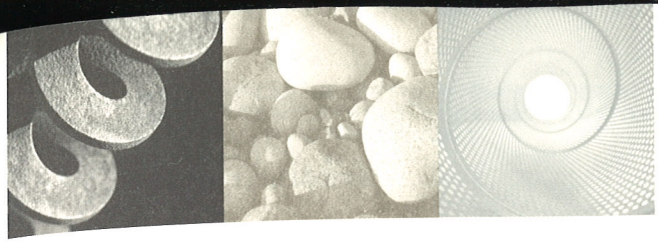


GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Subsurface Investigation and Geotechnical Report

Waterfront Street Reconstruction

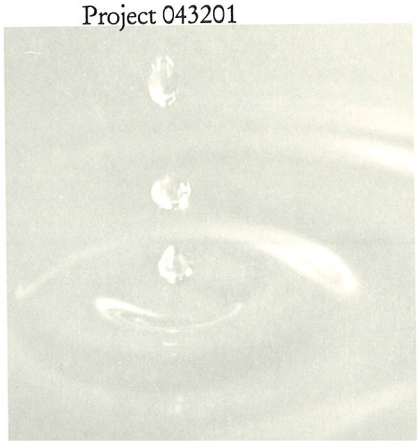
Waterfront Street Corridor
New Haven, Connecticut

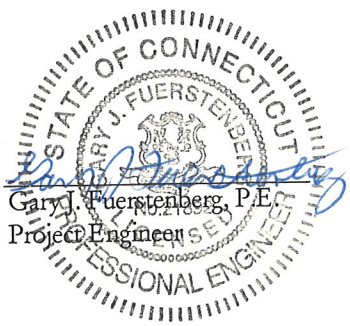
Submitted to:
URS Corporation
500 Enterprise Drive
Rocky Hill, CT 06067

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860-368-5300

February 28, 2005
Revised October 17, 2008

Project 043201





Gary J. Fuerstenberg, P.E.
Project Engineer

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1. Introduction

1.1 Purpose

This report presents the results of our subsurface explorations and our design and construction recommendations for the proposed Waterfront Street Reconstruction in New Haven, Connecticut.

1.2 Scope of Work

We performed the following tasks:

- Engaged a drilling subcontractor to advance 12 soil borings.
- Provided a geotechnical engineer to coordinate the subsurface explorations, observe the explorations, and classify the soil samples.
- Engaged a chemical testing laboratory to test soil samples from two test borings.
- Evaluated the subsurface conditions and prepared a report dated February 28, 2005, presenting our recommendations for design and construction of the utility protection system, retaining wall, and roadway improvements.
- Evaluated the subsurface conditions and prepared this revised report presenting our recommendations for design and construction of the roadway improvements.

1.3 Project Personnel

The following personnel performed services for this project.

Jay Curran	Project Manager
Rachel Greengas, E.I.T.	Field Engineer
Gary Fuerstenberg, P.E.	Geotechnical Engineer
Nathan Whetten, P.E.	In-house Review

1.4 Authorization

The work was completed in accordance with subcontract Nos. 3690805.00000 and 36937935.80000 authorized by Mr. Roger Krahn of URS Corporation.

2. Site and Project Description

2.1 Site Description

The site is the Waterfront Street corridor. The corridor is located east of the New Haven Harbor and south of Forbes Avenue (US Route 1) and the I-95 Quinnipiac River Bridge in New Haven, Connecticut. The industrial corridor includes the Waterfront Street roadway, abandoned railroads within the roadway, a new railroad west of the roadway, warehouses, fuel (oil and gas) storage tanks, shipping terminal, and an electric power plant. A site location plan is shown in Figure 1.

A fuel recovery system and soil vapor extraction system were located in the northern portion of the project for a fuel oil pipeline leak which occurred in the summer of 2004. About 60,000 to 70,000 gallons of gasoline leaked into the soil and groundwater. About 50,000 gallons of free-product has been recovered. The spill and remedial action are discussed in the *Remedial Action Report, Waterfront Street Release Site, Buckeye Pipeline Company, New Haven Connecticut, March 2005.*

The roadway ground surface along Waterfront Street ranges from about elevations 2 to 4. Elevations in this report are in meters and are referenced to the North American Vertical Datum of 1988 (NAVD 1988).

2.2 Project Description

The proposed reconstruction of Waterfront Street includes roadway improvements. Our understanding of the project is based on review of the *Reconstruction of Waterfront Street* plan set dated September 26, 2007 prepared by URS Corporation.

Roadway improvements have a mainline length of about 725 meters (2,400 feet). The roadway improvements include removal of the existing Waterfront Street pavement, full-depth reconstruction of Waterfront Street pavement, and storm water improvements. The proposed pavement section includes 225 mm (9 inches) of asphalt over 300mm (12 inches) of base course. The roadway alignment and grade will be mostly unchanged. The abandoned railroad tracks will be removed within the project limits.

3. Subsurface Conditions

3.1 Geologic Setting

The site is located in the Central Connecticut Lowlands section of the New England physiographic Province. Soil along the Quinnipiac River eastern banks is mapped as artificial fill in the 1965 USGS *Surficial Geology of New Haven and Woodmont Quadrangle.* The fill was likely placed for industrial development along the Quinnipiac River. The soil beneath the fill likely consists of alluvial deposits, glacial till and/or outwash sediment, based on mapped soil adjacent to the fill. Bedrock is mapped as red-brown and poorly sorted New Haven Arkose (sandstone) in the 1985 USGS *Bedrock Geological Map of Connecticut.*

3.2 GEI Subsurface Explorations

Hardiman Company and Associates of Shelton, Connecticut performed twelve borings (B-101 through B-112) from November 15, 2004, to November 18, 2004, at the locations shown on Figure 2. The proposed boring locations were reviewed by URS Corporation prior to the fieldwork. The borings were located within the public right-of-way except for boring B-110 and B-112, which were located on private property owned by Coastline Terminals of Connecticut. GEI coordinated access with Jack Wynne of Coastline terminals for access to the private property and private utilities. The borings were located throughout the corridor for the railroad and retaining wall that were constructed in 2005, and the proposed roadway improvements.

A GEI field engineer was present full time to locate and observe the borings, screen the soil samples for contamination, and log the soil and rock samples. Boring logs are included in Appendix A. URS surveyed the ground surface at the boring locations. A summary of the subsurface conditions is in included in Table 1.

The borings were advanced to depths of 2.1 to 10.8 meters (7 to 35.3 feet). The borings were drilled using 3½-inch inside diameter hollow-stem augers. Test borings B-102, B-104, B-107, B-108, B-110, B-111 and B-112 were advanced to auger refusal (estimated top of bedrock). Bedrock was cored in two boring (B-101 and B-103) located along the sheet pile wall that was constructed in 2005. Three meters (10 feet) of bedrock was cored in B-101 from a depth of 7.6 to 10.7 meters (25 to 35 feet) and 1.5 meters (5 feet) of bedrock was cored in B-103 from 6.7 to 8.2 meters (22 to 27 feet).

3.3 NHWPCA Subsurface Explorations

The New Haven Water Pollution Control Authority provided boring logs for borings performed in Waterfront Street for a proposed sanitary sewer project. Associated Borings Company, Inc. of Naugatuck, Connecticut performed six borings (B-1 through B-6) on August 27, 2004, at the locations shown on Figure 2. The boring locations were scaled from drawings titled *Waterfront Street Sanitary Sewer Extension, New Haven Connecticut, Plan & Profile* sheets 6, 7, and 8 dated September 2004 prepared by Cardinal Engineering Associates of Meriden, Connecticut. The driller's logs are included as Appendix B. A summary of the pavement thickness is included in Table 1. These logs do not differentiate between fill and native soil.

The borings were drilled using 2½-inch inside diameter hollow-stem augers and were advanced to auger refusal at depths of 3 to 4 meter (10 to 13 feet).

3.4 ConnDOT Subsurface Explorations

The Connecticut Department of Transportation (ConnDOT) provided logs for borings and test pits performed along the I-95 corridor (located at the northern portion of the Waterfront Street corridor) for reconstruction of the I-95 Quinnipiac River Bridge (Pearl Harbor Memorial Bridge).

Warren George, Inc. of Jersey City, New Jersey, Associated Borings Company, Inc. of Naugatuck, Connecticut, and the former Guild Drilling Company, Inc. of East Providence, Rhode Island, performed a series of borings and test pits at the locations shown on Figure 2. The exploration locations were scaled from drawings titled *Boring and Test it Layout Plan, New Haven Harbor Crossing Corridor Improvements Contract B, New Haven Connecticut, drawing Nos. BOR-03 and BOR-04* dated June 23, 2004 prepared by URS Corporation. The exploration logs are included as Appendix C.

Logs were not available for all the ConnDOT explorations shown on Figure 2.

3.5 Chemical Testing

We engaged Connecticut Testing Laboratories, Inc. of Meriden, Connecticut to perform chemical tests on two soil samples collected from B-101 and B-107. The samples were tested for CT-ETPH, EPA 8100 PAH, RCRA 8 Metals, EPA 8260B and SPLP EPA 1312. The analytical data is included in Appendix D.

High levels of petroleum products (BTEX and naphthalene) were detected in the soil samples. Waterfront Street is a highly industrial corridor. Based on the test results and industrial use of the corridor, the soil will be considered to be contaminated soil, requiring special handling.

3.6 Subsurface Conditions

The soil and rock strata encountered in the borings are described below. Subsurface conditions are known only at the boring locations and may differ significantly between the explorations. Some ConnDOT explorations are only sampled bedrock. The driller's logs for the NHWPCA borings (B-1 through B-6) do not describe the soil in detail and do not differentiate fill soil from native soil. Therefore, the strata descriptions are primarily based on data obtained from borings B-101 through B-112.

Pavement – A pavement structure consisting of asphalt overlying concrete with a total pavement thickness of 0.6 to 0.8 meters (2 to 2.5 feet), of which 0.3 to 0.6 meters (1 to 2 feet) was concrete, was encountered in the Waterfront Street roadway north of Alabama Street in boring B-105, B-4, B-5, and B-6. Up to 0.15 meters (6 inches) of asphalt pavement was encountered at the ground surface in borings B-109, B-111, B-1, B-2, and B-3 located in the Waterfront street roadway south of Alabama Street and in boring B-106, B-107 and B-108 located in parking lots adjacent to Waterfront Street. A summary of the pavement thickness is included in Table 1.

Fill – About 0.9 to 4.4 meter (3 to 14.5 feet) of fill was encountered in all the test borings. The fill generally consisted of black to brown widely graded sand with less than 20 percent fines (silt and clay) and less than 15 percent fine to coarse gravel. Traces of wood, brick, and plastic fragments were present in the soil samples. Standard Penetration Test N-Values predominantly ranged from 6 to 30 blows per foot indicating loose to dense soil. SPT refusal was occasionally encountered due to encountering a cobble or boulder.

Sand – About 0.5 to 4.6 meters (1.5 to 15 feet) of sand was encountered below the fill in borings B-101, B-102, B-103, B-104, B-105, B-106 and B-107. The sand typically consisted of brown, narrowly graded fine to medium sand with varying proportions of fine to coarse gravel and non-plastic silt. The SPT N-values predominantly ranged from 7 to 32 blows per foot indicating the sand stratum is loose to medium dense.

Glacial Till – About 0.3 to 2.1 meters (1 to 7 feet) of glacial till was generally encountered below the fill or sand strata. The till generally consisted of red-brown, widely graded sand with approximately 15 to 20 percent fines (silt and clay) and greater than 15 percent gravel. The SPT N-values ranged from 18 to greater than 50 blows per foot indicating the till is medium dense to dense.

Highly Weathered Bedrock – About 0.2 to 1.1 meters (0.5 to 3.5 feet) of highly weathered bedrock was generally encountered in all the GEI borings, except B-105 and B-106. About 0.6 to 1.5 meters (2 to 5 feet) of highly weathered bedrock was encountered in all the NHWPCA borings. Depth to highly weathered bedrock ranged from about 1.5 to 7.5 meters (5 to 24.5 feet) below ground surface, and was typically encountered at depths ranging from 1.5 to 3 meters (5 to 10 feet) south of Alabama Street.

The highly weathered bedrock generally consisted of red-brown fine to coarse sand with 10 to 20 percent fines (silt and clay) and greater than 15 percent fine to coarse gravel. The bedrock appeared to be highly weathered New Haven Arkose. The highly weathered bedrock was penetrated by the hollow-stem augers.

Bedrock – Less-weathered bedrock was encountered below the highly-weathered bedrock in two borings (B-101 and B-103). The top of the bedrock surface was encountered at elevations -2.9 to -3.5 (-9½ to -11½ feet). The bedrock consisted of red-brown, slightly weathered and highly fractured sandstone, New Haven Arkose. The recovery for the three core samples ranged from about 63 percent to 90 percent. The Rock Quality Designation (RQD) for the three core samples ranged from about 10 percent to 50 percent, indicating the bedrock was highly fractured.

3.7 Groundwater Conditions

Groundwater was encountered at depths ranging from about 1.5 to 4 meters (5 to 20 feet) below ground surface based on the observed sample moisture. The depths correlate to a groundwater surface elevation ranging from elevation 0 to 1.2 (0 to 4 feet). Due to the site's proximity to the New Haven harbor, the groundwater surface is likely to be tidally influenced and is anticipated to have a westerly gradient. A summary of the groundwater conditions is in included in Table 1.

The measured depth to groundwater represents conditions at the location and time at which the measurement was made. Groundwater levels may be different at other locations and times.

4. Recommendations

4.1 Roadway Subgrade

The existing fill should be adequate for support of the reconstructed roadway. The roadway subgrade should be prepared by excavating to the roadway subgrade and compacting the subgrade using a large compactor (20-ton minimum centrifugal force). Soft or unstable subgrade should be over-excavated and backfilled with compacted granular fill (M.02.01) or CLSM. The existing fill subgrade is not considered to be frost-susceptible.

4.2 Excavations for Stormwater Improvements

All excavations should be made in accordance with Occupational Safety and Health Administration (OSHA) standards.

We recommend that excavations for the stormwater system be backfilled with compacted granular fill (M.02.01) or CLSM. CLSM is essentially a low-strength concrete used as backfill. Use of CLSM will need to be addressed in the contract special provisions. ConnDOT special provision specifications for item 216012A (CLSM) and notes to the designer are included in Appendix E.

Use of CLSM will minimize settlement of utility trench backfill, and eliminate the need for compacting the backfill. For permanent roadway surfaces, CLSM should be placed to the pavement subgrade and a conventional pavement section should be installed over the CLSM (i.e. do not place CLSM to the finished roadway surface). For temporary roadway surfaces, CLSM may be placed to the pavement finished surface, provided that the CLSM is removed to the pavement subgrade for the reconstructed roadway and a conventional pavement section installed over the CLSM.

4.3 Management of Excavated Soil and Groundwater

Excavated soil should be managed as contaminated soil and will require special handling consisting of stockpiling, sampling, and testing for off-site disposal or on-site reuse.

Should dewatering from excavations be required, it will likely require special handling consisting of pre-treatment, sampling, and testing prior to discharge to the waste water treatment collection system or off-site disposal at a waste water treatment facility.

Management for contaminated soil and water will need to be addressed in the contract special provisions. Infrastructure (i.e. water pre-treatment and soil stockpile pads) for special management of soil and water are available as part of the I-95 corridor improvements.

4.4 Protection of Existing Utilities

Protection of existing utilities and fuel pipelines during construction should be the responsibility of the Contractor. The Contractor should submit a protection plan that is stamped by a professional engineer registered in the state of Connecticut.

The condition and construction of the existing utilities may not be known. The Contractor should be required to excavate test pits to investigate the utilities prior to excavation near existing utilities.

5. Future Services and Limitations

5.1 Future Engineering Services

We recommend that GEI be engaged during final design to:

- Review the plans and specifications to verify that our assumptions have not changed and to verify that our recommendations have been properly implemented.

We recommend that GEI be engaged during construction to:

- Review contractor submittals for geotechnical aspects of the work;
- Provide consultation for subsurface and geotechnical issues that arise; and
- Observe subgrade preparation, and observe and test compaction of backfill.

5.2 Limitations

Our recommendations are based on the project information provided to us at the time of this report and may require modification if there are any changes in the nature, design, or location of the project. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations, and whether our recommendations have been properly implemented in the design.

The recommendations in this report are based in part upon the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to make site visits during construction to: a) check that the subsurface conditions exposed during construction are in general conformance with our design assumptions, and b) ascertain that, in general, the work is being performed is in compliance with the contract documents.

