GEOTECHNICAL ENGINEERING REPORT
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
BRIDGE NO. 05774, I-84 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 28 January 2003
21 May 2001
File 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. 05774, I-84 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. 05774, I-84 over the Mad River, for the I-84 Reconstruction project. The work was conducted in accordance with our agreement dated 26 December 2000.

In summary, subsurface conditions consist of fill and glaciofluvial sand overlying bedrock. Bridge No. 05774 will be a simply supported bridge on two abutments. We recommend the structure be supported on end bearing H-Piles. Our detailed recommendations follow.

PROPOSED CONSTRUCTION

Bridge No. 05774 (formerly referred to as Structure 6) carries I-84 eastbound and westbound lanes over the Mad River in Waterbury, Connecticut, see Figure 1, Project Locus.

Bridge No. 05774 will be a simply-supported, single-span bridge with a welded steel plate girder super structure. The spans will be about 38.8 m along the westbound baseline, and 38.9 m along the eastbound. Wingwalls will be U-type. I-84 bridge grade will be approximately El. 115.5. Abutment 1 subgrade will be El. 109.5, Abutment 2 subgrade will be El 110.

The Mad River currently runs through both Abutment 1 and 2 footprint areas. Prior to construction of the bridge the river will be relocated and the old river channel backfilled. The new channel will be straightened and routed between the abutments as shown on Figure 2. Proposed 100-yr flood level at Bridge No. 05774 ranges from El. 112.8 on the downstream side to El. 113.2 on the upstream side.

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

SITE CONDITIONS

Abutment 1 is located within the dry lakebed of the former Scoville Pond on the west bank of the Mad River. The Mad River flows through the Abutment 1 footprint area. The lakebed is relatively flat, with grades ranging from approximately El. 112 to El 110. Contaminated demolition debris was placed within Scoville Pond in the late 1990's in the approximate area shown on Figure 2. Abutment 1 is located about 35 m east of the contaminated fill.

Abutment 2 is located near the eastern limits of the former Scoville Pond. The Mad River flows through the proposed Abutment 2 footprint area. The east bank of Scoville Pond rises to a gravel road at El. 114 and then up to Harpers Ferry Road at El. 121 as shown in Figure 2. A pump station is located about 10.5 m east of Abutment 2. A 600-mm dia. reinforced concrete sewer runs along the unpaved road and connects with the pump station. It is not yet known whether the sewer will be relocated at Bridge No. 05774 as part of this project. We have assumed that this portion of the sewer will remain in service during construction.

The bottom of the Mad River channel is El 109.5. The elevation of the Mad River is approximately El. 110.

SUBSURFACE INVESTIGATIONS

Recent Explorations

Six borings (S6-1 through S6-6) were drilled by General Borings, Inc of Prospect, Connecticut, between 26 February 2001 and 13 March 2001. The test borings were drilled with 76 mm I.D. casing to depths ranging from 13.87 m to 23.77 m, including 23.21 m of rock coring. Bedrock was cored at each boring with a 55 mm I.D. NX core barrel. Standard Penetration Tests were conducted at maximum 1.5 m intervals in overburden soil. Boring locations are shown on Figure 2. Haley & Aldrich, Inc. monitored the drilling. As drilled locations and elevations were surveyed by A-I Engineering of Middletown, Connecticut.

SUBSURFACE CONDITIONS

Subsurface conditions encountered in the explorations consist of fill, alluvial deposits 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 on Table I.

Thickness (m)	Generalized Description
0 to 2.4	**FILL** – Loose to medium dense, brown, coarse to fine SAND, little to trace medium to fine gravel, some to trace silt. Loose black SILT and fine SAND varying to a dense dark brown SILT with little to trace coarse sand. An acrid odor was noted and a sheen was visible on the surface of the drilling water at S6-1.
0 to 0.9	**Alluvial Deposits** – Very loose to loose dark gray, gray-brown SILT and fine SAND to fine SAND, trace silt, organics, fine gravel. A strong odor similar to petroleum was noted in S6-3
9.3 to 17.4	**Glaciofluvial Deposits** – Medium dense to very dense light brown, olive-brown to brown, coarse to fine SAND and coarse to fine GRAVEL varying to a coarse to fine SAND, trace to little silt. A fine SAND and SILT, trace medium to fine gravel. A slight acrid odor was encountered in S6-1, and an odor similar to petroleum was noted in the upper part of the deposit in S6-1, S6-2, and S6-5.

Bedrock – The bedrock is described as very hard, fresh to slightly weathered, BIOTITE GNEISS, and is part of the Waterbury Gneiss formation. Bedrock level ranges from El. 92.06 to El. 101.86. Elevations of the top of bedrock are listed in Table I and shown on the subsurface profile.

Groundwater Conditions

Water was encountered in all the borings, at approximately EL. 109.9 to El. 111.0. Groundwater levels will fluctuate with water levels in the Mad River, season, precipitation, and nearby construction activity. Normal water level in the Mad River is about El 110, and the 100-yr. flood level is 113.2.

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 Type

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.

- 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.

- 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.

- Maximum total settlement is estimated at 6 mm. Maximum differential settlement between abutments will be less than 6 mm. This settlement will occur during construction.

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

Abutment No. 1

Abutment No. 1 is located at EB Sta. 2+328. The bottom of pile cap is El. 109.5 within the glaciofluvial and alluvial deposits. Bedrock is between El. 92.06 and El. 97.55, as shown in figure 3A.

Abutment No. 2

Abutment No. 2 is located at EB Sta.2+369. The bottom of pile cap is El. 110, within the glaciofluvial and alluvial deposits. Bedrock is between El. 96.83 and El.101.86, as shown on Figure 3B.

Estimated vertical pile lengths, assuming top of pile is 0.3 m above the bottom of 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. Based on the Bridge Design Manual, single span structures do not need to be designed for seismic loads.

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 backfill should meet the requirements of CONNDOT Form 815M.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 3m.

Environmental Observations

Odors similar to petroleum were noted at borings S6-2, S6-3 and S6-5, and an acrid odor was noted in S6-1. The Department's environmental consultant should evaluate the environmental

impacts of contamination, including health and safety issues for the workers during construction, whether existing soils may be reused as fill, and other issues.

Abutment 1 is located about 35 m east of the contaminated demolition debris placed in Scoville Pond. Contamination noted in the borings may not be related to the contaminated fill near Abutment 1, but may be the result of historical industrial uses upstream of the site.

Reuse of Excavated Material

The existing fill and alluvial deposits are not suitable for reuse as pervious structure backfill or granular fill. Excavated soils will generally be suitable for embankment fill. However, contaminated soils at Abutment 1 may not be suitable for reuse and may require special offsite 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

Temporary excavations up to approximately 3 m will be required for both abutments. Open cut excavations appear feasible above groundwater, however, temporary lateral support will likely be required below groundwater, and at the end of Abutment 2 to protect the existing sewer. Steel sheetpiling is expected to be the preferred lateral support alternative since it will form a groundwater cutoff and facilitate excavation dewatering. However, boulders in the glaciofluvial deposits could obstruct installation of sheets. We anticipate that soldier piles and lagging will also be feasible. However, boulders would obstruct installation of soldier piles and predrilling may be necessary at some locations.

