

Appendix P

Geotechnical Data Report

GEOTECHNICAL DATA REPORT

Rehabilitation of Weston Aqueduct Supply Main 3 MWRA Contract No. 6539

Weston, Waltham, Belmont, Arlington,
Somerville, and Medford, Massachusetts

Stantec, Inc.

for the

Massachusetts Water
Resources Authority

September 2023



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- Appendix B – Recent Test Boring and Monitoring Well Installation Logs
- Appendix C – Rock Core Photo Logs
- Appendix D – Geotechnical Laboratory Test Results
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Acronyms

bgs	below ground surface
BCB	Boston City Base
bl/ft	blows per foot
CP1	Construction Package 1
CP2	Construction Package 2
CP3	Construction Package 3
El.	elevation
CTI	CorrTech, Inc.
HA	hand auger
HSA	hollow stem auger
I.D.	inside diameter
MWRA	Massachusetts Water Resources Authority
N-Value	standard penetration resistance
O.D.	outside diameter
RQD	rock quality designation
SPT	standard penetration test
Stantec	Stantec, Inc.
WASM 3	Weston Aqueduct Supply Main 3

Section 1

Introduction

1.1 General

This report summarizes CDM Smith's field exploration and laboratory test program for the Rehabilitation of the Weston Aqueduct Supply Main 3 (WASM 3) Project, MWRA Contract No. 6539, in the Town of Weston, City of Waltham, Town of Belmont, Town of Arlington, City of Somerville, and City of Medford, Massachusetts.

The Massachusetts Water Resources Authority (MWRA) Rehabilitation of WASM 3 Project, MWRA Contract No. 6539, consisted of evaluating the condition of the existing WASM 3 water mains, and providing recommendations for the rehabilitation or replacement of the water mains. This report was completed in conjunction with the hazardous materials and corrosion assessments to characterize subsurface conditions to be used in design. Rehabilitation recommendations will be provided by Stantec, Inc (Stantec), of Boston, MA, under separate cover.

The project site and existing WASM 3 main alignment are illustrated on **Figure 1-1** - Project Locus Plan.

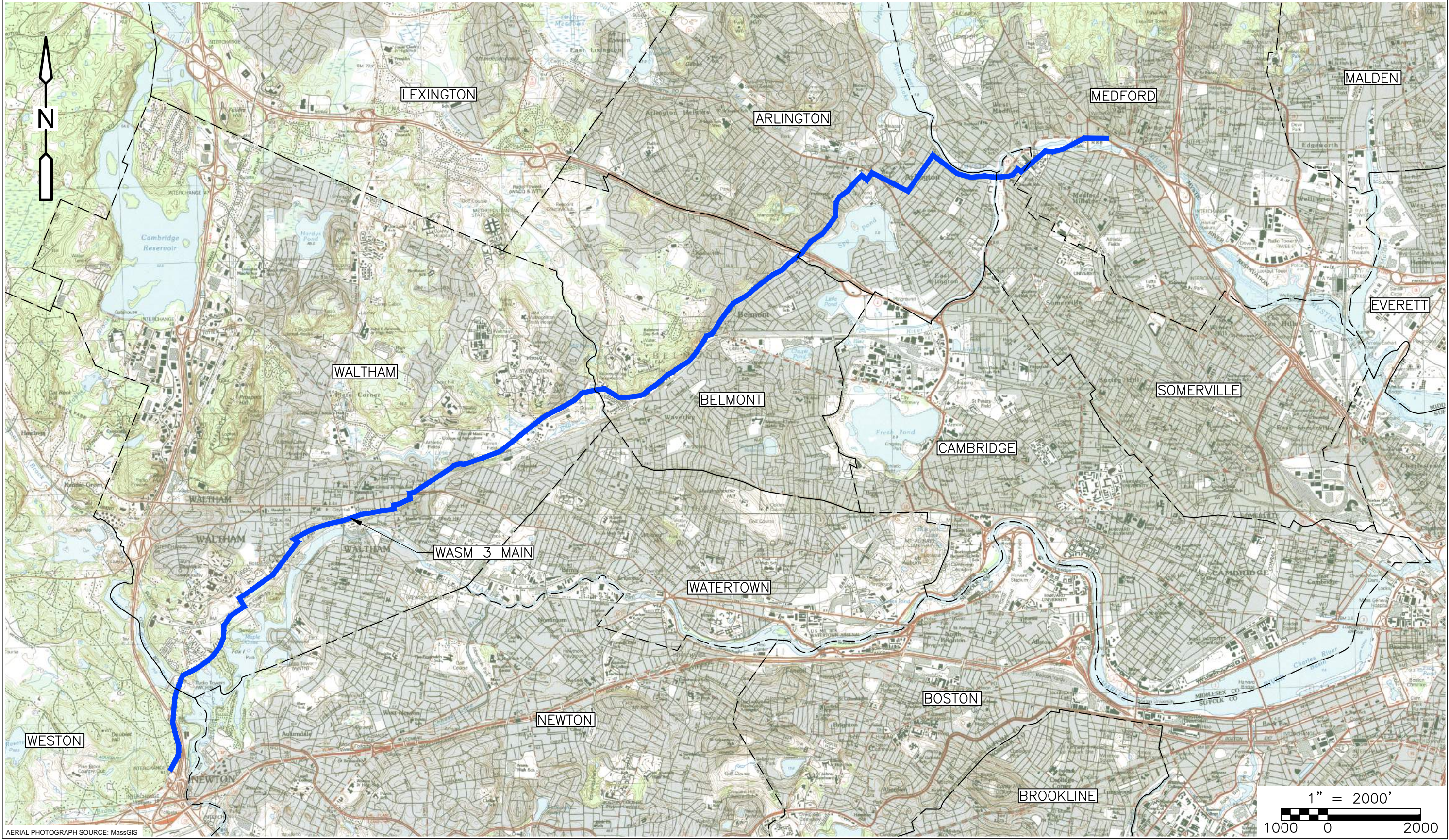
Elevations noted are in feet and referenced to North American Vertical Datum 1988 (NAVD88).

1.2 Purpose and Scope

The purpose of the subsurface exploration program was to provide the design team with subsurface information along the existing WASM 3 alignments; including soil boring logs, approximate location of bedrock surface, groundwater levels and installation of groundwater monitoring wells, collection of soil and bedrock samples for geotechnical analysis, corrosion analysis, and analytical analysis.

Specifically, CDM Smith's scope of work included:

- Review existing subsurface information;
- Prepare a soil exploration program work plan for Stantec and MWRA's approval;
- Conduct a subsurface exploration program along the existing WASM 3 alignment, that consisted of performing 112 test borings;
- Install 12 groundwater monitoring wells at select test boring locations;
- Collect soil and bedrock samples for geotechnical testing, analytical analysis, and corrosion analysis;
- Coordinate with CorrTech, Inc. (CTI) of Hopkinton, MA for corrosion sample collection;
- Coordinate with Stantec for analytical sample collection;



MWRA
REHABILITATION OF WESTON AQUEDUCT SUPPLY MAIN 3
WESTON, WALTHAM, BELMONT, ARLINGTON, SOMERVILLE, AND MEDFORD, MASSACHUSETTS

PROJECT LOCUS PLAN
FIGURE 1-1

- Conduct geotechnical laboratory tests on select soil samples to assist with the classification of soils encountered;
- Prepare test boring logs;
- Prepare groundwater monitoring well logs;
- Provide Stantec with subsurface information to prepare geotechnical profile drawings of the existing section alignments; and
- Prepare this memorandum summarizing the geotechnical data collected as part of the recent subsurface exploration program.

Section 2

Site and Subsurface Conditions

2.1 Existing Site Conditions

The WASM 3 rehabilitation project is separated for bidding purposes into three proposed Construction Packages denoted as CP-1, CP-2 and CP-3. The conditions along each construction package are presented below.

Construction Package 1

The proposed WASM 3 Construction Package 1 (CP-1) includes the rehabilitation of approximately 13,609 feet of lock-bar steel pipe as follows:

- 5,080 feet of existing 56-inch diameter steel pipe along Section W11 between Sta. 394+70 and Sta. 445+50 in Arlington, MA; and
- 8,529 feet of existing 60-inch diameter steel pipe along Sections W12, W51, and W16 between Sta. 445+50 and Sta. 557+19 in Arlington, Somerville, and Medford, MA.

The alignment is located within the streets of Arlington, Somerville and Medford; including, Pleasant Street, Swan Street, Swan Place, Massachusetts Avenue, Broadway, Palmer Street, Hamlet Street, Coral Street, and the Mystic Valley Parkway in Arlington, Mystic Valley and Alewife Brook Parkway, Capen Street, Irvington Road, and Boston Avenue in Somerville, and Boston Street, and the Mystic Valley Parkway in Medford. The pipe invert ranges from approximately 6.5 feet to 21 feet bgs. The existing water main crosses beneath the Charles River in Medford.

Construction Package 2

The proposed WASM 3 Construction Package 2 (CP-2) includes the rehabilitation of approximately 10,769 feet of existing 56-inch diameter lock-bar steel pipe along Section W11 between Sta. 288+44 and Sta. 394+34 in Belmont and Arlington, MA.

The alignment begins at Pleasant Street in Belmont, and extends east to Venner Road in Arlington, MA. The alignment is located along Route 60 (Pleasant Street) within Belmont. The pipe invert ranges from approximately 6 feet to 21 feet bgs. The existing water main within the CP-2 limits connects to other MWRA distribution alignments including Section 59 and W118 and crosses beneath the Concord Turnpike/Route 2.

Construction Package 3

The proposed WASM 3 Construction Package 3 (CP-3) includes the rehabilitation of approximately 28,719 feet of 56-inch or 60-inch diameter lock-bar steel pipe as follows:

- 26,825 feet of existing 60-inch diameter steel pipe along Sections W9 and W10 between Sta. 0+00 and Sta. 269+50 in Weston and Waltham, MA; and

- 1,894 feet of existing 56-inch diameter steel pipe along Section W11 between Sta. 269+50 and Sta. 288+44 in Waltham, and Belmont, MA.

The alignment begins near the intersection of MA Route 30 and River Road in Weston, and extends east where it connects to the CP-2 alignment at Pleasant Street in Belmont. The alignment is located within the streets of Weston, Waltham and Belmont; including, River Road in Weston, and South Street, Charles River Road, Howe Avenue, Hope Avenue, Sun Street, Fern Street, Felton Street, Central Street, Newton Street, Barton Street, Chamberlain Terrace, Linden Street, and Waverly Oaks Road in Waltham, and Trapelo Road in Belmont. The areas along the pipe alignment are generally a mixture of residential and commercial properties; a portion of the alignment is adjacent to the Charles River and Stony Brook Basin. The pipe invert ranges from approximately 6 feet to 17 feet below ground surface (bgs).

Within the CP-3 limits, the existing water main connects to other MWRA distribution alignments; including, Section W1, Section W10B and 10C, and the Watertown Section.

2.2 Subsurface Exploration Programs

2.2.1 Existing Subsurface Information

A variety of existing documents were reviewed prior to developing the subsurface exploration program for the proposed Rehabilitation of WASM 3 Project. Documents included: contract plans, record drawings, detail records, existing boring data, and construction drawings for the WASM 3 water mains, as well as for other nearby projects including the following:

Construction Package 1

- Utility System Record Plans including the following:
 - 1924 and 1926 Section W11,
 - 1925 Section W12, and
 - 1934 Section W16 Distribution
- Parsons Brinkerhoff. "MWRA Weston Aqueduct Supply Main 3 – New Shaft 7 Connection Alignment Plan", March 3, 2003.
- One (1) test boring log prepared by CDM Smith conducted for the MWRA – Contract 6540 project.
- One (1) test boring log conducted for the MassDOT, Line Borings Arlington, Lexington, and Belmont, 1966 project.
- One (1) test boring log conducted for the MWRA Proposed Distribution Line from Shaft 9, Medford, MA, 1967 project.
- Six (6) test boring logs conducted for the MassDOT, River Street and Harvard Avenue Over the Mystic River, Arlington, MA, 1933 project.

- Eight (8) test boring logs conducted for the MassDOT, Mystic Valley Parkway Over Alewife Brook, Arlington and Somerville, MA, 2010 project.
- Ten (10) test boring logs conducted for the MassDOT, Winthrop Street Bridge Over Mystic River, Medford, MA project.
- Eleven (11) test boring logs conducted for the MWRA WASM 3, 1933 project.
- One (1) test boring log conducted for the MWRA 1937 Contract No. 59, 1937 project.

Construction Package 2

- Utility System Record Plans of 1926 Section W11 Distribution.
- One (1) test boring log conducted by Capone Construction Co., Belmont, MA, January 1987.
- Twenty-one (21) test boring logs conducted for the MassDOT Pleasant Street (Route 60) Belmont, MA 2004 project.
- Two (2) test boring logs conducted for the MassDOT Route 2 Arlington/Belmont, 1964 project.
- Eleven (11) test boring logs conducted for the MassDOT Route 60 at Route 2 Belmont/Arlington, MA 1967, project.
- Test boring logs by Raymond Concrete Pile Co. prepared for MassDOT, Belmont, MA, 1967

Construction Package 3

- Utility System Record Plans including:
 - 1924 Section W9,
 - 1932 Section W10, and
 - 1926 Section W11 Distribution.
- Sixteen (16) test boring logs conducted for the MassDOT Rte. 128 Widening Under River Street, Weston, MA, October, 1960 project.
- Twelve (12) test boring logs conducted for the MassDOT Northern Circumferential Highway Over Norumbega Rd, Weston, MA, March 1950 project.
- Four (4) test boring logs prepared by Hager-Richter Geoscience, Inc., Weston, MA, January 1997.
- Thirteen (13) test boring logs conducted for the MWRA Contract No. 233,8, Charles Relief Sewer, Waltham, MA, 1956 project.
- One (1) test boring logs conducted for the MWRA 1937 Contract No. 59, 1937 project.

Site plans identifying the approximate location of relevant existing test borings and test boring locations are included in **Figures 2-1, 2-2 and 2-3**. Relevant existing test boring logs are included in **Appendix A**.

2.2.2 Subsurface Exploration Program

A work plan was prepared for and approved by Stantec and the MWRA, outlining the subsurface exploration program for the MWRA Rehabilitation of the WASM 3 Project (*Final Soil Exploration Program Work Plan*, Stantec/CDM Smith, September 2017).

The subsurface exploration program consisted of performing one hundred and twelve (112) test borings. Seventy-one (71) test borings were drilled from ground surface without utilizing vacuum excavation. The locations of forty-two (42) test borings were advanced using vacuum excavation prior to performing the test borings. Twelve (12) groundwater monitoring wells were installed in completed test borings. A breakdown of the subsurface exploration program by Construction Package is provided below.

All test borings were conducted and completed by GeoLogic-Earth Exploration Inc. of Norfolk, Massachusetts between August 28, 2017 and January 29, 2018. Test borings were conducted using a Acker Soil Scout ATV track-mounted drill rigs. Test borings were drilled using drive and wash techniques with 3 to 4-inch inside diameter (I.D.) steel casing.

Prior to drilling, select test boring locations were cleared using vacuum excavation methods to locate existing utilities that may not have been identified as part of the DigSafe utility clearance. Vacuum excavation was conducted to depths ranging from four (4) feet to six (6) feet bgs unless a subsurface obstruction, such as a utility, boulder or shallow bedrock was encountered. Test borings were then drilled to depths ranging from 5 to 26 feet bgs, approximately.

Split spoon sampling was typically conducted continuously, from the ground surface or bottom of the vacuum excavation depth through the approximate existing pipe depth, and at five-foot intervals thereafter. Split spoon sampling was conducted in accordance with ASTM D1586 (using a 2-inch outside diameter (O.D.) sampler, driven 24 inches by blows from a 140-pound hammer falling freely for 30-inches). The number of blows required to drive the sampler each 6-inch increment was recorded and the Standard Penetration Resistance (N-value) was determined as the sum of the blows over the middle 12 inches of penetration. Samples collected from the test borings were visually logged and classified by a CDM Smith representative at the time of drilling. Representative soil samples from each split spoon were collected and stored in jars for subsequent review and laboratory testing.

Rock coring was conducted at select locations where bedrock was encountered at or near the approximate existing pipe invert depth. Rock coring was conducted using an NX core barrel and in accordance with ASTM D2113. In the field, rock core samples were evaluated for percent recovery and Rock Quality Designation (RQD). The RQD was estimated for each rock core by dividing the total length of the rock segments longer than four inches by the total length of the rock core run. The time to advance each foot of rock core was recorded during the rock coring process. Rock core samples collected from rock coring activities were visually logged and classified by a CDM Smith representative at the time of coring.

Soil samples and rock core samples were transported to and stored at the CDM Smith Geotechnical Testing Laboratory in Somerville, Massachusetts.

Analytical and corrosivity soil samples were collected during the subsurface exploration program; analysis and results are reported by others under separate cover.

Where encountered, groundwater levels at the test boring locations were estimated from the condition of the samples obtained, and by the observed water levels within the borehole at the time of drilling.

Where installed, groundwater monitoring wells were constructed in accordance with ASTM D5092 (Standard Practice for Design and Installation of Groundwater Monitoring Wells). Each groundwater monitoring well was constructed using 2-inch I.D. Schedule 40 PVC riser, and 10-foot-long well screens. Clean No. 2 silica sand was placed in the annular space surrounding the well screens to approximately two feet above the top of the well screen. A bentonite seal, between one (1) and two (2) feet thick, was placed in the annular space above the silica sand pack, and the annular space above the bentonite seal was backfilled with native material to approximately one foot below ground surface. Wells were completed with flush-mount casing with a bolted road box cover and surface seal consisting of approximately one foot of concrete.

Boreholes not completed as monitoring wells were backfilled with cuttings with asphalt patch as required.

Development of monitoring wells will be performed by Stantec. Well development will be performed to remove fine-grained materials from the monitoring well and sand filter pack, to establish hydraulic connections between the well and screened formations, and to improve well yield.

The test boring locations were located in the field through the use of a portable, hand-held Global Positioning System (GPS) receiver. The approximate as-drilled test boring locations are shown on **Figures 3-3A** through **3-3R**.

Construction Package 1

The CP-1 subsurface exploration program included conducting the following:

- Thirty-two (32) test borings, B-84 through B-116, excluding B-106;
- Six (6) test borings were converted into groundwater monitoring wells upon completion, B-93 (MW), B-100 (MW), B-104 (MW), B-107 (MW), B-110 (MW), and B-113 (MW);
- Forty (40) analytical samples and fifteen (15) corrosion samples were collected;
- Split spoon refusal or split spoon and auger refusal encountered at four (4) test boring locations, B-84, B-87, B-104 (MW), and B-105; and
- Rock coring was conducted at two (2) test boring locations, B-86 and B-107 (MW).

Construction Package 2

The CP-2 subsurface exploration program included conducting the following:

- Twenty-three (23) test borings, B-60 through B-82A;
- One (1) test boring was converted into a groundwater monitoring well upon completion, B-75A (MW);
- Thirty-two (32) analytical samples and eleven (11) corrosion samples were collected;
- Split spoon refusal or split spoon and auger refusal encountered at eleven (11) test boring locations, B-62 through B-64, B-66, B-67, B-69, B-70, B-72, B-73, B-76, and B-78; and
- Five-foot long rock core samples were collected at four (4) test boring locations, B-60, B-61, B-62, and B-75A (MW).

Construction Package 3

The CP-3 subsurface exploration program included conducting the following:

- Fifty-seven (57) test borings, B-1 through B-59, with the exception of B-15 and B-23;
- Five (5) test borings were converted into groundwater monitoring wells upon completion, B-9 (MW), B-17 (MW), B-20 (MW), B-25 (MW), and B-53 (MW);
- In addition to geotechnical sampling, seventy (70) analytical samples and twenty-three (23) corrosion samples were collected;
- Split spoon or rollerbit refusal encountered at nine (9) test boring locations, B-3, B-7, B-18, B-20 (MW), B-31, B-51, B-52, B-54, and B-58; and
- Rock coring was conducted at six (6) test boring locations, B-8A, B-19, B-22, B-53 (MW), B-55, and B-57.

2.3 Deviations from the Work Plan

The following deviations were made to the final work plan:

Construction Package 1

- At test boring locations B-87 and B-90, groundwater monitoring wells were not installed because groundwater was not encountered within the existing pipe invert depth.
- At test boring location B-102, the boring was terminated in very soft clay. Based on previous borings conducted by the Massachusetts DOT in 1933 this location was known to have a 30 to 40 ft thick soft clay layer. Therefore, the boring was terminated at 23 ft bgs, after penetrating approximately 9 ft into the soft clay layer.
- At test boring location B-108, an unmarked and abandoned utility was encountered at approximately 8 ft bgs. The boring was backfilled and offset approximately 10 ft to location B-108A where vacuum excavation was performed to a depth of approximately 6 feet bgs and the boring was drilled to a depth of 16 ft bgs.

- At test boring location B-108A, the planned corrosion sample was not collected due to insufficient volume of soil material recovered in the split spoon.

Construction Package 2

- At test boring locations B-71 and B-80, the planned second analytical samples were not collected due to insufficient volume of soil material available; very dense materials or numerous cobbles and boulders were encountered within the existing pipe zone depth.
- At test boring location B-82, the test boring was terminated prematurely at approximately 10 ft bgs because the drill crew was informed that the location was too close to an existing utility. The drill crew offset the boring to location B-82A and drilled the boring to 26 ft bgs.

Construction Package 3

- At test boring locations B-3, B-14, B-40, B-53 (MW) and B-60 the planned second analytical soil samples were not collected due to insufficient volume of soil material available; very dense materials or cobbles and coarse gravel were encountered within the existing pipe zone depth.
- At test boring location B-8, the test boring was terminated prematurely at 5 ft bgs because it was suspected that an unmarked utility was encountered. The test boring location was offset approximately 5 ft south to location B-8A where vacuum excavation was performed and the boring was drilled to a depth of 16 ft bgs.
- At test boring locations B-13, B-35, B-37, and B-59 groundwater monitoring wells were not installed because groundwater was not encountered at the time of drilling.
- At test boring location B-23, the boring was not performed due to the number of utilities in the vicinity of the proposed boring location. A hand auger was attempted at location B-23, but the auger could not be advanced due to frost.
- At test boring location B-52, a soil corrosion sample was not collected due to insufficient volume of soil material available; numerous cobbles and boulders were encountered within the existing pipe zone depth.

2.4 Geotechnical Laboratory Testing

Geotechnical laboratory tests were performed on select split spoon soil samples recovered from the subsurface exploration program. Soil geotechnical laboratory tests were performed by CDM Smith at the Geotechnical Testing Laboratory located in Somerville, Massachusetts. A summary of the laboratory testing conducted for each construction package follows. Testing was performed in accordance with the cited ASTM standards on samples selected from various test borings, strata, and depths.

A summary of the geotechnical laboratory test results is presented in **Table 2-1**. The laboratory test results are included in **Appendix C**.

Geotechnical Laboratory Test	Test Standard	Quantity of Tests Performed		
		CP-1	CP-2	CP-3
Soil:				
Gradation (Sieve)	ASTM D422	38	28	67
Gradation (Sieve & Hydrometer)	ASTM D422	11	8	10
Atterberg Limits	ASTM D4318	9	1	5
Organic Content	ASTM D2974	10	3	4

2.5 Subsurface Conditions

2.5.1 Regional Geology

Select available regional geology references were reviewed and are included in [Appendix D](#) including:

- Stone, J.R., “Surficial Geologic Map of the Clinton-Concord-Grafton-Medfield 12-Quadrangle Area in East Central Massachusetts”, 2006.
- Nelson, A.E., “Surficial Geologic Map of the Natick Quadrangle, Middlesex and Norfolk Counties, Massachusetts”, 1974.
- Goldsmith, R., “Bedrock Geologic Map of Massachusetts”, 1983.

Subsurface geology in the area of the project site may be classified as glacial stratified deposits, consisting of a mix of sand and gravel, with cobbles, clay, and silt.

The bedrock geology within the CP-1 alignment consists of Cambridge Argillite, composed of gray argillite and minor quartzite, with rare sandstone and conglomerate. The bedrock geology within the CP-2 and CP-3 alignments consists of diorite and gabbro, and gray granite or granodiorite.

2.5.2 Subsurface Conditions

Construction Package 1

The subsurface conditions encountered within the CP-1 limits typically consist of Pavement or Topsoil located at ground surface that is underlain by a sequence of Fill, Sand and Gravel, Silty Sand, Sand, Organic Soils, Silty Clay, Weathered Rock, and Bedrock.

Pavement

Pavement was encountered at 13 of the 32 CP-1 test boring locations, B-84, B-91, B-92, B-94, B-96 through B-100 (MW), and B-105 through B-109. The pavement ranged from approximately 0.2 to 1.2 ft thick, with an average thickness of approximately 0.6 ft. The pavement typically consisted of asphalt with an underlying gravel base.

Topsoil

Topsoil was encountered at 17 of the 32 CP-1 test boring locations. The topsoil layer ranged from approximately 0.2 to 0.5 ft thick, with an average thickness of approximately 0.3 ft at the test boring locations. The topsoil layer typically consisted of fine to coarse SAND, with varying amounts of fine gravel and silt.

Fill

A Fill stratum was encountered underlying the pavement or topsoil at 15 of the 32 CP-1 test boring locations. This stratum generally consists of dry to moist, gray to brown, medium dense to very dense, fine to coarse SAND, some to “and” fine to coarse gravel, trace to little silt.

- The Fill stratum was fully penetrated at all test boring locations where it was encountered, B-91, B-92, B-94, B-95, B-101 through B-105, and B-108A through B-113 (MW). The stratum thickness ranged from approximately 1.3 to 8.5 ft, with an average thickness of approximately 4 ft at the test boring locations.
- Standard Penetration Test (SPT) N-values in the Fill stratum ranged from 5 to greater than 100 blows per foot (bl/ft), with an average value of approximately 52 bl/ft at the test boring locations.

Sand and Gravel

A Sand and Gravel stratum was encountered at 23 of the 32 CP-1 test boring locations and typically consists of moist, medium to very dense, brown, fine to coarse SAND, little to “and” amounts fine to coarse gravel, trace to little silt or fine to coarse GRAVEL, little to “and” amounts fine to coarse sand, trace to little silt.

- This stratum was fully penetrated at 9 test boring locations, B-86 through B-88, B-98, B-102, B-107 (MW), B-109 through B-111. At these locations the average stratum thickness was approximately 8.2 ft.
- This stratum was not fully penetrated at the following 14 test boring locations: B-84, B-89 through B-97, B-99, B-101, B-103, and B-104 (MW). At these locations, the average stratum penetration depth was approximately 12.7 ft.
- SPT N-values in the Sand and Gravel stratum ranged from 7 to greater than 100 bl/ft, with an average value of approximately 86 bl/ft at the test boring locations.

Silty Sand

A Silty Sand stratum was encountered at 12 of the 32 CP-3 test boring locations. This stratum typically consists of moist, medium to very dense, brown, fine to medium SAND, little to “and” amounts of silt, trace to little fine gravel.

- This stratum was fully penetrated at 9 test boring locations, B-85, B-90, B-104 (MW), B-109, B-111 through B-113 (MW), B-115, and B-116. At these locations, the average stratum thickness was approximately 5.9 ft.

- This stratum was not fully penetrated at 3 test boring locations: B-104 (MW), B-108A, and B-114. At these locations, the average stratum penetration depth was approximately 7.6 ft.
- SPT N-values in the Silty Sand stratum ranged from 9 to greater than 100 bl/ft, with an average value of approximately 54 bl/ft at the test boring locations.

Sand

A Sand stratum was encountered at 4 of the 32 CP-1 test boring locations. This stratum typically consisted of moist, medium to very dense, brown, fine to coarse SAND, trace to little fine gravel, trace to little silt.

- The Sand stratum was fully penetrated at 2 test boring locations, B-95 through B-114. At these locations, the average penetration depth into the stratum was approximately 7.5 ft.
- The Sand stratum was not fully penetrated at 2 test borings locations, B-98 and B-100 (MW). At these locations, the stratum penetration depth was approximately 12.1 ft.
- SPT N-values in the Sand stratum ranged from 8 to greater than 100 bl/ft, with an average value of approximately 42 bl/ft at the test boring locations.

Organic Soils

An Organic Soils stratum was encountered at 5 of the 32 CP-1 test boring locations: B-88, B-103, and B-111 through B-113. This stratum typically consisted of moist, very stiff to hard, brown, Organic Silty CLAY, trace to “and” amounts of fine to coarse sand, trace to little fine gravel, trace peat.

- The Organic Soils stratum was fully penetrated at all test boring location where encountered. At these locations, the average stratum thickness was approximately 1.5 ft.
- SPT N-values in the Organic Soils stratum ranged from 3 to 39 bl/ft, with an average value of approximately 21 bl/ft at the test boring locations.

Silty Clay

A Silty Clay stratum was encountered at 12 of the 32 CP-1 test boring locations. This stratum typically consisted of moist to wet, very stiff to hard, brown, Silty CLAY or CLAY & SILT, trace to “and” amounts of fine to coarse sand, trace to little fine gravel.

- The Silty Clay stratum was fully penetrated at 3 test boring locations, B-84, B-103, and B-109. At these locations, the penetration depth into the stratum was approximately 5.0, 5.5, and 3.5 ft, respectively.
- The Silty Clay stratum was not fully penetrated at 9 test boring locations B-85, B-88, B-102, B-110 (MW) through B-113 (MW), B-115, and B-116. At these locations, the average stratum penetration depth was approximately 6.5 ft.
- SPT N-values in the Silty Clay stratum ranged from 0 to 76 bl/ft, with an average value of approximately 27 bl/ft at the test boring locations.

Weathered Rock

A Weathered Rock stratum was encountered at 3 of the 32 CP-1 test boring locations. This stratum consisted of moist, very dense, gray-brown, fine to coarse GRAVEL, little to “and” amounts of fine to coarse sand, trace to some silt.

- The Weathered Rock stratum was fully penetrated at test boring locations B-86, and B-107 (MW). The average stratum penetration depth was approximately 3.3 ft.
- The Weathered Rock stratum was not fully penetrated at test boring location B-87. At this location the stratum penetration depth was 2.6 ft.
- SPT N-values in the Weathered Rock stratum were greater than 100 bl/ft.

Bedrock

Bedrock was encountered at 2 of the 32 CP-1 test boring locations: B-86, and B-107 (MW). At these test boring locations, the depth to top of bedrock was approximately 10.0, and 14.5 ft bgs, respectively. Rock core recovery was approximately 100 and 96 percent, and the RQD was approximately 22 and 8 percent, respectively.

- The Bedrock at test boring B-86 consisted of hard, moderately fractured, very slightly weathered, dark gray, fine grained, GRANITE; primary joint set moderate, very close to close, rough, stepped.
- The Bedrock at test boring location B-107 (MW) consisted of medium hard, sound, slightly weathered, gray, fine grained, ARGILLITE; primary joint set shallow to vertical, very close to close, rough, stepped.

Refusal (drilling and split spoon) was encountered at depths ranging from of approximately 14 to 24.7 ft bgs at 4 of the 32 test boring locations, B-84, B-87, B-104 (MW), and B-105 in the following strata: Sand and Gravel, Silty Sand, and Weathered Rock.

Construction Package 2

The subsurface conditions encountered within the CP-2 limits typically consist of Pavement or Topsoil located at ground surface that is underlain by a sequence of Fill, Sand and Gravel, Sandy Silt, Silty Sand, Clay, Weathered Rock, and Bedrock.

Pavement

Pavement was encountered at 17 of the 23 CP-2 test boring locations, B-60 through B-62, B-66 through B-70, B-72 through B-78, B-80, and B-82A. The pavement ranged from approximately 0.3 to 1.0 ft thick, with an average thickness of approximately 0.5 ft. The pavement typically consisted of asphalt with an underlying gravel base.

Topsoil

Topsoil was encountered at 4 of the 23 CP-2 test boring locations, B-65, B-71, B-79, and B-81. The topsoil layer ranged from approximately 0.2 to 0.5 ft thick, with an average thickness of approximately 0.3 ft. The topsoil layer typically consisted of fine to coarse SAND, with varying amounts of fine gravel and silt.

Fill

A Fill stratum was encountered underlying the pavement or topsoil at 9 of the 23 CP-2 test boring locations. This stratum generally consists of dry to moist, gray to brown, medium dense to very dense, fine to coarse SAND, some to “and” fine to coarse gravel, trace silt.

- The Fill stratum was fully penetrated at all test boring locations where it was encountered, B-62, B-64, B-67 through B-69, B-76, B-80, B-81, and B-82A. The stratum thickness ranged from approximately 1.7 to 6.0 ft, with an average thickness of approximately 3.5 ft.
- Standard Penetration Test (SPT) N-values in the Fill stratum ranged from 10 to greater than 100 blows per foot (bl/ft), with an average value of approximately 60 bl/ft at the test boring locations.

Sand and Gravel

A Sand and Gravel stratum was encountered at 20 of the 23 CP-2 test boring locations and typically consists of moist, medium to very dense, brown, fine to coarse SAND, little to “and” amounts fine to coarse gravel, trace to little silt or fine to coarse GRAVEL, little to “and” amounts fine to coarse sand, trace to little silt.

- This stratum was fully penetrated at 6 test boring locations, B-60 through B-62, B-75A (MW), B-79 and B-82A. At these locations the average stratum thickness was approximately 6.9 ft.
- This stratum was not fully penetrated at 14 test boring locations: B-63 through B-66, B-70 through B-74, B-76 through B-78, B-80, and B-81. At these locations, the average stratum penetration depth was approximately 11.3 ft.
- SPT N-values in the Sand and Gravel stratum ranged from 14 to greater than 100 bl/ft, with an average value of greater than 100 bl/ft at the test boring locations.

Sandy Silt

A Sandy Silt stratum was encountered at 5 of the 23 CP-2 test boring locations. This stratum typically consists of moist, medium to very dense, brown, SILT, little to “and” amounts fine to coarse sand, trace to “and” fine to coarse gravel.

- This stratum was fully penetrated at all test boring location where encountered, B-66, B-77 through B-79, and B-82A. At these locations, the average stratum thickness was approximately 3.8 ft.
- SPT N-values in the Sandy Silt stratum ranged from 17 to greater than 100 bl/ft, with an average value of approximately 68 bl/ft at the test boring locations.

Silty Sand

A Silty Sand stratum was encountered at 4 of the 23 CP-2 test boring locations. This stratum typically consists of moist, medium to very dense, brown, fine to medium SAND, little to “and” amounts of silt, trace to little fine gravel.

- This stratum was not fully penetrated at test boring locations, B-67 through B-69, and B-82A. At these locations, the average stratum penetration depth was approximately 12.2 ft.
- SPT N-values in the Silty Sand stratum ranged from 33 to greater than 100 bl/ft, with an average value of approximately greater than 100 bl/ft at the test boring locations.

Silty Clay

A Silty Clay stratum was encountered at 2 of the 23 CP-2 test boring locations. This stratum typically consisted of moist to wet, very stiff to hard, brown, CLAY or Silty CLAY, little to “and” amounts of silt, trace to some fine to medium sand.

- The Silty Clay stratum was fully penetrated at test boring location B-76. At this location, penetration depth into the stratum was approximately 4 ft.
- The Silty Clay stratum was not fully penetrated at test boring location B-79. At this location, the stratum penetration depth was approximately 4 ft.
- SPT N-values in the Silty Clay stratum ranged from 6 to 38 bl/ft, with an average value of approximately 33 bl/ft at the test boring locations.

Weathered Rock

A Weathered Rock stratum was encountered at 2 of the 23 CP-2 test boring locations. This stratum consisted of moist, very dense, gray-brown, fine to coarse GRAVEL, with varying amounts of fine to coarse SAND, trace silt.

- The Weathered Rock stratum was fully penetrated at test boring location B-61. The stratum thickness at this location was approximately 3 ft.
- The Weathered Rock stratum was not fully penetrated at test boring location B-62. At this location, the stratum penetration depth was approximately 4.6 ft.
- SPT N-values in the Weathered Rock stratum were greater than 100 bl/ft.

Bedrock

Bedrock was encountered at the following 3 of the 23 CP-2 test boring locations: B-60, B-61, and B-75A (MW). At these test boring locations, the depth to top of bedrock was approximately 3.5, 9.0, and 8.5 ft bgs, respectively. Rock core recovery was approximately 93, 87, and 50 percent. The RQD was approximately 35, 17, and 24 percent, respectively.

- The bedrock at test boring location B-60 consisted of hard, moderately fractured, slightly weathered, gray, medium grained, GRANITE; primary joint set shallow, very to moderately close, rough, stepped.
- The bedrock at test boring location B-61 consisted of hard, moderately fractured, slightly weathered, gray, medium grained, GRANITE; primary joint set shallow to steep, very close to close, rough, stepped.

- The bedrock at test boring location B-75A (MW) consisted of hard, slightly weathered, fine to medium grained, gray, GRANITE, close jointing.

Refusal (drilling and split spoon) was encountered at depths ranging from of approximately 11 of 22 test boring locations, B-62 through B-64, B-66, B-67, B-69, B-70, B-72, B-73, B-76, and B-78 and in the following strata: Sand and Gravel, Silty Sand, and Silty Clay.

Construction Package 3

The subsurface conditions encountered within the CP-3 limits typically consist of Pavement or Topsoil located at ground surface that is underlain by a sequence of Fill, Sand and Gravel, Silty Sand, Sand, Sandy Silt, Clay, Weathered Rock, and Bedrock.

Pavement

Pavement was encountered at 30 of the 58 CP-3 test boring locations, B-9 (MW), B-12, B-18, B-19, B-24 through B-31, B-33 through B-40, B-42, B-48, B-50, B-52 through B-55, and B-57 through B-59. The pavement ranged from approximately 0.2 to 0.7 feet thick, with an average thickness of approximately 0.4 feet. The pavement typically consisted of asphalt with an underlying gravel base.

Topsoil

Topsoil was encountered at 27 of the 58 CP-3 test boring locations, B-1 through B-8, B-10, B-11, B-13 through B-17 (MW), B-20 (MW) through B-22, B-32, B-41, B-43 through B-47, B-49, B-51, and B-56. The topsoil layer ranged from approximately 0.2 to 4 feet thick, with an average thickness of approximately 1.1 feet. The topsoil layer typically consisted of fine to coarse SAND, with varying amounts of fine gravel and silt.

Fill

A Fill stratum was encountered underlying the pavement or topsoil at 23 of the 58 CP-3 test boring locations. This stratum generally consists of dry to moist, gray to brown, medium dense to very dense, fine to coarse SAND, some to “and” fine to coarse gravel, trace to little silt.

- The Fill stratum was fully penetrated at all test boring locations where it was encountered, B-10, B-13, B-16, B-18, B-19, B-21, B-22, B-24 through B-26, B-29, B-30, B-32, B-33, B-36 through B-38, B-40, B-41, B-43, B-49, B-54, and B-59. The stratum thickness ranged from approximately 0.5 to 7.5 feet, with an average thickness of approximately 3.1 feet.
- Standard Penetration Test (SPT) N-values in the Fill stratum ranged from 9 to greater than 100 blows per foot (bl/ft), with an average value of approximately 75 bl/ft at the test boring locations.

Sand and Gravel

A Sand and Gravel stratum was encountered at 53 of the 58 CP-3 test boring locations and typically consists of moist, medium to very dense, brown, fine to coarse SAND, little to “and” amounts fine to coarse gravel, trace to little silt or fine to coarse GRAVEL, little to “and” amounts fine to coarse sand, trace to little silt.

- This stratum was fully penetrated at 19 test boring locations, B-3, B-6, B-7, B-18, B-20 (MW), B-22, B-38 through B-41, B-42, B-44, B-46, B-48, B-52 through B-55, and B-57. At these locations, the average stratum thickness was approximately 5.8 feet.
- This stratum was not fully penetrated at 34 test boring locations, B-1, B-2, B-4, B-5, B-8A, B-9 (MW), B-10 through B-17 (MW), B-21, B-24 through B-37, B-47, B-49 through B-51, B-56, B-58, and B-59. At these locations, the average stratum penetration depth was approximately 13.4 feet.
- SPT N-values in the Sand and Gravel stratum ranged from 6 to greater than 100 bl/ft, with an average value of greater than 100 bl/ft at the test boring locations.

Silty Sand

A Silty Sand stratum was encountered at 10 of the 57 CP-3 test boring locations. This stratum typically consists of moist, medium to very dense, brown, fine to medium SAND, little to “and” amounts of silt, trace to little fine gravel.

- This stratum was fully penetrated at 4 test boring locations, B-11, B-13, B-18, and B-20 (MW). At these locations, the average stratum thickness was approximately 6 feet.
- This stratum was not fully penetrated at 6 test boring locations, B-6, B-7, B-41, B-42, B-43, and B-48. At these locations, the average stratum penetration depth was approximately 9.1 feet.
- SPT N-values in the Silty Sand stratum ranged from 4 to greater than 100 bl/ft, with an average value of approximately 54 bl/ft at the test boring locations.

Sand

A Sand stratum was encountered at 4 of the 57 CP-3 test boring locations: B-36 through B-39. This stratum typically consists of moist, medium dense to dense, to dense, brown, fine to coarse SAND, with trace to little silt and fine gravel.

- The Sand stratum was fully penetrated at 4 test boring locations, B-36 through B-39. At these locations, the average stratum thickness was approximately 8.4 feet.
- The Sand stratum was not fully penetrated at test boring location B-44. At this location, the penetration depth into the stratum was approximately 4 ft.
- SPT N-values in the Sand stratum ranged from 9 to 68 bl/ft, with an average value of approximately 33 bl/ft at the test boring locations.

Sandy Silt

A Sandy Silt stratum was encountered at 6 of the 57 CP-3 test boring locations. This stratum typically consists of moist, medium to very dense, brown, SILT, little to “and” amounts fine to coarse sand, trace to “and” fine to coarse gravel.

- This stratum was fully penetrated at 3 test boring locations B-44 through B-46. At these locations, the average stratum thickness was approximately 7.1 feet.

- This stratum was not fully penetrated at 3 test boring locations, B-38 through B-40. At these locations, the average stratum penetration depth was approximately 6.3 feet.
- SPT N-values in the Sandy Silt stratum ranged from 17 to greater than 100 bl/ft, with an average value of approximately 68 bl/ft at the test boring locations.

Silty Clay

A Silty Clay stratum was encountered at 4 of the 57 CP-3 test boring locations. This stratum typically consisted of moist to wet, very stiff to hard, gray-brown, CLAY or Silty CLAY, trace to little fine sand.

- The Silty Clay stratum was fully penetrated at test boring location B-43. At this location, the stratum thickness was approximately 4 feet.
- The stratum was not fully penetrated at 3 test boring location B-44 through B-46. At these locations, the average stratum penetration depth was approximately 3.7 feet.
- SPT N-values in the Silty Clay stratum ranged from 21 to 78 bl/ft, with an average value of approximately 44 bl/ft at the test boring locations.

Weathered Rock

A Weathered Rock stratum was encountered at 10 of the 57 CP-3 test boring locations. This stratum consisted of moist, very dense, gray-brown, fine to coarse GRAVEL, with varying amounts of fine to coarse sand, trace to some silt.

- This stratum was fully penetrated at 4 test boring locations, B-19, B-22, B-53, and B-57. At these locations, the average stratum thickness at these locations was approximately 1.2 feet.
- The stratum was not fully penetrated at 6 test boring locations, B-3, B-18, B-20 (MW), B-52, B-54, and B-55. At these locations, the average stratum penetration depth was approximately 2.9 feet.
- SPT N-values in the Weathered Rock stratum were greater than 100 bl/ft.

Bedrock

Bedrock was encountered at the following 4 of the 57 CP-3 test boring locations: B-19, B-22, B-53 (MW), and B-57. At these test boring locations, the depth to top of bedrock was approximately 9.0, 11.5, 6.0, 9.0, and 3.5 feet bgs, respectively. Rock core recovery was approximately 67, 95, 75, and 100 percent. The RQD was approximately 7, 50, 0, and 55 percent, respectively.

- The bedrock at test boring location B-19 consisted of hard, extremely fracture, slightly weathered, gray, fine grained, GABBRO; primary joint set moderately dipping to vertical, very close, rough, stepped.
- The bedrock at test boring location B-22 consisted of hard, slightly weathered, gray, fine grained, FELSITE; primary joint set steep to vertical, very close, rough, stepped.

- The bedrock at test boring location B-53 (MW) consisted of hard, extremely fractured, slightly weathered, gray, fine grained, GRANITE; primary joint set very close.
- The bedrock at test boring location B-57 consisted of hard, moderately fractured, slightly weathered, gray, fine grained, GABBRO; primary joint set moderate to vertical, very close to close, rough, planar.

Refusal (drilling and split spoon) was encountered at depths ranging from of approximately 14 to 24.7 feet bgs at 9 of the 58 CP-3 test boring locations, B-3, B-7, B-18, B-20 (MW), B-31, B-51, B-52, B-54, and B-58 in the following strata: Sand and Gravel, Silty Sand, and Weathered Rock.

A summary of the subsurface conditions encountered at the test boring locations is presented in **Table 2-2**. Test boring logs, groundwater monitoring well installation logs prepared by CDM Smith, are included in **Appendix E**. Rock core photo logs, prepared by CDM Smith, are included in **Appendix F**.

2.6 Groundwater Levels

2.6.1 During Drilling and Excavation

Where groundwater was encountered at the time of drilling, the depth to groundwater was recorded prior to backfilling the test boring.

- Along the CP-1 alignment, groundwater was encountered at 24 of the 32 test boring locations. At the time of drilling, the depth to groundwater was recorded between 3.0 and 15.7 feet bgs, approximately.
- Along the CP-2 alignment, groundwater was encountered at 20 of the 23 test boring locations. At the time of drilling, the depth to groundwater ranged from approximately 2.5 to 11.8 feet bgs.
- Along the CP-3 alignment, groundwater was encountered at 38 of the 57 test boring locations. At the time of drilling, the depth to groundwater ranged from approximately 1.5 to 14 feet bgs.

Groundwater levels recorded at the completion of drilling are included in **Table 2-2**.

2.6.2 Groundwater Monitoring Well Readings

Groundwater monitoring wells were installed at the following 12 test boring locations at the completion of drilling:

CP-1:	B-93 (MW)	B-100 (MW)	B-104 (MW)
	B-107 (MW)	B-110 (MW)	B-113 (MW)
CP-2:	B-75A (MW)		
CP-3:	B-9 (MW)	B-17 (MW)	B-20 (MW)
	B-25 (MW)	B-53 (MW)	

Groundwater levels were collected within the installed monitoring wells between on February 27, 2018. A summary of groundwater monitoring well readings is presented in **Table 2-3**.

2.7 Expected Variations in Subsurface Conditions

Subsurface conditions presented herein are based on soil, rock and groundwater conditions observed at the test boring locations. However, subsurface conditions may vary at other locations within the site.

Groundwater levels change with time, season, river levels, temperature, and construction activities in the area, as well as with other factors. In addition, stabilized groundwater levels can be difficult to obtain in test borings drilled using drive and wash drilling methods (during rock coring) due to the presence of drilling fluid in the borehole. Therefore, groundwater conditions at the time of construction may be different from those observed at the time of explorations.



LEGEND:



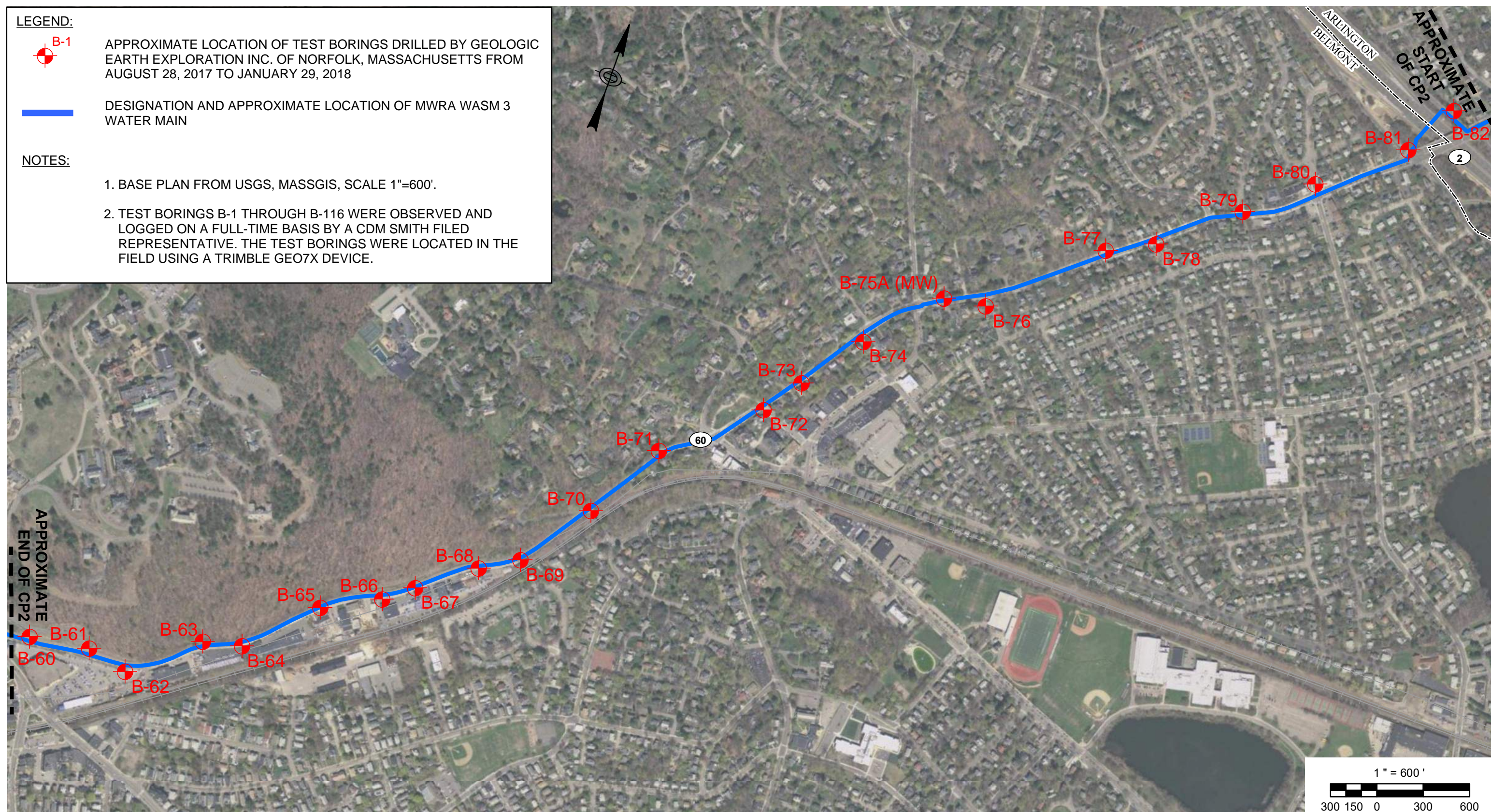
APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY GEOLOGIC EARTH EXPLORATION INC. OF NORFOLK, MASSACHUSETTS FROM AUGUST 28, 2017 TO JANUARY 29, 2018

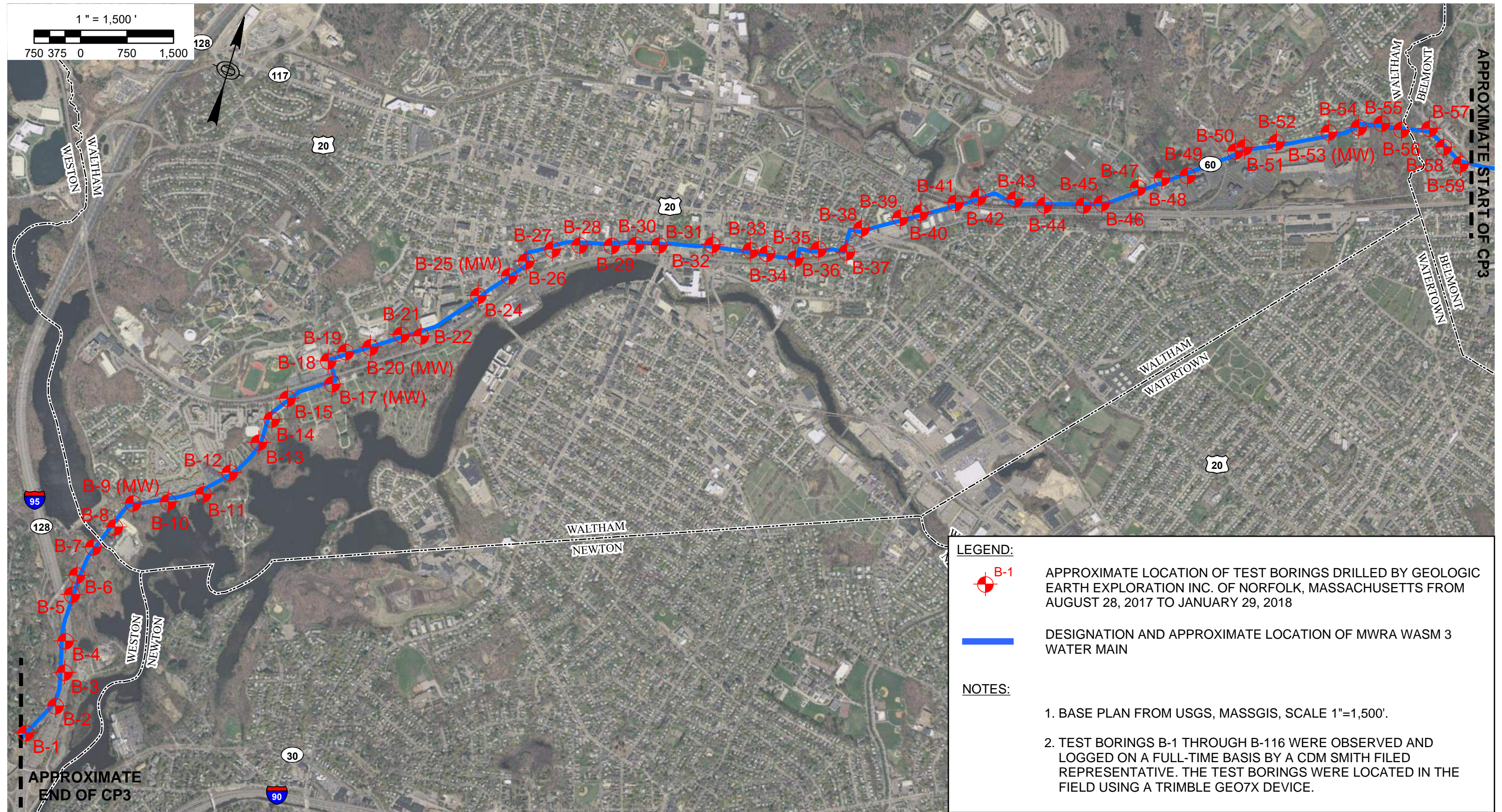


DESIGNATION AND APPROXIMATE LOCATION OF MWRA WASM 3 WATER MAIN

NOTES:

1. BASE PLAN FROM USGS, MASSGIS, SCALE 1"=600'.
2. TEST BORINGS B-1 THROUGH B-116 WERE OBSERVED AND LOGGED ON A FULL-TIME BASIS BY A CDM SMITH FILED REPRESENTATIVE. THE TEST BORINGS WERE LOCATED IN THE FIELD USING A TRIMBLE GEO7X DEVICE.





Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, Massachusetts

Table 2-1
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ¹	Grain Size Analysis ²					Atterberg Limits ³			Moisture Content (%) ⁽⁴⁾	Organic Content (%) ⁽⁵⁾	
					Gravel (%)		Sand (%)			Fines (%)		LL (%)			PL (%)
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay				
Construction Package 3															
B-1	S-2	2-4	Sand and Gravel	SP-SM	13.2	21.9	9.8	23.3	22.9	8.9	--	--	--	4.2	--
B-2	S-1	6-8	Sand and Gravel	GP-GM	8.0	36.8	13.0	19.1	12.5	10.6	--	--	--	--	--
B-3	S-1	6-6.8	Sand and Gravel	SW-SM	7.2	34.4	17.0	21.6	10.8	9.0	--	--	--	8.3	--
B-4	V-1	2.5-3	Sand and Gravel	SM	0.0	1.0	2.3	9.4	61.7	25.6	--	--	--	10.9	--
B-5	S-1	6-8	Sand and Gravel	SM	0.0	0.6	0.8	6.9	71.3	20.4	--	--	--	14.1	--
B-6	S-1	6-8	Sand and Gravel	SW-SM	10.8	19.8	15.2	37.7	11.2	5.3	--	--	--	12.1	--
B-7	S-3	4-5.3	Sand and Gravel	SM	9.6	15.2	10.7	21.8	18.2	24.5	--	--	--	11.3	--
B-9 (MW)	S-1	6-8	Sand and Gravel	SM	0.0	26.7	11.7	13.1	13.6	34.9	--	--	--	32.1	3.1
B-10	S-2	2-4	Fill	SP-SM	18.4	19.6	12.0	24.9	17.6	7.5	--	--	--	5.1	--
B-10	S-4	6-8	Sand and Gravel	SP	0.0	0.3	4.4	53.8	38.7	2.8	--	--	--	21.3	--
B-11	S-3	4-6	Sand and Gravel	GW-GM	25.1	22.2	14.7	19.7	10.5	7.8	--	--	--	10.5	--
B-11	S-5	8-10	Silty Sand	SM	0.0	3.2	1.6	19.2	28.9	45.4	1.7	NV	NP	NP	4.2
B-12	S-2	8-10	Sand and Gravel	SP-SM	0.0	3.9	5.3	32.6	51.6	6.6	--	--	--	8.7	--
B-13	S-4	6-8	Silty Sand	SM	0.0	23.7	9.1	19.3	26.4	21.5	--	--	--	4.0	--
B-14	S-2	2-2.5	Sand and Gravel	SM	12.7	26.4	12.6	16.0	15.6	16.7	--	--	--	7.5	--
B-16	S-2	2-4	Sand and Gravel	GM	13.8	31.5	13.7	12.9	12.8	15.3	--	--	--	9.1	--
B-17 (MW)	S-3	4-6	Sand and Gravel	GW-GM	17.8	30.7	14.6	19.5	10.5	6.9	--	--	--	8.5	--
B-18	S-5	9-10.5	Silty Sand	SM	3.2	11.1	10.9	24.2	23.9	26.7	--	--	--	11.6	--
B-19	S-3	4-6	Fill	SM	0.0	39.8	15.1	18.5	12.8	13.8	--	--	--	9.7	--
B-20 (MW)	S-2	2-4	Silty Sand	ML	0.0	0.2	3.2	18.2	26.1	52.3	--	--	--	22.9	3.2
B-21	S-5	8-10	Fill	SM	30.0	6.4	6.8	17.6	23.9	15.3	--	--	--	13.8	--
B-22	S-3	4-6	Sand and Gravel	SM	9.5	18.6	16.6	21.9	16.3	17.1	--	--	--	11.0	--
B-24	V-1	2-2.5	Fill	SM	0.0	11.5	9.1	21.7	28.2	29.5	--	--	--	13.8	--
B-24	V-2	4.5-5	Fill	SM	0.0	19.3	13.3	22.1	25.0	20.3	--	--	--	8.3	--
B-25 (MW)	V-1	2-2.5	Fill	GM	18.4	26.8	10.3	18.1	13.1	13.3	--	--	--	7.2	--
B-25 (MW)	S-1	6-8	Sand and Gravel	GP-GM	14.5	33.6	11.8	18.0	13.6	8.5	--	--	--	11.4	--
B-26	V-1	2-2.5	Fill	SM	0.0	36.1	14.5	22.5	12.8	14.1	--	--	--	8.6	--
B-26	S-2	9-9.7	Sand and Gravel	SM	1.8	37.3	13.3	22.2	12.6	12.8	--	--	--	7.9	--
B-27	S-1	0.5-2	Sand and Gravel	SM	0.0	24.8	13.5	25.3	21.1	15.3	--	--	--	6.5	--
B-28	S-4	9-9.8	Sand and Gravel	SP-SM	21.8	18.9	13.3	23.2	11.7	11.1	--	--	--	7.2	--

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Table 2-1
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Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ¹	Grain Size Analysis ²						Atterberg Limits ³			Moisture Content (%) ⁽⁴⁾	Organic Content (%) ⁽⁵⁾	
					Gravel (%)		Sand (%)			Fines (%)		LL (%)	PL (%)			PI (%)
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay					
B-29	S-5	8-10	Sand and Gravel	GW-GM	22.1	29.4	12.7	18.7	9.1	8.0	--	--	--	10.8	--	
B-30	V-2	5-5.5	Sand and Gravel	ML	0.0	6.3	4.5	15.4	19.0	45.1	9.7	20	17	3	20.2	--
B-31	V-1	2-2.5	Sand and Gravel	SM	18.1	1.2	3.2	19.0	15.0	43.5		--	--	--	20.3	--
B-31	S-3	14-14.7	Sand and Gravel	ML	0.0	6.2	4.1	14.7	24.9	32.5	17.6	--	--	--	11.0	--
B-32	S-2	8-10	Sand and Gravel	SW-SM	13.8	28.5	14.9	22.8	10.8	9.2		--	--	--	9.0	--
B-33	S-2	2-4	Sand and Gravel	GP-GM	9.5	41.1	10.6	21.0	11.0	6.8		--	--	--	5.6	--
B-34	V-1	2-2.5	Sand and Gravel	SM	12.2	21.3	9.0	19.1	14.5	23.9		--	--	--	13.1	--
B-35	S-2	2-3.5	Sand and Gravel	SP-SM	18.7	27.5	13.8	21.9	11.3	6.8		--	--	--	6.3	--
B-36	S-3	4-6	Sand	SP	0.0	3.5	13.5	55.5	26.0	1.5		--	--	--	4.5	--
B-37	V-1	2-2.5	Sand	SP	3.2	7.5	3.2	52.2	32.0	1.9		--	--	--	5.1	--
B-38	V-1	3-3.5	Sand	SP	5.3	4.9	4.8	51.3	31.7	2.0		--	--	--	6.3	--
B-38	S-3	14-16	Sandy Silt	ML	0.0	0.0	0.0	0.3	2.6	87.1	10.0	NV	NP	NP	28.6	--
B-39	S-5	8-10	Sand	SW-SM	0.0	10.5	8.5	53.6	18.8	8.6		--	--	--	6.4	--
B-40	S-6	14-16	Sandy Silt	ML	0.0	0.0	0.0	0.6	1.6	80.7	17.1	--	--	--	27.4	--
B-41	V-2	5.5-6	Sand and Gravel	SP-SM	0.0	4.0	3.9	52.0	29.0	11.1		--	--	--	28.8	--
B-41	S-2	8-10	Silty Sand	SM	0.0	0.0	0.0	0.6	79.9	19.5		--	--	--	28.5	--
B-42	S-2	8-10	Silty Sand	SM	0.0	12.4	4.2	7.8	37.7	25.3	12.6	--	--	--	80.6	9.4
B-42	S-3	14-16	Silty Sand	ML	0.0	0.0	0.1	0.6	7.2	92.1		--	--	--	25.1	--
B-43	S-5	8-10	Clay	CL	0.0	0.0	0.1	0.6	2.1	44.8	52.4	42	21	21	25.7	--
B-44	S-1	6-8	Sand and Gravel	SM	5.6	29.2	12.0	18.4	22.0	12.8		--	--	--	14.4	--
B-45	S-3	10-12	Sandy Silt	ML	0.0	0.7	0.3	1.1	3.6	87.9	6.4	--	--	--	24.1	--
B-45	S-4	14-16	Clay	CL	0.0	0.0	0.0	0.1	0.4	59.3	40.2	30	18	12	24.8	--
B-46	S-2	8-10	Sandy Silt	ML	0.0	0.0	0.0	0.1	29.3	66.7	3.9	--	--	--	26.0	--
B-47	V-1	2-2.5	Sand and Gravel	GP-GM	13.8	32.9	12.4	21.0	12.1	7.8		--	--	--	5.4	--
B-48	S-4	6-8	Silty Sand	SM	0.0	0.0	0.1	1.7	76.8	21.4		--	--	--	9.2	--
B-50	S-2	2-4	Sand and Gravel	SM	20.4	17.5	11.0	14.1	14.0	23.0		--	--	--	11.7	--
B-51	S-4	6-8	Sand and Gravel	GW-GM	21.5	33.5	11.1	15.2	10.5	8.2		--	--	--	6.3	--
B-52	S-3	4-5	Sand and Gravel	SM	0.0	17.0	14.3	26.5	28.6	13.6		--	--	--	13.4	--
B-53 (MW)	S-2	2-3.3	Sand and Gravel	SM	9.6	24.7	10.8	13.5	14.5	26.9		--	--	--	10.3	--
B-54	S-3	4-6	Sand and Gravel	GM	10.6	33.2	12.5	15.7	10.9	17.1		--	--	--	10.3	--
B-55	S-1	2-3.8	Sand and Gravel	GW-GM	18.6	30.5	14.4	19.0	10.7	6.8		--	--	--	9.4	--
B-56	S-2	2-3.3	Sand and Gravel	SM	0.0	31.4	15.2	21.7	18.0	13.7		--	--	--	9.6	2.6

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Table 2-1
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ¹	Grain Size Analysis ²					Atterberg Limits ³			Moisture Content (%) ⁽⁴⁾	Organic Content (%) ⁽⁵⁾		
					Gravel (%)		Sand (%)			Fines (%)		LL (%)			PL (%)	PI (%)
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay					
B-56	S-3	11-13	Sand and Gravel	SM	11.5	24.2	12.1	22.6	16.8	12.8	--	--	--	10.1	--	
B-57	S-3	4-5.5	Sand and Gravel	GM	0.0	47.0	16.8	10.8	8.7	16.7	--	--	--	10.9	--	
B-58	V-1	2-3	Sand and Gravel	GW-GM	5.1	41.3	15.3	19.5	10.6	8.2	--	--	--	5.1	--	
B-59	V-2	5-6	Fill	GP-GM	6.6	44.3	11.4	15.8	13.5	8.4	--	--	--	6.1	--	
B-59	S-3	14-16	Sand and Gravel	GW-GM	16.6	33.2	15.2	14.7	13.0	7.3	--	--	--	7.8	--	
Construction Package 2																
B-60	S-2	2-3.3	Sand and Gravel	GW-GM	17.5	39.5	12.1	15.9	9.6	5.4	--	--	--	6.8	--	
B-61	S-3	4-6	Sand and Gravel	GW	9.0	40.9	19.2	19.5	8.0	3.4	--	--	--	12.4	--	
B-63	S-3	4-6	Sand and Gravel	SM	14.3	23.2	10.5	19.1	13.0	19.9	--	--	--	18.4	--	
B-64	S-1	6-8	Sand and Gravel	SM	13.6	11.0	8.0	15.1	18.1	34.2	--	--	--	10.7	--	
B-65	S-3	4-6	Sand and Gravel	ML	0.0	4.8	3.0	8.2	16.5	59.4	8.1	--	--	--	19.9	--
B-65	S-5	8-8.5	Sand and Gravel	SM	11.1	20.4	10.1	16.1	19.7	22.6	--	--	--	9.7	--	
B-66	S-1	6-8	Sandy Silt	ML	0.0	5.9	4.0	12.5	21.1	56.5	--	--	--	48.2	6.8	
B-67	S-1	6-7.1	Silty Sand	SM	0.0	28.1	8.5	12.3	15.4	35.7	--	--	--	34.0	5.9	
B-68	S-2	8-10	Silty Sand	ML	0.0	7.0	6.3	9.5	17.4	50.5	9.3	--	--	--	13.2	--
B-69	S-3	4-6	Silty Sand	SM	0.0	12.2	11.8	21.2	27.1	27.7	--	--	--	11.5	--	
B-70	S-2	2-4	Sand and Gravel	SM	4.7	30.5	13.2	19.7	14.8	17.1	--	--	--	8.0	--	
B-70	S-4	6-8	Sand and Gravel	SM	0.0	32.3	13.4	19.6	19.3	15.4	--	--	--	8.8	--	
B-71	V-1	2-3	Sand and Gravel	SP-SM	15.5	25.8	11.6	19.7	16.1	11.3	--	--	--	6.8	--	
B-71	S-4	14-15.5	Sand and Gravel	SM	0.0	22.9	21.7	24.4	14.7	16.3	--	--	--	15.4	--	
B-72	S-2	2-4	Sand and Gravel	ML	0.0	16.9	8.2	11.0	13.2	40.0	10.7	--	--	--	23.9	--
B-73	S-2	2-4	Sand and Gravel	SM	0.0	16.3	14.6	23.3	26.7	19.1	--	--	--	6.2	--	
B-74	S-1	0.5-1.7	Sand and Gravel	SM	0.0	33.1	14.6	20.7	14.6	17.0	--	--	--	9.5	--	
B-74	S-5	8-9.3	Sand and Gravel	SW	8.6	37.9	20.7	20.5	7.8	4.5	--	--	--	8.3	--	
B-75A	S-1	6-8	Sand and Gravel	GM	14.4	40.6	10.9	10.8	8.5	14.8	--	--	--	14.0	--	
B-76	S-2	2-4	Clay	CL	0.0	0.0	0.8	6.3	16.3	44.3	32.3	--	--	--	20.4	--
B-77	S-2	2-4	Sandy Silt	ML	0.0	12.6	5.4	14.0	14.1	44.3	9.6	--	--	--	40.9	--
B-78	S-2	2-4	Sand and Gravel	SW-SM	6.0	21.2	19.6	28.1	15.8	9.3	--	--	--	13.5	--	
B-78	S-5	8-10	Sandy Silt	ML	0.0	0.0	0.0	0.0	12.3	70.1	17.6	--	--	--	21.8	--
B-79	S-6	14-16	Clay	CL	0.0	0.0	0.2	3.7	24.6	71.5		32	20	12	28.8	--
B-80	S-2	6-8	Sand and Gravel	SP-SM	11.0	25.8	11.6	23.5	19.9	8.2	--	--	--	8.2	--	

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Table 2-1
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ¹	Grain Size Analysis ²						Atterberg Limits ³			Moisture Content (%) ⁽⁴⁾	Organic Content (%) ⁽⁵⁾		
					Gravel (%)		Sand (%)			Fines (%)		LL (%)	PL (%)			PI (%)	
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay						
B-81	S-4B	9.5-10	Sand and Gravel	ML	0.0	1.3	3.1	6.6	25.9	34.3	28.8	--	--	--	18.0	--	
B-82A	S-1	0.5-2	Fill	ML	0.0	7.9	4.6	11.2	18.9	57.4		--	--	--	32.5	5.0	
B-82A	S-5A	8-8.5	Sandy Silt	ML	0.0	5.6	2.0	7.4	13.4	44.2	27.4	--	--	--	21.3	--	
Construction Package 1																	
B-84	S-5	9-11	Clay	CL	0.0	0.0	0.0	0.7	9.0	52.8	37.5	28	16	12	21.0	--	
B-85	S-6	14-16	Clay	CL	0.0	0.0	0.0	0.2	1.3	47.1	51.4	39	25	14	31.0	--	
B-86	S-3	4-6	Sand and Gravel	SM	4.8	13.0	7.8	16.6	29.9	27.9		--	--	--	30.8	--	
B-87	S-2	2-4	Sand and Gravel	SP-SM	8.8	27.9	9.7	24.0	19.9	9.7		--	--	--	2.4	--	
B-88	S-1	0-2	Organic Soils				Additional Laboratory Testing Assigned and Pending Completion									21.6	4.3
B-88	S-6B	14.2-15.1	Clay	ML	0.0	1.6	1.8	6.7	20.0	69.9		--	--	--	29.0	--	
B-89	S-3	9-10.5	Sand and Gravel	GM	30.7	13.6	7.4	13.3	14.3	20.7		--	--	--	8.9	--	
B-90	S-1	0-2	Silty Sand				Additional Laboratory Testing Assigned and Pending Completion									10.1	4.4
B-90	S-3	4-4.8	Sand and Gravel	SP-SM	4.3	33.6	14.5	24.7	14.6	8.3		--	--	--	7.5	--	
B-91	S-1	5-7	Sand and Gravel	SW-SM	12.0	31.9	11.8	24.2	11.8	8.3		--	--	--	8.6	--	
B-92	S-1	5-7	Sand and Gravel	SW	0.0	40.9	19.4	25.3	9.9	4.5		--	--	--	8.2	--	
B-93 (MW)	S-2	2-4	Sand and Gravel	SP	11.9	21.1	13.5	33.8	16.3	3.4		--	--	--	3.9	--	
B-94	S-3	4-5.3	Fill	SP-SM	2.5	27.4	18.4	29.1	17.0	5.6		--	--	--	12.6	--	
B-95	S-2	2-4	Fill	SP-SM	0.0	27.0	10.3	29.5	24.6	8.6		--	--	--	4.8	--	
B-96	S-3	4-6	Sand and Gravel	SP-SM	0.0	17.7	12.1	28.3	35.0	6.9		--	--	--	4.2	--	
B-97	S-1B	0.9-2	Sand and Gravel	SM	0.0	0.0	0.8	13.5	36.8	47.3	1.6	--	--	--	25.9	--	
B-97	S-5	8-10	Sand and Gravel	SP	0.0	24.3	10.4	37.6	24.0	3.7		--	--	--	3.8	--	
B-98	S-1	5-7	Sand and Gravel	SP-SM	3.2	12.0	7.9	48.8	22.3	5.8		--	--	--	13.1	--	
B-99	S-2	7-9	Sand and Gravel	SW	0.0	18.1	22.0	41.9	13.4	4.6		--	--	--	9.1	--	
B-100 (MW)	S-1	0.5-2	Sand				Additional Laboratory Testing Assigned and Pending Completion									19.2	2.9
B-100 (MW)	S-3	4-6	Sand	SP	0.0	7.0	10.0	54.3	24.9	3.8		--	--	--	4.2	--	
B-101	S-4	4-6	Sand and Gravel	SP-SM	13.4	30.0	13.9	21.9	10.2	10.6		--	--	--	7.2	--	
B-102	S-4	6-8	Sand and Gravel	GP-GM	22.3	25.3	12.3	20.2	12.3	7.6		--	--	--	25.5	7.8	
B-103	S-4	6-8	Organic Soils	ML	0.0	0.1	4.2	10.1	19.9	65.7		--	--	--	80.2	9.4	
B-104 (MW)	S-2	8-10	Sand and Gravel	SM	0.0	27.2	15.8	24.9	17.5	14.6		--	--	--	28.4	4.2	

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Table 2-1
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification ¹	Grain Size Analysis ²						Atterberg Limits ³			Moisture Content (%) ⁽⁴⁾	Organic Content (%) ⁽⁵⁾	
					Gravel (%)		Sand (%)			Fines (%)		LL (%)	PL (%)			PI (%)
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay					
B-105	S-4	6-8	Silty Sand	SM	0.0	13.8	8.0	20.7	25.6	31.9	--	--	--	11.4	--	
B-107 (MW)	S-1	0.5-2	Sand and Gravel	SM	0.0	11.7	12.6	34.2	29.3	12.2	--	--	--	14.6	--	
B-107 (MW)	S-4	6-8	Sand and Gravel	SM	0.0	13.2	11.8	18.7	24.3	32.0	--	--	--	9.6	--	
B-108	S-2	8-10	Silty Sand	SM	0.0	22.8	11.4	21.1	26.3	18.4	--	--	--	16.2	--	
B-110 (MW)	S-3	4-6	Organic Soil	OH	Additional Laboratory Testing Assigned and Pending Completion									62.9	7.8	
B-110 (MW)	S-5	8-10	Organic Soil	OH	0.0	0.0	0.6	3.0	11.1	46.5	38.8	98	41	57	80.0	--
B-110 (MW)	S-7	19-21	Clay	CL	0.0	0.0	0.0	0.5	3.3	47.9	48.3	33	17	16	31.8	--
B-111	S-3B	4.5-6	Silty Sand	SM	0.0	0.7	2.2	17.1	46.5	33.5	--	--	--	26.2	--	
B-112	S-2	2-4	Organic Soils	CL	0.0	0.0	0.0	4.3	5.4	31.0	59.3	--	--	--	55.7	5.9
B-112	S-6	14-16	Clay	CL	0.0	0.0	0.0	0.2	1.6	33.2	65.0	46	21	25	38.7	--
B-113 (MW)	S-3A	4-5	Organic Soils		Additional Laboratory Testing Assigned and Pending Completion									185.9	21.1	
B-113 (MW)	S-5	9-11	Clay	CH/OH	0.0	0.0	0.0	1.1	1.9	49.6	47.4	96	36	60	85.5	--
B-113 (MW)	S-6B	14.5-16	Clay	CL	0.0	0.0	0.0	0.8	10.1	33.6	55.5	37	18	19	35.3	--
B-114	S-1	6-8	Sand	SP-SM	7.3	9.2	6.3	15.7	54.9	6.6	--	--	--	14.6	--	
B-115	S-2	8-10	Silty Sand	SM	0.0	12.5	7.2	21.2	15.4	43.7	--	--	--	63.4	5.4	
B-115	S-4	19-21	Clay	CL	0.0	0.0	0.0	0.3	11.5	44.1	44.1	38	18	20	32.5	--
B-116	S-2	8-10	Silty Sand	SP-SM	0.0	28.5	11.5	31.9	22.4	5.7	--	--	--	11.0	--	
B-116	S-3	14-16	Clay	CL	0.0	0.0	0.7	0.3	5.4	41.4	52.2	30	16	14	29.9	--

Notes:

1. USCS classifications were performed in accordance with ASTM D2487.
2. Grain size analysis tests performed in accordance with ASTM D7928 & D6913 and ASTM D1140.
3. Atterberg limit tests performed in accordance with ASTM D4318.
4. Moisture content analysis performed in accordance with ASTM D2216.
5. Organic content analysis performed in accordance with ASTM D2974.

Abbreviations:

- | | |
|--|------------------|
| SP-SM: Poorly Graded Sand and Silty Sand | ML: Silt |
| GP-GM: Poorly Graded Gravel and Silty Gravel | GM: Silty Gravel |
| SW-SM: Well Graded Sand and Silty Sand | CL: Lean Clay |
| SM: Silty Sand | CH: Fat Clay |
| SP: Poorly Graded Sand | OH: Organic Silt |
| GW-GM: Well Graded Gravel | |
| -- Not conducted | |

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**Table 2-2
Summary of Subsurface Conditions**

Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
Construction Package 1														
B-84	Survey Pending	15.0	0.6	NE	6.9/>2.0	NE	NE	NE	NE	5.5	NE	NE	NE	NE
B-85	Survey Pending	16.0	0.4	NE	NE	8.6	NE	NE	NE	>7.0	NE	NE	NE	6.5
B-86	Survey Pending	15.0	0.3	NE	7.7	NE	NE	NE	NE	NE	2.0	>5.0	10.0	3.0
B-87	Survey Pending	14.0	0.3	NE	11.1	NE	NE	NE	NE	NE	>2.6	NE	NE	11.5
B-88	Survey Pending	16.0	0.5	NE	11.2	NE	NE	2.5	NE	>1.8	NE	NE	NE	NE
B-89	Survey Pending	15.3	0.5	NE	>14.8	NE	NE	NE	NE	NE	NE	NE	NE	2.0
B-90	Survey Pending	16.0	NE	NE	>14.0	2.0	NE	NE	NE	NE	NE	NE	NE	NE
B-91	Survey Pending	16.0	0.9	3.1	>12.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-92	Survey Pending	16.0	0.7	4.3	>11.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-93 (MW)	Survey Pending	16.0	1.0	NE	>15.0	NE	NE	NE	NE	NE	NE	NE	NE	3.0
B-94	Survey Pending	16.0	0.3	4.9	>10.8	NE	NE	NE	NE	NE	NE	NE	NE	10.0
B-95	Survey Pending	16.0	1.3	3.5	>8.0	NE	3.2	NE	NE	NE	NE	NE	NE	NE
B-96	Survey Pending	16.0	0.3	NE	>15.7	NE	NE	NE	NE	NE	NE	NE	NE	14.5
B-97	Survey Pending	16.0	0.6	NE	>15.4	NE	NE	NE	NE	NE	NE	NE	NE	10.0
B-98	Survey Pending	21.0	1.0	NE	11.5	NE	>8.5	NE	NE	NE	NE	NE	NE	8.0
B-99	Survey Pending	16.0	0.9	NE	>15.1	NE	NE	NE	NE	NE	NE	NE	NE	13.2
B-100 (MW)	Survey Pending	16.0	0.3	NE	NE	NE	>15.7	NE	NE	NE	NE	NE	NE	8.0
B-101	Survey Pending	16.0	0.7	3.3	>12.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-102	Survey Pending	23.0	0.3	4.0	7.7	NE	NE	NE	NE	>11.0	NE	NE	NE	7.5
B-103	Survey Pending	26.0	0.5	5.5	4.0/>8.5	NE	NE	2.0	NE	5.5	NE	NE	NE	7.2
B-104 (MW)	Survey Pending	24.7	0.3	5.2	>12.7	6.0	NE	NE	NE	NE	NE	NE	NE	5.3
B-105	Survey Pending	14.8	0.3	3.7	NE	>10.8	NE	NE	NE	NE	NE	NE	NE	4.0
B-107 (MW)	Survey Pending	18.5	0.3	NE	9.7	NE	NE	NE	NE	NE	4.5	>4.0	14.5	5.0
B-108	Survey Pending	16.0	1.2	6.8	NE	>8.0	NE	NE	NE	NE	NE	NE	NE	7.4
B-109	Survey Pending	21.0	1.0	8.5	5.5	2.5	NE	NE	NE	3.5	NE	NE	NE	6.5
B-110 (MW)	Survey Pending	21.0	NE	2.0	5.5	NE	NE	NE	NE	10.0/ >3.5	NE	NE	NE	5.8
B-111	Survey Pending	16.0	0.5	1.7	4.0	4.3	NE	2.0	NE	>3.5	NE	NE	NE	5.5
B-112	Survey Pending	26.0	0.7	1.3	NE	5.5	NE	2.0	NE	>16.5	NE	NE	NE	5.1
B-113 (MW)	Survey Pending	26.0	0.3	1.7	NE	7.5/2.0/ 5.0	NE	1.0	NE	2.0/7.5/ 3.0/>3.5	NE	NE	NE	5.5

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**Table 2-2
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Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
B-114	<i>Survey Pending</i>	16.0	0.3	NE	NE	>4.0	11.7	NE	NE	NE	NE	NE	NE	4.0
B-115	<i>Survey Pending</i>	21.0	0.2	NE	NE	11.8	NE	NE	NE	>9.0	NE	NE	NE	4.3
B-116	<i>Survey Pending</i>	16.0	0.2	NE	NE	9.8	NE	NE	NE	>6.0	NE	NE	NE	3.7

Notes:

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**Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, Massachusetts**

**Table 2-2 Continued
Summary of Subsurface Conditions**

Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
Construction Package 2														
B-60	Survey Pending	8.5	0.5	NE	3.0	NE	NE	NE	NE	NE	NE	>5.0	3.5	NE
B-61	Survey Pending	14.0	1.0	NE	5.0	NE	NE	NE	NE	NE	3.0	>5.0	9.0	6.0
B-62	Survey Pending	14.1	0.3	1.7	12.1	NE	NE	NE	NE	NE	>4.6	NE	NE	6.0
B-63	Survey Pending	14.3	NE	NE	>14.3	NE	NE	NE	NE	NE	NE	NE	NE	6.2
B-64	Survey Pending	15.3	NE	6.0	>9.3	NE	NE	NE	NE	NE	NE	NE	NE	11.8
B-65	Survey Pending	15.0	0.3	NE	>14.7	NE	NE	NE	NE	NE	NE	NE	NE	9.0
B-66	Survey Pending	14.2	0.3	NE	4.2/>3.2	NE	NE	NE	6.5	NE	NE	NE	NE	7.0
B-67	Survey Pending	14.8	0.5	4.5	NE	>9.8	NE	NE	NE	NE	NE	NE	NE	2.5
B-68	Survey Pending	15.5	0.3	4.7	NE	>10.5	NE	NE	NE	NE	NE	NE	NE	6.1
B-69	Survey Pending	14.8	0.5	3.5	NE	>10.8	NE	NE	NE	NE	NE	NE	NE	11.5
B-70	Survey Pending	13.5	0.3	NE	>13.2	NE	NE	NE	NE	NE	NE	NE	NE	3.2
B-71	Survey Pending	15.5	0.5	NE	>15.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-72	Survey Pending	13.5	0.4	NE	>13.1	NE	NE	NE	NE	NE	NE	NE	NE	3.0
B-73	Survey Pending	14.3	0.5	NE	>13.8	NE	NE	NE	NE	NE	NE	NE	NE	8.0
B-74	Survey Pending	16.0	0.3	NE	>15.7	NE	NE	NE	NE	NE	NE	NE	NE	7.0
B-75A (MW)	Survey Pending	14.5	0.8	NE	7.7	NE	NE	NE	NE	NE	NE	>6.0	8.5	5.0
B-76	Survey Pending	14.8	0.5	1.5	>10.8	NE	NE	NE	NE	4.0	NE	NE	NE	NE
B-77	Survey Pending	15.0	0.3	NE	>10.5	NE	NE	NE	4.2	NE	NE	NE	NE	8.0
B-78	Survey Pending	14.5	0.3	NE	7.7/>2.5	NE	NE	NE	4.0	NE	NE	NE	NE	7.5
B-79	Survey Pending	16.0	0.3	NE	8.4	NE	NE	NE	3.3	>4.0	NE	NE	NE	9.5
B-80	Survey Pending	16.0	0.5	3.5	>12.0	NE	NE	NE	NE	NE	NE	NE	NE	8.5
B-81	Survey Pending	26.0	0.3	4.7	>21.0	NE	NE	NE	NE	NE	NE	NE	NE	9.0
B-82A	Survey Pending	26.0	0.3	1.7	6.0	>17.5	NE	NE	0.5	NE	NE	NE	NE	8.5

Notes:

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**Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, Massachusetts**

**Table 2-2 Continued
Summary of Subsurface Conditions**

Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
Construction Package 3														
B-1	Survey Pending	16.0	0.5	NE	>15.5	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-2	Survey Pending	16.0	3.5	NE	>12.5	NE	NE	NE	NE	NE	NE	NE	NE	10.9
B-3	Survey Pending	14.0	0.2	NE	11.8	NE	NE	NE	NE	NE	>2.0	NE	NE	5.2
B-4	Survey Pending	16.0	1.0	NE	>15.0	NE	NE	NE	NE	NE	NE	NE	NE	9.0
B-5	Survey Pending	16.0	0.7	NE	>15.3	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-6	Survey Pending	16.0	1.5	NE	10.5	>4.0	NE	NE	NE	NE	NE	NE	NE	NE
B-7	Survey Pending	24.7	3.0	NE	14.0	>7.7	NE	NE	NE	NE	NE	NE	NE	11.1
B-8A	Survey Pending	16.0	0.8	NE	>15.2	NE	NE	NE	NE	NE	NE	NE	NE	14.0
B-9 (MW)	Survey Pending	21.0	1.0	NE	>20.0	NE	NE	NE	NE	NE	NE	NE	NE	9.0
B-10	Survey Pending	16.0	0.7	3.3	>12.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-11	Survey Pending	16.0	0.5	NE	7.5/>4.0	4.0	NE	NE	NE	NE	NE	NE	NE	NE
B-12	Survey Pending	16.0	0.2	NE	>15.8	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-13	Survey Pending	16.0	1.0	1.0	>4.0	10.0	NE	NE	NE	NE	NE	NE	NE	NE
B-14	Survey Pending	16.0	0.7	NE	>15.3	NE	NE	NE	NE	NE	NE	NE	NE	12.0
B-16	Survey Pending	16.0	0.5	1.5	>14.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-17 (MW)	Survey Pending	21.0	0.5	NE	>20.5	NE	NE	NE	NE	NE	NE	NE	NE	8.4
B-18	Survey Pending	14.0	0.3	1.7	5.5	4.5	NE	NE	NE	NE	>2.0	NE	NE	1.5
B-19	Survey Pending	14.0	0.3	6.2	NE	NE	NE	NE	NE	NE	2.5	>5.0	9.0	9.3
B-20 (MW)	Survey Pending	14.0	0.5	NE	6.0	5.5	NE	NE	NE	NE	>2.0	NE	NE	4.1
B-21	Survey Pending	15.0	4.0	7.5	>3.5	NE	NE	NE	NE	NE	NE	NE	NE	12.0
B-22	Survey Pending	16.5	0.3	2.7	6.2	NE	NE	NE	NE	NE	2.3	>5.0	11.5	7.8
B-23					To Be Conducted In the Spring of 2018									
B-24	Survey Pending	21.0	1.0	3.8	>16.2	NE	NE	NE	NE	NE	NE	NE	NE	14.5
B-25 (MW)	Survey Pending	15.0	0.3	3.2	>11.5	NE	NE	NE	NE	NE	NE	NE	NE	8.5
B-26	Survey Pending	15.0	0.3	5.2	>9.5	NE	NE	NE	NE	NE	NE	NE	NE	8.0

**Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, Massachusetts**

**Table 2-2 Continued
Summary of Subsurface Conditions**

Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
B-27	Survey Pending	16.0	0.3	NE	>15.7	NE	NE	NE	NE	NE	NE	NE	NE	6.5
B-28	Survey Pending	16.0	0.3	NE	>15.7	NE	NE	NE	NE	NE	NE	NE	NE	14.5
B-29	Survey Pending	16.0	0.3	1.7	>14.0	NE	NE	NE	NE	NE	NE	NE	NE	6.6
B-30	Survey Pending	16.0	0.4	4.1	>11.5	NE	NE	NE	NE	NE	NE	NE	NE	5.2
B-31	Survey Pending	19.8	1.2	NE	>18.6	NE	NE	NE	NE	NE	NE	NE	NE	6.0
B-32	Survey Pending	16.0	3.0	3.0	>10.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-33	Survey Pending	16.0	0.3	1.7	>14.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-34	Survey Pending	16.0	0.7	NE	>15.3	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-35	Survey Pending	16.0	0.5	NE	>15.5	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-36	Survey Pending	15.3	0.3	1.7	>6.8	NE	6.5	NE	NE	NE	NE	NE	NE	NE
B-37	Survey Pending	16.0	0.3	0.7	>4.0	NE	11.0	NE	NE	NE	NE	NE	NE	NE
B-38	Survey Pending	16.0	0.7	2.3	4.0	NE	5.0	NE	>4.0	NE	NE	NE	NE	8.5
B-39	Survey Pending	17.0	0.4	NE	3.6	NE	11.1	NE	>1.9	NE	NE	NE	NE	11.8
B-40	Survey Pending	21.0	0.2	3.8	4.0	NE	NE	NE	>13.0	NE	NE	NE	NE	5.2
B-41	Survey Pending	16.0	0.2	3.3	4.5	>8.0	NE	NE	NE	NE	NE	NE	NE	4.1
B-42	Survey Pending	21.0	0.2	NE	5.8	>15.0	NE	NE	NE	NE	NE	NE	NE	3.2
B-43	Survey Pending	16.0	0.5	1.5	NE	6.0/>4.0	NE	NE	NE	4.0	NE	NE	NE	5.3
B-44	Survey Pending	16.0	1.0	NE	6.5	NE	>4.0	NE	4.5	>4.0	NE	NE	NE	7.0
B-45	Survey Pending	16.0	0.3	NE	NE	NE	NE	NE	12.7	>3.0	NE	NE	NE	5.4
B-46	Survey Pending	16.0	1.0	NE	7.0	NE	NE	NE	4.0	>4.0	NE	NE	NE	6.4
B-47	Survey Pending	16.0	1.0	NE	>15.0	NE	NE	NE	NE	NE	NE	NE	NE	12.8
B-48	Survey Pending	16.0	0.5	NE	5.5	>10.0	NE	NE	NE	NE	NE	NE	NE	11.3
B-49	Survey Pending	16.0	0.8	5.2	>10.0	NE	NE	NE	NE	NE	NE	NE	NE	7.2
B-50	Survey Pending	15.0	1.0	NE	>14.0	NE	NE	NE	NE	NE	NE	NE	NE	NE
B-51	Survey Pending	14.4	0.3	NE	>14.1	NE	NE	NE	NE	NE	NE	NE	NE	7.7
B-52	Survey Pending	14.5	0.3	NE	8.7	NE	NE	NE	NE	NE	>5.5	NE	NE	5.2
B-53 (MW)	Survey Pending	11.0	0.3	NE	2.6	NE	NE	NE	NE	NE	3.1	>5.0	6.0	6.0
B-54	Survey Pending	14.1	0.4	1.6	11.0	NE	NE	NE	NE	NE	>1.1	NE	NE	11.0
B-55	Survey Pending	13.0	1.5	NE	6.5	NE	NE	NE	NE	NE	>5.0	NE	NE	5.8
B-56	Survey Pending	15.0	0.5	NE	>14.5	NE	NE	NE	NE	NE	NE	NE	NE	7.2
B-57	Survey Pending	14.0	0.5	NE	5.5	NE	NE	NE	NE	NE	3.0	>5.0	9.0	5.8
B-58	Survey Pending	10.0	0.4	NE	>9.6	NE	NE	NE	NE	NE	NE	NE	NE	NE

**Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, Massachusetts**

**Table 2-2 Continued
Summary of Subsurface Conditions**

Exploration Number	Approximate Ground Surface Elevation (ft) ⁽¹⁾	Approximate Exploration Depth (ft)	Stratum Thickness (ft)										Approximate Depth to Top of Bedrock (ft)	Approximate Depth to Groundwater (ft) ⁽²⁾
			Pavement or Topsoil	Fill	Sand and Gravel	Silty Sand	Sand	Organic Soils	Sandy Silt	Silty Clay	Weathered Rock	Bedrock		
B-59	<i>Survey Pending</i>	16.0	0.8	5.2	>10.0	NE	NE	NE	NE	NE	NE	NE	NE	NE

Notes:

1. Ground surface elevations have not yet been acquired. Survey will be scheduled in the Spring 2018 when conditions are favorable for locating the boreholes.
2. Indicated depths are depths below ground surface at the time of drilling.
3. Groundwater levels were measured at the completion of drilling and may not represent static groundwater conditions.

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Massachusetts Water Resources Authority
Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, MA

Table 2-3
Summary of Groundwater Monitoring Well Readings

Monitoring Well Number	Ground Surface Elevation ⁽¹⁾	Depth to Groundwater (ft) ⁽²⁾
		2/27/2018
B-9 (MW)	<i>Survey Pending</i>	8.32
B-17 (MW)	<i>Survey Pending</i>	NE
B-20 (MW)	<i>Survey Pending</i>	3.40
B-25 (MW)	<i>Survey Pending</i>	8.12
B-53 (MW)	<i>Survey Pending</i>	6.90
B-75A (MW)	<i>Survey Pending</i>	5.70
B-93 (MW)	<i>Survey Pending</i>	NE
B-100 (MW)	<i>Survey Pending</i>	13.77
B-104 (MW)	<i>Survey Pending</i>	8.15
B-107 (MW)	<i>Survey Pending</i>	7.08
B-110 (MW)	<i>Survey Pending</i>	6.55
B-113 (MW)	<i>Survey Pending</i>	2.50

Notes:

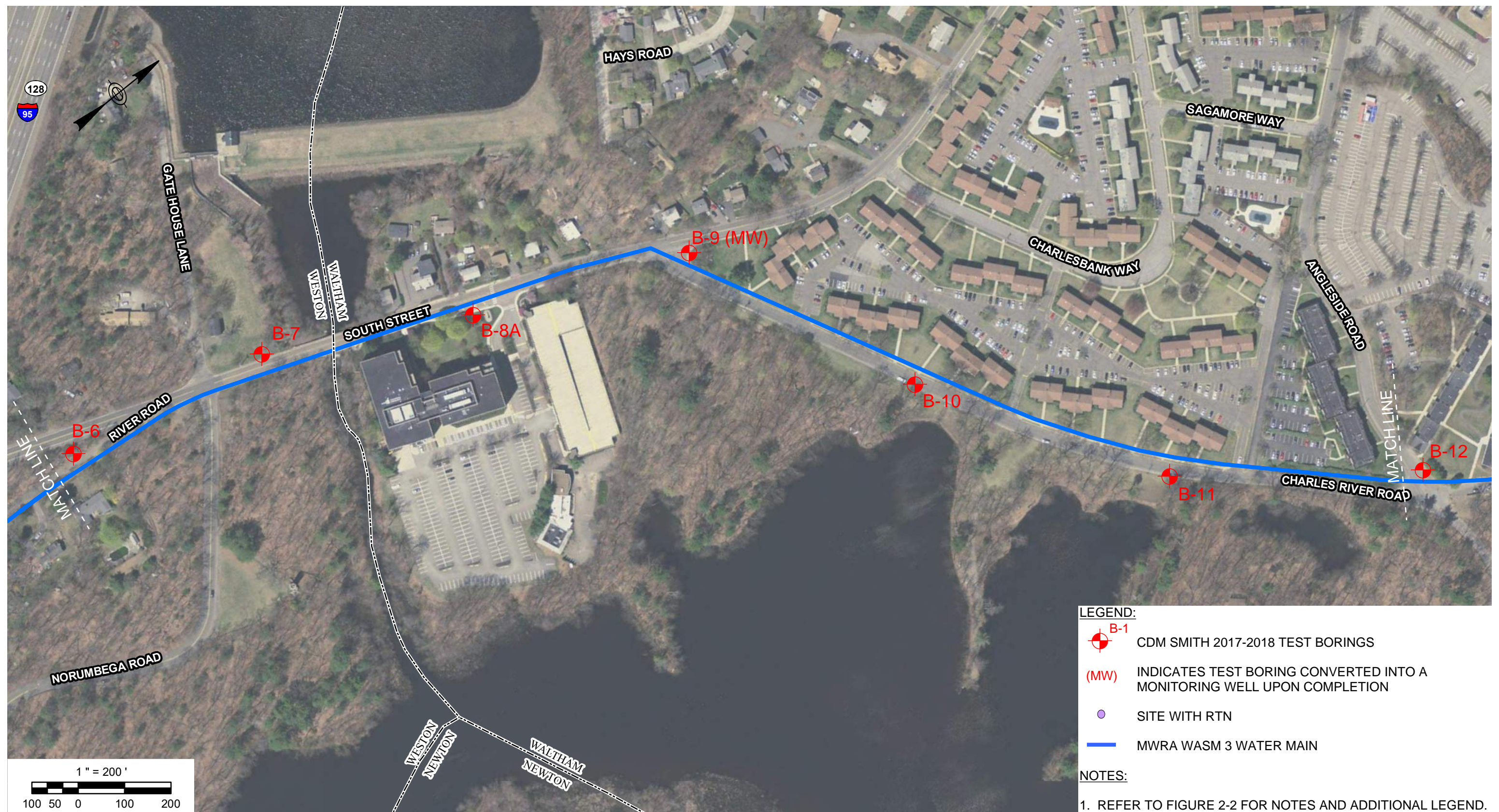
1. Ground surface elevations have not yet been acquired. Survey will be scheduled in the Spring 2018 when conditions are favorable for locating the boreholes.
2. Indicated depths are depths below ground surface as measured on the date identified.

