	
	S-4	8 6 7 6	24	14			Medium dense, gray/red brown fine SAND, some Silt	
10								65
	S-5	3 3 3 3	24	14		Clay & Silt (varved)	Medium, gray CLAY and SILT, trace Sand	
15								60
	S-6	2 1 2 1	24	20			Soft, gray Silty CLAY	
20								55
	S-7	3 2 1 2	24	24			Soft, gray Sity CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	
25								50
	S-8	1 0 1 1	24	24			Very soft, gray brown Sity CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	
30								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: 112ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to 4" casing. Open hole below 10' advanced with drillers mud to maintain stability. Mobile B53 rig, hydraulic safety hammer used.	Sheet 1 of 4
No. of Soil Samples: 25 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Ben Brandt	Town: Hartford / West Hartford	Hole No.: RW-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
		Northing: 831092.4	
Start Date: 6-17-08	Route No.:	Easting: 1009165.1	
Finish Date: 6-18-08	Bridge No.:	Surface Elevation: 74.7	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 4' after 10 min.

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)
30	S-9	1 0 1 1	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray brown Sity CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	
35	S-10	WOR 1 0 1	24	24			Very soft, red brown Sity CLAY layers to 1/4" thick varved with gray brown CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	40
40	S-11	WOR 0 1 1	24	24			Very soft, red brown Sity CLAY layers to 1/4" thick varved with gray brown CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	35
45	S-12	WOR 0 1 1	24	24			Very soft, red brown Sity CLAY layers to 1/4" thick varved with gray brown CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	30
50	S-13	WOR 0 1 1	24	24			Very soft, red brown Sity CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	25
55	S-14	WOR 0 0 0	24	15			Very soft, red brown Sity CLAY layers to 2" thick varved with CLAY and SILT layers to 2"	20
60								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: 112ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to 4" casing. Open hole below 10' advanced with drillers mud to maintain stability. Mobile B53 rig, hydraulic safety hammer used.	Sheet 2 of 4
No. of Soil Samples: 25 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Ben Brandt	Town: Hartford / West Hartford	Hole No.: RW-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-17-08	Route No.:	Northing: 831092.4	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009165.1	
		Surface Elevation: 74.7	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 4' after 10 min.

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)
60	S-15	WOR 0 0 0	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray brown CLAY and SILT layers to 3" thick varved with red brown Silty CLAY layers to 1" thick	
								10
65	S-16	WOR 1 0 1	24	24			Very soft, red brown Silty CLAY layers to 1" thick varved with CLAY and SILT layers to to 3" thick	
								5
70	S-17	1 1 2 2	24	24			Soft, gray brown CLAY and SILT layers to 2" thick varved with red brown Silty CLAY layers to 1" thick	
								0
75	S-18	WOR 0 1 0	24	24			Very soft, gray brown CLAY and SILT layers to 2" thick varved with red brown Silty CLAY layers to 1" thick	
								-5
80	S-19	5 3 1 1	24	16			Soft, red brown Silty CLAY layers to 2" thick varved with gray brown CLAY and SILT layers to 2" thick	
								-10
85	S-20	WOR 0 0 0	24	24			Very soft, red brown Silty CLAY layers to 2" thick varved with gray brown CLAY and SILT layers to 2" thick	
								-15
90								

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: 112ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to 4" casing. Open hole below 10' advanced with drillers mud to maintain stability. Mobile B53 rig, hydraulic safety hammer used.	Sheet 3 of 4
No. of Soil Samples: 25 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Ben Brandt	Town: Hartford / West Hartford	Hole No.: RW-2	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-17-08	Route No.:	Northing: 831092.4	
Finish Date: 6-18-08	Bridge No.:	Easting: 1009165.1	
		Surface Elevation: 74.7	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 4' after 10 min.

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)
90	S-21	WOR 4 4 4	24	24		Clay & Silt (varved) *(con't)*	Medium, red brown CLAY and SILT layers to 2" thick varved with Silty CLAY layers to 1" thick	
								-20
95	S-22	4 1 0 1	24	12			Very soft, red brown CLAY and SILT layers to 2" thick varved with Silty CLAY layers to 1" thick	
								-25
100	S-23	7 5 6 7	24	12			Stiff, red brown SILT and CLAY	
								-30
105	S-24	19 19 19 17	24	12		Sand	Dense, fine red brown SAND, some Silt	
								-35
110	S-25	17 20 20 27	24	15			Dense, fine red brown/gray brown SAND, little Silt	
							END OF BORING 112ft	
115								-40
120								-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: 112ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to 4" casing. Open hole below 10' advanced with drillers mud to maintain stability. Mobile B53 rig, hydraulic safety hammer used.	Sheet 4 of 4
No. of Soil Samples: 25 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Ben Brandt	Town:	Hartford / West Hartford	Hole No.:	RW-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-19-08	Route No.:		Northing:	831044.2
Finish Date:	6-19-08	Bridge No.:		Easting:	1009552
				Surface Elevation:	69.6

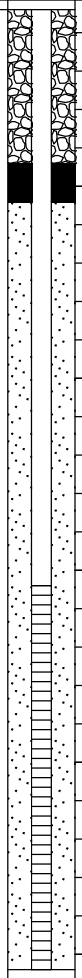
Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: SSA	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' wet sample, 4.1' after 10 minutes

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		
						Fill		
	S-1	4 2 2 4	24	12			Loose, red brown fine to coarse SAND, little Silt	
	S-2	5 5 5 11	24	12			Medium dense, gray fine SAND, some fine Gravel, little Silt, trace Asphalt,	65
5	S-3	8 10 11 13	24	12			Medium dense, gray fine SAND, trace Silt	
	S-4	9 9 11 15	24	18		Clay & Silt (varved)	Very stiff, gray brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	
10	S-5	5 7 8 9	24	24			Stiff, gray brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	60
	S-6	5 6 7 6	24	24			Stiff, gray brown Silty CLAY with occasional red fine Sand partings	
15	S-7	2 3 3 4	24	24			Medium, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	55
20	S-8	2 2 2 2	24	24			Soft to medium, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/2" thick with occasional red fine Sand partings	50
25	S-9	1 1 1 1	24	24			Soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	45
30								40

Well Construction



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: 42ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to casing. Open hole below 10' with drillers mud used to maintain open hole. Mobile B53 rig.	Sheet 1 of 2
No. of Soil Samples: 12 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Ben Brandt	Town:	Hartford / West Hartford	Hole No.:	RW-3
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-19-08	Route No.:		Northing:	831044.2
Finish Date:	6-19-08	Bridge No.:		Easting:	1009552
				Surface Elevation:	69.6

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: SSA	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @3' wet sample, 4.1' after 10 minutes

Depth (ft)	SAMPLES: Sample Type/No.	Blows on Sampler per 6 inches	Pen. (in.)	Rec. (in.)	RQD %	Generalized Strata Description	Material Description and Notes	Well Construction	Elevation (ft)
30	S-10	WOR 0 1 1	24	24		Clay & Silt (varved) *(con't)*	Very soft, red brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/2" thick with occasional red fine Sand partings		
35	S-11	- W O R	24	24			Very soft, red brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/2" thick with occasional red fine Sand partings		35
40	S-12	- W O R	24	24			Very soft, red brown Silty CLAY layers to 1/2" thick varved with gray brown CLAY and SILT layers to 1/2" thick with occasional red fine Sand partings		30
							END OF BORING 42ft		
45									25
50									20
55									15
60									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: 42ft Rock: 0ft	NOTES: Pilot hole to 9' with 4" SSA, then switched to casing. Open hole below 10' with drillers mud used to maintain open hole. Mobile B53 rig.	Sheet 2 of 2
No. of Soil Samples: 12 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	RW-4
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-10-08	Route No.:		Northing:	831036.6
Finish Date:	6-11-08	Bridge No.:		Easting:	1009605.8
				Surface Elevation:	69.2

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @16' after 15 minutes, (close to 7' per RW-7 obs. well)

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		
						Fill		
	S-1	4 6 3 4	24	4			Loose, dark brown fine to coarse GRAVEL, some fine to coarse Sand, trace Asphalt fragments, trace Silt	
	S-2	4 16 17 16	24	16			Dense, gray to orange brown fine to medium SAND, trace fine Gravel, trace Silt, trace Ash	65
5	S-3	6 10 11 8	24	12			Medium dense, brown to orange fine to coarse SAND, little Asphalt fragments, trace fine Gravel, trace Silt	
	S-4	6 11 12 17	24	24			Medium dense, Top 14": brown to orange fine to coarse SAND, little Asphalt fragments, trace fine Gravel, trace Silt	
						Clay & Silt (varved)	Bottom 10": red brown to gray brown CLAY and SILT layers to 1/4" thick varved with occasional fine Sand layers	60
10	S-5	3 4 4 7	24	24			Stiff, gray brown SILT and CLAY, trace fine Sand	
								55
15	S-6	2 2 4 5	24	24			Medium, gray brown CLAY and SILT layers to 1/4" thick varved with Silty CLAY layers to 1/4" thick with occasional gray fine Sand partings	
								50
20	S-7	2 3 4 9	24	24			Medium, gray brown CLAY and SILT layers to 1/2" thick varved with Silty CLAY layers to 1/8" thick with occasional red fine Sand partings	
								45
25	S-8	2 2 3 3	24	24			Medium, gray brown CLAY and SILT	
								40
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: 112ft Rock: 0ft	NOTES: Pilot hole to 10' with 3 1/4" HSA, then switched to 4" casing. Open hole after 15' using drillers mud to maintain open hole.	Sheet 1 of 4
No. of Soil Samples: 23 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Matt Volovski	Town: Hartford / West Hartford	Hole No.: RW-4	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-10-08	Route No.:	Northing: 831036.6	
Finish Date: 6-11-08	Bridge No.:	Easting: 1009605.8	
		Surface Elevation: 69.2	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @16' after 15 minutes, (close to 7' per RW-7 obs. well)

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)
30	S-9	1 0 1 2	24	24		Clay & Silt (varved) *(con't)*	Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	
								35
35	UP-1	P U S H	24	24				
	S-10	1 1 1 1	24	24			Very soft, brown Silty CLAY layers to 5/8" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	30
40	S-11	1 1 0 1	24	24			Very soft, brown varved CLAY and SILT with occasional red fine Sand partings	
								25
45	UP-2	P U S H	24	24				
	S-12	WOH 0 1 1	24	24			Very soft, brown Silty CLAY layers to 3/4" thick varved with gray brown CLAY and SILT layers to 1/2" thick	20
50	S-13	WOH 0 1 1	24	24			Very soft, brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 3/8" thick varved with occasional red fine Sand partings	
								15
55	S-14	1 WOH 1 2	24	24			Very soft, brown varved CLAY and SILT	
								10
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: 112ft Rock: 0ft	NOTES: Pilot hole to 10' with 3 1/4" HSA, then switched to 4" casing. Open hole after 15' using drillers mud to maintain open hole.	Sheet 2 of 4
No. of Soil Samples: 23 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Matt Volovski	Town: Hartford / West Hartford	Hole No.: RW-4	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-10-08	Route No.:	Northing: 831036.6	
Finish Date: 6-11-08	Bridge No.:	Easting: 1009605.8	
		Surface Elevation: 69.2	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @16' after 15 minutes, (close to 7' per RW-7 obs. well)

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)
60	S-15	1 2 2 2	24	24		Clay & Silt (varved) *(con't)*	Soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with brown Silty CLAY layers to 1" thick with occasional red fine Sand partings	
								5
65	S-16	1 1 2 3	24	24			Soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with brown Silty CLAY layers to 1" thick with occasional red fine Sand partings	
								0
70	S-17	1 1 3 3	24	24			Soft, gray brown CLAY and SILT layers to 3" thick varved with brown Silty CLAY layers to 1 1/4" thick with occasional red fine Sand partings	
								-5
75	S-18	5 10 12 10	24	16			Very stiff, Top 10": gray brown CLAY and SILT layers to 3" thick varved with brown Silty CLAY layers to 1 1/4" thick with occasional red fine Sand partings Bottom 6": red brown CLAY and SILT layers to 1 1/2", trace fine Sand	
								-10
80	S-19	5 4 6 7	24	20			Stiff, red brown varved CLAY and SILT	
								-15
85	S-20	6 8 9 11	24	24			Very stiff, red brown varved CLAY and SILT	
								-20
90								

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: 112ft Rock: 0ft	NOTES: Pilot hole to 10' with 3 1/4" HSA, then switched to 4" casing. Open hole after 15' using drillers mud to maintain open hole.	Sheet 3 of 4
No. of Soil Samples: 23 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovski	Town:	Hartford / West Hartford	Hole No.:	RW-4
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-10-08	Route No.:		Northing:	831036.6
Finish Date:	6-11-08	Bridge No.:		Easting:	1009605.8
				Surface Elevation:	69.2

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @16' after 15 minutes, (close to 7' per RW-7 obs. well)

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)
90	S-21	3 4 4 4	24	24		Clay & Silt (varved) *(con't)*	Stiff, red brown CLAY and SILT layers to 2" thick varved with Silty CLAY layers to 1 1/4" thick with occasional red fine Sand partings	
								-25
95	S-22	8 11 14 17	24	6			Very stiff, red brown varved CLAY and SILT	
						Clay		-30
100	S-23	10 13 13 16	24	18			Very stiff, red brown CLAY, little Silt	
								-35
105	S-24	13 17 17 18	24	16			Stiff, red brown CLAY, little Silt	
								-40
110	S-25	22 29 30 31	24	16			Very stiff, red brown CLAY, some Silt	
							END OF BORING 112ft	
								-45
115								
								-50
120								

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: 112ft Rock: 0ft	NOTES: Pilot hole to 10' with 3 1/4" HSA, then switched to 4" casing. Open hole after 15' using drillers mud to maintain open hole.	Sheet 4 of 4
No. of Soil Samples: 23 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	RW-9
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-11-08	Route No.:		Northing:	831116.9
Finish Date:	6-11-08	Bridge No.:		Easting:	1009021.9
				Surface Elevation:	75.8

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample

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		
	S-1	7 6 5 6	24	2		Fill	Medium dense, brown fine to medium SAND, some fine to coarse Gravel, little Silt, trace Asphalt fragments	75
	S-2	7 8 9 14	24	2		Sand & Gravel	Medium dense, gray fine GRAVEL and fine to medium SAND, some Silt, (slightly plastic)	
5	S-3	10 11 14 16	24	17		Silt	Medium dense, orange brown to gray brown SILT, some Sand	70
	S-4	10 14 17 22	24	24			Dense, gray brown SILT, trace fine Sand, horizontal orange brown/gray banding	
10	S-5	3 3 6 7	24	16			Loose, gray Clayey SILT	65
						Clay & Silt (varved)		
15	S-6	1 1 1 1	24	20			Soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/8" thick	60
20	S-7	1 1/12" 0 1	24	24			Very soft, gray Silty CLAY layers to 1/8" thick varved with CLAY and SILT layers to 1/8" thick	55
25	S-8	1/12" 0 1 1	24	24			Very soft, gray brown Silty CLAY layers to 1/4" thick varved with gray brown SILT nad CLAY layers to 1/4" thick with occasional red brown fine Sand partings to 1/16" thick	50
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: 42ft Rock: 0ft	NOTES: Pilot hole to 5' with 4" SSA, then switched to 4" casing to 10'. Borehole advanced open hole below 10' with drillers mud used to maintain open hole.	Sheet 1 of 2
No. of Soil Samples: 9 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	RW-9
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-11-08	Route No.:		Northing:	831116.9
Finish Date:	6-11-08	Bridge No.:		Easting:	1009021.9
				Surface Elevation:	75.8

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample

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)
30	S-9	WOR/6" 1 1 2	24	24		Clay & Silt (varved) *(con't)*	Soft, gray brown Silty CLAY layers to 1/4" thick varved with gray brown SILT nad CLAY layers to 1/4" thick with occasional red brown fine Sand partings to 1/16" thick	45
35	S-10	WOR/12"0 1 2	24	24			Very soft, gray brown Silty CLAY layers t 1/4" thick varved with gray brown to red brown CLAY and SILT layers to 3/8" thick	40
40	S-11	WOR/6" 2 1 1	24	24			Soft, gray brown Silty CLAY layers t 1/4" thick varved with gray brown to red brown CLAY and SILT layers to 3/8" thick	35
							END OF BORING 42ft	
45								30
50								25
55								20
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: 42ft Rock: 0ft	NOTES: Pilot hole to 5' with 4" SSA, then switched to 4" casing to 10'. Borehole advanced open hole below 10' with drillers mud used to maintain open hole.	Sheet 2 of 2
No. of Soil Samples: 9 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovksi	Town:	Hartford / West Hartford	Hole No.:	RW-10
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	5' South
				Northing:	830918.3
Start Date:	6-12-08	Route No.:		Easting:	1009588.4
Finish Date:	6-13-08	Bridge No.:		Surface Elevation:	71.3

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 10' after 10 minutes

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		
	S-1	6 11 11 9	24	22		Fill	Medium dense, Top 6": brown to gray brown fine to medium SAND, little Roots, trace Organics, trace Silt Bottom 16": dark brown fine to medium SAND, little fine Gravel, trace Ash, trace Silt	70
	S-2	8 9 10 10	24	16				
5							Medium dense, gray brown to light brown fine to medium SAND, trace Silt, trace fine Gravel, trace Organics	
	S-3	7 6 6 5	24	16				65
	S-4	4 3 4 5	24	20			Medium dense, light brown to brown fine to medium SAND, little Silt, trace Ash Loose, brown to gray brown fine to medium SAND, little Silt, trace fine Gravel, trace Ash, (gray fine Gravel layer 2" thick in sample)	
10						Sand		
	S-5	3 5 5 8	24	14			Medium dense, orange brown to light brown fine SAND, little Silt	60
						Clay & Silt (varved)		
15								
	S-6	4 3 5 6	24	14			Stiff, gray brown CLAY and SILT with occasional gray fine Sand partings	55
20								
	S-7	1 1 1 1	24	24			Soft, gray CLAY and SILT with occasional fine Sand partings	50
25								
	S-8	1 1 1 1	24	24			Soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	45
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: 104ft Rock: 0ft	NOTES: Mobile B-53 Rig. Hydraulic safety hammer used. Pilot hole to 10' with 4 1/4" HSA, casing advanced to 15', open hole below 15' with drillers mud used to maintain open hole	Sheet 1 of 4
No. of Soil Samples: 24 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Matt Volovksi	Town: Hartford / West Hartford	Hole No.: RW-10	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset: 5' South	
Start Date: 6-12-08	Route No.:	Northing: 830918.3	
Finish Date: 6-13-08	Bridge No.:	Easting: 1009588.4	
		Surface Elevation: 71.3	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 10' after 10 minutes

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)
30	S-9	1 1 1 2	24	24		Clay & Silt (varved) *(con't)*	Soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	40
35	S-10	1 0 1 2	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings	35
40	S-11	1 0 1 1	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/8" thick with occasional red fine Sand partings and coarse Gravel lenses	30
45	S-12	WOH 0 0 3	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	25
50	S-13	WOR 0 1 2	24	24			Very soft, gray brown Silty CLAY layers to 1/2" thick varved with CLAY and SILT layers to 1/4" thick with occasional red fine Sand partings	20
55	S-14	1 1 1 2	24	18			Soft, gray brown Silty CLAY layers to 1 1/2" thick varved with CLAY and SILT layers to 1/2" thick with occasional red fine Sand partings	15
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: 104ft Rock: 0ft	NOTES: Mobile B-53 Rig. Hydraulic safety hammer used. Pilot hole to 10' with 4 1/4" HSA, casing advanced to 15', open hole below 15' with drillers mud used to maintain open hole	Sheet 2 of 4
No. of Soil Samples: 24 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Matt Volovksi	Town: Hartford / West Hartford	Hole No.: RW-10	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset: 5' South	
		Northing: 830918.3	
Start Date: 6-12-08	Route No.:	Easting: 1009588.4	
Finish Date: 6-13-08	Bridge No.:	Surface Elevation: 71.3	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 10' after 10 minutes

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)
60	S-15	1 1 1 1	24	24		Clay & Silt (varved) *(con't)*	Soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with Silty CLAY layers to 1" thick with occasional red fine Sand partings	10
65	S-16	1 1 1 2	24	22			Soft, gray brown CLAY and SILT layers to 1 1/2" thick varved with Silty CLAY layers to 1" thick with occasional red fine Sand partings	5
70	S-17	1 1 1 1	24	24			Soft, red brown Silty CLAY layers to 1" thick varved with CLAY and SILT layers to 1" thick with occasional red fine Sand partings	0
75	S-18	WOR 0 1 1	24	24			Soft, red brown Silty CLAY layers to 1" thick varved with CLAY and SILT layers to 1" thick with occasional red fine Sand partings	-5
80	S-19	WOR 1 1 3	24	24			Soft, Top 14": red brown CLAY and SILT Bottom 10": gray brown Silty CLAY layers to 1 1/2" thick varved with CLAY and SILT layers to 1 1/2" thick with occasional red fine Sand partings	-10
						Sandy Silt		
85	S-20	5 9 10 11	24	24			Medium, red brown Clayey SILT and fine SAND	-15
						Clay & Silt		
90								

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: 104ft Rock: 0ft	NOTES: Mobile B-53 Rig. Hydraulic safety hammer used. Pilot hole to 10' with 4 1/4" HSA, casing advanced to 15', open hole below 15' with drillers mud used to maintain open hole	Sheet 3 of 4
No. of Soil Samples: 24 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Matt Volovksi	Town:	Hartford / West Hartford	Hole No.:	RW-10
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	5' South
				Northing:	830918.3
Start Date:	6-12-08	Route No.:		Easting:	1009588.4
Finish Date:	6-13-08	Bridge No.:		Surface Elevation:	71.3

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: FJ4	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 lbs. Fall: 24in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample, 10' after 10 minutes

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)
90	S-21	1 1 1 5	24	18		Clay & Silt *(con't)*	Soft, brown CLAY and SILT with occsional tan fine Sand partings	-20
95	S-22	6 6 6 6	24	24			Stiff, brown CLAY and SILT	-25
100	S-23	7 6 7 7	24	24			Stiff, Top 18": brown CLAY and SILT Bottom 6": red brown Clayey SILT, some fine Sand	-30
	S-24	16 17 17 18	24	18			Dense, red brown Clayey SILT, some fine Sand, trace CLAY and SILT pieces to 3/4" in diameter	
105							END OF BORING 104ft	-35
110								-40
115								-45
120								

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: 104ft Rock: 0ft	NOTES: Mobile B-53 Rig. Hydraulic safety hammer used. Pilot hole to 10' with 4 1/4" HSA, casing advanced to 15', open hole below 15' with drillers mud used to maintain open hole	Sheet 4 of 4
No. of Soil Samples: 24 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Patty Kral	Town: Hartford / West Hartford	Hole No.: RW-12	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 5-12-08	Route No.:	Northing: 830991.2	
Finish Date: 5-12-08	Bridge No.:	Easting: 1009275.3	
		Surface Elevation: 70	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HSA 3 ¼"	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' after 0 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								70
	S-1	3 13 18 26	24	1		Fill	Dense, black-brown fine to coarse SAND, little Silt, little fine Gravel, trace Brick fragments, (oil odor/stain)	
	S-2	28 34 37 41	24	12			Very dense, black-dark brown fine to medium SAND, some Silt, little Brick fragments, trace coarse Gravel, (oil odor/stain)	
5								65
	S-3	7 14 17 25	24	20		Sand & Silt	Dense, gray-brown varved fine SAND and SILT	
10								60
	S-4	5 6 7 7	24	16			Medium dense, gray SILT, some fine Sand	
						Silt & Clay (varved)		
15								55
	S-5	2 3 3 4	24	20			Loose, gray varved Clayey SILT	
20								50
	S-6	1 2 1 2	24	24			Very loose, gray varved Silty CLAY with occasional red brown fine SAND partings	
25								45
	S-7	1 1 1 2	24	24			Very loose, gray varved Silty CLAY with occasional red brown fine SAND partings	
30								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: 42ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 1 of 2
No. of Soil Samples: 9 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Patty Kral	Town: Hartford / West Hartford	Hole No.: RW-12	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
		Northing: 830991.2	
Start Date: 5-12-08	Route No.:	Easting: 1009275.3	
Finish Date: 5-12-08	Bridge No.:	Surface Elevation: 70	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HSA 3 ¼"	Sampler Type/Size: SS / 1 3/8" ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' after 0 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)
30	S-8	1 2 1 1	24	18		Silt & Clay (varved) *(con't)*	Very loose, gray varved Silty CLAY with occasional red brown fine SAND partings	40
35	S-9	WOH 1 1 2	24	24			Very loose, gray varved SILT and CLAY with occasional red brown fine SAND partings	35
40	S-10	1 0 1 0	24	24			Very loose, gray varved SILT and CLAY with occasional red brown fine SAND partings	30
							END OF BORING 42ft	
45								25
50								20
55								15
60								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: 42ft Rock: 0ft	NOTES: Mobile B53 rig, hydraulic safety hammer used.	Sheet 2 of 2
No. of Soil Samples: 9 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	R-102
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	
Start Date:	6-11-08	Route No.:		Northing:	831242.5
Finish Date:	6-11-08	Bridge No.:		Easting:	1008984.2
				Surface Elevation:	76.5

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: SSA 4" OD	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample

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		
	S-1	7 10 8 5	24	10		Fill	Medium dense, red brown fine to coarse GRAVEL and fine to medium SAND, little Silt	75
	S-2	4 7 5 7	24	4			Medium dense, red brown to gray fine SAND, little Silt, little fine Gravel	
5	S-3	8 9 9 10	24	20		Silt	Medium dense, red brown to gray SILT, some fine Sand	70
10	S-4	4 6 7 7	24	18			No recovery, re-drove for sample Medium dense, gray SILT, trace fine Sand	65
15	S-5	6 7 7 7	24	24			Medium dense, gray SILT, trace fine Sand	60
							END OF BORING 17ft	
20								55
25								50
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: 17ft Rock: 0ft	NOTES:	Sheet 1 of 1
No. of Soil Samples: 3 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Robert Marshall	Town:	Hartford / West Hartford	Hole No.:	R-103
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	5' East
				Northing:	831081.5
Start Date:	6-11-08	Route No.:		Easting:	1009698.7
Finish Date:	6-11-08	Bridge No.:		Surface Elevation:	67.1

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: SSA	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @4' wet sample

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	10 8 9 15	24	18		Topsoil Fill	Medium dense, Top 4": brown topsoil Bottom 14": gray brown SILT, some fine to medium Sand, trace fine to coarse Gravel	65
	S-2	11 12 14 16	24	20			Medium dense, gray brown fine SAND, some Silt	
5	S-3	5 5 6 8	24	14		Clay & Silt (varved)	Medium dense, orange brown SILT, trace fine Sand varved with occasional gray SILT and CLAY layers to 1/8" thick	60
	S-4	6 8 9 9	24	22			Medium dense, orange brown SILT, trace fine Sand varved with occasional gray SILT and CLAY layers to 1/8" thick	
10	S-5	3 3 3 5	24	24			Medium, gray Silty CLAY layers to 1/8" thick varved with gray SILT and CLAY layers to 1/8" thick	55
15	S-6	3 4 4 5	24	18			Medium, gray Silty CLAY layers to 1/8" thick varved with gray SILT and CLAY layers to 1/8" thick	50
							END OF BORING 17ft	
20								45
25								40
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: 17ft Rock: 0ft	NOTES:	Sheet 1 of 1
No. of Soil Samples: 6 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector:	Ben Brandt	Town:	Hartford / West Hartford	Hole No.:	R-104
Engineer:	Geo**Design**, Inc.	Project No.:	155-H025	Stat./Offset:	15' South
				Northing:	831159.2
Start Date:	6-13-08	Route No.:		Easting:	1009818.4
Finish Date:	6-13-08	Bridge No.:		Surface Elevation:	63.3

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: 4" OD SSA	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @12' wet sample, after 10 minutes 12'

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	S-1	8 6 7 7	24	18		Fill	Medium dense, tan to light brown fine to medium SAND, trace fine gravel, trace Ash, trace Brick fragments, trace Roots	
	S-2	6 9 12 14	24	18			Medium dense, tan to light brown SILT, some fine to coarse Sand, trace Ash, trace Brick fragments, trace Roots	60
5	S-3	12 13 13 15	24	24		Clayey Silt	Very stiff, tan to light brown Clayey SILT	
						Clay & Silt (varved)		55
10	S-4	6 5 6 8	24	24			Stiff, tan to brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick	50
15	S-5	6 6 5 6	24	24			Stiff, tan to brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT layers to 1/8" thick	
							END OF BORING 17ft	45
20								40
25								35
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: 17ft Rock: 0ft	NOTES:	Sheet 1 of 1
No. of Soil Samples: 5 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Ben Brandt	Town: Hartford / West Hartford	Hole No.: R-105	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
		Northing: 831201.0	
Start Date: 6-13-08	Route No.:	Easting: 1009895.8	
Finish Date: 6-13-08	Bridge No.:	Surface Elevation: 59.2	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HW/4"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @15' wet sample

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		
						Fill		
	S-1	20 16 14 12	24	18			Medium dense to dense, dark brown fine SAND, some Silt, trace Ash, trace Brick fragments	
	S-2	10 18 14 14	24	12			Dense, dark brown fine SAND, trace Silt, trace Ash, trace Brick fragments	55
5								
	S-3	1 1 2 3	24	12			Soft, gray brown Clayey SILT, trace Ash, trace Brick, trace Roots	
	S-4	3 7 9 12	24	12			Very stiff, gray brown Clayey SILT, trace Roots	
								50
10						Clay & Silt (varved)		
	S-5	7 8 8 10	24	24			Very stiff, tan to brown Clayey SILT with occasional red fine Sand partings	
								45
15								
	S-6	2 3 2 3	24	24			Medium, gray brown Silty CLAY layers to 1/4" thick varved with CLAY and SILT (layers to 1/8" thick with occasional red fine Sand partings)	
							END OF BORING 17ft	
								40
20								
								35
25								
								30
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: 17ft Rock: 0ft	NOTES:	Sheet 1 of 1
No. of Soil Samples: 6 No. of Core Runs: 0		SM-001-M REV. 1/02

Connecticut DOT Boring Report

Inspector: Matt Volovski	Town: Hartford / West Hartford	Hole No.: R-108	
Engineer: Geo**Design**, Inc.	Project No.: 155-H025	Stat./Offset:	
Start Date: 6-13-08	Route No.:	Northing: 831007.9	
Finish Date: 6-13-08	Bridge No.:	Easting: 1009651.7	
		Surface Elevation: 68.6	

Project Description: New Britain - Hartford Busway / Geo**Design** Project No. 0380-004.0 -

Casing Size/Type: HSA 3 ¼"	Sampler Type/Size: SS/ 1 3/8 " ID	Core Barrel Type:
Hammer Wt.: Fall: in.	Hammer Wt.: 140 lbs. Fall: 30 in.	

Groundwater Observations: @5' wet sample

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		
						Sub-base	Medium dense, Top 6": gray to gray brown fine to coarse SAND and fine to coarse GRAVEL, little Asphalt fragments, trace Silt	
	S-1	11 8 3 4	24	12		Fill	Bottom 6": brown fine Sand, trace Ash, trace Silt	
	S-2	5 5 5 6	24	12			Medium dense, brown fine Sand, trace Ash, trace Silt	65
5								
	S-3	5 5 6 7	24	14			Medium dense, Top 4": tan/brown gray fine SAND and ASPHALT fragments, little fine Gravel, trace Silt	
	S-4	7 7 9 12	24	14			Bottom 10": orange brown/gray fine SAND and SILT, trace Organics, trace Ash	
							Medium dense, orange brown/brown/gray SILT and SAND, little fine Gravel, trace Ash, trace Organics	60
10						Clay & Silt		
	S-5	2 3 5 6	24	18			Stiff, gray CLAY and SILT	
	S-6	4 5 5 6	24	22		Clay & Silt (varved)	Stiff, gray brown CLAY and SILT layers to 1/2" thick varved with Silty CLAY layers to 1/8" thick with occasional gray fine Sand partings	55
15								
	S-7	2 3 3 5	24	23			Medium, gray brown CLAY and SILT layers to 1/2" thick varved with Silty CLAY layers to 1/4" thick with occasional gray fine Sand partings	
							END OF BORING 17ft	50
20								
								45
25								
								40
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: 17ft Rock: 0ft	NOTES:	Sheet 1 of 1
No. of Soil Samples: 7 No. of Core Runs: 0		SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	A-N		1.5					70
2–3	S-1	7 12 11	1.5	0.5			WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM) - brown to black fine to medium sand, some medium gravel, little silt; moist, medium dense, NP; (FILL).	69, 68
4	A-N		1.5					67
5–6	S-2	4 3 3	1.5	0.0			NO RECOVERY	66, 65
7	A-N		1.5					64
8	S-3	8 9 7	1.5	0.7		7.5'	ELEV. 62.6 WELL-GRADED SAND WITH SILT (SW-SM) - dark gray, fine to medium sand, little silt, trace fine gravel; moist, medium dense, NP.	63, 62
9–10	W-N		1.5					61
11	S-4	6 6 9	1.5	0.0		10.5'	ELEV. 59.6 NO RECOVERY; however it seemed to be the beginning of the varved clay by change in drilling.	60, 59
12–13	W-N		1.5					58
14–15	S-5	2 2 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand, little silt; moist, soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	57, 56
16	W-N		1.5					55
17–18	S-6	2 1 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand, little silt; moist, soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	54, 53
19	W-N		1.5					52
		2					CLAY WITH SAND (CL) - medium gray to brown clay,	51

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **1** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		
Baker Info: S.O. Number: B25624LPDSOIL41802/42002	File: northern	Template: CDOT E (LD4 1/03)

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	1 WOH	1.5	1.5			little fine sand, little silt; moist, very soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	50
21	W-N		1.5					49
22								48
23	S-8	WOH WOH WOH	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand, little silt; moist, very soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	47
24	W-N		1.5					46
25								45
26	S-9	WOR WOR WOH	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand, little silt; moist, very soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	44
27	W-N		1.5					43
28								42
29	S-10	WOH WOH WOH	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand, little silt; moist, soft, PL; (GLACIAL LAKE DEPOSIT, VARVED CLAY).	41
30	ST-1		2.0	1.9				40
31								39
32	W-N		3.0					38
33								37
34								36
35	S-11	WOH WOH 1	1.5	1.5			CLAY (CL) - gray to brown clay; moist, very soft, +PL; (GLACIAL LAKE DEPOSIT).	35
36								34
37	W-N		3.5					33
38								32
39								31

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **2** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40	S-12	WOH WOH WOH	1.5	1.5			CLAY (CL) - gray to brown clay; moist, very soft, +PL; (GLACIAL LAKE DEPOSIT).	30
41								29
42	W-N		3.5					28
43								27
44								26
45	S-13	WOH 1 1	1.5	1.0			CLAY (CL) - gray to brown clay; moist, very soft to soft, +PL; (GLACIAL LAKE DEPOSIT).	25
46								24
47	W-N		3.5					23
48								22
49								21
50	S-14	1 1 WOH	1.5	1.3			CLAY (CL) - gray to brown clay; moist, very soft, +PL; (GLACIAL LAKE DEPOSIT).	20
51								19
52	W-N		3.5					18
53								17
54								16
55	S-15	1 1 WOH	1.5	1.5			CLAY (CL) - gray to brown clay; moist, very soft, +PL; (GLACIAL LAKE DEPOSIT).	15
56								14
57	W-N		3.5					13
58								12
59								11

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **3** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
60	S-16	1 1 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL; (GLACIAL LAKE DEPOSIT).	10
61								9
62	W-N		3.5					8
63								7
64								6
65	S-17	1 1 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL; (GLACIAL LAKE DEPOSIT).	5
66								4
67	W-N		3.5					3
68								2
69								1
70	S-18	1 2 2	1.5	0.6			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL; (GLACIAL LAKE DEPOSIT).	0
71								-1
72	W-N		3.5					-2
73								-3
74								-4
75	S-19	1 1 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL; (GLACIAL LAKE DEPOSIT).	-5
76								-6
77	W-N		3.5					-7
78								-8
79								-9