Excavations will be in fill, alluvial and glaciofluvial deposits. Conventional heavy construction equipment appears practical for excavation of overburden soils. However, chiseling or mechanical splitting may be necessary for removal of 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 (Soil Profile Type B), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Cofferdam and Dewatering

Water levels in recent borings were between El. 109.9 and El. 111.0, approximately 0.36 to 1 m above the bottom of pile cap. Therefore, cofferdam and dewatering will be required. The fill and glaciofluvial deposits are very pervious, and excavation dewatering quantities could be significant. A steel sheetpile cofferdam would help reduce excavation dewatering quantities. We anticipate that excavation dewatering may be accomplished by pumping from filtered sumps or wells. Crushed stone over geotextile fabric placed over the exposed subgrade should facilitate excavation dewatering and help maintain a stable subgrade.

Pile Installation

The maximum hammer energy should be determined by a wave equation analysis by the contractor based on the specific hammer characteristics. Test piles should be installed in advance of production pile driving, as indicated on Table II.

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

Final Comments

This report has been prepared for specific application to Bridge No. 05774, as understood at this time, in accordance with generally accepted geotechnical engineering practice common to the local area. In the event that changes in the nature, design or location of the project elements are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed by Haley & Aldrich, Inc. and the conclusions of this report modified or verified in writing.

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

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

Sincerely yours,
HALEY & ALDRICH, INC.

Allison St. Pierre
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 Subsurface Profile
- Figure 3B –Abutment No. 2 Subsurface Profile
- Figure 4 – Recommended Lateral Loads on Unrestrained Abutments and Wingwalls
- Appendix A – Recent Test Borings Logs
- Appendix B – Laboratory Results

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TABLE I
SUMMARY OF SUBSURFACE DATA
BRIDGE 05774, I-84 OVER MAD RIVER
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-0273
WATERBURY, CONNECTICUT

EXPLOR. NUMBER	ELEV. (m)	DEPTH (m)	THICKNESS OF SOIL STRATA (m)			BEDROCK LEVEL (m)		GROUNDWATER LEVEL (m)	
			FILL	ALLUVIAL DEPOSITS	GLACIO FLUVIAL	DEPTH	ELEV.	DEPTH	ELEV.
S6-1	111.38	21.03	1.60	--	15.44	17.04	94.34	1.52	109.86
S6-2	112.68	20.42	2.44	--	13.41	15.85	96.83	2.39	110.29
S6-3	111.87	23.77	1.52	0.92	17.37	19.81	92.06	1.52	110.35
S6-4	110.29	15.24	--	0.61	10.64	11.25	99.04	0.05	110.24
S6-5	111.88	18.29	1.22	--	13.11	14.33	97.55	1.68	110.20
S6-6	111.16	13.87	[illegible]	[illegible]	9.30	9.30	101.86	0.15	111.01

NOTES:

Haley & Aldrich, Inc.

1. "--" - indicates n[illegible]
2. Elevations are in n[illegible] /D 29.
3. Refer to boring log[illegible] descriptions.
4. Groundwater levels [illegible] er drilling.

Tables

TABLE II
SUMMARY OF ESTIMATED PILE QUANTITIES
BRIDGE 05774, I-84 OVER MAD RIVER
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-0273
WATERBURY, CONNECTICUT

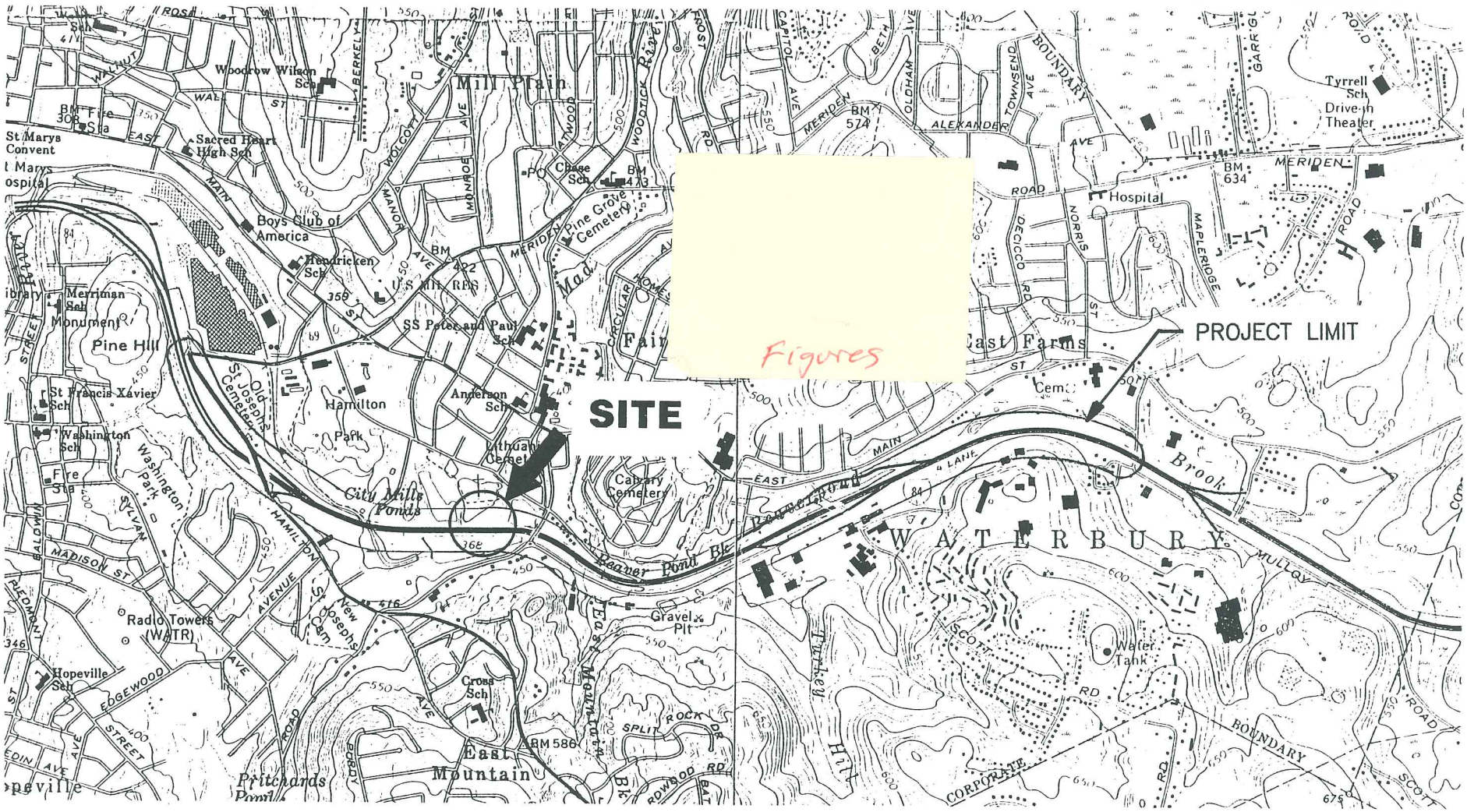
LOCATION	BOTTOM OF FOOTING ELEVATION	ASSUMED PILE CUT OFF ELEVATION	PILE TIP ELEVATION (RANGE)	PILE TIP ELEVATION (AVERAGE)	ESTIMATED PILE ORDER LENGTH, (m)	RECOMMENDED NUMBER OF TEST PILES	RECOMMENDED LENGTH TEST PILE (m)
Abutment No. 1	109.5	109.8	92.1-97.5	94.8	16.2	4	19
Abutment No. 2	110	110.3	96.9-101.8	99.4	12.1	4	15

NOTES:

Haley & Aldrich, Inc.

