GEOTECHNICAL ENGINEERING REPORT
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
BRIDGE NO. 06284, EASTBOUND EXIT 24
OFF RAMP OVER MAD RIVER,
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

by

Haley & Aldrich, Inc.
East Hartford, Connecticut

for

Berger, Lehman Associates, P.C.
Wethersfield, Connecticut

File 91313-100
Revised January 2003

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HALEY & ALDRICH

Revised 24 January 2003
1 May 2001
File No. 91313-100

Berger, Lehman Associates, P.C.
20-30 Beaver Road
Wethersfield, Connecticut 06109

Attention: Thomas J. Bulzak, P.E.

Subject: U.S. Interstate Route 84 Reconstruction
Bridge No. 06284, Eastbound Exit 24 Off-Ramp Over Mad River
State Project No. 151-273
Waterbury, Connecticut

Ladies and Gentlemen:

This report presents our evaluation of subsurface conditions and geotechnical engineering recommendations for Bridge No. 06284, I-84 Eastbound Exit 24 Off-ramp Over Mad River, for the I-84 Reconstruction project in Waterbury, Connecticut. This work was conducted in accordance with our agreement dated 26 December 2000.

In summary, subsurface conditions consist of fill and glaciofluvial deposits over bedrock. Bridge No. 06284 is a single span bridge supported by two abutments. We recommend each abutment be supported by end bearing H-piles driven to refusal. Our detailed recommendations follow.

PROPOSED CONSTRUCTION

Bridge No. 06284 (formerly referred to as Structure 5) Eastbound Exit 24 Off-Ramp over the Mad River is located in Waterbury, Connecticut, see Figure 1, Project Locus. Bridge No. 06284 will be a single-span bridge. The bridge will be 13.2 m wide and 55.7 m long, between Station E24 11+280.5 and Station E24 11+336.2, as shown on Figure 2. The abutments will have U-type wingwalls (1A, 1B, 2A, and 2B). There will also be one flared wingwall (2C) off the east side of Abutment No. 2.

Subgrade at Abutments No. 1 and 2 will be El. 109.3 and 110.3, respectively. Wingwalls will bear at the same elevation as the abutments. Proposed 100-yr flood level at Bridge No. 06284 ranges from El. 112.1 on the downstream side to El. 112.6 on the upstream side.

Elevations in this report are in meters and refer to NGVD 29.

SITE CONDITIONS

Abutment 1 will be located within the dry lakebed of the former Scoville Pond. Ground surface is vegetated and slopes gently toward the Mad River. Ground surface at Abutment 1 is about El. 112.

Contaminated materials were buried within the former Scoville Pond during the late 1990's. Materials consisted of demolition debris. Based on available records Abutment 1 is very close to, or partially within the area of contaminated fill, as shown on Figure 2.

Abutment 2 will be located east of the Mad River, where the existing slope is about 1V:2H. Ground surface slopes upward from the Mad River to an unpaved road at El. 114, and then up to Harpers Ferry Road at El. 124. The slope is vegetated with grass, brush and some trees.

A pump station is located about 80 m northeast of Abutment 2. A sanitary sewer, consisting of a 600-mm reinforced concrete pipe (RCP) runs southwest from the pump station along the unpaved road, and passes beneath Abutment 2. It has not yet been decided whether to relocate the sewer or leave it in place. For purposes of this report, we have assumed the sanitary sewer will be relocated prior to construction.

The existing Mad River channel has 1V:2H side slopes, and the west side is covered with riprap. Bottom of channel is at El. 109.5. Normal water level is about El. 110.

SUBSURFACE EXPLORATIONS

Recent Explorations

Four borings (S5-1 through S5-4), two at each abutment, were drilled by General Borings, Inc. of Prospect, Connecticut, between 26 February 2001 and 2 March 2001 The test borings were drilled with 76-mm I.D. casing to depths ranging from 17.8 to 25.1 m, including 3 to 6 m of bedrock coring. Bedrock was cored at each boring with 51-mm I.D. NQ core barrel. Standard Penetration Tests were conducted at maximum 1.5-m intervals in the overburden soil. Boring locations are shown on Figure 2. As drilled locations and elevations were surveyed by A-I Engineering of Middletown, Connecticut. Haley & Aldrich, Inc. monitored the drilling. Test boring logs are located in Appendix A.

Previous Explorations

There are no previous subsurface explorations in the vicinity of Bridge No. 06284.

SUBSURFACE CONDITIONS

Subsurface conditions encountered in the explorations consist of fill and glaciofluvial deposits overlying bedrock. Soil strata are described below, in order of increasing depth. Subsurface profiles at each abutment are shown in Figures 3A and 3B. Subsurface conditions are summarized in Table I.

Thickness (m)	Generalized Description
1.8 to 2.1	**Fill** – Medium dense to very dense, black brown to brown, coarse to fine SAND, with varying amounts of gravel and silt, with occasional grass fragments. Very dense, dark brown, SILT with leaves, wood, grass and cobbles was encountered in S5-3.
9.8 to 19.2	**Glaciofluvial Deposits** – Dense to very dense, brown to gray brown, SAND and GRAVEL, trace silt, with numerous cobbles and boulders.

Odors similar to fuel were noted in the fill and upper portion of the glaciofluvial deposits in borings S5-1 and S5-2 (Abutment No. 1).

Bedrock – Bedrock is described as hard, gray and white, fresh, biotite GNEISS. Bedrock is part of the Waterbury Gneiss formation. Bedrock is 11.6 m to 21.3 m deep, which ranges between El. 90.1 and El. 102.5. Elevations of the top of bedrock are in Table I and shown in Figures 3A and 3B.

Groundwater Conditions

Water was encountered in subsurface explorations between El. 109.1 and 110.6. The level of the Mad River (approx. El. 110) will control groundwater levels.

Laboratory Testing

Three grain size analyses (ASTM D422) were performed on representative soil samples to confirm visual classification and to aid in determining engineering properties. Laboratory testing results are included in Appendix B.

GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Foundation Design Criteria

We recommend that abutments and wingwalls be founded on steel H-piles driven to refusal.

- H-piles should be HP310x1.079 (HP12x74) or HP360x1.295 (HP14x89), consisting of Grade 345 MPa (50 ksi) steel due to the expected hard driving conditions.

- IF LRFD design is used, HP310x1.079 H-piles should be designed for an ultimate capacity of 4,840 kN (544 tons) and a resistance factor of 0.35; HP360x1.295 H-piles should be designed for an ultimate capacity of 5,825 kN (655 tons) and a resistance factor of 0.35. The recommended resistance criteria consider hard driving conditions due to the dense soil with cobbles and boulders. We discussed this resistance factor with the Department and agreed that it results in an appropriate stress level in the piles for this application.

- If ASD design is used, HP310x1.079 H-piles should be designed for an allowable capacity of 1160 kN (130 tons); HP360x1.295 H-piles should be designed an allowable capacity of 1400 kN (157 tons).

- Point reinforcement is recommended for piles to assist in penetration and to protect pile tips during hard driving.

- Lateral loads may be resisted by a combination of shear and bending at the tops of the piles, and the horizontal component of axial loads in batter piles. For a maximum allowable horizontal deflection of 6 mm (1/4 in) at the top of the pile, assume the allowable lateral load in the strong axis for a hinged condition is 40 kN (9 kips) and 50 kN (12 kips) for the HP310x1.079 and HP360x1.295 piles, respectively.

