

**STATE OF NEW HAMPSHIRE  
INTER-DEPARTMENT COMMUNICATION**

**FROM** Aaron Smart  
Geotechnical Engineer

**DATE** August 25, 2011  
**AT** Materials and Research Bureau  
Geotechnical Section

**SUBJECT** Geotechnical Baseline Report  
US-1 Memorial Bridge over Piscataqua River (NHDOT Bridge 247/084)  
Portsmouth-Kittery 13678F, A000(911)

**TO** Keith Cota  
Project Manager

This report summarizes available geotechnical information for the US-1 Memorial Bridge spanning the Piscataqua River between Portsmouth, New Hampshire and Kittery, Maine. The following documents were used to prepare this report:

- Original drawings for the Piscataqua River Bridge dated August 1920 (Sheets 1 through 3)
- Masonry Plan for the North Approach dated October 1921
- Details of Reinforced Concrete for the Portsmouth Approach dated February 1922
- Record Drawings for the Piscataqua River Bridge dated March 1923 (Sheets 2 through 5)
- Geotechnical Report for the Scott Avenue Bridge prepared by Haley & Aldrich, Inc. dated June 15, 2007, with subsequent March 19, 2008, revisions
- General Plans 1A, 1B, and 2 through 4 prepared by McFarland-Johnson dated June 2008
- Rock strength testing report prepared by GZA GeoEnvironmental, Inc. dated August 5, 2011
- Published regional geological information (Novotny, 1969, USGS, 1992, and Lyons et al, 1997)

Geotechnical Baseline Report limitations are provided in Appendix A. Copies of select historical drawings dated August 1920 to March 1923 are provided in Appendix B. Copies of the Scott Avenue Bridge geotechnical report and the rock strength testing report are not included in this report, but can be found at the project website.

Engineering units refer to the Imperial system with stations, offsets, and elevations given in feet. The bridge has a south to north bearing with stations beginning at the southern end of the project in Portsmouth and increasing toward the north. Elevations reference the National Geodetic Vertical Datum of 1929. Northing and easting coordinates reference the North American Datum of 1983/1986. Project stationing shown on the general plans is as follows:

- Memorial Bridge – Station 23+58 (approximate) to 40+00
- Dutton Avenue, Portsmouth – Station 40+17.63 to 44+78.23
- Scott Avenue, Portsmouth – Station 60+00 to 64+75 (approximate)
- Daniel Street, Portsmouth – Station 100+66.20 to 109+34.87

1. **Site Conditions** – The Memorial Bridge spans the Piscataqua River between the Scott Avenue Bridge (NHDOT bridge 246/083) in Portsmouth, New Hampshire and the Kittery Approach Bridge in Kittery, Maine (Badger Island). The site is located at the mouth of the Piscataqua River, which is tidally influenced. Generalized foundation information for Scott Avenue Bridge and Memorial Bridge, and the Kittery Approach Bridge is outlined below.
  - 1.1 **Scott Avenue Bridge (Station 23+58 to 24+80)** – The Scott Avenue Bridge is located at the convergence of Dutton Avenue (US-1 NB) and Scott Avenue (US-1 SB) spanning Daniel Street and a small parking area at the Portsmouth shoreline. The Scott Avenue Bridge connects Dutton/Scott Avenue to the Memorial Bridge south abutment. The Scott Avenue Bridge has five spans totaling about 125 feet in length. The bridge substructure consists of a south abutment, five multi-column pier bents and a shared abutment with the Memorial Bridge. The abutments and pier bents range in height from about 16 to 18 feet above the ground surface. According to the February 1922 “Portsmouth Approach” reinforced concrete details, the south abutment and next adjacent pier bent are supported on spread footing foundations although there is a possibility that piles may be present. There was a contingency for the installation of driven piles if unsuitable soil conditions were encountered during construction, and it is unknown whether the piles were installed. The remaining four pier bents are supported on driven pile foundations, and the piles appear to be wooden piles.
  - 1.2 **Memorial Bridge (Station 24+80 to 33+80)** – The Memorial Bridge is a three-span, through-truss bridge that is approximately 900 feet in length with three equal span lengths of 300 feet between bearing lines. The center section is a lift span. The Memorial Bridge substructures consist of a south abutment, south pier, north pier, and north abutment. The abutments and piers range in height from 27 to 87 feet above the river bottom. The abutments and piers are constructed of reinforced concrete and are supported on spread footing foundations founded directly on bedrock. According to the March 1923 “Record Drawings”, the piers were constructed using temporary cofferdams and pressurized caissons. The caissons were lowered to the river bottom, dewatered, and pressurized to permit hand excavation of muck, soil, and ledge beneath the bottoms of the piers. Upon completion of the excavation, the caissons were filled with concrete, becoming permanent parts of the piers. The remaining upper portions of the piers were incrementally constructed on top of the caissons.
  - 1.3 **Kittery Approach Bridge (Station 33+80 to 36+80)** – The Kittery Approach Bridge is located between the Memorial Bridge north abutment and the Badger Island shoreline spanning a shallow portion of the Kittery waterfront. This area is mostly submerged during high tide and mostly above water during low tide. The Kittery Approach Bridge has ten spans totaling about 300 feet in length. The bridge’s south abutment is the north abutment of the Memorial Bridge. For the Kittery Approach Bridge there are nine piers, each consisting of two individual pedestals on their own square footings, and a north abutment. The piers and north abutment range in height from about 8 to 24 feet above the river bottom. According to the October 1921 “North Approach” masonry plan, the three southernmost piers, the northernmost pier, and the north abutment may be configured as spread footing foundations on bedrock. The five remaining piers may be

supported on pile foundations extending to bedrock. The pile type is unknown. The existing piers (columns) look somewhat different than the configuration shown on the 1921 plans, indicating the original pedestals were partially replaced by the existing columns during a post-construction repair.

2. **Project Description** – The project involves constructing a replacement bridge for all three existing bridges through a contractor awarded design-build contract; therefore, details of the proposed replacement structures were not available at the time this report was prepared. The replacement bridge structure is expected to be constructed in the approximate location of the existing bridge structures, and it could be configured as one or several bridges.
3. **Subsurface Explorations** – The exploration program for this site consisted of six test borings and two test corings. New Hampshire Boring, Inc. of Londonderry, New Hampshire performed the subsurface explorations at the site between July 15 and August 23, 2011. The explorations were observed and documented by John Soper, Earth Scientist, with the NHDOT Geotechnical Section. Select soil and rock samples were provided to the NHDOT Materials Testing Laboratory and GZA GeoEnvironmental, Inc., respectively, for characterization testing. After completion, the exploration locations were determined using a Trimble GeoXH GPS unit. Ground surface elevations at the explorations were determined by the NHDOT Survey Section or were obtained with an engineer's level referencing local control points set by them. Exploration types, field tests, and laboratory testing for the investigation are described below.

**3.1 Test Borings (B1 through B6)** – Six test borings were drilled at various locations throughout the project site (see Figure 1). The borings were drilled to depths ranging from 14.2 to 39.4 feet below the ground surface/river bottom. The borings were terminated in about 10 to 15 feet of bedrock. Soil sampling and Standard Penetration Tests (SPT) were performed in the borings in general accordance with AASHTO T206 standards. Soil consistencies were estimated by obtaining SPT N-values, which are the number of 140 pound hammer blows required to drive the soil sampler in increments of six inches. NX-sized (1.875-inch diameter) rock samples were obtained from bedrock in the borings in general accordance with AASHTO T225 standards. Soil and rock samples were generally described using NHDOT modified manual-visual descriptions. The Rock Quality Designation (RQD), which is an approximate measure of the overall rock condition, was determined for each rock core sample and are shown on the logs. Groundwater levels were measured in open boreholes soon after drilling was completed. Borings logs are provided in Appendix C.

**3.2 Test Corings (C1 and C2)** – One test coring was drilled through each of the piers into the underlying bedrock (see Figure 1). The corings were drilled from the southbound sidewalk, which was about 11 feet above the top of the piers. The corings were located on the upstream sides of the piers within about 10 feet of the pier nosings (see Figure 2). The corings were drilled to depths ranging from 101.5 to 111.8 feet below the top of the piers. The test corings were terminated in about 10 feet of bedrock. NX-sized (1.875-inch diameter) concrete/rock samples were obtained from the test corings in general accordance with AASHTO T225 standards. Concrete and rock samples were generally described using NHDOT modified manual-visual descriptions. RQDs for concrete and

rock core samples were determined and shown on the logs. (*The RQDs for the concrete cores are for reference only and do not indicate strength, condition, or quality of the concrete.*) The concrete thickness at C1 and C2 was 101.0 and 92.2 feet, respectively. Bedrock was encountered at elevation -81.0 and -72.0, respectively. Coring logs are provided in Appendix D.

**3.3 Laboratory Testing** – The below-listed laboratory tests were performed on select soil and rock core samples, respectively, for this investigation. Laboratory soil samples were classified in accordance with the Unified Soil Classification System (USCS). Copies of the soil sample test results are provided in Appendix E. Rock core strength testing results are contained a separate report posted on the project website.

- Grain-size Distribution (AASHTO T27 and T11)
- Uniaxial Compressive Strength (ASTM D7012)

**4. Subsurface Conditions** – Based on the available information, general interpretations of the subsurface conditions are outlined below.

**4.1 Overburden Materials and Bedrock** – Overburden material and bedrock descriptions are provided below, presented in the general order the materials were encountered proceeding downward from the surface. Any one or several of the materials could be in a different sequence or absent at specific locations on the project. Summarized subsurface conditions by exploration are provided in Table 1. Exploration logs should be referenced for a more detailed description of the subsurface conditions at their specific locations.

- **Asphalt Pavement** – A 0.3 foot thick layer of asphalt pavement was encountered at the surface of B6, which was drilled just north of the Kittery Approach Bridge north abutment through the existing northbound sidewalk.
- **Fill** – Layers of fill were encountered at B1, B5, and B6. The fill layers were generally comprised of silty fine sand, gravel, or fine sandy silt and ranged in thickness from 3 to 19.4 feet depending upon location. Occasional traces of red brick and wood fragments were also encountered in the fill. A soil sample from B1-S1 (2 feet) was classified as Well Graded Sand with Silt and Gravel (SW-SM) and a soil sample from B6-A1 (7.5 feet) was classified as Silty Sand (SM) from grain size distribution tests. The consistencies of the fill layers varied from loose to very dense.
- **Alluvial Deposit** – An alluvial deposit was encountered at the river bottom at B2, B3, and B4 and beneath 3 feet of fill at B5. The alluvial deposit was generally comprised of silty fine sand that contained partings of silt. The alluvial deposit ranged in thickness from 0.3 to 6.9 feet thick. The consistency of the alluvial deposit was loose to medium dense.
- **Glacial Till Deposit** – A glacial till deposit was encountered at all six test boring locations. A till deposit is an accumulation of sediments that were transported by or overridden by glacial ice that once covered the region. The till deposit was generally comprised of silty fine sand and lesser amounts of medium and coarse sands and fine

gravels. The till deposit ranged in thickness from 2.6 to 18.9 feet. Soil samples from B1-S1 (20 feet) and B1-S5 (24 feet) below the ground surface were classified as Silty Sand (SM) and Silty Sand with Gravel (SM) from grain size distribution tests, respectively. The till's consistency was medium dense to very dense.

- **Concrete** – The concrete (Memorial Bridge piers) contained a wide variety of aggregate sizes, shapes, and mineral types. The core samples contained some fractures, most of which were along the cement/aggregate interface, some air pockets, occasional reinforcing and structural steel, and occasional cold joints. Some of the horizontal cold joints in C2 appear to correspond with construction joints shown on the March 1923 “Record Drawings” for the north pier. In C1, the top and bottom surface of a horizontal cold joint at elevation -103.5 (core sample 20) was coated with coal tar. Concrete core sample RQDs from both piers generally ranged from 70% to 100%; however, south pier concrete core sample RQDs from elevations -37 to -47.2 (core samples C13 and C14) were 0% and 66%, respectively.
- **Bedrock** – Metasedimentary bedrock (calcareous metasilstone) of the Kittery Formation was encountered at all eight exploration locations. At B3, the metasedimentary bedrock was intruded with igneous basalt between elevations -7.4 and -15.2. The bedrock was generally described as moderately hard, slightly to moderately weathered, and slightly to extremely fractured. Fracture patterns were typically along the natural, moderately to steeply dipped foliations. Rock core sample RQDs ranged from 8% to 74%; therefore, the estimated quality of the bedrock ranges from very poor to fair. Uniaxial compressive strengths of the metasilstone core samples ranged from 6.4 to 27.8 ksi. Uniaxial compressive strengths of the basalt core samples ranged from 7.4 to 7.5 ksi.