1. For estimating purposes, assume the number of splices to be one per pile.
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°32'23.11"N 073°00'38.02"W

CONNECTICUT

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

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

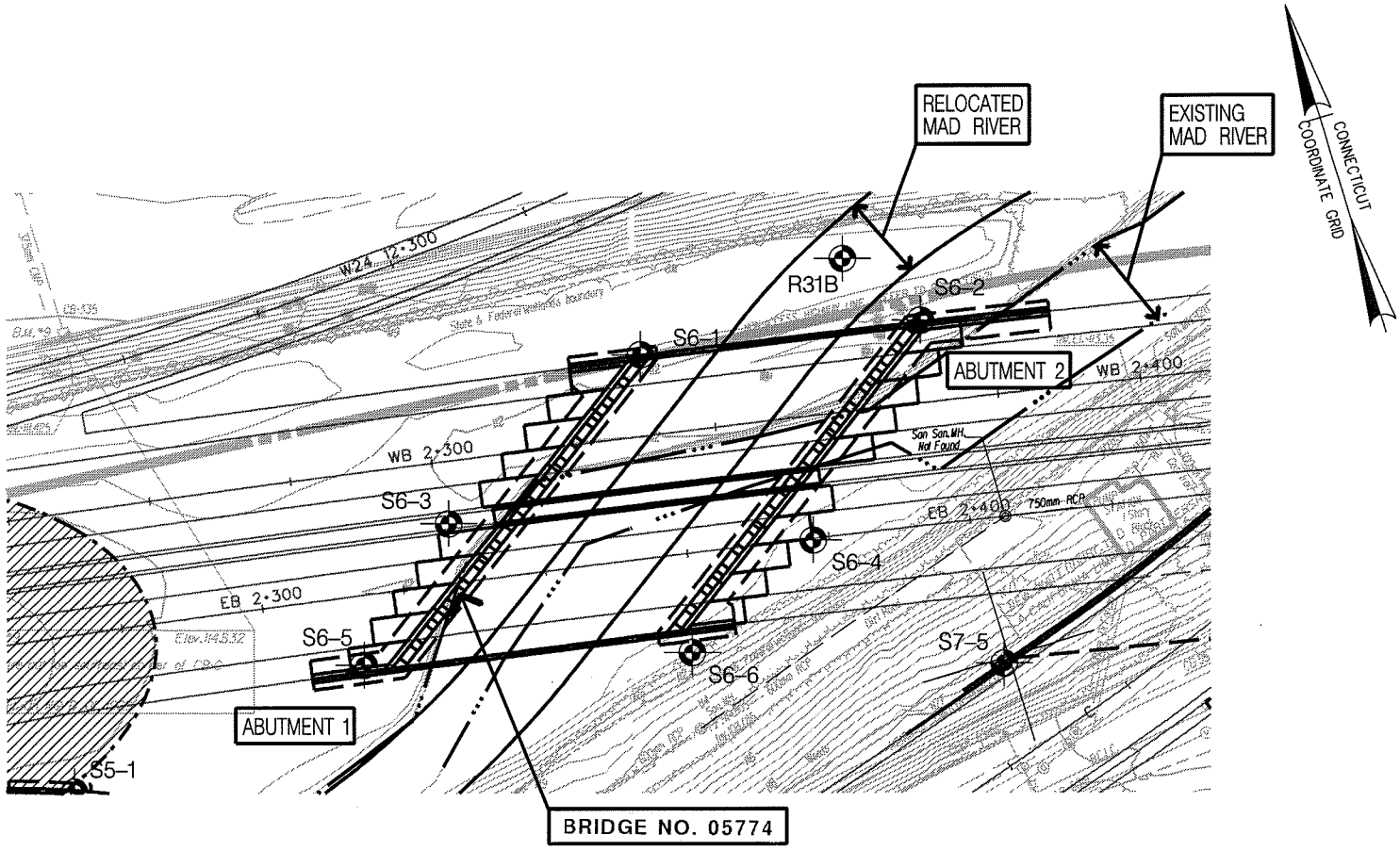
U.S. INTERSTATE 84 RECONSTRUCTION
STATE PROJECT NO. 151-0273
WATERBURY, CONNECTICUT

PROJECT LOCUS

SCALE: 1:24,000

APRIL 2001

FIGURE 1



PLAN LEGEND

LOCATION OF RECENT TEST BORING DRILLED BY GENERAL BORINGS, INC. OF PROSPECT, CONNECTICUT.

APPROXIMATE LIMITS OF CONTAMINATED SOIL AREA

NOTES:

1. BASE PLAN PROVIDED BY BERGER, LEHMAN ASSOCIATES. BORING LOCATIONS WERE SURVEYED BY A-I ENGINEERS.
2. ELEVATIONS ARE IN METERS, REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. REFER TO THE TEXT AND APPENDICES.

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

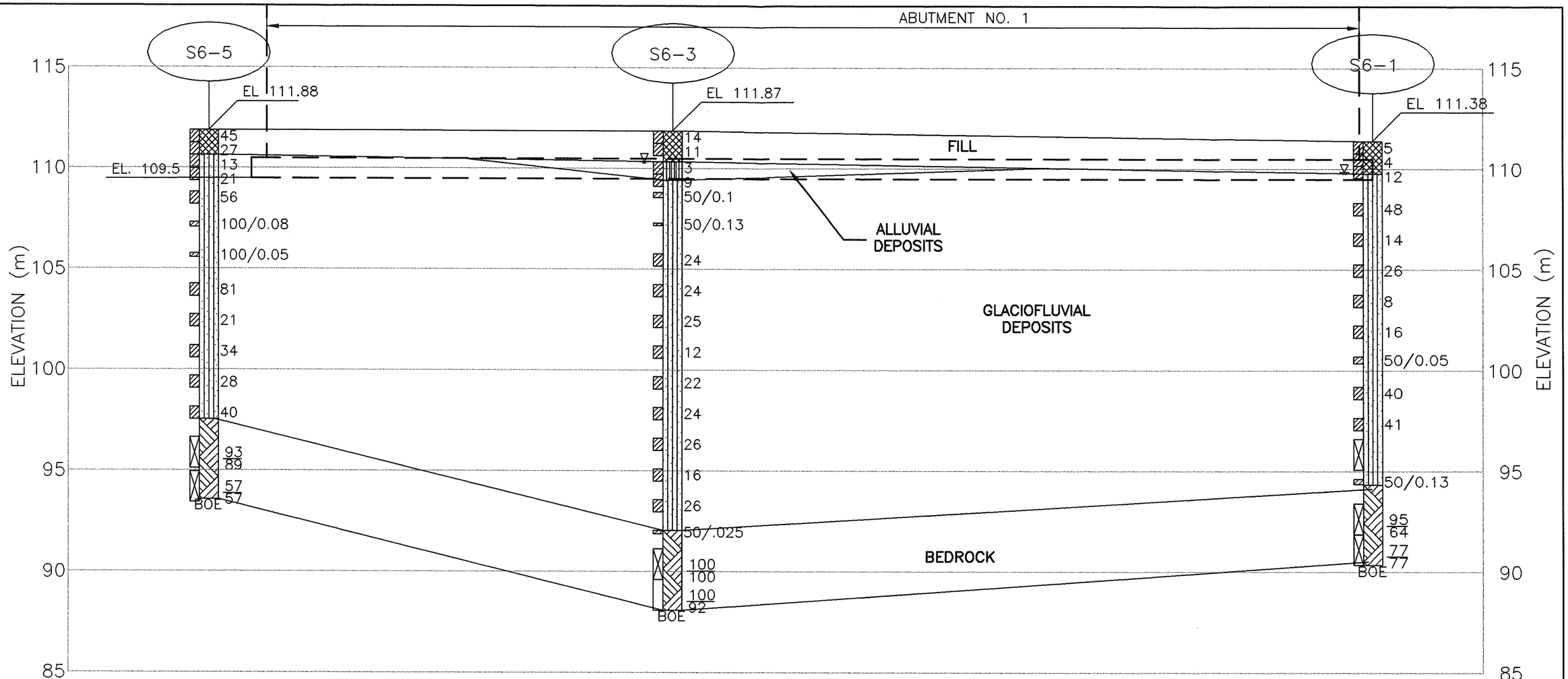
BRIDGE NO. 05774
SUBSURFACE EXPLORATION PLAN