- Piles should have a minimum center-to-center spacing of 2.5 times the pile width in accordance with AASHTO requirements. Greater pile spacings are anticipated.

- Pile caps should bear on a 300 mm thick layer of granular fill, or on crushed stone (Form 815 M.01.01, No.6) placed over geotextile fabric above undisturbed glaciofluvial deposits. Crushed stone placed over the exposed subgrade should facilitate excavation dewatering and help maintain a stable subgrade.

- For frost protection, bottom of pile caps should be at least 1.2 m below the lowest proposed adjacent grade.

- Maximum total settlement is estimated at 9 mm. Maximum differential settlement

between abutments will be less than 9 mm. This settlement will occur during construction.

Abutment No. 1

Abutment No. 1 is located at Sta. E24 11+282. Bottom of pile cap is El. 109.3. Bedrock is between El. 90.1 and El. 90.4, as shown on Figure 3A.

Abutment No. 2

Abutment No. 2 is located at Sta. E24 11+335. Bottom of pile cap is El. 110.3. Bedrock is between El. 98.8 and El.102.5.

Estimated vertical pile lengths, assuming the top of pile is 0.3 above the bottom of the pile cap, are provided in Table II.

Lateral Earth Pressures

Design abutments and wingwalls for active earth pressures as shown in Figure 4.

Seismic Design

Soils conditions at the site are defined as AASHTO Soil Profile Type I. A seismic soil coefficient, S, equal to 1.0 is recommended. The soils at the site are not considered to be liquefaction susceptible under the design earthquake event. Seismically induced settlement should not be significant. The bridge design manual indicates that single span structures do not need to be designed for seismic loading.

Environmental Observations

Odors similar to fuel were observed at borings S5-1 and S5-2 (near Abutment No. 1). Additionally, excavation at the Abutments may encounter contaminated demolition debris. The environmental impacts of contamination should be evaluated by the Department's environmental consultant, including health and safety of workers during the construction, whether excavated materials may be reused as fill, and other issues.

Structure Backfill and Drainage

Pervious structure backfill should be placed behind the abutments and wingwalls above a line defined by a 1V:1.5H slope extending up from the heel of the footing and extending to the bottom of subgrade. Pervious structure backfill should meet the requirements of CONNDOT Form 815 M.02.05.

We recommend the abutment and wingwalls be drained by 100-mm dia. weep holes installed according to CONNDOT specifications. Maximum spacing between weep holes should be 3 m.

Existing Sewer

We have assumed that the 600-mm RCP sewer will be removed prior to construction of Abutment 2. Excavation to remove the pipe will penetrate below groundwater. We recommend that the excavation below Abutment 2 be backfilled with crushed stone.

Reuse of Excavated Materials

Soils to be excavated consist primary of fill. Based on results of gradation analysis, the fill is not considered suitable for reuse as pervious structure backfill or granular fill. Excavated soils will generally be suitable for embankment fill. Contaminated soils at Abutment 1 may not be suitable for reuse and may require special disposal.

CONSTRUCTION CONSIDERATIONS

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

Excavation and Temporary Lateral Support

Excavations up to 3 m high at Abutment 1 and 7 m high at Abutment 2 will be required to construct abutments and wingwalls. Open cut excavation appears feasible above groundwater. However, temporary lateral support will likely be required for the portions of the excavation below groundwater, and may be desirable to limit the overall size of excavations. We anticipate that steel sheet piling will be preferred because it will block water flow into the excavation more efficiently than solder piles and lagging. However, cobbles and boulders in the overburden may hinder installation of sheets. Soldier piling and lagging will likely be feasible above groundwater, although boulders could obstruct soldier piles and predrilling may be required at some locations.

Conventional excavation equipment appears practical for excavation these soils. However, cobbles and boulders are present in the glaciofluvial deposits, and mechanical splitting or chiseling may be necessary for removal of large boulders.

Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR

Part 1926, latest edition. Temporary soil slopes above groundwater of 1V:1H, or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Cofferdam and Dewatering

Water levels measured in recent borings were between El. 109.1 and El.110.6. The water level in the Mad River is at about El. 110. Crushed stone or granular fill subgrade at Abutment No. 1 will be 0.1 m to 1.0 m below water level readings in S5-1 and S5-2. Crushed stone or granular fill subgrade at Abutment No. 2 will be 0.1 to 0.6 m below water level readings in S5-3 and S5-4. Cofferdam and dewatering will therefore be required. Additionally, a line of steel sheet piles driven between the excavation and the Mad River would help to reduce excavation dewatering quantities. We anticipate that excavation dewatering may be accomplished using filtered sumps. Crushed stone and geotextile fabric placed over the exposed subgrade should facilitate excavation dewatering and help maintain a stable subgrade. Surface water should be diverted away from excavations.

Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Two test piles are recommended at each abutment.

Due to boulders in glaciofluvial deposits, predrilling or spudding will likely be required to advance piles at some locations, and should be anticipated.

FINAL COMMENTS

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

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

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

Sincerely yours,
HALEY & ALDRICH, INC.

Kurtis E. Amidon
Engineer

Nathan L. Whetten, P.E., C.G.
Senior Engineer

John P. Dugan, Jr., P.E.
Senior Vice President

Enclosures:

- Table I - Summary of Subsurface Data
- Table II - Summary of Estimate Pile Quantities
- Figure 1 - Project Locus
- Figure 2 – Subsurface Exploration Plan
- Figure 3A – Abutment No. 1 Profile
- Figure 3B –Abutment No. 2 Profile
- Figure 4 – Recommended Lateral Loads on Unrestrained Abutments and Wingwalls
- Appendix A – Recent Test Borings Logs
- Appendix B – Laboratory Results

TABLE I
SUMMARY OF SUBSURFACE DATA
BRIDGE NO. 06284, EASTBOUND E24 OFF RAMP OVER MAD RIVER
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

EXPLOR. NUMBER	ELEV. (m)	DEPTH (m)	THICKNESS OF SOIL STRATA (m)		BEDROCK LEVEL (m)		GROUNDWATER LEVEL (m)	
			FILL	GLACIO-FLUVIAL	DEPTH	ELEV.	DEPTH	ELEV.
Recent								
S5-1	111.69	24.38	2.13	19.21	21.34	90.35	1.68	110.01
S5-2	111.41	25.14	2.13	19.21	21.34	90.07	2.29	109.12
S5-3	114.07	17.83	1.83	9.75	11.58	102.49	3.96	110.11
S5-4	114.32	21.79	2.13	13.41	15.54	98.78	3.74	110.58

NOTES:

1. Water levels were measured shortly after coring rock, and may not represent stabilized groundwater.
2. Elevations are in meters and refer to the NGVD 29.
3. Refer to boring logs for detailed soil and rock descriptions.

Haley & Aldrich, Inc.