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **4** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
80	S-20	WOH 1 1	1.5	1.5			CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL; (GLACIAL LAKE DEPOSIT).	-10
81								-11
82	W-N		3.5					-12
83								-13
84								-14
85	S-21	2 4 4	1.5	1.5		85.0'	ELEV. -14.9	-15
86							CLAY WITH SAND (CL) - medium gray to brown clay, little fine sand; moist, soft, PL.	-16
87	W-N		3.5					-17
88								-18
89								-19
90	S-22	6 8 8	1.5	0.2			CLAY (CL) - red to brown clay; moist, very stiff, +PL.	-20
91								-21
92	W-N		3.5					-22
93								-23
94								-24
95	S-23	8 10 10	1.5	1.2			CLAY (CL) - red to brown clay; moist, very stiff, +PL.	-25
96								-26
97	W-N		3.5					-27
98						98.0'	ELEV. -27.9	-28
99								-29

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **5** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-56**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830814.2
Start Date: 7-11-03	Route No.:	Easting: 1009164.4
Finish Date: 7-14-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type: NQ/1 7/8" ID
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	
Groundwater Obs. @ 56.6 after: 0 hours, @ after: hours, @ after: hours		

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
100	S-24	26 28 28	1.5	0.3			SILTY SAND (SM) - red brown fine sand, some silt; moist, very dense, NP.	-30
101								-31
102	W-N		3.5					-32
103								-33
104								-34
105							ELEV. -34.9	-35
106	S-25	28 36 65	1.5	1.2			SILTY SAND (SM) - red to brown and black fine to coarse sand, some silt; moist, very dense, NP; (TILL).	-36
107	W-N		3.5					-37
108								-38
109								-39
110	S-26	49 52 66	1.5	0.6			SILTY SAND (SM) - red to brown and black fine to coarse sand, some silt; moist, very dense, NP; (TILL).	-40
111								-41
							ELEV. -41.4	
112							END OF BORING AT 111.5	-42
113								-43
114								-44
115								-45
116								-46
117								-47
118								-48
119								-49

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

Total Penetration in Earth: 111.5' Rock: 0.0' No. of Samples: 26	NOTES:	Sheet **6** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @12.1 after: 48 hours

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
0–1	A-N		1.5					70
2	S-1	12 20 20	1.5	0.8			WELL-GRADED SAND WITH SILT (SW-SM) - reddish brown and black fine to coarse sand, little silt; moist, dense, NP; (FILL).	69, 68
3–4	A-N		1.5			3.5'	ELEV. 66.6	67
5	S-2	12 11 12	1.5	1.0			POORLY-GRADED SAND WITH SILT (SP-SM) - gray fine sand, some silt; moist, medium dense, NP.	66, 65
6–7	W-N		1.5					64, 63
8	S-3	8 6 6	1.5	0.8			POORLY-GRADED SAND WITH SILT (SP-SM) - gray fine sand, some silt, little clay; moist, medium dense, @ PL.	62
9–10	W-N		1.5					61, 60
11	S-4	3 3 3	1.5	0.2		10.5'	ELEV. 59.6 SANDY SILT (ML) - dark to medium gray silt, some very fine to fine sand, little clay; moist, medium stiff, @ PL.	59
12–13	W-N		1.5					58, 57
14	S-5	3 2 3	1.5	0.0			NO RECOVERY	56
15–16	W-N		1.5					55, 54
17	S-6	3 4 4	1.5	0.5		16.5'	ELEV. 53.6 CLAY (CL) - medium gray clay, trace medium gravel; moist to wet, medium stiff, +PL; (GLACIAL LAKE DEPOSIT).	53
18–19	W-N		1.5					52, 51
		1					SANDY CLAY (CL) - medium gray and reddish brown	

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **1** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @12.1 after: 48 hours

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
20	S-7	WOH WOH	1.5	1.5			clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	50
21								49
22	W-N		1.5					48
23	S-8	WOR WOR WOR	1.5	1.5			SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	47
24								46
25	W-N		1.5					45
26	S-9	WOR WOH 1	1.5	1.5			SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	44
27								43
28	W-N		1.5					42
29	S-10	WOH WOH WOH	1.5	1.5			SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	41
30								40
31								39
32	W-N		5.0					38
33								37
34								36
35	S-11	WOH WOH WOH	1.5	1.5			SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	35
36								34
37								33
38	W-N		3.5					32
39								31

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **2** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @12.1 after: 48 hours

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
40, 41	S-12	WOR WOR 1	1.5				SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	30, 29
42, 43, 44	W-N		3.5					28, 27, 26
45, 46	S-13	WOR WOR WOR	1.5	1.5			SANDY CLAY (CL) - medium gray and reddish brown clay, some fine sand; moist, very soft, +PL, varved; (GLACIAL LAKE DEPOSIT).	25, 24
47, 48, 49	W-N		3.5					23, 22, 21
50						50.0'	ELEV. 20.1	20
51	S-14	WOR WOR 1	1.5	1.5			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	19
52, 53, 54	W-N		3.5					18, 17, 16
55, 56	S-15	WOR 1 WOH	1.5	1.5			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves; (GLACIAL LAKE DEPOSIT).	15, 14
57, 58, 59	W-N		3.5					13, 12, 11

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **3** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1

Project Description: New Britain to Hartford Busway

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

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @ 12.1 after: 48 hours

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
60	S-16	WOR 1 1	1.5	1.5			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	10
61								9
62	W-N		3.5					8
63								7
64								6
65	S-17	2 2 2	1.5	1.0			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	5
66								4
67	W-N		3.5					3
68								2
69								1
70	S-18	WOR WOR WOR	1.5	1.5			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	0
71								-1
72	W-N		3.5					-2
73								-3
74								-4
75	S-19	WOR 1 1	1.5	1.0			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	-5
76								-6
77	W-N		3.5					-7
78								-8
79								-9

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **4** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @12.1 after: 48 hours

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

Depth (ft.)	Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
80	S-20	WOH WOH WOH	1.5	1.0			SILTY CLAY (CL-ML) - gray to reddish brown clay, some silt; moist, very soft, +PL, silt varves, (GLACIAL LAKE DEPOSIT).	-10
81								-11
82	W-N		3.5					-12
83								-13
84								-14
85	S-21	WOR 1 1	1.5	1.5		85.0'	ELEV. -14.9 CLAY (CL) - red to brown clay, trace silt; very soft, +PL; (GLACIAL LAKE DEPOSIT).	-15
86								-16
87	W-N		3.5					-17
88								-18
89								-19
90	S-22	3 3 2	1.5	1.3		90.0'	ELEV. -19.9 SILT (ML) - reddish brown silt, little clay; wet, medium stiff, @ PL; (GLACIAL LAKE DEPOSIT).	-20
91								-21
92	W-N		3.5					-22
93								-23
94								-24
95	S-23	4 6 6	1.5	1.0		95.0'	ELEV. -24.9 SANDY CLAY (CL) - gray clay, some fine to medium sand; moist, stiff, @ PL, varved; (GLACIAL LAKE DEPOSIT).	-25
96								-26
97	W-N		3.5					-27
98								-28
99								-29

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **5** of **6** SM-001-M REV. 1/02

Driller: Jeff Leavitt/NEBC	**Connecticut DOT Boring Report**	Hole No.: **SB-57**
Inspector: Rachael Marks	Town: West Hartford / Hartford, CT	Stat./Offset:
Engineer: Baker Engineering	Project No.: 171-0305	Northing: 830806.525170,
Start Date: 7-14-03	Route No.:	Easting: 1009178.3
Finish Date: 7-15-03	Bridge No.:	Surface Elevation: 70.1
Project Description: New Britain to Hartford Busway		
Casing Type/Size: HW 4" ID	Sampler Type/Size: SS/ 1-3/8 " ID	Core Barrel Type:
Hammer Wt.: 300 Fall: 24	Hammer Wt.: 140 Fall: 30	

Groundwater Obs. @ 14.4 after: 0 hours, @ after: hours, @12.1 after: 48 hours

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

Depth (ft.)	SAMPLES Sample Type/No.	Blows on Sampler per 0.5 ft.	Pen. (ft.)	Rec. (ft./%)	RQD (ft./%)	Generalized Strata Description	Material Description and Notes	Elevation (ft.)
100						100.0'	ELEV. -29.9	-30
101	S-24	19 28 24	1.5	0.4			SILT (ML) - reddish brown silt; moist, hard, @ PL.	-31
102								-32
103	W-N		3.5					-33
104								-34
105						105.0'	ELEV. -34.9	-35
106	S-25	27 28 17	1.5	0.4			WELL GRADED SAND (SW) - red, brown, and black fine to coarse sand, trace silt, trace gravel; wet, dense, NP; (TILL).	-36
107								-37
108	W-N		3.5					-38
109								-39
110								-40
111	S-26	38 61 67	1.5	0.2			WELL GRADED SAND (SW) - red, brown, and black fine to coarse sand, trace silt, trace gravel; wet, very dense, NP; (TILL).	-41
112								-42
113	W-N		3.5					-43
114						113.6'	ELEV. -43.5	-44
115								-45
116	S-27	55 57 76	1.5	0.6			SILT WITH GRAVEL (ML) - reddish brown silt, little fine to medium gravel; moist, very dense, NP; (TILL).	-46
117							ELEV. -46.4 END OF BORING AT 116.5	-47
118								-48
119								-49

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

Total Penetration in Earth: 116.5' Rock: 0.0' No. of Samples: 27	NOTES: Retaining wall, south approach to Flatbush Ave.	Sheet **6** of **6** SM-001-M REV. 1/02

Appendix 5

Selected Previous Laboratory Data

Consolidation Tests Results

Strength Tests

Atterberg Limits & Moisture Contents

Gradation and Hydrometer Tests

Corrosivity Tests

Unconfined Compression Tests (Rock)

Consolidation Test Results

2003 Consolidation Tests

LABORATORY TESTING DATA SHEET

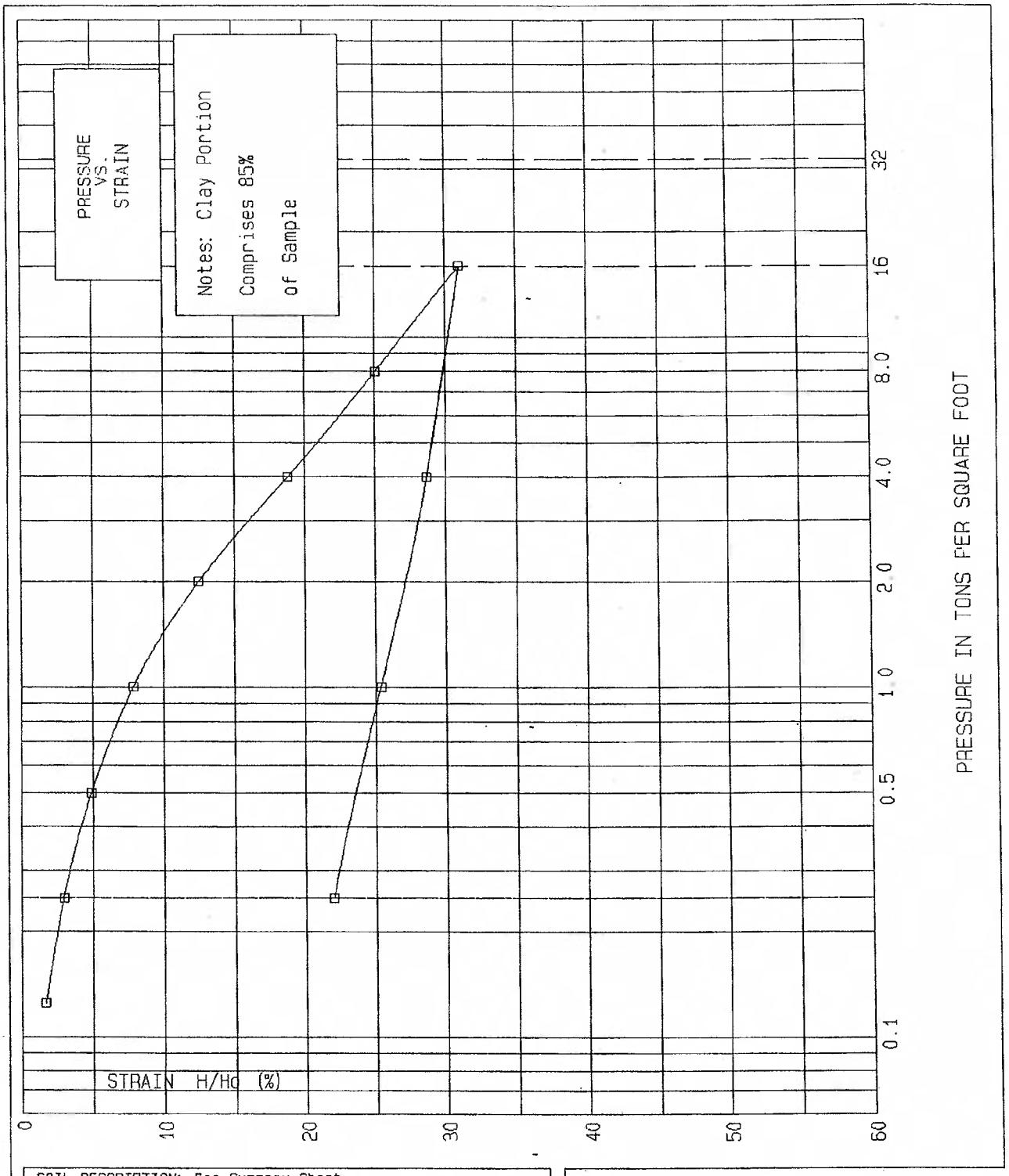
Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828 — Assigned By: D. Gaffney — Reviewed By: Don Schulze
Project Engineer: D. SCHULZE — Date: Feb.04 — Date Reviewed: 2/24/04

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-56	ST-1	30.0-32.0	401	Average Total Unit Weight (30.0-32.0') = 103.0 Pcf																Gray-brown Varved Soil as follows: Fat Clay (CH) grading to Silt (ML)
		30.1		62.8	(Clay Portion)									Tv= 0.20 tsf						
		30.1-30.6		60.3							62.9			CIU	4320	P/A MAX	2027	5.7		
		30.6		44.5	(Silt Portion)									Tv= 0.20 tsf						Varve thickness varies from 0.5-1.5" Clay portion varies from 0.25-1.25" in thickness and comprises approx. 25-50% of total varve
		30.6-31.1		60.5							65.5			CIU	5760	P/A MAX	2846	5.1		
		31.1		53.6	(entire varve)									Tv= 0.21 tsf						Note: 0.5" piece of Siltstone observed at 30.5'
		31.1-31.7		62.0							63.8			CIU	7200	P/A MAX	3395	6.6		
		31.7-31.8		66.1							61.6			Tv= 0.20 tsf					0.20	
		31.0-32.0		60.2	56	27	95	57		2.85	(Clay Portion)									

GZA GeoEnvironmental, Inc.

Q:\NEWTON\LAB\LABFORM7.XLS

labform1.xls



SOIL DESCRIPTION: See Summary Sheet

SAMPLE DIAM. 2.5 IN.	LIQUID LIMIT 0 %	PLASTIC LIMIT 0 %	SPECIFIC GRAVITY 2.85

	WATER CONTENT, %	DRY UNIT WEIGHT, pcf	VOID RATIO	SATURATION, %	SAMPLE HEIGHT, INCH
INITIAL	66.10	61.55			0.80
FINAL	46.30	78.91			0.62

New Britain-Hartford Busway

CONSOLIDATION TEST

BORING NO.	SB-56	TEST SERIES NO.	C401.1
SAMPLE	ST-1	DATE	2/23/04
DEPTH	31.7-31.8'		
TECH	MST		
REVIEWER	DAS	FILE	L17828

FIGURE

Job Number L17828
Project Name ..... New Britain-Hartford Busway
Test Number C401.1
Sample Description .. See Summary Sheet
Boring Number SB-56
Sample Number ST-1
Depth ..... 31.7-31.8'

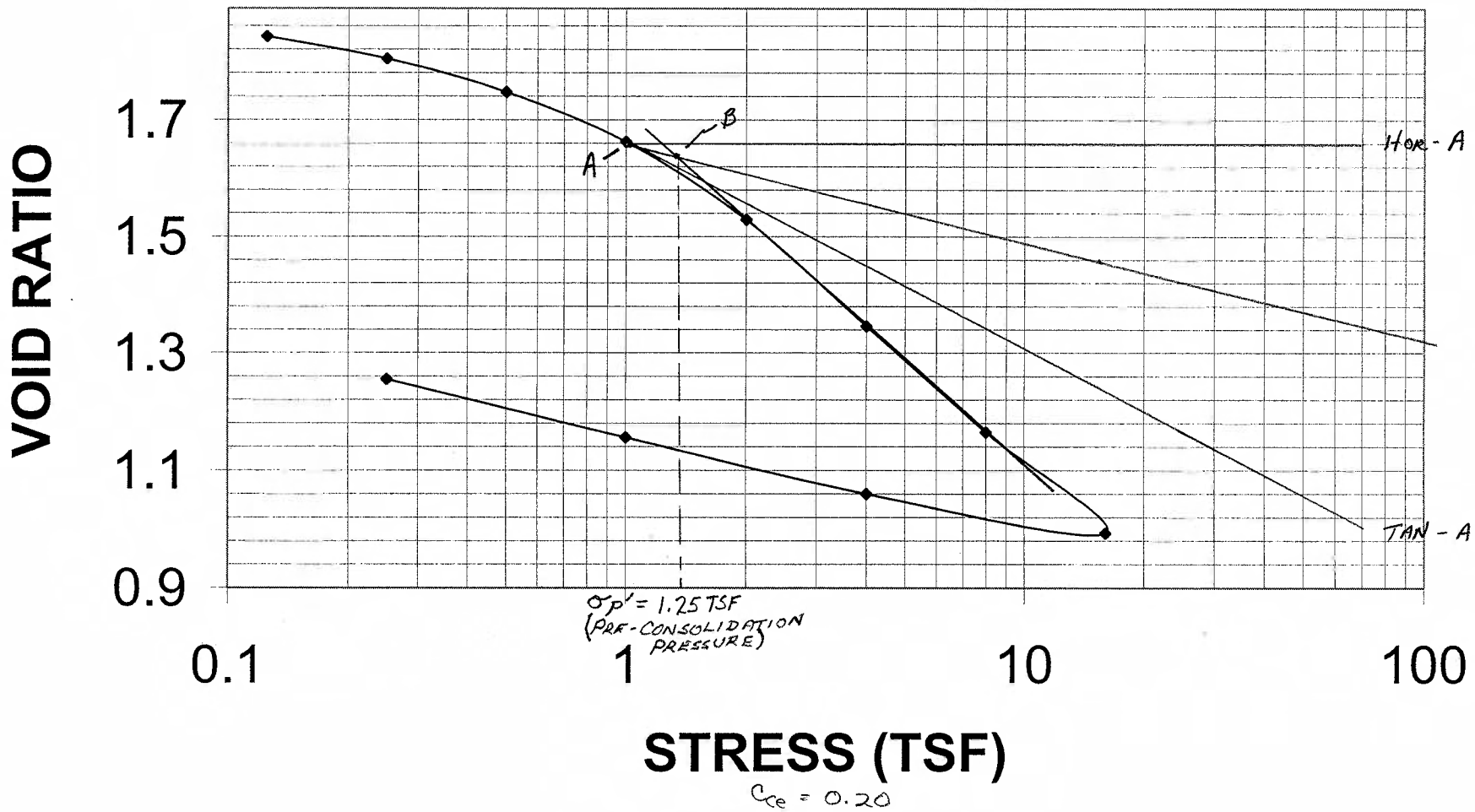
Technician ..... MST
Reviewer ..... DAS

NOTES: Clay Portion
Comprises 85%
of Sample

Specific Gravity ..... 2.8500E+00
Sample Dry Weight ..... 6.3450E+01
Sample Diameter ..... 2.5000E+00
Initial Void Ratio ..... 0.0000E+00
Initial Sample Height 8.0000E-01
Final Sample Height 6.2400E-01
Initial Water Content .... 6.6100E+01
Final Water Content ..... 4.6300E+01
Liquid Limit ..... 0.0000E+00
Plastic Limit ..... 0.0000E+00
Initial Saturation ..... 0.0000E+00
Final Saturation ..... 0.0000E+00
T50 data excluded
T90 data included

Increment umber	Pressure (TSF)	Final Dial	Percent Strain	Void Ratio	T90 (min)	Cv (T90) (/10000)	C_α
1	0.000	0.0	0.00	1.889			
2	0.125	131.0	1.64	1.842			
3	0.250	236.0	2.95	1.804	11.6	12.01	0.0020
4	0.500	393.0	4.91	1.747	9.6	14.03	0.0024
5	1.000	630.0	7.87	1.662	7.8	16.39	
6	2.000	998.0	12.47	1.529	9.6	12.26	
7	4.000	1505.0	18.81	1.346	10.2	10.18	
8	8.000	2005.0	25.06	1.165	7.8	11.40	0.0039
9	16.000	2481.0	31.01	0.993	6.3	11.99	
10	4.000	2295.0	28.69	1.060			
11	1.000	2030.0	25.37	1.156			
12	0.250	1757.0	21.96	1.255			

SB-56 Consolidation



2008

Constant Rate of Strain Consolidation Tests

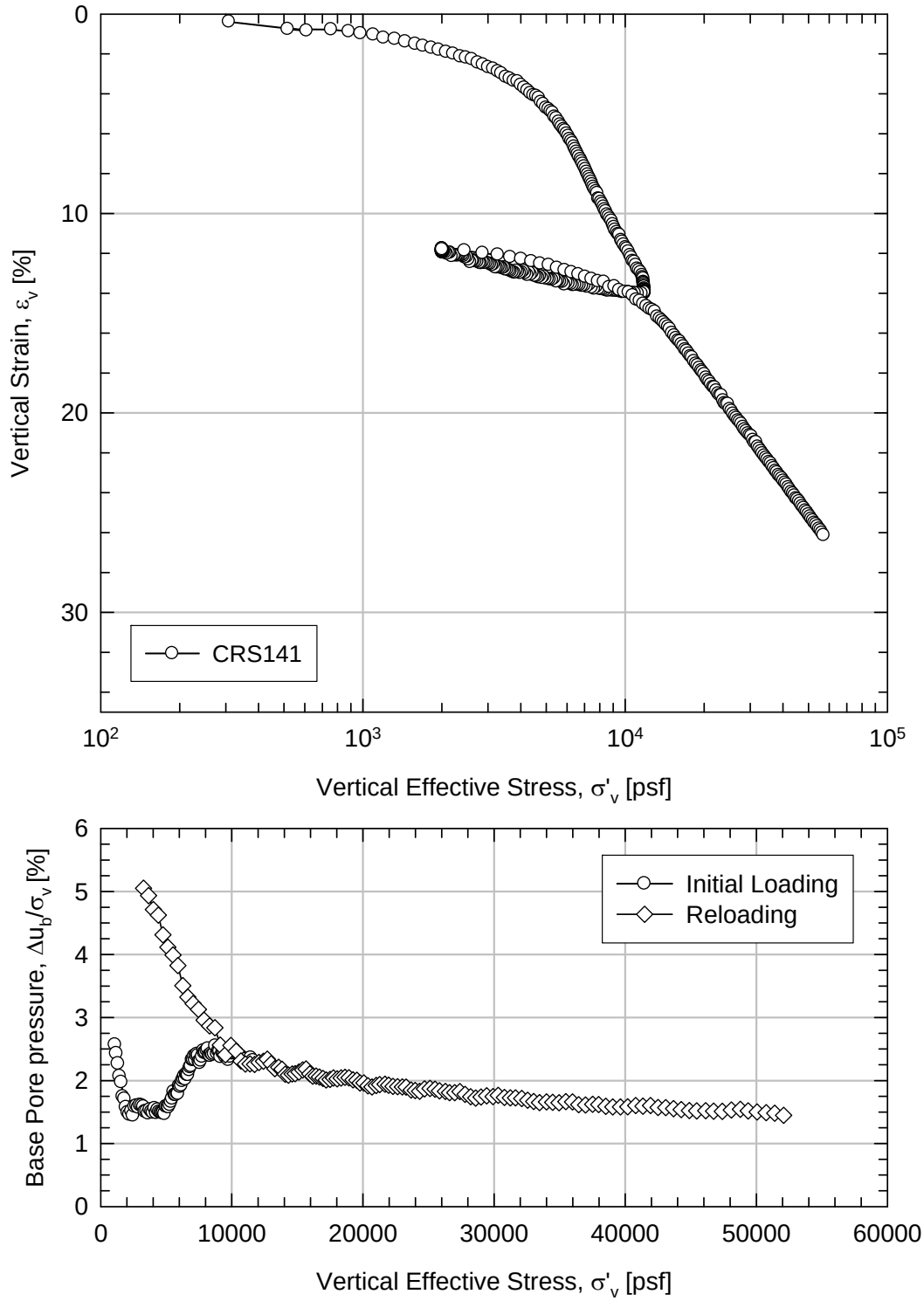


Figure 5.3.6 Vertical strain and normalized base pore pressure versus vertical effective stress for test CRS141 on sample SB-01-1 UP2 30-32 ft.

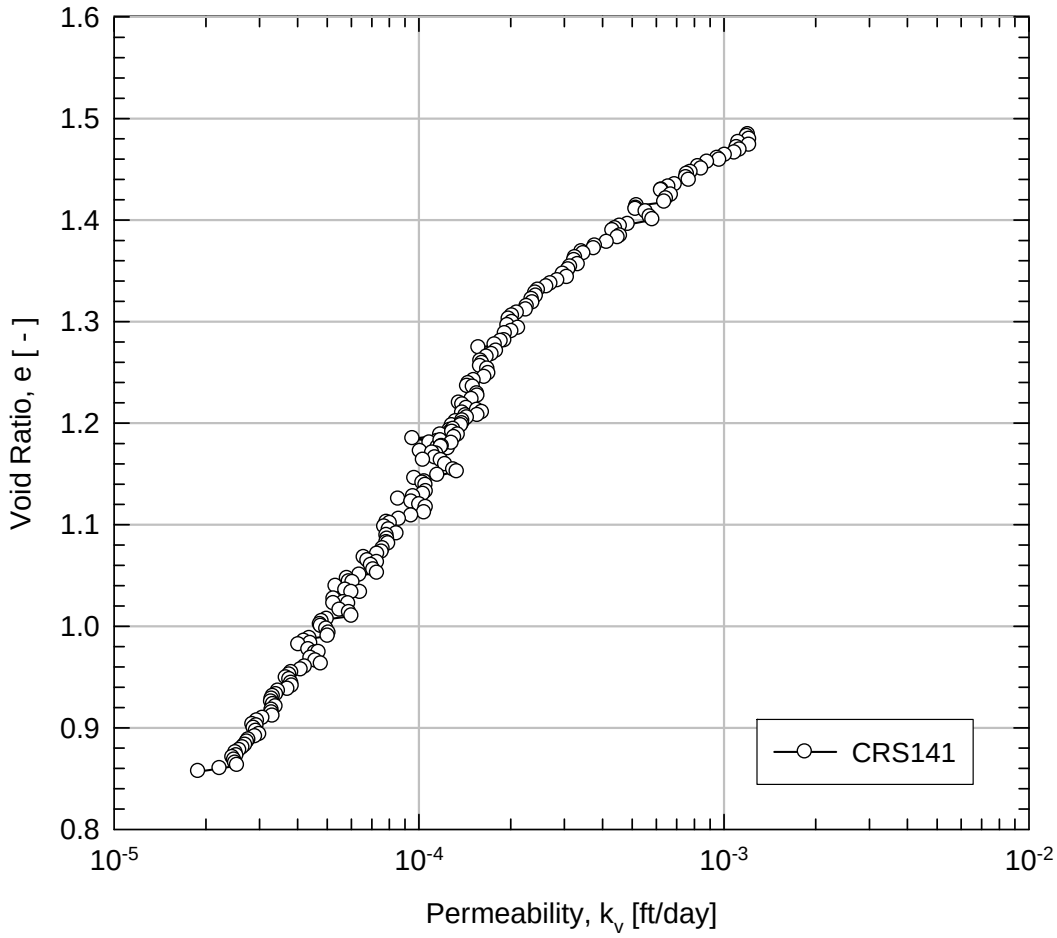
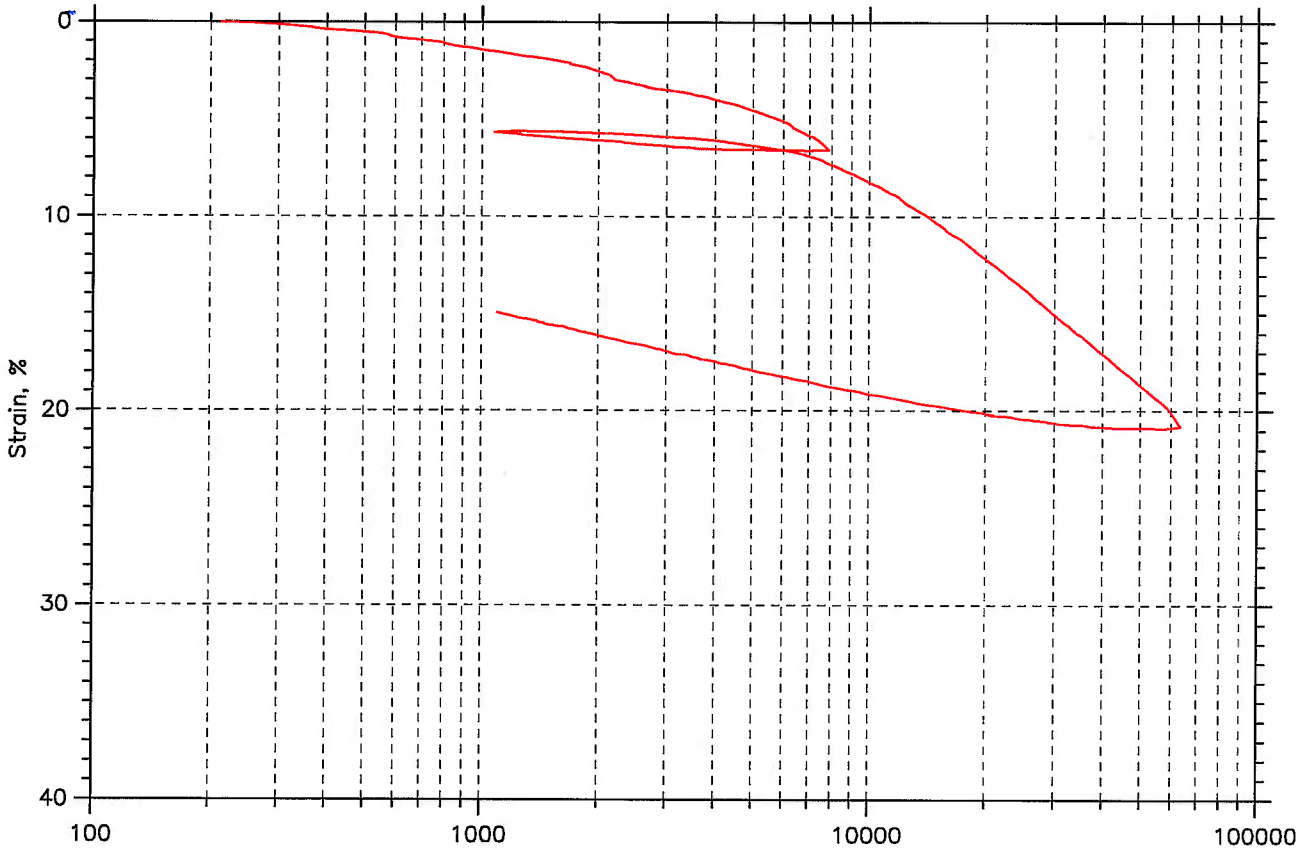


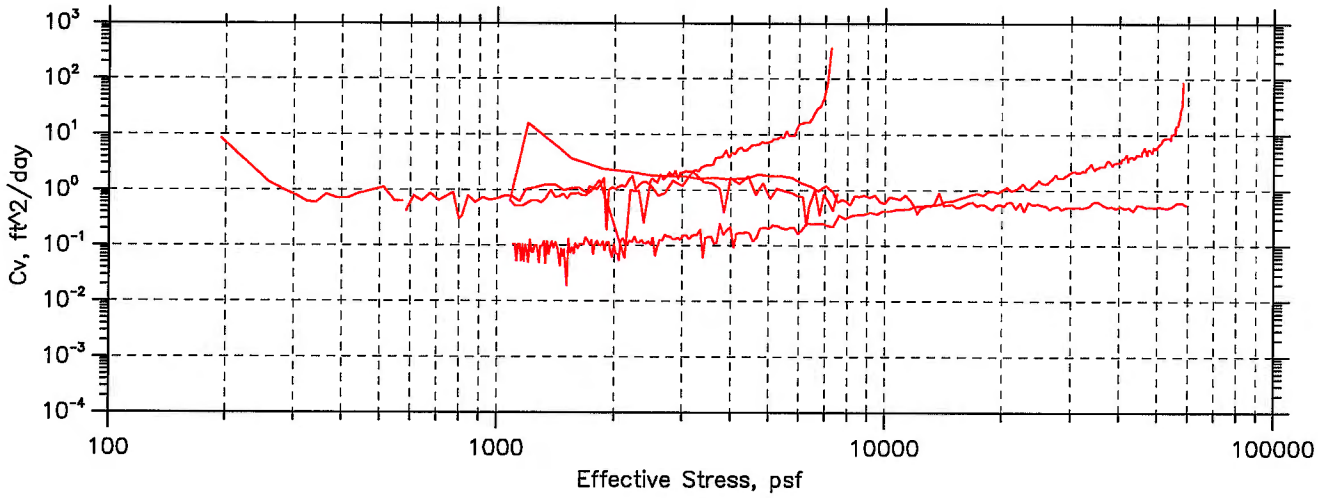
Figure 5.3.7 Void ratio versus permeability for CRS141 on sample SB-01-1 UP2 30-32 ft.