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

Tables

Table 1
Exploration Summary Table
Waterfront Street Reconstruction
New Haven, Connecticut

Table 1a - Metric units

Boring Identification	Ground Surface Elevation[1] (meters)	Thickness of Asphalt Pavement (meters)	Thickness of Underlying Concrete Pavement (meters)	Thickness of Fill[2] (meters)	Elevation of bottom of Fill (meters)	Thickness of Sand (meters)	Elevation of bottom of Sand (meters)	Thickness of Glacial Till (meters)	Elevation of bottom of Glacial Till (meters)	Thickness of weathered bedrock (meters)	Elevation of bottom of weathered bedrock (meters)	Thickness of Bedrock (meters)	Elevation of bottom of bedrock (meters)	Depth to groundwater (meters)	Elevation of groundwater surface (meters)
B-101	4.204	NE	NE	2.4	1.8	4.6	-2.8	NE	NE	0.6	-3.4	3.0	-6.5	3.7	0.5
B-102	3.637	NE	NE	2.9	0.7	3.7	-2.9	0.3	-3.2	0.5	-3.7	NE	NE	3.0	0.6
B-103	4.002	NE	NE	2.9	1.1	3.4	-2.2	NE	NE	0.6	-2.9	1.5	-4.4	3.7	0.3
B-104	7.350	NE	NE	4.4	2.9	1.5	1.4	1.5	-0.1	3.2	-3.3	NE	NE	6.1	1.3
B-105	2.364	0.15	0.30	1.1	1.3	2.0	-0.7	NE	NE	NE	NE	NE	NE	1.8	0.5
B-106	2.373	0.01	NE	1.4	1.0	2.0	-1.0	0.9	-1.9	NE	NE	NE	NE	2.1	0.2
B-107	2.128	0.09	NE	1.5	0.6	0.5	0.1	0.6	-0.5	1.1	-1.5	NE	NE	1.5	0.6
B-108	2.741	0.15	NE	1.4	1.4	NE	NE	2.1	-0.8	0.5	-1.2	NE	NE	2.1	0.6
B-109	3.551	0.10	NE	1.2	2.3	NE	NE	1.4	0.9	0.1	0.8	NE	NE	NE	NE
B-110	3.552	NE	NE	1.2	2.3	NE	NE	0.8	1.5	0.7	0.8	NE	NE	NE	NE
B-111	3.331	0.10	NE	0.9	2.4	NE	NE	0.6	1.8	0.6	1.2	NE	NE	NE	NE
B-112	3.124	NE	NE	1.2	1.9	NE	NE	1.2	0.7	0.5	0.2	NE	NE	NE	NE
B-1	NA	0.13	NE												
B-2	NA	0.13	NE												
B-3	NA	0.13	NE												
B-4	NA	0.15	0.61												
B-5	NA	0.15	0.61												
B-6	NA	0.15	0.61												

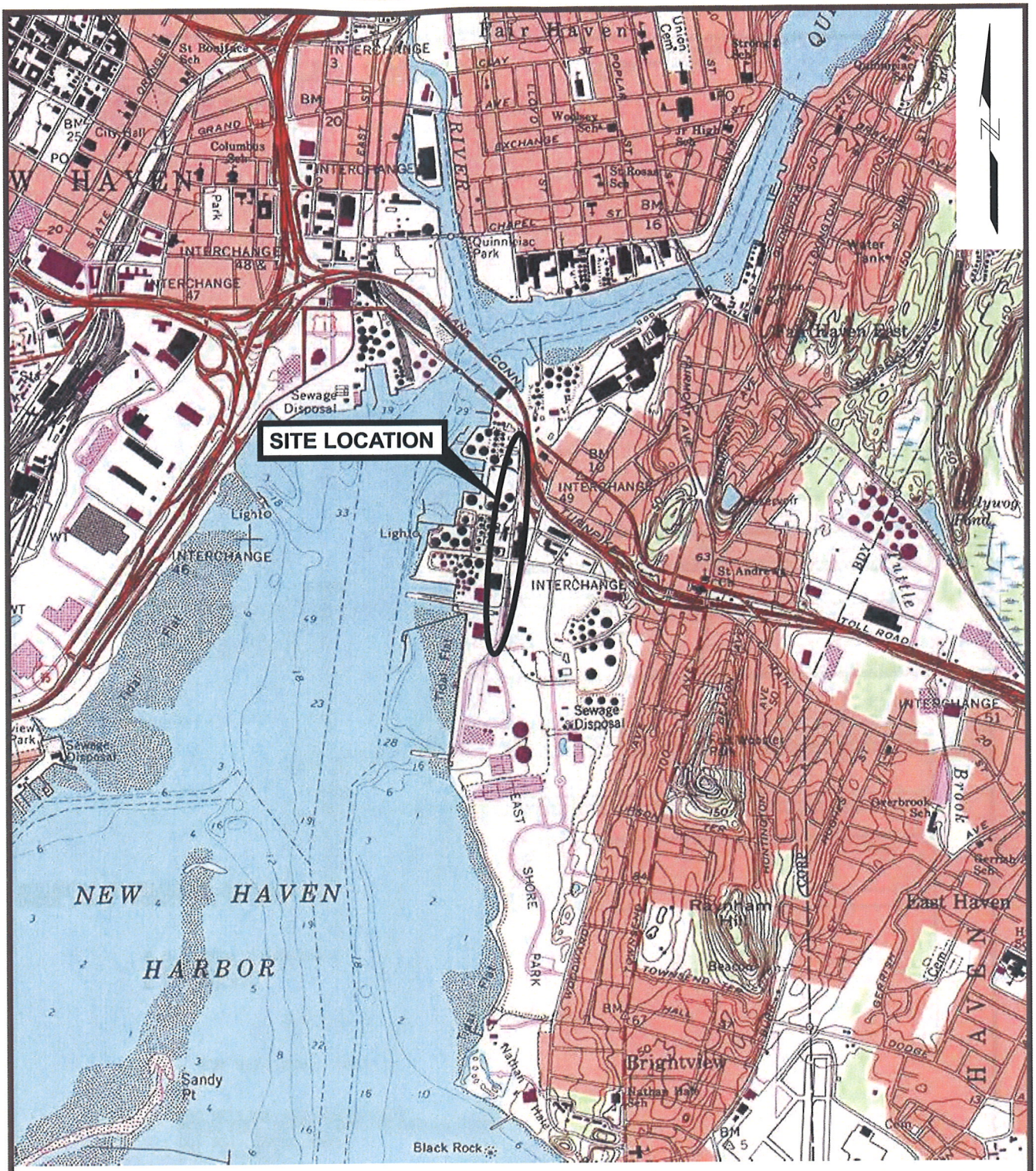
Table 1b - English units

Boring Identification	Ground Surface Elevation[1] (feet)	Thickness of Asphalt Pavement (inches)	Thickness of Underlying Concrete Pavement (inches)	Thickness of Fill[2] (feet)	Elevation of bottom of Fill (feet)	Thickness of Sand (feet)	Elevation of bottom of Sand (feet)	Thickness of Glacial Till (feet)	Elevation of bottom of Glacial Till (feet)	Thickness of weathered bedrock (feet)	Elevation of bottom of weathered bedrock (feet)	Thickness of Bedrock (feet)	Elevation of bottom of bedrock (feet)	Depth to groundwater (feet)	Elevation of groundwater surface (feet)
B-101	13.8	NE	NE	8.0	5.8	15.0	-9.2	NE	NE	2.0	-11.2	10.0	-21.2	12.0	1.8
B-102	11.9	NE	NE	9.5	2.4	12.0	-9.6	1.0	-10.6	1.5	-12.1	NE	NE	10.0	1.9
B-103	13.1	NE	NE	9.5	3.6	11.0	-7.4	NE	NE	2.0	-9.4	5.0	-14.4	12.0	1.1
B-104	24.1	NE	NE	14.5	9.6	5.0	4.6	5.0	-0.4	10.5	-10.9	NE	NE	20.0	4.1
B-105	7.8	6.0	12.0	3.5	4.3	6.5	-2.2	NE	NE	NE	NE	NE	NE	6.0	1.8
B-106	7.8	0.5	NE	4.5	3.3	6.5	-3.2	3.0	-6.2	NE	NE	NE	NE	7.0	0.8
B-107	7.0	3.5	NE	5.0	2.0	1.5	0.5	2.0	-1.5	3.5	-5.0	NE	NE	5.0	2.0
B-108	9.0	6.0	NE	4.5	4.5	NE	NE	7.0	-2.5	1.5	-4.0	NE	NE	7.0	2.0
B-109	11.6	4.0	NE	4.0	7.6	NE	NE	4.8	2.9	0.3	2.6	NE	NE	NE	NE
B-110	11.7	NE	NE	4.0	7.7	NE	NE	2.8	4.9	2.3	2.7	NE	NE	NE	NE
B-111	10.9	4.0	NE	3.0	7.9	NE	NE	2.0	5.9	2.0	3.9	NE	NE	NE	NE
B-112	10.2	NE	NE	4.0	6.2	NE	NE	4.0	2.2	1.5	0.7	NE	NE	NE	NE
B-1	NA	5.0	NE												
B-2	NA	5.0	NE												
B-3	NA	5.0	NE												
B-4	NA	6.0	24.0												
B-5	NA	6.0	24.0												
B-6	NA	6.0	24.0												

Notes:
1 - Ground Surface referenced to the North American Vertical Datum of 1988 (NAVD 1988)
2 - Fill includes pavement
NE = Stratum was not encountered
NA = Not Available
B-101 through B-112 performed by GEI Consultants
B-1 through B-6 performed by Cardinal Engineering
In boring B-105 6" of base course was encountered between the asphalt and concrete

GEI Consultants

Figures



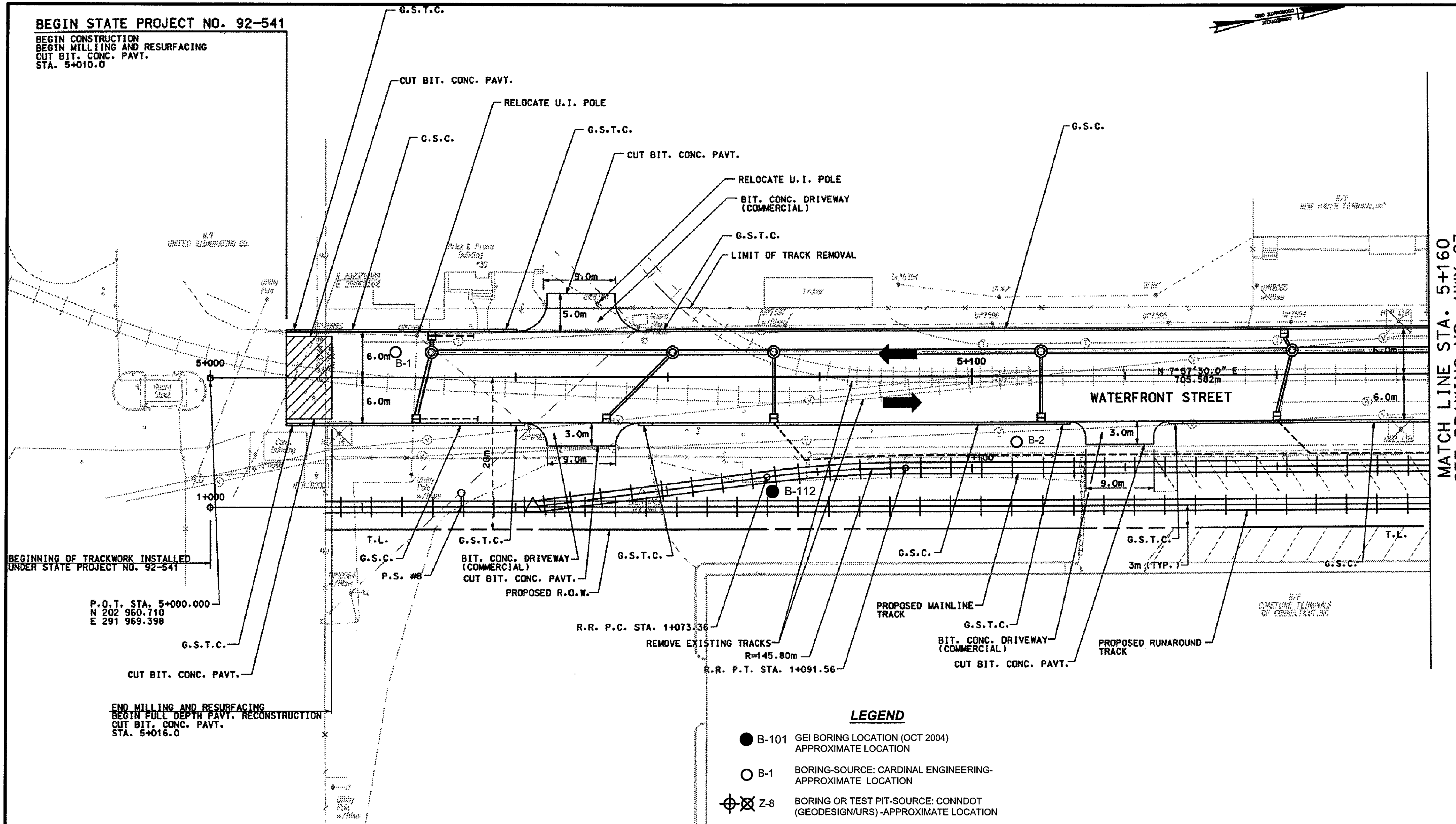
2000 1000 0 2000 4000

GRAPHIC SCALE IN FEET

SOURCE: MAP CREATED WITH TOPO!™ ©2000 WILDFLOWER PRODUCTIONS (www.topo.com)

GEOTECHNICAL ENGINEERING REPORT WATERFRONT STREET RECONSTRUCTION NEW HAVEN, CONNECTICUT	GEI Consultants	SITE LOCATION MAP
URS CORPORATION	PROJECT 043200	January 2005 Figure 1

CITY OF NEW HAVEN\WATERFRONT ST\WATERFRONT-LOC.CDR



LEGEND

- ● B-101 GEI BORING LOCATION (OCT 2004) APPROXIMATE LOCATION
- ○ B-1 BORING-SOURCE: CARDINAL ENGINEERING-APPROXIMATE LOCATION
- ⊕ ⊠ Z-8 BORING OR TEST PIT-SOURCE: CONNDOT (GEODESIGN/URS) -APPROXIMATE LOCATION

SOURCE:

DRAWING TITLED "ROADWAY PLAN 1" FROM RECONSTRUCTION OF WATERFRONT STREET, DATED SEPTEMBER 29, 2003.

0 40 80
SCALE, FEET

RECONSTRUCTION OF WATERFRONT STREET NEW HAVEN, CONNECTICUT

CITY OF NEW HAVEN

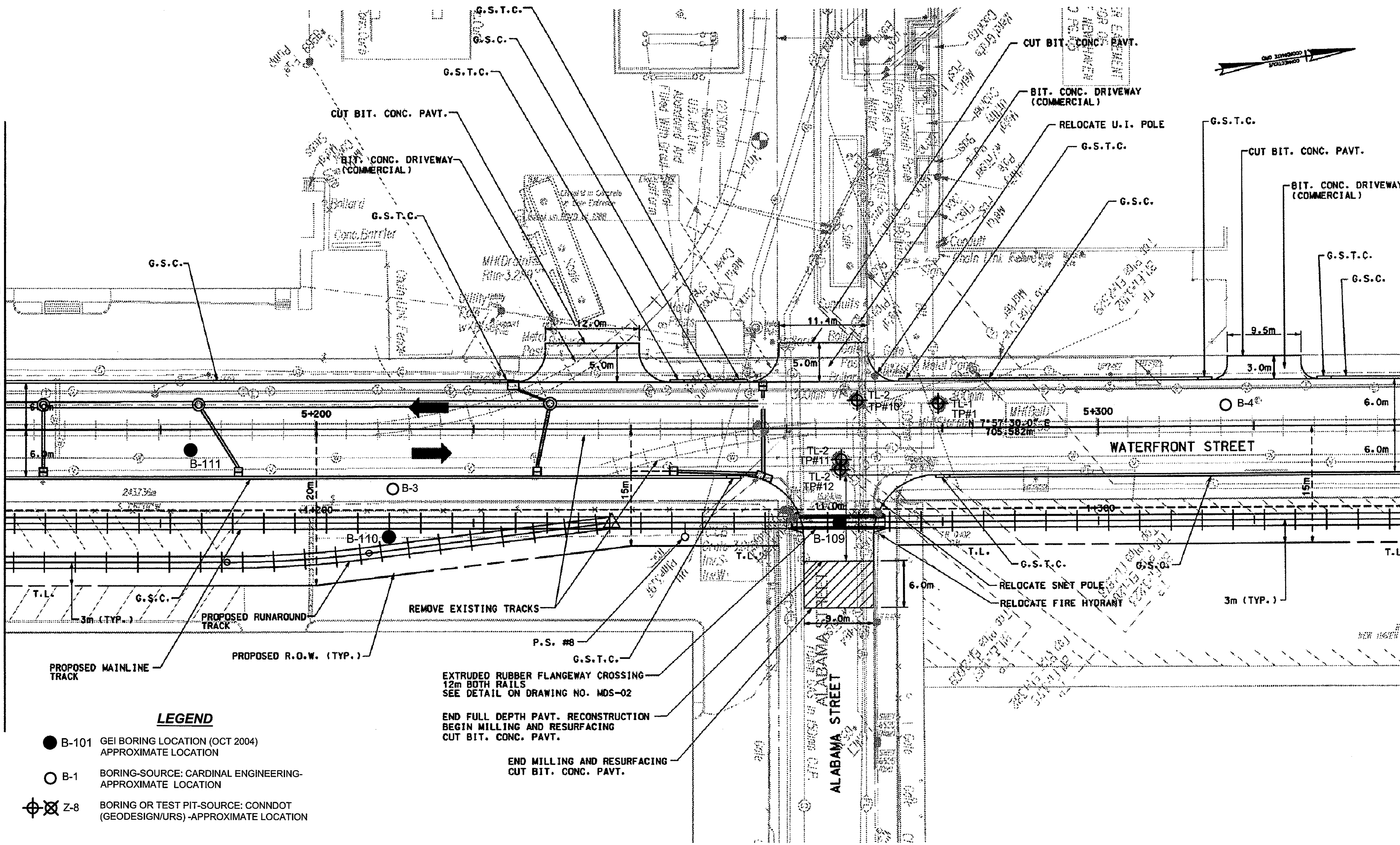
GEI Consultants

Project 04320

EXPLORATION PLAN

January 2005 Figure 2

TECH\URS\WATERFRONT ST\DRAWINGS\1-19-05\WATERFRONT ST.dwg



LEGEND

- ● B-101 — GEI BORING LOCATION (OCT 2004) APPROXIMATE LOCATION
- ○ B-1 — BORING-SOURCE: CARDINAL ENGINEERING-APPROXIMATE LOCATION
- ⊕ ⊠ Z-8 — BORING OR TEST PIT-SOURCE: CONNDOT (GEODESIGN/URS) -APPROXIMATE LOCATION