TABLE II
SUMMARY OF ESTIMATED PILE QUANTITIES
BRIDGE NO. 06284, EASTBOUND E24 OFF RAMP OVER MAD RIVER
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-0273
WATERBURY, CONNECTICUT

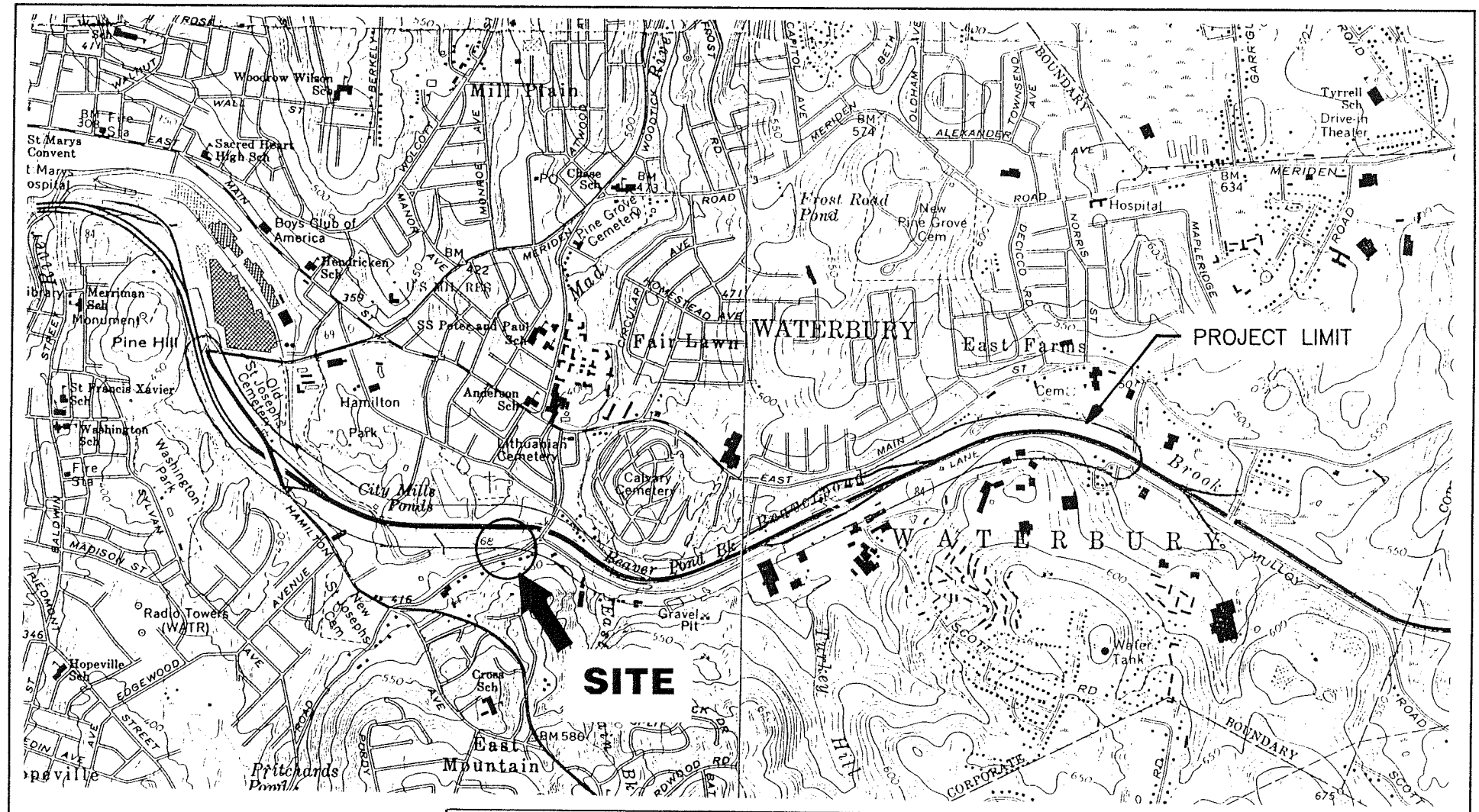
LOCATION	BOTTOM OF FOOTING ELEVATION	ASSUMED PILE CUT OFF ELEVATION	PILE TIP ELEVATION (RANGE)	PILE TIP ELEVATION (AVERAGE)	ESTIMATED AVERAGE PILE ORDER LENGTH, (m)	RECOMMENDED NUMBER OF TEST PILES TEST PILES	RECOMMENDED LENGTH TEST PILE (m) TEST PILE (m)
Abutment No. 1	109.3	109.6	90.1 - 90.4	90.3	20.5	2	21.5
Abutment No. 2	110.3	110.6	98.8 - 102.5	100.5	11.3	2	13.5

NOTES:

Haley & Aldrich, Inc.

1. For estimating purposes, assume one splice for Abutment 1 piles and no splices for Abutment 2 piles.
2. Assume point rienforcement for all piles.
3. Elevations are in meters and refer to NGVD 29.
4. Estimated pile order lengths include a contingency of 1.2 m.

91313-100 A01



SITE COORDINATES: 041°32'20.01"N 073°00'38.51"W

U.S.G.S. QUADRANGLES: WATERBURY & SOUTHINGTON, CONNECTICUT

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

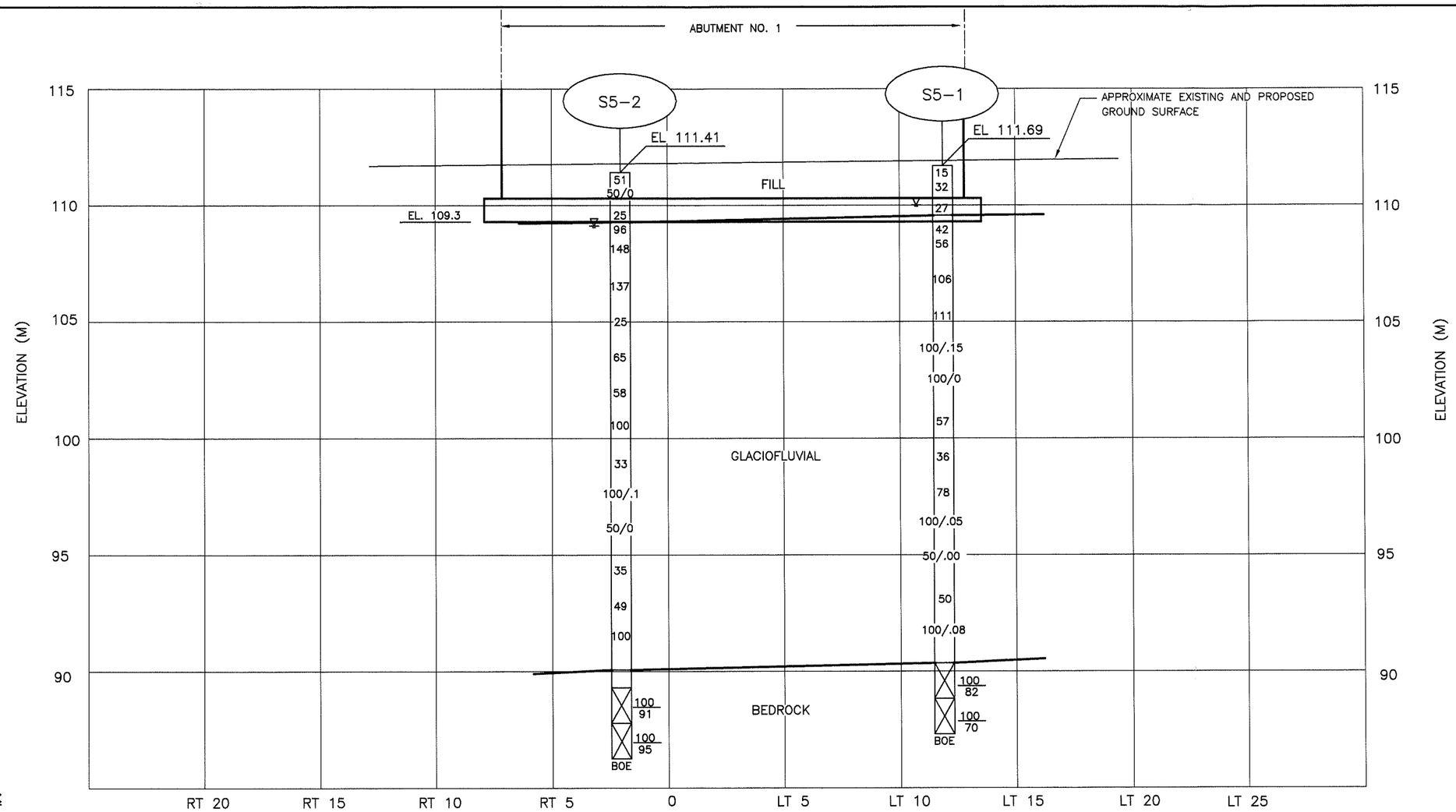
U.S. INTERSTATE 84 RECONSTRUCTION
STATE PROJECT NO. 151-0273
WATERBURY, CONNECTICUT