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report





Project: Hartford Busway	Location: Hartford, CT	Project No.: GTX-8398
Boring No.: SB-01-2	Tested By: md	Checked By: jdt
Sample No.: UP-1	Test Date: 08/10/08	Depth: 15-17
Test No.: CRC-3	Sample Type: tube	Elevation: ---
Description: Moist, brown clay		
Remarks: System K		

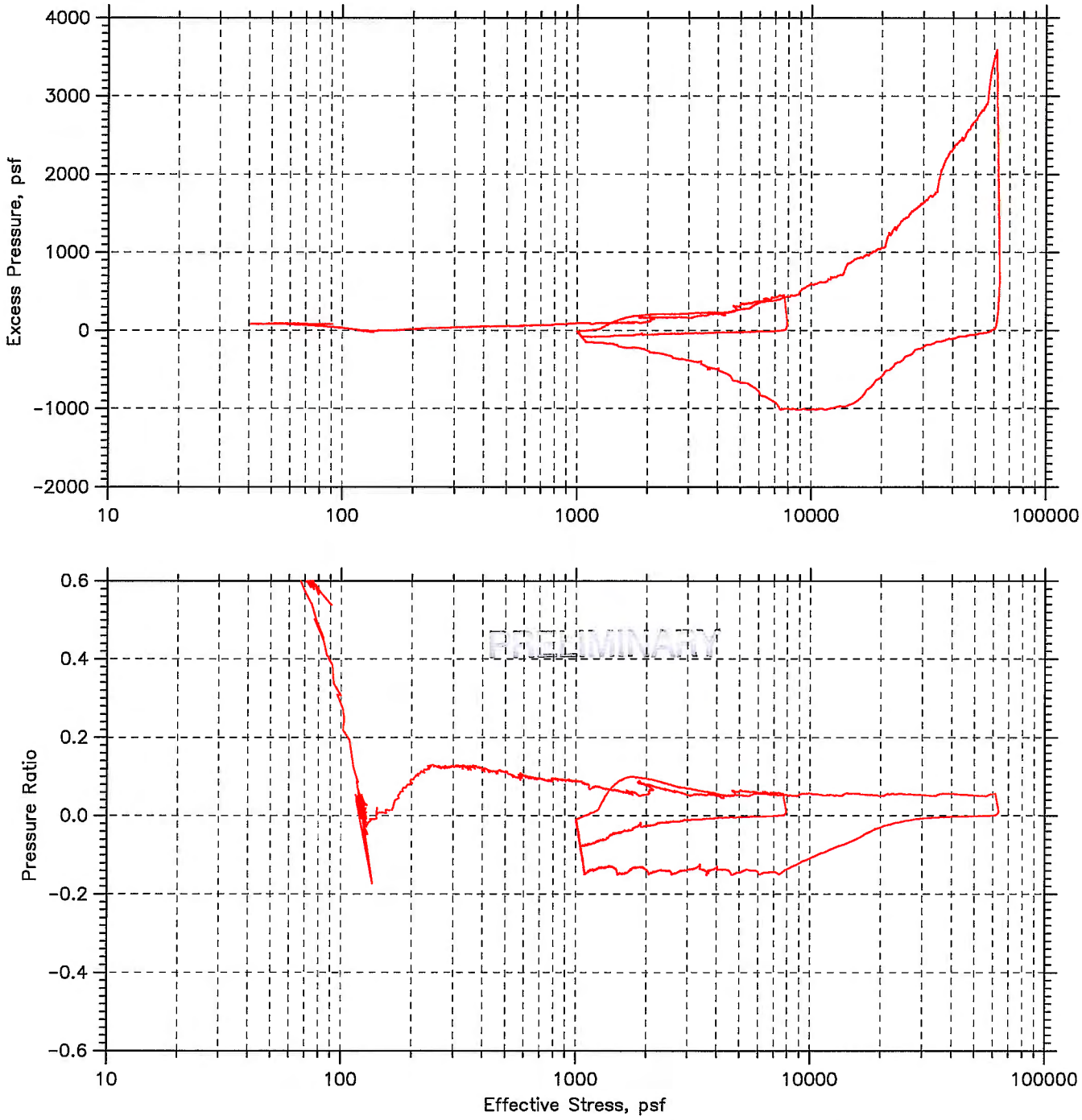
Tue, 26-AUG-2008 16:28:11

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves

PRELIMINARY



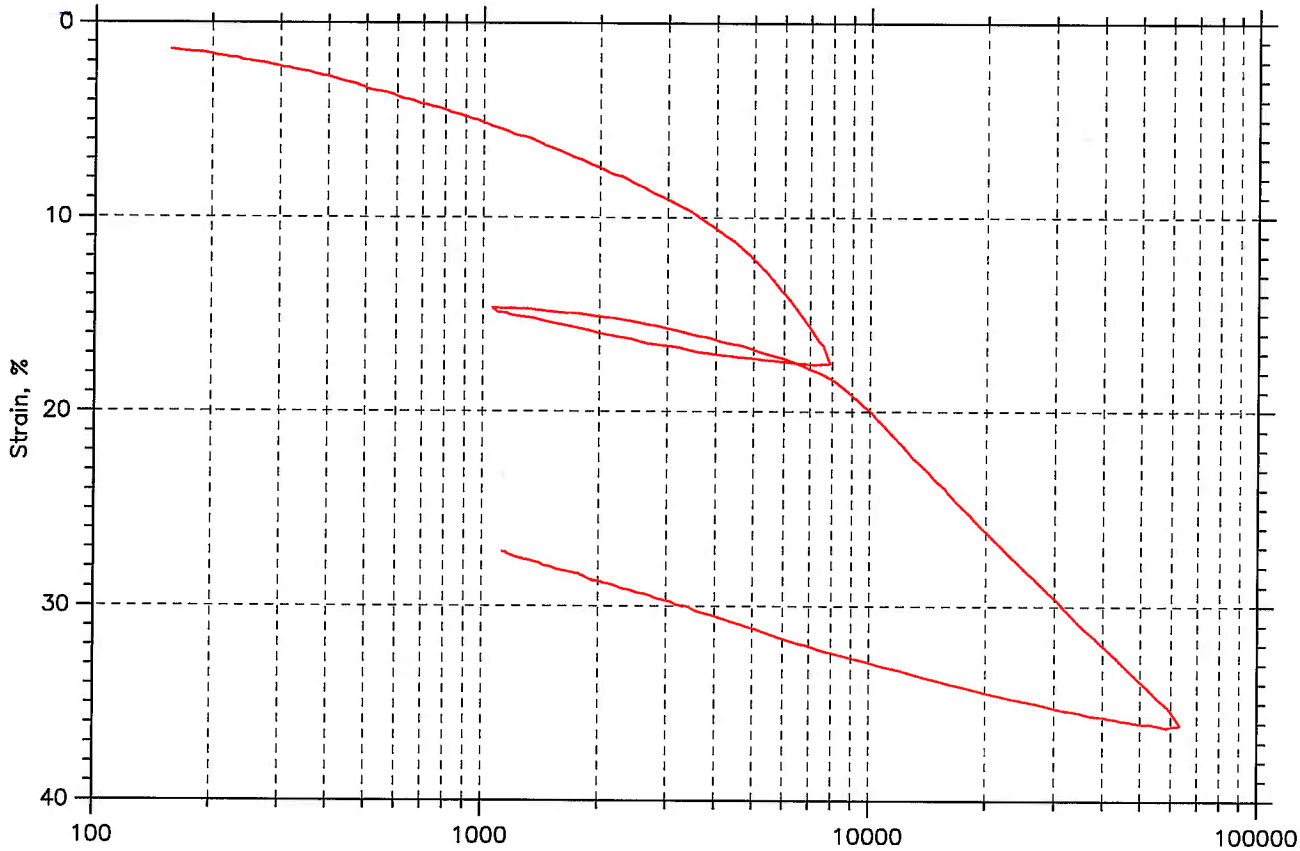
Project: Busway South	Location: Hartford, CT	Project No.: GTX-8398
Boring No.: SB-01-2	Tested By: md	Checked By: jdt
Sample No.: UP-1	Test Date: 08/10/08	Depth: 15-17
Test No.: CRC-3	Sample Type: tube	Elevation: ---
Description: Moist, brown clay		
Remarks: System K		

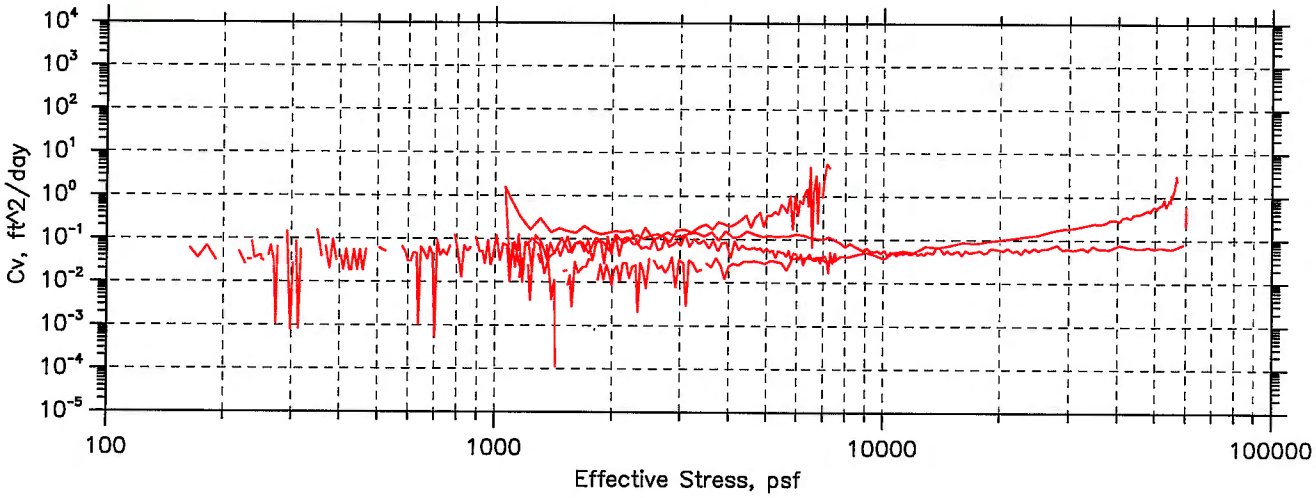
Tue, 19-AUG-2008 08:26:44

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Summary Report





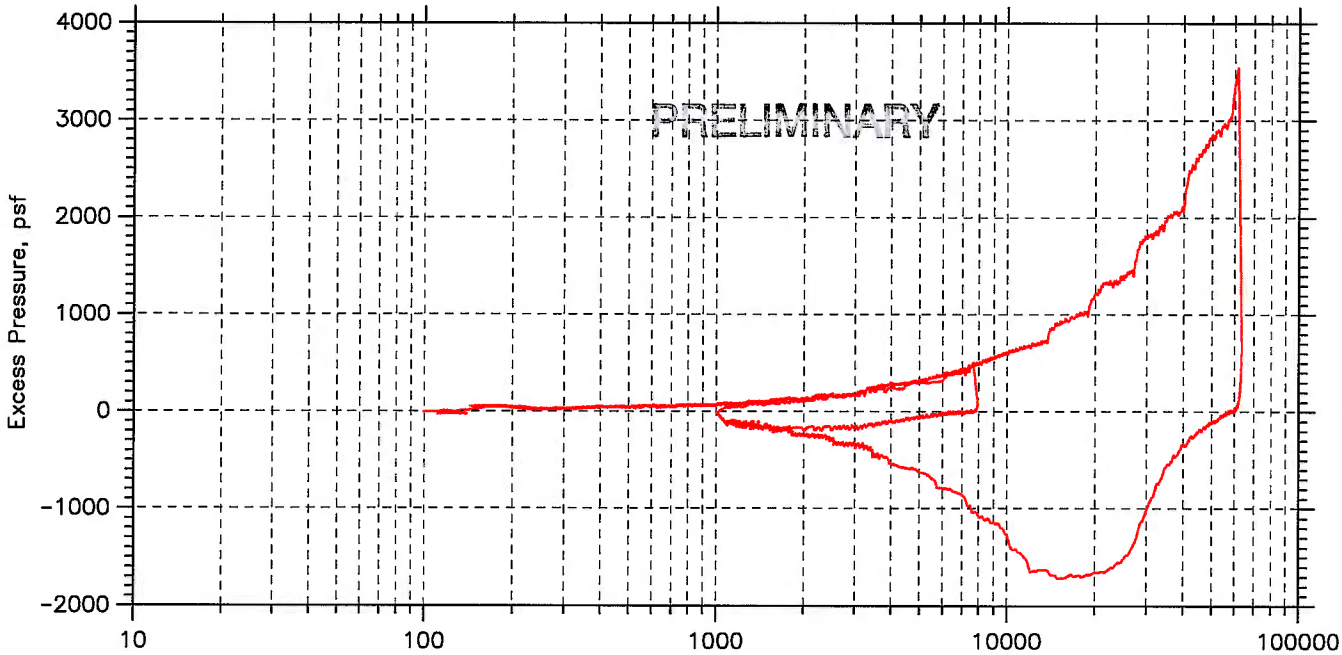
Project: Hartford Busway	Location: Hartford, CT	Project No.: GTX-8398
Boring No.: RW-4	Tested By: md	Checked By: jdt
Sample No.: UP-2	Test Date: 08/04/08	Depth: 45-47
Test No.: CRC-1	Sample Type: tube	Elevation: ---
Description: Moist, reddish brown silt		
Remarks: System T		

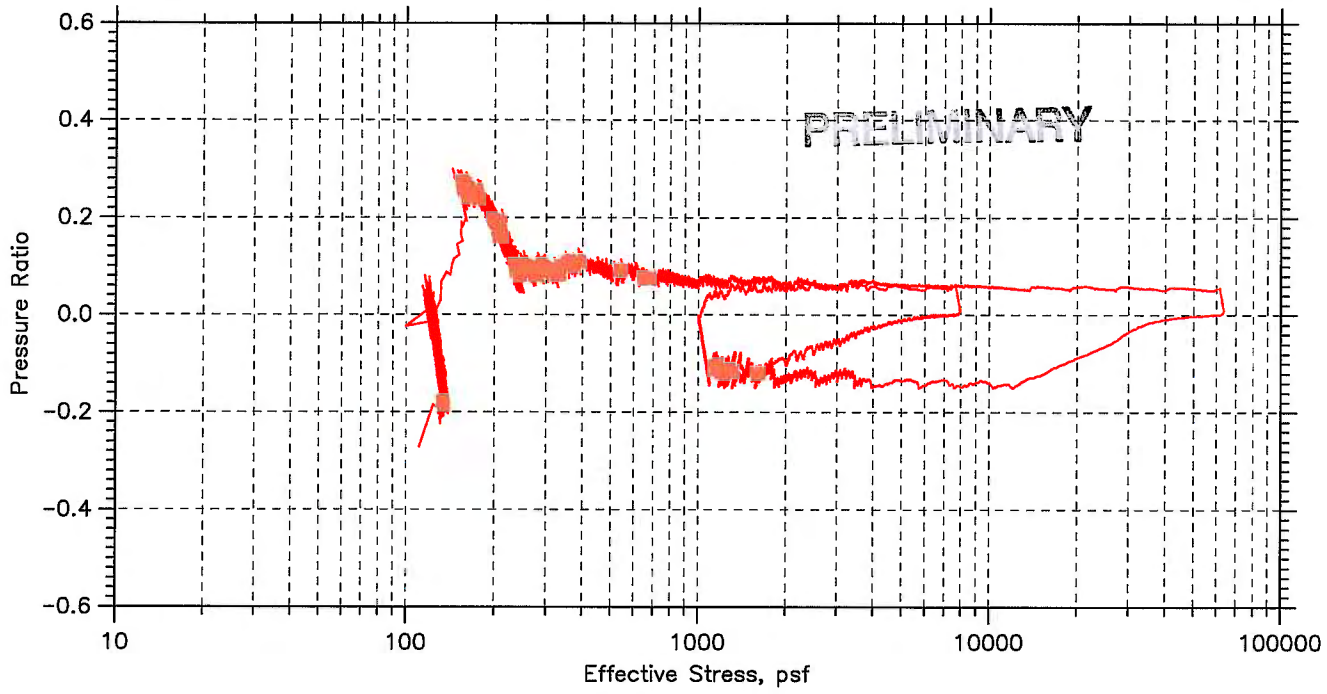
Tue, 26-AUG-2008 13:34:21

Constant Rate of Consolidation

Constant Strain Rate by ASTM D4186

Pressure Curves





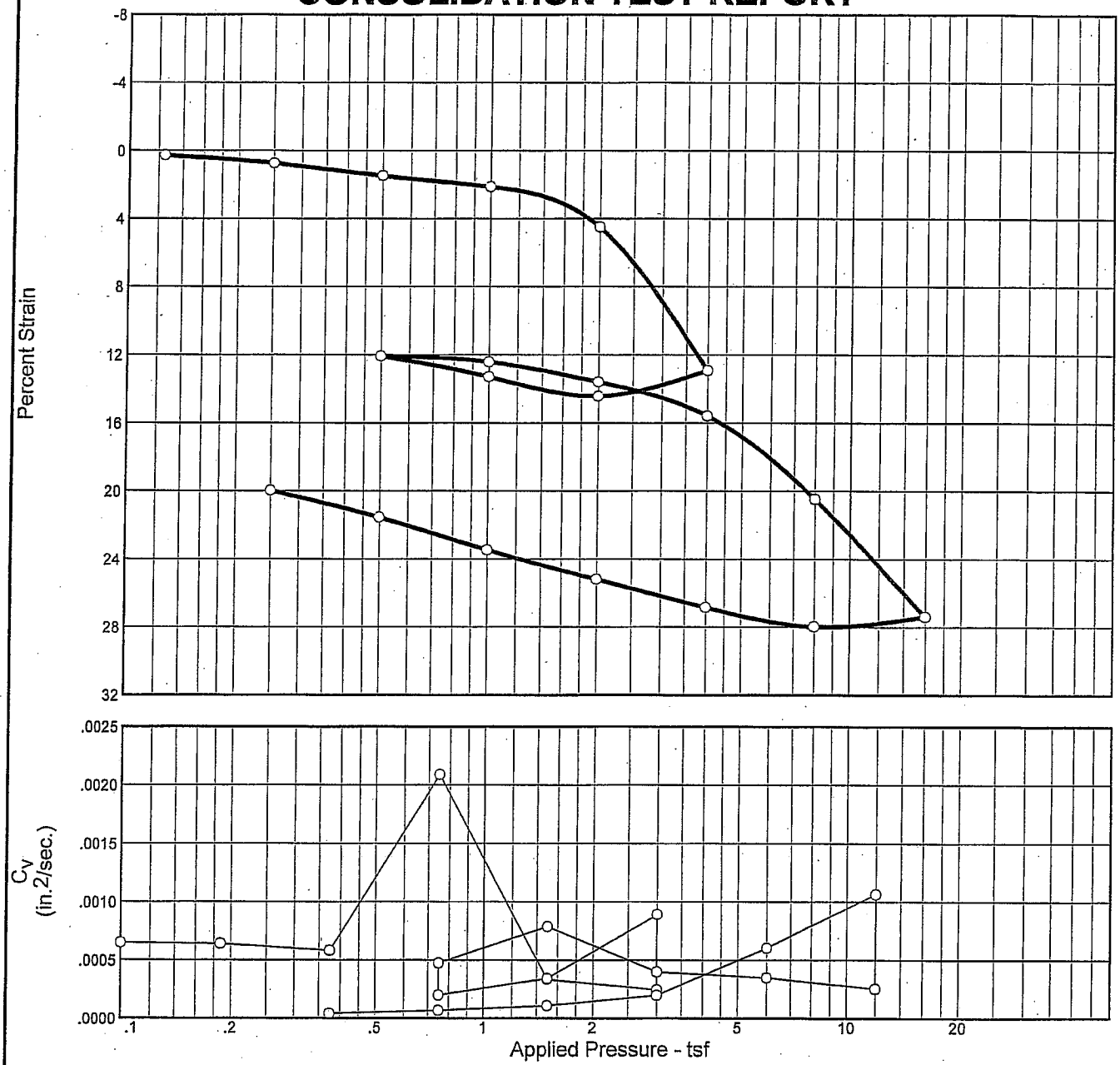
Project: Busway	Location: Hartford CT	Project No.: GTX-8398
Boring No.: RW-4	Tested By: md	Checked By: jdt
Sample No.: UP-2	Test Date: 08/04/08	Depth: 45-47
Test No.: CRC-1	Sample Type: tube	Elevation: ---
Description: Moist reddish brown clay		
Remarks: System T		

Mon, 18-AUG-2008 14:24:48

2008

Incremental Load Consolidation Tests

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Heave %	e_o
98.3 %	46.2 %	74.3	49	25	2.699		1.44	0.53	0.10			1.269

MATERIAL DESCRIPTION	USCS	AASHTO
	CL	A-7-6

Project No.

Project: New Britain-Hartford Busway #155-H025

Source: Boring SB-01-1 (Flatbush Ave., over Busway)

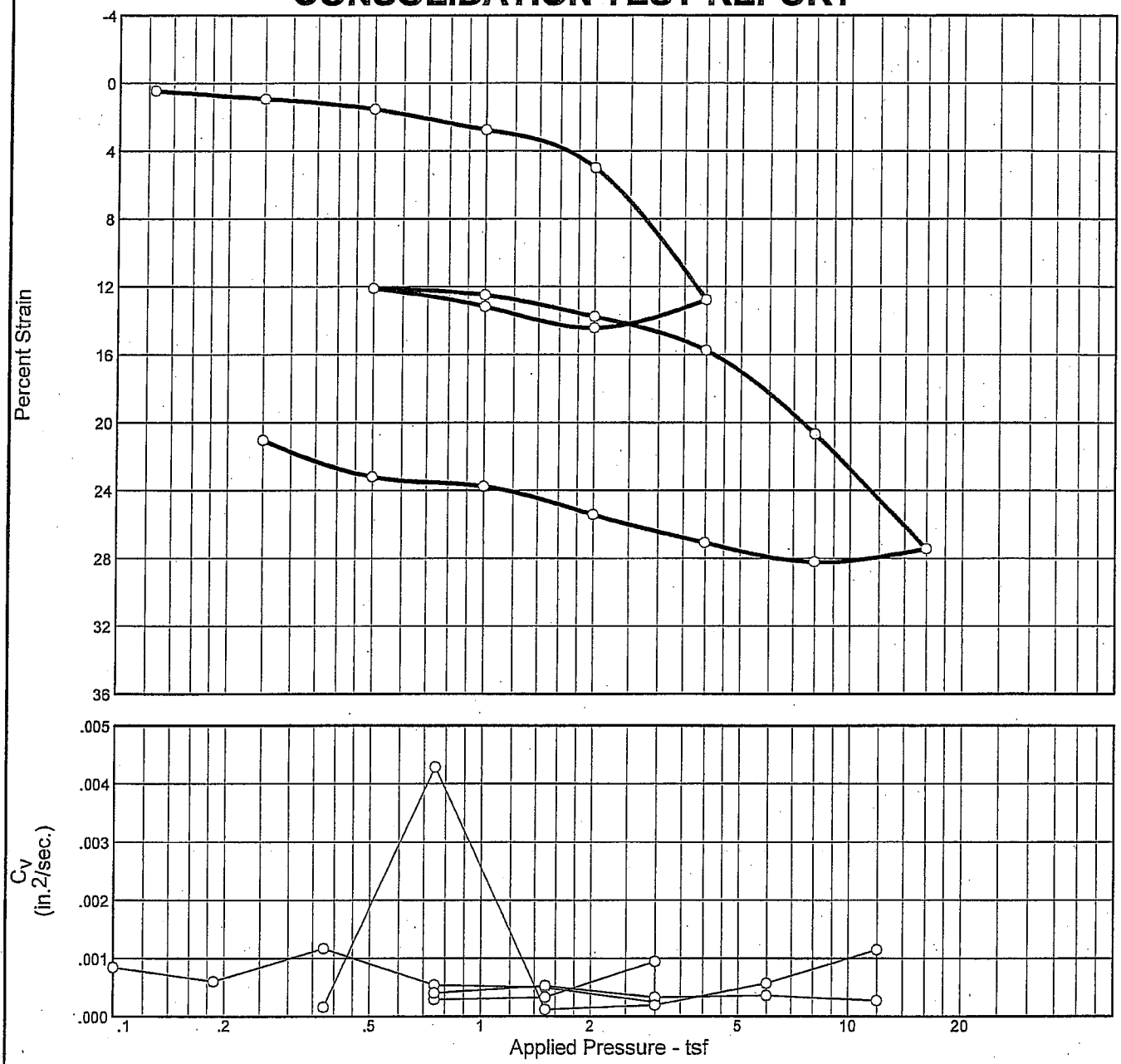
Test-Con, Inc.
P.O. Box 3116
Danbury, CT 06813-3116

Remarks:
Boring No SB-01-1, Sample No UP1, Depth from 20'to 22'

E-MAILED SEP 02 2008

Figure 1

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Heave %	e_o
88.2 %	51.2 %	65.8	49	24	2.712		1.46	0.58	0.11			1.575

MATERIAL DESCRIPTION	USCS	AASHTO
	CL	A-7-6

Project No.

Project: New Britain-Hartford Busway #155-H025

Source: SB-01-2 (Flatbush Ave., over Busway)

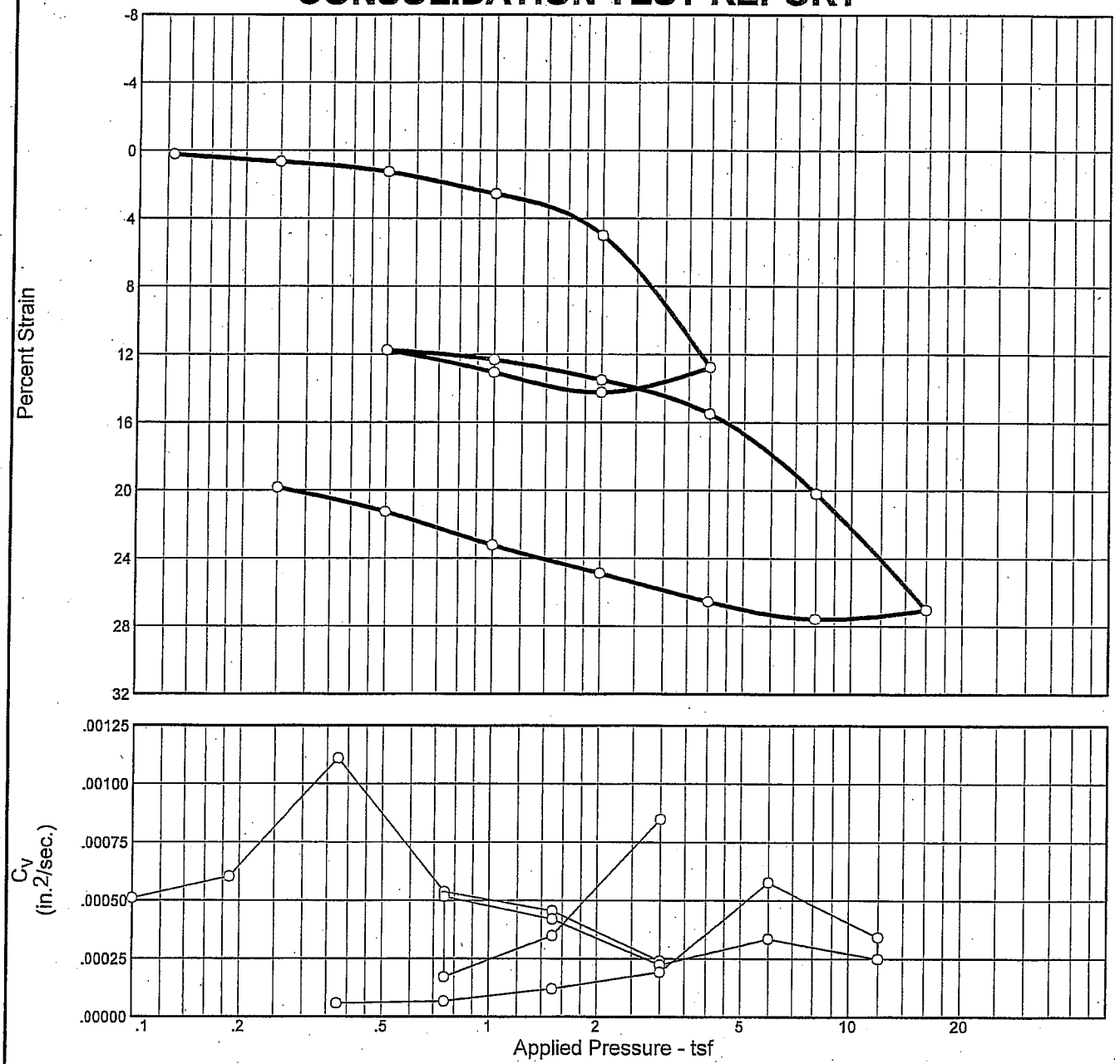
Test-Con, Inc.
P.O. Box 3116
Danbury, CT 06813-3116

Remarks:
Boring SB-01-2, Sample No UP2.
Depth from 25' to 27'

E-MAILED SEP 02 2008

Figure 1

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Heave %	e_o
96.3 %	54.3 %	66.6	49	26	2.679		1.64	0.58	0.11			1.512

MATERIAL DESCRIPTION	USCS	AASHTO
	CL	A-7-6

Project No.

Project: New Britain-Hartford Busway #155-H025

Source: Boring RW-4 (Flatbush Ave., over Busway)

Test-Con, Inc.
P.O. Box 3116
Danbury, CT 06813-3116

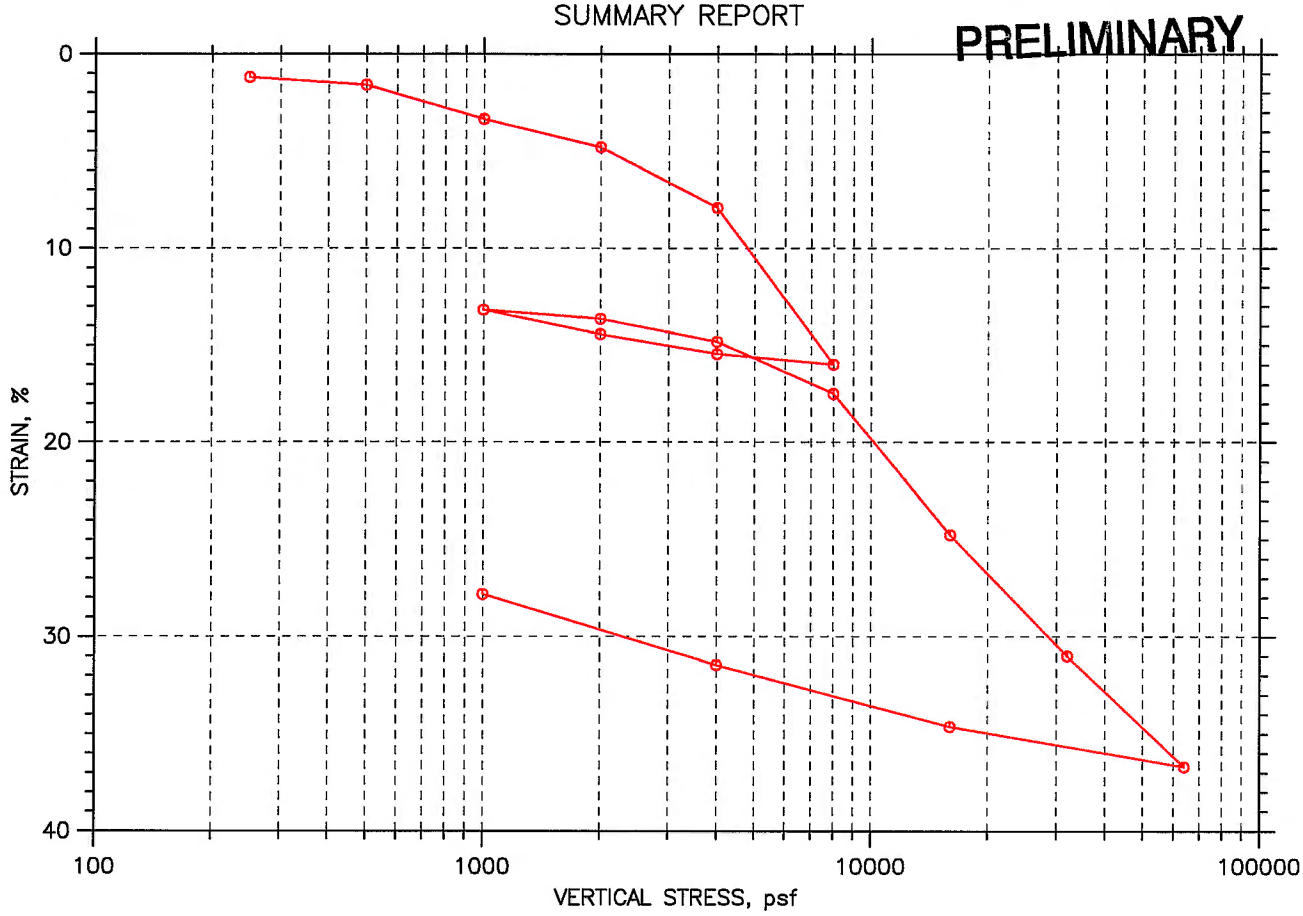
Remarks:
Boring RW-4, Sample No UP1.
Depth from 35' to 37'

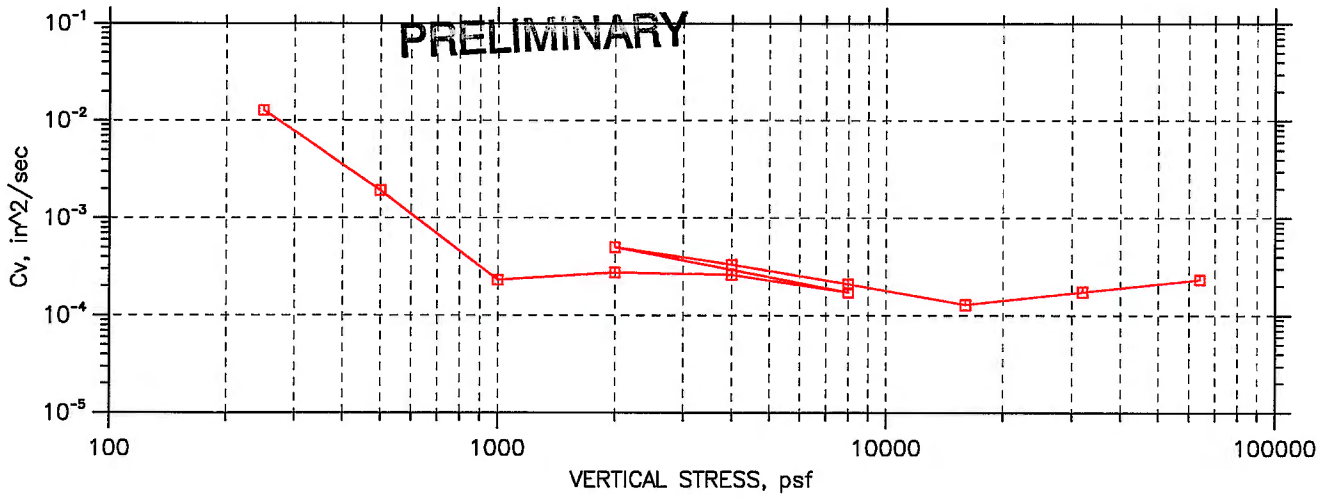
E-MAILED SEP 02 2008

Figure 1

CONSOLIDATION TEST DATA

SUMMARY REPORT





GeoTesting express, a subsidiary of Geocomp Corporation	Project: Busway	Location: Hartford CT	Project No.: GTX-8398
	Boring No.: RW-4	Tested By: md	Checked By: jdt
	Sample No.: UP-2	Test Date: 08/04/08	Depth: 45-47 ft
	Test No.: C-1	Sample Type: Tube	Elevation: ---
	Description: Moist reddish brown clay		
	Remarks: System G		

Mon, 18-AUG-2008 14:51:00

Strength Tests

2003 Triaxial Strength Tests

LABORATORY TESTING DATA SHEET

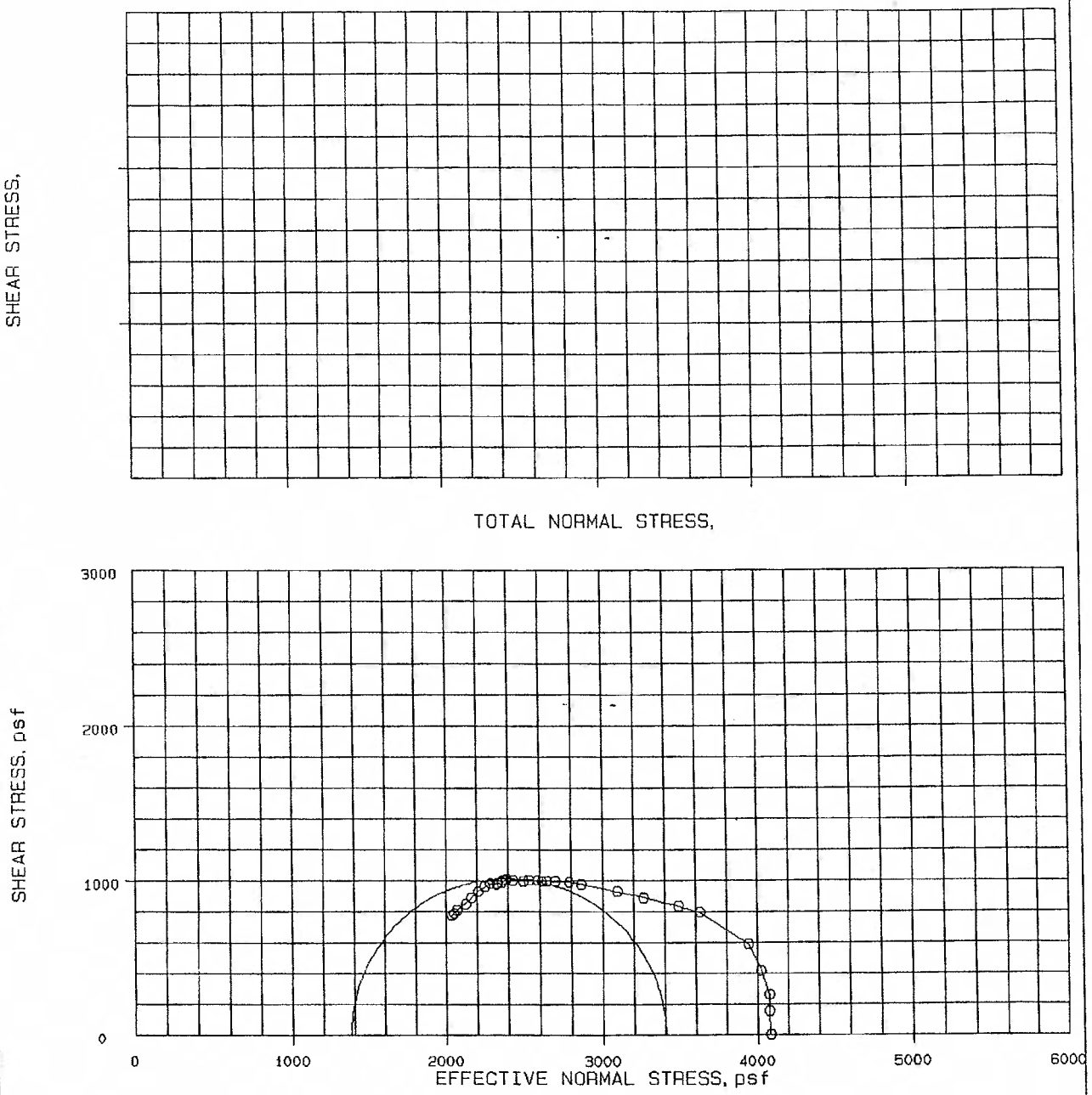
Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828 — Assigned By: D. Gaffney — Reviewed By: [signature]
Project Engineer: D. SCHULZE — Date: Feb.04 — Date Reviewed: 2/24/04

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
SB-56	ST-1	30.0-32.0	401		Average Total Unit Weight (30.0-32.0') = 103.0 Pcf															Gray-brown Varved Soil as follows:
		30.1		62.8	(Clay Portion)									Tv= 0.20 tsf						Fat Clay (CH) grading to Silt (ML)
		30.1-30.6		60.3							62.9			CIU	4320	P/A MAX	2027	5.7		
		30.6		44.5	(Silt Portion)									Tv= 0.20 tsf						Varve thickness varies from 0.5-1.5" Clay portion varies from 0.25-1.25"
		30.6-31.1		60.5							65.5			CIU	5760	P/A MAX	2846	5.1		in thickness and comprises approx. 25-50% of total varve
		31.1		53.6	(entire varve)									Tv= 0.21 tsf						Note: 0.5" piece of Siltstone
		31.1-31.7		62.0							63.8			CIU	7200	P/A MAX	3395	6.6		observed at 30.5'
		31.7-31.8		66.1							61.6			Tv= 0.20 tsf					0.20	
		31.0-32.0		60.2	56	27	95	57		2.85	(Clay Portion)									

GZA GeoEnvironmental, Inc.