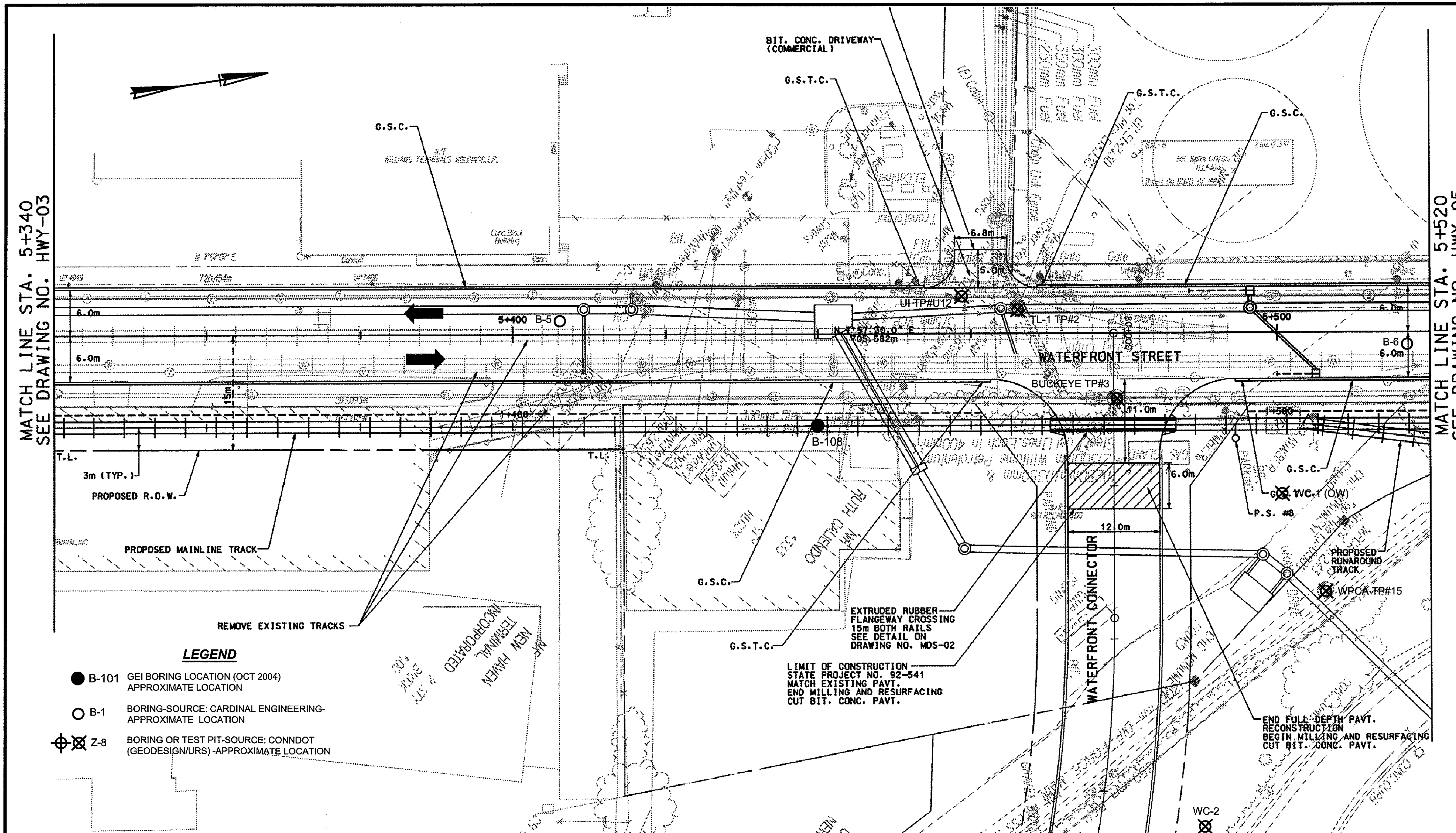
SOURCE:

DRAWING TITLED "ROADWAY PLAN 2" FROM RECONSTRUCTION OF WATERFRONT STREET, DATED SEPTEMBER 29, 2003.

0 40 80
SCALE, FEET

RECONSTRUCTION OF WATERFRONT STREET NEW HAVEN, CONNECTICUT	GEI Consultants	**EXPLORATION PLAN**
CITY OF NEW HAVEN	Project 04320	January 2005 Figure 3

TECH\URS\WATERFRONT ST\DRAWINGS\1-19-05\WATERFRONT ST.dwg



LEGEND

- ● B-101 GEI BORING LOCATION (OCT 2004) APPROXIMATE LOCATION
- ○ B-1 BORING-SOURCE: CARDINAL ENGINEERING-APPROXIMATE LOCATION
- ⊕⊠ Z-8 BORING OR TEST PIT-SOURCE: CONNDOT (GEODESIGN/URS) -APPROXIMATE LOCATION

SOURCE:

DRAWING TITLED "ROADWAY PLAN 3" FROM RECONSTRUCTION OF WATERFRONT STREET, DATED SEPTEMBER 29, 2003.

0 40 80
SCALE, FEET

RECONSTRUCTION OF WATERFRONT STREET NEW HAVEN, CONNECTICUT

CITY OF NEW HAVEN

GEI Consultants

Project 04320

EXPLORATION PLAN

January 2005 Figure 4

TECH\URS\WATERFRONT ST\DRAWINGS\1-19-05\WATERFRONT ST.dwg

MATCH LINE STA. 5+520
SEE DRAWING NO. HWY-04

MATCH LINE STA. 5+680
SEE DRAWING NO. HWY-06

G.S.T.C.
G.S.C.
BIT. CONC. DRIVEWAY (COMMERCIAL)
CUT BIT. CONC. PAVT.
18.5m
3.5m
34.9m
5.0m
6.0m
6.3m
SNET TP#3/UI TP #U11
RWA TP #U11A
WE TP#1
54600
N 1°57'30.0" E
705.582m
WATERFRONT STREET
B-105
B-106
B-107
PB-33
R=145.80m
B-102
Z-8
B-103
R.R. P.C. STA. 1+557.68
R=145.80m
PROPOSED RUNAROUND TRACK
R.R. P.T. STA. 1+576.70
B-104
PROPOSED MAINLINE TRACK
R.R. P.C. STA. 1+621.22
R.R. P.T. STA. 1+642.89
REMOVE EXISTING TRACKS
TEMP. SHEET PILING
P.S. #8
Z-10
B-65
TP-1
RAMP REMOVED UNDER STATE PROJECT NO. 92-532
BRIDGE PARAPET I-95 NB CONSTRUCTED UNDER STATE PROJECT NO. 92-532
TP-4

LEGEND

- B-101 GEI BORING LOCATION (OCT 2004) APPROXIMATE LOCATION
- B-1 BORING-SOURCE: CARDINAL ENGINEERING-APPROXIMATE LOCATION
- Z-8 BORING OR TEST PIT-SOURCE: CONNDOT (GEODESIGN/URS) -APPROXIMATE LOCATION

SOURCE:

DRAWING TITLED "ROADWAY PLAN 4" FROM RECONSTRUCTION OF WATERFRONT STREET, DATED SEPTEMBER 29, 2003.

0 40 80

SCALE, FEET

RECONSTRUCTION OF
WATERFRONT STREET
NEW HAVEN, CONNECTICUT

CITY OF NEW HAVEN

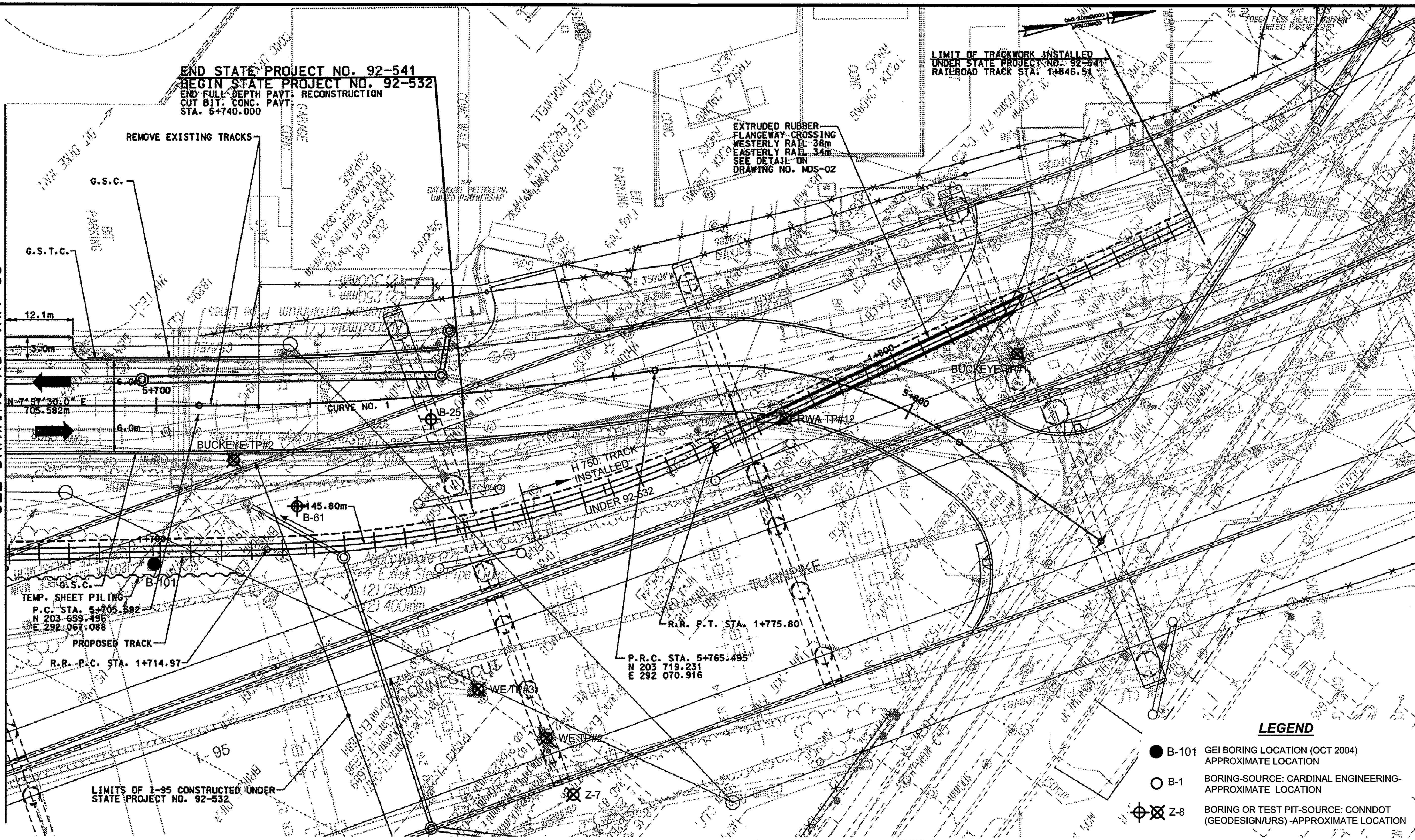
GEI Consultants

Project 04320

EXPLORATION PLAN

January 2005 Figure 5

TECH\URS\WATERFRONT ST\DRAWINGS\1-19-05\WATERFRONT ST.dwg



SOURCE:

DRAWING TITLED "ROADWAY PLAN 5" FROM RECONSTRUCTION OF WATERFRONT STREET, DATED SEPTEMBER 29, 2003.

0 40 80

SCALE, FEET

RECONSTRUCTION OF
WATERFRONT STREET
NEW HAVEN, CONNECTICUT

CITY OF NEW HAVEN

GEI Consultants

Project 04320

EXPLORATION PLAN

January 2005

Figure 6

TECH\URS\WATERFRONT ST\DRAWINGS\1-19-05\WATERFRONT ST.dwg

Appendix A

GEI Boring Logs

GEI Consultants

Boring (B-101)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203655.917 East:292087.338 Station:5+704.84 Offset:20.61
Date:	11/18/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	10.7 meters (35 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	4.204 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3 0.6	S1	600	0	2 3 5 6	150	Silty sand (SM); mostly widely graded fine to coarse, subrounded and subangular sand; ~15% fines;<10% subangular gravel; wood fragments; moist, black.	
0.9 1.2	S2	600	0	8 15 11 7	350	Silty sand (SM); mostly widely graded fine to coarse, subrounded and subangular sand;~20-25% fines;<10% subangular gravel; plastic and styrofoam; moist, black.	
1.5 1.8	S3	600	0	5 4 6 8	150	bottom 75mm see description below fines; <10% subangular gravel; crushed stone; moist; dark brown.	
2.1 2.4	S4	600	10	8 7 7 10	375	Silty sand (SM); mostly widely graded fine to coarse, subrounded and subangular sand;~20-25% fines;<10% subangular gravel; plastic and styrofoam; moist, black.	
2.7 3.0	S5	600	120	11 8 7 5	250	Widely graded sand with silt (SW-SM); mostly fine to coarse subrounded and subangular sand; ~10% fines;<5% subangular gravel; damp, brown.	
3.4 3.7	S6	600	1250	4 4 7 6	375	Widely graded sand with silt (SW-SM); mostly fine to coarse subrounded and subangular sand; ~10% fines;<5% subangular gravel; damp, brown.	
4.0 4.3	S7	600	1230	7 7 7 7	375	Narrowly graded sand (SP); mostly fine to medium, subrounded and subangular sand; <5% fines; <5% angular gravel; brown, wet. Augered to 4.6m	
4.6							
4.9 5.2	S8	600	52	4 5 9 10	450	Narrowly graded sand (SP); mostly fine to medium, subrounded and subangular sand; <5% fines; <5% angular gravel; brown, wet. Augered to 6.1m	
5.5 5.8 6.1							

GEI Consultants

Boring (B-101)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203655.917 East:292087.338 Station:5+704.84 Offset:20.61
Date:	11/18/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	10.7 meters (35 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	4.204 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
6.4	S9	250	40	4 25	250	Narrowly graded sand (SP); mostly fine to medium, subrounded and subangular sand; <5% fines; <5% angular gravel; brown, wet.	
6.7						Encountered cobbles 6.4m to 6.7m	
7.0							
7.3						Augered to 7.6m Driller note- 7.0m (23') bedrock	
7.6							
7.9	C1			1 min		Cored- NQ core barrel; 7.6m to 9.1m RQD=13%	
8.2		1500		2 min	950	slightly weathered, highly fractured, red-brown New Haven Arkose	
8.5				2 min			
8.8				2 min			
				2 min			
9.1	C2						
9.4				3 min		Cored- NQ core barrel 9.1m to 10.7m RQD=47%	
9.8		1500		3 min	1350	slightly weathered, highly fractured red-brown New Haven Arkose	
10.1				2 min			
10.4				3 min			
10.7				4 min		End of boring 10.7m	
11.0							
11.3							
11.6							
11.9							
12.2							

GEI Consultants

Boring (B-102)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203606.695 East:292079.575 Station:5+655.02 Offset:19.74
Date:	11/16/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	7.3 meters (24 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	3.637 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

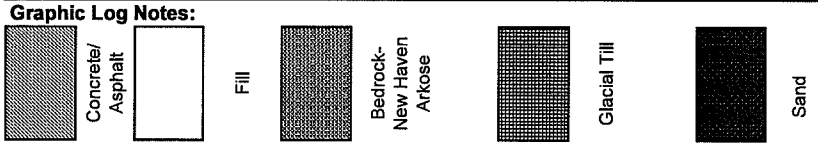
Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3	S1	600	0	1 3 9 8	250	Silty sand with gravel (SM); mostly widely graded fine to coarse, subrounded and subangular sand 15% fines;10-15% subangular gravel; top 50mm soil with root fibers; topsoil; bottom 200mm plastic and brick; damp dark, brown.	
0.6							
0.9	S2	600	0	7 8 10 11	300	Widely graded sand with silt (SW-SM); mostly fine to coarse, subrounded and subangular sand; ~15% fines; ~10% subangular gravel; cinders brick and plastic; moist, red-brown.	
1.2							
1.5	S3	600	0	17 17 16 18	400	bottom 75mm see description below ~15% fines; ~15% angular gravel; cinder and brick fragments; moist, black.	
1.8							
2.1	S4	600	0	18 10 7 10	300	Silty sand with gravel (SM); mostly widely graded fine to coarse, subangular and subrounded sand; ~15-20% fines; ~15% angular gravel; cinder, crush stone and brick fragments; moist, black.	
2.4							
2.7	S5	600	0	6 6 4 5	450	Silty sand with gravel (SM) and narrowly graded sand with silt (SP-SM); SM top 300mm mostly widely graded fine to coarse, subangular and subrounded sand; ~15-20% fines; ~15% angular gravel; SP-SM layer is mostly fine to medium subrounded and subangular sand; <10% fines; ~10% subrounded gravel; SM layer with cinder and brick is moist black fill; SP-SM is moist, brown.	
3.0							
3.4	S6	600	0	6 8 6 8	375	Narrowly graded sand with silt (SP-SM); mostly fine to medium subrounded and subangular sand; ~10% fines; ~5% subangular gravel; wet, brown.	
3.7							
4.0	S7	600	0	6 7 8 10	600	Narrowly graded sand with silt (SP-SM); mostly fine to medium subrounded and subangular sand; ~10% fines; ~5% subangular gravel; wet, brown. Augered to 4.6m	
4.3							
4.6							
4.9	S8	600	0	4 6 11 12	500	Narrowly graded sand with silt (SP-SM); mostly fine to medium subrounded and subangular sand; ~10% fines; ~5% subangular gravel; wet, brown. Augered to 6.1m	
5.2							
5.5							
5.8							
6.1							