**4.2 Groundwater Levels from Boreholes** – Test borings B1, B5, and B6 were drilled at dry land locations near the Memorial Bridge south abutment and the Kittery Approach Bridge north abutment. Borehole water levels in B1, B5, and B6 measured shortly after drilling ranged from 6 to 13.5 feet below the ground surface (elevations 2.4 to 11.5).

Test borings B2 through B4 were drilled at river locations within the tidal influence zone. B2 and B4 were drilled from the deck of a barge on the east side (US-1 NB) of the Memorial Bridge. The river bottom at B2 and B4 was 17 and 13.7 feet below the water surface, respectively, at the time of measurement. B3 was drilled on the river bottom during low tide on the west side (US-1 SB) of the Memorial Bridge. The borehole water level in B3 measured shortly after drilling was at 0 feet below the ground surface (river bottom, elevation -2.4).

Water levels were not measured in the test corings.

Borehole water levels represent the conditions at the times of measurement and change in response to tidal influence. Borehole water levels could also change in response to several factors including tidal influence, seasonal variations and precipitation amounts.

Please contact us at 271-3151 if there any questions about information contained within this report.

Sincerely,



Aaron L. Smart, PE  
Geotechnical Engineer



Charles R. Dusseault, PE  
Geotechnical Section Chief

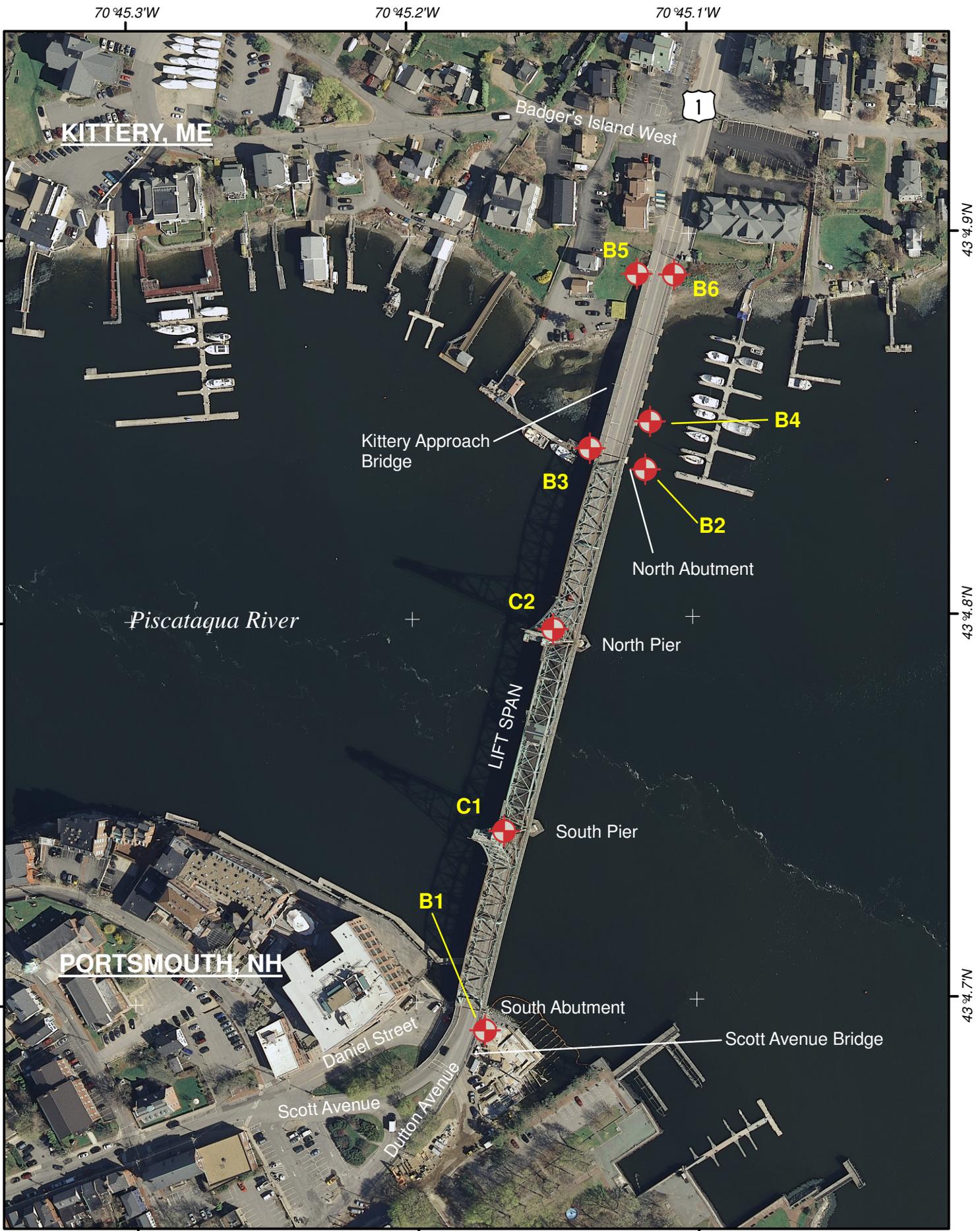
enc: Table 1 – General Subsurface Conditions by Exploration  
Figure 1 – Exploration Location Plan  
Figure 2 – Test Coring Locations  
Figure 3 – Bedrock Geologic Map of New Hampshire (Lyons, et al 1997)  
Figure 4 – Subsurface Fence Diagram  
Appendix A – Geotechnical Baseline Report Limitations  
Appendix B – Select Historical Drawings (August 1920 to March 1923)  
Appendix C – Test Boring Logs B1 through B6  
Appendix D – Test Coring Logs C1 and C2  
Appendix E – Geotechnical Laboratory Test Results

cc: Project Website  
File

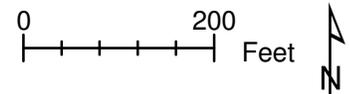
**TABLE 1 - GENERAL SUBSURFACE CONDITIONS BY EXPLORATION (PAGE 1 OF 1)**

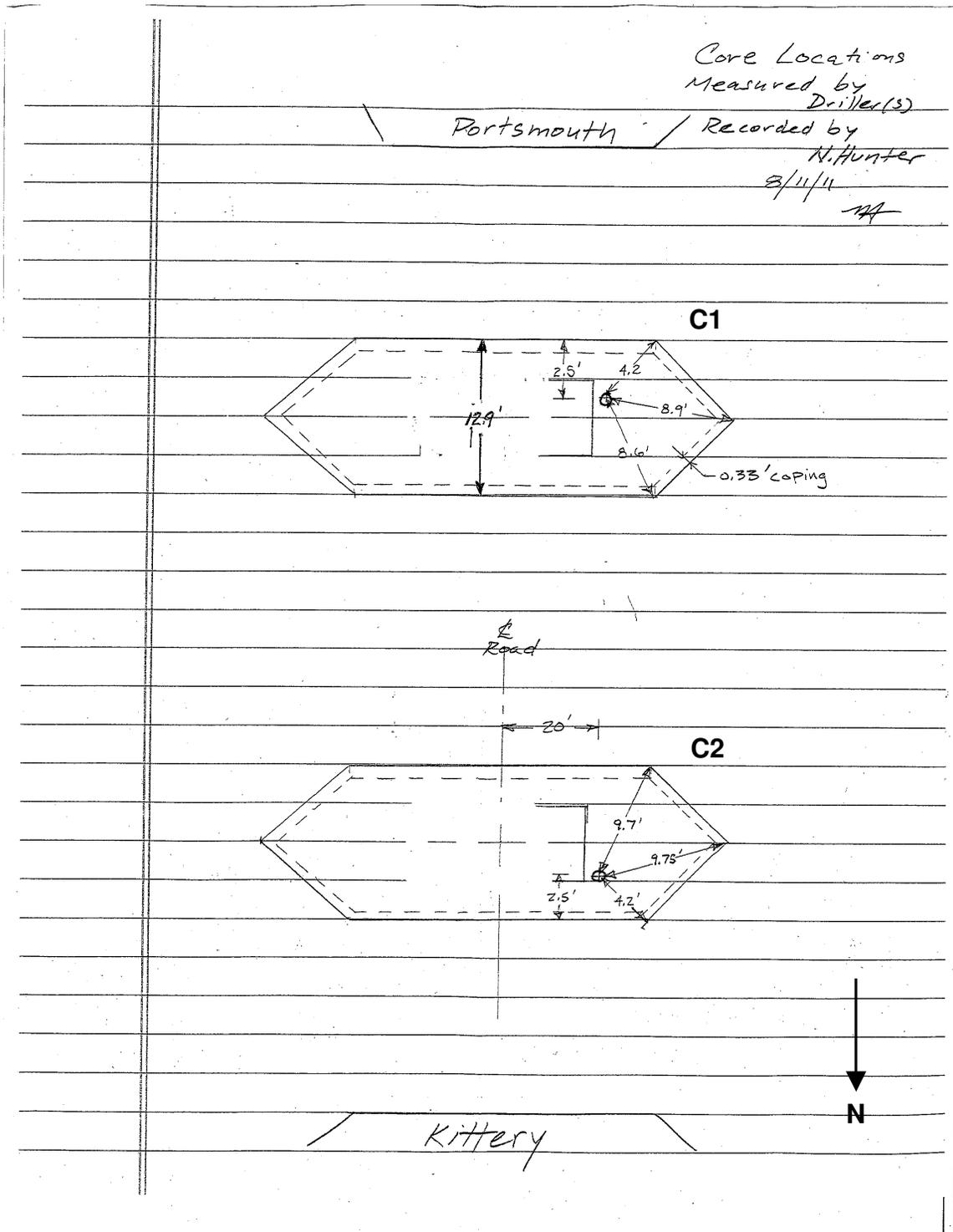
Exploration	Easting (x.ft)	Northing (y.ft)	Elevation (ft)	Pavement (ft)	Fill		Alluvial Deposit		Glacial Till Deposit		Concrete			Bedrock			Water Level (ft)	Bottom of Exploration (ft)	Special Note			
					Depth (ft)	Density	Depth (ft)	Density	Depth (ft)	Density	Depth (ft)	RQD	RMD	Depth (ft)	RQD	RMD						
B1	1228372.69	212058.09	8.4		0.0 - 19.4	L-D			19.4 - 27.5	MD-VD				27.5	36-74	P-F	6.0	38.0				
B2	1228627.00	212948.79	-16.2				0.0 - 1.0	Undet.	1.0 - 19.9	VD				19.9	42	P-F	+17.0	30.2	A			
B3	1228539.17	212981.45	-2.4				0.0 - 3.5	MD						3.5	29-52	P-F	0.0	14.2	B			
B4	1228634.63	213024.52	-12.3				0.0 - 0.3	Undet.						0.3	32-88	P-G	+13.7	16.8	A			
B5	1228613.65	213258.41	15.4		0.0 - 3.0	MD	3.0 - 8.9	L	8.9 - 11.5	Undet.				11.5	8-65	VP-F	10.0	26.8				
B6	1228672.43	213257.76	25.0	0.3	0.3 - 15.2	VD			15.2 - 23.8	VD				23.8	16-46	VP-P	13.5	39.4				
C1	1228403.08	212374.06	31.2											11.2 - 112.2	0-100	n/a	112.2	46-60	P-F	Undet.	123.0	C
C2	1228480.83	212694.94	31.2											11.0 - 103.2	78-98	n/a	103.2	48-60	P-F	Undet.	112.5	C

General Notes	Rock Consistency			Soil Consistency			
	RQD (%)	Rock Mass Description		Soil/Abbrev.	Density	SPT N-Value	
1. "Undet." denotes parameter values could not be determined. 2. "Dry" denotes borehole water level not present within the borehole at the time of drilling. 3. "RQD" denotes Rock Quality Designation 4. "RMD" denotes rock mass description based on Rock Quality Designation. 5. Elevations reference NGVD29. 6. Northing and easting coordinates reference NAD 83/86.	0-24	VP	Very poor	Non-Cohesive	VL	Very Loose	0-4
	25-49	P	Poor		L	Loose	5-10
	50-74	F	Fair		MD	Medium Dense	11-24
	75-89	G	Good		D	Dense	25-50
	90-100	E	Excellent		VD	Very Dense	>50
Special Notes A "+" river surface was 17.0 and 13.7 feet above river bottom at B2 and B4, respectively, at the time of drilling (drilled from barge). B At B3, river surface below river bottom at the time of drilling (drilled at low tide). C C1 and C2 located on south and north piers, respectively, which were about 11 feet below the Memorial Bridge SB sidewalk.	Exploration Type			Cohesive	VS	Very Soft	0-1
	Notation	Type			S	Soft	2-4
	B	Test Boring			MST	Medium Stiff	5-8
	C	Test Coring			ST	Stiff	9-15
					VST	Very Stiff	16-30
					H	Hard	31-60
			VH	Very Hard	>60		



**FIGURE 1 - PRELIMINARY GEOTECHNICAL EXPLORATION PLAN**  
**US-1 Memorial Bridge over Piscataqua River (NHDOT Bridge 247/084)**  
**Portsmouth-Kittery 13678F, A000(911)**