Abbreviations:

ft - feet

NE - Not Encountered

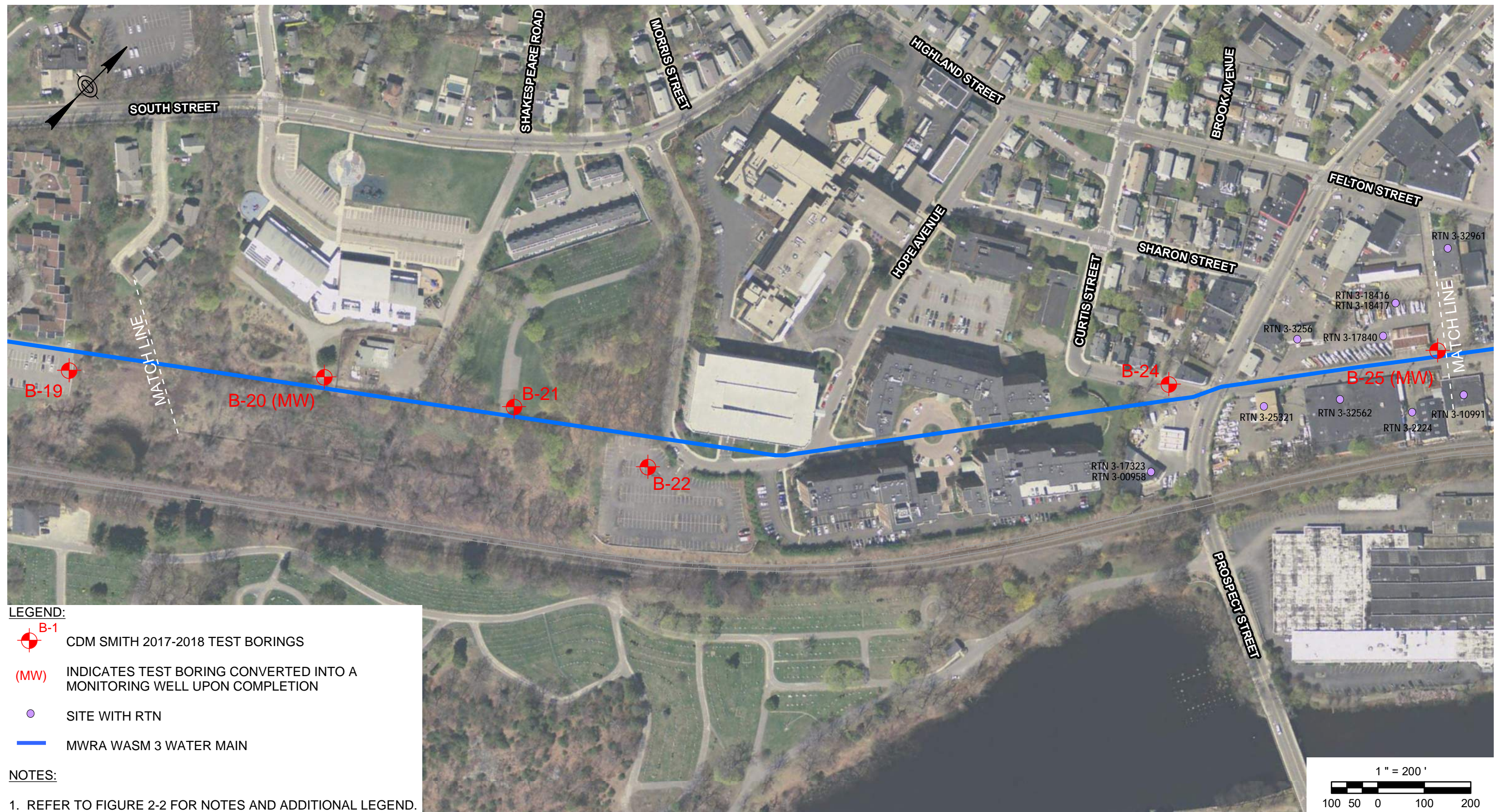


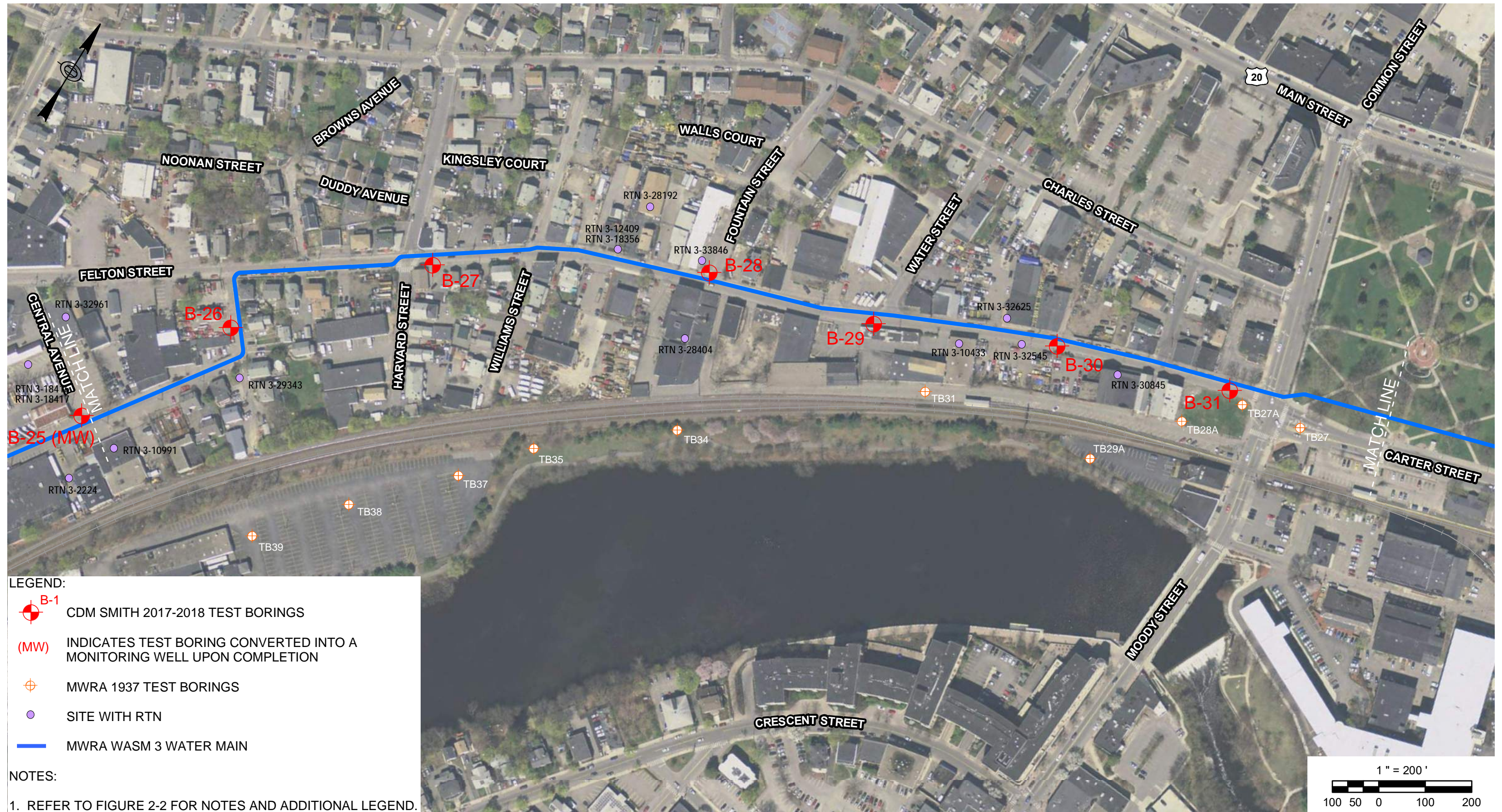


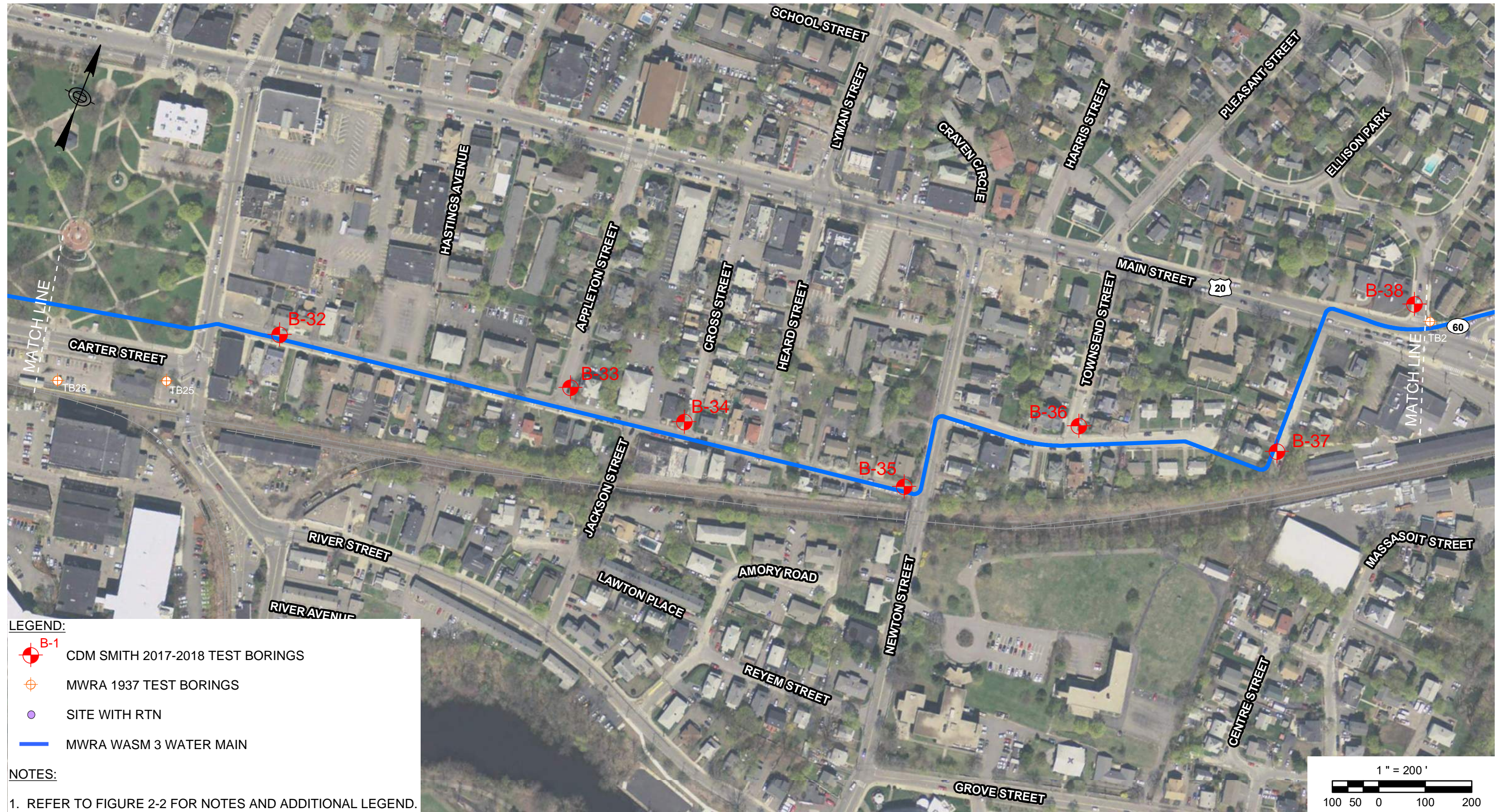
MWRA
REHABILITATION OF WESTON AQUEDUCT SUPPLY MAIN 3
WESTON, WALTHAM, BELMONT, ARLINGTON, SOMERVILLE, AND MEDFORD, MASSACHUSETTS

TEST BORING LOCATION PLAN
FIGURE 3-3B

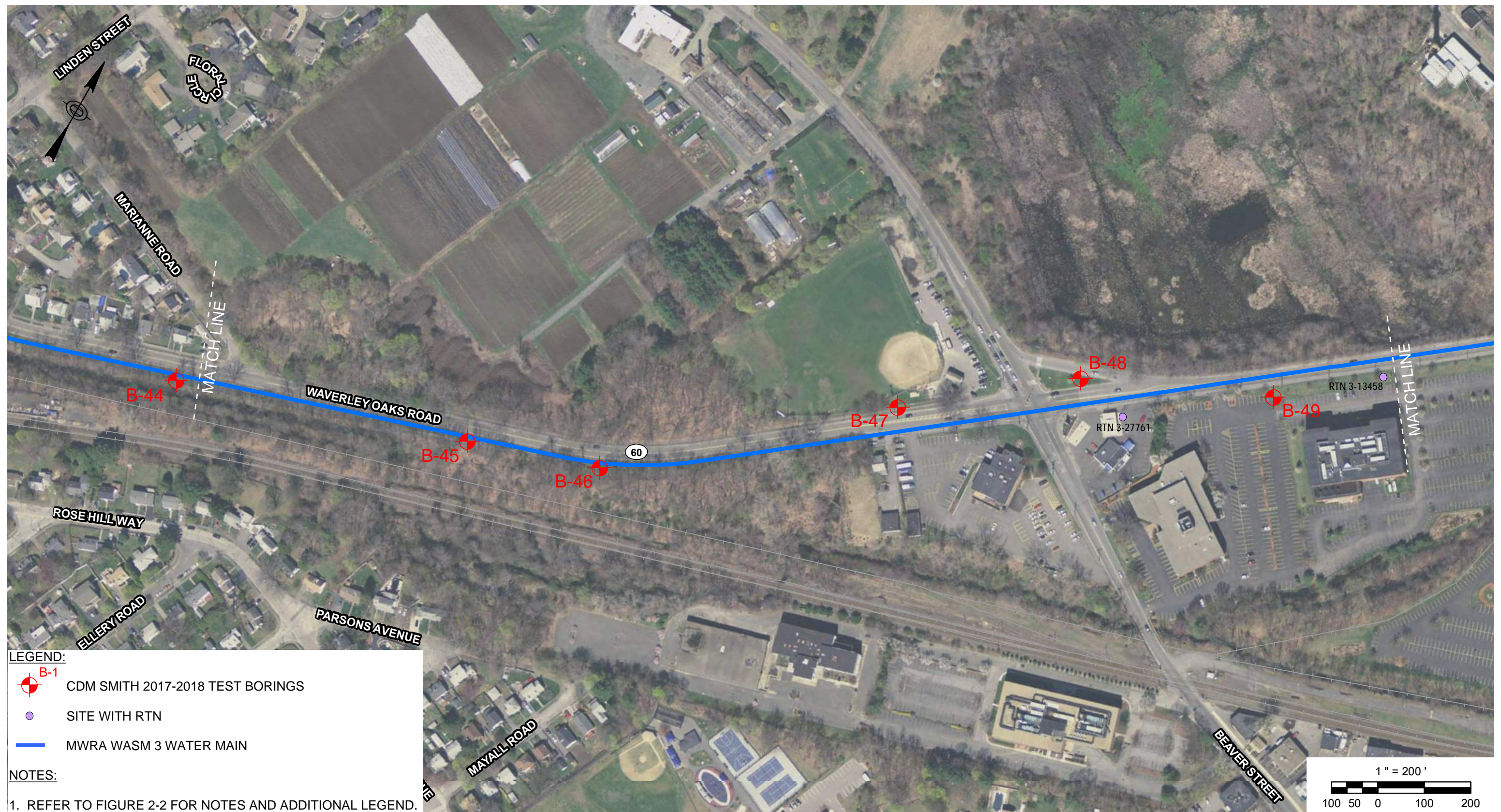




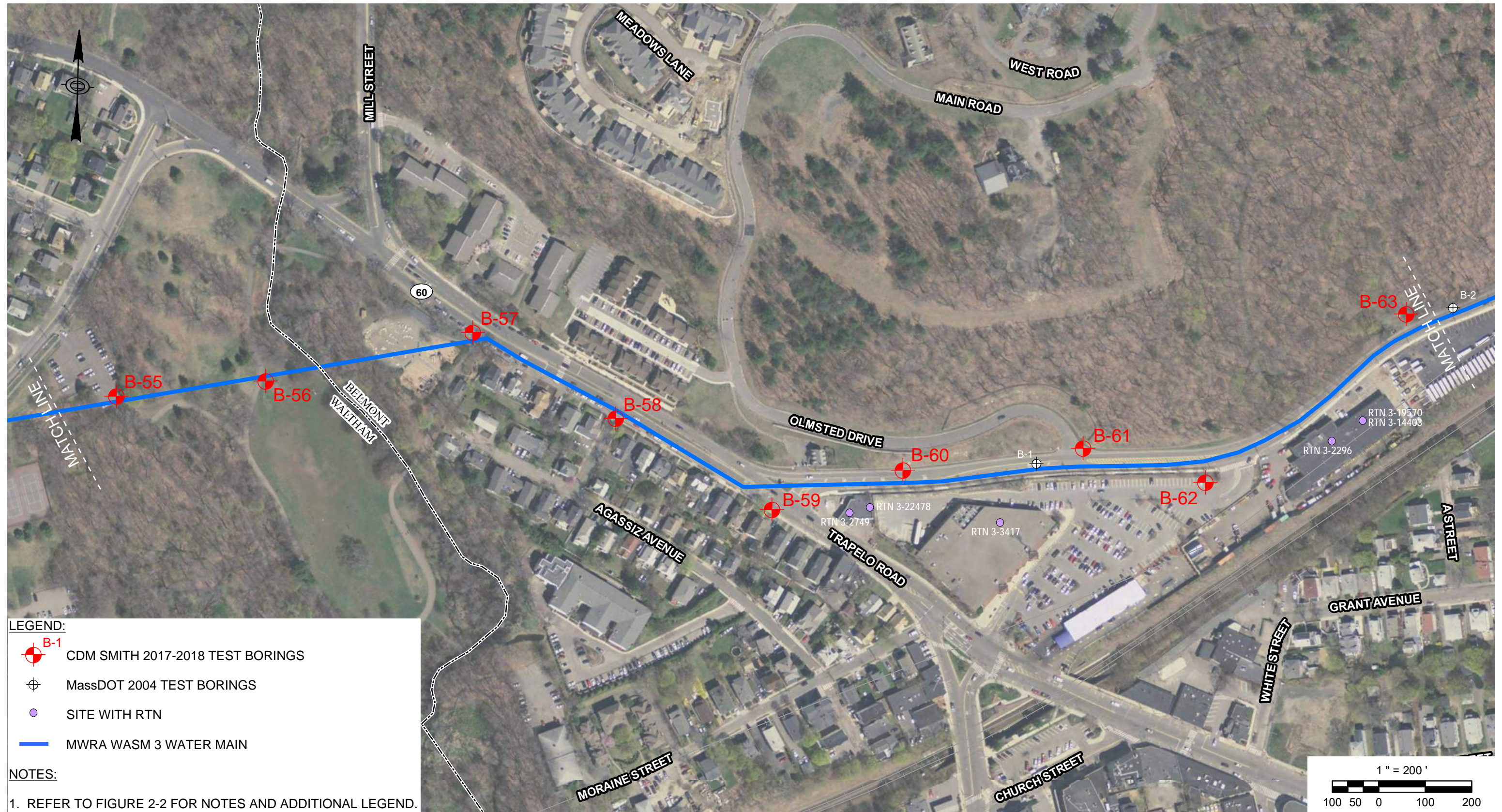




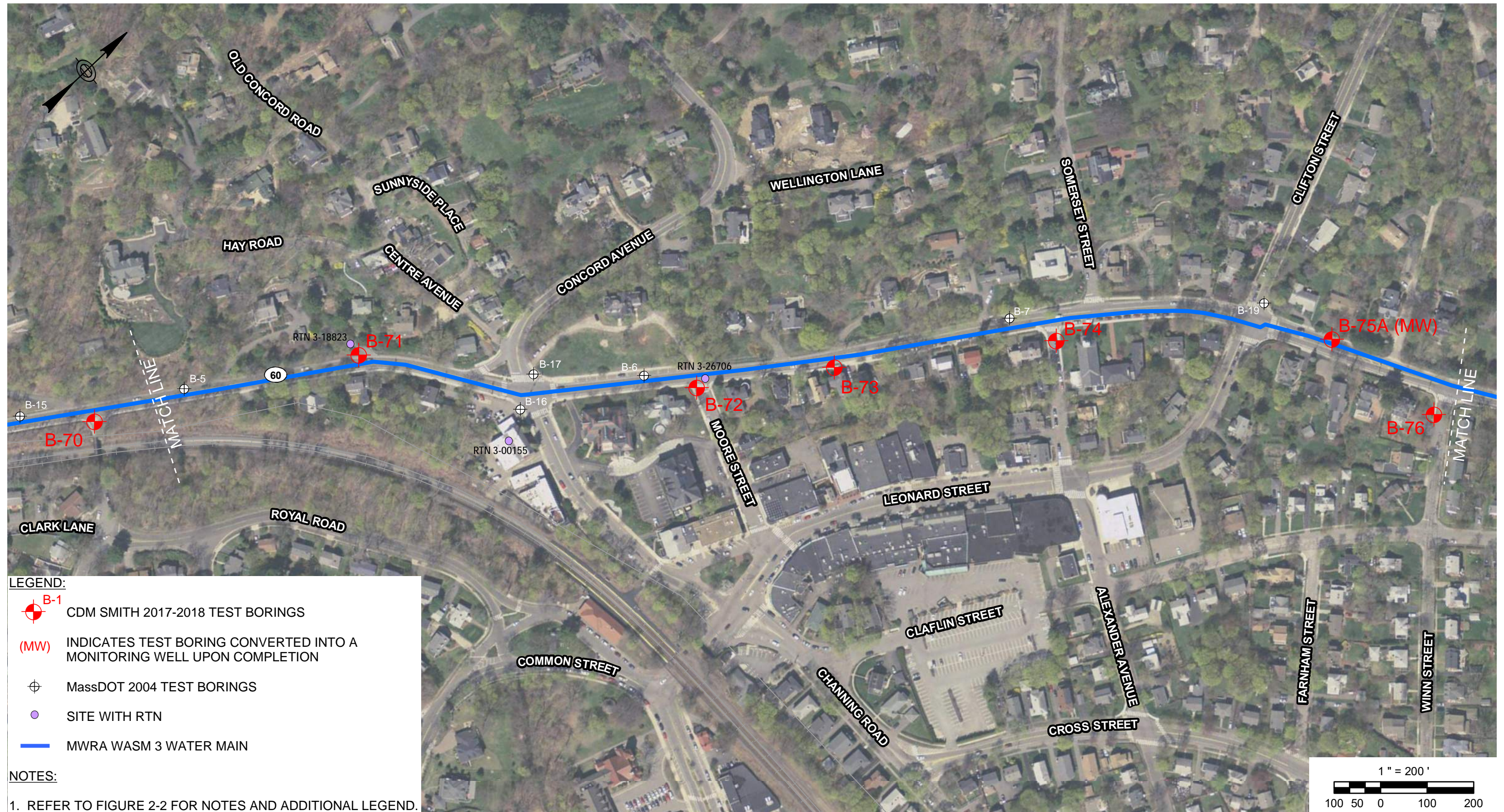




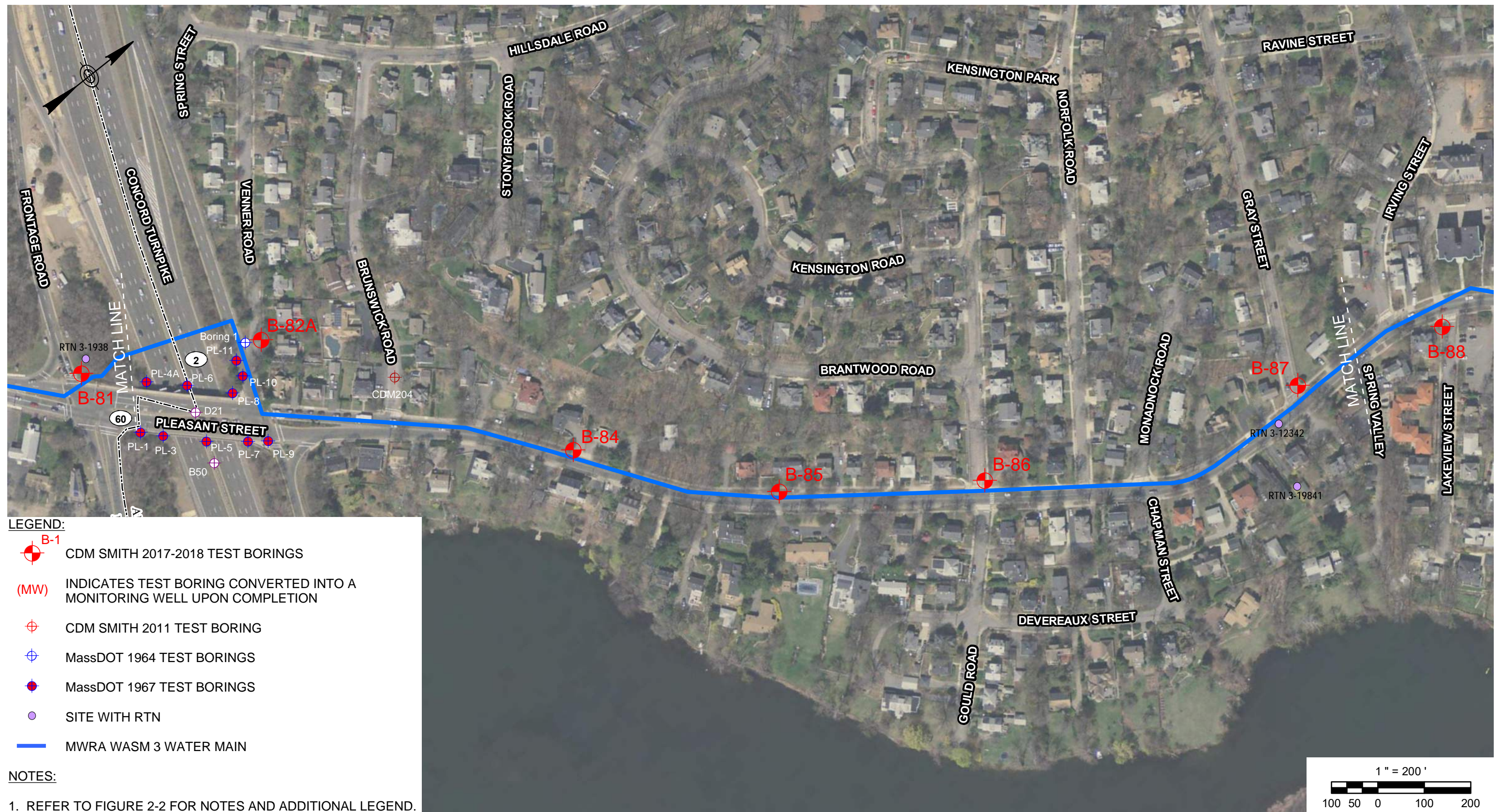

















LEGEND:

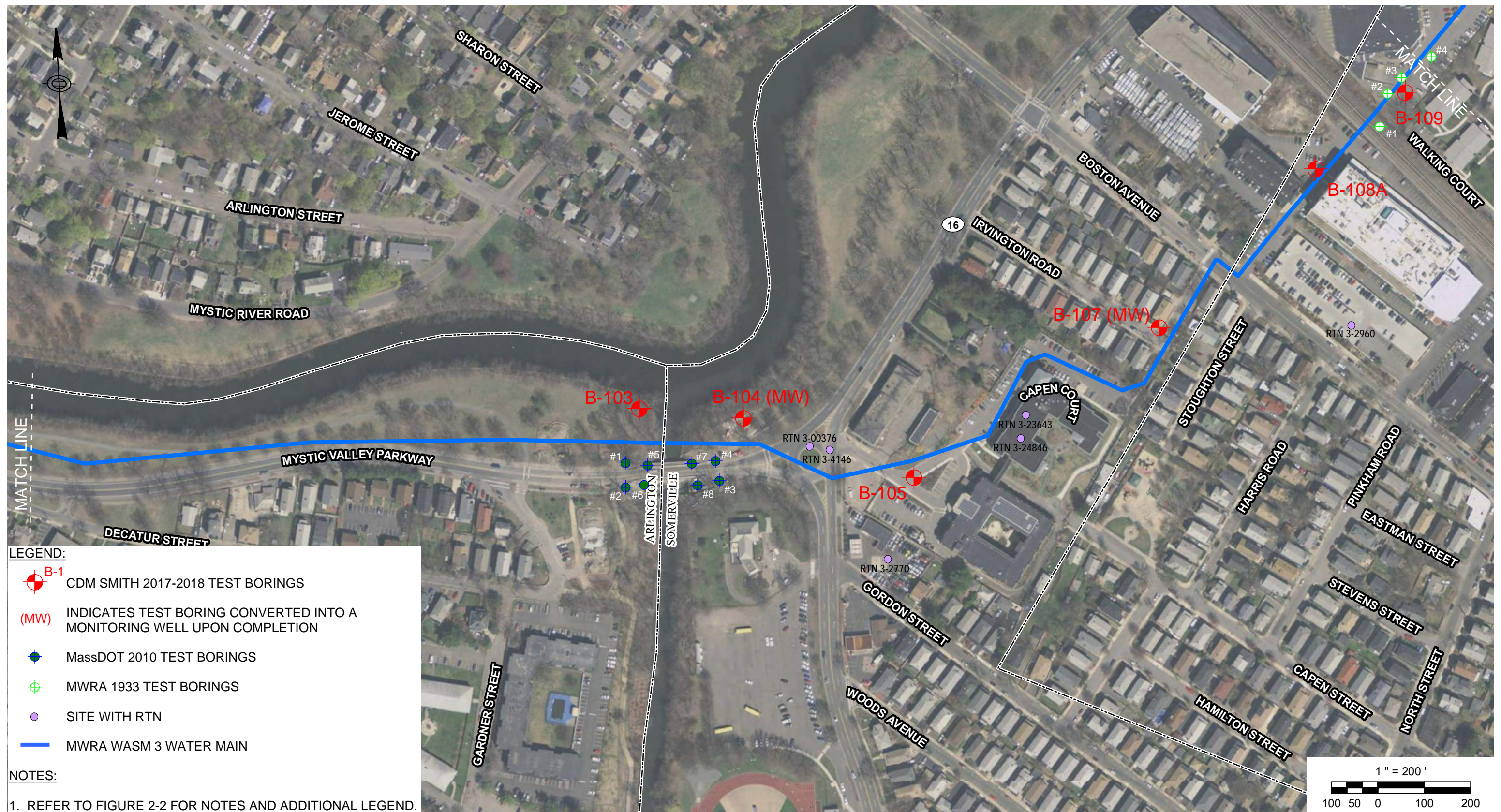
-  CDM SMITH 2017-2018 TEST BORINGS
-  INDICATES TEST BORING CONVERTED INTO A MONITORING WELL UPON COMPLETION
-  MassDOT 1966 TEST BORINGS
-  SITE WITH RTN
-  MWRA WASM 3 WATER MAIN

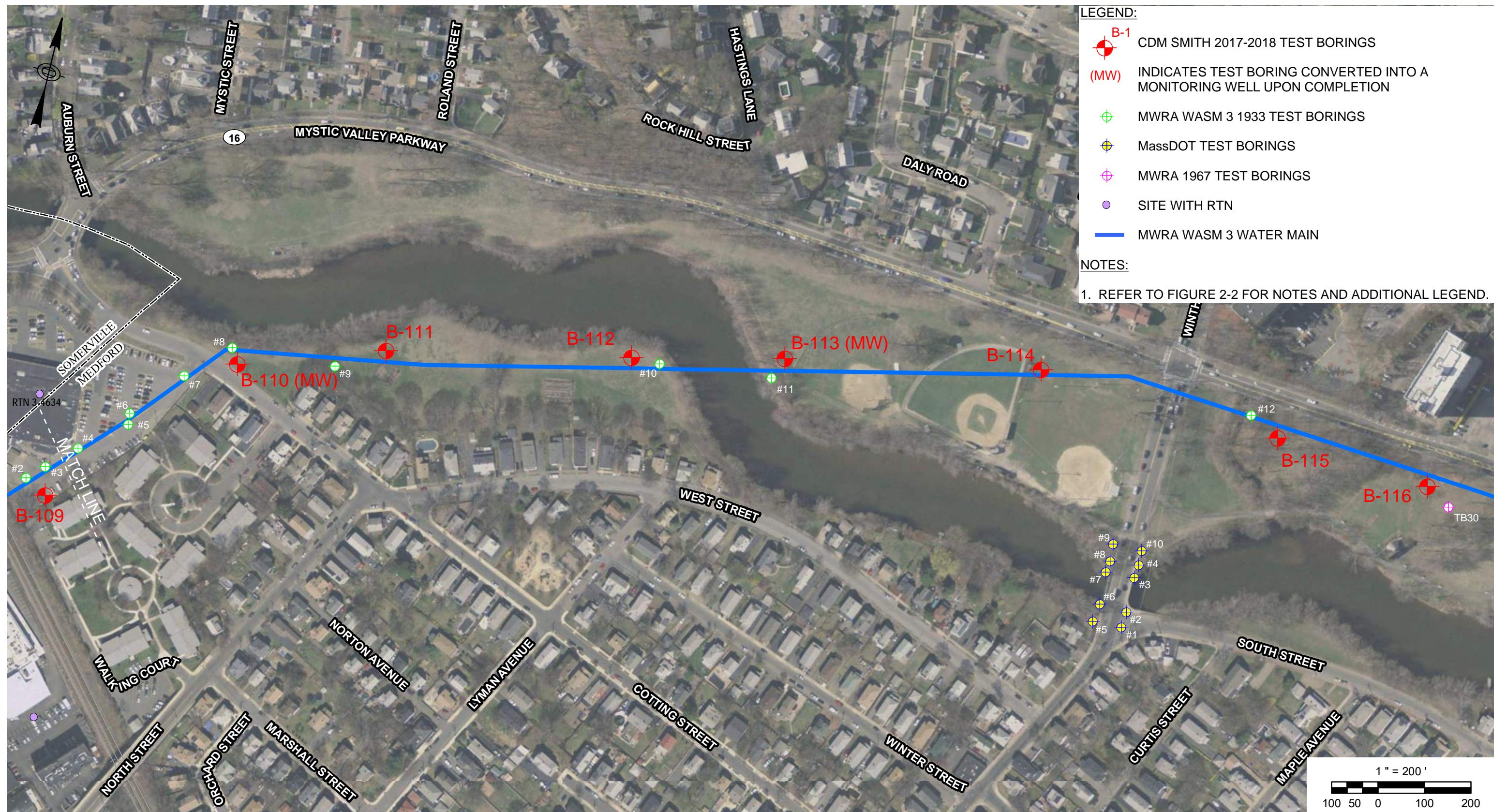
NOTES:

1. REFER TO FIGURE 2-2 FOR NOTES AND ADDITIONAL LEGEND.









Appendix A

Existing Test Boring Logs

CDM Smith 2011 Test Boring
Arlington, MA

Client: Green International Affiliates
Project Location: Arlington, MA

Project Name: MWRA - Contract 6540
Project Number: 33341-82080

Drilling Contractor/Driller: Soil Exploration / George Guinto

Drilling Method/Casing/Core Barrel Size: Hollow Stem Auger / 4/

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2

Bore Hole Location: Brunswick Ave

N: 2973476 **E:** 747149

Drilling Date: Start: 6/15/2011 End: 6/15/2011

Surface Elevation (ft.): 54.1

Total Depth (ft.): 15.5

Depth to Initial Water Level (ft):

Depth **Date** **Time**
NE

Abandonment Method: Backfill with cuttings, cold patch
Logged By: A Thompson

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	Split Spoon Size (O.D.)	Graphic Log	Strata	Material Description	Remarks
54.1 0									Asphalt	
	SS	S-1	24	4 4 2 6	10			Fill	Moist, loose, brown, medium to coarse SAND and fine to coarse GRAVEL, trace silt	
49.1 5										Hard drilling - rig chatter
	SS	S-2	24	29 46 50 48	22			Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-3	24	5 50 45 45	17				Moist, very dense, dark gray, fine to coarse SAND, some silt, little fine gravel	
44.1 10										
	SS	S-4	24	58 44 30 30	16				Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Rock fragments in top of spoon
39.1 15										
	SS	S-5	7	40 50/1"	5				Moist, very dense, brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt	
									Boring terminated at 15.5 ft bgs.	
34.1										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4
Loose: 4-10
M. Dense: 10-30
Dense: 30-50
V. Dense: >50

Fine Grained (Clay):
V. Soft: <2
Soft: 2-4
M. Stiff: 4-8
Stiff: 8-15
V. Stiff: 15-30
Hard: >30

Burmister Classification

and some little trace moisture, density, color
35-50%
20-35%
10-20%
<10%

Reviewed by: Geoff B. Schwartz

Date: 12/8/2011

Boring Number: CDM-204

MassDOT 1966 Project
Arlington, MA

BORING REPORT AMERICAN DRILLING & BORING CO., INC.

54 WATER STREET
EAST PROVIDENCE, R. I.

TO Mass. Dept Public Works ADDRESS Boston, Mass.
SITE LOCATION Line Borings, Arlington, Lexington, Belmont
REPORT SENT TO above DATE
SAMPLES SENT TO Soils Lab, Wellesly, Mass. VIA DATE
SCALE 1" = 8 ft. REFERENCE DATUM
DEPTH 71 DEPTH 73 DEPTH
ELEVATION 260.0'

LINE & STATION: 7 + 50

OFFSET: 62' RIGHT

ELEVATION: 241.0'

LINE & STATION: 8 + 0

OFFSET: 500' RIGHT

ELEVATION: 205.7'

0.0'	BROWN FINE TO MEDIUM SAND, LITTLE SILT, LITTLE FINE TO MEDIUM GRAVEL.	18	
10.0'	TOP OF COBBLES CORED COBBLES, Rec. 1'0"/	3.5	
15.0'	TOP OF ROCK: 15.0' GRAY SANDSTONE, VERY FRACTURED, SEAMY.	C	
20.0'	RUN #1, 15'-20', REC. 2'4"/		
23.0'	GRAY SANDSTONE, FRACTURED & SEAMY	C	
25.0'	RUN #2, 20'-25', REC. 3'9"/		
29.0'	GRAY SANDSTONE, VERY FRACTURED AND SEAMY.	C	
29.0'	RUN #3, 25'-29', REC. 2'7"/		

BOTTOM OF BORING AT: 29.0'
BOTTOM ELEVATION AT: 212.0'
WATER AT: 23.0'

STARTED: 1-19-66 @ 8:00 AM
FINISHED: 1-20-66 @ 11:00 AM

FOREMAN: C. LENLING
INSPECTOR: CONFALONE

NOTE: OFFSET CHANGED, HOLE FELL ON SIDE OF SLOPE. BECAUSE OF SNOW & FROST & DANGER OF SLIDING & SKIDDING, IT WAS MOVED TO PRESENT POSITION.

0.0'	BROWN PEAT.	1	204.0'
2.0'			
5.0'		7	
10.0'	GRAY FINE TO COARSE SAND, TRACE OF SILT.		196.0'
16.0'	BROWN FINE SAND, LITTLE SILT,	8	
18.0'	BROWN FINE SAND, SOME SILT.	26	188.0'

BOTTOM OF BORING AT: 18.0'
BOTTOM ELEVATION AT: 187.7'
WATER AT: 2.0'

STARTED: 1-21-66 @ 1:00 PM
FINISHED: 1-21-66 @ 3:00 PM

FOREMAN: C. LENLING
INSPECTOR: CONFALONE

MWRA Proposed Distribution Line from
Shaft 9
Medford, MA

NEW ENGLAND TEST BORING CORP. TEST BORING REPORT

Contract No. C-348
BOSTON, MASSACHUSETTS

Telephone 888-8888

To Comm. of Mass. - Met. Dist. Comm. - Construction Date 2/23/67 Job No. 3628
Location Proposed Distribution Line from Shaft 9, Medford, Mass. Scale 1" = 4 ft.

Figures in right hand column indicate number of blows required to drive 2 inch sampling spoon 1 foot, using 140-lb. weight falling 30 inches.

104+84			106+17		
Sta. 103+20			Sta. 106+10		
BORING # 28			BORING # 30		
Elev. 8.95			Elev. 8.77		
0'0"	sand, gravel and loam, fill	--	0'0"	sandy loam, fill	--
W.L. 3'0"	(no sample)		1'6"	SOFT, DARK-BROWN SANDY, SILTY PEAT	2
3'0"	V. LOOSE, COARSE TO MEDIUM DK-GRAY-YELLOW SAND, GRAVEL & SILT, FILL	3	(wet)		
6'0"	SOFT, DK-GRAY-YELLOW PEATY ORGANIC SILT (moist)	2	5'0"	MED-DENSE, COARSE TO MEDIUM YELLOW SAND & GRAVEL, some fine sand (wet)	13
9'0"	LOOSE, COARSE TO MEDIUM DK-GRAY SAND & GRAVEL, some fine sand and silt (wet)	8	7'0"	MEDIUM, VERY FINE TO FINE GRAY SAND & INORGANIC SILT & CLAY (some plasticity; wet)	9
12'6"	SOFT GRAY SANDY, SILTY CLAY	5	12'0"	MED-DENSE, VERY FINE TO FINE SILTY GRAY SAND, trace of clay	14
	(moderately to very plastic; wet)		16'0"	(wet)	
20'0"	Water Level -2'6"		16'0"	MEDIUM TO SOFT SANDY, SILTY GRAY CLAY (moderately plastic; wet)	7
			20'0"	Water Level -2'0"	
104+84			106+17		
Sta. 104+94			Sta. 106+10		
BORING # 29			BORING # 30		
Elev. 10.85			Elev. 8.77		
0'0"	sand, loam, fill	--	0'0"	sandy loam, fill	--
	(no sample)		1'6"	SOFT, DARK-BROWN SANDY, SILTY PEAT	2
3'0"	VERY SOFT, DARK-BROWN SILTY PEAT	1	(wet)		
W.L. 3'0"	trace of gravel		5'0"	MED-DENSE, COARSE TO MEDIUM YELLOW SAND & GRAVEL, some fine sand (wet)	13
6'6"	(wet)		7'0"	MEDIUM, VERY FINE TO FINE GRAY SAND & INORGANIC SILT & CLAY (some plasticity; wet)	9
			12'0"	MED-DENSE, VERY FINE TO FINE SILTY GRAY SAND, trace of clay	14
10'0"	DENSE, COARSE TO MEDIUM SILTY GRAY SAND AND GRAVEL, some fine sand, trace clay	25	16'0"	(wet)	
13'6"	MEDIUM, VERY FINE GRAY SAND, INORGANIC SILT AND CLAY	5	16'0"	MEDIUM TO SOFT SANDY, SILTY GRAY CLAY (moderately plastic; wet)	7
	(slightly plastic; moist)		20'0"	Water Level -2'0"	
20'0"	Water Level -5'0"				

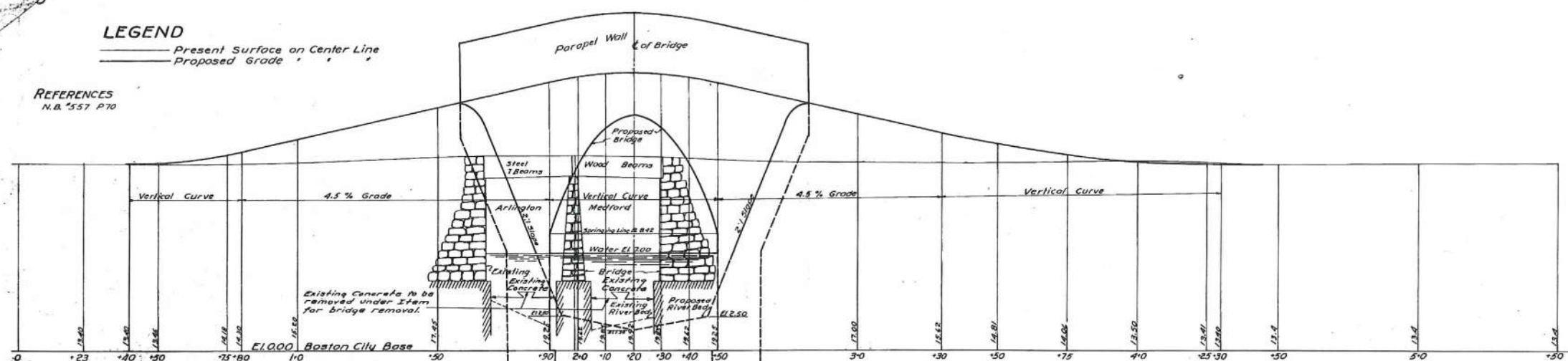
Water levels indicated are those observed at the completion of each boring, and do not necessarily represent permanent ground water level.

MassDOT River Street and Harvard
Avenue Over the Mystic River 1933 Project
Arlington, MA

LEGEND

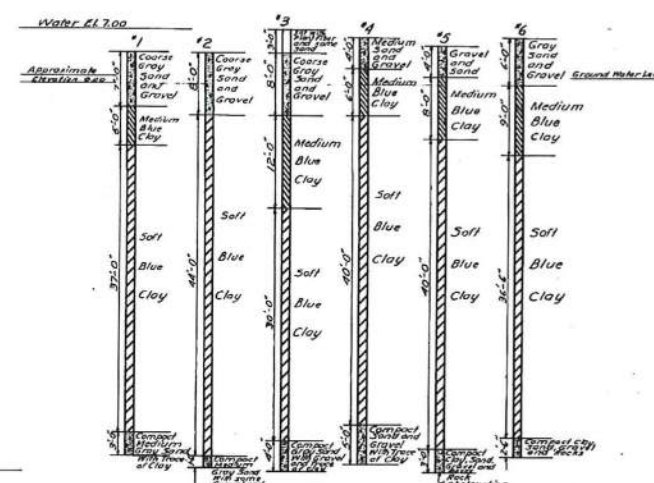
— Present Surface on Center Line
 — Proposed Grade

REFERENCES
 N.B. 557 P.70



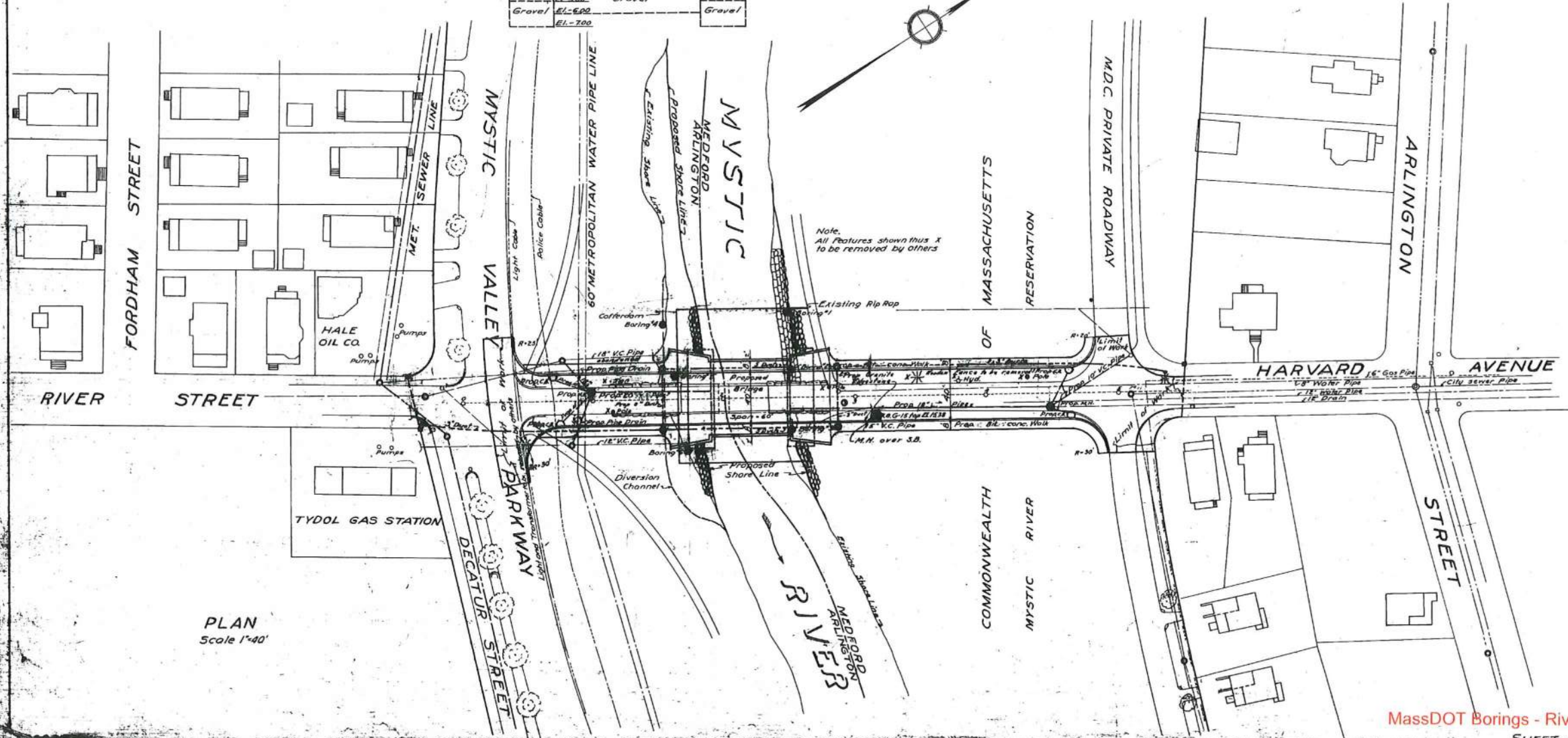
PROFILE
 Horizontal Scale 1"=20'
 Vertical 1"=4'

EL. 5.00	12" x 12" - 92' H Beam	EL. 5.00
EL. 5.00	Gravel	EL. 5.00
EL. 6.00	Gravel	EL. 6.00

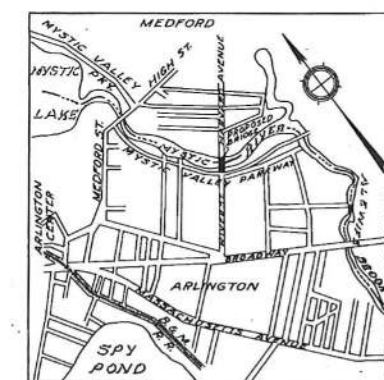


BORINGS
 Scale 1"=10'

Note:
 The Borings shown on this Sheet have been carefully made and are believed to be correct. The Commission however does not even guarantee their approximate accuracy.



PLAN
 Scale 1"=40'



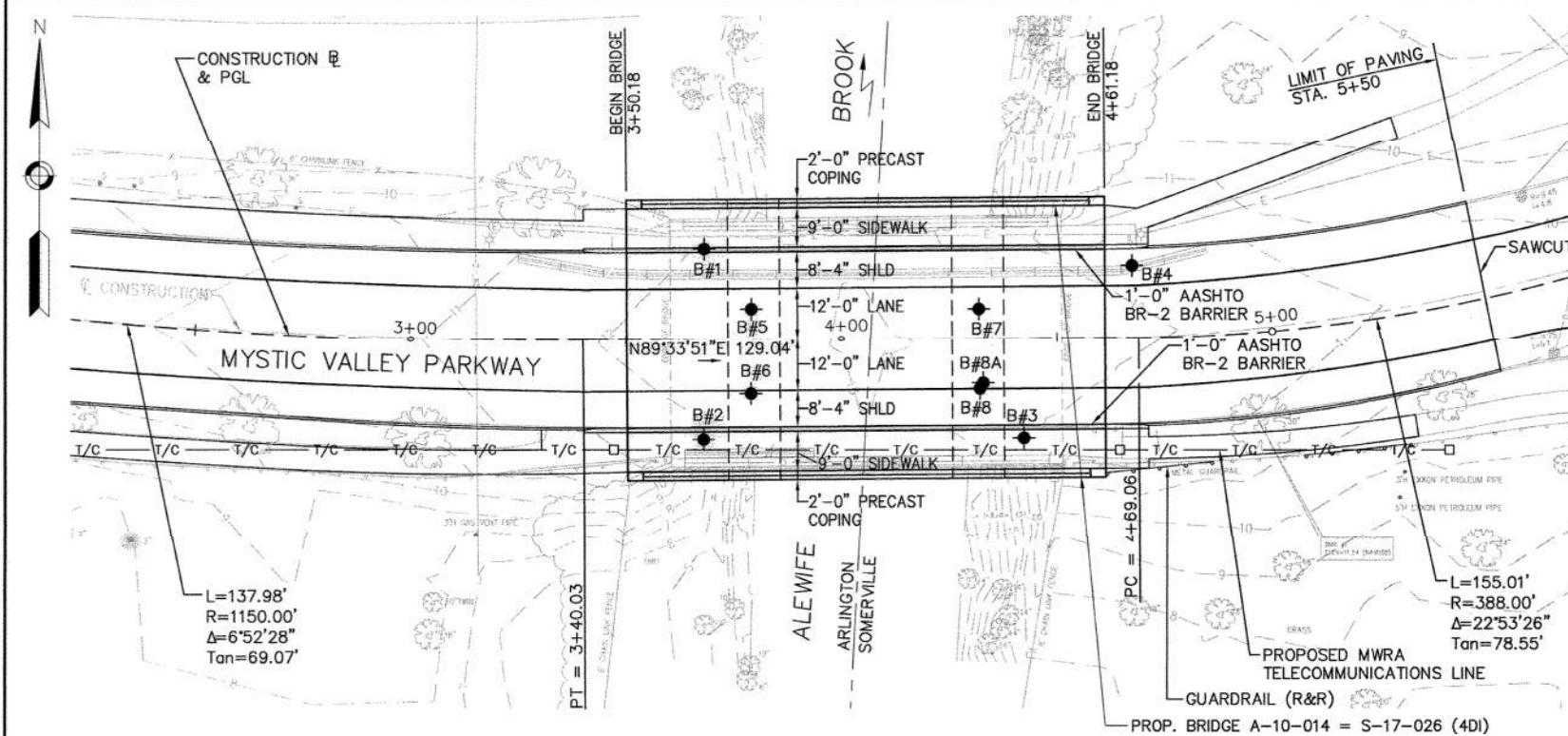
GENERAL LOCATION PLAN
 Scale 1"=1500'

Built under Chapter 432 Acts of 1937
 Approp. 445

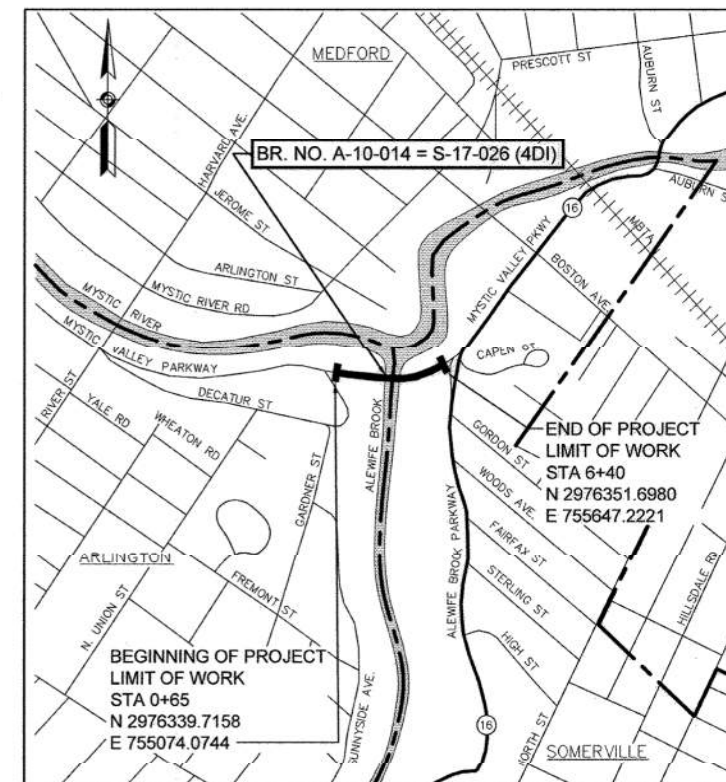
Commonwealth of Massachusetts
 METROPOLITAN DISTRICT COMMISSION
 Parks Division
MYSTIC VALLEY PARKWAY
 ARLINGTON & MEDFORD
PROPOSED BRIDGE OVER MYSTIC RIVER
 RIVER STREET & HARVARD AVENUE
 Scales as noted July 28, 1937
 By: *W. A. Brown* Director of Park Engineering

MassDOT Borings - River St/Harvard Ave over Mystic River - Arlington - 1933 - Sheet 1 of 1
 SHEET 1 OF 4 SHEETS

MassDOT Mystic Valley Parkway Over
Alewife Brook 2010 Project
Arlington/Somerville, MA



KEY PLAN
1"=20'-0"



LOCUS
1"=500'

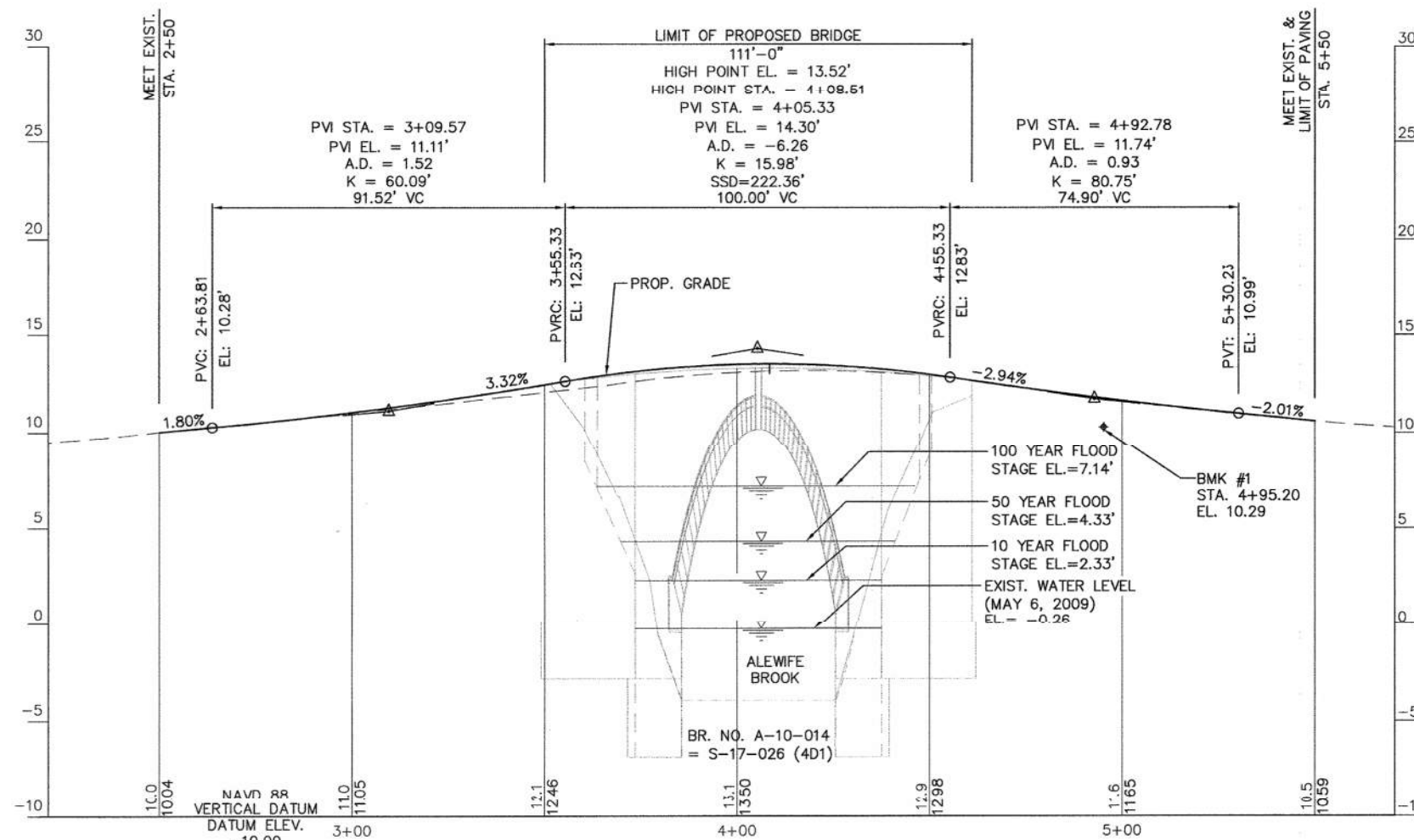
ARLINGTON / SOMERVILLE
MYSTIC VALLEY PARKWAY

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	21	40

PROJECT FILE NO. 605520
KEY PLAN & PROFILE

INDEX OF DRAWINGS

BRIDGE SHEET NO.	TITLE
1	KEY PLAN & PROFILE
2	GENERAL NOTES
3	BORING LOGS
4	BORING LOGS
5	PLAN & SECTION
6	EXISTING & PROPOSED ELEVATIONS
7	TYPICAL SECTIONS
8	DEMOLITION PLAN AND SECTION
9	SEQUENCE OF CONSTRUCTION STAGE I
10	SEQUENCE OF CONSTRUCTION STAGE II
11	SEQUENCE OF CONSTRUCTION STAGE III
12	MISCELLANEOUS DETAILS
13	MISCELLANEOUS DETAILS
14	FOUNDATION LAYOUT DETAILS
15	BRIDGE RAIL DETAILS
16	BRIDGE RAIL DETAILS
17	HISTORIC DRAWINGS
18	HISTORIC DRAWINGS
19	HISTORIC DRAWINGS
20	HISTORIC DRAWINGS

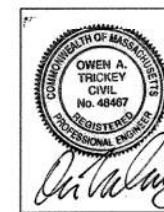


PROFILE - MYSTIC VALLEY PARKWAY
VERTICAL: 1"=4'
HORIZONTAL: 1"=20'

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
DEMOLITION OF BRIDGE NO A-10-014=S-17-026	LS	1
BRIDGE EXCAVATION	CY	1,620
BRIDGE EXCAVATION WITHIN COFFERDAM	CY	160
CLASS B ROCK EXCAVATION	CY	45
DREDGING AND DISPOSAL OF MATERIAL	CY	520
GRAVEL BORROW	CY	62
GRAVEL BORROW - TYPE C	CY	140
GRAVEL BORROW FOR BRIDGE FOUNDATIONS	CY	860
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	CY	1,900
FINE GRADING AND COMPACTING	SY	750
HEALTH AND SAFETY PLAN	LS	1
IMPLEMENTATION OF HEALTH AND SAFETY PLAN	HR	110
PERSONNEL PROTECTION LEVEL 'C' UPGRADE	HR	430
MONITORING/HANDLING AND STOCKPILING OF CONTAMINATED SOILS	CY	626
LICENSED SITE PROFESSIONAL (LSP) SERVICES	HR	40
MISCELLANEOUS SOIL TESTING	EA	2
DISPOSAL OF UNREGULATED SOIL	TON	1,100
DISPOSAL OF REGULATED SOIL: IN-STATE FACILITY	TON	140
DISPOSAL OF REGULATED SOIL: OUT-OF-STATE FACILITY	TON	70
DISPOSAL OF HAZARDOUS WASTE	TON	70
DENSE GRADED CRUSHED STONE FOR SUBBASE	CY	56
HOT MIX ASPHALT BASE COURSE	TON	113
HOT MIX ASPHALT	TON	120
CEMENT CONCRETE SIDEWALK	SY	225
CEMENTIOUS MORTAR FOR PATCHING	SF	550
TEMPORARY SHORING	LS	1
METAL BRIDGE RAILING	FT	208
CONTROL OF WATER, BRIDGE NO. A-10-014=S-17-026	LS	1
BRIDGE STRUCTURE, BRIDGE NO. A-10-014=S-17-026	LS	1

NOTE:
FOR GENERAL NOTES, SEE SHEET 2 OF 20.



Gannett Fleming
199 WELLS AVE.
SUITE 210
NEWTON, MA 02459
(617) 527-7822

SEPT. 25, 2010 ISSUED FOR CONSTRUCTION
massDOT
PROPOSED BRIDGE REHABILITATION
ARLINGTON/SOMERVILLE
MYSTIC VALLEY PARKWAY
OVER ALEWIFE BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS
TITLE: DR. BRIDGE PROJECT 5012. Chief Engineer



Technical Drilling Services, Inc.
P.O. Box 10/2 Peter Drive, Sterling, MA 01564

TEL (978) 422-0005 FAX (978) 422-0006

BORING B#1
STA. 3+68.20
OFFSET: 21.20 RT
ELEV. 12.5±

DRILLER:	CLIENT:	INSPECTOR:
Bridge	Gannett Fleming	6/8/05
Mystic Valley Parkway	199 Wells Avenue	FINISH DATE
Somerville, MA	Newton, MA	WELL TYPE
Sample Hammer	140 lb	Drop 30"

Sample Number	Depth of Sample	Casing Blows	Depth in Feet	Blows Per Foot on open run Hammer	Recovery	SOIL DESCRIPTION
			From	To		
			0"	4"		Concrete
S-1	5'-7"		2-3-4-2			Loose, dry to moist, fine to med. sand, some coarse sand and silt, trace gravel
S-2	10'-12"		2-2-2-2			V. soft, moist to wet silt and fine sand, some clay, some organic matter
S-3	15'-17"		3-6-15-15			Loose to med. dense, wet, fine to med. coarse sand, some inorganic silt, some clay, trace cobbles and gravel
						FOOTING AT EL. 0.00 (BOSTON CITY BASE)
S-4	20'-22"		2-2-3-4			V. soft to soft, moist to wet, clay, some silt
S-5	25'-27"		36-41-29-26			Med. dense, wet, fine to med. coarse sand, some silt, some clay
S-6	30'-32"		19-21-29-20			Trace gravel
S-7	35'-37"		48-56-66-120-2			Dense to v. dense, wet, fine to med. coarse sand, some clay, some silt, some med. to coarse gravel, trace cobbles (possible weathered rock)
						End of B-2/Auger Refusal/Auger Refusal
						NX Core 37.5'-47.5'
						No well installed
						Water at 8'-10' upon completion

PENETRATION RESISTANCE	PROPORTIONS USED	REMARKS
140 LB. Wt. Falling 30" on 2" O.D. Sampler Cohesive Consistency (Blows/ft.)	Trace: 0% to 10% Liquid: 10% to 20% Plastic: 20% to 35% Stiff: 35% to 50% Very stiff: 50% to 60% Hard: 60% to 70% Very hard: 70% to 80% Extremely hard: 80% to 90% Super hard: 90% to 100%	• The stratification lines represent the approximate boundary between soil types and the transition may be gradual. • Water level readings have been made in the drill holes of times and under conditions stated on the boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.



Technical Drilling Services, Inc.
P.O. Box 10/2 Peter Drive, Sterling, MA 01564

TEL (978) 422-0005 FAX (978) 422-0006

BORING B#2
STA. 3+68.20
OFFSET: 22.90 RT
ELEV. 12.6±

DRILLER:	CLIENT:	INSPECTOR:
Bridge	Gannett Fleming	6/8/05
Mystic Valley Parkway	199 Wells Avenue	FINISH DATE
Somerville, MA	Newton, MA	WELL TYPE
Sample Hammer	140 lb	Drop 30"

Sample Number	Depth of Sample	Casing Blows	Depth in Feet	Blows Per Foot on open run Hammer	Recovery	SOIL DESCRIPTION
			From	To		
			0"	5"		Concrete
S-1	5'-7"		3-3-4-4			Loose, dry, fine to med. coarse sand, trace silt, trace gravel
S-2	10'-12"		2-1-2-2			V. soft to soft, moist to wet silt and fine sand, trace clay
S-3	15'-17"		4-6-12-8			V. loose to loose, moist to wet, fine to med. coarse sand, some silt, some fine to med. gravel
						FOOTING AT EL. 0.00 (BOSTON CITY BASE)
S-4	20'-22"		2-2-2-4			V. soft, wet, silty clay, trace fine sands
S-5	25'-27"		20-18-21-19			Med. dense, wet, fine to med. coarse sand, some inorganic silt and clay (glacial till) trace cobbles
S-6	30'-34"		18-21-20-23			
S-7	35'-37"		11-15-17-18			
S-8	39'-40"		57-120-3*			
S-9	40'-42"		28-120-3*			
						End of B-2/Auger Refusal/Auger Refusal
						No well installed
						Water at 10'-12' upon completion

PENETRATION RESISTANCE	PROPORTIONS USED	REMARKS
140 LB. Wt. Falling 30" on 2" O.D. Sampler Cohesive Consistency (Blows/ft.)	Trace: 0% to 10% Liquid: 10% to 20% Plastic: 20% to 35% Stiff: 35% to 50% Very stiff: 50% to 60% Hard: 60% to 70% Very hard: 70% to 80% Extremely hard: 80% to 90% Super hard: 90% to 100%	• The stratification lines represent the approximate boundary between soil types and the transition may be gradual. • Water level readings have been made in the drill holes of times and under conditions stated on the boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.



Technical Drilling Services, Inc.
P.O. Box 10/2 Peter Drive, Sterling, MA 01564

TEL (978) 422-0005 FAX (978) 422-0006

BORING B#3
STA. 4+42.20
OFFSET: 23.10 RT
ELEV. 12.7±

DRILLER:	CLIENT:	INSPECTOR:
Bridge	Gannett Fleming	6/10/05
Mystic Valley Parkway	199 Wells Avenue	FINISH DATE
Somerville, MA	Newton, MA	WELL TYPE
Sample Hammer	140 lb	Drop 30"

Sample Number	Depth of Sample	Casing Blows	Depth in Feet	Blows Per Foot on open run Hammer	Recovery	SOIL DESCRIPTION
			From	To		
			0"	4"		Concrete
S-1	5'-7"		2-2-1-2			V. loose, dry, med. coarse to fine sand, some gravel, trace silt
S-2	10'-12"		2-2-3-5			
S-3	15'-17"		2-2-4-12			V. loose to med. dense, moist to wet, fine to med. coarse sand, some inorganic silt, trace clay, trace gravel
S-4	20'-22"		2-2-2-2			V. soft, wet, clay, some silty sand
						FOOTING AT EL. 0.00 (BOSTON CITY BASE)
S-5	25'-27"		9-15-15-17			Med. dense, wet, (silt), fine to med. sand, some silt, some clay and mod. to coarse gravel, trace cobbles
S-6	30'-32"		120-4"			
						End of B-3/Auger Refusal/Auger Refusal
						NX Core 30'-40'-46'-4"
						No well installed
						Water at 12'-14' upon completion

PENETRATION RESISTANCE	PROPORTIONS USED	REMARKS
140 LB. Wt. Falling 30" on 2" O.D. Sampler Cohesive Consistency (Blows/ft.)	Trace: 0% to 10% Liquid: 10% to 20% Plastic: 20% to 35% Stiff: 35% to 50% Very stiff: 50% to 60% Hard: 60% to 70% Very hard: 70% to 80% Extremely hard: 80% to 90% Super hard: 90% to 100%	• The stratification lines represent the approximate boundary between soil types and the transition may be gradual. • Water level readings have been made in the drill holes of times and under conditions stated on the boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.

**ARLINGTON / SOMERVILLE
MYSTIC VALLEY PARKWAY**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	23	40
PROJECT FILE NO. 605520			

BORING LOGS



Technical Drilling Services, Inc.
P.O. Box 10/2 Peter Drive, Sterling, MA 01564

TEL (978) 422-0005 FAX (978) 422-0006

BORING B#4
STA. 4+68.00
OFFSET: 16.70 LT
ELEV. 11.8±

DRILLER:	CLIENT:	INSPECTOR:
Bridge	Gannett Fleming	6/13/05
Mystic Valley Parkway	199 Wells Avenue	FINISH DATE
Somerville, MA	Newton, MA	WELL TYPE
Sample Hammer	140 lb	Drop 30"

Sample Number	Depth of Sample	Casing Blows	Depth in Feet	Blows Per Foot on open run Hammer	Recovery	SOIL DESCRIPTION
			From	To		
			0"	4"		Asphalt
S-1	5'-7"		18-25-21-15			Med. dense, dry, fine to med. sand, some coarse sand, some inorganic silt, trace gravel
S-2	10'-12"		2-2-2-2			V. soft, moist, fine to silty sand, some clay, organic root matter
S-3	15'-17"		2-3-16-17			V. loose to med. dense, wet, fine to med. sand, some med. to coarse sand, some silt, trace gravel and cobbles
						FOOTING AT EL. 0.00 (BOSTON CITY BASE)
S-4	20'-22"		18-23-23-21			Soft to v. stiff to med. dense clay and silty sand, some med. to coarse sand, some fine sand (possible weathered rock)
S-5	25'-27"		120-3"			
						End of B-4/Auger Refusal/Auger Refusal at 25.5'
						No well installed
						Water at 10'-12' upon completion

PENETRATION RESISTANCE	PROPORTIONS USED	REMARKS
140 LB. Wt. Falling 30" on 2" O.D. Sampler Cohesive Consistency (Blows/ft.)	Trace: 0% to 10% Liquid: 10% to 20% Plastic: 20% to 35% Stiff: 35% to 50% Very stiff: 50% to 60% Hard: 60% to 70% Very hard: 70% to 80% Extremely hard: 80% to 90% Super hard: 90% to 100%	• The stratification lines represent the approximate boundary between soil types and the transition may be gradual. • Water level readings have been made in the drill holes of times and under conditions stated on the boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.

NOTES:

- BORING LOCATIONS ON PLAN ARE SHOWN THUSLY; B#2.
- BORINGS ARE TAKEN FOR THE PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF BORINGS BEING TAKEN AND DO NOT NECESSARILY SHOW THE TRUE GROUNDWATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/8" ID SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA ROOM 6500, BOSTON, MA. 02116-3973 AT 617-973-8836.
- BORINGS B-1, B-2, B-3 & B-4 WERE MADE JUNE 2005.
- BORINGS B-1, B-2, B-3 & B-4 WERE MADE BY TECHNICAL DRILLING SERVICES, INC. P.O. BOX 10/2 PETER DRIVE, STERLING, MA. 01564.
- BORINGS B-5, B-6, B-7 & B-8+B8A WERE MADE BY GEOLOGIC EARTH EXPLORATION, INC. 7 SHERWOOD DRIVE NORFOLK, MA. 02050
- THE BOSTON CITY BASE VERTICAL DATUM IS USED ON THE BORING LOGS. TO CONVERT FROM BOSTON CITY BASE VERTICAL DATUM TO NAVD 88, SUBTRACT 6.46 FT FROM THE ELEVATION.
- FOOTING ELEVATIONS ARE BASED ON HISTORIC DRAWINGS.

SEPT. 25, 2010	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

BORING B#5

STA. 3+79.11
OFFSET: 7.25 LT
ELEV. 12.5±

Geologic - Earth Exploration, Inc.		CLIENT: Gannett Fleming, Inc.		BORING # B-5	
7 Sherwood Drive TEL (508) 384-4434		Norfolk, MA 02055 FAX (508) 384-4432		PROJECT: Mystic Valley Parkway over Alewife Brook	
LOCATION: Arlington/Somerville, MA		1 OF 1			
File #:	11016	CASING	TYPE	SAMPLER	CORE BARREL
Date Started:	2/9/11	SIZE	4"	140#	140#
Date Completed:	2/9/11	DRILLER	D. Sheldon	DATE	2/9/11
Driller:	D. Sheldon	DATE	2/9/11	DATE	2/9/11
Site Rep:	Rob Gurnaw	DATE	2/9/11	DATE	2/9/11
Depth	No.	Depth ft	Pen. in	Blows/6"	Sample Description
0	S-1	0.5-2.0	24	12	14-58-42-31
5	S-2	4.0-6.0	24	12	27-79-11-12
10	S-3	9.5-11.0	24	8	40-21-22-24
15		14.5			14.5
20	S-4	19.5-21.5	24	24	4-6-7-6
25	S-5	24.0-26.0	24	18	72-16-17-21
30					26.0
35					
Ground Surface to used then					
Proportions Used					
Cohesive Consistency					
Cohesionless Density					
Sample Type					
Notes:					
Remarks:					

BORING B#6

STA. 3+78.94
OFFSET: 21.70 RT
ELEV. 12.5±

Geologic - Earth Exploration, Inc.		CLIENT: Gannett Fleming, Inc.		BORING # B-6	
7 Sherwood Drive TEL (508) 384-4434		Norfolk, MA 02055 FAX (508) 384-4432		PROJECT: Mystic Valley Parkway over Alewife Brook	
LOCATION: Arlington/Somerville, MA		1 OF 1			
File #:	11016	CASING	TYPE	SAMPLER	CORE BARREL
Date Started:	2/10/11	SIZE	4"	140#	140#
Date Completed:	2/10/11	DRILLER	D. Sheldon	DATE	2/10/11
Driller:	D. Sheldon	DATE	2/10/11	DATE	2/10/11
Site Rep:	Rob Gurnaw	DATE	2/10/11	DATE	2/10/11
Depth	No.	Depth ft	Pen. in	Blows/6"	Sample Description
0	S-1	0.5-2.0	24	13	56-44-16-23
5	S-2	4.0-6.0	24	9	22-11-12-13
10	S-3	9.0-11.0	24	7	15-6-4-5
15		14.0			14.0
20	S-4	20.0-22.0	24	24	7-6-8-8
25	S-5	24.0-26.0	24	12	24-43-34-41
30	S-6	28.0-30.0	24	9	10-16-46-64
35	S-7	34.0-36.0	24	11	30-37-38-22
40	S-8	35.0-37.5	18	6	62-75-2*
Ground Surface to used then					
Proportions Used					
Cohesive Consistency					
Cohesionless Density					
Sample Type					
Notes:					
Remarks:					

BORING B#7

STA. 4+31.90
OFFSET: 6.90 LT
ELEV. 12.5±

Geologic - Earth Exploration, Inc.		CLIENT: Gannett Fleming, Inc.		BORING # B-7	
7 Sherwood Drive TEL (508) 384-4434		Norfolk, MA 02055 FAX (508) 384-4432		PROJECT: Mystic Valley Parkway over Alewife Brook	
LOCATION: Arlington/Somerville, MA		1 OF 1			
File #:	11016	CASING	TYPE	SAMPLER	CORE BARREL
Date Started:	2/7/11	SIZE	4"	140#	140#
Date Completed:	2/7/11	DRILLER	D. Sheldon	DATE	2/7/11
Driller:	D. Sheldon	DATE	2/7/11	DATE	2/7/11
Site Rep:	Rob Gurnaw	DATE	2/7/11	DATE	2/7/11
Depth	No.	Depth ft	Pen. in	Blows/6"	Sample Description
0	S-1	0.5-1.9	23	9	24-36-100-5
5	S-2	4.0-6.0	24	7	24-4-9-10
10	S-3	9.0-11.0	24	12	10-5-10-8
15		14.2			14.2
20	S-4	19.0-21.0	24	24	14-9-7-4
25	S-5	24.0-26.0	24	19	50-52-55-100-2*
30					26.0
35					
Ground Surface to used then					
Proportions Used					
Cohesive Consistency					
Cohesionless Density					
Sample Type					
Notes:					
Remarks:					

ARLINGTON / SOMERVILLE
MYSTIC VALLEY PARKWAY

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	24	40
PROJECT FILE NO. 605520			

BORING LOGS

BORING B#8+B#8A

STA. 4+32.06
OFFSET: 11.94 RT
ELEV. 12.5±

Geologic - Earth Exploration, Inc.		CLIENT: Gannett Fleming, Inc.		BORING # B-8/B-8A	
7 Sherwood Drive TEL (508) 384-4434		Norfolk, MA 02055 FAX (508) 384-4432		PROJECT: Mystic Valley Parkway over Alewife Brook	
LOCATION: Arlington/Somerville, MA		1 OF 2			
File #:	11016	CASING	TYPE	SAMPLER	CORE BARREL
Date Started:	2/11/11	SIZE	4"	140#	140#
Date Completed:	2/11/11	DRILLER	D. Sheldon	DATE	2/11/11
Driller:	D. Sheldon	DATE	2/11/11	DATE	2/11/11
Site Rep:	Rob Gurnaw	DATE	2/11/11	DATE	2/11/11
Depth	No.	Depth ft	Pen. in	Blows/6"	Sample Description
0	S-1	0.0-2.0	24	12	42-04-03-03
5	S-2	6.0-8.0	24	24	13-12-10-10
10	S-3	9.0-11.0	24	7	26-10-13-12
15		13.5			13.5
20	S-4	20.0-22.0	24	24	4-5-7-7
25	S-5	24.0-26.0	24	10	20-25-38-41
30	S-6	28.0-31.0	24	12	25-27-39-35
35	S-7	34.0-34.5	8	10	108-115
Ground Surface to used then					
Proportions Used					
Cohesive Consistency					
Cohesionless Density					
Sample Type					
Notes:					
Remarks:					

BORING B#8+B#8A

STA. 4+32.85
OFFSET: 10.66 RT
ELEV. 12.5±

Geologic - Earth Exploration, Inc.		CLIENT: Gannett Fleming, Inc.		BORING # B-8/B-8A	
7 Sherwood Drive TEL (508) 384-4434		Norfolk, MA 02055 FAX (508) 384-4432		PROJECT: Mystic Valley Parkway over Alewife Brook	
LOCATION: Arlington/Somerville, MA		2 OF 2			
File #:	11016	CASING	TYPE	SAMPLER	CORE BARREL
Date Started:	2/11/11	SIZE	4"	140#	140#
Date Completed:	2/11/11	DRILLER	D. Sheldon	DATE	2/11/11
Driller:	D. Sheldon	DATE	2/11/11	DATE	2/11/11
Site Rep:	Rob Gurnaw	DATE	2/11/11	DATE	2/11/11
Depth	No.	Depth ft	Pen. in	Blows/6"	Sample Description
0	S-8	39.5-39.8	4	4	125-4*
45					
50					
55					
60					
65					
70					
75					
80					
85					
Ground Surface to used then					
Proportions Used					
Cohesive Consistency					
Cohesionless Density					
Sample Type					
Notes:					
Remarks:					

NOTES:

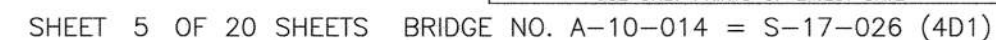
- BORING LOCATIONS ON PLAN ARE SHOWN THUSLY; B#5.
- BORINGS ARE TAKEN FOR THE PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1½" ID SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- ALL BORINGS WERE MADE FEBRUARY 2011.
- BORINGS B-5, B-6, B-7, B-8 & B-8A WERE MADE BY GEOLOGIC EARTH EXPLORATION, INC., 7 SHERWOOD DRIVE, NORFOLK, MA 02056.
- THE BOSTON CITY BASE VERTICAL DATUM IS USED ON THE BORING LOGS. TO CONVERT FROM BOSTON CITY BASE VERTICAL DATUM TO NAVD 88, SUBTRACT 6.46 FT FROM THE ELEVATION.
- FOOTING ELEVATIONS ARE BASED ON HISTORIC DRAWINGS.

SEPT. 25, 2010	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	25	
PROJECT FILE NO. 605520			

NOTES:

- COFFERDAMS SHALL
EXTEND NO FURTHER
THAN 15'-0" FROM FACE
OF EXISTING STRUCTURE
(TYP.)



MassDOT Winthrop Street Bridge Over
Mystic River Project
Medford, MA

NOTE: BUILD TOP OF CAP PARALLEL TO GRADE OF PATHWAY.

SECTION G-G

MYSTIC

WINTHROP

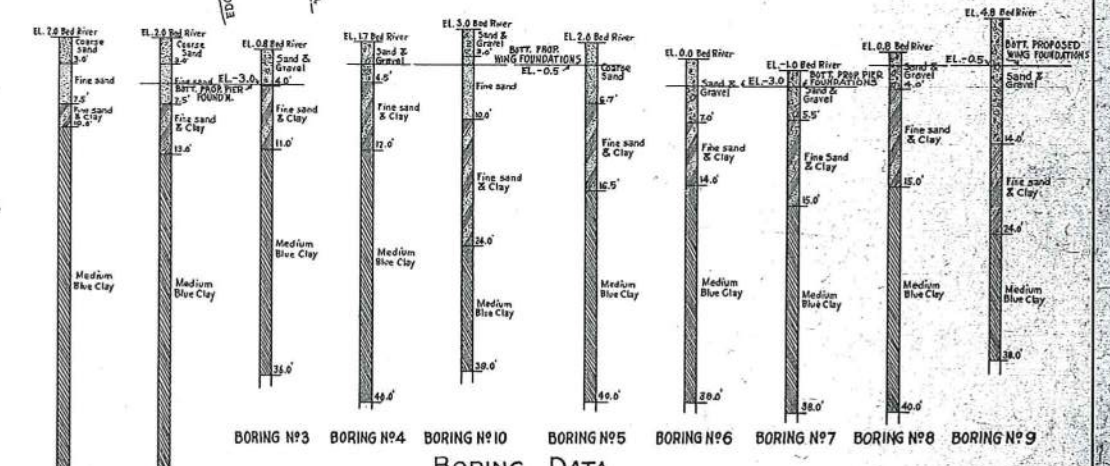
STREET

RIVER

SOUTH ST.

PLAN SCALE: 1" = 10'-0"

NOTE: Underlined Figures are Proposed Grades



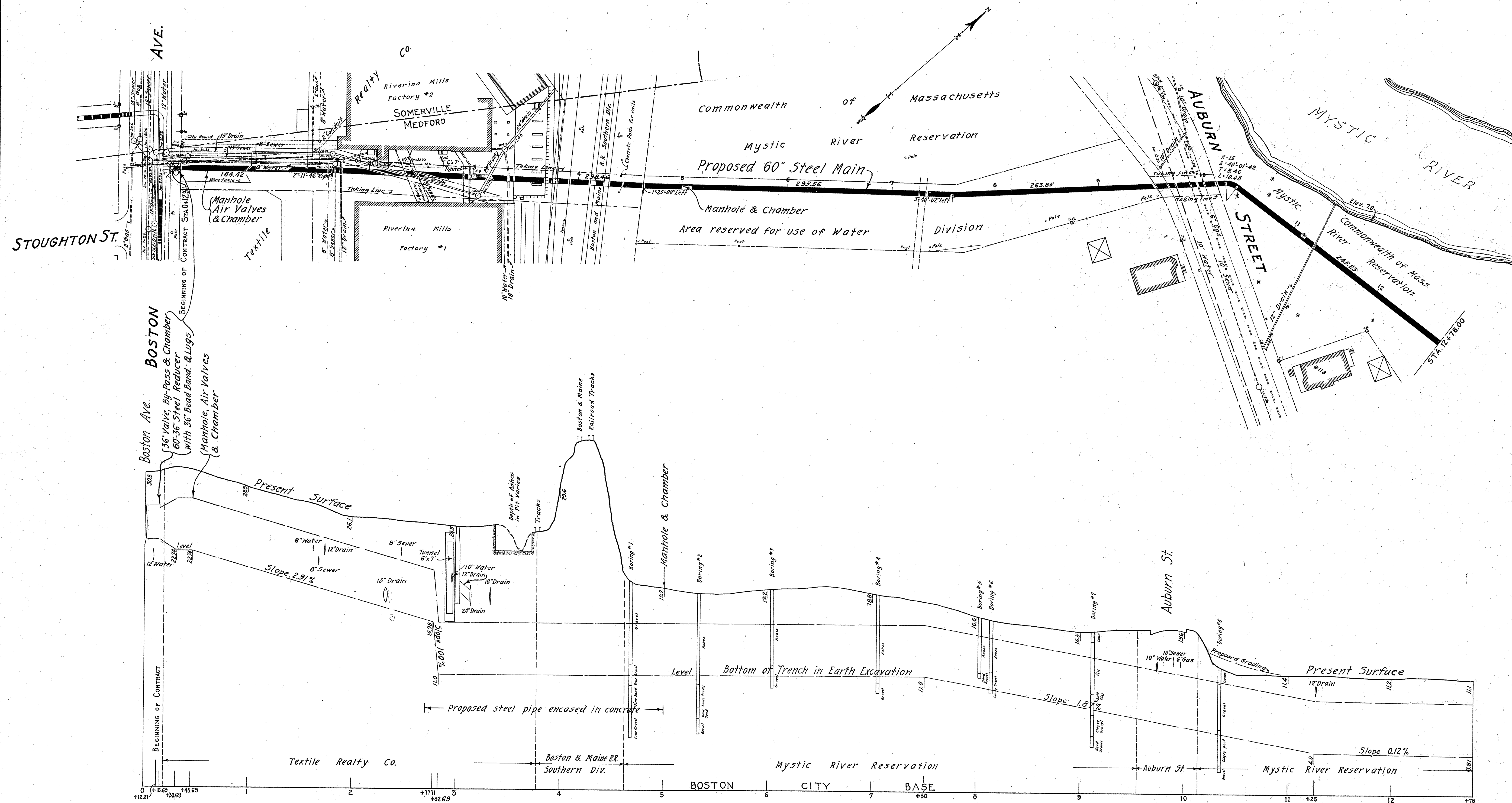
BORING NOTES: LOCATION OF BORINGS SHOWN ON KEY PLAN THUS ● BORINGS TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW NATURE OF MATERIAL TO BE ENCOUNTERED IN CONNECTION WITH THE CONSTRUCTION OF THE BRIDGE.

PROFILE

HORIZ. SCALE: 1" = 10' VERT. SCALE: 1" = 5'

MEDFORD WINTHROP ST. SHEET 4 OF 6 SHEETS FILE N° V-34

MWRA WASM 3 Contract Drawings
Medford, MA



- Explanation
- Hydrant (Post) — S —
 - Valve (Line) — + —
 - Valve (Air) — o —
 - Valve (Check) — > —
 - Catch Basin — □ —
 - Manhole (Sewer) — ○ —
 - Manhole (Electric) — △ —
 - Gas (Drips) — x —
 - Pole (Electric) — o —
 - Tree — * —

Hor. Scale, 40 feet to an inch
Ver. Scale, 4 feet to an inch

William E. Fox
Director and Chief Engineer

SCALE BAR ADDED FOR
REPRODUCTION PURPOSES (10-10-00)
0 1 2
SCALE: 1"

COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION
WATER DIVISION
WESTON AQUEDUCT SUPPLY MAINS

PRIVATE LAND
MYSTIC RIVER RESERVATION

MEDFORD

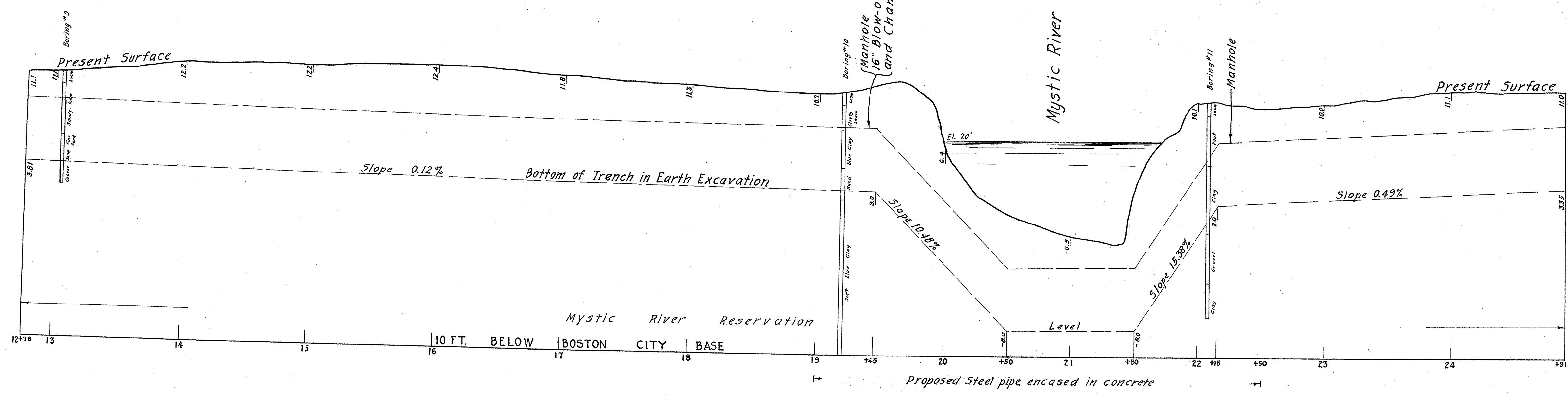
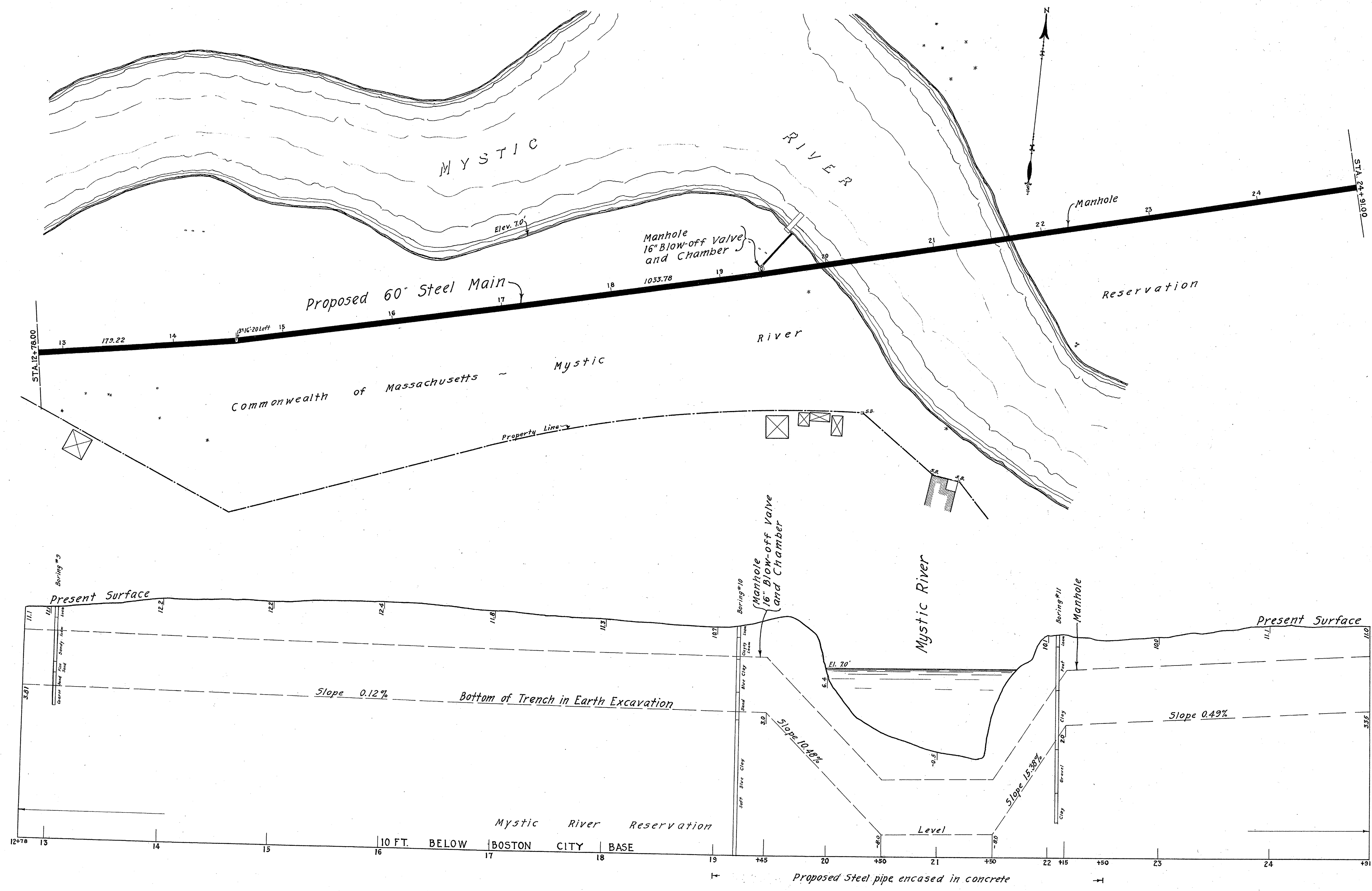
CONTRACT NO. 92
SECTION NO. 16
SHEET NO. 1

Note:—The Commonwealth does not warrant the character of the ground or the location of pipes and other underground objects as shown, to be even approximately correct.

28-49-6

JUNE 1, 1933

D 718



- Explanation**
- Hydrant (Post) —
 - Valve (Line) —
 - Valve (Air) —
 - Valve (Check) —
 - Catch Basin —
 - Manhole (Sewer) —
 - Manhole (Electric) —
 - Gas (Drips) —
 - Pole (Electric) —
 - Tree —

Hor. Scale, 40 feet to an inch
Ver. Scale, 4 feet to an inch

William E. Fox
Director and Chief Engineer

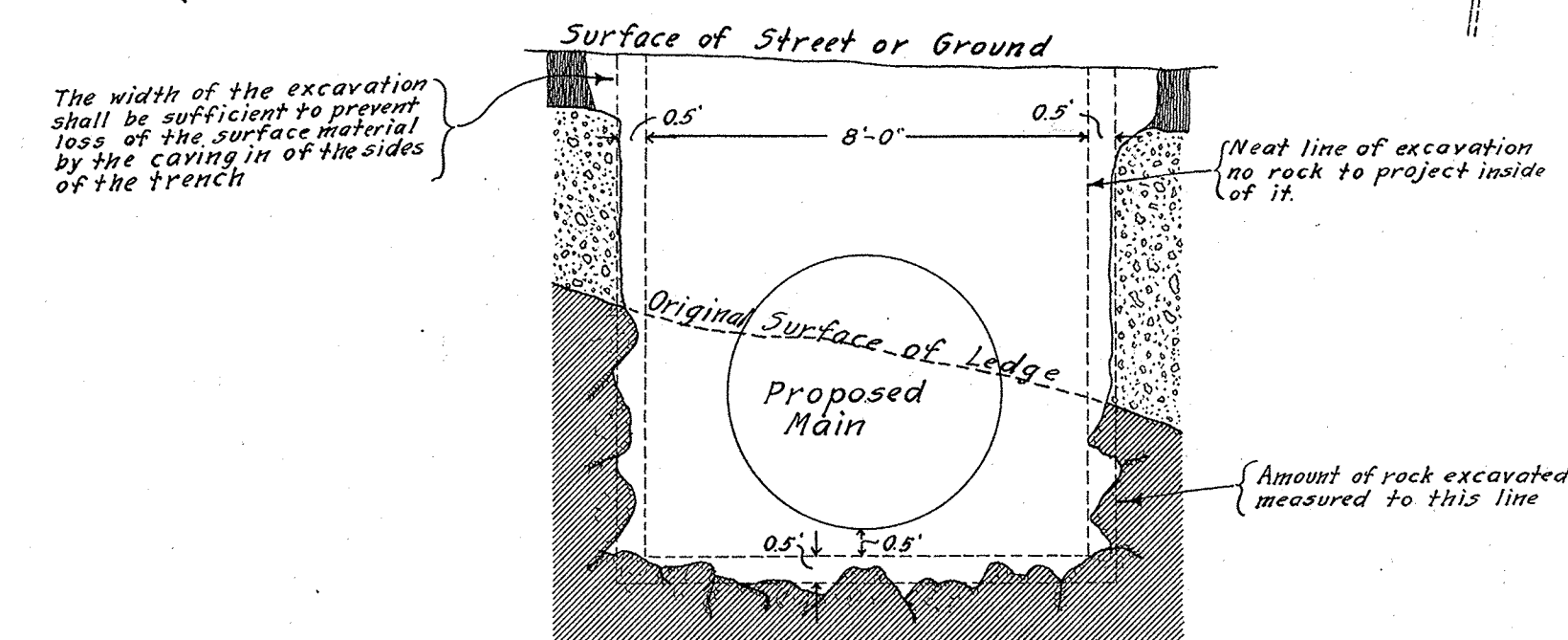
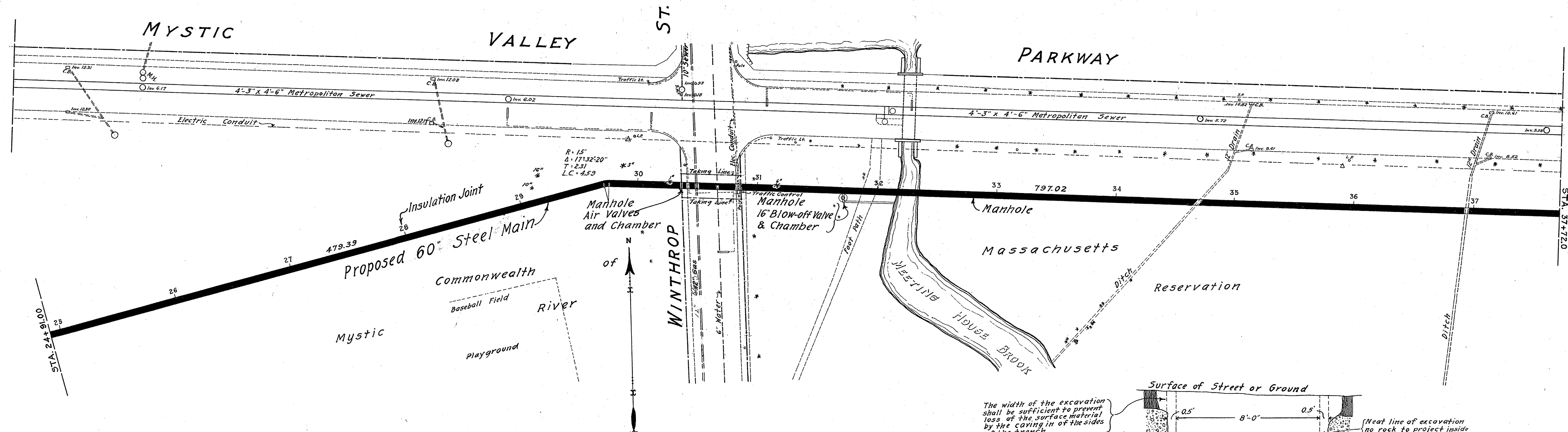
SCALE BAR ADDED FOR
REPRODUCTION PURPOSES (10-10-00)
0 1 2
SCALE : 1" = 40'

COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION
WATER DIVISION
WESTON AQUEDUCT SUPPLY MAINS
MYSTIC RIVER RESERVATION MEDFORD

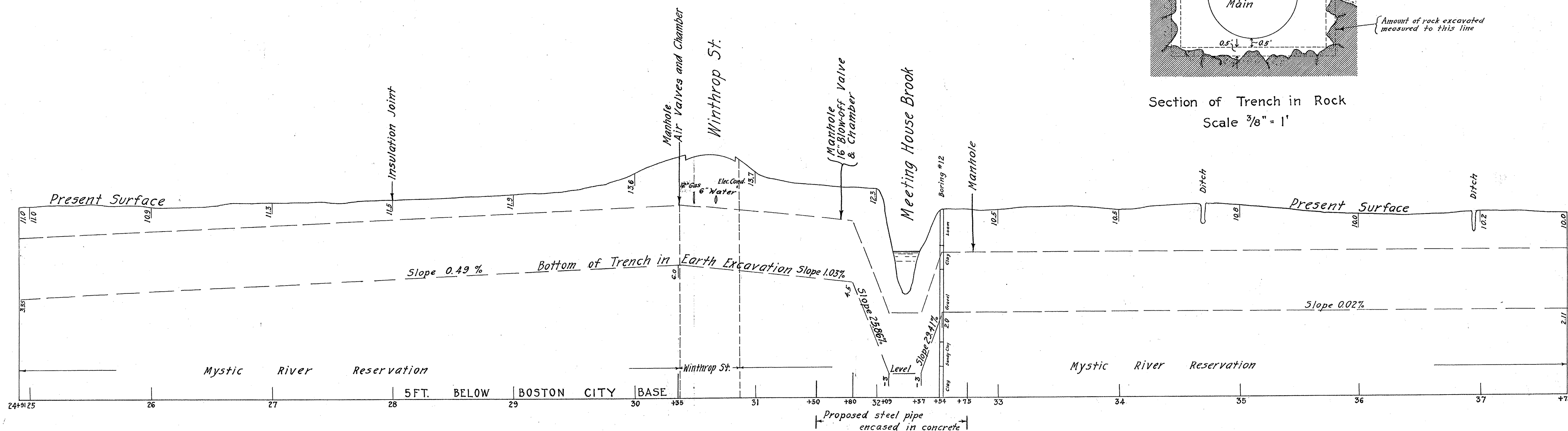
CONTRACT NO. 92
SECTION NO. 16
SHEET NO. 2

JUNE 1, 1933

Note:—The Commonwealth does not warrant the character of the ground or the location of pipes and other underground objects as shown, to be even approximately correct.



Section of Trench in Rock
Scale $\frac{3}{8}'' = 1'$



Explanation	
Hydrant (Post)	⊕
Valve (Line)	+
Valve (Air)	○
Valve (Check)	⌢
Catch Basin	□
Manhole (Sewer)	⊙
Manhole (Electric)	⊕
Gas (Drips)	⊖
Pole (Electric)	⊕
Tree	*

Hor. Scale, 40 feet to an inch
Ver. Scale, 4 feet to an inch

William E. Ford
Director and Chief Engineer

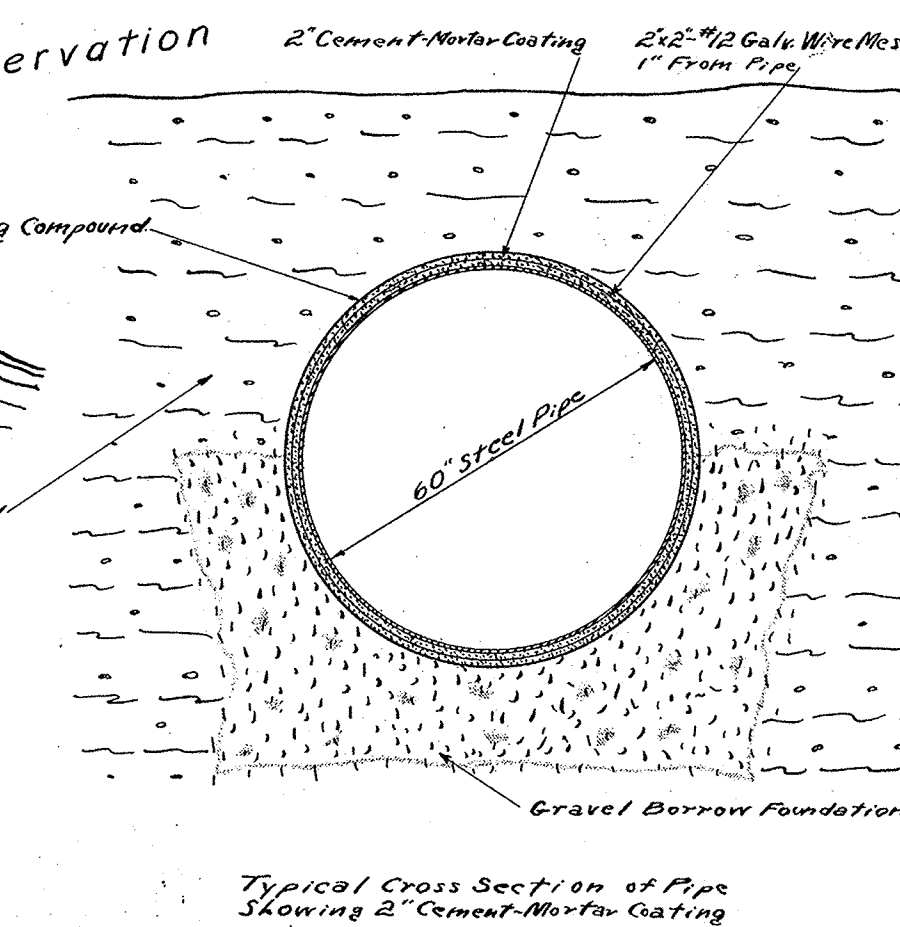
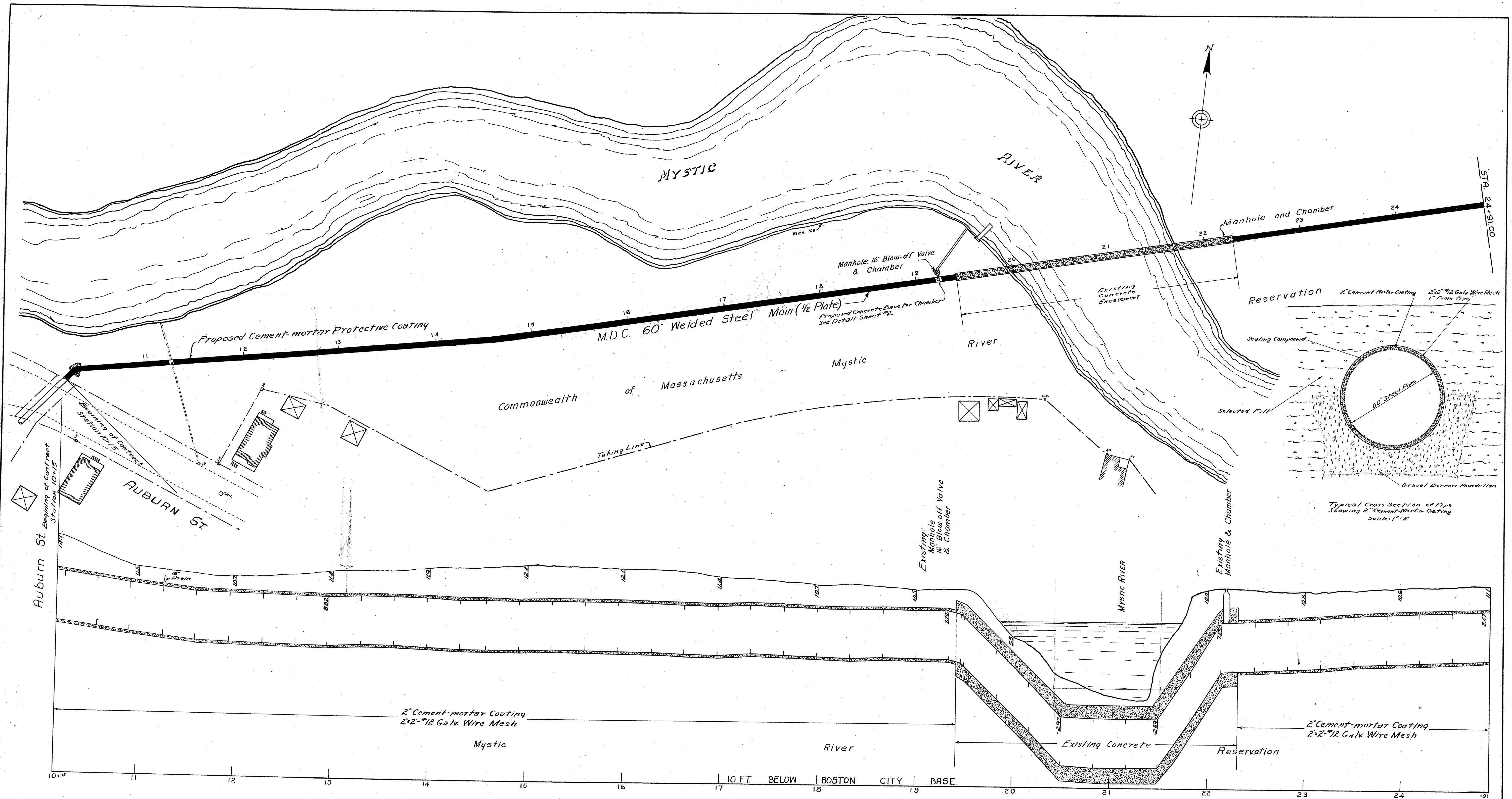
COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION
WATER DIVISION
WESTON AQUEDUCT SUPPLY MAINS
MYSTIC RIVER RESERVATION.. MEDFORD

JUNE 1, 1933

SCALE BAR ADDED FOR
REPRODUCTION PURPOSES (10-10-00)
0 1 2
SCALE : 1" = 100'

CONTRACT NO. 92
SECTION NO. 16
SHEET NO. 3

Note: The Commonwealth does not warrant the character of the ground or the location of pipes and other underground objects as shown, to be even approximately correct.



COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION
WATER DIVISION
CEMENT-MORTAR PROTECTIVE COATING
MYSTIC RIVER RESERVATION . . . MEDFORD

MAY 12, 1952

Note: The Commonwealth does not warrant the character of the ground or the location of pipes and other underground objects, as shown, to be even approximately correct.

Harold J. T. ...
Director of the Water Division
and Chief Water Supply Engineer

Acc. No. 502,088

CONTRACT 186
SHEET No. 1 SEC. 16 - W.A.S.M.

Capone Construction Co. 1987 Project
Belmont, MA

DATE START 1-16-87
DATE FINISH 1-16-87
WEIGHT OF HAMMER 140 300
HEIGHT OF FALL 30" 24"

GROUND WATER OBSERVATION
DATE TIME DEPTH
1-16 none

SAMPLER O.D. 2" I.D. 1-3/8"
TYPE OF RIG Mobile

TEST BORING LOG
AL SHINER TEST BORING, INC.

BOX 142
MELROSE, MASS. 02176
(617) 665-0852

CLIENT

Capone Construction Co.
850A Providence Highway
Dedham, Mass.

SHEET 1 of 1

PROJ. NO.
LOCATION Belmont L-2
FILE NO.
OFFSET
GROUND ELEVATION
HOLE NO. 59&62
CASING SAMPLER CORE BARR
TYPE Augers SS
SIZE I.D. 3" 1-3/8"

SCALE IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
5'	4'		8 8 9 10	S1	3' 5'	Fine yellow sand, trace of silt. Medium sand and gravel.
10'	10'		11 14 14 17	S2	8' 10'	Hard medium to coarse sand, gravel, and boulders.
15'						Depth of boring 10'
20'						
25'						
30'						

Proportions used: trace 0-10%, little 10-20%, some 20-35%, and 35-50%

DRILLER Al Shiner
HELPER Vinny
SOILS ENGINEER
DRILLING INSPECTOR

SAMPLE TYPE
C Cored W Washed
SS Split spoon
UP Undisturbed piston
TP Test Pin
UT Undisturbed thin wall

COHESIONLESS DENSITY
0-4 very loose
4-10 loose
10-30 medium compact
30-50 compact
50+ very compact

COHESIVE CONSISTENCY
0-2 very soft
2-4 soft
4-8 medium stiff
8-15 stiff
15-30 very stiff

TOTAL FOOTAGE
Earth Boring 10' "
Rock Coring "
HOLE NO. B-59&62

MassDOT Pleasant Street (Route 60) 2004
Project
Belmont, MA

THE COMMONWEALTH OF MASSACHUSETTS
HIGHWAY DEPARTMENT

PLAN AND PROFILE OF
PLEASANT STREET (ROUTE 60)
IN THE TOWN OF
BELMONT
MIDDLESEX COUNTY

FEDERAL AID PROJECT NO. STP-001S(220)X

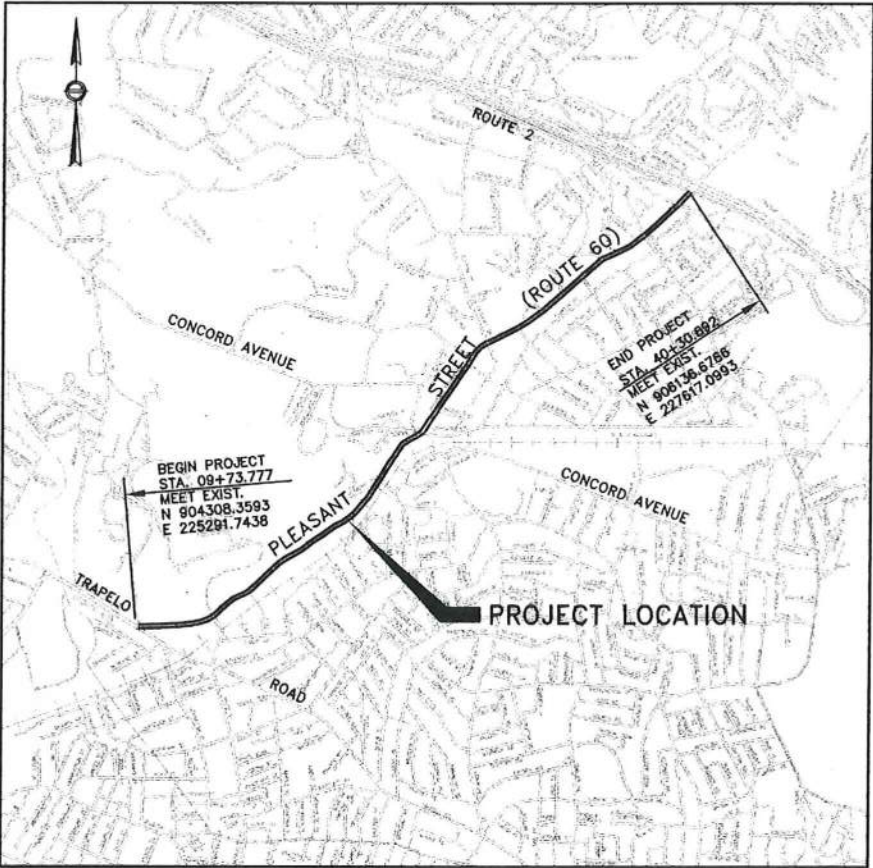
BELMONT PLEASANT STREET (ROUTE 60)				
STATE	FED. PROJ. AID NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.	STP-001S(220)X	2003	1	241
PROJ. FILE NO. 601790				
TITLE SHEET AND INDEX				

THE 1995 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE DECEMBER 2002 SUPPLEMENTAL SPECIFICATIONS, THE 1996 CONSTRUCTION AND TRAFFIC STANDARD DETAILS, THE APRIL 2003 SUPPLEMENTAL DRAWINGS, "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, MILLENNIUM EDITION", THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING", THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z-60.1-1990), AND THE LATEST EDITIONS OF THE MHD WHEELCHAIR RAMP STANDARDS WILL GOVERN.

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2,3	KEY PLAN/BORING LOCATIONS
4	LEGEND AND GENERAL NOTES
5-8	BORING LOGS
9-15	TYPICAL SECTIONS
16-26	CONSTRUCTION DETAILS
27-43	GENERAL PLANS
44-60	PROFILES-PLEASANT STREET
61-67	PROFILES-MINOR STREETS
68-84	ALIGNMENT AND CURB TIE PLANS
85-93	GRADING PLANS
94-110	DRAINAGE AND UTILITY PLANS
111-116	TRAFFIC SIGNAL PLANS
117-119	TRAFFIC SIGNAL DETAILS
120-123	PAVEMENT MARKING AND SIGNING PLANS
124-125	SIGN SUMMARY SHEETS
126-132	TRAFFIC MANAGEMENT PLANS
133-137	DRAINAGE CONSTRUCTION STAGING PLANS
138-220	CROSS SECTIONS-PLEASANT STREET
221-241	CROSS SECTIONS-MINOR STREET

DESIGN DESIGNATION

DESIGN SPEED	= 60 K.P.H.
ADT (2001)	= 15,850
ADT (2021)	= 17,550
K	= 9%
D	= 62%
T (PEAK HOUR)	= 1.5%
T (AVERAGE DAY)	= 1.5%
DHV	= 1,580
DDHV	= 980



LOCATION MAP
1: 36,800

CONVENTIONAL SIGNS

COUNTY, CITY, OR TOWN BOUNDARY	-----
COUNTY, CITY, OR TOWN SIDE LINE	-----
FENCE LINE	=====
BASE LINE OR SURVEY LINE	-----
RIGHT OF WAY LINE	=====
CULVERT	=====
ELEVATIONS	-----
POLE	-----

NOTE
LENGTH OF PROJECT 3,057.115 METERS = 3.057 KILOMETERS



MASSACHUSETTS
HIGHWAY DEPARTMENT
RECOMMENDED FOR APPROVAL

CHIEF ENGINEER *[Signature]* 1/7/04
DATE



BSC GROUP
15 ELKINS STREET
BOSTON, MASSACHUSETTS 02127
(617) 896-4300
<http://www.bscgroup.com>

APPROVED
MB COMMISSIONER *[Signature]* 1/7/04
DATE

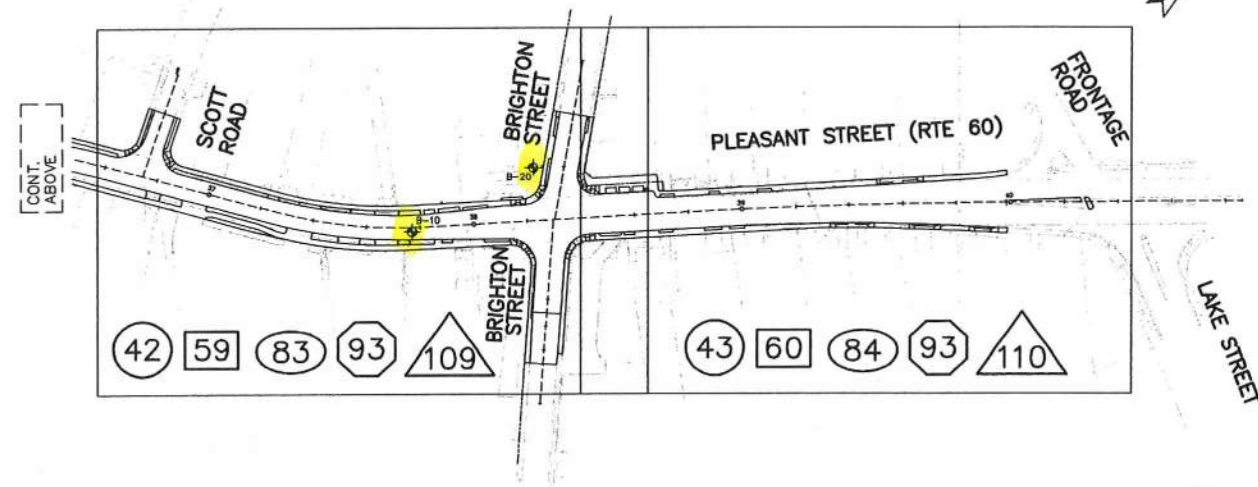
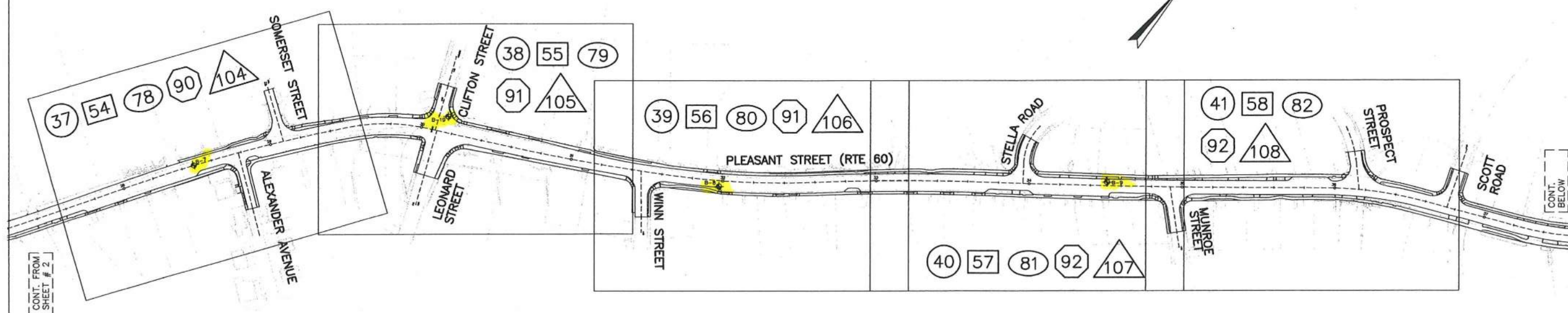
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED

DIVISION ADMINISTRATOR DATE

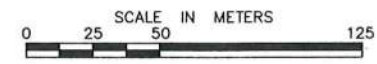
1/7/04
ASSOCIATE COMMISSIONER DATE

BELMONT PLEASANT STREET (ROUTE 60)				
STATE	FED. PROJ. AID NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.	STP-0015(220)X	2003	3	241
PROJ. FILE NO. 601790				

KEY PLAN
BORING LOCATIONS



- LEGEND
- ## GENERAL PLAN
 - ## PROFILE PLAN
 - ## ALIGNMENT PLAN
 - ## GRADING PLAN
 - ### DRAINAGE & UTILITY PLAN
 - B-3 EXISTING BORING LOCATION
 - B-P-1 EXISTING PROBE LOCATION



LEGEND

EXISTING PROPOSED DESCRIPTION

UTILITIES

CB	CATCH BASIN (OR GUTTER INLET)
CBCI	CATCH BASIN WITH CURB INLET
CS	CURB STOP
→	DRAIN PIPE
DMH	DRAINAGE MANHOLE
—	ELECTRIC DUCT
□	ELECTRIC MANHOLE
HH	ELECTRIC HANDHOLE
GG	GAS GATE
—	GAS MAIN
—	SEWER MAIN
SMH	SEWER MANHOLE
—	TELEPHONE DUCT
TMH	TELEPHONE MANHOLE
⌈	UTILITY PLUG
WG	WATER GATE
WMH	WATER MANHOLE
—	WATER MAIN
200mm SD	SUBDRAIN

SURFACE DETAILS/TOPO

N57° 18' 41"E 74	BASE/SURVEY LINE
59.57	
—	CITY, TOWN OR COUNTY BOUNDARY
—	CURB (OR BERM) — TYPE NOTED
—	EDGE OF ROAD (MEET CEM. CONC.)
-----	EDGE OF ROAD (MEET BIT. CONC.)
— x —	FENCE (SIZE AND TYPE NOTED)
— x x x —	HIGHWAY GUARD (TYPE NOTED)
MHB,SB,CB	HIGHWAY/PROPERTY BOUND (TYPE NOTED)
R.O.W	RIGHT OF WAY LINE
—	STATE BOUNDARY
○	TREE (SIZE AND TYPE NOTED)
—	WHEEL CHAIR RAMP

MISCELLANEOUS

B-#	BORING
FA	FIRE ALARM BOX
⊕	HYDRANT
□	MAIL BOX
*	STREET LIGHT
⊕	TEST PIT
○	WOODEN POLE

EXISTING PROPOSED DESCRIPTION

TRAFFIC, PAVEMENT MARKINGS & SIGNING

=====	CONDUIT
⊠	CONTROL CABINET — GROUND MOUNTED
⊠	CONTROL CABINET — POLE MOUNTED
∅ 1	CONTROLLER PHASE
CW	CROSSWALK (SEE PAVEMENT MARKING PLAN FOR DETAIL)
←	DIRECTION OF FLOW
★	EMERGENCY CONFIRMATION BEACON
⚡	FLASHING BEACON (ALPHA-NUMERIC DESIGNATION NOTED)
□	INDUCTIVE LOOP DETECTOR
8m	LIMIT OF VISIBILITY OF OPTICALLY PROGRAMMED SIGNAL HEAD
8m	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
⚡	OPTICAL EMERGENCY DETECTOR
-----	OVERHEAD CABLE
→	PAVEMENT ARROW AND LEGEND
⊕	PEDESTRIAN PUSH BUTTON
⊠	PEDESTRIAN SIGNAL HEAD (ALPHA-NUMERIC DESIGNATION NOTED)
PB	PULL BOX 300mm X 300mm
PB	PULL BOX 200mm X 575mm, 300mm X 600mm
⚡	SIGN AND POST
R1-1	SIGN LEGEND
• TS	SIGNAL POST AND BASE
SL	STOP LINE, 300mm WHITE LINE 1.2m BEHIND CW (TYP.)
←	VEHICULAR SIGNAL HEAD (ALPHA-NUMERIC DESIGNATION NOTED)
←	VEHICULAR SIGNAL HEAD OPTICALLY PROGRAMMED (ALPHA-NUMERIC DESIGNATION NOTED)
==X==X==	" X " DUCT (CONCRETE ENCASED)

GENERAL NOTES

- ALL NEW GRANITE CURB SHALL BE TYPE VB UNLESS OTHERWISE NOTED.
- ALL GRANITE CURB SHALL BE SET TO HAVE A 150 mm REVEAL ABOVE FINAL PAVEMENT GRADES (UNLESS OTHERWISE NOTED).
- ALL BASELINE TIES FOR CURB CORNERS AND RADII ARE TO THE P.C.'S OR P.T.'S, UNLESS OTHERWISE NOTED. WHERE PROPOSED CURB MEETS EXISTING CURB, BERM, ROADWAY, AND/OR DRIVEWAY PAVEMENT EDGES, MINOR FIELD ADJUSTMENTS TO EITHER THE DESIGNATED RADIUS OR THE DESIGNATED STATION OF THE P.C. OR P.T. FOR THE PROPOSED CURB OR BERM MAY BE REQUIRED. THESE ADJUSTMENTS SHALL BE MADE IN THE FIELD BY THE CONTRACTOR AS DIRECTED BY THE RESIDENT ENGINEER.
- ALL EXISTING MUNICIPAL UTILITY CASTINGS THAT ARE TO REMAIN WITHIN AREAS TO BE REPAVED SHALL BE ADJUSTED TO LINE AND GRADE BY THE CONTRACTOR UNLESS OTHERWISE NOTED. ALL PRIVATE TELEPHONE, GAS, AND ELECTRICAL CASTINGS SHALL BE ADJUSTED BY OTHERS.
- THE LOCATIONS OF EXISTING SUBSURFACE UTILITIES SHOWN ON THE PLANS WERE COMPILED FROM AVAILABLE RECORD DRAWINGS AND ARE NOT WARRANTED TO BE CORRECT. THE LOCATIONS ARE APPROXIMATE ONLY AND IN SOME CASES MAY BE INCOMPLETE. THE CONTRACTOR SHALL NOTIFY ALL AGENCIES REQUIRED AND VERIFY THE LOCATIONS OF ALL EXISTING SUBSURFACE UTILITIES PRIOR TO PERFORMING ANY WORK.
- PRIOR TO THE INSTALLATION OF PROPOSED UTILITIES, THE CONTRACTOR SHALL EXCAVATE TEST PITS AT LOCATIONS OF UTILITY CROSSINGS TO VERIFY DEPTHS OF EXISTING PIPES, CONDUITS OR OTHER FACILITIES, AS DIRECTED BY ENGINEER.
- THE CONTRACTOR SHALL ENSURE THAT ALL ROADWAY RUNOFF SHALL BE DIRECTED TO CATCH BASINS.
- THE CONTRACTOR SHALL VERIFY ALL OUTLET GRADES OF DRAINAGE STRUCTURES PRIOR TO CONSTRUCTING THE DRAINAGE IMPROVEMENTS.
- THE CONTRACTOR SHALL SAWCUT TO THE FULL PAVEMENT DEPTH AT BOUNDARIES BETWEEN FULL DEPTH CONSTRUCTION AND EXISTING PAVEMENT.
- EXCEPT AS NOTED, ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.
- BASE MAPPING PREPARED BY THE BSC GROUP, INC.
- ALL AREAS OUTSIDE OF THE LIMIT OF WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S OWN EXPENSE.
- ALL WHEELCHAIR RAMPS SHALL BE CONSTRUCTED TO COMPLY WITH THE LATEST M.H.D. STANDARDS. SEE APPENDIX OF SPECIAL PROVISIONS FOR ADDITIONAL DETAILS.
- THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL OTHER ONGOING PROJECTS, INCLUDING BUT NOT LIMITED TO THE MWRA WATER LINE IN ALEXANDER STREET, THE TOWN RECONSTRUCTION OF CONCORD AVENUE, AND THE PROPOSED REDEVELOPMENT OF 790 PLEASANT STREET.