PROJECT LOCUS

SCALE: 1:24,000

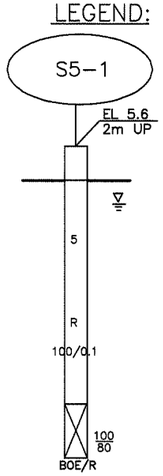
JANUARY 2001

FIGURE 1



EASTBOUND E24 OFF RAMP
BASELINE
ABUTMENT NO. 1
CENTER LINE STATION E24 11+282.0
(LOOKING WEST)

LEGEND:



- EL 5.6 / 2m UP — APPROXIMATE GROUND SURFACE ELEVATION OFFSET DISTANCE AND DIRECTION FROM BASELINE
- MAJOR STRATUM BOUNDARY
- WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING.
- 5 — LOCATION OF SAMPLE OBTAINED BY DRIVING A 50 mm O.D. SPLIT-SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 762 mm. NUMBER INDICATES STANDARD PENETRATION RESISTANCE "N" VALUE, IN BLOWS PER 0.30 m.
- R — INDICATES SPLIT SPOON REFUSAL
- 100/0.1 — SAMPLER DRIVEN <0.30 m, FRACTION INDICATES: NUMBER BLOWS TO DRIVE SAMPLER / DEPTH SAMPLER WAS DRIVEN (m)
- 100/80 — CORE SAMPLE, 50 mm DIA., FRACTION INDICATES: % CORE RECOVERY / ROCK QUALITY DESIGNATION (%RQD)
- BOE/R — BOTTOM OF EXPLORATION/REFUSAL

NOTES:

1. SEE FIGURE 2, SUBSURFACE EXPLORATION PLAN, FOR TEST BORING AND FOUNDATION LOCATIONS.
2. FOR DETAILED DESCRIPTION OF SUBSURFACE MATERIAL REFER TO TEST BORING LOGS CONTAINED IN APPENDIX A OF THIS REPORT.
3. LINES REPRESENTING CHANGES IN STRATA ARE BASED UPON INTERPOLATION BETWEEN SUBSURFACE EXPLORATIONS AND MAY NOT REPRESENT ACTUAL FIELD CONDITIONS AT OTHER THAN SPECIFIED EXPLORATION LOCATIONS.
4. THE STRATIFICATION LINES SHOWN ON THE GRAPHIC REPRESENTATION OF THE TEST BORINGS REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL OR ROCK TYPES. THE TRANSITION BETWEEN MATERIALS IS APPROXIMATE.

0 5 10
SCALE IN METERS

HALEY & ALDRICH
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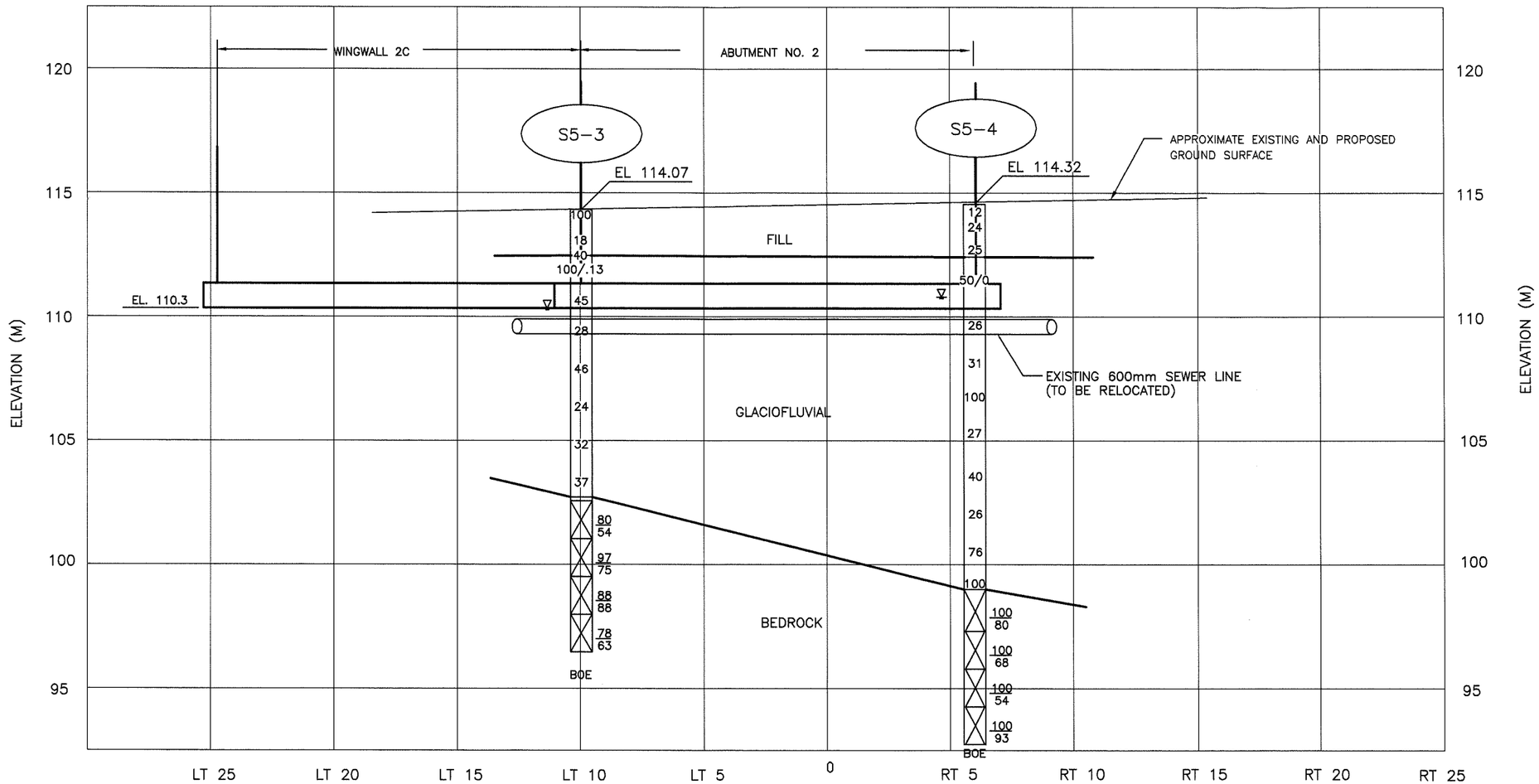
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