Q:\NEWTON\LAB\LABFORM7.XLS

labform1.xls



SOIL DESCRIPTION:	See Summary Sheet	
LIQUID LIMIT 0 %	PLASTIC LIMIT 0	SPECIFIC GRAVITY 0

FAILURE CRITERIA $\sigma_1 - \sigma_3$ MAX

REMARKS

NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

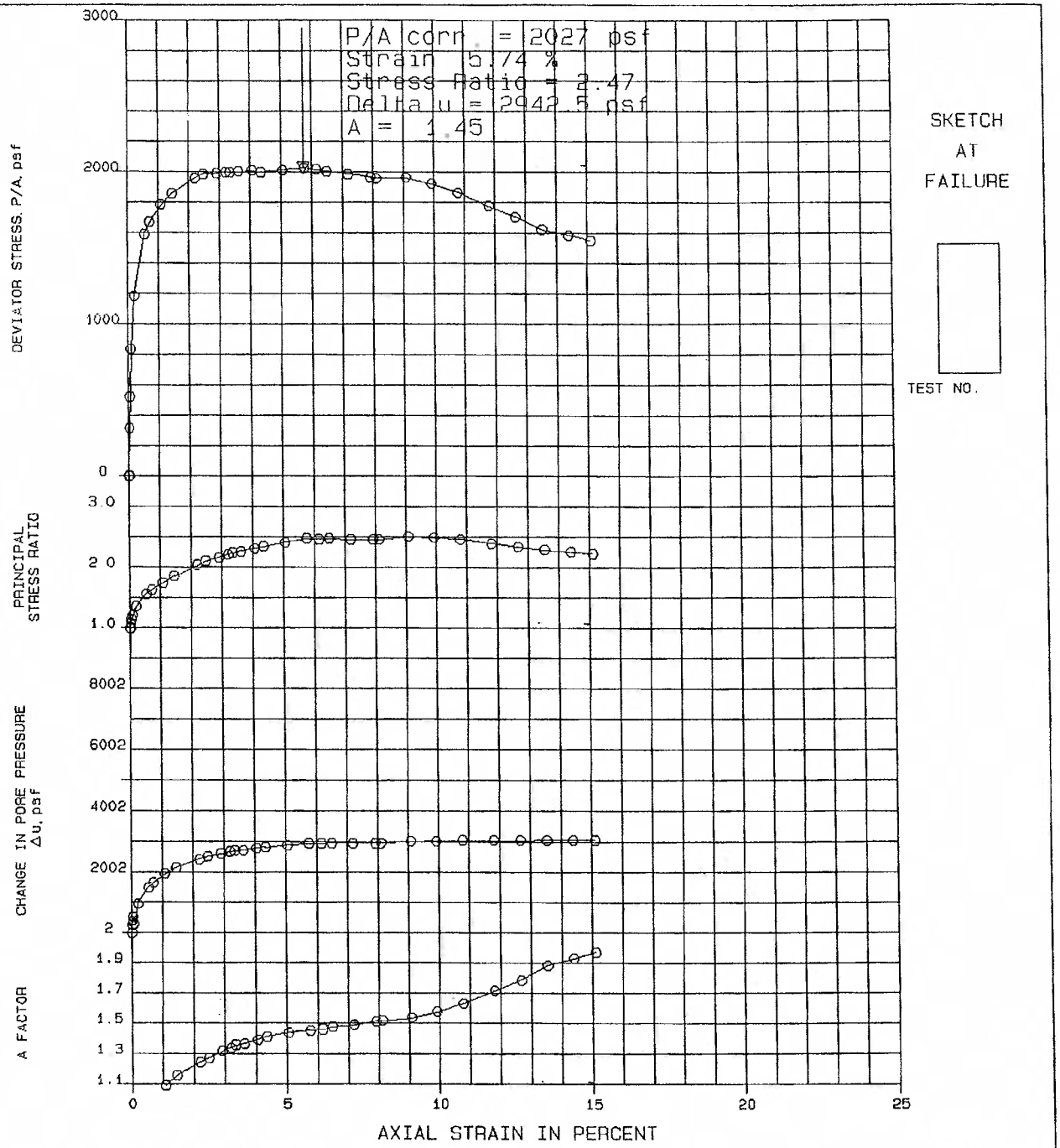
MOHR STRENGTH ENVELOPE

TRIAXIAL COMPRESSION TESTS (CIU)

FIGURE

BORING NO.	SB-56	TEST SERIES NO	401
SAMPLE	ST-1	DATE	Feb.04
DEPTH	30.1-30.6'		
TECH.	MST		
REVIEWER		FILE	L1782B

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



TEST NO /SYMBOL	INITIAL CONDITIONS: INITIAL WATER CONTENT, %	INITIAL CONDITIONS: INITIAL DRY UNIT WEIGHT, pcf	INITIAL CONDITIONS: SAMPLE HEIGHT & DIAMETER, IN.	CONDITIONS BEFORE SHEAR: INITIAL STRESSES $\bar{\sigma}_1 = \bar{\sigma}_3$, ksf	CONDITIONS BEFORE SHEAR: FINAL BACK PRESSURE, ksf	CONDITIONS BEFORE SHEAR: VOLUMETRIC STRAIN, %	CONDITIONS BEFORE SHEAR: PORE PRESSURE RESPONSE, %	FINAL CONDITIONS: FINAL WATER CONTENT, %	FINAL CONDITIONS: FINAL DRY UNIT WEIGHT,	RATE OF STRAIN, PERCENT PER MINUTE
401 1.1	60.3	62.9	5.821 2.834	4.32	10.08	12.9	95.8	49.6	72.2	.004

SOIL DESCRIPTION: See Summary Sheet

LIQUID LIMIT 0 % PLASTIC LIMIT 0 % SPECIFIC GRAVITY 0

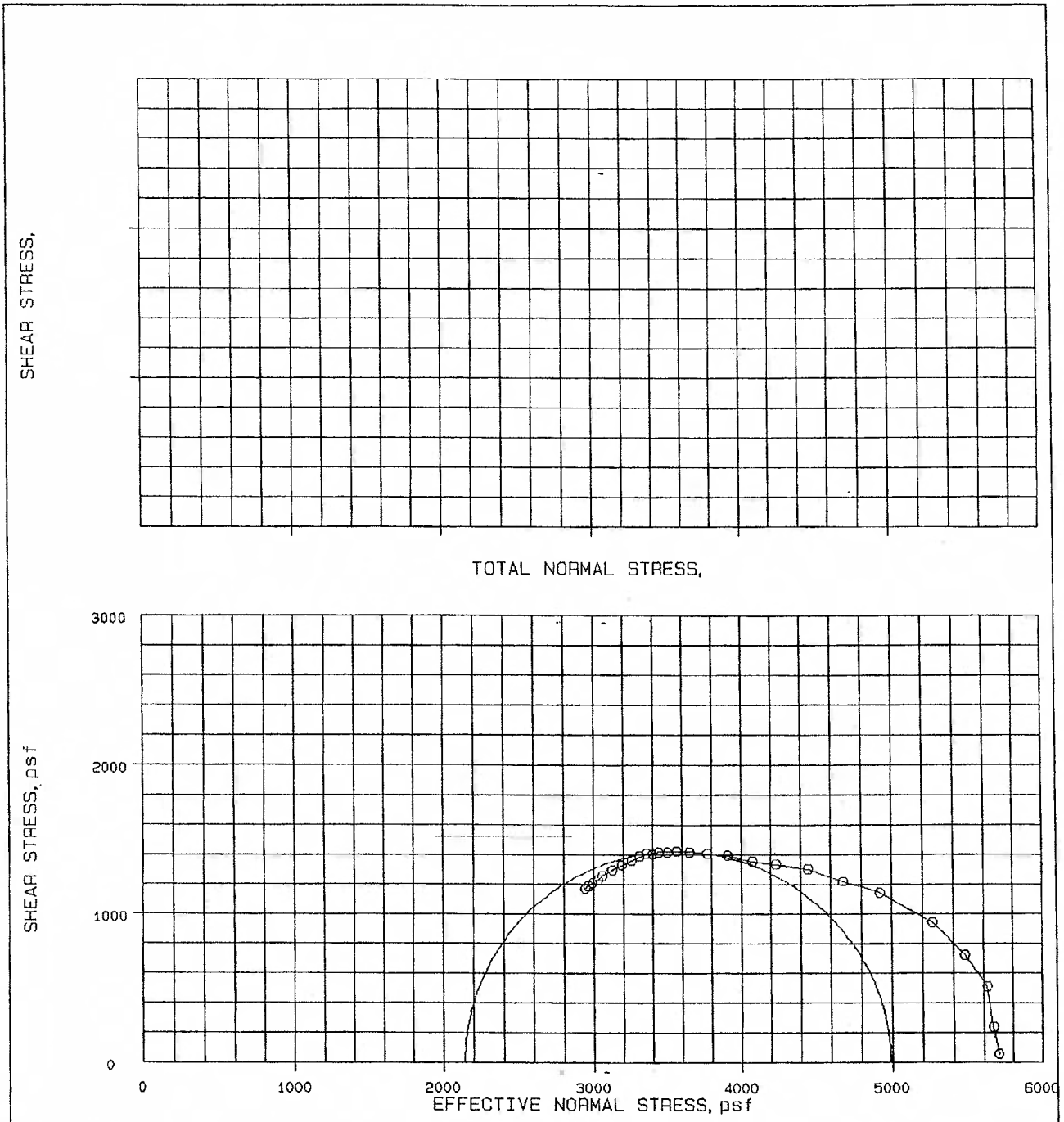
NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
TRIAXIAL COMPRESSION TESTS ($\overline{CIU}$)

BORING NO. SB-56
SAMPLE ST-1
DEPTH 30.1-30.6'
TECH MST
REVIEWER

TEST SERIES NO. 401
DATE Feb 04
FILE L17828

FIGURE

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



SOIL DESCRIPTION:	See Summary Sheet				
LIQUID LIMIT	0 %	PLASTIC LIMIT	0	SPECIFIC GRAVITY	0

FAILURE CRITERIA $\sigma_1 - \sigma_3$ MAX

REMARKS

NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

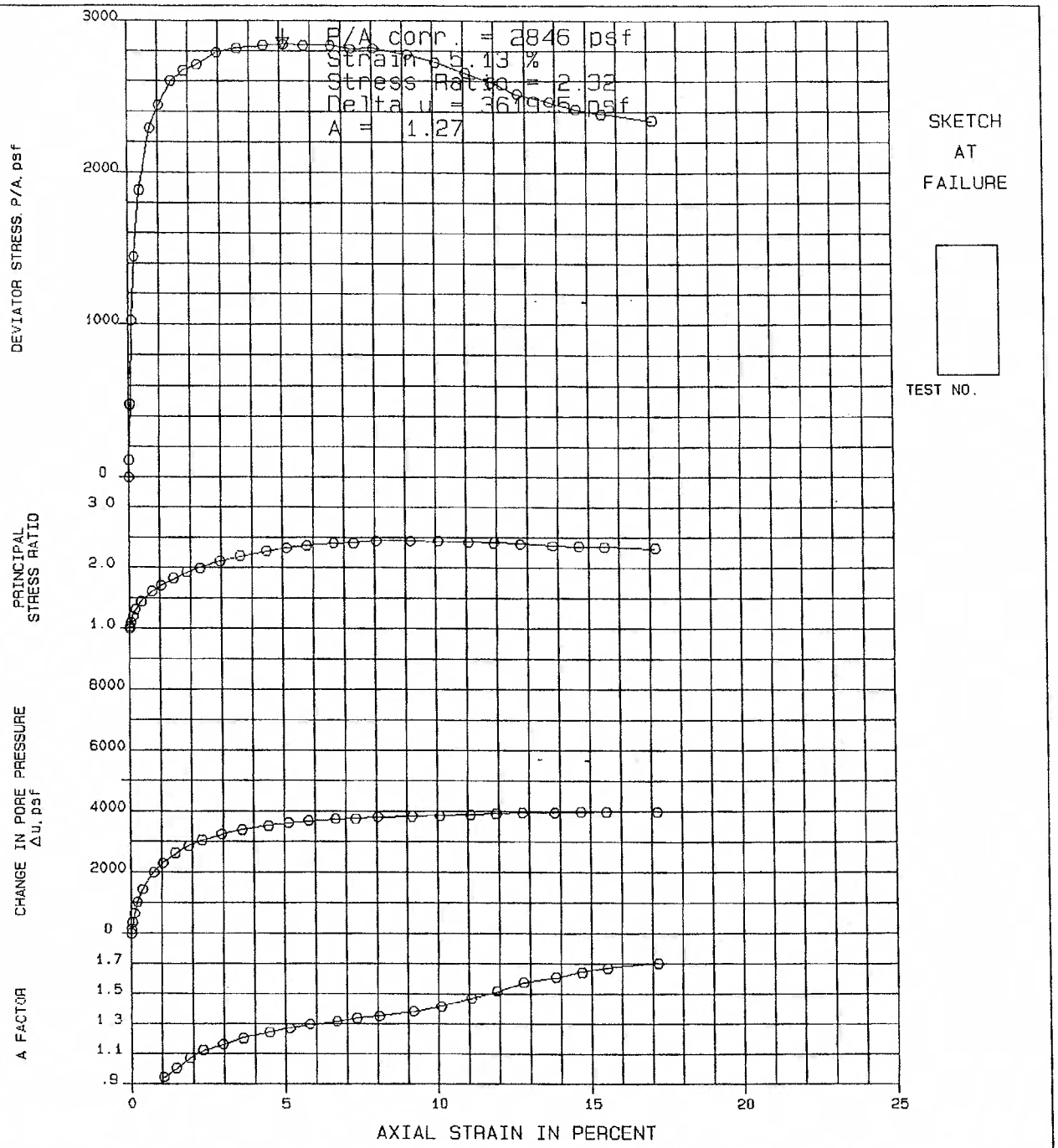
MOHR STRENGTH ENVELOPE

TRIAXIAL COMPRESSION TESTS (CIU)

FIGURE

BORING NO	SB-56	TEST SERIES NO.	401
SAMPLE	ST-1	DATE	Feb.04
DEPTH	30.6-31.1'		
TECH.	MST		
REVIEWER		FILE	L1782B

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



TEST NO./SYMBOL	INITIAL CONDITIONS: INITIAL WATER CONTENT, %	INITIAL CONDITIONS: INITIAL DRY UNIT WEIGHT, pcf	INITIAL CONDITIONS: SAMPLE HEIGHT & DIAMETER, IN.	CONDITIONS BEFORE SHEAR: INITIAL STRESSES $\bar{\sigma}_1 = \bar{\sigma}_3$, ksf	CONDITIONS BEFORE SHEAR: FINAL BACK PRESSURE, ksf	CONDITIONS BEFORE SHEAR: VOLUMETRIC STRAIN, %	CONDITIONS BEFORE SHEAR: PORE PRESSURE RESPONSE, %	FINAL CONDITIONS: FINAL WATER CONTENT, %	FINAL CONDITIONS: FINAL DRY UNIT WEIGHT,	RATE OF STRAIN, PERCENT PER MINUTE
401 1.2	60.5	65.5	5.703 2.815	5.76	8.64	13.2	95.5	46.8	75.5	.005

SOIL DESCRIPTION: See Summary Sheet

LIQUID LIMIT 0 % PLASTIC LIMIT 0 % SPECIFIC GRAVITY 0

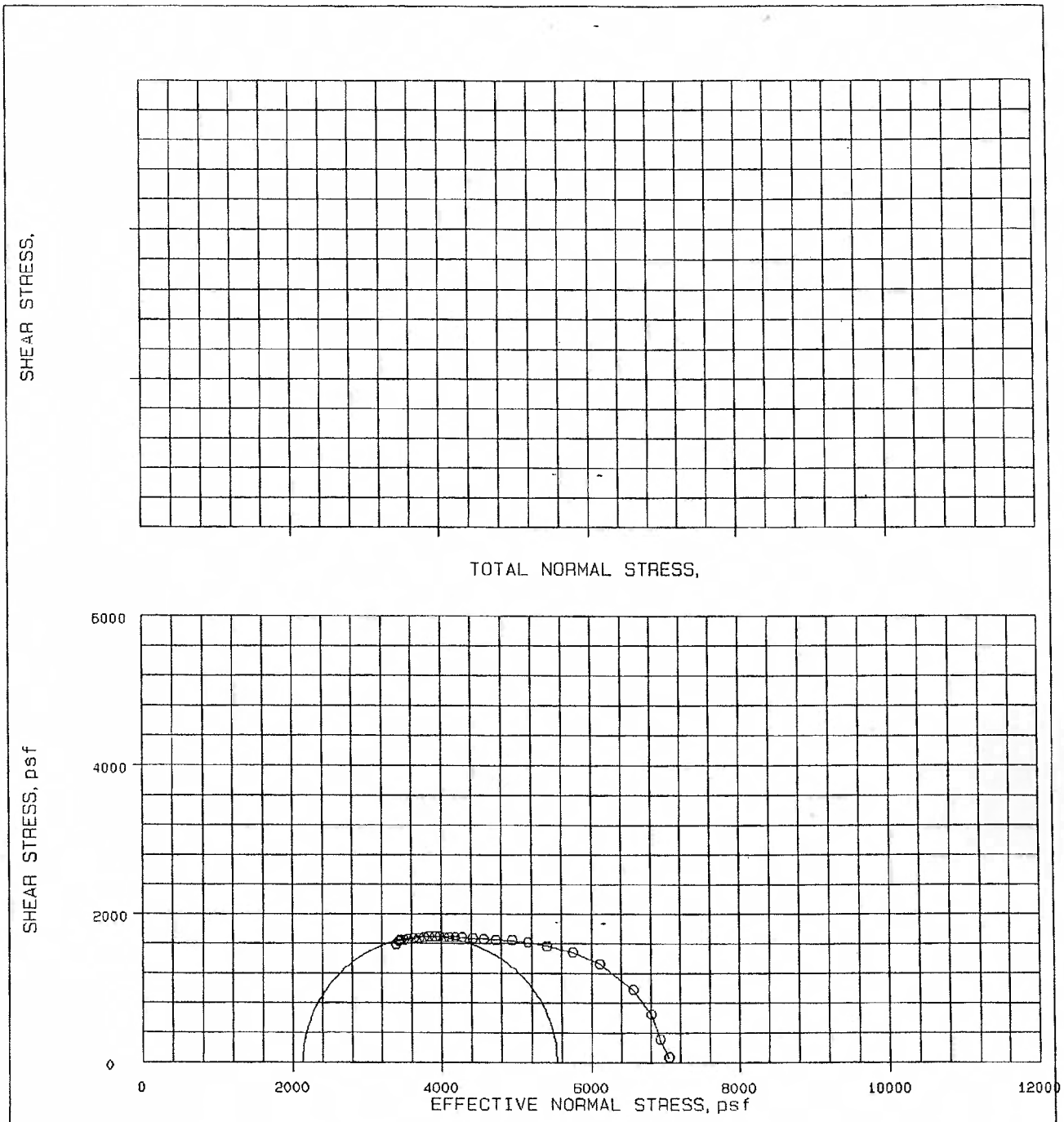
NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT
TRIAXIAL COMPRESSION TESTS ($\overline{CIU}$)

BORING NO. SB-56
SAMPLE ST-1
DEPTH 30.6-31.1'
TECH. MST
REVIEWER

TEST SERIES NO. 401
DATE Feb.04
FILE L1782B

FIGURE

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



SOIL DESCRIPTION:	See Summary Sheet				
LIQUID LIMIT	0 %	PLASTIC LIMIT	0	SPECIFIC GRAVITY	0

FAILURE CRITERIA $\sigma_1 - \sigma_3$ MAX

REMARKS

NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

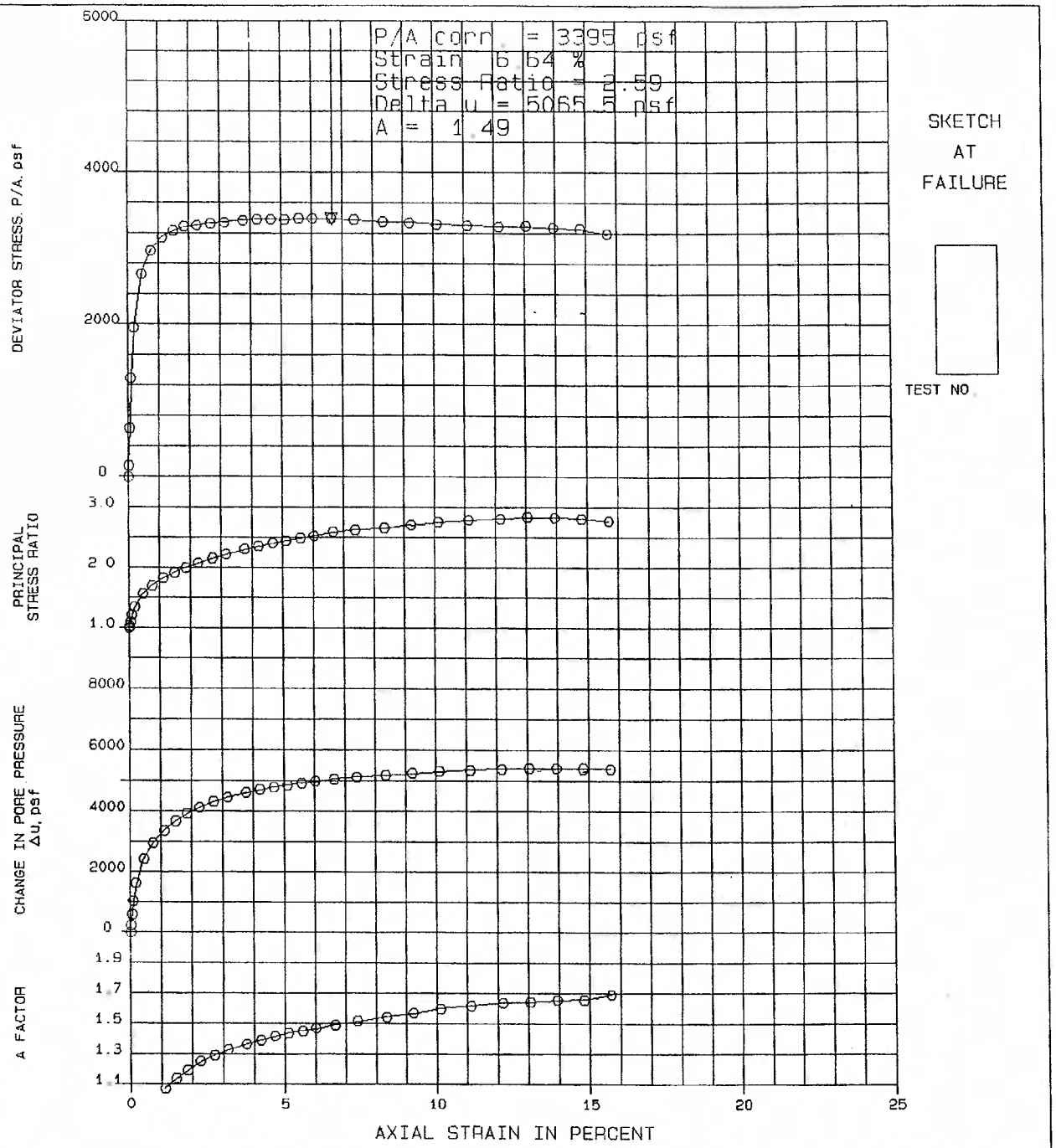
MOHR STRENGTH ENVELOPE

TRIAXIAL COMPRESSION TESTS (CIU)

FIGURE

BORING NO.	SB-56	TEST SERIES NO.	401
SAMPLE	ST-1	DATE	Feb.04
DEPTH	31.1-31.7'		
TECH	MST		
REVIEWER		FILE	L1782B

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



TEST NO./SYMBOL	INITIAL CONDITIONS: INITIAL WATER CONTENT, %	INITIAL CONDITIONS: INITIAL DRY UNIT WEIGHT, pcf	INITIAL CONDITIONS: SAMPLE HEIGHT & DIAMETER, IN.	CONDITIONS BEFORE SHEAR: INITIAL STRESSES $\bar{\sigma}_1 = \bar{\sigma}_3$, ksf	CONDITIONS BEFORE SHEAR: FINAL BACK PRESSURE, ksf	CONDITIONS BEFORE SHEAR: VOLUMETRIC STRAIN, %	CONDITIONS BEFORE SHEAR: PORE PRESSURE RESPONSE, %	FINAL CONDITIONS: FINAL WATER CONTENT, %	FINAL CONDITIONS: FINAL DRY UNIT WEIGHT,	RATE OF STRAIN, PERCENT PER MINUTE
401 1.3	62	63.9	5.62 2.83	7.2	8.64	11.7	92.8	47.8	72.2	.004

SOIL DESCRIPTION: See Summary Sheet

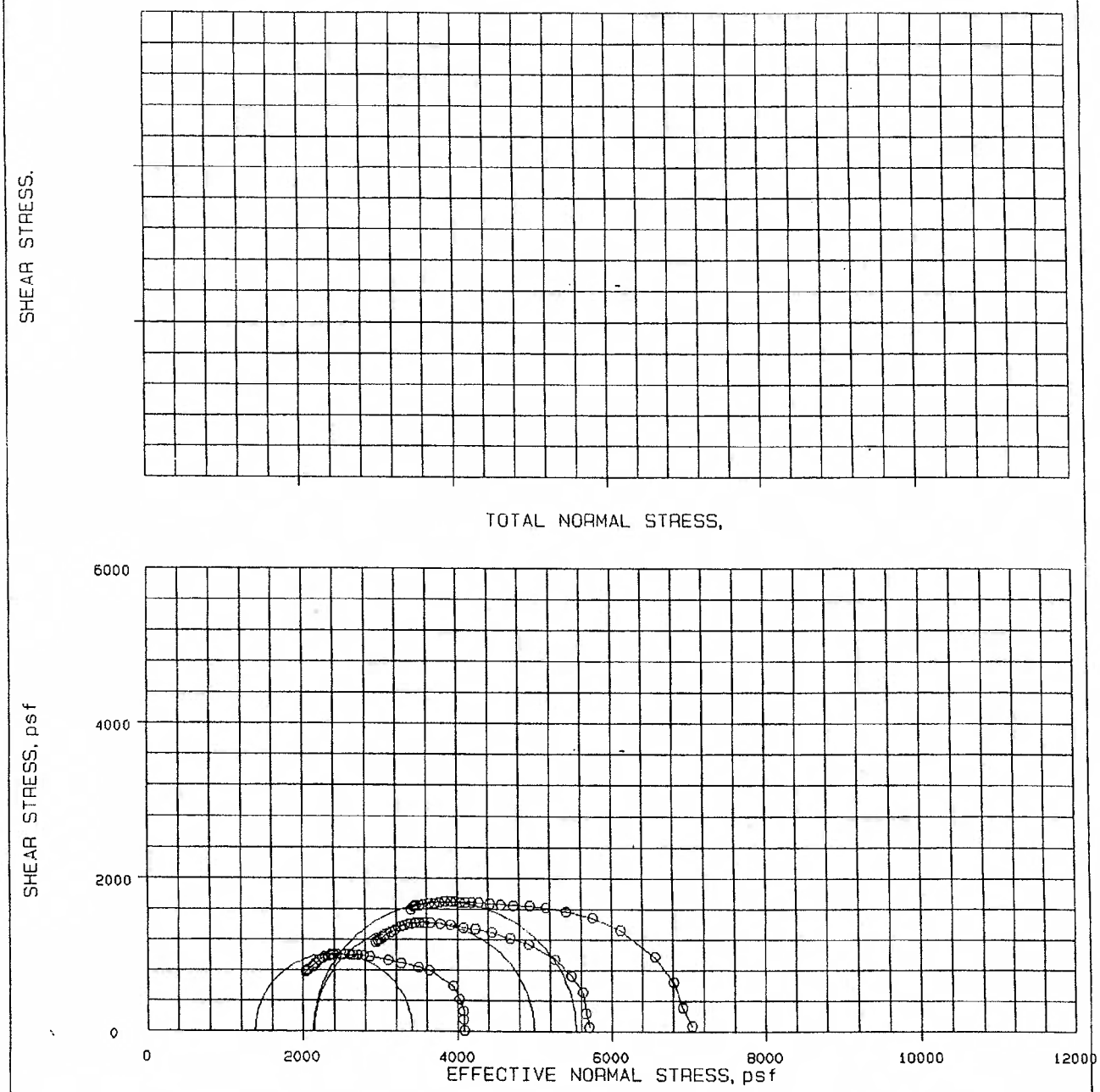
LIQUID LIMIT 0 % PLASTIC LIMIT 0 % SPECIFIC GRAVITY 0

NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
TRIAXIAL COMPRESSION TESTS ($\bar{C}\bar{I}\bar{U}$)

BORING NO	SB-56	TEST SERIES NO.	401
SAMPLE	ST-1	DATE	Feb.04
DEPTH	31.1-31.7'		
TECH	MST		
REVIEWER		FILE	L1782B

FIGURE

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



SOIL DESCRIPTION:		See Summary Sheet			
LIQUID LIMIT	0 %	PLASTIC LIMIT	0	SPECIFIC GRAVITY	0

FAILURE CRITERIA $\sigma_1 - \sigma_3$ MAX

REMARKS

NEW BRITAIN-HARTFORD BUSWAY
CONNECTICUT

MOHR STRENGTH ENVELOPE

TRIAXIAL COMPRESSION TESTS (CIU)

FIGURE

BORING NO	SB-56	TEST SERIES	
SAMPLE	ST-1	NO	401
DEPTH	31 1-31 7'	DATE	Feb.04
TECH	MST		
REVIEWER		FILE	L1782B

GZA GEOENVIRONMENTAL, INC
ENGINEERS AND SCIENTISTS

2008 Direct Simple Shear Tests

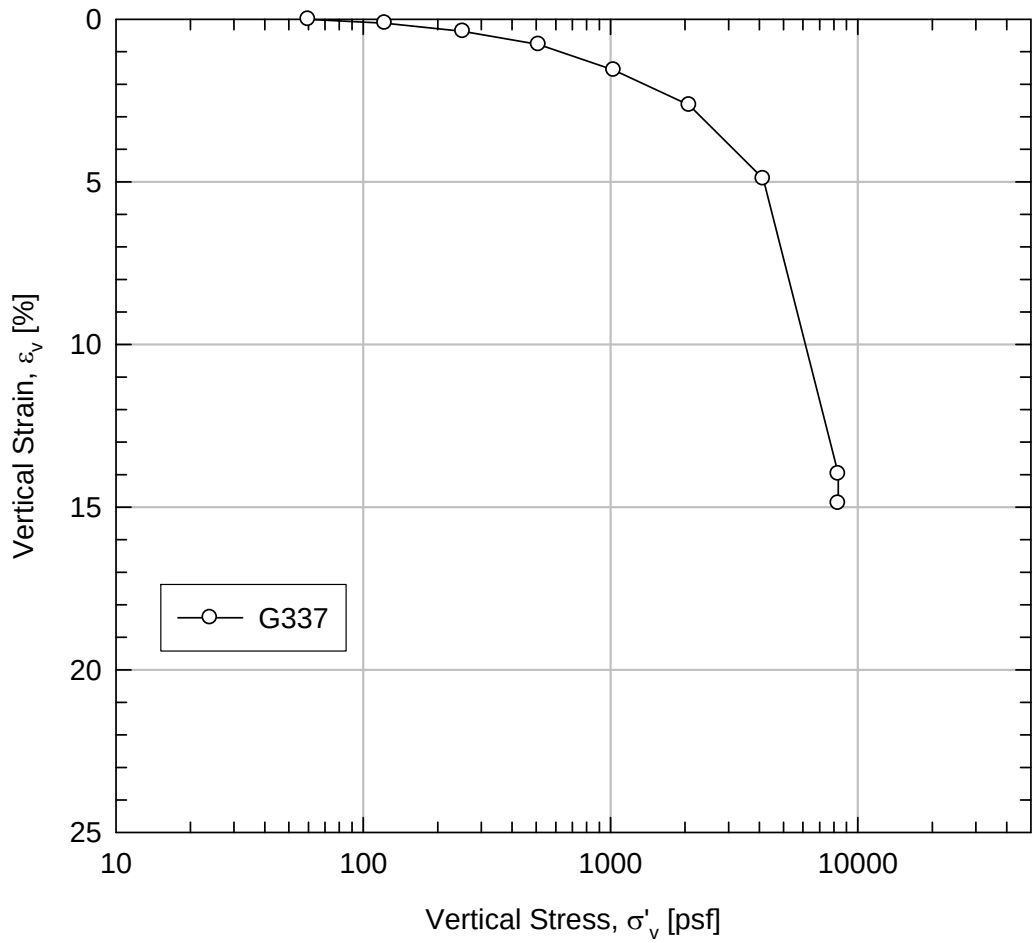


Figure 5.4.6 Vertical strain versus vertical effective stress for test DSS G337 on sample SB-01-1 UP2 30-32 ft