ABBREVIATIONS

R	CIRCULAR RED
Y	CIRCULAR AMBER
G	CIRCULAR GREEN
FR	FLASHING CIRCULAR RED
FY	FLASHING CIRCULAR AMBER
RV	RED VERTICAL ARROW
YV	AMBER VERTICAL ARROW
GV	GREEN VERTICAL ARROW
RL	RED LEFT ARROW
YL	AMBER LEFT ARROW
GL	GREEN LEFT ARROW
RR	RED RIGHT ARROW
YR	AMBER RIGHT ARROW
GR	GREEN RIGHT ARROW
W	WALK — LUNAR WHITE
F0	FLASHING DON'T WALK — PORTLAND ORANGE
0	DON'T WALK — PORTLAND ORANGE
ADJ	ADJUST
ABAN	ABANDON
BO	BY OTHERS
CIT	CHANGE IN TYPE
DIP	DUCTILE IRON PIPE
FE	FLARED END
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
MA	MAST ARM
N.I.C.	NOT IN CONTRACT
PBS	PAINTED BOTH SIDES
PWW	PAVED WATERWAY
RCP	REINFORCED CONCRETE PIPE
RET	RETAIN
REM	REMOVE
REMOD	REMODEL
R&S	REMOVE & STACK
R&R	REMOVE & RESET
R&T	REMOVE & TRANSPORT
BWLL	BROKEN WHITE LANE LINE, 100 mm (3m MARK — 9m SKIP)
BYCL	BROKEN YELLOW CENTER LINE, 100 mm (3m MARK — 9m SKIP)
CW	CROSSWALK (SEE PAVEMENT MARKING PLAN FOR DETAIL)
DWLL	DOTTED WHITE LANE LINE, 100 mm (0.6m MARK — 1.2m SKIP)
DYCL	DOUBLE YELLOW CENTER LINE, 100 mm
SL	STOP LINE, 300 mm
SWCHL	SOLID WHITE CHANNELIZATION LINE, 300 mm
SWEL	SOLID WHITE EDGE LINE, 100 mm
SWGL	SOLID WHITE GORE LINE, 100 mm
SWLL	SOLID WHITE LANE LINE, 100 mm
SYCHL	SOLID YELLOW CHANNELIZATION LINE, 300 mm
SYEL	SOLID YELLOW EDGE LINE, 100 mm
SYGL	SOLID YELLOW GORE LINE, 300 mm
WCL	WHITE CHEVRON LINE, 300 mm
YCL	YELLOW CHEVRON LINE, 300 mm

BELMONT				
PLEASANT STREET (ROUTE 60)				
STATE	FED. PROJ. AID NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
MASS.	STP-001S(220)X	2003	4	241
PROJ. FILE NO. 601790				

LEGEND AND GENERAL NOTES

BORING LOGS

BORING # B-1

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.5			6" Asphalt Pavement (2.5" bituminous, 3.5" macadam)	Asphalt					
	S-1	24/15	18-25-22-22		S-1 Top 4" - Poorly Graded GRAVEL with Sand (GP), less than 5% fines, gray, moist. Middle 5" - Well Graded SAND with Gravel (SW), fine to medium, 5-10% fines, 35-40% gravel, orange-brown, moist. Middle 3" - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15% gravel, gray, moist. Bottom 3" - Well Graded SAND with Silt and Gravel (SW-SM), 10-15% fines, 15-20% gravel, gray, moist. Boring Terminated at about 2.5 ft.	Fill					
2.0		2.5									
4.0											
6.0											
8.0											
Remarks:											

BORING # B-2

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.4			5.5" Asphalt Pavement (2.5" bituminous/ 3" macadam)	Asphalt					
	S-1	24/10	35-50-37-37		S-1 Top 5" - Poorly Graded GRAVEL with Sand (GP), fine, 35-40% sand, 5% fines, gray, slightly moist. Bottom 5" - Well Graded SAND with Silt (SW-SM), 10% fines, 5-10% gravel, chunks of black organics, brown, moist.	Fill					
2.0		2.4									
	S-2	54	100-5"		S-2 Top 2" - Poorly Graded GRAVEL with Sand (GP), 15-20% sand, 5% fines, gray, moist. Bottom 2" - Silty SAND with Gravel (SM), 20-25% fines, 15% gravel, brown, moist.						100-5"
4.0											
6.0											
	S-3	24/4	3-4-7-14		S-3 SILT with Gravel (ML), 20% gravel, 5-10% sand, non-plastic to slightly plastic, light brown, moist. (possible natural soil)	ML					
8.0											
Remarks:											

BORING # B-3

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.6			7.5" Asphalt Pavement (5.5" bituminous/ 3" macadam)	Asphalt					
	S-1	24/0	10-8-5-9		S-1 No Recovery, See Note 1.						
2.0											
	S-2	24/12	5-5-9-7		S-2 Top 5" Silty SAND with Gravel (SM), trace organics, 15% fines, 25-30% gravel, black, wet. Middle 2" - Silty SAND (SM), fine to coarse, 15% fines, 10-15% gravel, gray-brown, wet. Bottom 5" - Silty SAND (SM), fine to medium, 20-25% fines, 5-10% gravel, chunks of organics, brown with dark brown chunks, moist.	Fill					
4.0											
	S-3	6/6	1206"		S-3 SILT (ML), 5% sand, 5% gravel, moderately plastic, light brown, wet. (Possibly natural, very soft silt. Spoon encountered an obstruction resulting in the high blow count.) Boring Terminated at about 5.5 ft.	ML					1206"
6.0											
8.0											
Remarks: 1 Based on bulk sample obtained in the top two feet below the pavement, the soil consisted of Silty SAND with Gravel (SM), 20% fines, 30% gravel, traces of clay, brown, wet.											

BORING # B-4

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.2			2" Asphalt Pavement (bituminous)	Asphalt					
	S-1	12/12	29-50-6"		S-1 Well Graded GRAVEL with Sand (GW), 40-45% sand, 5% fines, brown, moist. (Based on bulk sample obtained in the top 2 ft. below pavement, refusal of sampler possibly occurred on large piece of gravel.)	Fill					79/12"
2.0											
	S-2	24/16	13-19-23-34		S-2 Silty SAND with Gravel (SM), fine to coarse, 20% fines, 15% gravel, gray, moist.						
4.0											
	S-3	24/12	18-21-28-33		S-3 Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 20% gravel, gray, moist.	SM					
6.0											
	S-3	24/15	12-17-15-38		S-3 Top 7" - Well Graded SAND with Silt and Gravel (SW-SM), 10% fines, 15% gravel, brown, slightly moist. (possible natural soil). Bottom 8" - Well Graded SAND with Gravel (SW), 5-10% fines, 10-15% gravel, gray, slightly moist. (possible natural soil).	SW					
8.0											
Remarks: 1 Transition from fill to natural soil not obvious based on auger action.											

BORING # B-5

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.5			5" Asphalt Pavement (3" bituminous/ 2" macadam)	Asphalt					
	S-1	24/13	42-27-20-20		S-1 Top 2" - Well Graded GRAVEL with Sand (GW), 15-20% sand, 5% fines, gray, moist. Middle 10" - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10% fines, 15-20% gravel, brown, moist. Bottom 1" - Silty SAND (SM), 20% fines, 5-10% gravel, brown, moist.	Fill					
2.0											
	S-2	24/12	6-5-20-40		S-2 Top 3" - Silty SAND (SM), 30-35% fines, trace organics, 5-10% gravel, brown, slightly moist. Bottom 9" - SILT with Sand (ML), non-plastic, 15-20% sand, 10-15% gravel, trace organics and roots, light brown, slightly moist. (possible natural soil).	ML					
4.0											
	S-3	24/15	12-17-15-38		S-3 Top 7" - Well Graded SAND with Silt and Gravel (SW-SM), 10% fines, 15% gravel, brown, slightly moist. (possible natural soil). Bottom 8" - Well Graded SAND with Gravel (SW), 5-10% fines, 10-15% gravel, gray, slightly moist. (possible natural soil).	SW					
6.0											
8.0											
Remarks: 1 Grain size analysis performed on bulk sample obtained in top one foot below pavement indicated a higher percentage (about 60%) of gravel than in the middle 10" of S-1. Bulk sample was obtained a few feet from the boring location.											

BORING # B-6

Depth (ft)	SAMPLE				Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
		0.4			5" Asphalt Pavement (3" bituminous/ 3" macadam)	Asphalt					
	S-1	9/8	100-100-5"		S-1 Well Graded SAND with Silt and Gravel (SW-SM), 35-40% gravel, 10% fines, gray-brown, moist.						200-5"
2.0											
	S-2	24/12	7-12-11-30		S-2 Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% gravel, mixed with organic soil, dark brown, slightly moist.	Fill					
4.0											
	S-3	23/14	20-40-61-70-5"		S-3 Well Graded SAND with Silt (SW-SM), 10-15% fines, 20-30% gravel, brown. (possibly natural soil).	SW-SM					101"
6.0											
8.0											
Remarks:											

BORING # B-7

SAMPLE					Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
Depth (ft)	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
0.4	S-1	9.9	20-75/3"			Asphalt					955*
1.2						SW/SM					
2.0											
4.0											
6.0											
8.0											
Remarks: 1 Drillers advanced augers through boulders from about 1 to 3 feet.											

BORING # B-8

SAMPLE					Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
Depth (ft)	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
						Asphalt					
						Fill					
2.0											
4.0											
6.0											
8.0											
Remarks: 1 Boring located near existing utilities. To avoid damaging utilities, split spoon samples not obtained.											

BORING # B-9

SAMPLE					Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
Depth (ft)	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
0.4						Asphalt					
1.2						Fill					
2.0											
2.4											
4.0											
5.0											
6.0											
7.0											
Remarks:											

BORING # B-10

SAMPLE					Remarks	Soil Strata	N VALUE (pcf) ▲				PID (ppm)
Depth (ft)	No.	Depth (ft)	Pen./ Rec. (in)	* Blows Per Six Inches/ RQD (%)			20	40	60	80	
0.5	S-1	3/2	70/3"			Asphalt					70/3*
0.8											
1.0											
2.0	S-2	24/15	5-5-5-7			Fill					
3.0											
4.0	S-3	24/12	7-7-17-66								
5.0											
6.0	S-4	24/16	35-52-70-95			SW					122*
7.0											
Remarks: 1 Grain-size analysis performed on bulk sample obtained in top one foot below pavement indicated a higher percentage (about 54%) of gravel. Bulk sample was obtained a few feet from the boring location.											

BORING # B-11 (FORMERLY B-14C)

Depth (ft)	Casing (ft)	Sample				Strata	Visual Identification of Soil and / or Rock Sample
		No.	Pen./ Rec. (in)	Depth	Blows/6"		
1		1	1'0"-3'2"	27-31-100/2"	1'0"	0'6"	Asphalt - 0'6" Gravel - 1'0"
5		2	5'0"-5'10"	44-100/4"		1'0"	Dry, very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles and boulders.
10						9'0"	Refusal at 5'10" with split spoon sampler, 100/4" Refusal at 9'0" with hollow stem auger. No water encountered upon completion.
15							
20							
25							
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING # B-12 (FORMERLY B-13B)

Depth (ft)	Casing (ft)	Sample				Strata	Visual Identification of Soil and / or Rock Sample
		No.	Pen./ Rec. (in)	Depth	Blows/6"		
1		1	1'0"-3'0"	7-15-12-15	1'0"	0'6"	Asphalt - 0'6" Gravel - 1'0"
5		2	5'0"-5'7"	25-100/1"		1'0"	Dry, medium dense to very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles and boulders.
10		3	10'0"-10'0"	100/0"		11'0"	Refusal at 10'0" with split spoon sampler, 100/0" Refusal at 11'0" with hollow stem auger. No water encountered upon completion.
15							
20							
25							
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING LOGS

BORING # B-13 (FORMERLY B-4A)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'0"-0'8"	22-100/2"		Dry, very dense, fine to coarse sand, some fine to coarse gravel and organic silt, trace cobbles.
5		2		5'0"-5'0"	100/0"	3'0"	Dry, very dense, weathered rock
10						6'0"	Refusal at 5'0" with split spoon sampler, 100/0". Refusal at 6'0" with hollow stem auger. No water encountered upon completion.
15							
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

BORING # B-14 (FORMERLY B-12A)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'0"-0'1"	100/1"		Dry, very dense, fine to coarse sand, some fine to coarse gravel, organic silt, trace cobbles.
5						3'0" 4'0"	Weathered rock
10							Refusal at 0'1" with split spoon sampler, 100/1". Refusal at 4'0" with hollow stem auger. No water encountered upon completion.
15							
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 - 30 M. Dense, 30 - 50 H. Dense, 50+ V. H. Dense, 1 to 10% Trace 0 to 10% 10 to 30% ID. 0.25 to 0.50 CASING SAMPLE CORE TYPE

BORING # B-15 (FORMERLY B-5A)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'0"-0'5"	100/5"		Dry, very dense, fine to coarse sand, some fine to coarse gravel, organic silt, trace cobbles.
5		2		5'0"-5'2"	100/2"	3'0"	Dry, very dense, weathered rock
10						6'0"	Refusal at 5'2" with split spoon sampler, 100/2". Refusal at 6'0" with hollow stem auger. No water encountered upon completion.
15							
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

BORING # B-16 (FORMERLY B-6B)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'2"-2'2"	10-10-7-7	0'2"	Asphalt - 0'2"
6		2		5'0"-7'0"	4-3-3-4		Dry, medium dense to loose, fine to medium sand, trace organic silt, fine gravel and cobbles. Fill
10		3		10'0"-12'0"	21-20-31-27	8'0"	Dry to moist, very dense to medium dense, fine to medium sand, some inorganic silt, trace fine gravel.
15		4		15'0"-17'0"	7-10-12-18		
20		5		20'0"-20'3"	100/3"	20'3"	Refusal at 20'3" with split spoon sampler, 100/3". End of boring at 20'3" with hollow stem auger. No water encountered upon completion.
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

BORING # B-17 (FORMERLY B-7B)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'6"-2'6"	12-22-27-31	0'6"	Asphalt - 0'6"
5		2		5'0"-5'8"	27-100/2"	6'0"	Dry, very dense, fine to medium sand, some organic silt, trace fine gravel and cobbles and boulders.
10		3		10'0"-10'5"	100/5"	8'0"	Cored boulders
15							Moist, very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles and boulders.
20		4		18'0"-20'0"	22-27-30-30	14'0"	Cored boulders
25						17'0"	Moist, very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles and boulders.
30						20'0"	End of boring at 20'0" with hollow stem auger. No water encountered upon completion.
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

BORING # B-19 (FORMERLY B-9A)

Depth Ft.	Casing M/B	No.	Pw/No.	Sample		Strata	Visual Identification of Soil and / or Rock Sample
				Depth	Blows/6"		
1		1		0'6"-2'6"	10-7-8-15	0'6"	Asphalt - 0'6"
5		2		5'0"-7'0"	14-24-27-14		Moist, medium dense to very dense, fine to coarse sand, some organic silt, trace fine gravel, cobbles and boulders.
10		3		10'0"-10'3"	100/3"	8'0"	Cored boulders
15		4		15'0"-15'1"	100/1"	10'0"	Moist, very dense, fine to coarse sand and nested cobbles and boulders, some inorganic silt.
20						15'6"	Refusal at 15'1" with split spoon sampler, 100/1". End of boring at 15'6" with hollow stem auger. No water encountered upon completion.
25							Note: Unable to advance through boulders.
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

BORING LOGS

BORING # B-20 (FORMERLY B-8)

DEPTH (FEET)	#	SAMPLE TYPE	REC/PEN (inch.)	PID VALUE (ppm)	BLOW COUNTS 6-12-18-24"	DESCRIPTION	COMMENTS
0						Asphalt pavement	
1	1	grab	N/A	0	N/A	Dk brown fn(+)-crs SAND, little gravel and silt, dry.	
5	2	SS	6/24	1	12-14-20-51	Brown fn-crs SAND, little gravel, trace silt, dry.	
10	3	grab	N/A	0	N/A	Dk brown gravel and fn(+)-crs sand, little silt, moist.	
10	4	SS	18/24	150	27-58-41-43	Gray brown fn(+)-crs SAND, little gravel and silt, dry.	
15	5	SS	3/8	170	65-120+	Gray brown fn(+)-crs SAND, little gravel and silt, dry.	
15	6	grab	N/A	250	N/A	Gray silt and fn(+)- crs sand, trace gravel, moist.	
REMARKS: SS - Split Spoon N/A - Not Applicable							

BORING # B-21

Depth Ft	Coring M/R	No.	Pen/Sec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1		0'2"-2'2"	7-8-10-8	0'2"	Asphalt - 0'2"
5		2		5'0"-5'7"	25-100/1"		Dry, medium dense to very dense, dry, fine to coarse sand, trace organic silt and fine gravel.
10		3		10'0"-12'0"	14-15-14-15	8'0"	Dry to wet, medium dense to very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles.
15		4		13'0"-15'0"	15-37-40-51	15'0"	End of boring at 15'0" with hollow stem auger. Water level at 10'0" upon completion.
20							
25							
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING # B-22

Depth Ft	Coring M/R	No.	Pen/Sec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1		0'2"-2'2"	6-5-5-6	0'2"	Asphalt - 0'2"
5		2		5'0"-7'0"	8-6-4-4		Moist, medium dense, fine to medium sand, some organic silt, trace fine gravel.
10		3		10'0"-12'0"	15-22-31-27	9'0"	Moist to wet, very dense to medium dense, fine to coarse sand, trace inorganic silt and fine gravel.
15		4		15'0"-17'0"	7-10-10-14		
20		5		18'0"-20'0"	15-15-21-30	18'0"	Wet, dense, very fine to fine sand and inorganic silt, trace fine gravel.
25						20'0"	End of boring at 20'0" with hollow stem auger. Water level at 15'0" upon completion.
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING # B-23

Depth Ft	Coring M/R	No.	Pen/Sec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1		0'1"-2'1"	7-10-10-5	0'1"	Asphalt - 0'1"
5		2		5'0"-7'0"	14-14-23-27	3'0"	Moist, medium dense, dry, fine to medium sand, some organic silt, trace fine gravel.
10		3		10'0"-12'0"	4-6-15-16		Moist to wet, medium dense to very dense, fine to coarse sand, some inorganic silt, trace fine gravel, cobbles.
15		4		13'0"-15'0"	92-50-38-27	15'0"	End of boring at 15'0" with hollow stem auger. Water level at 6'0" upon completion.
20							
25							
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING # W-1

Depth Ft	Coring M/R	No.	Pen/Sec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1		0'1"-2'1"	8-10-9-9	0'1"	Asphalt - 0'1"
5		2		5'0"-7'0"	17-19-21-21	3'0"	Moist, medium dense, dry, fine to medium sand, some organic silt.
10		3		10'0"-12'0"	21-23-17-37		Moist to wet, dense, fine to coarse sand, some inorganic silt, trace fine gravel.
15						15'0"	End of boring at 15'0" with hollow stem auger. Water level at 6'0" upon completion. Set well point at 15'0".
20							
25							
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

BORING # W-2

Depth Ft	Coring M/R	No.	Pen/Sec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1		1'0"-3'0"	4-5-4-5	1'0"	Bark mulch - 1'0"
5		2		5'0"-7'0"	5-3-2-2		Moist, loose, fine to medium sand, some organic silt, trace fine gravel.
10		3		10'0"-12'0"	18-17-22-14	9'0"	Dry to wet, dense to medium dense, fine to coarse sand, some to trace inorganic silt, trace fine gravel.
15		4		15'0"-17'0"	8-9-15-17		
20		5		20'0"-22'0"	17-18-18-17		
25		5		23'0"-25'0"	7-10-15-17	25'0"	End of boring at 25'0" with hollow stem auger. Water level at 15'0" upon completion. Set well point at 20'0".
30							
35							
39							
Notes: Hollow Stem Auger Size - 4-1/4"							

PROBES

Number	Depth to Refusal
P1	4'0"
P1-A	6'0"
P1-B	4'0"
P-2	4'0"
P-3	9'0"

MassDOT Route 2 1964 Project
Arlington/Belmont, MA

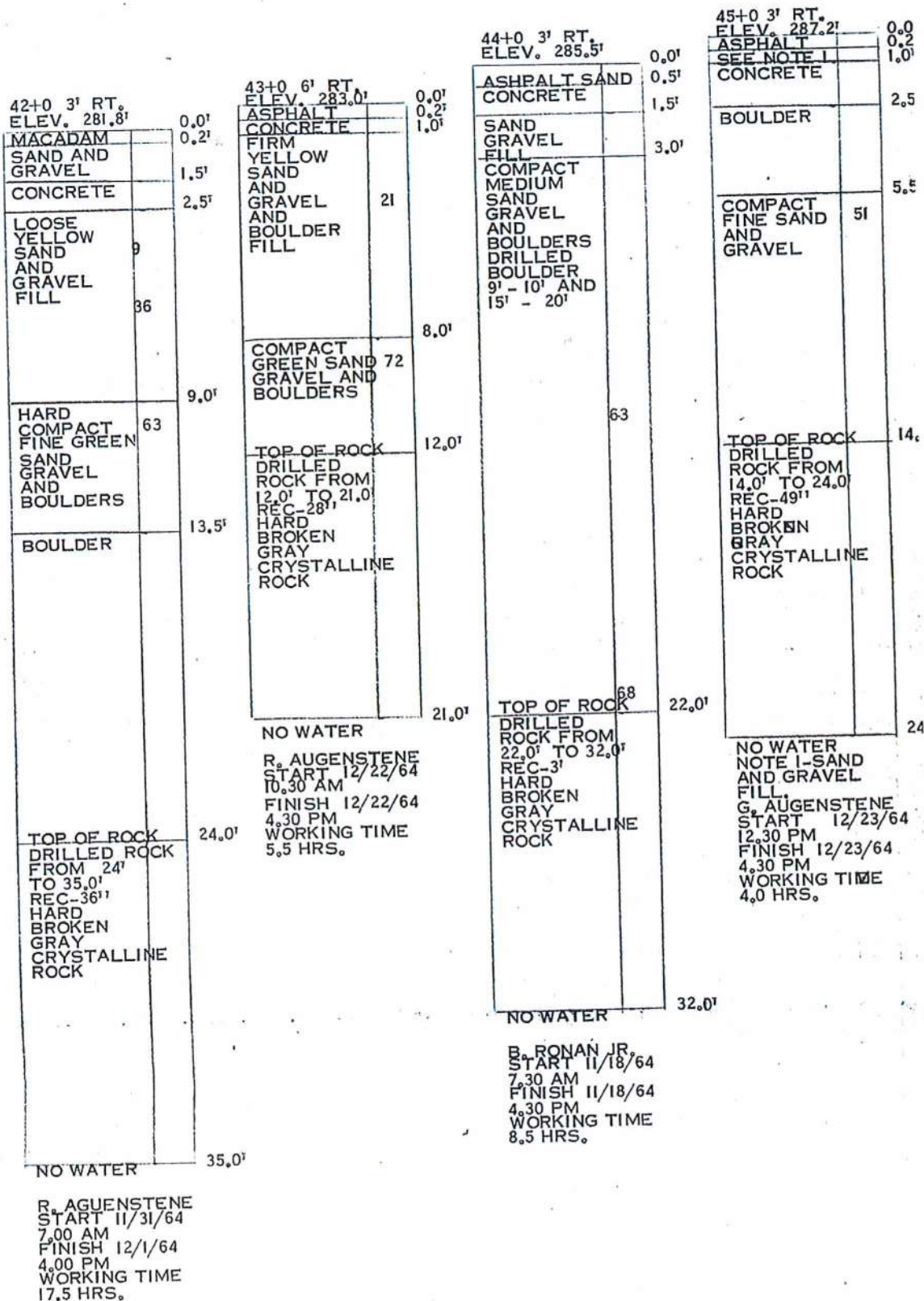
TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY

A DIVISION OF RAYMOND INTERNATIONAL INC.

To UNIVERSAL ENGINEERING CORP. Date JANUARY 8, 1965
 Location of Borings ROUTE 2, ARLINGTON AND BELMONT, MASSACHUSETTS
 All borings are plotted to a scale of 1" = 4 ft. using _____ as a fixed datum.
 Boring No. D 21 Boring No. D 22 Boring No. D 23 Boring No. D 24



TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY

A DIVISION OF RAYMOND INTERNATIONAL INC.

To UNIVERSAL ENGINEERING CORP. Date JANUARY 21, 1963
Location of Borings ROUTE 2, ARLINGTON AND BELMONT, MASSACHUSETTS

All borings are plotted to a scale of 1" = 8 ft. using _____ as a fixed datum.

Boring No. 49 Boring No. 50 Boring No. 51 Boring No. 52

0+50 200' LT.
ELEV. 47.6'
BROWN LOAMY
SAND GRAVEL
& BOULDERS 10 2.5'

COMPACT
FINE TO
COARSE GRAY
SAND
GRAVEL
AND
BOULDERS 81 12.5'
SEE NOTE
NO 1 125 15.0'

NO WATER
NOTE NO 1-VERY
COMPACT LIGHT
GRAY FINE TO
COARSE SAND
GRAVEL AND
BOULDERS.

T. HUNT

START 12/31/64
11.30 AM
FINISH 12/31/64
4.30 PM
WORKING TIME
4.5 HRS.

72+0 45' LT.
ELEV. 38.3'
LOAM SAND
AND GRAVEL 8 2.5'

FINE TO
COARSE
COMPACT
SAND
GRAVEL
AND
SMALL
BOULDERS 50
70
60
65 20.0'

NO WATER

T. HUNT

START 12/30/64
9.00 AM
FINISH 12/30/64
2.30 PM
WORKING TIME
5.0 HRS.

72+0 70' RT.
ELEV. 38.1'
ASPHALT
CRUSH ROCK 0.0'
FILL 0.3'

FIRM FINE
YELLOW
SAND II 3.0'
HARD MED.
YELLOW
SAND 6.0'
AND GRAVEL 24 10.5'
VERY COMPT.
YELLOW
SAND GRAV.
STONES 145 15.0'

HARDPAN

NO WATER

E. WALSH

START 12/10/64
10.00 AM
FINISH 12/10/64
2.30 PM
WORKING TIME
4.0 HRS.

63+50 300' RT.
ELEV. 1.2' 0.0'

LOOSE DARK
GRAY
SILTY
SAND 10 5.0'

FINE TO
COARSE GRAY 22 10.0'
SAND AND
GRAVEL

FIRM
FINE
TO
COARSE
DARK
GRAY
SAND
AND
GRAVEL 18

16

35.0'

FIRM
FINE
TO
COARSE
BROWN
SAND 17

BORING REPORT

AMERICAN DRILLING & BORING CO., INC.

100 WATER STREET
EAST PROVIDENCE, R. I.

TO COMMONWEALTH OF MASS. DPW ADDRESS BOSTON, MASS.
 SITE LOCATION ROUTE 2 - PEDESTRAIN OVERPASS - ARLINGTON, MASS.
 REPORT SENT TO RESEARCH & MATERIALS DIV. DATE _____
 SAMPLES SENT TO " " " VIA _____ DATE _____
 SCALE 1" = 8 FT. REFERENCE DATUM _____

ELEVATION

DEPTH

BORING NO. 1

LINE & STATION: 18 + 43

OFFSET: 47' LT

ELEVATION: 8.6'

0.0'	MOIST MEDIUM DENSE, BROWN FINE TO COARSE SAND, TRACE OF FINE GRAVEL, TRACE OF SILT	17	10.0'
3.6'			
W 6.0'	MOIST DENSE, BROWN FINE SAND, SOME SILT	50	2.0'
10.0'	WET MEDIUM DENSE, GRAY FINE TO MEDIUM SAND, SOME SILT	26	
14.0'	WET VERY STIFF, GRAY CLAY WITH SOME FINE SAND LAYERS	20 (2 SAMPLES)	-6.0'
20.0'	WET STIFF, GRAY CLAY WITH TRACE OF FINE SAND LAYERS	9	-14.0'
	AT 30' BECOMES WET MEDIUM STIFF	7	-22.0'
	(NOTE: CHANGED OFFSET BECAUSE OF HIGH PRESSURE GASOLINE LINE BEING DIRECTLY UNDER OTHER OFFSET - A. CONFALONE)		-30.0'
40.0'		5	-38.0'

BOTTOM OF BORING: 40.0'
 BOTTOM ELEVATION: -31.5'

WATER: 6.0'

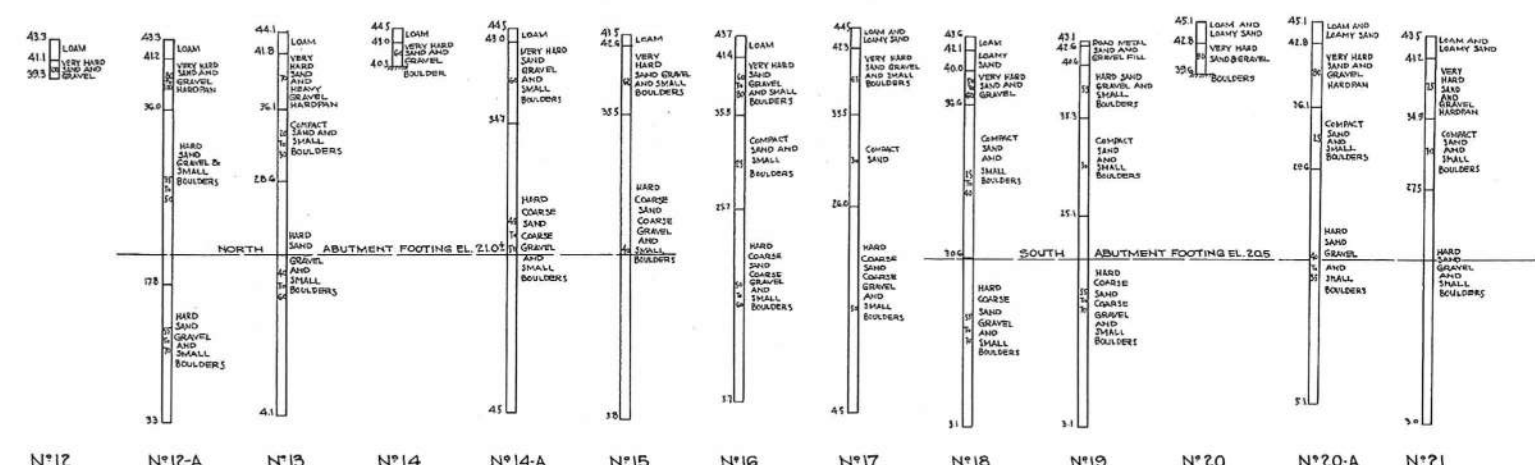
STARTED: 6/15/72
 FINISHED: 6/15/72

DRILLER: A. GOMES
 INSPECTOR: A. CONFALONE

W = WATER SURFACE BELOW STARTING GRADE IN FEET AT COMPLETION OF BORING.

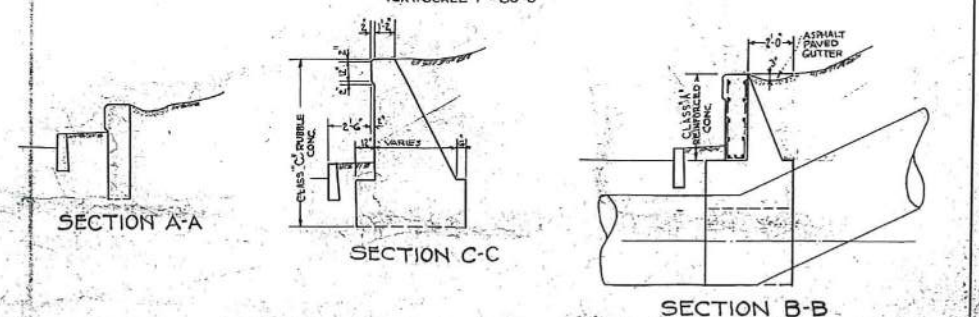
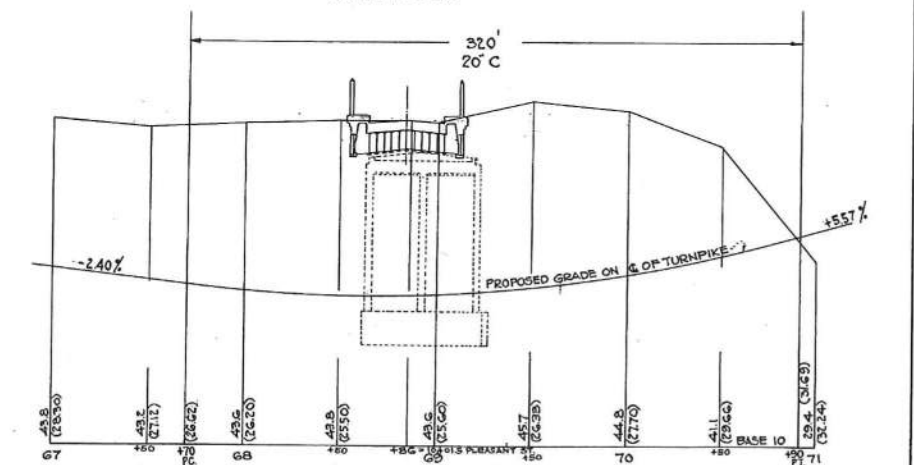
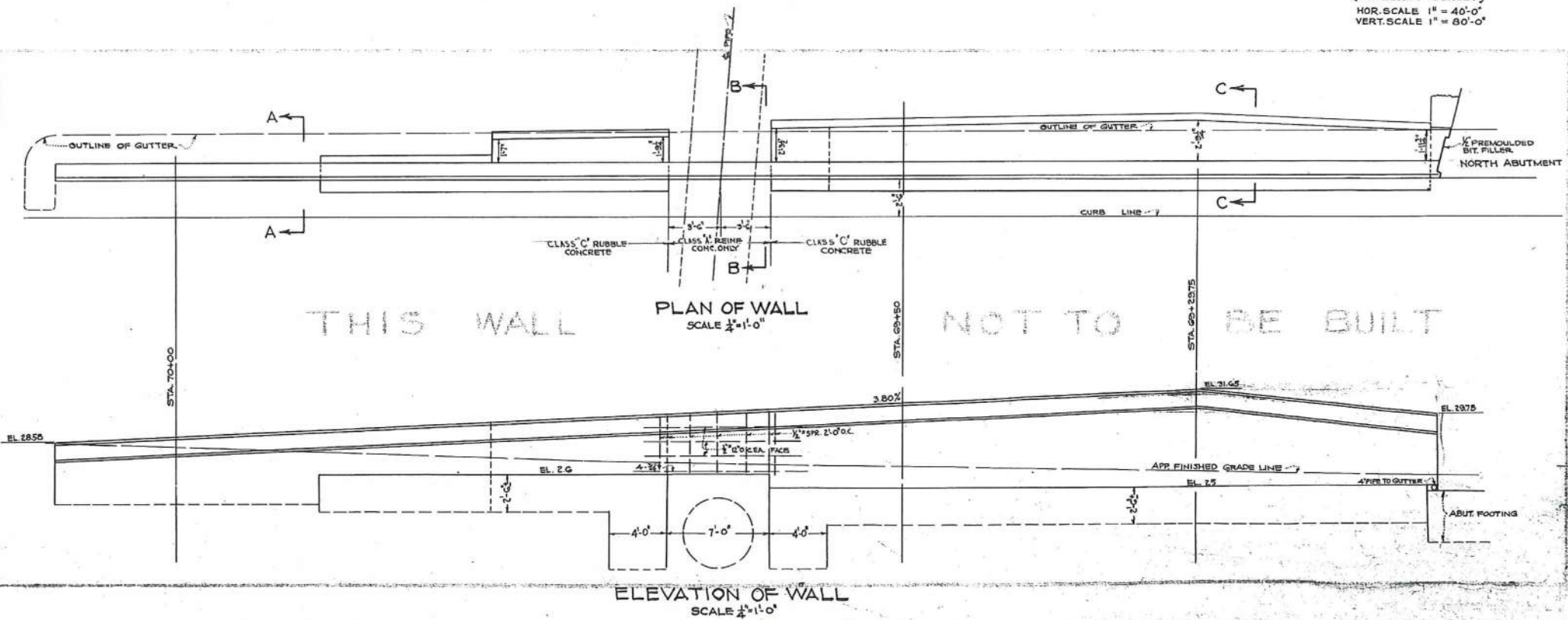
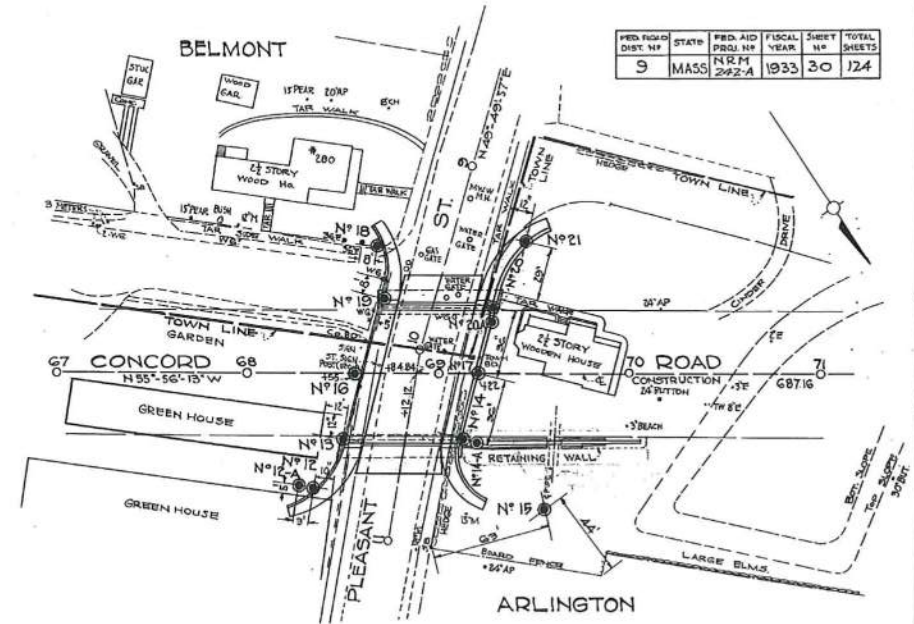
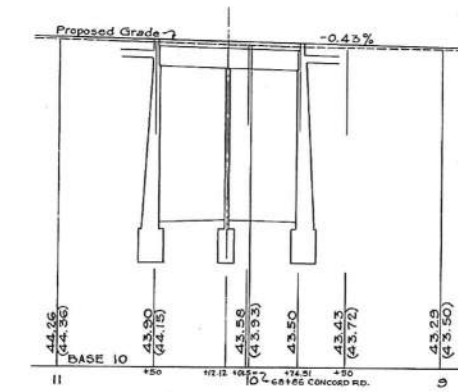
OR _____ FT. IN _____ HRS. 6.0 FT. IN COMP. 140 #WT. FALLING 30 " TO DRIVE SAMPLER 12 INCHES
 FIGURES IN LOG COLUMN, UNLESS EXCEPTED = BLOWS WITH _____
 CASING DIA. BW INCHES, LENGTH _____ FEET. 2" OD SAMPLER DIA. 3/8" ID INCHES, TYPE SPLIT SPOON
 + = MUD LOST IN THIS LAYER OF SOIL. FOOTAGE OF BORING THIS SHEET 40.0'
 SHEET 1 OF 1 FOREMAN A. GOMES CLASSIFICATION BY AG & LIM JOB NO. 71-290

MassDOT Route 60 at Route 2 1967
Project
Belmont, MA



BORING DATA
SCALE 1"=8'-0"
BORINGS TAKEN JULY 5, 1933

BORING NOTES
LOCATION OF BORINGS SHOWN ON KEY PLAN THUS @ BORING N°
BORINGS TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY BUT DO NOT NECESSARILY SHOW NATURE OF MATERIAL TO BE ENCOUNTERED IN CONNECTION WITH CONSTRUCTION OF THE BRIDGE. FIGURES IN COLUMNS INDICATE BLOWS PER FOOT ON SPOON.



PUB. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
1	MASS.	U-242(14)	19	182	600

GENERAL NOTES

BENCH MARK
(B.M. #A-44) RIGHT OUTER CORNER OF FIRST STEP (BRICK) HOUSE #17 YENNER ROAD. 240' RT. STA. 48+40 @ RECONSTRUCTED ROUTE 2 (ARLINGTON) ELEV. 49.043 (U.S.C.G.S. 1929 DATUM).

SURVEY NOTEBOOKS
#16918 ; X-SECTIONS: 25875 ; DETAIL: 14864, 17018.

FOUNDATIONS
MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED IN CONSTRUCTION.

DATE & SEAL
TO BE PLACED ON THE INSIDE FACE OF THE NORTHWEST AND SOUTHEAST END POSTS A SHEET SHOWING THE SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. SEAL WILL BE FURNISHED BY THE COMMONWEALTH AND SET BY THE CONTRACTOR.

DESIGN
IN ACCORDANCE WITH THE 1961 SPECIFICATIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS AND INTERIM SPECIFICATIONS FOR H20-44 LOADING.

REINFORCEMENT
ALL BARS SHALL HAVE DEFORMATIONS CONFORMING TO A.S.T.M. SPECIFICATION A305. UNLESS OTHERWISE SHOWN ON THE PLANS, REINFORCING BARS SHALL BE LAPPED 20 DIAMETERS TO MAKE A SPLICE, EXCEPT THAT MAIN REINFORCING BARS NEAR THE TOP OF SLABS AND BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS SHALL BE LAPPED 35 DIAMETERS TO MAKE A SPLICE.

BRIDGE RAILINGS
SEE DEPARTMENT STANDARD PLANS, DATED OCT. 1966 FOR DETAILS OF BRIDGE RAILINGS.

UNSUITABLE MATERIAL
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE.

SCALES
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR 4 SIZE PRINTS.

ANCHOR BOLTS
ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE AND PLACED BEFORE THE CONCRETE IS POURED EXCEPT WHERE NOTED ON SHEET 8.

ESTIMATED QUANTITIES
(NOT GUARANTEED)

CLASS B ROCK EXCAVATION	10 C.Y.
BRIDGE EXCAVATION	980 C.Y.
GRAVEL BORROW	1430 C.Y.
GRAVEL BORROW FOR BRIDGE FOUNDATIONS	170 C.Y.
CLASS I BITUMINOUS CONCRETE PAVEMENT TYPE I-1	113 TONS
CLASS I DENSE PROTECTIVE BOTTOM COURSE FOR BRIDGES	115 TONS
METAL BRIDGE RAILING (3 RAILS) OPTION	489 L.F.
REMOVAL OF PRESENT BRIDGE (BRIDGE NO. A-10-12-B-7-3)	1 L.S.
BRIDGE STRUCTURE (BRIDGE NO. A-10-12-B-7-3)	1 L.S.

ESTIMATED WEIGHT OF REINFORCING STEEL 239,000 LBS.
ESTIMATED WEIGHT OF STRUCTURAL STEEL 815,500 LBS.
THESE QUANTITIES ARE PART OF ITEM 995.01 BRIDGE STRUCTURE (BRIDGE NO. A-10-12-B-7-3) AND ARE NOT GUARANTEED.

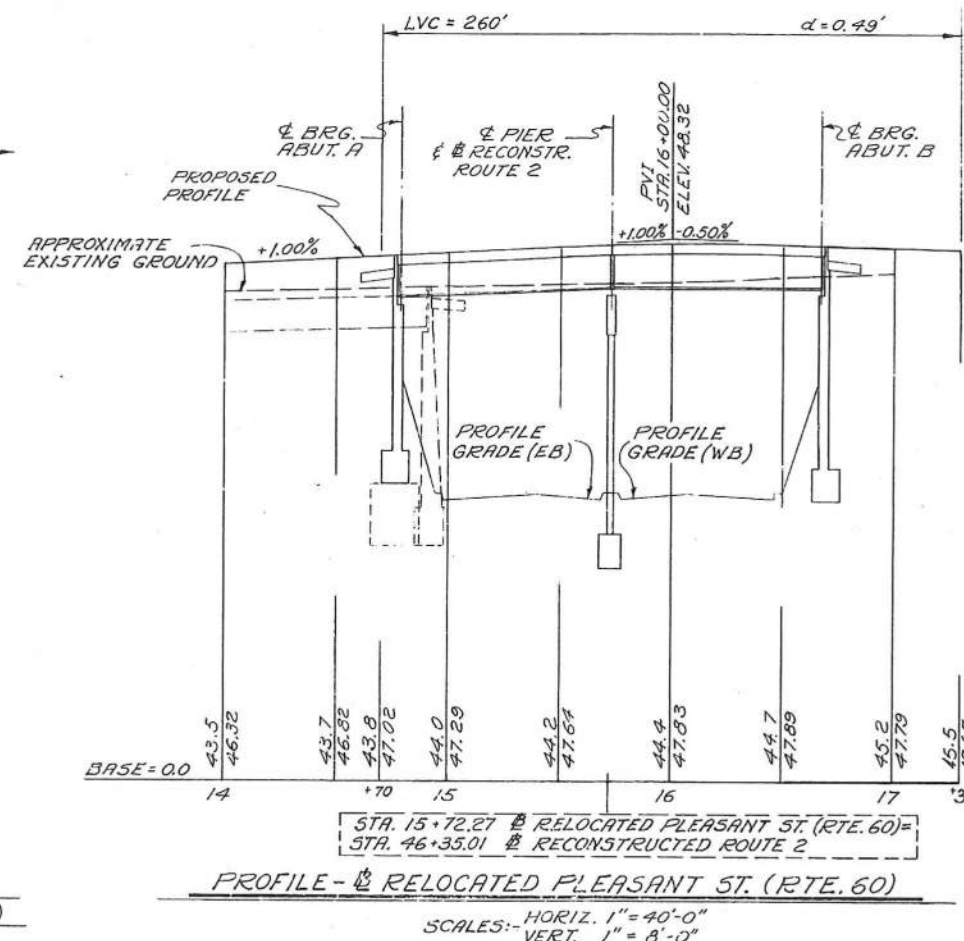
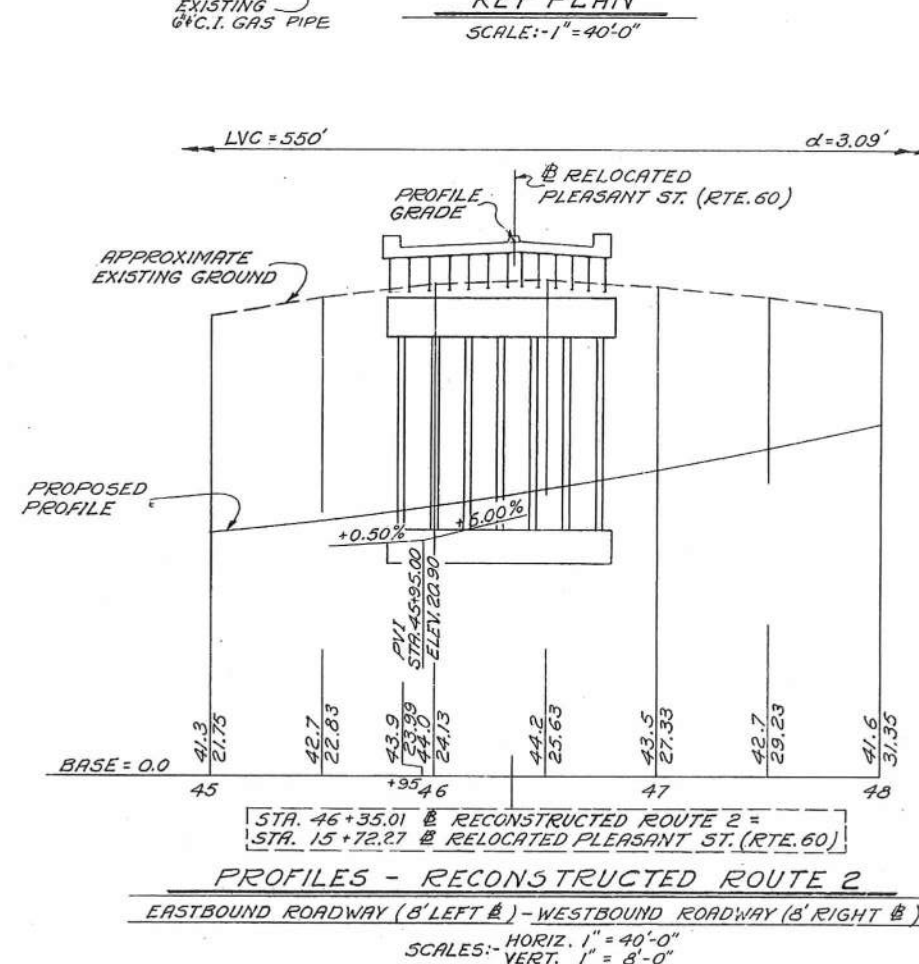
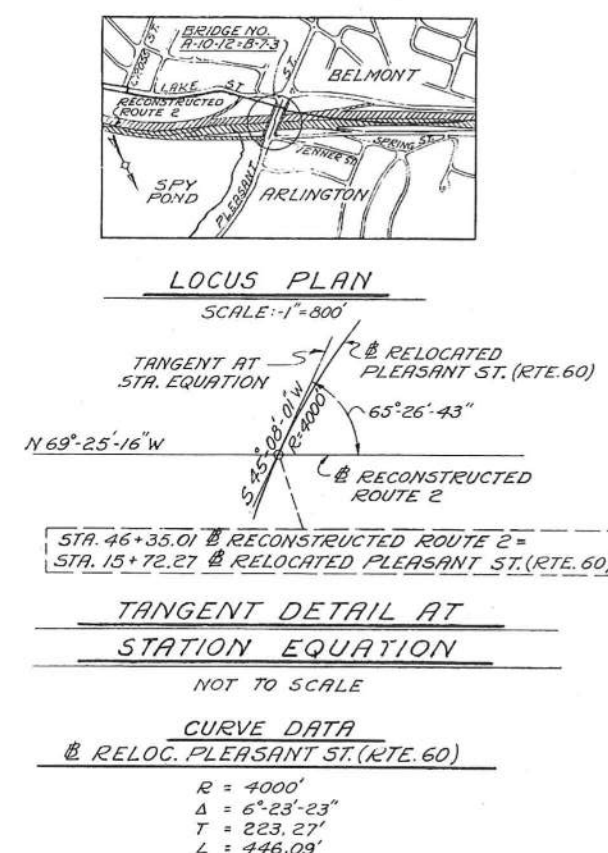
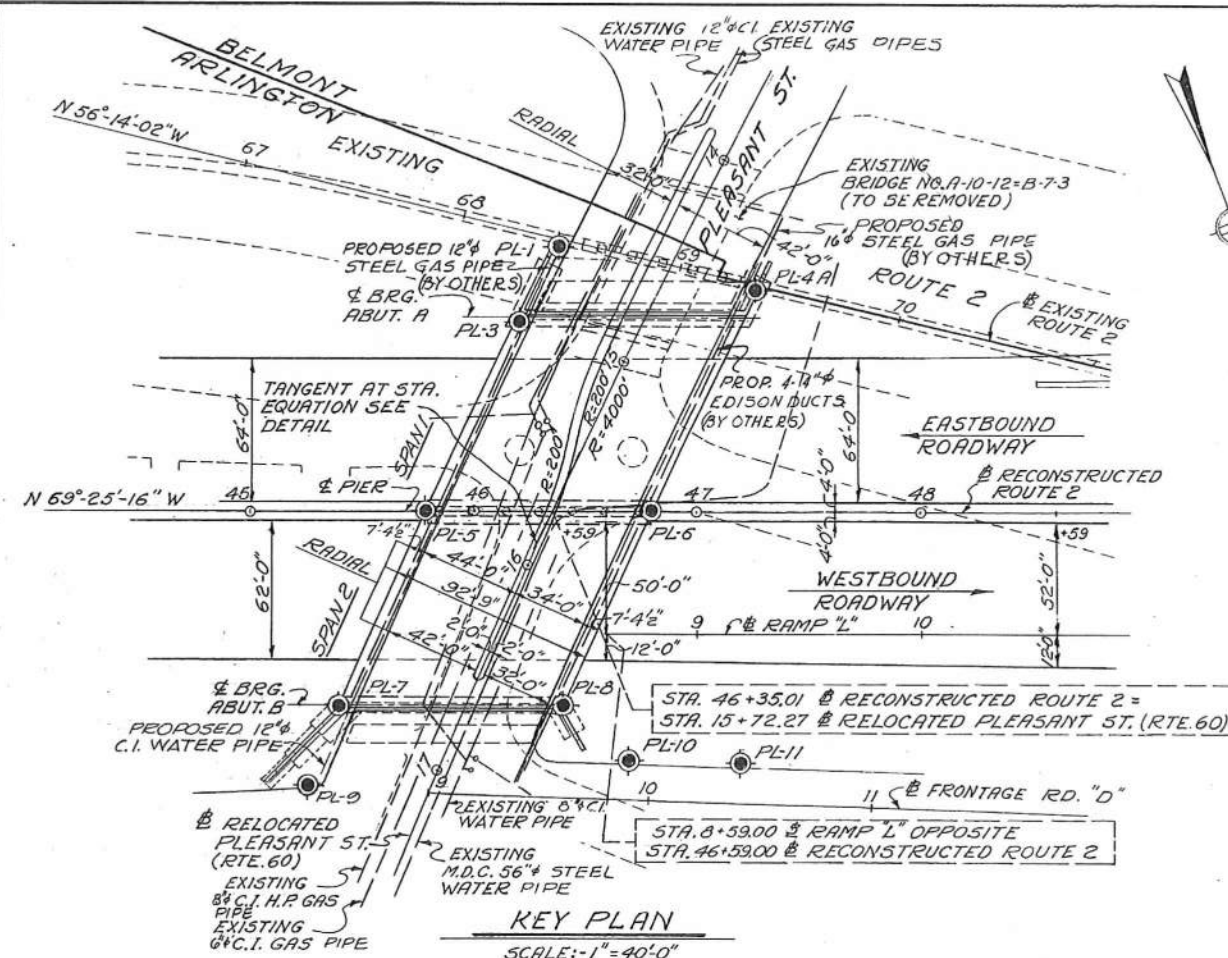
NOTE: PLANS OF EXISTING BRIDGE MAY BE SEEN AT THE M.D.R.W. 100 NASHUA ST. BOSTON, MASS. ROOM 609

JAN. 28, 1967	ISSUED FOR CONSTRUCTION
THE COMMONWEALTH OF MASSACHUSETTS PROPOSED BRIDGE	
ARLINGTON - BELMONT	
RECONSTRUCTED ROUTE 2	
UNDER	
RELOCATED PLEASANT ST. (RTE. 60)	
SCALES: AS NOTED	
OFFICE OF DEPARTMENT OF PUBLIC WORKS 100 NASHUA ST., BOSTON 14, MASS. JAN. 1967	
<i>R. J. McDonald</i> CHIEF ENGINEER	<i>Donald P. E.</i> CHIEF ENGINEER

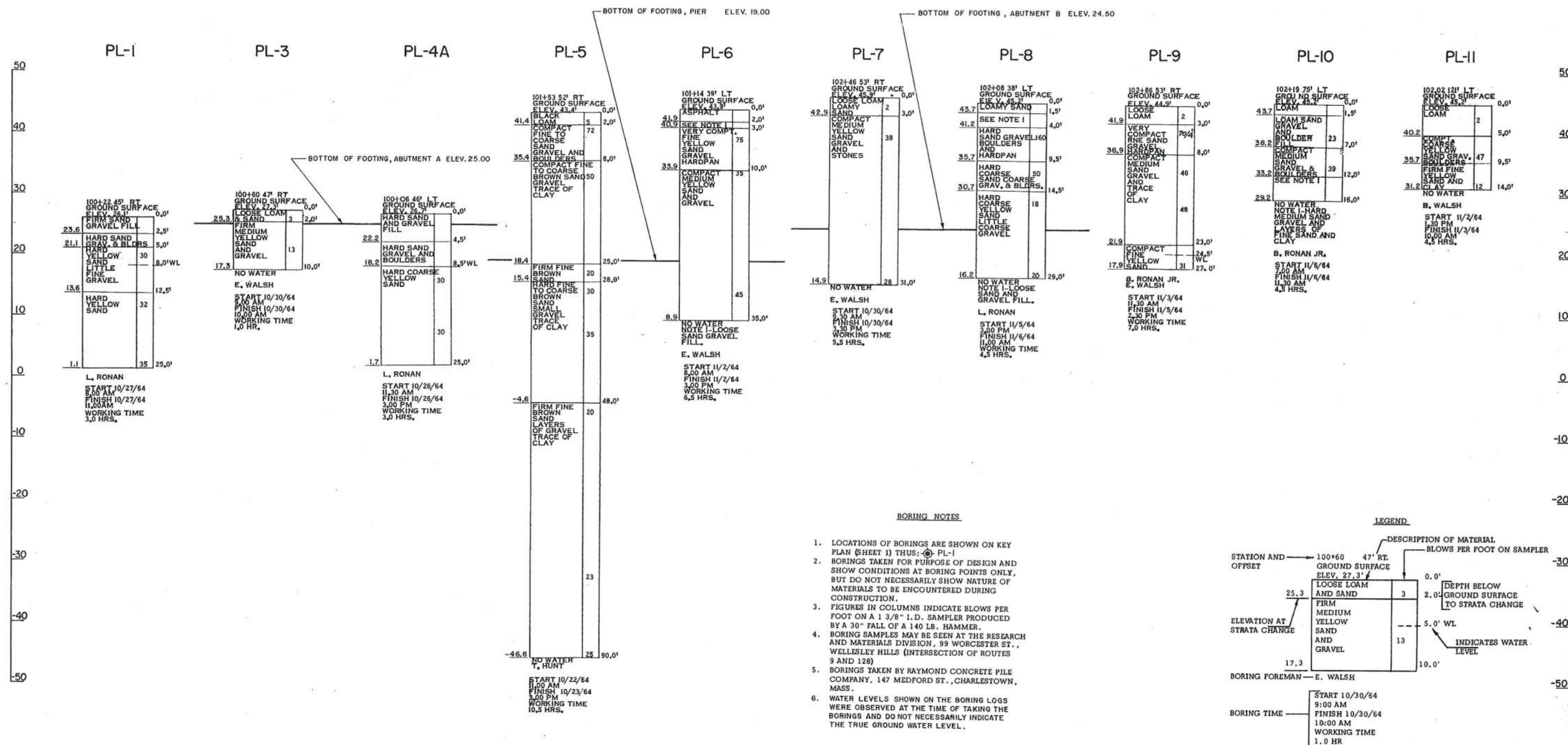


UNIVERSAL ENGINEERING CORPORATION
DESIGNING ENGINEERS
38 CHAUNCEY STREET
BOSTON 11, MASS.

SHEET 1 OF 14 SHEETS - BRIDGE NO. A-10-12-B-7-3



DESIGNED BY: E.L.M. CHECKED BY: J.A.O.D.
DRAWN BY: E.L.M. GEOMETRICS, E.L.M.



DESIGNED BY R.L.M. CHECKED BY R.L.M.
DRAWN BY E.K. GEOMETRICS R.L.M.

JAN 28, 1967	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 2 OF 14 SHEETS - BRIDGE NO. A-10-12-B-7-3

MassDOT Route 128 Widening Under River
Street 1960 Project
Weston, MA

PUB. NO.	STATE	FED. AID	FISCAL	SHEET	TOTAL
1	MASS.	U-272 (44)	19	42	315

GENERAL NOTES

FOUNDATIONS:-

May be altered, if necessary, to suit conditions encountered in construction.

DATE AND SEAL:-

To be placed on the inside face of the Northeastly & Southwesterly end posts.
A sheet showing size and character of numerals will be furnished. Seal will be furnished by the Commonwealth, and installed by Contractor.

DESIGN:-

In accordance with the current specifications of the American Association of State Highway Officials (1957 Edition) For H 20-44 Loading.

BENCH MARK:-

Sta 58+65 230' Rt. R.R. Spike 24"
Oak Elev 71.50. Sea Level Datum of 1929.

REINFORCEMENT:-

All bars shall have deformations conforming to A.S.T.M. Designation A 305. Unless otherwise shown on plans, reinforcing bars shall be lapped 20 diameters to make a splice, except that main reinforcing bars near top of slabs and beams having more than 12 inches of concrete under the bars shall be lapped 35 diameters to make a splice.

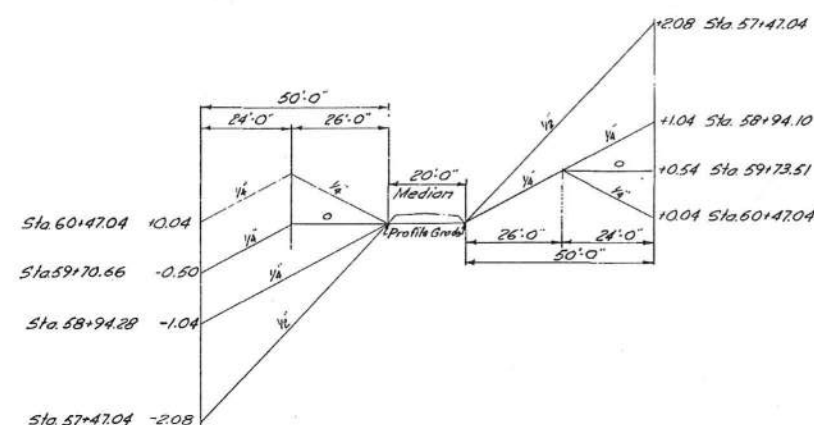
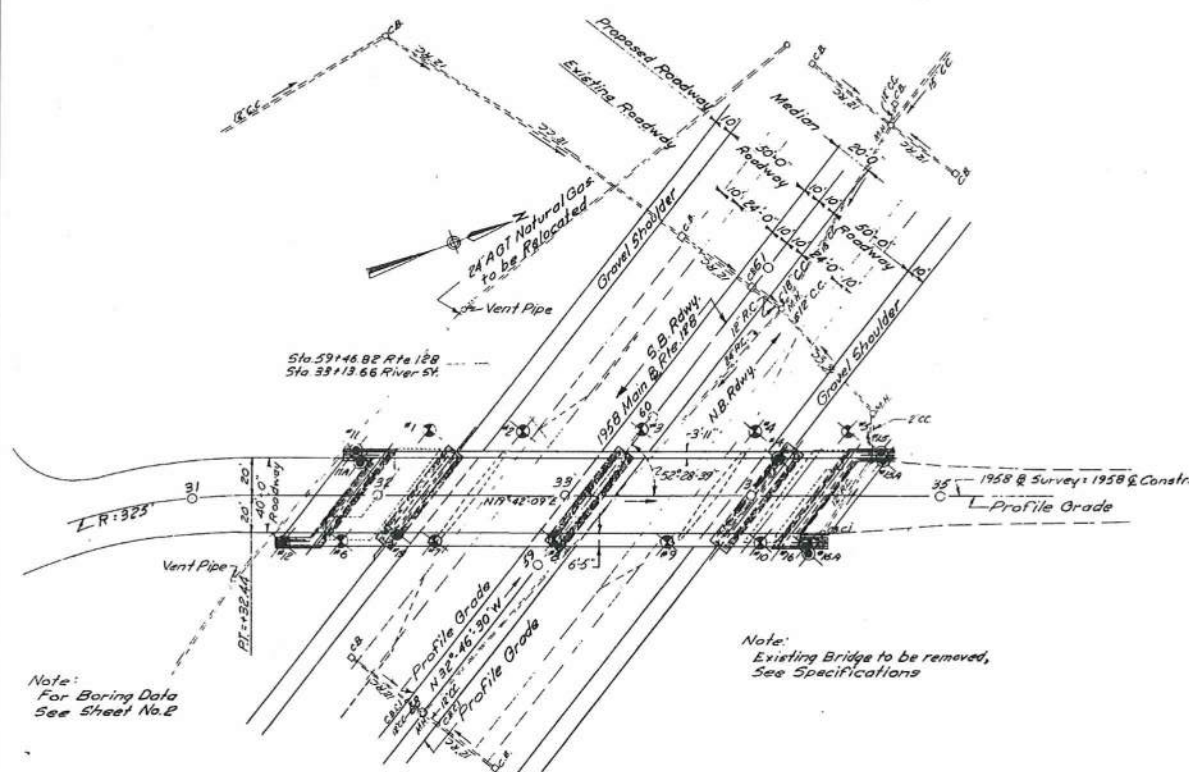
RAILING:-

A sheet showing Railing Details will be furnished.

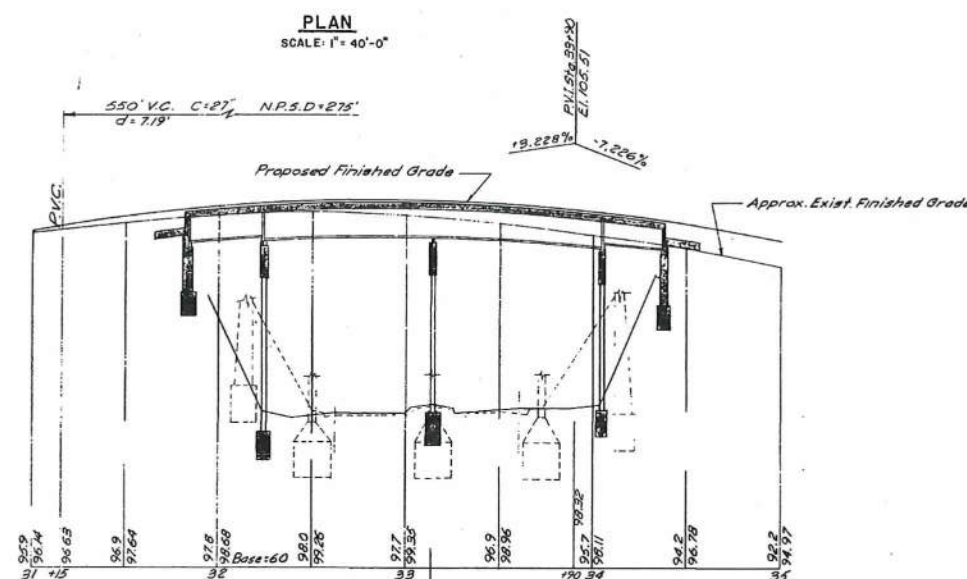
ESTIMATED QUANTITIES (NOT GUARANTEED)

Bridge Excavation ———— 1440 C.Y.
Class B Rock Excavation ———— 30 C.Y.
Gravel Borrow ———— 200 C.Y.
Class I Bit Conc. Pavement Type I-1 ———— 180 T.
Removal of Present Bridge (W-29-17) ———— 1 L.S.
Bridge Structure (W-29-17) ———— 1 L.S.

Note:
The following items are part of item GIS-1 & are not guaranteed
Structural Steel ———— 518,000 lbs.
Reinforcing Steel ———— 149,000 lbs.

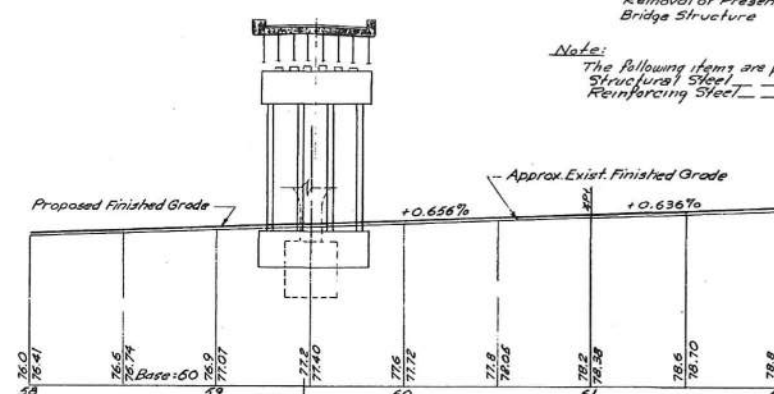


METHOD OF BANKING RTE.128
NOT TO SCALE



RIVER ST

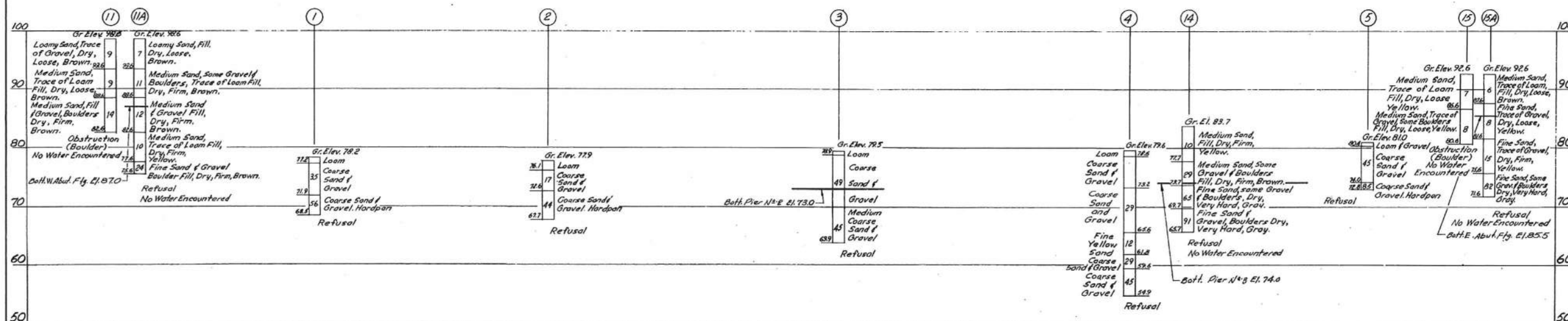
PROFILES
HOR. 1"=40'-0"
VERT. 1"=8'-0"



ROUTE 128

DES. 30A	DR. 11B	CHK. 11B	APPROVED FOR	DES. 30A	DR. 11B	CHK. 11B	APPROVED FOR
<p>THE COMMONWEALTH OF MASSACHUSETTS PROPOSED BRIDGE</p> <p>WESTON</p> <p>RTE. 128 WIDENING UNDER RIVER STREET</p> <p>SCALE AS NOTED</p> <p>OFFICE OF DEPARTMENT OF PUBLIC WORKS 100 NASHUA ST. BOSTON, MASS. JUNE 1960</p>				<p>DATE: JAN. 5, 1961</p> <p>DESCRIPTION: Revision - Changes to beam seal elevations, sheets 10</p> <p>ISSUED FOR CONSTRUCTION</p>			
<p>BRIDGE ENGINEER</p>				<p>CHIEF ENGINEER</p>			

PUR. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
1	MASS.	U-272(44)	19	43	315

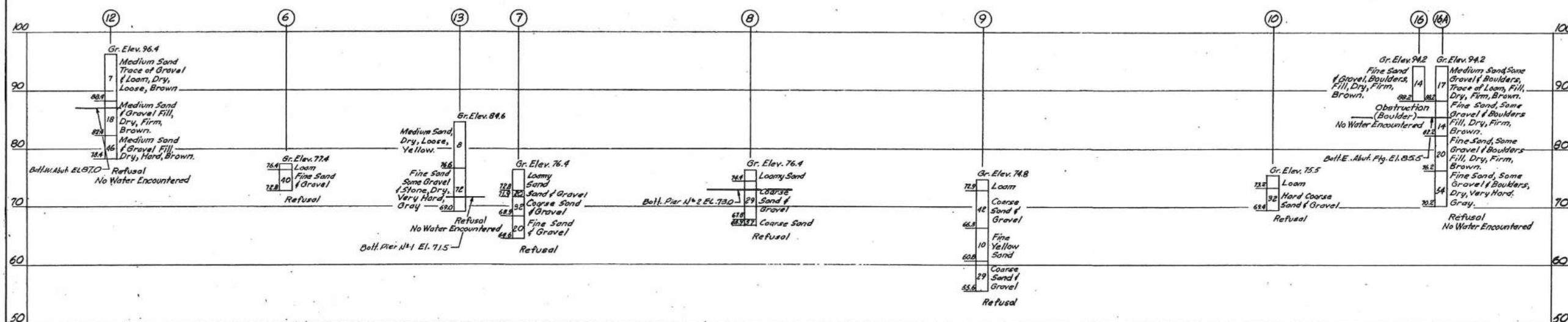


BORING DATA Scale: 1/8" = 1'-0"

NEW BORINGS TAKEN BY CARR-DEE TEST BORING & CONST. CORP. BOSTON, SEPT. 1958

BORING NOTES

Location of Borings Taken Oct. 1949 Shown on Plan Thus - Location of Borings Taken Sept. 1958 Shown on Plan Thus - Figures in Columns Indicate Blows Per Ft. on Two Inch Pipe Produced by 30" Fall of 140 lb. Hammer. Borings Taken For Purpose of Design & Show Conditions at Boring Points Only. But do not Necessarily Show Nature of Materials to be Encountered During Construction. Boring Samples May be Seen at the Maintenance Bldg. Rte. 9 in Wellesley.



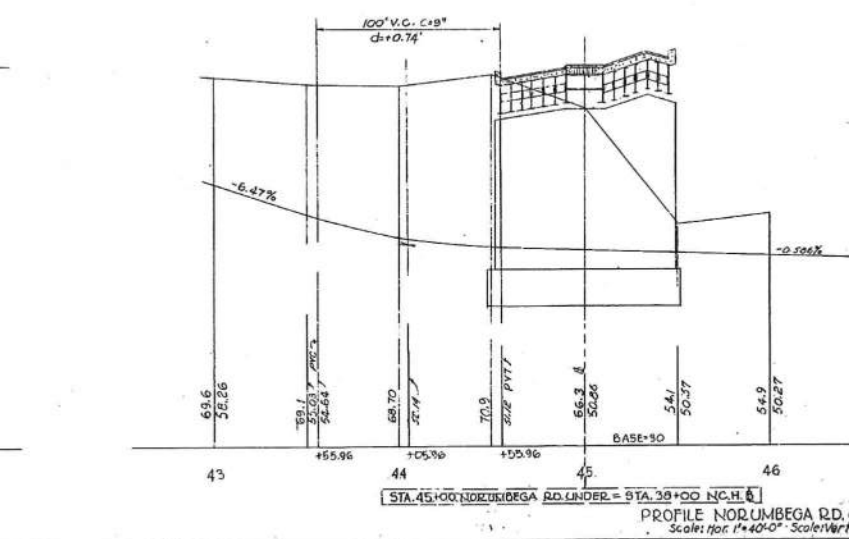
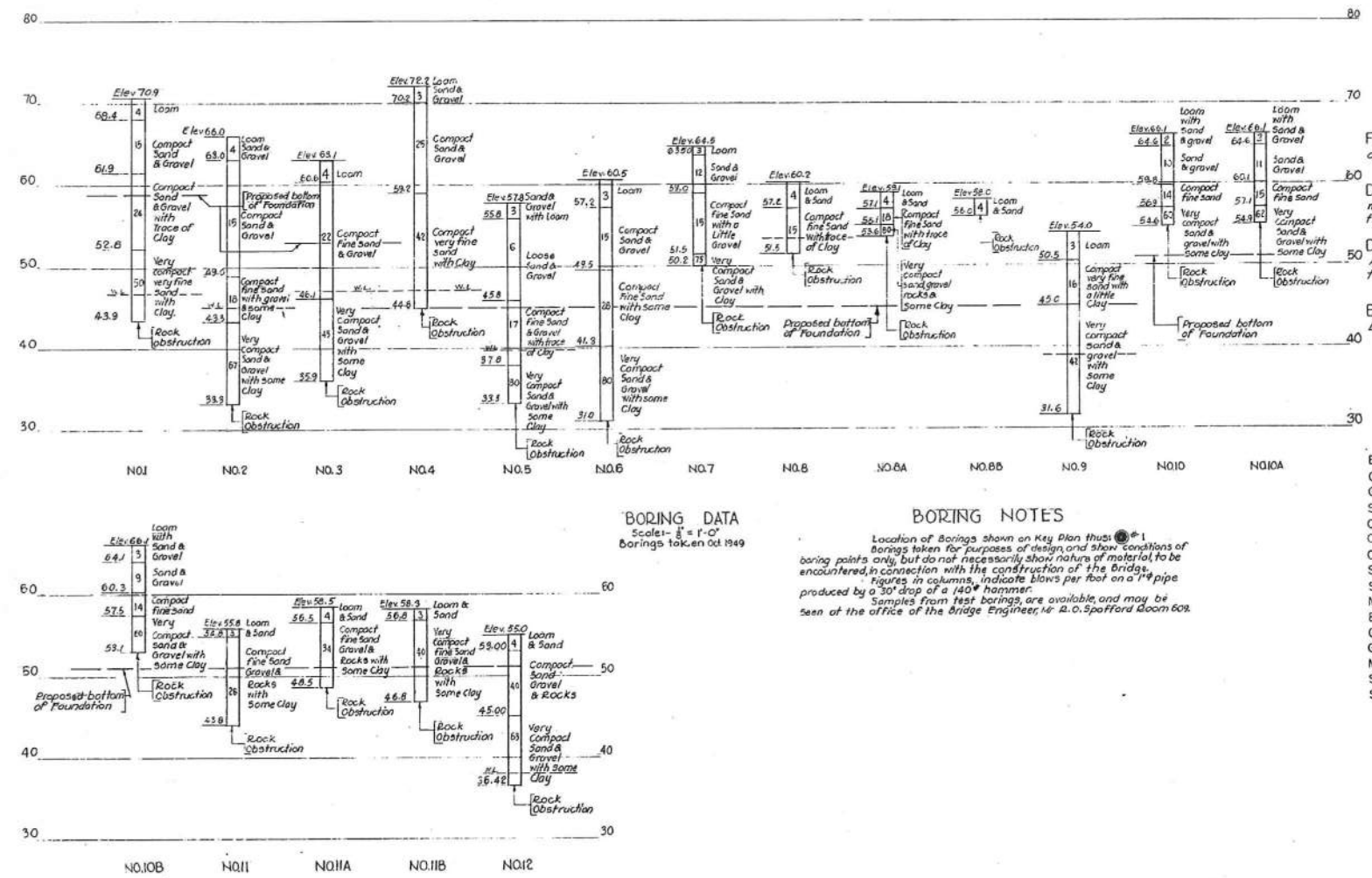
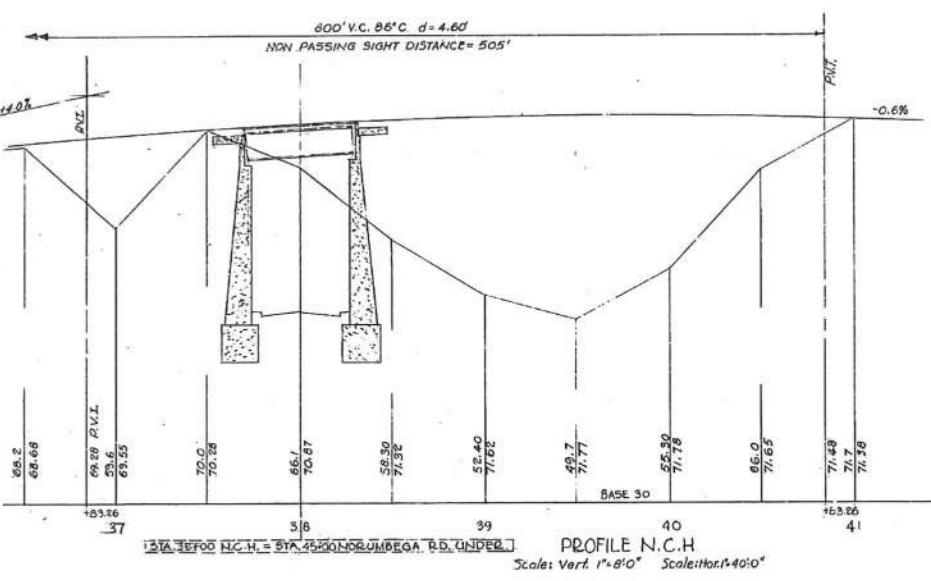
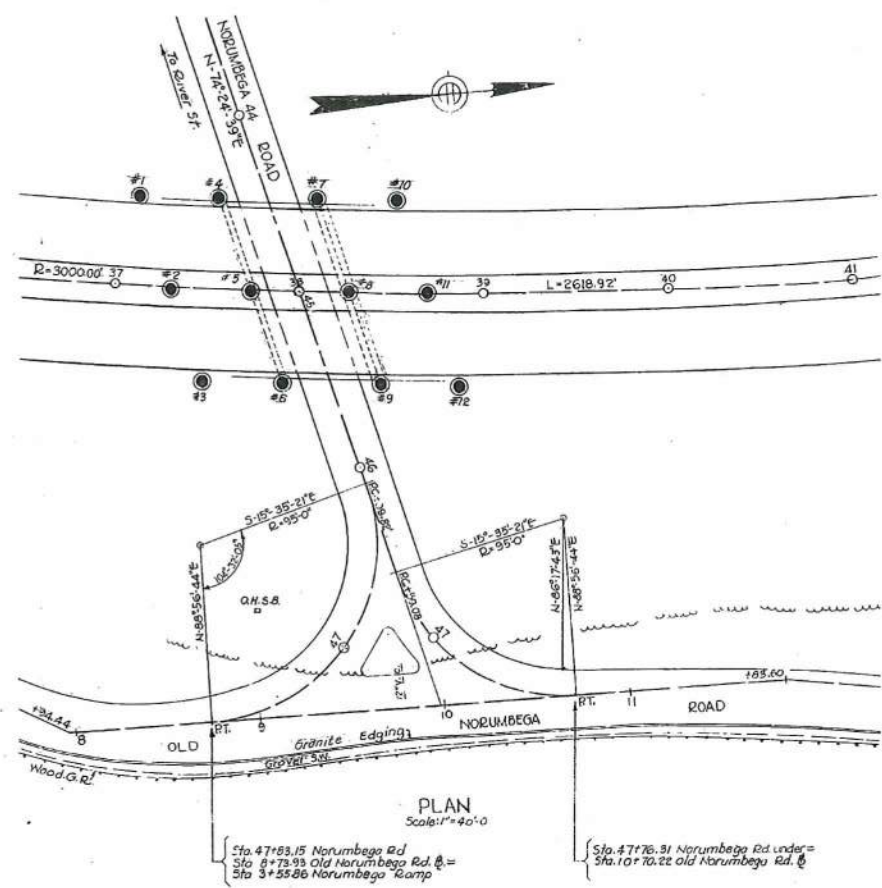
JUNE 25, 1960	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
	USE ONLY PRINTS OF LATEST DATE

SHEET 2 OF 9 SHEETS BRIDGE NO. W-29-17

MassDOT Borings at I95 and River Road, Weston, MA - 1960 - Sheet 2 of 2

MassDOT Northern Circumferential
Highway Over Norumbega Rd. 1950
Project

Weston, MA



GENERAL NOTES

FOUNDATION: May be altered if necessary to suit conditions of construction.

DATE & SEAL: To be located in stone facing of northeasterly and southwesterly wing walls, approximately five feet above finished grade. See details sheet no. 4.

DESIGN: According to specifications of the American Association of State Highway Officials for H-20-44 loading.

BENCHMARK: Sta. 30+92 - 159' Ft. Spk. Root 24" P. E.I. = 45.16 Sea Level Datum of 1929.

ESTIMATED QUANTITIES (NOT GUARANTEED)

BRIDGE EXCAVATION	1,885 CU.YDS.
CLASS B ROCK EXCAVATION	495 CU.YDS.
GRAVEL BORROW	2,930 CU.YDS.
STRIPPING GRAVEL PITS	293 CU.YDS.
CLASS I BIT. CONC. PAVEMENT TYPE I-1	70 TONS
CEM. CONC. MASONRY CLASS A	305 CU.YDS.
CEM. CONC. MASONRY CLASS B	3,280 CU.YDS.
STEEL REINF. FOR STRUCTURES	102,100 POUNDS
STRUCTURAL STEEL	203,700 POUNDS
MEMBRANE WATERPROOFING (3 PLY)	560 SQ.YDS.
BITUMINOUS DAMP-PROOFING	860 SQ.YDS.
GRANITE EDGING TYPE SFA	118 LIN. FT.
GRANITE CURB TYPE VA STR (6"x11")	333 LIN. FT.
METAL BRIDGE RAILINGS (2 PIPE, 3 PLATE)	333 LIN. FT.
STONE FACING (LONG COURSED)	2,980 SQ. FT.
STEEL GRID FLOORING	655 SQ. FT.

ADVERTISING 1/21/50 CONSTRUCTION 1/21/50

THE COMMONWEALTH OF MASSACHUSETTS

PROPOSED BRIDGE

NORTHERN CIRCUMFERENTIAL HIGHWAY

OVER NORUMBEGA RD. - WESTON

STA. 38+00

SCALES AS NOTED

DEPARTMENT OF PUBLIC WORKS

100 NASHUA ST. - BOSTON, MASS.

1950

DESIGNED BY *R. H. Worchester*

BRIDGE ENGINEER

TRACED BY *R. H. Worchester*

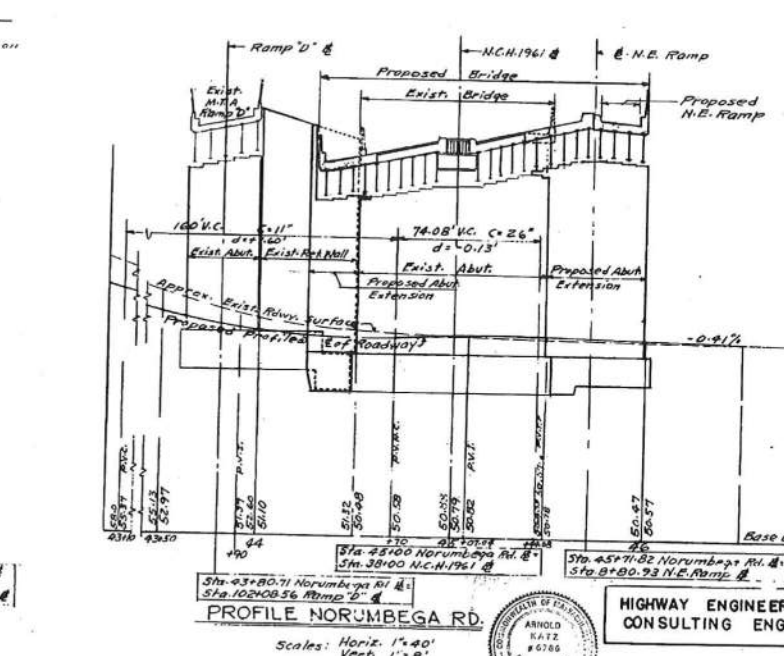
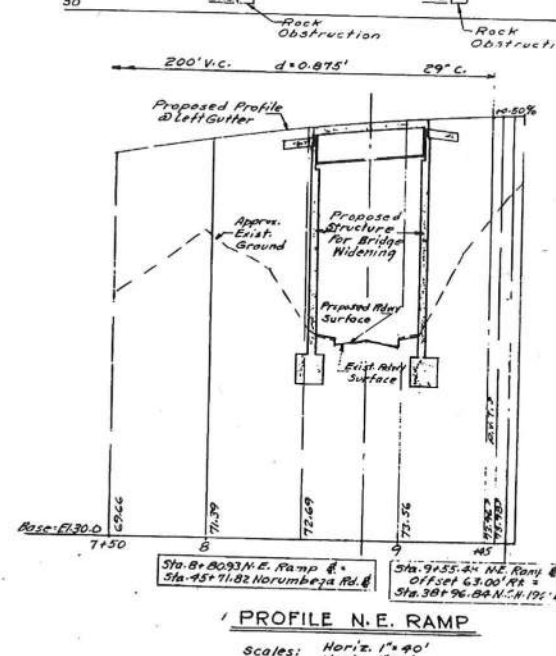
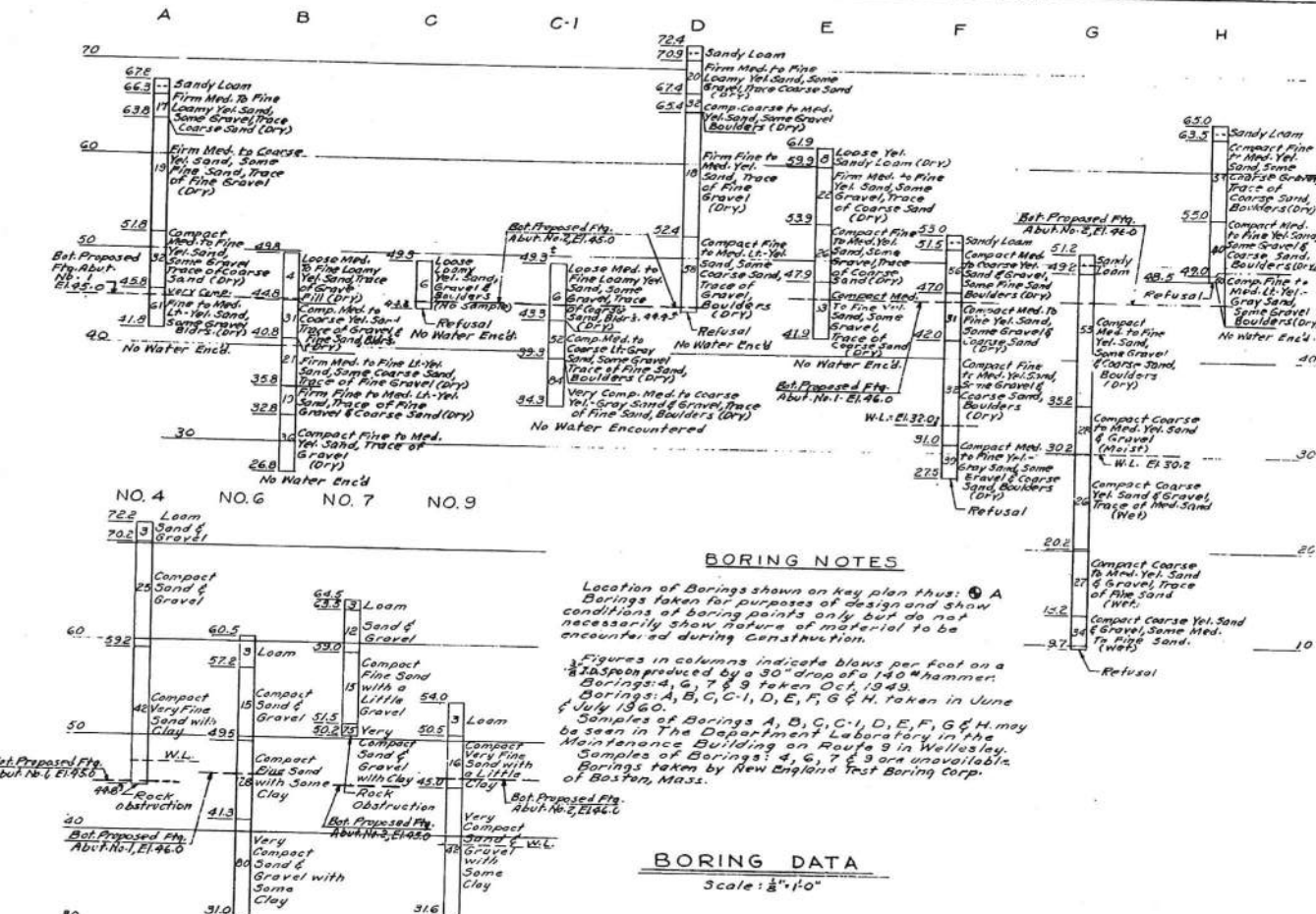
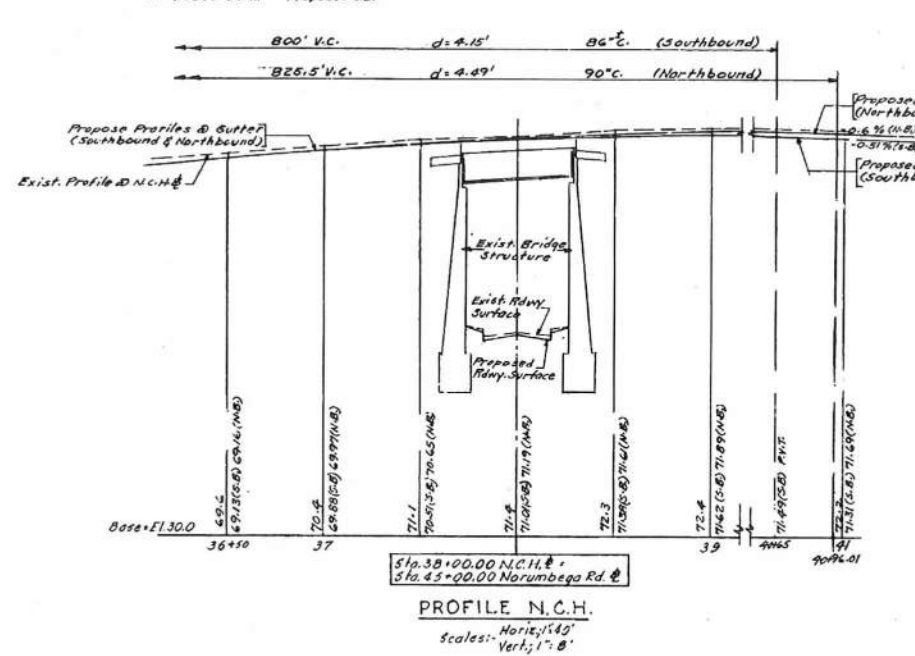
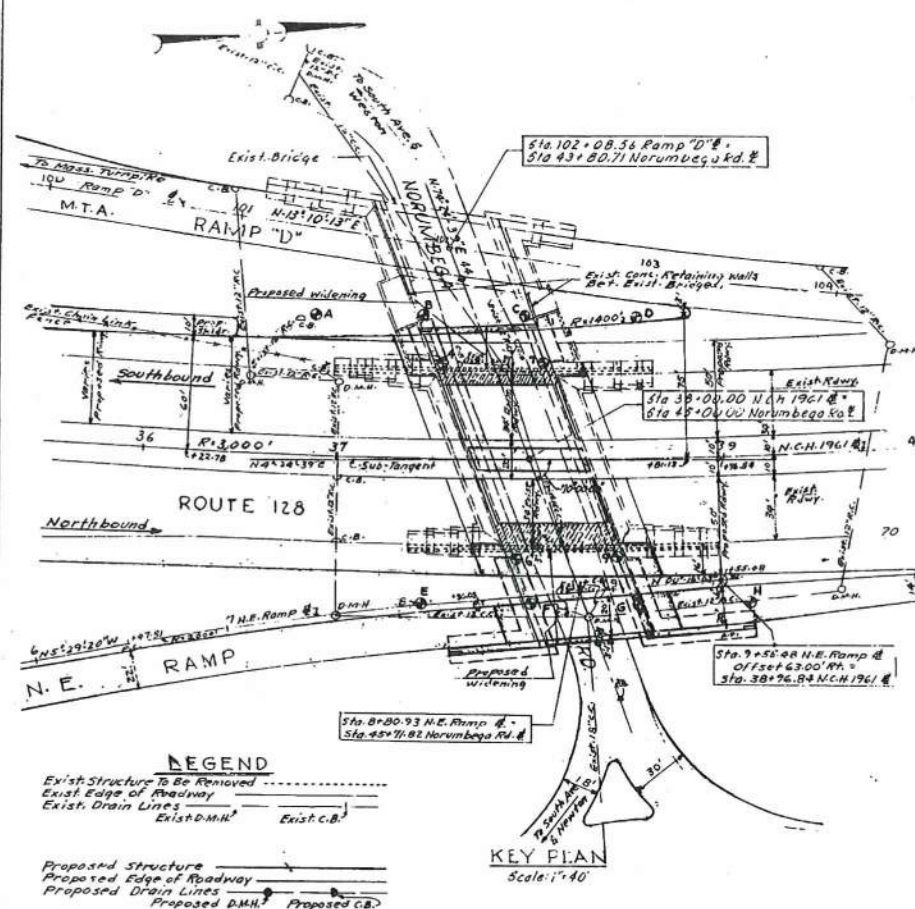
CHECKED BY *R. H. Worchester*

CHIEF ENGINEER

THOMAS WORCESTER INC. CONSULTING ENGR.

84 STATE ST. BOSTON, MASS.

SHEET 1 OF 4 SHEETS BRIDGE NO. W-29-18



GENERAL NOTES

- FOUNDATIONS:**
Foundations may be altered, if necessary to suit conditions encountered in construction.
- DATE AND SEAL:**
To be located as shown on Sheet No. 13. A sheet showing size and character of numerals will be furnished. Seal will be furnished by the Commonwealth.
- DESIGN:**
In accordance with the specifications of 'The American Association of State Highway Officials' for H20-44 loading 1957 Edition.
- REINFORCEMENT:**
All bars shall have deformations conforming to A.S.T.M. Designation A305. Unless otherwise shown on the plans, reinforcement bars shall be lapped 20 diameters to make a splice, except that main reinforcing bars near the top of slabs and beams having more than 12 inches of concrete under the bars shall be lapped 35 diameters to make a splice.
- BENCH MARK:**
R.F. 30, S.E. Wall of Bridge Over Charles River, Elevation 74.00
- CHAMFER:**
Chamfer all exposed edges of concrete at Abutments, Wingwalls, Piers and Slabs, not subjected to special treatment, unless otherwise shown, thus:
- BEARING SEATS:**
Bearing seats to be bush-hammered level at elevations given. Elevations shown for the Bearing Seats are to the theoretical bottom of base plates. These elevations must be lowered by the thickness of the packing required under the base plates. The remainder of the bearing shelf shall be sloped approximately 1/8" per ft. toward the outer face of piers and abutments.

ESTIMATED QUANTITIES (NOT GUARANTEED)

CLASS "B" ROCK EXCAVATION	10 C.Y.
BITUMINOUS CONCRETE EXCAVATION	450 S.Y.
BRIDGE EXCAVATION	900 C.Y.
CONCRETE EXCAVATION	150 C.Y.
REINFORCED CONCRETE EXCAVATION	170 C.Y.
GRAVEL BORROW	1,700 C.Y.
CLASS I BITUMINOUS CONCRETE PAVEMENT, TYPE I-1	135 Tons
ALTERATIONS TO BRIDGE (W-29-18)	1 L.S.
GRAVEL BORROW FOR BRIDGE FOUNDATIONS	65 C.Y.
BRIDGE STRUCTURE (W-29-18)	1 L.S.
ESTIMATED WEIGHT OF STRUCTURAL STEEL	100,000 Lbs.
ESTIMATED WEIGHT OF REINFORCING STEEL	126,000 Lbs.
These Items Are Included in Lump Sum For Bridge Structure W-29-18	

31 MAR 1962 ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS
PROPOSED BRIDGE
WESTON
NORUMBEGA ROAD
UNDER
NORTHERN CIRCUMFERENTIAL HIGHWAY

SCALES AS NOTED
OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 NASHUA ST., BOSTON, MASS.
MARCH 1962

HIGHWAY ENGINEERS INC.
CONSULTING ENGINEER

SHEET 1 OF 13 SHEETS BRIDGE NO. W-29-18

Hager-Richter Geoscience Inc. 1997
Project
Weston, MA

EARTH EXPLORATION, INC.

CLIENT: Hager-Richter Geoscience, Inc.

BORING #:

B102

PROJECT: Local Water Main Improvements

LOCATION: River Road, Weston, Mass.

PAGE

1 OF 1

88 ELM STREET • HOPKINTON, MASSACHUSETTS 01748
TEL (508) 435-5543 FAX (508) 435-5512

File #: 96228-EE

Date Started: 1/6/97

Date Completed: 1/6/97

Driller: R. Eastwood

Site Rep.: C. Martin

CASING	SAMPLER	CORE BARREL
TYPE <u>HW</u>	<u>SS</u>	
SIZE <u>4"</u>	<u>1-3/8"</u>	
HAMMER <u>300#</u>	<u>140#</u>	
FALL <u>24"</u>	<u>30"</u>	

Surface Elevation: _____
Station: _____
Groundwater level readings
Date 1/6/97 Depth 4'2"
Date _____ Depth _____

Depth ft	Cas bl/ ft	Sample					Strata Change ft	Sample Description
		No.	Depth ft	Pen."	Rec."	Blows/6"		
		S1	0.5-2.5	24	22	23-41-39-62		6" ASPHALT S1 Very dense brown fine to medium SAND & medium to coarse gravel, trace silt
5		S2	4.0-6.0	24	13	101-21* 37*-68*	4.0	S2 Very dense brown medium to coarse SAND & gravel, some silt & cobbles
10		S3	10.0-11.5	18	12	100-53*-70*	11.5	S3 Similar to S2
15								Bottom of exploration 11.5'
20								
25								
30								

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/Ft.				Cohesionless Density Blows/Ft.		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer

Notes: 1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

BL 96228 3/26/97

EARTH EXPLORATION, INC.

88 ELM STREET • HOPKINTON, MASSACHUSETTS 01748
TEL (508) 435-5543 FAX (508) 435-5512

CLIENT: Hager-Richter Geoscience, Inc.
PROJECT: Local Water Main Improvements
LOCATION: River Road, Weston, Mass.

BORING #:

B101

PAGE

1 OF 1

File #: 96228-EE
Date Started: 1/3/97
Date Completed: 1/3/97
Driller: R. Eastwood
Site Rep.: C. Martin

CASING TYPE: HW
SIZE: 4"
HAMMER: 300#
FALL: 24"

SAMPLER: SS
CORE: 1-3/8"
BARREL: 140#
CORE: 30"

Surface Elevation: _____
Station: _____
Groundwater level readings
Date _____ Depth _____
Date _____ Depth _____

Depth ft	Cas bl/ ft	Sample					Strata Change ft	Sample Description
		No.	Depth ft	Pen."	Rec."	Blows/6"		
		S1	0.0-2.0	24	19	3-6-10-29		S1 Medium dense brown fine to medium SAND & fine to medium gravel, some coarse gravel & silt
5		S2	4.0-6.0	24	20	21-23-17-17		S2 Dense brown fine to medium SAND & fine to medium gravel some coarse gravel & silt
10		S3	10.0-12.0	24	14	10-14-28-37	9.5 12.0	S3 Dense brown medium to coarse SAND & gravel, trace cobbles & fine sand
15								Bottom of exploration at 12'
20								
25								
30								

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/Ft.				Cohesionless Density Blows/Ft.		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer

Notes: 1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

EARTH EXPLORATION, INC.

CLIENT: Hager-Richter Geoscience, Inc.

BORING #:

B100

PROJECT: Local Water Main Improvements

PAGE

LOCATION: River Road, Weston, Mass.

1 OF 1

88 ELM STREET · HOPKINTON, MASSACHUSETTS 01748
TEL (508) 435-5543 FAX (508) 435-5512

File #: 96228-EE CASING HW SAMPLER SS CORE BARREL _____ Surface Elevation: _____
Date Started: 1/6/97 TYPE HW Station: _____
Date Completed: 1/6/97 SIZE 4" 1-3/8" Groundwater level readings _____
Driller: T. Galvin HAMMER 300# 140# Date _____ Depth _____
Site Rep.: C. Martin FALL 24" 30" Date _____ Depth _____

Depth ft	Cas bl/ ft	Sample				Strata Change ft	Sample Description
		No.	Depth ft	Pen."	Rec."	Blows/6"	
		S1	0.3-2.3	24	13	49-22-24-18	S1 Very dense brown fine to medium silty SAND & gravel
5		S2	4.0-5.3	15	0	11-15 100/3"	S2 No recovery
						6.0	Bottom of exploration at 6'
10							
15							
20							
25							
30							

Ground Surface to _____ used _____ then _____

Proportions Used		Cohesive Consistency Blows/Ft.				Cohesionless Density Blows/Ft.		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31 +	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50 +	V-Dense	* = 300# hammer

Notes: 1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

BL 96228 3/25/97

EARTH EXPLORATION, INC.

CLIENT: Hager-Richter Geoscience, Inc.

PROJECT: Local Water Main Improvements

LOCATION: River Road, Weston, Mass.

BORING #:

B99

PAGE

1 OF 1

88 ELM STREET • HOPKINTON, MASSACHUSETTS 01748
TEL (508) 435-5543 FAX (508) 435-5512

File #: 96228-EE CASING HW SAMPLER SS CORE BARREL _____ Surface Elevation: _____
Date Started: 1/6/97 TYPE _____ Station: _____
Date Completed: 1/6/97 SIZE 4" 1-3/8" _____ Groundwater level readings _____
Driller: R. Eastwood HAMMER 300# 140# _____ Date _____ Depth _____
Site Rep.: C. Martin FALL 24" 30" _____ Date _____ Depth _____

Depth ft	Cas bl/ ft	Sample				Strata Change ft	Sample Description
		No.	Depth ft	Pen."	Rec."	Blows/6"	
		S1	0.5-2.5	24	16	52-47-38-61	S1 Very dense brown fine to medium silty SAND & gravel
5		S2	4.0-6.0	24	13	94-37*50*	S2 Very dense brown medium to coarse SAND & gravel, some fine sand & silt
10		S3	10.0-12.0	24	12	37-42-50-71	S3 Very dense brown to gray medium to coarse SAND & gravel, cobbles & silt
15							Bottom of exploration at 12'
20							
25							
30							

Ground Surface to _____ used _____ then _____			
Proportions Used		Cohesive Consistency Blows/Ft.	
Trace	0 to 10%	0-2 Very Soft	9-15 Stiff
Little	10 to 20%	3-4 Soft	16-30 V-Stiff
Some	20 to 35%	5-8 M-Stiff	31+ Hard
And	35 to 50%		
		Cohesionless Density Blows/Ft.	
		0-10 Loose	
		10-30 M-Dense	
		30-50 Dense	
		50+ V-Dense	
		Sample Type	
		UP = Fixed Piston	
		UT = Shelby Tube	
		OE = Open End Rod	
		* = 300# hammer	

Notes: 1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

MWRA Contract No. 2338 1937 Project
Waltham, MA

TEST BORING REPORT RAYMOND

CONCRETE PILE COMPANY 304 Park Sq. Building

NEW YORK

GOW DIVISION

304 Park Sq. Building

BOSTON 16, Massachusetts

To The Commonwealth of Massachusetts

Date January 3rd

1956 Job No. 8-165172BOS

Location of Borings Contract No. 233, S. Charles Relief Sewer, WALTHAM, Massachusetts.

All borings are plotted to a scale of 1" = 8 ft. using _____ as a fixed datum.

No. 36

No. 37

No. 28

No. 39

[illegible]

TB37

TB37	
ELEV. 146.81	
HARD SAND, GRAVEL & CINDERS FILL.	2.0'
VERY COMPACT COARSE SAND, GRAVEL, BOULDERS & LITTLE CLAY.	132 6.0'
BOULDER.	8.0'
VERY COMPACT COARSE SAND, GRAVEL, BOULDERS & LITTLE CLAY.	98 10.0'
COMPACT COARSE SAND, GRAVEL, BOULDERS & LITTLE CLAY.	82 12.5'
20.0'	
WATER LEVEL TAKEN THIRTY MINUTES AFTER COMPLETION.	
FOREMAN REPORTS BOULDER DRIVEN AHEAD OF SAMPLER FROM 81 TO 110.	
WATER LEVELS INDICATED AT COMPLETION OF EACH BORING, PROBABLY REPRESENT PERMANENT WATER LEVELS.	
TESTS TAKEN WITH TWO	

TB38

ELEV. 146.21		
LOOSE LOAMY SAND, GRAVEL, CINDERS FILL.		3.0'
VERY COMPACT COARSE SAND, BOULDERS & LITTLE CLAY.	98	4.2'
		WATER 5.5'
HARD COARSE SAND, GRAVEL & CLAY.	120	
		12.0'
VERY COMPACT COARSE SAND, GRAVEL & LITTLE CLAY.	93	
	180	20.0'
WATER LEVEL TAKEN THREE HOURS AFTER COMPLETION.		
THOSE OBSERVED BY THE ICE AS NOTED, AND DO NOT GO INTO GROUND WATER.		
10 INCH SPLIT SAMPLE		
BENT 10 INCH 5/7 BARS		
12 INCH 3/4		

TB39

ELEV. 146.21	
HARD SAND, GRAVEL, BRICK, CINDERS FILL	
VERY COMPACT GRAVEL SAND, BOULDERS & LITTLE CLAY	85
COMPACT COARSE SAND, GRAVEL, BOULDERS & LITTLE CLAY	49
VERY COMPACT COARSE SAND, GRAVEL, BOULDERS & LITTLE CLAY	310
WATER LEVEL TAKEN THIRTY MINUTES AFTER COMPLETION	

WATER LEVELS INDICATED ARE THOSE OBSERVED AT COMPLETION OF EACH BORING OR AS NOTED AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS.

SAMPLES TAKEN WITH TWO INCH SPLIT SAMPLERS

WENT 10:00 25 JUL 63
MURKIN 11:00 25 JUL 63

Total Roofage: 30,000

BOGARD, R. K. - BOGARD

Classification by

3105 2453 13

Figures in right hand column indicate number of blow results to drive sampling pipe one foot using a 60 lb weight falling 30 inches

TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY 30 Park St. Building

NEW YORK

COW DIVISION

304 Park Sq. Building

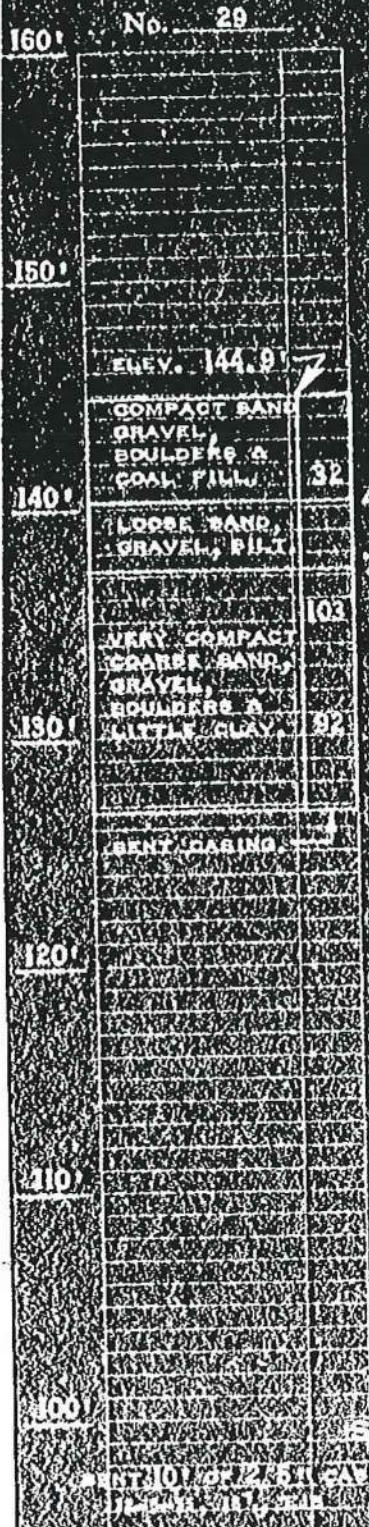
BOSTON 16, Massachusetts

To The Commonwealth of Massachusetts

Date January 23rd 1956 Job No. B-16517-E03

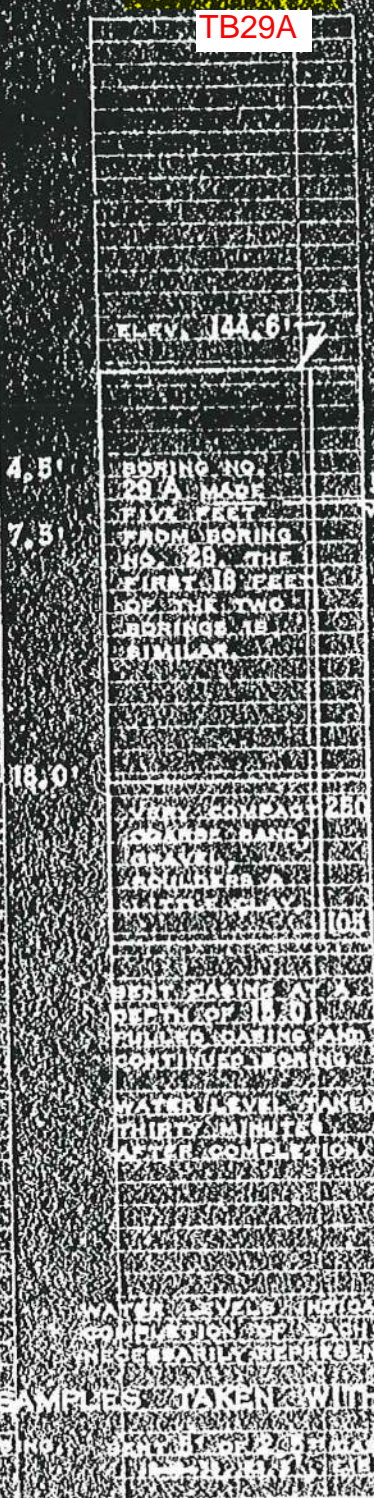
Location of Borings Contract No. 233, S. Charles Hall of Somer. 1. ALTHAM, Massachusetts.

All borings are plotted to a scale of 1" = 8' ft. using _____ as a fixed datum.



No. 29 A

TB29A



No. 30



No. 13

TB31



Boat People

1900年11月11日

Classification by

1990年11月10日

[Faint handwritten notes at the bottom of the page]

TEST BORING REPORT RAYMOND

CONCRETE PILE COMPANY 304 Park Sq. Building

NEW YORK

GOW DIVISION

BOSTON 16, Massachusetts

To The Commonwealth of Massachusetts

Date January 3rd 1955

Job No. B-16517-509

Location of Borings Contract No. 233, S. Charles Relief Saker, WALTHAM, Massachusetts.

All borings are plotted to a scale of 1" = 5 ft. using as a fixed datum.

60'

No. 27

No. 27A

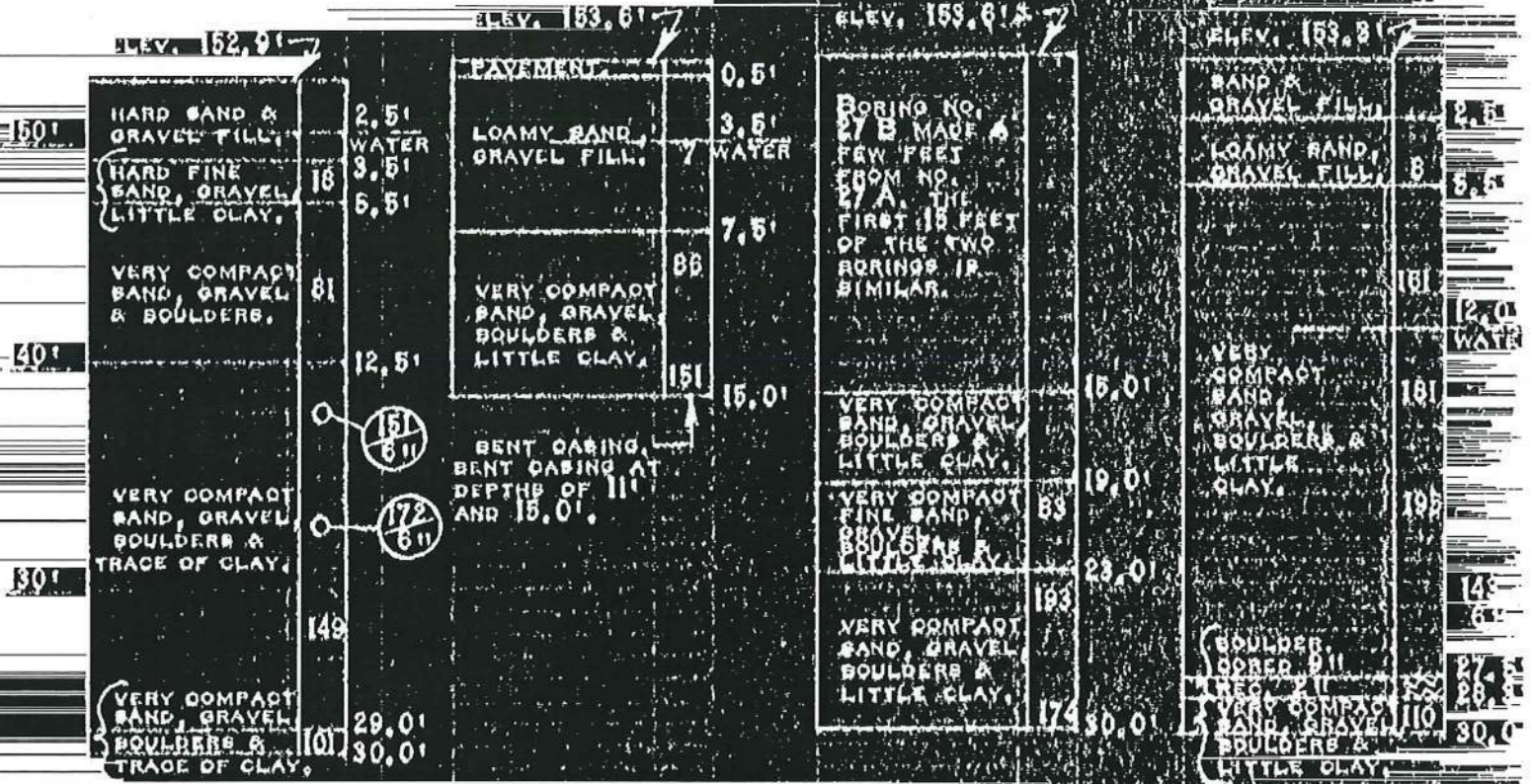
No. 27B

No. 28A

TB27

TB27A

TB28A



FOREMAN REPORTS LOSS OF WASH WATER WHILE CORING BOULDER. SAMPLE AT THE DEPTH OF 30.0' TAKEN WITH ONE INCH PIPE SAMPLER.

MADE THREE TRIALS AT THIS LOCATION, HIT AN OBSTRUCTION IN EACH TRIAL AT DEPTHS OF 7.5', 6.0', AND 19.0'.

WATER LEVEL TAKEN 55 HOURS AFTER COMPLETION.

WATER LEVELS INDICATED ARE THOSE OBSERVED AT THE COMPLETION OF EACH BORING, OR AS NOTED, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS.

SAMPLES TAKEN WITH TWO INCH SPLIT SAMPLER.

BENT 10' OF 2.5" CASING.

12-9-55, 27, 8'

12-27-55

12-27-55, 27B

12-14-55, 27A

Total Footage 131.5'

Figures in right hand column indicate number of blows required to drive Peterson-Ralph V. Long sampling pipe one foot, using 140 lb. weight falling 30 inches.

Classification by Sheet 2 of 13

TEST BORING REPORT

RAYMOND

CONCRETE PILE COMPANY 304 Park Sq. Building

NEW YORK

GOW DIVISION

BOSTON 36, Massachusetts

To The Commonwealth of Massachusetts

Date January 3rd 19 55 Job No. 8-16517-809

Location of Borings Contract No. 233, S. Charles Relief Sagar, WALTHAM, Massachusetts

All borings are plotted to a scale of 1" = 8 ft. using _____ as a fixed datum.

160

No. 23 A

No. 24

No. 25

No. 26

TB25

TB26

150

ELEV. 152.3' - 2

FIRM COARSE
SAND, GRAVEL,
BOULDERS FILL

FIRM COARSE
SAND, GRAVEL
LITTLE CLAY.