ABUTMENT NO. 1 PROFILE
BRIDGE NO. 06284
EASTBOUND E24 OFF RAMP
OVER MAD RIVER

SCALE: AS SHOWN APRIL 2001

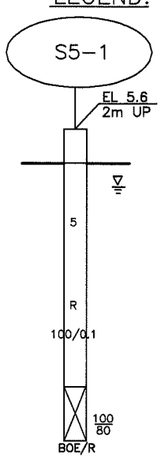
91313-100 B03

FIGURE 3A



EASTBOUND E24 OFF RAMP
BASELINE
ABUTMENT NO. 2
CENTER LINE STATION E24 11+335.0
(LOOKING EAST)

LEGEND:



- EL 5.6 / 2m UP — APPROXIMATE GROUND SURFACE ELEVATION OFFSET DISTANCE AND DIRECTION FROM BASELINE
- MAJOR STRATUM BOUNDARY
- WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING.
- 5 — LOCATION OF SAMPLE OBTAINED BY DRIVING A 50 mm O.D. SPLIT-SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 762 mm. NUMBER INDICATES STANDARD PENETRATION RESISTANCE "N" VALUE, IN BLOWS PER 0.30 m.
- R — INDICATES SPLIT SPOON REFUSAL
- 100/0.1 — SAMPLER DRIVEN <0.30 m, FRACTION INDICATES: NUMBER BLOWS TO DRIVE SAMPLER / DEPTH SAMPLER WAS DRIVEN (m)
- 100/80 — CORE SAMPLE, 50 mm DIA., FRACTION INDICATES: % CORE RECOVERY / ROCK QUALITY DESIGNATION (%RQD)
- BOE/R — BOTTOM OF EXPLORATION/REFUSAL

NOTES:

1. SEE FIGURE 2, SUBSURFACE EXPLORATION PLAN, FOR TEST BORING AND FOUNDATION LOCATIONS.
2. FOR DETAILED DESCRIPTION OF SUBSURFACE MATERIAL REFER TO TEST BORING LOGS CONTAINED IN APPENDIX A OF THIS REPORT.
3. LINES REPRESENTING CHANGES IN STRATA ARE BASED UPON INTERPOLATION BETWEEN SUBSURFACE EXPLORATIONS AND MAY NOT REPRESENT ACTUAL FIELD CONDITIONS AT OTHER THAN SPECIFIED EXPLORATION LOCATIONS.
4. THE STRATIFICATION LINES SHOWN ON THE GRAPHIC REPRESENTATION OF THE TEST BORINGS REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL OR ROCK TYPES. THE TRANSITION BETWEEN MATERIALS IS APPROXIMATE.

0 5 10
SCALE IN METERS

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

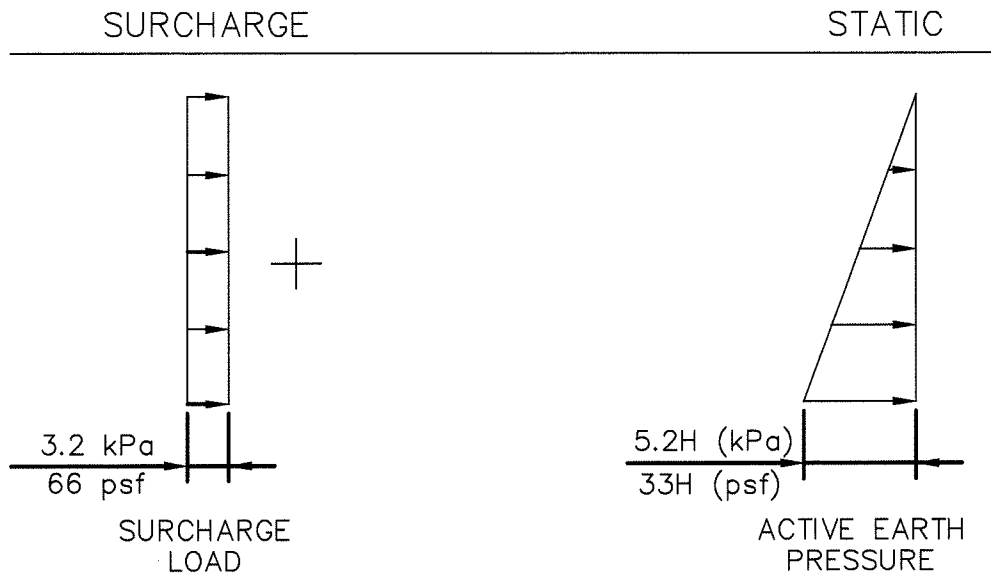
ABUTMENT NO. 2 PROFILE
BRIDGE NO. 06284
EASTBOUND E24 OFF RAMP
OVER MAD RIVER

SCALE: AS SHOWN APRIL 2001

91313-100 B03

FIGURE 3B

91313-100 A02



NOTES:

1. H IS IN METERS FOR S.I. CALCULATIONS AND FEET FOR ENGLISH CALCULATIONS.
2. THE WALL SHOULD BE DRAINED BY PERVIOUS STRUCTURE BACKFILL AND A STRUCTURE UNDERDRAIN OR WEEPHOLES, THEREFORE A HYDROSTATIC PRESSURE DIAGRAM IS OMITTED FROM THIS FIGURE.
3. THESE PRESSURE DISTRIBUTIONS ASSUME A HORIZONTAL BACKFILL BEHIND THE WALL.
4. SLIDING:
   COEFF. OF FRICTION BETWEEN FOOTING AND BASE = 0.60
   FS≥1.5 (STATIC)
   FS≥1.1 (SEISMIC)
5. OVERTURNING:
   FS≥2.0 (STATIC)
   FS≥1.1 (SEISMIC)
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

BRIDGE NO. 06284, EASTBOUND EXIT 24 OFF RAMP
OVER MAD RIVER
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

RECOMMENDED LATERAL LOADS ON UNRESTRAINED ABUTMENTS AND WINGWALLS

SCALE: AS SHOWN

APRIL 2001

FIGURE 4

APPENDIX A

Recent Test Borings Logs

R. Posa	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
S. Poff	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230820.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282869.10**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **111.69**	Utilized		X						X					X
Date Started: **2 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **2 March 2001**	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
Groundwater Observations	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ **1.68** m after **24** days	Fall (m)	0.6	0.6	0.6	0.6				0.76		of bit		Carbide	
@ m after days														