SCALE: 1:1000

APRIL 2001

91313-100

FIGURE 2



ABUTMENT NO. 1
(LOOKING WEST)

LITHOLOGY GRAPHICS

- Fill
- Glaciofluvial Deposits
- Bedrock
- Alluvial Deposits

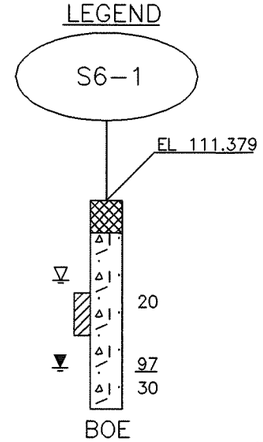
SAMPLER GRAPHICS

- SAMPLE OBTAINED BY A 51 mm O.D. SPLIT SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 0.76 m – NUMBER INDICATES STANDARD PENETRATION RESISTANCE N-VALUE OF SAMPLE INTERVAL, IN BLOWS PER 0.3 m
- CORE SAMPLE 55 mm DIA.

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.

LEGEND



- EXPLORATION DESIGNATION.
- APPROXIMATE GROUND SURFACE ELEVATION (METERS) AT EXPLORATION
- MAJOR STRATUM BOUNDARY BETWEEN DIFFERENT SOIL TYPES
- WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING
- SAMPLE LOCATION AND INTERVAL. SEE SAMPLER GRAPHIC LEGEND FOR SAMPLE TYPE
- WATER LEVEL NOTED AFTER DRILLING IN MONITORING WELL
- RECOVERY (%) / ROCK QUALITY DESIGNATION (%)
- BOTTOM OF EXPLORATION

0 5 10
SCALE IN METERS

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

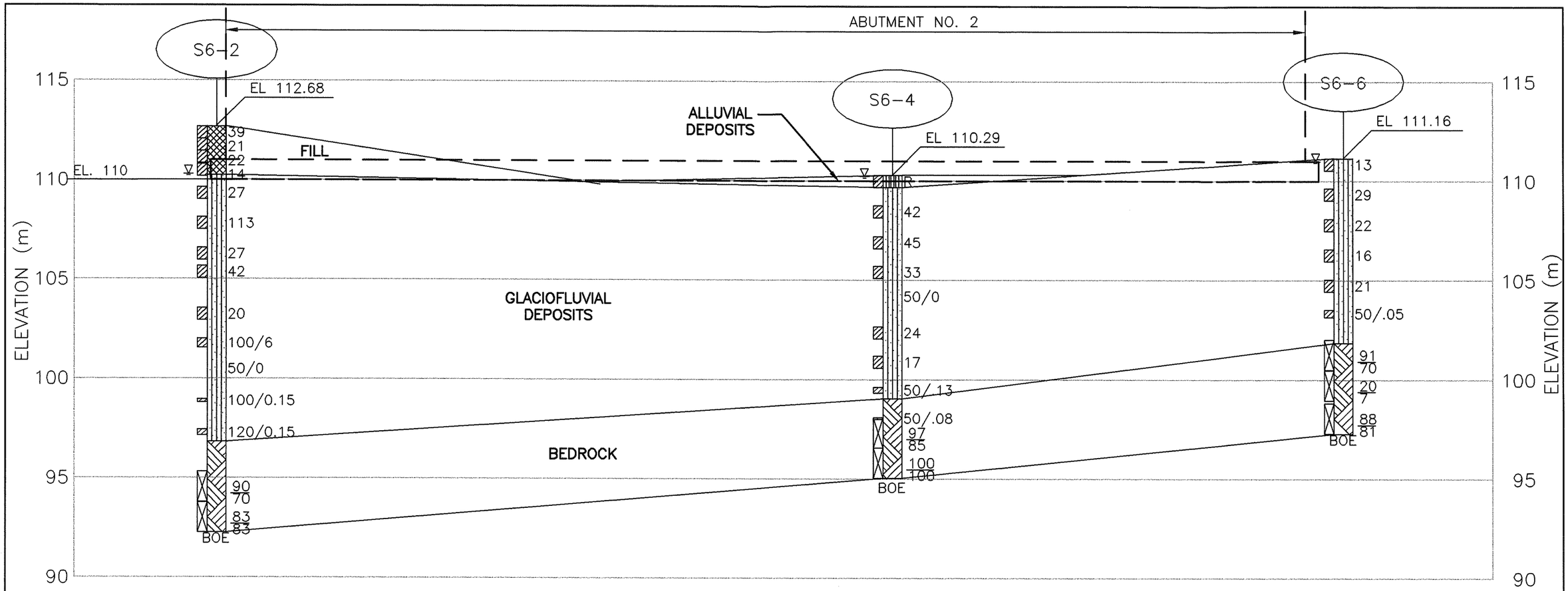
U.S. INTERSTATE ROUTE 84 RECONSTRUCTION
STATE PROJECT NO. 151-273
WATERBURY, CONNECTICUT

ABUTMENT NO. 1
SUBSURFACE PROFILE
BRIDGE NO. 05774
I-84 OVER MAD RIVER

SCALE: AS SHOWN
APRIL 2001

91313-100 B02

FIGURE 3A



ABUTMENT NO. 2
(LOOKING EAST)

LITHOLOGY GRAPHICS

Fill — Glaciofluvial Deposits — Bedrock — Alluvial Deposits

SAMPLER GRAPHICS

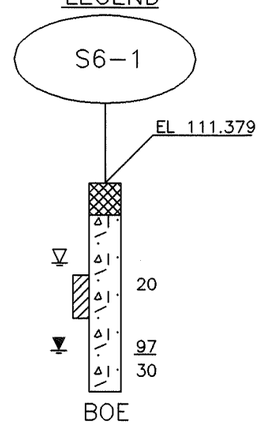
SAMPLE OBTAINED BY A 51 mm O.D. SPLIT SPOON SAMPLER WITH A 63.5 kg WEIGHT FALLING 0.76 m – NUMBER INDICATES STANDARD PENETRATION RESISTANCE N-VALUE OF SAMPLE INTERVAL, IN BLOWS PER 0.3 m

CORE SAMPLE 55 mm DIA.

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.

LEGEND



EXPLORATION DESIGNATION.