140

130

HARD
MEDIUM
BAND,
LITTLE
FINE
GRAVEL &
TRACE OF
CLAY.

120

VERY COMPACT
COARSE SAND,
GRAVEL
BOULDERS &
LITTLE CLAY.

110

WATER LEVEL TAKEN
THIRTY MINUTES
AFTER COMPLETION

ELEV. 153.2'

**SAND &
GRAVEL FILL.**

COMPACT
MEDIUM
BAND,
GRAVEL &
BOULDERS.

HARD FINE
YELLOW SAND
LITTLE FINE
GRAVEL &
LITTLE IMOA

VERY COMPACT
MEDIUM
SAND, GRAVEL
& BOULDERS.

VERY COMPACT
COARSE SAND
GRAVEL &
BOULDERS &
LITTLE CLAY

REFUGAL, 100201

WATER LEVEL TAKEN
THIRTY MINUTES
AFTER COMPLETION.

WATER LEVELS INDICATED ARE THOSE OBSERVED AT THE COMPLETION OF EACH BORING, OR AS NOTED, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS.

SAMPLES TAKEN WITH TWO INCH SPIGOT SAMPLER

E. J. BOUDREAU
421P-984391

1. MONAGHAN, D. D. 1973.
2. BOUREAU, J. 1973.
3. 1973.

BOUDREAU
1971

PHOTOGRAPHY

Total Profit = 128.95

EBERYL SIBAN

CHARTERED 1916

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Figures in right hand column indicate number of shows required to drive sampling pipe one foot, using 220 lb. weight running 30 in. dia.

Mass. Dept. of Public Works
Research & Materials Section
Soils & Foundation Unit.
R & M 522

BORING PROFILES

TB2

Town: WALTHAM (W-4-23)

Road: WINTER STREET

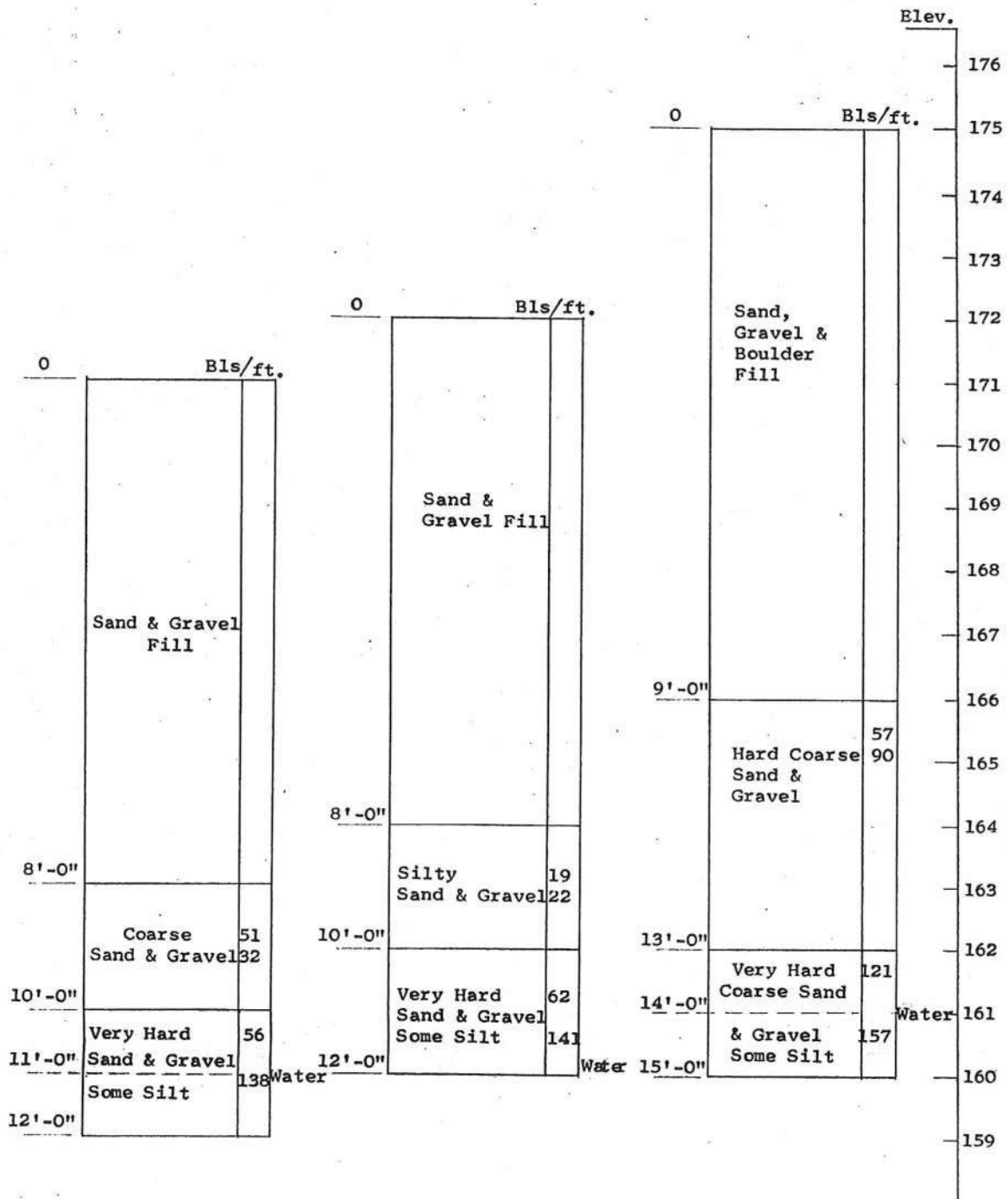
Date: June 30, 1966

Vert. Scale: 1"=2'-0"

Boring No. 1
Sta. 25+55, 30' Lt.
Grnd. Elev. 171.0

Boring No. 2
Sta. 25+92, 26' Lt.
Grnd. Elev. 172.0

Boring No. 3
Sta. 26+00 @ R.
Grnd. Elev. 175.0



MWRA Contract No. 59 1937 Project
Weston, MA

COMMONWEALTH OF MASSACHUSETTS
MET. DIST. WATER SUPPLY COMMISSION
RECORD OF BORINGS CONTRACT NO 58
MIDDLESEX, NORFOLK, SUFFOLK AND WORCESTER COUNTIES

SHEET 16 OF 22 SHEETS

937

Contract Awarded March 23 1937 to Pennsylvania Drilling Co., Pittsburg, Penn.
 Work started April 8 1937; completed December 18 1937.

Item 1 \$2.75 Per Foot
 Item 2 \$3.25 Per Foot

HOLE NO.	STATION	LOCATION		SIZE OF CASING	ELEVATION OF		DEPTH TO LEDGE	LEDGE PENETRATION	CORE RECOVER %	NATURE OF LEDGE	ITEM 1	ITEM 2	BEGUN 1937	COMPLETED	ACTUAL DRILLING TIME PER HOUR	FEET DRILLED
		N	E		GROUND	LEDGE										
1	0+41	30483	83405	2 1/2"	284.88	264.88	20.0	280.93	96.1	Biotite Schist and Granite	20.00	280.93	4/26	5/6	76:55	3.65
2	204+48	28050	103749	2 1/2, 3 1/2"	260.24	241.20	19.04	58.42	45.77	Chlorite Schist	19.22	44.00	7/13	7/16	8:20	7.0
3	238+42	27646	107118	2 1/2, 3 1/2"	263.92	204.40	59.52	48.00	48.7	Granite and Biotite Schist	59.50	37.78	6/28	7/10	8:20	5.76
4	266+89	27308	109945	2 1/2"	200.25	191.16	9.09	215.08	62.5	Biotite Schist and Granite	9.09	198.88	5/7	5/18	71:40	3.0
5A	339+14	28816	117011	2 1/2, 3 1/2"	217.46	187.04	30.42	30.04	66.8	Biotite Gneiss	30.42	29.08	7/17	7/21	5:40	5.3
6	346+68	28982	117747	2 1/2, 3 1/2"	206.69	138.33	68.36	29.33	82.0	Gneiss	68.36	29.33	6/11	6/22	10:15	2.86
7A	354+46	29145	118508	2 1/2, 3 1/2"	209.20	171.58	37.62	38.08	85.3	Biotite Gneiss	37.62	38.08	6/22	6/25	7:15	5.25
8	426+57	30656	125558	2 1/2"	175.82	163.82	12.00	254.00	90.68	Chlorite Schist	12.00	254.00	5/19	5/24	Not Noted	
9	458+74	31256	128717	2 1/2, 3 1/2"	184.19	171.52	12.67	31.00	84.8	Mica Schist	12.67	31.00	4/12	4/14	3:21	9.25
10	482+23	31604	131040	2 1/2, 3 1/2"	165.80	137.55	28.25	20.08	86.75	Greenstone	28.25	20.08	4/12	4/15	3:05	6.5
11	502+19	31830	133026	2 1/2, 3 1/2"	157.00	83.43	73.57	30.33	97.8	Chlorite Schist	73.57	30.33	4/16	4/20	2:35	11.7
12A	513+31	32073	134113	2 1/2, 3 1/2"	168.55	87.84	80.71	31.04	99.2	Mica Schist	80.71	31.04	4/21	4/27	2:35	12.0
13	524+53	32232	135224	2 1/2, 3 1/2"	134.10	112.60	21.50	30.42	83.1	Muscovite Schist	21.28	30.42	4/16	4/17	3:06	9.6
14	543+11	32507	137061	2 1/2, 3 1/2"	183.08	82.35	100.73	35.21	64.8	Chlorite Schist	100.73	33.38	4/20	4/24	3:40	9.6
15	559+71	32744	138703	2 1/2, 3 1/2"	162.10	31.90	130.20	32.83	67.0	Chlorite Schist	130.20	31.85	4/26	5/1	3:30	9.38
16A1		34846	139691	2 1/2, 3 1/2, 6"	180.5	Abandoned	11/12/37 at depth of 171'	(EL. 9.5)					10/28	Did not reach ledge		
16A2		34872	139719	2 1/2, 4 1/2, 6"	175.50	-45.50	221.00	29.60	79.7	Granite	218.55	32.25	11/15	12/3	6:45	4.4
17	574+82	32977	140197	2 1/2, 1 1/2"	152.30	Abandoned	6/8/37 at depth of 242.2'	(EL. -92.2)					4/28	Did not reach ledge		
18A	587+13	33160	141417	2 1/2, 4", 4 1/2, 6"	190.11	-28.11	218.22	83.29	66.6	Diabase and Granite	218.22	80.46	5/12	6/1	27:35	3.0
18B	580+64	33076	140773	2 1/2, 4 1/2, 6"	190.06	-49.42	239.48	69.58	34.1	Chlorite Granite and Diabase	289.48	48.71	6/5	6/17	10:25	6.68
19	598+31	33325	142520	2 1/2, 4"	189.45	75.35	114.10	38.75	68.8	Diabase and Greenstone	114.10	38.29	5/4	5/11	5:40	6.8
20	636+04	33870	146152	2 1/2"	183.00	157.00	26.00	407.00	79.7	Quartzite and Diabase	26.00	407.00	5/26	6/16	11:22	3.65
21	81+16	36969	163486	2 1/2"	245.00	214.40	30.60	519.90	92.3	Granite	30.60	519.90	6/17	7/15	Not Noted	
22A	825+20	40840	170945	3"	89.90	60.40	29.50	53.040	67.36	Granodiorite	29.50	51.640	7/13	8/16		
23	901+78	41143	171528	3", 4 1/2, 6"	51.60	-6.40	58.00	315.00	62.5	Granodiorite	58.00	291.38	7/12	9/8		
24A	911+01	41049	172448	2 1/2, 3 1/2"	48.30	-75.20	123.50	233.50	40.0	Volcanic Breccia	123.50	163.45	5/24	6/15		
24B	904+70	41149	171823	2 1/2, 3 1/2"	43.00	-76.35	119.35	255.65	82.4	Granodiorite and Volcanic Breccia	119.35	178.96	6/17	7/10		
25	918+06	41005	173152	2 1/2, 3", 3 1/2"	56.09	0.92	55.17	60.58	56.2	Volcanic Breccia	55.17	52.22	5/13	5/19	12:38	4.80
26	941+73	40851	175514	2 1/2"	104.72	84.62	20.10	40.25	76.0	Dark Gray Shales	20.10	40.25	5/20	5/22	Not Noted	
27	1039+11	39980	185213	2 1/2, 3 1/2"	112.50	87.50	25.0	502.50	98.1	Green Shales and Volcanics	25.00	502.50	6/30	7/20	67:06	7.49
28	1056+96	39555	181965	3", 4"	160.80	40.00	120.80	34.42	56.9	Greenish Shales	120.80	29.91	8/27	9/4	4:50	7.12
29	1082+89	39312	189540	3 1/2, 4"	161.40	36.50	124.90	30.00	55.97	Dark Gray Shales	124.90	25.80	9/7	9/16	4:05	7.35
30	1199+57	37581	201072	2 1/2"	116.72	87.72	29.00	403.48	67.29	Dark Gray Shales	29.00	392.57	6/9	6/29	66:55	6.01
31	1246+29	37487	205743	1 1/2, 2 1/2, 3 1/2"	95.70	15.12	80.58	103.04	48.9	Light Brown Shale	80.58	81.30	6/17	7/2	For 1/2 of hole	4.44
32	1264+91	37469	207605	1 1/2, 2 1/2, 3 1/2"	85.20	-27.60	112.80	72.50	10.16	Gray Sandstone	112.80	50.75	8/7	8/26	12:50	5.65
33	1286+69	37423	209783	2 1/2, 3 1/2, 4"	47.50	-83.56	131.08	96.92	37.2	Conglomerate	131.08	67.84	7/17	8/3	Not Noted	
34	1311+03	37425	212217	3 1/2"	18.25	-91.41	106.66	60.75	54.0	Gray Shale	106.66	51.03	5/10	5/19	10:07	6.0
35	1313+73	37423	212487	1 1/2, 2 1/2, 3 1/2"	21.90	-118.60	140.50	101.87	31.33	Gray Shale	140.50	71.31	4/21	6/15	15:30	6.58
36A	1322+92	37414	213405	2 1/2, 3"	38.61	-5.60	44.21	30.18	92.2	Conglomerate	44.21	30.18	6/19	6/25	10:31	2.87
Total Pay Quantities											2871.72	4792.64				

Elevations: Boston City Base.

Coordinates: Wachusett System of the Water Div., M.D.C.

LOCATION OF BORINGS:

Alternative Pressure Tunnel Line: Nos. 1 to 17, incl.

South Line of Pressure Tunnel Loop: Nos. 17-A to 41-B, incl. and 52.

North Line of Pressure Tunnel Loop: Nos. 52-A, 52-B, 54 to 60, incl.

South Branch Tunnel to Franklin Field: Nos. 49 to 51, incl.

Exploration in Northborough: Nos. A-1, A-2 and A-3.

Exploration in East Boston: Nos. 43, 43-A and 43-B.

Exploration in Chelsea: No. 45.

Exploration at North End of Lake Cochituate: Nos. 12-A-1, 12-A-2.

Numbers not used: 42, 44, 46, 47, 48, 69.

Drawn: F.W.S. - CHLD, G.W.S.

Traced: J.H.B. - CHLD, G.W.S.

FILE CONT 58 336

Acc. 25.041

Appendix B

Boring and Monitoring Well Installation Logs

Boring Number:
B-1

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 85.68

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 28 River Rd., Weston, MA

Depth	Date	Time
-------	------	------


Northing: 2950924.3547 **Easting:** 719979.0651

NE 11/29/2017 09:35

Drilling Date: Start: 11/29/2017 **End:** 11/29/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
85.7 0				5 6 7 14	12	13			6" Topsoil	
	SS	S-1	24	15 34 42 18	14	76			Moist, medium dense, brown, fine to medium SAND, little silt, little fine gravel	Analytical sample (4'-6')
	SS	S-2	24	16 18 16 16	8	34			Moist, very dense, light brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
80.7 5	SS	S-3	24	19 27 24 18	12	51			Moist, dense, light brown, fine to medium SAND, some fine to coarse gravel, trace silt	
	SS	S-4	24	13 10 9 9	10	19			Wet, very dense, gray-brown, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-5	24						Wet, medium dense, gray-brown, fine to coarse SAND, little fine gravel, trace silt	
75.7 10										
70.7 15	SS	S-6	24	10 9 15 11	1	24			Wet, medium dense, gray-brown, fine to coarse SAND, little fine gravel, trace silt	Coarse gravel in spoon tip.
65.7									Test boring B-1 terminated at 16' bgs and backfilled with soil cuttings.	

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%
moisture, density, color	

Reviewed by:

Date:

Boring Number: B-1



Boring Number: B-2

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 80.15**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 44 River Rd., Weston, MA**Depth Date Time****Northing:** 2951336.9957 **Easting:** 720113.614

10.9 12/11 12:40

Drilling Date: Start: 12/11/2017 **End:** 12/11/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
80.2 0								Topsoil	42" Topsoil: Moist, brown, fine to coarse SAND, some silt, trace fine gravel, trace organics	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--				
75.2 5									Moist, brown, fine to coarse SAND and fine to coarse GRAVEL, trace to little silt	Analytical sample (2'-2.5')
	SS	S-1	24	32 76 76 42	14	>100			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, little silt	Corrosion sample (6'-8')
	SS	S-2	18	30 48 100	12	>100			Top 8": Moist, very dense, brown, fine SAND, little silt Bottom 4": Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Rollerbit through boulder from 9.5 to 11' bgs.
70.2 10										
	SS	S-3	24	50 56 60 42	10	>100			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
65.2 15										
									Test boring B-2 terminated at 16' bgs and backfilled with soil cuttings.	
60.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-2**



Boring Number: B-4

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 79.01**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** River Rd./Prescott Ln., Weston, MA**Depth Date Time****Northing:** 2952499.7577 **Easting:** 720002.1819

9.0 12/6/2017 10:00

Drilling Date: Start: 12/6/2017 **End:** 12/6/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
79.0 0									12" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--			Moist, brown, fine to medium SAND, some silt, trace fine gravel	Analytical sample (2.5'-3')
74.0 5	VE	V-2			--	--			Moist, brown, fine SAND, little fine to coarse gravel, trace to little silt	Analytical sample (5'-5.5')
	SS	S-1	24	16 30 21 16	12	51			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	24	20 16 20 23	12	36			Moist, dense, light brown, fine SAND, some silt	
69.0 10										
64.0 15	SS	S-3	24	17 21 19 17	10	40			Wet, dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
									Test boring B-4 terminated at 16' bgs and backfilled with soil cuttings.	
59.0										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose:	0-4	Dense:	30-50	
						Loose:	4-10	V. Dense:	>50	
						M. Dense:	10-30			
						V. Soft:	<2	Stiff:	8-15	and 35-50%
						Soft:	2-4	V. Stiff:	15-30	some 20-35%
						M. Stiff:	4-8	Hard:	>30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:	Boring Number: B-4	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

**Boring Number:
B-5**



Boring Number: B-6

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 76.21**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 139 River Rd., Weston, MA**Depth Date Time****Northing:** 2953595.3338 **Easting:** 719974.3851

NE 12/1/2017 12:40

Drilling Date: Start: 12/1/2017 **End:** 12/1/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
76.2 0									18" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--			Moist, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-2.5')
71.2 5										
	SS	S-1	24	20 20 54 18	12	74		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	24	20 35 28 26	16	63			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
66.2 10										
61.2 15	SS	S-3	24	9 12 11 12	12	23		Silty Sand	Moist, medium dense, brown, fine SAND, some silt	
									Test boring B-6 terminated at 16' bgs and backfilled with soil cuttings.	
56.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-6**

Boring Number:
B-7

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 60.77

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 24.7

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Gate House Ln., Weston, MA

Depth	Date	Time
-------	------	------

Northings: 2954140.7322 **Easting:** 720062.8788

11.1 11/28/2017 13:20

Drilling Date: Start: 11/27/2017 **End:** 11/28/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
60.8 0	SS	S-1	24	2 5 7 6	15	12			36" Topsoil	Analytical sample (0'-2')
	SS	S-2	10	10 100/4"	4	>100				
								Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, some silt	Rollerbit through boulder from 3 to 4' bgs.
55.8 5	SS	S-3	16	22 33 100/4"	10	>100				
	SS	S-4	18	14 28 100	10	>100				
	SS	S-5	6	100/6"	3	--				
50.8 10								Sand and Gravel	Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
	SS	S-6	3	100/3"	3	--		Silty Sand	Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
45.8 15										
	SS	S-7	1	100/1"	1	--		Silty Sand	Wet, very dense, brown, fine to medium SAND, little silt	
40.8										

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture density color	

Reviewed by:

Date:

Boring Number: B-7

**Boring Number:
B-7**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170[illegible]

Boring Number: B-7



Boring Number: B-8

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 57.99**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 800 South St., Waltham, MA**Depth Date Time****Northing:** 2954553.6435 **Easting:** 720278.0534

NE NE NE

Drilling Date: Start: 12/27/2017 **End:** 1/11/2018**Abandonment Method:** Backfilled with soil cuttings**Logged By:** D. Abt

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
58.0 0	VE	V-1			--	--		Sand and Gravel	3" Topsoil: Dry, brown, fine to coarse SAND, some fine gravel, trace silt Dry, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Vacuum excavate test boring from the ground surface to 4.2' bgs.
	VE	V-2			--	--			Dry, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (3'-4')
53.0 5									Rollerbit refusal at 5.1' bgs. The field crew determined that the obstruction could be an unmarked utility and offset to boring location B-8A.	
48.0 10										
43.0 15										
38.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-8**



Boring Number: B-8A

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 57.99**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 800 South St., Waltham, MA**Depth Date Time****Northing:** 2954553.6435 **Easting:** 720278.0534

14 1/29/2018 10:25

Drilling Date: Start: 1/24/2018 **End:** 1/29/2018**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
58.0 0								Topsoil	9" Topsoil	Vacuum excavate test boring from the ground surface to 4.5' bgs. Cobbles and boulders visible throughout vacuum excavated hole. Analytical sample (2'-4') taken on 12/24/2017.
	VE	V-1			--	--			Moist, gray, fine to medium SAND, some fine to coarse gravel, little silt Moist, brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt	
53.0 5									See core log for description	
	NX	C-1	60		28	--		Sand and Gravel		
48.0 10										
	SS	S-1	4	100/4"	3	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
43.0 15	SS	S-2	24	12 15 25 28	16	40			Wet, dense, brown, fine SAND, trace silt	
									Test boring B-8 terminated at 16' bgs and backfilled with soil cuttings.	
38.0										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Loose: 4-10 M. Dense: 10-30		Fine Grained (Clay): Dense: 30-50 V. Dense: >50		and some 35-50% little 20-35% trace 10-20% moisture, density, color <10%
Reviewed by:						Date:			Boring Number: B-8A	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-8A

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 57.99**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 800 South St., Waltham, MA**Depth Date Time****Northing:** 2954553.6435 **Easting:** 720278.0534

14 1/29/2018 10:25

Drilling Date: Start: 1/24/2018 **End:** 1/29/2018**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks		
5.0						NR				Hard, extremely fractured, slightly weathered, gray to white, coarse grained, GRAVEL and COBBLES	Core run consists of fractured cobbles and boulders.		
48.0	NX	C-1	60	47	0		NR		Cobbles and Boulders				
10.0										Continue split spoon sampling at 10' bgs.			
43.0													
15.0													
38.0													
20.0													
33.0													
Bedding (mm)				Joint Spacing (mm)				Continuity (mm)		Attitude Angle	Aperture (mm)		
Extremely Thin	<20			Extremely Close	<20			Extremely	<25	Horizontal	0° - 5°	Very Tight	< 0.1
Very Thin	20-60			Very Close	20-60			Moderately	25-100	Shallow	5° - 35°	Tight	0.1 - 0.25
Thin	60-200			Close	60-200			Slightly	100-200	Moderate	35° - 55°	Partly Open	0.25 - 0.5
Medium	200-600			Mod Close	200-600			Sound	>200	Steep	55° - 85°	Open	0.5 - 2.5
Thick	600-2000			Wide	600-2000					Vertical	85° - 90°	Mod. Wide	2.5 - 10
Very Thick	2000-6000			Very Wide	2000-6000							Wide	>10
Extremely Thick	>6000			Extremely Wide	>6000								
Field Hardness				Weathering									
Very Hard	Knife Can't Scratch			Fresh	No Visible sign of rock material weathering; slight to no discoloration.								
Hard	Scratches with Difficulty			Slight	Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.								
Med. Hard	Scratches Readily			Moderate	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.								
Medium	Grooves with Difficulty			Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.								
Soft	Grooves Readily			Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.								
Very Soft	Carves with Knife			Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.								
Reviewed by:								Date:		Boring Number: B-8A			



Boring Number: B-9 (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 53.56

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 21

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: South St./Charles River Rd., Waltham, MA

Depth Date Time

Northing: 2954994.4460 Easting: 720460.624

9.0 11/30/2017 10:00

Drilling Date: Start: 11/30/2017 End: 11/30/2017

Abandonment Method: Monitoring well installed

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks	
53.6 0									5" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.	
	VE	V-1			--	--		Sand and Gravel	Gravel Base: Moist, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (2'-2.5')	
	VE	V-2			--	--			Moist, dark brown, Organic SILT, trace sand, trace fine gravel		
48.6 5									Moist, brown, fine to coarse SAND, some fine to coarse gravel, some silt		
	SS	S-1	24	13 21 2 5	6	23			Wet, medium dense, brown, fine to coarse SAND, some slightly organic silt, some fine gravel, trace organic fibers	Corrosion sample (6'-8')	
▼	SS	S-2	24	10 9 15 16	4	24			Wet, medium dense, brown, fine to medium SAND, some silt, some fine gravel, trace organic fibers		
43.6 10											
	SS	S-3	24	10 13 36 52	10	49			Wet, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
38.6 15											
	SS	S-4	24	18 38 33 22	8	71			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
33.6 20											
									Test boring B-9 (MW) terminated at 21' bgs and converted into a monitoring well.		
28.6											
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe				Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30	
										Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30	
										and some 35-50% little 20-35% trace 10-20% moisture, density, color <10%	
Reviewed by:								Date:		Boring Number: B-9 (MW)	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-10

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 58.1**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 52 Charles River Rd., Waltham, MA**Depth Date Time****Northing:** 2955208.8030 **Easting:** 720983.944

NE 11/27/2017 10:35

Drilling Date: Start: 11/27/2017 **End:** 11/27/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
58.1 0				3					8" Topsoil	
	SS	S-1	24	8 13 10	15	21		Fill	Bottom 7": Moist, medium dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	24	6 27 35 100	8	62			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
53.1 5	SS	S-3	24	20 18 17 9	6	35		Sand and Gravel	Wet, dense, brown-gray, fine to coarse SAND, some fine gravel, trace silt	Analytical sample (4'-6')
	SS	S-4	24	9 15 14 22	8	29			Wet, medium dense, brown, fine to medium SAND, trace silt, trace fine gravel	
	SS	S-5	24	22 16 30 31	3	46			Wet, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
48.1 10										
43.1 15	SS	S-6	24	16 22 20 60	5	42			Wet, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
									Test boring B-10 terminated at 16' bgs and backfilled with soil cuttings.	
38.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-10**

**Boring Number:
B-11**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 59.1

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 98 Charles River Rd., Waltham, MA

Depth	Date	Time
-------	------	------

Northings: 2955519.2640 **Easting:** 721477.3143

NE 11/14/2017 13:20

Drilling Date: Start: 11/14/2017 **End:** 11/14/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-11



Boring Number: B-12

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 61.1**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 110 Angleside Rd., Waltham, MA**Depth Date Time****Northing:** 2955956.5908 **Easting:** 721803.1967

NE 11/29/2017 13:30

Drilling Date: Start: 11/29/2017 **End:** 11/29/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
61.1 0									2" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1	6		--	--			Moist, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-2.5')
56.1 5										
	SS	S-1	24	16 15 14 10	10	29			Moist, medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-2	24	12 12 14 16	16	26			Moist, medium dense, dark brown, fine to medium SAND, trace silt, trace fine gravel	
51.1 10										
	SS	S-3	24	15 23 21 14	10	44			Wet, dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
46.1 15										
									Test boring B-12 terminated at 16' bgs and backfilled with soil cuttings.	
41.1										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30				
Reviewed by:								Date:		Boring Number: B-12

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-13

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 71.39**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 85 Suyer Rd., Waltham, MA**Depth Date Time****Northing:** 2956567.2811 **Easting:** 722088.8573

NE 12/12/2017 11:55

Drilling Date: Start: 12/12/2017 **End:** 12/12/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks		
71.4												
0	SS	S-1	24	14 100/4"	18	>100			12" Topsoil			
								Fill	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt			
	SS	S-2	24	32 25 26 26	10	51		Silty Sand	Dry, very dense, brown, fine to medium SAND and SILT, trace fine gravel	Analytical sample (2'-4')		
66.4 5	SS	S-3	24	45 66 30 23	10	96			Dry, very dense, brown, fine to medium SAND and SILT, trace fine gravel	Analytical sample (4'-6')		
	SS	S-4	24	35 34 18 33	8	52			Dry, very dense, brown, fine to coarse SAND, some fine gravel, some silt	Corrosion sample (6'-8')		
	SS	S-5	24	25 18 16 18	12	34			Dry, dense, brown, fine to medium SAND and SILT, trace fine gravel			
61.4 10												
								Sand and Gravel				
56.4 15	SS	S-6	24	44 40 66 66	10	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	No monitoring well installed due to not encountering water in the borehole.		
									Test boring B-13 terminated at 16' bgs and backfilled with soil cuttings.			
51.4												
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification		
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30		Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30		and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color		
Reviewed by:									Date:		Boring Number: B-13	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Boring Number:
B-14

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 73.63

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Stanley Ave./Lt. L. Duffy Ave., Waltham, MA

Depth	Date	Time
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Northing: 2957004.6964 **Easting:** 722143.7997

12.0	11/08/2017	08:30
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Drilling Date: Start: 11/7/2017 End: 11/8/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks			
73.6													
0				4					8" Topsoil				
	SS	S-1	24	8 38 55	12	46			Bottom 4": Moist, dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (4'-6')			
	SS	S-2	6	100	6	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt				
68.6 5	SS	S-3	24	24 26 30 32	12	56			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt				
	SS	S-4	6	100	5	--			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt				
	SS	S-5	24	15 22 26 19	8	48			Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt				
63.6 10													
58.6 15	SS	S-6	24	100 52 72 100	16	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt				
									Test boring B-14 terminated at 16' bgs and backfilled with soil cuttings.				
53.6													
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification			
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe		Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30		Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30		and some little trace moisture, density, color	
Reviewed by:									Date:		Boring Number: B-14		

**Boring Number:
B-16**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 77.96

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Howe Ave./Lt. L. Duffy Ave., Waltham, MA

Depth	Date	Time
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Northing: 2957384.4010 **Easting:** 722328.183

NE 11/21/2017 09:30

Drilling Date: Start: 11/21/2017 **End:** 11/21/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-16



Boring Number: B-17 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 75.26**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 21**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Clark Ave./Howe Ave., Waltham, MA**Depth Date Time****Northing:** 2957827.8270 **Easting:** 722931.809

8.4 11/07/2017 07:00

Drilling Date: Start: 11/6/2017 **End:** 11/7/2017**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
75.3 0				12 16 20 33	15	36			Top 6": Topsoil	
	SS	S-1	24	35 100/2"	4	>100			Bottom 9": Dry, dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
	SS	S-2	8						Dry, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
70.3 5	SS	S-3	24	10 38 50 60	12	88			Dry, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (4'-6')
	SS	S-4	4	100/4"	2				Dry, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
▼	SS	S-5	24	8 15 25 14	4	40			Dry, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Corrosion sample (8'-10')
65.3 10										
60.3 15	SS	S-6	24	13 16 16 18	11	32			Wet, dense, brown, fine to coarse SAND, some fine gravel, trace silt	
55.3 20	SS	S-7	24	15 27 39 39	10	66			Wet, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	
50.3									Test boring B-17 (MW) terminated at 21' bgs and converted into a monitoring well.	
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30										
Reviewed by:								Date:		Boring Number: B-17 (MW)

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-18

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 87.85**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 415 South St., Waltham, MA**Depth Date Time****Northing:** 2958168.8310 **Easting:** 722741.199

1.5 12/15/2017 12:15

Drilling Date: Start: 12/15/2017 **End:** 12/15/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
87.9									4" Asphalt	
0										
	SS	S-1	12	56 75	8	>75		Fill	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
	SS	S-2	18	85 48 100	16	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, little fine to coarse gravel, trace silt	
	SS	S-3	9	66 100/3"	5	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (4'-6')
82.9 5	SS	S-4	2	100/2"	2	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-5	18	86 48 100	12	>100		Silty Sand	Moist, very dense, brown, fine to coarse SAND, some silt, little fine to coarse gravel	
77.9 10										
								Weathered Rock		Rollerbit from 12 to 14' bgs. Possible boulders or bedrock.
									Test boring B-18 terminated at 14' bgs and backfilled with soil cuttings.	
72.9 15										
67.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-18**

**Boring Number:
B-19**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 82.01

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NX

Total Depth (ft.): 14

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Brandeis University, Waltham, MA

Depth	Date	Time
-------	------	------

Northing: 2958306.2240 **Easting:** 723000.451

9.3 12/14/2017 14:20

Drilling Date: Start: 12/14/2017 **End:** 12/14/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler		V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	SS - Split Spoon	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	ST - Shelby Tube	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
	GP - Geoprobe					moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-19



Boring Number: B-19

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 82.01**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NX**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Brandeis University, Waltham, MA**Depth Date Time****Northing:** 2958306.2240 **Easting:** 723000.451

9.3 12/14/2017 14:20

Drilling Date: Start: 12/14/2017 **End:** 12/14/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
72.0 10.0						1:00		XXXX		Hard, slightly weathered, fine grained, gray, GRANITE, very close jointing	
	NX	C-1	60	67	7	1:00		XXXX	Granite		
						2:00		XXXX			
						3:00		XXXX			
						3:00		XXXX			
67.0 15.0										Test boring B-19 terminated at 14' bgs.	
62.0 20.0											
57.0 25.0											
Bedding (mm)				Joint Spacing (mm)				Continuity (mm)		Attitude Angle	Aperture (mm)
Extremely Thin	<20	Extremely Close	<20	Extremely	<25	Horizontal	0° - 5°	Very Tight	< 0.1		
Very Thin	20-60	Very Close	20-60	Moderately	25-100	Shallow	5° - 35°	Tight	0.1 - 0.25		
Thin	60-200	Close	60-200	Slightly	100-200	Moderate	35° - 55°	Partly Open	0.25 - 0.5		
Medium	200-600	Mod Close	200-600	Sound	>200	Steep	55° - 85°	Open	0.5 - 2.5		
Thick	600-2000	Wide	600-2000			Vertical	85° - 90°	Mod. Wide	2.5 - 10		
Very Thick	2000-6000	Very Wide	2000-6000					Wide	>10		
Extremely Thick	>6000	Extremely Wide	>6000								
Field Hardness				Weathering							
Very Hard	Knife Can't Scratch	Fresh	No Visible sign of rock material weathering; slight to no discoloration.								
Hard	Scratches with Difficulty	Slight	Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.								
Med. Hard	Scratches Readily	Moderate	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.								
Medium	Grooves with Difficulty	Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.								
Soft	Grooves Readily	Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.								
Very Soft	Carves with Knife	Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.								
Reviewed by:								Date:		Boring Number: B-19	



Boring Number: B-20 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 76.95**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 250 South St., Waltham, MA**Depth Date Time****Northing:** 2958679.1419 **Easting:** 723407.2716

4.1 12/13/2017 07:45

Drilling Date: Start: 12/12/2017 **End:** 12/13/2017**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
77.0 0	SS	S-1	24	46 55 44 36	18	99		Silty Sand	Top 6": Moist, very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little silt Bottom 12": Moist, very dense, brown to gray, fine SAND, little silt trace organic fibers Moist, very dense, brown to gray, Slightly Organic SILT and fine to medium SAND, trace fine gravel, trace organic fibers	Analytical sample (2'-4')
72.0 5	SS	S-2	24	55 40 28 33	24	68			Moist, very dense, brown, fine SAND, trace silt	Corrosion sample (4'-6')
72.0 5	SS	S-3	24	20 38 72 50	12	>100				
67.0 10	SS	S-4	24	14 80 76 80	12	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-5	4	100/4"	4	--			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
62.0 15								Weathered Rock		Rollerbit from 12 to 14' bgs. Possible boulder, weathered rock, or bedrock.
									Test boring B-20 (MW) terminated at 14' bgs and backfilled with soil cuttings.	
57.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-20 (MW)**



Boring Number: B-21

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 82.47**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 15**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 190 South St., Waltham, MA**Depth Date Time****Northing:** 2958896.4760 **Easting:** 723754.5903

12 12/15/2017 14:40

Drilling Date: Start: 12/15/2017 **End:** 12/15/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
82.5 0	SS	S-1	9	100 100/3"	9	>100		Topsoil	48" Topsoil: Moist, very dense, dark brown, fine to coarse SAND, little fine gravel, little silt, trace organic fibers	Analytical sample (2'-4')
	SS	S-2	24	17 15 12 16	12	27			Moist, very dense, dark brown, fine to coarse SAND, little fine gravel, little silt, trace organic fibers	
77.5 5	SS	S-3	24	10 85 36 11	6	>100		Fill	Moist, very dense, dark brown, fine to medium SAND and fine to coarse GRAVEL, little silt, trace brick and mortar	
	SS	S-4	24	10 10 11 44	8	21			Moist, medium dense, dark brown, fine to medium SAND and fine to coarse GRAVEL, little silt, trace brick and mortar	
	SS	S-5	24	4 7 16 36	8	23			Moist, medium dense, dark brown, fine to coarse SAND and fine to coarse GRAVEL, little silt, trace brick and mortar	
72.5 10								Sand and Gravel		
	SS	S-6	24	86 80 56 38	18	>100			Wet, very dense, brown, fine to coarse SAND, little fine to coarse gravel, trace silt	
67.5 15									Test boring B-21 terminated at 15' bgs and backfilled with soil cuttings.	
62.5										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-21**

Boring Number: B-22

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 96.12

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NX

Total Depth (ft.): 16.5

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):
Bore Hole Location: 99 Hope Ave., Waltham, MA

Depth Date Time
Northing: 2959021.3215 **Easting:** 724037.4743

7.8 12/13/2017 12:50

Drilling Date: Start: 12/13/2017 **End:** 12/13/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
96.1 0				26 80 82 78	18	>100			4" Topsoil	
	SS	S-1	24					Fill	Bottom 4": Moist, very dense, gray-brown, fine to medium SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4')
	SS	S-2	6	100/6"	6	>100			Moist, very dense, gray-brown, fine to medium SAND, some fine to coarse gravel, little silt	
91.1 5	SS	S-3	18	76 80 100	12	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-4	3	100/3"	3	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
86.1 10	SS	S-5	3	100/3"	1	>100		Weathered Rock	No Recovery	Fractured piece of coarse gravel in spoon tip. Rollerbit through boulder or weathered rock from 9.2 to 11.5' bgs.
									See core log for description	
81.1 15	NX	C-1	60		95	--		Bedrock		
76.1									Test boring B-22 terminated at 16.5' bgs and backfilled with soil cuttings.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
V - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:
Date:
Boring Number: B-22



Boring Number: B-22

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 96.12**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NX**Total Depth (ft.):** 16.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 99 Hope Ave., Waltham, MA**Depth Date Time****Northing:** 2959021.3215 **Easting:** 724037.4743

7.8 12/13/2017 12:50

Drilling Date: Start: 12/13/2017 **End:** 12/13/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

<u>Elevation</u> Depth (ft)	<u>Sample</u> Type	<u>Sample</u> Number	<u>Sample</u> Length (in)	<u>Recovery</u> (%)	<u>RQD</u> (%)	<u>Drill Rate</u> (min/ft)	<u>Down Press.</u> (psi)	<u>Graphic</u> Log	<u>Strata</u>	<u>Material Description</u>	<u>Remarks</u>
81.1 15.0	NX	C-1	60	95	50	1:30 1:30 1:30 1:30 1:30			Granodiorite	Hard, slightly weathered, fine grained, gray, GRANODIORITE; primary joint set very close, steep	
76.1 20.0										Test boring B-22 terminated at 16.5' bgs.	
71.1 25.0											
66.1 30.0											

Bedding (mm)

Extremely Thin <20
Very Thin 20-60
Thin 60-200
Medium 200-600
Thick 600-2000
Very Thick 2000-6000
Extremely Thick >6000

Joint Spacing (mm)

Extremely Close <20
Very Close 20-60
Close 60-200
Mod Close 200-600
Wide 600-2000
Very Wide 2000-6000
Extremely Wide >6000

Continuity (mm)

Extremely <25
Moderately 25-100
Slightly 100-200
Sound >200

Attitude Angle

Horizontal 0° - 5°
Shallow 5° - 35°
Moderate 35° - 55°
Steep 55° - 85°
Vertical 85° - 90°

Aperture (mm)

Very Tight < 0.1
Tight 0.1 - 0.25
Partly Open 0.25 - 0.5
Open 0.5 - 2.5
Mod. Wide 2.5 - 10
Wide >10

Field Hardness

Very Hard Knife Can't Scratch
Hard Scratches with Difficulty
Med. Hard Scratches Readily
Medium Grooves with Difficulty
Soft Grooves Readily
Very Soft Carves with Knife

Weathering

Fresh No Visible sign of rock material weathering; slight to no discoloration.
Slight Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.
Moderate Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Severe More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.
Complete All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.
Residual Soil All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

Reviewed by:**Date:****Boring Number: B-22**



Boring Number: B-24

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 55**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 21**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 11 Bellevue St., Waltham, MA**Depth Date Time****Northing:** 2959921.0834 **Easting:** 724730.7697

14.5 11/22/2017 11:00

Drilling Date: Start: 10/11/2017 **End:** 11/22/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** D. Abt / A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks	
55.0 0									6" Asphalt 6" Cobble Stones	Vacuum excavate boring from the ground surface to 4.8' bgs.	
	VE	V-1	6		--	--		Fill	Moist, brown, fine to coarse SAND, some silt, little fine gravel	Analytical sample (2'-2.5')	
50.0 5	VE	V-2	6		--	--			Moist, brown, fine to coarse SAND, some silt, little fine gravel	Analytical sample (4.5'-5') Rollerbit through boulder or cobbles from 4.8 to 8' bgs.	
	SS	S-1	24	30 26 36 39	0	62		Sand and Gravel	No Recovery: 3" Spoon: Moist, very dense, brown, fine to medium SAND, some fine to coarse gravel, some silt	Corrosion sample (8'-10')	
45.0 10											
	SS	S-2	24	95 24 27 44	5	51				Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
35.0 20	SS	S-3	24	79 72 63 88	6	>100			Wet, very dense, gray-brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt		
									Test boring B-24 terminated at 21' bgs and backfilled with soil cuttings.		
30.0											
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample		V - Vac Ex/Grab Sample		Granular (Sand):		Fine Grained (Clay):		and 35-50%			
CS - California Sampler		SS - Split Spoon		V. Loose: 0-4 Dense: 30-50		V. Soft: <2 Stiff: 8-15		some 20-35%			
BQ - 1.5" Rock Core		ST - Shelby Tube		Loose: 4-10 V. Dense: >50		Soft: 2-4 V. Stiff: 15-30		little 10-20%			
NQ - 2" Rock Core		GP - Geoprobe		M. Dense: 10-30		M. Stiff: 4-8 Hard: >30		trace <10%			
										moisture, density, color	
Reviewed by:								Date:		Boring Number: B-24	



Boring Number: B-25 (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 49.64

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NX

Total Depth (ft.): 15

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 45 Sun St., Waltham, MA

Depth Date Time

Northing: 2960373.8970 Easting: 725100.683

8.5 10/23/2017 10:00

Drilling Date: Start: 10/23/2017 End: 10/23/2017

Abandonment Method: Monitoring well installed

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
49.6 0									4" Asphalt	
	VE	V-1			--	--		Fill	Moist, dark brown, fine to coarse GRAVEL and fine to coarse SAND, little silt	Analytical sample (2'-2.5')
44.6 5	VE	V-2			--	--			Moist, dark brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (4.5'-5')
	SS	S-1	24	32 15 8 100	5	23			Wet, medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt, trace organics	
	SS	S-2	24	19 10 8 20	2	18			Wet, medium dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt, trace wood	
39.6 10										
	SS	S-3	12	95 100	10	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
34.6 15									Test boring B-25 (MW) terminated at 15' bgs and converted into a monitoring well.	
29.6										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	and 35-50%
						Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	some 20-35%
						M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:		Boring Number: B-25 (MW)

**Boring Number:
B-26**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 53.01

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 15

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 5 Fern St., Waltham, MA

Depth	Date	Time
-------	------	------

Northings: 2960688.6660 **Easting:** 725293.7979

8.0 10/12/2017 13:45

Drilling Date: Start: 10/12/2017 **End:** 10/12/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
53.0 0									3" Asphalt	
	VE	V-1			--	--		Fill	Moist, brown, fine SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-2.5')
48.0 5	VE	V-2			--	--				
	SS	S-1	9	60 100/3"	9	>100			Moist, brown, fine to coarse SAND and fine GRAVEL, trace silt Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (5.5'-6')
43.0 10	SS	S-2	9	90 100/3"	9	>100		Sand and Gravel	Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, little silt	
38.0 15	SS	S-3	12	100/3" 50/9"	10	>100			Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, little silt	50/9" blow count with 300 lb hammer.
33.0									Test boring B-26 terminated at 15' bgs and backfilled with soil cuttings.	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler		V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	SS - Split Spoon	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	ST - Shelby Tube			M. Stiff: 4-8	Hard: >30	trace	<10%
	GP - Geoprobe	M. Dense: 10-30				moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-26

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-27

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 50.08**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 146 Felton St., Waltham, MA**Depth Date Time****Northing:** 2961016.6280 **Easting:** 725613.5234

6.5 10/16/2017 14:30

Drilling Date: Start: 10/16/2017 **End:** 10/16/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
50.1 0									4" Asphalt	
	SS	S-1	18	30 22 32	4	54			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
	SS	S-2	21	18 92 98 100/3"	3	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-4')
45.1 5	SS	S-3	10	80 100/4"	10	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Corrosion sample (4'-6')
▼	SS	S-4	3	100/3"	3	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Rollerbit through cobbles from 6.2 to 8' bgs.
	SS	S-5	4	100/4"	4	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
40.1 10										
35.1 15	SS	S-6	24	100/6" 14 14 15	18	--			Wet, very dense, gray, fine to coarse SAND, some fine gravel, little silt	Blows from 14.5 to 16' bgs with 300 lb hammer.
									Test boring B-27 terminated at 16' bgs and backfilled with soil cuttings.	
30.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-27**

**Boring Number:
B-28**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 54.8

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 100 Felton St., Waltham, MA

Depth	Date	Time
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Northing: 2961222.6986 **Easting:** 726042.7302

14.5	10/16/2017	10:00
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Drilling Date: Start: 10/16/2017 **End:** 10/16/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%
moisture, density, color	

Reviewed by:

Date:

Boring Number: B-28

**Boring Number:
B-29**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 47.8

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 62 Felton St., Waltham, MA

Depth	Date	Time
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Northing: 2961354.6919 **Easting:** 726508.8779

6.6 10/13/2017 13:30

Drilling Date: Start: 10/13/2017 End: 10/13/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
47.8 0									3.5" Asphalt	
	SS	S-1	18	34 42 22	12	64		Fill	Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	20 45 28 36	14	73		Sand and Gravel	Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4')
42.8 5	SS	S-3	15	40 58 100/3"	14	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (4'-5.3') and Corrosion sample (4'-5.3')
▼	SS	S-4	3	100/3"	3	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-5	24	95 80 56 54	18	>100			Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
37.8 10										
32.8 15	SS	S-6	24	56 80 90 68	15	>100			Wet, very dense, gray, fine to medium SAND, some fine to coarse gravel, little clay	
27.8									Test boring B-29 terminated at 16' bgs and backfilled with soil cuttings.	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture density color	

Reviewed by:

Date:

Boring Number: B-29



Boring Number: B-30

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 44.87**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 42 Felton St., Waltham, MA**Depth Date Time****Northing:** 2961499.8980 **Easting:** 726877.4759

5.2 10/13/2017 09:30

Drilling Date: Start: 10/13/2017 **End:** 10/13/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
44.9 0									5" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--		Fill	Moist, brown, fine SAND, trace silt	Analytical sample (3'-3.5')
39.9 5	VE	V-2			--	--			Wet, brown, Clayey SILT and fine to coarse SAND, trace fine gravel	Analytical sample (5'-5.5')
	SS	S-1	14	42 80 100/2"	12	>100			Wet, very dense, gray, fine to medium SAND, some silt, trace fine gravel	
	SS	S-2	5	100/5"	5	--			Wet, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
34.9 10										
29.9 15	SS	S-3	24	72 38 52 58	9	90			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
24.9									Test boring B-30 terminated at 16' bgs and backfilled with soil cuttings.	

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-30**



Boring Number: B-31

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 51.73

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 19.8

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 8 Felton St., Waltham, MA

Depth Date Time

Northing: 2961592.0985 Easting: 727250.3929

6.0 10/12/2017 10:20

Drilling Date: Start: 10/12/2017 End: 10/12/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
51.7 0									8" Asphalt Pavement	Vacuum excavate boring from the ground surface to 6' bgs. Analytical sample (2'-2.5')
	VE	V-1			--	--			6" Subbase: Dry, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
									Moist, brown, SILT and fine to medium SAND, little coarse gravel	
46.7 5										
	SS	S-1	6	100/6"	6	--			Moist, very dense, brown, fine SAND, some silt, some fine to coarse gravel	Corrosion sample (8'-10')
	SS	S-2	24	58 62 66 70	18	>100			Moist, very dense, brown, fine SAND, some silt, some fine to coarse gravel	
41.7 10										
	SS	S-3	9	80 100/3"	9	>100			Moist, very dense, brown, SILT and fine to medium SAND, trace fine gravel	
36.7 15										
	SS	S-4	10	95 100/4"	10	>100			Moist, very dense, gray, fine SAND, some silt, trace fine gravel	
31.7 20									Test boring B-31 terminated at 19.8' bgs and backfilled with soil cuttings.	
26.7										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30				
Reviewed by:								Date:		Boring Number: B-31

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-32

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 67.25**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 85 Central St., Waltham, MA**Depth Date Time****Northing:** 2961885.9469 **Easting:** 728253.0253

NE 11/30/2017 13:30

Drilling Date: Start: 11/30/2017 **End:** 11/30/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
67.3 0									36" Topsoil	
	VE	V-1	6		--	--				
								Fill	Moist, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (2'-2.5')
62.3 5										
	SS	S-1	4	100/4"	4	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Corrosion sample (6'-6.3')
	SS	S-2	24	18 38 66 60	10	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
57.3 10										
	SS	S-3	24	14 90 48 60	9	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
52.3 15										
									Test boring B-32 terminated at 16' bgs and backfilled with soil cuttings.	
47.3										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-32**



Boring Number: B-33

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 65.84**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 58 Central St./ 40 Appleton St., Waltham, MA**Depth Date Time****Northing:** 2961982.2488 **Easting:** 728675.3252

NE 10/17/2017 13:50

Drilling Date: Start: 10/17/2017 **End:** 10/17/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
65.8										
0									4" Asphalt	
	SS	S-1	18	36 36 52	8	88		Fill	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	38 96 64 70	15	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (2'-4')
	SS	S-3	10	79 100/4"	10	>100			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
60.8	SS	S-4	6	100/6"	6	>100			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
5										
	SS	S-5	18	54 76 100	10	>100			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
55.8										
10										
	SS	S-6	24	50 100 100 100	0	>100			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
50.8										
15										
									Test boring B-33 terminated at 16' bgs and backfilled with soil cuttings.	
45.8										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-33**



Boring Number: B-34

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 65.67**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 41 Central St./Cross St., Waltham, MA**Depth Date Time****Northing:** 2962009.9284 **Easting:** 728929.5735

NE 10/17/2017 09:45

Drilling Date: Start: 10/17/2017 **End:** 10/17/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
65.7 0									8" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--			Moist, brown, fine to coarse SAND, some fine to coarse gravel, some silt	Analytical sample (2'-2.5')
60.7 5	VE	V-2			--	--			Moist, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-1	18	72 75 100	12	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Corrosion sample (6'-7.5')
	SS	S-2	18	45 66 100	14	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
55.7 10										
50.7 15	SS	S-3	24	80 90 100 100	13	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
45.7									Test boring B-34 terminated at 16' bgs and backfilled with soil cuttings.	

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-34**




Boring Number: B-35

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 66.47**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 4 Central St./Newton St., Waltham, MA**Depth Date Time****Northing:** 2962067.6581 **Easting:** 729417.6995

NE 10/19/2017 11:45

Drilling Date: Start: 10/19/2017 **End:** 10/19/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks	
66.5											
0									6" Asphalt		
	SS	S-1	18	60 40 34	12	74		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-3.5')	
	SS	S-2	18	60 98 100	12	>100			Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
	SS	S-3	2	100/2"	1	--			Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
61.5 5											
	SS	S-4	9	66 100/3"	8	>100			Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt		Corrosion sample (6'-6.75')
	SS	S-5	4	100/4"	4	--			Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
56.5 10											
51.5 15	SS	S-6	24	40 45 38 28	18	83			No Recovery 3 in: Moist, very dense, brown-gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Drove 3" spoon.	
									Test boring B-35 terminated at 16' bgs and backfilled with soil cuttings.		
46.5											
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core		V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe		Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30		Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30		and some 35-50% little 20-35% trace 10-20% moisture, density, color <10%			
Reviewed by:					Date:		Boring Number: B-35				

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-36

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 66.06

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 15.3

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 22 Townsend St., Waltham, MA

Depth Date Time

Northing: 2962336.1513 Easting: 729714.3343

NE 10/19/2017 14:00

Drilling Date: Start: 10/19/2017 End: 10/19/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
66.1 0									4" Asphalt	
	SS	S-1	18	16 16 10	8	26		Fill	Moist, medium dense, gray, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	24	8 4 5 5	12	9		Sand	Moist, loose, brown, fine to medium SAND, trace silt	Analytical sample (2'-4')
61.1 5	SS	S-3	24	5 3 11 21	14	14			Moist, medium dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
	SS	S-4	24	31 34 34 38	16	68			Moist, very dense, brown, fine to medium SAND, trace silt	
56.1 10	SS	S-5	24	54 46 42 46	5	88		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace to little silt	
51.1 15	SS	S-6	15	36 36 100/3"	5	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace to little silt	
									Test boring B-36 terminated at 15.3' bgs and backfilled with soil cuttings.	
46.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-36



Boring Number: B-37

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 65.28**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 99 Chamberlain Terrace, Waltham, MA**Depth Date Time****Northing:** 2962447.3562 **Easting:** 730136.9483

NE 10/18/2017 14:00

Drilling Date: Start: 10/18/2017 **End:** 10/18/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
65.3 0								Fill	4" Asphalt Moist, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--			Moist, brown, fine to medium SAND, little fine to coarse gravel, trace silt	Analytical sample (2'-2.5')
60.3 5										
	SS	S-1	24	34 36 32 26	3	68		Sand	Moist, very dense, gray to brown, fine to medium SAND, little fine gravel, trace silt	
	SS	S-2	24	24 18 22 20	10	40			Moist, dense, gray to brown, fine to medium SAND, little fine gravel, trace silt	
55.3 10										
	SS	S-3	24	60 60 55 86	8	>100		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
50.3 15										
									Test boring B-37 terminated at 16' bgs and backfilled with soil cuttings.	
45.3										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-37**



Boring Number: B-38

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 57.74**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 401 Main St., Waltham, MA**Depth Date Time****Northing:** 2962860.4893 **Easting:** 730274.4037

8.5 10/18/2017 09:55

Drilling Date: Start: 10/18/2017 **End:** 10/18/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
57.7 0									8" Asphalt	Vacuum excavate
								Fill	Dry, gray to brown, fine to coarse GRAVEL, some fine to coarse sand	boring from the ground surface to 6' bgs. Boulders and cobbles from 1 to 3' bgs.
	VE	V-1			--	--			Moist, brown, fine to medium SAND, little fine to coarse gravel, trace silt	Analytical sample (3'-3.5')
52.7 5								Sand	Wet, very dense, brown, fine to medium SAND, trace silt	Analytical sample (6'-8')
	SS	S-1	24	36 30 26 30	10	56				
	SS	S-2	24	32 40 44 45	8	84		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine gravel, trace silt	
47.7 10										
								Sandy Silt	Wet, hard, brown, SILT, trace fine to medium sand	
42.7 15	SS	S-3	24	22 30 34 40	16	64				
									Test boring B-38 terminated at 16' bgs and backfilled with soil cuttings.	
37.7										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-38**

**Boring Number:
B-39**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 50.99

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 17

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 50 Linden St., Waltham, MA

Depth	Date	Time
-------	------	------

Northings: 2963203.1720 **Easting:** 730823.592

11.8 10/23/2017 13:45

Drilling Date: Start: 10/23/2017 **End:** 10/23/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types	
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
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16	16
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88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by:

Date:

Boring Number: B-39



Boring Number: B-40

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / D. Jacobs

Surface Elevation (ft.): 43.17

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 21

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 74 Linden St., Waltham, MA

Depth Date Time

Northing: 2963369.1110 Easting: 731109.016

5.2 1/11/2018 15:00

Drilling Date: Start: 1/11/2018 End: 1/11/2018

Abandonment Method: Backfilled with soil cuttings

Logged By: D. Abt

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
43.2 0				98 70 44 13	5	>100			2" Asphalt	
	SS	S-1	24	18 14 10 14	4	24		Fill	Dry, very dense, brown, fine to coarse SAND, trace silt	
	SS	S-2	24	19 24 27 20	2	51			Moist, medium dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
38.2 5	SS	S-3	24	12 20 18 13	5	38		Sand and Gravel	Moist, very dense, brown, fine to coarse GRAVEL, some fine to coarse sand, little silt	
	SS	S-4	24	26 15 11 22	8	26			Wet, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
33.2 10	SS	S-5	24	23 25 27 22	18	52			Wet, very stiff, brown, SILT, little fine to medium sand, trace fine gravel	Analytical sample (8'-10')
28.2 15	SS	S-6	24	10 15 16 19	20	31		Sandy Silt	Wet, hard, gray, SILT, trace fine sand	
23.2 20	SS	S-7	24						Moist, hard, gray, SILT, little fine sand	
18.2									Test boring B-40 terminated at 21' bgs and backfilled with soil cuttings.	

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - GeoprobeGranular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-40

Boring Number:
B-41

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 41.3

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 127 Linden St., Waltham, MA

Depth	Date	Time
-------	------	------

Northings: 2963681.2446 **Easting:** 731597.5608

4.1 11/21/2017 12:30

Drilling Date: Start: 11/21/2017 **End:** 11/21/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-41



Boring Number: B-42

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 42.13**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 21**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 168 Linden St., Waltham, MA**Depth Date Time****Northing:** 2963916.3760 **Easting:** 731917.682

3.2 11/2/2017 09:25

Drilling Date: Start: 11/2/2017 **End:** 11/2/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
42.1 0									2" Asphalt	
	VE	V-1			--	--		Sand and Gravel	Bottom 6": Moist, gray, fine to coarse SAND and fine GRAVEL, little silt	Vacuum excavate boring from the ground surface to 6' bgs.
37.1 5									Moist, gray, fine to coarse SAND and fine GRAVEL, little silt	Analytical sample (3'-3.5')
	SS	S-1	24	13 2 2 2	3	4			Wet, soft, dark gray, Organic SILT	Silty Sand is a potentially varved deposit.
	SS	S-2	24	2 2 10 15	12	12			Wet, stiff, dark gray, fine to medium SAND, some organic clayey silt, little fine gravel	Corrosion sample (8'-10')
32.1 10										
	SS	S-3	24	16 16 18 16	15	34			Wet, dense, brown, SILT, trace fine sand	
27.1 15										
	SS	S-4	24	12 14 18 16	16	32			Wet, dense, brown, fine to medium SAND, trace silt	
22.1 20										
									Test boring B-42 terminated at 21' bgs and backfilled with soil cuttings.	
17.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-42**

**Boring Number:
B-43**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 43.5

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 32 Waverly Oaks Rd., Waltham, MA

Depth	Date	Time
-------	------	------

Northing: 2964059.3675 **Easting:** 732508.0332

5.3 10/26 14:10

Drilling Date: Start: 10/26/2017 **End:** 10/27/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by:

Date:

Boring Number: B-43



Boring Number: B-44

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 45.65**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 68 Waverly Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2964126.8030 **Easting:** 732954.263

7.0 10/31/2017 11:00

Drilling Date: Start: 10/31/2017 **End:** 10/31/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
45.7 0									12" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--		Sandy Silt	Moist, brown, SILT, little fine to medium sand, little fine to coarse gravel	Analytic Sample (2'-2.5')
40.7 5										
	SS	S-1	24	12 14 18 30	8	37		Sand and Gravel	Wet, dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	14 5 6 5	6	11			Wet, medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
35.7 10										
	SS	S-3	24	7 9 14 13	14	23		Silty Clay	Wet, very stiff, gray, Silty CLAY	PP = 2.0, 2.5, and 3.0 tsf
30.7 15										
									Test boring B-44 terminated at 16' bgs and backfilled with soil cuttings.	
25.7										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
						V. Loose: 0-4 Loose: 4-10 M. Dense: 10-30	Dense: 30-50 V. Dense: >50	V. Soft: <2 Soft: 2-4 M. Stiff: 4-8	Stiff: 8-15 V. Stiff: 15-30 Hard: >30	
Reviewed by:								Date:		Boring Number: B-44

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

**Boring Number:
B-45**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 48.52

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 131 Waverly Oaks Rd., Waltham, MA

Depth	Date	Time
-------	------	------

Northing: 2964321.5588 **Easting:** 733550.3289

5.4 10/31/2017 13:15

Drilling Date: Start: 10/31/2017 **End:** 10/31/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks			
48.5													
0									4" Topsoil: Moist, gray, fine to medium SAND	Vacuum excavate boring from the ground surface to 6' bgs.			
	VE	V-1			--	--			Moist, brown, SILT	Analytical sample (2'-2.5')			
43.5													
	SS	S-1	24	14 14 6 7	0	20		Sandy Silt	No Recovery				
	SS	S-2	24	5 8 4 5	0	12			No Recovery 3" split spoon- fine to coarse SAND, some fine gravel, trace silt				
38.5													
10	SS	S-3	24	13 4 7 11	8	11			Wet, stiff, brown, SILT, trace fine to medium sand				
33.5	SS	S-4	24	13 14 7 16	16	21		Silty Clay	Wet, very stiff, gray, CLAY & SILT, trace fine to medium sand				
15													
									Test boring B-45 terminated at 16' bgs and backfilled with soil cuttings.				
28.5													
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification			
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Loose: 4-10 M. Dense: 10-30		Dense: 30-50 V. Dense: >50		Fine Grained (Clay): V. Soft: <2 Soft: 2-4 M. Stiff: 4-8 Stiff: 8-15 V. Stiff: 15-30 Hard: >30		and some little trace moisture, density, color 35-50% 20-35% 10-20% <10%	
Reviewed by:								Date:		Boring Number: B-45			



Boring Number: B-46

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 56.94**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 161 Waverly Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2964423.8834 **Easting:** 733848.2348

6.4 11/16/2017 14:05

Drilling Date: Start: 11/14/2017 **End:** 11/16/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
56.9 0									12" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--		Sand and Gravel	Moist, brown, fine to medium SAND, some fine to coarse gravel, little silt	Analytical sample (2.5'-3')
51.9 5										
	SS	S-1	24	4 3 3 3	6	6			Wet, loose, gray, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	24	8 12 12 8	8	24		Sandy Silt	Wet, very stiff, brown, SILT, some fine sand	Corrosion sample (8'-10')
46.9 10										
	SS	S-3	24	20 34 44 50	16	78		Silty Clay	Wet, hard, gray, Silty CLAY	
41.9 15										
									Test boring B-46 terminated at 16' bgs and backfilled with soil cuttings.	
36.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-46**

Boring Number:
B-47

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 68.65

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 191 Waverly Oaks Rd., Waltham, MA

Depth	Date	Time
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Northing: 2964858.9158 **Easting:** 734327.5545

12.8 11/2/2017 14:50

Drilling Date: Start: 11/2/2017 End: 11/2/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks			
68.7 0									12" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs.			
	VE	V-1			--	--		Sand and Gravel	Moist, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (2'-2.5')			
63.7 5													
	SS	S-1	24	46 98 66 56	12	>100			Moist, very dense, brown to gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt				
	SS	S-2	24	32 30 27 20	3	57			Moist, very dense, brown to gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt				
58.7 10													
													
53.7 15	SS	S-3	24	21 25 21 20	3	46			Wet, dense, brown to gray, fine to coarse SAND, little fine gravel, trace silt				
									Test boring B-47 terminated at 16' bgs and backfilled with soil cuttings.				
48.7													
Sample Types							Consistency vs Blowcount/Foot			Burmister Classification			
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe							Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30			Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30		and some little trace moisture, density, color	
Reviewed by:									Date:		Boring Number: B-47		

Boring Number:
B-48

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 62.23

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 225 Waverly Oaks Rd., Waltham, MA

Depth	Date	Time
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Northing: 2965111.7525 **Easting:** 734637.5415

11.3 10/24/2017 13:25

Drilling Date: Start: 10/24/2017 **End:** 10/24/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-48



Boring Number: B-49

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 59.22**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 271 Waverley Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2965275.1540 **Easting:** 735017.5246

7.2 1/26/2018 10:00

Drilling Date: Start: 1/24/2018 **End:** 1/26/2018**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
59.2 0									9" Topsoil	Vacuum excavate boring from the ground surface to 6' bgs. Analytical sample (1.5'-2')
	VE	V-1			--	--			Moist, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
									Moist, brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt	
54.2 5										
	SS	S-1	24	32 54 22 20	8	76		Sand and Gravel	Wet, very dense, gray, fine to medium SAND, little silt, little fine gravel	Analytical sample (6'-8')
	SS	S-2	24	7 9 10 12	18	19			Wet, medium dense, brown, fine to medium SAND, trace silt	
49.2 10										
44.2 15	SS	S-3	24	5 6 6 6	6	12			No Recovery: 3" Spoon: Wet, medium dense, gray-brown, fine to medium SAND, little fine gravel, little silt	
									Test boring B-49 terminated at 16' bgs and backfilled with soil cuttings.	
39.2										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample V - Vac Ex/Grab Sample CS - California Sampler SS - Split Spoon BQ - 1.5" Rock Core ST - Shelby Tube NQ - 2" Rock Core GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	and 35-50%
						Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	some 20-35%
						M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:	Boring Number: B-49	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-50

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 71.29**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 15**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 320 Waverley Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2965897.0948 **Easting:** 735637.6863

NE 10/25/2017 13:40

Drilling Date: Start: 10/25/2017 **End:** 10/25/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
71.3 0									3" Asphalt Pavement 9" Cobble Base	
	SS	S-1	9	80 100/3"	4	>100			Wet, very dense, gray, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	24	48 26 36 24	4	62			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, some silt	Analytical sample (2'-4')
66.3 5	SS	S-3	24	18 18 20 24	2	38			Moist, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, some silt	Analytical sample (4'-6')
	SS	S-4	24	14 12 22 100	5	34			Moist, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Corrosion sample (6'-8')
	SS	S-5	9	15 100/3"	4	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
61.3 10										
	SS	S-6	12	85 100	8	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
56.3 15									Test boring B-50 terminated at 15' bgs and backfilled with soil cuttings.	
51.3										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose:	0-4	Dense:	30-50	
						Loose:	4-10	V. Dense:	>50	
						M. Dense:	10-30			
						V. Soft:	<2	Stiff:	8-15	and 35-50%
						Soft:	2-4	V. Stiff:	15-30	some 20-35%
						M. Stiff:	4-8	Hard:	>30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:		Boring Number: B-50

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-51

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 77**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14.4**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 356 Waverley Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2965991.6800 **Easting:** 735756.981

7.7 10/25/2017 10:40

Drilling Date: Start: 10/25/2017 **End:** 10/25/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
77.0 0				6 5 4 14	8	9			3" Topsoil	
	SS	S-1	24						Moist, loose, brown, fine to coarse SAND, some fine gravel, little silt	Analytical sample (0'-2')
	SS	S-2	3	100/3"	3	>100			Moist, very dense, gray, fine to coarse GRAVEL, some fine to coarse sand, trace silt	
72.0 5	SS	S-3	24	36 32 40 62	8	72			Wet, very dense, brown-gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (4'-6')
	SS	S-4	24	72 62 90 70	12	>100			Wet, very dense, brown-gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
	SS	S-5	24	61 71 45 51	16	>100			Moist, very dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
67.0 10										
	SS	S-6	4	100/4"	4	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
62.0 15									Test boring B-51 terminated at 14.4' bgs and backfilled with soil cuttings.	
57.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-51**



Boring Number: B-52

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 87.91**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 390 Waverley Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2966243.2130 **Easting:** 736227.419

5.2 10/26/2017 13:00

Drilling Date: Start: 10/26/2017 **End:** 10/26/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
87.9 0									4" Asphalt	
	SS	S-1	18	26 32 100	11	>100		Sand and Gravel	Moist, very dense, brown, fine to medium SAND, some fine gravel, little silt	
	SS	S-2	2	100/2"	2	--			Moist, very dense, brown, fine to coarse SAND, trace silt	Analytical sample (2'-2.2')
82.9 5	SS	S-3	12	42 76	5	>76			Moist, very dense, brown, fine to coarse SAND, little fine gravel, little silt	Analytical sample (4'-5') Corrosion sample not obtained due to boulder and low recovery.
	SS	S-4	9	53 100/3"	8	>100			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
77.9 10	SS	S-5	6	100/6"	5	--		Weathered Rock	Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Weathered rock encountered at approximately 8.8' bgs.
72.9 15	SS	S-6	6	100/6"	5	--			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
									Test boring B-52 terminated at 14.5' bgs and backfilled with soil cuttings.	
67.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-52**

**Boring Number:
B-53 (MW)**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 105.91

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 11

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 450 Waverley Oaks Rd., Waltham, MA

Depth	Date	Time
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Northing: 2966643.9120 **Easting:** 736978.095

6.0 11/3/2017 11:00

Drilling Date: Start: 10/26/2017 **End:** 11/3/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler		V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	SS - Split Spoon	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	ST - Shelby Tube			M. Stiff: 4-8	Hard: >30	trace	<10%
	GP - Geoprobe	M. Dense: 10-30				moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-53 (MW)



Boring Number: B-53 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 105.91**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 11**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 450 Waverley Oaks Rd., Waltham, MA**Depth Date Time****Northing:** 2966643.9120 **Easting:** 736978.095

6.0 11/3/2017 11:00

Drilling Date: Start: 10/26/2017 **End:** 11/3/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elevation Depth (ft) ▼	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks								
95.9 10.0	NX	C-1	60	75	0	4.0 5.0 2.5 3.5	NR	XXXX XXXX XXXX XXXX XXXX XXXX XXXX	Granite	Hard, slightly weathered, fine grained, gray GRANITE; primary joint set very close, extremely fractured									
90.9 15.0										Test boring B-53 terminated at 11' bgs and converted into monitoring well.									
85.9 20.0																			
80.9 25.0																			
Bedding (mm)				Joint Spacing (mm)				Continuity (mm)		Attitude Angle		Aperture (mm)							
Extremely Thin		<20		Extremely Close		<20		Extremely		<25		Horizontal		0° - 5°		Very Tight		< 0.1	
Very Thin		20-60		Very Close		20-60		Moderately		25-100		Shallow		5° - 35°		Tight		0.1 - 0.25	
Thin		60-200		Close		60-200		Slightly		100-200		Moderate		35° - 55°		Partly Open		0.25 - 0.5	
Medium		200-600		Mod Close		200-600		Sound		>200		Steep		55° - 85°		Open		0.5 - 2.5	
Thick		600-2000		Wide		600-2000						Vertical		85° - 90°		Mod. Wide		2.5 - 10	
Very Thick		2000-6000		Very Wide		2000-6000										Wide		>10	
Extremely Thick		>6000		Extremely Wide		>6000													
Field Hardness				Weathering															
Very Hard		Knife Can't Scratch		Fresh		No Visible sign of rock material weathering; slight to no discoloration.													
Hard		Scratches with Difficulty		Slight		Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.													
Med. Hard		Scratches Readily		Moderate		Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.													
Medium		Grooves with Difficulty		Severe		More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.													
Soft		Grooves Readily		Complete		All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.													
Very Soft		Carves with Knife		Residual Soil		All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.													
Reviewed by:									Date:			Boring Number: B-53 (MW)							

ROCK CORE ONLY: GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-55

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 99.15**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 13**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Beaver Brook Reservation, Waltham, MA**Depth Date Time****Northing:** 2967033.9054 **Easting:** 737747.5134

5.8 10/27/2017 14:40

Drilling Date: Start: 10/27/2017 **End:** 10/27/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
99.2 0									4" Asphalt 14" Cobbles and Coarse Gravel	
	SS	S-1	21	55 76 92 100/3"	12	>100		Sand and Gravel	Moist, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (2'-3.75')
94.2 5	SS	S-2	12	72 100	6	>100			Moist, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Corrosion sample (4'-5') Rollerbit through boulder from 5 to 6 ft bgs.
	SS	S-3	18	80 84 110	10	>100			Moist, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
89.2 10	NX	C-1	60		24	--		Weathered Rock	See core log for description	
84.2 15									Test boring B-55 terminated at 13' bgs and backfilled with soil cuttings.	
79.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-55**



Boring Number: B-55

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 99.15**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 13**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Beaver Brook Reservation, Waltham, MA**Depth Date Time****Northing:** 2967033.9054 **Easting:** 737747.5134

5.8 10/27/2017 14:40

Drilling Date: Start: 10/27/2017 **End:** 10/27/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
89.2 10.0	NX	C-1	60	40	0	1.5 1.5 1.5 1.5 1.5		XXXX XXXX XXXX XXXX XXXX XXXX	GRANITE	Hard, extremely fractured, slightly weathered, gray, fine grained, GRANITE; primary joint set very close	
84.2 15.0										Test boring B-55 terminated at 13' bgs and backfilled with soil cuttings.	
79.2 20.0											
74.2 25.0											
Bedding (mm)				Joint Spacing (mm)				Continuity (mm)		Attitude Angle	Aperture (mm)
Extremely Thin	<20	Extremely Close	<20	Extremely	<25	Horizontal	0° - 5°	Very Tight	< 0.1		
Very Thin	20-60	Very Close	20-60	Moderately	25-100	Shallow	5° - 35°	Tight	0.1 - 0.25		
Thin	60-200	Close	60-200	Slightly	100-200	Moderate	35° - 55°	Partly Open	0.25 - 0.5		
Medium	200-600	Mod Close	200-600	Sound	>200	Steep	55° - 85°	Open	0.5 - 2.5		
Thick	600-2000	Wide	600-2000			Vertical	85° - 90°	Mod. Wide	2.5 - 10		
Very Thick	2000-6000	Very Wide	2000-6000					Wide	>10		
Extremely Thick	>6000	Extremely Wide	>6000								
Field Hardness				Weathering							
Very Hard	Knife Can't Scratch	Fresh	No Visible sign of rock material weathering; slight to no discoloration.								
Hard	Scratches with Difficulty	Slight	Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.								
Med. Hard	Scratches Readily	Moderate	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.								
Medium	Grooves with Difficulty	Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.								
Soft	Grooves Readily	Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.								
Very Soft	Carves with Knife	Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.								
Reviewed by:								Date:		Boring Number: B-55	

**Boring Number:
B-56**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 74.6

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NX

Total Depth (ft.): 15

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Beaver Brook Reservation, Waltham, MA

Depth	Date	Time
-------	------	------

Northing: 2967084.8840 **Easting:** 738063.3567

7.2 10/27/2017 12:15

Drilling Date: Start: 10/27/2017 **End:** 10/27/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	density, color

Reviewed by:

Date:

Boring Number: B-56



Boring Number: B-57

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 95.47

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NX

Total Depth (ft.): 14

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):
Bore Hole Location: 628 Trapelo Rd., Belmont, MA

Depth Date Time
Northing: 2967193.5570 **Easting:** 738503.346

5.8 9/20/2017 12:15

Drilling Date: Start: 9/20/2017 **End:** 9/20/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
95.5 0									6" Asphalt Pavement	
	SS	S-1	2	100/2"	2	--			Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	5 14 18 20	4	32		Sand and Gravel	Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4')
90.5 5	SS	S-3	18	66 72 100	14	>100			Wet, very dense, brown, fine GRAVEL and fine SAND, little silt	
	SS	S-4	3	100/3"	3	--			Wet, very dense, brown, fine to coarse GRAVEL, some fine to coarse sand, little silt	
								Weathered Rock		Attempted rock core starting at 7.5' bgs. Core barrel jammed and consisted of little recovery of large gravel sized fractured rock. Advance to 9' bgs with the rollerbit and start rock core.
85.5 10	NX	C-1	60		60	--		Bedrock	See core log for description	
80.5 15									Test boring B-57 terminated at 14' bgs and backfilled with soil cuttings.	
75.5										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
V - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:
Date:
Boring Number: B-57



Boring Number: B-57

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 95.47**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NX**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 628 Trapelo Rd., Belmont, MA**Depth Date Time****Northing:** 2967193.5570 **Easting:** 738503.346

5.8 9/20/2017 12:15

Drilling Date: Start: 9/20/2017 **End:** 9/20/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks		
85.5 10.0	NX	C-1	60	60	63	2.0	NR		Gabbro	Hard, slightly weathered, gray, fine grained GABBRO; primary joint set close.			
2.5													
1.5													
1.5													
80.5 15.0										Test boring B-57 terminated at 14' bgs.			
75.5 20.0													
70.5 25.0													
Bedding (mm)				Joint Spacing (mm)				Continuity (mm)		Attitude Angle	Aperture (mm)		
Extremely Thin <20				Extremely Close <20				Extremely <25		Horizontal 0° - 5°	Very Tight < 0.1		
Very Thin 20-60				Very Close 20-60				Moderately 25-100		Shallow 5° - 35°	Tight 0.1 - 0.25		
Thin 60-200				Close 60-200				Slightly 100-200		Moderate 35° - 55°	Partly Open 0.25 - 0.5		
Medium 200-600				Mod Close 200-600				Sound >200		Steep 55° - 85°	Open 0.5 - 2.5		
Thick 600-2000				Wide 600-2000						Vertical 85° - 90°	Mod. Wide 2.5 - 10		
Very Thick 2000-6000				Very Wide 2000-6000							Wide >10		
Extremely Thick >6000				Extremely Wide >6000									
Field Hardness				Weathering									
Very Hard	Knife Can't Scratch			Fresh	No Visible sign of rock material weathering; slight to no discoloration.								
Hard	Scratches with Difficulty			Slight	Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition.								
Med. Hard	Scratches Readily			Moderate	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.								
Medium	Grooves with Difficulty			Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.								
Soft	Grooves Readily			Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.								
Very Soft	Carves with Knife			Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.								
Reviewed by:								Date:		Boring Number: B-57			



Boring Number: B-58

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 94.08**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 10**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 602 Trapelo Rd./Agassiz St., Belmont, MA**Depth Date Time****Northing:** 2967013.6930 **Easting:** 738818.938

NE 9/28/2017 --

Drilling Date: Start: 9/28/2017 **End:** 9/28/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
94.1 0									5" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--			Moist, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (2'-3')
89.1 5										
	SS	S-1	10	90 100/4"	6	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Corrosion sample (6'-7')
	SS	S-2	10	58 100/4"	10	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-3	0	100/0"	0	--			No recovery	Advance rollerbit to 10' bgs.
84.1 10										
									Test boring B-58 terminated at 10' bgs and backfilled with soil cuttings.	
79.1 15										
74.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-58**



Boring Number: B-59

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 88.34**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 579 Trapelo Rd., Belmont, MA**Depth Date Time****Northing:** 2966834.7650 **Easting:** 739160.765

NE 9/29/2017 --

Drilling Date: Start: 9/29/2017 **End:** 9/29/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith/J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks		
88.3 0									10" Asphalt	Vacuum excavate boring from the ground surface to 6' bgs.		
	VE	V-1			--	--		Fill	Moist, dark gray, fine to coarse SAND, some fine to coarse gravel	Analytical sample (2'-3')		
83.3 5	VE	V-2			--	--			Moist, dark gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (5'-6')		
	SS	S-1	24	23 40 64 82	10	>100			Sand and Gravel	Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt		
78.3 10	SS	S-2	9	80 100/3"	8	>100				Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt		
73.3 15	SS	S-3	24	70 86 70 70	4	>100				Moist, very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt		
									Test boring B-59 terminated at 16' bgs and backfilled with soil cuttings.			
68.3												
Sample Types							Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample		V - Vac Ex/Grab Sample		Granular (Sand):			Fine Grained (Clay):			and 35-50%		
CS - California Sampler		SS - Split Spoon		V. Loose: 0-4			Dense: 30-50			some 20-35%		
BQ - 1.5" Rock Core		ST - Shelby Tube		Loose: 4-10			V. Dense: >50			little 10-20%		
NQ - 2" Rock Core		GP - Geoprobe		M. Dense: 10-30			M. Soft: <2			trace <10%		
							Soft: 2-4			moisture, density, color		
							M. Stiff: 4-8					
							Hard: >30					
Reviewed by:								Date:		Boring Number: B-59		



Boring Number: B-60

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 96.11**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NX**Total Depth (ft.):** 8.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 1075 Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2966922.9100 **Easting:** 739437.503

NE 9/21/2017 --

Drilling Date: Start: 9/21/2017 **End:** 9/21/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
96.1 0	SS	S-1	9	38 100/3"	7	>100			6" Asphalt	
									Moist, very dense, dark gray, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	15	58 73 100/3"	12	>100		Sand and Gravel	Moist, very dense, dark gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (2'-3.25')
									See core log for description	
91.1 5	NX	C-1	60		56	--		Bedrock		
									Test boring B-60 terminated at 8.5' bgs and backfilled with soil cuttings.	
86.1 10										
81.1 15										
76.1										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-60**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 96.11

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NX

Total Depth (ft.): 8.5

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 1075 Pleasant St., Belmont, MA

Depth	Date	Time
-------	------	------

Northing: 2966922.9100 **Easting:** 739437.503

NE 9/21/2017

Drilling Date: Start: 9/21/2017 End: 9/21/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: J. Wang

[illegible]



Boring Number: B-61

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 94.5**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Pleasant St./Olmstead Dr., Belmont, MA**Depth Date Time****Northing:** 2966985.6420 **Easting:** 739825.182

6 9/21/2017 12:00

Drilling Date: Start: 9/21/2017 **End:** 9/21/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
94.5 0									6" Asphalt 6" Cobble	
	SS	S-1	12	45 70	7	>70		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-4')
	SS	S-2	24	22 21 20 20	2	41			Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
89.5 5	SS	S-3	24	27 26 45 46	8	71			Moist, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	Analytical sample (4'-6')
	SS	S-4	7	70 50/1"	7	>50		Weathered Rock	Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
	SS	S-5	5	100/5"	5	--			Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
84.5 10	NX	C-1	60		52	--		Bedrock	See core log for description	
79.5 15									Test boring B-61 terminated at 14' bgs and backfilled with soil cuttings.	
74.5										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-61**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 94.5

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 14

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Pleasant St./Olmstead Dr., Belmont, MA

Depth	Date	Time
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6	9/21/2017	12:00
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Northing: 2966985.6420 **Easting:** 739825.182

Abandonment Method: Backfilled with soil cuttings

Drilling Date: Start: 9/21/2017 End: 9/21/2017

Logged By: A. Smith

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
84.5 10.0	NX	C-1	60	87	17	2:00	NR	XXXX	Granite	Hard, slightly weathered, medium grained, gray, GRANITE; very close to close jointing	
2:30						XXXX					
2:30						XXXX					
1:30						XXXX					
2:00						XXXX					
79.5 15.0									Test boring B-61 terminated at 14' bgs.		
74.5 20.0											
69.5 25.0											

Bedding (mm)		Joint Spacing (mm)		Continuity (mm)		Attitude Angle		Aperture (mm)	
Extremely Thin	<20	Extremely Close	<20	Extremely	<25	Horizontal	0° - 5°	Very Tight	< 0.1
Very Thin	20-60	Very Close	20-60	Moderately	25-100	Shallow	5° - 35°	Tight	0.1 - 0.25
Thin	60-200	Close	60-200	Slightly	100-200	Moderate	35° - 55°	Partly Open	0.25 - 0.5
Medium	200-600	Mod Close	200-600	Sound	>200	Steep	55° - 85°	Open	0.5 - 2.5
Thick	600-2000	Wide	600-2000			Vertical	85° - 90°	Mod. Wide	2.5 - 10
Very Thick	2000-6000	Very Wide	2000-6000					Wide	>10
Extremely Thick	>6000	Extremely Wide	>6000						

Field Hardness		Weathering	
Very Hard	Knife Can't Scratch Scratches with Difficulty	Fresh	No Visible sign of rock material weathering; slight to no discoloration.
Hard		Slight	Discoloration indicated weathering. All the rock material may be discoloredand may be weaker externally than its fresh condition.
Med. Hard	Scratches Readily Grooves with Difficulty	Moderate	Less than half of the rock material is decomposed and/or disintergrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Medium		Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.
Soft	Grooves Readily Carves with Knife	Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.
Very Soft		Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

Reviewed by:				Date:		Boring Number: B-61	
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Boring Number: B-62

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 85.85

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NX

Total Depth (ft.): 14.1

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 1010 Pleasant St., Belmont, MA

Depth Date Time

Northing: 2966921.5300 Easting: 740085.377

6.0 11/13/2017 09:15

Drilling Date: Start: 11/9/2017 End: 11/13/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
85.9 0									4" Asphalt	
	SS	S-1	10	17 100/4"	6	>100		Fill	Moist, very dense, brown, fine to medium SAND, little silt	
	SS	S-2	24	14 28 28 25	8	56		Sand and Gravel	Moist, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-4')
80.9 5	SS	S-3	24	14 44 38 56	10	82			Moist, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (4'-6')
	SS	S-4	18	66 92 100	16	>100			Moist, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Corrosion sample (6'-7.5')
	SS	S-5	16	18 40 100/4"	8	>100			Moist, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Advanced rollerbit from 10 to 11' in rock. Cored rock from 11 to 14' and retrieved 12" of cobbles and coarse gravel.
75.9 10								Weathered Rock	See core log for description	
	NX	C-1	36		12	--				
	SS	S-6	1	100/1"	0	--			No Recovery	
70.9 15									Test boring B-62 terminated at 14.1' bgs and backfilled with soil cuttings.	
65.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-62

**Boring Number:
B-62**

Boring Number:
B-64

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 73

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 15.3

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 1000 Pleasant St., Belmont, MA

Depth	Date	Time
-------	------	------



Northing: 2967341.7673 **Easting:** 740754.7076

11.8 11/20/2017 10:25

Drilling Date: Start: 11/20/2017 **End:** 11/20/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks			
73.0													
0								Fill	4" Peastone	Vacuum excavate boring from the ground surface to 6' bgs.			
	VE	V-1			--	--			Moist, brown-gray, fine to medium SAND, some fine to coarse gravel, little silt	Analytical sample (2'-2.5')			
68.0 5													
	SS	S-1	24	16 21 20 50	10	41		Sand and Gravel	Moist, hard, brown, fine to coarse SAND, some silt, some fine to coarse gravel	Analytical sample (6'-8')			
	SS	S-2	24	54 52 54 100	16	>100			Moist, hard, brown, SILT, little fine to coarse gravel, trace fine sand	Corrosion sample (8'-10')			
63.0 10													
▼													
58.0 15	SS	S-3	16	23 26 100/4"	8	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt				
									Test boring B-64 terminated at 15.3' bgs and backfilled with soil cuttings.				
53.0													
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification			
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe		Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30		Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30		and some little trace moisture, density, color	35-50% 20-35% 10-20% <10%
Reviewed by:								Date:		Boring Number: B-64			



**Boring Number:
B-65**

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Number: 101038-102170

Surface Elevation (ft.): 74.4

Total Depth (ft.): 15

Depth to Initial Water Level (ft):

Depth	Date	Time
-------	------	------

9.0 9/19/2017 13:40

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	density, color

Reviewed by:

Date:

Boring Number: B-65

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-66

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 73.6**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NX**Total Depth (ft.):** 14.2**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 790 Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2967939.2190 **Easting:** 741497.916

7.0 9/26/2017 13:20

Drilling Date: Start: 9/26/2017 **End:** 9/26/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
73.6 0									3" Concrete 1" Gravel Subbase	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1	12		--	--		Sand and Gravel	Moist, dark gray, fine to coarse SAND, some silt, little fine to coarse gravel	Analytical sample (3-4')
68.6 5	VE	V-2	6		--	--			Moist, dark brown, SILT, little clay, trace fine gravel	Corrosion sample (4'-6')
	SS	S-1	24	17 10 7 14	12	17		Sandy Silt	Wet, medium dense, black, Organic SILT and fine to coarse SAND, trace fine gravel	
	SS	S-2	3	100/3"	3	--			No Recovery	
63.6 10										
	NX	C-1	12		--	--		Sand and Gravel		Rollerbit from 12 to 13' bgs.
	SS	S-3	2	100/2"	1	--			Wet, very dense, brown, fine to coarse SAND, some silt, little fine to coarse gravel	
58.6 15									Test boring B-66 terminated at 14.1' bgs and backfilled with soil cuttings.	
53.6										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-66**



Boring Number: B-67

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 73.01**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14.8**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 782 Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2968066.8890 **Easting:** 741677.9

2.5 10/3/2017 12:15

Drilling Date: Start: 10/3/2017 **End:** 10/3/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
73.0 0									3" Concrete 3" Sand Subbase	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1			--	--		Fill	Moist, dark brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (3-4')
68.0 5										
	SS	S-1	14	11 18 100/2"	5	>100			Moist, hard, brown, Organic fine to coarse SAND and SILT, some fine gravel	
	SS	S-2	3	100/3"	3	--			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
63.0 10										
	SS	S-3	9	70 100/3"	6	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
58.0 15									Test boring B-67 terminated at 14.8' bgs and backfilled with soil cuttings.	
53.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-67**



Boring Number: B-68

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 69.93**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 15.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 762 Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2968334.4810 **Easting:** 742022.9

6.1 10/2/2017 13:15

Drilling Date: Start: 10/2/2017 **End:** 10/2/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith / J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
69.9 0									3" Concrete & 1" Sand Subbase	Vacuum excavate boring from the ground surface to 6' bgs.
	VE	V-1	12		--	--		Fill	Moist, dark brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-3')
	VE	V-2	12		--	--			Moist, dark brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (3'-4')
64.9 5										
	SS	S-1	24	33 28 9 36	8	37			Moist, dense, brown, fine SAND and SILT	
	SS	S-2	24	38 84 70 100	14	>100			Moist, very dense, brown, SILT, some fine to coarse sand, trace fine gravel	
59.9 10										
	SS	S-3	18	44 46 100/6"	12	>100			Wet, very dense, brown, fine to medium SAND, some fine to coarse gravel, some silt	
54.9 15										
									Test boring B-68 terminated at 15.5' bgs and backfilled with soil cuttings.	
49.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-68**

**Boring Number:
B-69**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 74.66

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 14.8

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 750 Pleasant St., Belmont, MA

Depth	Date	Time
-------	------	------

Northings: 2968469.5950 **Easting:** 742257.907

11.5 9/19/2017 10:25

Drilling Date: Start: 9/19/2017 End: 9/19/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%

moisture, density, color

Reviewed by:

Date:

Boring Number: B-69



Boring Number: B-70

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher, J. Murphy**Surface Elevation (ft.):** 78.82**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 13.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Pleasant St./Snake Hill Rd., Belmont, MA**Depth Date Time****Northing:** 2968930.1200 **Easting:** 742578.168

3.2 9/18/2017 15:15

Drilling Date: Start: 9/18/2017 **End:** 9/18/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
78.8 0									5" Asphalt	
	SS	S-1	18	10 26 32	10	58			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	20 20 15 14	18	35			Moist, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-4')
73.8 5	SS	S-3	9	13 100/3"	4	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-4	24	40 48 45 70	18	93			Moist, very dense, gray-brown, fine to coarse SAND, some fine gravel, little silt	Analytical sample (6'-8')
	SS	S-5	24	34 50 62 80	14	>100			Moist, very dense, gray-brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
68.8 10										
	SS	S-6	6	100	1	--			Moist, very dense, gray-brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
63.8 15									Test boring B-70 terminated at 13.5' bgs and backfilled with soil cuttings.	
58.8										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
						Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30				
Reviewed by:								Date:		Boring Number: B-70

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



**Boring Number:
B-71**

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Number: 101038-102170

Surface Elevation (ft.): 75.15

Total Depth (ft.): 15.5

Depth to Initial Water Level (ft):

Depth	Date	Time
-------	------	------

NE 9/25/2017 13:45

Abandonment Method: Backfilled with soil cuttings

Logged By: J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
75.2 0									6" Topsoil	Vacuum excavate
									Moist, medium dense, brown, fine to medium SAND, little silt	boring from the ground surface to 4' bgs.
	VE	V-1							Moist, dark brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-3') Some cobbles in sample VE-1.
									No Recovery	Coarse gravel fragment in spoon tip.
70.2 5	SS	S-1	8	20 100/2"	1	>100				
	SS	S-2	4	100/4"	2	>100			Moist, very dense, dark gray, fine to coarse SAND, little fine gravel	
	SS	S-3	13	71 60 100/1"	13	>100			Moist, very dense, gray, fine SAND, some fine to coarse gravel, little silt	
65.2 10										
60.2 15	SS	S-4	18	28 40 100/5.5"	12	>100			Moist, very dense, dark brown, fine to coarse SAND, some fine gravel, little silt	
									Test boring B-71 terminated at 15.5' bgs and backfilled with soil cuttings.	
55.2										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and some little trace moisture, density, color
V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30				
Reviewed by:									Date:	
									Boring Number: B-71	

**Boring Number:
B-72**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 71.72

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NX

Total Depth (ft.): 13.5

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Pleasant St./Moore St., Belmont, MA

Depth	Date	Time
-------	------	------

Northing: 2969926.0748 **Easting:** 743401.939

3.0 9/15/2017 11:45

Drilling Date: Start: 9/15/2017 End: 9/15/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	density, color

Reviewed by:

Date:

Boring Number: B-72

Boring Number:
B-73

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 81.67

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 14.3

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 624 Pleasant St., Belmont, MA

Depth	Date	Time
-------	------	------

Northings: 2970178.3111 **Easting:** 743563.9377

8.0 9/15/2017 14:30

Drilling Date: Start: 9/15/2017 End: 9/15/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

Sample Types			
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

	Burmister Classification
--	--------------------------

and	35-50%
some	20-35%
little	10-20%
trace	<10%
moisture, density, color	

Reviewed by:

Date:

Boring Number: B-73



Boring Number: B-74

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 74.86**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Alexander Ave./Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2970563.1560 **Easting:** 743850.058

7.0 9/14/2017 15:10

Drilling Date: Start: 9/14/2017 **End:** 9/14/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
74.9 0									4" Asphalt	
	SS	S-1	14	44 50 100/2"	12	>100			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
				12 34 14 35	4	48			Moist, dense, brown, fine to coarse SAND, some fine gravel, little silt	Analytical sample (2'-4')
	SS	S-2	24							
	SS	S-3	12	38 100	12	>100			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
69.9 5										
	SS	S-4	5	100/5"	4	--				Core through boulder from 6 to 7.5' bgs.
	SS	S-5	15	52 70 100/3"	10	>100			Wet, very dense, dark gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
64.9 10										
	SS	S-6	24	40 46 80 100	6	>100			Wet, very dense, dark gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
59.9 15										
									Test boring B-74 terminated at 16' bgs and backfilled with soil cuttings.	
54.9										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample V - Vac Ex/Grab Sample CS - California Sampler SS - Split Spoon BQ - 1.5" Rock Core ST - Shelby Tube NQ - 2" Rock Core GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	and 35-50%
						Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	some 20-35%
						M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:		Boring Number: B-74

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-75

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / P. Fisher**Surface Elevation (ft.):** 55.69**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NX**Total Depth (ft.):** 1.8**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 543 Pleasant St., Belmont, MA**Depth Date Time****Northing:** 2971000.5200 **Easting:** 744248.625

NE NE NE

Drilling Date: Start: 9/22/2017 **End:** 9/22/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
55.7 0									6" Asphalt	
	VE	V-1			--	--		Fill	Moist, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	
									Concrete block encountered in vacuum excavated hole. Test boring B-75 backfilled with soil cuttings and offset to B-75A (MW).	
50.7 5										
45.7 10										
40.7 15										
35.7										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-75**



Boring Number: B-75A (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 55.69

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NX

Total Depth (ft.): 14.5

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 543 Pleasant St., Belmont, MA

Depth Date Time

Northing: 2971005.5200 Easting: 744248.625

5.0 11/16/2017 11:15

Drilling Date: Start: 11/16/2017 End: 11/16/2017

Abandonment Method: Monitoring well installed

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
55.7 0									9" Asphalt	Vacuum excavate boring
	VE	V-1			--	--		Sand and Gravel	Moist, brown, fine to medium SAND, little fine gravel, trace silt	from the ground surface to 4' bgs.
	VE	V-2			--	--			Moist to wet, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Vacuum excavation could not be conducted past 4' bgs due to cobbles. Cobbles were noted in the vacuum excavated hole.
50.7 5										
	SS	S-1	24	12 13 20 21	8	33			Wet, dense, brown, fine to coarse GRAVEL, some fine to coarse sand, little silt	Corrosion sample (6'-8')
	SS	S-2	6	100/6"	0	>100				
45.7 10								Bedrock	See core log for description	
	NX	C-1	60		30	--				
40.7 15									Test boring B-75A (MW) terminated at 14.5' bgs and backfilled with soil cuttings.	
35.7										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**

AS - Auger/Grab Sample V - Vac Ex/Grab Sample
CS - California Sampler SS - Split Spoon
BQ - 1.5" Rock Core ST - Shelby Tube
NQ - 2" Rock Core GP - Geoprobe

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:


Boring Number: B-75A (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Graphic Log	Strata	Material Description	Remarks	
10.0	NX	C-1	60	50	24	NR		DIORITE	Hard, slightly fractured, slightly weathered, gray, fine to medium grained, DIORITE; primary joint set shallow to moderate, close, rough, stepped		
15.0											
20.0											
25.0											
Bedding (mm)			Joint Spacing (mm)			Continuity (mm)		Attitude Angle		Aperture (mm)	
Extremely Thin	<20		Extremely Close	<20		Extremely	<25	Horizontal	0° - 5°	Very Tight	< 0.1
Very Thin	20-60		Very Close	20-60		Moderately	25-100	Shallow	5° - 35°	Tight	0.1 - 0.25
Thin	60-200		Close	60-200		Slightly	100-200	Moderate	35° - 55°	Partly Open	0.25 - 0.5
Medium	200-600		Mod Close	200-600		Sound	>200	Steep	55° - 85°	Open	0.5 - 2.5
Thick	600-2000		Wide	600-2000				Vertical	85° - 90°	Mod. Wide	2.5 - 10
Very Thick	2000-6000		Very Wide	2000-6000						Wide	>10
Extremely Thick	>6000		Extremely Wide	>6000							
Field Hardness			Weathering								
Very Hard	Knife Can't Scratch		Fresh	No Visible sign of rock material weathering; slight to no discoloration.							
Hard	Scratches with Difficulty		Slight	Discoloration indicated weathering. All the rock material may be discoloredand may be weaker externally than its fresh condition.							
Med. Hard	Scratches Readily		Moderate	Less than half of the rock material is decomposed and/or disintergrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.							
Medium	Grooves with Difficulty		Severe	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone.							
Soft	Grooves Readily		Complete	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.							
Very Soft	Carves with Knife		Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.							
Reviewed by:								Date:		Boring Number: B-75A (MW)	



Boring Number:
B-76

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Number: 101038-102170

Surface Elevation (ft.): 48.09

Total Depth (ft.): 14.8









Depth to Initial Water Level (ft):

Depth	Date	Time
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NE 9/18/2017 13:45

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
48.1 0				3					Top 6": Topsoil	
	SS	S-1	24	7 8 5	10	15		Fill	Bottom 4": Moist, medium dense, brown, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	24	2 2 4 6	12	6		Silty Clay	Moist, medium stiff, brown, CLAY and SILT, some fine to medium sand	Analytical sample (2'-4')
43.1 5	SS	S-3	20	8 20 40 50/2"	8	60			Moist, hard, brown, CLAY and SILT, some fine to medium sand	
	SS	S-4	14	45 90 50/2"	12	>100			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
	SS	S-5	4	100/4"	4	--			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
38.1 10								Sand and Gravel		
33.1 15	SS	S-6	9	85 100/3"	9	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
28.1									Test boring B-76 terminated at 14.8' bgs and backfilled with soil cuttings.	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler		V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	SS - Split Spoon	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	ST - Shelby Tube			M. Stiff: 4-8	Hard: >30	trace	<10%
	GP - Geoprobe	M. Dense: 10-30				moisture	densitv. color

Boring Number: B-76

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21



Boring Number: B-77

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 51.11**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 15**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 5 Stella Road, Belmont, MA**Depth Date Time****Northing:** 2971652.8460 **Easting:** 745125.079

8.0 9/11/2017 13:20

Drilling Date: Start: 9/11/2017 **End:** 9/11/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
51.1 0									4" Asphalt	
	SS	S-1	9	48 100/3"	8	>100		Sandy Silt	Moist, very dense, brown, fine to medium SAND, some fine gravel, little silt	Cobbles from 1.2 to 2' bgs.
	SS	S-2	24	18 25 38 11	10	63			Moist, very dense, brown, SILT, some fine to coarse sand, little fine gravel	Analytical sample (2'-4')
46.1 5	SS	S-3	20	20 25 70 100/4"	18	95		Sand and Gravel	Top 6": Moist, very dense, brown, SILT, some fine to coarse sand, little fine gravel Bottom 12": Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-4	24	46 46 25 31	9	71			Moist, very dense, brown, fine to coarse SAND, little fine gravel, little silt	
	SS	S-5	6	100	6	--			Moist, very dense, brown, fine to coarse SAND, little fine gravel, little silt	
41.1 10										Rollerbit through cobbles from 10 to 13' bgs.
	SS	S-6	24	42 66 44 40	12	>100			Moist, very dense, brown, fine to coarse SAND, little fine gravel, little silt	
36.1 15									Test boring B-77 terminated at 15' bgs and backfilled with soil cuttings.	
31.1										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30
										and 35-50% some 20-35% little 10-20% trace <10% moisture, density, color
Reviewed by:								Date:		Boring Number: B-77

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/8/21

**Boring Number:
B-78**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 50.47

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 14.5

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 422 Pleasant St., Belmont, MA

Depth	Date	Time
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Northing: 2971804.7740 **Easting:** 745417.737

7.5 9/13/2017 10:35

Drilling Date: Start: 9/13/2017 End: 9/13/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
50.5										
0				7					4" Asphalt	
	SS	S-1	18	35 38	9	73		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4'). Coarse gravel in spoon tip. Coarse gravel in spoon tip. Corrosion sample (6'-8')
	SS	S-2	24	10 10 90	6	20			Wet, medium dense, brown, fine to coarse SAND, some fine gravel, trace silt	
				70 95 80	0	>100			No Recovery	
45.5 5	SS	S-3	21	50/3"						
	SS	S-4	24	48 25 23 20	0	48			No Recovery; 3" Spoon: Moist, dense, brown, fine to medium SAND, little silt	
	SS	S-5	24	12 21 23 28	18	44		Sandy Silt	Moist, dense, brown, SILT, little fine sand	
40.5 10										
								Sand and Gravel		
	SS	S-6	6	100	6	>100			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt Test boring B-78 terminated at 14.5' bgs and backfilled with soil cuttings.	
35.5 15										



Boring Number: B-79

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 48.61**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 3 Scott Road, Belmont, MA**Depth Date Time****Northing:** 2972192.9570 **Easting:** 745884.085

9.5 9/14/2017 10:00

Drilling Date: Start: 9/14/2017 **End:** 9/14/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
48.6 0	SS	S-1	24	5 7 8 9	12	15		Sand and Gravel	Top 4": Topsoil Bottom 8": Moist, medium dense, brown, fine to medium SAND, trace silt	
	SS	S-2	24	12 20 27 50	10	47			Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4')
43.6 5	SS	S-3	24	42 30 80 62	12	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (4'-6')
	SS	S-4	24	33 36 32 52	12	68			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Corrosion sample (6'-8')
	SS	S-5	24	76 65 45 52	14	>100			Top 8": Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt Bottom 6": Moist, very dense, brown, SILT, little fine sand	
38.6 10								Silty Silt		
								Silty Clay		
33.6 15	SS	S-6	24	11 15 23 24	24	38			Wet, hard, gray, CLAY & SILT, little fine to medium sand	
									Test boring B-79 terminated at 16' bgs and backfilled with soil cuttings.	
28.6										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-79**



Boring Number: B-80

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 49.15

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Pleasant St./Brighton St., Belmont, MA

Depth Date Time

Northing: 2972521.9200 Easting: 746251.684

8.5 9/25/2017 10:30

Drilling Date: Start: 9/22/2017 End: 9/22/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: J. Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
49.2 0									6" Asphalt	Vacuum excavate
	VE	V-1			--	--		Fill	Moist, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	boring from the ground surface to 4' bgs. Cobbles observed in borehole fro 1 to 5' bgs.
	VE	V-2			--	--			Moist, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
44.2 5	SS	S-1	23	21 27 72 100/5"	6	99			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (3'-4.5')
	SS	S-2	24	40 18 19 15	18	37			Moist, dense, brown to gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
▼										
39.2 10	SS	S-3	15	38 65 100/3"	1	>100		Sand and Gravel	Wet, very dense, dark gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
34.2 15	SS	S-4	24	30 35 40 35	12	75			Wet, very dense, dark gray, fine to medium SAND, trace silt, trace fine gravel	
									Test boring B-80 terminated at 16' bgs and backfilled with soil cuttings.	
29.2										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample V - Vac Ex/Grab Sample CS - California Sampler SS - Split Spoon BQ - 1.5" Rock Core ST - Shelby Tube NQ - 2" Rock Core GP - Geoprobe						Granular (Sand):		Fine Grained (Clay):		
						V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	and 35-50%
						Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	some 20-35%
						M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	little 10-20%
										trace <10%
										moisture, density, color
Reviewed by:								Date:	Boring Number: B-80	



Boring Number: B-81

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 50.22**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 26**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Pleasant St./Concord Turnpike, Belmont, MA**Depth Date Time****Northing:** 2972932.4574 **Easting:** 746740.3706

9.0 10/4/2017 14:30

Drilling Date: Start: 10/4/2017 **End:** 10/4/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** J.Wang

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
50.2 0				8 19 41 75	24	60			3" Topsoil	
	SS	S-1	24						Dry, very dense, light brown, fine SAND and SILT, trace roots	
	SS	S-2	9	60 100/3"	6	>100		Fill	Dry, very dense, light brown, fine SAND and SILT, trace roots	Analytical sample (2'-2.9') Asphalt encountered from 3 to 3.5' bgs.
45.2 5										
	SS	S-3	24	18 26 35 59	4	61			Wet, very dense, brown, fine to coarse GRAVEL, little fine to coarse sand, trace silt	Analytical sample (6'-8')
	SS	S-4	24	32 45 30 35	18	75			Top 12": Moist, very dense, brown, fine to coarse SAND, trace silt Bottom 8": Moist, very dense, light brown, SILT and fine to medium SAND, trace fine gravel	
40.2 10										
	SS	S-5	5	100/5"	2			Sand and Gravel	Wet, very dense, gray, fine to medium GRAVEL	
35.2 15										
	SS	S-6	24	37 42 40 40	18	82			Wet, very dense, light brown, fine SAND, some silt	
30.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-81**



Boring Number: B-81

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
30.2 20										
25.2 25	SS	S-7	24	20 30 23 41	15	53		Sand and Gravel	Wet, very dense, light brown, fine SAND	
20.2 30									Test boring B-81 terminated at 26' bgs and backfilled with soil cuttings.	
15.2 35										
10.2 40										
5.2 45										

Boring Number: B-81



Boring Number: B-82

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 51.64

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 10

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 9 Venner Rd., Arlington, MA

Depth Date Time

Northing: 2973277.1544 Easting: 746927.0222

NE NE NE

Drilling Date: Start: 10/3/2017 End: 10/3/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
51.6 0									8" Asphalt	
	SS	S-1	12	36 40	8	--		Fill	Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-4')
	SS	S-2	24	30 26 24 23	10	50			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
46.6 5	SS	S-3	24	10 10 10 18	10	20		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Corrosion sample (6'-8')
	SS	S-4	24	14 15 16 35	14	31			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-5	24	20 38 50 72	12	88		Silty Clay	Moist, hard, brown, CLAY & SILT, some fine sand	
41.6 10									Drill crew notified that test boring location was too close to an existing utility. The boring was backfilled with drill cuttings and offset to boring location B-82A.	
36.6 15										
31.6										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**

AS - Auger/Grab Sample V - Vac Ex/Grab
CS - California Sampler Sample
BQ - 1.5" Rock Core SS - Split Spoon
NQ - 2" Rock Core ST - Shelby Tube
GP - Geoprobe

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-82



Boring Number: B-82A

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / P. Fisher

Surface Elevation (ft.): 51.64

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 26

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 9 Venner Rd., Arlington, MA

Depth Date Time

Northing: 2973277.1544 Easting: 746927.0222

8.5 11/9/2017 11:10

Drilling Date: Start: 11/9/2017 End: 11/9/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
51.6										
0									4" Asphalt	
	SS	S-1	18	8 6 4	10	10		Fill	Moist, stiff, dark brown, Organic SILT, some fine to coarse sand, trace fine gravel	
	SS	S-2	24	14 18 25 30	14	43		Sand and Gravel	Moist, dense, brown, fine to coarse SAND, some fine gravel, little silt	
46.6	SS	S-3	12	30 100	4	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
5	SS	S-4	24	18 32 50 54	8	82			Moist, very dense, brown, fine to medium SAND, some fine to coarse gravel, little silt	
	SS	S-5	24	13 46 62 56	12	>100		Sandy Silt	Top 6": Moist, hard, brown, SILT, some fine to medium sand, trace fine gravel Bottom 6": Moist, very dense, light brown, fine SAND, little silt	
41.6										
10										
	SS	S-6	24	19 21 21 23	12	42		Silty Sand	Moist, dense, brown, fine SAND, little silt	
36.6										
15										
	SS	S-7	24	12 21	12	43			Moist, dense, brown, fine SAND, little silt	
31.6										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - GeoprobeGranular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-82A



Boring Number: B-82A

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
31.6 20	SS	S-7	24	22 24	12	43		Silty Sand	Moist, very dense, brown, fine SAND, little silt	
26.6 25	SS	S-8	24	22 20 32 22	15	52				
21.6 30										
16.6 35									Test boring B-82A terminated at 26' bgs and backfilled with soil cuttings.	
11.6 40										
6.6 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 3/22/21

Boring Number: B-82A



Boring Number: B-84

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 49.41**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 15**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 235 Pleasant Street, Arlington, MA**Depth Date Time****Northing:** 2973644.3219 **Easting:** 747551.1924

NE 10/2/2017 10:00

Drilling Date: Start: 10/2/2017 **End:** 10/2/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
49.4 0									7" Concrete	
	SS	S-1	12	30 28	9	--		Sand and Gravel	Moist, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-4')
	SS	S-2	35	22 50 60 50	9	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
44.4 5	SS	S-3	24	28 30 36 38	12	66			Moist, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	Corrosion sample (4'-6')
	SS	S-4	18	32 66 100	12	>100			Moist, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	Silt in spoon tip.
39.4 10	SS	S-5	24	20 28 48 48	24	76		Silty Clay	Moist, hard, brown, CLAY & SILT, trace fine to medium sand	
34.4 15	SS	S-6	12	100/4"	6	>100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Sample S-6 driven to 15' bgs with 300lb hammer.
									Test boring B-84 terminated at 15' bgs and backfilled with soil cuttings.	
29.4										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-84**



Boring Number: B-85

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 45.35**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 211 Pleasant St., Arlington, MA**Depth Date Time****Northing:** 2973919.8504 **Easting:** 747898.0533

6.5 9/8/2017 09:00

Drilling Date: Start: 9/7/2017 **End:** 9/8/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
45.4									5" Topsoil	
0	SS	S-1	24	1866	12	14			Moist, medium dense, brown, SILT and fine SAND	
	SS	S-2	24	12303240	16	62			Moist, medium dense, brown, fine to medium SAND, little fine gravel, trace silt	Analytical sample (2'-4')
40.4	SS	S-3	24	42605560	12	>100			Wet, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	
5	SS	S-4	24	44454560	14	90			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Corrosion sample (6'-8')
	SS	S-5	24	23273035	20	57			Moist, hard, brown, SILT	
35.4									Moist, hard, brown, CLAY	PP = 2.5 tsf
10										
	SS	S-6	24	20302425	24	54			Moist, hard, brown, CLAY and SILT, trace fine to medium sand	PP = 2 tsf
30.4										
15									Test boring B-85 terminated at 16' bgs and backfilled with soil cuttings.	
25.4										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-85**

**Boring Number:
B-86**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 55.91

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NX

Total Depth (ft.): 15

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Kensington Park at Pleasant St., Arlington, MA

Depth	Date	Time
-------	------	------

Northing: 2974281.9003 **Easting:** 748160.7361

3.0 9/6/2017 15:45

Drilling Date: Start: 9/6/2017 End: 9/6/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	<u>Granular (Sand):</u>		<u>Fine Grained (Clay):</u>		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture density color	

Reviewed by:

Date:

Boring Number: B-86



Client: MWRA

Project Location: Massachusetts

Elevation Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks		
10.0	NX	C-1	60	100	22	2	NR	XXXX	Bedrock	Hard, very slightly weathered, moderately fractured, dark gray, GRANITE, medium dipping with very close to close joint spacing.			
						4		XXXX					
						6		XXXX					
						2		XXXX					
						2		XXXX					
40.9 15.0										Test boring B-86 terminated at 15' bgs.			
35.9 20.0													
30.9 25.0													
25.9													
<u>Bedding (mm)</u>				<u>Joint Spacing (mm)</u>				<u>Continuity (mm)</u>		<u>Attitude Angle</u>		<u>Aperture (mm)</u>	
Extremely Thin <20 Very Thin 20-60 Thin 60-200 Medium 200-600 Thick 600-2000 Very Thick 2000-6000 Extremely Thick >6000				Extremely Close <20 Very Close 20-60 Close 60-200 Mod Close 200-600 Wide 600-2000 Very Wide 2000-6000 Extremely Wide >6000				Extremely <25 Moderately 25-100 Slightly 100-200 Sound >200		Horizontal 0° - 5° Shallow 5° - 35° Moderate 35° - 55° Steep 55° - 85° Vertical 85° - 90°		Very Tight < 0.1 Tight 0.1 - 0.25 Partly Open 0.25 - 0.5 Open 0.5 - 2.5 Mod. Wide 2.5 - 10 Wide >10	
<u>Field Hardness</u>				<u>Weathering</u>									
Very Hard Knife Can't Scratch Hard Scratches with Difficulty Med. Hard Scratches Readily Medium Grooves with Difficulty Soft Grooves Readily Very Soft Carves with Knife				Fresh No Visible sign of rock material weathering; slight to no discoloration. Slight Discoloration indicated weathering. All the rock material may be discolored and may be weaker externally than its fresh condition. Moderate Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones. Severe More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestone. Complete All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact. Residual Soil All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.									
Reviewed by:									Date:		Boring Number: B-86		



Boring Number: B-87

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 60.23**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 14**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Pleasant St./Gray St., Arlington, MA**Depth Date Time****Northing:** 2974926.5197 **Easting:** 748441.0614

11.5 9/8/2017 13:30

Drilling Date: Start: 9/8/2017 **End:** 9/8/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
60.2 0				18					3" Topsoil	
	SS	S-1	24	58 12 16	14	70			Dry, very dense, brown, fine to medium SAND, some fine to coarse GRAVEL, little silt	
	SS	S-2	24	22 40 12 12	12	52			Dry, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (2'-4')
55.2 5	SS	S-3	24	60 52 46 80	17	98			Dry, very dense, brown, fine to medium SAND, some fine to coarse GRAVEL, little silt Moist, very dense, brown, fine SAND, little silt	Analytical sample (4'-6')
	SS	S-4	2	100/2"	2	--			Moist, very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-5	0	100/0"	0	--			No recovery	
50.2 10										
	SS	S-6	5	100/5"	4	--			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, little silt	
	SS	S-7	0	100/0"	0	--			No Recovery	
45.2 15										
40.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-87**









Boring Number: B-88

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 58.94**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Lakeview St./Pleasant St., Arlington, MA**Depth Date Time****Northing:** 2975244.8954 **Easting:** 748545.6563

NE 9/6/2017 10:40

Drilling Date: Start: 9/6/2017 **End:** 9/6/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks	
58.9 0				4					6" Topsoil		
	SS	S-1	24	7 6 5	14	13		Organic Soils	Moist, medium dense, brown, Slightly Organic SILT and fine SAND. 1" fine to medium sand lens at 17' bgs		
	SS	S-2	24	3 22 50 40	16	72			Top 6": Moist, dense, brown, Organic SILT and fine SAND	Analytical sample (2-4')	
									Bottom 10": Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
53.9 5	SS	S-3	15	36 85 100/3"	12	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt		
	SS	S-4	9	80 100/3"	9	>100			Moist, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	Corrosion sample (6-6.75')	
	SS	S-5	24	33 42 40 40	16	82		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND, little fine gravel, trace silt		
48.9 10											
43.9 15	SS	S-6	24	10 9 30 34	14	39		Silty Clay	Top 3": Moist, dense, brown, fine to coarse SAND, little fine gravel, trace silt		
									Bottom 11": Wet, hard, brown, CLAY, some fine to medium sand, trace fine gravel		
									Bottom 1": Wet, dense, brown, fine to medium SAND		
									Test boring B-88 terminated at 16' bgs and backfilled with soil cuttings.		
38.9											
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample		V - Vac Ex/Grab Sample				Granular (Sand):		Fine Grained (Clay):		and 35-50%	
CS - California Sampler		SS - Split Spoon				V. Loose: 0-4		V. Soft: <2		some 20-35%	
BQ - 1.5" Rock Core		ST - Shelby Tube				Dense: 30-50		Stiff: 8-15		little 10-20%	
NQ - 2" Rock Core		GP - Geoprobe				Loose: 4-10		Soft: 2-4		trace <10%	
						M. Dense: 10-30		V. Stiff: 15-30		moisture, density, color	
								Hard: >30			
Reviewed by:								Date:		Boring Number: B-88	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19



Boring Number: B-89

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 62.64**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 15.3**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Hopkins Rd./Pleasant St., Arlington, MA**Depth Date Time****Northing:** 2975525.9291 **Easting:** 748812.8921

2.0 9/7/2017 10:20

Drilling Date: Start: 9/7/2017 **End:** 9/7/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
62.6 0									6" Topsoil	Vacuum excavate
									Moist, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	boring from the ground surface to 4' bgs. Analytical sample (0.5'-4.3')
	VE	V-1			--	--				
	SS	S-1	3	100/3"	0	--				
57.6 5										Rollerbit throughout boulder from 4.5 to 5.5'
	SS	S-2	3	100/3"	3	--			Wet, very dense, brown, fine to coarse GRAVEL, some fine to coarse SAND, little silt	Rollerbit through cobbles from 6.5 to 8' bgs.
52.6 10	SS	S-3	18	50 72 100	16	>100			Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, some silt	
47.6 15	SS	S-4	15	40 72 100/3"	12	>100			Wet, very dense, brown, fine to coarse GRAVEL, some fine to coarse SAND, little silt	
									Test boring B-89 terminated at 15.3' bgs and backfilled with soil cuttings.	
42.6										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-89**



Boring Number: B-90

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 62.43**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Lombard Rd./Pleasant St., Arlington, MA**Depth Date Time****Northing:** 2976065.1933 **Easting:** 749373.6117

NE 9/1/2017 11:00

Drilling Date: Start: 9/1/2017 **End:** 9/1/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
62.4 0	SS	S-1	24	11 12 11 12	18	23		Silty Sand	Dry, medium dense, brown, Slightly Organic fine SAND and SILT	
	SS	S-2	21	55 80 80 100/3"	14	>100		Sand and Gravel	Dry, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	Analytical sample (2' - 3.75')
	SS	S-3	9	66 100/3"	9	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Analytical sample (4'-4.75')
57.4 5										
	SS	S-4	24	55 40 82 100	16	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
	SS	S-5	2	100/2"	2	>100			Wet, very dense, gray and brown, medium to coarse SAND and fine to coarse GRAVEL	
52.4 10										
	SS	S-6	24	33 75 75 77	10	>100			Wet, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
47.4 15										
									Test boring B-90 terminated at 16' bgs and backfilled with soil cuttings.	
42.4										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-90**



Boring Number: B-91

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 51.88**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Swan St./Pleasant St., Arlington, MA**Depth Date Time****Northing:** 2976361.5967 **Easting:** 749665.2126

NE 9/1/2017 14:00

Drilling Date: Start: 9/1/2017 **End:** 9/1/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
51.9 0									3" Asphalt 8" Gravel base course	Vacuum excavate boring from the ground surface to 5' bgs. Analytical sample (2'-4')
	VE	V-1						Fill	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt, trace brick	
46.9 5				9					Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Rollerbit through boulder from 4 to 5' bgs.
	SS	S-1	24	17 60 60	10	77			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-2	4	100/4"	4	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
41.9 10				55					Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-3	10	100/4"	10	>100				
36.9 15				60 65 72 80					Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-4	24		12	137				
									Test boring B-91 terminated at 16' bgs and backfilled with soil cuttings.	
31.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-91**



Boring Number: B-92

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 46.61

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Swan St./Swan Pl., Arlington, MA

Depth Date Time

Northing: 2976218.8527 **Easting:** 749859.8445

NE 9/5/2017 10:15

Drilling Date: Start: 9/5/2017 **End:** 9/5/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
46.6 0									4" Asphalt 4" Gravel base course	Vacuum excavate boring from the ground surface to 5' bgs.
	VE	V-1			--	--		Fill	Dry, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt, trace brick	
41.6 5										Analytical sample (4'-6')
	SS	S-1	24	50 72 44 50	12	>100			Moist, very dense, brown, fine to coarse SAND and fine GRAVEL, trace silt	
	SS	S-2	24	88 76 83 78	12	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
36.6 10	SS	S-3	24	48 50 50 76	12	100		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
31.6 15	SS	S-4	24	32 22 38 72	8	60			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
									Test boring B-92 terminated at 16' bgs and backfilled with soil cuttings.	
26.6										

Sample Types

Consistency vs Blowcount/Foot

Burmister Classification

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core

V - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:

Date:

Boring Number: B-92



Boring Number: B-93 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 44.09**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Massachusetts Ave./Broadway, Arlington, MA**Depth Date Time****Northing:** 2976272.7917 **Easting:** 750377.6421

3.0 9/5/2017 13:00

Drilling Date: Start: 9/5/2017 **End:** 9/5/2017**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
44.1 0				8 1 1 2	16	2			Top 12": Topsoil	
	SS	S-1	24	30 36 36 40	15	72			Bottom 12": Dry, very loose, brown, fine SAND, some silt Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (2'-4')
	SS	S-2	24	40 46 62 75	12	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Analytical sample (4'-6')
39.1 5	SS	S-3	24	56 70 70 68	14	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	Corrosion sample (6'-8')
	SS	S-4	24	28 50 62 50	14	>100			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
34.1 10	SS	S-5	24	20 15 30 20	10	45			Wet, dense, brown, fine to coarse SAND, little fine gravel, trace silt	
29.1 15	SS	S-6	24						Test boring B-93 (MW) terminated at 16' bgs and converted into a monitoring well.	
24.1										

Sample Types		Consistency vs Blowcount/Foot						Burmister Classification			
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):				Fine Grained (Clay):				and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50			V. Soft: <2	Stiff: 8-15	some	20-35%		
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50			Soft: 2-4	V. Stiff: 15-30	little	10-20%		
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30				M. Stiff: 4-8	Hard: >30	trace	<10%		
										moisture, density, color	

Reviewed by:**Date:****Boring Number: B-93 (MW)**



Boring Number: B-94

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 39.91**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Broadway/Alton St., Arlington, MA**Depth Date Time****Northing:** 2976203.5501 **Easting:** 750682.654

10.0 8/30/2017 11:30

Drilling Date: Start: 8/30/2017 **End:** 8/30/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
39.9 0									4" Asphalt	
	SS	S-1	4	100/4"	4	--		Fill	Wet, medium dense, dark gray, medium to coarse SAND, trace fine gravel, trace brick	Analytical sample (2'-4')
	SS	S-2	24	15 11 8 6	6	19			Wet, very dense, dark gray, fine to coarse SAND, some fine gravel, trace silt, trace brick and mortar	Analytical sample (4'-5.2')
34.9 5	SS	S-3	15	5 6 100/3"	10	>100			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Corrosion sample (6'-8')
	SS	S-4	24	95 50 60 50	12	>100		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-5	8	76 100/2"	8	>100			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
24.9 10										
	SS	S-6	24	30 30 70 40	12	100			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
									Test boring B-94 terminated at 16' bgs and backfilled with soil cuttings.	
19.9										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-94**



Boring Number: B-95

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 36.25**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Broadway, Arlington, MA**Depth Date Time****Northing:** 2975925.3156 **Easting:** 751155.8707

NE 8/28/2017 13:00

Drilling Date: Start: 8/28/2017 **End:** 8/28/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
36.3 0	SS	S-1	24	3 3 2 2	12	5			16" Topsoil	
	SS	S-2	24	2 1 4 7	12	5		Fill	Dry, loose, brown, fine to medium SAND, some SILT, trace fine gravel Dry, loose, brown, fine to coarse SAND, trace fine gravel, trace silt	Analytical sample (2'-4')
31.3 5	SS	S-3	9	11 100/3"	6	>100			Moist, very dense, brown, fine to medium SAND, some SILT, trace fine gravel	
	SS	S-4	24	10 10 14 18	10	24		Sand	Wet, medium dense, brown, fine to coarse SAND, trace silt, trace fine to coarse gravel	
26.3 10	SS	S-5	24	15 24 28 32	18	52		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
21.3 15	SS	S-6	24	12 14 14 14	7	28			Wet, medium dense, gray, fine to medium SAND, trace silt, trace fine gravel	
16.3									Test boring B-95 terminated at 16' bgs and backfilled with soil cuttings.	