**FIGURE 2 – TEST CORING LOCATIONS**  
**US-1 Memorial Bridge over Piscataqua River (NHDOT 247/084)**  
**Portsmouth-Kittery 13876F, A00(911)**





**APPENDIX A**

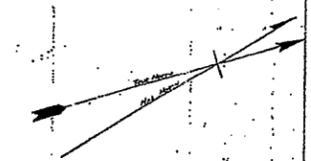
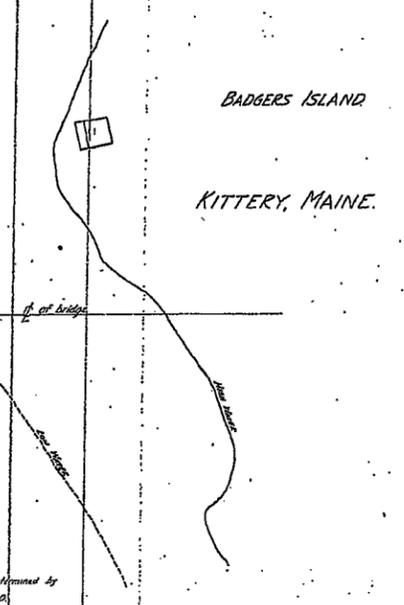
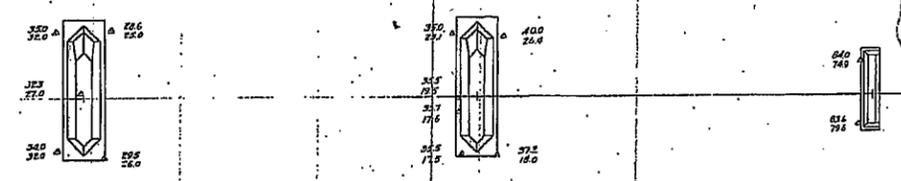
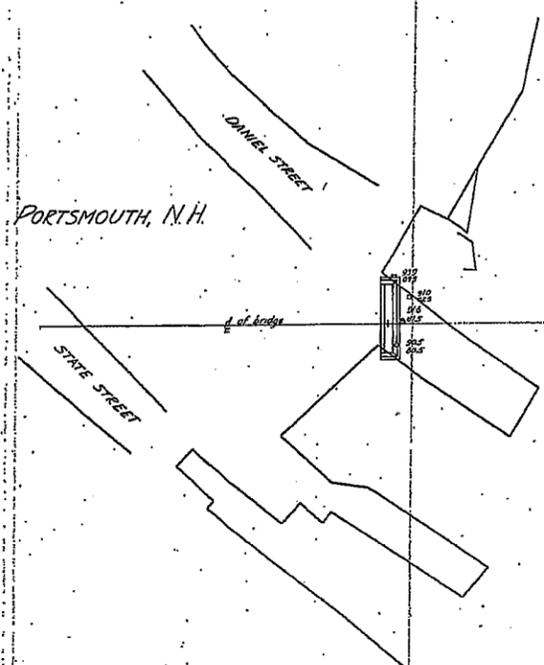
**GEOTECHNICAL BASELINE REPORT LIMITATIONS**

## **GEOTECHNICAL BASELINE REPORT LIMITATIONS**

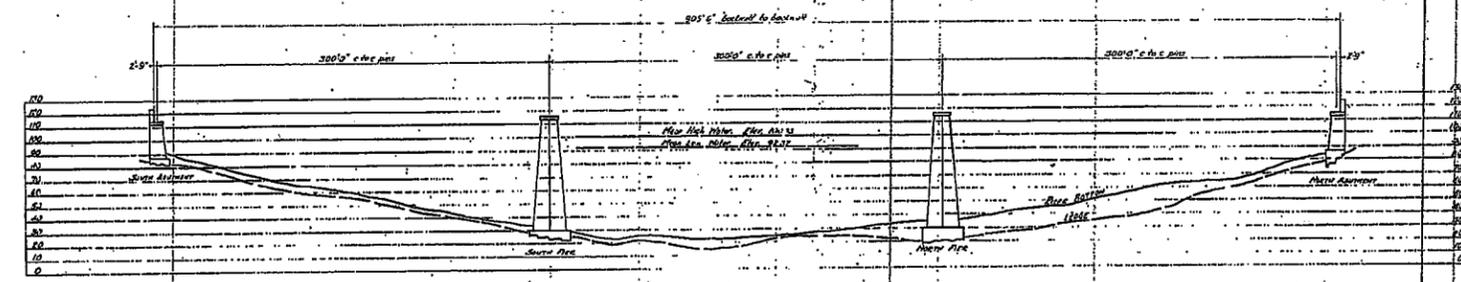
1. The baseline geotechnical report was written to summarize and communicate available subsurface information obtained from a variety of sources including: published sources, subsurface explorations conducted in the general area of the project site, laboratory test results on soil samples collected in the subsurface explorations, and existing information in NHDOT records. The report does not include geotechnical design interpretations or recommendations. The report presents subsurface information available at the time of its preparation, and it may be supplemented and/or amended through other prepared documents with information obtained at a later date. The report was prepared prior to finalization of the project design or scope, so it may not reflect or be coordinated with post-preparation changes to the project. The report is not part of the proposal or a contract document, unless stated otherwise.
2. All interpretations and conclusions of the project site subsurface conditions made in this report are based upon the data obtained from a limited number of soil samples from widely spaced subsurface explorations. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, whereas actual soil transitions are probably intermixed and more irregular. Variation of subsurface conditions between explorations may and should be expected to occur. The nature and extent of variations between these explorations may not become evident until further subsurface investigation is conducted or during the construction phase. If variations or other latent conditions are revealed by further exploration or during construction, it may be necessary to revise or amend information presented in this report.
3. Groundwater level readings were made in the various explorations and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and presented in the report. However, it must be noted that groundwater level measurements obtained in the subsurface explorations may not represent fully stabilized levels, which could have taken a longer period of time to reach equilibrium than was available during the actual completion of the exploration. Also, fluctuations in the groundwater levels may occur due to variations in precipitation amounts, seasonal influences and other factors different from those prevailing at the time measurements were made.
4. Except as presented within the report, no other quantitative laboratory testing was performed as part of the site assessment. Where an outside laboratory has conducted such analyses, the NHDOT has not conducted an independent evaluation of the reliability of these data.
5. It is the responsibility of the design-builder to determine geotechnical design parameters from the information provided in this report and to determine if any additional information is needed for the interpretation of site subsurface conditions.
6. Any questions about the information or presentations made in this report should be referred to the NHDOT Geotechnical Section.

**APPENDIX B**

**SELECT HISTORICAL DRAWINGS (AUGUST 1920 TO MARCH 1923)**



a. Elev. of bottom and rock surface as determined by  
 well drilling apparatus July 1920.  
 b. Elev. of bottom and rock surface as determined by  
 land survey July 1920.

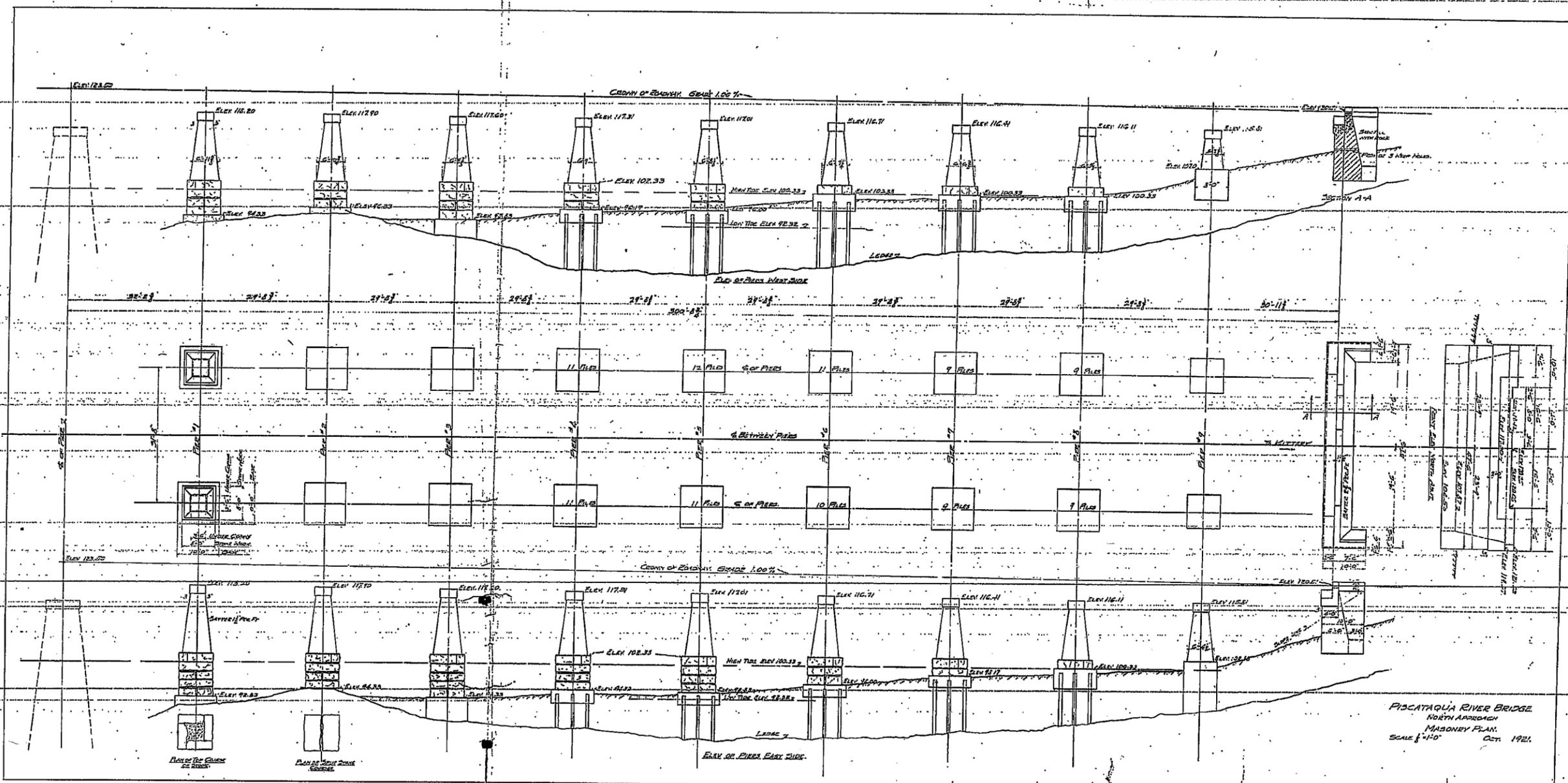


SUBMITTED FOR APPROVAL August 12, 1920.  
 E. H. Brownell  
 BOARD OF ENGINEERS.  
 APPROVED AND ADOPTED August 12, 1920.  
 PISCATAQUA RIVER BRIDGE COMMISSION  
 by John H. Boothill Secretary.

GENERAL PLAN AND PROFILE







PISCATAQUA RIVER BRIDGE  
 NORTH APPROACH  
 MASONRY PLAN  
 SCALE 1/4" = 1'-0" OCT. 1921

1-19 2/1

WEIR HOLES OR DRAINS  
A weep hole or drain shall be provided in the concrete at the bottom of the wall in the vicinity of the base of the wall. The hole shall be 1/2" diameter and shall be protected by a grate.

SECTION G.C.  
Scale 1"=10'

SECTION B.E.  
Scale 1"=10'

PLAN OF APPROACH AND PILE FOOTINGS  
Showing plan of approach and pile footings.

EXPANSION JOINT  
The substructure shall be provided with expansion joints at the locations shown on this drawing. The joints shall be constructed in accordance with the provisions of the Specifications for Highway Bridges, Part 10, Section 10.01.01.

SECTION E.E.  
Typical arrangement of drainage pipe by expansion joint.

PART SECTION E.B.  
DETAIL OF SLAB REINFORCING SHOWING SLAB CONNECTION.

SECTION A.A.  
Scale 1"=10'

SECTION F.F.  
Scale 1"=10'

SECTION D.A.  
DETAIL OF SLAB REINFORCING AT EXPANSION JOINT.

SECTION B.B.  
Scale 1"=10'

PART SECTION E.E.  
REINFORCING OF TRANSVERSE CURBLETTER AND APPROACH.