GEI Consultants

Boring (B-102)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203606.695 East:292079.575 Station:5+655.02 Offset:19.74
Date:	11/16/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	7.3 meters (24 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	3.637 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:



Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
6.4	S9	600	0	6 13 6 16	600	Narrowly graded sand with silt (SP-SM) and silty sand with gravel (SM); top 500mm SM mostly fine to medium subrounded and subangular sand;~10% fines; ~5% subangular gravel; wet, brown. SM mostly widely graded subrounded and subangular sand; ~25% fines,15% subangular gravel; moist red-brown.	
6.7							
7.0						Weathered Bedrock	
7.3							
7.6						Auger refusal at 7.3m End of boring 7.3m	
7.9							
8.2							
8.5							
8.8							
9.1							
9.4							
9.8							
10.1							
10.4							
10.7							
11.0							
11.3							
11.6							
11.9							
12.2							

GEI Consultants

Boring (B-103)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203575.573 East:292080.429 Station:5+624.31 Offset:24.83
Date:	11/18/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	8.2 meters (27 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	4.002 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3 0.6	S1	600	0	2 4 8 8	300	Silty sand (SM); mostly narrowly graded fine to medium, subangular and subrounded sand; ~20% fines; <10% subrounded gravel; wood and root fragments; top 125mm damp top soil; bottom 175mm brown.	
0.9 1.2	S2	600	0	17 16 8 10	0	No recovery	
1.5 1.8	S3	600	0	11 13 9 10	100	bottom 75mm see description below <10% subrounded gravel; brick and wood fragments; damp, red-brown.	
2.1						Augered to 2.1m	
2.4 2.7	S4	600	0	6 3 3 7	100	Silty sand with gravel (SM); mostly narrowly graded fine to medium, subrounded and subangular sand; ~20% fines; >30% subangular gravel; brick and wood fragments; moist, black/brown.	
3.0						Augered to 3.0m	
3.4 3.7	S5	600	0	10 11 6 10	450	Narrowly graded sand with silt (SP-SM) and narrowly graded sand (SP); top 100mm consist of mostly fine to to medium sand; ~10% fines; ~15% subrounded gravel; SP layer consists of mostly fine to medium, subrounded and subangular sand; <5% fines;10-15% subrounded gravel; SP-SM is black fill; SP is brown.	
4.0 4.3	S6	600	0	8 8 6 7	425	Narrowly graded sand with silt (SP-SM); mostly fine to medium, subrounded and subangular sand; <5% fines<5% subrounded gravel; wet, brown.	
4.6						Augered to 4.6m	
4.9 5.2	S7	600	0	5 6 9 17	450	Narrowly graded sand (SP); mostly fine to medium, subrounded and subangular sand;<5% fines ~10-15% subrounded gravel; wet, brown.	
5.5 5.8 6.1						Augered to 6.1m	

GEI Consultants

Boring (B-103)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203575.573 East:292080.429 Station:5+624.31 Offset:24.83
Date:	11/18/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	8.2 meters (27 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	4.002 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
6.4	S8	450	40	12 29 100	450	Narrowly graded sand (SP) and silty sand with gravel (SM); SP top 500mm is mostly fine to medium, subrounded and subangular sand; <5% fines;<5% subrounded gravel; SM consists of mostly widely graded fine to coarse sand;~15% fines; ~20% subrounded gravel; SM is wet brown sand; SM is red-brown weathered bedrock	
6.7							
7.0	C1			2min		Augered to 6.7m Cored- NQ core barrel 6.7m to 8.2m	
7.3		1500		2min	950	RQD=28% slightly weathered, highly fractured red-brown New Haven Arkose	
7.6				2min			
7.9				3 min 3min			
8.2						End of boring 8.2m	
8.5							
8.8							
9.1							
9.4							
9.8							
10.1							
10.4							
10.7							
11.0							
11.3							
11.6							
11.9							
12.2							

GEI Consultants

Boring (B-104)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203541.799 East:292084.237 Station:5+591.39 Offset:33.32
Date:	11/19/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	10.8 meters (35.3 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	7.350 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3 0.6	S1	600	NA	1 2 3 7	450	Silty sand (SM); mostly narrowly graded fine to medium subangular-subrounded sand;~ 20-30% fines; 10% subangular gravel; brick and ash fragments; red-brown.	
0.9 1.2	S2	600	NA	9 8 7 9	300	Silty sand (SM); mostly narrowly graded fine to medium subangular and subrounded sand; ~20% fines;~10% subangular gravel; ash and brick fragments present towards top; red-brown.	
1.5 1.8	S3	600	NA	10 7 9 8	275	bottom 75mm see description below ~20% fines;~10% subangular gravel; brick and plastic fragments; red-brown.	
2.1 2.4	S4	600	NA	10 7 9 8	550	Silty sand (SM); mostly narrowly graded fine to medium subangular and subrounded sand; ~20% fines;~10% subangular gravel; brick fragments; red-brown.	
2.7 3.0	S5	600	NA	8 8 10 14	475	Silty sand (SM); mostly narrowly graded fine to medium subangular and subrounded sand; ~20-25% fines;<10% subangular gravel; ash and cinder.	
3.4 3.7	S6	600	NA	23 25 22 22	0	Widely graded sand with silt (SW-SM); mostly fine to coarse subrounded and subangular, sand; <20% fines; ~10% subangular gravel; ash and cinder; red-brown.	
4.0 4.3	S7	600	NA	22 13 11 11	400	Widely graded sand with silt (SW-SM); mostly fine to coarse subrounded and subangular, sand; <20% fines; ~10% subangular gravel; ash and cinder; red-brown.	
4.6 4.9	S8	600	NA	21 20 17 13	50	Silty sand (SM); mostly widely graded fine to coarse, subangular and subrounded sand;<10% fines;	
5.2 5.5	S9	600	NA	21 30 22 27	450	Silty sand (SM); mostly widely graded fine to coarse, subangular and subrounded sand;<10% fines; <10% subangular and subrounded gravel; moist, grey/red.	
5.8 6.1	S10	600	NA	50	0	No recovery - cobble encountered	

GEI Consultants

Boring (B-104)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203541.799 East:292084.237 Station:5+591.39 Offset:33.32
Date:	11/19/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	10.8 meters (35.3 feet)	**Driller Foreman:**	Tom Hardiman
Elevation (ground):	7.350 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

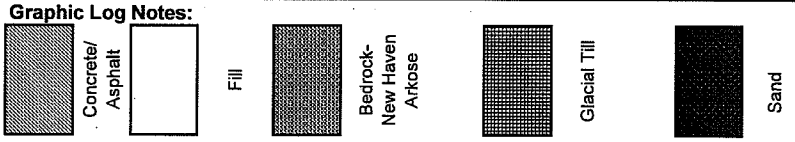
Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
6.4	S11	600	NA	5 6 5 5	450	Narrowly graded sand (SP); mostly fine to medium subangular and subrounded sand; 10% fines; <5% subangular gravel; wet, brown.	
6.7							
7.0	S12	600	NA	6 6 9 10	550	Narrowly graded sand (SP); mostly fine to medium subangular and subrounded sand;~10% fines; <5% subangular gravel; wet, brown. Augered to 7.6m	
7.3							
7.6							
7.9	S13	250	NA	11 100	250	Widely graded sand with gravel (SW); mostly fine to coarse subangular and subrounded sand;<10% fines; >15% subrounded gravel; Cobbles-densely packed rock; wet, red-brown	
8.2						Augered to 9.1m	
8.5							
8.8							
9.1							
9.4	S14	600	NA	17 20 24 28	600	Widely graded sand with gravel (SW); mostly fine to coarse subangular and subrounded sand;<10% fines; >15% subrounded gravel; Cobbles-densely packed rock; wet, red-brown.	
9.8							
10.1							
10.4							
10.7							
11.0						Auger refusal at 10.7m End of boring 10.7m	
11.3							
11.6							
11.9							
12.2							

GEI Consultants

Boring (B-105)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203575.047 East:292056.951 Station:5+620.54 Offset:2.28
Date:	11/17/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	3.0 meters (10 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	2.364 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:



Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3 0.6						150mm asphalt, 150mm base course, 300mm concrete	
0.9 1.2	S1	600	0	6 6 7 5	200	Widely graded gravel with silt (GW-GM) and narrowly graded sand with silt (SP-SM); top 125mm GW-GM consists of ~10% widely graded fine to coarse, subangular and subrounded sand; ,5% fines; ~85% subangular gravel; SP-SM bottom 75mm mostly fine to medium, subrounded and subangular sand; <15% fines;<5% subrounded gravel; GW-GM is damp grey fill; SP-SM is brown.	
1.5 1.8	S2	600	0	2 3 4 5	450	bottom 75mm see description below <10% fines;<5% subangular gravel, moist red-brown.	
2.1 2.4	S3	600	0	6 5 6 8	550	Narrowly graded sand with silt (SP-SM); mostly fine to medium, subrounded and subangular sand; <10% fines;<5% subangular gravel, wet red-brown.	
2.7 3.0	S4	600	0	8 8 9 10	600	Widely graded sand with silt (SW-SM); mostly fine to coarse, subrounded and subangular sand; <10% fines;<5% subangular gravel, wet, red-brown.	
3.4 3.7 4.0 4.3 4.6 4.9 5.2 5.5 5.8 6.1						End of boring 3.0m	

GEI Consultants

Boring (B-106)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203538.196 East:292061.183 Station:5+584.63 Offset:11.06
Date:	11/16/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	4.3 meters (14 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	2.373 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
						12mm asphalt	
0.3 – 0.6	S1	600	0	18 14 8 8	375	Silty sand with gravel (SM); mostly widely graded fine to coarse, subrounded and subangular sand ~10% fines;~15% subrounded gravel; cinder, ash, brick and crushed stone fragments; damp, black.	
0.9 – 1.2	S2	600	0	4 5 6 5	300	No recovery first sample-Blows first sample 10-9-6-4 Narrowly graded sand with silt (SP-SM); top 225mm mostly narrowly graded fine to medium subrounded and subangular sand; ~10% fines; <5% subangular gravel; shells and crush stone; damp black fill; bottom 75mm see description below	
1.5 – 1.8	S3	600	0	3 4 6 5	300	Narrowly graded sand with silt (SP-SM); mostly fine to medium subrounded and subangular sand; ~10% fines; <1% subrounded gravel; moist, brown.	
2.1 – 2.4	S4	600	0	3 4 4 3	550	Narrowly graded sand with silt (SP-SM); mostly fine to medium subrounded and subangular sand; ~10% fines; <1% subrounded gravel; wet, brown.	
2.7 – 3.0						Augered to 3m	
3.4 – 3.7	S5	600	0	2 3 2 3	600	Narrowly graded sand (SP) and silty sand (SM); top 300mm SP mostly fine to medium, subrounded and subangular sand; <10%fines;<1% subangular gravel; bottom 300mm mostly fine to coarse, subrounded and subangular sand;~20% fines,~10% subangular gravel; SP is moist, brown; SM is wet, red-brown.	
4.0 – 4.3	S6	600	0	8 8 11 12	450	Silty sand with gravel (SM); mostly widely graded fine to coarse, subrounded and subangular sand; ~20-25% fines;~10-15% subrounded gravel; moist, red-brown.	
4.6 – 4.9 – 5.2 – 5.5 – 5.8 – 6.1						End of boring 4.3m	

GEI Consultants

Boring (B-107)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203481.963 East:292053.694 Station:5+527.90 Offset:11.42
Date:	11/15/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	3.7 meters (12 feet)	**Driller Foreman:**	Tony Sciaff
Elevation (ground):	2.128 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
						88mm asphalt, 50mm base course	
0.3	S1	600	0	28	450	Silty sand (SM); mostly widely graded fine to coarse, subrounded and subangular sand;~10-20% fines; <10% subrounded gravel; cinder fragments; damp, black.	
0.6				18 15 10			
0.9	S2	600	0	8	350	Silty sand (SM); mostly widely graded fine to coarse, subrounded and subangular sand;~10-20% <5% subangular and subrounded gravel; cinder and brick fragments; moist, black.	
1.2				8 8 10		bottom 75mm see description below	
1.5	S3	600	0	13	375	Silty sand (SM) and silty sand with gravel (SM). Top 75mm mostly fine to coarse, subrounded and subangular sand; ~10-20% fines; <10% subangular gravel; bottom 300mm mostly widely graded fine to coarse, subrounded and subangular sand; ~10-15% fines; ~30% subrounded gravel; top 75mm brick fragments moist black fill; bottom 375mm moist, grey.	
1.8				16 16 20			
2.1	S4	600	0	22	500	Silty sand with gravel (SM); mostly widely graded fine to coarse, subrounded and subangular sand; ~20-25% fines; ~30% subrounded gravel; moist, red-brown.	
2.4				14 12 24			
2.7	S5	600	0	12	400	Narrowly graded sand with silt and gravel (SP-SM); mostly narrowly graded fine to medium, subangular and subrounded sand; ~10% fines; >15% subangular gravel; moist, grey/red.	
3.0				24 36 100			
3.4							
3.7							
4.0						Auger refusal at 3.7m End of boring 3.7m	
4.3							
4.6							
4.9							
5.2							
5.5							
5.8							
6.1							

GEI Consultants

Boring (B-108)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203395.857 East:292041.592 Station:5+440.95 Offset:11.36
Date:	11/16/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	4.0 meters (13 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	2.741 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
						150mm asphalt	
0.3 – 0.6	S1	600	0	11 12 17 10	250	Silty sand with gravel (SM); mostly fine to coarse, subrounded and subangular sand; ~15% fines; ~15% subangular gravel; cinder and brick fragments; damp dark, brown.	
0.9 – 1.2	S2	600	0	8 8 7 15	300	Silty sand with gravel (SM); mostly fine to coarse, subrounded and subangular sand; ~15% fines; ~15% subangular gravel; cinder, brick and plastic fragments; damp, dark brown. bottom 75mm see description below	
1.5 – 1.8	S3	600	66	13 21 16 17	550	Silty sand (SM); mostly well graded fine to coarse, subrounded and subangular sand;~25% fines; <10% subangular gravel; local staining and zones of petroleum odor; moist, red-brown.	
2.1 – 2.4	S4	600	125	12 13 11 10	550	Silty sand (SM); mostly well graded fine to coarse, subrounded and subangular sand;~25% fines; <5% gravel; local zones with petroleum odor and staining; wet, red-brown.	
2.7 – 3.0						Augered to 3m	
– 3.4 – 3.7	S5	600	15	4 12 11 30	450	Silty sand (SM) and widely graded sand with silt (SW-SM); Top 300mm SM consists of mostly narrowly graded fine to medium, subangular and subrounded sand;~40% fines; <5% subrounded gravel; SW-SM bottom 150mm; mostly widely graded fine to coarse, subrounded and subangular sand; ~10% fines; <10% subangular gravel; SM is moist red-brown; SW-SM damp red-brown.	
4.0 – 4.3 – 4.6 – 4.9 – 5.2 – 5.5 – 5.8 – 6.1						Auger refusal at 4.0m End of boring 4.0m Cave in depth 1.4m	

GEI Consultants

Boring (B-109)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203219.287 East:292031.264 Station:5+264.65 Offset:25.52
Date:	11/17/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	2.7 meters (9 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	3.551 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3						100mm asphalt; 150mm base course	
0.6	S1	600	0	4 18	400	Well graded gravel with sand (GW) and widely graded sand with silt and gravel (SW-SM); GW top 100mm consists of ~25% fine to medium, subangular and subrounded sand; <5% fines; >50% subangular gravel; SW-SM bottom 300mm consists of mostly well graded fine to coarse, subangular and subrounded sand; ~15% fines; ~15% subrounded gravel; GW and SW-SM plastic and crush stone; damp, black.	
0.9				20 23			
1.2	S2	600	0	25 26	350	Silty sand (SM); mostly well graded fine to coarse, subangular and subrounded sand; >20% fines; ~10% subangular gravel; ash present in top 100mm; moist, red-brown.	
1.5				26 10		bottom 75mm see description below	
1.8	S3	600	0	7 9	400	Silty sand (SM); mostly well graded fine to coarse, subangular and subrounded sand;~40% fines; ~5% subrounded gravel; wet, red-brown.	
2.1				9 15			
2.4	S4	600	0	30 32	500	Silty sand (SM) and widely graded sand with gravel (SW); top 400mm SM consists of mostly well graded fine to coarse, subrounded and subangular sand; >30% fines; ~10% subangular gravel; SW bottom 100mm is mostly well graded fine to coarse, subrounded and subangular sand, <5% fines; ~25% 'subangular gravel; SM layer is moist, red-brown; SW layer is damp, red-brown.	
2.7				22 50			
3.0						End of boring 2.7m	
3.4							
3.7							
4.0							
4.3							
4.6							
4.9							
5.2							
5.5							
5.8							
6.1							