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-95**



Boring Number: B-96

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 34.71**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Palmer St./Broadway, Arlington, MA**Depth Date Time****Northing:** 2975780.4278 **Easting:** 751467.8792

14.5 8/29/2017 13:30

Drilling Date: Start: 8/29/2017 **End:** 8/29/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
34.7 0									3" Asphalt	
	SS	S-1	18	7 4 3	4	7			Wet, loose, brown, fine to medium SAND, little silt	
	SS	S-2	24	8 14 21 23	18	36			Wet, dense, dark gray, fine to medium SAND, trace silt	Analytical sample (2'-4')
29.7 5	SS	S-3	24	17 20 28 27	16	48			Moist, dense, brown, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-4	24	30 36 36 45	22	72			Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
	SS	S-5	24	16 48 62 62	14	>100			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
24.7 10										
19.7 15	SS	S-6	24	15 18 23 24	14	41			Wet, dense, brown, fine SAND, trace silt	
									Test boring B-96 terminated at 16' bgs and backfilled with soil cuttings.	
14.7										

Sample Types			Consistency vs Blowcount/Foot			Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample		Granular (Sand):		Fine Grained (Clay):		
CS - California Sampler	SS - Split Spoon		V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	and 35-50%
BQ - 1.5" Rock Core	ST - Shelby Tube		Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	some 20-35%
NQ - 2" Rock Core	GP - Geoprobe		M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	little 10-20%
							trace <10%
							moisture, density, color

Reviewed by:**Date:****Boring Number: B-96**



Boring Number: B-97

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 31.85**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 84-86 Palmer St., Arlington, MA**Depth Date Time****Northing:** 2976280.7598 **Easting:** 751947.828

10.0 8/30/2017 15:10

Drilling Date: Start: 8/30/2017 **End:** 8/30/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
31.9 0									3" Asphalt 4" Gravel base course	
	SS	S-1	18	5 5 3	10	8			Top 4": Wet, loose, gray, fine to coarse GRAVEL, some fine to coarse sand Bottom 6": Moist, loose, brown, fine to medium SAND and SILT	Analytical sample (2'-4')
	SS	S-2	24	5 6 6	14	11			Top 8": Wet, medium dense, gray, medium SAND, trace silt Bottom 6": Moist, medium dense, brown, fine SAND, some silt	
26.9 5	SS	S-3	21	13 15 23	12	38			Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-4	24	3 27 34 32	12	61			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Corrosion sample (6'-8')
	SS	S-5	24	26 31 22 15	16	53			Moist, very dense, brown, fine to coarse SAND, some fine gravel, trace silt	
21.9 10										
	SS	S-6	24	24 21 20 22	14	41			Wet, dense, brown, fine to medium SAND, trace silt	
16.9 15									Test boring B-97 terminated at 16' bgs and backfilled with soil cuttings.	
11.9										
Sample Types						Consistency vs Blowcount/Foot				Burmister Classification
AS - Auger/Grab Sample CS - California Sampler BQ - 1.5" Rock Core NQ - 2" Rock Core						Granular (Sand): V. Loose: 0-4 Dense: 30-50 Loose: 4-10 V. Dense: >50 M. Dense: 10-30				and some little trace moisture, density, color
V - Vac Ex/Grab Sample SS - Split Spoon ST - Shelby Tube GP - Geoprobe						Fine Grained (Clay): V. Soft: <2 Stiff: 8-15 Soft: 2-4 V. Stiff: 15-30 M. Stiff: 4-8 Hard: >30				35-50% 20-35% 10-20% <10%
Reviewed by:								Date:		Boring Number: B-97

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19



Boring Number: B-98

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 27.55

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 21

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 124-126 Palmer St., Arlington, MA

Depth Date Time

Northing: 2976660.2076 **Easting:** 752246.5993

8.0 8/31/2017 13:30

Drilling Date: Start: 8/31/2017 **End:** 8/31/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: D. Abt / A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
27.6 0									10" Asphalt 2" Gravel base course	Vacuum excavate test boring from the ground surface to 5' bgs.
	VE	V-1			--	--			Moist, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	Analytical sample (2.5'-5.0') Obstruction encountered. Offset boring 2' NW and resumed drilling.
22.6 5										
	SS	S-1	24	17 32 33 36	12	65		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, little fine to coarse gravel, trace silt	
	SS	S-2	24	38 30 38 28	14	68			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
17.6 10										
	SS	S-3	24	40 35 33 30	10	68			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
12.6 15										
	SS	S-4	24	45 26 29 32	8	55		Sand	Wet, very dense, brown, fine SAND, trace silt	
7.6										
	SS	S-5	24	18 15	24	37			Wet, dense, gray, fine SAND, trace silt	

Sample Types

Consistency vs Blowcount/Foot

Burmister Classification

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core

V - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:


Date:

Boring Number: B-98



Boring Number: B-98

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
7.6 20	SS	S-5	24	22 31	24	37		Sand		
2.6 25									Test boring B-98 terminated at 21' bgs and backfilled with soil cuttings.	
-2.5 30										
-7.5 35										
-12.5 40										
-17.5 45										
									Boring Number: B-98	



Boring Number: B-99

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 25.98**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 143-145 Palmer St., Arlington, MA**Depth Date Time****Northing:** 2976965.7177 **Easting:** 752462.7051

13.2 8/31/2017 10:25

Drilling Date: Start: 8/31/2017 **End:** 8/31/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** D. Abt / A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
26.0 0									9" Asphalt 2" Gravel base course	Vacuum excavate boring from the ground surface to 5.2' bgs. Analytical sample (2.5'-5.2')
	VE	V-1			--	--			Dry, brown, fine to coarse SAND, some fine to coarse GRAVEL	
21.0 5				7					Moist, very dense, brown, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-1	24	17 34 34	10	51			Wet, very dense, brown, fine to coarse SAND, little fine to coarse gravel, trace silt	
	SS	S-2	24	32 32 40 33	14	72			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
16.0 10	SS	S-3	24	30 33 37 48	14	70			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
11.0 15	SS	S-4	24	32 22 22 27	14	44			Wet, very dense, brown, fine to coarse SAND, some fine to coarse GRAVEL, trace silt	
									Test boring B-99 terminated at 16' bgs and backfilled with soil cuttings.	
6.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-99**



Client: MWRA **Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3
Project Location: Massachusetts **Project Number:** 101038-102170

Surface Elevation (ft.): 24.39

Total Depth (ft.): 16

Depth to Initial Water Level (ft):

Depth	Date	Time
-------	------	------

8.0 8/29/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Reviewed by:	Date:	Boring Number: B-100 (MW)
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Boring Number: B-101

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 24.21**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 3 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 4 Coral St., Arlington, MA**Depth Date Time****Northing:** 2977083.4322 **Easting:** 752971.992

NE 12/21/2017 09:05

Drilling Date: Start: 12/20/2017 **End:** 12/21/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
24.2 0				10					8" Topsoil	
	SS	S-1	24	11 18 18	16	29		Fill	Bottom 8": Moist, medium dense, brown, fine to medium SAND, little fine gravel, little silt	
	SS	S-2	24	14 16 15 42	10	31			Moist, dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Analytical sample (2'-4')
19.2 5	SS	S-3	24	48 52 40 34	10	92		Sand and Gravel	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
	SS	S-4	24	70 58 92 100	12	>100			Moist, very dense, gray and brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	
	SS	S-5	24	92 88 76 90	10	>100			Moist, very dense, gray and brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
14.2 10										Rollerbit through boulder from 10 to 11.5' bgs.
9.2 15	SS	S-6	24	30 24 26 26	10	50			Wet, very dense, gray, fine to coarse SAND, little fine gravel, trace silt	
									Test boring B-101 terminated at 16' bgs and backfilled with soil cuttings.	
4.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-101**



Boring Number: B-102

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-7.1 20										
	SS	S-7	24	WOH WOH WOH 3	12	WOH		Silty Clay	Wet, very soft, gray, Silty CLAY	
									Test boring B-102 terminated at 23' bgs and backfilled with soil cuttings.	
-12.1 25										
-17.1 30										
-22.1 35										
-27.1 40										
-32.1 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-102



Boring Number: B-103

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 12.19**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 26**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Mystic Valley Parkway, Arlington, MA**Depth Date Time****Northing:** 2976439.0809 **Easting:** 755355.8314

7.2 12/22/2017 12:30

Drilling Date: Start: 12/22/2017 **End:** 12/22/2017**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
12.2									6" Topsoil	
0	SS	S-1	24	93 30 33 35	16	63			Bottom 10": Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	24	17 13 9 8	8	22		Fill	Moist, medium dense, gray, fine SAND, some silt	Analytical sample (2'-4')
7.2	SS	S-3	24	10 9 6 6	12	15			Moist, medium dense, gray, fine SAND, some silt	Analytical sample (4'-6')
5										
	SS	S-4	24	6 10 6 8	12	16		Organic Soils	Moist, very stiff, dark brown, Organic SILT, some fine to coarse sand, trace fine gravel	Corrosion sample (6'-8')
	SS	S-5	24	22 36 25 32	10	61		Sand and Gravel	Wet, very dense, gray, fine to coarse SAND, some fine gravel, little silt, trace organic fibers	
2.2										
10										
	SS	S-6	24	8 9 10 12	6	19		Silty Clay	Wet, very stiff, gray, Silty CLAY	PP < 0.5 tsf
-2.8										
15										
	SS	S-7	24	30 32	12	62			Wet, very dense, gray, fine SAND, some fine gravel, little silt	
-7.8										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-103**



Boring Number: B-103

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-7.8 20	SS	S-7	24	30 30	12	62		Sand and Gravel	Wet, very dense, gray, fine SAND, some fine gravel, little silt	
-12.8 25	SS	S-8	24	58 54 56 52	12	>100				
-17.8 30									Test boring B-103 terminated at 26' bgs and backfilled with soil cuttings.	
-22.8 35										
-27.8 40										
-32.8 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-103



Boring Number: B-104 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 14.26**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 24.7**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Mystic Valley Parkway, Somerville, MA**Depth Date Time****Northing:** 2976424.5058 **Easting:** 755588.63

5.3 1/8/2018 15:30

Drilling Date: Start: 12/27/2017 **End:** 1/8/2018**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
14.3									3" Topsoil: Dry, brown, fine to coarse SAND, some fine gravel, little silt	Vacuum excavate boring from the ground surface to 6' bgs.
0	VE	V-1			--	--		Fill	Moist, brown, fine to coarse SAND, some fine to coarse gravel, little silt	Analytical sample (2'-4')
9.3										
	SS	S-1	24	67 58 70 16	2	>100		Silty Sand	Wet, very dense, gray, fine to medium SAND, some organic silt, trace fine gravel	
	SS	S-2	24	3 9 10 9	6	19			Wet, medium dense, gray, fine to coarse SAND, some fine gravel, trace organic fibers	Analytical sample (8'-10')
4.3										
10										
	SS	S-3	24	38 55 46 56	12	>100		Sand and Gravel	Wet, very dense, gray, fine to medium SAND, some fine to coarse gravel, little silt	
-0.7										
15										
	SS	S-4	24	60 65	12	>100			Wet, very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little silt	
-5.7										

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock Core
V - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe

Consistency vs Blowcount/Foot

Granular (Sand):
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30

Fine Grained (Clay):
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30

Burmister Classification

and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color

Reviewed by:**Date:****Boring Number: B-104 (MW)**



Boring Number: B-104 (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-5.7 20	SS	S-4	24	60 40	12	>100		Sand and Gravel	Wet, very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little silt	Test boring B-104 (MW) terminated at 24.7' bgs and converted into a monitoring well.
-10.7 25	SS	S-5	8	44 100/2"	0.5	>100				
-15.7 30										
-20.7 35										
-25.7 40										
-30.7 45										

BL GINT LOGS MWRA WASH 3 20180220.GPJ - 11/4/19

Boring Number: B-104 (MW)

**Boring Number:
B-105**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 25.24

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 14.8

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Capen St., Somerville, MA

Depth	Date	Time
-------	------	------

Northing: 2976277.1826 **Easting:** 755945.5454

4.0 9/12/2017 10:00

Drilling Date: Start: 9/12/2017 End: 9/12/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

[illegible]

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-105



Boring Number: B-107 (MW)

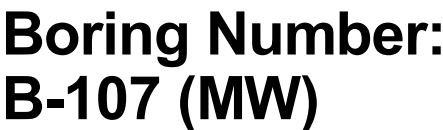
Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 34.79**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NX**Total Depth (ft.):** 18.5**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 44 Irvington Rd., Somerville, MA**Depth Date Time****Northing:** 2976571.8345 **Easting:** 756490.7311

5.0 9/12/2017 11:30

Drilling Date: Start: 9/12/2017 **End:** 9/12/2017**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
34.8 0									3" Asphalt	
	SS	S-1	18	15 12 12	12	24			Moist, medium dense, brown, fine to coarse SAND, little fine gravel, little silt	
	SS	S-2	24	16 22 25 50	18	47			Moist, dense, brown, fine to medium SAND, little fine gravel, little silt	Analytical sample (2'-4')
24.8 5	SS	S-3	24	30 46 56 42	16	>100			Moist, very dense, brown, fine to medium SAND, little fine gravel, little silt	
	SS	S-4	24	20 28 28 25	14	56			Moist, very dense, brown, fine to coarse SAND, some silt, little fine gravel	
	SS	S-5	24	20 35 56 60	14	91			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
24.8 10										Rollerbit through cobbles and boulders from 10 to 14.5' bgs.
19.8 15	NX	C-1	48		46	--			See core log for description	
14.8									Test boring B-107 (MW) terminated at 18.5' bgs and converted into a monitoring well.	

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab
Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**
V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**
V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-107 (MW)**

ROCK CORING LOG GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19



Boring Number: B-108

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 26.21**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 3**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 200 Boston Ave., Medford, MA**Depth Date Time****Northing:** 2976911.0610 **Easting:** 756850.1348

NE NE NE

Drilling Date: Start: 10/5/2017 **End:** 10/5/2017**Abandonment Method:** Backfilled with concrete**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
26.2 0									5" Asphalt	
	SS	S-1	6	100/6"	6	>100		Fill	Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	1	100/1"	1	>100			Wet, very dense, gray, fine to medium SAND, trace silt	
21.2 5									Unmarked utility encountered at 3' bgs. The utility appeared to be abandoned. The top of the utility was filled with concrete, and the hole was backfilled with soil cuttings.	
16.2 10										
11.2 15										
6.2										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-108**

**Boring Number:
B-109**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 18.3

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 21

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Whole Foods Parking Lot, Medford, MA

Depth	Date	Time
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Northing: 2977044.4331 **Easting:** 757045.8241

6.5 10/5/2017 13:25

Drilling Date: Start: 10/5/2017 **End:** 10/5/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
18.3 0									2" Asphalt 10" Gravel and Cobbles	
	SS	S-1	12	80 16	6	--		Fill	Wet, very dense, gray, fine to medium SAND, trace silt Wet, medium dense, brown, fine to medium SAND, some silt	
	SS	S-2	24	9 6 6 4	1	12				
13.3 5	SS	S-3	24	8 5 6 6	0	11				
▼	SS	S-4	24	9 18 23 18	0	41				
	SS	S-5	24	11 8 5 5	2	13				
8.3 10	SS	S-6	12	-- --	12	--		Silty Sand	Bottom 6": Wet, medium dense, brown, fine SAND, little silt Wet, medium dense, brown, fine SAND, little silt	Analytical sample (10'-11')
3.3 15	SS	S-7	24	19 25 52 72	14	77		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
-1.7	SS	S-8	24	7 9	20	39		Silty Clay	Wet, hard, gray, Silty CLAY	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture, density, color	

Reviewed by:

Date:

Boring Number: B-109




Boring Number: B-109

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-1.7 20	SS	S-8	24	30 100	20	39				
-6.7 25									Test boring B-109 terminated at 21' bgs and backfilled with soil cuttings.	
-11.7 30										
-16.7 35										
-21.7 40										
-26.7 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-109



Boring Number: B-110 (MW)

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / M. Ferreira**Surface Elevation (ft.):** 14.53**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 21**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** 105 Auburn St., Medford, MA**Depth Date Time****Northing:** 2977428.7695 **Easting:** 757370.1157

5.8 12/19/2017 12:30

Drilling Date: Start: 12/19/2017 **End:** 12/19/2017**Abandonment Method:** Monitoring well installed**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
14.5 0	SS	S-1	24	70 62 52 32	16	>100		Fill	Moist, very dense, brown, fine to medium SAND, trace silt	
	SS	S-2	24	19 21 25 20	20	46		Organic Soils	Moist, hard, gray, Silty CLAY	Analytical sample (2'-4') PP = 2.5 tsf
9.5 5	SS	S-3	24	7 8 12 17	20	20			Moist, very stiff, gray, Organic Silty CLAY, trace peat	Corrosion sample (4'-6') PP = 1.6 tsf
	SS	S-4	24	3 3 3 6	24	6			Moist, medium stiff, gray, Organic Silty CLAY, trace peat	PP = 0.8 tsf
	SS	S-5	24	7 7 7 8	24	14			Moist, stiff, gray, Organic CLAY, little fine to medium sand, trace peat	PP = 0.7 tsf
4.5 10								Sand and Gravel		
	SS	S-6	24	44 53 48 64	12	>100			Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
-0.5 15								Silty Clay		
	SS	S-7	24	11 9	24	18			Wet, very stiff, gray, CLAY & SILT, trace fine to medium sand	PP = 1.0 tsf
-5.5										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-110 (MW)**




Boring Number: B-110 (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-5.5 20	SS	S-7	24	9 12	24	18				PP = 1.0 tsf
-10.5 25									Test boring B-110 (MW) terminated at 21' bgs and converted into a monitoring well.	
-15.5 30										
-20.5 35										
-25.5 40										
-30.5 45										
									Boring Number: B-110 (MW)	

Boring Number:
B-111

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 11.9

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 16

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 120 Auburn St., DCR Property, Medford, MA

Depth	Date	Time
-------	------	------

Northing: 2977545.8348 **Easting:** 757673.1903

5.5 12/18/2017 13:50

Drilling Date: Start: 12/18/2017 **End:** 12/18/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
11.9 0				42					6" Topsoil	
	SS	S-1	24	30 24 42	16	54		Fill	Bottom 10": Moist, very dense, brown, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	24	17 20 14 10	8	34		Organic Soils	Top 3": Moist, dense, brown, fine to coarse SAND, some fine gravel, trace silt Bottom 5": Moist, hard, dark brown, Organic SILT	Analytical sample (2'-4')
6.9 ▼	SS	S-3	24	4 4 5 5	12	9		Organic Soils	Top 3": Moist, stiff, dark brown, Organic SILT Bottom 9": Moist, loose, brown, fine to medium SAND, some silt, trace fine gravel	
	SS	S-4	24	9 8 10 8	12	18		Silty Sand	Moist, medium dense, brown, fine SAND, some silt	
1.9 10	SS	S-5	24	26 31 41 30	10	72		Sand and Gravel	Wet, very dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
-3.1 15	SS	S-6	24	34 12 16 21	16	28		Silty Clay	Wet, very stiff, brown, Silty CLAY	PP = 2.2 tsf
-8.1									Test boring B-111 terminated at 16' bgs and backfilled with soil cuttings.	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture	densitv. color

Reviewed by:

Date:

Boring Number: B-111

**Boring Number:
B-112**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 10.08

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 3 in / NA

Total Depth (ft.): 26

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: DCR Property, Medford, MA

Depth	Date	Time
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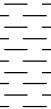


Northing: 2977680.1306 **Easting:** 758176.0581

5.1 12/18/2017 10:48

Drilling Date: Start: 12/18/2017 End: 12/18/2017

Abandonment Method: Backfilled with soil cuttings

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
10.1 0				15					8" Topsoil	
	SS	S-1	24	21 25 19	18	46		Fill	Bottom 10": Moist, dense, brown, gray, fine SAND, some silt	
	SS	S-2	24	17 19 20 23	20	39		Organic Silts	Moist, hard, dark brown, Organic Silty CLAY, trace fine to medium sand	Analytical sample (2'-4')
5.1 5	SS	S-3	24	10 15 16 26	24	31		Silty Sand	Moist, dense, brown, fine to medium SAND, some silt, trace organic fibers	Corrosion sample (4'-6')
	SS	S-4	24	20 25 31 23	24	56			Wet, very dense, brown, fine to coarse SAND, little silt, trace fine gravel	
0.1 10	SS	S-5	24	32 22 13 11	10	35		Silty Clay	Top 6": Wet, dense, gray, fine to medium SAND, trace silt Bottom 4": Wet, hard, brown, Silty CLAY	
-4.9 15	SS	S-6	24	6 4 6 7	24	10			Wet, stiff, gray, Silty CLAY, trace fine to medium sand	PP = 1.0 tsf
-9.9	SS	S-7	24	7 8	24	22			Wet, very stiff, gray, Silty CLAY	PP = 1.7 tsf

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%
moisture, density, color	

Reviewed by:

Date:

Boring Number: B-112



Boring Number: B-112

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-9.9 20	SS	S-7	24	14 15	24	22		Silty Clay	Wet, very stiff, gray, Silty CLAY	PP = 1.7 tsf
-14.9 25	SS	S-8	24	8 8 9 11	24	17				
-19.9 30									Test boring B-112 terminated at 26' bgs and backfilled with soil cuttings.	
-24.9 35										
-29.9 40										
-34.9 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-112

**Boring Number:
B-113 (MW)**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / M. Ferreira

Surface Elevation (ft.): 11.11

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 26

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: Veterans Memorial Park, Medford, MA

Depth	Date	Time
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Northing: 2977766.8067 **Easting:** 758496.2043

5.5 12/20/2017 11:00

Drilling Date: Start: 12/19/2017 **End:** 12/20/2017

Abandonment Method: Monitoring well installed

Logged By: A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
11.1 0				20					4" Topsoil	
	SS	S-1	24	25 36 33	20	61		Fill	Bottom 16": Moist, very dense, gray, fine SAND, some clay, trace fine gravel	
	SS	S-2	24	9 11 14 10	10	25		Organic Silts Clay	Moist, very stiff, brown, Silty CLAY, some fine sand, trace fine gravel	Analytical sample (2'-4')
	SS	S-3	24	1 2 1 1	22	3		Organic Silts Clay	Top 12": Wet, soft, brown, PEAT	Corrosion sample (4'-6')
6.1 ▼									Bottom 10": Wet, soft, gray, Silty CLAY, trace peat	PP = 1.0 tsf
	SS	S-4	24	3 2 1 2	20	3		Silty Clay	Wet, soft, gray, Silty CLAY, trace peat	PP = 0.8 tsf
1.1 10	SS	S-5	24	2 2 3 4	24	5		Silty Clay	Wet, medium stiff, gray, CLAY, trace fine to medium sand, trace peat	PP < 0.5 tsf
								Silty Sand		
-3.9 15	SS	S-6	24	60 38 20 18	10	58		Silty Clay	Top 6": Wet, very dense, gray, fine to medium SAND, little fine gravel, trace silt Bottom 4": Wet, hard, brown, Silty CLAY, little fine sand	PP = 2.0 tsf
								Silty Clay		
								Silty Sand		
-8.9	SS	S-7	24	13 16	16	36		Silty Sand	Wet, dense, gray, fine SAND, little silt	

Sample Types		Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	V - Vac Ex/Grab Sample	Granular (Sand):		Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some	20-35%
BQ - 1.5" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little	10-20%
NQ - 2" Rock Core	GP - Geoprobe	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30	trace	<10%
						moisture density color	

Reviewed by:

Date:

Boring Number: B-113 (MW)





Boring Number: B-113 (MW)

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-8.9 20	SS	S-7	24	20 13	16	36		Silty Sand		
-13.9 25	SS	S-8	24	2 3 4 5	24	7		Silty Clay	Wet, medium stiff, gray, Silty CLAY	
-18.9 30										
-23.9 35										
-28.9 40										
-33.9 45										
									Test boring B-113 (MW) terminated at 26' bgs and converted into a monitoring well.	

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-113 (MW)



Boring Number: B-114

Client: MWRA**Project Name:** Rehabilitation of Weston Aqueduct Supply Main 3**Project Location:** Massachusetts**Project Number:** 101038-102170**Drilling Contractor/Driller:** GeoLogic - Earth Exploration, Inc. / D. Jacobs**Surface Elevation (ft.):** 12.03**Drilling Method/Casing/Core Barrel Size:** Drive and Wash / 4 in / NA**Total Depth (ft.):** 16**Hammer Weight/Drop Height/ Spoon Size:** 140 lb / 30 in / 2 in O.D.**Depth to Initial Water Level (ft):****Bore Hole Location:** Veterans Memorial Park, Medford, MA**Depth Date Time****Northing:** 2977894.5906 **Easting:** 759032.9731

4.0 1/9/2018 11:55

Drilling Date: Start: 1/9/2018 **End:** 1/9/2018**Abandonment Method:** Backfilled with soil cuttings**Logged By:** A. Smith

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
12.0 0									3" Topsoil: Dry, brown, fine to coarse SAND, some fine gravel, trace silt Moist, brown, fine to coarse SAND, some silt, some fine to coarse gravel	Vacuum excavate test boring from the ground surface to 6' bgs. Analytical sample (2'-4')
7.0 5	VE	V-1			--	--		Sand	Wet, brown, fine to coarse SAND, some silt, some fine to coarse gravel Wet, very dense, brown, fine to medium SAND, little fine to coarse gravel, trace silt	
	VE	V-2			--	--				
	SS	S-1	24	27 28 66 100	14	94				
	SS	S-2	24	54 65 70 110	14	>100			Wet, very dense, brown, fine to coarse SAND, little fine to coarse gravel, trace silt	
2.0 10										
								Silty Sand		
-3.0 15	SS	S-3	24	52 40 36 58	12	76			Wet, very dense, brown, fine SAND, little silt	
									Test boring B-114 terminated at 16' bgs and backfilled with soil cuttings.	
-8.0										

Sample Types**Consistency vs Blowcount/Foot****Burmister Classification**AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NQ - 2" Rock CoreV - Vac Ex/Grab Sample
SS - Split Spoon
ST - Shelby Tube
GP - Geoprobe**Granular (Sand):**V. Loose: 0-4 Dense: 30-50
Loose: 4-10 V. Dense: >50
M. Dense: 10-30**Fine Grained (Clay):**V. Soft: <2 Stiff: 8-15
Soft: 2-4 V. Stiff: 15-30
M. Stiff: 4-8 Hard: >30and 35-50%
some 20-35%
little 10-20%
trace <10%
moisture, density, color**Reviewed by:****Date:****Boring Number: B-114**

**Boring Number:
B-115**

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Drilling Contractor/Driller: GeoLogic - Earth Exploration, Inc. / D. Jacobs

Surface Elevation (ft.): 10.34

Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA

Total Depth (ft.): 21

Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in /2 in O.D.

Depth to Initial Water Level (ft):

Bore Hole Location: 2400 Mystic Valley Parkway, Medford, MA

Depth	Date	Time
-------	------	------

Northing: 2977890.9394 **Easting:** 759561.8584

4.3 1/10/2018 11:00

Drilling Date: Start: 12/26/2016 End: 1/10/2018

Abandonment Method: Backfilled with soil cuttings

Logged By: D. Abt

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
10.3 0										
	VE	V-1			--	--			2" Topsoil: Dry, brown, fine to coarse SAND, some fine gravel, little silt	Vacuum excavate test boring from the ground surface to 5.6' bgs. Analytical sample (3'-5')
	VE	V-2			--	--			Moist, brown, fine to coarse SAND and SILT, some fine to coarse gravel	
									Moist, brown, fine to coarse SAND and SILT, some fine gravel	
5.3 5										
	SS	S-1	24	26 8 5 6	0	13			No Recovery	
	SS	S-2	24	7 6 5 8	10	11			Wet, medium dense, brown, Organic fine to coarse SAND and SILT, little fine gravel	Corrosion sample (8'-10')
0.3 10										
-4.7 15	SS	S-3	24	15 16 25 21	21	41			Wet, hard, brown to gray, CLAY & SILT, little fine sand	Rig chatter from 12 to 14' bgs.
-9.7	SS	S-4	24	15 9	20	20			Wet, very stiff, brown to gray, CLAY & SILT, little fine sand	

3BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Sample Types

AS - Auger/Grab Sample	V - Vac Ex/Grab Sample
CS - California Sampler	SS - Split Spoon
BQ - 1.5" Rock Core	ST - Shelby Tube
NQ - 2" Rock Core	GP - Geoprobe

Consistency vs Blowcount/Foot

<u>Granular (Sand):</u>			
V. Loose:	0-4	Dense:	30-50
Loose:	4-10	V. Dense:	>50
M. Dense:	10-30		

Fine Grained (Clay):

V. Soft:	<2	Stiff:	8-15
Soft:	2-4	V. Stiff:	15-30
M. Stiff:	4-8	Hard:	>30

Burmister Classification

and	35-50%
some	20-35%
little	10-20%
trace	<10%
moisture, density, color	

Reviewed by:

Date:

Boring Number: B-115




Boring Number: B-115

Client: MWRA

Project Name: Rehabilitation of Weston Aqueduct Supply Main 3

Project Location: Massachusetts

Project Number: 101038-102170

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
-9.7 20	SS	S-4	24	11 14	20	20				
-14.7 25									Test boring B-115 terminated at 21' bgs and backfilled with soil cuttings.	
-19.7 30										
-24.7 35										
-29.7 40										
-34.7 45										

BL GINT LOGS MWRA WASM 3 20180220.GPJ - 11/4/19

Boring Number: B-115

Appendix C

Rock Core Photo Logs

Rock Core Photographs

MWRA – Rehabilitation of Weston Aqueduct Supply Main 3
Weston, Waltham, Belmont, Arlington, Somerville, and Medford, MA

B-8A, B-19 and B-22



B-22: 11.5'-16.5'

B-19: 9.0'-14.0'

B-8A: 5.0'-10.0'

B-53, B-62, and B-75A



B-53: 6.0'-11.0'

B-62: 11.0'-14.0'

B-75A: 9.0'-11.5'

B-55, B-60, and B-61



B-61: 9.0'-14.0'

B-60: 3.5'-8.5'

B-55: 8.0'-13.0'

B-57, B-86, and B-107



B-86: 10.0'-15.0'

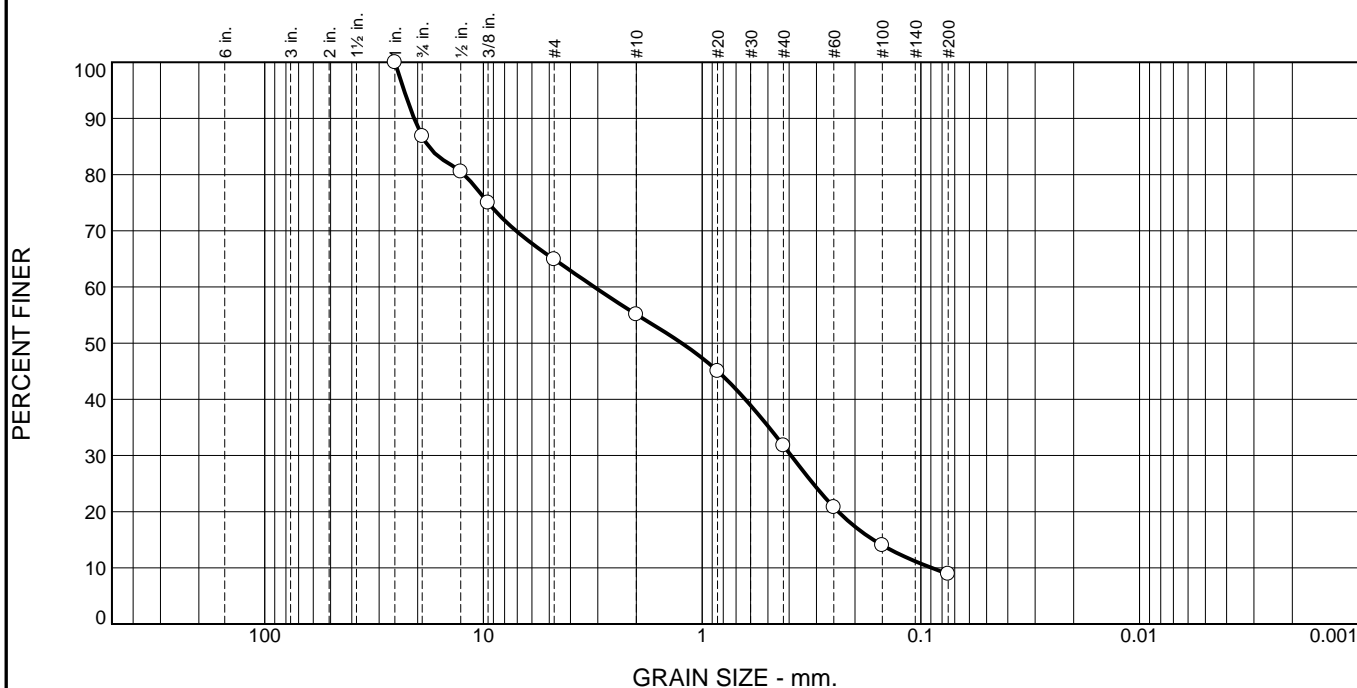
B-107: 14.5'-18.5'

B-57: 9.0'-14.0'

Appendix D

Geotechnical Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.2	21.9	9.8	23.3	22.9	8.9	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	86.8		
.5"	80.5		
.375"	75.0		
#4	64.9		
#10	55.1		
#20	45.0		
#40	31.8		
#60	20.8		
#100	14.0		
#200	8.9		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 20.7450 D₈₅= 17.7866 D₆₀= 3.1124
 D₅₀= 1.2385 D₃₀= 0.3918 D₁₅= 0.1649
 D₁₀= 0.0892 C_u= 34.89 C_c= 0.55

Remarks
As received MC = 4.2%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-1 **Depth:** 2-4'
Sample Number: S-2

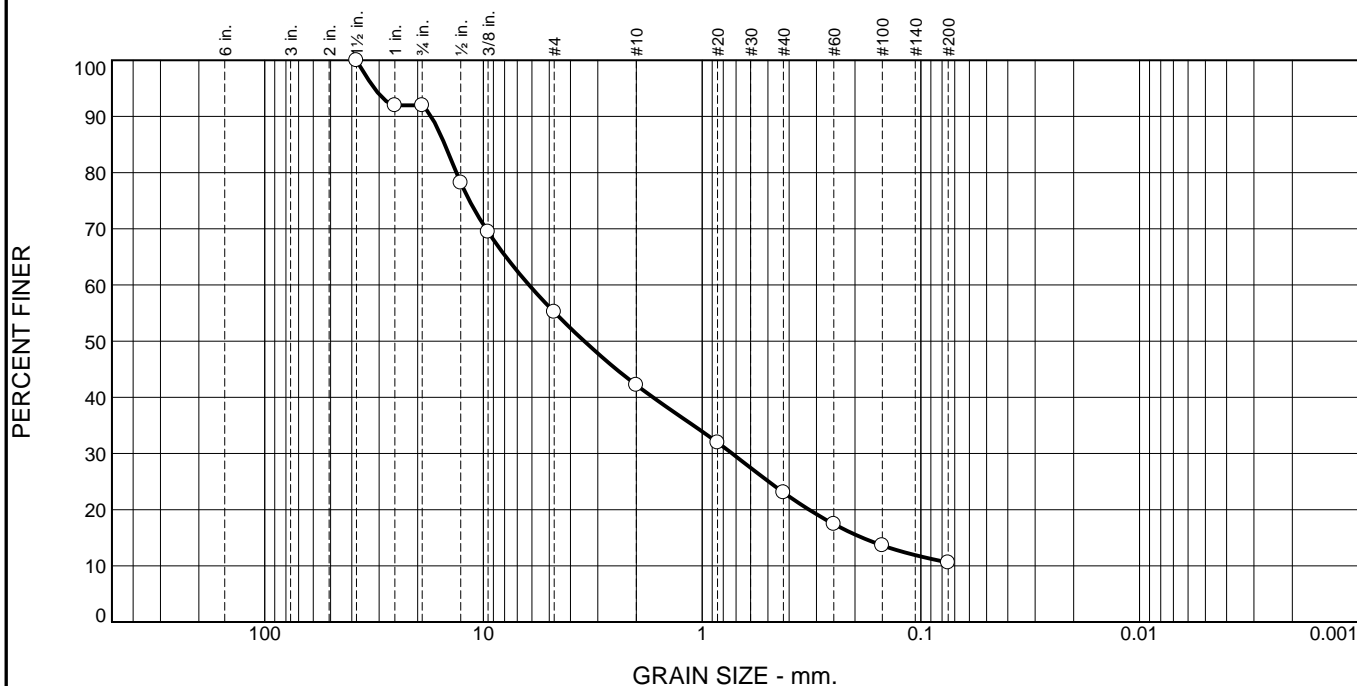
Date Sampled: 11/29/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.0	36.8	13.0	19.1	12.5	10.6	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	92.0		
.75	92.0		
.5	78.2		
.375	69.5		
#4	55.2		
#10	42.2		
#20	31.9		
#40	23.1		
#60	17.4		
#100	13.6		
#200	10.6		

* (no specification provided)

Material Description
Gray-brown poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 17.3166 D₈₅= 15.0225 D₆₀= 6.1897
D₅₀= 3.4602 D₃₀= 0.7295 D₁₅= 0.1851
D₁₀= C_u= C_c=

Remarks

Date Received: 1/30/18 Date Tested: 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

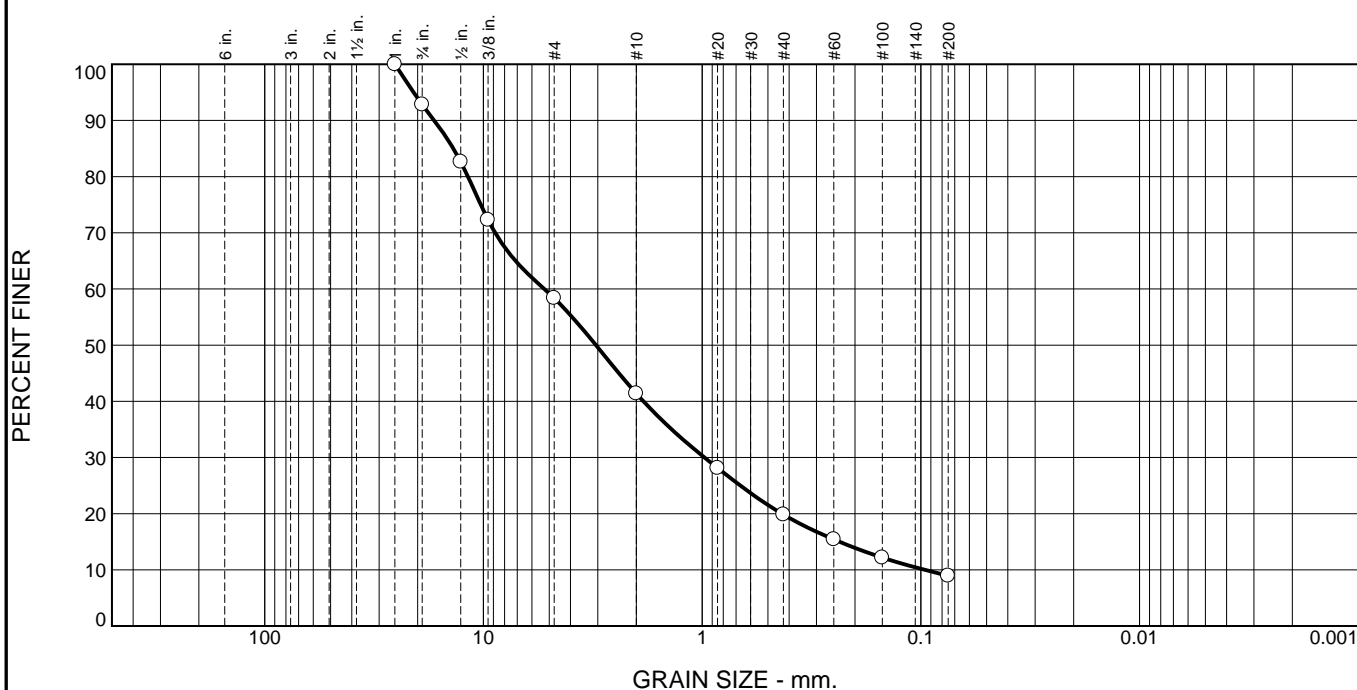
Source of Sample: B-2 Depth: 6-8'
Sample Number: S-1

Date Sampled: 12/11/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.2	34.4	17.0	21.6	10.8	9.0	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	92.8		
.5	82.6		
.375	72.3		
#4	58.4		
#10	41.4		
#20	28.1		
#40	19.8		
#60	15.4		
#100	12.2		
#200	9.0		

* (no specification provided)

Material Description
Gray well-graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SW-SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 16.8087 D₈₅= 13.7251 D₆₀= 5.2635
 D₅₀= 3.0592 D₃₀= 0.9762 D₁₅= 0.2355
 D₁₀= 0.0957 C_u= 54.98 C_c= 1.89

Remarks
As received MC = 8.3%

Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-3 **Depth:** 6-6.9'
Sample Number: S-1

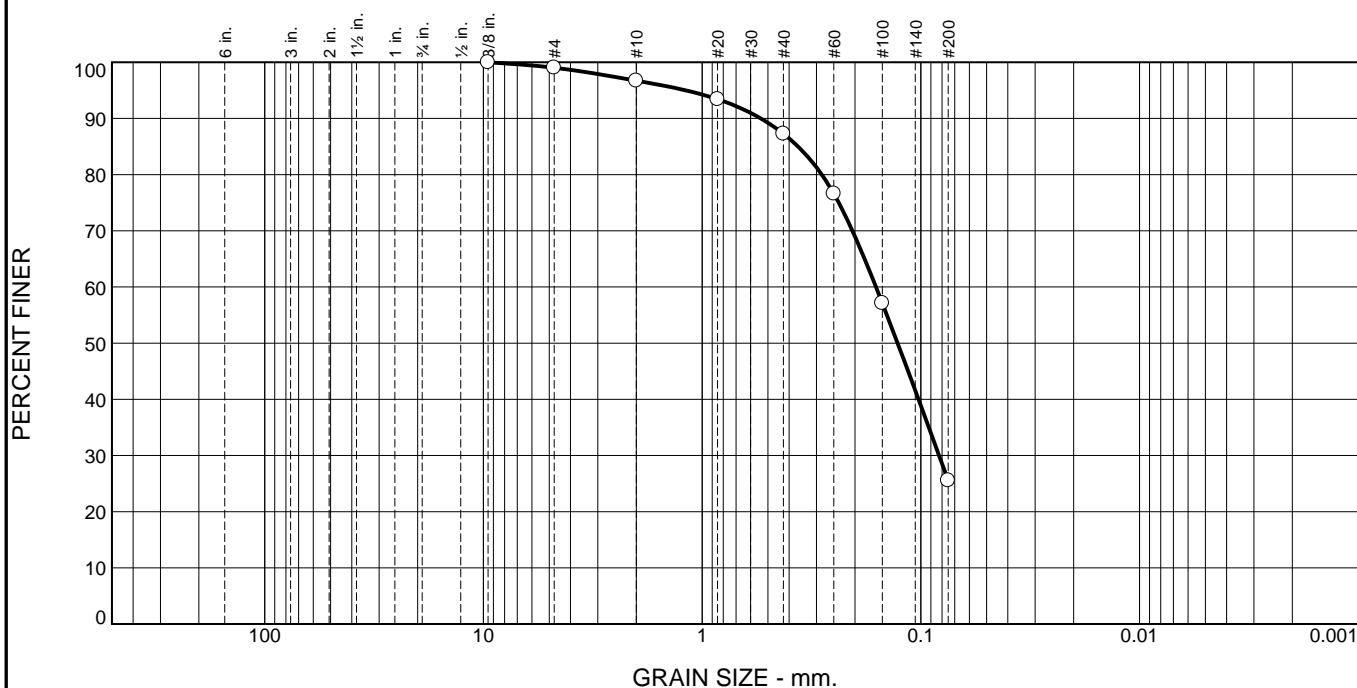
Date Sampled: 12/16/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	2.3	9.4	61.7	25.6	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.0		
#10	96.7		
#20	93.4		
#40	87.3		
#60	76.6		
#100	57.1		
#200	25.6		

* (no specification provided)

Material Description
Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 0.5391 D₈₅= 0.3641 D₆₀= 0.1604
 D₅₀= 0.1277 D₃₀= 0.0825 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As recieved MC = 10.9%

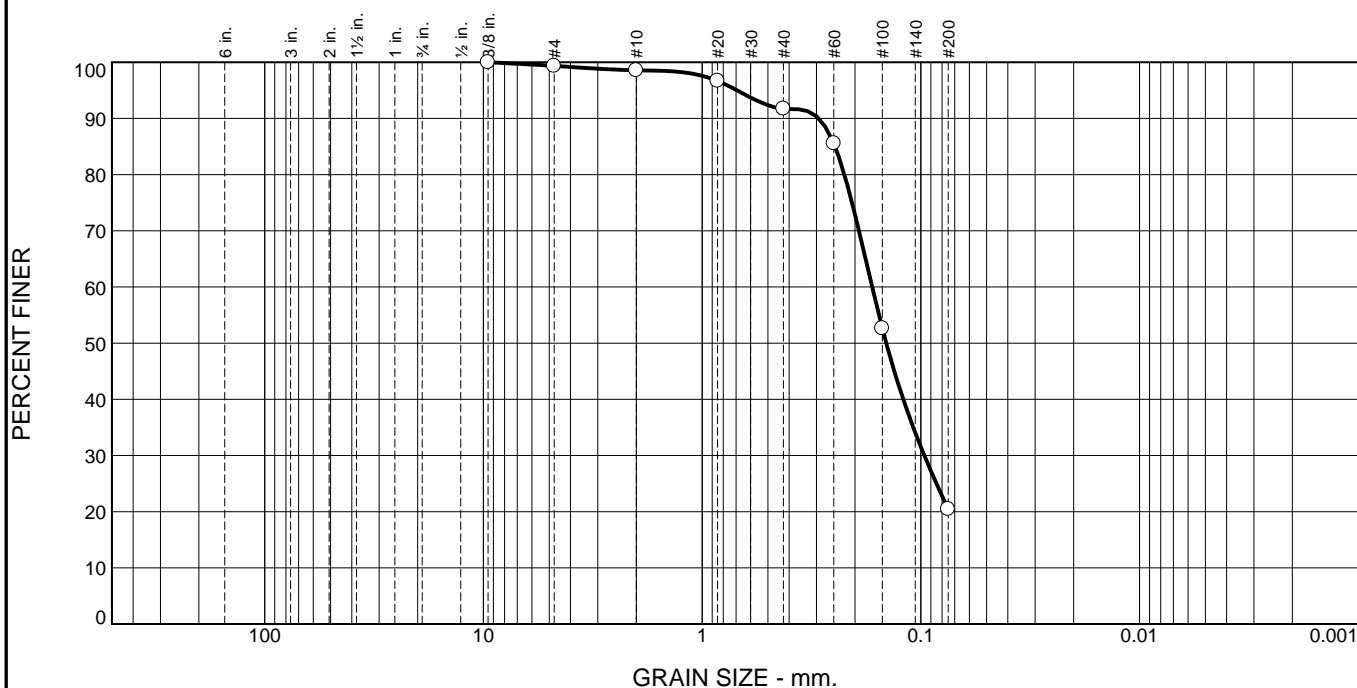
Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-4 **Depth:** 2.5-3'
Sample Number: S-V-1

Date Sampled: 12/6/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.8	6.9	71.3	20.4	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.4		
#10	98.6		
#20	96.7		
#40	91.7		
#60	85.6		
#100	52.6		
#200	20.4		

* (no specification provided)

Material Description
Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 0.2930 D₈₅= 0.2467 D₆₀= 0.1668
 D₅₀= 0.1439 D₃₀= 0.0964 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As received MC = 14.1%

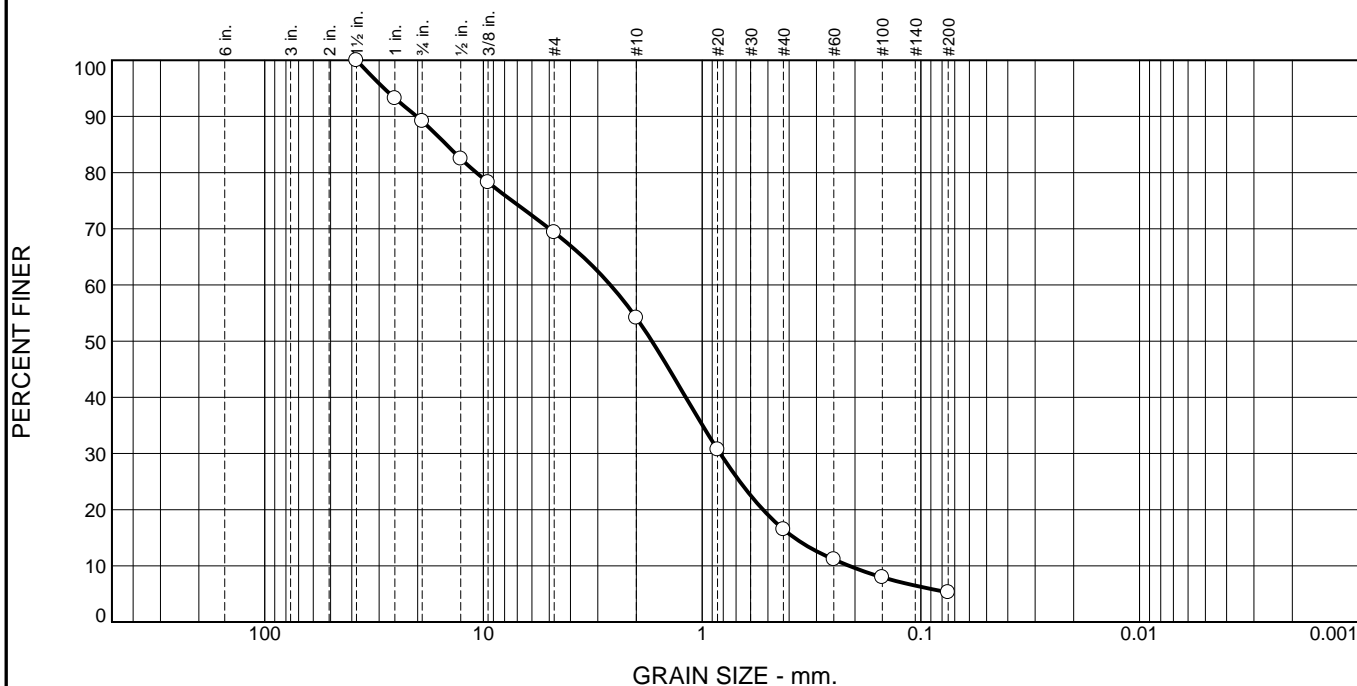
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-5 **Depth:** 6-8'
Sample Number: S-1

Date Sampled: 12/4/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.8	19.8	15.2	37.7	11.2	5.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	93.2		
.75"	89.2		
.5"	82.5		
.375"	78.3		
#4	69.4		
#10	54.2		
#20	30.7		
#40	16.5		
#60	11.1		
#100	8.0		
#200	5.3		

* (no specification provided)

Material Description
Brown well-graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SW-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 20.1852 D₈₅= 14.7773 D₆₀= 2.6262
 D₅₀= 1.6972 D₃₀= 0.8270 D₁₅= 0.3788
 D₁₀= 0.2125 C_u= 12.36 C_c= 1.23

Remarks
As received MC = 12.1%

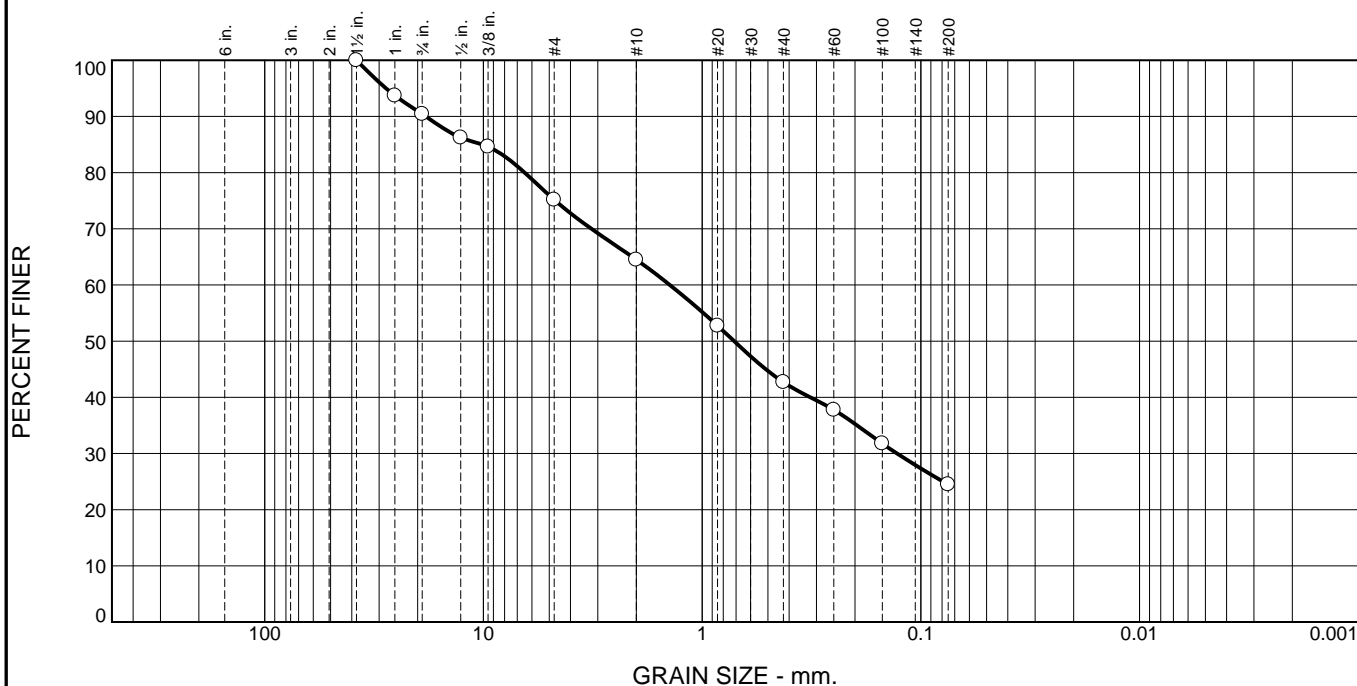
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-6 **Depth:** 6-8'
Sample Number: S-1

Date Sampled: 12/1/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.6	15.2	10.7	21.8	18.2	24.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	93.7		
.75"	90.4		
.5"	86.2		
.375"	84.6		
#4	75.2		
#10	64.5		
#20	52.7		
#40	42.7		
#60	37.8		
#100	31.8		
#200	24.5		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 18.3462 D₈₅= 10.1034 D₆₀= 1.4042
 D₅₀= 0.7141 D₃₀= 0.1285 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 11.3%

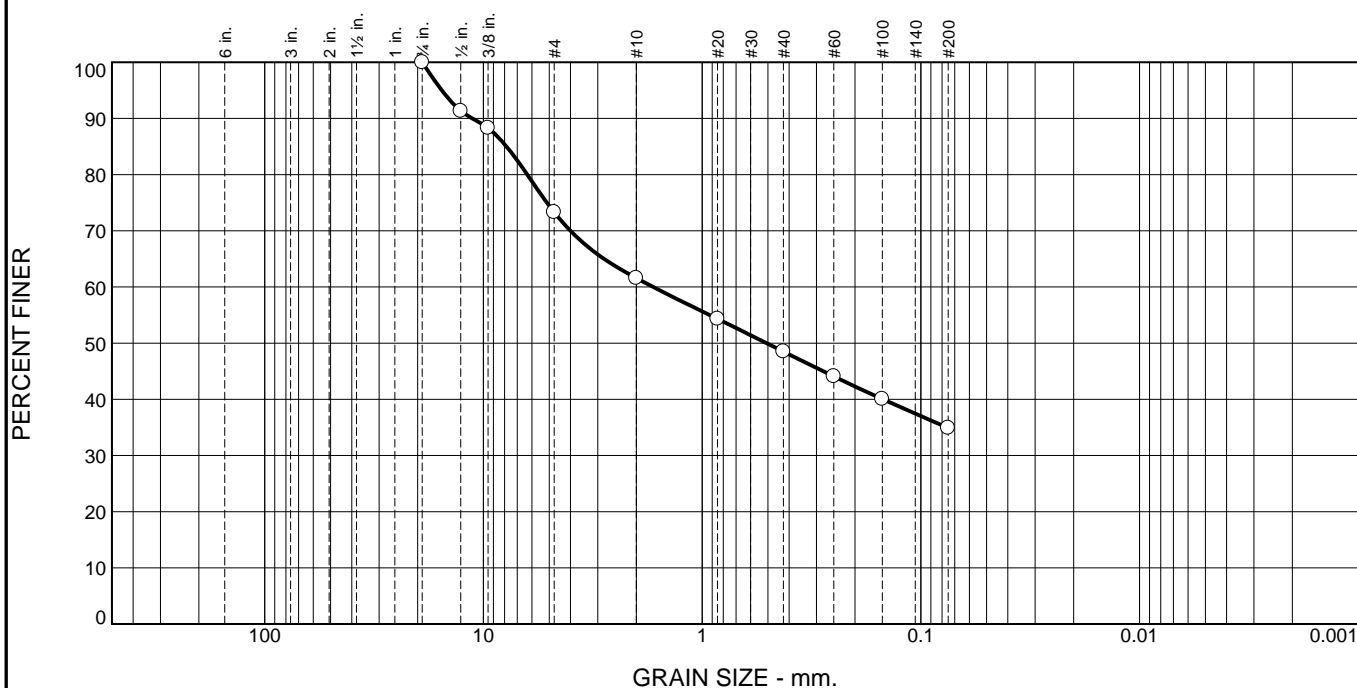
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-7 **Depth:** 4-5.3'
Sample Number: S-3

Date Sampled: 11/28/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	26.7	11.7	13.1	13.6	34.9	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	91.3		
.375"	88.3		
#4	73.3		
#10	61.6		
#20	54.3		
#40	48.5		
#60	44.1		
#100	40.1		
#200	34.9		

* (no specification provided)

Material Description	
Dark brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-2-4(0)
Coefficients	
D ₉₀ = 11.2557	D ₈₅ = 7.8409 D ₆₀ = 1.6733
D ₅₀ = 0.5075	D ₃₀ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 32.1%	
Date Received: 12/8/17 Date Tested: 12/12/17	
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-9 Depth: 6-8'
Sample Number: S-1

Date Sampled: 11/30/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-9
Sample Number: S-1
Sample Depth (ft): 6-8
Sample Date: 11/30/2017

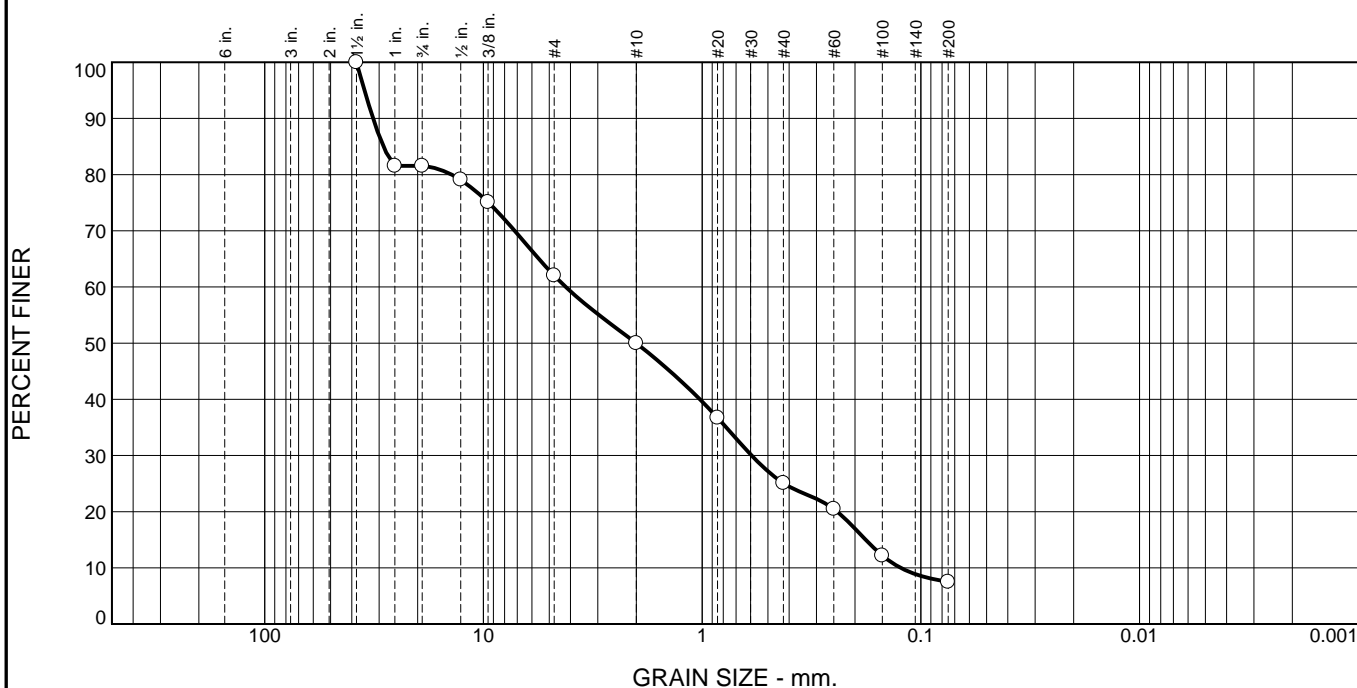
Tested By: MP
Test Date: 12/12/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.65
Wet Mass of Sample & Tin (g)	169.30
Dry Mass of Sample & Tin (g)	158.94
Mass of Water (g)	10.36
Mass of Dry Soil (g)	32.29
Moisture Content (%)	32.1

ASH CONTENT	
Porcelain Dish Mass (g)	126.65
Porcelain Dish + Oven Dried Soil (g)	158.94
Mass of Oven Dried Soil (g)	32.29
Mass of Dish & Burned Soil (g)	157.94
Mass of Burned Soil (g)	31.29
Mass of Organic Material (g)	1.00
Ash Content (%)	96.9
Organic Content (%)	3.1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.4	19.6	12.0	24.9	17.6	7.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	81.6		
.75"	81.6		
.5"	79.1		
.375"	75.1		
#4	62.0		
#10	50.0		
#20	36.7		
#40	25.1		
#60	20.5		
#100	12.2		
#200	7.5		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=
Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-a
Coefficients
 D₉₀= 31.9769 D₈₅= 28.6660 D₆₀= 4.2026
 D₅₀= 2.0042 D₃₀= 0.5936 D₁₅= 0.1787
 D₁₀= 0.1236 C_u= 34.00 C_c= 0.68

Remarks
As received MC = 5.1%

Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-10 **Depth:** 2-4'
Sample Number: S-2

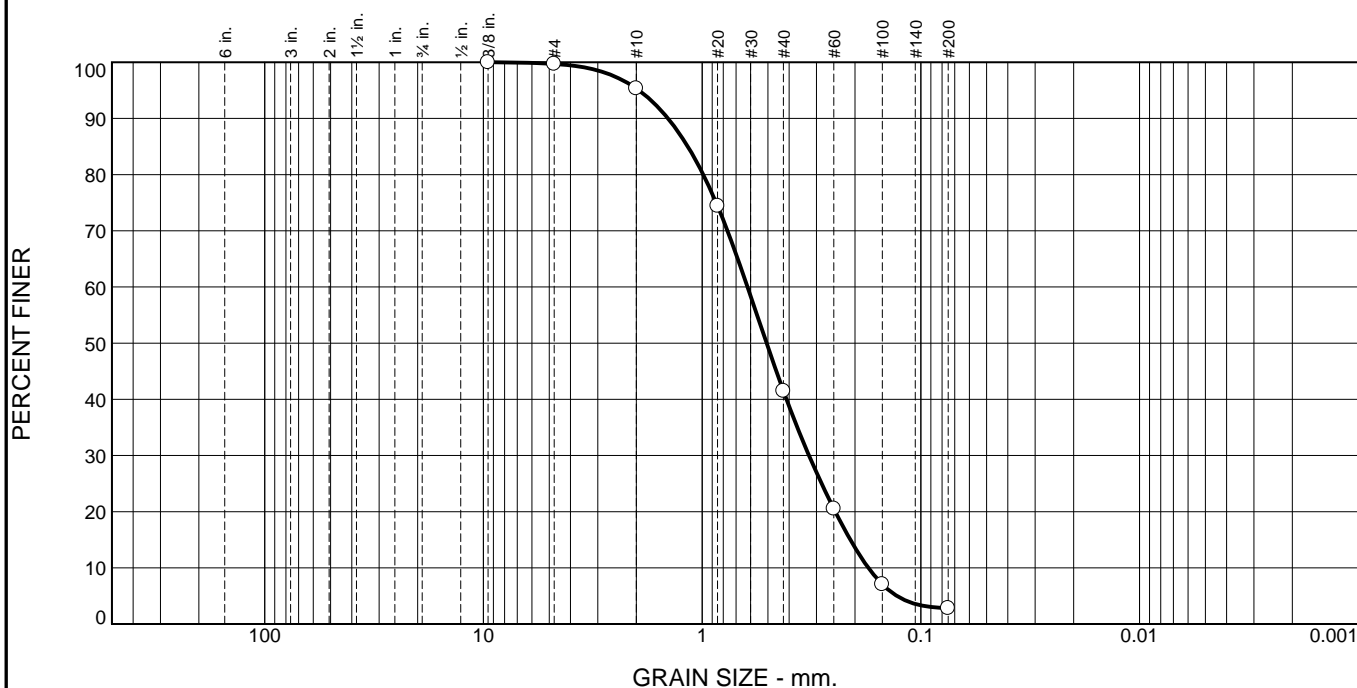
Date Sampled: 11/27/17

CDM Smith

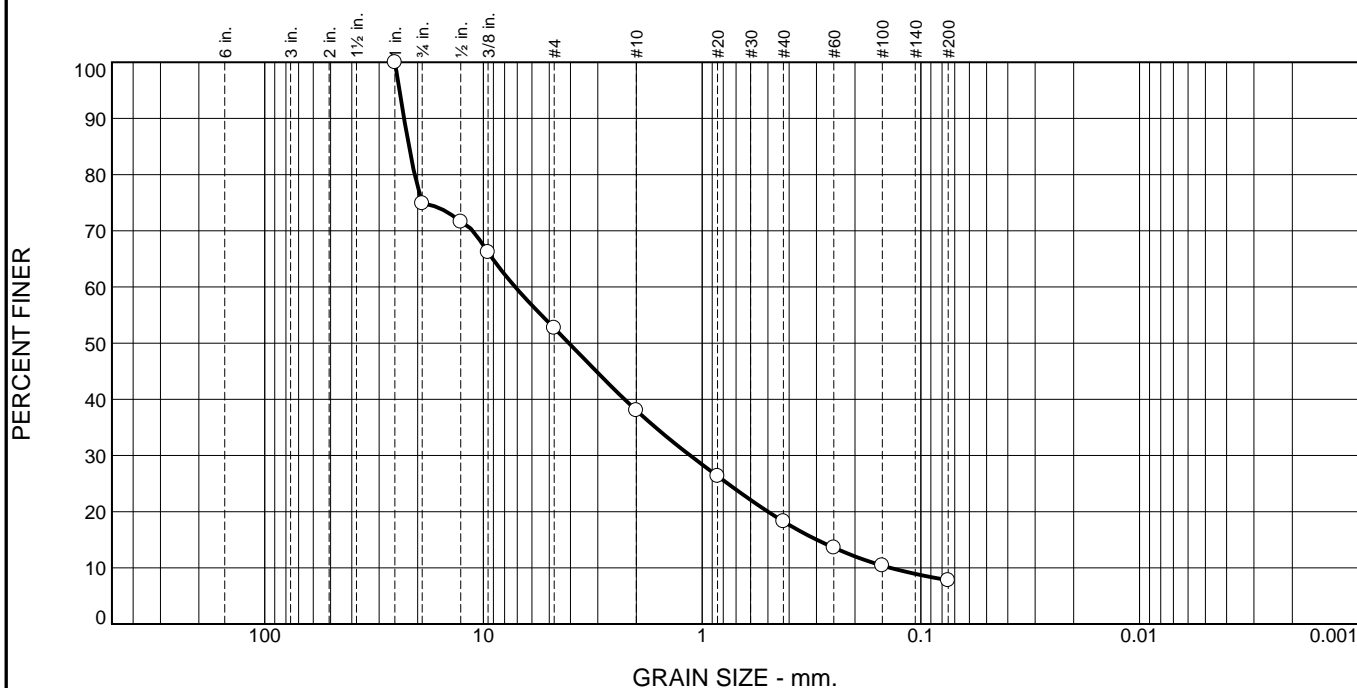
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.1	22.2	14.7	19.7	10.5	7.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	74.9		
.5"	71.6		
.375"	66.2		
#4	52.7		
#10	38.0		
#20	26.3		
#40	18.3		
#60	13.6		
#100	10.4		
#200	7.8		

* (no specification provided)

Material Description
Dark brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 23.0722 D₈₅= 21.8991 D₆₀= 7.1641
 D₅₀= 4.0649 D₃₀= 1.1331 D₁₅= 0.2990
 D₁₀= 0.1378 C_u= 52.00 C_c= 1.30

Remarks
As received MC = 10.5%

Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-11 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 11/14/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Grain Size (mm)

PERCENT FINER

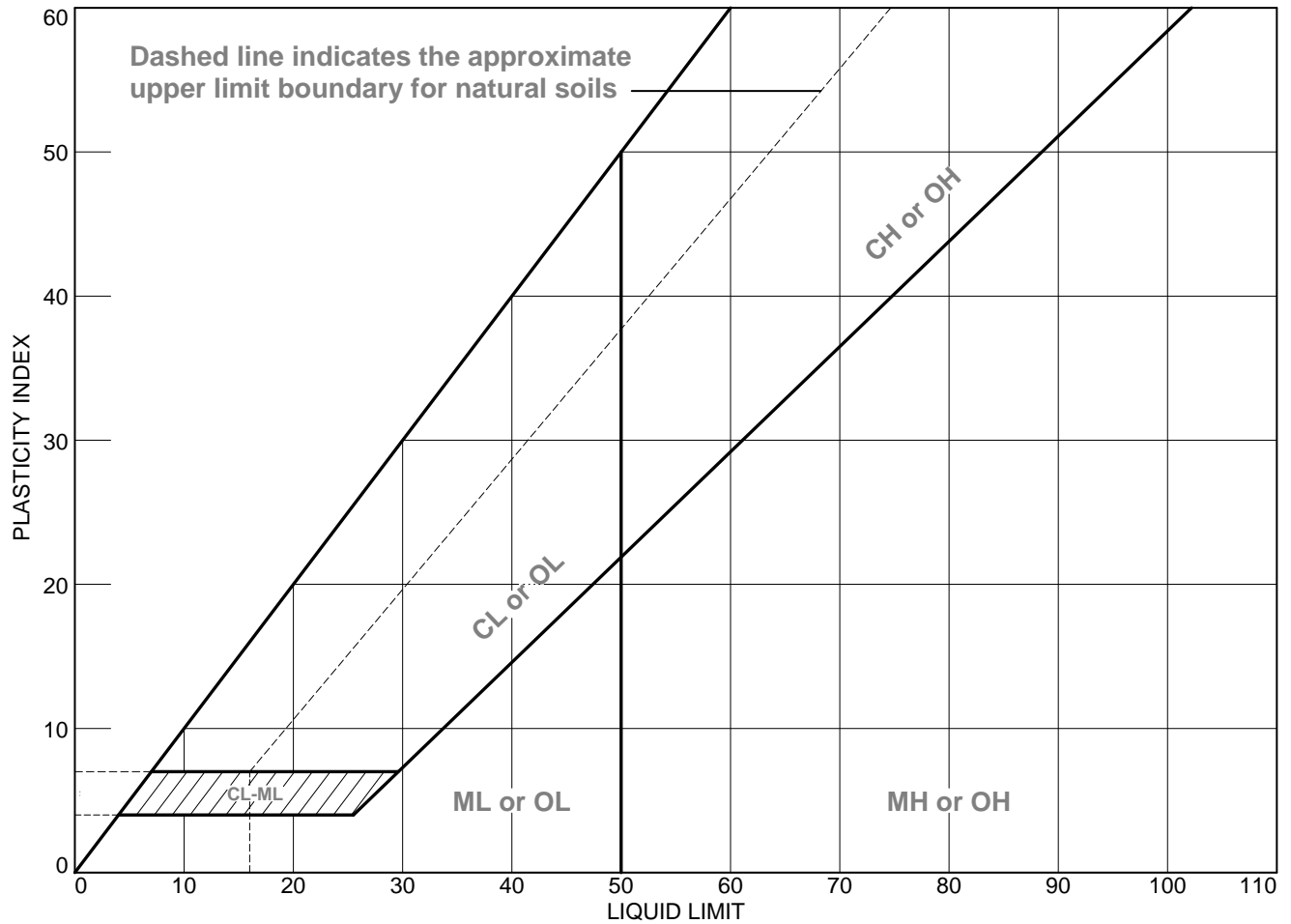
Grain Size (mm)	Percent Finer (%)
75	100
42.5	100
25	100
15	100
7.5	100
4.75	100
2.5	100
1.18	100
0.85	100
0.6	98
0.425	95
0.3	90
0.25	85
0.2	75
0.15	65
0.125	55
0.106	50
0.075	47
0.06	34
0.0425	19
0.03	10
0.025	8
0.02	4
0.015	2
0.0125	1
0.0106	1
0.0085	1
0.0075	1
0.006	0
0.00425	0
0.003	0
0.0025	0
0.002	0

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	98.6		
.375"	97.9		
#4	96.8		
#10	95.2		
#20	89.7		
#40	76.0		
#60	66.6		
#100	54.9		
#200	47.1		
0.0433 mm.	33.5		
0.0338 mm.	18.4		
0.0226 mm.	8.6		
0.0133 mm.	4.3		
0.0095 mm.	2.4		
0.0068 mm.	1.9		
0.0048 mm.	1.6		
0.0034 mm.	1.3		
0.0015 mm.	1.1		

Title: Laboratory Manager

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



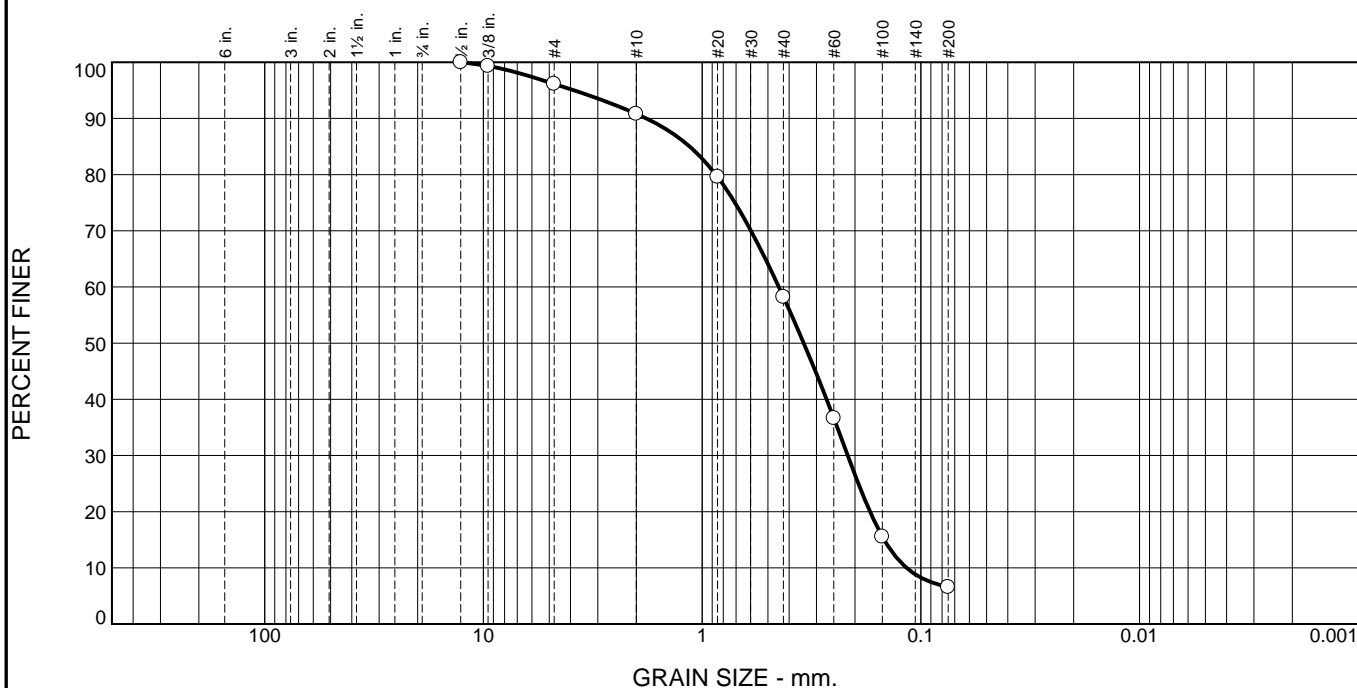
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-11	S-5	8-10'	4.2	NP	NV	NP	SM

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170
Figure

Tested By: RZ Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.9	5.3	32.6	51.6	6.6	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	99.3		
#4	96.1		
#10	90.8		
#20	79.6		
#40	58.2		
#60	36.6		
#100	15.6		
#200	6.6		

* (no specification provided)

Material Description

Brown poorly graded sand with silt

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= A-3

Coefficients

D₉₀= 1.8018 D₈₅= 1.1406 D₆₀= 0.4460
D₅₀= 0.3431 D₃₀= 0.2159 D₁₅= 0.1472
D₁₀= 0.1163 C_u= 3.84 C_c= 0.90

Remarks

As received MC = 8.7%

Date Received: 12/8/17 Date Tested: 12/12/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

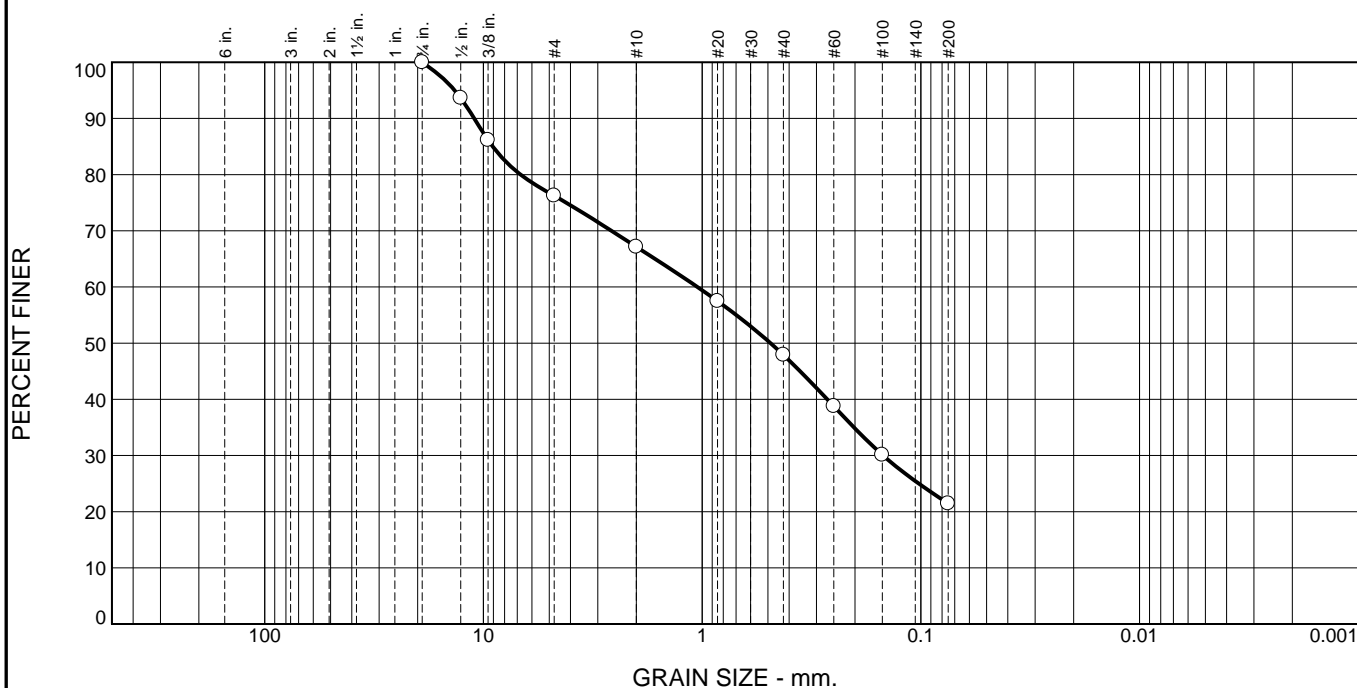
Source of Sample: B-12 Depth: 8-10'
Sample Number: S-2

Date Sampled: 11/29/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	23.7	9.1	19.3	26.4	21.5	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	93.6		
.375	86.1		
#4	76.3		
#10	67.2		
#20	57.5		
#40	47.9		
#60	38.8		
#100	30.1		
#200	21.5		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 11.0216 D₈₅= 9.0688 D₆₀= 1.0508
 D₅₀= 0.4868 D₃₀= 0.1488 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As recieved MC = 4.0%

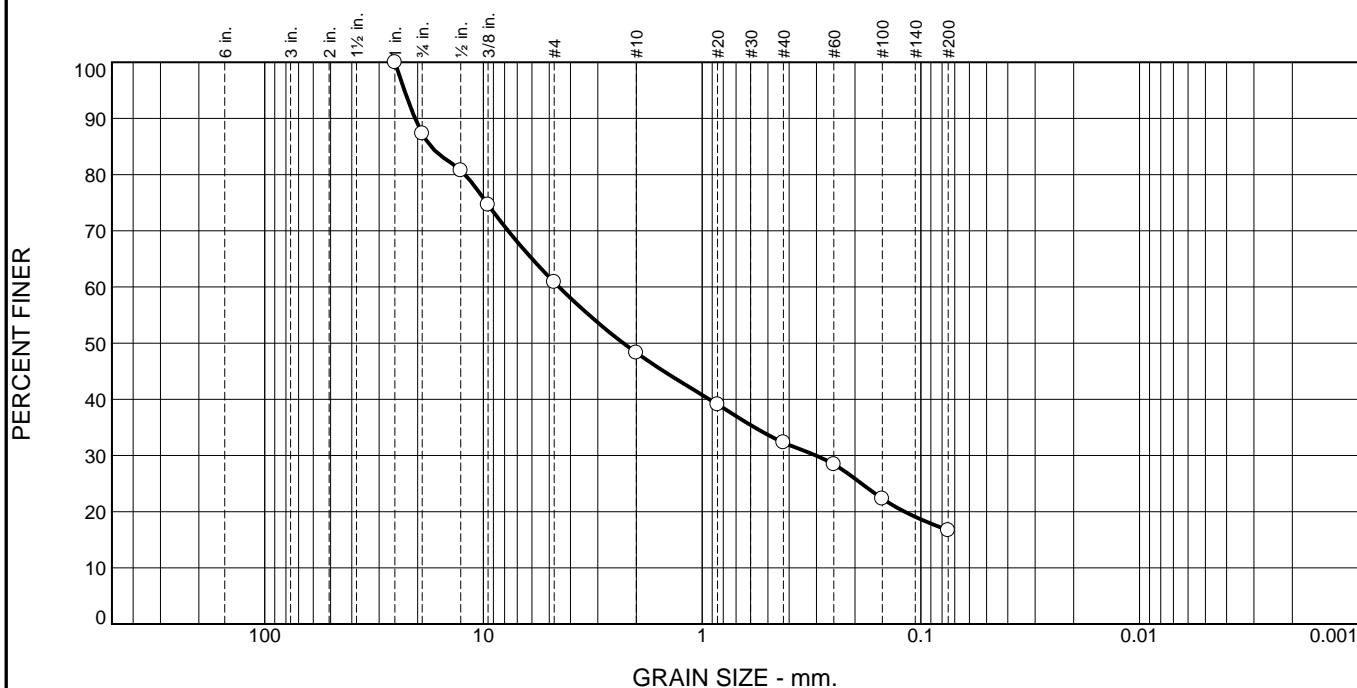
Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-13 **Depth:** 6-8'
Sample Number: S-4

Date Sampled: 12/12/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.7	26.4	12.6	16.0	15.6	16.7	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	87.3		
.5"	80.7		
.375"	74.6		
#4	60.9		
#10	48.3		
#20	39.1		
#40	32.3		
#60	28.4		
#100	22.3		
#200	16.7		

* (no specification provided)

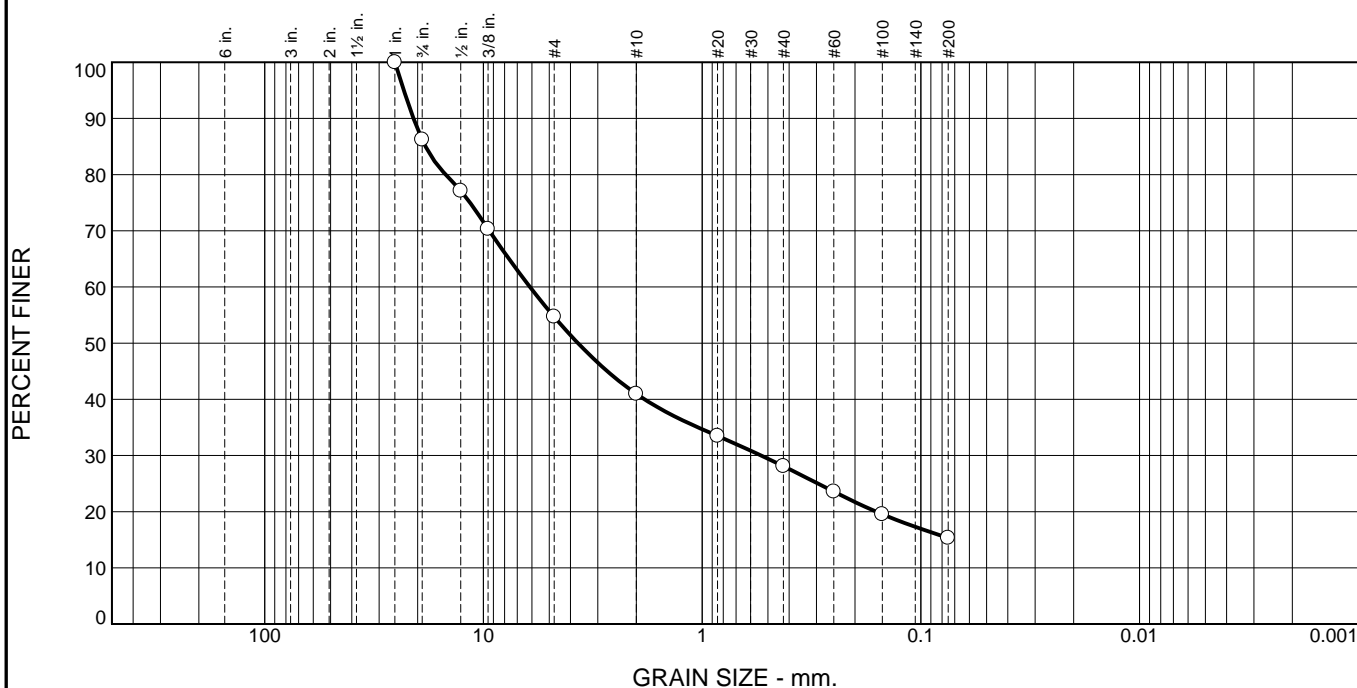
Material Description	
Brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 20.5433	D ₈₅ = 17.3554 D ₆₀ = 4.5101
D ₅₀ = 2.2920	D ₃₀ = 0.3019 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 7.5%	
Date Received: 12/8/17	Date Tested: 12/13/17
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-14 Depth: 2-2.5'
Sample Number: S-2

Date Sampled: 11/7/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.8	31.5	13.7	12.9	12.8	15.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	86.2		
.5"	77.1		
.375"	70.3		
#4	54.7		
#10	41.0		
#20	33.5		
#40	28.1		
#60	23.6		
#100	19.5		
#200	15.3		

* (no specification provided)

Material Description
Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 20.8855 D₈₅= 18.3864 D₆₀= 6.1286
 D₅₀= 3.6958 D₃₀= 0.5376 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As received MC = 9.1%

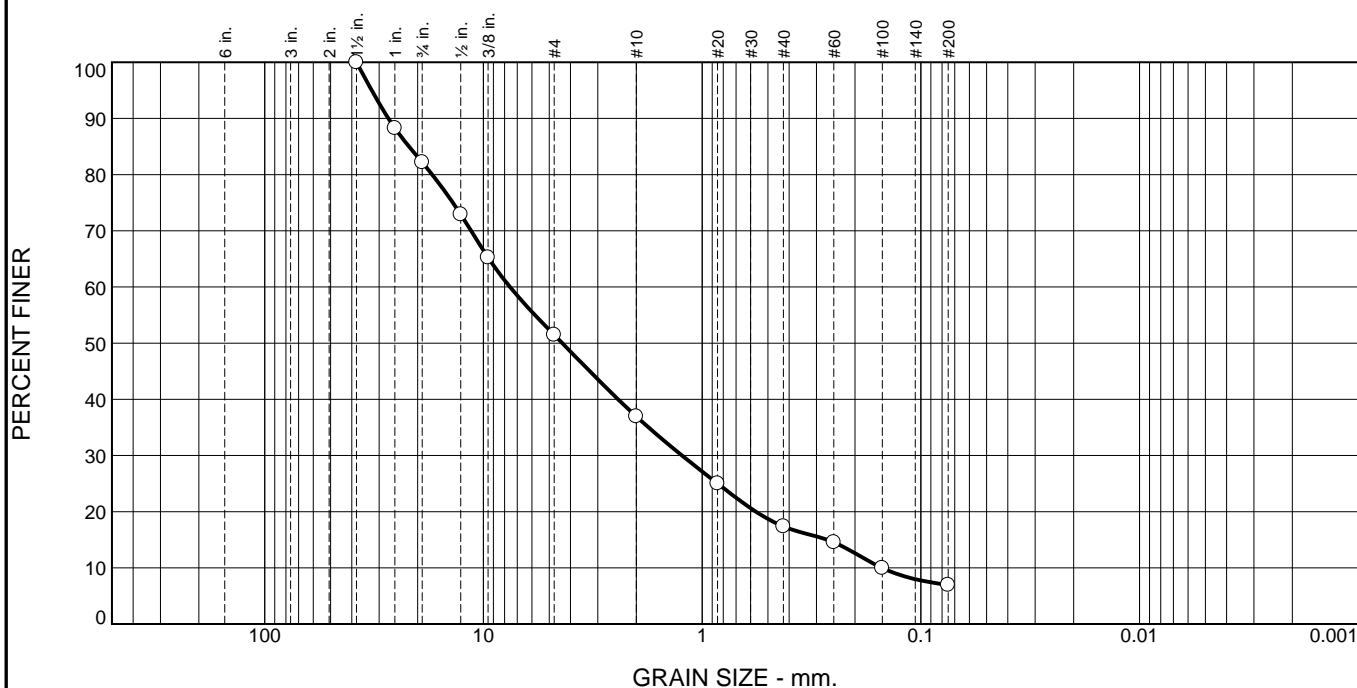
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-16 **Depth:** 2-4'
Sample Number: S-2

Date Sampled: 11/21/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.8	30.7	14.6	19.5	10.5	6.9	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	88.3		
.75"	82.2		
.5"	72.9		
.375"	65.3		
#4	51.5		
#10	36.9		
#20	25.0		
#40	17.4		
#60	14.5		
#100	10.0		
#200	6.9		

* (no specification provided)

Material Description
Gray-brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

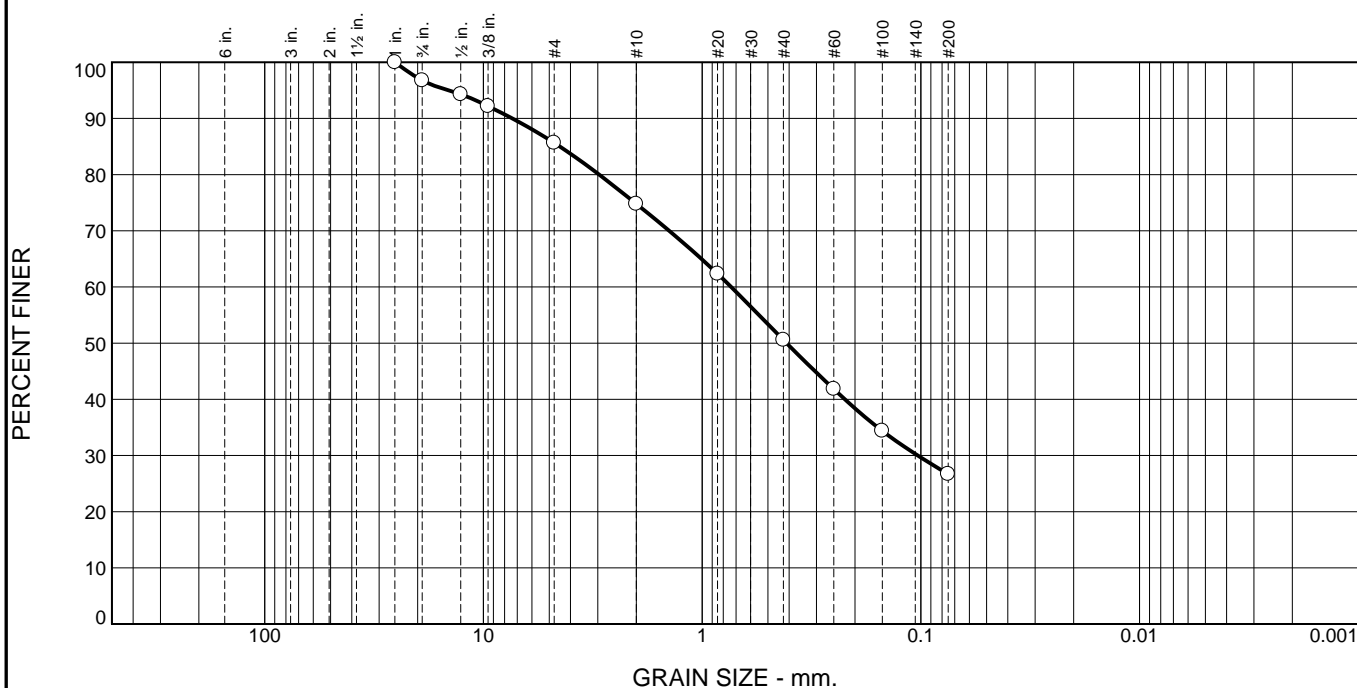
Coefficients
 D₉₀= 27.2148 D₈₅= 21.9000 D₆₀= 7.5619
 D₅₀= 4.3591 D₃₀= 1.2356 D₁₅= 0.2684
 D₁₀= 0.1507 C_u= 50.18 C_c= 1.34

Remarks
As received MC = 8.5%

Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-17 Depth: 4-6' Sample Number: S-3	Date Sampled: 11/7/17
CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.2	11.1	10.9	24.2	23.9	26.7	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	96.8		
.5	94.3		
.375	92.2		
#4	85.7		
#10	74.8		
#20	62.3		
#40	50.6		
#60	41.8		
#100	34.4		
#200	26.7		

* (no specification provided)

Material Description
Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 7.3800 D₈₅= 4.4718 D₆₀= 0.7369
 D₅₀= 0.4110 D₃₀= 0.1033 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As recieved MC = 11.6%

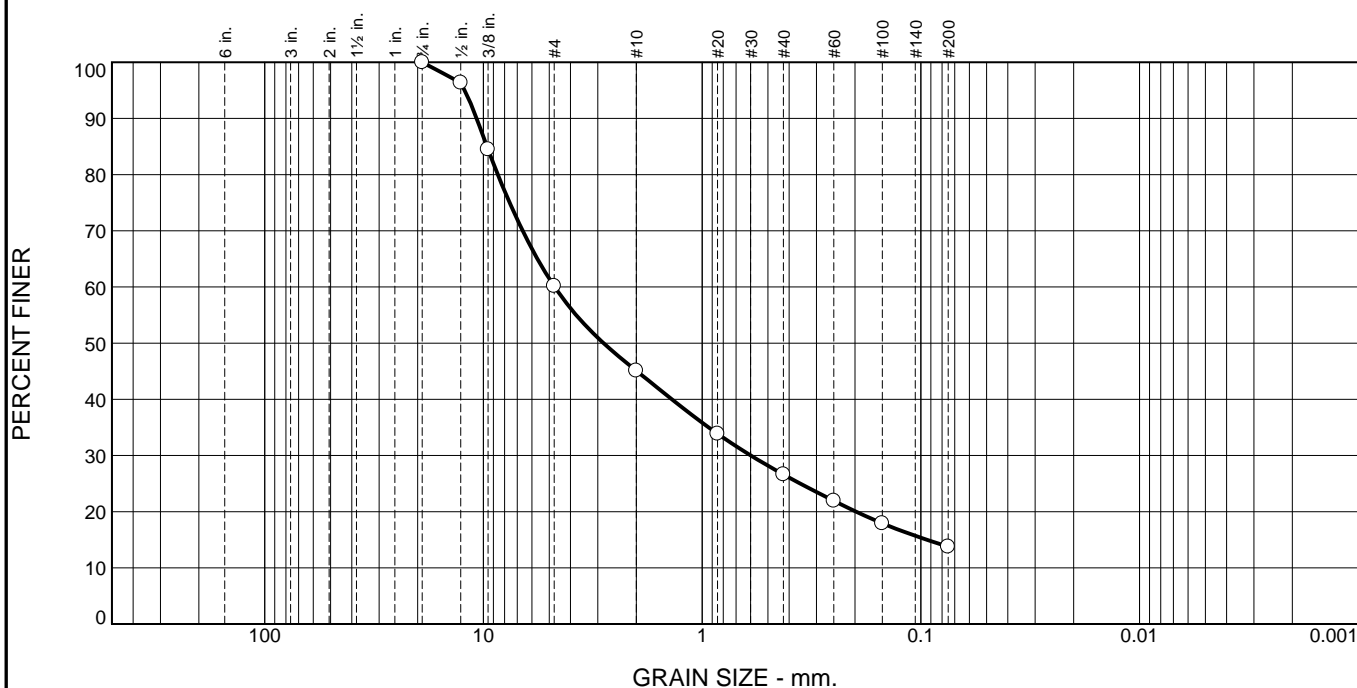
Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-18 **Depth:** 9-10.5'
Sample Number: S-5

Date Sampled: 12/15/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	39.8	15.1	18.5	12.8	13.8	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	96.4		
.375	84.5		
#4	60.2		
#10	45.1		
#20	33.9		
#40	26.6		
#60	21.9		
#100	17.9		
#200	13.8		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 10.7458 D₈₅= 9.6325 D₆₀= 4.7194
 D₅₀= 2.8244 D₃₀= 0.5985 D₁₅= 0.0937
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 9.7%

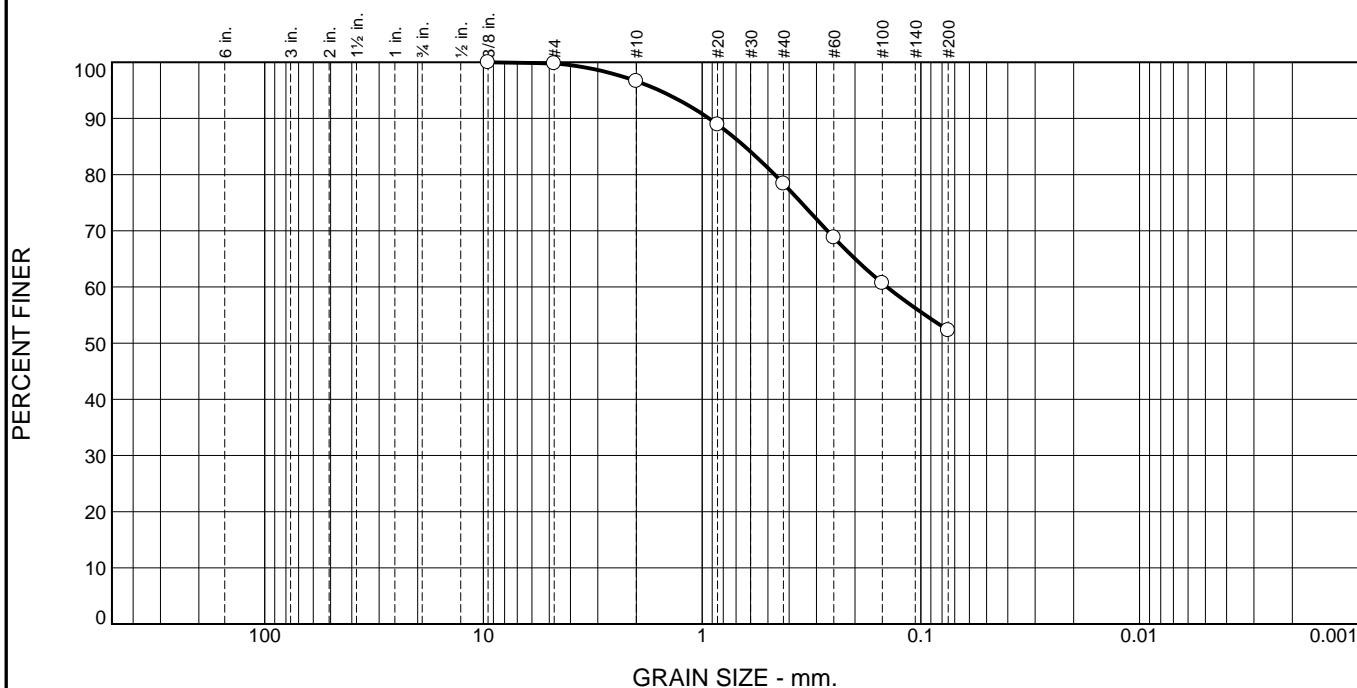
Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-19 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 12/14/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	3.2	18.2	26.1	52.3	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.8		
#10	96.6		
#20	88.9		
#40	78.4		
#60	68.8		
#100	60.7		
#200	52.3		

* (no specification provided)

Material Description		
Gray-brown sandy silt with organics		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)	
Coefficients		
D ₉₀ = 0.9304	D ₈₅ = 0.6380	D ₆₀ = 0.1427
D ₅₀ =	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As recieved MC = 22.9%		
Date Received: 1/30/18		Date Tested: 1/31/18
Tested By: SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-20 Depth: 2-4'
Sample Number: S-2

Date Sampled: 12/13/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-20
Sample Number: S-2
Sample Depth (ft): 2-4
Sample Date: 12/13/2017

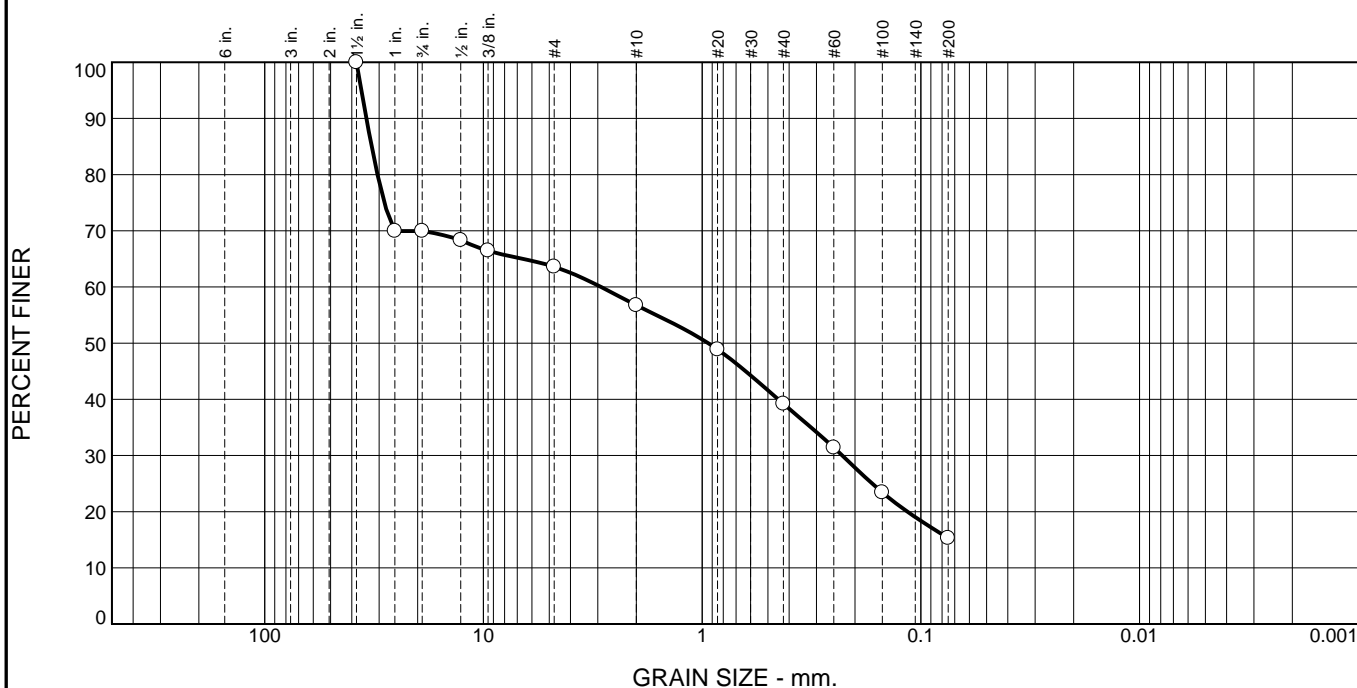
Tested By: AS
Test Date: 1/31/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.70
Wet Mass of Sample & Tin (g)	212.00
Dry Mass of Sample & Tin (g)	196.26
Mass of Water (g)	15.74
Mass of Dry Soil (g)	69.56
Moisture Content (%)	22.6