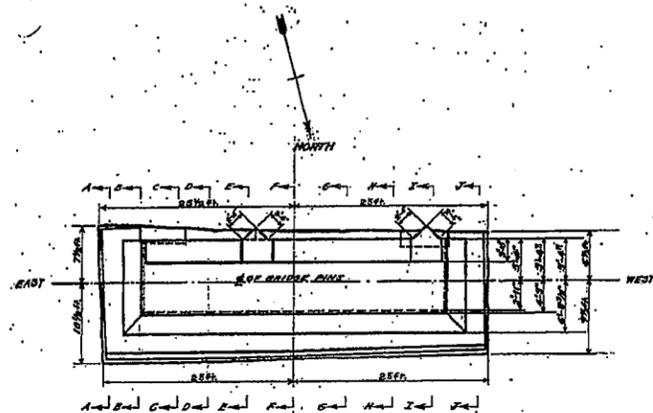
DETAIL OF REINFORCING IN BEAM B.  
Scale 1"=1'

CROSS SECTION OF COLUMN  
Showing reinforcement and pile cap.  
Scale 1"=1'

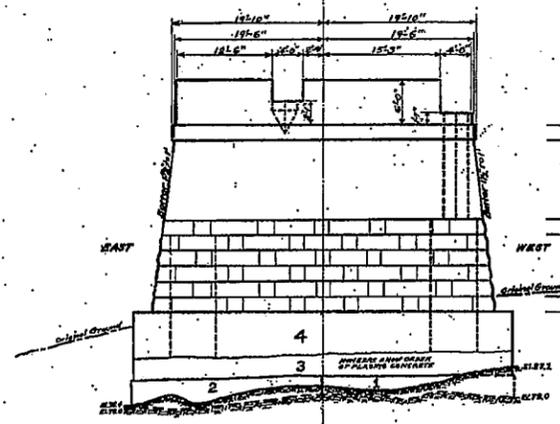
DETAIL OF REINFORCING IN BEAM A.  
Scale 1"=1'

PISCATAQUA RIVER BRIDGE  
PORTSMOUTH APPROACH  
DETAIL OF REINFORCED CONCRETE

Scales 1"=10' and 1"=1'  
Reinforcing steel  
Pile cap and reinforcement  
Scale 1"=1'



PLAN

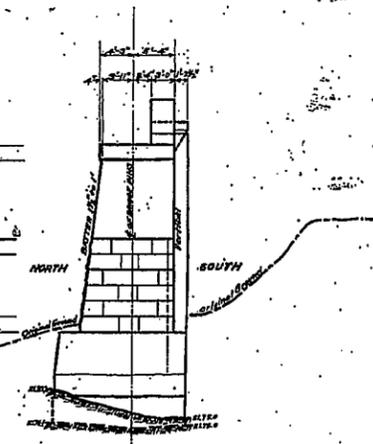


FRONT ELEVATION

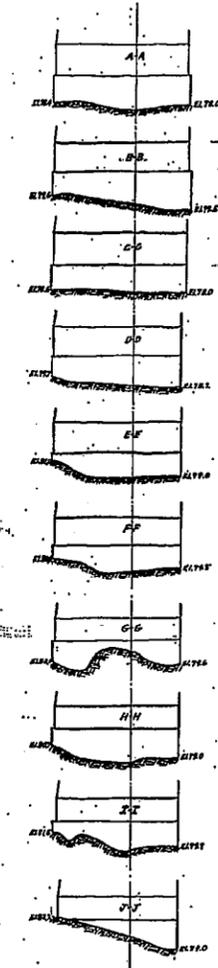
TOP OF ARCHMENT ELEV. 114.52  
 BOTTOM OF CURVE ELEV. 112.89

TOP OF STONE ELEV. 108.33  
 NEAR HIGH WATER ELEV. 100.37

NEAR LOW WATER ELEV. 92.32  
 BOTTOM OF STONE ELEV. 90.32



END ELEVATION



SECTIONS OF LEDGE UNDER ABUTMENT

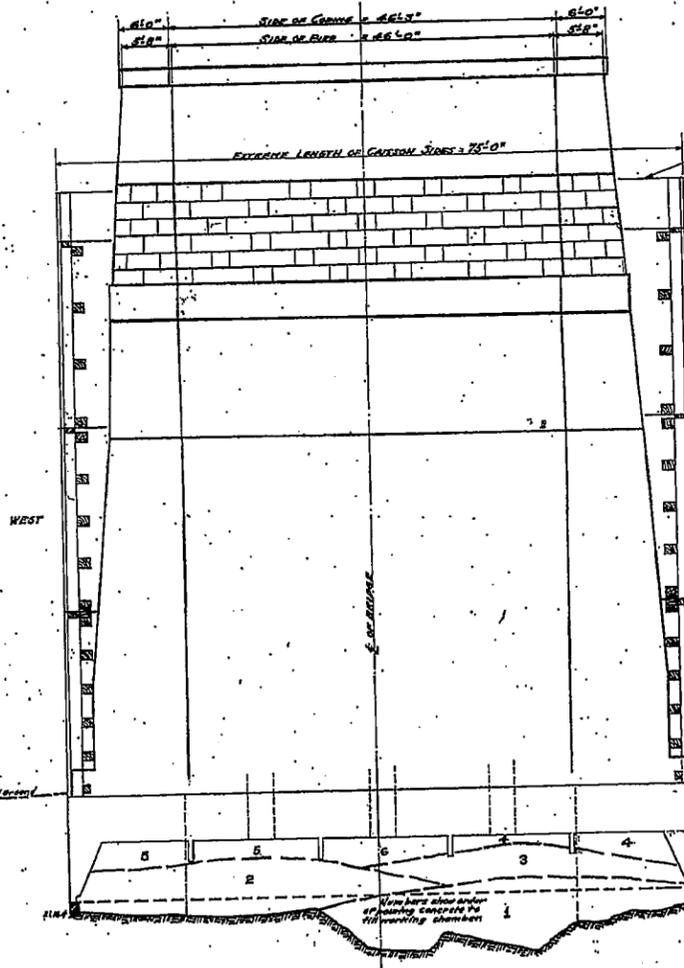
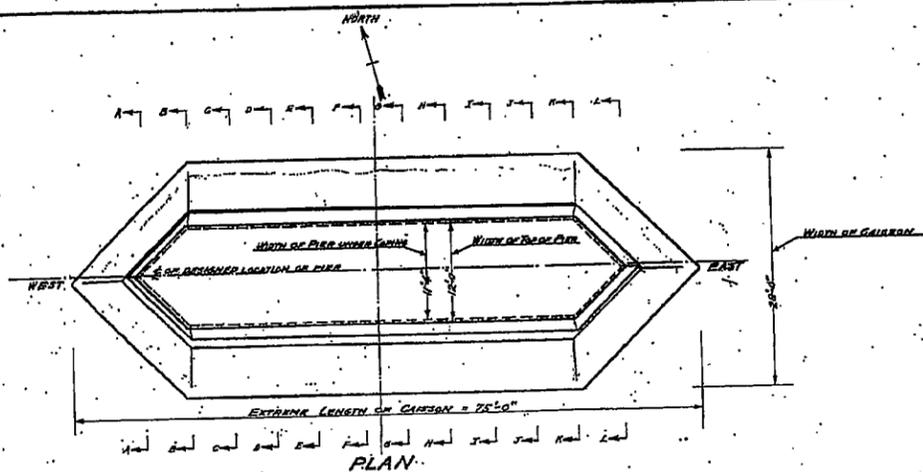
PISCATAQUA RIVER BRIDGE  
 RECORD DRAWING  
 SOUTH ABUTMENT  
 SCALE 3/8"=1' DATE MARCH 1923  
 DRAWN BY C.M.R.

67-A

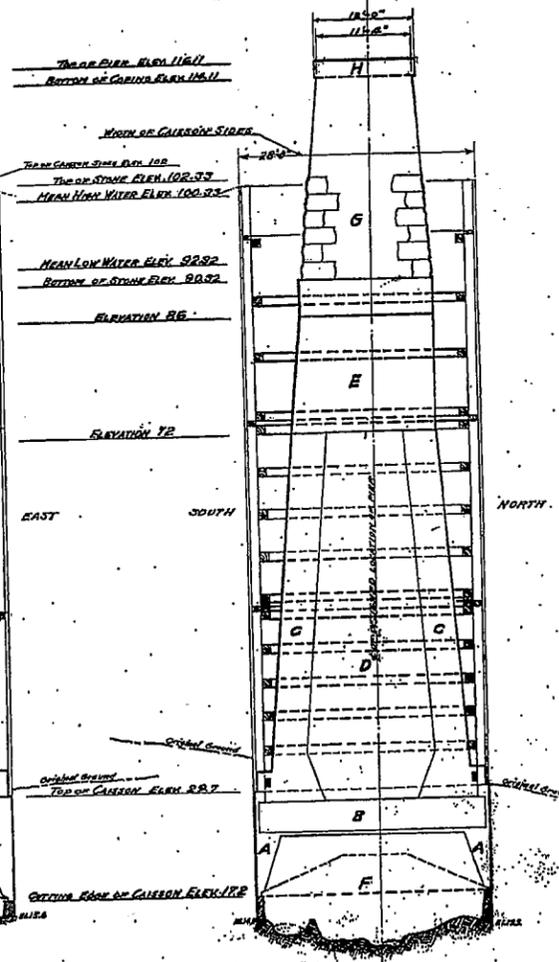
SHEET 2065

1-16-23

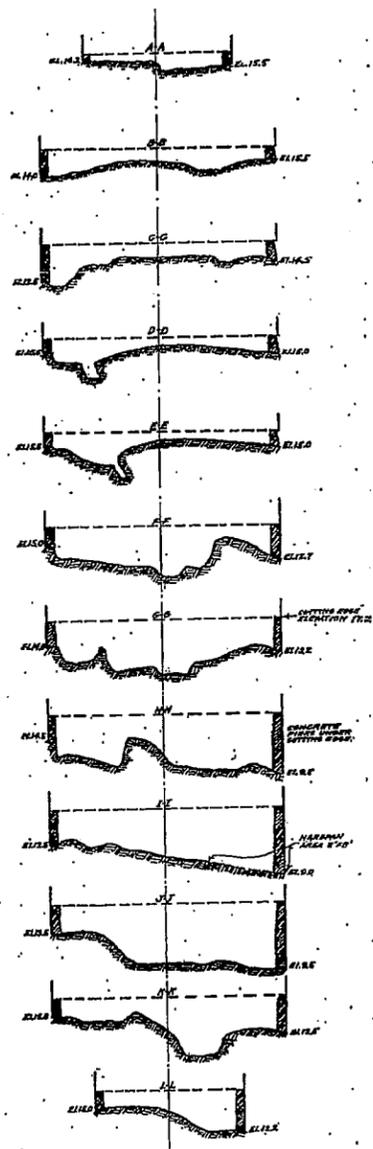
Div. of Highways, File 31-20-B



**SIDE ELEVATION**  
CAISSON AND CAISSON SIDES ARE SHOWN IN SECTION THROUGH CENTER



**SECTION B-B**  
LETTERS DESIGNATE SECTIONS OF CAISSON,  
A - CAISSON TOP;  
B - CAISSON SIDES;  
C - CAISSON INTERIOR FILLING;  
D - SPALLS AND STONE;  
E - SPALLS AND STONE;  
F - SPALLS AND STONE;  
G - SPALLS AND STONE;  
H - CAISSON.