APPROXIMATE GROUND SURFACE ELEVATION (METERS) AT EXPLORATION

MAJOR STRATUM BOUNDARY BETWEEN DIFFERENT SOIL TYPES

WATER LEVEL NOTED DURING OR SHORTLY AFTER DRILLING

SAMPLE LOCATION AND INTERVAL. SEE SAMPLER GRAPHIC LEGEND FOR SAMPLE TYPE

WATER LEVEL NOTED AFTER DRILLING IN MONITORING WELL

RECOVERY (%) / ROCK QUALITY DESIGNATION (%)

BOTTOM OF EXPLORATION

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

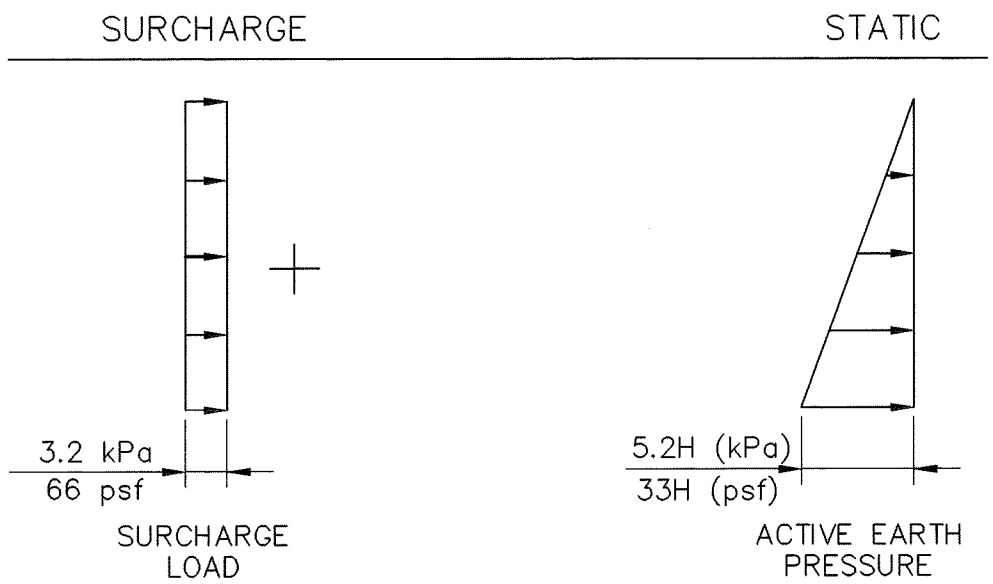
ABUTMENT NO. 2
SUBSURFACE PROFILE
BRIDGE NO. 05774
I-84 OVER MAD RIVER

SCALE: AS SHOWN — APRIL 2001

91313-100 B02

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
   RESISTANCE FACTOR = 0.80
5. OVERALL STABILITY:
   RESISTANCE FACTOR = 0.65
6. IGNORE PASSIVE RESISTANCE IN FRONT OF FOOTING.

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

BRIDGE NO. 05774, INTERSTATE 84 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

Test Borings Logs

Appendix A

J. Ouellette	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-1**
DRILLER	STATE OF CONNECTICUT	Line & Station
S. Poff	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230856.20**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282963.10**
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: **111.38**	Utilized		X						X					X
Date Started: **7 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **8 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	
@ **1.52** m after **0** 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	0.51	D	2	2	3	2	0.02	-TOPSOIL-
		0.61-1.22	2	0.61	0.41	D	2	2	2	2	110.70 / 0.68	Loose light brown coarse to fine SAND, trace silt, no odor, moist
		1.22-1.83	3	0.61	0.46	D	2	6	6	8	0.83 / 109.78	Loose black SILT and fine SAND, trace coarse sand, acrid odor, wet
											1.60	Medium dense dark brown coarse to fine SAND, some silt, wet, slight acrid odor Note: Sheen visible on drill water
		3.05-3.66	4	0.61	0.36	D	16	24	24	27		-FILL-
5		4.57-5.18	5	0.61	0.46	D	11	7	7	6		Medium dense light brown to olive-brown coarse to fine SAND and coarse to fine GRAVEL, little silt, slight odor, wet Note: Roller bit through common cobbles and boulders 2.13 m. to 4.57 m.
		6.10-6.71	6	0.61	0.28	D	7	11	15	17		Dense light brown coarse to fine GRAVEL and coarse to fine SAND, trace silt, wet, no odor
		7.62-8.23	7	0.61	0.00	D	6	4	4	4		Medium dense gray to olive-brown coarse to fine GRAVEL and coarse to fine SAND, little silt, wet, no odor Medium dense light gray-brown coarse to fine SAND, little medium to fine gravel, trace silt, no odor, wet No Recovery
10		9.14-9.75	8	0.61	0.36	D	6	7	9	9		Note: Hammer possibly pushed cobble Note: Roller bit ahead of casing at 7.62 m.
		10.67-11.02	9	0.35	0.15	D	15	30	50/0.05			Medium dense light brown to olive-brown coarse to fine SAND, some medium to fine gravel, little silt, no odor, wet
		12.19-12.80	10	0.61	0.30	D	19	20	20	22		Very dense light brown coarse to fine SAND and coarse to fine GRAVEL, little silt, no odor, wet Note: Split spoon refusal at 11.02 m. on boulder
		13.72-14.33	11	0.61	0.08	D	19	18	23	29	98.27 / 13.11	Note: Roller bit through boulder 11.02 m. Dense brown fine SAND, some silt, little coarse sand, coarse to fine gravel
15												Dense coarse to fine GRAVEL

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**14.8**	**17.98** m	**3.05** m
			No. of Samples	
			12D, 2C	

NOTES: **Bombadier mounted CME-45C with automatic 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. **S6-1**
Sheet **1** of **2**

J. Ouellette DRILLER	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No. **S6-1**
S. Poff INSPECTOR	TOWN: **Waterbury, Connecticut**	Line & Station Offset N. Coordinate **230856.20**
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282963.10**
	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: **111.38**	Utilized		X						X					X
Date Started: **7 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **8 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	
@ **1.52** m after **0** 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.)
		14.78-16.30	1	1.52	0.59	C						Cored boulders with 0.59 m. rec.
		16.76-17.01	12	0.25	0.05	D	15	50/0.13			94.34 17.04	Very dense gray brown medium to fine GRAVEL, some coarse to fine sand, trace silt -GLACIOFLUVIAL DEPOSITS-
		17.98-19.50	2	1.52	1.44	C		[RQD = 64%]				C1- Very hard, fresh to slightly weathered, gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is high angle to vertical, extremely close to very close. Joints are low angle to vertical, very close to moderately spaced, rough, undulating to stepped, discolored, open.
20		19.51-21.03	3	1.52	1.17	C		[RQD = 77%]				C2- Same as C1, except joints are low angle to moderately dipping, moderately spaced, undulating, fresh to discolored.
											90.35 21.03	-BEDROCK- Bottom of Exploration at 21.03 m.
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**14.8**	**17.98** m	**3.05** m
			No. of Samples	
			12D, 2C	