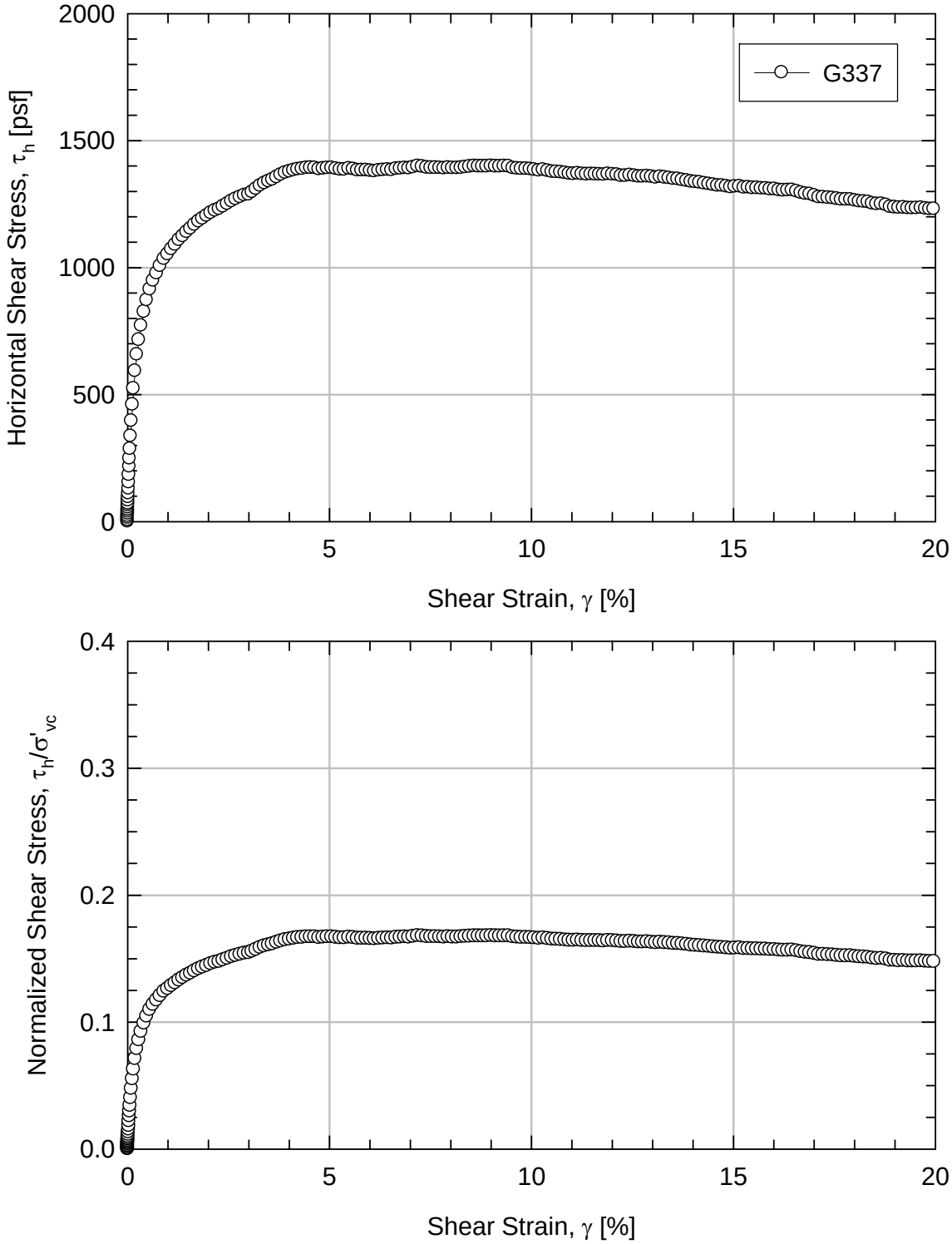


Figure 5.4.7 Horizontal shear stress and normalized shear stress versus shear strain for test DSS G337 on sample SB-01-1 UP2 30-32 ft

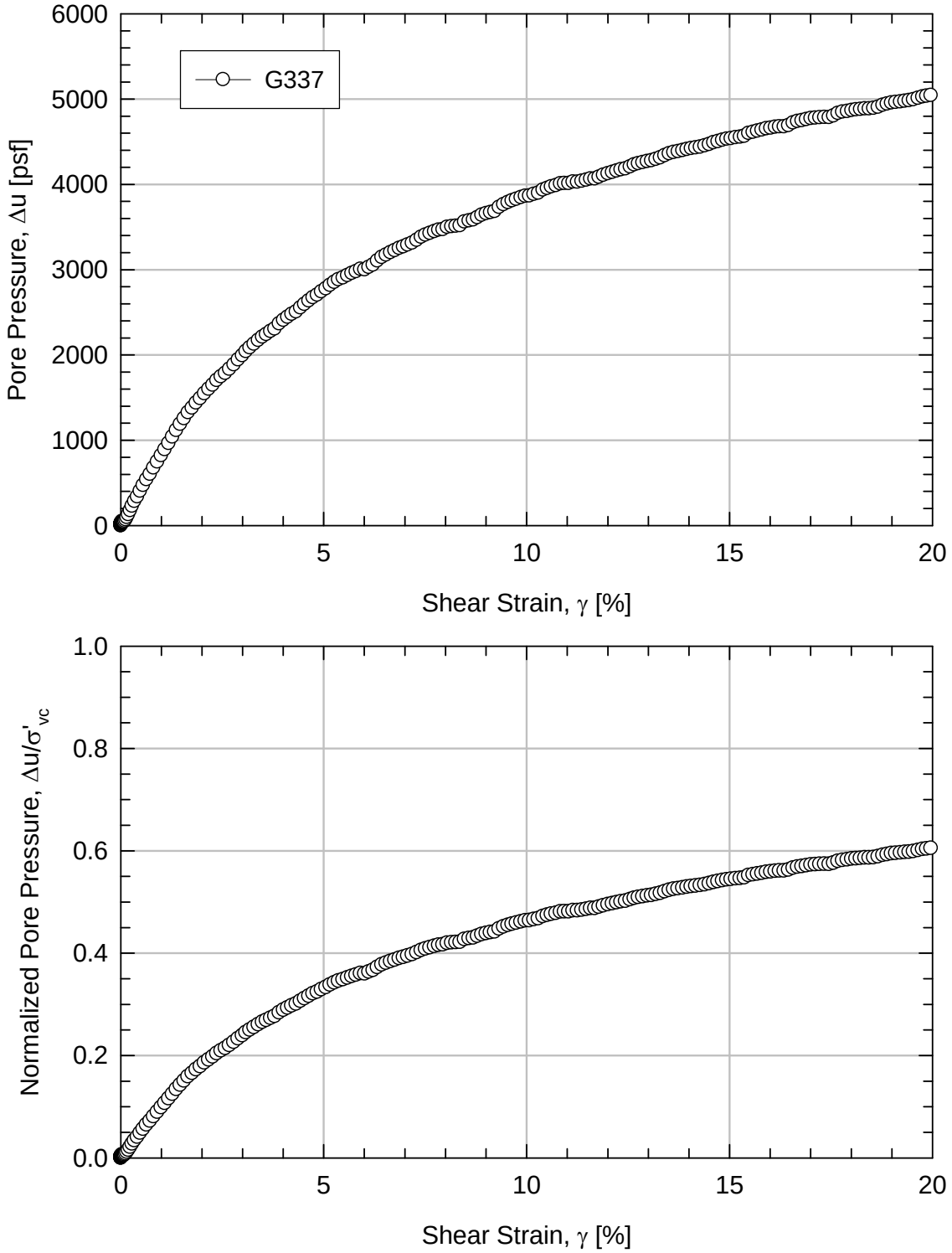


Figure 5.4.8 Pore pressure and normalized pore pressure versus shear strain for test DSS G337 on sample SB-01-1 UP2 30-32 ft

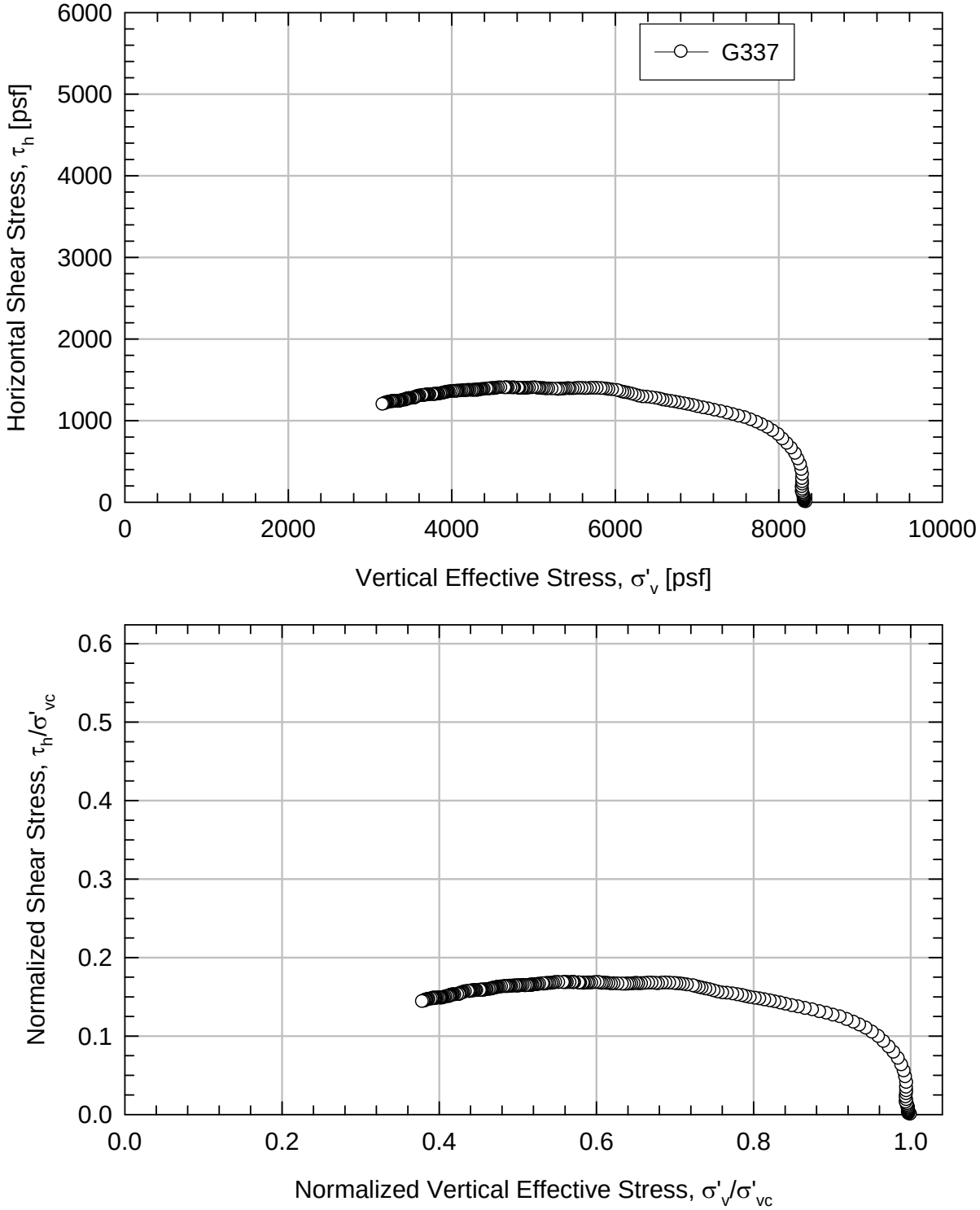


Figure 5.4.9 Horizontal shear stress versus vertical effective stress and normalized shear stress versus normalized vertical effective stress for test DSS G337 on sample SB-01-1 UP2 30-32 ft

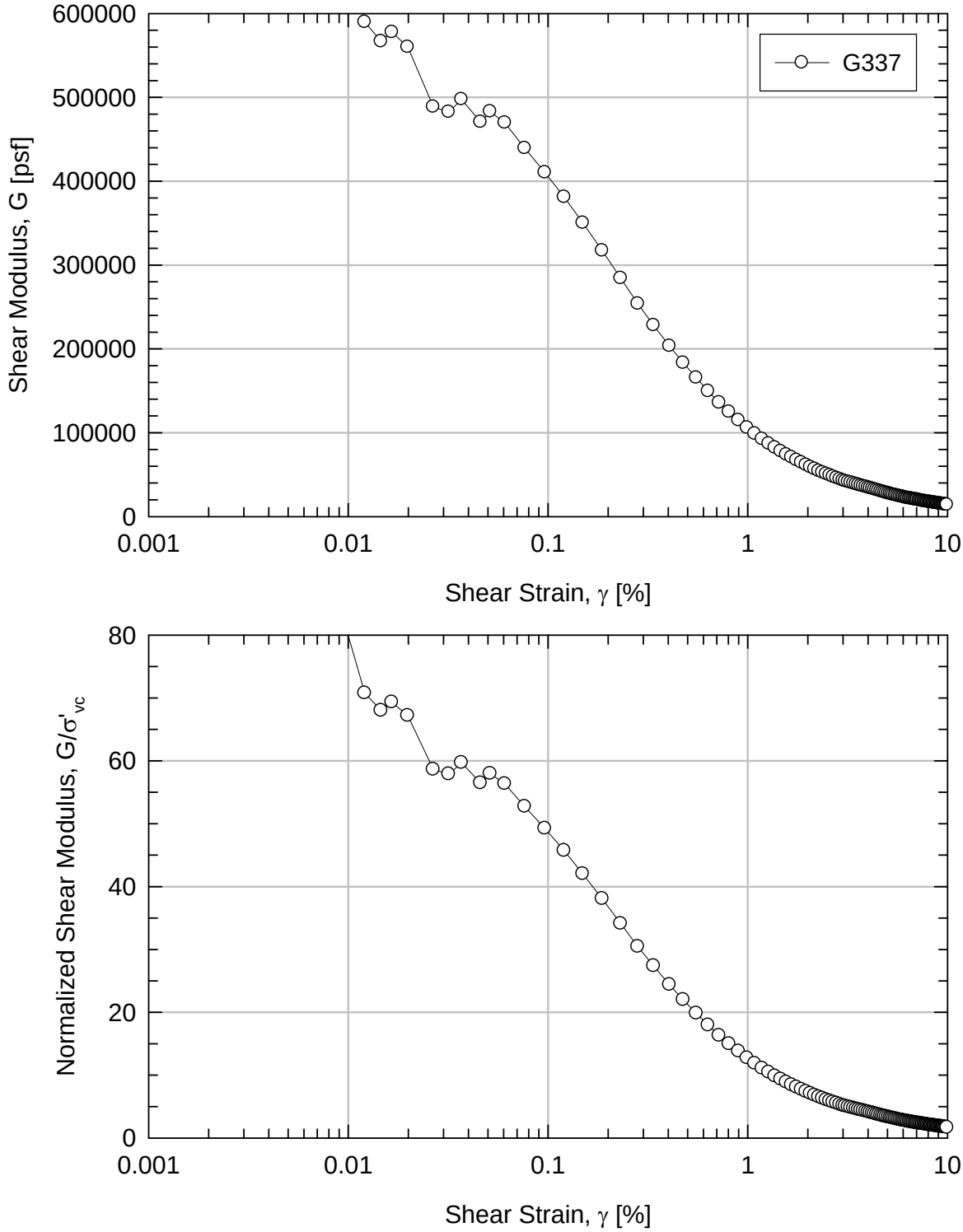


Figure 5.4.10 Shear modulus and normalized shear modulus versus shear strain for test DSS G337 on sample SB-01-1 UP2 30-32 ft.

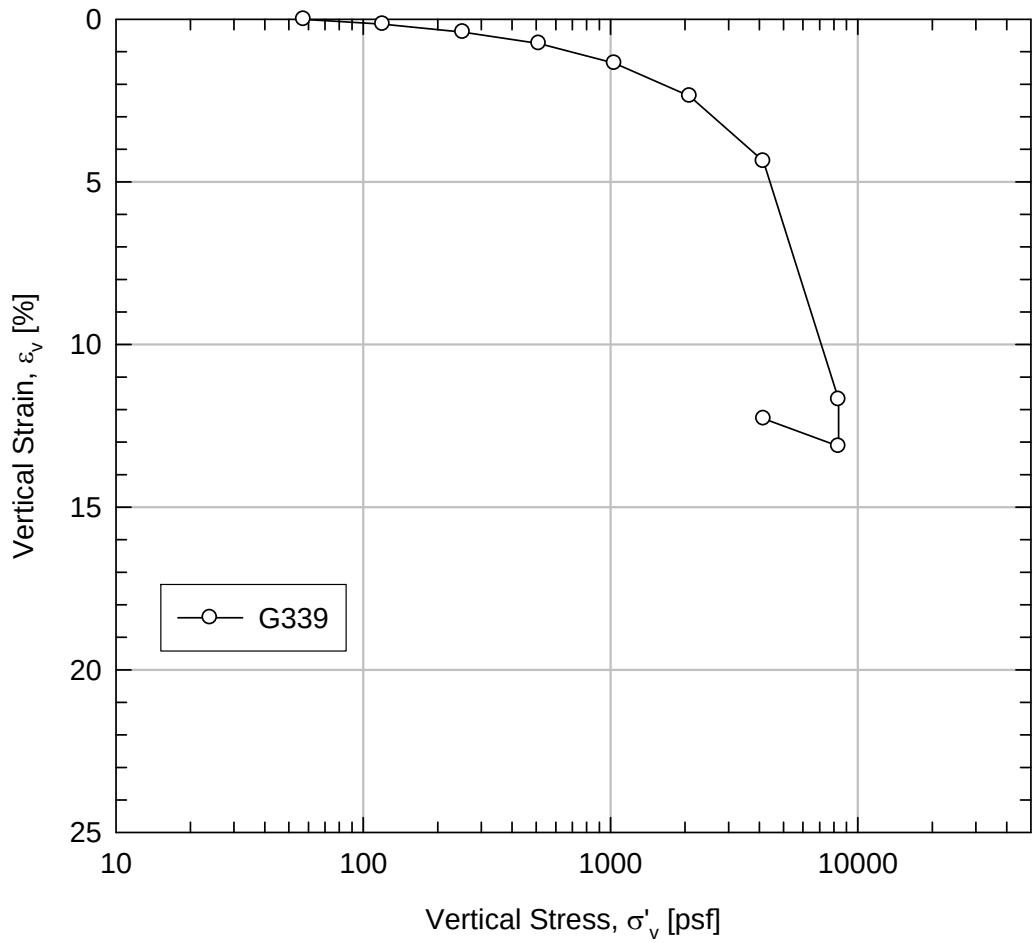


Figure 5.4.16 Vertical strain versus vertical effective stress for test DSS G339 on sample SB-01-1 UP2 30-32 ft.

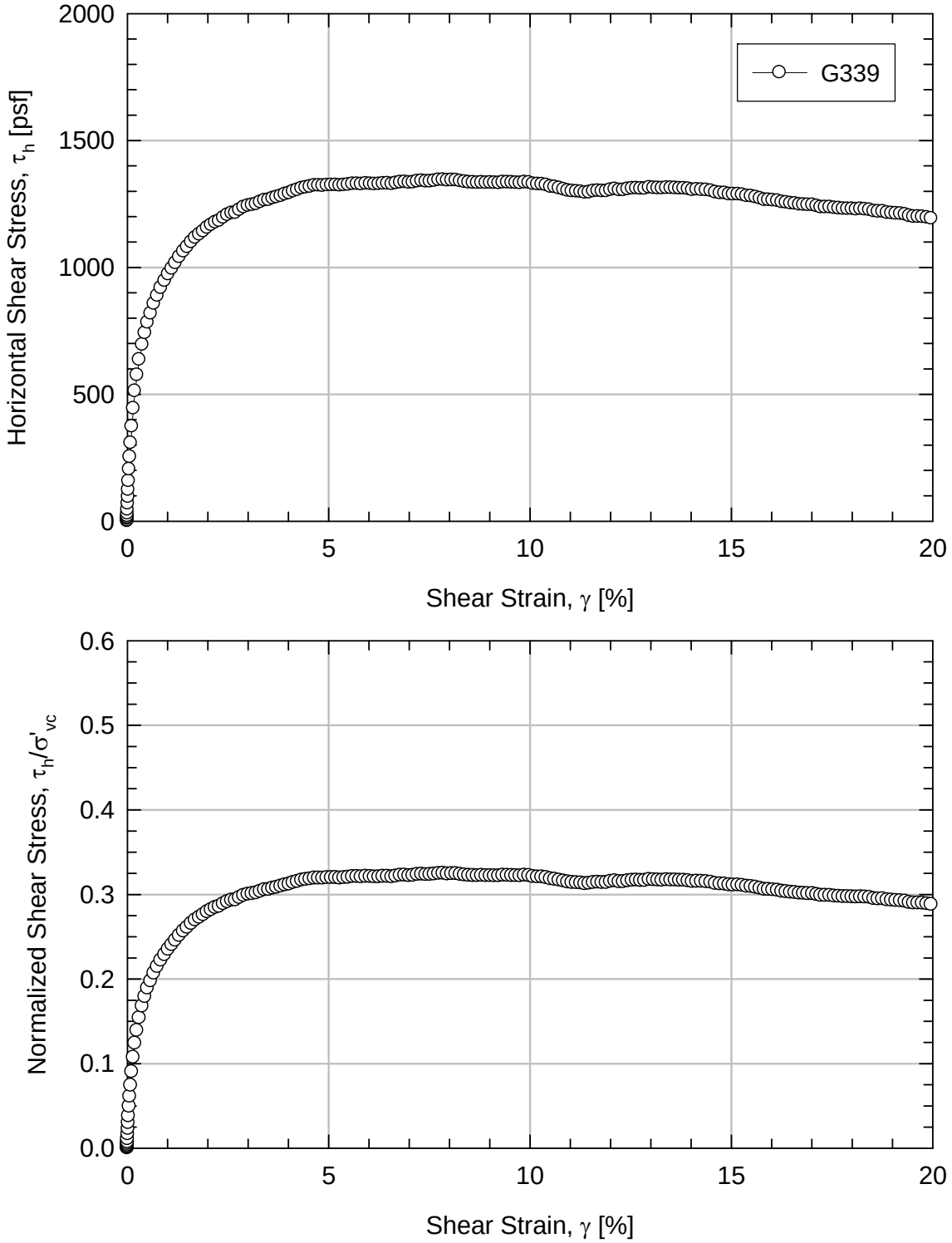


Figure 5.4.17 Horizontal shear stress and normalized shear stress versus shear strain for test DSS G339 on sample SB-01-1 UP2 30-32 ft.

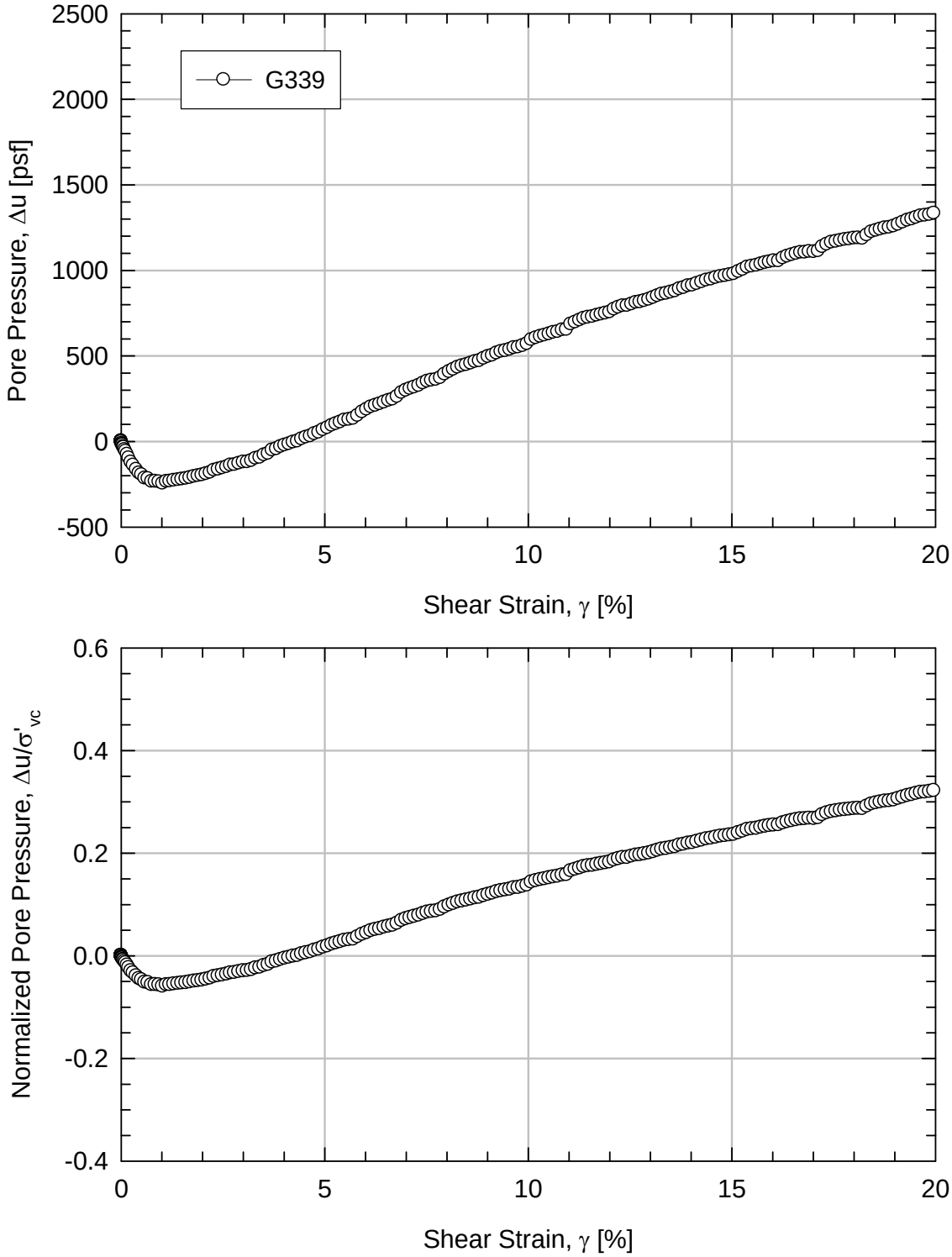


Figure 5.4.18 Pore pressure and normalized pore pressure versus shear strain for test DSS G339 on sample SB-01-1 UP2 30-32 ft.

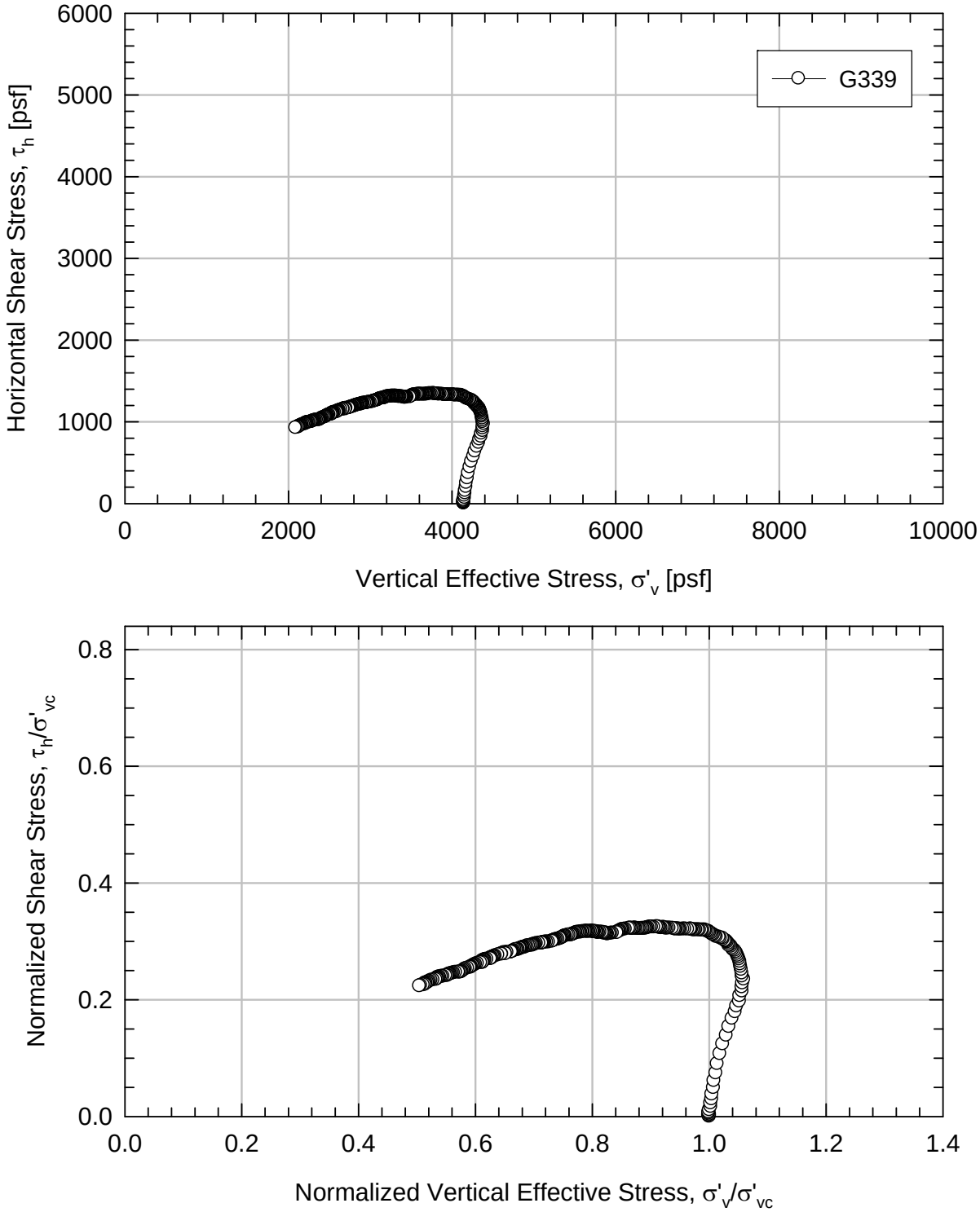


Figure 5.4.19 Horizontal shear stress versus vertical effective stress and normalized shear stress versus normalized vertical effective stress for test DSS G339 on sample SB-01-1 UP2 30-32 ft.

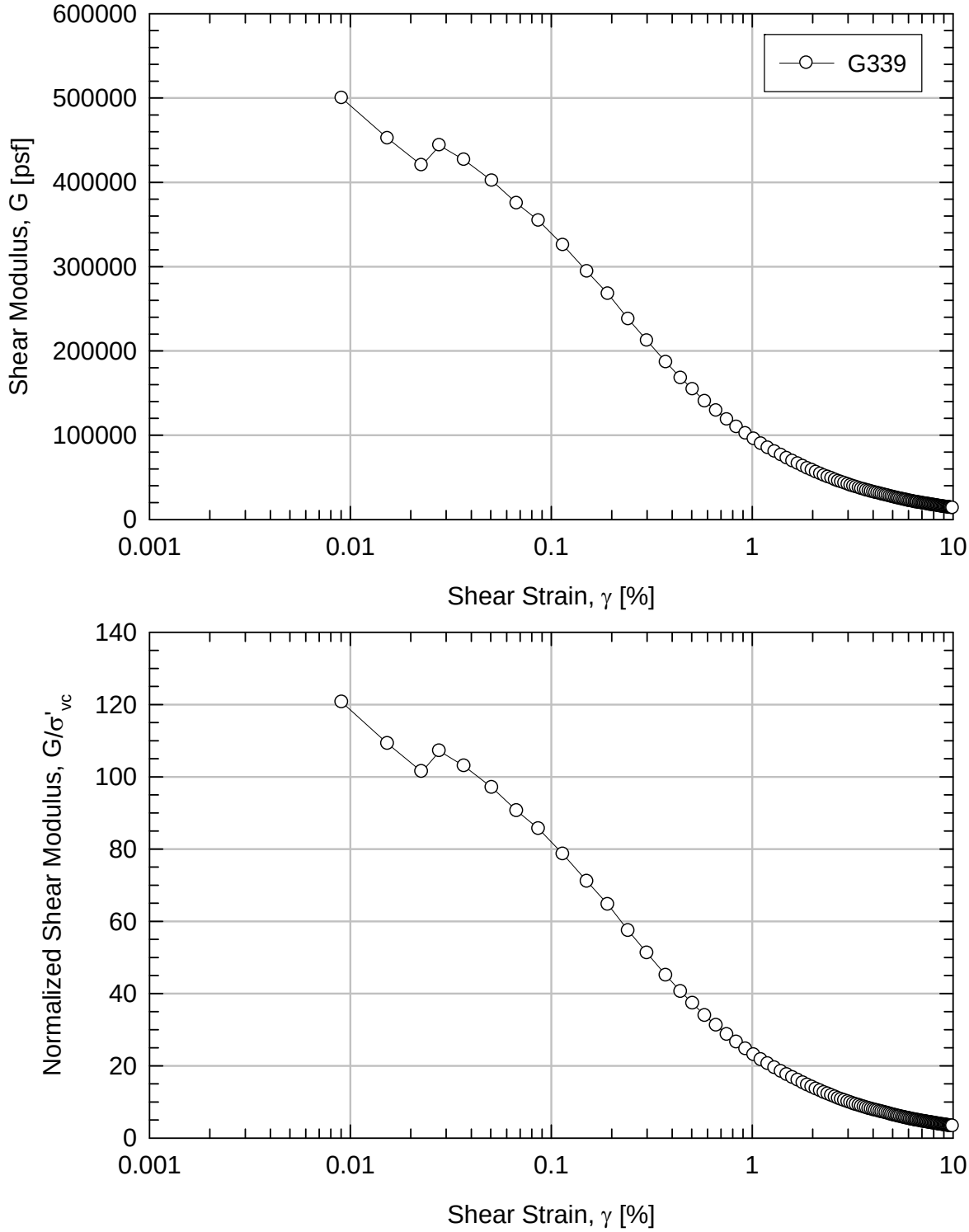
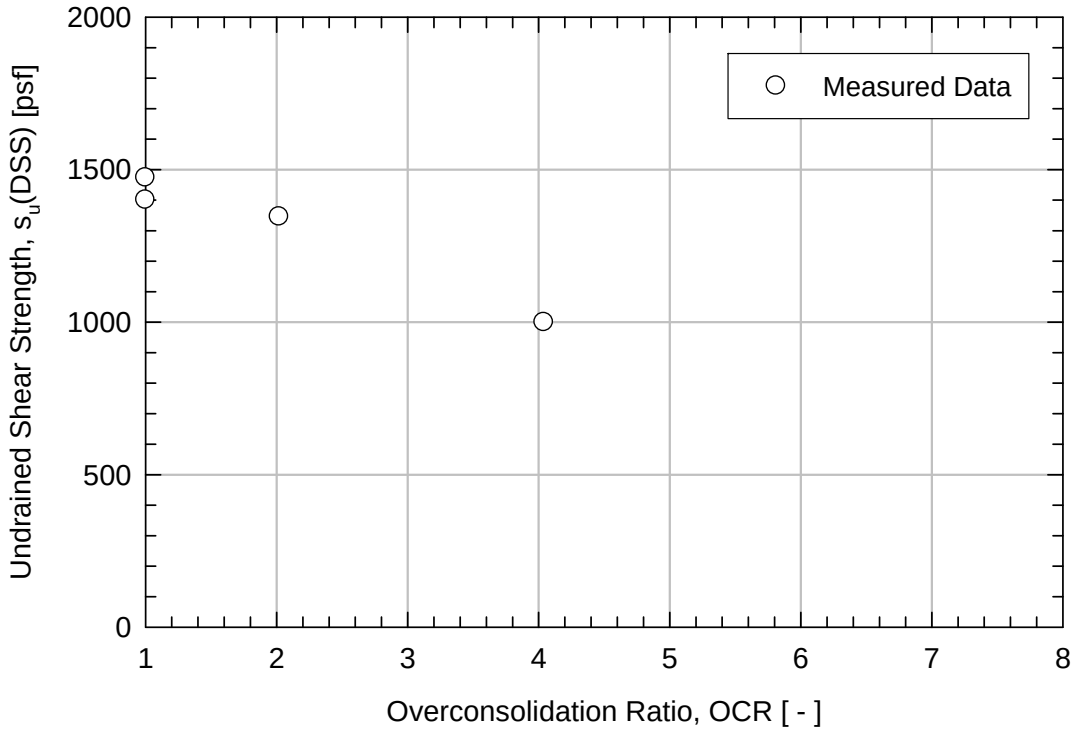
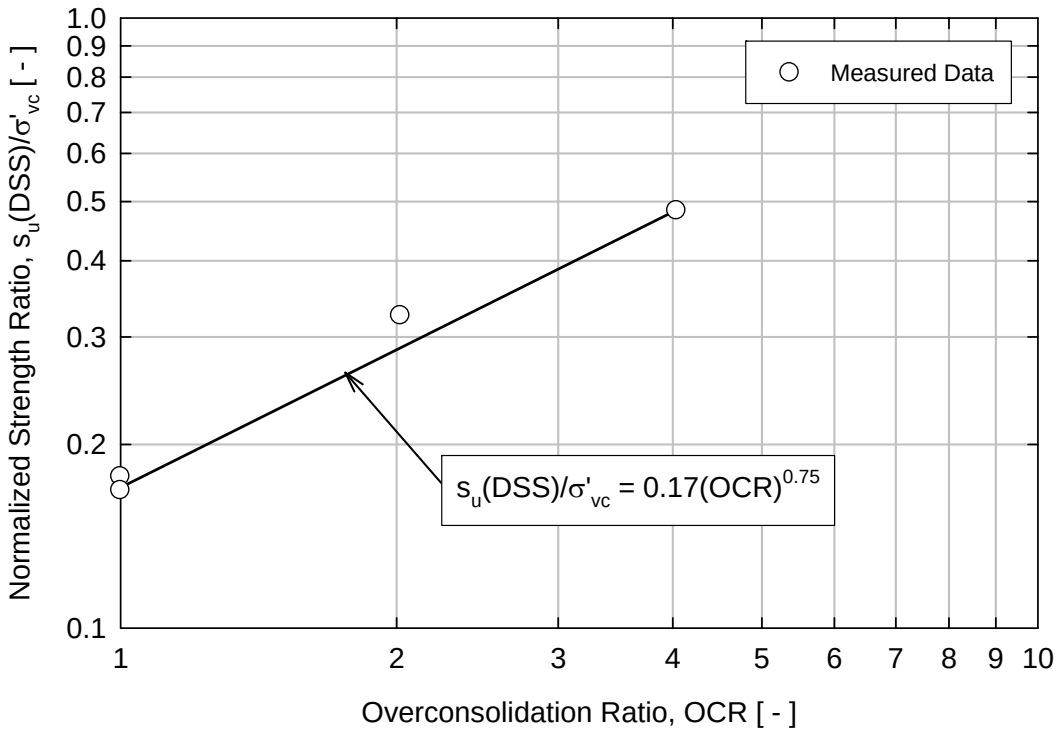


Figure 5.4.20 Shear modulus and normalized shear modulus versus shear strain for test DSS G339 on sample SB-01-1 UP2 30-32 ft.