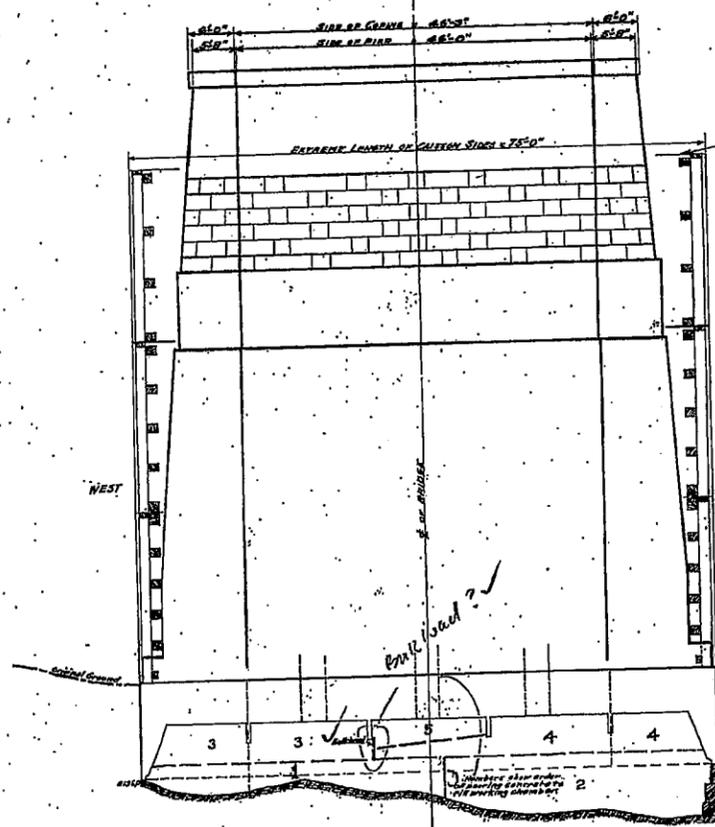
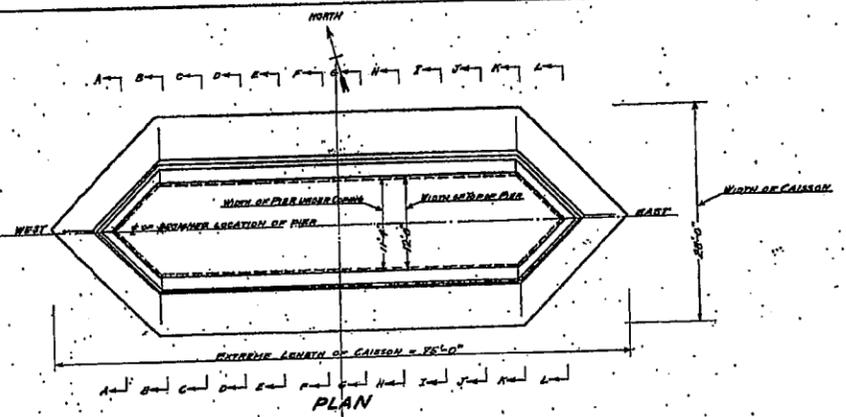
**SECTIONS OF LEDGE UNDER PIER**

**PISCATAQUA RIVER BRIDGE  
RECORD DRAWING  
SOUTH PIER**  
SCALE 1/8" = 1' DATE MARCH 1923  
DRAWN BY C.H.R.

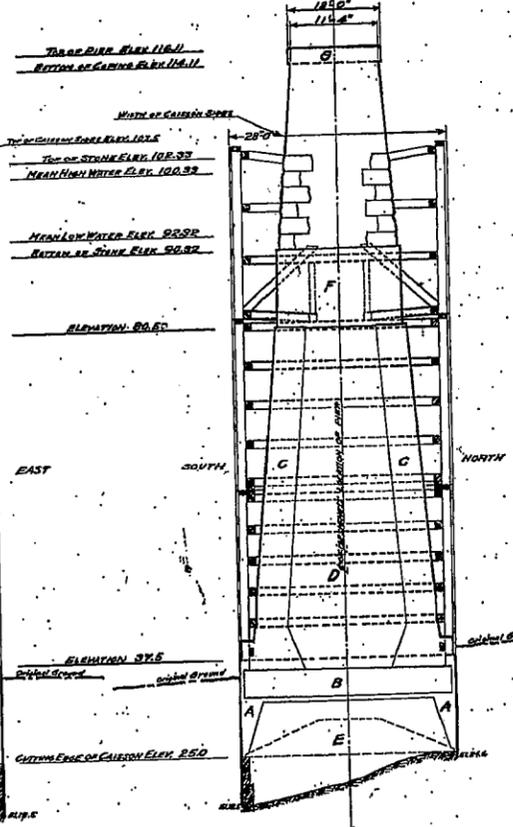
**SHEET 3 OF 5**

1-18-3-1

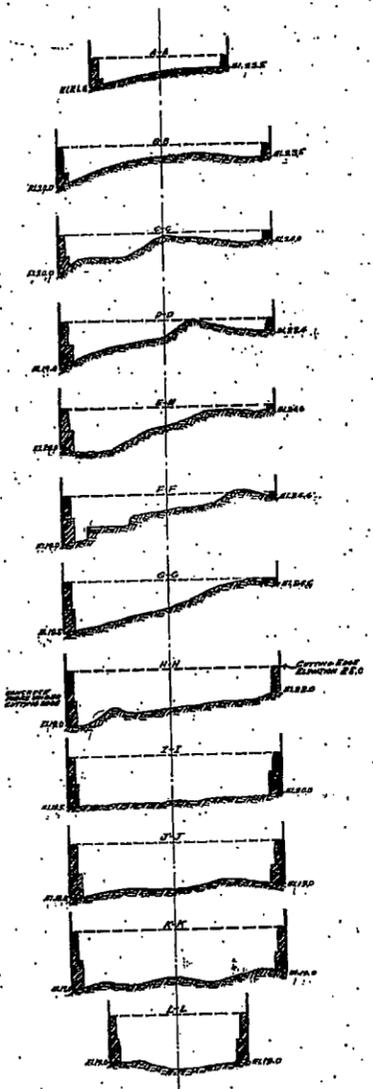
Div. 7 Office File 51-205



**SIDE ELEVATION**  
 DIMENSIONS AND ELEVATIONS ARE  
 SHOWN IN FEET AND INCHES



**SECTION G-G**  
 ALL DIMENSIONS ARE IN FEET AND INCHES  
 UNLESS OTHERWISE SPECIFIED  
 1. CONCRETE  
 2. STEEL  
 3. BRICK  
 4. SAND  
 5. GRAVEL  
 6. ROCK



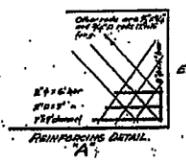
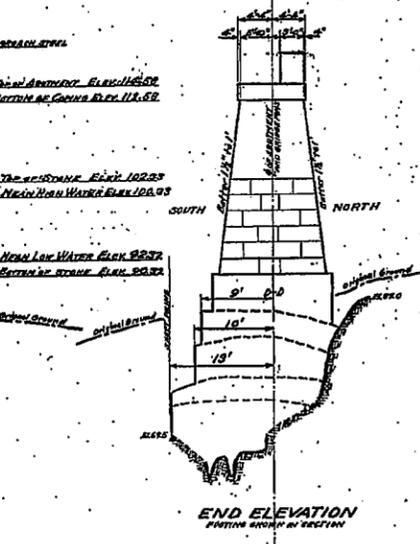
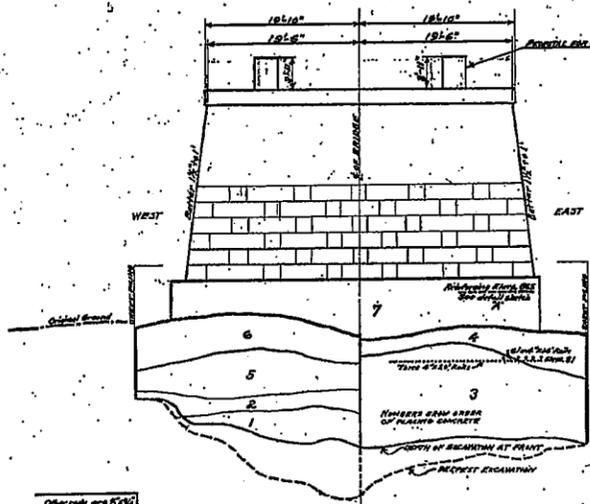
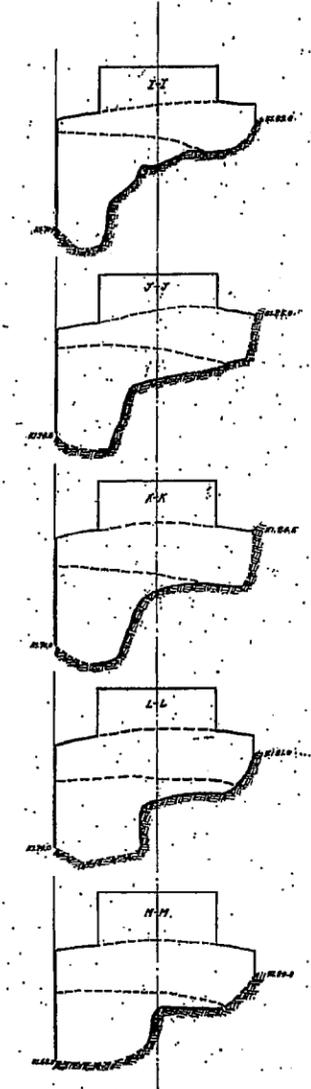
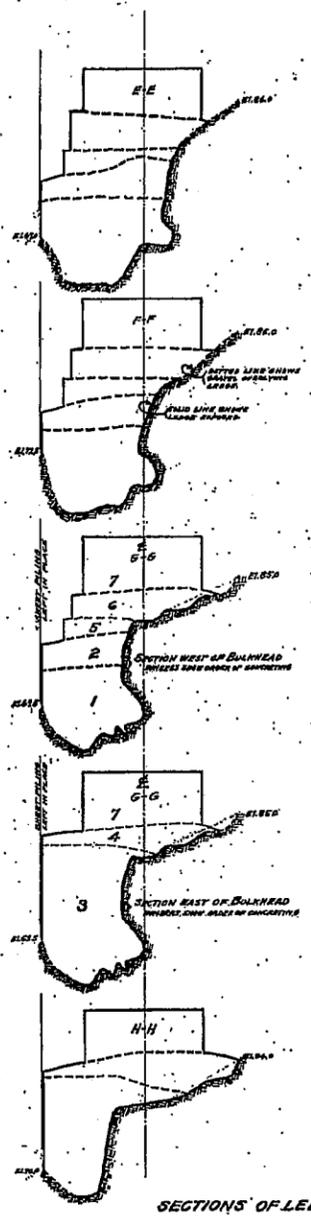
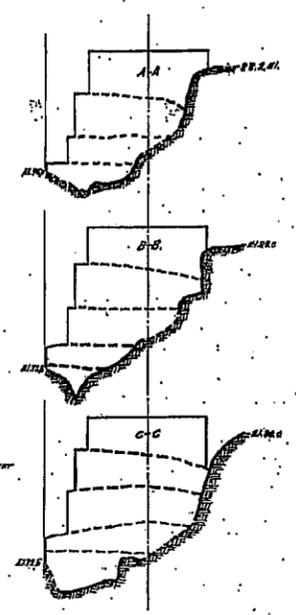
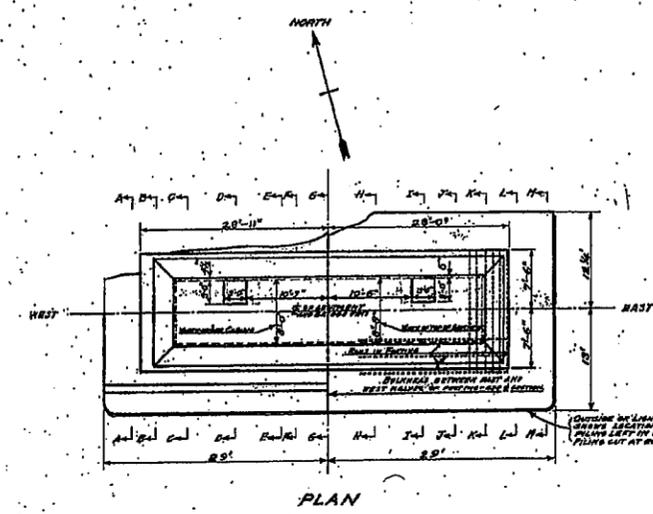
**SECTIONS OF LEDGE  
 UNDER PIER**

**PISCATAQUA RIVER BRIDGE  
 RECORD DRAWING  
 NORTH PIER**  
 SCALE 1/4" = 1' DATE MARCH 1922  
 DRAWN BY G.M.R.

**SHEET 4 OF 6**

1-18-22

Div. 7 Office File 31-20



**PISCATAQUA RIVER BRIDGE  
RECORD DRAWING  
NORTH ABUTMENT**

SCALE 1/8" = 1' DATE MARCH 1923  
DRAWN BY G.M.R.