GEI Consultants

Boring (B-110)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203165.155 East:292016.707 Station:5+209.03 Offset:18.61
Date:	11/15/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	2.7 meters (9 feet)	**Driller Foreman:**	Tony Sciaff
Elevation (ground):	3.552 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3	S1	600	0	18 33 20 14	450	Narrowly graded sand with silt (SP-SM) and well graded sand with silt (SW-SM); SP-SM top 275mm mostly fine to medium, subrounded and subangular sand; ~10-15% fines; ~5% angular gravel; SW-SM mostly fine to coarse subrounded and subangular sand; ~10-15% fines; ~10% angular gravel; SP-SM olive color fill; SW-SM coal fragments dark black.	
0.6							
0.9	S2	600	0	10 19 13 18	400	Widely graded sand with silt (SW-SM); mostly fine to coarse subrounded and subangular sand; ~10-15% fines; ~5-10% subrounded gravel; coal and cinder; top 175mm black fill, bottom red-brown.	
1.2							
1.5	S3	600	0	12 14 22 20	425	bottom 75mm see description below coarse subrounded sand; ~20-25% fines; ~10% subangular gravel; wet red-brown.	
1.8							
2.1	S4	300	0	16 100	300	Narrowly graded sand with silt (SP-SM); mostly fine subrounded and subangular sand; ~10% coarse subrounded sand; ~20-25% fines; ~10% subangular gravel; wet, red-brown.	
2.4							
2.7							
3.0						Auger refusal at 2.7m End of boring 2.7m	
3.4							
3.7							
4.0							
4.3							
4.6							
4.9							
5.2							
5.5							
5.8							
6.1							

GEI Consultants

Boring (B-111)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203140.185 East:292000.036 Station:5+181.99 Offset:5.72
Date:	11/17/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	2.1 meters (7 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	3.331 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3						100mm asphalt; 150mm base course	
0.6	S1	600	0	17 39	350	Widely graded gravel with sand (GW) and Silty sand (SM); GW layer top 250mm consists of~40% widely graded fine to coarse, subrounded and subangular sand; <10% fines; 40-50% angular gravel;	
0.9				20 11		SM bottom 100mm consists of mostly well graded fine to coarse, subrounded and subangular sand; >20% fines; ~10% subrounded gravel; brick and cinder fragments; damp; red-brown.	
1.2	S2	600	0	9 11	400	Silty sand (SM); mostly well graded fine to coarse, subrounded and subangular sand;~30-40% fines; ~10% subrounded gravel; moist top 250mm, wet bottom 150mm red-brown.	
1.5				11 16		bottom 75mm see description below	
1.8	S3	450	0	20 51 100	300	Widely graded sand with silt (SW-SM); mostly widely graded fine to coarse, subangular and subrounded sand; ~10% fines; ~10-15% subangular gravel; damp, red-brown.	
2.1						Auger refusal at 2.1m End of boring 2.1m	
2.4							
2.7							
3.0							
3.4							
3.7							
4.0							
4.3							
4.6							
4.9							
5.2							
5.5							
5.8							
6.1							

GEI Consultants

Boring (B-112)

Client:	URS	**Project Name:**	Waterfront Street Reconstruction
Project Number:	043201	**Site Location:**	Waterfront Street, New Haven
Logged By:	Rachel Greengas	**Boring Coordinates:**	North:203031.185 East:291995.2668 Station:5+073.38 Offset:15.94
Date:	11/15/2004	**Drilling Contractor:**	Hardiman Company and Associates
Total Depth:	2.9 meters (9.5 feet)	**Driller Foreman:**	Tony Scaiff
Elevation (ground):	3.124 meters	**Drilling Method:**	87.5 millimeters (3-1/2 inch) ID Hollow Stem Auger

Graphic Log Notes:

Concrete/ Asphalt | Fill | Bedrock- New Haven Arkose | Glacial Till | Sand

Depth (meters)	Sample Type and Number	Penetration (millimeters)	PID Headspace (ppm)	Blows / 150 millimeters	Recovery (millimeters)	Soil/Geologic Description	Graphic Log
0.3	S1	600	0	8 12 15 8	325	Silty sand with gravel (SM); mostly widely graded fine to coarse, subangular and subrounded sand;~15-20% fines;~10-15% subrounded gravel; wood fragments; damp, dark brown.	
0.6							
0.9	S2	600	0	16 39 18 12	175	Silty sand with gravel (SM); mostly widely graded fine to coarse, subangular and subrounded sand; ~15-20% fines; ~15% subangular gravel; brick and cinder fragments; damp, dark brown.	
1.2							
1.5	S3	600	0	4 4 3 3	325	bottom 75mm see description below fine to coarse, subrounded and subangular sand; <5% fines; <5% subrounded gravel; SM bottom 150mm consist of mostly well graded fine to coarse sand, subrounded and subangular; ~20-25% fines; ~15% rounded gravel; SW and SM moist, red-brown.	
1.8							
2.1	S4	600	0	8 4 6 14	325	Silty sand (SM); mostly widely graded find to coarse, subrounded and subangular sand; ~20-25% fines; ,5% subrounded gravel; wet; red-brown.	
2.4							
2.7	S5	375	0	16 29 100	200	Silty sand (SM); mostly well graded fine to coarse, subrounded and subangular sand; ~10-15% fines; <5% subrounded gravel; moist; red-brown.	
3.0						Auger refusal at 2.9m End of boring 2.9m	
3.4							
3.7							
4.0							
4.3							
4.6							
4.9							
5.2							
5.5							
5.8							
6.1							

Appendix B

NHWPCA Boring Logs

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-1

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION | PROJECT NO | ROCK CORE DIA. | DRILLER J. Lloret | DATE 8/27/04

LINE & STA | OFFSET | METHOD 2 1/4" HSA | INSP | PAGE OF

	DEPTH		S.P.T. SAMPLE					A		
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	FIELD IDENTIFICATION OF SOILS
									0.4	Bituminous Concrete
										Red Br. C-F Sand and C-F Gravel, Cobbles (Fill)
									4.0	
1	5.0	7.0	2	1	1	1	4"	MOIST		Blk M-F Sand and C-F Gravel, Some Silt
									7.0	
										Red Br M-F Sand
									9.0	
2	10.0	11.0	16	50	X	X	10"	WET		Red Sandstone
									12.5	
										Refusal - 12.5
										End of Boring - 12.5
										G.W.O. - 7.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
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TEST BORING REPORT

BORING # B-2

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION | PROJECT NO | ROCK CORE DIA. | DRILLER J. Lloret | DATE 8/27/04

LINE & STA | OFFSET | METHOD 2 1/4" HSA | INSP | PAGE OF

	DEPTH		S.P.T. SAMPLE A						
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH
									0.4
									3.0
1	5.0	6.5	12	26	50	X	6"	MOIST	5.5
									9.0

FIELD IDENTIFICATION OF SOILS

Bituminous Concrete

Trap Rock

Red Br. M-F Sand and C-F Gravel

Red Sandstone

Refusal - 9.0

End of Boring - 9.0

G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
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TEST BORING REPORT

BORING # B-3

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret / DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP / PAGE OF

	DEPTH		S.P.T. SAMPLE						A	FIELD IDENTIFICATION OF SOILS
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	
									0.4	Bituminous Concrete
									2.0	Trap Rock
										Red Br. M-F Sand and Silt
										Some C-F Gravel
1	5.0	5.5	60	X	X	X	4"	MOIST	5.0	
										Red Sandstone
									10.0	

Refusal - 10.0

End of Boring - 10.0

G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

[redacted] BORINGS CO INC
[redacted] Margaret Circle
[redacted], Ct. 06770
Tel (203) 729-5435
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TEST BORING REPORT

BORING # B-4

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret	DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP	PAGE OF

	DEPTH		S.P.T. SAMPLE						A	
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	FIELD IDENTIFICATION OF SOILS
									0.5	Bituminous Concrete
									2.0	Concrete
										Red Br. M-F Sand and Silt
										Some C-F Gravel
1	5.0	5.5	62	X	X	X	4"	MOIST	5.0	
										Red Sandstone
									10.0	
										Refusal - 10.0
										End of Boring - 10.0
										G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
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TEST BORING REPORT

BORING # B-5

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret / DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP / PAGE OF

	DEPTH		S.P.T. SAMPLE					A	
S-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH
									0.5
									2.0
1	5.0	7.0	12	16	21	26	20"	WET	
2	10.0	10.3	50/3"	X	X	X	3"	WET	10.0
									12.0

FIELD IDENTIFICATION OF SOILS

Bituminous Concrete

Concrete

Red Br. M-F Sand and Silt

Some C-F Gravel

Red Sandstone

Refusal - 12.0

End of Boring - 12.0

G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
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TEST BORING REPORT

BORING # B-6

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION | PROJECT NO | ROCK CORE DIA. | DRILLER J. Lloret | DATE 8/27/04

LINE & STA | OFFSET | METHOD 2 1/4" HSA | INSP | PAGE OF

	DEPTH		S.P.T. SAMPLE					A		FIELD IDENTIFICATION OF SOILS
S-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	
									0.5	Bituminous Concrete
									2.0	Concrete
										Blk. M-F Sand and C-F Gravel
1	5.0	7.0	10	12	12	14	12"	WET	5.0	
										Red Br. M-F Sand and Silt
										Some C-F Gravel
2	10.0	10.5	50	X	X	X	6"	WET	10.0	
										Red Sandstone
									13.0	
										Refusal - 13.0
										End of Boring - 13.0
										G.W.O. - 2.0

- BLOWS ON CASING
  DRILL TIME PER FOOT
- SPT 140# 30"FALL
- 1 3/8 ID SS
- WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

Appendix C

ConnDOT Exploration Logs

	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	**B-25**
DRILLER **P. Brown**	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Line & Station	**NB 6+837.045**
		Offset (m)	**19.784m RT.**
INSPECTOR **RTS**	TOWN: **New Haven, Connecticut**	N. Coordinate	**203689.74**
	PROJECT NAME: **I-95 New Haven Harbor Crossing, B**	E. Coordinate	**292073.64**
SOILS ENGINEER **GeoDesign, Inc.**	PROJECT NUMBER: **92-532 / 0228-001.1**	**URS Corporation**	
	BORING CONTRACTOR: **Warren George, Inc.**	PRIME DESIGNER	

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation(m): **1.9**	Utilized			X				X	X					X
Date Started: 12 October 2001	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: 12 October 2001	Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
▼ @ **Mud** m after **N/A** hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
▼ @ m after hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
												Fill 0-5.5 m inferred
5												
											5.50	
											-3.60	Decomposed Bedrock 5.5-7.62 m, inferred
											7.62	
		7.62 - 9.14	C-1	1.52	1.50	C	[REC= 99%; RQD= 78%] [Time: 3,3,4,4,5]				-5.72	Good quality, cemented to well cemented, slightly to moderately weathered, red brown, fine grain, SANDSTONE, trace Gravel, interbedded Conglomerate, fracturing 0-80 degrees, fracturing along gravel
10		9.14 - 10.66	C-2	1.52	1.50	C	[REC= 99%; RQD= 83%] [Time: 4,3,3,3,3]					Good quality, cemented to well cemented, slightly to moderately weathered, red brown, fine grain, SANDSTONE, trace to little Gravel, Quartz & Greenstone, fracturing 0-20 degrees

Casing Size	From (m)	To (m)	Meters of Earth	Rock
HW	**0.0**	**6.1**	**7.62** m	**3.04** m
			No. of Soil Samples (SS / UP)	
			0	**0**

NOTES: **Spun casing to bedrock at 7.62 m, roller bit chatter at 5.5m, decomposed bedrock inferred, grouted on completion.**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)

PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	P. Brown
INSPECTOR	RTS
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Warren George, Inc.

Hole No.	B-25
Line & Station	NB 6+837.045
Offset (m)	19.784m RT.
N. Coordinate	203689.74
E. Coordinate	292073.64
	URS Corporation
	PRIME DESIGNER

Surface Elevation(m): 1.9
Date Started: 12 October 2001
Date Finished: 12 October 2001
Groundwater Observations
▼ @ Mud m after N/A hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized			X				X	X					X
Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
											10.66 -8.76	End of Exploration 10.66 m
15												
20												

Casing Size	From (m)	To (m)
HW	0.0	6.1

Meters of Earth	Rock
7.62 m	3.04 m
No. of Soil Samples (SS / UP)	
0	0

NOTES: Spun casing to bedrock at 7.62 m, roller bit chatter at 5.5m, decomposed bedrock inferred, grouted on completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B-61
DRILLER: P. Brown	STATE OF CONNECTICUT	Line & Station	NB 6+858.389
	DEPARTMENT OF TRANSPORTATION	Offset (m)	15.077m RT.
INSPECTOR: RTS	TOWN: New Haven, Connecticut	N. Coordinate	203668.9
	PROJECT NAME: I-95 New Haven Harbor Crossing, B	E. Coordinate	292082.66
SOILS ENGINEER	PROJECT NUMBER: 92-532 / 0228-001.1	URS Corporation	
GeoDesign, Inc.	BORING CONTRACTOR: Warren George, Inc.	PRIME DESIGNER	

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation(m): 3.61	Utilized							X	X					X
Date Started: 17 September 2001	Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: 17 September 2001	Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
▼ @ Mud m after N/A hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
▼ @ m after hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.61	1	0.61	0.38	SS	5	14	24	21	3.58	Dense, gray-brown, fine-coarse GRAVEL, some fine-medium Sand, some Silt
		0.61 - 1.22	2	0.61	0.43	SS	14	18	16	29		Dense, dark brown, fine-medium SAND, little fine-coarse Gravel, Silt (FILL)
		1.22 - 1.83	3	0.61	0.46	SS	33	38	33	36		Very dense, dark brown-black, fine-medium SAND, little fine-coarse Gravel, little Silt, trace Cinders (FILL)
		3.05 - 3.66	4	0.61	0.15	SS	5	6	6	6		Medium dense, brown, fine SAND and REBAR, trace Silt (FILL)
5		4.67 - 5.28	5	0.61	0.41	SS	5	7	9	10		Medium dense, red brown, fine-medium SAND, trace Silt (FILL)
		6.10 - 6.71	6	0.61	0.51	SS	3	3	4	11	6.50	Loose, light brown, fine-medium SAND and SILT
											-2.89	
		7.62 - 8.23	7	0.61	0.30	SS	9	12	11	12		Medium dense, red brown, fine-medium SAND, little fine Gravel, little Silt
											9.14	
10		9.14 - 10.66	C-1	1.52	1.26	C	[REC= 83%; RQD= 52%] [Time: 3,3,3,3,3]				-5.53	Fair quality, cemented to poorly cemented, moderately to highly weathered, red brown (mottled), fine to coarse grain, ARKOSE SANDSTONE, trace Gravel, Siltstone interbedding, fracturing 0-30 degrees

Casing Size	From (m)	To (m)
PW-127mm	0.0	7.6

Meters of Earth	Rock
9.14 m	1.52 m
No. of Soil Samples (SS / UP)	
7/6	0

NOTES: Automatic Hammer, offset due to utilities, hole grouted on completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)

PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

TOWN: New Haven, Connecticut
PROJECT NAME: I-95 New Haven Harbor Crossing, B
PROJECT NUMBER: 92-532 / 0228-001.1
BORING CONTRACTOR: Warren George, Inc.

DRILLER	P. Brown
INSPECTOR	RTS
SOILS ENGINEER	GeoDesign, Inc.