Measured Data
Undrained Shear Strength, s_u(DSS) [psf]
2000
1500
1000
500
0
1
2
3
4
5
6
7
8
Overconsolidation Ratio, OCR [-]


Measured Data
$s_u(DSS)/\sigma'_{vc} = 0.17(OCR)^{0.75}$
Normalized Strength Ratio, $s_u(DSS)/\sigma'_{vc}$ [-]
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1
2
3
4
5
6
7
8
9
10
Overconsolidation Ratio, OCR [-]

Atterberg Limits & Moisture Contents

2003 Atterberg Limits

LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828
Project Engineer: D. SCHULZE
Assigned By: D. GAFFNEY
Date: NOV.03
Reviewed By: Don Schulze
Date Reviewed: 11/18/03

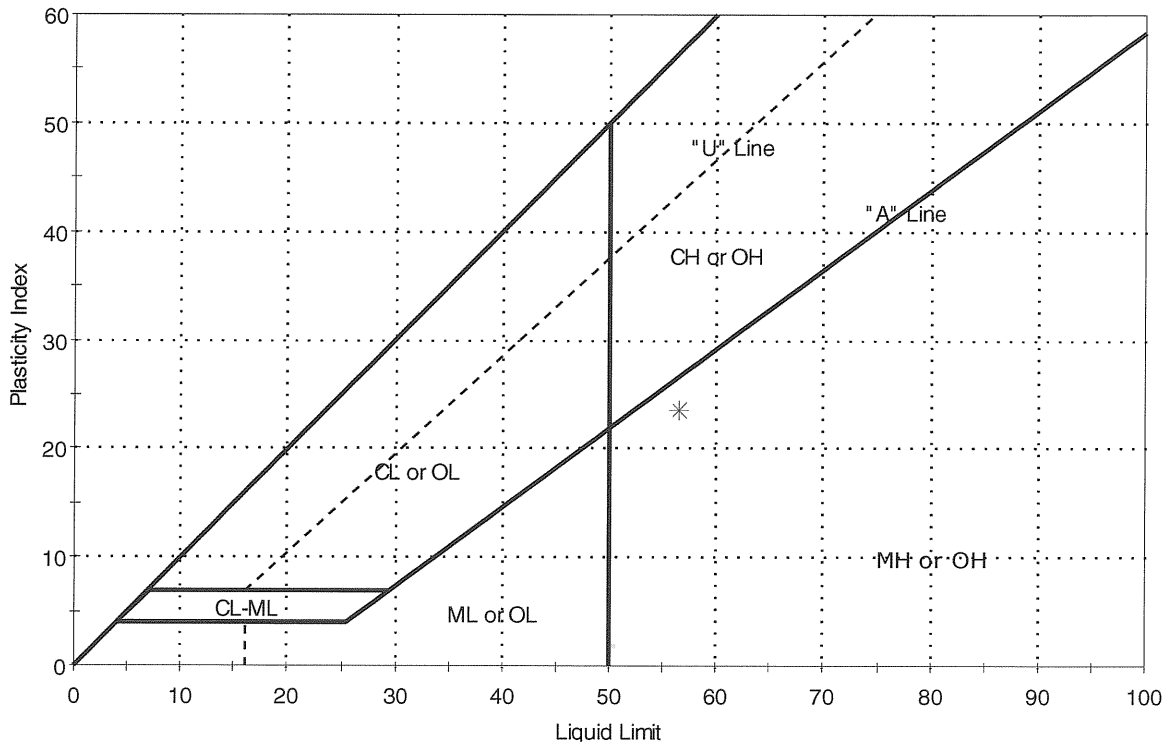
Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{\Delta e_c}{1 + e_0}$	Laboratory Log and Soil Description
SB-54	S-6	16.5-18.0	127	20.1	21	20	43	9												Brown Silty sand (SM)
SB-54	S-15	55.0-56.5	128	42.1	44	22	98	44												Red-brown Lean clay (CL)
SB-55	S-4	10.0-11.5	129	18.5	22	20	39	8												Brown Silty sand with gravel (SM)
SB-55	S-17	65.0-66.5	130	33.7	29	22	99	25												Red-brown Silty clay (CL-ML)
SB-55	S-28	120.0-121.5	131	16.1	NP	NP	25													Brown Silty sand (SM)
SB-56	S-15	55.0-56.5	132	40.2	41	25	100	40												Red-brown Lean clay (CL)
SB-56	S-25	105.0-106.5	133	15.2	NP	NP	15													Brown Silty sand (SM)
SB-57	S-15	55.0-56.5	134	45.7	42	23	100	35												Red-brown Lean clay (CL)
SB-58	S-14	50.0-51.5	135	56.6	53	25	100	60												Brown Fat clay (CH)
SB-58	S-21	90.0-91.5	136	34.2	24	24	100	15												Red-brown Silt (ML)
SB-58	S-25	110.0-111.5	137	23.1	NP	NP	30	5												Red-brown Silty sand (SM)

2008 Atterberg Limits

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	GeoDesign, Inc.		
Project:	Hartford Busway		
Location:	Hartford, CT	Project No:	GTX-8398
Boring ID: RW-4	Sample Type: tube	Tested By:	ap
Sample ID:UP-2	Test Date: 08/15/08	Checked By:	jdt
Depth : 45-47 ft	Test Id: 136050		
Test Comment:	---		
Sample Description:	Moist, reddish brown silt		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05

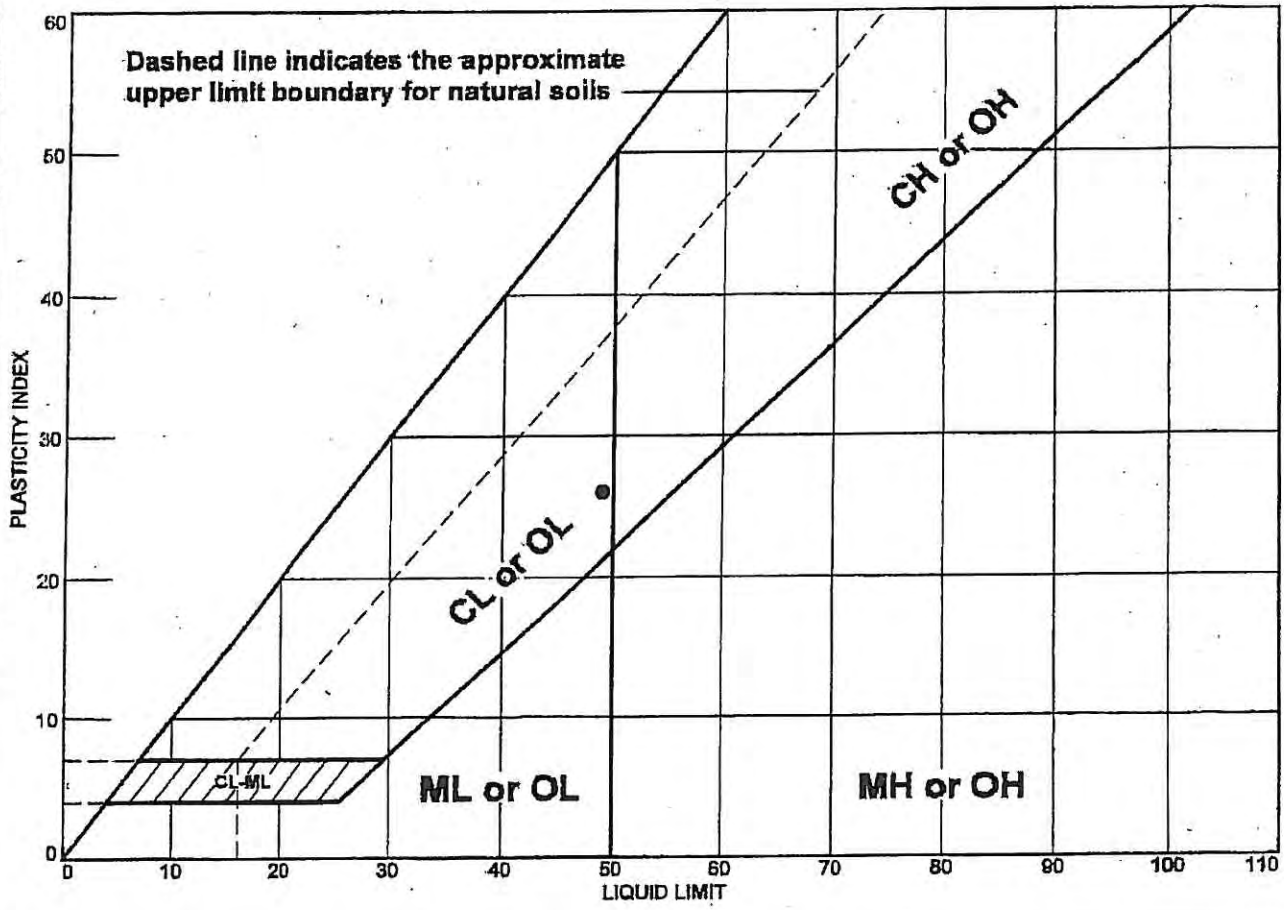


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	UP-2	RW-4	45-47 ft	54	56	33	23	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilentancy: SLOW
Toughness: LOW

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive color, lean clay	49	23	26	100.0	99.4	CL

Project No.

Project: New Britain-Hartford Busway #155-H025

● **Sample Source:** Boring RW-4 (Flatbush Ave., over Busway) UP-1

Remarks:

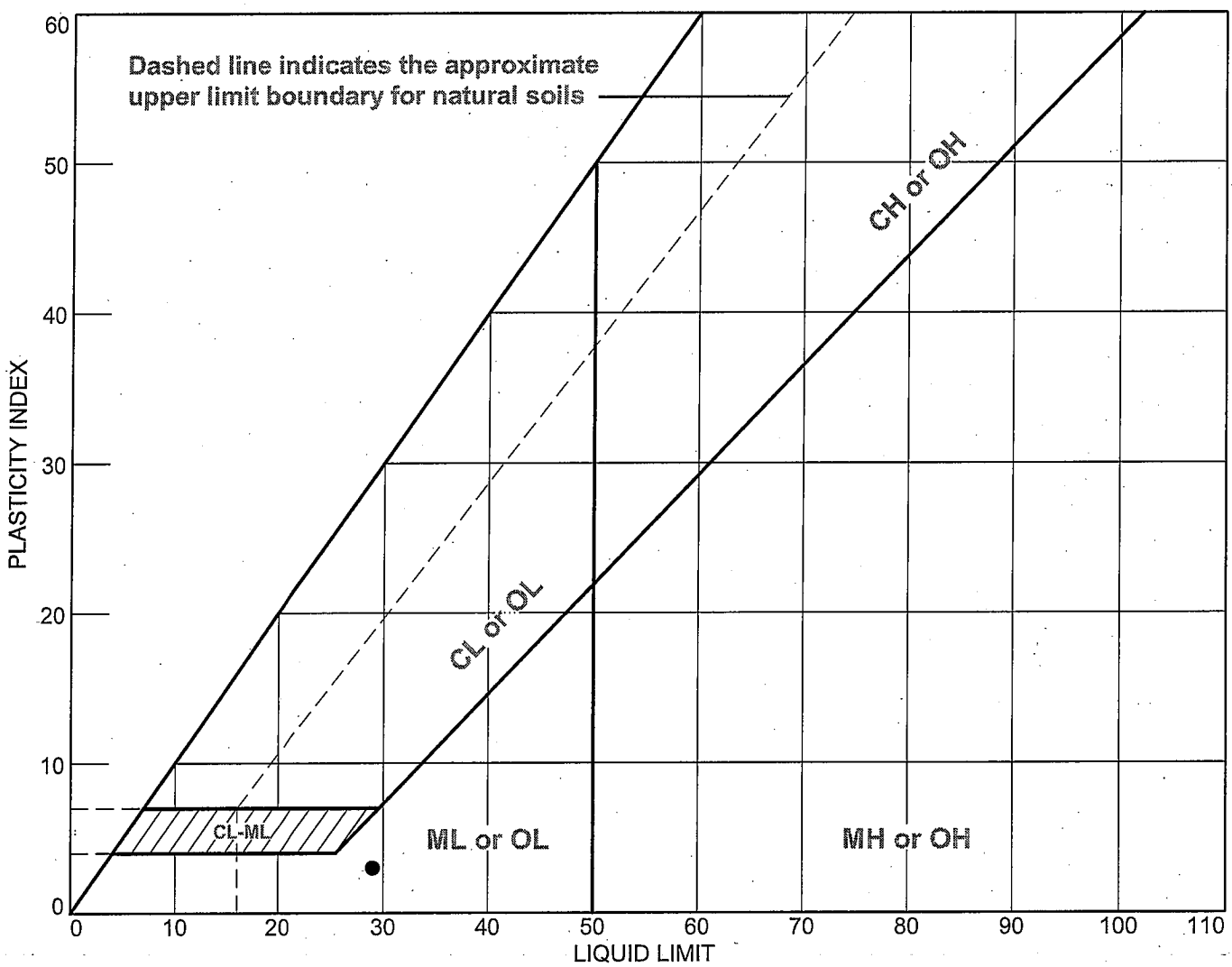
● Sampled and Dropped off by the Client,

TEST-CON INCORPORATED
PO BOX 3116
Danbury, CT 06813-3116

page

Tested By: _____ **Checked By:** _____

LIQUID AND PLASTIC LIMITS TEST REPORT



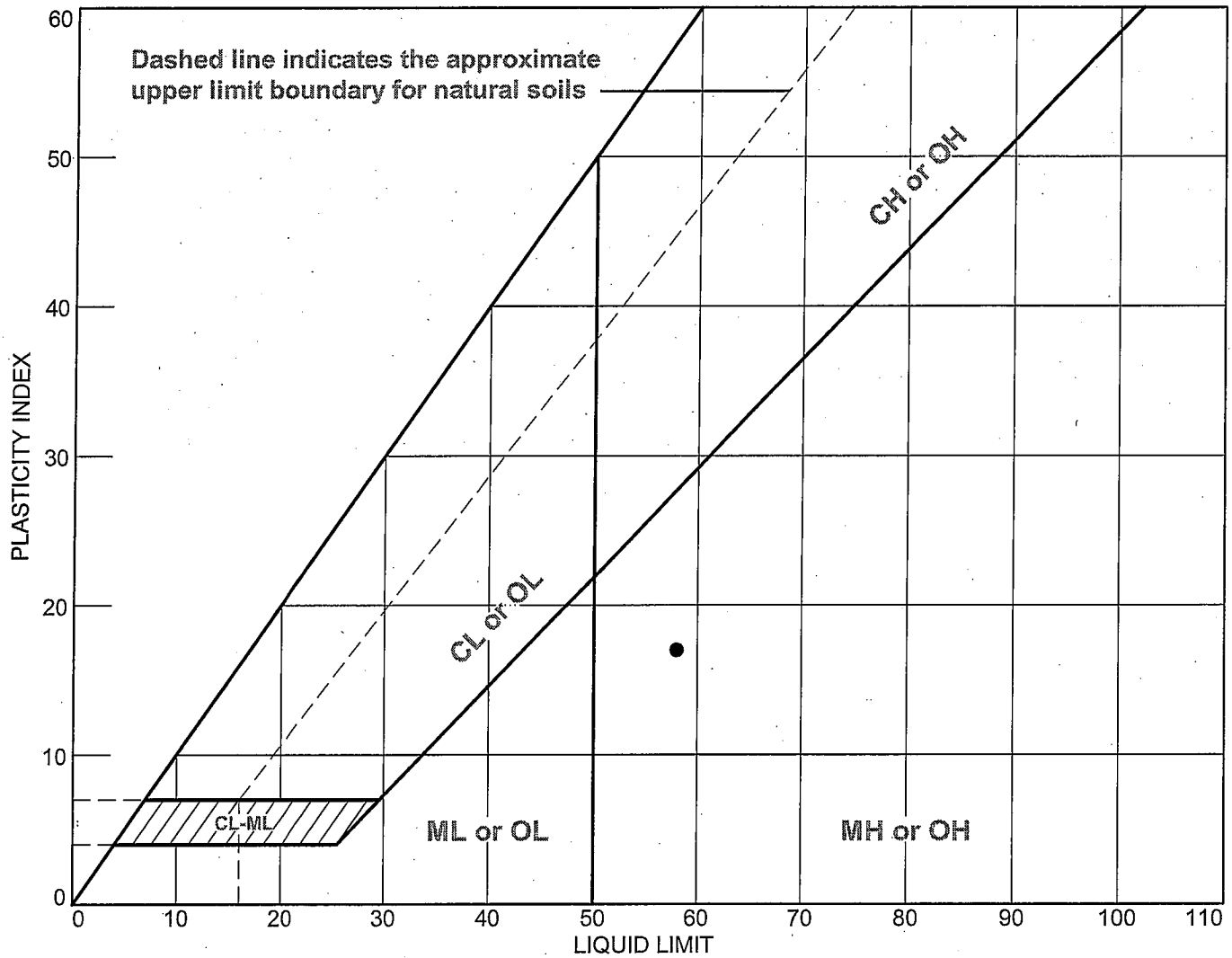
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	RW-9	S-5	10' - 12'		26	29	3	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



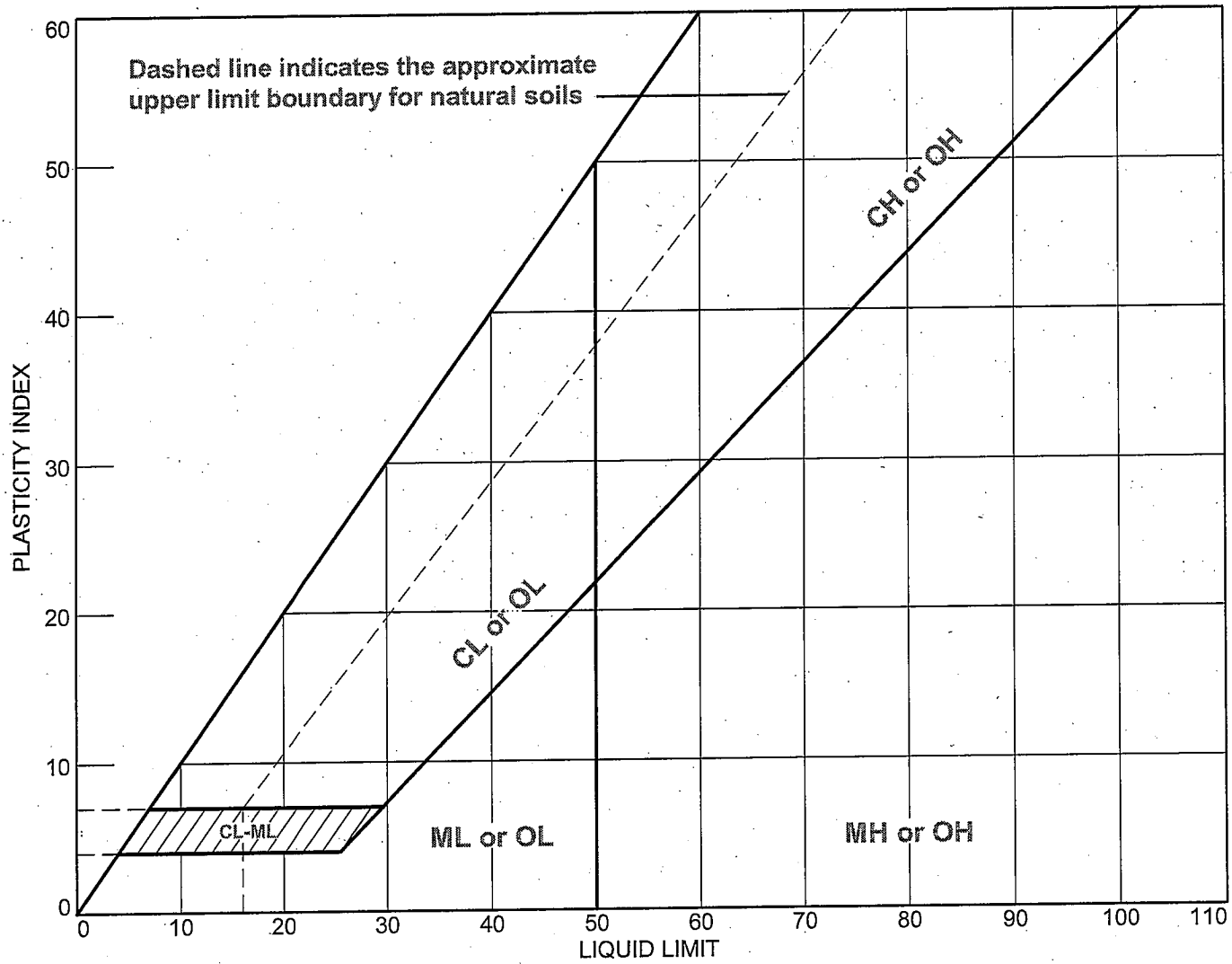
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	RW-9	S-10	35' - 37'		41	58	17	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

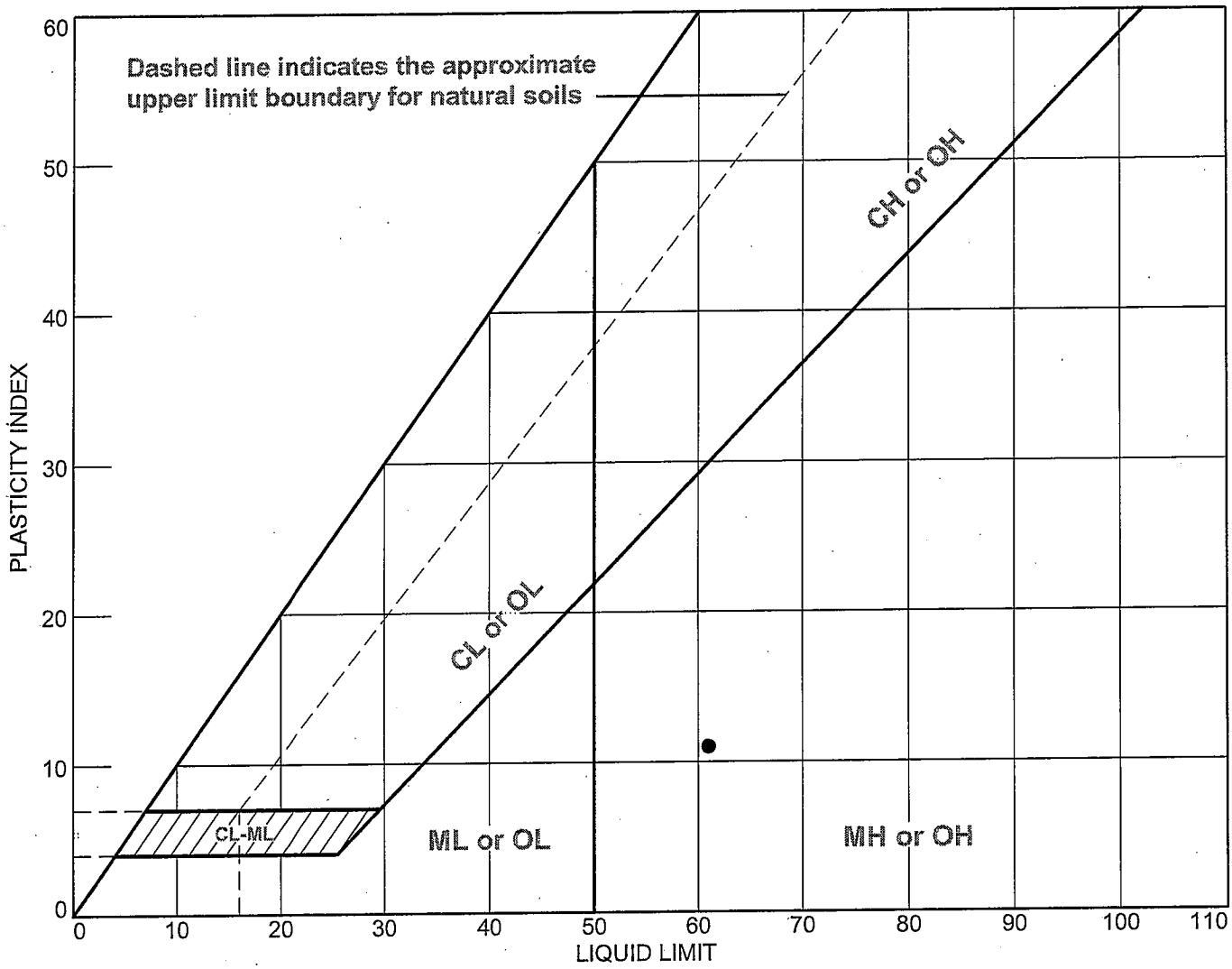
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SB-01-1 (S-7)	S-7	22' - 24'		34	32	NP	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

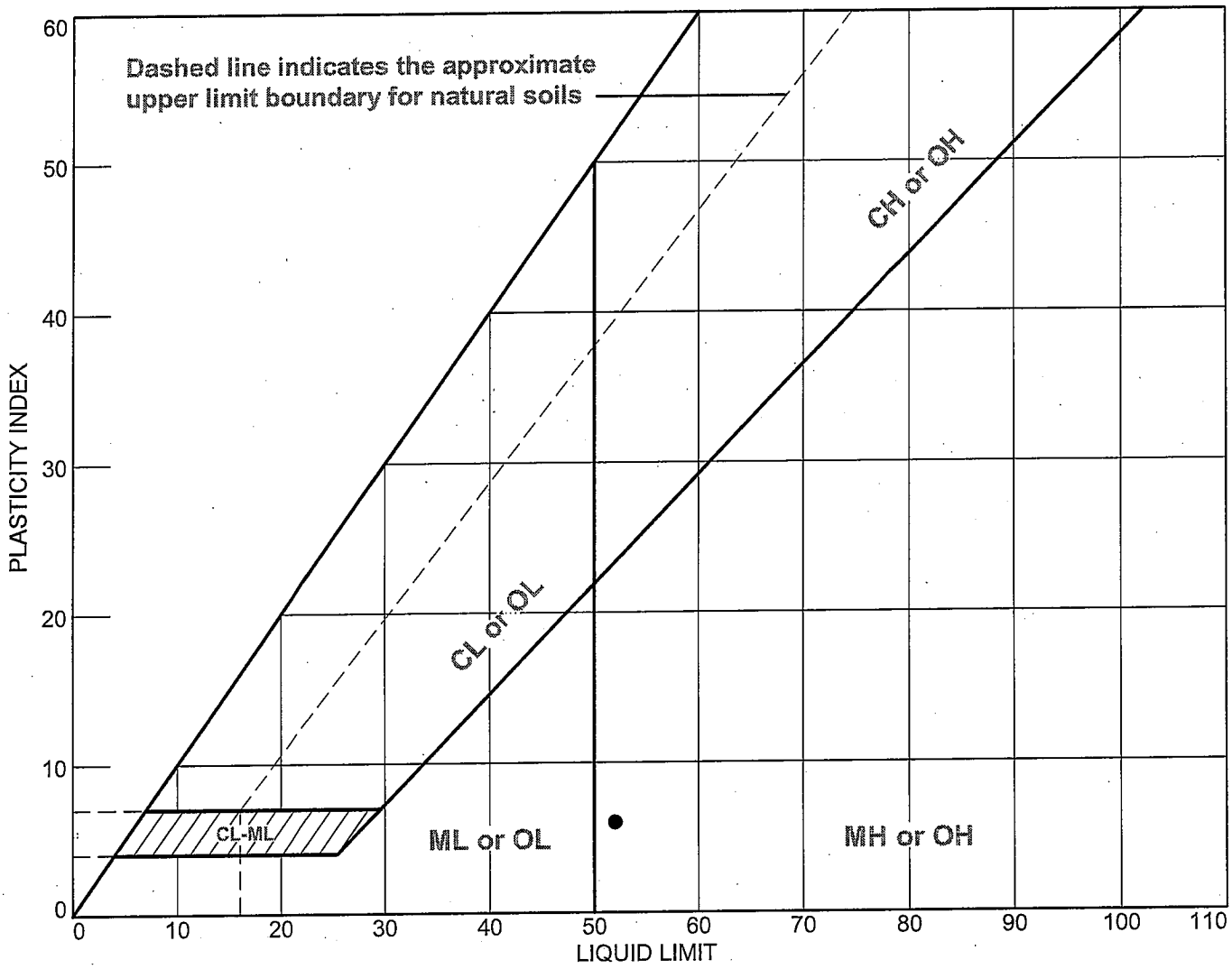
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SB-01-1	S-11	40' - 42'		50	61	11	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

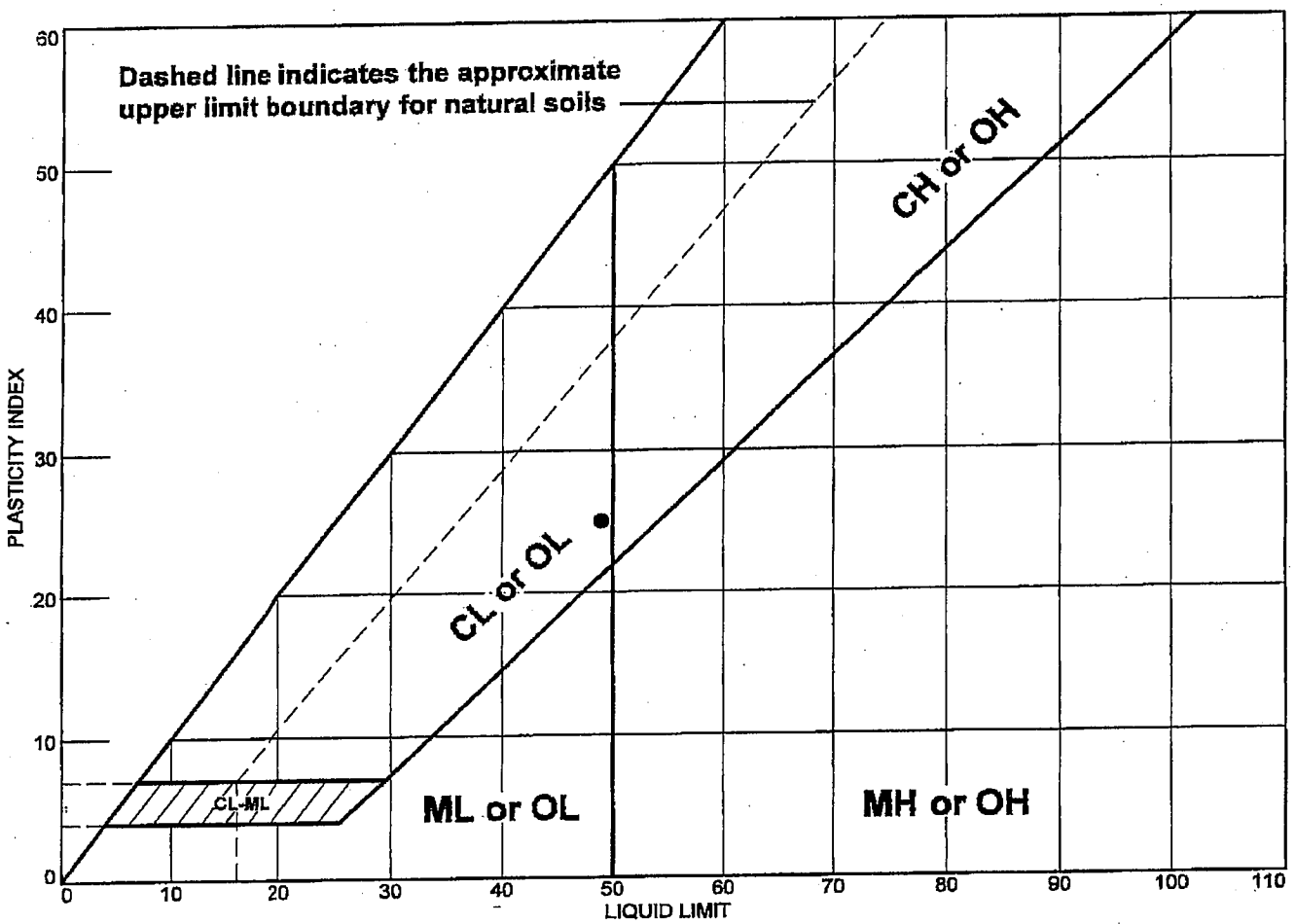
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SB-01-1 (S-13)	S-13	50' - 52'		46	52	6	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive color, lean clay	49	24	25	100.0	99.4	CL

Project No.

Project: New Britain-Hartford Busway #155-H025

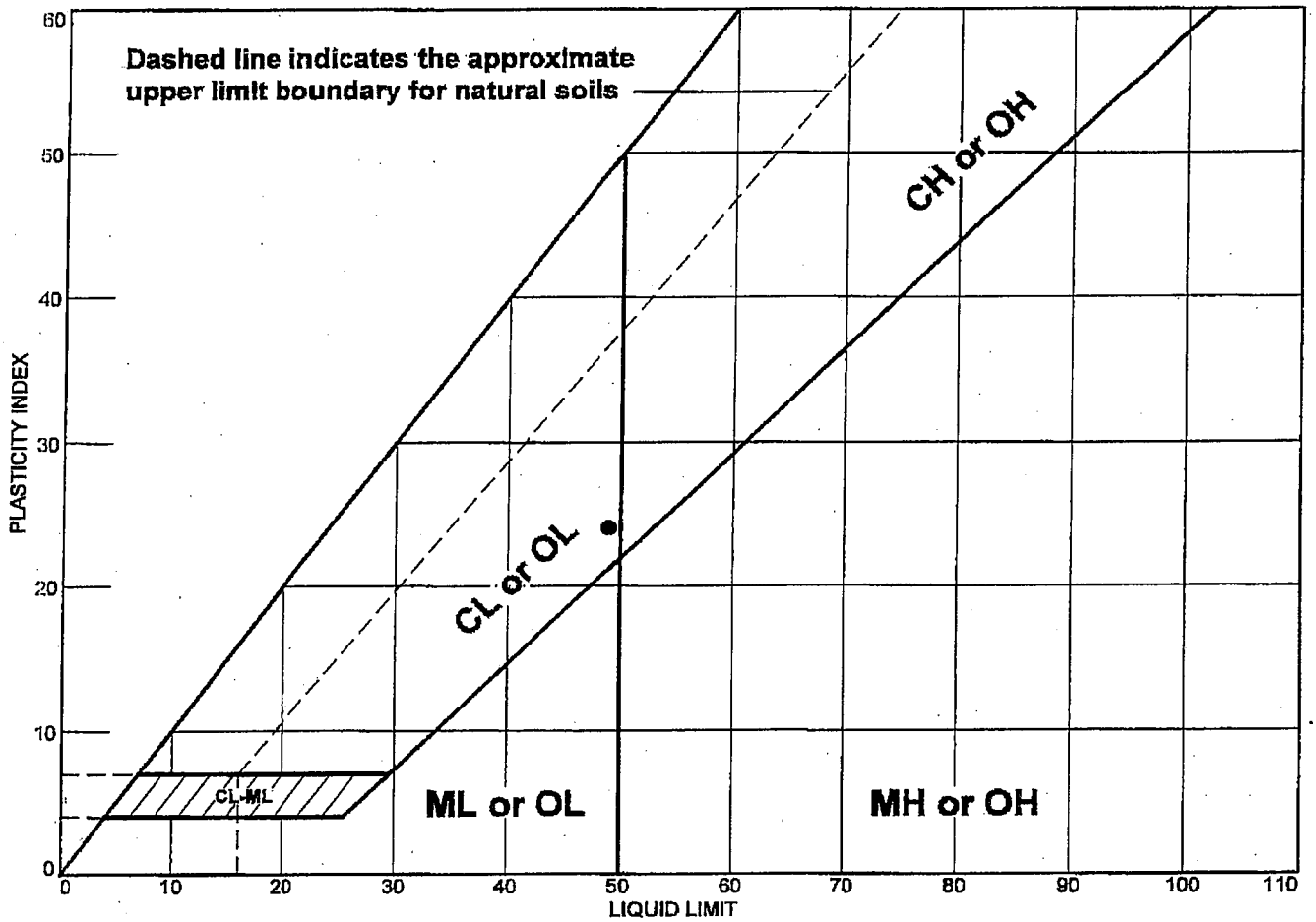
● **Sample Source:** Boring SB-01-1 (Flatbush Ave., over Busway)

Remarks:

● Sampled and Dropped off by the Client,

TEST-CON INCORPORATED
PO BOX 3116
Danbury, CT 06813-3116

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive color, lean clay	49	25	24	100.0	99.4	CL

Project No.