SHEET 3 OF 6  
1-18-34

Div. of Public Works, City of New York

**APPENDIX C**

**TEST BORING LOGS B1 THROUGH B6 (JULY-AUGUST 2011)**

# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B1**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. **247-084**  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 2  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 8.4  
START/END 7/15/11 / 7/15/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228373/212058

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
7/15/11	2:30 pm	6.0	2.4	0	38	SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> <b>Strata Star 15</b>	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0			6			0.0	Dense, grayish brown, silty fine SAND, some medium and coarse sand, trace fine gravel, trace coarse gravel.	[Cross-hatch symbol]
			14 13 12	S1	1.1 [55]	2.0		
							-FILL-	
5			8			4.0	Similar to S1 except loose.	[Cross-hatch symbol]
			7 3	S2	0.5 [25]	6.0		
10			18			9.0	Medium dense, olive gray, silty fine SAND, some medium and coarse sand, some fine gravel, trace coarse gravel.	[Cross-hatch symbol]
			13 5	S3	1.1 [55]	11.0		
							12.5' - Red brick and wood fragments observed in wash water while advancing from 9' to 14'.	
15			9			14.0	Dense, olive gray, silty fine SAND, some fine gravel, little medium and coarse sand, occasional red brick and wood fragments.	[Cross-hatch symbol]
			13 23	S4	0.8 [40]	16.0		
20	19.4	-11.0	21			20.0	Medium dense, olive brown, silty fine SAND, trace medium and coarse sand.	[Cross-hatch symbol]
			12 12	S5	1.0 [50]	22.0		
							-GLACIAL TILL DEPOSIT-	
25			26			24.0	Very dense, olive gray, silty fine SAND, trace medium and coarse sand, trace fine and coarse gravel, occasional cobble.	[Cross-hatch symbol]
			50/0.2	S6	0.5 [71]	24.7		
	27.5	-19.1				28.0	-APPROXIMATE BEDROCK SURFACE-	[Cross-hatch symbol]

Sampler	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard	WOH - Weight of Hammer			

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B1**

SHEET NO. 2 OF 2

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) 8.4

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30				C1	5.0 [100]		Moderately hard, fine to medium grained, dark gray CALCAREOUS METASILTSTONE, unweathered to slightly weathered, very closely spaced and moderately dipping foliations, sound to moderately fractured with most fractures occurring along foliations except smooth-faced, steep angled fractures occurring from 31.3' to 31.5', 31.8' to 32.3' (iron stained), and 32.4' to 32.7'. RQD: 3.7 / 5.0 = 74%	
						33.0		
35				C2	4.4 [88]		Moderately hard, fine to medium grained, dark gray CALCAREOUS METASILTSTONE, unweathered to slightly weathered, very closely spaced and steeply dipping foliation, slightly to extremely fractured with most fractures occurring along foliation except vertical fractures occurring from 34.1' to 34.6' (iron stained). RQD: 1.8 / 5.0 = 36%	
						38.0		
40							Bottom of Exploration @ 38.0 ft (El. - 29.6)	
45								
50								
55								
60								
65								

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B2**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. **247-084**  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 2  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) - 16.2  
START/END 8/23/11 / 8/23/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228627/212949

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
8/23/11	See	Note				SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Diedrich D-50 Track	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0	1.0	-17.2					Dark gray, fine GRAVEL, some sand, trace silt. -ALLUVIAL DEPOSIT- Olive brown, fine and coarse SAND, some silt, little fine gravel.  -GLACIAL TILL DEPOSIT-	
5			27 43 48 32	S2	1.3 [65]	5.0 7.0	Very dense, olive brown, fine and coarse SAND, some silt, little fine gravel.	
10				S3	0.0 [0]	9.8 10.2	NO RECOVERY - Boulder from 9.8' to 12.8'	
15			26 46 50/0.1	S4	0.4 [36]	12.9 14.0	Very dense, olive brown, fine and coarse SAND, some silt, little fine gravel.	
20	19.9	-36.1	27 75/0.3	S5	0.3 [38]	16.4 17.2	Very dense, olive brown, silty fine SAND, little fine gravel, trace medium and coarse sand.	
25				C1	5.0 [100]	20.2 25.2	-APPROXIMATE BEDROCK SURFACE- Moderately hard, sound to extremely fractured, very slightly to slightly weathered, fine grained, dark gray, CALCAREOUS METASILTSTONE. Calcite stringers throughout core run. Moderately to steeply dipping fractures along stringers at 1.3', 2.9', and 4.4'. All other fractures moderately dipping and light to strong iron staining. Some hairline fractures and pitting along stringers. Some parts of the core run appear to be blocky. RQD: 2.1 / 5.0 = 42%	
				C2	5.0 [100]		Moderately hard, very slightly to slightly weathered, slightly to extremely fractured, fine grained, dark gray CALCAREOUS METASILTSTONE. Calcite stringers throughout core run. Most fractures moderately to steeply dipping along stringers. Some fractures shallow angle and iron stained. Pitting along some stringers. Some parts of the core run appear to be blocky.	

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard	WOH - Weight of Hammer			

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B2**

SHEET NO. 2 OF 2

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) - 16.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30						30.2	RQD: 2.1 / 5.0 = 42%	
35							Bottom of Exploration @ 30.2 ft (El. - 46.4)	
40								
45								
50								
55								
60								
65								

NOTE: Boring located in tidally influenced Piscataqua River and was drilled from a barge where the deck was at elevation 6.4'. At the time of drilling, the river surface elevation was at elevation 0.8', which was 17' above the river bottom.

# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B3**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 1  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) -2.4  
START/END 7/21/11 / 7/25/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228539/212981

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
7/25/11	2:30 pm	0.0	-2.4	0	14.2	SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Diedrich D-50 Track	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Automatic		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0			2			0.0	Medium dense, gray, fine GRAVEL, little medium and coarse sand, little silt.  -ALLUVIAL DEPOSIT-  -APPROXIMATE BEDROCK SURFACE-	
	3.5	-5.9	12 3 7	S1	0.4 [20]	2.0		
5				C1	4.8 [96]	5.0	Hard, fine to medium grained, dark gray BASALT, slightly weathered, slightly to extremely fractured at shallow angles (smooth, iron-stained), steep angled fractures occurring from 6.6' to 6.8' (rough) and 8.7' to 8.9' (smooth). RQD: 2.6 / 5.0 = 52%	
10				C2	3.5 [83]	10.0		
15						14.2	Bottom of Exploration @ 14.2 ft (El. - 16.6)	
20							NOTE: Boring located in within tidal zone of river drilled from river bottom, which was elevation -2.4', during low tide.	
25								

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod WOH - Weight of Hammer		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard				

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B4**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 1  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 11.9  
START/END 8/22/11 / 8/22/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228635/213025

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
8/22/11	See	Note				SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Diedrich D-50 Track	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0	0.3	11.6	WOH/0.3	S1	0.3 [100]	0.0 - 0.3	Dark gray, fine and coarse GRAVEL. -ALLUVIAL DEPOSIT- -APPROXIMATE BEDROCK SURFACE- 0.3' to 2.5' - Weathered rock (based on cuttings and drill behavior).	▼
5				C1	4.4 [88]	2.5 - 7.5	Moderately hard, moderately to extremely fractured, fresh to very slightly weathered, fine grained, dark gray CALCAREOUS METASILTSTONE. Moderately to steeply dipping foliations with calcite stringers throughout. Low angle fractures across foliations at 0.8' and 1.2'. RQD: 1.6 / 5.0 = 32%	
10				C2	4.3 [100]	7.5 - 11.8	Moderately hard, slightly to extremely fractured, fresh to very slightly weathered, fine grained, dark gray, CALCAREOUS METASILTSTONE. Moderately to steeply dipping foliations with calcite stringers throughout. Hairline fractures throughout. Some low angle fractures across foliations. Recovered remaining 0.6' of above (not includes in RQD). RQD: 3.8 / 4.3 = 88%	
15				C3	4.5 [90]	11.8 - 16.8	Moderately hard, sound to extremely fractured, slightly to very slightly weathered, fine grained, dark gray CALCAREOUS METASILTSTONE. Moderately to steeply dipping foliations with calcite stringers throughout. Hairline fractures throughout. Some low angle, iron stained fractures across foliations. Recovered remaining 0.6' of above (not includes in RQD). Steep, iron stained fracture from 36.6' to 37.6'. RQD: 2.4 / 5.0 = 48%	
20						16.8	Bottom of Exploration @ 16.8 ft (El. - 4.9)	
25							NOTE: Boring located in tidally influenced Piscataqua River and was drilled from a barge where the deck was at elevation 11.9'. At the time of drilling, the river surface elevation was at elevation -1.6', which was 13.5' above the river bottom.	

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard	WOH - Weight of Hammer			

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B5**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 1  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 15.4  
START/END 7/19/11 / 7/19/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228614/213258

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
7/19/11	2:30 pm	10.0	5.4	0	26.8	SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Strata Star 15	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL	
	DEPTH	ELEVATION							
0			3			0.0	Medium dense, fine sandy SILT, trace fine gravel, trace medium and coarse sand.  -FILL-		
	3.0	12.4	10 5	S1	1.1 [55]	2.0			
5			4			4.0	Loose, olive gray, silty fine SAND, trace fine sand, trace clay, thin layer of silt.  -ALLUVIAL DEPOSIT-		
	8.9	6.5	3 3	S2	1.7 [85]	6.0			
10			8			9.0	Olive gray, silty fine SAND, trace medium and coarse sand, trace fine gravel, cobble from 9.8 to 10.5'.  -GLACIAL TILL DEPOSIT-		
	11.5	3.9	50/0.3	S3	0.5 [62]	9.8			
15						13.0	Soft to moderately hard, fine grained, dark gray CALCAREOUS METASILTSTONE, slightly to severely weathered, very closely spaced and moderately dipping foliation, extremely fractured with clayey, iron-stained fracture faces. RQD: 0.3 / 4.0 = 8%		
				C1	3.2 [80]	17.0			
20						17.0			
						22.0	Moderately hard, fine grained, gray CALCAREOUS METASILTSTONE, very slightly to slightly weathered, closely spaced and steeply dipping foliations, smooth-faced fractures occurring along foliations. RQD: 2.8 / 5.0 = 56%		
				C2	4.5 [90]	22.0			
25						22.0	Moderately hard, gray, fine grained, CALCAREOUS METASILTSTONE, very slightly to slightly weathered, closely spaced and steeply dipping foliations, sound to extremely fractured, fractures occurring along foliations, some fractured iron-stained. RQD: 3.1 / 4.8 = 65%		
				C3	4.8 [100]	26.8			
							Bottom of Exploration @ 26.8 ft (El. - 11.4)		

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod WOH - Weight of Hammer		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard				

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B6**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. **247-084**  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 2  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 25.0  
START/END 7/18/11 / 7/18/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228672/213258

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
7/18/11	3:30 pm	13.5	11.5	0	39.4	SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Strata Star 15	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0	0.3	24.7					-ASPHALT PAVEMENT-	
							-FILL-	
			14			2.0	Very dense, dark olive gray, silty fine SAND, some fine gravel, some medium and coarse sand, trace coarse gravel.	[Cross-hatch pattern]
			56	S1	1.1 [55]	4.0		
			16			4.0	NO RECOVERY - Stone lodged in tip of sampler.	[Cross-hatch pattern]
5			12	S2	0.0 [0]	6.0		
			8			6.0	Sample collected from auger flights for laboratory tests.	[Cross-hatch pattern]
			9			9.0		
			7	A1	3.0 [100]	9.0	Similar to S1 except very dense.	[Cross-hatch pattern]
10			46			11.0		
			33	S3	0.9 [45]	14.0	Similar to S1.	[Cross-hatch pattern]
			21			16.0		
15	15.2	9.8	5	S4	0.3 [15]	19.0	Olive gray, silty fine SAND, little fine gravel, little medium and coarse sand.	[Cross-hatch pattern]
			2			20.2		
			14			19.0	Very dense, olive gray, silty fine SAND, trace fine gravel, trace medium and coarse sand.	[Cross-hatch pattern]
20			5	S5	1.2 [100]	20.2		
			5			20.2	-GLACIAL TILL DEPOSIT-	[Cross-hatch pattern]
			50/0.2			24.4		
	23.8	1.2				24.4	-APPROXIMATE BEDROCK SURFACE-	[Cross-hatch pattern]
25								
				C1	4.8 [96]		Moderately hard, fine grained, dark gray CALCAREOUS METASILTSTONE, slightly to moderately weathered, very closely spaced and moderately to steeply dipping foliation, moderately to extremely fractured with most fractures occurring along foliations, occasional calcite stringers throughout core sample. RQD: 0.8 / 5.0 = 16%	[Cross-hatch pattern]

Sampler	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard	WOH - Weight of Hammer			

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. B6**

SHEET NO. 2 OF 2

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) 25.0

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30				C2	4.8 [96]	29.4 29.4	Moderately hard, fine to medium grained, dark gray CALCAREOUS METASILTSTONE, slightly to moderately weathered, very closely spaced and moderately to steeply dipping foliations, slightly to extremely fractured with most fractures occurring along foliations, occasional calcite stringers throughout core sample. RQD: 1.6 / 5.0 = 32%	
35				C3	4.9 [98]	34.4 34.4		
40						39.4	Bottom of Exploration @ 39.4 ft (El. - 14.4)	
45								
50								
55								
60								
65								

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**APPENDIX D**

**TEST CORING LOGS C1 AND C2 (AUGUST 2011)**

# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C1**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 4  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 31.2  
START/END 8/1/11 / 8/8/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228403/212374

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
						SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Mobile Surveyer	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0	0.3	30.9					-WOODEN SIDEWALK-	
5							-AIR GAP-	
10							-TOP OF PIER-	
	11.2	20.0		C1	2.0 [100]	11.2 13.2	Light brownish gray, CONCRETE, slightly to extremely fractured, with fine and coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone, schist. All fractures are along interface of gravel and cement. RQD: 1.5 / 2.0 = 75%	
				C2	4.9 [98]	13.2 18.2	Light brownish gray, CONCRETE, slightly to moderately fractured, with fine and coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone, schist. Pitting around gravel at 14.0 feet. At 15.6, could break concrete with finger pressure. Air pockets/voids throughout core run. All fractures are along interface of gravel and cement. RQD: 3.5 / 5.0 = 70%	
				C3	5.0 [100]	18.2 23.2	Light brownish gray, CONCRETE, sound to moderately fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone and schist. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.5 / 5.0 = 90%	
				C4	5.0 [100]	23.2 28.2	Light brownish gray, CONCRETE, sound to moderately fractured, with fine gravel, some coarse gravel, rounded to subangular to shape gravel, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone, and schist. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.5 / 5.0 = 90%	
						28.2		