NOTES: **Bombadier mounted CME-45C with automatic 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. **S6-1**
Sheet **2** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230849.30**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283002.10**
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: **112.68**	Utilized			X					X					
Date Started: **7 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **8 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	
@ **2.39** m after **0** 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	0.46	D	11	26	13	13	112.07	Dense dark brown SILT, some fine sand, little coarse sand, trace gravel
		0.61-1.22	2	0.61	0.36	D	2	11	10	9	0.61	Medium dense brown coarse to fine SAND, little medium to fine gravel, trace silt
		1.22-1.83	3	0.61	0.30	D	13	17	5	7		Medium dense brown coarse to fine SAND, trace silt
		1.88-2.49	4	0.61	0.45	D	9	7	7	9	110.24	Medium dense brown coarse to fine SAND, little silt
											2.44	-FILL-
		3.05-3.66	5	0.61	0.15	D	19	13	14	11		Medium dense gray-brown coarse to fine SAND, little silt, trace fine gravel, petroleum odor, wood
5		4.57-5.18	6	0.61	0.20	D	25	65	48	34	107.96 4.72	Boulder 3.66 m. to 4.42 m. Very dense gray brown coarse SAND, some fine sand, little silt, trace coarse to fine gravel
		6.10-6.71	7	0.61	0.02	D	29	14	13	20		Very dense orange to gray-brown fine SAND, some silt, coarse sand, little coarse to fine gravel
		7.02-7.63	8	0.61	0.46	D	15	15	27	25		Note: Some coarse gravel, in spoon probable boulder fragments
											104.70 7.98	Medium dense gray brown coarse to fine SAND, little silt, trace fine gravel
												Very dense orange-brown fine SAND, little silt, trace coarse to fine gravel
10		9.14-9.75	9	0.61	0.15	D	12	10	10	11		Medium dense brown coarse to fine SAND, little silt, trace coarse to fine gravel
		10.67-11.13	10	0.46	0.15	D	19	21	100/6			Dense coarse to fine SAND and coarse to fine GRAVEL
												Very dense coarse to fine SAND and GRAVEL, some silt
		12.19-12.19	11	0.00	0.00	D	50/0					No Recovery
												Note: Split spoon refusal at 12.19 m. a probable boulder
		13.72-13.87	12	0.15	0.00	D	100/0.15					Note: Roller bit through boulder at 12.19 m. No Recovery
15												

Casing Size	From	To	Meters of Earth	Rock
HW	**0.0**	**17.3**	**17.37** m	**3.04** m
			No. of Samples	
			13D, 2C	

NOTES: **Bomb mounted Diedrich D-25 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. **S6-2**
Sheet **1** of **2**

E. Del Priore	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-2**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230849.30**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **283002.10**
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: **112.68**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **7 March 2001**	Utilized			X					X					
Date Finished: **8 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
@ **2.39** 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.)
		15.24-15.54	13	0.30	0.15	D	28	120/0.15			96.83 / 15.85	Dense coarse to fine SAND and medium to fine GRAVEL, trace silt Note: Drill action suggests common cobbles and boulders -GLACIOFLUVIAL DEPOSITS-
		17.37-18.89	1	1.52	1.37	C		[RQD = 70%]				Note: Weathered bedrock at 15.85 m. Roller bitted down to 17.37 m. C1- Very hard, fresh, gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is moderately dipping, extremely close. Joints are moderately dipping, parallel to foliation, close to wide spacing, rough, undulating to planar, fresh to discolored, open to tight.
20		18.90-20.42	2	1.52	1.26	C		[RQD = 83%]			92.26 / 20.42	C2- Very hard, fresh, gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is moderately dipping, extremely close to very close. Indeterminate joints. -BEDROCK- Bottom of Exploration at 20.42 m.
25												
30												

Casing Size	From	To	Meters of Earth	Rock
HW	**0.0**	**17.3**	**17.37** m	**3.04** m
			No. of Samples	
			13D, 2C	

NOTES: **Bomb mounted Diedrich D-25 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. **S6-2**
Sheet **2** of **2**

J. Ouellette	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230841.11**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282930.47**
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: **111.87**	Utilized		X						X					
Date Started: **12 March 2001**	Type	BW	NW	HW	Pipe	Solid	Hollow		SS		B(st)	B(dt)	NX(st)	NX(dt)
Date Finished: **13 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	
@ **1.52** m after **0** 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	0.51	D	11	8	6	6		Medium dense brown fine SAND, trace silt, coarse sand
		0.61-1.22	2	0.61	0.51	D	5	5	6	8		Medium dense brown coarse to fine SAND, trace fine gravel
		1.52-2.13	3	0.61	0.46	D	2	2	1	2	110.35 1.52	-FILL-
		2.13-2.74	4	0.61	0.38	D	12	3	6	20	109.43 2.44	Loose dark gray SILT and fine SAND, trace leaves organics, strong petroleum odor Loose gray brown coarse to fine SAND, trace silt, fine gravel -ALLUVIAL DEPOSITS-
		3.05-3.30	5	0.25	0.10	D	40	50/0.1				
5		4.57-4.70	6	0.13	0.13	D	50/0.13					Very dense gray coarse to fine GRAVEL, trace coarse to fine sand, silt Very dense gray brown medium to fine GRAVEL, some coarse to fine sand, trace silt
		6.10-6.71	7	0.61	0.20	D	23	11	13	11	105.62 6.25 104.87	Medium dense olive-brown SILT and fine SAND, trace coarse to medium gravel
		7.62-8.23	8	0.61	0.36	D	15	13	11	12	7.00	Medium dense brown fine SAND and SILT, trace fine gravel
10		9.14-9.75	9	0.61	0.25	D	15	13	12	13		Medium dense brown coarse to fine SAND, little coarse to fine gravel, silt
		10.67-11.28	10	0.61	0.20	D	9	5	7	9		Medium dense olive fine SAND and SILT, trace coarse sand, medium to fine gravel
		12.19-12.80	11	0.61	0.25	D	10	11	11	13	98.87	Medium dense olive fine SAND, little silt, trace coarse sand
		13.72-14.33	12	0.61	0.61	D	11	11	13	12	13.00	Medium dense brown fine SAND, little silt
15												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**19.8**	**20.73** m	**3.06** m
			No. of Samples	
			16D, 2C	

NOTES: **Bomb mounted CME C-45 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. **S6-3**
Sheet **1** of **2**

J. Ouellette	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-3**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230841.11**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282930.47**
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: **111.87**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **12 March 2001**	Utilized		X						X					
Date Finished: **13 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
@ **1.52** 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.)
		15.24-15.85	13	0.61	0.00	D	12	13	13	15		No Recovery
		16.76-17.37	14	0.61	0.23	D	17	7	9	11		Medium dense olive-brown fine SAND and SILT, little coarse sand, trace medium to fine gravel
		18.29-18.90	15	0.61	0.20	D	11	9	17	23		Medium dense brown coarse SAND, some silt
												-GLACIOFLUVIAL DEPOSITS-
20		19.81-19.99	16	0.18	0.15	D	50/.025				92.06 19.81	Very dense gray-brown coarse to fine GRAVEL and coarse to fine SAND, trace silt (weathered bedrock)
		20.73-22.25	1	1.52	1.52	C		[RQD = 100%]			91.14 20.73	C1- Very hard, fresh, gray and white, medium to fine grained BIOTITE GNEISS. Foliation is high angle, extremely close. Joints low angle to moderately dipping, close to wide, rough, undulating, fresh, open.
		22.25-23.77	2	1.52	1.52			[RQD = 92%]				C2- Same as C1, except foliation is moderately dipping, extremely close to very close. Joints are fresh to discolored (carbonate mineral growth on some joint surfaces).
											88.10 23.77	-BEDROCK-
25												Bottom of Exploration at 23.77 m.
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**19.8**	**20.73** m	**3.06** m
			No. of Samples	
			16D, 2C	

NOTES: **Bomb mounted CME C-45 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. **S6-3**
Sheet **2** of **2**