Project: New Britain-Hartford Busway #155-H025

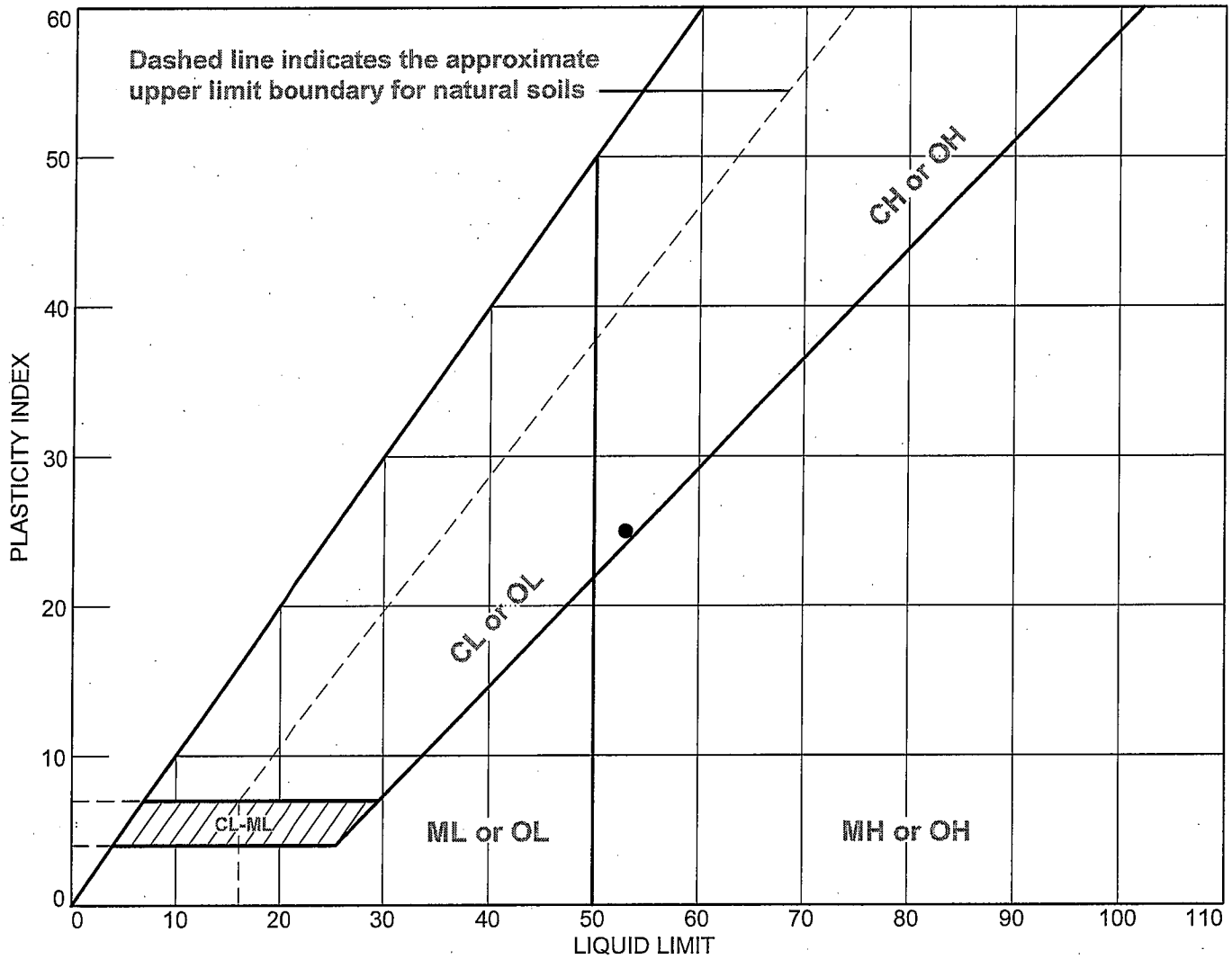
● **Source of Sample:** SB-01-2 (Flatbush Ave., over Busway)

Remarks:

● Sampled and Dropped off by the Client,

TEST-CON INCORPORATED
PO BOX 3116
Danbury, CT 06813-3116

LIQUID AND PLASTIC LIMITS TEST REPORT



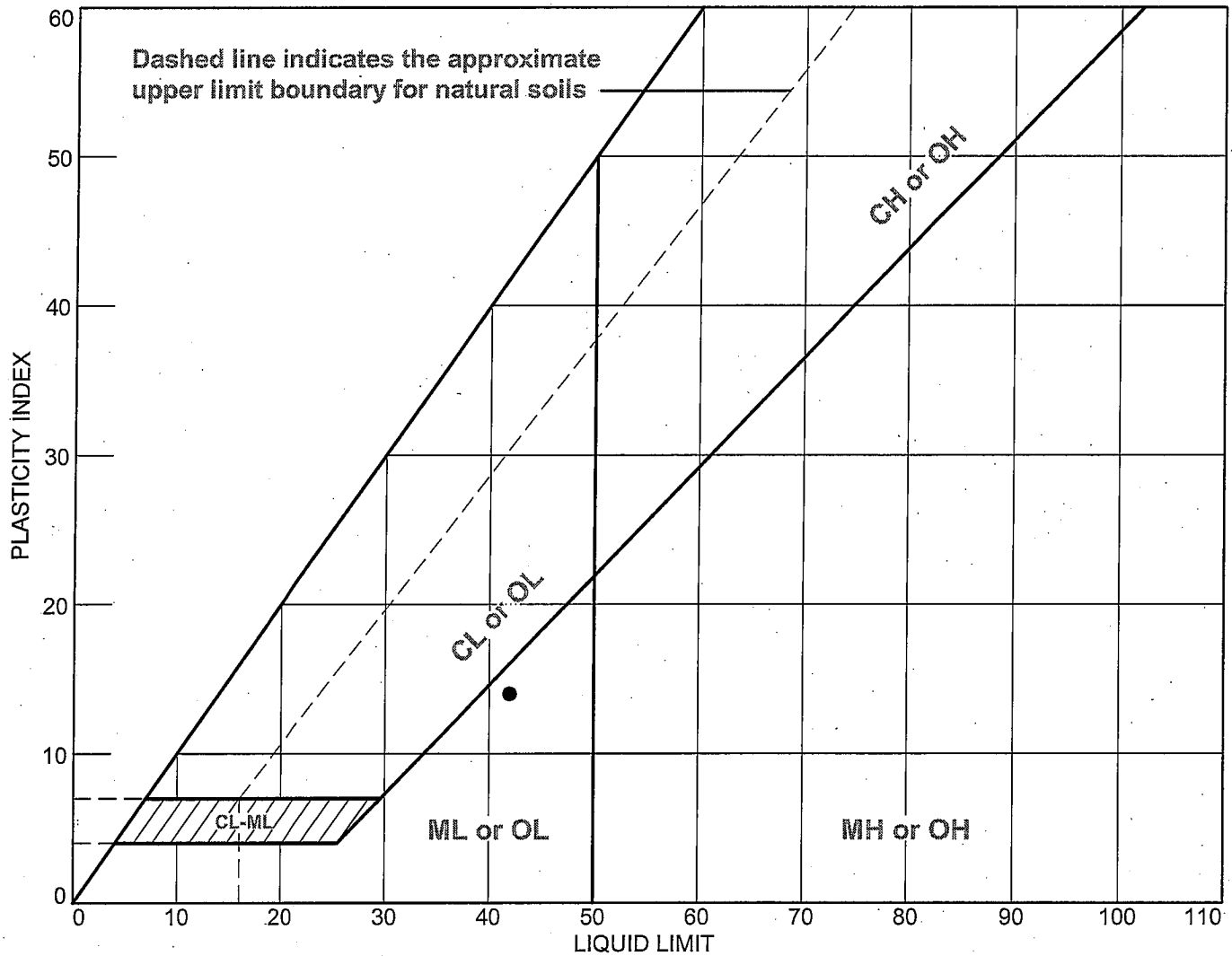
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SB-01-3	S-10	30' - 32'		28	53	25	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	SB-01-3	S-12	40' - 42'		28	42	14	

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No.:
Figure

Tested By: R. DeCesare

2003 Moisture Contents

LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828
Assigned By: D. GAFFNEY
Reviewed By: Matthew Coley
Project Engineer: D. SCHULZE
Date: NOV.03
Date Reviewed: 11/11/03

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. C_c / $1 + e_0$	Laboratory Log and Soil Description
SB-50	S-2	4.5-6.0	289	32.6																
SB-50	S-10	28.5-30.0	290	55.5																
SB-51	S-5	13.5-15.0	291	49.0																
SB-51	S-13	45.0-46.5	292	21.1																
SB-52	S-10	28.5-30.0	293	23.8																
SB-53	S-13	45.0-46.5	294	41.2																
SB-54	S-21	85.0-86.5	295	24.3																
SB-55	S-10	28.5-30.0	296	54.9																
SB-55	S-25	105.0-106.5	297	20.9																
SB-56	S-19	75.0-76.5	298	27.3																
SB-57	S-10	28.5-30.0	299	57.1																
SB-57	S-22	90.0-91.5	300	22.5																
SB-58	S-4	10.0-11.5	301	32.7																
SB-58	S-11	35.0-36.5	302	59.5																

LABORATORY TESTING DATA SHEET

Project Name: NEW BRITAIN-HARTFORD BUSWAY CONNECTICUT
Project No.: L17828
Project Engineer: D. SCHULZE
Assigned By: D. GAFFNEY
Date: NOV.03
Reviewed By: Don Schulze
Date Reviewed: 11/18/03

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Density: γ_d MAX (pcf) / W_{opt} (%)	Perme-ability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol.: $\frac{\Delta e_c}{1 + e_0}$	Laboratory Log and Soil Description
SB-54	S-6	16.5-18.0	127	20.1	21	20	43	9												Brown Silty sand (SM)
SB-54	S-15	55.0-56.5	128	42.1	44	22	98	44												Red-brown Lean clay (CL)
SB-55	S-4	10.0-11.5	129	18.5	22	20	39	8												Brown Silty sand with gravel (SM)
SB-55	S-17	65.0-66.5	130	33.7	29	22	99	25												Red-brown Silty clay (CL-ML)
SB-55	S-28	120.0-121.5	131	16.1	NP	NP	25													Brown Silty sand (SM)
SB-56	S-15	55.0-56.5	132	40.2	41	25	100	40												Red-brown Lean clay (CL)
SB-56	S-25	105.0-106.5	133	15.2	NP	NP	15													Brown Silty sand (SM)
SB-57	S-15	55.0-56.5	134	45.7	42	23	100	35												Red-brown Lean clay (CL)
SB-58	S-14	50.0-51.5	135	56.6	53	25	100	60												Brown Fat clay (CH)
SB-58	S-21	90.0-91.5	136	34.2	24	24	100	15												Red-brown Silt (ML)
SB-58	S-25	110.0-111.5	137	23.1	NP	NP	30	5												Red-brown Silty sand (SM)

2008 Moisture Contents

GEO**DESIGN**, INC.

LAB ASSIGNMENT SHEET

Project Name: New Britain-Hartford Busway

Location (*Town,State*): Hartford/West Hartford, CT (Flatbush Ave.) #155-H025

GeoDesign File No.: 380-04

Client / Company Name: URS/Washington Group

Project Engineer's Name: Chi Zhang

Contact Phone: (203) 758 8836 x 119

Page 1 of 6

Date Samples Submitted

Date Results Requested

Samples Collected By Matt Volovski

Date(s) Samples Collected 06/09/08-06/12/08

Assigned to Geo**Design**, Inc.

SAMPLE IDENTIFICATION				IDENTIFICATION TESTS							ROCK STRENGTH	CONSOLIDATION			SOIL STRENGTH			CORROSITIVITY		NOTES
Boring / Test Pit No.	Sample No.	From Depth (ft)	To Depth (ft)	Water Content (%)	Atterberg Limits	Washed Sieve -200 (%)	Hydrometer	Sieve - Hydrometer	Organic Content Determination (%)	Soil Specific Gravity	Unconfined Compressive Strength	Thin Walled Tube Extrusion [1]	Consolidation Test with Coefficent of Consolidation Data (Constant Rate of Strain Consolidation)	Consolidation Test with Coefficent of Consolidation Data (With unload - reload)	Unconsolidated Undrained (UU)	Consoldated Undrained (CIU)	Direct Simple Shear (DSS)	pH	Sulfides	
SB-01-3	S-7	17	19	40																
SB-01-3	S-9	25	27	56																
SB-01-3	S-11	35	37	60																
SB-01-3	S-13	45	47	57																
SB-01-3	S-15	55	57	42																
SB-01-3	S-17	65	67	52																
SB-01-3	S-19	75	77	25																

[1]Tube Extrusion includes Torvane measurements and Natural Water Contents.

Submitted By _____ *Date* _____

Printed Name _____

Samples Received By _____ *Date* _____

Printed Name

GEODESIGN INCORPORATED
984 Southford Rd
Middlbury, CT 06762
Phone: 203 758 8836 Fax: 203 758 8842

GEO**DESIGN**, INC.

LAB ASSIGNMENT SHEET

Project Name: New Britain-Hartford Busway

Location (*Town,State*): Hartford/West Hartford, CT (Flatbush Ave.) #155-H025

GeoDesign File No.: 380-04

Client / Company Name: URS/Washington Group

Project Engineer's Name: Chi Zhang

Contact Phone: (203) 758 8836 x 119

Page 4 of 6

Date Samples Submitted

Date Results Requested

Samples Collected By Robert Marshall / Matt Volovski

Date(s) Samples Collected 06/05/2008-06/13/2008

Assigned to Geo**Design**, Inc.

SAMPLE IDENTIFICATION				IDENTIFICATION TESTS							ROCK STRENGTH	CONSOLIDATION			SOIL STRENGTH			CORROSITIVITY		NOTES
Boring / Test Pit No.	Sample No.	From Depth (ft)	To Depth (ft)	Water Content (%)	Atterberg Limits	Washed Sieve -200 (%)	Hydrometer	Sieve - Hydrometer	Organic Content Determination (%)	Soil Specific Gravity	Unconfined Compressive Strength	Thin Walled Tube Extrusion [1]	Consolidation Test with Coefficent of Consolidation Data (Constant Rate of Strain Consolidation)	Consolidation Test with Coefficent of Consolidation Data (With unload - reload)	Unconsolidated Undrained (UU)	Consoildated Undrained (CIU)	Direct Simple Shear (DSS)	pH	Sulfides	
SB-01-4	S-6	20	22	53.6																
SB-01-4	S-9	35	37	62.1																
SB-01-4	S-12	40	42	53.4																
SB-01-4	S-15	65	67	45.5																
SB-01-4	S-18	80	82	43.2																
RW-9	S-7	20	22	65.2																
RW-9	S-9	30	32	58.1																

[1]Tube Extrusion includes Torvane measurements and Natural Water Contents.

Submitted By		*Date*	
Printed Name			
Samples Received By		*Date*	
Printed Name			

GEODESIGN INCORPORATED
984 Southford Rd
Middlbury, CT 06762
Phone: 203 758 8836 Fax: 203 758 8842

GEO**DESIGN**, INC.

LAB ASSIGNMENT SHEET

Project Name: New Britain-Hartford Busway

Location (*Town,State*): Hartford/West Hartford, CT (Flatbush Ave.) #155-H025

GeoDesign File No.: 380-04

Client / Company Name: URS/Washington Group

Project Engineer's Name: Chi Zhang

Contact Phone: (203) 758 8836 x 119

Page 5 of 6

Date Samples Submitted

Date Results Requested

Samples Collected By Ben Brandt

Date(s) Samples Collected 61.5

Assigned to Geo**Design**, Inc.

SAMPLE IDENTIFICATION				IDENTIFICATION TESTS							ROCK STRENGTH	CONSOLIDATION			SOIL STRENGTH			CORROSITIVITY		
Boring / Test Pit No.	Sample No.	From Depth (ft)	To Depth (ft)	Water Content (%)	Atterberg Limits	Washed Sieve -200 (%)	Hydrometer	Sieve - Hydrometer	Organic Content Determination (%)	Soil Specific Gravity	Unconfined Compressive Strength	Thin Walled Tube Extrusion [1]	Consolidation Test with Coefficent of Consolidation Data (Constant Rate of Strain Consolidation)	Consolidation Test with Coefficent of Consolidation Data (With unload - reload)	Unconsolidated Undrained (UU)	Consoildated Undrained (CIU)	Direct Simple Shear (DSS)	pH	Sulfides	NOTES
RW-9	S-11	40	42	61.5																
SB-01-1	S-6	15	17	32																
SB-01-1	S-9	32	34	57.4																
SB-01-1	S-12	45	47	62.3																
SB-01-1	S-15	60	62	40.4																
SB-01-1	S-18	75	77	52.1																
SB-01-1	S-21	90	92	38.2																

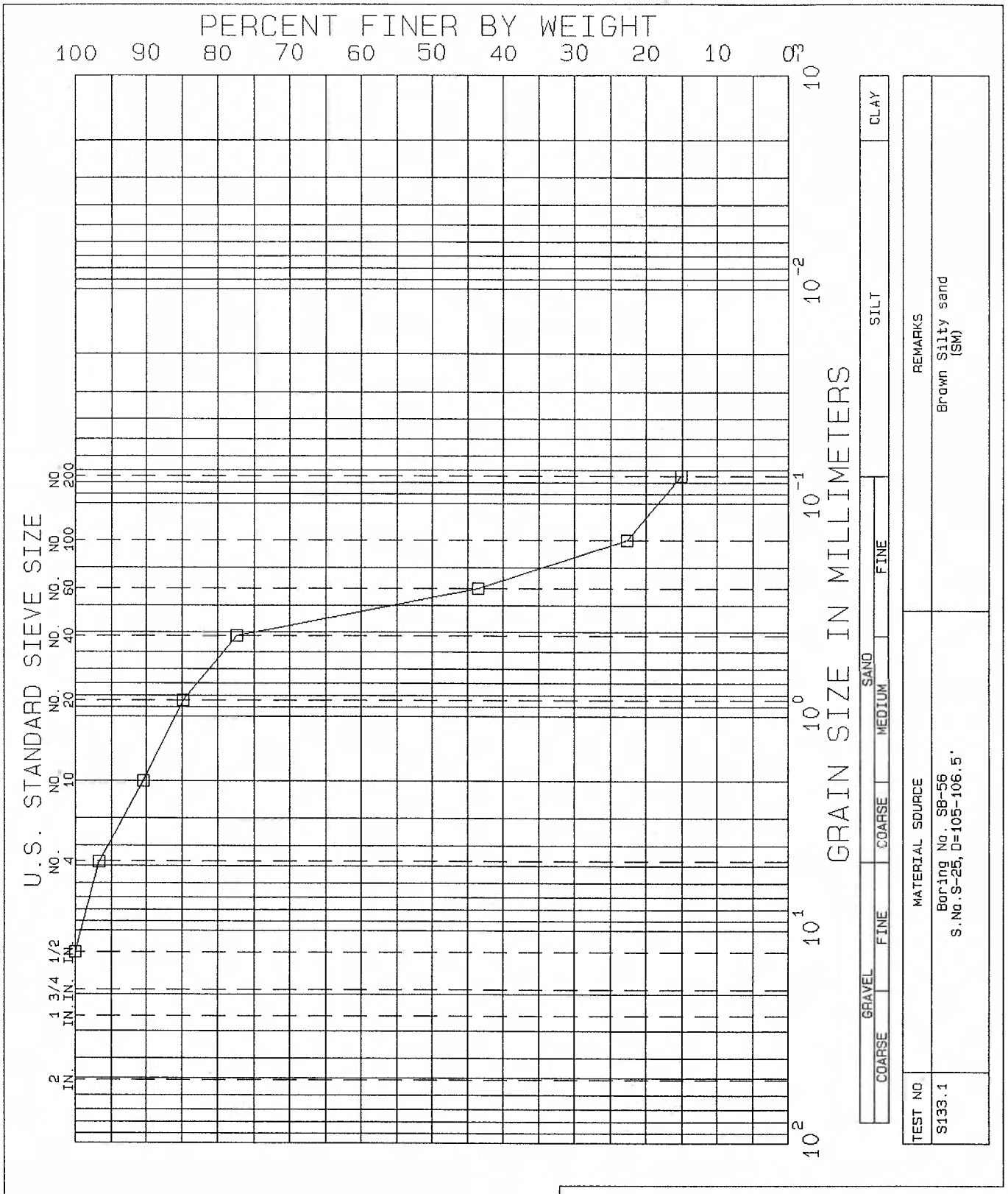
[1]Tube Extrusion includes Torvane measurements and Natural Water Contents.

Submitted By		*Date*	
Printed Name			
Samples Received By		*Date*	
Printed Name			

GEODESIGN INCORPORATED
984 Southford Rd
Middlbury, CT 06762
Phone: 203 758 8836 Fax: 203 758 8842

Gradation and Hydrometer Tests

2003 Gradation and Hydrometer Tests

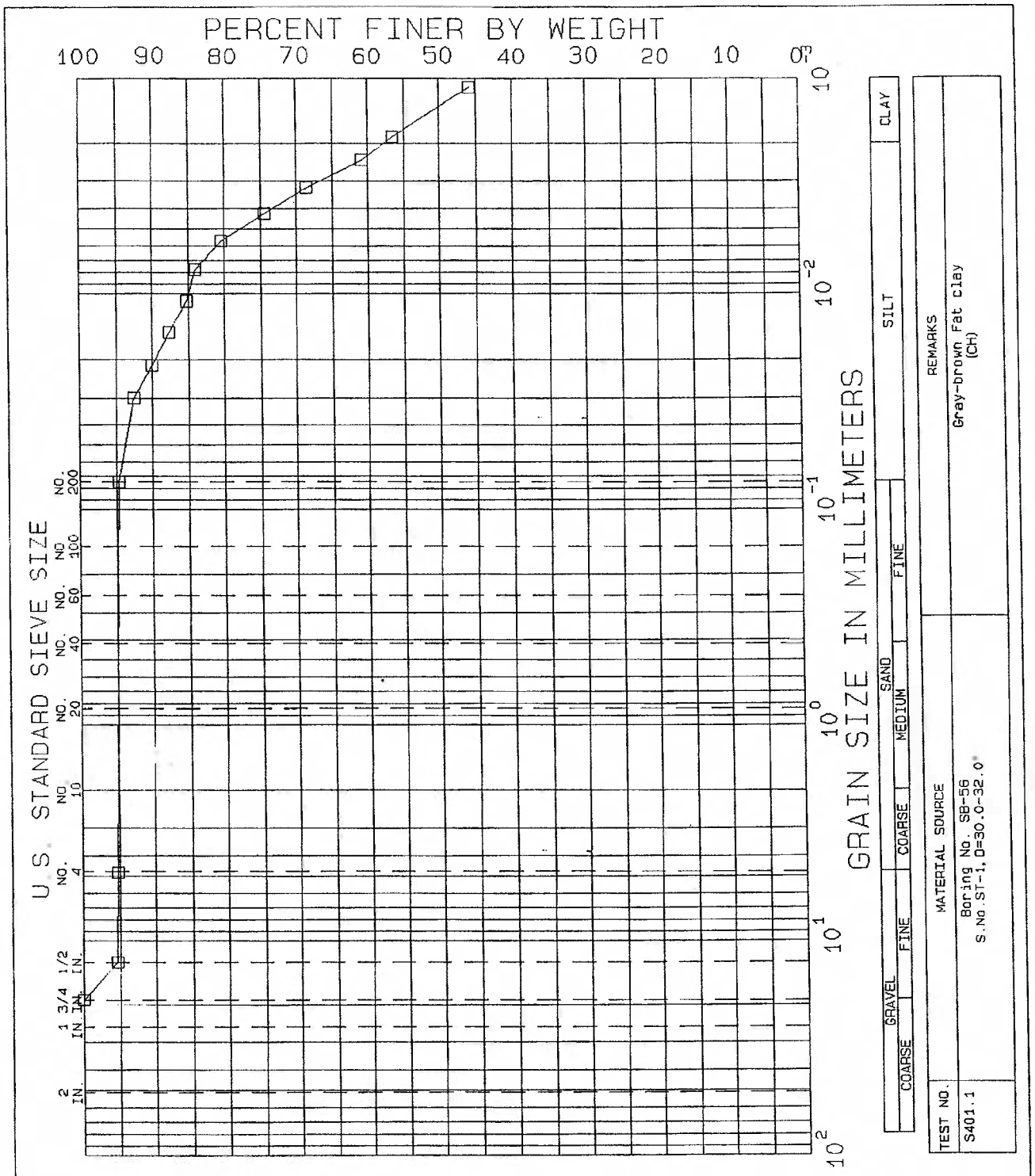


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO	SB-56	TEST SERIES	
SAMPLE	S-25	NO.	133
DEPTH	105-106.5'	DATE	Nov.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

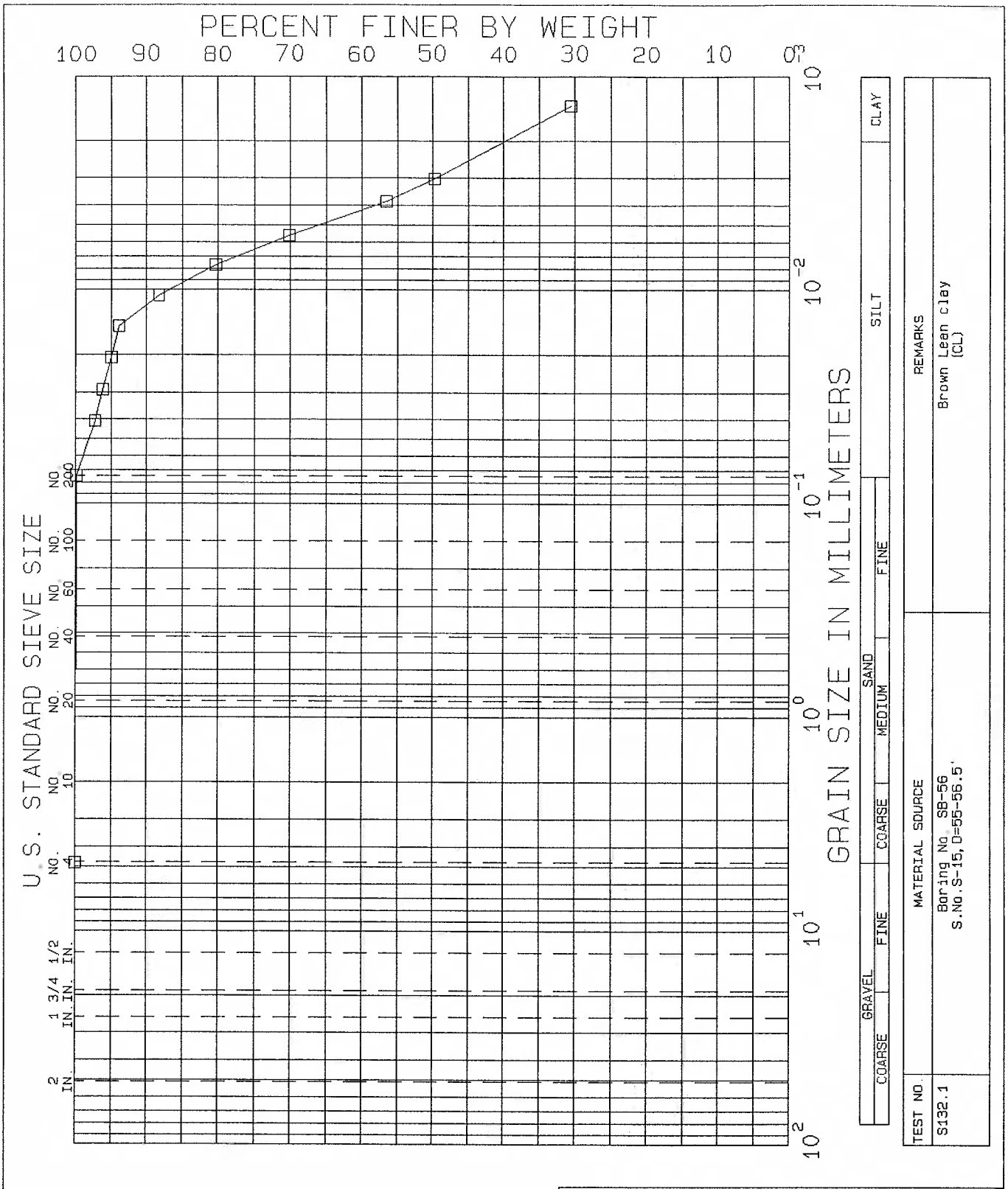


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-56	TEST SERIES	
SAMPLE	ST-1	NO	401
DEPTH	30.0-32.0'	DATE	Feb.04
TECH.	PEC		
REVIEWER	MBP	FILE	L17828

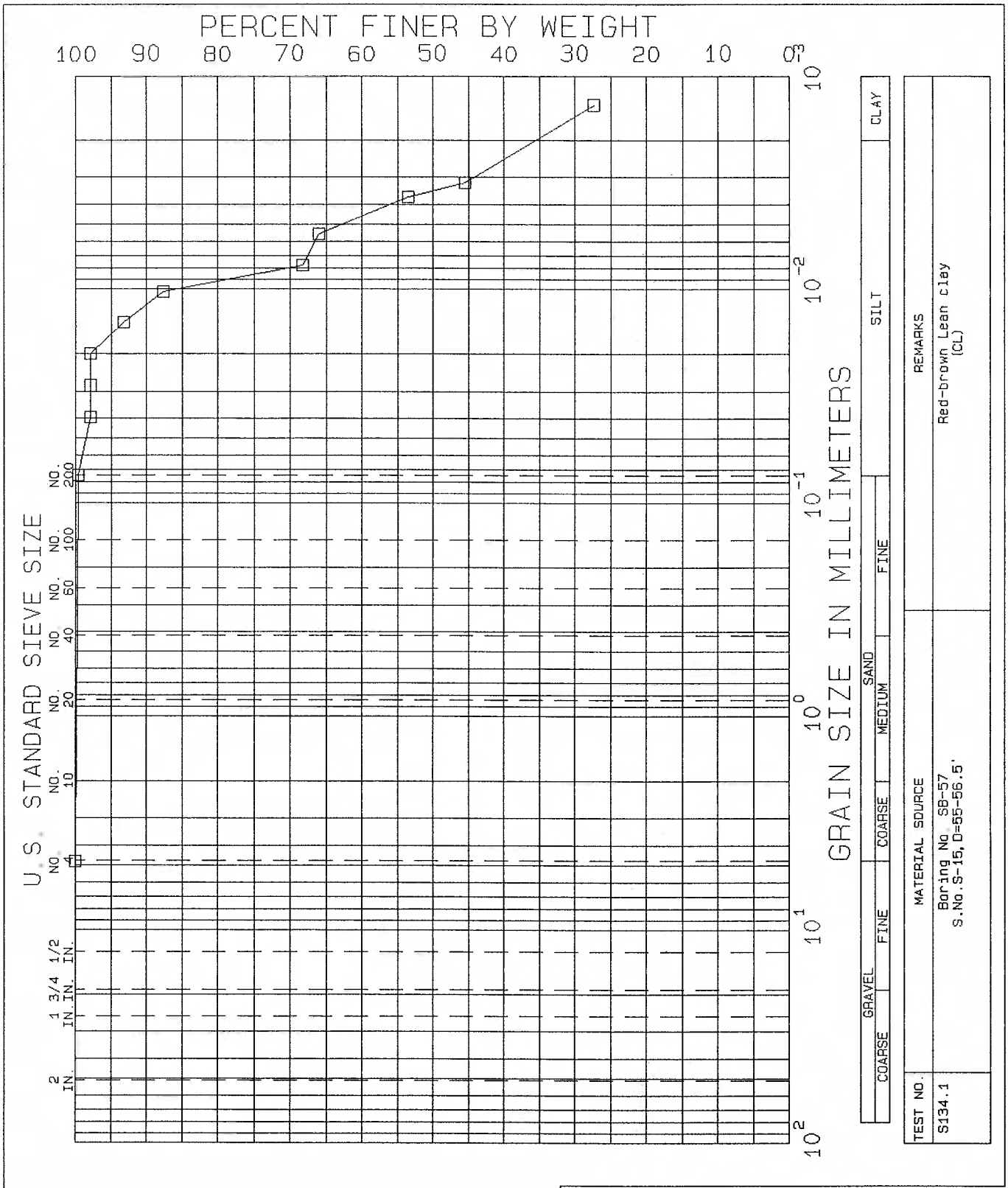


NEW BRITAIN-HARTFORD BUSWAY

CONNECTICUT

GRADATION TESTS

BORING NO.	SB-56	TEST SERIES	
SAMPLE	S-15	NO.	132
DEPTH	55-56.5'	DATE	Nov.03
TECH.	PEC		
REVIEWER	MBP	FILE	L17828



NEW BRITAIN-HARTFORD BUSWAY

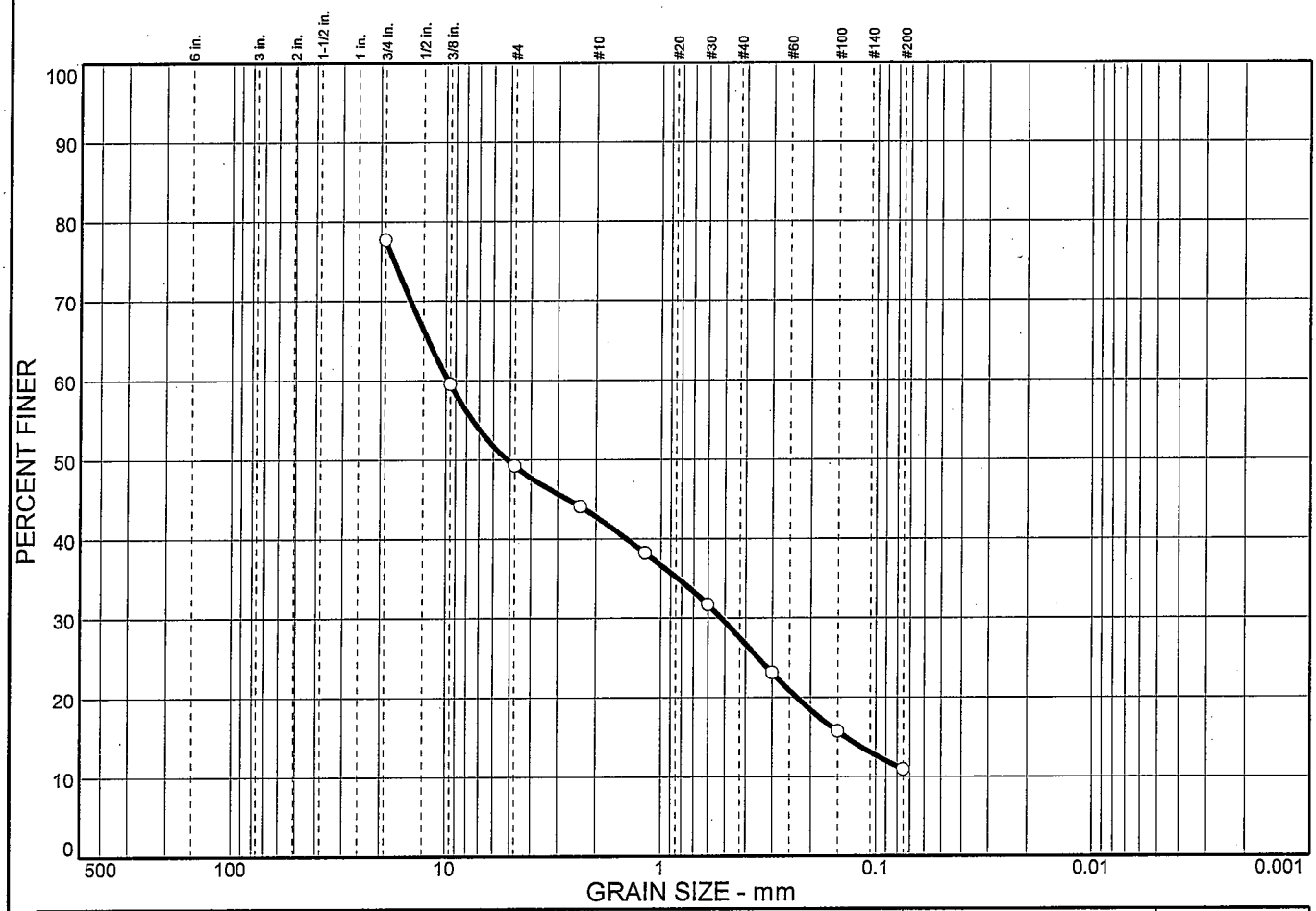
CONNECTICUT

GRADATION TESTS

BORING NO.	SB-57	TEST SERIES	
SAMPLE	S-15	NO.	134
DEPTH	55-56.5'	DATE	Nov.03
TECH	PEC		
REVIEWER	MBP	FILE	L17828

2008 Gradation Tests

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		38.3	10.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	77.7		
.375 in.	59.5		
#4	49.2		
#8	44.1		
#16	38.2		
#30	31.7		
#50	23.1		
#100	15.7		
#200	10.9		

* (no specification provided)

Soil Description

Dark reddish brown-Poorly graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= D_{60}= 9.75 D_{50}= 5.15
D_{30}= 0.518 D_{15}= 0.138 D_{10}=
C_u= C_c=

Classification

USCS= GP-GM AASHTO=

Remarks

Sample delivered by client on 08/01/08. Tested by M. Mbakwe on 10/08/08.