ASH CONTENT	
Porcelain Dish Mass (g)	126.70
Porcelain Dish + Oven Dried Soil (g)	196.26
Mass of Oven Dried Soil (g)	69.56
Mass of Dish & Burned Soil (g)	194.00
Mass of Burned Soil (g)	67.30
Mass of Organic Material (g)	2.26
Ash Content (%)	96.8
Organic Content (%)	3.2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.0	6.4	6.8	17.6	23.9	15.3	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	70.0		
.75	70.0		
.5	68.3		
.375	66.5		
#4	63.6		
#10	56.8		
#20	48.9		
#40	39.2		
#60	31.4		
#100	23.4		
#200	15.3		

* (no specification provided)

Material Description
Brown silty sand with gravel and brick fragments

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 34.3126 D₈₅= 32.4495 D₆₀= 2.9007
 D₅₀= 0.9393 D₃₀= 0.2287 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 13.8%

Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-21 **Depth:** 8-10'
Sample Number: S-5

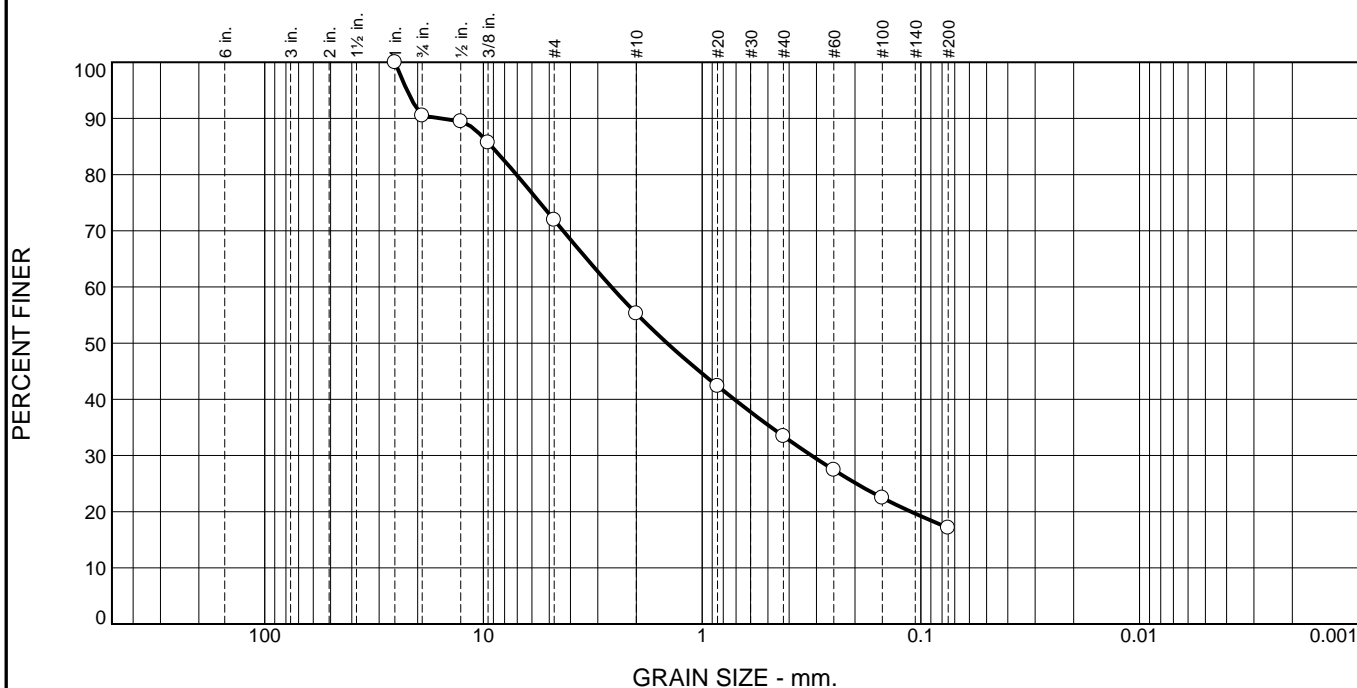
Date Sampled: 12/15/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.5	18.6	16.6	21.9	16.3	17.1	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	90.5		
.5	89.5		
.375	85.7		
#4	71.9		
#10	55.3		
#20	42.4		
#40	33.4		
#60	27.4		
#100	22.5		
#200	17.1		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 15.6606 D₈₅= 9.1673 D₆₀= 2.5985
 D₅₀= 1.4458 D₃₀= 0.3161 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 11.0%

Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-22 **Depth:** 4-6'
Sample Number: S-3

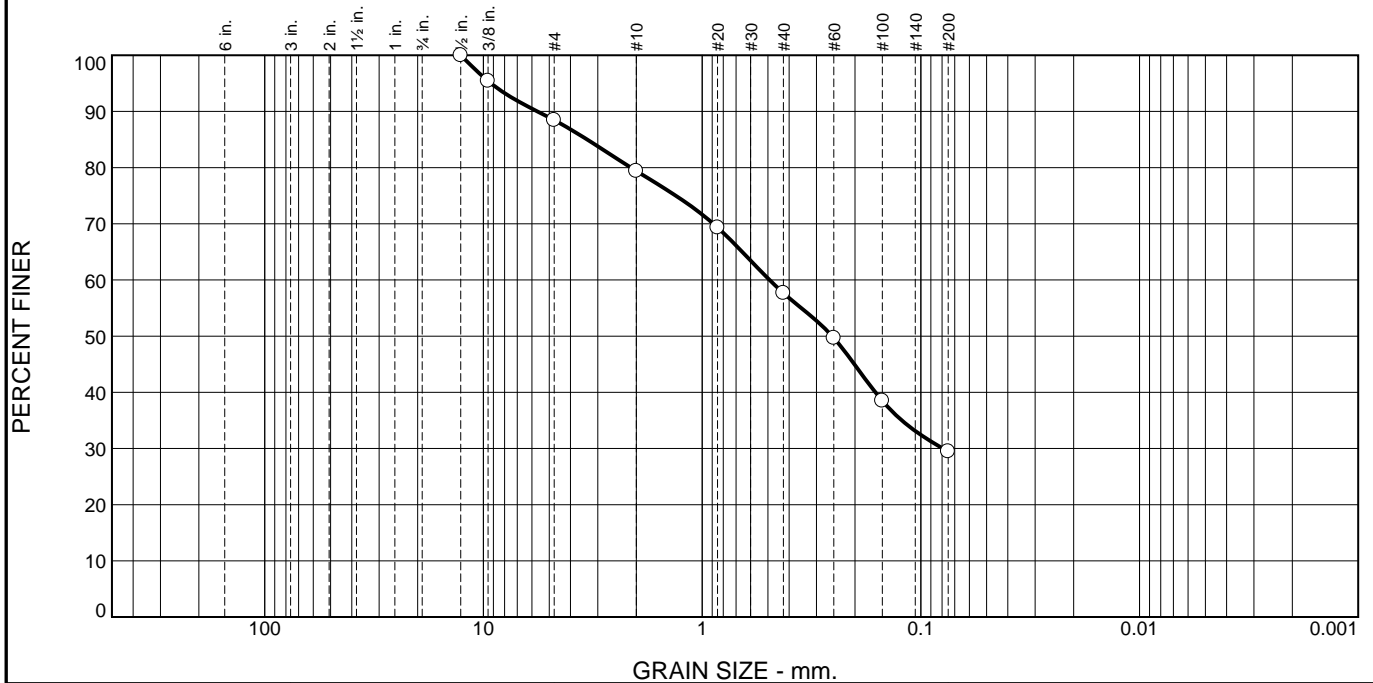
Date Sampled: 12/13/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.5	9.1	21.7	28.2	29.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	95.4		
#4	88.5		
#10	79.4		
#20	69.3		
#40	57.7		
#60	49.7		
#100	38.5		
#200	29.5		

* (no specification provided)

Material Description
Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 5.6639 D₈₅= 3.3553 D₆₀= 0.4919
 D₅₀= 0.2543 D₃₀= 0.0792 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 13.8%

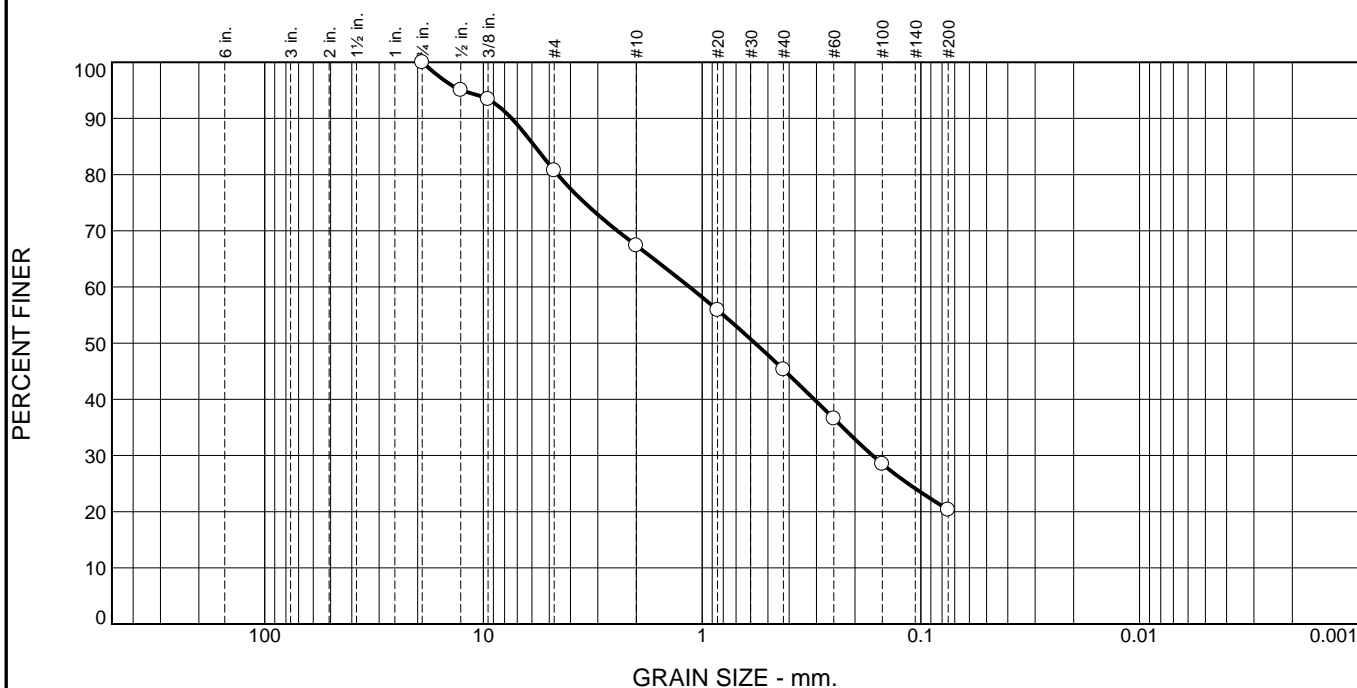
Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-24 **Depth:** 2-2.5'
Sample Number: S-V-1

Date Sampled: 10/11/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	19.3	13.3	22.1	25.0	20.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	95.1		
.375"	93.4		
#4	80.7		
#10	67.4		
#20	55.9		
#40	45.3		
#60	36.6		
#100	28.5		
#200	20.3		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 7.4288 D₈₅= 5.8075 D₆₀= 1.1427
 D₅₀= 0.5728 D₃₀= 0.1662 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 8.3%

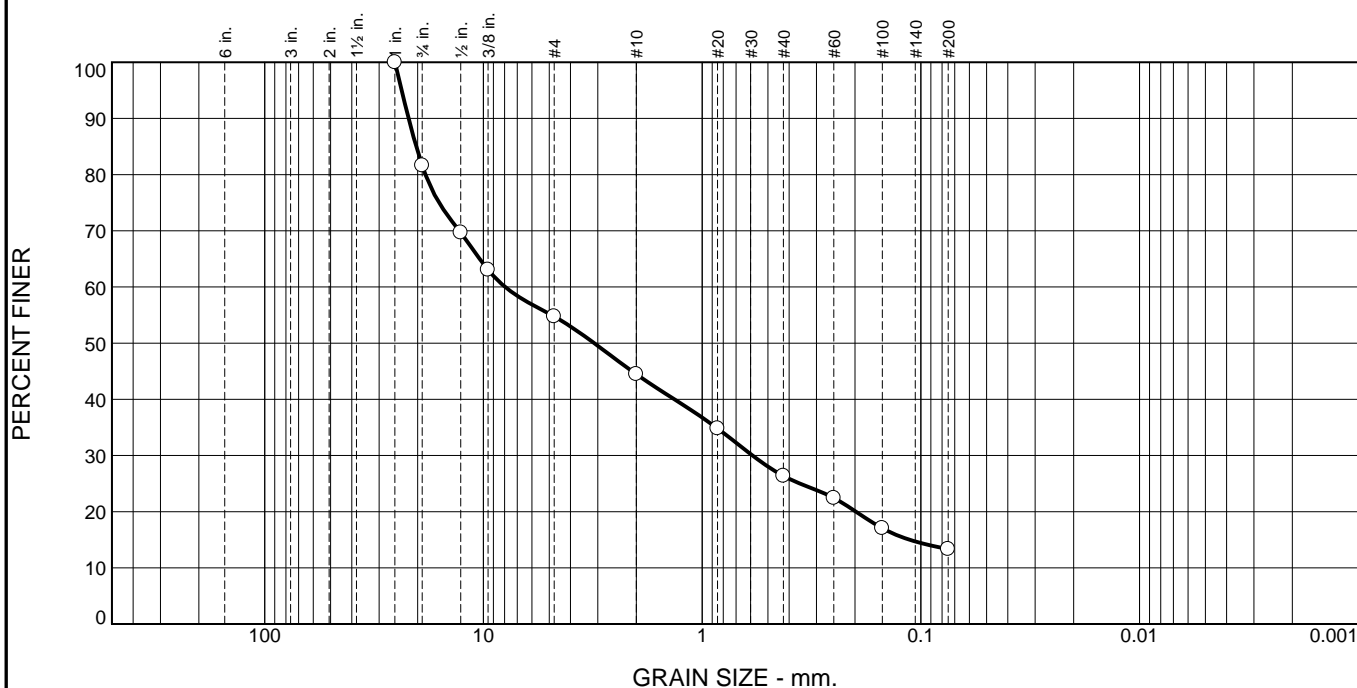
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-24 **Depth:** 4.5-5'
Sample Number: S-V-2

Date Sampled: 11/22/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.4	26.8	10.3	18.1	13.1	13.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	81.6		
.5"	69.7		
.375"	63.1		
#4	54.8		
#10	44.5		
#20	34.8		
#40	26.4		
#60	22.4		
#100	17.1		
#200	13.3		

* (no specification provided)

Material Description

Dark brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= GM AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 21.9989 D₈₅= 20.2959 D₆₀= 7.9574
D₅₀= 3.1169 D₃₀= 0.5884 D₁₅= 0.1125
D₁₀= C_u= C_c=

Remarks

As received MC = 7.2%

Date Received: 12/8/17 Date Tested: 12/12/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

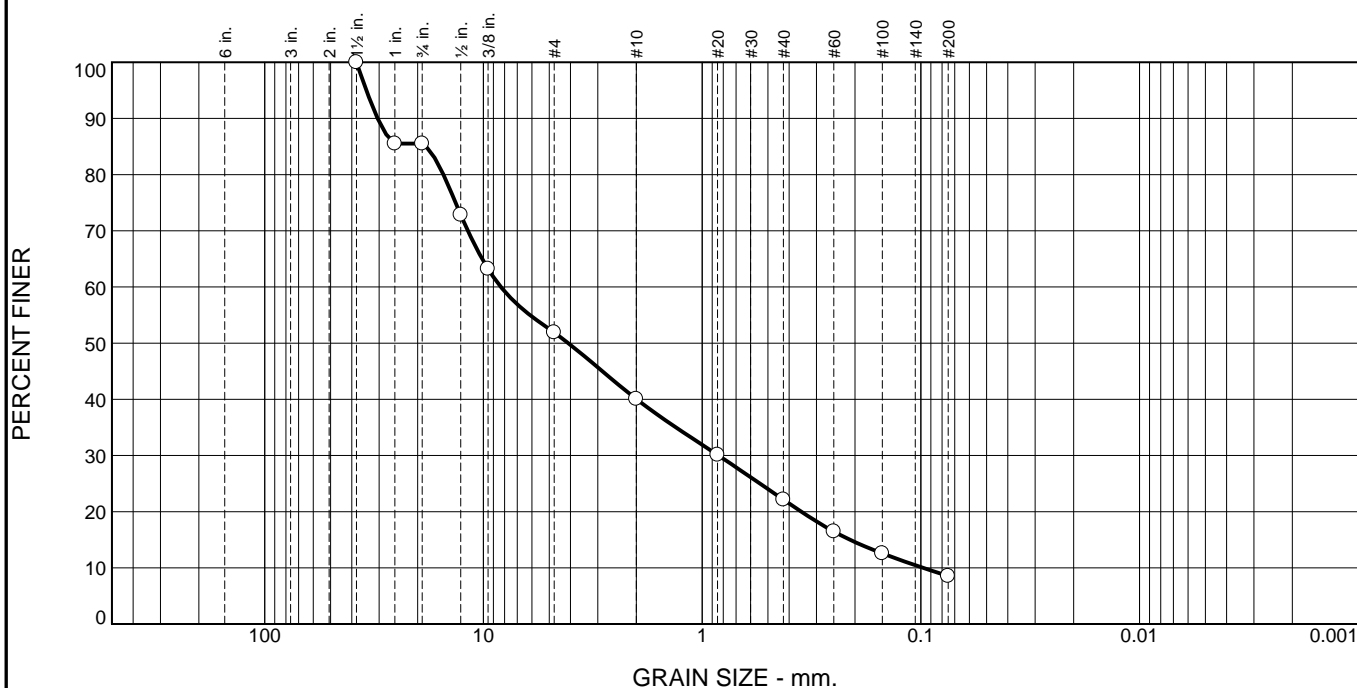
Source of Sample: B-25 Depth: 2-2.5'
Sample Number: S-V-1

Date Sampled: 10/23/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.5	33.6	11.8	18.0	13.6	8.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.5		
.75"	85.5		
.5"	72.8		
.375"	63.2		
#4	51.9		
#10	40.1		
#20	30.1		
#40	22.1		
#60	16.5		
#100	12.6		
#200	8.5		

* (no specification provided)

Material Description
Dark brown poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 30.4787 D₈₅= 18.2613 D₆₀= 8.3201
 D₅₀= 4.0955 D₃₀= 0.8422 D₁₅= 0.2108
 D₁₀= 0.0975 C_u= 85.33 C_c= 0.87

Remarks
As received MC = 11.4%

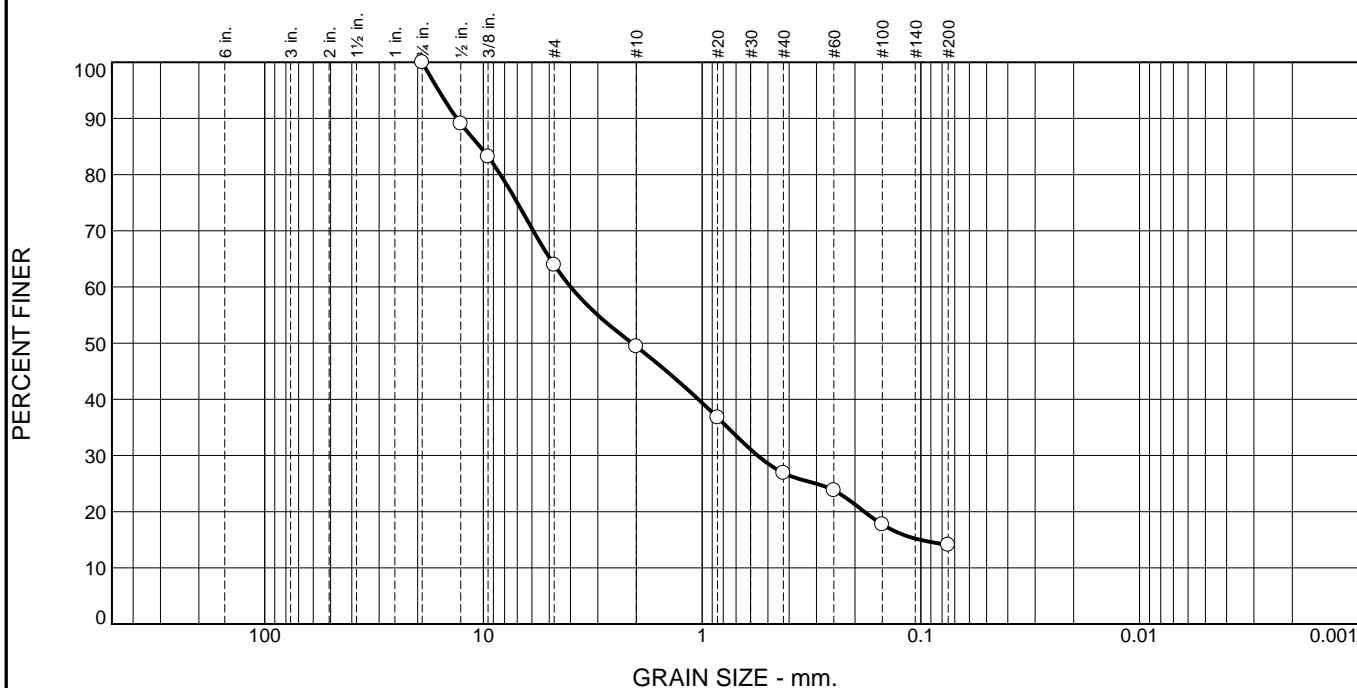
Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-25 **Depth:** 6-8'
Sample Number: S-1

Date Sampled: 10/23/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	36.1	14.5	22.5	12.8	14.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	89.1		
.375"	83.2		
#4	63.9		
#10	49.4		
#20	36.8		
#40	26.9		
#60	23.8		
#100	17.7		
#200	14.1		

* (no specification provided)

Material Description
 Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 13.2292 D₈₅= 10.3766 D₆₀= 3.9915
 D₅₀= 2.0913 D₃₀= 0.5579 D₁₅= 0.1010
 D₁₀= C_u= C_c=

Remarks
 As received MC = 8.6%
 Contains trace asphalt

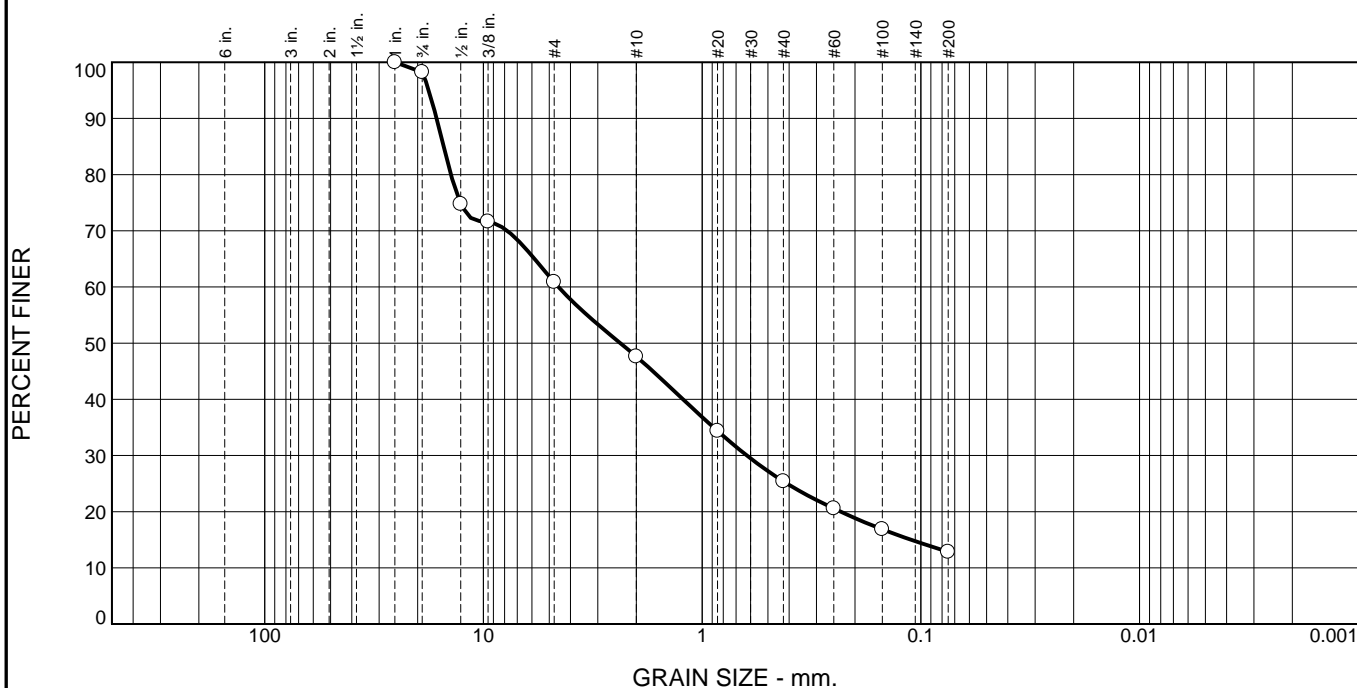
Date Received: 12/8/17 Date Tested: 12/12/17
 Tested By: RZ
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-26 Depth: 2-2.5'
 Sample Number: S-V-1

Date Sampled: 10/12/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.8	37.3	13.3	22.2	12.6	12.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	98.2		
.5"	74.8		
.375"	71.6		
#4	60.9		
#10	47.6		
#20	34.4		
#40	25.4		
#60	20.6		
#100	16.9		
#200	12.8		

* (no specification provided)

Material Description
Gray-brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 16.3695 D₈₅= 15.2061 D₆₀= 4.5366
D₅₀= 2.3651 D₃₀= 0.6242 D₁₅= 0.1107
D₁₀= C_u= C_c=

Remarks
As received MC = 7.9%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

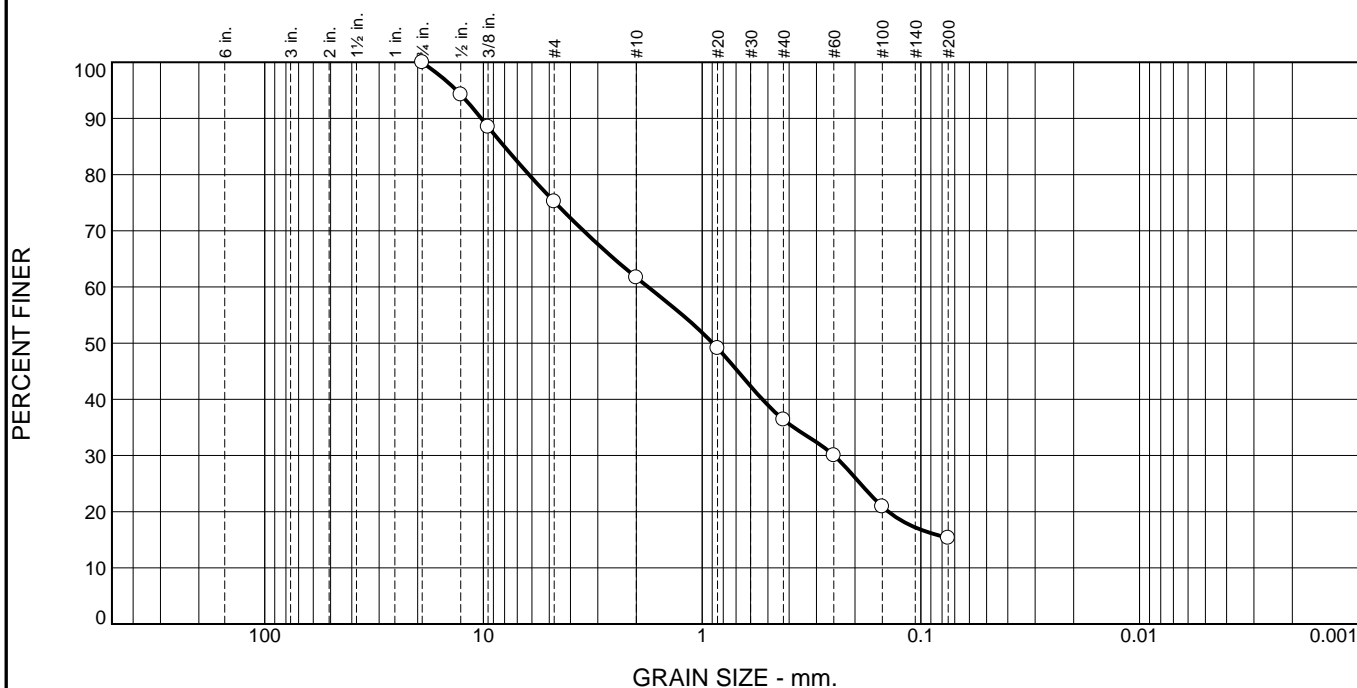
Source of Sample: B-26 **Depth:** 9-9.7'
Sample Number: S-2

Date Sampled: 10/12/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	24.8	13.5	25.3	21.1	15.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	94.3		
.375"	88.5		
#4	75.2		
#10	61.7		
#20	49.1		
#40	36.4		
#60	30.0		
#100	20.9		
#200	15.3		

* (no specification provided)

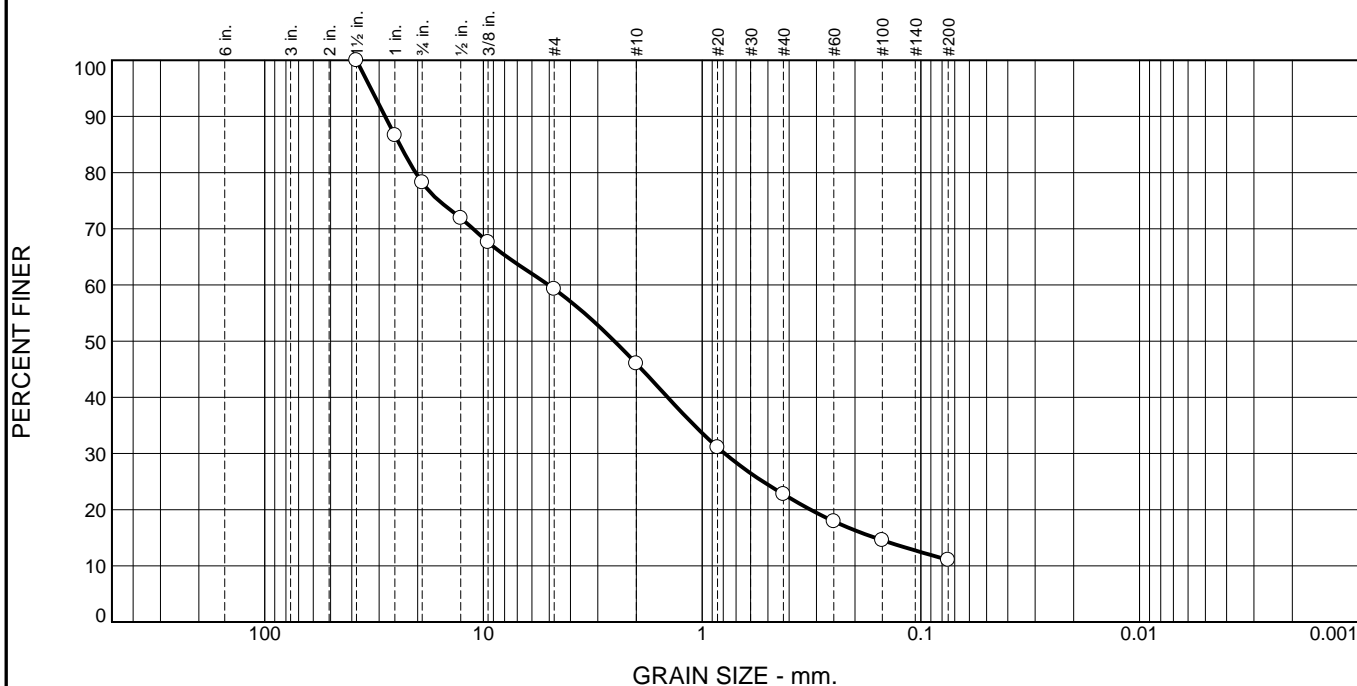
Material Description	
Brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 10.2326	D ₈₅ = 8.0192 D ₆₀ = 1.7682
D ₅₀ = 0.8945	D ₃₀ = 0.2496 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 6.5%	
Date Received: 12/8/17	Date Tested: 12/13/17
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-27 Depth: 0.5-2'
Sample Number: S-1

Date Sampled: 10/16/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.8	18.9	13.3	23.2	11.7	11.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	86.6		
.75"	78.2		
.5"	71.9		
.375"	67.6		
#4	59.3		
#10	46.0		
#20	31.1		
#40	22.8		
#60	17.9		
#100	14.6		
#200	11.1		

* (no specification provided)

Material Description
Gray poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 28.1526 D₈₅= 24.1488 D₆₀= 5.0381
 D₅₀= 2.5190 D₃₀= 0.7887 D₁₅= 0.1616
 D₁₀= C_u= C_c=

Remarks
As received MC = 7.2%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-28 **Depth:** 9-9.8'
Sample Number: S-4

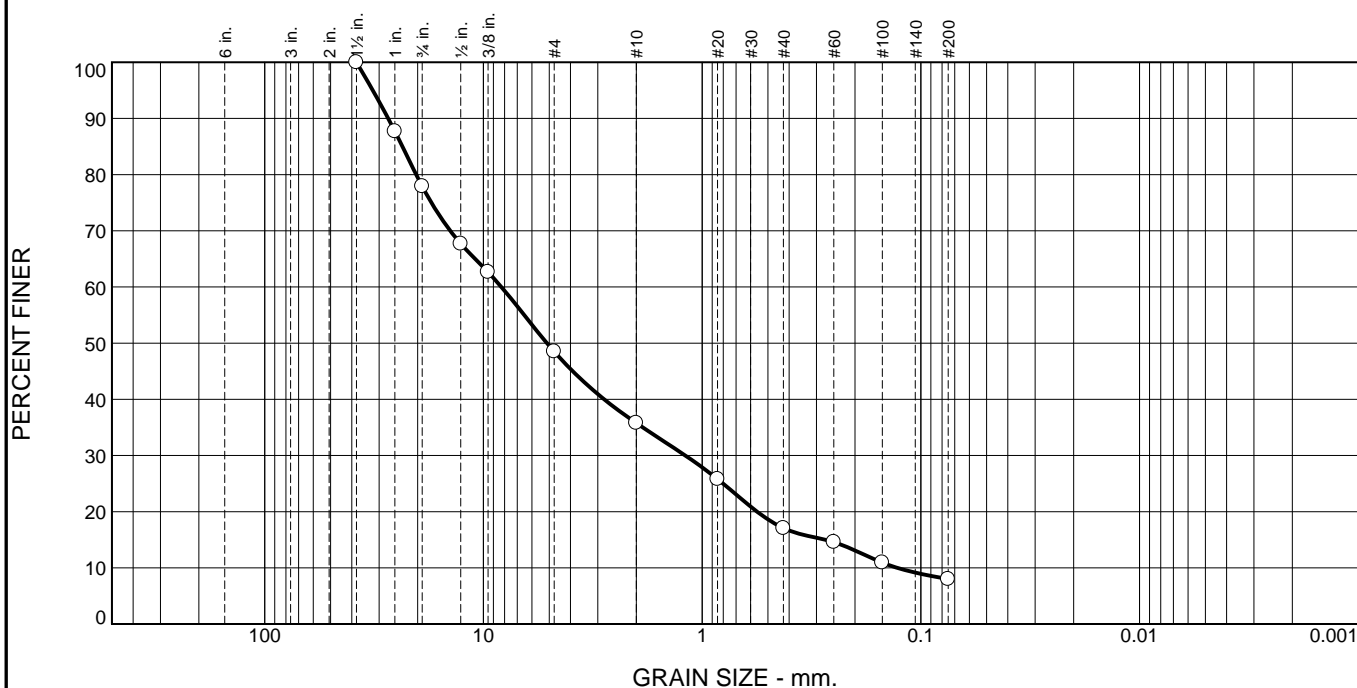
Date Sampled: 10/16/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.1	29.4	12.7	18.7	9.1	8.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	87.7		
.75"	77.9		
.5"	67.7		
.375"	62.7		
#4	48.5		
#10	35.8		
#20	25.8		
#40	17.1		
#60	14.6		
#100	10.9		
#200	8.0		

* (no specification provided)

Material Description
Gray-brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 27.2493 D₈₅= 23.4705 D₆₀= 8.2794
D₅₀= 5.1239 D₃₀= 1.1943 D₁₅= 0.2732
D₁₀= 0.1280 C_u= 64.70 C_c= 1.35

Remarks
As received MC = 10.8%

Date Received: 12/8/17 Date Tested: 12/13/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

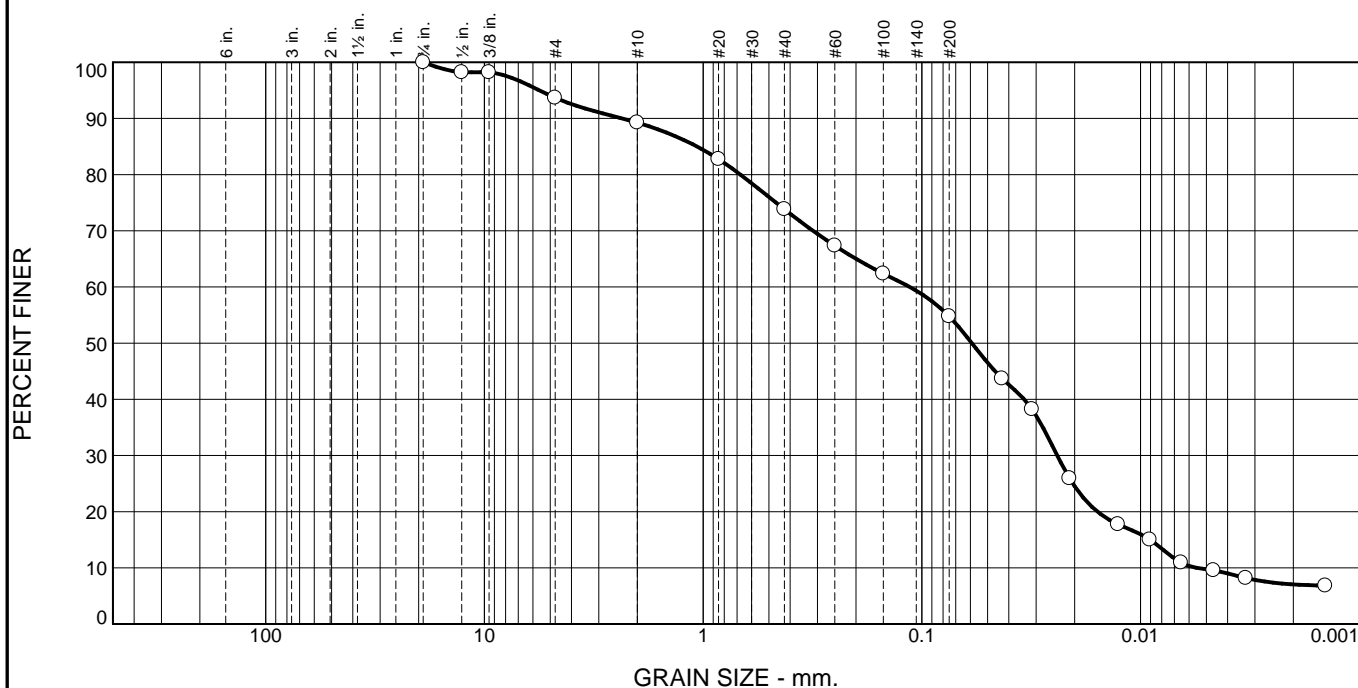
Source of Sample: B-29 Depth: 8-10'
Sample Number: S-5

Date Sampled: 10/13/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.3	4.5	15.4	19.0	45.1	9.7

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	98.2		
.375"	98.2		
#4	93.7		
#10	89.2		
#20	82.7		
#40	73.8		
#60	67.3		
#100	62.4		
#200	54.8		
0.0429 mm.	43.7		
0.0313 mm.	38.2		
0.0211 mm.	25.9		
0.0127 mm.	17.8		
0.0091 mm.	15.0		
0.0065 mm.	10.9		
0.0046 mm.	9.6		
0.0033 mm.	8.2		
0.0014 mm.	6.8		

* (no specification provided)

Material Description
Gray-brown sandy silt

Atterberg Limits (ASTM D 4318)
PL= 17 LL= 20 PI= 3

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 2.3483 D₈₅= 1.0661 D₆₀= 0.1136
D₅₀= 0.0590 D₃₀= 0.0240 D₁₅= 0.0090
D₁₀= 0.0055 C_u= 20.54 C_c= 0.92

Remarks
As received MC = 20.2%

Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: MP/RZ
Checked By: MP
Title: Laboratory Manager

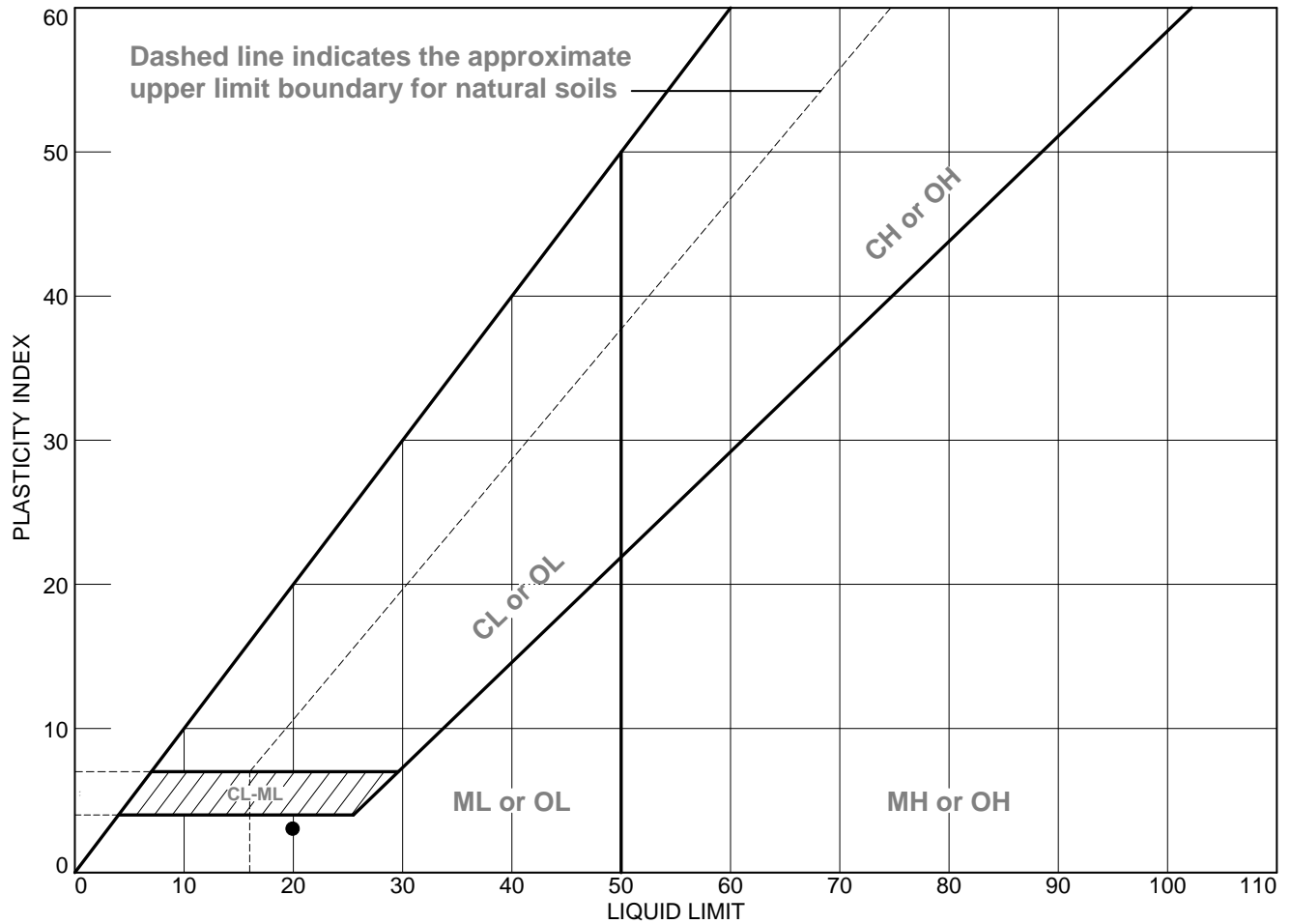
Source of Sample: B-30 **Depth:** 5-5.5'
Sample Number: S-V-2

Date Sampled: 10/13/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



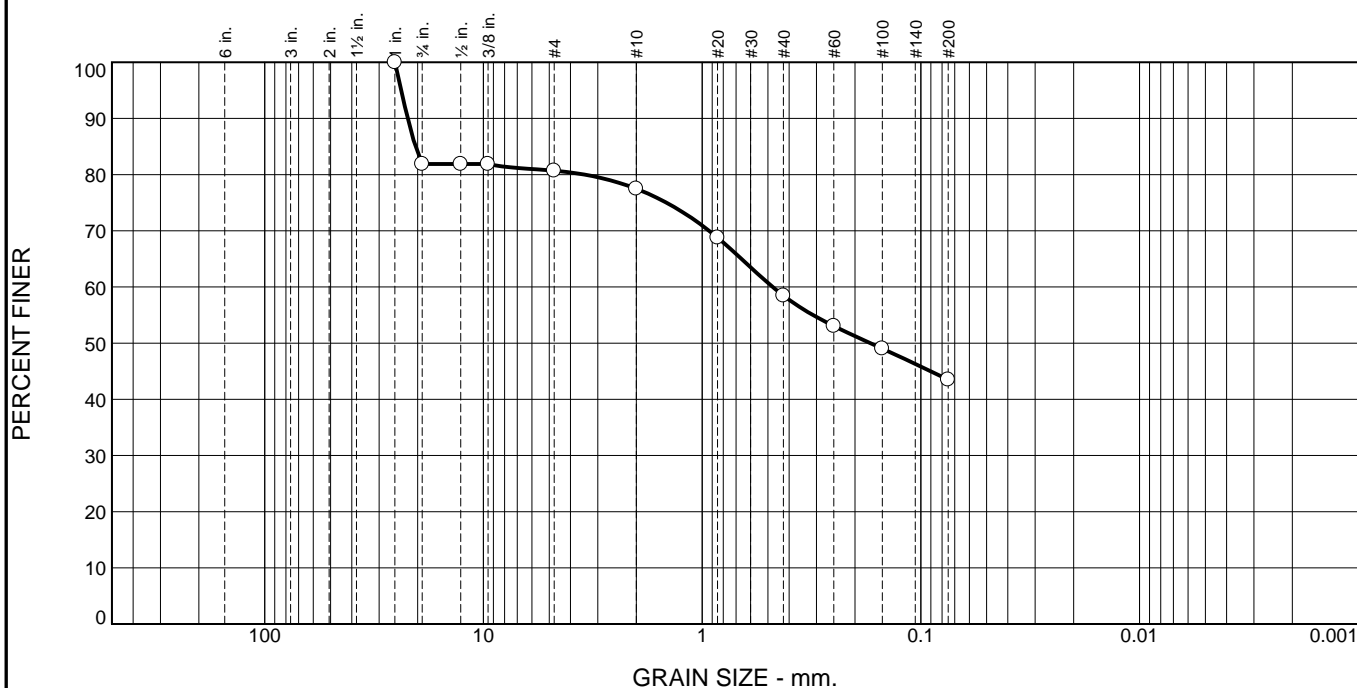
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-30	S-V-2	5-5.5'	20.2	17	20	3	ML

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Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170 **Figure**

Tested By: RZ Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.1	1.2	3.2	19.0	15.0	43.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	81.9		
.5"	81.9		
.375"	81.9		
#4	80.7		
#10	77.5		
#20	68.8		
#40	58.5		
#60	53.0		
#100	49.0		
#200	43.5		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 22.1958 D₈₅= 20.4479 D₆₀= 0.4757
D₅₀= 0.1701 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks
As received MC = 20.3%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

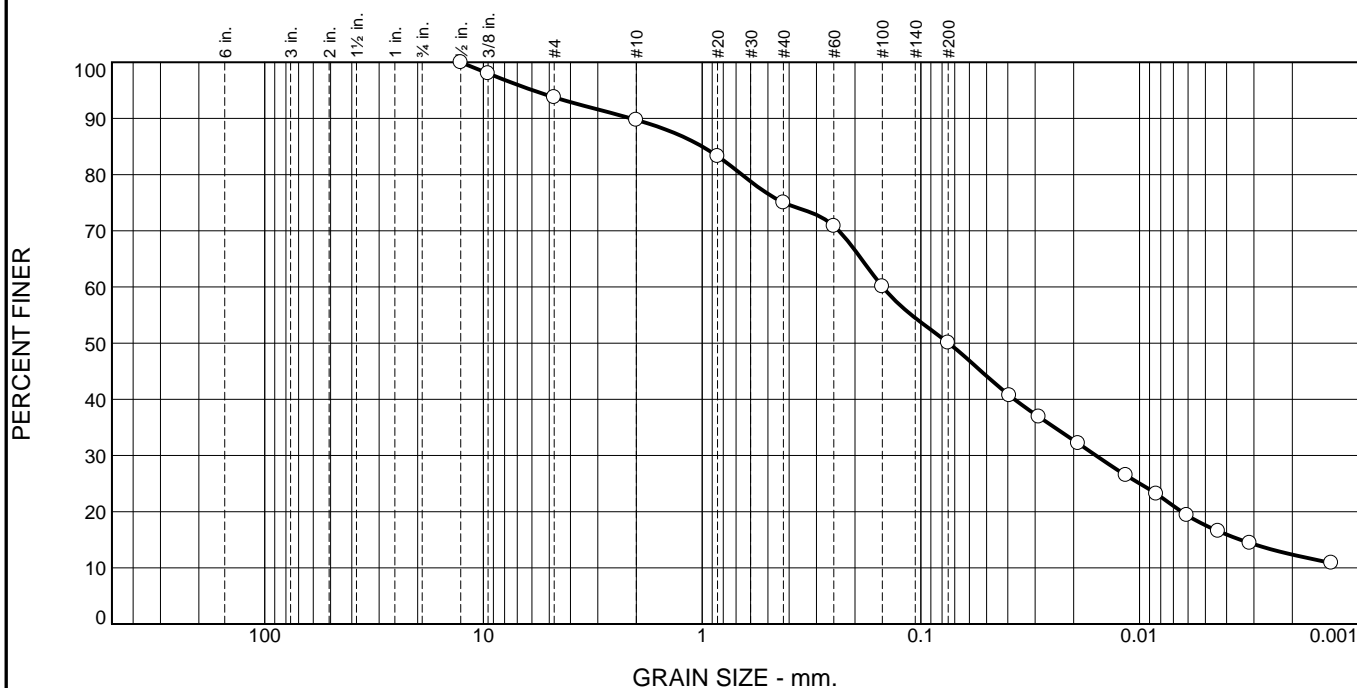
Source of Sample: B-31 **Depth:** 2-2.5'
Sample Number: S-V-1

Date Sampled: 10/12/17

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Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.2	4.1	14.7	24.9	32.5	17.6

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	98.0		
#4	93.8		
#10	89.7		
#20	83.3		
#40	75.0		
#60	70.9		
#100	60.1		
#200	50.1		
0.0394 mm.	40.7		
0.0289 mm.	36.9		
0.0191 mm.	32.2		
0.0116 mm.	26.5		
0.0084 mm.	23.2		
0.0061 mm.	19.4		
0.0044 mm.	16.6		
0.0031 mm.	14.4		
0.0013 mm.	10.9		

* (no specification provided)

Material Description
Brown sandy silt

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 2.1107 D₈₅= 0.9990 D₆₀= 0.1494
 D₅₀= 0.0746 D₃₀= 0.0158 D₁₅= 0.0035
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 11.0%

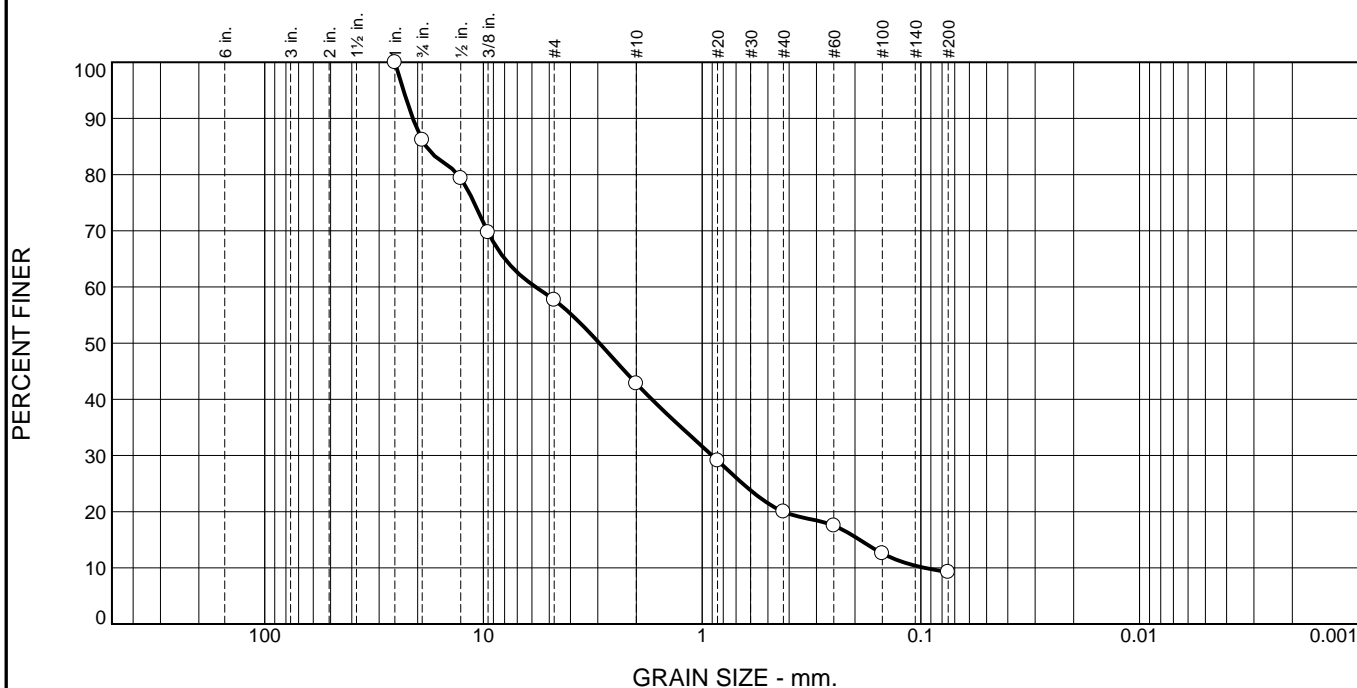
Date Received: 12/8/17 **Date Tested:** 12/15/17
Tested By: MP/RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-31 **Depth:** 14-14.7'
Sample Number: S-3

Date Sampled: 10/12/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.8	28.5	14.9	22.8	10.8	9.2	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	86.2		
.5"	79.4		
.375"	69.7		
#4	57.7		
#10	42.8		
#20	29.1		
#40	20.0		
#60	17.5		
#100	12.6		
#200	9.2		

* (no specification provided)

Material Description

Brown well-graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SW-SM AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 21.0220 D₈₅= 18.2593 D₆₀= 5.7680
D₅₀= 2.9506 D₃₀= 0.9004 D₁₅= 0.1904
D₁₀= 0.0961 C_u= 60.02 C_c= 1.46

Remarks

As received MC = 9.0%

Date Received: 12/8/17 Date Tested: 12/13/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

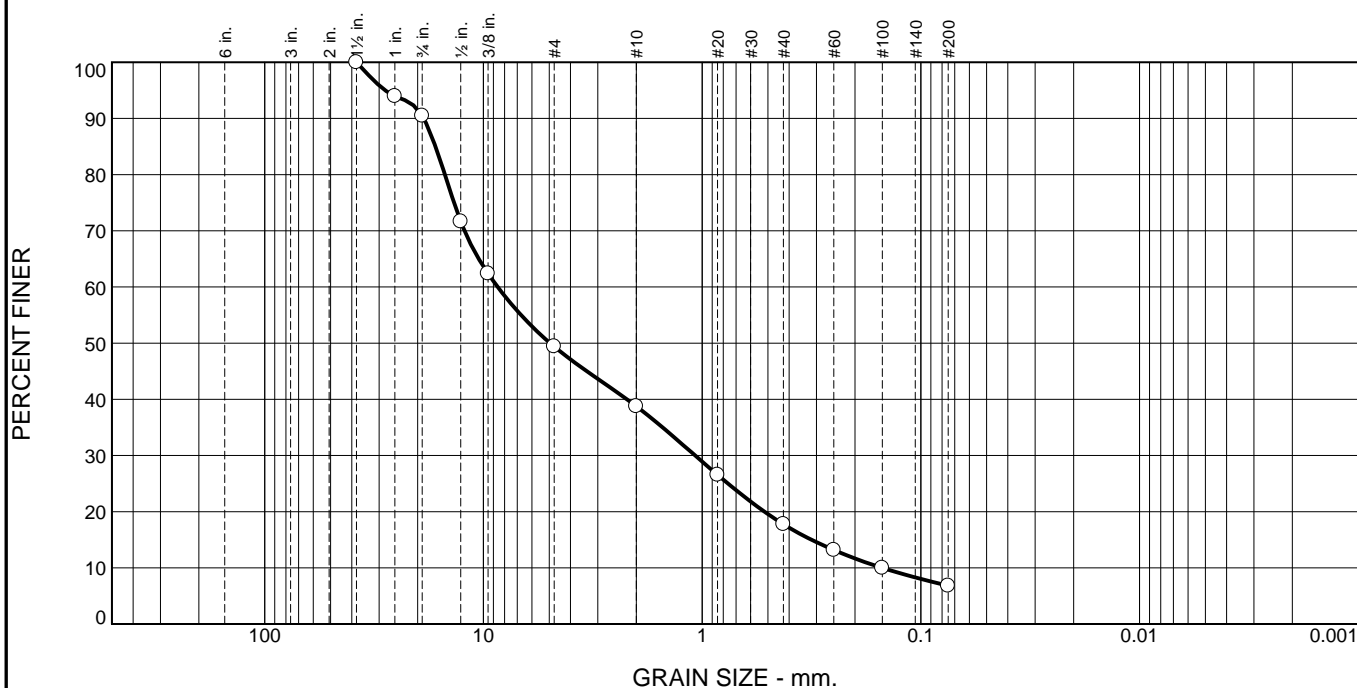
Source of Sample: B-32 Depth: 8-10'
Sample Number: S-2

Date Sampled: 11/30/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.5	41.1	10.6	21.0	11.0	6.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	94.0		
.75"	90.5		
.5"	71.6		
.375"	62.4		
#4	49.4		
#10	38.8		
#20	26.6		
#40	17.8		
#60	13.2		
#100	10.0		
#200	6.8		

* (no specification provided)

Material Description
Gray poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 18.7522 D₈₅= 16.5644 D₆₀= 8.6017
 D₅₀= 4.9512 D₃₀= 1.0764 D₁₅= 0.3162
 D₁₀= 0.1503 C_u= 57.24 C_c= 0.90

Remarks
As received MC = 5.6%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-33 **Depth:** 2-4'
Sample Number: S-2

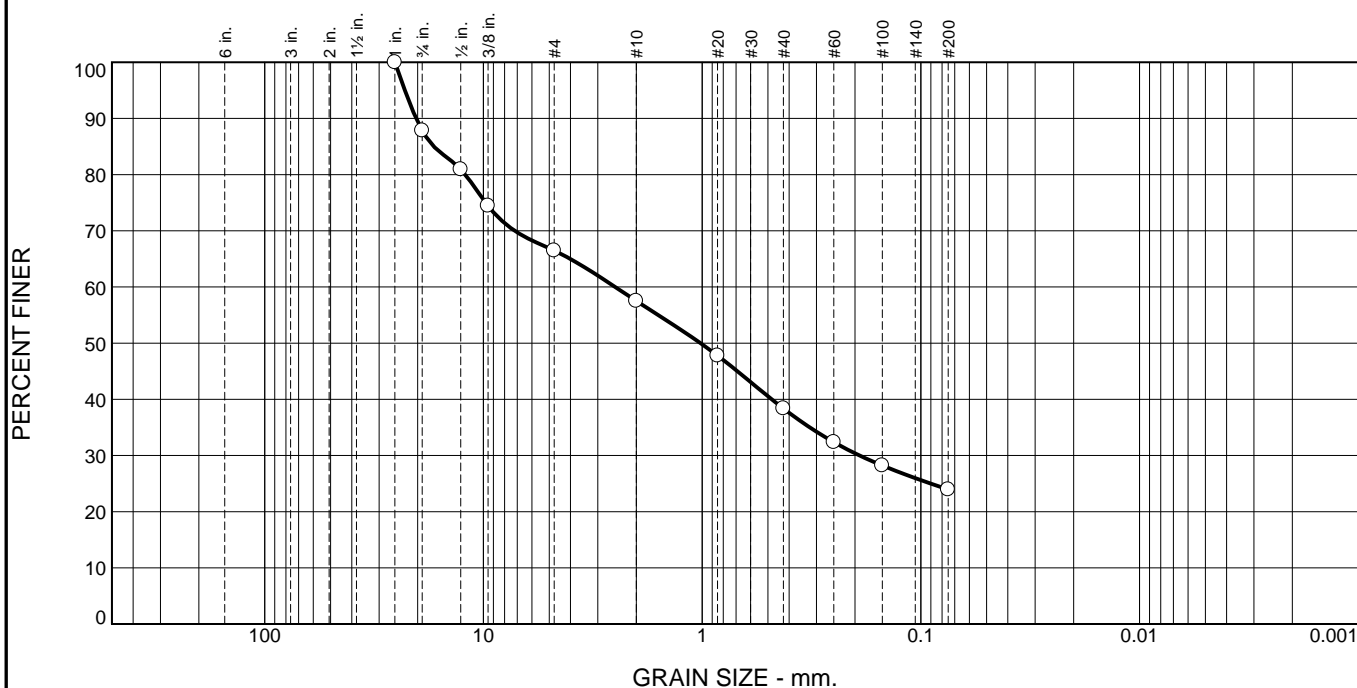
Date Sampled: 10/17/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.2	21.3	9.0	19.1	14.5	23.9	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	87.8		
.5"	80.9		
.375"	74.4		
#4	66.5		
#10	57.5		
#20	47.8		
#40	38.4		
#60	32.4		
#100	28.2		
#200	23.9		

* (no specification provided)

Material Description
Dark brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 20.3132 D₈₅= 16.8408 D₆₀= 2.4980
 D₅₀= 1.0173 D₃₀= 0.1905 D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 13.1%

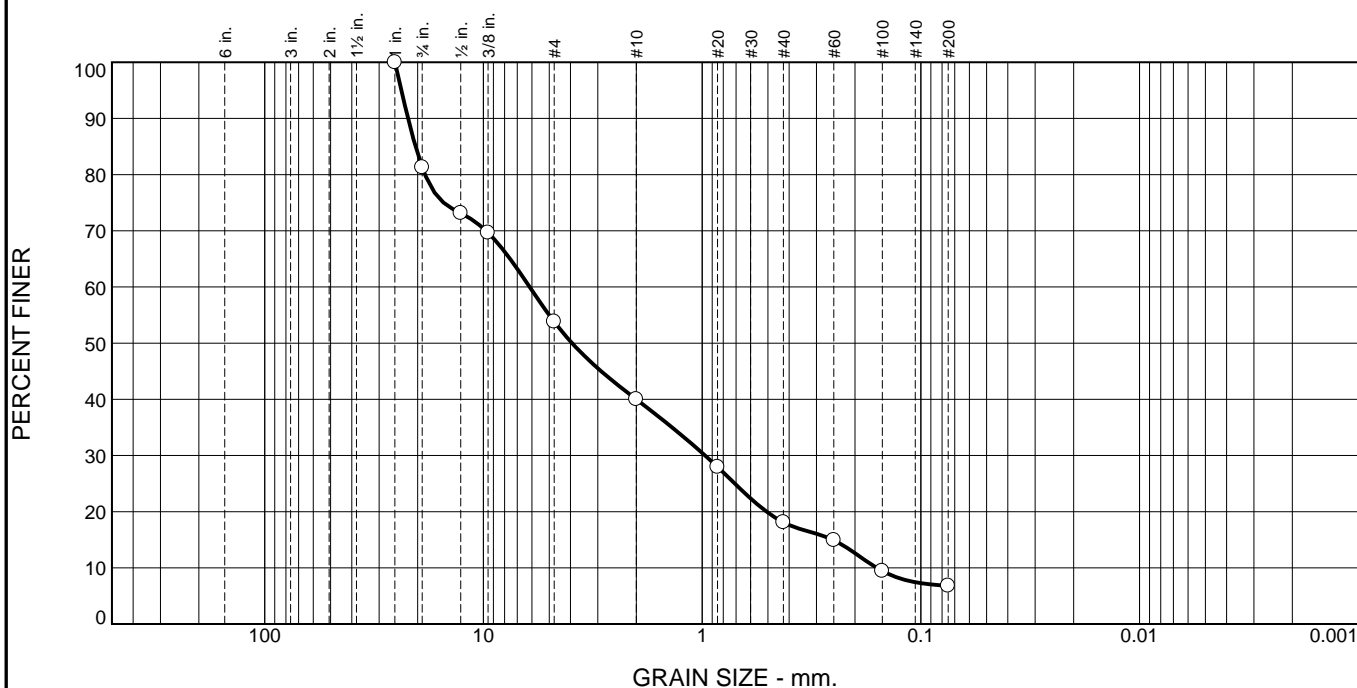
Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-34 **Depth:** 2-2.5'
Sample Number: S-V-1

Date Sampled: 10/6/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.7	27.5	13.8	21.9	11.3	6.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	81.3		
.5"	73.2		
.375"	69.7		
#4	53.8		
#10	40.0		
#20	28.0		
#40	18.1		
#60	14.9		
#100	9.4		
#200	6.8		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 22.1212 D₈₅= 20.4452 D₆₀= 6.1462
 D₅₀= 3.9328 D₃₀= 0.9697 D₁₅= 0.2528
 D₁₀= 0.1589 C_u= 38.69 C_c= 0.96

Remarks
As received MC = 6.3%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-35 **Depth:** 2-3.5'
Sample Number: S-2

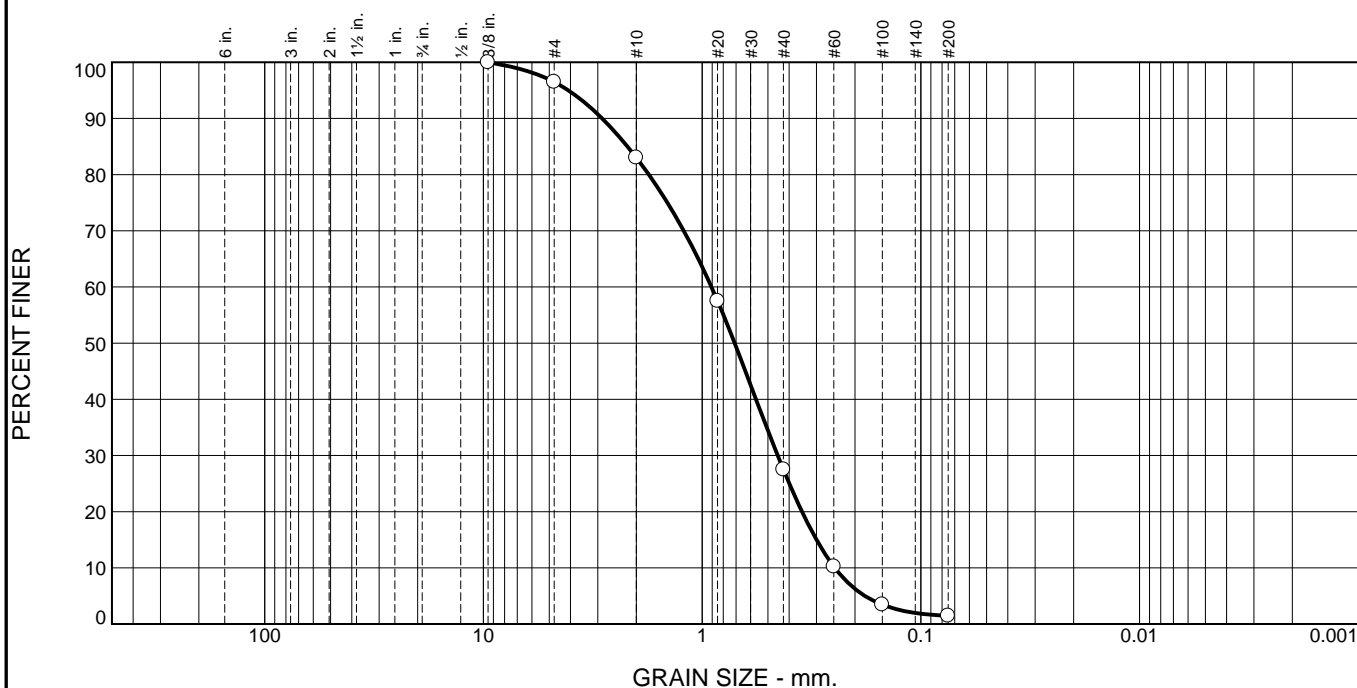
Date Sampled: 10/19/17

CDM Smith

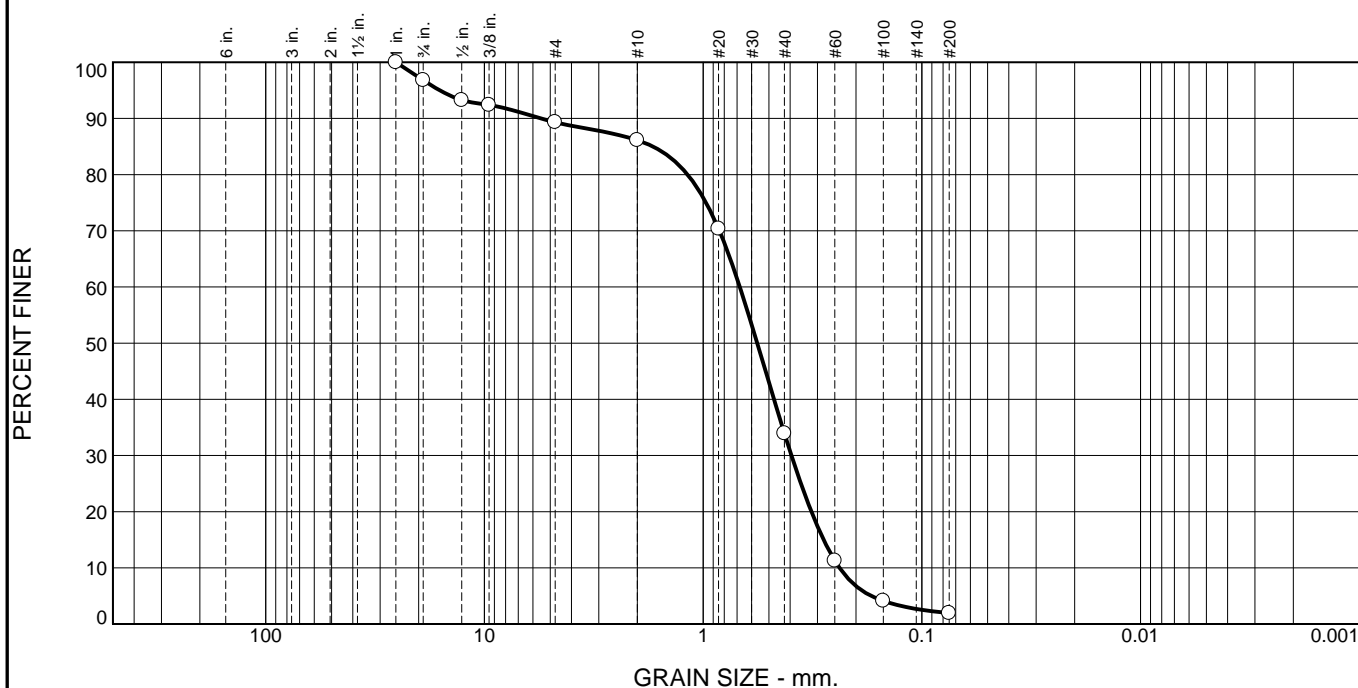
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.2	7.5	3.2	52.2	32.0	1.9	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	96.8		
.5	93.3		
.375	92.4		
#4	89.3		
#10	86.1		
#20	70.4		
#40	33.9		
#60	11.3		
#100	4.1		
#200	1.9		

* (no specification provided)

Material Description

Brown poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 5.5138 D₈₅= 1.6965 D₆₀= 0.6797
D₅₀= 0.5657 D₃₀= 0.3946 D₁₅= 0.2814
D₁₀= 0.2379 C_u= 2.86 C_c= 0.96

Remarks

As recieved MC = 5.1%

Date Received: 1/30/18 Date Tested: 1/31/18

Tested By: SB

Checked By: MP

Title: Laboratory Manager

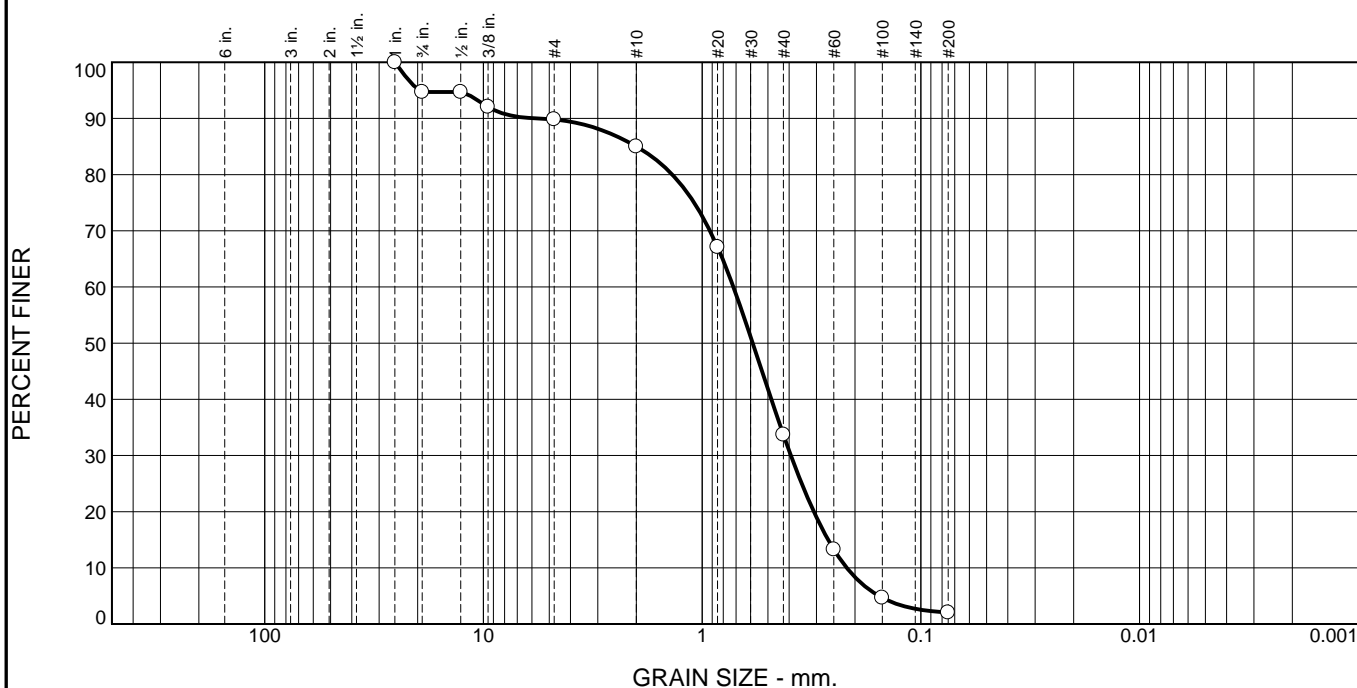
Source of Sample: B-37 Depth: 2-2.5'
Sample Number: S-V-1

Date Sampled: 10/18/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.3	4.9	4.8	51.3	31.7	2.0	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	94.7		
.5	94.7		
.375	92.0		
#4	89.8		
#10	85.0		
#20	67.1		
#40	33.7		
#60	13.3		
#100	4.7		
#200	2.0		

* (no specification provided)

Material Description

Brown poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 5.6976 D₈₅= 2.0000 D₆₀= 0.7197
D₅₀= 0.5868 D₃₀= 0.3928 D₁₅= 0.2656
D₁₀= 0.2181 C_u= 3.30 C_c= 0.98

Remarks

As recieved MC = 6.3%

Date Received: 1/30/18 Date Tested: 1/31/18

Tested By: SB

Checked By: MP

Title: Laboratory Manager

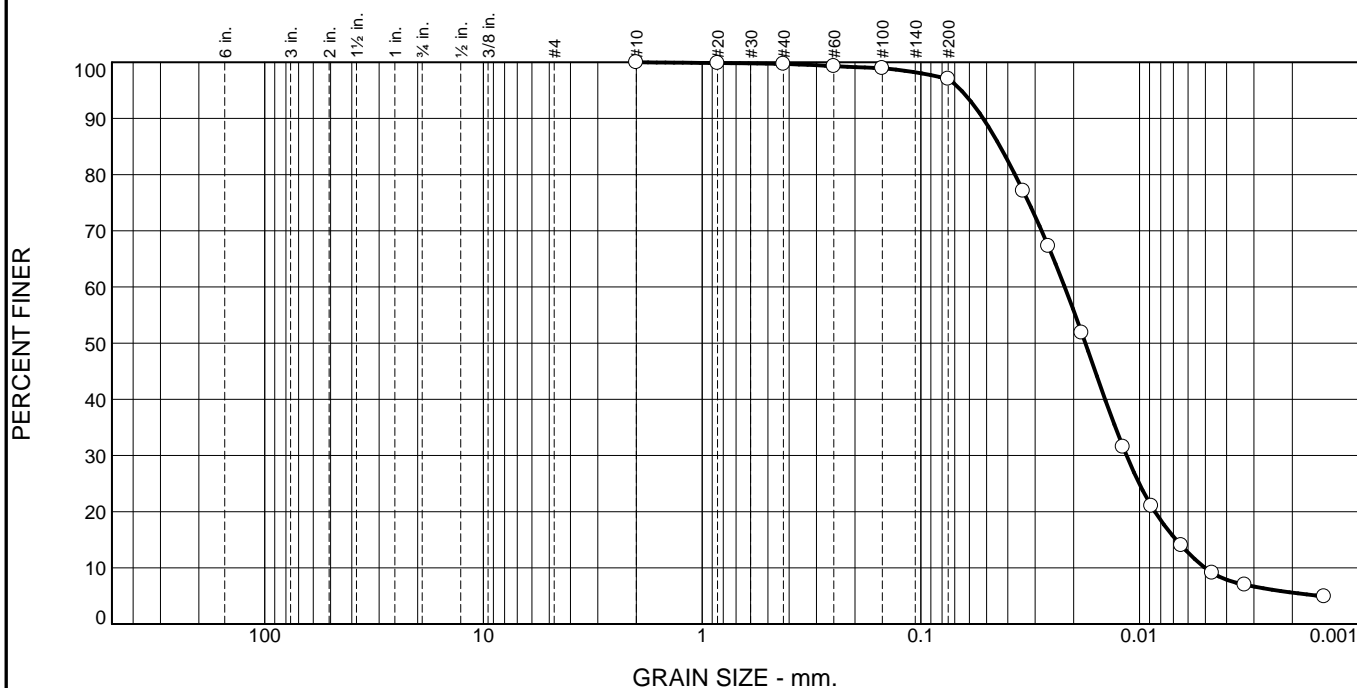
Source of Sample: B-38 Depth: 3-3.5'
Sample Number: S-V-1

Date Sampled: 10/18/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	2.6	87.1	10.0

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.3		
#100	98.9		
#200	97.1		
0.0341 mm.	77.1		
0.0261 mm.	67.3		
0.0184 mm.	51.9		
0.0119 mm.	31.5		
0.0088 mm.	21.0		
0.0064 mm.	14.0		
0.0047 mm.	9.1		
0.0033 mm.	7.0		
0.0014 mm.	4.9		

* (no specification provided)

Material Description
Gray-brown silt

Atterberg Limits (ASTM D 4318)
PL= NP LL= NV PI= NP

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 0.0519 D₈₅= 0.0434 D₆₀= 0.0220
D₅₀= 0.0177 D₃₀= 0.0115 D₁₅= 0.0068
D₁₀= 0.0050 C_u= 4.38 C_c= 1.19

Remarks
As recieved MC = 28.6%

Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: MP
Checked By: MP
Title: Laboratory Manager

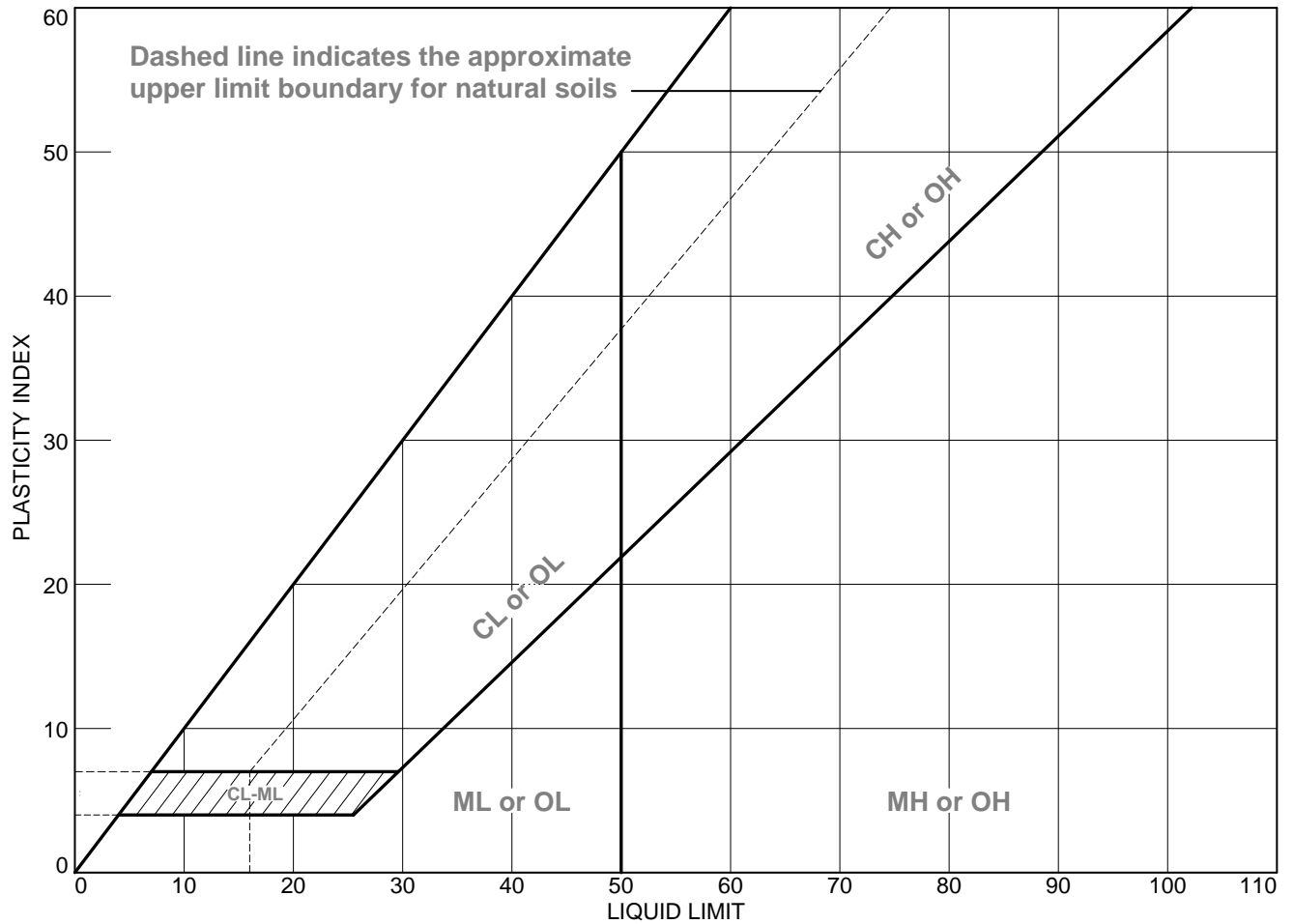
Source of Sample: B-38 **Depth:** 14-16'
Sample Number: S-3

Date Sampled: 10/18/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



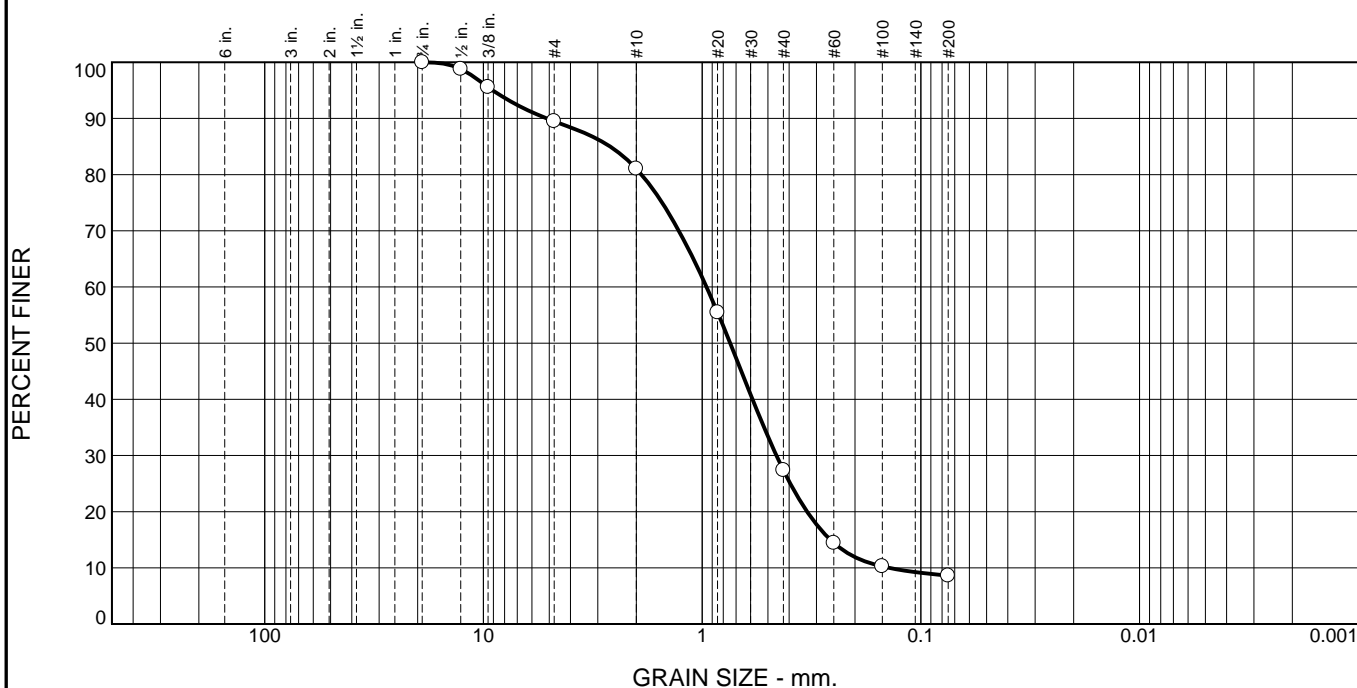
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-38	S-3	14-16'	28.6	NP	NV	NP	ML

CDM Smith
Boston, Massachusetts

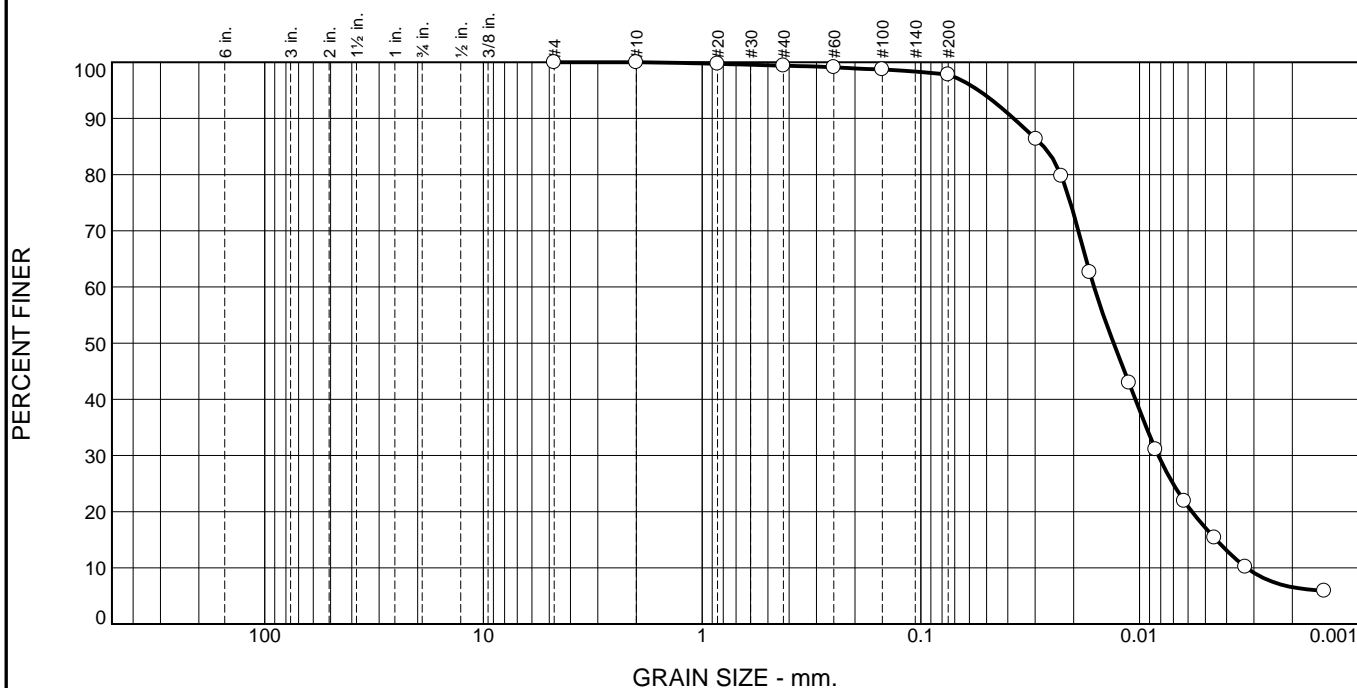
Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: MP

Particle Size Distribution Report



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	1.6	80.7	17.1

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	99.7		
#40	99.4		
#60	99.1		
#100	98.7		
#200	97.8		
0.0298 mm.	86.4		
0.0228 mm.	79.8		
0.0169 mm.	62.6		
0.0112 mm.	42.9		
0.0084 mm.	31.1		
0.0063 mm.	21.9		
0.0045 mm.	15.4		
0.0033 mm.	10.2		
0.0014 mm.	5.9		

* (no specification provided)

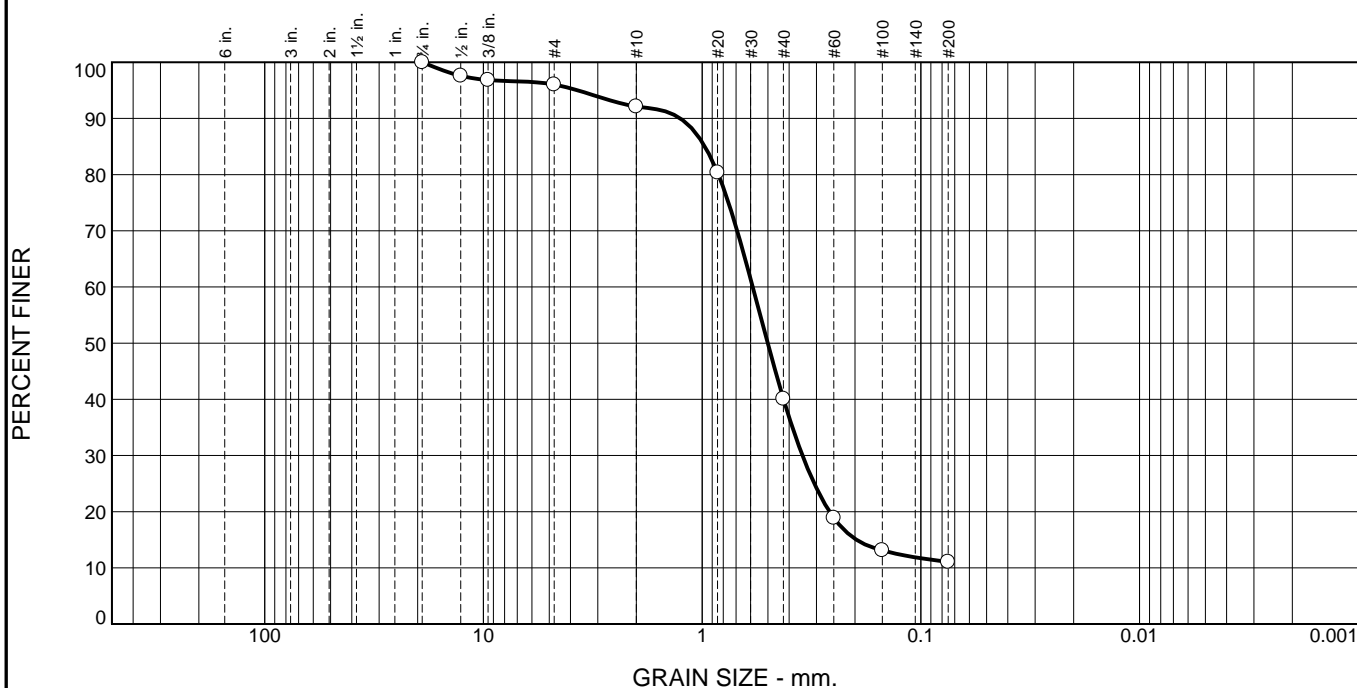
Material Description	
Gray silt	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)
Coefficients	
D ₉₀ = 0.0376	D ₈₅ = 0.0274 D ₆₀ = 0.0161
D ₅₀ = 0.0131	D ₃₀ = 0.0082 D ₁₅ = 0.0045
D ₁₀ = 0.0032	C _u = 4.98 C _c = 1.29
Remarks	
As received MC = 27.4%	
Date Received: 1/31/18	Date Tested: 2/5/18
Tested By: MP/SB	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-40 Depth: 14-16'
Sample Number: S-6

Date Sampled: 1/11/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.0	3.9	52.0	29.0	11.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	97.6		
.375"	96.8		
#4	96.0		
#10	92.1		
#20	80.4		
#40	40.1		
#60	18.9		
#100	13.1		
#200	11.1		

* (no specification provided)

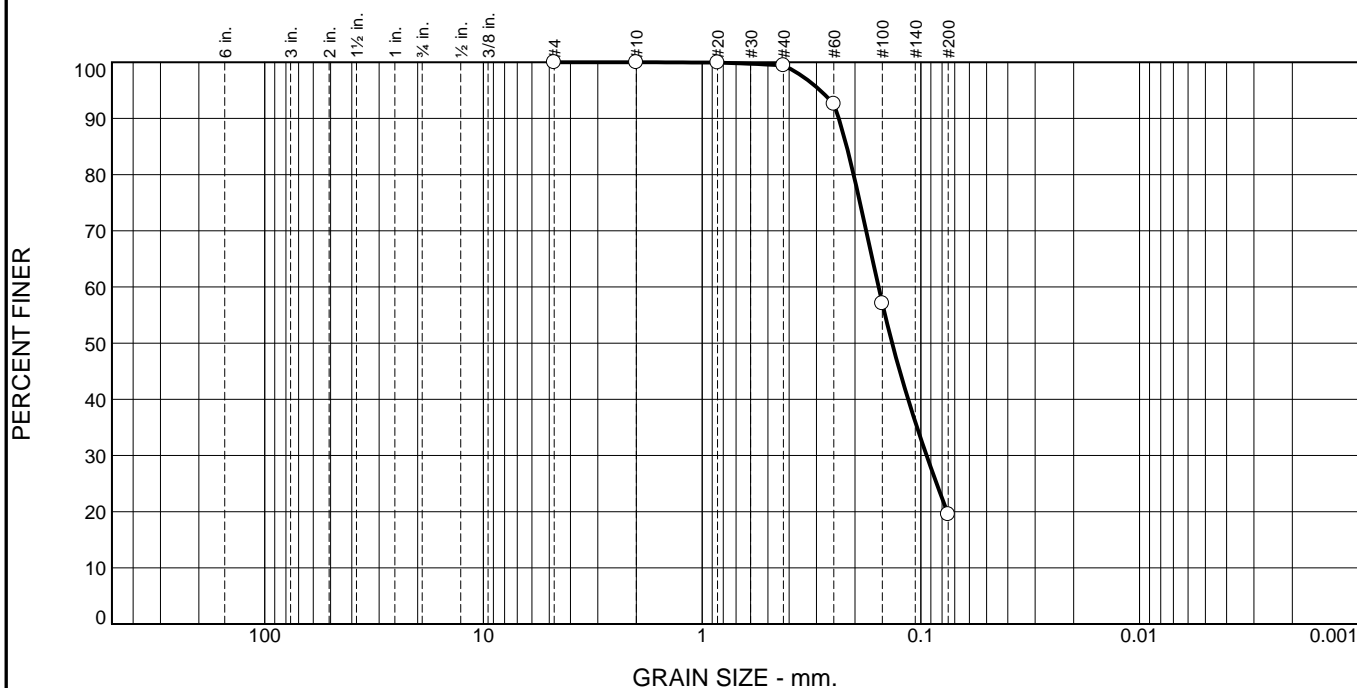
Material Description	
Brown poorly graded sand with silt	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SP-SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 1.2577	D ₈₅ = 0.9711 D ₆₀ = 0.5867
D ₅₀ = 0.5013	D ₃₀ = 0.3477 D ₁₅ = 0.1970
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 28.8%	
Date Received: 12/8/17	Date Tested: 12/13/17
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-41 Depth: 5.5-6'
Sample Number: S-V-2

Date Sampled: 11/21/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	79.9	19.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.4		
#60	92.6		
#100	57.1		
#200	19.5		

* (no specification provided)

Material Description
Gray-brown silty sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
D₉₀= 0.2372 D₈₅= 0.2181 D₆₀= 0.1561
D₅₀= 0.1352 D₃₀= 0.0941 D₁₅=
D₁₀= C_u= C_c=

Remarks
As received MC = 28.5%

Date Received: 12/8/17 **Date Tested:** 12/13/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

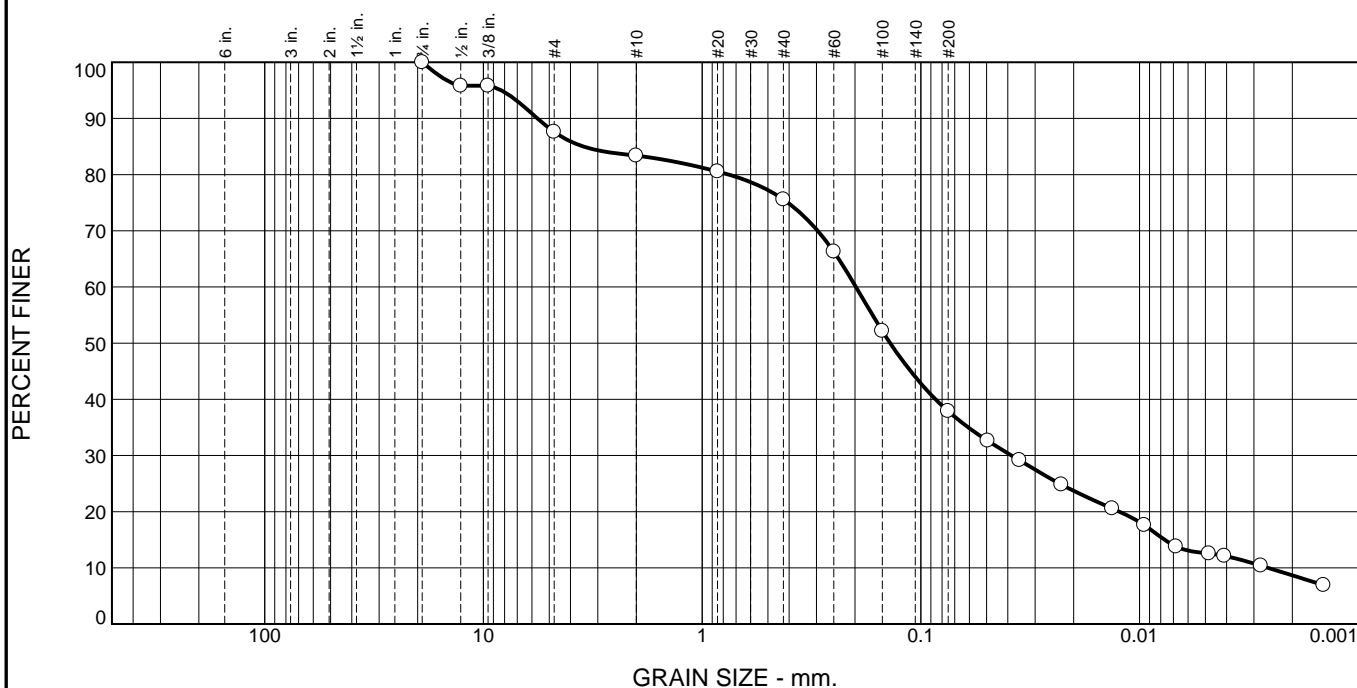
Source of Sample: B-41 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 11/21/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.4	4.2	7.8	37.7	25.3	12.6

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	95.8		
.375"	95.8		
#4	87.6		
#10	83.4		
#20	80.5		
#40	75.6		
#60	66.3		
#100	52.2		
#200	37.9		
0.0494 mm.	32.6		
0.0354 mm.	29.2		
0.0228 mm.	24.8		
0.0133 mm.	20.6		
0.0095 mm.	17.6		
0.0068 mm.	13.8		
0.0048 mm.	12.6		
0.0041 mm.	12.1		
0.0028 mm.	10.4		
0.0014 mm.	6.9		

* (no specification provided)

Material Description
Dark brown silty sand with organics

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 5.6616 D₈₅= 3.4915 D₆₀= 0.1979
D₅₀= 0.1380 D₃₀= 0.0385 D₁₅= 0.0077
D₁₀= 0.0026 C_u= 76.65 C_c= 2.90

Remarks
As received MC = 80.6%

Date Received: 1/31/18 **Date Tested:** 2/2/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-42 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 11/2/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-42
Sample Number: S-2
Sample Depth (ft): 8-10
Sample Date: 11/2/2017

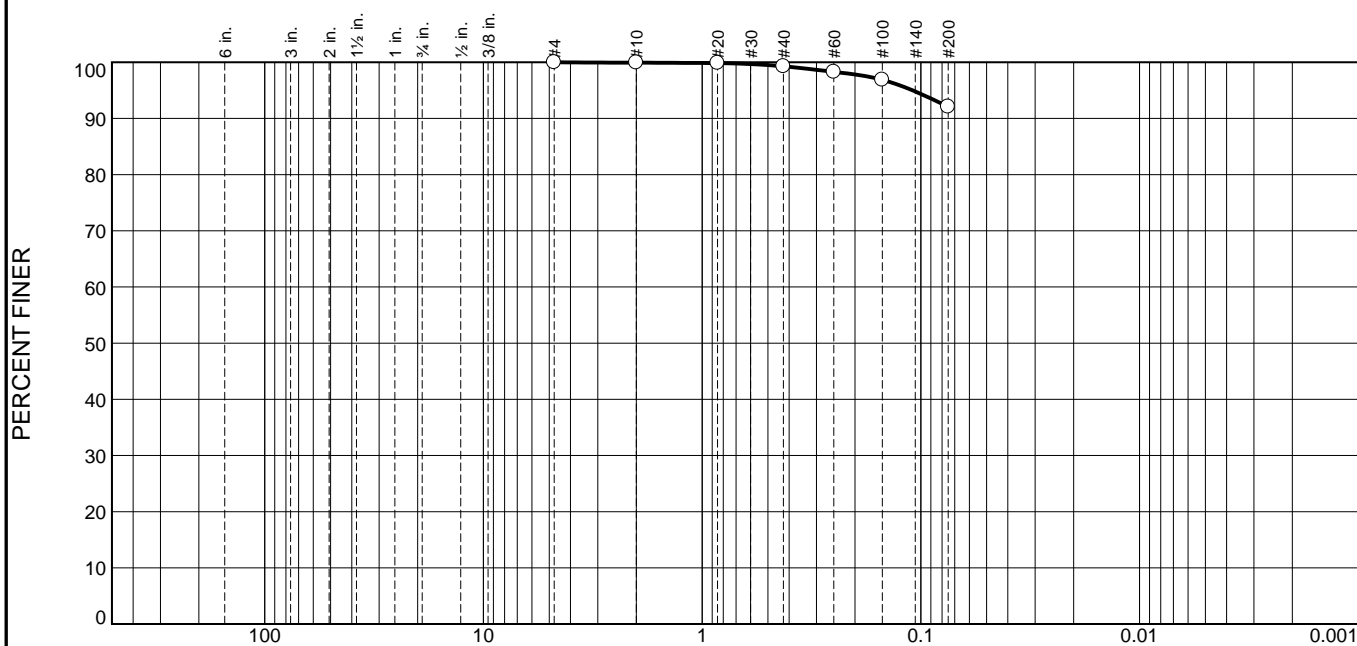
Tested By: AS
Test Date: 1/31/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.89
Wet Mass of Sample & Tin (g)	173.07
Dry Mass of Sample & Tin (g)	139.08
Mass of Water (g)	33.99
Mass of Dry Soil (g)	42.19
Moisture Content (%)	80.6

ASH CONTENT	
Porcelain Dish Mass (g)	96.89
Porcelain Dish + Oven Dried Soil (g)	139.08
Mass of Oven Dried Soil (g)	42.19
Mass of Dish & Burned Soil (g)	135.11
Mass of Burned Soil (g)	38.22
Mass of Organic Material (g)	3.97
Ash Content (%)	90.6
Organic Content (%)	9.4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.6	7.2	92.1	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.3		
#60	98.3		
#100	96.9		
#200	92.1		

* (no specification provided)

Material Description
Gray-brown silt

Atterberg Limits (ASTM D 4318)
 PL= NP LL= NV PI= NP

Classification
 USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= D₈₅= D₆₀=
 D₅₀= D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 25.1%

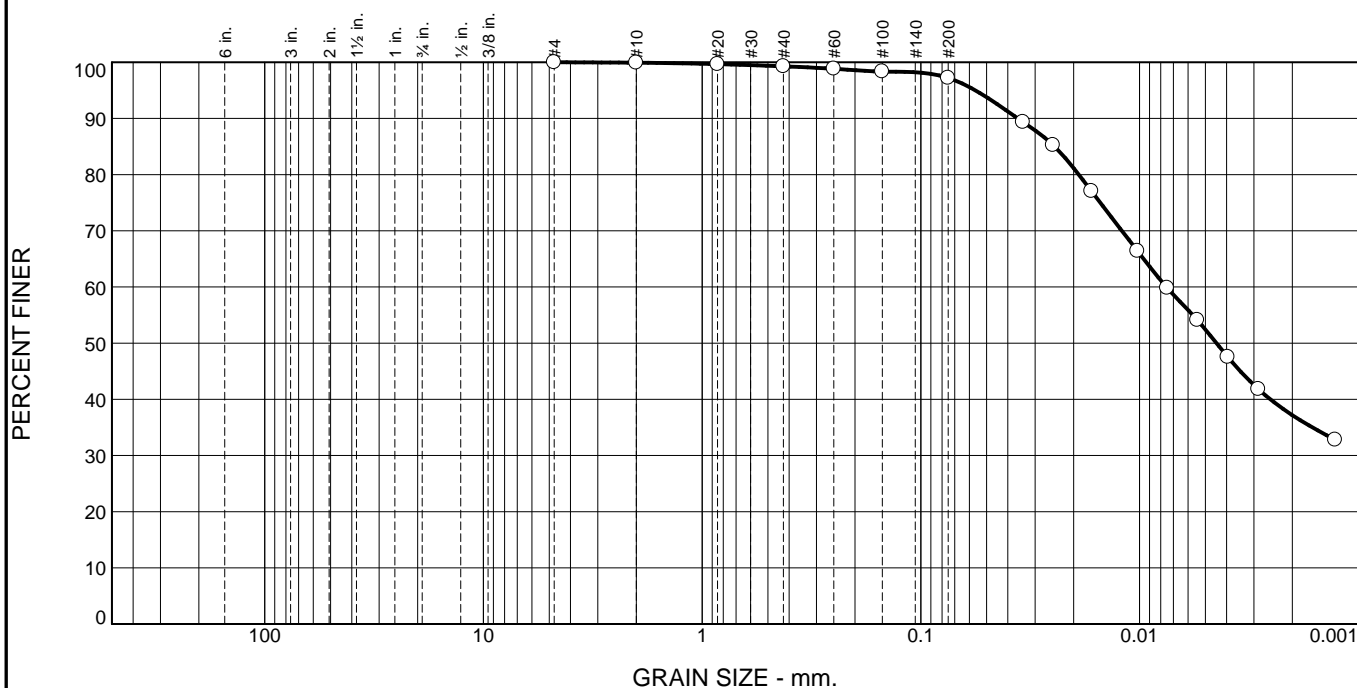
Date Received: 1/30/18 **Date Tested:** 1/31/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-42 **Depth:** 14-16'
Sample Number: S-3

Date Sampled: 11/2/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.6	2.1	44.8	52.4

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.3		
#60	98.8		
#100	98.3		
#200	97.2		
0.0341 mm.	89.4		
0.0248 mm.	85.3		
0.0166 mm.	77.1		
0.0102 mm.	66.4		
0.0075 mm.	59.8		
0.0054 mm.	54.1		
0.0039 mm.	47.5		
0.0029 mm.	41.8		
0.0013 mm.	32.8		

* (no specification provided)

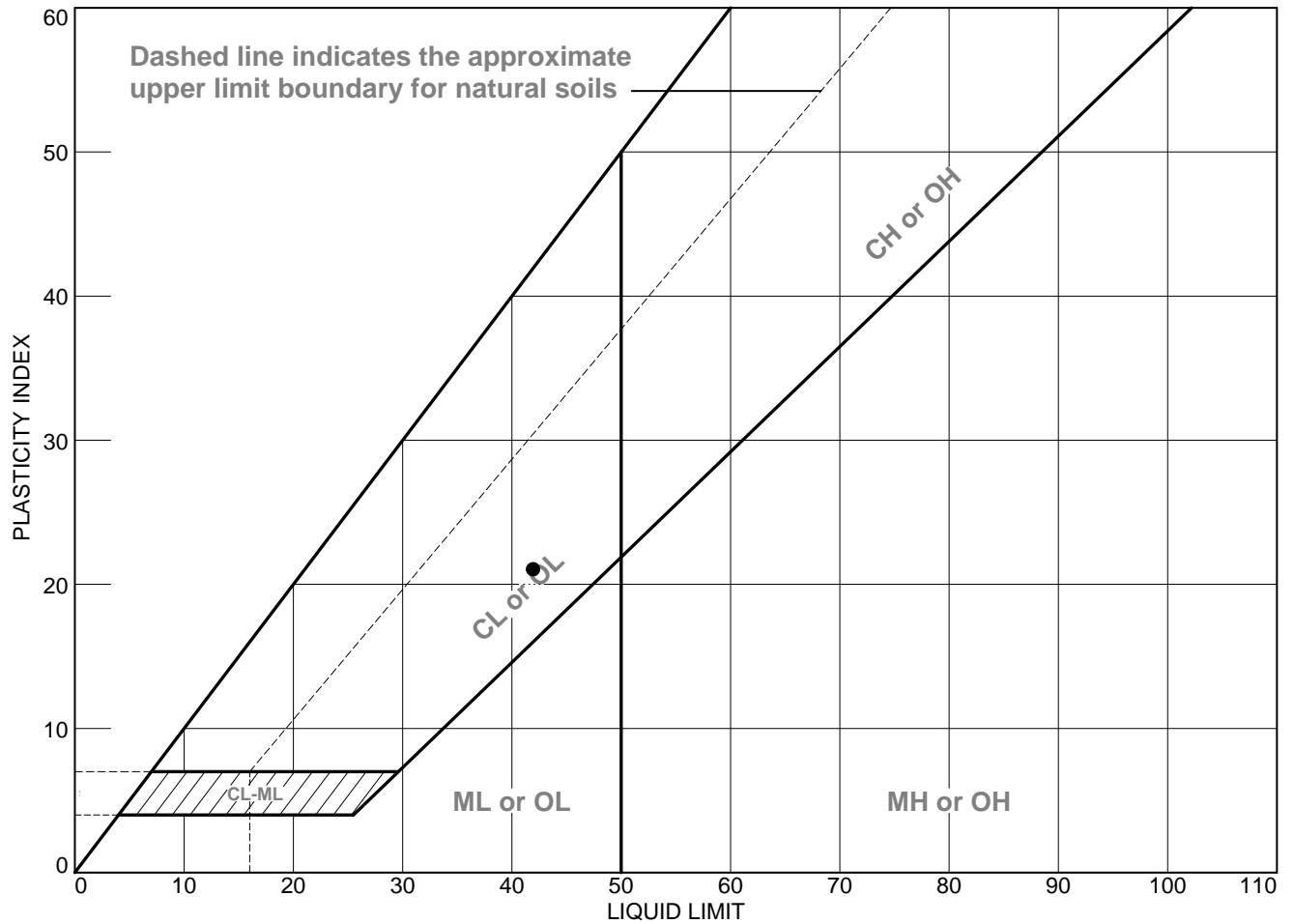
Material Description		
Gray lean clay		
Atterberg Limits (ASTM D 4318)		
PL= 21	LL= 42	PI= 21
Classification		
USCS (D 2487)= CL	AASHTO (M 145)= A-7-6(22)	
Coefficients		
D ₉₀ = 0.0360	D ₈₅ = 0.0245	D ₆₀ = 0.0075
D ₅₀ = 0.0044	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As recieved MC = 25.7%		
Date Received: 1/30/18		Date Tested: 1/31/18
Tested By: MP		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-43 Depth: 8-10'
Sample Number: S-5

Date Sampled: 10/26/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



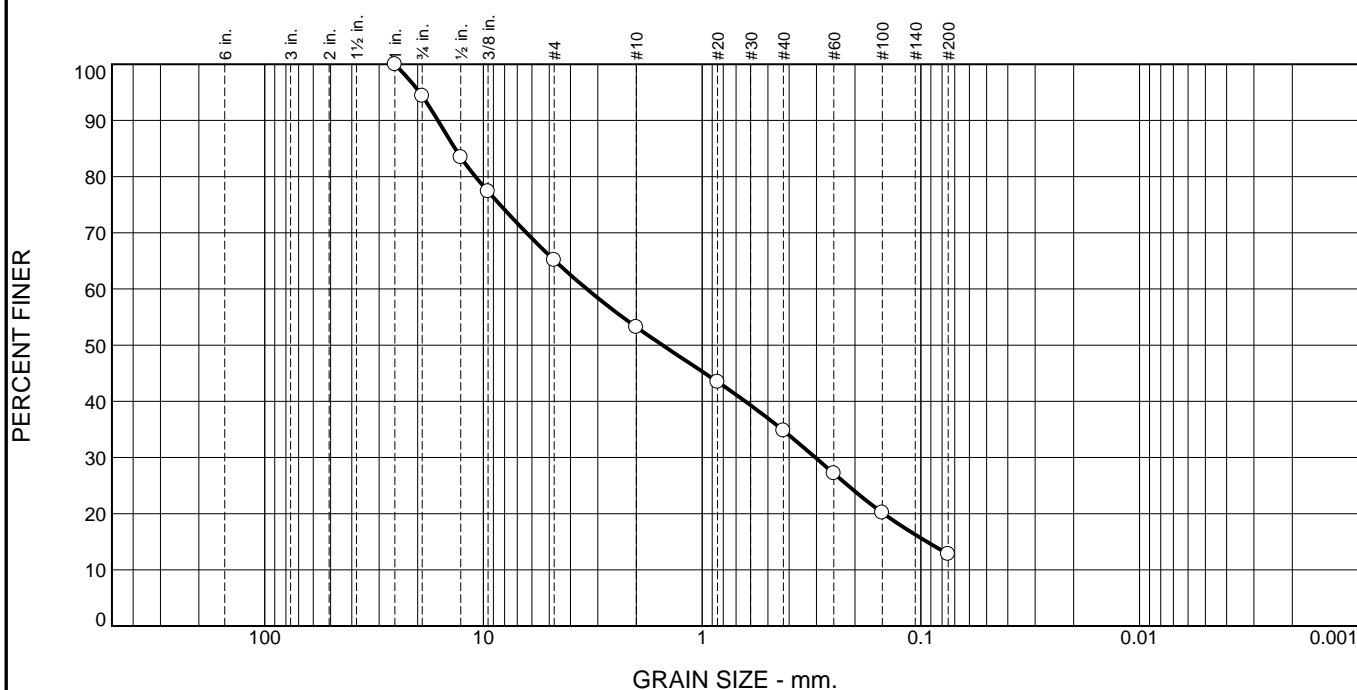
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-43	S-5	8-10'	25.7	21	42	21	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.6	29.2	12.0	18.4	22.0	12.8	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	94.4		
.5	83.4		
.375	77.4		
#4	65.2		
#10	53.2		
#20	43.5		
#40	34.8		
#60	27.2		
#100	20.2		
#200	12.8		