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 ELEV./ DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.41	D	5	3	12	15	111.13	Medium dense red-brown coarse to fine SAND, some coarse to fine gravel, trace silt, moist, slight odor noted similar to fuel, top 0.08 m. frozen
		0.61-1.22	2	0.61	0.48	D	13	17	15	14	0.56	Dense black to gray coarse to fine SAND, little silt, trace gravel, moist, odor noted similar to fuel
		1.52-2.13	3	0.61	0.51	D	9	12	15	12	109.56	Same as S2, except medium dense
		2.44-3.05	4	0.61	0.46	D	11	21	21	25	2.13	Note: Auger through cobble 2.1 m. to 2.4 m.
		3.05-3.66	5	0.61	0.51	D	34	28	28	19		-FILL-
5		4.57-5.18	6	0.61	0.38	D	40	51	55	62		Dense light brown to olive brown coarse to fine SAND, some gravel, little silt, wet, slight odor noted similar to fuel
												Very dense gray brown to olive brown coarse to fine SAND, some coarse to fine gravel, little silt, wet, very slight odor
		6.10-6.71	7	0.61	0.43	D	14	48	63	70		Very dense light brown coarse to fine SAND and coarse to fine GRAVEL, little silt, no odor, wet
		7.62-8.08	8	0.46	0.29	D	31	39	100/.15			Note: Cored through boulder 5.2 m. to 6.1 m.; rec.= 0.46 m.
												Very dense light brown coarse to fine SAND, little silt, trace coarse to fine gravel, no odor, wet
10		9.14-9.14	9	0.00	0.00	D	100/0					Same as S7
												Note: Drill action suggest few cobbles and boulders
		10.67-11.28	10	0.61	0.46	D	21	18	39	47		No Recovery
												Note: Split spoon refusal on boulder
		12.19-12.80	11	0.61	0.30	D	15	18	18	31		Note: Roller bit through boulder 9.14 m. to 9.53 m.
												Very dense light brown coarse to fine SAND, some coarse to fine gravel, little silt, no odor, wet
		13.72-14.33	12	0.61	0.51	D	48	51	27	19		Note: Drill action suggest cobbles and few boulders
15												Dense gray brown coarse to fine SAND, some

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**19.8**	**21.34** m	**3.05** m
			No. of Samples	
			16D, 2C	

NOTES: **Case mounted Mobile Drill B-47 with rope cathead drive safety hammer. Borehole backfilled upon completion.**

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

Hole No. **S5-1**
Sheet **1** of **3**

R. Posa	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
S. Poff	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230820.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282869.10**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	Berger, Lehman Associates, P.C.
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **111.69**														
Date Started: **2 March 2001**	Utilized		X						X					X
Date Finished: **2 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **1.68** m after **24** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after days	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 ELEV./ DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24-15.29	13	0.05	0.00	D	100/.05					coarse to fine gravel, little silt, no odor, wet Very dense light brown coarse to fine SAND and coarse to fine GRAVEL, trace silt, wet, no odor
		16.76-16.76	14	0.00	0.00	D	50/0.0					Note: Drill action suggest numerous cobbles and boulders
		18.29-18.90	15	0.61	0.00	D	27	26	24	28		Note: Roller bit through boulder 14.33 m. to 14.88 m. No Recovery
20		19.81-20.04	16	0.23	0.00	D	58	100/.08				Note: Split spoon refusal at 15.29 m. on boulder Note: Roller bit through boulder 15.29 m. to 15.54 m. No Recovery
		21.34-22.86	1	1.52	1.24	C		[RQD = 82%]			90.35 21.34	Note: Split spoon refusal at 16.76 m. on boulder Note: Cored through boulder 16.76 m. to 17.07 m.
		22.86-24.38	2	1.52	1.06	C		[RQD = 70%]			87.31 24.38	Note: Roller bit through boulder 17.37 m. to 17.68 m. No Recovery, coarse gravel lodged in split spoon shoe, probable cobble fragment No Recovery
25												Note: Split spoon refusal on boulder at 20.42 m. Note: Boulder to 21.2 m. Note: Roller bit refusal at 21.34 m. -GLACIOFLUVIAL DEPOSITS- C1- Very hard, fresh, gray and white, coarse to fine grained, BIOTITE GNEISS. Foliation is moderately dipping, extremely close. Joints are moderately dipping, moderate, rough, undulating, fresh, tight. C2- Same as C1, except joints are wide
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**19.8**	**21.34** m	**3.05** m
			No. of Samples	
			16D, 2C	

NOTES: **Case mounted Mobile Drill B-47 with rope cathead drive safety hammer. Borehole backfilled upon completion.**

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

Hole No. **S5-1**
Sheet **2** of **3**

R. Posa	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
S. Poff	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230820.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282869.10**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **111.69**
Date Started: **2 March 2001**
Date Finished: **2 March 2001**

Groundwater Observations
@ **1.68** m after **24** days
@ m after days

	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	X	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 ELEV./ DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
												Note: Left last 0.46 m. down the hole
												-BEDROCK-
												Bottom of Exploration at 24.38 m.
35												
40												
45												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**19.8**	**21.34** m	**3.05** m
			No. of Samples	
			16D, 2C	

NOTES: **Case mounted Mobile Drill B-47 with rope cathead drive safety hammer. Borehole backfilled upon completion.**

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

Hole No. **S5-1**
Sheet **3** of **3**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230812.12**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282857.77**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **111.41**														
Date Started: **27 February 2001**	Utilized			X					X					X
Date Finished: **2 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **2.29** m after **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after days	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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.30	D	15	17	34	29		Very dense brown coarse to fine SAND and SILT, trace fine gravel, grass, no odor
		0.61-0.61	2	0.00	0.00	D	50/0					No Recovery
		1.52-2.13	3	0.61	0.15	D	15	13	12	17		Medium dense red-brown to black coarse to fine SAND, little fine gravel, silt, strong odor noted similar to fuel
		2.13-2.74	4	0.61	0.45	D	37	61	35	36	109.28 / 2.13	-FILL-
		3.05-3.50	5	0.45	0.50	D	29	48	100			Very dense gray-brown coarse to fine SAND, trace silt, fine gravel, strong odor noted similar to fuel
5		4.57-5.18	6	0.61	0.15	D	47	61	76	79		Very dense gray brown medium to fine GRAVEL and coarse to fine SAND
												Very dense gray brown coarse to fine SAND and coarse to fine GRAVEL, trace silt
		6.10-6.71	7	0.61	0.15	D	15	11	14	16	105.01 / 6.40	Medium dense gray brown coarse to fine SAND and GRAVEL
												Medium dense gray SILT and fine SAND
		7.62-8.23	8	0.61	0.00	D	29	31	34	20		Pushing gravel (pieces in tip)
10		9.14-9.75	9	0.61	0.45	D	18	27	31	22		Very dense gray brown coarse to fine SAND, little fine gravel, trace silt
		10.67-10.97	10	0.30	0.10	D	47	100				Very dense gray brown coarse to fine SAND, some gravel, trace silt
												Boulder 10.97 m. to 11.89 m.
		12.19-12.80	11	0.61	0.10	D	24	14	19	22		Dense gray brown coarse to fine SAND, some fine gravel, trace silt
		13.72-13.82	12	0.10	0.00	D	100/.1					No Recovery
15												Boulder to 15.85 m.