Sample No.: 30 SA **Source of Sample:** R-102 (S-1) **Date:** 10/08/08
Location: **Elev./Depth:** 0.5'-2.5'

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No: **Plate**

2008 Minus No. 200 Gradation Tests

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.comWeb-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/19/08

Report #: 30 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Dark reddish brown

Date Received: Sample delivered by client on 08/01/08

Identification #: R-102 (S-1) Elevation/Depth: 0.5'- 2.5'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	334.0 g
Weight After Wash:	297.5 g
Percentage of material finer than #200:	10.9 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.comWeb-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/15/08

Report #: 3 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Light Tan

Date Received: Sample delivered by client on 07/28/08

Identification #: R-102 (S-3) Elevation/Depth: 5'-7'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked

SUMMARY DATA

Initial Weight:	195.6 g
Weight After Wash:	47.9 g
Percentage of material finer than #200:	75.5 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/19/08

Report #: 31 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Light brown

Date Received: Sample delivered by client on 08/01/08

Identification #: R-103 (S-2) Elevation/Depth: 2'- 4'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	222.4 g
Weight After Wash:	90.5 g
Percentage of material finer than #200:	59.3 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/19/08

Report #: 32 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Medium brown

Date Received: Sample delivered by client on 08/01/08

Identification #: R-104 (S-2) Elevation/Depth: 2'- 4'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	145.1 g
Weight After Wash:	32.9 g
Percentage of material finer than #200:	77.3 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.comWeb-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/19/08

Report #: 33 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Dark brown

Date Received: Sample delivered by client on 08/01/08

Identification #: R-105 (S-1) Elevation/Depth: 1'- 3'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	130.8 g
Weight After Wash:	82.7 g
Percentage of material finer than #200:	36.7 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.comWeb-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/21/08

Report #: 22 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Light Brown

Date Received: Sample delivered by client on 08/01/08

Identification #: R-108 (S-2) Elevation/Depth: 3'- 5'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	238.9 g
Weight After Wash:	119.4 g
Percentage of material finer than #200:	50.0 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.comWeb-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 08/19/08

Report #: 15 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Light Brown, Goldish Color

Date Received: Sample delivered by client on 08/01/08

Identification #: RW-9 (S-3) Elevation/Depth: 5'- 7'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	161.2 g
Weight After Wash:	44.9 g
Percentage of material finer than #200:	72.1 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 09/10/08

Report #: 40 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Light brown

Date Received: Sample delivered by client on 08/01/08

Identification #: SB-01-1 (S-3) Elevation/Depth: 5'- 7'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

SUMMARY DATA

Initial Weight:	217.4 g
Weight After Wash:	123.6 g
Percentage of material finer than #200:	43.1 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

LABORATORY TEST CERTIFICATE

Date: 09/10/08

Report #: 43 SA
Technician: R. DeCesare

Client: Geodesign Inc.
984 Southford Rd
Middlebury, CT 06762

Project: New Britain-Hartford Busway #155-H025
Hartford/West Hartford, CT

Description: Gray

Date Received: Sample delivered by client on 08/01/08

Identification #: SB-01-3 (S-3) **Elevation/Depth:** 5' – 7'

Test Requirements: Material in soil finer than #200 sieve

Remarks: D1140 Method A – Dry mass calculated by oven drying. Specimen was soaked.

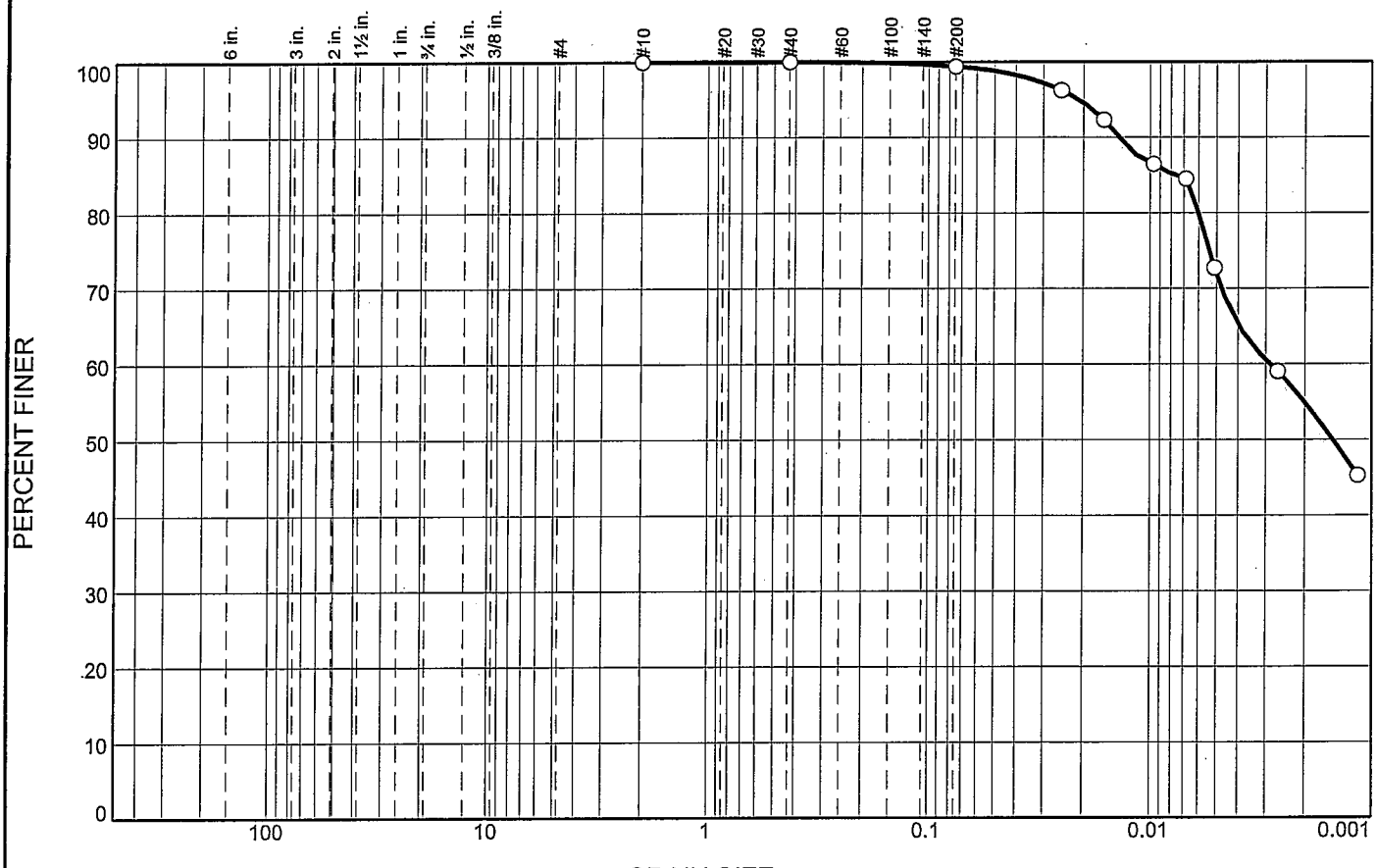
SUMMARY DATA

Initial Weight:	162.4 g
Weight After Wash:	0.9 g
Percentage of material finer than #200:	99.4 %

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
6/26/08

2008 Hydrometer Tests

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.6	27.5	71.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#200	99.4		

* (no specification provided)

Material Description

Olive color, lean clay

Atterberg Limits

PL= 23 LL= 49 PI= 26

Coefficients

D_{85}= 0.0077 D_{60}= 0.0029 D_{50}= 0.0015
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(29)

Remarks

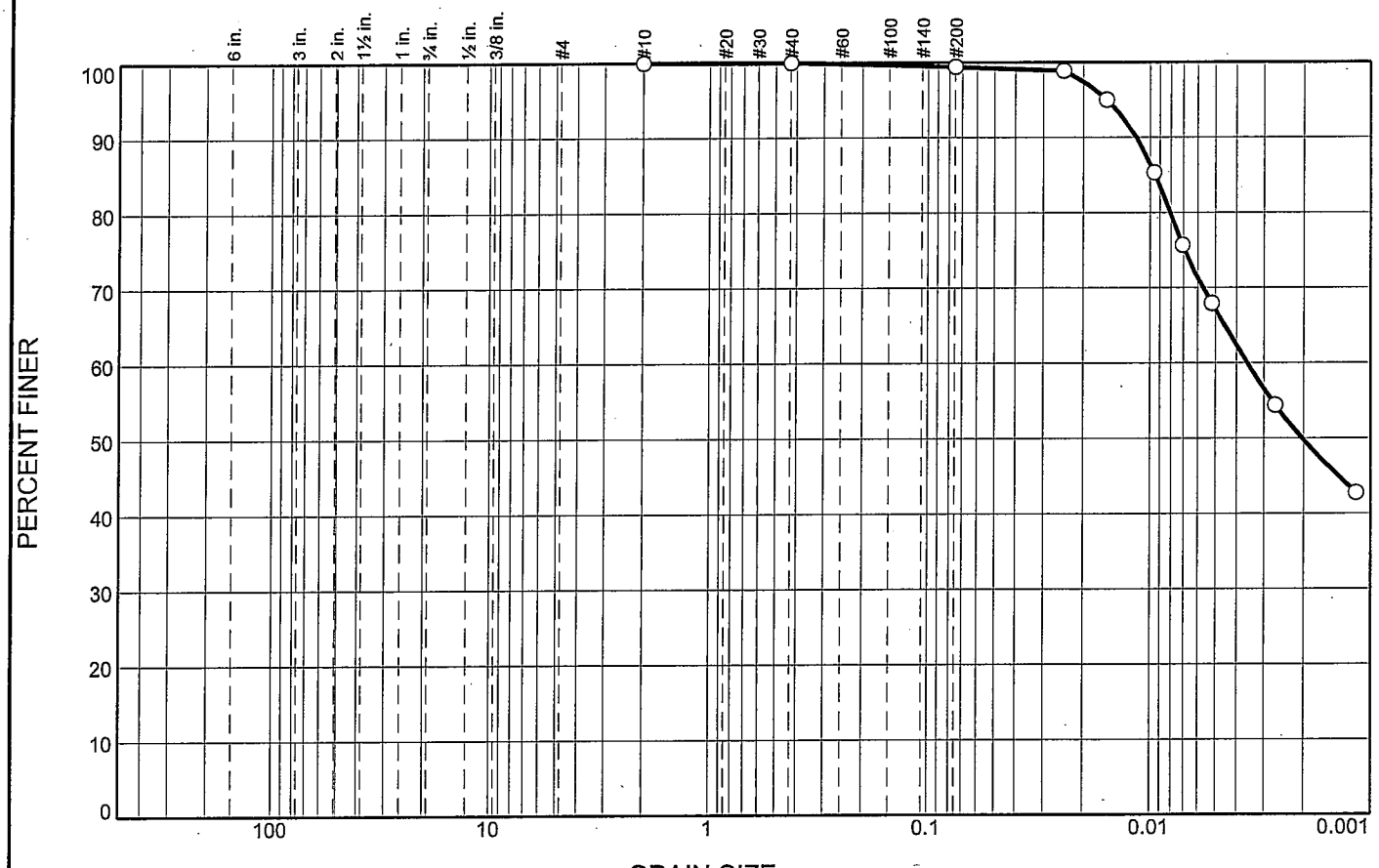
Samples collected 6/5/08-6/18/08.
Sampled and Dropped off by client.

Sample Number: UP1 **Depth:** 35' to 37'
Location: Boring RW-4(Flatbush Ave., Over Busway) **Date:** 8/5/08

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No: **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.6	32.2	67.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#200	99.4		

* (no specification provided)

Material Description

Olive color, lean clay

Atterberg Limits

PL= 24 LL= 49 PI= 25

Coefficients

D_{85}= 0.0094 D_{60}= 0.0036 D_{50}= 0.0020
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(28)

Remarks

Samples collected 6/5/08-6/18/08.
Sampled and Dropped off by Client.

Sample Number: UP1 **Depth:** 20' to 22'
Location: Boring SB-01-1 (Flatbush Ave., over Busway) **Date:** 8/8/08

TEST-CON INCORPORATED
16 East Franklin Street, PO BOX 3116
DANBURY, CT 06813-3116

Client: GeoDesign
Project: New Britain-Hartford Busway #155-H025
Project No: **Figure**

Corrosivity Tests

2008 Corrosivity Tests

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Phone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

Construction Material Testing & Inspection - Geotechnical Services

SULFIDE TEST REPORT

Client:	GeoDesign Incorporated 984 Southford Rd. Middlebury, CT 06762	**Date:** **Tested by:** **Collected Date:**	9/30/08 York (CT # PH-0723) 7/28/08
Project:	New Britain-Hartford Busway # 155-H025 Hartford/West Hartford, CT	**Matrix:** **Report No.:**	Soil 1 – 10 Sulfide (08090862)

Progress of Work:
The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the summary tables.

The results of the analysis, which are all reported on an as-received basis unless otheriwise noted, are summarized in the following table(s).

Analysis Results

Boring/Test Pit No.	Sample No.	Depth (ft)	Parameter	Method	Units	Results	MDL
SB-01-2	S-2	2' – 4'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-01-3	S-2	2' – 4'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-01-4	S-2	2' – 4'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-01-3	S-3	5' – 7'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-02-1	S-1	0' – 0.7'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-02-3	S-1	0' – 2'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-02-2	S-2	2' – 4'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-03-2	S-4	7' – 9'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-03-3	S-1	0' – 2'	Sulfide	EPA376.1	mg/kg	Not detected	20.0
SB-03-3	S-4	7' – 9'	Sulfide	EPA376.1	mg/kg	Not detected	20.0

Units Key: For Waters/Liquids: mg/L = ppm ; ug/L – ppb For Soils/Solids: mg/hg = ppm ; ug/kg = ppb

Notes:

1. The MDL (Minimum Detectable Limit) reported is adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. This MDL is the REPORTING LIMIT and is based upon the lowest standard utilized for calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. Test-Con's liability for the above data is limited to the dollar value paid to Test-Con for the reference project.
4. All samples were received in proper condition for analysis with proper documentation.

Reproduction or publication of this report only with our express permission.
TEST-CON Inc. excludes all liability of work performed by others.
The above tests/results apply only to specific locations tested/inspected.

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

PH OF SOIL MATERIAL REPORT

Date: September 26, 2008

Report #: 1 - 10pH
Technician: R. DeCesare

Client: GeoDesign Incorporated
984 Southford Rd.
Middlebury, CT 06762

Project: New Britain-Harford Busway
155-H025

Date Received: Delivered by Client on 7/28/08

Test Requirements: pH

Summary Data

Boring/Test Pit No.	Sample No.	Depth (ft)	pH Test Results
SB-01-2	S-2	From 2' to 4'	6.7
SB-01-3	S-2	From 2' to 4'	7.4
SB-01-4	S-2	From 2' to 4'	7.4
SB-01-3	S-3	From 5' to 7'	7.5
SB-02-1	S-1	From 0' to 0.7'	5.9
SB-02-3	S-1	From 0' to 2'	3.6
SB-02-2	S-2	From 2' to 4'	5.9
SB-03-2	S-3	From 5' to 7'	7.4
SB-03-3	S-2	From 2' to 4'	3.7
SB-03-3	S4	From 7' to 9'	4.0

Reproduction or publication of this report only with our express permission. TEST-CON Inc. excludes all liability of work performed by others. This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government. The above tests/results apply only to specific locations tested/inspected.
5/15/07

Unconfined Compression Tests (Rock)

TEST-CON INCORPORATED

16 East Franklin Street
P. O. Box 3116
Danbury, CT 06813-3116
Telephone: (203) 748-3012 Fax: (203) 778-0633
E-Mail: Service@test-con.com Web-Site: www.test-con.com

Construction Material Testing & Inspection - Geotechnical Services

ROCK CORE REPORT

Client: GeoDesign Incorporated
984 Southford Rd.
Middlebury, CT 06762
Project: New Britain-Hartford Busway # 155-H025

Date: 9/30/08
Technician: R. DeCesare
Report #: 1 – 5 Core
Page 1 of 2

Progress of Work: As requested, Test-Con performed unconfined compressive strength of rock core samples and the results are as follow:

Identification #:	SB-01-3 (C-1) 135' to 140'	SB-01-3 (C-1) 135' to 140'	SB-06-4 (C-1) 125' to 130"
ACTUAL DEPTH	139.5ft.	138.5ft.	114.5ft.
Total Length of Core Recovered, inches; and No. of pieces of Core, in parenthesis	5.4" (1)	5.9" (2)	5.7" (1)
Sample Height, inches, after cutting and capping	3.7"	1.9"	4.0"
Capping Material	Sulfur	Sulfur	Sulfur
Diameter, inches	2.0"	2.0"	2.0"
Area, square inches	3.14	3.14	3.14
Heigh/Diameter Ratio	1.85 : 1	0.95 : 1	2 : 1
Total Load, lbs.	16252	22247	12820
Load, P.S.I.	5175.8	7085	4082
Correction Factor	0.984	0.860	N/A
Corrected P.S.I.	5093	6093	4082
Date Tested	9/30/08	9/30/08	9/30/08
No. of End Cuts	2	2	2

Reproduction or publication only with our express permission.
TEST-CON Inc. excludes all liability of work performed by others.
NVLAP bears no responsibility for the foregoing information.
The above tests/results apply only to specific locations tested/inspected.
5-15-07

Appendix 6

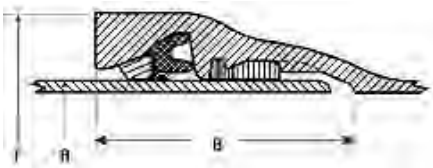
American Ductile Iron Pipe
Cut Sheet

American Ductile Iron Pipe

MENU CATEGORIES

Flex-Ring® Joint 14''-48''

Standard Dimensions and Pressure Ratings



14" - 48"

> Standard Dimensions
> Assembly Instructions
> Disassembly Instructions

ADIP Table No. 7-20

Size in.	Working Pressure* psi	Nominal Laying Length** ft.	A O.D. in.	B Socket Depth in.	F Bell O.D.+ in.	Allowable Pulling Load++ lb.	Allowable Deflection degree	Offset per 20' Length in.	Radius of Curve^ ft.	Empty Pipe Buoyancy in Water (lb/ft)^^
14	350	20	15.3	7.38	19.31	75,000	4	17	285	27
16	350	20	17.4	7.38	21.43	95,000	3 3/4	16	305	38
18	350	20	19.5	8.2	23.7	120,000	3 3/4	16	305	52
20	350	20	21.6	8.2	25.82	150,000	3 1/2	15	327	69
24	350	20	25.8	8.96	29.88	210,000	3	12	380	104
30	250	20	32	9.63	36.34	220,000	2 1/2	10	458	175
36	250	20	38.3	9.63	42.86	310,000	2	8	570	266
42	250	20	44.5	10.84	49.92	390,000	2	8	570	359
48	250	20	50.80	12.37	56.36	500,000	2	8	570	484

Notes:
* Working pressure is the maximum pressure rating of the joint and is based on its capability to resist thrust due to internal pressure. If higher working pressure is required, check AMERICAN. Pressure rating of the joint is limited by the pressure rating of the parent pipe.
** Laying length is nominal 20'. Where exact lengths are required, contact AMERICAN.

+ Dimensions subject to change at our option. Check AMERICAN if smaller or exact dimensions are required.
++ Intended for Horizontal Directional Drilling (HDD) applications. The tabulated values are based on Pressure Class 350 pipe thickness. Contact AMERICAN when it may be desirable to use lesser pressure class pipe or when higher pulling loads are required. Flex-Ring pipe may be available for greater pulling loads than indicated in the tabulated values.
^ Approximate radius of curve produced by a succession of 20' lengths of pipe fully deflected.
^^ Based on weight of empty (full of air) Pressure Class 350 Flex-Ring pipe with standard cement lining immersed in water. Positive numbers indicate such pipe will float.

ADIP Minimum Laying Lengths (Table No. 9-2)

Size in.	Flex-Ring & Flex-Ring End	Flex-Ring End & Flex-Ring End
14	1'-6"	2'-0"
16	1'-6"	2'-0"
18	1'-6"	2'-0"
20	1'-6"	2'-0"
24	2'-0"	2'-6"
30	2'-0"	2'-6"

36	2'-0"	2'-6"
42	2'-0"	3'-0"
48	2'-6"	3'-0"

Assembly Instructions

Standard Dimensions and Pressure Ratings | Assembly Instructions | Disassembly Instructions
To Top of Page

1) Cleaning and Fastite gasket insertion

1

Thoroughly clean the socket restraining groove (nearest the bell end), the Fastite gasket recess, and the pipe plain end, removing dirt, sand, ice, mud, or any other material which could prevent the proper placement of the Fastite gasket and flex-ring. As in normal Fastite joint assembly, insert the gasket into the gasket socket groove (Photo 1). Important: A Fastite gasket must also be used, because the rubber-backed flex-ring does not perform any sealing function.

2) Placement of the flex-ring in socket and joint lubrication

2

Remove the flex-ring from its container and place it in the socket restraining groove in gasket-like fashion (Photo 2).

3

The yellow restraining segments of the flex-ring must be oriented toward the entering spigot. This may be done by first placing the flex-ring in the socket groove by forming one or more inward or lateral loops in the rubber-backed ring (Photo 3).

4

Work all inward or lateral loops fully outward and planar such that each metal segment fits reasonably flush against the wedging surface of the socket, and no rubber bulges or twists remain (Photo 4).

Lubricate the inside surface of the gasket and the first four inches of the spigot including the beveled nose end of the pipe. Do not allow the lubricated spigot end of the pipe to contact the ground prior to insertion.

3) Initial placement of Flex-Ring spigot end into socket

5

With the spigot in reasonably straight alignment and centered within the flex-ring (Photo 5), insert the spigot until it contacts the back of the socket per normal Fastite joint assembly procedure. (See Fastite assembly procedures for additional detail.) When the weld bead is in proper assembled position fully beyond the yellow Flex-Ring segments, every segment will be trapped firmly between the weld bead, the spigot, and the wedging surface of the socket.

Verify the correct positioning of the yellow Flex-Ring segments by visual inspection (or by "feeler" gauge if installed in conditions of poor visibility). The segments will normally snap directly into the correct assembled position. However, if any segment should not come down firmly onto the pipe at any location, deflect the pipe slightly in that direction, thereby allowing the segment to seat itself correctly.

After joint assembly, the joint may be extended and then deflected within the range of allowable joint deflection for the size of pipe being assembled.

4) Assembly of fittings

Flex-Ring pipe and fitting joints can generally be assembled with the same tools and methods used for many years with Fastite joints. When using a field-cut pipe to locate a fitting, it may be advantageous to use an uncut flex-ring spigot end (with factory weld bead) and a standard Flex-Ring in the fitting socket rather than using a field-cut plain end and Field Flex-Ring with black-toothed gripping segments. A Field Flex-Ring and cut pipe plain end may then be used in the nearest pipe socket on either side of the fitting. When possible, the use of standard flex-rings with yellow segments and factory spigots with weld beads in the sockets of a fitting may allow easier orientation or rotation of the fitting relative to the pipe after assembly, if this is needed. (See Assembly of Fastite fittings, for additional detail.)

5) Joint extension after installation

The 14"-48" Flex-Ring locking mechanism allows approximately one inch of free axial movement and also provides substantial flexibility after installation. However, the joints may be extended after assembly to minimize this joint take-up in test or service conditions.

In most underground installations (including most restrained bend locations), joint take-up is advantageous in that increased thrust-resisting forces are generated. Also, expansion and contraction due to temperature variations may be accommodated without excessive stress in pipe

members. The amount of joint take-up or line movement in buried restrained pipelines is substantially limited by the surrounding soil. Therefore, system security and safety is maximized by filling and testing restrained sections of pipelines after backfilling as recommended by ANSI/AWWA C600, *Installation of Ductile Iron Water Mains and Their Appurtenances* and AWWA Manual M41.

In any application where axial or lateral movement may be undesirable, such as certain bridge crossings, certain exposed or unburied piping applications, or certain connections of restrained pipe sections to rigid piping, special provisions, including effective joint extension, may be necessary to control unacceptable pipeline movement.

Depending on job conditions and restrained pipe length, cumulative joint take-up can obviously be substantial, particularly in exposed piping applications.

Where joint pre-extension is necessary in a piping system, it may be accomplished by pulling or jacking the spigot away from the socket until firm resistance is encountered. This will not limit joint flexibility. See "Restrained Joint Pipe Assembly Extension Procedure" in this section for more information concerning joint extension.

The versatile performance capabilities of AMERICAN Flex-Ring Joint Pipe are perfectly suited for projects containing a variety of conditions such as the hilly, rocky terrain shown in this photo.

Disassembly Instructions

Standard Dimensions and Pressure Ratings | Assembly Instructions | Disassembly Instructions
To Top of Page

Flex-Ring joints may be disassembled if required using sharp wedges and 3/16"-1/4" thick disassembly shims. Flex-Ring disassembly sets are available from AMERICAN and are suggested for disassembly. These disassembly sets include two sharp steel starter wedges and fifteen "L"-shaped shims. The wedges are used to start the separation of the yellow Flex-Ring joint locking segments outward from the spigot while it is in the bell of an already assembled joint. The "L"-shaped shims are then hammered between the spigot and each locking segment. The thicker shims lift the locking segments entirely away from the spigot when fully inserted, and allow the spigot weld bead to pass under the locking segments generally located as shown in Figs. 1 and 2. Step-by-step instructions follow:

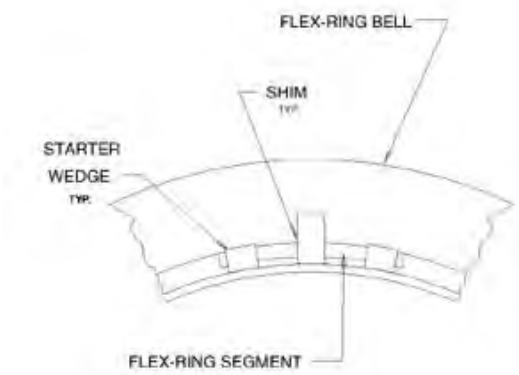


Figure 1
Starter shim and wedge arrangement for 14", 18", and 20" sizes.

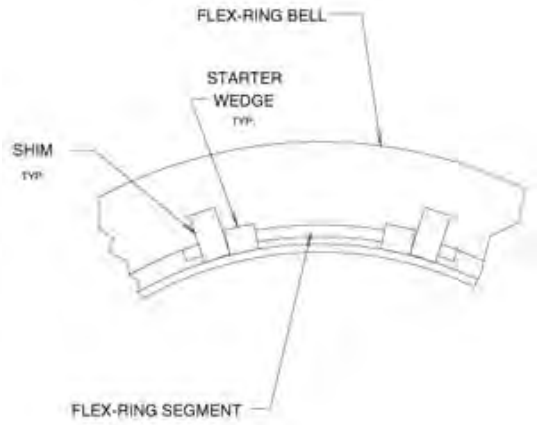
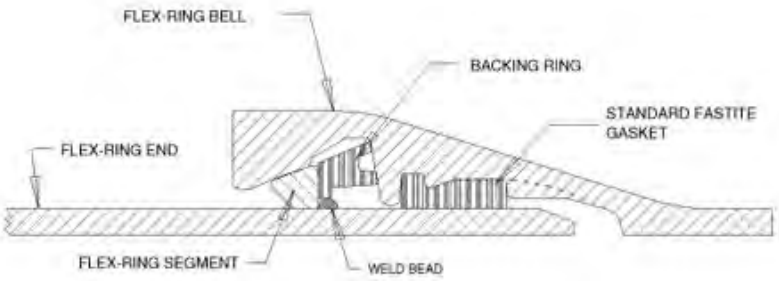


Figure 2
Shim and wedge arrangement for 16", 24", 30", 36", 42", and 48"sizes.

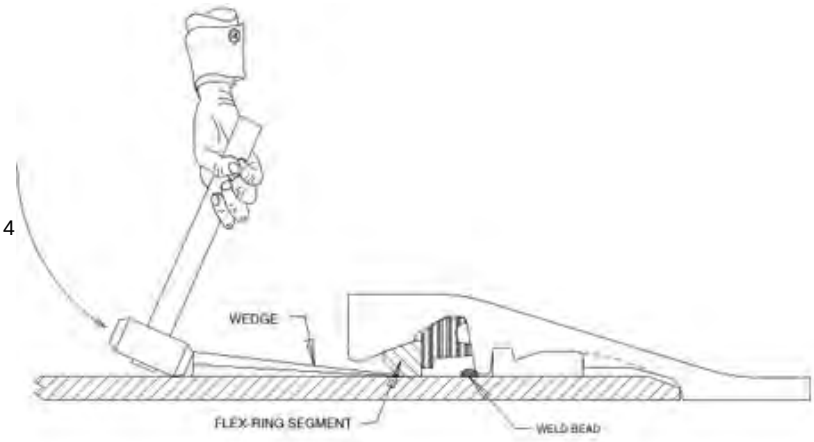
1. First straighten the joint as much as possible and push or pull the spigot back into the bell until it "bottoms out" in the rear of the socket. (Fig. 3)

Figure 3



2. Hammer a starter wedge under a yellow locking segment until an approximately 1/8" gap is seen between the segment and the spigot. (Fig. 4)

Figure 4

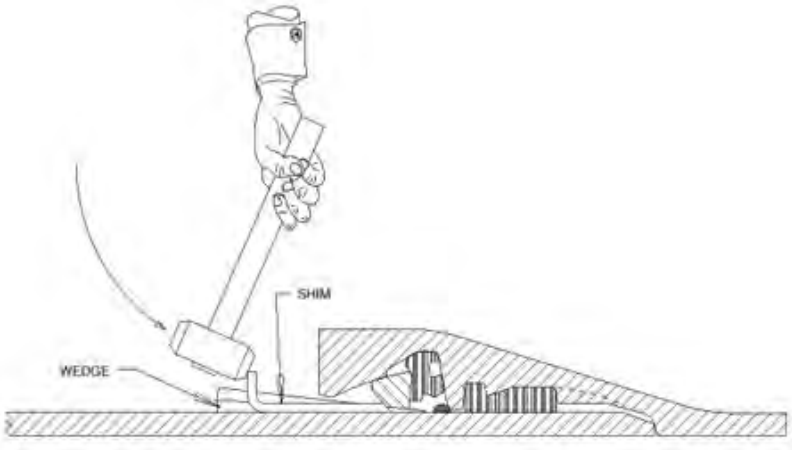


3. Hammer a second wedge (if necessary to start the shims) under the other end of the locking segment as in step 2.

4. With a large hammer (such as a six pounder) vigorously drive one or two "L"-shaped shims under the locking segment until the ends of the shims firmly contact the spigot

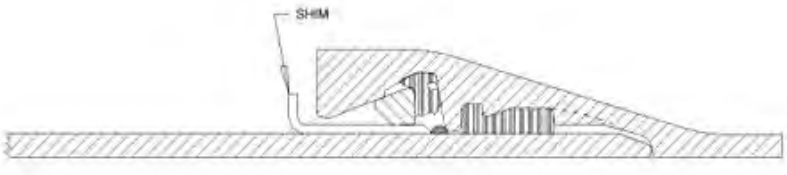
weld bead. (Fig. 5) Shims and wedges can be safely and firmly held against the pipe as they are hammered using a block of wood or a board. Safety precautions such as the wearing of safety glasses and keeping clear of the hammer during striking should always be taken to avoid injury.

Figure 5



5. Remove the starter wedges from between the locking segment and spigot, leaving the shim(s) in place. (Fig. 6) Note that the wedges are reused for each locking segment.

Figure 6



6. Drive wedges and shims under all locking segments as shown in steps 2-5. (See photo.) Check to be sure that the inner surface of all segments will not interfere with the spigot weld bead during joint separation after inserting shims.

7. Separate the joint. During joint separation, it is generally best to pull the spigot straight out of the socket. Extreme back and forth deflecting motions of the spigot during joint separation can cause shims to fall out of the joint and/or relocking to occur. If the joint does not readily come apart, check to see if one or more of the segments is in locking contact with the spigot weld bead. If so, push or deflect the spigot back in that location and add or replace shims as required.

Disassembly kits accompanied by instructions for use can be furnished by AMERICAN upon request.

© 1995 – 2010, American Cast Iron Pipe Company

Appendix 7

Limitations

GEOTECHNICAL LIMITATIONS

Explorations

1. The analyses and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until further explorations are made and construction occurs. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

2. The generalized soil and bedrock profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil and bedrock transitions are probably more erratic. For specific information, refer to the boring logs.

3. The geologic and geomorphologic settings at this site are complex and the uncertain historic site usage has resulted in the varied distribution and stress history of compressible soils across the site. Limited spacing of borings and lab testing can at best, only allow for estimates to be developed for duration and magnitude of consolidation settlements.

4. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in river levels, rainfall, temperature, and other factors occurring since the time measurements were made.

Review

5. In the event that any changes in the nature, design, or location of the proposed utilities, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Geo**Design**, Inc. It is recommended that this firm be provided the opportunity for a general review of design and specifications in order that design and construction recommendations may be properly interpreted and implemented in the design and specifications.

Use of Report

6. This report has been prepared for the exclusive use URS, the Connecticut Department of Transportation (ConnDOT), and other members of the design team for specific application to the relocation of utilities at Flatbush Ave. in relation to New Britain - Hartford Busway located in Hartford, Connecticut, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

7. This design soil and foundation engineering report has been prepared for this project by Geo**Design**. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.