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod WOH - Weight of Hammer		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard				

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C1**

SHEET NO. 2 OF 4

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) 31.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30				C5	5.0 [100]		Light brownish gray, CONCRETE, sound to slightly fractured, with fine gravel, some coarse gravel rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone. Some pitting at 31.6 feet to 32.0 feet. Other areas are most likely air pockets/voids. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						33.2		
35				C6	5.0 [100]		Light brownish gray, CONCRETE, sound to moderately fractured, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone. At 37.8 feet, pitting around gravel. Other areas show some pitting around gravel. Air pockets/voids throughout core run. Cold joints at 35.5 and 37.3 feet. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						38.2		
40				C7	5.0 [100]		Light brownish gray, CONCRETE, sound to moderately fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone, and schist. From 41.6 to 42.5 feet, pitting around gravel. Wood fiber in concrete at 41.9 feet. At 41.4 feet cold joint. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.7 / 5.0 = 94%	
						43.2		
45				C8	4.7 [94]		Light brownish gray, CONCRETE, sound to moderately fractured, with coarse gravel, some fine gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. From 46.6 to 47.1 feet, severe weathering, concrete is dark gray/black, extremely fracture. Air pockets/voids throughout core run. All fractures are along interface of gravel and cement. RQD: 4.1 / 5.0 = 82%	
						48.2		
50				C9	5.0 [100]		Light brown gray, CONCRETE, sound, with fine and coarse gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Some pitting along the interface of gravel and concrete. Other areas are most likely air pockets/voids. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						53.2		
55				C10	5.0 [100]		Light brownish gray, CONCRETE, sound to slightly fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular, trace angular gravel. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Air pockets/voids throughout core run. At 55.2 feet, hairline fracture across gneiss coarse gravel. All fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						58.2		
60				C11	5.0 [100]		Light brownish gray, CONCRETE, sound to slightly fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Vugs and pitting around gravel at 58.9 and 59.2 feet. Pitting around gravel from 59.9 to 60.1 feet. Air pockets/voids throughout core run. Fractures are along interface of gravel in the concrete. RQD: 4.9 / 5.0 = 98%	
						63.2		
65							Light brownish gray, CONCRETE, slightly fractured to sound, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss, metasiltstone, trace	

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C1**

SHEET NO. 3 OF 4

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) 31.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
				C12	3.8 [76]		schist. Vugs and pitting around gravel and concrete. Fractures are along interface of gravel in the concrete. RQD: 3.8 / 5.0 = 76%	
						68.2		
70				C13	1.5 [30]		Light brownish gray, CONCRETE, moderately to extremely fractured, with fine and coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasilstone, trace schist. Cement around gravel appears to be weathered, concrete is soft. RQD: 0.0 / 5.0 = 0%	
						73.2		
75				C14	4.2 [84]		Light brownish gray, CONCRETE, sound to extremely fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular gravel. Gravel is a mixture of granite, gneiss and metasilstone, trace schist. Cold joint at 77.6 feet (material was cement, little fine gravel, coarse gravel absent). From 74.4 to 74.7 feet, gravel is clean. Small cavity at 75.4 to 75.7 feet, soft. RQD: 3.3 / 5.0 = 66%	
						78.2		
80				C15	5.3 [110]		Light brownish gray, CONCRETE, sound, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss, metasilstone, trace schist. Portion of smooth steel bar (apparent 1.5 inches dia.) at 79.0 feet. Fractures are along interface of gravel in the concrete. RQD: 4.7 / 4.8 = 98%	
						83.0		
85				C16	5.0 [100]		Light brownish gray, CONCRETE, sound, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss and metasilstone. Trace amount of coarse gravel are 3 inches in length. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						88.0		
90				C17	5.0 [100]		Light brownish gray, CONCRETE, sound to moderately fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss and metasilstone. Trace amount of coarse gravel are 3 inches in length. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						93.0		
95				C18	5.0 [100]		Light brownish gray, CONCRETE, sound to slightly fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss and metasilstone. Trace amount of coarse gravel are 3 inches in length. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						98.0		
100				C19	5.0 [100]		Light brownish gray, CONCRETE, with fine and coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss and metasilstone. Trace amount of coarse gravel are 3 inches in length. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 5.0 / 5.0 = 100%	

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C1**  
SHEET NO. 4 OF 4  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 31.2

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION Replacement of US-1 Memorial Bridge

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
105				C20	5.0 [100]	103.0 103.0	Light brownish gray, CONCRETE, sound to moderately fractured, with fine gravel and trace coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss, and metasiltstone. Part of steel bar at 103.3 feet. Cold joint at 103.5 feet coated each side with coal tar (black in color, naphthalene-like odor when scratched). From 105.5 to 105.9 feet very little fine gravel. Fractures are along interface of gravel and cement. RQD: 4.7 / 5.0 = 94%	[Concrete with gravel pattern]
110	112.2	-81.0		C21	5.0 [100]	108.0 108.0	Light brownish gray, CONCRETE, sound to moderately fractured, with fine gravel little coarse gravel, rounded to subangular in shape, trace angular shape gravel. Gravel is a mixture of granite, gneiss and metasiltstone. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. RQD: 4.0 / 5.0 = 80%	[Concrete with gravel pattern]
				-APPROXIMATE BEDROCK SURFACE-				
115				C22	5.0 [100]	113.0 113.0	Moderately hard, sound to moderately fractured, fresh, dark gray, fine grained, CALCAREOUS METASILTSTONE. Foliation is moderately dipping to steep angle. Calcite stringer throughout rock. At 113.4 and 114 feet, and 117.5 feet moderately dipping fractures, smooth, across stringer. RQD: 3.0 / 5.0 = 60%	[Metasiltstone pattern]
120				C23	4.2 [84]	118.0 118.0	Moderately hard, sound to moderately hard, fresh, dark gray, fine grained, CALCAREOUS METASILTSTONE. Calcite stringer throughout core run. Foliation is moderately to steep angle. Several moderately dipping fractures along the stringers. RQD: 2.3 / 5.0 = 46%	[Metasiltstone pattern]
125						123.0	Bottom of Exploration @ 123.0 ft (El. - 91.8)	
130								
135								

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C2**

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084  
DESCRIPTION **Replacement of US-1 Memorial Bridge**

SHEET NO. 1 OF 4  
STA. \_\_\_\_\_ OFF. \_\_\_\_\_  
BASELINE n/a  
ELEVATION (ft) 31.2  
START/END 8/10/11 / 8/12/11  
DRILLER NHB  
INSPECTOR John Soper  
CLASSIFIER JKS  
EAST/NORTH (ft) 1228490/212695

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	HW	NX
						SIZE I.D. (in):	1.375	4	1.875
						HAMMER WT. (lb):	140	<b>DRILL RIG</b> Mobile Surveyer	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Safety		

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
0	0.3	30.9					-WOODEN SIDEWALK-	
5							-AIR GAP-	
10							-TOP OF PIER-	
	11.0	20.2		C1	1.5 [100]	11.0 - 12.5	Brownish gray/dark gray, CONCRETE, slightly fractured, with fine gravel, angular, trace rounded to subangular. Gravel is mostly metasiltstone, trace granite, gneiss, and quartz. Fractures are along interface of gravel and cement. Dark gray from 11.3 to 12.5 feet. RQD: 1.4 / 1.5 = 93%	
				C2	5.0 [100]	12.5 - 17.5	Brownish gray, CONCRETE, sound to moderately fractured. From 12.5 to 13.4 feet, dark gray, fine gravel, angular, trace rounded to subangular. Cold joint at 13.4 feet. From 13.4 feet to 17.5 feet, brownish gray, gravel is coarse, little fine gravel, rounded to subangular, trace angular is shape. Gravel is a mixture of granite, gneiss and metasiltstone. Air pockets throughout core run. Fractures are along interface of gravel and cement. RQD: 4.6 / 5.0 = 92%	
				C3	4.9 [98]	17.5 - 22.5	Brownish gray, CONCRETE, sound to slightly fractured, with fine gravel, trace coarse gravel, rounded to subangular in shape. Gravel mixture is granite, some gneiss, trace schist. At 18.9 feet, iron stain around gravel. Air pockets/voids throughout core run. Fractures are along interface of gravel and cement. Portion of steel bar (apparent 1 inch dia.) at 21.8 feet, horizontal to core run. RQD: 4.7 / 5.0 = 94%	
				C4	5.0 [100]	22.5 - 27.5	Brownish gray, CONCRETE, sound to moderately fractured, with fine and coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, metasiltstone, and gneiss. Fractures are along interface of gravel and cement. From 23.1 to 24.0 feet, pitting around gravel, with some gravel showing iron staining. Piece of 1/8 inch thick steel, horizontal to core run, at 24.6 feet. Air pockets/voids throughout. RQD: 4.3 / 5.0 = 86%	

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard	WOR - Weight of Rod		<b>ENGLISH</b>	
NR	Not Recorded	> 60	Very Hard	WOH - Weight of Hammer			

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C2**

SHEET NO. 2 OF 4

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

DESCRIPTION Replacement of US-1 Memorial Bridge

BASELINE n/a

ELEVATION (ft) 31.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30				C5	4.9 [98]		Brownish gray, CONCRETE, sound, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Fractures are along interface of gravel and cement. A few coarse gravel are 3 inches in size. RQD: 4.8 / 5.0 = 96%	
						32.5		
35				C6	5.0 [100]		Brownish gray, CONCRETE, sound, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Fractures are along interface of gravel and cement. A few coarse gravel are 3 inches in size. Cold joint at 36.8 feet. Some gravel has iron staining around the edges. RQD: 4.8 / 5.0 = 96%	
						37.5		
40				C7	5.0 [100]		Brownish gray, CONCRETE, sound to slightly fractured, with fine gravel, some coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone. Air pockets/voids throughout core run. Fractures are along the interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						42.5		
45				C8	5.0 [100]		Brownish gray, CONCRETE, sound to moderately fractured, with fine gravel, some coarse gravel, rounded to subangular in shape. Gravel is a mixture of metasiltstone, granite, and gneiss, trace schist. Some gravel has iron staining. Trace coarse gravel was 3 inches in size. Fractures are along interface of gravel and cement. At 44.2 feet, concrete is iron stained with pitting. Vug at 44.4 feet along gravel and cement interface. Possible cold joint at 46.5 feet. Air pockets/voids throughout core run. RQD: 4.4 / 5.0 = 88%	
						47.5		
50				C9	5.0 [100]		Brownish gray, CONCRETE, sound to moderately fractured, with fine gravel, trace coarse gravel, rounded to subangular in shape. Gravel is a mixture of metasiltstone, gneiss, granite, and schist. Air pockets/voids throughout core run. At 48.0 feet, pitting around gravel interface with cement. Fractures are along the interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						52.5		
55				C10	5.0 [100]		Brownish gray, CONCRETE, sound to slightly fractured with fine gravel, some coarse gravel, rounded to subangular in shape. Gravel is a mixture of gneiss, granite, metasiltstone and schist. Fractures are along the interface of gravel and cement. Air pockets/voids throughout core run. At 54.5 and 59.8 feet, pitting along the interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
						57.5		
60				C11	5.0 [100]		Brownish gray, CONCRETE, sound to slightly fractured, with fine and coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone and schist. Air pockets/voids throughout core run. Some gravel and cement contacts are iron stained. Vug at 59.0 feet between cement and gravel. At 60.3 and 61.6 feet, fractures are across gravel. Other fractures are along the interface of gravel and cement. RQD: 4.9 / 5.0 = 98%	
						62.5		
65				C12	5.0 [100]		Brownish gray, CONCRETE, sound, with fine gravel, little coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Possible cold joint at 63.6 feet. Fractures	