Casing Size	From	To	Meters of Earth	Rock
HW	**0.0**	**19.8**	**22.10** m	**3.05** m
			No. of Samples	
			16D, 2C	

NOTES: **Bomb mounted Diedrich D-50 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion. Redrilled hole 4 times, broke casing on obstruction at 13.72 m. twice and shopped roller bit at same depth.**

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

Hole No. **S5-2**
Sheet **1** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230812.12**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282857.77**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **111.41**														
Date Started: **27 February 2001**	Utilized			X					X					X
Date Finished: **2 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **2.29** m after **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after days	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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24-15.24	13	0.00	0.00	D	50/0					No Recovery
												Cored boulder 15.85 m. to 16.61 m.
		16.76-17.37	14	0.61	0.61	D	11	17	18	17		Dense brown coarse to fine SAND and coarse to fine GRAVEL, with cobbles
		18.29-18.90	15	0.61	0.61	D	18	25	24	31		Very dense brown coarse to fine SAND, trace fine gravel
20		19.81-19.96	16	0.15	0.00	D	100					No Recovery
												Advanced roller bit to 22.10 m. through boulders
											90.07 / 21.34	-GLACIOFLUVIAL DEPOSITS-
		22.10-23.62	1	1.52	1.52	C		[RQD = 91%]				C1- Hard, fresh, gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is moderately dipping, extremely close. Joints are low angle to moderate, rough, undulating, discolored, open.
		23.62-25.14	2	1.52	1.52	C		[RQD = 95%]				C2- Same as C1, except foliation is extremely to very close. Joints are moderately dipping, very close to moderate.
25											86.27 / 25.14	-BEDROCK-
												Bottom of Exploration at 25.14 m.
30												

Casing Size	From	To	Meters of Earth	Rock
HW	**0.0**	**19.8**	**22.10** m	**3.05** m
			No. of Samples	
			16D, 2C	

NOTES: **Bomb mounted Diedrich D-50 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion. Redrilled hole 4 times, broke casing on obstruction at 13.72 m. twice and shopped roller bit at same depth.**

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

Hole No. **S5-2**
Sheet **2** of **2**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230791.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282912.90**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **114.07**														
Date Started: **26 February 2001**	Utilized		X						X					X
Date Finished: **27 February 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **3.96** m after **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after days	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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.30	1	0.30	0.15	D	8	100				Very dense dark brown SILT, with leaves, grass, wood, little coarse gravel (in tip of spoon), trace coarse to fine sand
		0.91-1.52	2	0.61	0.20	D	5	10	8	5		Cobble from 0.3 m. to .91m.
		1.52-2.13	3	0.61	0.30	D	9	15	25	42	112.24	Medium dense brown coarse to fine SAND, some medium to fine gravel, little silt, wood
											1.83	-FILL-
		2.13-2.26	4	0.13	0.13	D	100/.13					Very dense orange brown coarse to fine SAND, little medium to fine gravel, trace coarse to fine gravel
		3.35-3.96	5	0.61	0.30	D	28	30	15	14		Same as D3
5		4.57-5.18	6	0.61	0.20	D	17	15	13	15		Boulder 2.74 m. to 3.35 m.
												Dense brown coarse to fine SAND and SILT, some coarse to fine gravel
		6.10-6.71	7	0.61	0.18	D	24	29	17	19		Medium dense brown coarse to fine SAND, little silt, coarse gravel
												Dense brown coarse to fine SAND, some medium to fine gravel, trace silt
		7.62-8.23	8	0.61	0.30	D	9	11	13	18		Medium dense brown coarse to fine SAND, little medium gravel, silt
10		9.14-9.75	9	0.61	0.10	D	15	14	18	23		Dense brown fine SAND, some silt, trace coarse gravel
		10.67-11.28	10	0.61	0.30	D	14	18	19	21		Dense brown fine SAND, little silt, trace sand, -GLACIOFLUVIAL DEPOSITS-
											102.49	
		11.73-13.25	1	1.52	1.21	C		[RQD = 54%]			11.58	C1- Hard, fresh, gray and white medium to fine grained BIOTITE GNEISS. Foliation is high angle, extremely close. Joints are low to high angle close to moderate, rough, undulating, discolored, open.
		13.26-14.78	2	1.52	1.47	C		[RQD = 75%]				C2- Same as C1, except joints are very close to moderate
15												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**10.7**	**11.73** m	**6.10** m
			No. of Samples	
			10D,4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

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

Hole No. **S5-3**
Sheet **1** of **2**

J. Muccino	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S5-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230791.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282912.90**
SOILS ENGINEER	PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	**Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **114.07**														
Date Started: **26 February 2001**	Utilized		X						X					X
Date Finished: **27 February 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	55
@ **3.96** m after **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ m after days	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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		14.78-16.30	3	1.52	1.33	C		[RQD = 88%]				C3- Same as C1, except joints are wide spaced
		16.31-17.83	4	1.52	1.19	C		[RQD = 63%]				C4- Same as C1, except joints are low angle to moderately dipping
											96.24	-BEDROCK-
											17.83	Bottom of Exploration at 17.83 m.
20												
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**10.7**	**11.73** m	**6.10** m
			No. of Samples	
			10D,4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

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

Hole No. **S5-3**
Sheet **2** of **2**

J. Muccino DRILLER	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No. **S5-4**
P. Carrera INSPECTOR	TOWN: **Waterbury, Connecticut**	Line & Station Offset N. Coordinate **230784.73**
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME: **Reconstruction of I-84** PROJECT NUMBER: **State: 151-273/H&A: 91313-100** BORING CONTRACTOR: **General Borings, Inc.**	E. Coordinate **282898.31** **Berger, Lehman Associates, P.C.** PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **114.32**														
Date Started: **27 February 2001**	Utilized		X						X				X	
Date Finished: **28 February 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NQ(st)	NQ(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	51
@ **3.74** m after **16** hours	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	

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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		0.00-0.61	1	0.61	0.45	D	5	6	6	19		Medium dense brown coarse to fine SAND, little fine gravel, trace silt
		0.61-1.22	2	0.61	0.41	D	21	8	16	18		Medium dense brown coarse to fine SAND, little silt, trace fine gravel
		1.52-2.13	3	0.61	0.30	D	7	11	14	24	112.19 2.13	Medium dense brown coarse to fine SAND and GRAVEL, trace silt
												-FILL-
		3.05-3.05	4	0.00	0.00	D	50/0					No recovery on cobble
5		4.57-5.18	5	0.61	0.25	D	8	10	16	18		Medium dense brown coarse to fine SAND, little fine gravel, trace silt
		6.10-6.71	6	0.61	0.36	D	13	16	15	13		Dense brown coarse to fine SAND, little fine gravel, trace silt
		7.62-7.92	7	0.30	0.15	D	18	100				Very dense brown coarse to fine SAND and medium to fine GRAVEL, trace silt
10		9.14-9.75	8	0.61	0.20	D	18	16	11	15		Medium dense brown coarse to fine SAND and medium to fine GRAVEL, trace silt
		10.67-11.28	9	0.61	0.30	D	11	16	24	21		Dense brown coarse to fine SAND and medium to fine GRAVEL, trace silt
		12.19-12.80	10	0.61	0.15	D	17	13	13	16		Medium dense brown fine SAND, little silt
		13.72-14.33	11	0.61	0.00	D	17	15	61	18		No recovery - coarse gravel in spoon tip
15												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**15.2**	**15.70** m	**6.10** m
			No. of Samples	
			12D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S5-4**
Sheet **1** of **2**