* (no specification provided)

Material Description
 Gray silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS(D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 16.1416 D₈₅= 13.4888 D₆₀= 3.3678
 D₅₀= 1.5183 D₃₀= 0.3036 D₁₅= 0.0936
 D₁₀= C_u= C_c=

Remarks
 As recieved MC = 14.4%

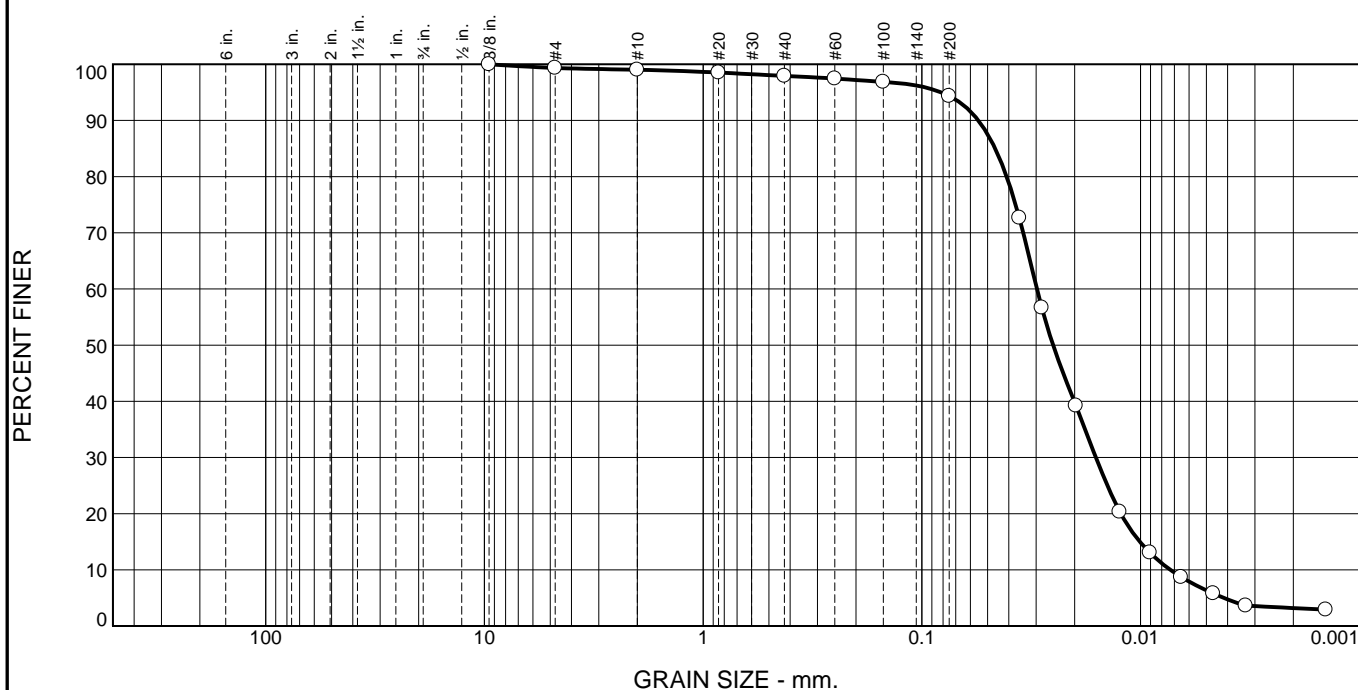
Date Received: 1/30/18 Date Tested: 2/1/18
 Tested By: SB
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-44 Depth: 6-8'
 Sample Number: S-1

Date Sampled: 10/31/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.3	1.1	3.6	87.9	6.4

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.3		
#10	99.0		
#20	98.5		
#40	97.9		
#60	97.5		
#100	96.8		
#200	94.3		
0.0358 mm.	72.7		
0.0283 mm.	56.7		
0.0197 mm.	39.2		
0.0124 mm.	20.3		
0.0091 mm.	13.1		
0.0065 mm.	8.7		
0.0046 mm.	5.8		
0.0033 mm.	3.6		
0.0014 mm.	2.9		

* (no specification provided)

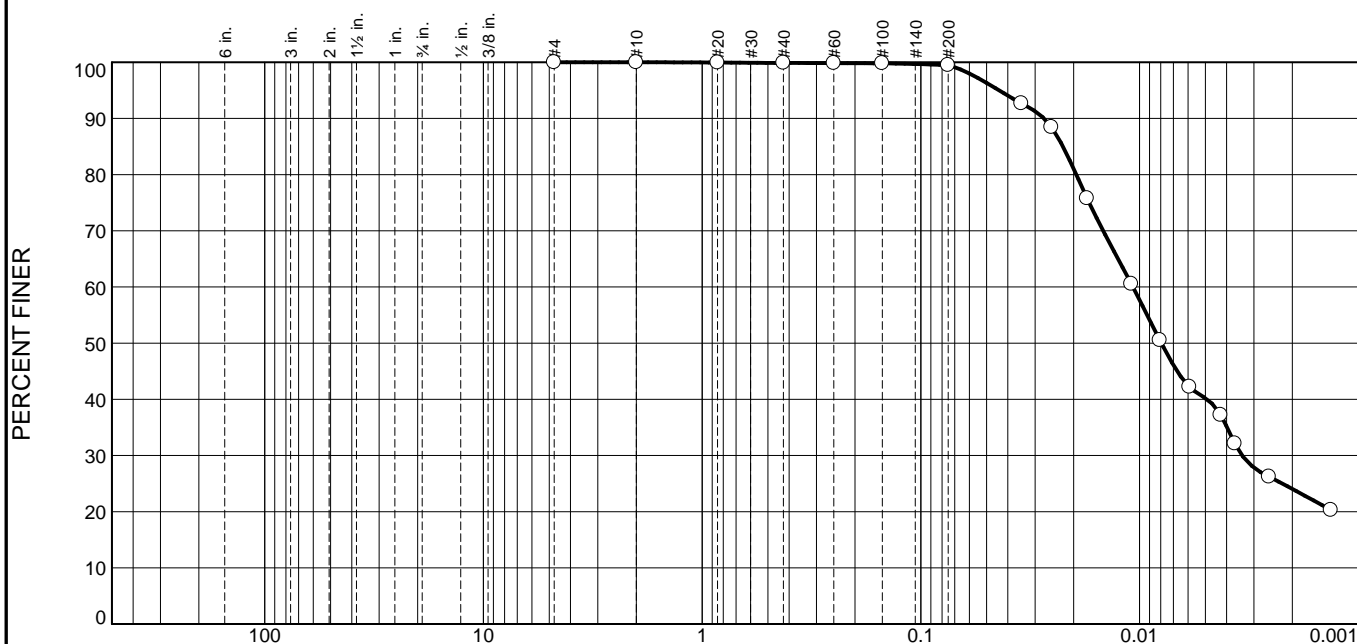
Material Description		
Gray-brown silt		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)	
Coefficients		
D ₉₀ = 0.0551	D ₈₅ = 0.0462	D ₆₀ = 0.0298
D ₅₀ = 0.0251	D ₃₀ = 0.0160	D ₁₅ = 0.0101
D ₁₀ = 0.0073	C _u = 4.08	C _c = 1.18
Remarks		
As recieved MC = 24.1%		
Date Received: 1/30/18		Date Tested: 1/31/18
Tested By: MP		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-45 Depth: 10-12'
Sample Number: S-3

Date Sampled: 10/31/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	0.4	59.3	40.2

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.9		
#60	99.8		
#100	99.8		
#200	99.5		
0.0347 mm.	92.7		
0.0253 mm.	88.5		
0.0174 mm.	75.8		
0.0109 mm.	60.5		
0.0081 mm.	50.5		
0.0059 mm.	42.2		
0.0043 mm.	37.2		
0.0037 mm.	32.1		
0.0026 mm.	26.2		
0.0013 mm.	20.3		

* (no specification provided)

Material Description
 Gray lean clay

Atterberg Limits (ASTM D 4318)
 PL= 18 LL= 30 PI= 12

Classification
 USCS (D 2487)= CL AASHTO (M 145)= A-6(11)

Coefficients
 D₉₀= 0.0273 D₈₅= 0.0224 D₆₀= 0.0107
 D₅₀= 0.0079 D₃₀= 0.0034 D₁₅=
 D₁₀= C_u= C_c=

Remarks
 As recieved MC = 24.8%

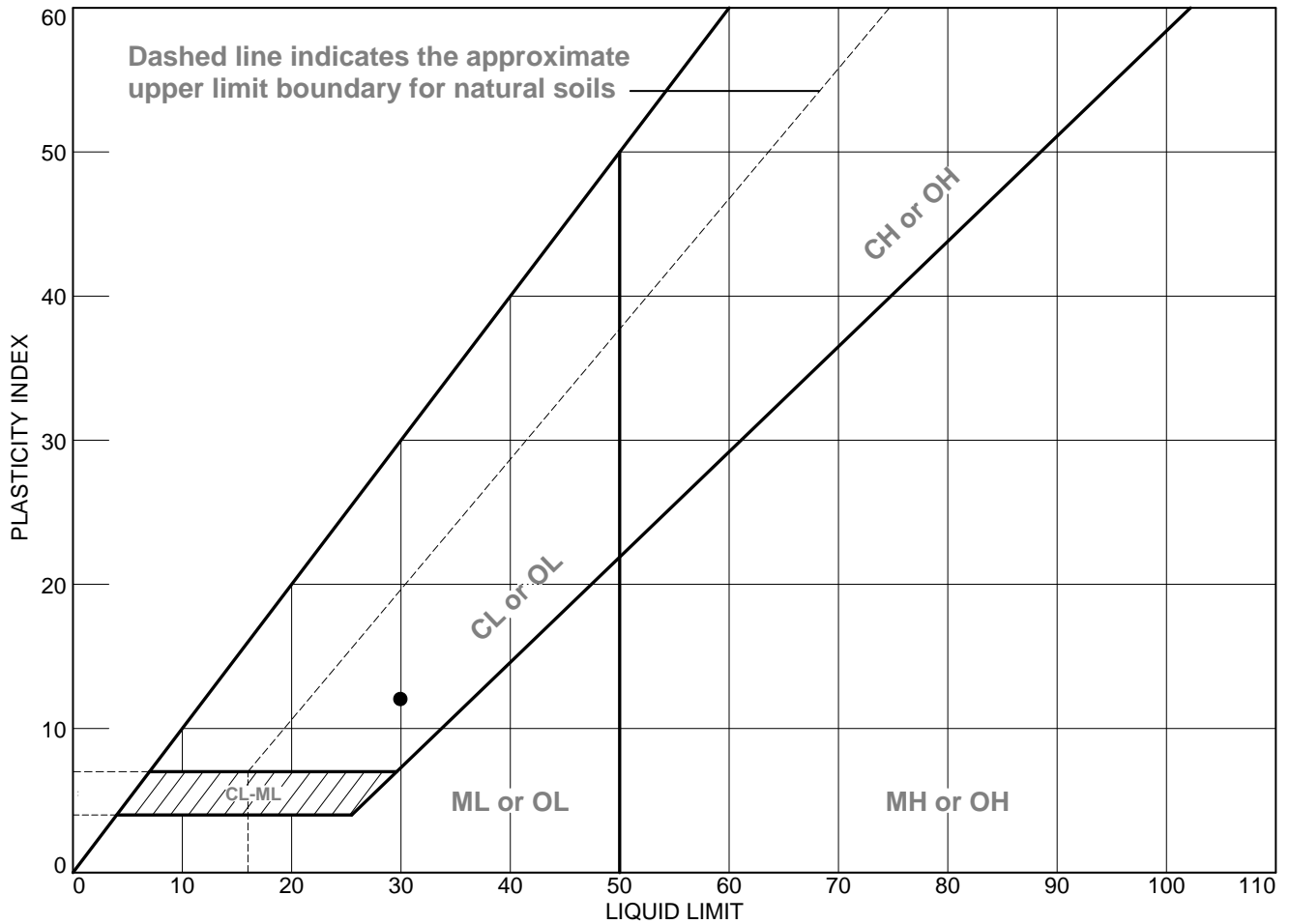
Date Received: 1/30/18 Date Tested: 2/1/18
 Tested By: MP
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-45 Depth: 14-16'
 Sample Number: S-4

Date Sampled: 10/31/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



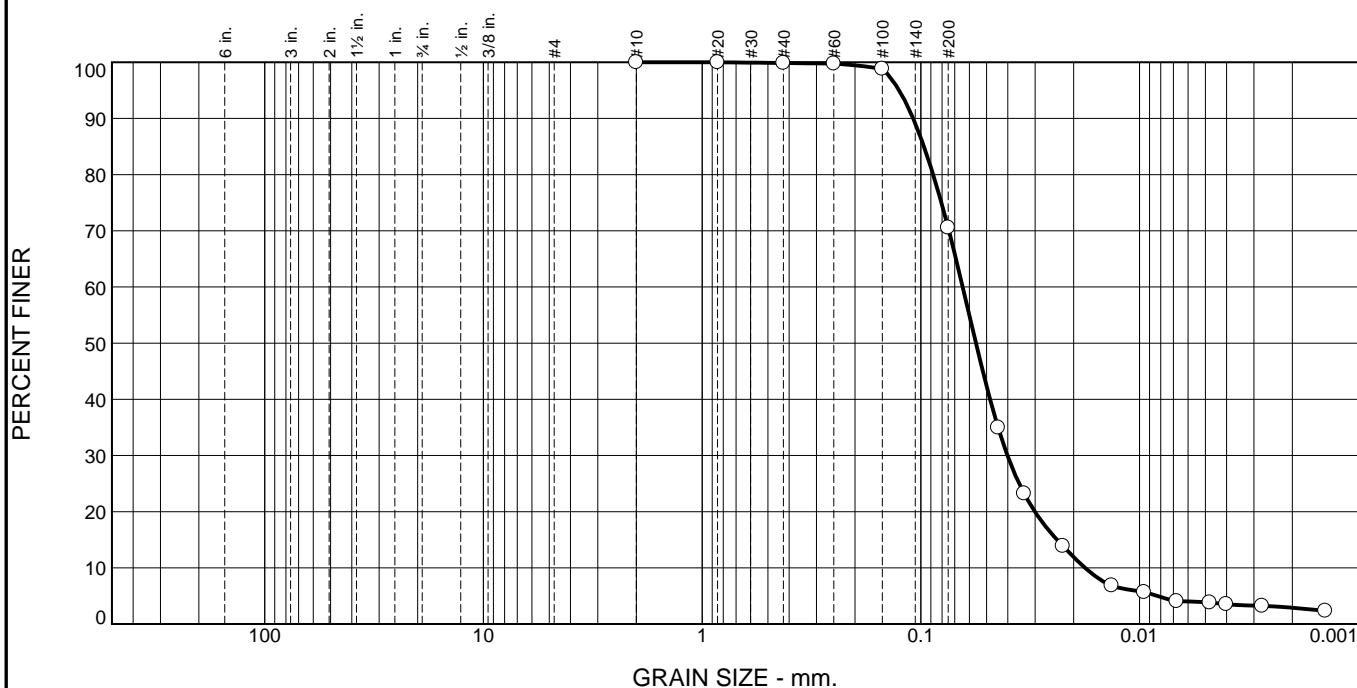
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-45	S-4	14-16'	24.8	18	30	12	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	29.3	66.7	3.9

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.8		
#100	98.8		
#200	70.6		
0.0443 mm.	35.0		
0.0337 mm.	23.2		
0.0224 mm.	13.9		
0.0134 mm.	6.8		
0.0095 mm.	5.7		
0.0068 mm.	4.1		
0.0048 mm.	3.8		
0.0040 mm.	3.5		
0.0027 mm.	3.2		
0.0014 mm.	2.3		

* (no specification provided)

Material Description
Brown silt with sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 0.1084 D₈₅= 0.0967 D₆₀= 0.0644
D₅₀= 0.0560 D₃₀= 0.0402 D₁₅= 0.0238
D₁₀= 0.0177 C_u= 3.63 C_c= 1.41

Remarks
As received MC = 26.0%

Date Received: 1/31/18 **Date Tested:** 2/2/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

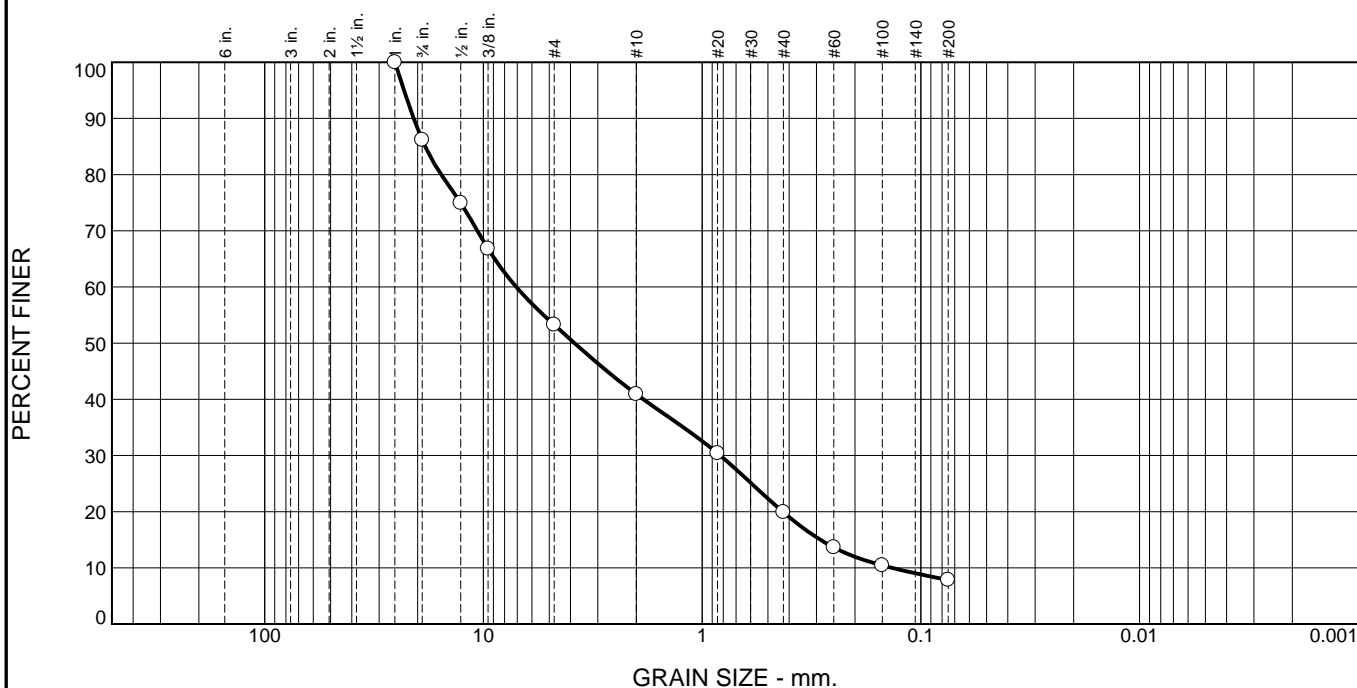
Source of Sample: B-46 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 11/16/18

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.8	32.9	12.4	21.0	12.1	7.8	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	86.2		
.5	74.9		
.375	66.8		
#4	53.3		
#10	40.9		
#20	30.4		
#40	19.9		
#60	13.6		
#100	10.4		
#200	7.8		

* (no specification provided)

Material Description
Brown poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 20.8441 D₈₅= 18.4565 D₆₀= 7.0810
 D₅₀= 3.8326 D₃₀= 0.8261 D₁₅= 0.2880
 D₁₀= 0.1355 C_u= 52.24 C_c= 0.71

Remarks
As recieved MC = 5.4%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-47 **Depth:** 2-2.5'
Sample Number: S-V-1

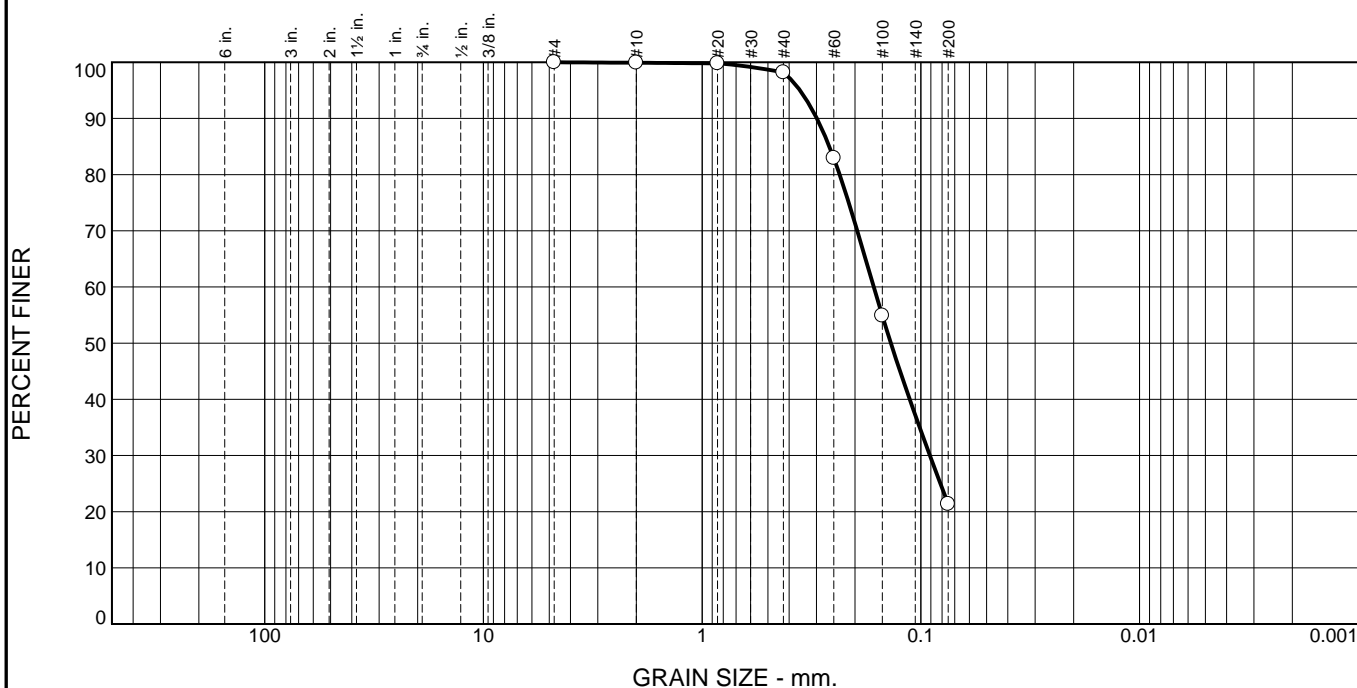
Date Sampled: 11/2/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.7	76.8	21.4	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.8		
#40	98.2		
#60	82.9		
#100	54.9		
#200	21.4		

* (no specification provided)

Material Description
Gray/red brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 0.2988 D₈₅= 0.2620 D₆₀= 0.1641
 D₅₀= 0.1371 D₃₀= 0.0908 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 9.2%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-48 **Depth:** 6-8'
Sample Number: S-4

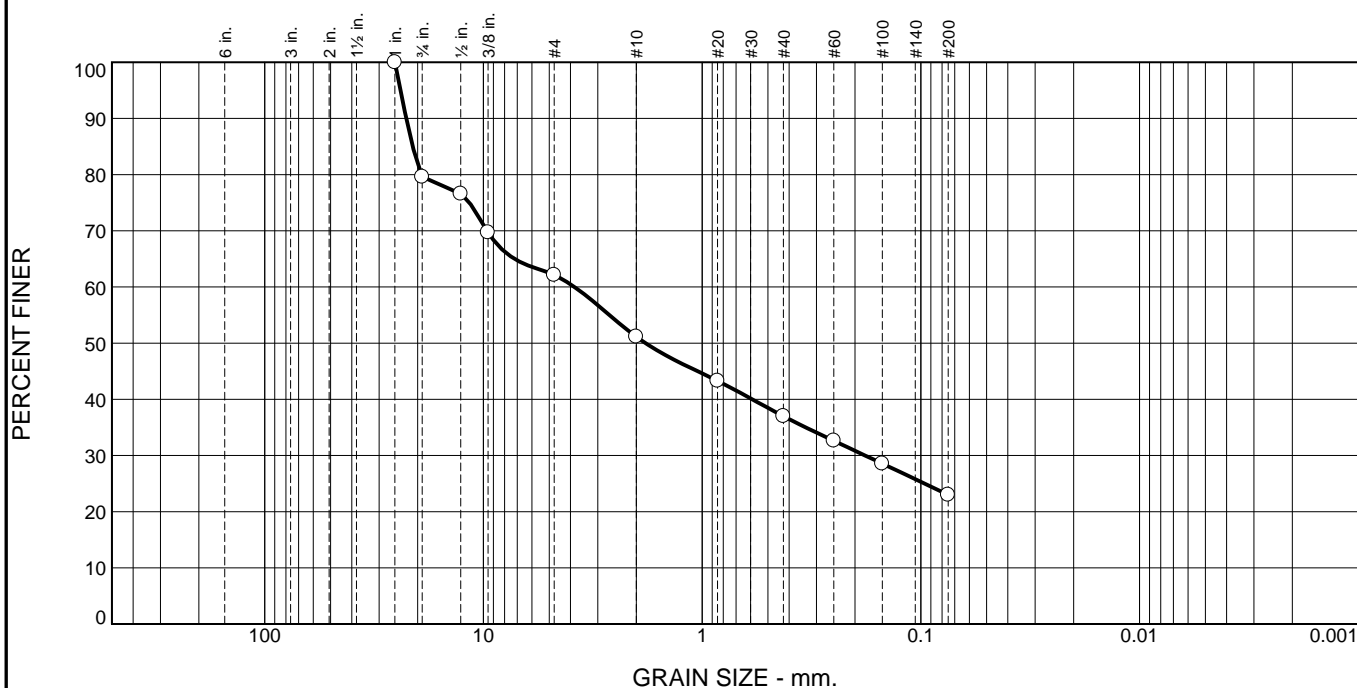
Date Sampled: 10/24/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.4	17.5	11.0	14.1	14.0	23.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	79.6		
.5"	76.6		
.375"	69.7		
#4	62.1		
#10	51.1		
#20	43.3		
#40	37.0		
#60	32.6		
#100	28.6		
#200	23.0		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 22.5460 D₈₅= 21.0526 D₆₀= 3.8366
D₅₀= 1.8161 D₃₀= 0.1798 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 11.7%

Date Received: 12/8/17 Date Tested: 12/13/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

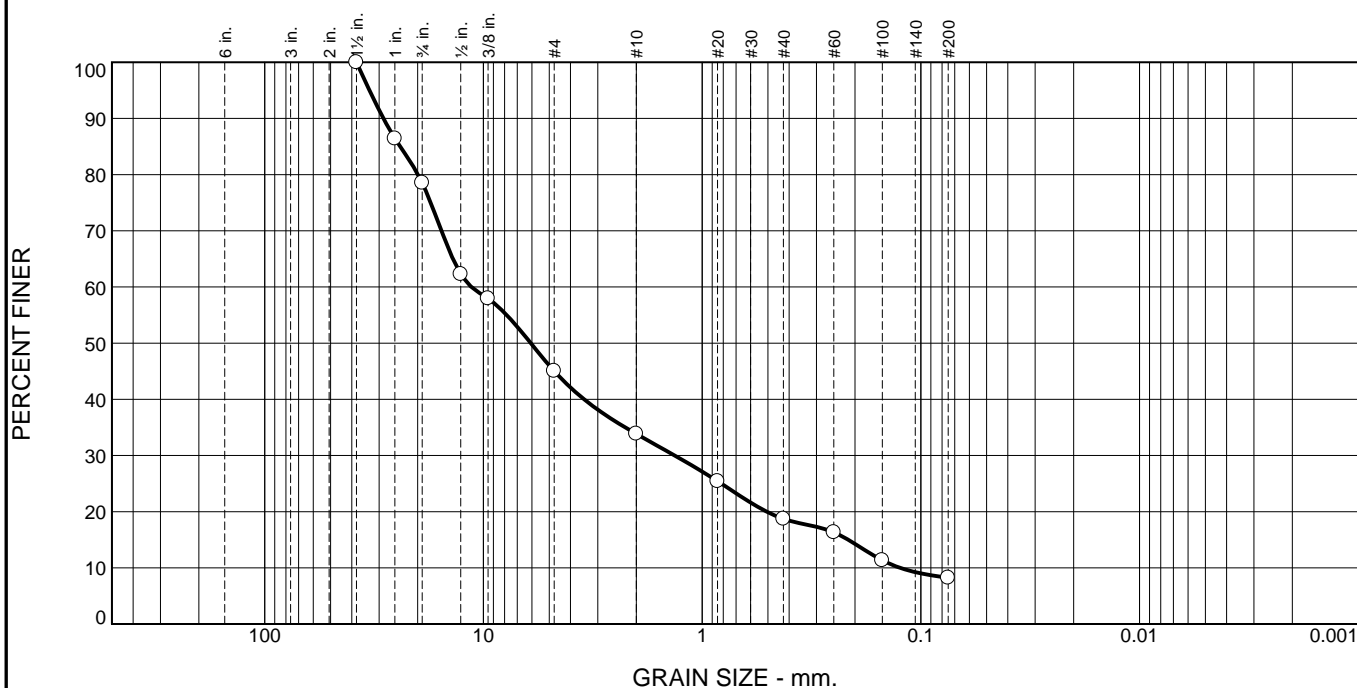
Source of Sample: B-50 Depth: 2-4'
Sample Number: S-2

Date Sampled: 10/25/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.5	33.5	11.1	15.2	10.5	8.2	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	86.4		
.75"	78.5		
.5"	62.3		
.375"	57.9		
#4	45.0		
#10	33.9		
#20	25.4		
#40	18.7		
#60	16.3		
#100	11.3		
#200	8.2		

* (no specification provided)

Material Description
Gray well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 28.6676 D₈₅= 24.0368 D₆₀= 11.3650
D₅₀= 6.0736 D₃₀= 1.3364 D₁₅= 0.2147
D₁₀= 0.1242 C_u= 91.51 C_c= 1.27

Remarks
As received MC = 6.3%

Date Received: 12/8/17 **Date Tested:** 12/12/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

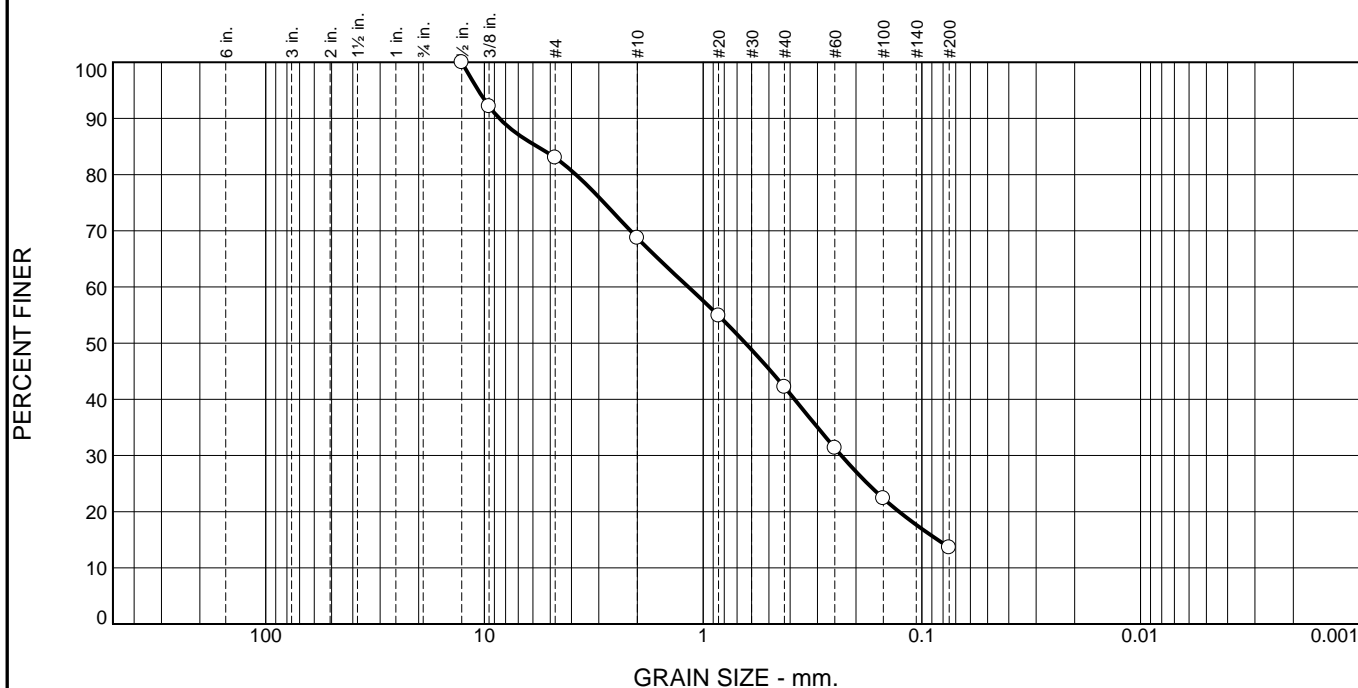
Source of Sample: B-51 **Depth:** 6-8'
Sample Number: S-4

Date Sampled: 10/25/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	17.0	14.3	26.5	28.6	13.6	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	92.2		
#4	83.0		
#10	68.7		
#20	54.9		
#40	42.2		
#60	31.3		
#100	22.4		
#200	13.6		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 8.5434 D₈₅= 5.7248 D₆₀= 1.1682
 D₅₀= 0.6405 D₃₀= 0.2334 D₁₅= 0.0846
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 13.4%

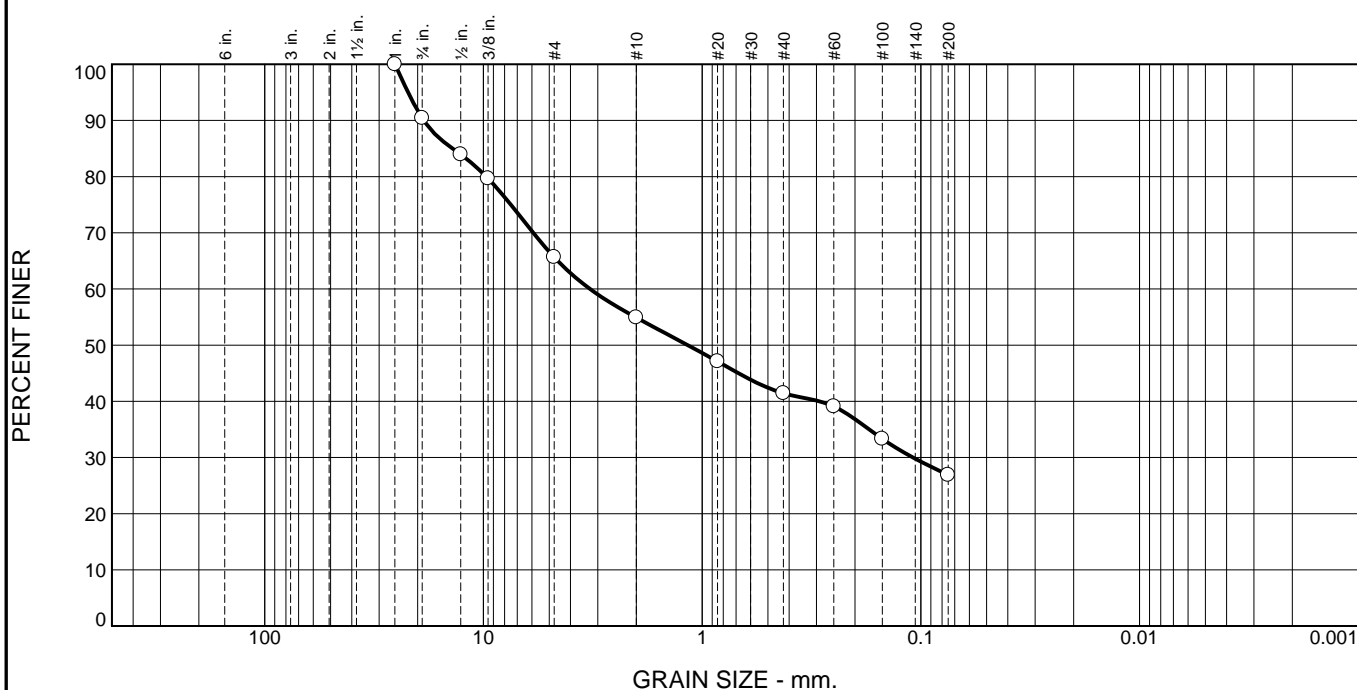
Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-52 **Depth:** 4-5'
Sample Number: S-3

Date Sampled: 10/26/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.6	24.7	10.8	13.5	14.5	26.9	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	90.4		
.5"	83.9		
.375"	79.7		
#4	65.7		
#10	54.9		
#20	47.1		
#40	41.4		
#60	39.1		
#100	33.3		
#200	26.9		

* (no specification provided)

Material Description
Gray-brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
D₉₀= 18.7379 D₈₅= 13.8487 D₆₀= 3.2574
D₅₀= 1.1635 D₃₀= 0.1086 D₁₅=
D₁₀= C_u= C_c=

Remarks
As received MC = 10.3%

Date Received: 12/8/17 Date Tested: 12/14/17

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

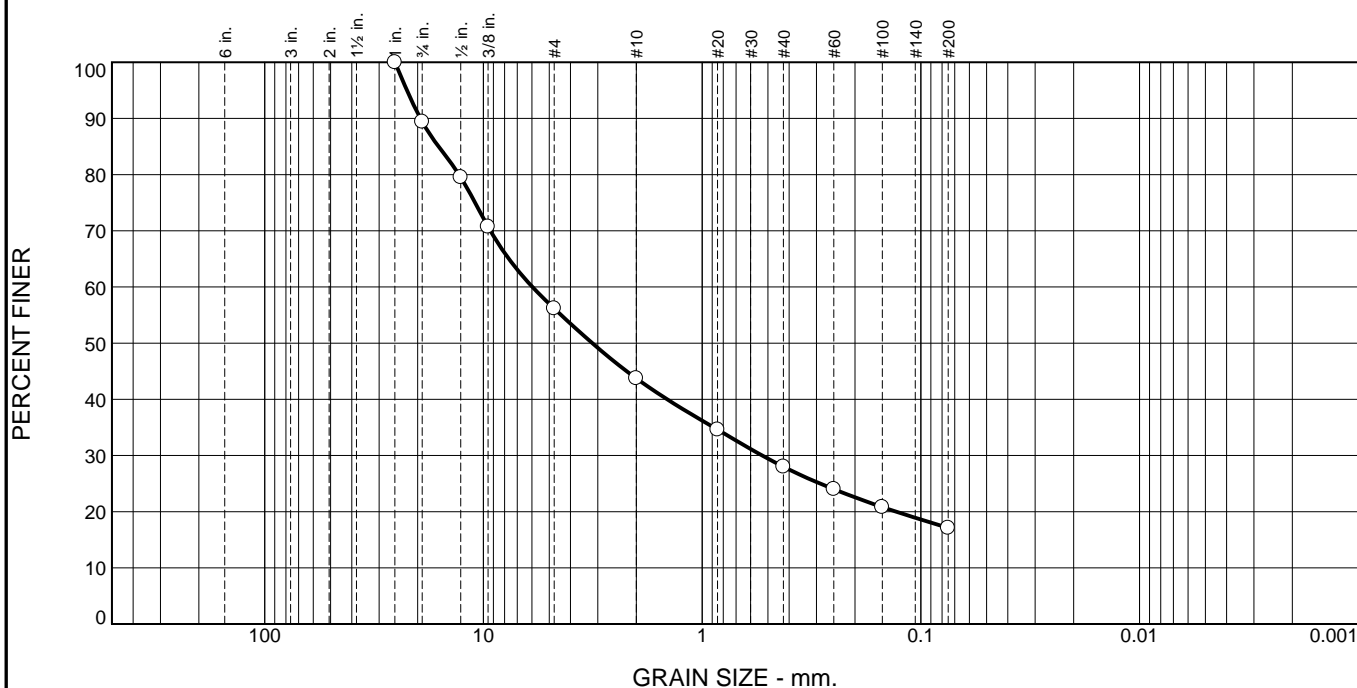
Source of Sample: B-53 Depth: 2-2.9'
Sample Number: S-2

Date Sampled: 11/3/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.6	33.2	12.5	15.7	10.9	17.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	89.4		
.5"	79.5		
.375"	70.7		
#4	56.2		
#10	43.7		
#20	34.6		
#40	28.0		
#60	24.0		
#100	20.8		
#200	17.1		

* (no specification provided)

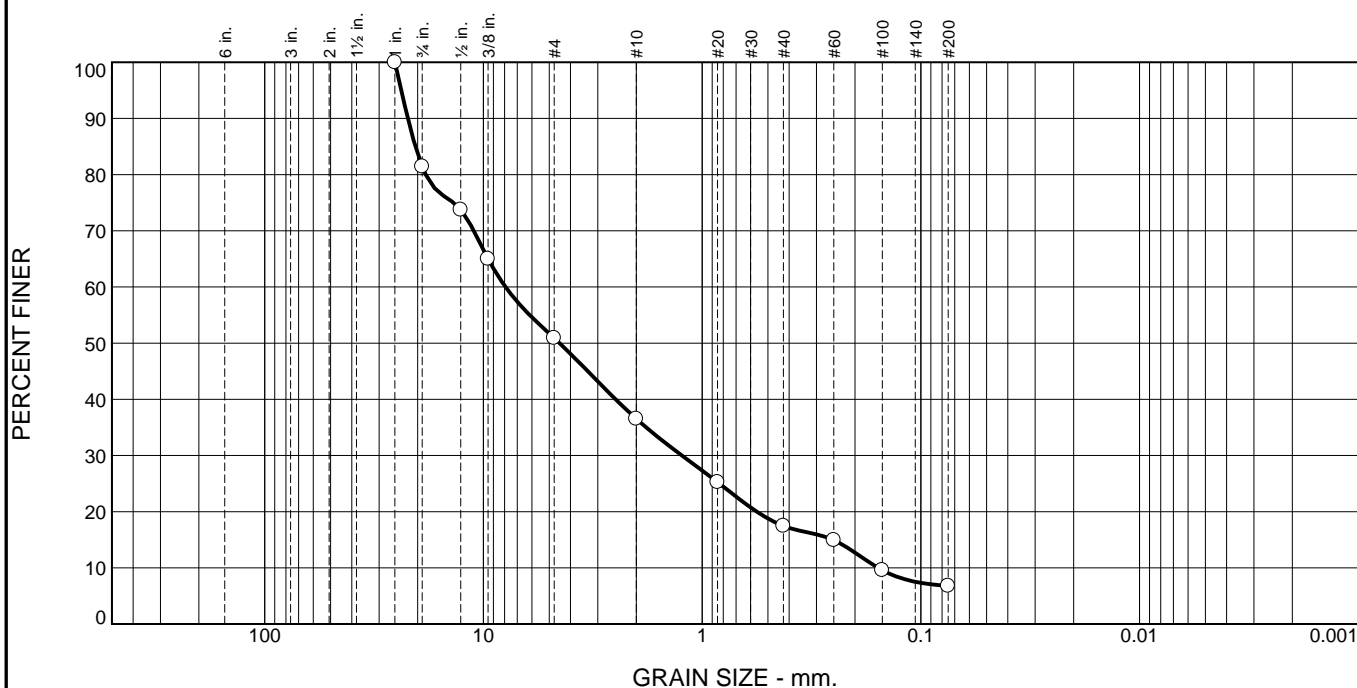
Material Description	
Brown silty gravel with sand	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= GM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 19.4225	D ₈₅ = 16.0362 D ₆₀ = 5.9678
D ₅₀ = 3.1787	D ₃₀ = 0.5313 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 10.3%	
Date Received: 12/8/17	Date Tested: 12/14/17
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-54 Depth: 4-6'
Sample Number: S-3

Date Sampled: 10/24/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.6	30.5	14.4	19.0	10.7	6.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	81.4		
.5"	73.7		
.375"	65.0		
#4	50.9		
#10	36.5		
#20	25.2		
#40	17.5		
#60	14.9		
#100	9.6		
#200	6.8		

* (no specification provided)

Material Description
Gray-brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 22.1623 D₈₅= 20.4709 D₆₀= 7.9258
 D₅₀= 4.4857 D₃₀= 1.2377 D₁₅= 0.2524
 D₁₀= 0.1568 C_u= 50.55 C_c= 1.23

Remarks
As received MC = 9.4%

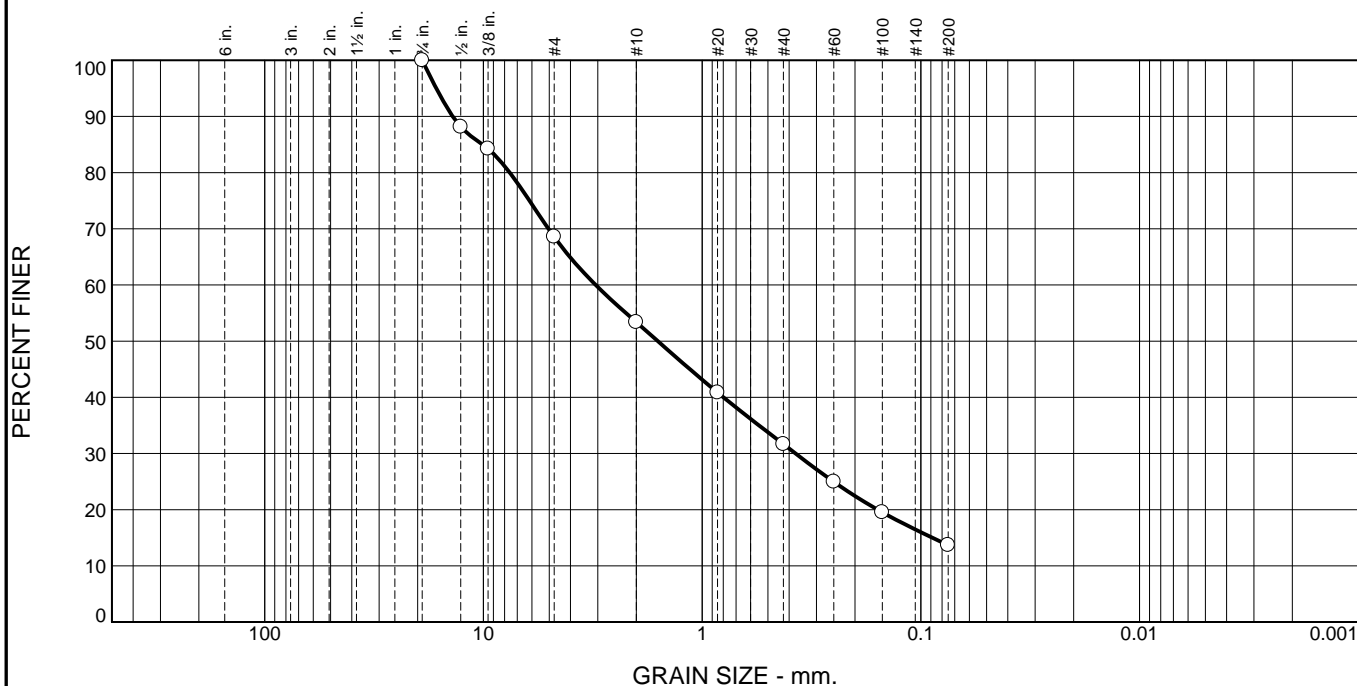
Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-55 **Depth:** 2-4'
Sample Number: S-1

Date Sampled: 10/27/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-56
Sample Number: S-2
Sample Depth (ft): 2-3.3
Sample Date: 10/27/2017

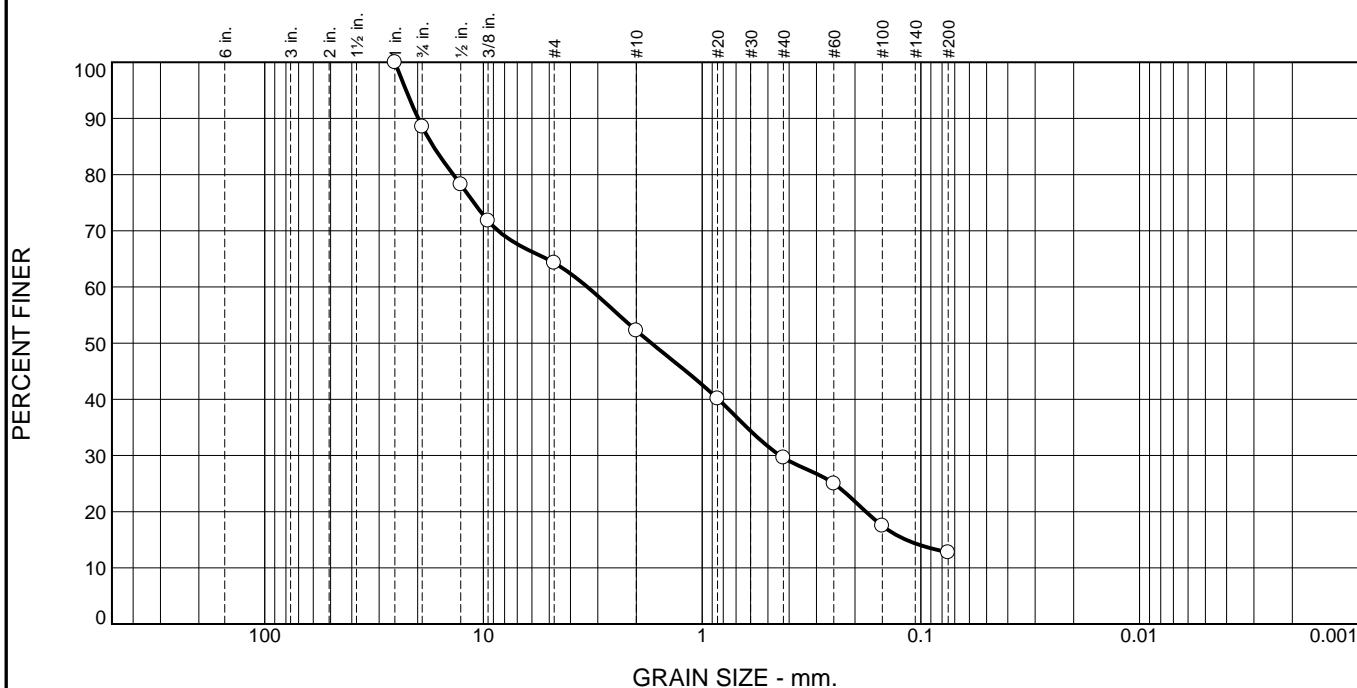
Tested By: MP
Test Date: 12/14/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.66
Wet Mass of Sample & Tin (g)	215.45
Dry Mass of Sample & Tin (g)	208.00
Mass of Water (g)	7.45
Mass of Dry Soil (g)	81.34
Moisture Content (%)	9.2

ASH CONTENT	
Porcelain Dish Mass (g)	126.66
Porcelain Dish + Oven Dried Soil (g)	208.00
Mass of Oven Dried Soil (g)	81.34
Mass of Dish & Burned Soil (g)	205.85
Mass of Burned Soil (g)	79.19
Mass of Organic Material (g)	2.15
Ash Content (%)	97.4
Organic Content (%)	2.6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.5	24.2	12.1	22.6	16.8	12.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	88.5		
.5"	78.2		
.375"	71.8		
#4	64.3		
#10	52.2		
#20	40.1		
#40	29.6		
#60	25.0		
#100	17.5		
#200	12.8		

* (no specification provided)

Material Description
Gray silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 19.8714 D₈₅= 16.9275 D₆₀= 3.3467
 D₅₀= 1.7080 D₃₀= 0.4404 D₁₅= 0.1170
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As received MC = 10.1%

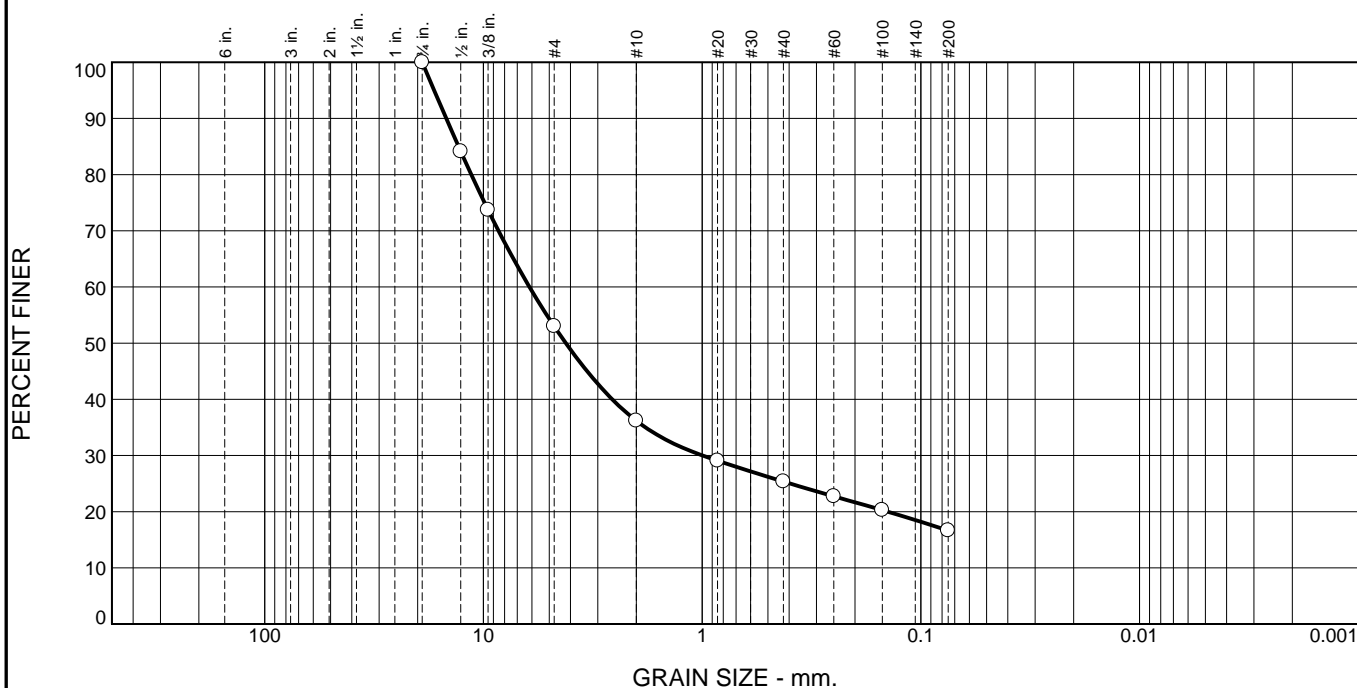
Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-56 **Depth:** 11-13'
Sample Number: S-3

Date Sampled: 10/27/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	47.0	16.8	10.8	8.7	16.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	84.1		
3/8"	73.7		
#4	53.0		
#10	36.2		
#20	29.1		
#40	25.4		
#60	22.7		
#100	20.3		
#200	16.7		

* (no specification provided)

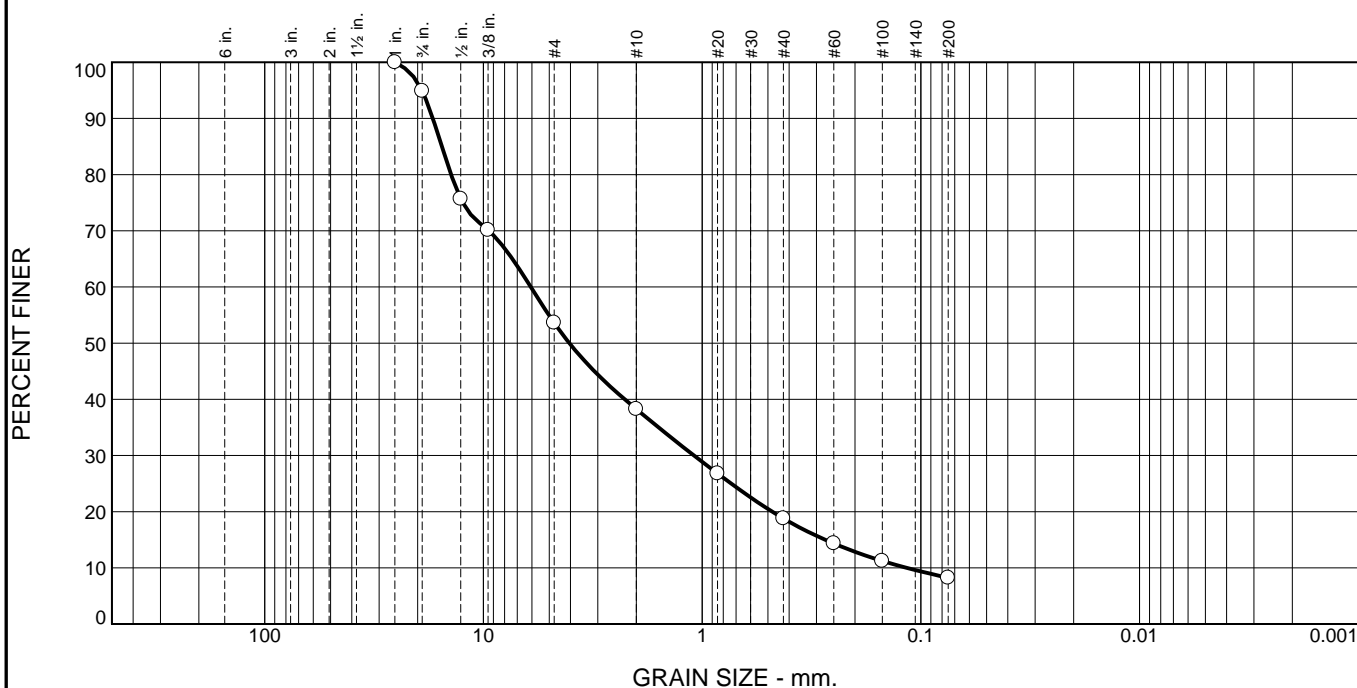
Material Description		
Dark-brown silty gravel with sand		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)=	GM	AASHTO (M 145)= A-1-b
Coefficients		
D ₉₀ = 14.7883	D ₈₅ = 12.9897	D ₆₀ = 6.1597
D ₅₀ = 4.2012	D ₃₀ = 0.9950	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 10.9%		
Date Received: 10/5/2017		Date Tested: 10/6/2017
Tested By: GW		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-57 Depth: 5-5.5
Sample Number: S-3

Date Sampled: 9/20/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.1	41.3	15.3	19.5	10.6	8.2	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	94.9		
.5"	75.7		
.375"	70.1		
#4	53.6		
#10	38.3		
#20	26.8		
#40	18.8		
#60	14.3		
#100	11.2		
#200	8.2		

* (no specification provided)

Material Description
 Brown well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 17.0273 D₈₅= 15.4805 D₆₀= 6.0706
 D₅₀= 4.0469 D₃₀= 1.0899 D₁₅= 0.2736
 D₁₀= 0.1159 C_u= 52.37 C_c= 1.69

Remarks
 As received MC = 5.1%

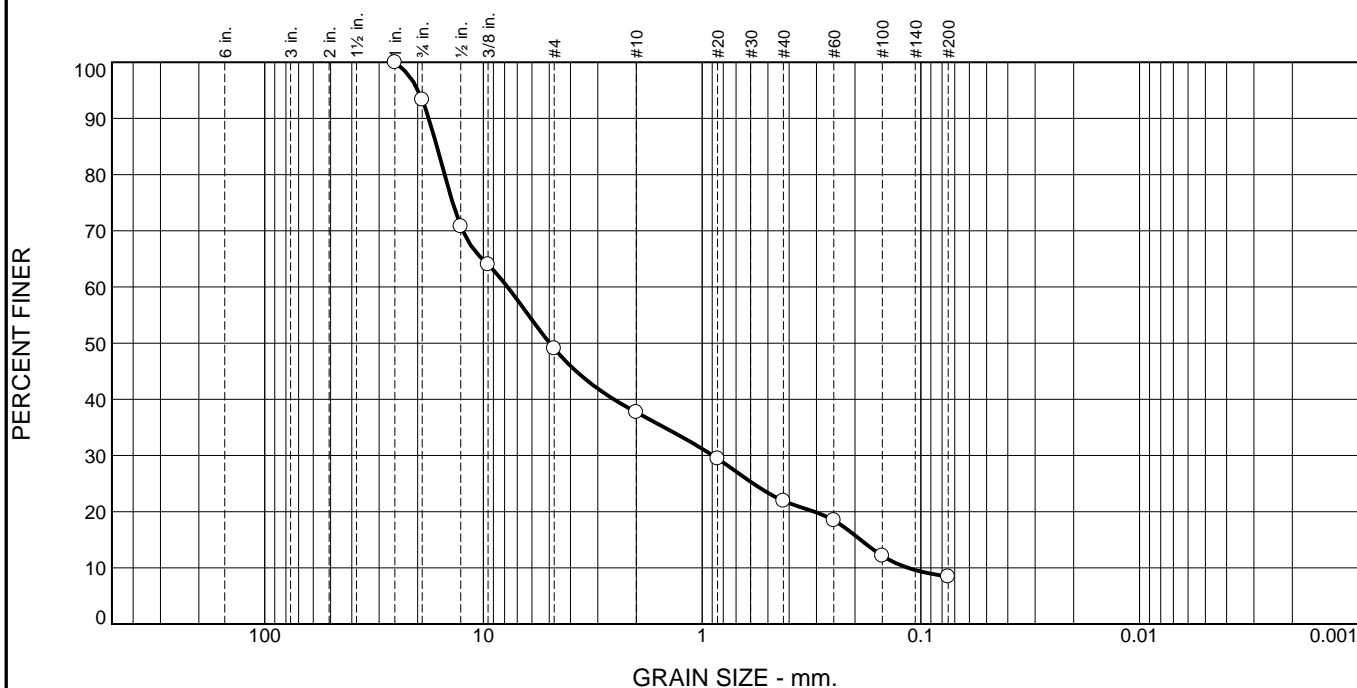
Date Received: 12/8/17 Date Tested: 12/14/17
 Tested By: RZ
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-58 Depth: 2-3'
 Sample Number: S-V-1

Date Sampled: 9/28/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.6	44.3	11.4	15.8	13.5	8.4	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	93.4		
.5"	70.8		
.375"	64.0		
#4	49.1		
#10	37.7		
#20	29.4		
#40	21.9		
#60	18.5		
#100	12.2		
#200	8.4		

* (no specification provided)

Material Description
Dark brown poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 17.7748 D₈₅= 16.3113 D₆₀= 7.7587
 D₅₀= 4.9744 D₃₀= 0.8940 D₁₅= 0.1885
 D₁₀= 0.1145 C_u= 67.74 C_c= 0.90

Remarks
As received MC = 6.1%

Date Received: 12/8/17 **Date Tested:** 12/14/17
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-59 **Depth:** 5-6'
Sample Number: S-V-2

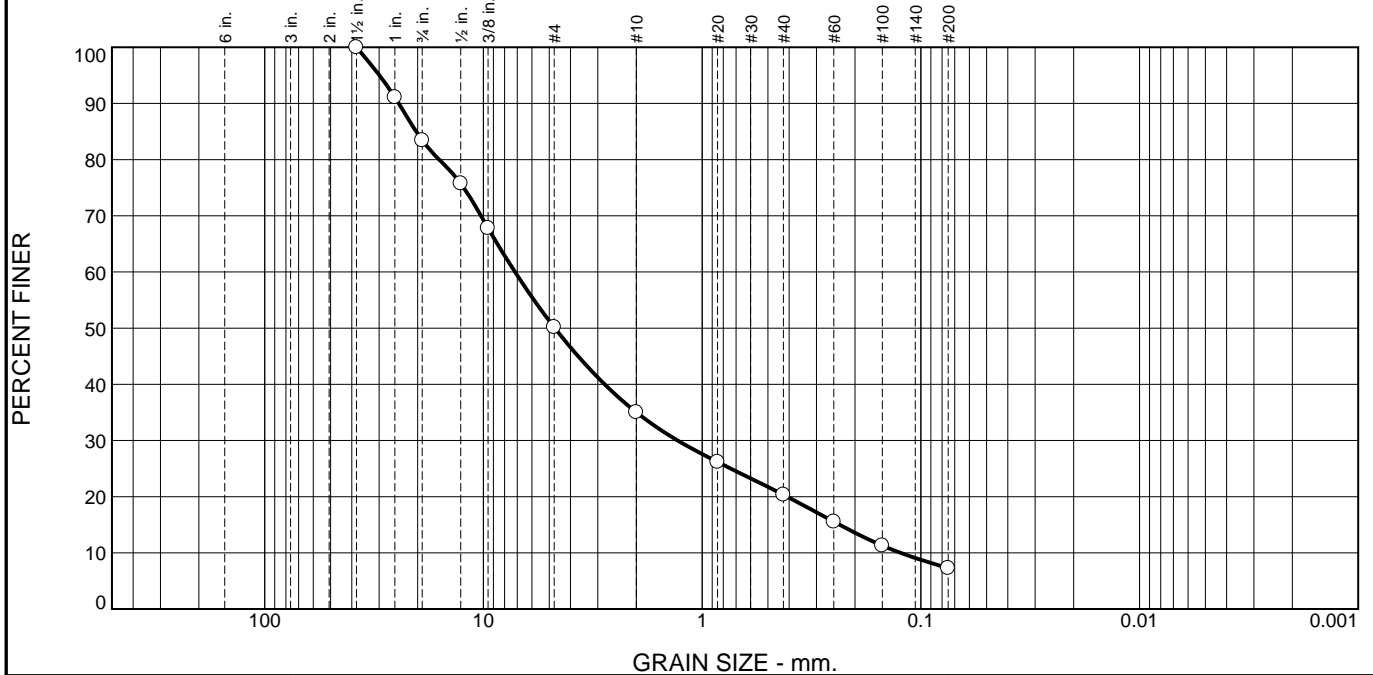
Date Sampled: 9/27/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	16.6	33.2	15.2	14.7	13.0	7.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.1		
.75"	83.4		
.5"	75.8		
.375"	67.8		
#4	50.2		
#10	35.0		
#20	26.2		
#40	20.3		
#60	15.6		
#100	11.3		
#200	7.3		

* (no specification provided)

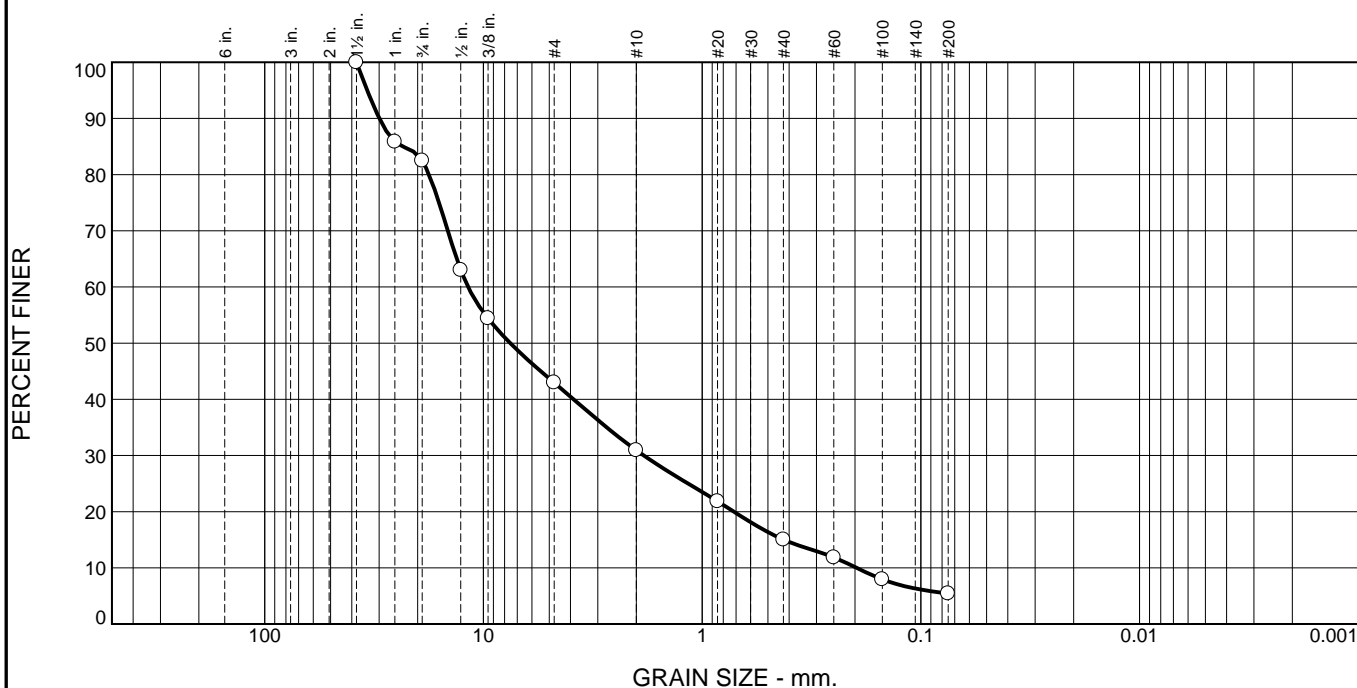
Material Description Gray well-graded gravel with silt and sand		
Atterberg Limits (ASTM D 4318) PL= LL= PI=		
Classification USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a		
Coefficients D ₉₀ = 24.3942 D ₈₅ = 20.3218 D ₆₀ = 7.1742 D ₅₀ = 4.7120 D ₃₀ = 1.2935 D ₁₅ = 0.2351 D ₁₀ = 0.1238 C _u = 57.96 C _c = 1.88		
Remarks As received MC = 7.8%		
Date Received: 12/8/17		Date Tested: 12/14/17
Tested By: RZ		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-59 Depth: 14-16'
 Sample Number: S-3

Date Sampled: 9/27/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170
	Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	17.5	39.5	12.1	15.9	9.6	5.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.8		
3/4"	82.5		
1/2"	63.0		
3/8"	54.4		
#4	43.0		
#10	30.9		
#20	21.8		
#40	15.0		
#60	11.9		
#100	8.0		
#200	5.4		

* (no specification provided)

Material Description
Dark gray well-graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= GW-GM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 29.9204 D₈₅= 23.4335 D₆₀= 11.7627
D₅₀= 7.5401 D₃₀= 1.8491 D₁₅= 0.4234
D₁₀= 0.1965 C_u= 59.86 C_c= 1.48

Remarks
As received MC = 6.8%

Date Received: 10/5/2017 **Date Tested:** 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

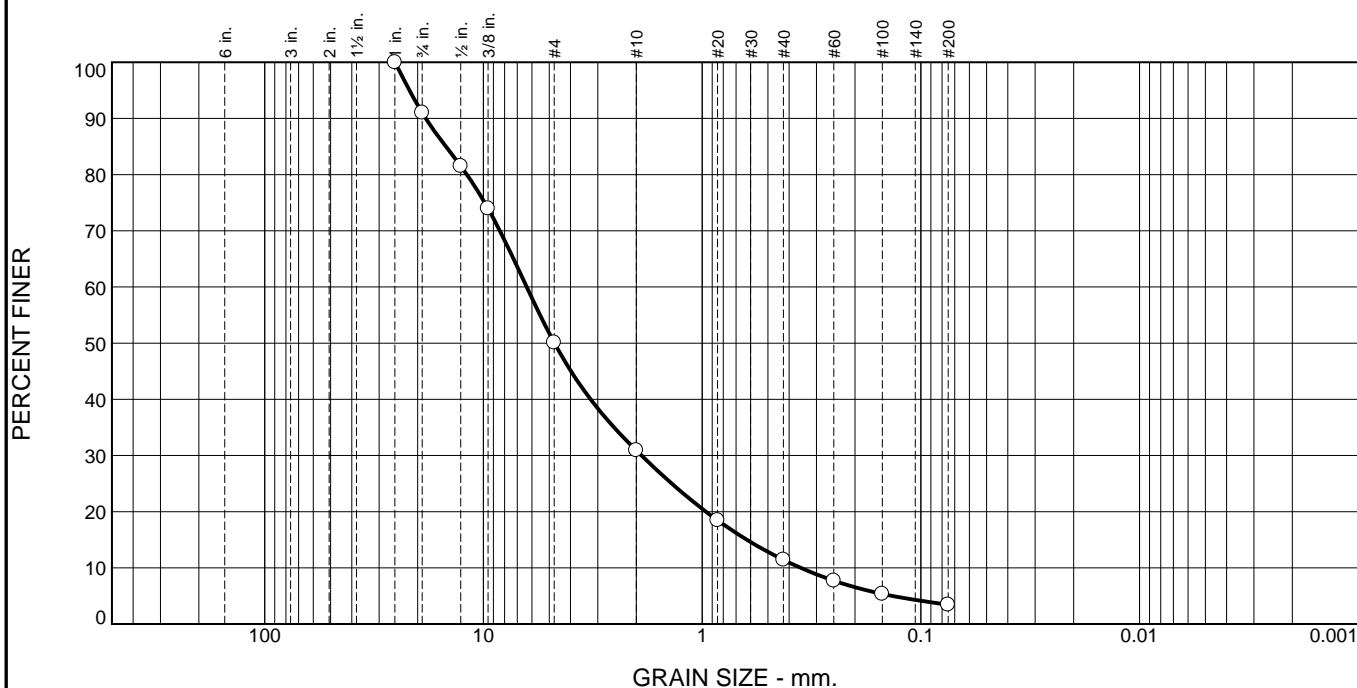
Source of Sample: B-60 **Depth:** 2-3.3
Sample Number: S-2

Date Sampled: 9/21/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.0	40.9	19.2	19.5	8.0	3.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	91.0		
1/2"	81.5		
3/8"	74.0		
#4	50.1		
#10	30.9		
#20	18.5		
#40	11.4		
#60	7.7		
#100	5.4		
#200	3.4		

* (no specification provided)

Material Description

Dark gray well-graded gravel with sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= GW AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 18.3483 D₈₅= 14.8403 D₆₀= 6.3401
D₅₀= 4.7336 D₃₀= 1.8930 D₁₅= 0.6243
D₁₀= 0.3542 C_u= 17.90 C_c= 1.60

Remarks

As received MC = 12.4%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-61

Depth: 4-6

Date Sampled: 9/21/2017

Sample Number: S-3

CDM Smith

Boston, Massachusetts

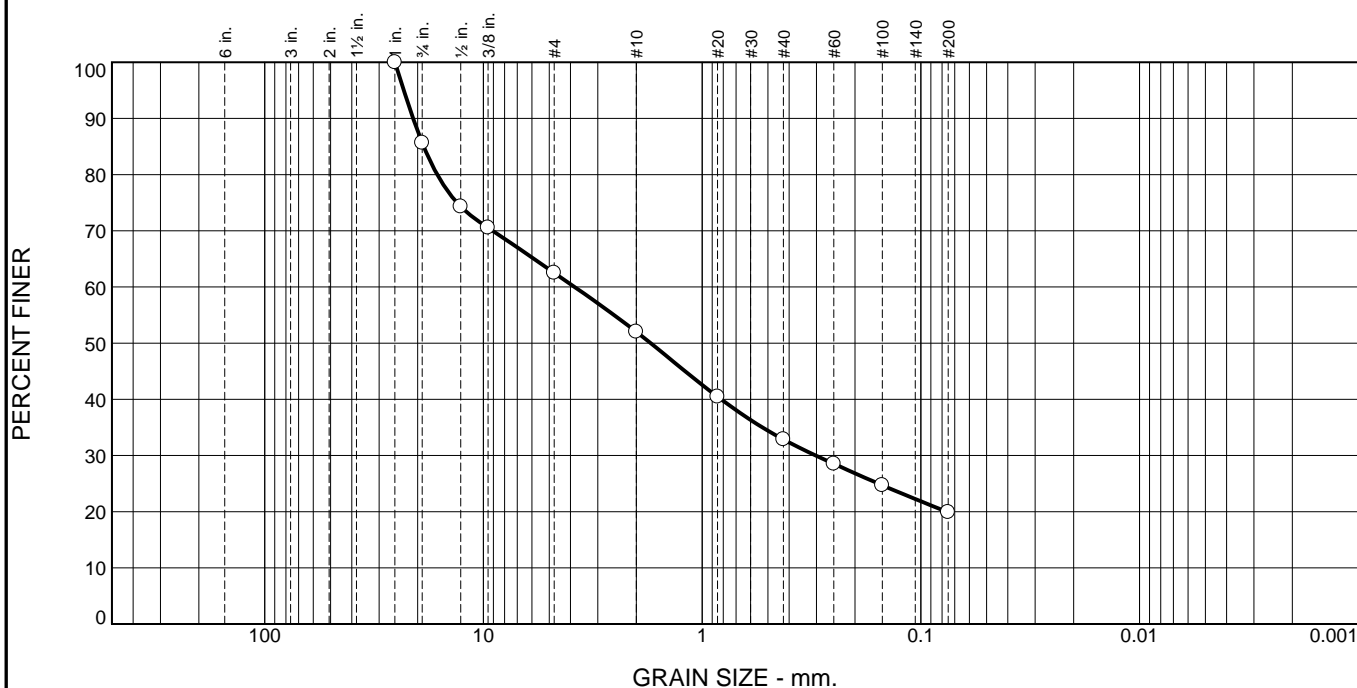
Client: Massachusetts Water Resources Authority (MWRA)

Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA

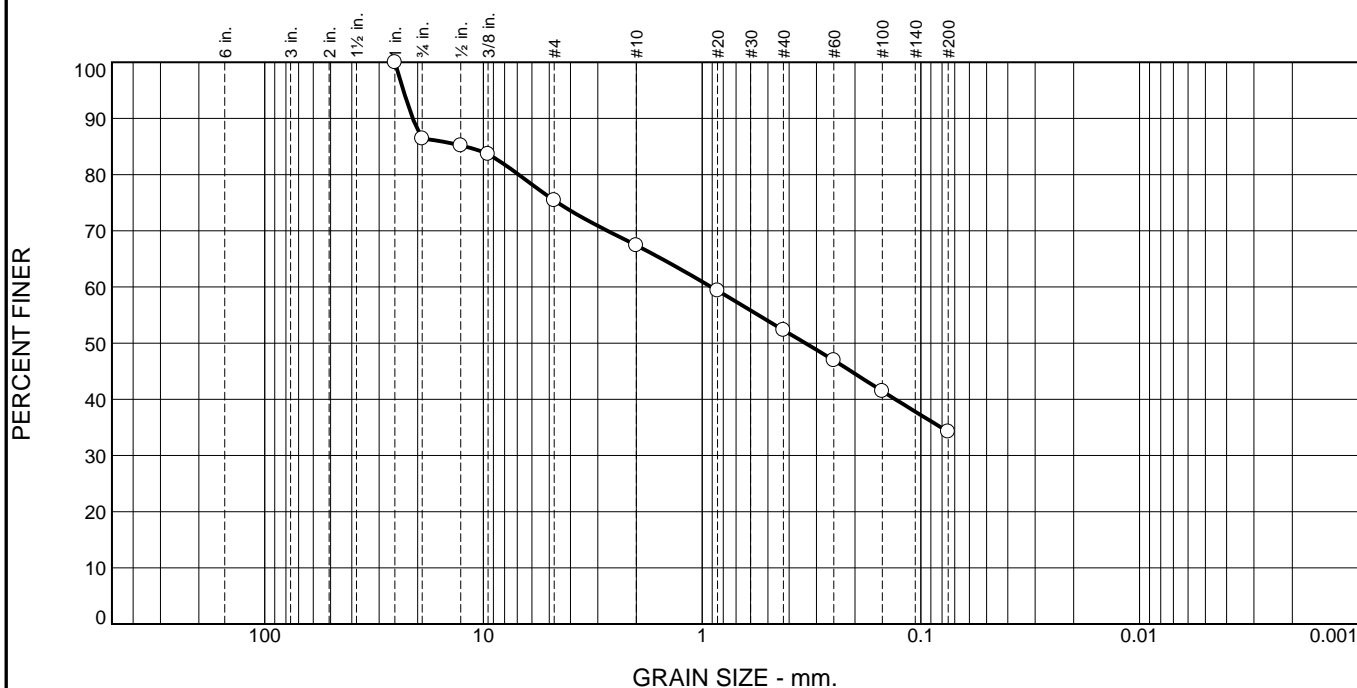
Project No: 101038.102170

Figure

Particle Size Distribution Report



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.6	11.0	8.0	15.1	18.1	34.2	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	86.4		
.5	85.2		
.375	83.7		
#4	75.4		
#10	67.4		
#20	59.3		
#40	52.3		
#60	46.9		
#100	41.5		
#200	34.2		

* (no specification provided)

Material Description
Gray-brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 21.0374 D₈₅= 12.1285 D₆₀= 0.9079
 D₅₀= 0.3373 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 10.7%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-64 **Depth:** 6-8'
Sample Number: S-1

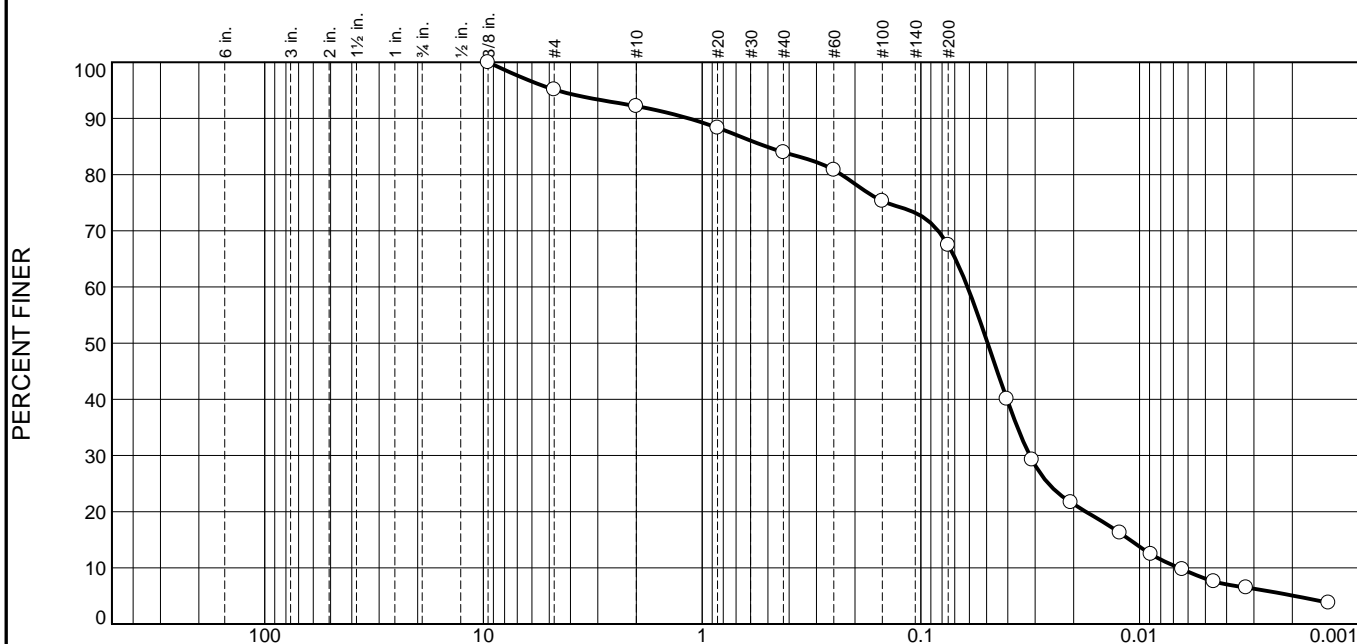
Date Sampled: 11/20/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.8	3.0	8.2	16.5	59.4	8.1

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	95.2		
#10	92.2		
#20	88.3		
#40	84.0		
#60	80.8		
#100	75.3		
#200	67.5		
0.0404 mm.	40.1		
0.0310 mm.	29.3		
0.0206 mm.	21.7		
0.0123 mm.	16.3		
0.0089 mm.	12.5		
0.0064 mm.	9.8		
0.0046 mm.	7.6		
0.0033 mm.	6.5		
0.0014 mm.	3.8		

* (no specification provided)

Material Description
Brown sandy silt

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 1.1517 D₈₅= 0.5089 D₆₀= 0.0612
 D₅₀= 0.0495 D₃₀= 0.0317 D₁₅= 0.0111
 D₁₀= 0.0066 C_u= 9.27 C_c= 2.50

Remarks
As received MC = 19.9%

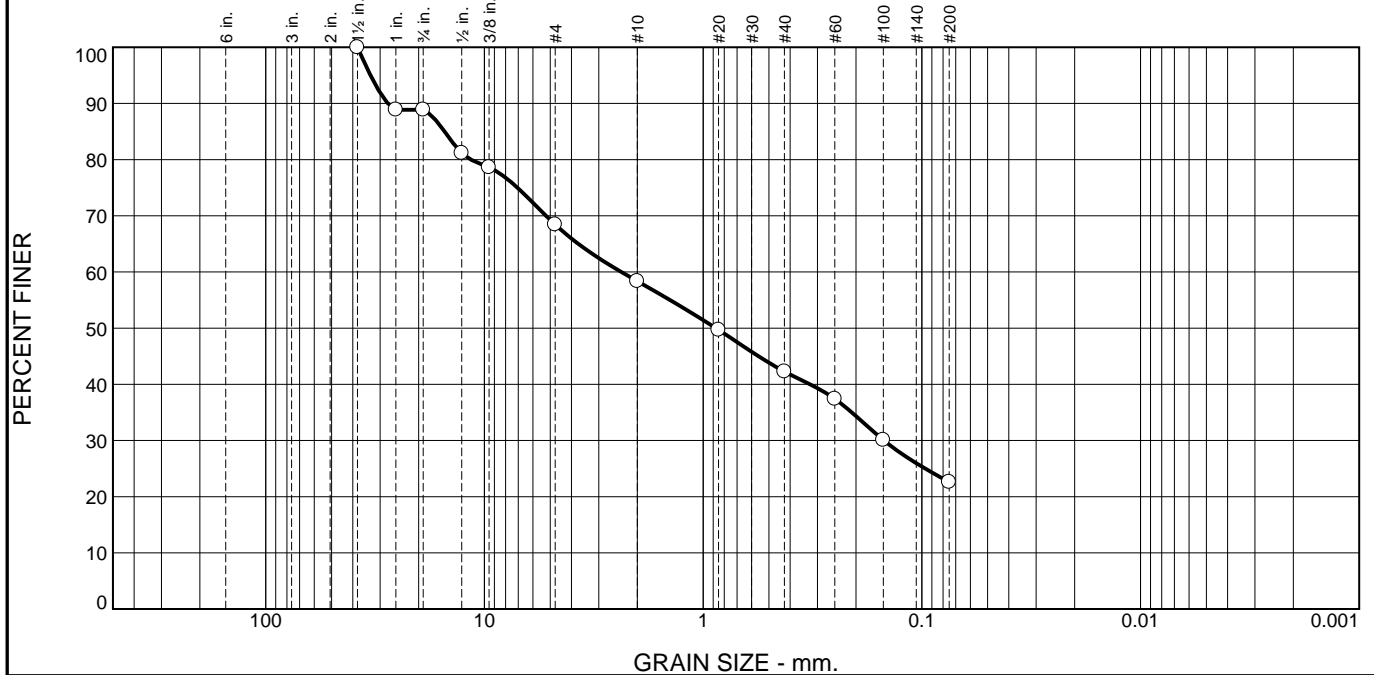
Date Received: 10/5/2017 **Date Tested:** 10/10/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-65 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 9/19/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.1	20.4	10.1	16.1	19.7	22.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	88.9		
3/4"	88.9		
1/2"	81.2		
3/8"	78.6		
#4	68.5		
#10	58.4		
#20	49.7		
#40	42.3		
#60	37.4		
#100	30.1		
#200	22.6		

* (no specification provided)

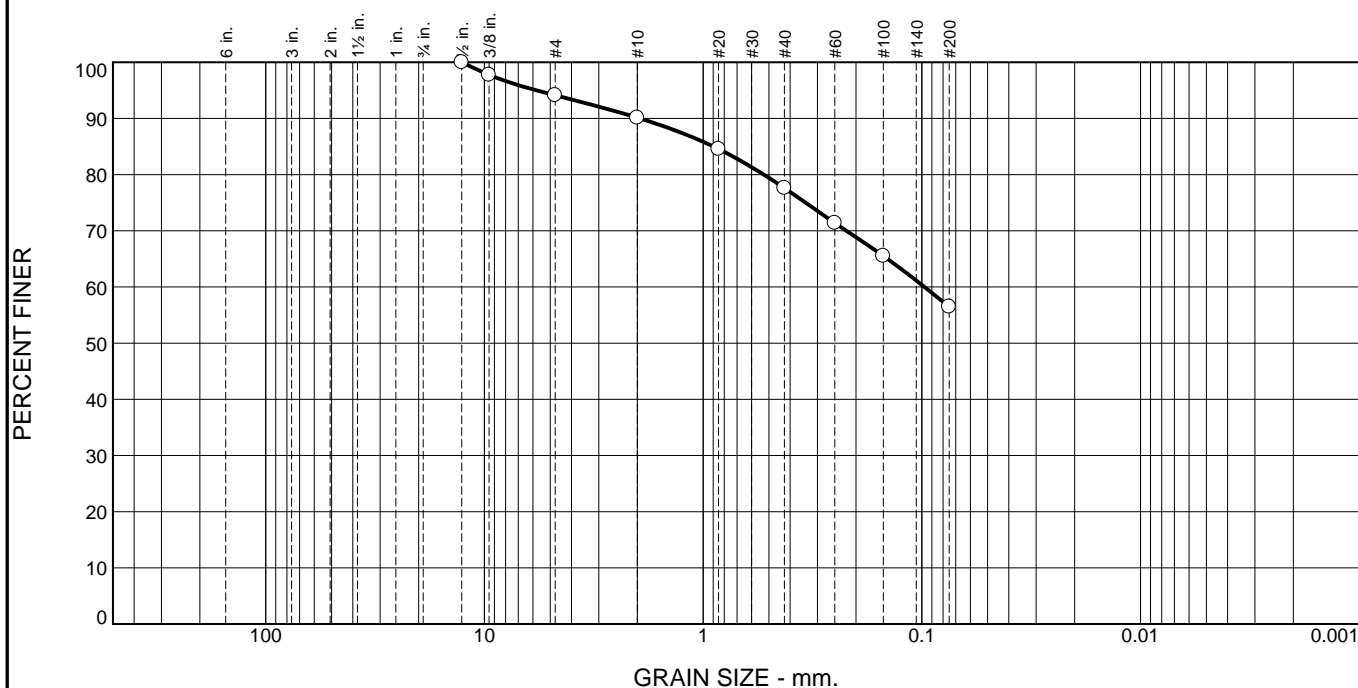
Material Description	
Dark brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 27.6426	D ₈₅ = 15.2143 D ₆₀ = 2.3665
D ₅₀ = 0.8741	D ₃₀ = 0.1489 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 9.7%	
Date Received: 10/5/2017	Date Tested: 10/6/2017
Tested By: GW	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-65 Depth: 8-8.5'
Sample Number: S-5

Date Sampled: 9/19/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.9	4.0	12.5	21.1	56.5	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5	100.0		
.375	97.8		
#4	94.1		
#10	90.1		
#20	84.6		
#40	77.6		
#60	71.4		
#100	65.5		
#200	56.5		

* (no specification provided)

Material Description
Dark brown sandy silt with organics

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 1.9510 D₈₅= 0.8966 D₆₀= 0.0973
 D₅₀= _____ D₃₀= _____ D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As recieved MC = 48.2%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-66 **Depth:** 6-8'
Sample Number: S-1

Date Sampled: 9/26/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-66
Sample Number: S-1
Sample Depth (ft): 6-8
Sample Date: 9/26/2017

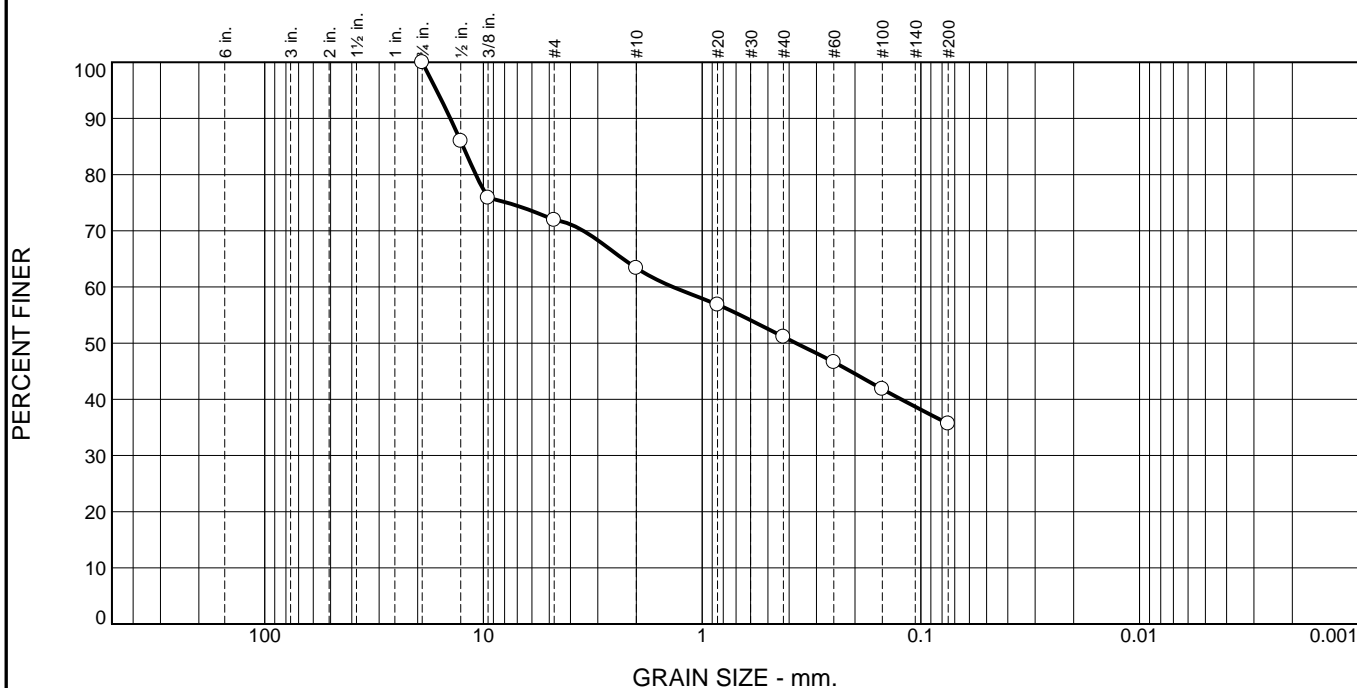
Tested By: AS
Test Date: 1/31/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	105.32
Wet Mass of Sample & Tin (g)	165.77
Dry Mass of Sample & Tin (g)	146.93
Mass of Water (g)	18.84
Mass of Dry Soil (g)	41.61
Moisture Content (%)	45.3

ASH CONTENT	
Porcelain Dish Mass (g)	105.32
Porcelain Dish + Oven Dried Soil (g)	146.93
Mass of Oven Dried Soil (g)	41.61
Mass of Dish & Burned Soil (g)	144.11
Mass of Burned Soil (g)	38.79
Mass of Organic Material (g)	2.82
Ash Content (%)	93.2
Organic Content (%)	6.8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	28.1	8.5	12.3	15.4	35.7	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	86.0		
.375	75.9		
#4	71.9		
#10	63.4		
#20	56.8		
#40	51.1		
#60	46.6		
#100	41.8		
#200	35.7		

* (no specification provided)

Material Description
Brown silty sand with gravel and organics

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 14.1715 D₈₅= 12.3775 D₆₀= 1.3602
 D₅₀= 0.3720 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
As recieved MC = 34.0%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-67 **Depth:** 6-7.1
Sample Number: S-1

Date Sampled: 10/3/17

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-67
Sample Number: S-1
Sample Depth (ft): 6-7.1
Sample Date: 10/3/2017

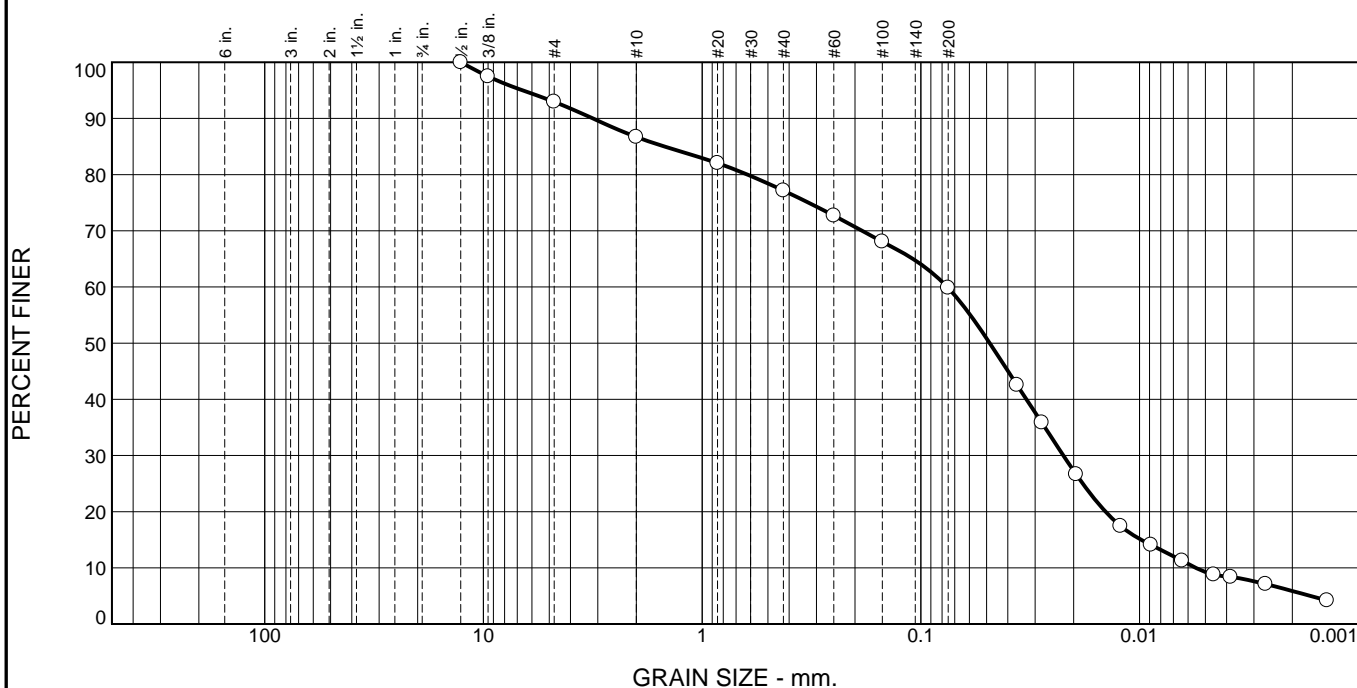
Tested By: AS
Test Date: 1/31/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.33
Wet Mass of Sample & Tin (g)	154.16
Dry Mass of Sample & Tin (g)	137.96
Mass of Water (g)	16.20
Mass of Dry Soil (g)	47.63
Moisture Content (%)	34.0

ASH CONTENT	
Porcelain Dish Mass (g)	90.33
Porcelain Dish + Oven Dried Soil (g)	137.96
Mass of Oven Dried Soil (g)	47.63
Mass of Dish & Burned Soil (g)	135.14
Mass of Burned Soil (g)	44.81
Mass of Organic Material (g)	2.82
Ash Content (%)	94.1
Organic Content (%)	5.9

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.0	6.3	9.5	17.4	50.5	9.3

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	97.5		
#4	93.0		
#10	86.7		
#20	82.0		
#40	77.2		
#60	72.7		
#100	68.1		
#200	59.8		
0.0363 mm.	42.5		
0.0280 mm.	35.9		
0.0195 mm.	26.6		
0.0122 mm.	17.4		
0.0089 mm.	14.1		
0.0064 mm.	11.3		
0.0046 mm.	8.8		
0.0038 mm.	8.4		
0.0027 mm.	7.1		
0.0014 mm.	4.2		

* (no specification provided)

Material Description
Brown sandy silt

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 3.1621 D₈₅= 1.4866 D₆₀= 0.0756
D₅₀= 0.0484 D₃₀= 0.0223 D₁₅= 0.0098
D₁₀= 0.0055 C_u= 13.69 C_c= 1.19

Remarks
As received MC = 13.2%

Date Received: 1/31/18 **Date Tested:** 2/2/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

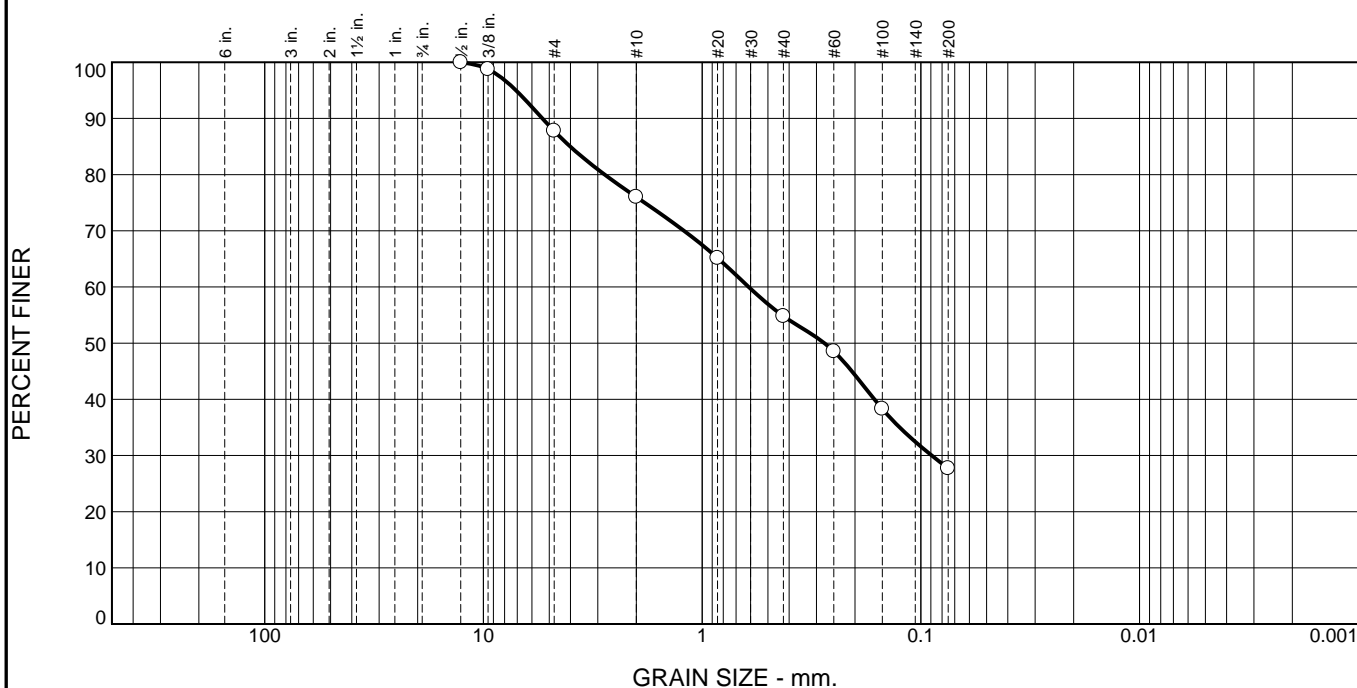
Source of Sample: B-68 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 10/2/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.2	11.8	21.2	27.1	27.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	98.8		
#4	87.8		
#10	76.0		
#20	65.1		
#40	54.8		
#60	48.5		
#100	38.3		
#200	27.7		

* (no specification provided)

Material Description

Brown silty sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 5.3738 D₈₅= 4.0079 D₆₀= 0.6123
D₅₀= 0.2762 D₃₀= 0.0891 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 11.5%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-69

Depth: 4-6

Date Sampled: 9/19/2017

Sample Number: S-3

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)

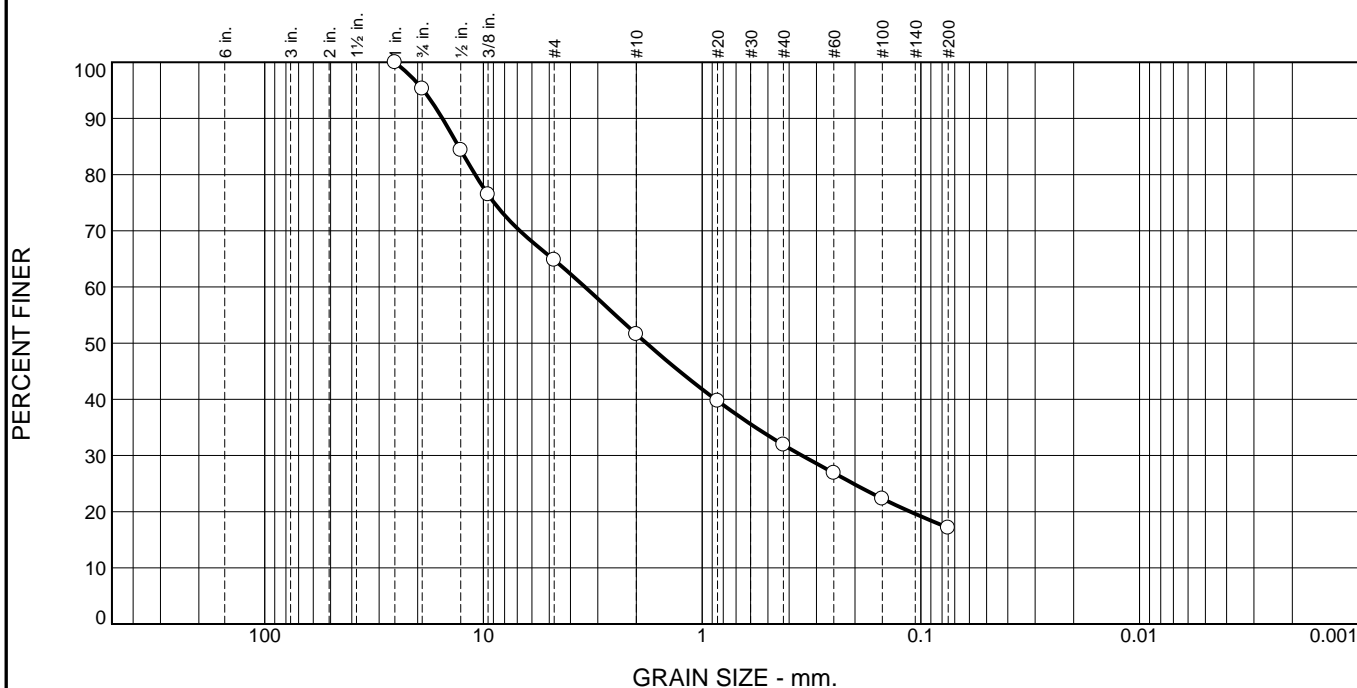
Project: Weston Aqueduct Supply Main 3 (WASM3)

Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA

Project No: 101038.102170

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.7	30.5	13.2	19.7	14.8	17.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	95.3		
1/2"	84.4		
3/8"	76.5		
#4	64.8		
#10	51.6		
#20	39.7		
#40	31.9		
#60	26.9		
#100	22.3		
#200	17.1		

* (no specification provided)

Material Description

Redish brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 15.4074 D₈₅= 12.9788 D₆₀= 3.4332
D₅₀= 1.7983 D₃₀= 0.3496 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 8.0%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

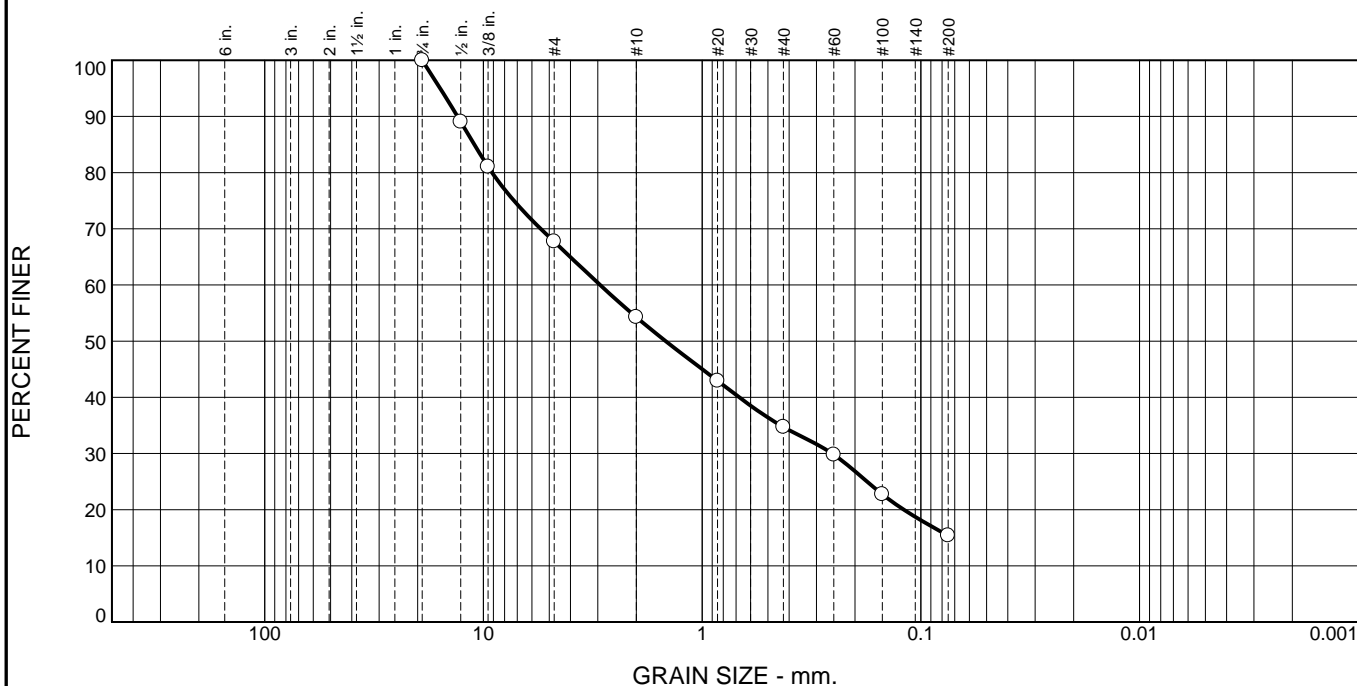
Source of Sample: B-70 Depth: 2-4
Sample Number: S-2

Date Sampled: 9/18/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	32.3	13.4	19.6	19.3	15.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	89.0		
3/8"	81.1		
#4	67.7		
#10	54.3		
#20	42.9		
#40	34.7		
#60	29.8		
#100	22.7		
#200	15.4		

* (no specification provided)

Material Description

Dark gray silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 13.1390 D₈₅= 11.0163 D₆₀= 2.9267
D₅₀= 1.4676 D₃₀= 0.2547 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 8.8%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

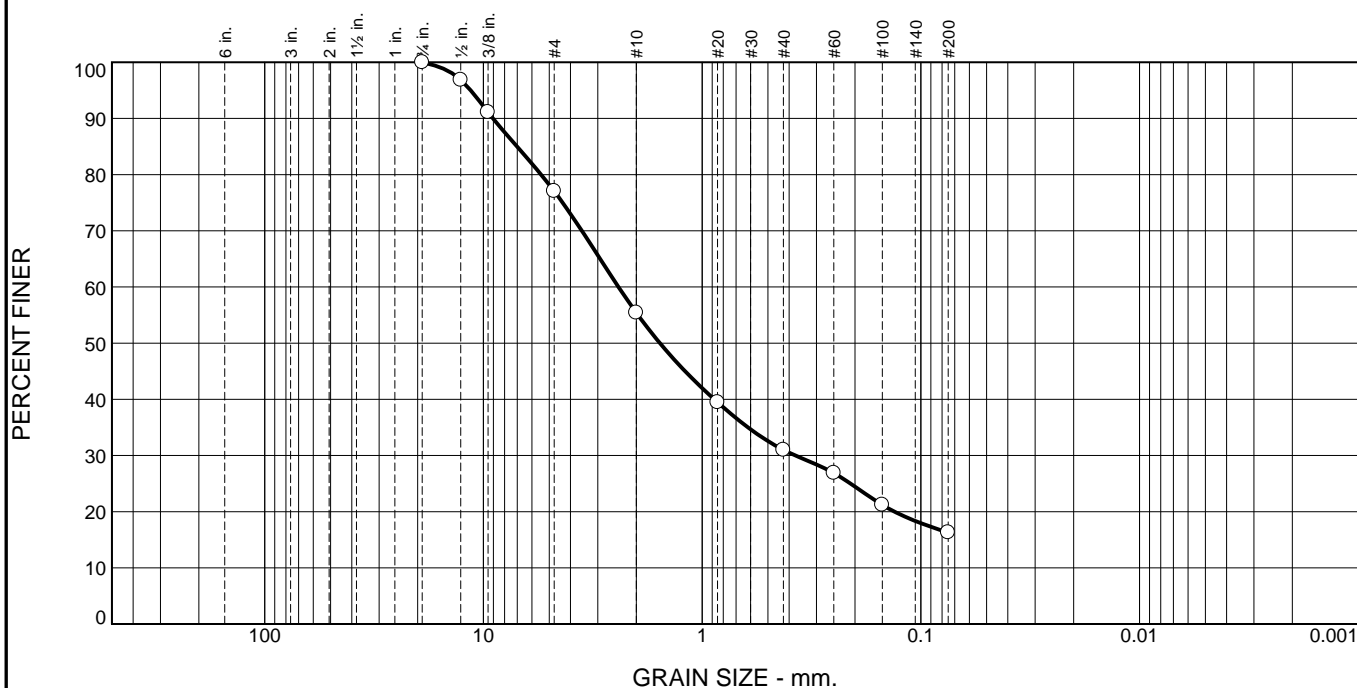
Source of Sample: B-70 Depth: 6-8
Sample Number: S-4

Date Sampled: 9/18/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.9	21.7	24.4	14.7	16.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	96.9		
3/8"	91.1		
#4	77.1		
#10	55.4		
#20	39.5		
#40	31.0		
#60	26.9		
#100	21.2		
#200	16.3		

* (no specification provided)