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C2**

SHEET NO. 3 OF 4

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

ELEVATION (ft) 31.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
							are along the interface of gravel and cement. RQD: 4.8 / 5.0 = 96%	
70				C13	4.5 [90]	67.5 67.5	Brownish gray, CONCRETE, sound, with fine gravel, little coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Portion of steel bar (apparent 2 inch dia.) at 69.6 feet. Fractures are along the interface of gravel and cement. RQD: 4.3 / 5.0 = 86%	
75				C14	5.0 [100]	72.5 72.5	Brownish gray, CONCRETE, sound to moderately fractured, with fine gravel, some coarse gravel, rounded to subangular, trace angular. Gravel is mixture of granite, gneiss, metasiltstone, trace schist. Trace of amount of coarse gravel is 3 inches in size. Air pockets/voids throughout core run. Pieces of steel plate at 74.1 and 75.5 feet (3/4 inch thick) parallel and at an approximate 45 degree angle. Fractures are along interface of gravel and cement. RQD: 4.0 / 5.0 = 80%	
80				C15	5.0 [100]	77.5 77.5	Brownish gray, CONCRETE, sound, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Some air pockets/void throughout core run. Some gravel shows iron staining at contact with cement. Vugs and pitting of gravel and cement at 80.7 feet. Trace amount of coarse gravel is 3 inches in size. Fractures are along interface of gravel and cement. RQD: 4.9 / 5.0 = 98%	
85				C16	5.0 [100]	82.5 82.5	Brownish gray, CONCRETE, sound to slightly fractured, with fine to coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, metasiltstone, trace schist. Cold joints at 85.0 and 88.5 feet. From 83.9 to end of run at 87.5 feet, cold joint, vertical to core run. RQD: 4.9 / 5.0 = 98%	
90				C17	5.0 [100]	87.5 87.5	Brownish gray, sound to slightly fractured, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Some air pockets/void throughout core run. From 87.5 to 90.1 feet, cold joint, vertical to core run. Possible cold joint horizontal to core run at 90.1 feet to 90.8 feet. Vugs at 86.7 feet. From 90.1 to 90.8 feet, area has vugs and pitting around gravel and cement contact. Fractures are along the interface of gravel and cement. RQD: 3.9 / 5.0 = 78%	
95				C18	5.0 [100]	92.5 92.5	Brownish gray, CONCRETE, sound to slightly fractured, with fine gravel, some coarse gravel, rounded to subangular in shape, trace angular. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. At 93.0 feet, cement is soft, breaks with finger pressure, with vugs. Possible cold joint at 94.5 feet. Fractures are along the interface of gravel and cement. RQD: 4.7 / 5.0 = 94%	
100				C19	5.0 [100]	97.5 97.5	Brownish gray, CONCRETE, sound, with fine and coarse gravel, rounded to subangular in shape. Gravel is a mixture of granite, gneiss, metasiltstone, trace schist. Possible cold joint at 105.0 feet. Fractures are along the interface of gravel and cement. Trace amount of coarse gravel 3 inches in size. RQD: 4.7 / 5.0 = 94%	

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# TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION  
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



**BORING NO. C2**

SHEET NO. 4 OF 4

STA. \_\_\_\_\_ OFF. \_\_\_\_\_

PROJECT NAME **PORTSMOUTH-KITTERY 13678F** BRIDGE NO. 247-084

BASELINE n/a

DESCRIPTION Replacement of US-1 Memorial Bridge

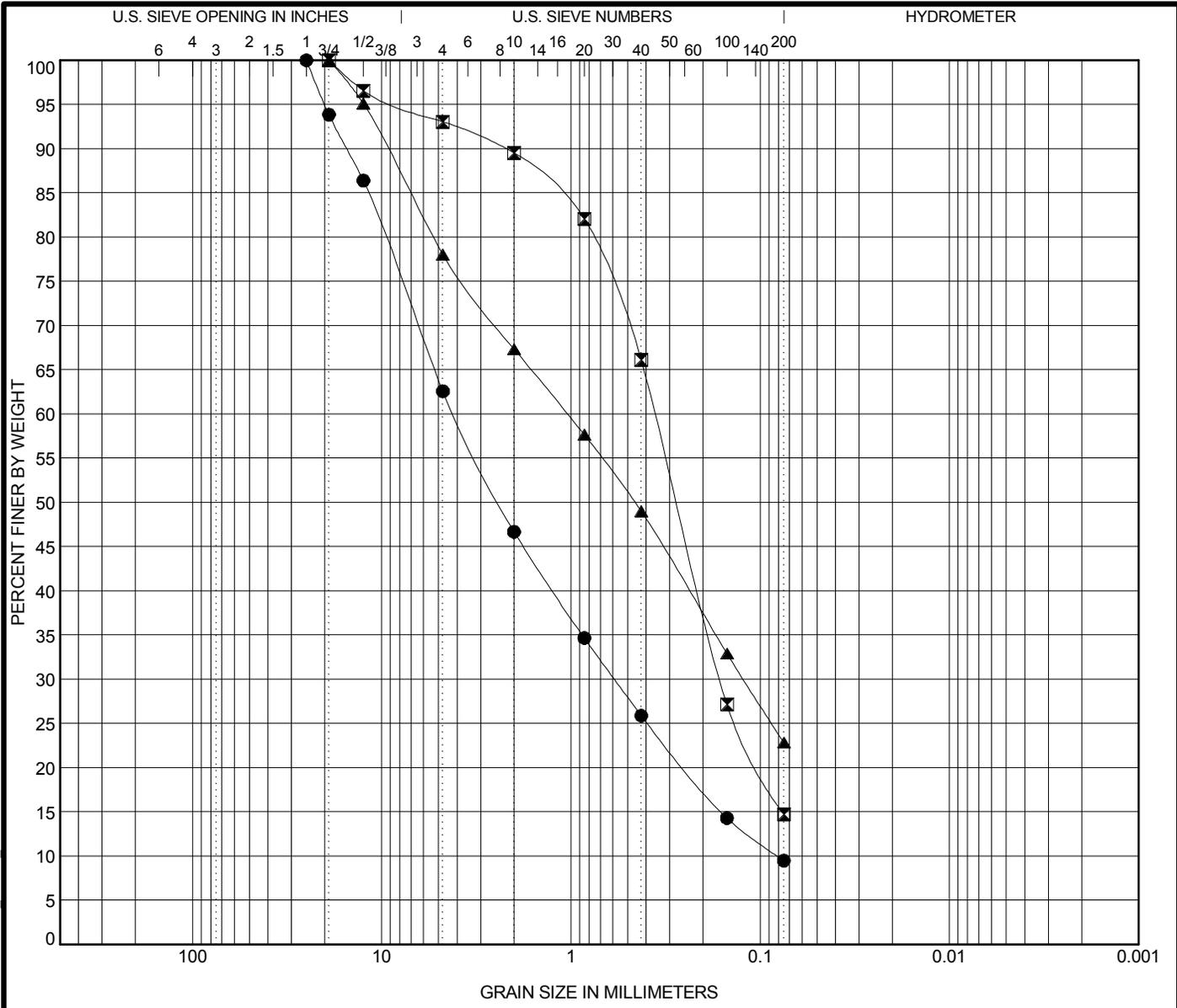
ELEVATION (ft) 31.2

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
105	103.2	-72.0		C20	5.0 [100]	102.5-102.5	<p style="text-align: center;">-APPROXIMATE BEDROCK SURFACE-</p> <p>Moderately hard, sound to extremely fractured, fresh to slightly weathered, dark gray, CALCAREOUS METASILTSTONE. Calcite stringers throughout core run. Several steep angle fractures along stringers, smooth in core run. Fractures are along moderately dipping foliation. RQD: 2.4 / 5.0 = 48%</p>	
						107.5-107.5		
110				C21	5.0 [100]	107.5-112.5	<p>Moderately hard, sound to extremely fractured, fresh to slightly weathered, dark gray, CALCAREOUS METASILTSTONE. Calcite stringers throughout core run. Fractures are along calcite stringers. RQD: 3.0 / 5.0 = 60%</p>	
115						112.5	Bottom of Exploration @ 112.5 ft (El. - 81.3)	
120								
125								
130								
135								

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**APPENDIX E**

**GEOTECHNICAL LABORATORY TESTING RESULTS**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	USCS Classification	LL	PL	PI	Cc	Cu
● B1, S1 1.0	WELL GRADED SAND W/SILT & GRAVEL (SW-SM)				1.04	51.16
☒ B1, S5 21.0	SILTY SAND (SM)					
▲ B1, S6 24.7	SILTY SAND W/GRAVEL (SM)					

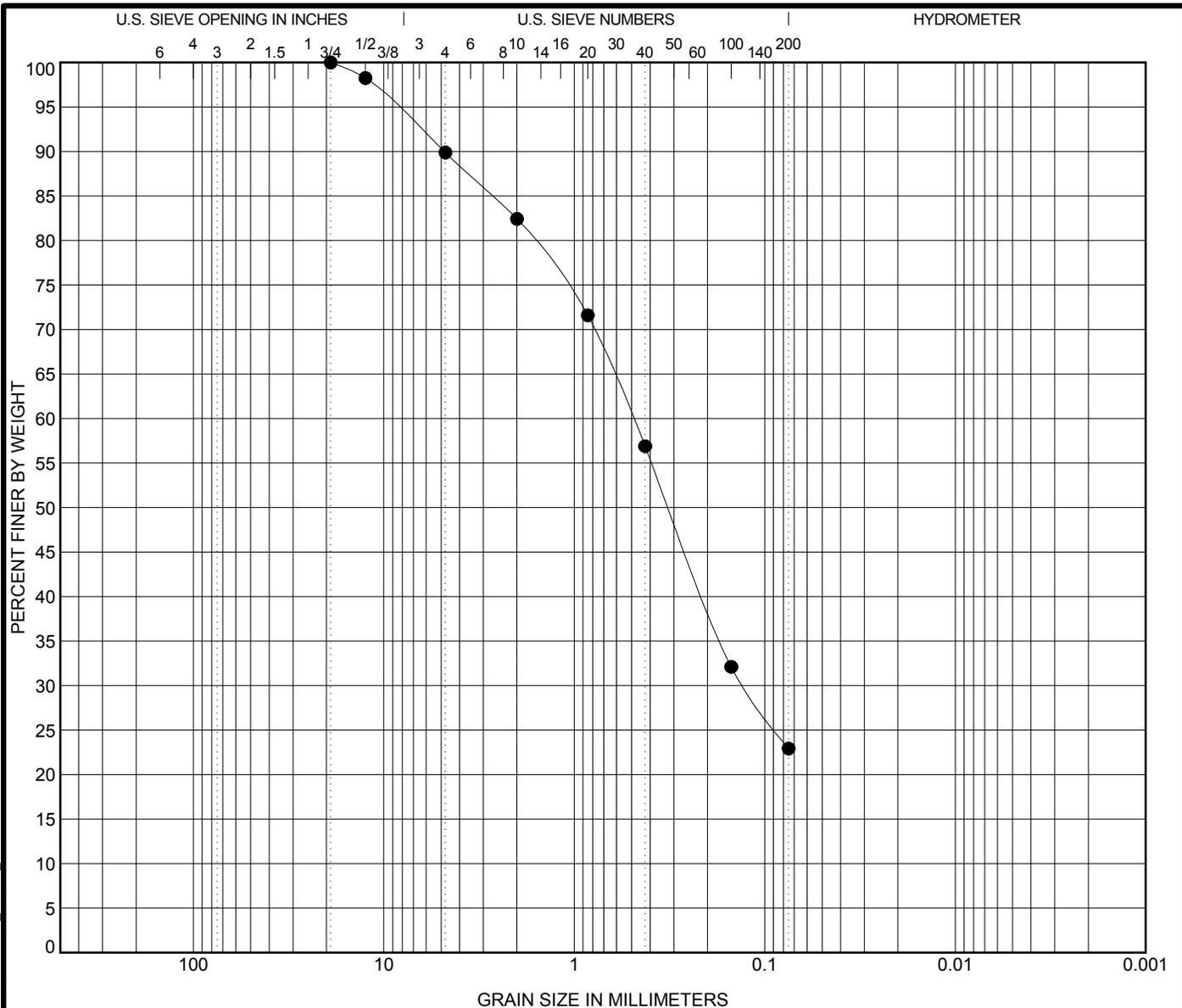
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B1, S1 1.0	25	4.13	0.588	0.081	37.4	53.1	9.5	
☒ B1, S5 21.0	19	0.361	0.162		6.9	78.3	14.7	
▲ B1, S6 24.7	19	1.046	0.123		22.0	55.2	22.8	



State of New Hampshire  
 Department of Transportation  
 Bureau of Materials & Research  
 Project: Portsmouth-Kittery  
 Location: US-1 Memorial Bridge  
 Number: 13678F

**GRAIN SIZE DISTRIBUTION**  
 AASHTO T27/T11 - Sieve Analysis of Fine and Coarse Aggregates/Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing

US GRAIN SIZE S:\GINT\PROJECTS\PORTSMOUTH\13678F\LABTESTS.GPJ 8/25/2011 3:28:02 PM US GRAIN SIZE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
● B6, A1	7.5	<b>SILTY SAND (SM)</b>					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B6, A1	7.5	19	0.492	0.128	10.1	67.0	22.9	


 State of New Hampshire  
 Department of Transportation  
 Bureau of Materials & Research  
 Project: Portsmouth-Kittery  
 Location: US-1 Memorial Bridge  
 Number: 13678F

**GRAIN SIZE DISTRIBUTION**

AASHTO T27/T11 - Sieve Analysis of Fine and Coarse Aggregates/Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing

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