J. Muccino DRILLER	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No. **S5-4**
P. Carrera INSPECTOR	TOWN: **Waterbury, Connecticut**	Line & Station Offset N. Coordinate **230784.73**
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME: **Reconstruction of I-84** PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	E. Coordinate **282898.31** **Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **114.32**														
Date Started: **27 February 2001**	Utilized		X						X				X	
Date Finished: **28 February 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NQ(st)	NQ(dt)
Groundwater Observations	Size I.D. (mm)	60	76	100	64				35	X	35	35	55	51
@ **3.74** m after **16** hours	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	

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 ELEV./DEPTH (m)	FIELD IDENTIFICATION OF SOIL REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)
		15.24-15.54	12	0.30	0.10	D	25	100			98.78	Very dense brown fine SAND and GRAVEL, little silt
		15.70-17.22	1	1.52	1.52	C		[RQD = 80%]			15.54	-GLACIOFLUVIAL DEPOSITS- C1- Hard, fresh, gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is moderately dipping, extremely close. Joints are low angle to moderately dipping, very close to moderate, rough, planar to undulating, discolored, open
		17.22-18.74	2	1.52	1.52	C		[RQD = 68%]				
		18.75-20.27	3	1.52	1.52	C		[RQD = 54%]				Note: Mineral growth on some joints surfaces C2- Same as C1 C3- Same as C1, except joints are low angle to vertical, extremely close to moderate C4- Same as C1, except joints are low angle, undulating, fresh to discolored
20												
		20.27-21.79	4	1.52	1.52	C		[RQD = 93%]				
											92.53 21.79	Bottom of Exploration at 21.79 m.
25												
30												

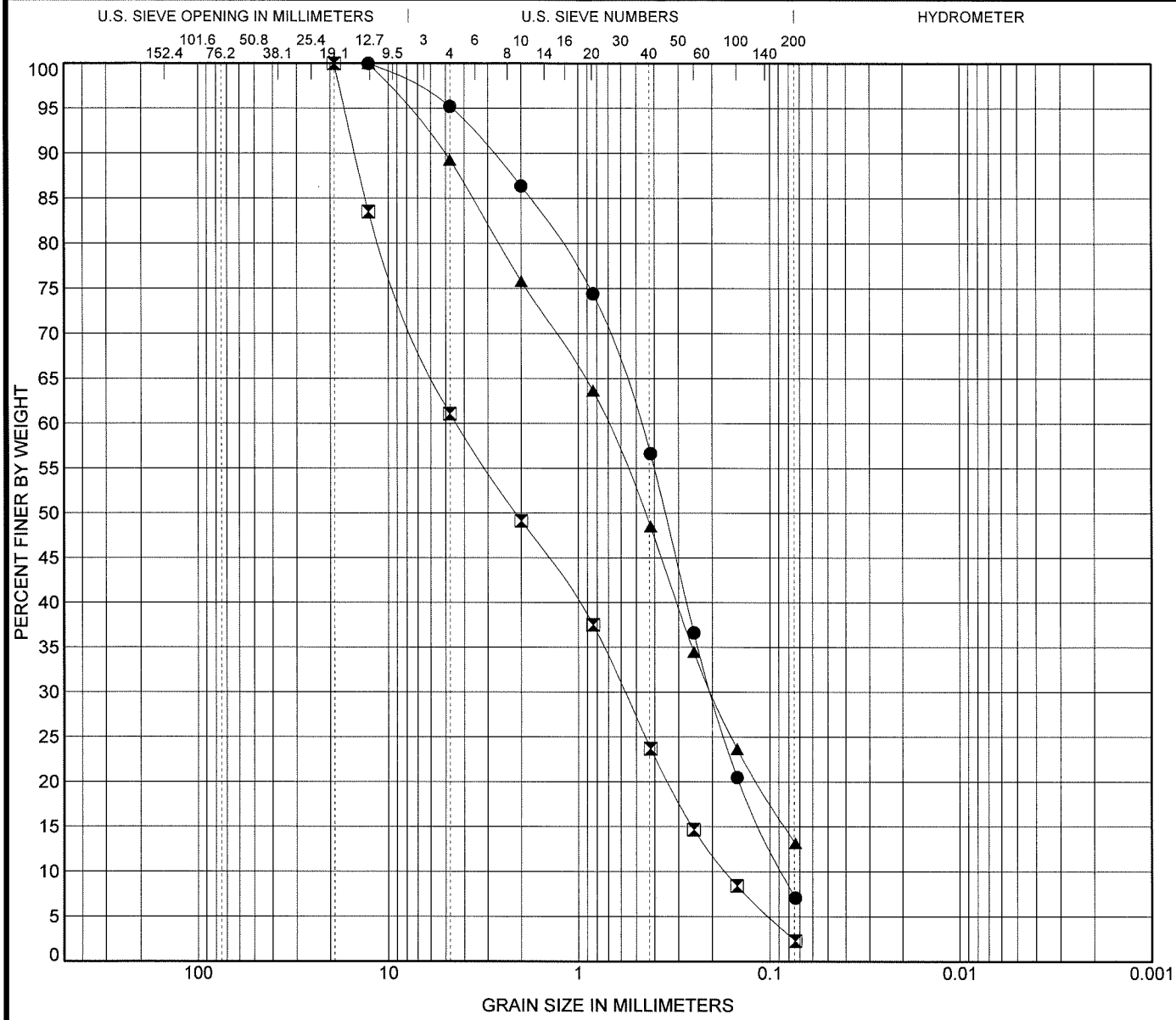
Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**15.2**	**15.70** m	**6.10** m
			No. of Samples	
			12D, 4C	

NOTES: **Truck mounted Mobile Drill B-53 with wire winch to drive safety hammer. Borehole backfilled with drill cuttings upon completion**

SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test
PROPORTIONS USED: Trace=1-10% Little=10-20%, Some=20-35%, And=35-50%

Hole No. **S5-4**
Sheet **2** of **2**

APPENDIX B
Laboratory Results



	COBBLES	% GRAVEL			% SAND		% FINES	
		COARSE	MEDIUM	FINE	COARSE	FINE	% SILT	% CLAY
●	0.0	0.0	1.4	12.2	29.7	49.5	7.1	
⊠	0.0	0.0	23.1	27.8	25.4	21.4	2.3	
▲	0.0	0.0	3.2	21.0	27.3	35.3	13.2	

	Expl. No.	Sample No.	Depth (m)	LL	PL	PI	Water Content (%)	Cc	Cu
●	S5-1	D1	0-0.61	NP	NP	NP	14.41	0.99	5.56
⊠	S5-2	D5	3.1 - 3.5	NP	NP	NP	12.34	0.45	25.94
▲	S5-3	D2	0.91-1.52	NP	NP	NP	18.82		

Sample Description

●	Red brown coarse to fine SAND, little fine gravel, trace silt - FILL
⊠	Gray brown medium to fine GRAVEL and coarse to fine SAND - GLACIOFLUVIAL
▲	Brown coarse to fine SAND, some medium to fine Gravel, little silt - FILL

Remarks:

HALEY & ALDRICH
Glastonbury, Connecticut

U.S. Interstate Route 84 Reconstruction
Waterbury, Connecticut
State Project No.: 151-273

GRAIN SIZE DISTRIBUTION

Date: 4/16/2001 File No.: 91313-100

CONN DOT SIEVE 91313SA.GPJ US LAB.GDT 4/25/01