Hole No.	B-61
Line & Station	NB 6+858.389
Offset (m)	15.077m RT.
N. Coordinate	203668.9
E. Coordinate	292082.66
	URS Corporation
	PRIME DESIGNER

Surface Elevation(m): 3.61
Date Started: 17 September 2001
Date Finished: 17 September 2001
Groundwater Observations
▼ @ Mud m after N/A hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized							X	X					X
Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
											10.66	
											-7.05	End of Exploration 10.66 m
15												
20												

Casing Size	From (m)	To (m)
PW-127mm	0.0	7.6

Meters of Earth	Rock
9.14 m	1.52 m
No. of Soil Samples (SS / UP)	
7/6	0

NOTES: Automatic Hammer, offset due to utilities, hole grouted on completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

DRILLER: P. Brown	SM - 001 - M REV. 1/94 BORING REPORT	Hole No.	B-65
INSPECTOR: RTS	STATE OF CONNECTICUT	Line & Station	NB 6+993.662
	DEPARTMENT OF TRANSPORTATION	Offset (m)	21.516m RT.
	TOWN: New Haven, Connecticut	N. Coordinate	203533.82
SOILS ENGINEER: GeoDesign, Inc.	PROJECT NAME: I-95 New Haven Harbor Crossing, B	E. Coordinate	292108.37
	PROJECT NUMBER: 92-532 / 0228-001.1	URS Corporation	
	BORING CONTRACTOR: Warren George, Inc.	PRIME DESIGNER	

Surface Elevation(m): 7.71
Date Started: 13 September 2001
Date Finished: 13 September 2001
Groundwater Observations
▼ @ Mud m after N/A hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized							X	X					
Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.61	1	0.61	0.61	SS	7	22	19	15	7.66	Dense, brown, fine-medium SAND, little fine Gravel, little Silt, trace Cinder, FILL
		1.52 - 2.13	2	0.61	0.30	SS	13	11	14	16		Medium dense, brown, fine-medium SAND, little, fine-coarse Gravel, little Silt, trace Brick, trace Cinder, FILL
		3.05 - 3.66	3	0.61	0.36	SS	6	7	6	3		Medium dense, red brown, fine-coarse SAND, some fine-coarse Gravel, little Silt
5		4.57 - 5.18	4	0.61	0.46	SS	5	15	12	7		Medium dense, black-red brown, fine-medium SAND, little fine Gravel, little Asphalt, little Silt, FILL
		6.10 - 6.71	5	0.61	0.36	SS	13	33	41	19		Very dense, black-red brown-white, fine-medium SAND, some fine-coarse Gravel, little Silt, trace Asphalt, trace Glass, FILL
		7.62 - 8.23	6	0.61	0.30	SS	15	22	17	17		Dense, red brown-gray-black, fine-medium SAND, some fine-coarse Gravel, little Silt, FILL
											8.50 -0.79	
10		9.14 - 9.75	7	0.61		SS	25	31	50	59	9.75 -2.04	Very dense, red brown, fine-medium SAND and SILT, little fine Gravel, (decomposed rock)
												End of Exploration 9.75 m

Casing Size	From (m)	To (m)
PW-127mm	0.0	9.14

Meters of Earth	Rock
9.75 m	0.00 m
No. of Soil Samples (SS / UP)	
7/7	0

NOTES: Automatic Hammer, grouted on completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. B-65
Sheet 1 of 1

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STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	J. Lloret
INSPECTOR	RJM
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Associated Borings, Co. Inc.

Hole No.	Z-7
Line & Station	SB+863.723
Offset (m)	24.804 m LT.
N. Coordinate	203700.73
E. Coordinate	292125.39
	URS Corporation
	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation(m): 2.84	Utilized			X										
Date Started: 1 November 2002	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: 4 November 2002	Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
▼ @ ____ m after ____ hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
▼ @ ____ m after ____ hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
5												
											6.40	
											-3.56	
		7.01 - 7.16	1	0.15	0.08	SS	83/0.15m				7.32	Very dense, red-brown fine to coarse SAND, some Silt, trace fine Gravel (Decomposed Sandstone)
		7.32 - 8.84	1	1.52	1.27	C	[REC= 84%; RQD= 45%] [Time: 2, 1.5, 3, 2.5, 2.5]				-4.48	Poor quality, cemented, highly weathered, very thickly bedded SANDSTONE (Friable)
		8.84 - 10.36	2	1.52	1.42	C	[REC= 93%; RQD= 37%] [Time: 3, 5, 5, 3, 4]					Poor quality, cemented to poorly cemented, very thick bedded, highly weathered SANDSTONE (very friable) (sections with Clay around core)
10												

Casing Size	From (m)	To (m)
HW	0.0	7.16

Meters of Earth	Rock
7.32 m	12.16 m
No. of Soil Samples (SS / UP)	
1/1	

NOTES: Inferred decomposed sandstone from 6.40m to 7.32m. Cathead and safety hammer. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)

PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

TOWN: New Haven, Connecticut
PROJECT NAME: I-95 New Haven Harbor Crossing, B
PROJECT NUMBER: 92-532 / 0228-001.1
BORING CONTRACTOR: Associated Borings, Co. Inc.

Hole No.	Z-7
Line & Station	SB+863.723
Offset (m)	24.804 m LT.
N. Coordinate	203700.73
E. Coordinate	292125.39
	URS Corporation
	PRIME DESIGNER

DRILLER	J. Lloret
INSPECTOR	RJM
SOILS ENGINEER	GeoDesign, Inc.

Surface Elevation(m): 2.84
Date Started: 1 November 2002
Date Finished: 4 November 2002
Groundwater Observations
▼ @ ____ m after ____ hours
▼ @ ____ m after ____ hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized			X										
Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		10.36 - 11.88	3	1.52	1.52	C	[REC= 100%; RQD= 70%] [Time: 2, 3, 4, 4, 4]					Fair quality, cemented, very thickly bedded, moderately weathered SANDSTONE
		11.88 - 13.40	4	1.52	1.52	C	[REC= 100%; RQD= 82%] [Time: 3, 5, 7, 3, 5]					Good quality, cemented, slightly weathered, thick bedded, SANDSTONE (76mm friable layer surrounded by Clay 305mm from base of core)
		13.40 - 14.92	5	1.52	1.52	C	[REC= 100%; RQD= 100%] [Time: 5, 5, 4, 4, 4]					Excellent quality, cemented, slightly weathered, thick bedded SANDSTONE (red Sandstone interbedded with two 305mm layers of gray coarser grained lithic Sandstone)
15		14.92 - 16.44	6	1.52	1.52	C	[REC= 100%; RQD= 83%] [Time: 2, 5, 4, 4, 4]					Good quality, cemented, slightly weathered, thick bedded SANDSTONE
		16.44 - 17.96	7	1.52	1.30	C	[REC= 86%; RQD= 68%] [Time: 4, 3, 4, 4, 4]					Fair quality, cemented, slightly weathered, thick bedded SANDSTONE
		17.96 - 19.48	8	1.52	1.22	C	[REC= 80%; RQD= 60%] [Time: 4, 4, 4, 6, 4]					Fair quality, cemented to poorly cemented, slightly weathered, thick bedded SANDSTONE
20											19.48 -16.64	End of Exploration 19.48 m

Casing Size	From (m)	To (m)
HW	0.0	7.16

Meters of Earth	Rock
7.32 m	12.16 m
No. of Soil Samples (SS / UP)	
1/1	

NOTES: Inferred decomposed sandstone from 6.40m to 7.32m. Cathead and safety hammer. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	G. Brouillette
INSPECTOR	TAS
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Guild Drilling Co., Inc.
Hole No.	Z-8
Line & Station	NB 6+902.0
Offset (m)	28.424 m RT.
N. Coordinate	203623.73
E. Coordinate	292077.98
	URS Corporation
	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation(m): 3.02	Utilized		X	X										X
Date Started: 12 November 2002	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: 13 November 2002	Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
▼ @ 2.44 m after 16.5 hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
▼ @ m after hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
											▼	
5											5.79	
											-2.77	
											7.32	
		7.32 - 8.84	1	1.52	1.37	C	[REC= 90%; RQD= 73%] [Time: 2, 2, 2, 2, 2]				-4.30	Fair quality, cemented, slightly weathered, thick bedded SANDSTONE
10		8.84 - 10.36	2	1.52	1.34	C	[REC= 88%; RQD= 85%] [Time: 2, 2, 2, 2, 2]					Good quality, cemented, slightly weathered, thick bedded, gray CONGLOMERATE

Casing Size	From (m)	To (m)
HW	0.0	5.79

Meters of Earth	Rock
7.32 m	18.28 m

No. of Soil Samples (SS / UP): 0

NOTES: Cathead and safety hammer. Decomposed Sandstone inferred at 5.79m. NW casing to 7.32m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)

PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	G. Brouillette
INSPECTOR	TAS
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Guild Drilling Co., Inc.
Hole No.	Z-8
Line & Station	NB 6+902.0
Offset (m)	28.424 m RT.
N. Coordinate	203623.73
E. Coordinate	292077.98
	URS Corporation
	PRIME DESIGNER

Surface Elevation(m): 3.02
Date Started: 12 November 2002
Date Finished: 13 November 2002
Groundwater Observations
▼ @ 2.44 m after 16.5 hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized		X	X										X
Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		10.36 - 11.88	3	1.52	1.49	C	[REC= 98%; RQD= 82%] [Time: 2, 2, 2, 2, 2]					Good quality, cemented to poorly cemented, moderately weathered, thick bedded, gray conglomerate SANDSTONE to red arkose SANDSTONE to gray CONGLOMERATE
		11.89 - 13.41	4	1.52	1.16	C	[REC= 76%; RQD= 73%] [Time: 2, 2, 2, 2, 2]					Fair quality, cemented, slightly weathered, thick bedded, gray CONGLOMERATE to red arkose SANDSTONE
		13.41 - 14.93	5	1.52	1.44	C	[REC= 95%; RQD= 85%] [Time: 2, 2, 2, 2, 2]					Good quality, cemented to poorly cemented, moderately weathered, thick bedded red arkose SANDSTONE to gray CONGLOMERATE to red arkose SANDSTONE
15		14.94 - 16.46	6	1.52	1.49	C	[REC= 98%; RQD= 97%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh medium bedded, red arkose SANDSTONE to gray conglomerate Sandstone to red arkose SANDSTONE to gray CONGLOMERATE
		16.96 - 18.48	7	1.52	1.52	C	[REC= 100%; RQD= 100%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh thick bedded, red conglomerate SANDSTONE to gray CONGLOMERATE to red arkose SANDSTONE
		17.98 - 19.50	8	1.52	1.49	C	[REC= 98%; RQD= 98%] [Time: 2, 2, 2, 2, 3]					Excellent quality, cemented to poorly cemented, slightly weathered, medium bedded gray CONGLOMERATE to red arkose SANDSTONE to gray/red CONGLOMERATE
20		19.51 - 21.03	9	1.52	1.52	C	[REC= 100%; RQD= 100%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh thick bedded gray CONGLOMERATE to red arkose SANDSTONE

Casing Size	From (m)	To (m)
HW	0.0	5.79

Meters of ✓ Earth 7.32 m Rock 18.28 m
No. of Soil Samples (SS / UP) 0

NOTES: Cathead and safety hammer. Decomposed Sandstone inferred at 5.79m. NW casing to 7.32m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

DRILLER: G. Brouillette	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No.	Z-8
INSPECTOR: TAS	TOWN: New Haven, Connecticut	Line & Station	NB 6+902.0
	PROJECT NAME: I-95 New Haven Harbor Crossing, B	Offset (m)	28.424 m RT.
SOILS ENGINEER: GeoDesign, Inc.	PROJECT NUMBER: 92-532 / 0228-001.1	N. Coordinate	203623.73
	BORING CONTRACTOR: Guild Drilling Co., Inc.	E. Coordinate	292077.98
		URS Corporation	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation(m): 3.02	Utilized		X	X										X
Date Started: 12 November 2002	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: 13 November 2002	Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
▼ @ 2.44 m after 16.5 hours	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
▼ @ m after hours														

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		21.03 - 22.55	10	1.52	1.47	C	[REC= 97%; RQD= 97%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh thick bedded gray CONGLOMERATE to red arkose SANDSTONE
		22.56 - 24.08	11	1.52	1.52	C	[REC= 100%; RQD= 100%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh thick bedded, red arkose SANDSTONE
25		24.08 - 25.60	12	1.52	1.47	C	[REC= 97%; RQD= 97%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, fresh, thick bedded, red arkose SANDSTONE
											25.60 -22.58	End of Exploration 25.6 m
30												

Casing Size	From (m)	To (m)	Meters of Earth	Rock
HW	0.0	5.79	7.32 m	18.28 m
			No. of Soil Samples (SS / UP)	
			0	

NOTES: Cathead and safety hammer. Decomposed Sandstone inferred at 5.79m. NW casing to 7.32m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)

PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	G. Brouillette
INSPECTOR	TAS
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Guild Drilling Co., Inc.
Hole No.	Z-10
Line & Station	NB 6+967.082
Offset (m)	12.822 m RT.
N. Coordinate	203562.64
E. Coordinate	292108.28
	URS Corporation
	PRIME DESIGNER

Surface Elevation(m): 8.39
Date Started: 14 November 2002
Date Finished: 15 November 2002
Groundwater Observations
▼ @ 7.47 m after 15 hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized		X	X										X
Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
5											5.80	
10											2.59 ▼	

Casing Size	From (m)	To (m)
HW	0.0	10.36

Meters of ✓

Earth	Rock
11.89 m	12.18 m

No. of Soil Samples (SS / UP): 0

NOTES: Cathead and safety hammer. Boulders inferred to 4.27m depth. Wood, asphalt, shells in tailings from 4.3m to 5.8m. Sand gravel tailings from 5.8m to 10.1m. NW casing to 11.9m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	G. Brouillette
INSPECTOR	TAS
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Guild Drilling Co., Inc.
Hole No.	Z-10
Line & Station	NB 6+967.082
Offset (m)	12.822 m RT.
N. Coordinate	203562.64
E. Coordinate	292108.28
	URS Corporation
	PRIME DESIGNER

Surface Elevation(m): 8.39
Date Started: 14 November 2002
Date Finished: 15 November 2002
Groundwater Observations
▼ @ 7.47 m after 15 hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized		X	X										X
Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
											10.06 -1.67	
		11.89 - 13.41	1	1.52	1.44	C	[REC= 95%; RQD= 95%] [Time: 2, 3, 2, 2, 2]				11.89 -3.50	Excellent quality, cemented, slightly weathered, thick bedded gray CONGLOMERATE to red arkose SANDSTONE to gray CONGLOMERATE
		13.41 - 14.93	2	1.52	1.49	C	[REC= 98%; RQD= 98%] [Time: 2, 2, 2, 2, 3]					Excellent quality, cemented to poorly cemented, slightly weathered, thick bedded, red arkose SANDSTONE
15		14.94 - 16.46	3	1.52	1.44	C	[REC= 95%; RQD= 82%] [Time: 4, 2, 2, 1, 2]					Good quality, cemented to poorly cemented, slightly weathered, thick bedded (top 0.43m) gray quartz pebble conglomerate to red arkose SANDSTONE to gray CONGLOMERATE
		16.46 - 17.98	4	1.52	1.52	C	[REC= 100%; RQD= 95%] [Time: 2, 2, 1, 2, 2]					Excellent quality, cemented, slightly weathered, thick bedded, red arkose SANDSTONE (with 0.23m gray CONGLOMERATE layer)
		17.98 - 19.50	5	1.52	0.69	C	[REC= 45%; RQD= 15%] [Time: 2, 1, 1, 1, 2]					Very poor quality, cemented to poorly cemented, moderately weathered, thick bedded, red arkose SANDSTONE
20		19.51 - 21.03	6	1.52	1.47	C	[REC= 97%; RQD= 97%] [Time: 4, 3, 3, 3, 3]					Excellent quality, cemented, slightly weathered, thick bedded, red/gray CONGLOMERATE

Casing Size	From (m)	To (m)
HW	0.0	10.36

Meters of: Earth 11.89 m; Rock 12.18 m
No. of Soil Samples (SS / UP): 0

NOTES: Cathead and safety hammer. Boulders inferred to 4.27m depth. Wood, asphalt, shells in tailings from 4.3m to 5.8m. Sand gravel tailings from 5.8m to 10.1m. NW casing to 11.9m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

DRILLER: G. Brouillette	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No.	Z-10
INSPECTOR: TAS	TOWN: New Haven, Connecticut	Line & Station	NB 6+967.082
SOILS ENGINEER: GeoDesign, Inc.	PROJECT NAME: I-95 New Haven Harbor Crossing, B	Offset (m)	12.822 m RT.
	PROJECT NUMBER: 92-532 / 0228-001.1	N. Coordinate	203562.64
	BORING CONTRACTOR: Guild Drilling Co., Inc.	E. Coordinate	292108.28
		URS Corporation	PRIME DESIGNER

Surface Elevation(m): 8.39
Date Started: 14 November 2002
Date Finished: 15 November 2002
Groundwater Observations
▼ @ 7.47 m after 15 hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized		X	X										X
Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		21.03 - 22.55	7	1.52	1.52	C	[REC= 100%; RQD= 97%] [Time: 2, 3, 2, 2, 2]					Excellent quality, cemented, slightly weathered, thick bedded, red arkose SANDSTONE to gray CONGLOMERATE
		22.55 - 24.07	8	1.52	1.52	C	[REC= 100%; RQD= 98%] [Time: 2, 2, 2, 2, 2]					Excellent quality, cemented, slightly weathered, thick bedded, red arkose SANDSTONE
											24.07	
25											-15.68	End of Exploration 24.07 m
30												

Casing Size	From (m)	To (m)
HW	0.0	10.36

Meters of Earth	Rock
11.89 m	12.18 m
No. of Soil Samples (SS / UP)	
0	

NOTES: Cathead and safety hammer. Boulders inferred to 4.27m depth. Wood, asphalt, shells in tailings from 4.3m to 5.8m. Sand gravel tailings from 5.8m to 10.1m. NW casing to 11.9m. Hole grouted upon completion.