J. Ouellette	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-4**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230823.89**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282978.55**
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: **110.29**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **28 February 2001**	Utilized			X					X					X
Date Finished: **1 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
@ **0.05** 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	0.08	D	W	O	R	WOR	109.68 / 0.61	Very loose brown coarse to fine SAND, little gravel, trace silt
												-ALLUVIAL DEPOSITS-
		1.52-2.13	2	0.61	0.30	D	8	14	28	14		Dense brown coarse to fine SAND, some medium to fine gravel, little silt, with cobbles
		3.08-3.69	3	0.61	0.30	D	20	21	24	27		Dense brown coarse to fine GRAVEL, some coarse to fine sand, trace silt, with cobbles
5		4.57-5.18	4	0.61	0.25	D	29	19	14	50		Dense brown coarse to fine GRAVEL and coarse to fine SAND, trace silt
		6.10-6.10	5	0.00	0.00	D	50/0					No recovery On boulder from 6.1 m. to 7.47 m.
		7.62-8.23	6	0.61	0.30	D	12	11	13	13		Medium dense brown coarse to fine SAND, trace fine gravel, silt
10		9.10-9.71	7	0.61	0.00	D	8	8	9	11		No recovery
		10.67-10.95	8	0.28	0.20	D	25	50/.13			99.04 / 11.25	Very dense brown coarse to fine SAND and GRAVEL, trace silt Piece of gravel in tip
		12.19-12.27 12.20-13.72	9 1	0.08 1.52	0.02 1.47	D C	50/.08	[RQD = 85%]				-GLACIOFLUVIAL DEPOSITS-
		13.72-15.24	2	1.52	1.52	C		[RQD = 100%]				C1- Very hard, fresh, dark gray and white, coarse to fine grained BIOTITE GNEISS. Foliation is high angle, extremely close. Joints are low angle very close to moderate, rough, undulating, fresh, open. C2- Same as C1, except foliation is extremely
15												

Casing			Meters of	
Size	From	To	Earth	Rock
HW	**0.0**	**12.2**	**12.20** m	**3.05** m
			No. of Samples	
			9D,2C	

NOTES: **Bomb mounted CME-45C with automatic 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. **S6-4**
Sheet **1** of **2**

J. Ouellette DRILLER	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No. **S6-4**
P. Carrera INSPECTOR	TOWN: **Waterbury, Connecticut**	Line & Station Offset N. Coordinate **230823.89**
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME: **Reconstruction of I-84** PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	E. Coordinate **282978.55** **Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

Surface Elevation: **110.29**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **28 February 2001**	Utilized			X					X					X
Date Finished: **1 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
@ **0.05** 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.)
											95.05 15.24	close to close. Joints are low angle to moderately dipping, close to moderate. -BEDROCK- Bottom of Exploration at 15.24 m.
20												
25												
30												

Casing			Meters of	
Size	From	To	Earth	Rock
HW	**0.0**	**12.2**	**12.20** m	**3.05** m
			No. of Samples	
			9D,2C	

NOTES: **Bomb mounted CME-45C with automatic 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. **S6-4**
Sheet **2** of **2**

R. Posa	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-5**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera/J. Miller	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230825.40**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282913.30**
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: **111.88**		Casing				Auger		Mud	Sampler		Core Barrel			
Date Started: **9 March 2001**	Utilized		X						X					X
Date Finished: **12 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 **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	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	0.15	D	18	26	19	29	111.27	Very dense brown coarse to fine SAND, some medium to fine gravel, little silt
		0.61-1.22	2	0.61	0.46	D	24	19	8	6	0.61 / 110.66	Medium dense brown coarse to fine SAND, trace silt, fine gravel
		1.22-1.83	3	0.61	0.46	D	7	6	7	21	1.22	-FILL-
		1.88-2.49	4	0.61	0.15	D	8	10	11	13		Medium dense gray coarse to fine SAND and SILT, slight petroleum odor
		3.05-3.66	5	0.61	0.30	D	17	22	34	41		Medium dense olive-brown SILT and fine SAND, little medium to fine gravel, strong weathered petroleum odor
5		4.57-4.80	6	0.23	0.15	D	39	100/0.08				Very dense olive-brown coarse to fine SAND and medium to fine GRAVEL, trace silt Very dense dark gray-brown coarse to fine SAND, some medium to fine gravel, trace silt
		6.10-6.30	7	0.20	0.15	D	63	100/0.05				Very dense olive-brown coarse to fine SAND and coarse to fine GRAVEL, trace silt
		7.62-8.23	8	0.61	0.23	D	31	33	48	51		Very dense olive-brown coarse to fine SAND, some coarse to fine gravel, little silt
10		9.14-9.75	9	0.61	0.23	D	7	8	13	16	102.74 / 9.14	Medium dense olive-gray-brown fine SAND, little coarse sand, trace fine gravel, silt
		10.67-11.28	10	0.61	0.41	D	12	17	17	18		Dense olive-gray-brown coarse to fine SAND and coarse to fine GRAVEL
		12.19-12.80	11	0.61	0.61	D	9	13	15	18		Medium dense olive-gray-brown coarse to fine SAND, trace coarse to fine gravel, silt
		13.72-14.33	12	0.61	0.30	D	27	31	9	5		Dense olive-brown fine SAND and SILT, trace coarse to fine gravel
15											97.55 / 14.33	Roller bit to 15.24 m.

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**13.7**	**15.24** m	**3.06** m
			No. of Samples	
			12D, 2C	

NOTES: **Case mounted Mobile Drill B-47 rope and cathead to 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. **S6-5**
Sheet **1** of **2**

R. Posa	SM - 001 - M REV. 1/94 BORING REPORT	Hole No. **S6-5**
DRILLER	STATE OF CONNECTICUT	Line & Station
P. Carrera/J. Miller	DEPARTMENT OF TRANSPORTATION	Offset
INSPECTOR	TOWN: **Waterbury, Connecticut**	N. Coordinate **230825.40**
Haley & Aldrich, Inc.	PROJECT NAME: **Reconstruction of I-84**	E. Coordinate **282913.30**
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: **111.88**		Casing			Auger		Mud	Sampler		Core Barrel			
Date Started: **9 March 2001**	Utilized		X					X					X
Date Finished: **12 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 **0** days	Hammer (kg)	136	136	136	136			Bit	63.5		Type	X	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.)
		15.24-16.76	1	1.52	1.42	C		[RQD = 89%]				C1- Very hard, fresh, gray and white, medium to fine grained BIOTITE GNEISS. Foliation is vertical, extremely close. Joints are horizontal, close to wide spaced, rough, undulating, fresh to discolored, open.
		16.76-18.28	2	1.52	0.86	C		[RQD = 57%]				C2- Same as C1, except joints are close to moderately spaced
											93.60	-BEDROCK-
											18.28	Bottom of Exploration at 18.28 m.
20												
25												
30												

Casing Size	From	To	Meters of Earth	Rock
NW	**0.0**	**13.7**	**15.24** m	**3.06** m
			No. of Samples	
			12D, 2C	

NOTES: **Case mounted Mobile Drill B-47 rope and cathead to 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. **S6-5**
Sheet **2** of **2**