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

DRILLER	T. Paquette
INSPECTOR	J. O'Brien
SOILS ENGINEER	GeoDesign, Inc.
TOWN:	New Haven, Connecticut
PROJECT NAME:	I-95 New Haven Harbor Crossing, B
PROJECT NUMBER:	92-532 / 0228-001.1
BORING CONTRACTOR:	Guild Drilling Co., Inc.
Hole No.	PB-33
Line & Station	NB 6+957.749
Offset (m)	50.531m RT.
N. Coordinate	203562
E. Coordinate	292069.3
	URS Corporation
	PRIME DESIGNER

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized			X				X	X					X
Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

Surface Elevation(m): 6.99
Date Started: 9 March 2000
Date Finished: 9 March 2000
Groundwater Observations
▼ @ 2.77 m after 6 hours
▼ @ m after hours

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00 - 0.60	1	0.60	0.41	D	1	3	17	54		Black, SILT and fine to medium SAND, little fine to medium Gravel, trace Brick, Ash. (FILL)
		1.22 - 1.82	2	0.60	0.13	D	17	17	25	27		Black, SILT, little fine to coarse Gravel, some fine to medium Sand, little Clay, trace Brick, Ash and Shells. (FILL)
		2.74 - 3.34	3	0.60	0.15	D	14	16	16	16	▼	Brown, fine to coarse SAND and fine to coarse GRAVEL, some Silt, trace Glass. (FILL)
5		4.27 - 4.87	4	0.60	0.28	D	5	4	5	4		Brown, fine to coarse GRAVEL and fine to medium SAND, trace Silt. (FILL)
		5.79 - 6.39	5	0.60	0.20	D	8	3	3	5	5.79	
											1.20	Red-brown, fine to medium SAND, some Silt, trace fine Gravel. (Decomposed ARKOSE SANDSTONE bedrock) Lost 40% water circulation at 5.94 m.
		7.32 - 7.92	6	0.60	0.36	D	32	60	34	45	7.92	Red-brown, fine to coarse SAND and SILT, trace fine Gravel. (Decomposed ARKOSE SANDSTONE bedrock)
		8.23 - 9.75	1	1.52	1.30	C	[REC= 86%; RQD= 60%] [Time: 4,5,4,4,4]				-0.93	Red-brown, ARKOSE SANDSTONE, moderately hard, slightly weathered, slightly fractured, fine to coarse grained, horizontal mechanical breaks.
10		9.76 - 11.28	2	1.52	1.22	C	[REC= 80%; RQD= 40%]					Red-brown, ARKOSE SANDSTONE, as above except moderately

Casing Size	From (m)	To (m)
100 mm	0.0	8.23

Meters of Earth: 8.23 m; Rock: 3.05 m
No. of Soil Samples (SS / UP): 6D / 2C

NOTES:

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

SM - 001 - M REV. 1/94 BORING REPORT

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

TOWN: New Haven, Connecticut
PROJECT NAME: I-95 New Haven Harbor Crossing, B
PROJECT NUMBER: 92-532 / 0228-001.1
BORING CONTRACTOR: Guild Drilling Co., Inc.

Hole No.	PB-33
Line & Station	NB 6+957.749
Offset (m)	50.531m RT.
N. Coordinate	203562
E. Coordinate	292069.3

DRILLER: T. Paquette
INSPECTOR: J. O'Brien
SOILS ENGINEER: GeoDesign, Inc.
PRIME DESIGNER: URS Corporation

Surface Elevation(m): 6.99
Date Started: 9 March 2000
Date Finished: 9 March 2000
Groundwater Observations
▼ @ 2.77 m after 6 hours
▼ @ m after hours

	Casing				Auger		Mud	Sampler		Core Barrel			
Utilized			X				X	X					X
Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS		B(st)	B(dt)	NX(st)	NX(dt)
Size I.D. (mm)	60	76	100	64				35		35	35	55	55
Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	Diamond	
Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	

DEPTH	Casing blows per half meter	SAMPLE DEPTH IN METERS FROM - TO	NO.	PEN. m	REC m	Type	BLOWS PER 0.15 METERS ON SAMPLER 0-0.15	0.15-0.30	0.30-0.45	0.45-0.60	STRATA CHANGE DEPTH ELEV.	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
								[Time: 3,3,4,3,3]				fractured.
											11.28	
											-4.29	End of Exploration 11.28 m
15												
20												

Casing Size	From (m)	To (m)
100 mm	0.0	8.23

Meters of Earth	Rock
8.23 m	3.05 m
No. of Soil Samples (SS / UP)	
6D	2C

NOTES:

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test SS=Split Spoon SSL=Large Split Spoon (76mm)
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Test Pit Field Log

GeoDesign, Inc.	Project Name	Test Pit No: TP-4
984 Southford Road, Middlebury, Connecticut 06762	I-95 New Haven Harbor Crossing, Contract B	File No.: 228-001.0 80-SSE L
Geotechnical Engineers & Environmental Consultants	State Project No. 92-532	Date: 9/29/01 Checked By: RDP

Engineer: Randall T. States, E.I.T.
Weather: 60's - 70's clear
Contractor: Warren George, Inc.
Operator: Dave Armentano
Make: John Deere
Capacity: 1/8 cubic meter +/-
Model: 310D
Reach: 4 m
Ground Elev. 2.5m +/-
Time Started: 0700
Time Stopped: 0830

Depth 0 m	Soil Description	Field Testing (PID)	Excavation Effort	Boulder Count Qty. Class	Remark No.
	0.05 m Topsoil		E		
0.30	Dark brown to black fine to medium SAND little Silt, trace Debris		E	2A	
0.61			E M	2B	
0.91			M	2A,1B	
	1.0				
1.22	Boulders, brick, concrete from 1.0 to 1.8 m		M	3A	
1.52			D	5A, 2B	
1.83	1.8		M	5A, 2B	
2.13	Gray to black CINDER FILL fine to medium SAND and fine to coarse GRAVEL, little Silt		E	2A, 1B	
2.44	2.4 ▽		E	2A	
	2.6 Red Brown fine to medium SAND, little fine to to coarse Gravel, little Silt				
2.74			E		
	End of Exploration				
3.05					
3.35					
3.66					
3.96					
4.27					
4.57					

Remarks:

N/O - none observed.

Test Pit Plan

3.7 × 1.8

North

Est. Vol. Excavated: 18 m^3

Boulder Count

Size Range	Desig.
0.15 - 0.46	A
0.46 - 0.91 m	B
> 0.91 m	C

Excavation Effort
E = Easy
M = Moderate
D = Difficult

Proportions Used

Trace (Tr.)	0-10%
Little (Li.)	10-20%
Some (So.)	20-35%
And	35-50%

Abbreviations

F-Fine
M-Medium
C-Coarse
F/M-Fine to Medium
F/C-Fine to Coarse
V-Very

Groundwater

Elapsed Time	Depth
0 hours	2.6 m
0.5 hours	2.4 m

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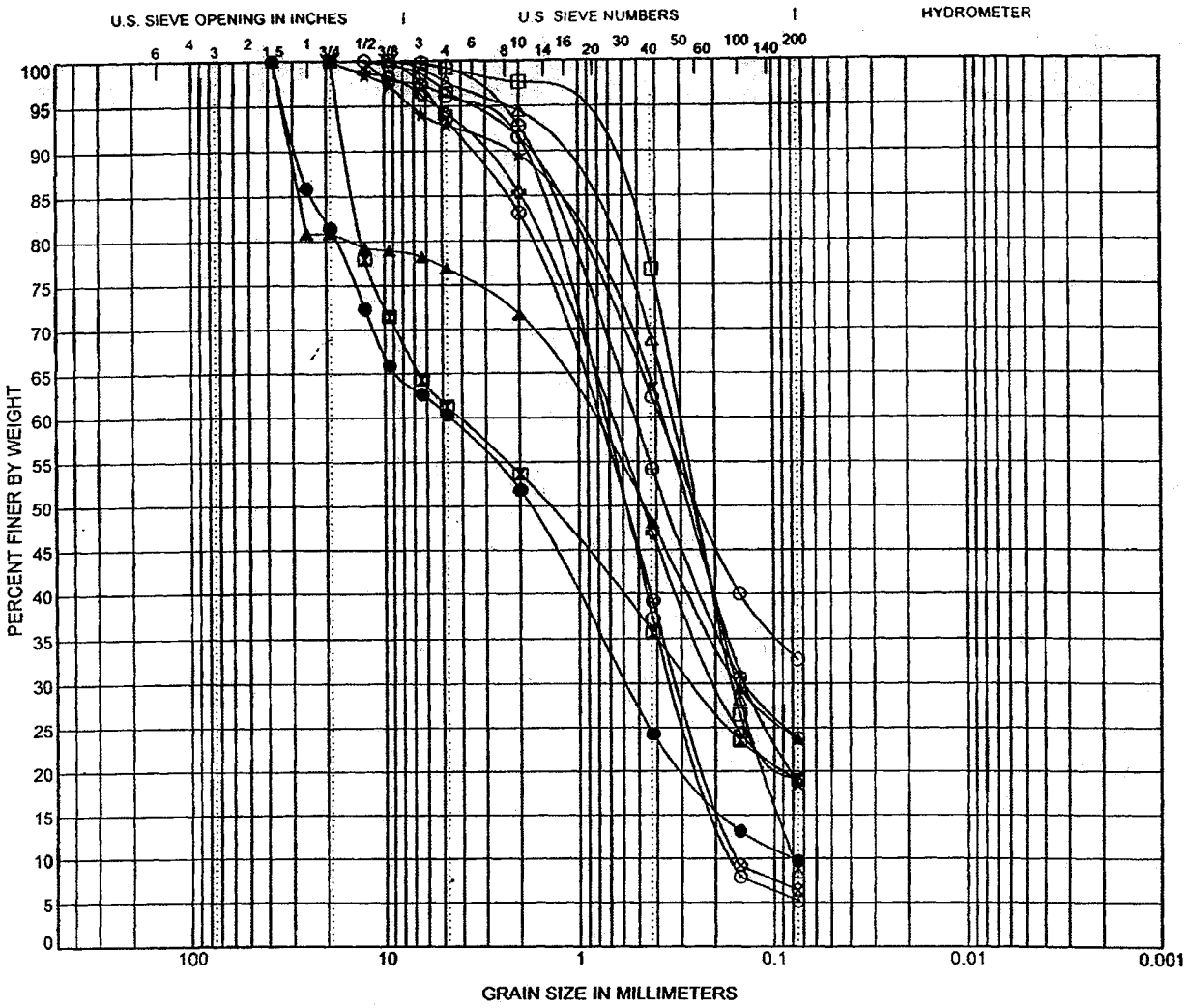

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring Number	Depth (m)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	AB2-2	3.1	38.1	4.608	0.581	0.079	39.7	50.6	9.7	
⊠	AB2-2	4.8	19.1	4.108	0.259		38.7	42.3	19.0	
▲	AB2-2	6.1	38.1	0.926	0.154		23.1	53.2	23.7	
★	AB2-2	9.8	19.1	0.373	0.14		7.1	74.3	18.6	
⊙	B-61	4.6	12.7	0.808	0.325	0.16	3.9	90.9	5.2	
✿	B-63	10.7	19.1	0.714	0.192		5.8	75.4	18.9	
○	B-63	12.2	12.7	0.378			3.3	64.0	32.6	
△	B-66	2.0	9.5	0.336	0.156	0.079	2.4	89.2	8.4	
⊗	B-66	6.0	9.5	0.881	0.306	0.153	6.4	87.3	6.4	
⊕	B-66	15.0	9.5	0.532	0.139		0.8	75.4	23.8	
□	R-8	3.1	9.5	0.298	0.16		0.9	79.9	19.2	

GEO GRAIN SIZE QBRIDGE.GPJ US_LAB.GDT 7/9/02

GEODESIGN INCORPORATED
P.O. Box 699
Windsor, VT 05089
Tel: 802-674-2033
Fax: 802-674-5943
1233 Shelburne Road
South Burlington, VT 05403
Tel: 802-652-5140
Fax: 802-674-5943

GRAIN SIZE DISTRIBUTION

I-95 New Haven Harbor Crossing, B
New Haven, CT
228-001-1

Boring Report — Hole No. VC-1 (OW)

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Driller	B. Holley
Inspector	SPK
Soils Engineer	GeoDesign, Inc.
Town	New Haven, Connecticut
Project Name	I-95 New Haven Harbor Crossing, B
Project Number	92-569 / 0820-001.1
Boring Contractor	Warren George, Inc.
Hole No.	VC-1 (OW)
Line & Station	80+021.096
Offset Lt/Rt	22.348m LT.
N. Coordinate	203453.85
E. Coordinate	232039.63
Surface Elevation	2.31
Date Started	4 September 2001
Date Finished	4 September 2001

Groundwater Observations: N/A

Strata Change Depth Elev.	Field Identification of Soil, Remarks (incl. color, loss of wash water, etc.)
	Very dense, black, fine-coarse SAND, trace Silt (pavement subbase) dry
	Dense, black and tan, fine-medium SAND, trace Silt, trace fine Gravel, wet, strong VOC odor
	Dense, tan, fine-medium SAND and SILT, strong VOC odor
	Very dense, red brown, fine-medium SAND, trace Silt, trace light gray-greenish white fine-medium Sand (decomposed rock)
	Very dense, red brown, fine-medium SAND, trace Silt (decomposed rock)
	End of Exploration 4.42 m

Casing: PW-127mm, From 0.0, To 1.52. Meters of Earth 4.42 m, Rock 0.00 m. No. of Soil Samples 5/0.

Remarks: Safety Hammer, Rope and Cathead. Acker Rig. Grouted on completion, observation well installed.

Hole No. VC-1 (OW) Sheet 1 of 1

Boring Report — Hole No. VC-2

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Driller	B. Holley
Inspector	SPK
Soils Engineer	GeoDesign, Inc.
Town	New Haven, Connecticut
Project Name	I-95 New Haven Harbor Crossing, B
Project Number	92-569 / 0820-001.1
Boring Contractor	Warren George, Inc.
Hole No.	VC-2
Line & Station	80+065.548
Offset Lt/Rt	12.112m LT.
N. Coordinate	203434.37
E. Coordinate	232105.68
Surface Elevation	2.38
Date Started	31 August 2001
Date Finished	31 August 2001

Groundwater Observations: N/A

Strata Change Depth Elev.	Field Identification of Soil, Remarks (incl. color, loss of wash water, etc.)
	0.1 m Topsoil. Dense, mixed color, dry, fine-medium SAND, trace Silt, trace fine Gravel (FILL)
	Medium dense, grey - light brown, fine-medium SAND, some Silt, wet, strong VOC odor (FILL)
	Very dense, pinkish brown, fine-medium SAND, trace Silt, wet, strong VOC odor, (decomposed rock)
	Decomposed Bedrock 3.0 - 3.96 m, Inferred
	End of Exploration 3.96 m

Casing: PW-127mm, From 0.0, To 3.96. Meters of Earth 3.96 m, Rock 0.00 m. No. of Soil Samples 3/0.

Remarks: Safety Hammer with Rope and Cathead. Acker Rig. NWJ Rods. Roller bit refusal 3.96m, grouted on completion.

Hole No. VC-2 Sheet 1 of 1

Boring Report — Hole No. VC-3

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Driller	B. Holley
Inspector	SPK
Soils Engineer	GeoDesign, Inc.
Town	New Haven, Connecticut
Project Name	I-95 New Haven Harbor Crossing, B
Project Number	92-569 / 0820-001.1
Boring Contractor	Warren George, Inc.
Hole No.	VC-3
Line & Station	80+141.971
Offset Lt/Rt	0.509m LT.
N. Coordinate	203386.84
E. Coordinate	232166.75
Surface Elevation	2.72
Date Started	4 September 2001
Date Finished	4 September 2001

Groundwater Observations: N/A

Strata Change Depth Elev.	Field Identification of Soil, Remarks (incl. color, loss of wash water, etc.)
	Top 0.1m Asphalt. Dense, mixed color, fine-medium SAND, trace Silt, trace fine Gravel, dry (FILL)
	Medium dense, brown, fine-medium SAND, little Silt, little fine Gravel, moist (FILL)
	Dense, pinkish red-orange, fine-medium SAND, trace Silt, moist (FILL)
	Dense, light red-brown, fine-medium SAND, trace Silt, trace fine Gravel, moist
	Very dense, red brown, fine-medium SAND, trace Silt (decomposed rock)
	End of Exploration 4.57 m

Casing: PW-127mm, From 0.0, To 1.52. Meters of Earth 4.57 m, Rock 0.00 m. No. of Soil Samples 5/0.

Remarks: Safety Hammer, Rope and Cathead. Acker Rig. Grouted on completion.