J. Ouellette DRILLER	SM - 001 - M REV. 1/94 BORING REPORT STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Hole No. **S6-6**
P. Carrera INSPECTOR	TOWN: **Waterbury, Connecticut**	Line & Station Offset N. Coordinate **230813.60**
Haley & Aldrich, Inc. SOILS ENGINEER	PROJECT NAME: **Reconstruction of I-84** PROJECT NUMBER: **State: 151-273/H&A: 91313-100**	E. Coordinate **282957.70** **Berger, Lehman Associates, P.C.**
	BORING CONTRACTOR: **General Borings, Inc.**	PRIME DESIGNER

		Casing				Auger		Mud	Sampler		Core Barrel			
Surface Elevation: **111.16**														
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
@ **0.15** 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	0.25	D	2	2	11	19		Medium dense white and brown coarse to fine SAND, some gravel, little silt
											109.64	Boulder .61 m. to 1.37 m.
		1.52-2.13	2	0.61	0.41	D	22	14	15	20	1.52	-FILL-
												Medium dense gray brown SILT, some fine sand, trace gravel
		3.05-3.66	3	0.61	0.48	D	12	11	11	13		Medium dense brown fine SAND and SILT
5		4.57-5.18	4	0.61	0.46	D	10	8	8	9		Medium dense brown fine SAND, some silt, little coarse sand, trace fine gravel
		6.10-6.71	5	0.61	0.61	D	10	11	10	13		Medium dense brown coarse to fine SAND, trace silt
		7.62-8.00	6	0.38	0.30	D	17	22	50/.05			Very dense brown coarse to fine SAND, little fine gravel, silt, trace medium gravel
											101.86	-GLACIOFLUVIAL DEPOSITS-
10		9.14-10.66	1	1.52	1.39	C		[RQD = 70%]			9.30	C1- Hard, fresh, gray and white, medium to fine grained BIOTITE GNEISS. Foliation is high to low angle, extremely close. Joints are high angle to moderately dipping, moderate rough, undulating to planar, fresh to discolored, open.
		10.67-12.19	2	1.52	0.30	C		[RQD = 7%]				C2- Same as C1, except joints are close
		12.34-13.86	3	1.52	1.34	C		[RQD = 81%]				C3- Hard to moderately hard, fresh, gray and white to brown, medium to fine grained BIOTITE GNEISS. Foliation is high angle, extremely close. Joints are low to high angle, close to moderately rough, fresh to discolored, open.
											97.29 13.87	
15												Bottom of Exploration at 13.87 m.

Casing Size	From	To	Meters of Earth	Rock
HW	**0.0**	**9.3**	**9.30** m	**4.06** m
			No. of Samples	
			6D, 3C	

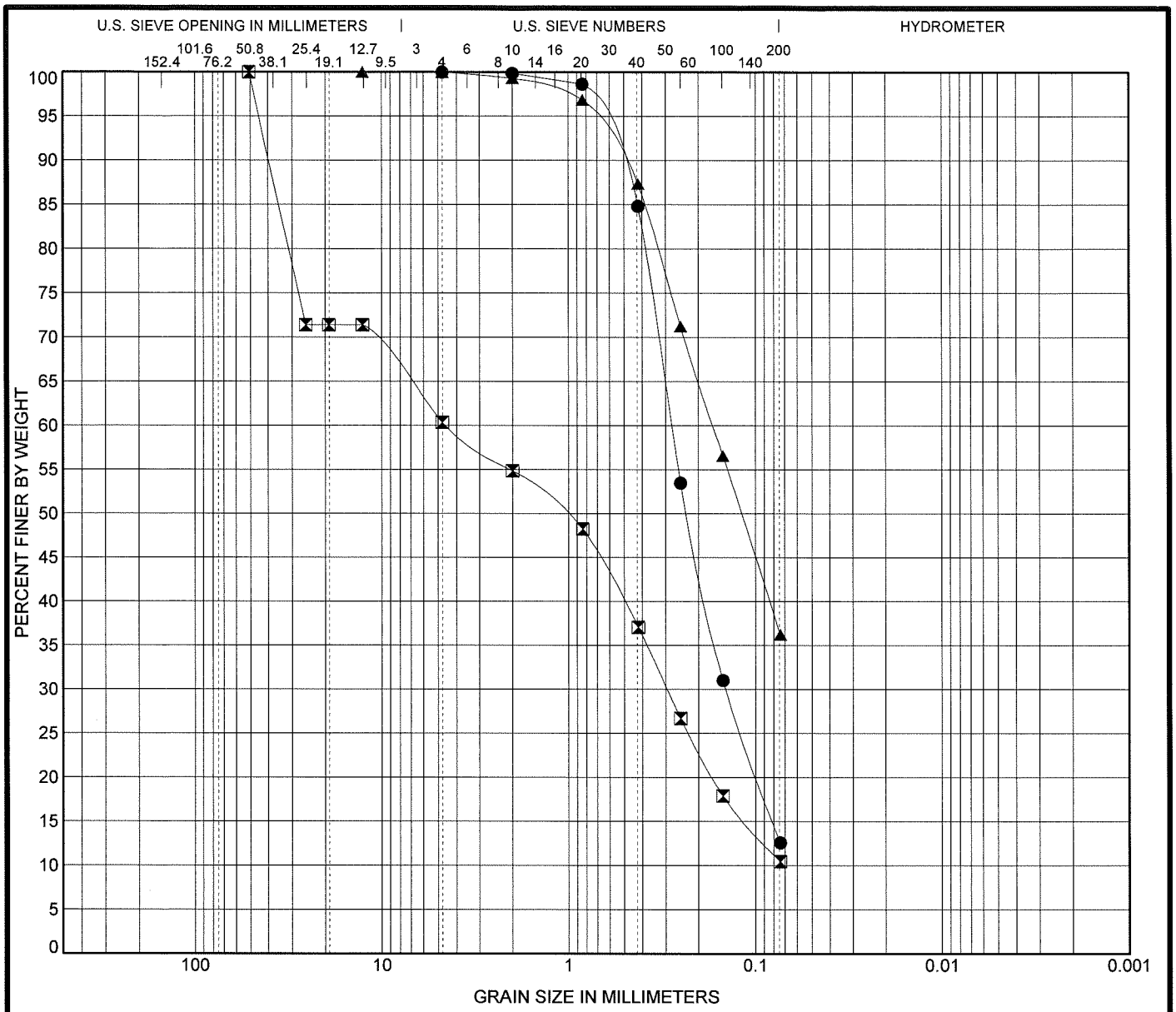
NOTES: **Bomb mounted CME-45C with automatic hammer. Borehole backfilled with drill cuttings upon completion.**

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. **S6-6**
Sheet **1** of **1**

Appendix B

APPENDIX B
Laboratory Results



	COBBLES	% GRAVEL			% SAND		% FINES	
		COARSE	MEDIUM	FINE	COARSE	FINE	% SILT	% CLAY
●	0.0	0.0	0.0	0.1	15.0	72.2	12.6	
⊠	0.0	28.6	3.3	13.3	17.8	26.6	10.5	
▲	0.0	0.0	0.0	0.7	11.9	51.1	36.2	

	Expl. No.	Sample No.	Depth (m)	LL	PL	PI	Water Content (%)	Cc	Cu
●	S6-2	D4	1.83-2.44				27.86		
⊠	S6-3	D4	1.52-2.13				14.62		
▲	S6-5	D3	1.22-1.83				38.17		

	Sample Description
●	**Brown coarse to fine SAND, little silt - FILL**
⊠	**Gray fine SAND, little gravel, trace silt - ALLUVIAL**
▲	**Gray coarse to fine SAND and SILT - GLACIOFLUVIAL DEPOSITS**

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