Hole No. VC-3 Sheet 1 of 1

Designer	R. STATES
Drafter	G. HROCKO

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Project Title: NEW HAVEN HARBOR CROSSING CORRIDOR IMPROVEMENTS
Town: NEW HAVEN
Drawing Title:
Project No.: 92-569
Drawing No.: BOR-21

Appendix D

Chemical Testing Data

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-1

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret	DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP	PAGE OF

DEPTH			S.P.T. SAMPLE						A	
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	FIELD IDENTIFICATION OF SOILS
									0.4	Bituminous Concrete
										Red Br. C-F Sand and C-F Gravel, Cobbles (Fill)
									4.0	
1	5.0	7.0	2	1	1	1	4"	MOIST		Blk M-F Sand and C-F Gravel, Some Silt
									7.0	
										Red Br M-F Sand
									9.0	
2	10.0	11.0	16	50	X	X	10"	WET		Red Sandstone
									12.5	
										Refusal - 12.5
										End of Boring - 12.5
										G.W.O. - 7.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-2

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION | PROJECT NO | ROCK CORE DIA. | DRILLER J. Lloret | DATE 8/27/04

LINE & STA | OFFSET | METHOD 2 1/4" HSA | INSP | PAGE OF

	DEPTH		S.P.T. SAMPLE A						
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH
									0.4
									3.0
1	5.0	6.5	12	26	50	X	6"	MOIST	5.5
									9.0

FIELD IDENTIFICATION OF SOILS

Bituminous Concrete

Trap Rock

Red Br. M-F Sand and C-F Gravel

Red Sandstone

Refusal - 9.0

End of Boring - 9.0

G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-3

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret	DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP	PAGE OF

	DEPTH		S.P.T. SAMPLE					A		
S-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	FIELD IDENTIFICATION OF SOILS
									0.4	Bituminous Concrete
									2.0	Trap Rock
										Red Br. M-F Sand and Silt
										Some C-F Gravel
1	5.0	5.5	60	X	X	X	4"	MOIST	5.0	
										Red Sandstone
									10.0	
										Refusal - 10.0
										End of Boring - 10.0
										G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
110 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-4

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret / DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP / PAGE OF

	DEPTH		S.P.T. SAMPLE						A	
SS-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	FIELD IDENTIFICATION OF SOILS
									0.5	Bituminous Concrete
									2.0	Concrete
										Red Br. M-F Sand and Silt
										Some C-F Gravel
1	5.0	5.5	62	X	X	X	4"	MOIST	5.0	
										Red Sandstone
									10.0	
										Refusal - 10.0
										End of Boring - 10.0
										G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-5

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION	PROJECT NO	ROCK CORE DIA.	DRILLER J. Lloret / DATE 8/27/04
LINE & STA	OFFSET	METHOD 2 1/4" HSA	INSP / PAGE OF

	DEPTH		S.P.T. SAMPLE						A	FIELD IDENTIFICATION OF SOILS
S-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	
									0.5	Bituminous Concrete
									2.0	Concrete
										Red Br. M-F Sand and Silt
										Some C-F Gravel
1	5.0	7.0	12	16	21	26	20"	WET		
2	10.0	10.3	50/3"	X	X	X	3"	WET	10.0	
										Red Sandstone
									12.0	
										Refusal - 12.0
										End of Boring - 12.0
										G.W.O. - 6.0

COL A - BLOWS ON CASING
DRILL TIME PER FOOT
HAMMER - SPT 140# 30"FALL
SAMPLER - 1 3/8 ID SS
W - WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

ASSOCIATED BORINGS CO INC
119 Margaret Circle
Naugatuck, Ct. 06770
Tel (203) 729-5435
Fax (203) 729-5116

TEST BORING REPORT

BORING # B-6

PROJ Waterfront Street

TOWN New Haven, Connecticut

CLIENT CARDINAL ENGINEERING, INC.

ELEVATION | PROJECT NO | ROCK CORE DIA. | DRILLER J. Lloret | DATE 8/27/04

LINE & STA | OFFSET | METHOD 2 1/4" HSA | INSP | PAGE OF

DEPTH		S.P.T. SAMPLE					A		FIELD IDENTIFICATION OF SOILS
S-#	FROM	TO	0-6	6-12	12-18	18-24	REC	NOTES	DEPTH	
									0.5	Bituminous Concrete
									2.0	Concrete
										Blk. M-F Sand and C-F Gravel
1	5.0	7.0	10	12	12	14	12"	WET	5.0	
										Red Br. M-F Sand and Silt
										Some C-F Gravel
2	10.0	10.5	50	X	X	X	6"	WET	10.0	
										Red Sandstone
									13.0	
										Refusal - 13.0
										End of Boring - 13.0
										G.W.O. - 2.0

- BLOWS ON CASING
  DRILL TIME PER FOOT
- SPT 140# 30"FALL
- 1 3/8 ID SS
- WEIGHT OF HAMMER

TRACE - 1-10%
LITTLE - 10-20% M-F MEDIUM TO FINE
SOME - 20-35% C-F COARSE TO FINE
AND - 35-50% GWO-GROUNDWATER LEVEL

Date Samples Received: 11/29/04

Client Name : **GEI Consultants, Inc.**	CTL Lab No. : 1104447
Report Date : 12/07/04	PO/ Job No. : NA

RESULTS OF ANALYSIS

SPLP EPA 1312

Matrix Type :		**S**	**S**		
CTL Sample No.:		**22209**	**22211**		
Field ID :		**B101 S6**	**B107 S4**		
Parameters	**MDL**				
Arsenic-mg/L	0.05	BDL	BDL		
Barium-mg/L	0.1	BDL	BDL		
Cadmium-mg/L	0.005	BDL	BDL		
Chromium, Total-mg/L	0.05	BDL	BDL		
Lead-mg/L	0.005	0.042	BDL		
Mercury-mg/L	0.002	BDL	BDL		
Selenium-mg/L	0.01	BDL	BDL		
Silver-mg/L	0.01	BDL	BDL		

Matrix Type :		**S**	**S**		
CTL Sample No.		**22209**	**22211**		
Field ID :		**B101 S6**	**B107 S4**		
Parameters	**MDL**				
CT ETPH-mg/kg	25	3,265	BDL		

MDL= Minimum Detectable Level **BDL**= Below Detection Level

Matrix Type: W= Water/Aqueous **S**= Soil/Solid **O**= Oil/Hydrocarbon

Connecticut Testing Laboratories, Inc.
165 Gracey Avenue / Meriden, CT 06451
(203) 634-3731 (Fax) 630-1336
Certification CT-PH0547/ MA-CT035

Client Name : **GEI Consultants, Inc.**	Date Extracted: 12/03/04
CTL Lab No.: 1104447	Date Analyzed: 12/04/04
Job/PO No. : NA	Analyst: SR
Report Date : 12/07/04	

EPA METHOD 8260B GC/MS Date Samples Rec'd: 11/29/04

	**	*		
Matrix Type	**S**	**S**		
CTL Sample #:	**22209**	**22211**		
Field ID :	**B101 S6**	**B107 S4**		

Results of Analysis

Parameters	**MDL**				
Dichlorodifluoromethane	10	BDL	BDL		
Chloromethane	10	BDL	BDL		
Vinyl chloride	10	BDL	BDL		
Chloroethane	10	BDL	BDL		
Bromomethane	10	BDL	BDL		
Trichlorofluoromethane	10	BDL	BDL		
1,1-Dichloroethylene	10	BDL	BDL		
Methylene chloride	10	BDL	BDL		
t-1,2-Dichloroethylene	10	BDL	BDL		
1,1-Dichloroethane	10	BDL	BDL		
2,2-Dichloropropane	10	BDL	BDL		
cis-1,2-Dichloroethylene	10	BDL	BDL		
Chloroform	10	BDL	BDL		
Bromochloromethane	10	BDL	BDL		
1,1,1-Trichloroethane	10	BDL	BDL		
1,1-Dichloropropylene	10	BDL	BDL		
Carbon tetrachloride	10	BDL	BDL		
Benzene	10	23,991.0	BDL		
1,2-Dichloroethane	10	BDL	BDL		
Trichloroethylene	10	BDL	BDL		
1,2-Dichloropropane	10	BDL	BDL		
Bromodichloromethane	10	BDL	BDL		
Dibromomethane	10	BDL	BDL		
cis-1,3-Dichloropropylene	10	BDL	BDL		
Toluene	10	209,444.0	425.0		
t-1,3-Dichloropropylene	10	BDL	BDL		
1,1,2-Trichloroethane	10	BDL	BDL		
Tetrachloroethylene	10	BDL	BDL		
1,3-Dichloropropane	10	BDL	BDL		
Dibromochloromethane	10	BDL	BDL		
1,2-Dibromoethane (EDB)	10	BDL	BDL		
Chlorobenzene	10	BDL	BDL		
Ethylbenzene	10	257,406.0	214.0		
1,1,1,2-Tetrachloroethane	10	BDL	BDL		
p/m-Xylene	10	345,411.0	330.0		
o-Xylene	10	207,408.0	281.0		

**MDL=100 times higher than indicated./*MDL=10 times higher than indicated.

MDL= Minimum Detectable Level **BDL**= Below Detection Level **Units**= ppb

Matrix Type: W= Water/Aqueous **S**= Soil/Solid **O**= Oil/Hydrocarbon

Connecticut Testing Laboratories, Inc.
165 Gracey Avenue / Meriden, CT 06451
(203) 634-3731 (Fax) 630-1336
Certification CT-PH0547/ MA-CT035

Client Name :	GEI Consultants, Inc.	Date Extracted:	12/03/04
CTL Lab No.:	1104447	Date Analyzed:	12/04/04
Job/PO No. :	NA	Analyst:	SR
Report Date :	12/07/04		

EPA METHOD 8260B GC/MS Date Samples Rec'd: 11/29/04

	**	*			
Matrix Type	**S**	**S**			
CTL Sample #:	**22209**	**22211**			
Field ID :	**B101 S6**	**B107 S4**			

Results of Analysis

Parameters	**MDL**				
Styrene	10	BDL	BDL		
Bromoform	10	BDL	BDL		
Isopropylbenzene	10	27,955.0	BDL		
1,1,2,2-Tetrachloroethane	10	BDL	BDL		
Bromobenzene	10	BDL	BDL		
1,2,3-Trichloropropane	10	BDL	BDL		
n-Propylbenzene	10	80,479.0	BDL		
2-Chlorotoluene	10	BDL	BDL		
1,3,5-Trimethylbenzene	10	131,814.0	181.0		
4-Chlorotoluene	10	BDL	BDL		
tert-Butylbenzene	10	BDL	BDL		
1,2,4-Trimethylbenzene	10	219,468.0	644.0		
sec-Butylbenzene	10	9,593.0	BDL		
p-Isopropyltoluene	10	17,911.0	BDL		
1,3-Dichlorobenzene	10	BDL	BDL		
1,4-Dichlorobenzene	10	BDL	BDL		
n-Butylbenzene	10	18,699.0	BDL		
1,2-Dichlorobenzene	10	BDL	BDL		
1,2-Dibromo-3-chloropropane	10	BDL	BDL		
1,2,4-Trichlorobenzene	10	BDL	BDL		
Hexachlorobutadiene	50	BDL	BDL		
Naphthalene	50	48,427.0	BDL		
1,2,3-Trichlorobenzene	10	BDL	BDL		
Methyl ethyl ketone	50	BDL	BDL		
Methyl butyl ketone	50	BDL	BDL		
Methyl isobutyl ketone	50	BDL	BDL		

**MDL=100 times higher than indicated./*MDL=10 times higher than indicated.

MDL= Minimum Detectable Level **BDL**= Below Detection Level **Units**= ppb

Matrix Type: W= Water/Aqueous **S**= Soil/Solid **O**= Oil/Hydrocarbon

Connecticut Testing Laboratories, Inc.
165 Gracey Avenue / Meriden, CT 06451
(203) 634-3731 (Fax) 630-1336
Certification CT-PH0547/ MA-CT035

Client Name :	GEI Consultants, Inc.	Date Extracted:	12/03/04
CTL Lab No.:	1104447	Date Analyzed:	12/03/04
PO/Job No.	NA	Analyst :	YK
Report Date :	12/07/04		

PAHs by EPA METHOD 8270C (GC/MS) Date Samples Rec'd: 11/29/04

	*	*
Matrix Type	**S**	**S**
CTL Sample #:	**22209**	**22211**
Field ID :	**B101 S6**	**B107 S4**

Results of Analysis

Parameters	MDL				
Naphthalene	10	12,068.0	175.0		
Acenaphthylene	10	BDL	BDL		
Acenaphthene	10	BDL	BDL		
Fluorene	10	183.0	BDL		
Phenanthrene	10	269.0	505.0		
Anthracene	10	BDL	119.0		
Fluoranthene	10	153.0	132.0		
Pyrene	10	157.0	209.0		
Benzo(a)anthracene	10	103.0	BDL		
Chrysene	10	BDL	BDL		
Benzo(b)fluoranthene	10	BDL	BDL		
Benzo(k)fluoranthene	10	BDL	BDL		
Benzo(a)pyrene	10	BDL	BDL		
Indeno (1,2,3-cd)pyrene	50	BDL	BDL		
Dibenzo(a,h)anthracene	50	BDL	BDL		
Benzo(ghi)perylene	50	BDL	BDL		
Benzo(j)fluoranthene	50	BDL	BDL		
Dibenzo(a.h)acridine	50	BDL	BDL		
Dibenzo(a.j)acridine	50	BDL	BDL		
7H-Dibenzo(c,g)carbazole	50	BDL	BDL		
3-Methylcholanthrene	50	BDL	BDL		

***MDL=10 times higher than indicated.**

MDL= Minimum Detectable Level **BDL=** Below Detection Level **Units=** ppb

Matrix Type: W= Water/Aqueous **S=** Soil/Solid **O=** Oil/Hydrocarbon

Connecticut Testing Laboratories, Inc.
165 Gracey Avenue / Meriden, CT 06451
(203) 634-3731 (Fax) 630-1336
Certification CT-PH0547/ MA-CT035

Appendix E

ConnDOT Controlled Low Strength Material (CLSM) Data

ITEM #216012A-CONTROLLED LOW STRENGTH MATERIAL

Description: Controlled Low Strength Material (CLSM) is a self consolidating, rigid setting material to be used in backfills, fills, structural fills and elsewhere as indicated on the plans, or as directed by the Engineer. The flow and set time characteristics of CLSM shall be designed to meet the specific job conditions. All CLSM material covered by this specification shall be designed to be hand excavatable at any time after placement. It shall be composed of a mixture of Portland cement, aggregate, and water with the option of using fly ash, air-entraining agents, and other approved admixtures.

Materials: All materials utilized in the CLSM mix design shall be in accordance with the applicable requirements of Article M.03.01

Composition: The composition of the CLSM shall be in accordance with the requirements set forth in Article M.03.01-General Composition of Concrete Mixes, as well as the applicable sections of ACI 229R. The Contractor shall submit each proposed mix design, with all supporting data, to the Engineer for review and approval at least two weeks prior to its use.

The setting time of CLSM materials shall be designed so as to achieve the strength necessary to comply with the time constraints called for under the Maintenance and Protection of Traffic requirements of the project specifications. Use of chloride accelerators is not permitted.

The minimum compressive strength of the CLSM material shall be 200 kilopascals (kPa) and the maximum compressive strength of the CLSM shall be 1,035 kilopascals (kPa) when tested in accordance with ASTM D4832 after 56 days.

The CLSM mix design shall utilize a nominal maximum size of No. 8 aggregate as specified in M.01.01.

CLSM mixes that are designed with high entrained air shall have a minimum of 25% entrained air when tested in accordance with AASHTO T152.

Construction Methods: CLSM shall only be placed when the ambient temperature is at least 0° C and rising. CLSM shall be deposited within 2 hours of initial mixing.

CLSM may be placed by chutes, conveyors, buckets or pumps depending upon the application and accessibility of the site. Should voids or cavities remain after the placement of the CLSM, the Contractor shall modify the placement method or flow characteristics of the CLSM. Voids or cavities which have not been filled properly shall be corrected as directed by the Engineer and at the Contractor's expense.

Method of Measurement: This work will be measured for payment by the actual number of cubic meters of "Controlled Low Strength Material" installed and accepted within the pay limits shown on the contract plans or as directed by the Engineer.

Basis of Payment: This work will be paid at the contract unit price per cubic meter "Controlled Low Strength Material," which price shall include all materials, equipment, tools and labor incidental thereto.

Controlled Low Strength Material (CLSM)

Notes to designers:

Controlled Low Strength Material is a self-compacting, cementitious material used primarily as a backfill in lieu of compacted fill. The term CLSM can be used to describe a variety of materials such as engineered fills, flowable fills, controlled density fill, flowable mortar, etc. Some of the benefits of CLSM are:

- It is readily available and easy to deliver. Any ready mix concrete supplier should be able to deliver CLSM.
- Ease of placement. CLSM can be placed by chute conveyor, pump or bucket. The material requires no compaction. Flowable mixes will be self-leveling, stiffer mixes may require a minor amount of spreading at the surface of the fill. Generally very little labor is required to place this material.
- Fast setting. CLSM mixes can be designed to allow paving operations to begin within a few hours of placement.
- Resistant to settlement. Unlike granular backfills that may settle over time, once CLSM is set, there is no long term settlement associated with this material.

The CLSM specification attached is developed to produce a material that is hand excavatable and relatively fast setting (typically within several hours). The mixes are generally sand based or a mix of ⅜-inch (No. 8) stone and sand. The flow characteristics of a CLSM are easily varied and should be based on its intended use and field conditions.

The permeability of CLSM produced under this specification is comparable to our compacted granular materials. CLSM mixes that have higher cement ratios or high fly ash content can result in a material that is relatively impervious.

Some gas utilities have raised concerns over the placement of CLSM in the vicinity of their facilities. The encasement of a gas utility within CLSM may create difficulties for them to locate leaks in their system. They also have concerns about not being able to hand excavate the CLSM when it is placed around their facility. For these reasons, CLSM should not be used where there is a potential for a gas utility to become encased in this material. If a gas utility is located within the vicinity of the proposed CLSM placement, the designer should coordinate with the utility about its use.

The cost of CLSM will be higher than other compacted fills. A designer should only consider specifying CLSM where it will not be practical to place standard backfill material. In certain trench backfilling applications it may be practical to include CLSM as an alternate to the standard backfill. In these cases the owned specification should be modified so that it is included with the trench excavation item with no additional payment for the CLSM material.