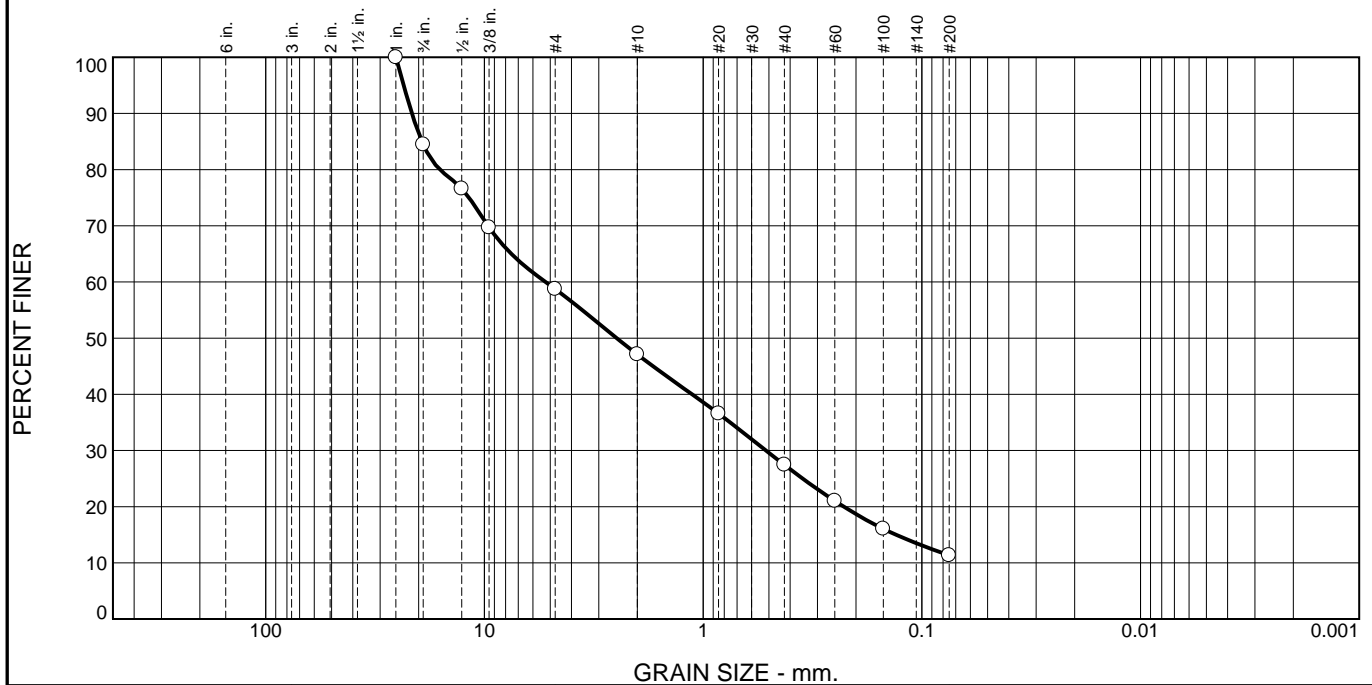
Material Description	
Dark brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 9.0409	D ₈₅ = 7.0232 D ₆₀ = 2.4129
D ₅₀ = 1.5604	D ₃₀ = 0.3747 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 15.4%	
Date Received: 10/5/2017	Date Tested: 10/6/2017
Tested By: GW	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-71 Depth: 14-15.5
Sample Number: S-4

Date Sampled: 9/25/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.5	25.8	11.6	19.7	16.1	11.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	84.5		
1/2"	76.6		
3/8"	69.7		
#4	58.7		
#10	47.1		
#20	36.6		
#40	27.4		
#60	21.0		
#100	16.1		
#200	11.3		

* (no specification provided)

Material Description
Brown gray poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 21.4646 D₈₅= 19.3109 D₆₀= 5.2564
 D₅₀= 2.4840 D₃₀= 0.5161 D₁₅= 0.1312
 D₁₀= C_u= C_c=

Remarks
As received MC = 6.8%

Date Received: 10/5/2017 **Date Tested:** 10/6/2017
Tested By: GW
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-71 **Depth:** 1-5
Sample Number: V-1

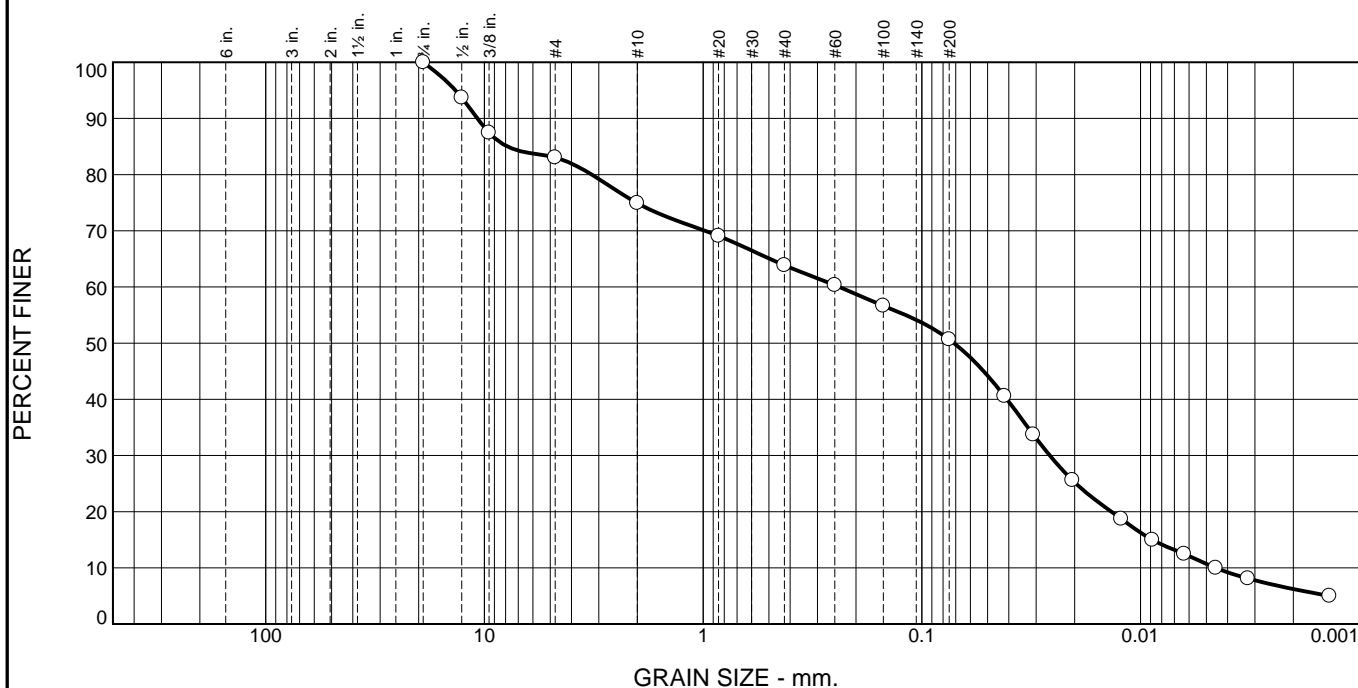
Date Sampled: 9/22/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.9	8.2	11.0	13.2	40.0	10.7

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	93.7		
3/8"	87.4		
#4	83.1		
#10	74.9		
#20	69.1		
#40	63.9		
#60	60.3		
#100	56.6		
#200	50.7		
0.0419 mm.	40.6		
0.0309 mm.	33.7		
0.0205 mm.	25.6		
0.0123 mm.	18.7		
0.0088 mm.	15.0		
0.0063 mm.	12.5		
0.0045 mm.	10.0		
0.0032 mm.	8.1		
0.0014 mm.	5.0		

* (no specification provided)

Material Description

Brown sandy silt with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients

D₉₀= 10.7774 D₈₅= 7.8514 D₆₀= 0.2387
D₅₀= 0.0712 D₃₀= 0.0260 D₁₅= 0.0088
D₁₀= 0.0045 C_u= 52.67 C_c= 0.62

Remarks

As received MC = 23.9%

Date Received: 10/5/2017 Date Tested: 10/10/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-72 Depth: 2-4'
Sample Number: S-2

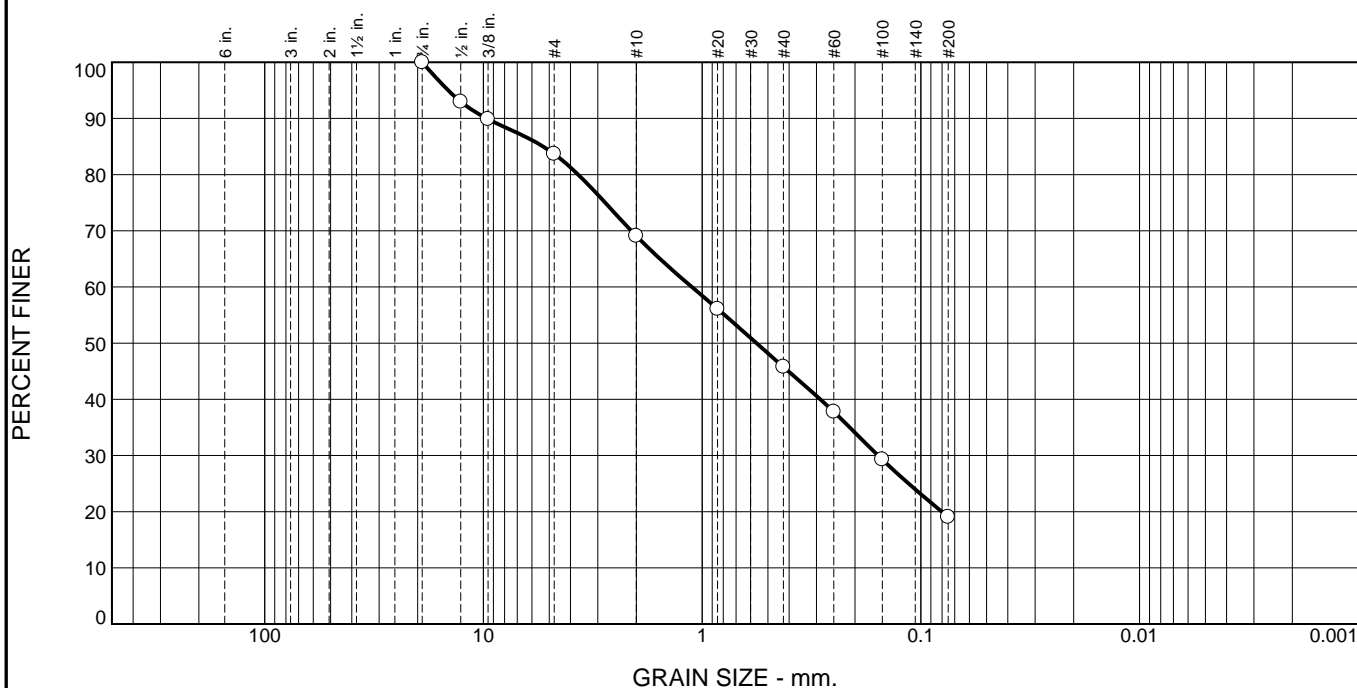
Date Sampled: 9/15/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.3	14.6	23.3	26.7	19.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	93.0		
3/8"	89.9		
#4	83.7		
#10	69.1		
#20	56.1		
#40	45.8		
#60	37.8		
#100	29.3		
#200	19.1		

* (no specification provided)

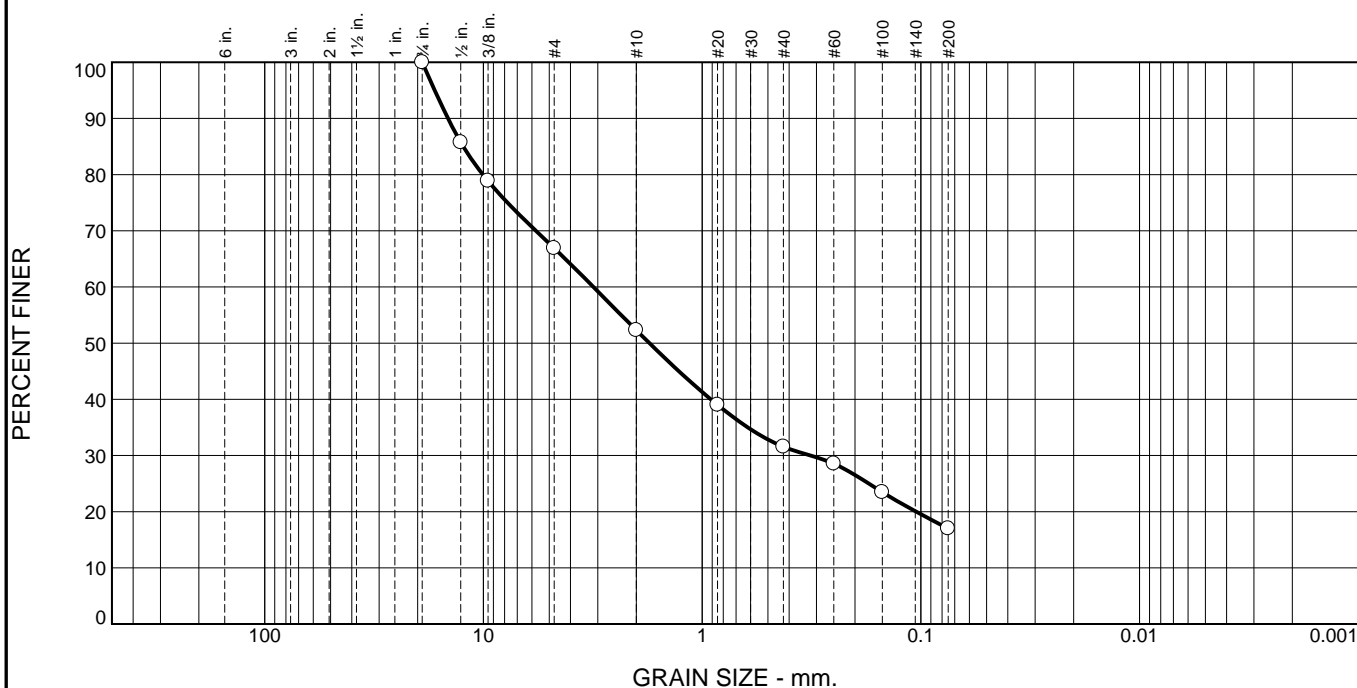
Material Description	
Brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 9.6599	D ₈₅ = 5.3292 D ₆₀ = 1.1139
D ₅₀ = 0.5643	D ₃₀ = 0.1568 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 6.2%	
Date Received: 10/5/2017	Date Tested: 10/6/2017
Tested By: GW	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-73 Depth: 2-4
Sample Number: S-2

Date Sampled: 9/15/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	33.1	14.6	20.7	14.6	17.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	85.7		
3/8"	78.9		
#4	66.9		
#10	52.3		
#20	39.0		
#40	31.6		
#60	28.5		
#100	23.5		
#200	17.0		

* (no specification provided)

Material Description

Brown gray silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 14.5261 D₈₅= 12.3723 D₆₀= 3.1422
D₅₀= 1.7423 D₃₀= 0.3200 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 9.5%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

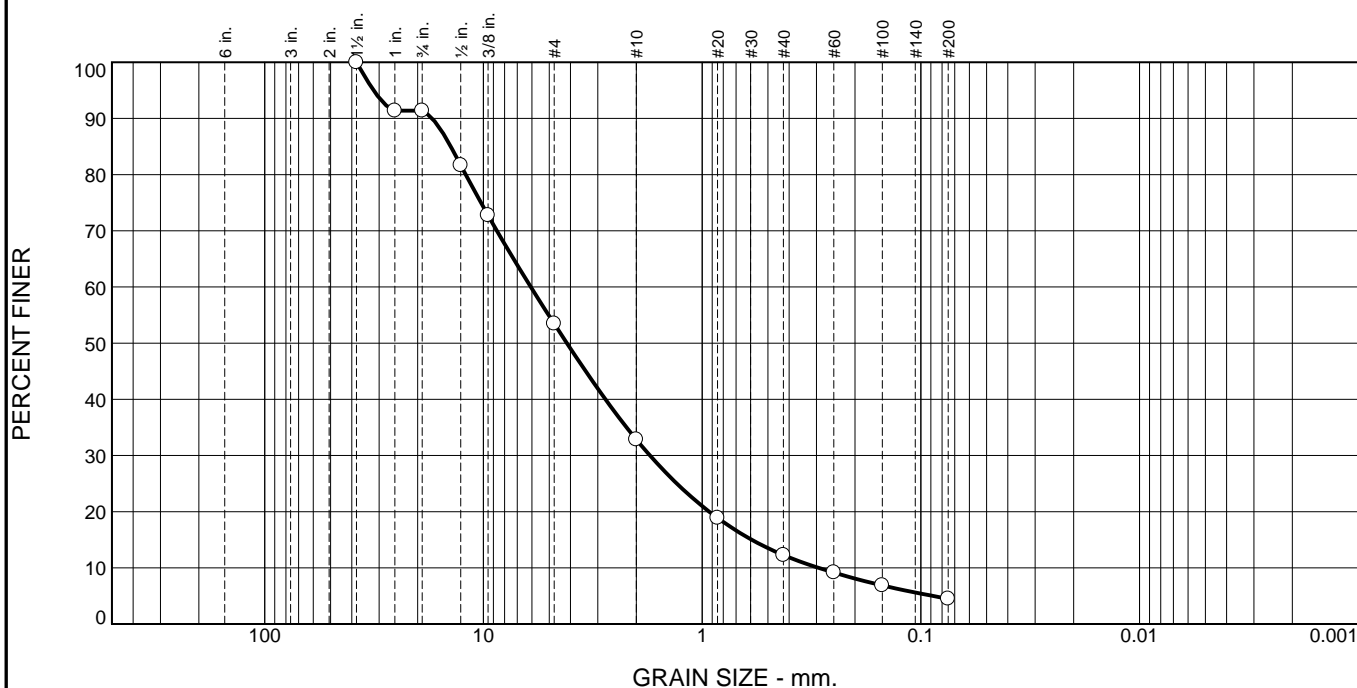
Source of Sample: B-74 Depth: 0.5-1.7
Sample Number: S-1

Date Sampled: 9/14/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.6	37.9	20.7	20.5	7.8	4.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.4		
3/4"	91.4		
1/2"	81.7		
3/8"	72.8		
#4	53.5		
#10	32.8		
#20	18.9		
#40	12.3		
#60	9.2		
#100	6.9		
#200	4.5		

* (no specification provided)

Material Description

Dark-gray well-graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SW AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 17.1353 D₈₅= 14.1094 D₆₀= 6.0734
D₅₀= 4.1535 D₃₀= 1.7322 D₁₅= 0.5927
D₁₀= 0.2936 C_u= 20.69 C_c= 1.68

Remarks

As received MC = 8.3%

Date Received: 10/5/2017 Date Tested: 10/6/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

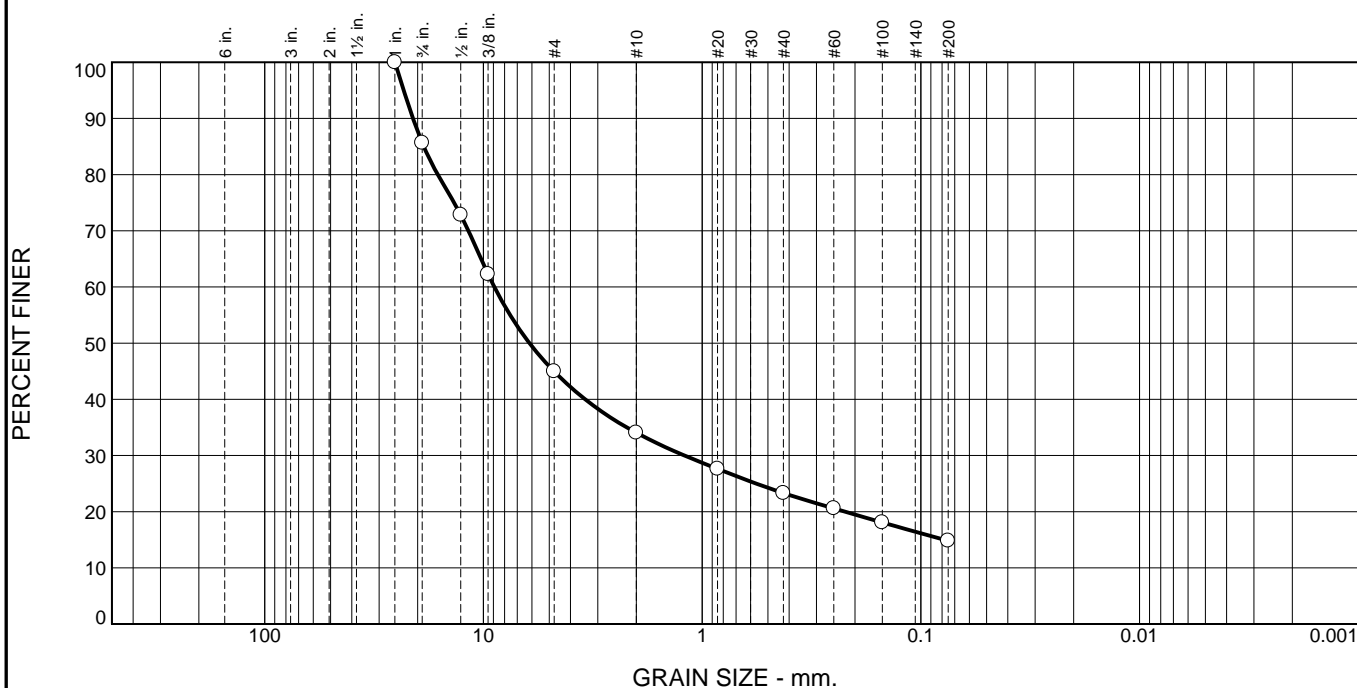
Source of Sample: B-74 Depth: 8-9.3
Sample Number: S-5

Date Sampled: 9/14/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.4	40.6	10.9	10.8	8.5	14.8	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	85.6		
.5"	72.8		
.375"	62.3		
#4	45.0		
#10	34.1		
#20	27.6		
#40	23.3		
#60	20.6		
#100	18.1		
#200	14.8		

* (no specification provided)

Material Description
Brown silty gravel with sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= GM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 20.9938 D₈₅= 18.7445 D₆₀= 8.9130
 D₅₀= 6.1619 D₃₀= 1.2043 D₁₅= 0.0779
 D₁₀= C_u= C_c=

Remarks
As received MC = 14.0%

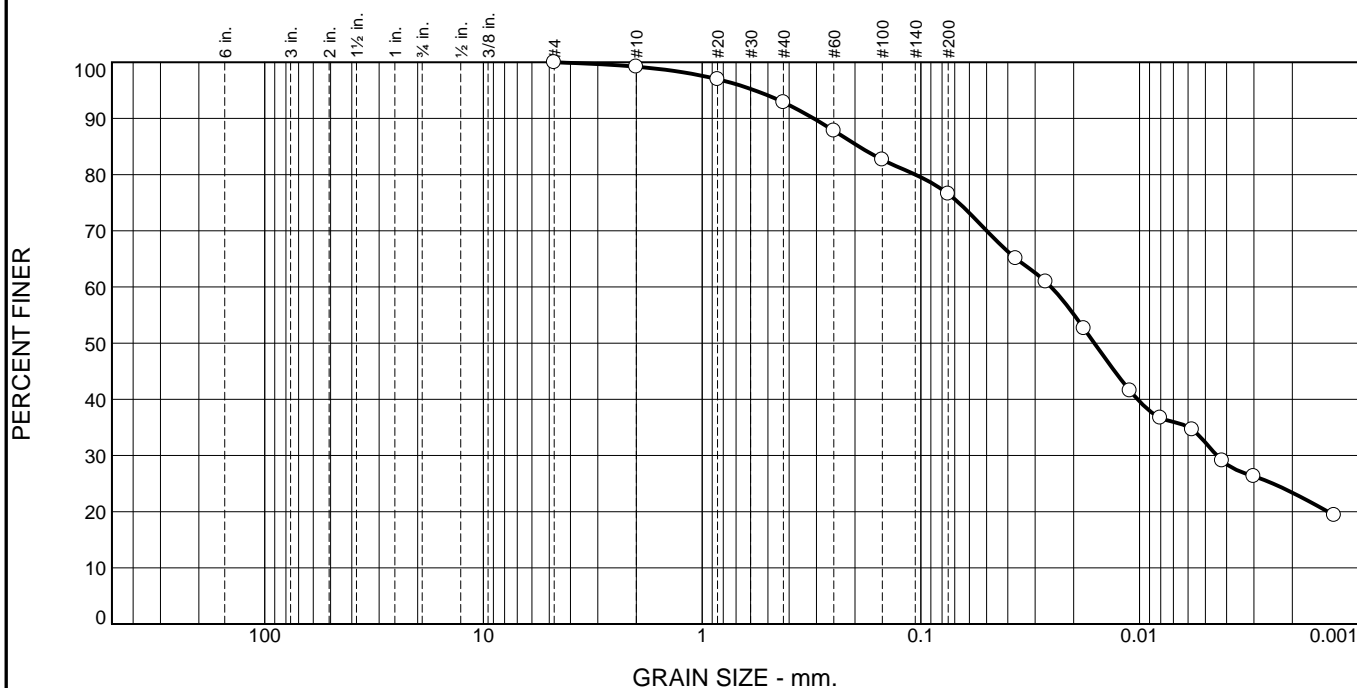
Date Received: 1/31/18 **Date Tested:** 2/5/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-75A **Depth:** 6-8'
Sample Number: S-1

Date Sampled: 11/15/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	6.3	16.3	44.3	32.3

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.2		
#20	97.0		
#40	92.9		
#60	87.8		
#100	82.7		
#200	76.6		
0.0368 mm.	65.1		
0.0269 mm.	61.0		
0.0180 mm.	52.6		
0.0111 mm.	41.6		
0.0080 mm.	36.7		
0.0057 mm.	34.6		
0.0042 mm.	29.1		
0.0030 mm.	26.3		
0.0013 mm.	19.4		

* (no specification provided)

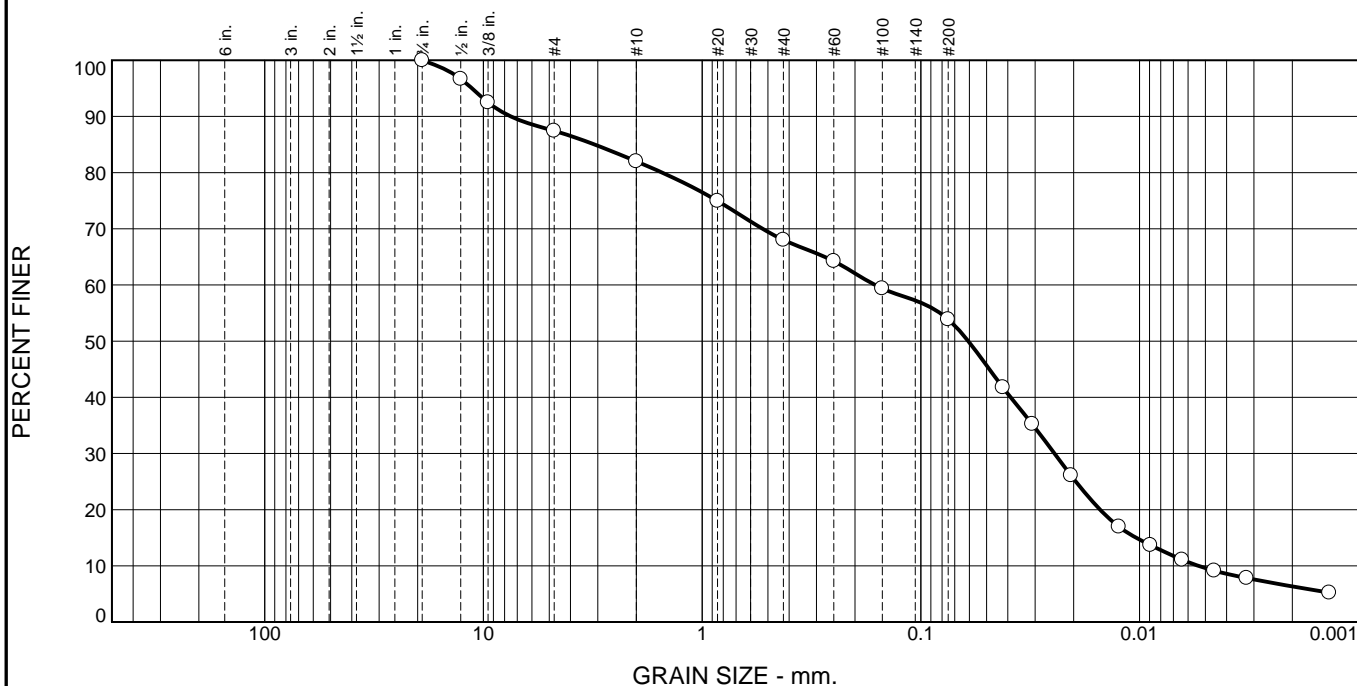
Material Description	
Brown lean clay with sand	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= CL	AASHTO (M 145)= A-6(7)
Coefficients	
D ₉₀ = 0.3091	D ₈₅ = 0.1917 D ₆₀ = 0.0254
D ₅₀ = 0.0161	D ₃₀ = 0.0044 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 20.4%	
Date Received: 10/5/2017 Date Tested: 10/10/2017 Tested By: RZ Checked By: MP Title: Laboratory Manager	

Source of Sample: B-76 Depth: 2-4'
Sample Number: S-2

Date Sampled: 9/13/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.6	5.4	14.0	14.1	44.3	9.6

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	96.7		
3/8"	92.5		
#4	87.4		
#10	82.0		
#20	75.0		
#40	68.0		
#60	64.2		
#100	59.4		
#200	53.9		
0.0421 mm.	41.8		
0.0310 mm.	35.2		
0.0206 mm.	26.1		
0.0124 mm.	17.0		
0.0089 mm.	13.7		
0.0064 mm.	11.1		
0.0046 mm.	9.1		
0.0032 mm.	7.8		
0.0014 mm.	5.2		

* (no specification provided)

Material Description
Dark brown sandy silt

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 7.5058 D₈₅= 3.1003 D₆₀= 0.1618
D₅₀= 0.0607 D₃₀= 0.0245 D₁₅= 0.0104
D₁₀= 0.0054 C_u= 30.12 C_c= 0.69

Remarks
As received MC = 40.9%

Date Received: 10/5/2017 **Date Tested:** 10/10/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

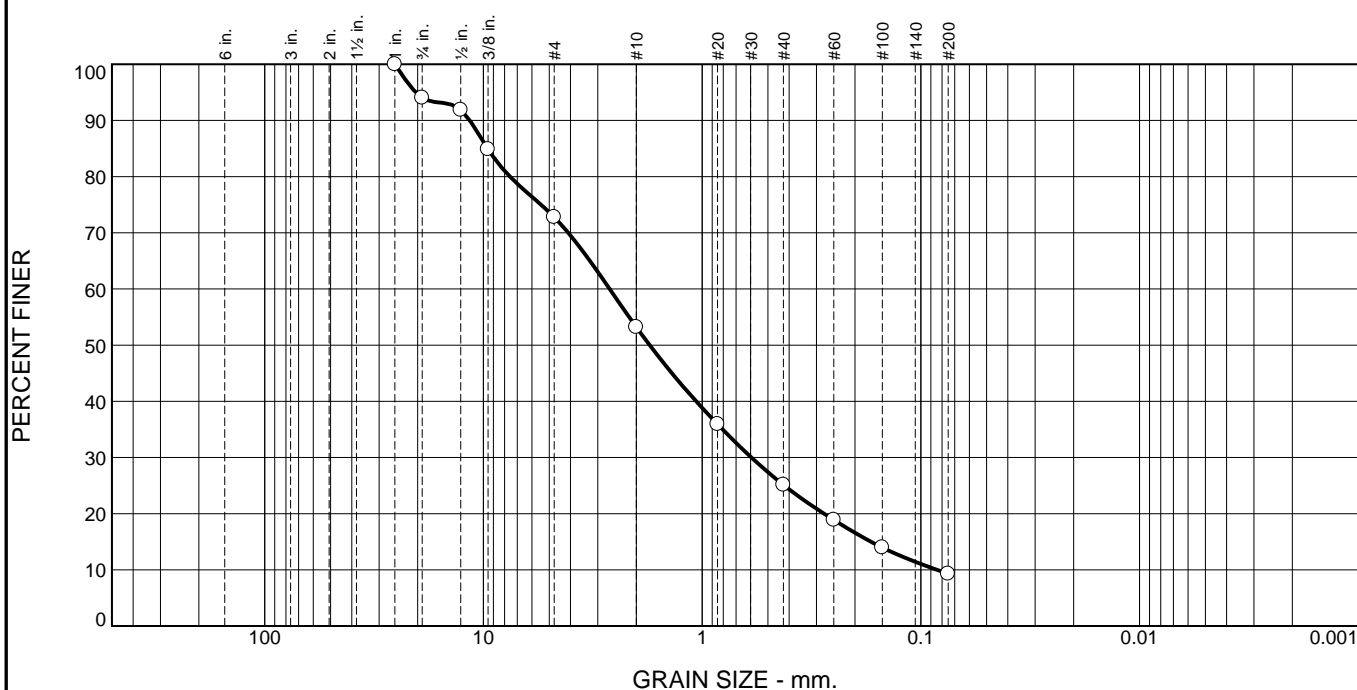
Source of Sample: B-77 **Depth:** 2-4'
Sample Number: S-2

Date Sampled: 9/11/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.0	21.2	19.6	28.1	15.8	9.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	94.0		
1/2"	91.9		
3/8"	84.9		
#4	72.8		
#10	53.2		
#20	35.9		
#40	25.1		
#60	18.9		
#100	14.0		
#200	9.3		

* (no specification provided)

Material Description
Dark brown well-graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=
Classification
 USCS (D 2487)= SW-SM AASHTO (M 145)= A-1-b
Coefficients
 D₉₀= 11.5533 D₈₅= 9.5728 D₆₀= 2.6478
 D₅₀= 1.7374 D₃₀= 0.5951 D₁₅= 0.1690
 D₁₀= 0.0843 C_u= 31.41 C_c= 1.59

Remarks
As received MC = 13.5%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

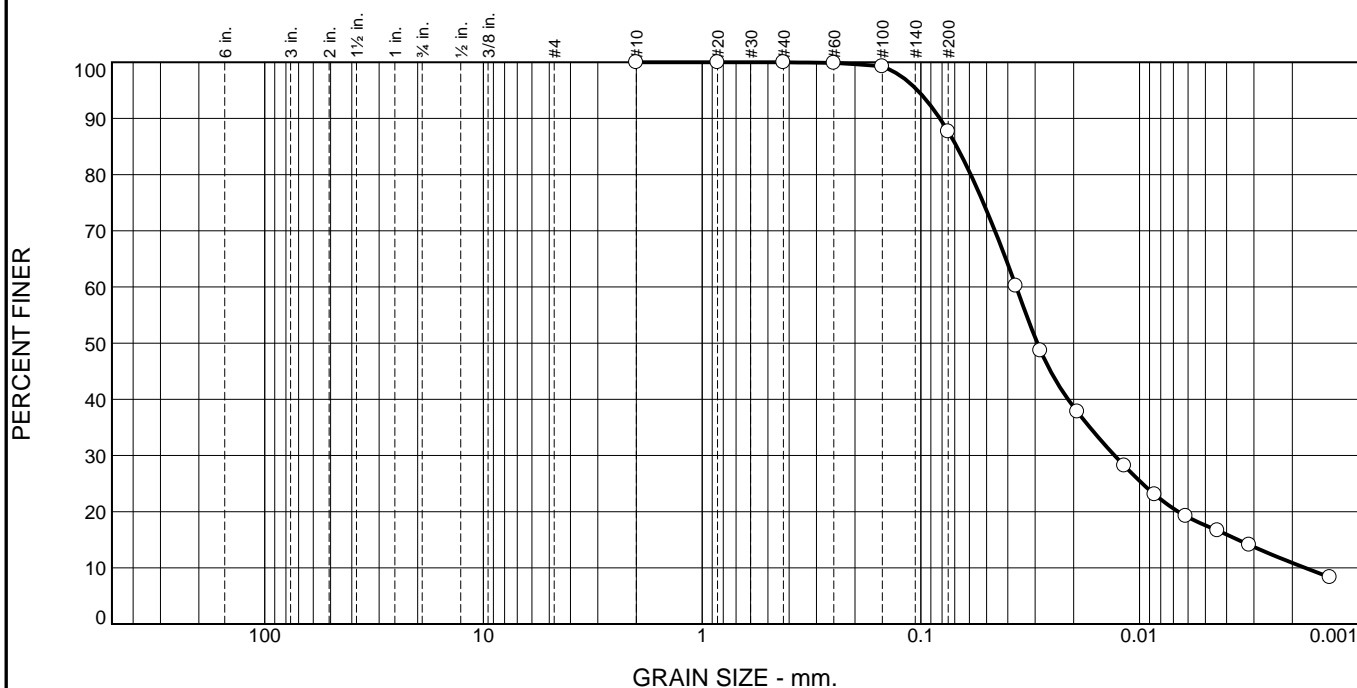
Source of Sample: B-78 **Depth:** 2-4
Sample Number: S-2

Date Sampled: 9/13/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	12.3	70.1	17.6

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	100.0		
#60	99.9		
#100	99.3		
#200	87.7		
0.036 mm.	60.2		
0.028 mm.	48.7		
0.019 mm.	37.8		
0.011 mm.	28.2		
0.008 mm.	23.1		
0.006 mm.	19.2		
0.004 mm.	16.7		
0.003 mm.	14.1		
0.001 mm.	8.3		

* (no specification provided)

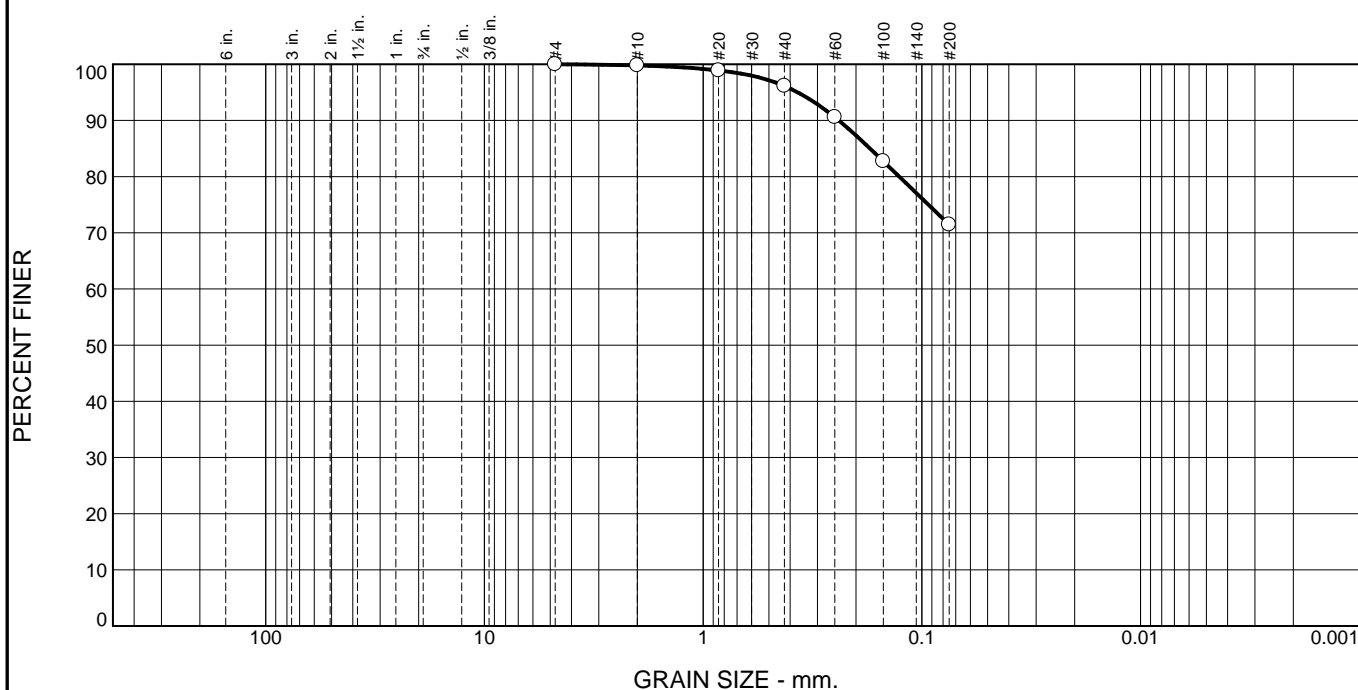
Material Description		
Brown silt		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)	
Coefficients		
D ₉₀ = 0.0818	D ₈₅ = 0.0686	D ₆₀ = 0.0366
D ₅₀ = 0.0293	D ₃₀ = 0.0130	D ₁₅ = 0.0035
D ₁₀ = 0.0017	C _u = 20.94	C _c = 2.64
Remarks		
As received MC = 21.8%		
Date Received: 10/5/2017		Date Tested: 10/10/2017
Tested By: RZ		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-78 Depth: 8-10'
Sample Number: S-5

Date Sampled: 9/13/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	3.7	24.6	71.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#20	98.9		
#40	96.1		
#60	90.6		
#100	82.7		
#200	71.5		

* (no specification provided)

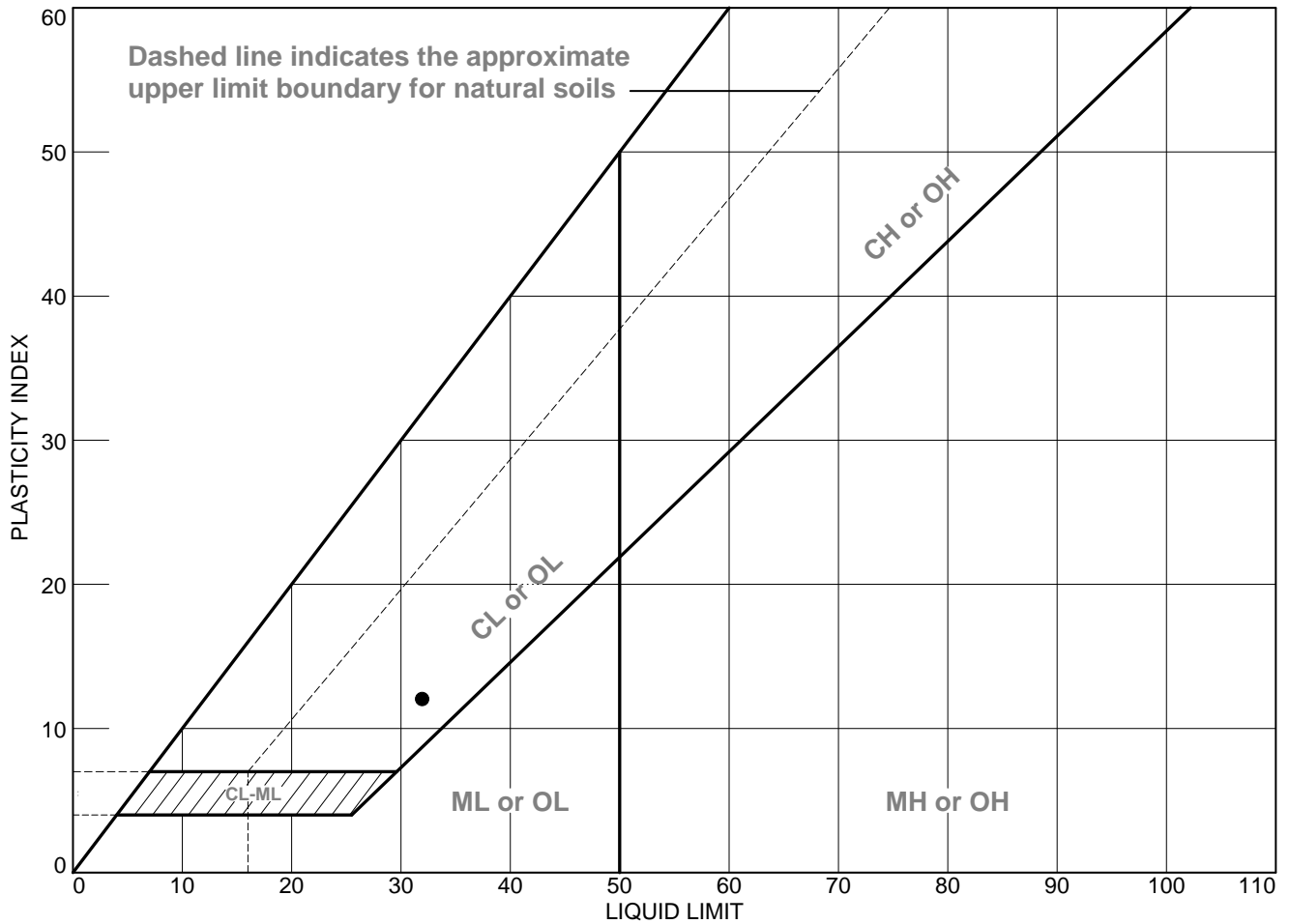
Material Description		
Gray lean clay with sand		
Atterberg Limits (ASTM D 4318)		
PL= 20	LL= 32	PI= 12
Classification		
USCS (D 2487)= CL	AASHTO (M 145)= A-6(7)	
Coefficients		
D ₉₀ = 0.2397	D ₈₅ = 0.1725	D ₆₀ =
D ₅₀ =	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 28.8%		
Date Received: 10/5/2017		Date Tested: 10/9/2017
Tested By: RZ		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-79 Depth: 14-16
Sample Number: S-6

Date Sampled: 9/14/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



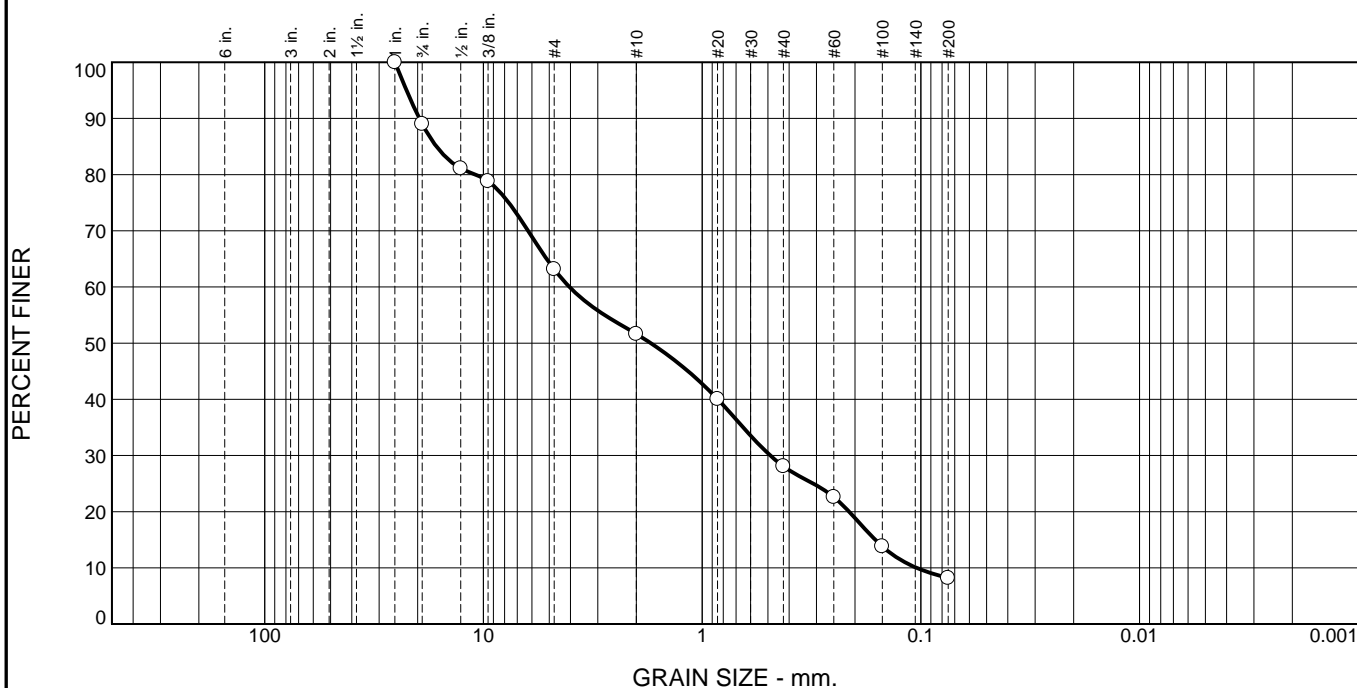
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-79	S-6	14-16	28.8	20	32	12	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No.: 101038.102170
Figure

Tested By: RZ Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.0	25.8	11.6	23.5	19.9	8.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	89.0		
1/2"	81.1		
3/8"	78.8		
#4	63.2		
#10	51.6		
#20	40.0		
#40	28.1		
#60	22.6		
#100	13.8		
#200	8.2		

* (no specification provided)

Material Description
Dark brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 19.6392 D₈₅= 16.4008 D₆₀= 4.0410
 D₅₀= 1.7172 D₃₀= 0.4882 D₁₅= 0.1615
 D₁₀= 0.1046 C_u= 38.63 C_c= 0.56

Remarks
As received MC = 8.2%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-80 **Depth:** 6-8
Sample Number: S-2

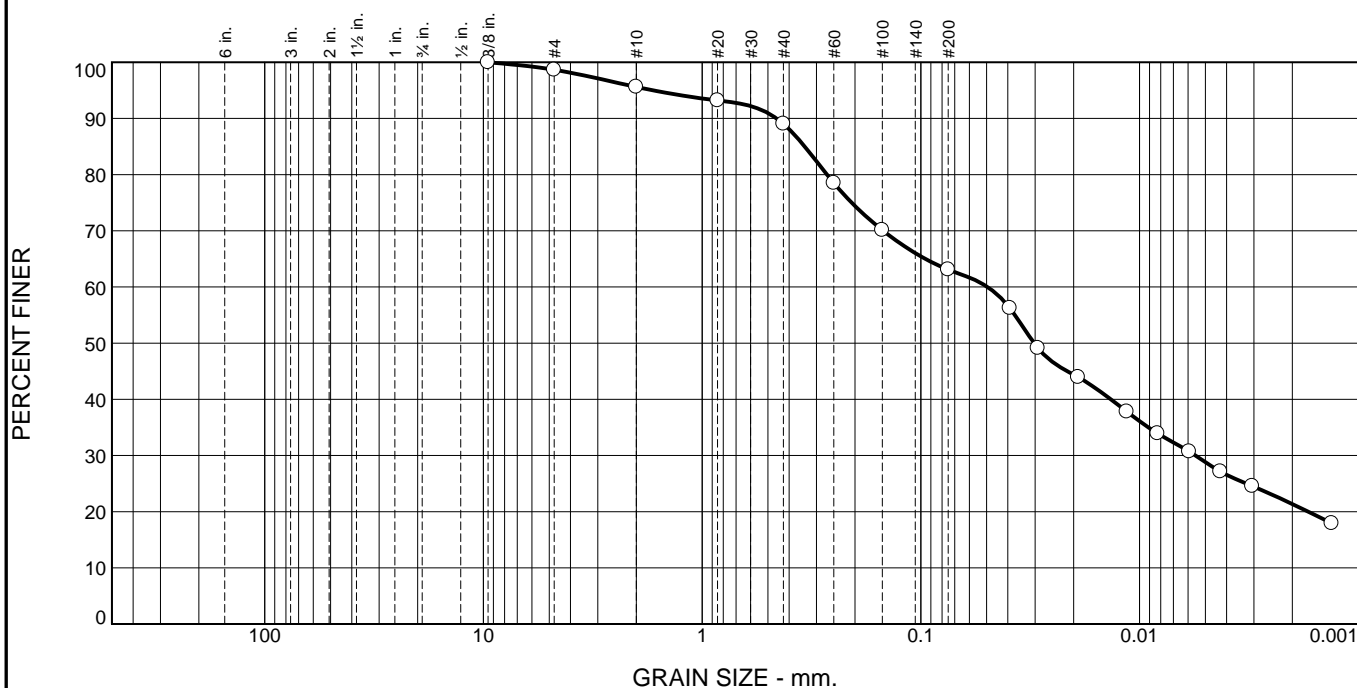
Date Sampled: 9/25/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	3.1	6.6	25.9	34.3	28.8

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	98.7		
#10	95.6		
#20	93.2		
#40	89.0		
#60	78.5		
#100	70.1		
#200	63.1		
0.0392 mm.	56.2		
0.0292 mm.	49.1		
0.0191 mm.	44.0		
0.0114 mm.	37.8		
0.0083 mm.	33.9		
0.0059 mm.	30.7		
0.0043 mm.	27.2		
0.0031 mm.	24.6		
0.0013 mm.	17.9		

* (no specification provided)

Material Description
Brown sandy silt

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 0.4567 D₈₅= 0.3396 D₆₀= 0.0495
D₅₀= 0.0303 D₃₀= 0.0056 D₁₅=
D₁₀= C_u= C_c=

Remarks
As received MC = 18.0%

Date Received: 1/31/18 **Date Tested:** 2/5/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

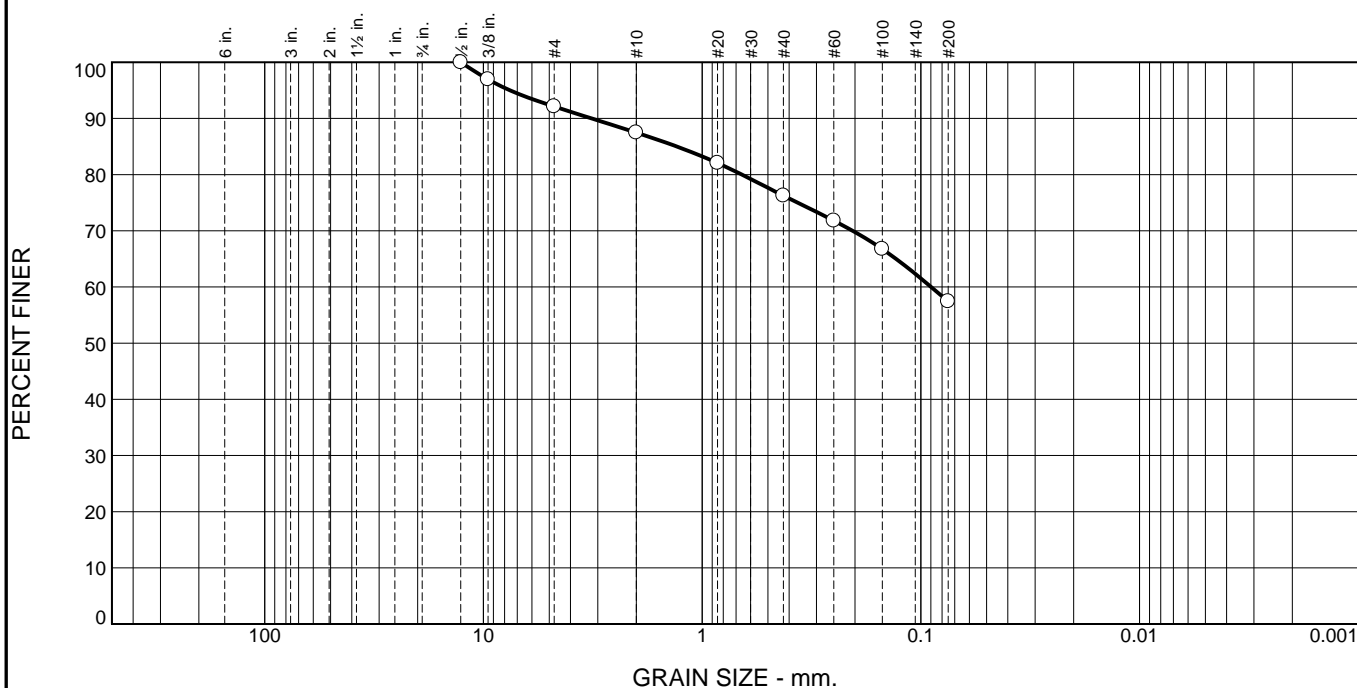
Source of Sample: B-81 **Depth:** 9.5-10'
Sample Number: S-4B

Date Sampled: 12/21/17

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.9	4.6	11.2	18.9	57.4	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	97.0		
#4	92.1		
#10	87.5		
#20	82.1		
#40	76.3		
#60	71.8		
#100	66.8		
#200	57.4		

* (no specification provided)

Material Description
Dark brown sandy silt with organics

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 3.2019 D₈₅= 1.3049 D₆₀= 0.0897
 D₅₀= D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
As received MC = 32.5%

Date Received: 1/31/18 **Date Tested:** 2/5/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-82A **Depth:** 0.3-2'
Sample Number: S-1

Date Sampled: 11/9/18

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Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-82A
Sample Number: S-1
Sample Depth (ft): 0.3-2
Sample Date: 11/9/2017

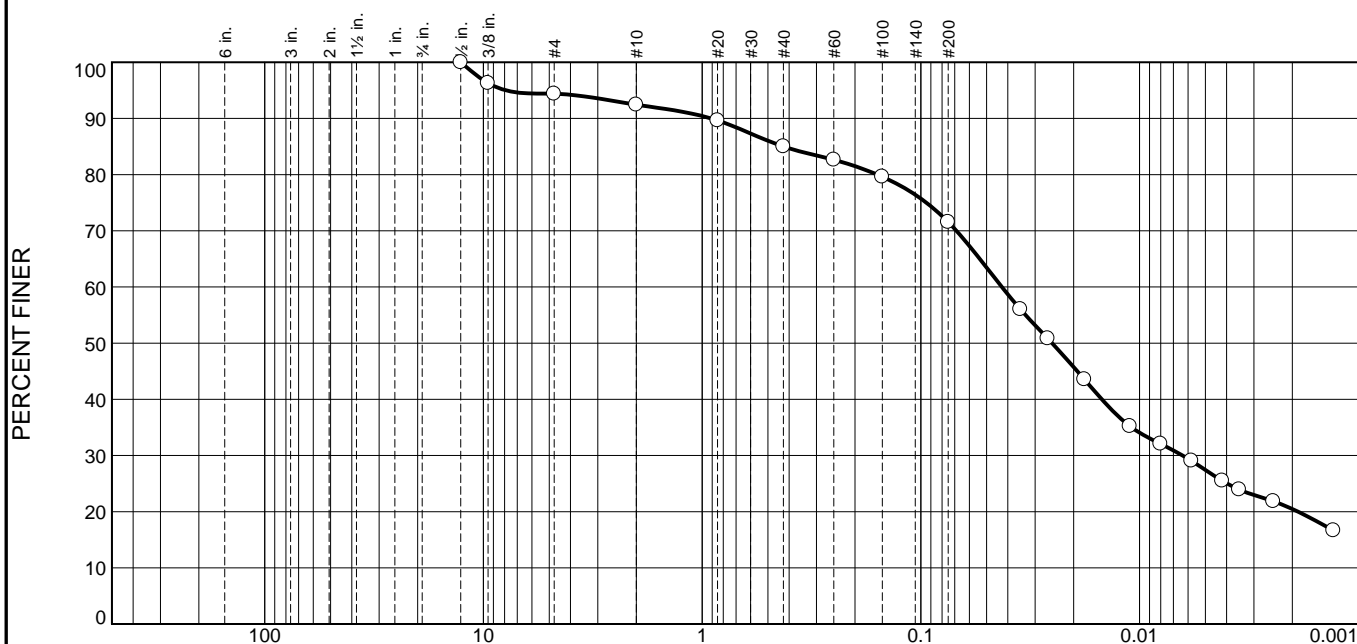
Tested By: MP
Test Date: 2/1/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.65
Wet Mass of Sample & Tin (g)	206.12
Dry Mass of Sample & Tin (g)	186.48
Mass of Water (g)	19.64
Mass of Dry Soil (g)	59.83
Moisture Content (%)	32.8

ASH CONTENT	
Porcelain Dish Mass (g)	126.65
Porcelain Dish + Oven Dried Soil (g)	186.48
Mass of Oven Dried Soil (g)	59.83
Mass of Dish & Burned Soil (g)	183.50
Mass of Burned Soil (g)	56.85
Mass of Organic Material (g)	2.98
Ash Content (%)	95.0
Organic Content (%)	5.0

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.6	2.0	7.4	13.4	44.2	27.4

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	96.3		
#4	94.4		
#10	92.4		
#20	89.6		
#40	85.0		
#60	82.6		
#100	79.6		
#200	71.6		
0.0351 mm.	56.0		
0.0263 mm.	50.8		
0.0179 mm.	43.5		
0.0111 mm.	35.2		
0.0080 mm.	32.1		
0.0058 mm.	29.1		
0.0042 mm.	25.5		
0.0035 mm.	23.9		
0.0024 mm.	21.9		
0.0013 mm.	16.7		

* (no specification provided)

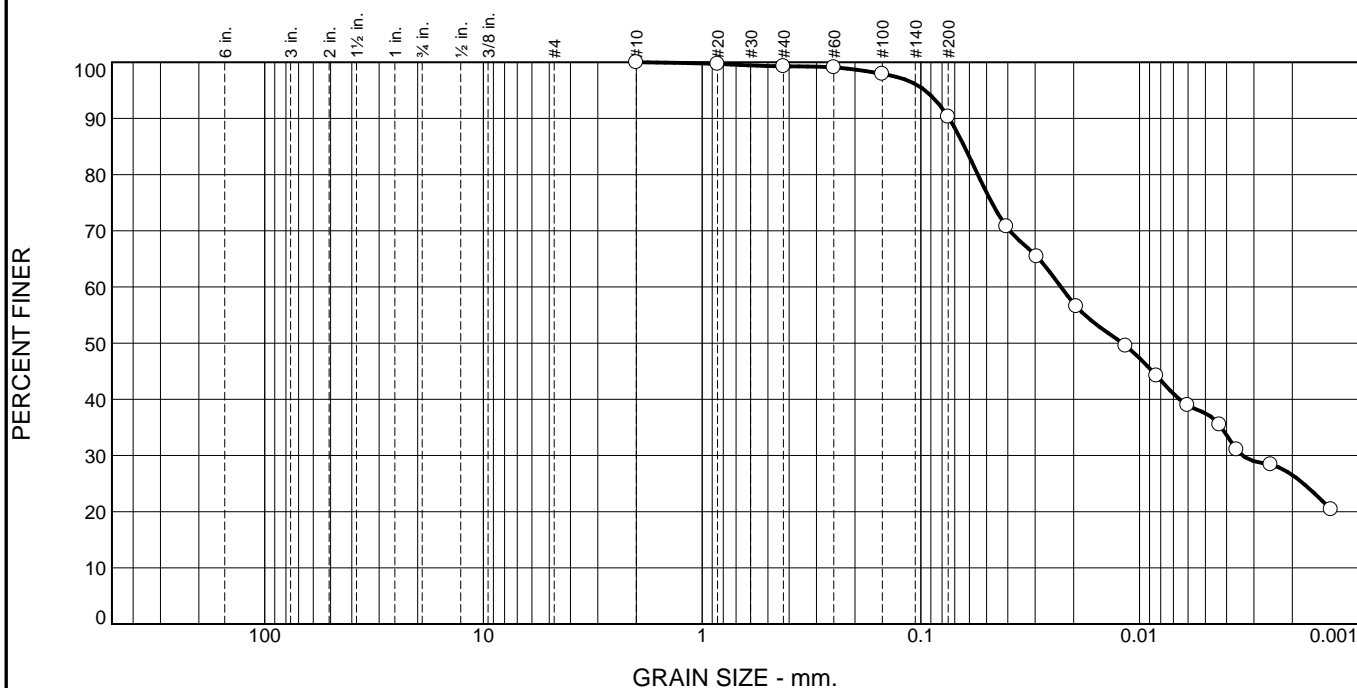
Material Description	
Brown silt with sand	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)
Coefficients	
D ₉₀ = 0.9103	D ₈₅ = 0.4245 D ₆₀ = 0.0426
D ₅₀ = 0.0251	D ₃₀ = 0.0064 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 21.3%	
Date Received: 1/31/18	Date Tested: 2/2/18
Tested By: MP/SB	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-82A Depth: 8-8.5'
Sample Number: S-5A

Date Sampled: 11/9/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	9.0	52.8	37.5

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.7		
#40	99.3		
#60	99.1		
#100	97.9		
#200	90.3		
0.0406 mm.	70.8		
0.0295 mm.	65.4		
0.0195 mm.	56.6		
0.0116 mm.	49.5		
0.0084 mm.	44.2		
0.0060 mm.	39.0		
0.0043 mm.	35.5		
0.0036 mm.	31.1		
0.0025 mm.	28.4		
0.0013 mm.	20.4		

* (no specification provided)

Material Description
Gray-brown lean clay

Atterberg Limits (ASTM D 4318)
PL= 16 LL= 28 PI= 12

Classification
USCS (D 2487)= CL AASHTO (M 145)= A-6(9)

Coefficients
D₉₀= 0.0742 D₈₅= 0.0632 D₆₀= 0.0229
D₅₀= 0.0120 D₃₀= 0.0034 D₁₅=
D₁₀= C_u= C_c=

Remarks
As received MC = 21.0%

Date Received: 1/31/18 **Date Tested:** 2/2/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

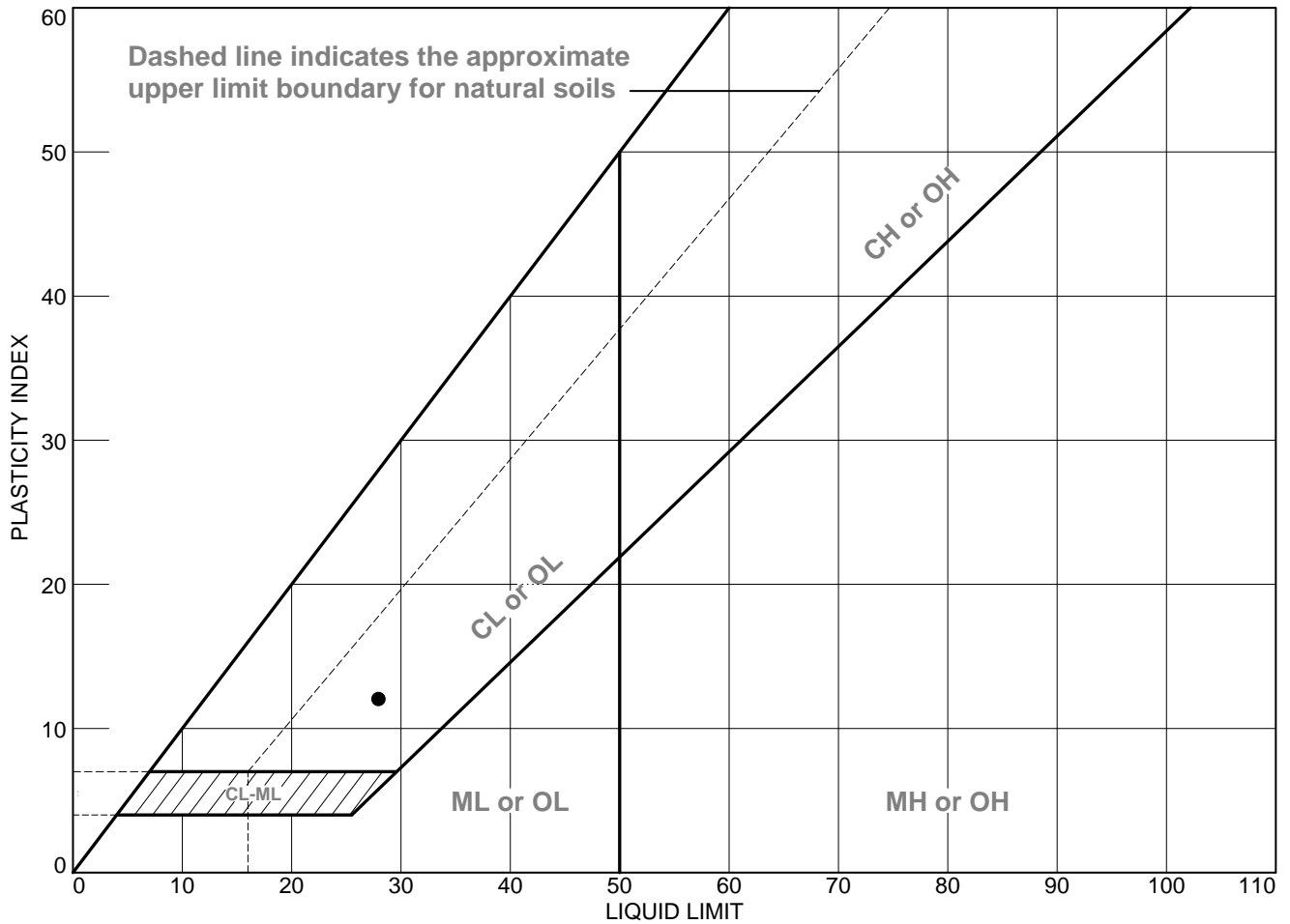
Source of Sample: B-84 **Depth:** 9-11'
Sample Number: S-5

Date Sampled: 10/2/18

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



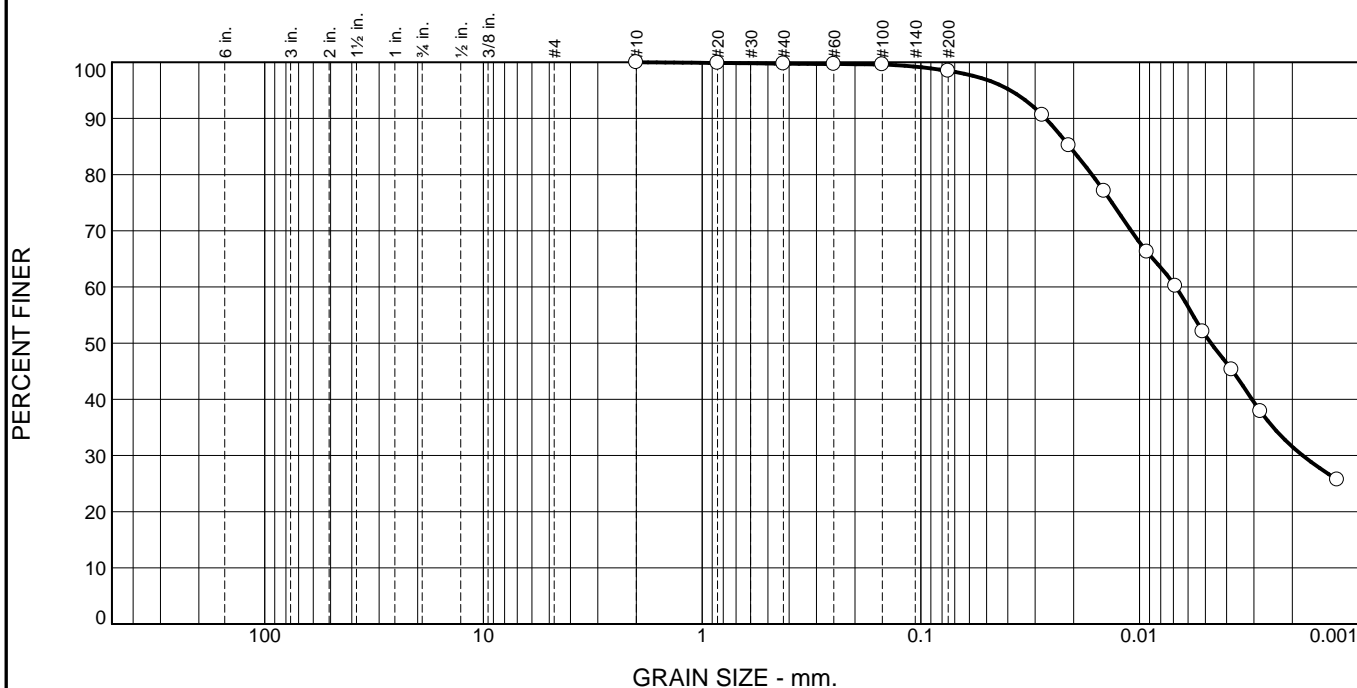
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-84	S-5	9-11'	21.0	16	28	12	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	1.3	47.1	51.4

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.7		
#100	99.6		
#200	98.5		
0.0278 mm.	90.6		
0.0211 mm.	85.2		
0.0145 mm.	77.1		
0.0093 mm.	66.3		
0.0069 mm.	60.2		
0.0051 mm.	52.1		
0.0038 mm.	45.3		
0.0028 mm.	37.9		
0.0012 mm.	25.7		

* (no specification provided)

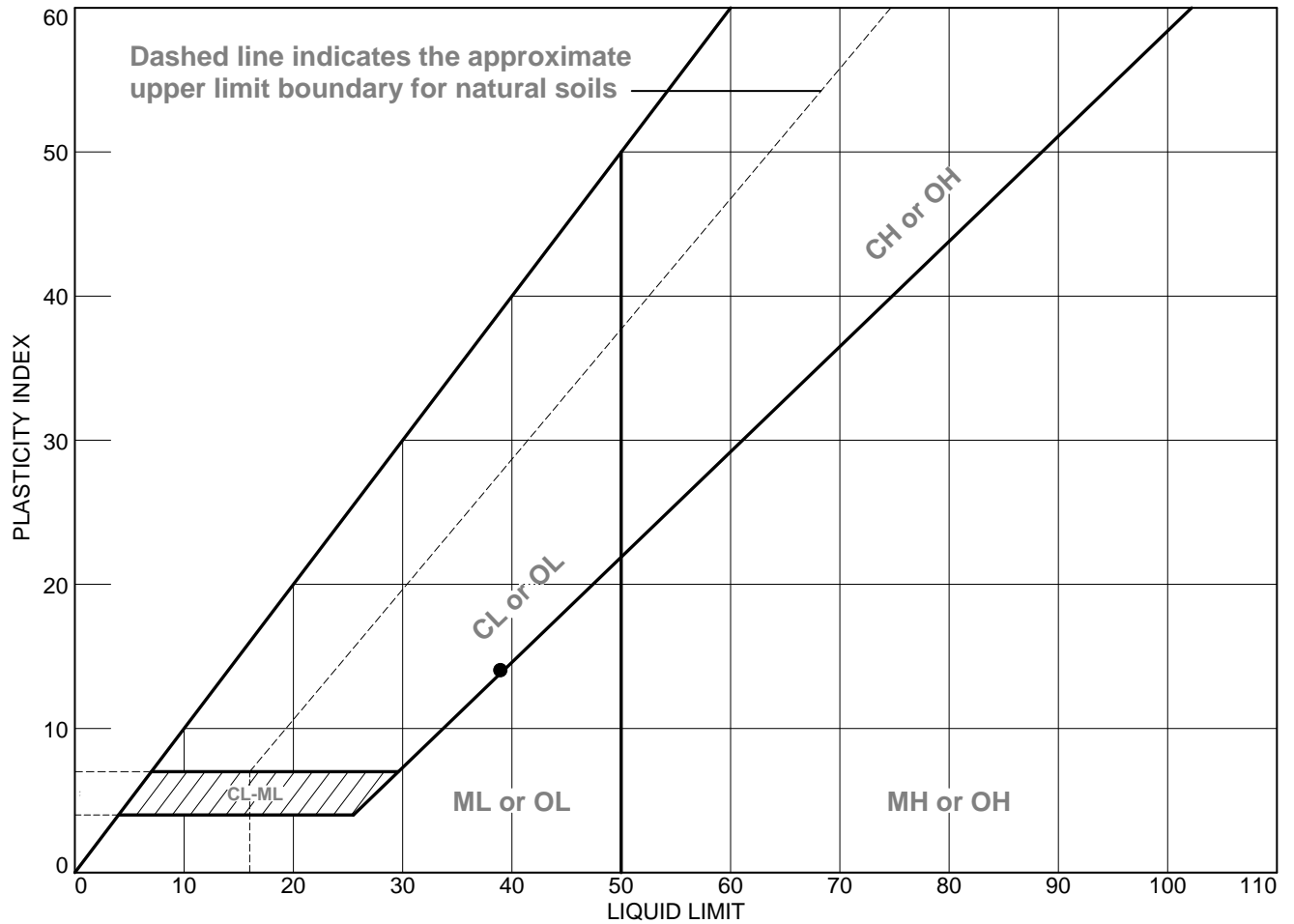
Material Description	
Gray lean clay	
Atterberg Limits (ASTM D 4318)	
PL= 25	LL= 39 PI= 14
Classification	
USCS (D 2487)= CL	AASHTO (M 145)= A-6(16)
Coefficients	
D ₉₀ = 0.0269	D ₈₅ = 0.0209 D ₆₀ = 0.0068
D ₅₀ = 0.0047	D ₃₀ = 0.0018 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 31.0%	
Date Received: 10/10/2017 Date Tested: 10/10/2017	
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-85 Depth: 14-16'
Sample Number: S-6

Date Sampled: 9/8/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



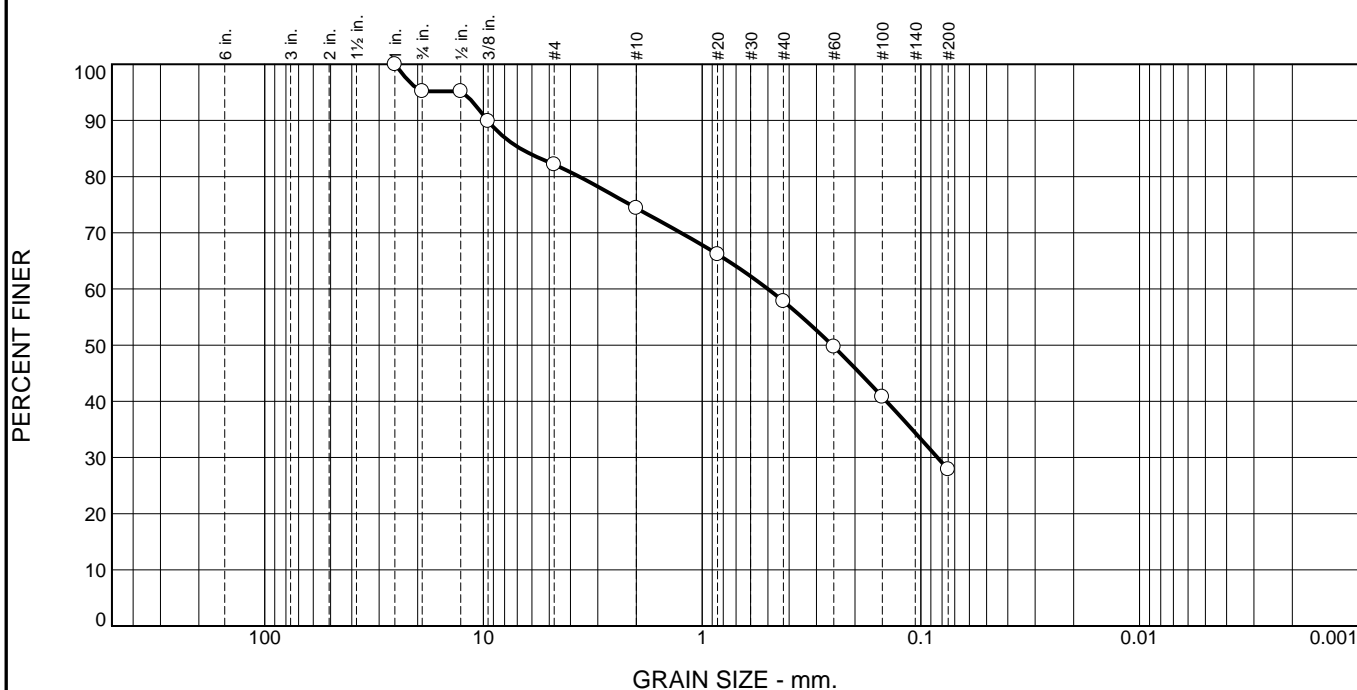
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-85	S-6	14-16'	31.0	25	39	14	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No.: 101038.102170
Figure

Tested By: RZ Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.8	13.0	7.8	16.6	29.9	27.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	95.2		
1/2"	95.2		
3/8"	89.9		
#4	82.2		
#10	74.4		
#20	66.2		
#40	57.8		
#60	49.7		
#100	40.8		
#200	27.9		

* (no specification provided)

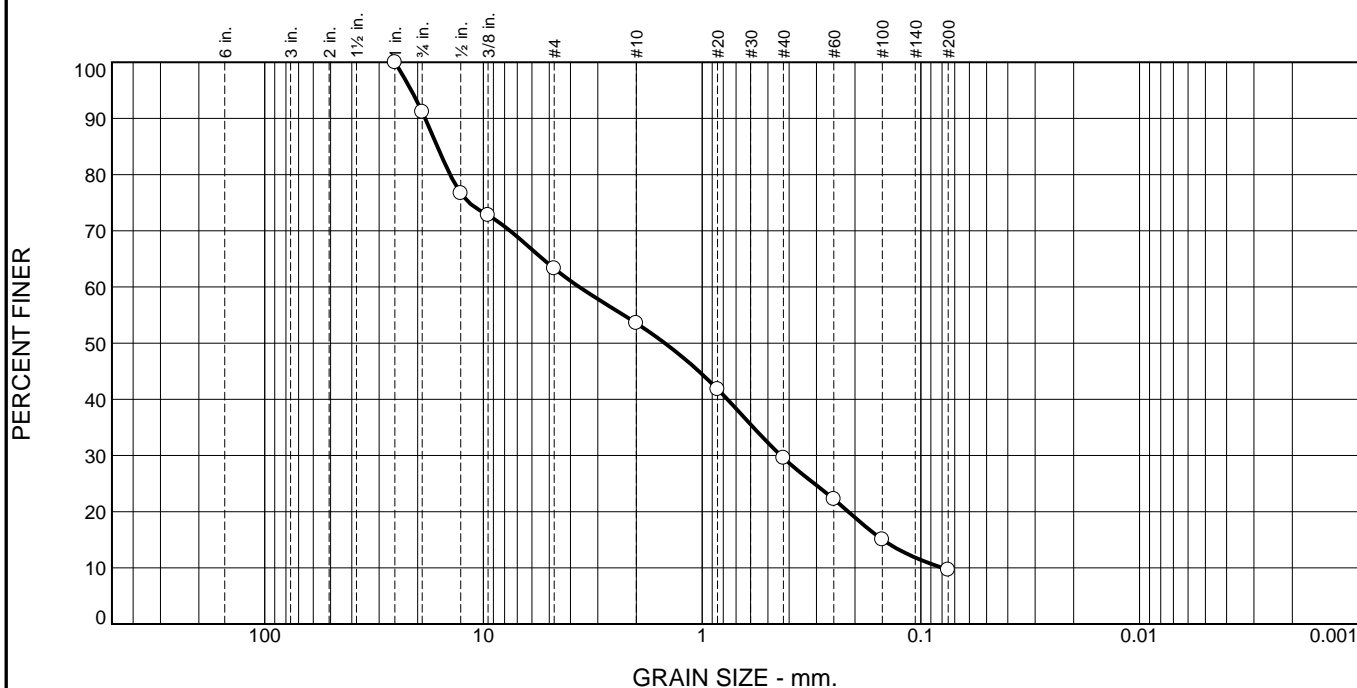
Material Description	
Dark brown silty sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-2-4(0)
Coefficients	
D ₉₀ = 9.5815	D ₈₅ = 6.7806 D ₆₀ = 0.5005
D ₅₀ = 0.2545	D ₃₀ = 0.0839 D ₁₅ =
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 30.8%	
Date Received: 10/5/2017	Date Tested: 10/9/2017
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-86 Depth: 4-6
Sample Number: S-3

Date Sampled: 9/6/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.8	27.9	9.7	24.0	19.9	9.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	91.2		
1/2"	76.7		
3/8"	72.8		
#4	63.3		
#10	53.6		
#20	41.8		
#40	29.6		
#60	22.2		
#100	15.1		
#200	9.7		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 18.4570 D₈₅= 16.2434 D₆₀= 3.6465
 D₅₀= 1.4814 D₃₀= 0.4368 D₁₅= 0.1493
 D₁₀= 0.0796 C_u= 45.81 C_c= 0.66

Remarks
As received MC = 2.4%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-87 **Depth:** 2-4
Sample Number: S-2

Date Sampled: 9/8/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-88
Sample Number: S-1
Sample Depth (ft): 0-2
Sample Date: 9/6/2017

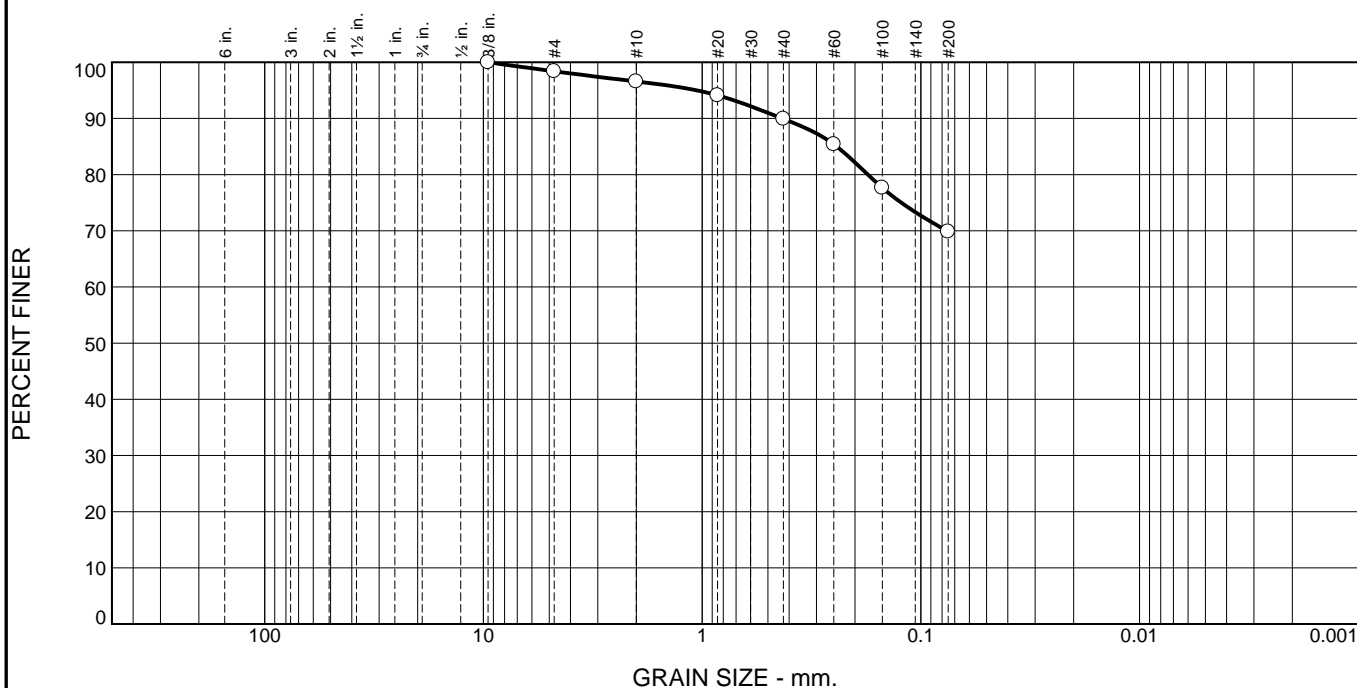
Tested By: MP
Test Date: 10/9/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.29
Wet Mass of Sample & Tin (g)	133.38
Dry Mass of Sample & Tin (g)	125.72
Mass of Water (g)	7.66
Mass of Dry Soil (g)	35.43
Moisture Content (%)	21.6

ASH CONTENT	
Porcelain Dish Mass (g)	90.29
Porcelain Dish + Oven Dried Soil (g)	125.72
Mass of Oven Dried Soil (g)	35.43
Mass of Dish & Burned Soil (g)	124.20
Mass of Burned Soil (g)	33.91
Mass of Organic Material (g)	1.52
Ash Content (%)	95.7
Organic Content (%)	4.3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	1.8	6.7	20.0	69.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	98.4		
#10	96.6		
#20	94.1		
#40	89.9		
#60	85.4		
#100	77.7		
#200	69.9		

* (no specification provided)

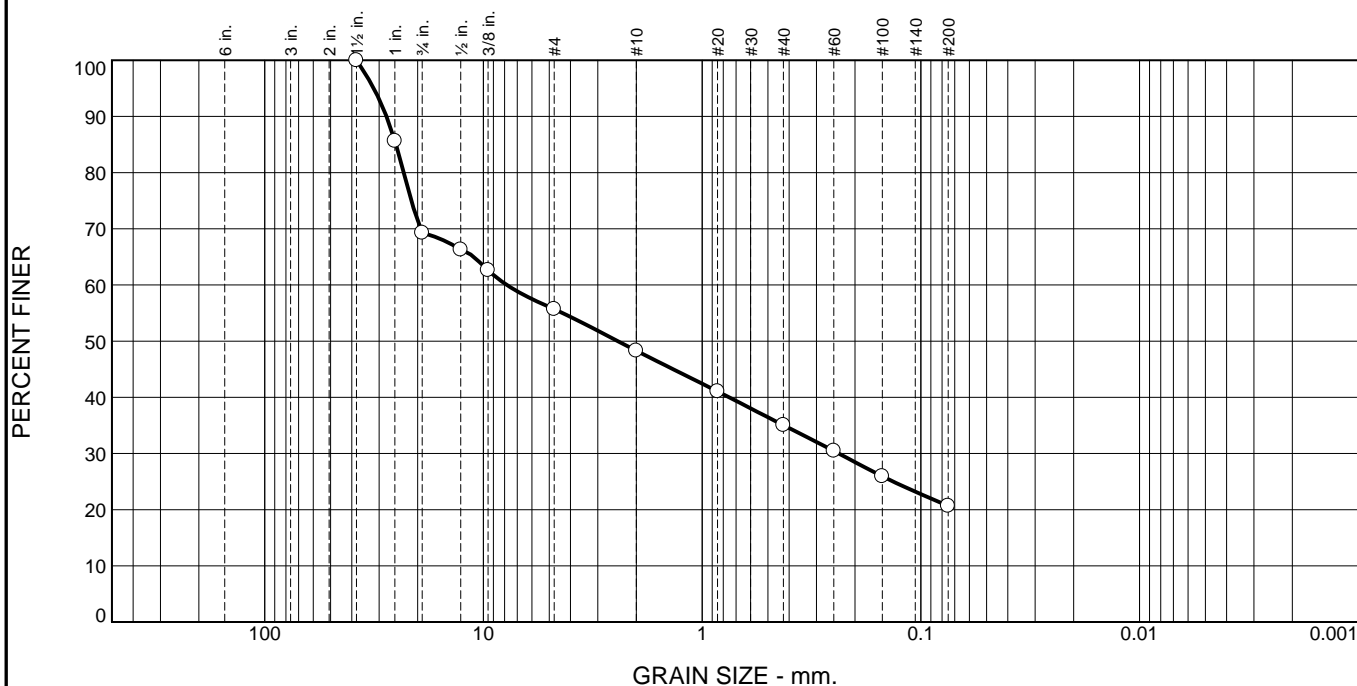
Material Description		
Brown sandy lean clay		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)= ML	AASHTO (M 145)=	A-4(0)
Coefficients		
D ₉₀ = 0.4304	D ₈₅ = 0.2425	D ₆₀ =
D ₅₀ =	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 29.0%		
Date Received: 10/5/2017		Date Tested: 10/9/2017
Tested By: RZ		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-88 Depth: 14-16'
Sample Number: S-6

Date Sampled: 9/6/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.7	13.6	7.4	13.3	14.3	20.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	85.6		
3/4"	69.3		
1/2"	66.3		
3/8"	62.6		
#4	55.7		
#10	48.3		
#20	41.1		
#40	35.0		
#60	30.5		
#100	25.9		
#200	20.7		

* (no specification provided)

Material Description

Light brown silty gravel with sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= GM AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 27.7408 D₈₅= 25.1189 D₆₀= 7.8166
D₅₀= 2.4277 D₃₀= 0.2374 D₁₅=
D₁₀= C_u= C_c=

Remarks

As received MC = 8.9%

Date Received: 10/5/2017 Date Tested: 10/9/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-89 Depth: 9-10.5
Sample Number: S-3

Date Sampled: 9/7/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-90
Sample Number: S-1
Sample Depth (ft): 0-2
Sample Date: 9/6/2017

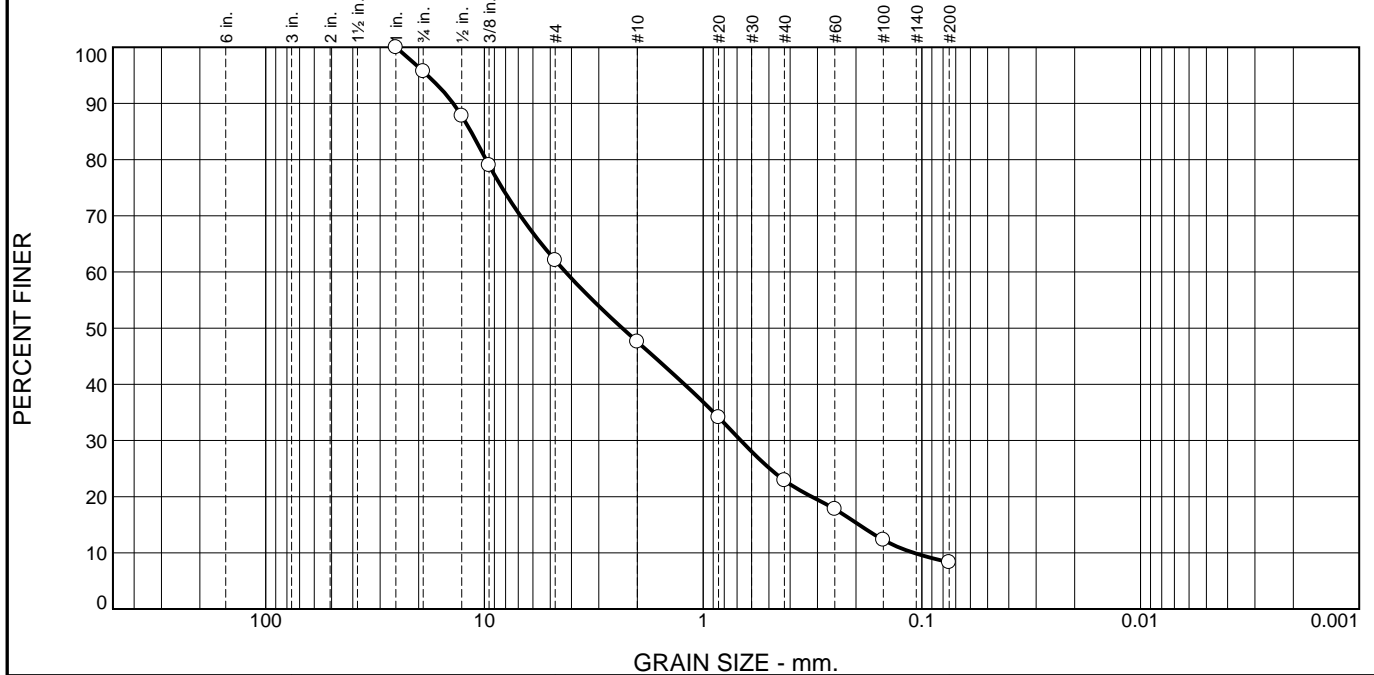
Tested By: MP
Test Date: 10/9/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.60
Wet Mass of Sample & Tin (g)	176.13
Dry Mass of Sample & Tin (g)	171.58
Mass of Water (g)	4.55
Mass of Dry Soil (g)	44.98
Moisture Content (%)	10.1

ASH CONTENT	
Porcelain Dish Mass (g)	126.60
Porcelain Dish + Oven Dried Soil (g)	171.58
Mass of Oven Dried Soil (g)	44.98
Mass of Dish & Burned Soil (g)	169.60
Mass of Burned Soil (g)	43.00
Mass of Organic Material (g)	1.98
Ash Content (%)	95.6
Organic Content (%)	4.4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.3	33.6	14.5	24.7	14.6	8.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	95.7		
1/2"	87.8		
3/8"	79.0		
#4	62.1		
#10	47.6		
#20	34.1		
#40	22.9		
#60	17.8		
#100	12.3		
#200	8.3		

* (no specification provided)

Material Description
Brown gray poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-a

Coefficients
 D₉₀= 13.8932 D₈₅= 11.5293 D₆₀= 4.2564
 D₅₀= 2.3420 D₃₀= 0.6720 D₁₅= 0.1936
 D₁₀= 0.1088 C_u= 39.12 C_c= 0.97

Remarks
As received MC = 7.5%

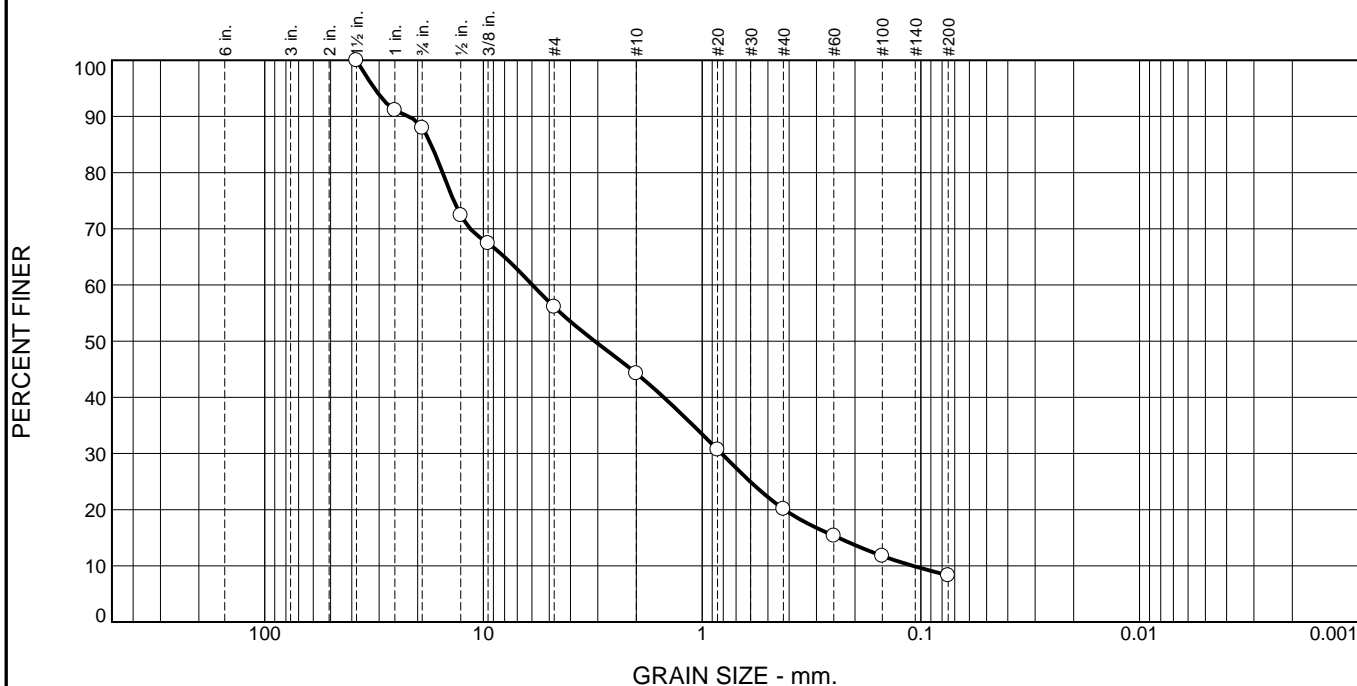
Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-90 **Depth:** 4-4.8'
Sample Number: S-3

Date Sampled: 9/1/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.0	31.9	11.8	24.2	11.8	8.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.1		
3/4"	88.0		
1/2"	72.4		
3/8"	67.4		
#4	56.1		
#10	44.3		
#20	30.7		
#40	20.1		
#60	15.4		
#100	11.8		
#200	8.3		

* (no specification provided)

Material Description
Brown well-graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SW-SM AASHTO (M 145)= A-1-a

Coefficients
D₉₀= 21.9441 D₈₅= 17.3383 D₆₀= 5.9677
D₅₀= 3.0977 D₃₀= 0.8160 D₁₅= 0.2385
D₁₀= 0.1086 C_u= 54.94 C_c= 1.03

Remarks
As received MC = 8.6%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

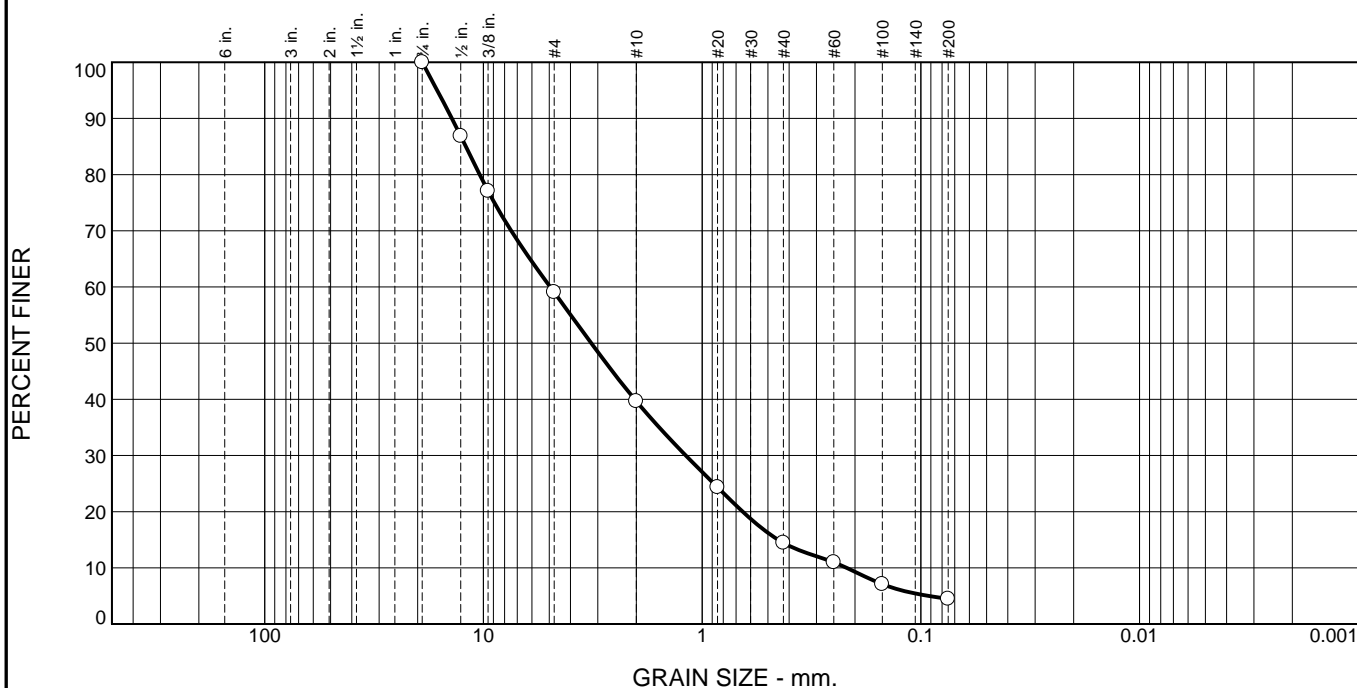
Source of Sample: B-91 **Depth:** 5-7'
Sample Number: S-1

Date Sampled: 9/1/2017

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Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	40.9	19.4	25.3	9.9	4.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	86.9		
3/8"	77.1		
#4	59.1		
#10	39.7		
#20	24.3		
#40	14.4		
#60	11.0		
#100	7.1		
#200	4.5		

* (no specification provided)

Material Description

Brown gray well-graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SW AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 13.9461 D₈₅= 12.0306 D₆₀= 4.9471
D₅₀= 3.2134 D₃₀= 1.1875 D₁₅= 0.4499
D₁₀= 0.2186 C_u= 22.63 C_c= 1.30

Remarks

As received MC = 8.2%

Date Received: 10/5/2017 Date Tested: 10/9/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

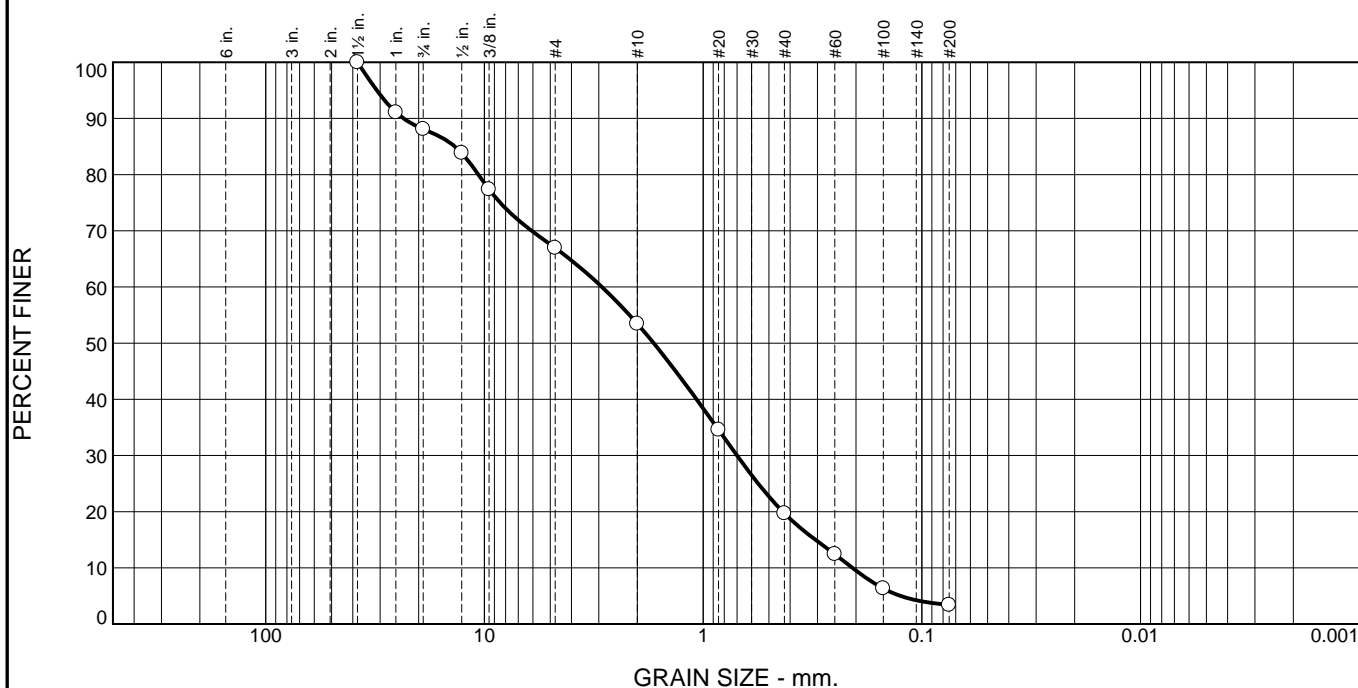
Source of Sample: B-92 Depth: 5-7'
Sample Number: S-1

Date Sampled: 9/5/2017

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Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.9	21.1	13.5	33.8	16.3	3.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	91.1		
3/4"	88.1		
1/2"	83.8		
3/8"	77.4		
#4	67.0		
#10	53.5		
#20	34.6		
#40	19.7		
#60	12.4		
#100	6.3		
#200	3.4		

* (no specification provided)

Material Description

Brown poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 23.4655 D₈₅= 13.6386 D₆₀= 2.9040
D₅₀= 1.6834 D₃₀= 0.6999 D₁₅= 0.3065
D₁₀= 0.2075 C_u= 14.00 C_c= 0.81

Remarks

As received MC = 3.9%

Date Received: 10/5/2017 Date Tested: 10/9/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

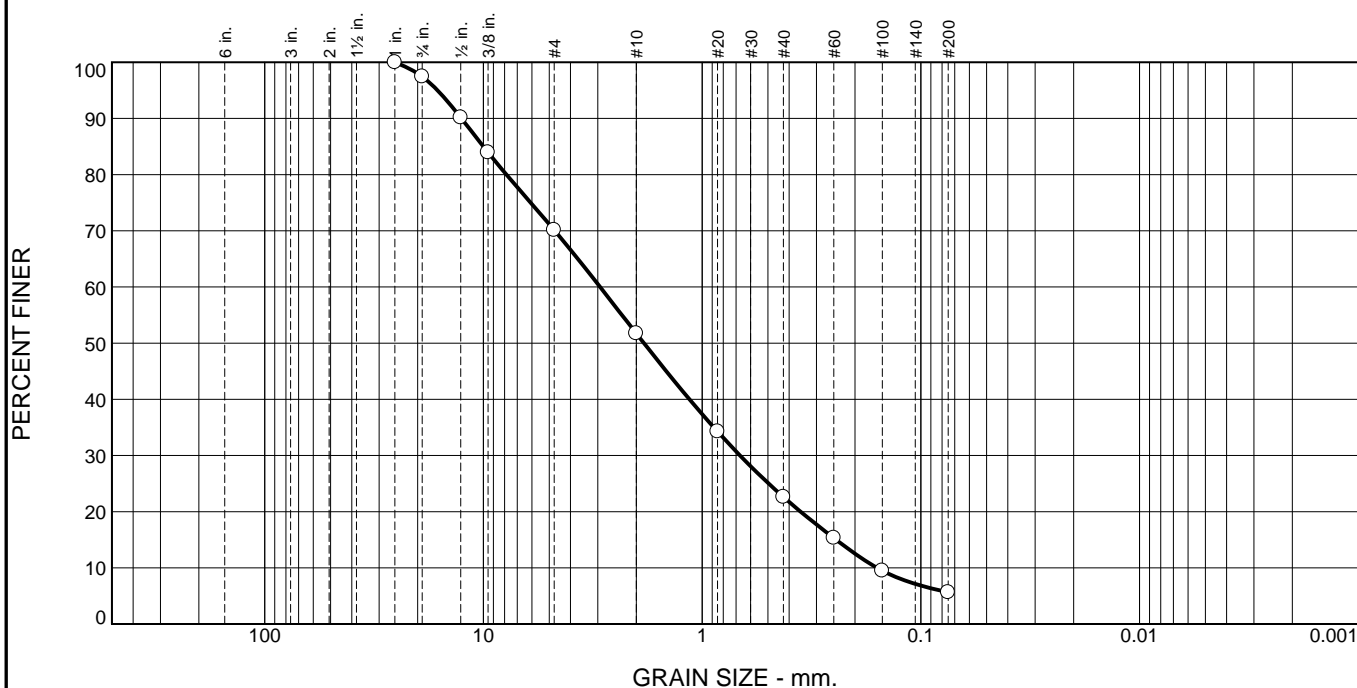
Source of Sample: B-93 Depth: 2-4'
Sample Number: S-2

Date Sampled: 9/5/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.5	27.4	18.4	29.1	17.0	5.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	97.5		
1/2"	90.2		
3/8"	84.0		
#4	70.1		
#10	51.7		
#20	34.3		
#40	22.6		
#60	15.3		
#100	9.5		
#200	5.6		

* (no specification provided)

Material Description
Brown gray poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 12.6098 D₈₅= 10.0041 D₆₀= 2.9292
 D₅₀= 1.8454 D₃₀= 0.6710 D₁₅= 0.2439
 D₁₀= 0.1585 C_u= 18.48 C_c= 0.97

Remarks
As received MC = 12.6%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-94 **Depth:** 4-5.3'
Sample Number: S-3

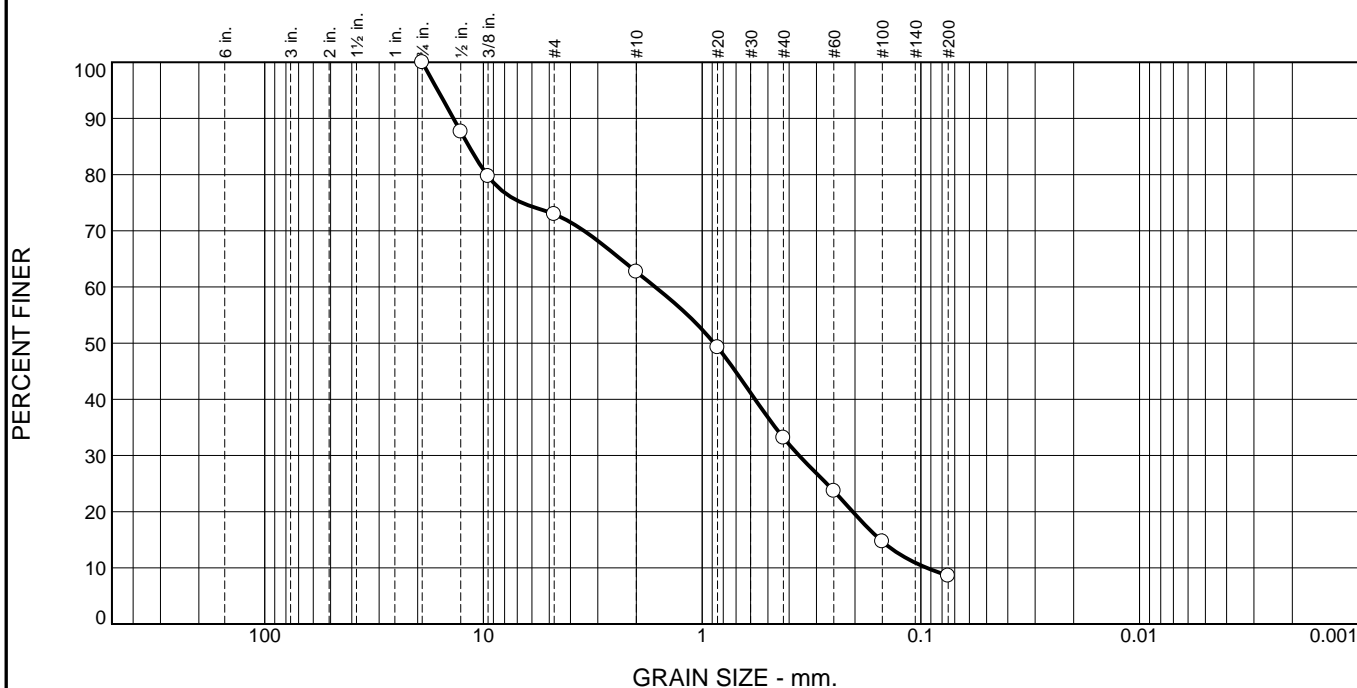
Date Sampled: 8/30/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	27.0	10.3	29.5	24.6	8.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	87.6		
3/8"	79.7		
#4	73.0		
#10	62.7		
#20	49.3		
#40	33.2		
#60	23.7		
#100	14.7		
#200	8.6		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 13.7196 D₈₅= 11.6339 D₆₀= 1.6396
 D₅₀= 0.8814 D₃₀= 0.3605 D₁₅= 0.1532
 D₁₀= 0.0939 C_u= 17.47 C_c= 0.84

Remarks
As received MC = 4.8%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-95 **Depth:** 2-4'
Sample Number: S-2

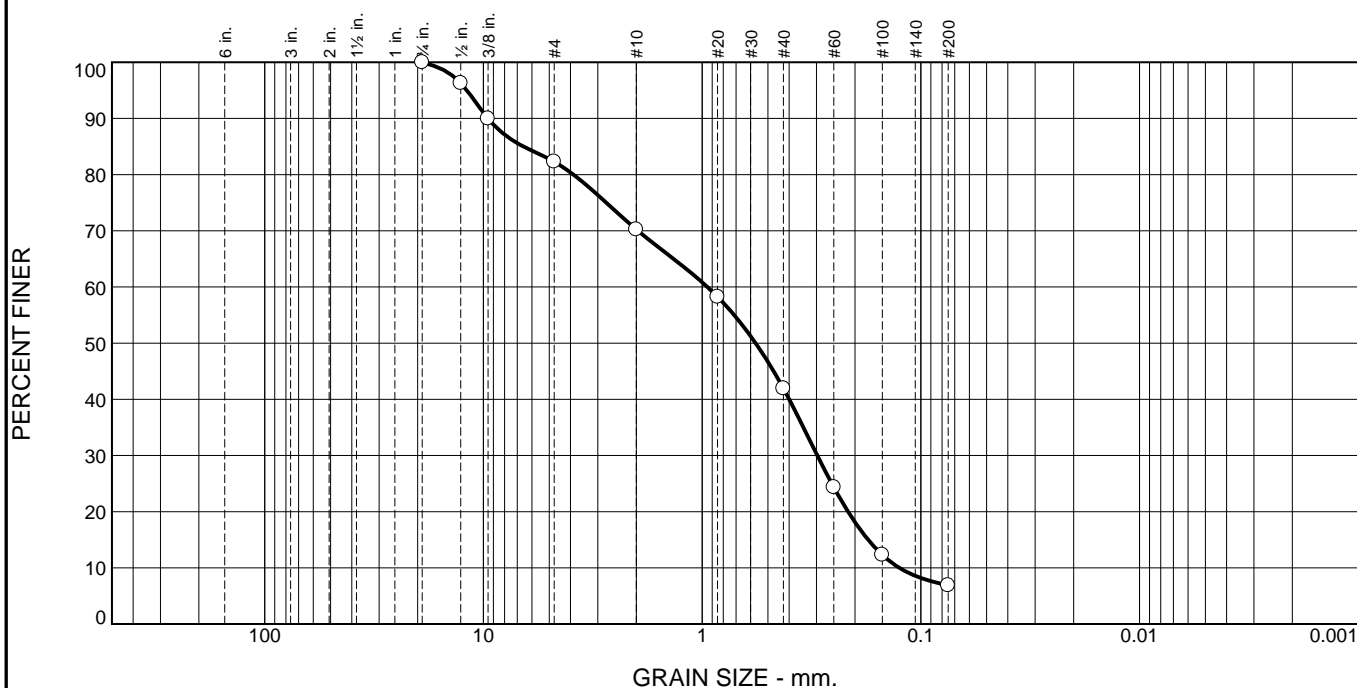
Date Sampled: 8/28/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	17.7	12.1	28.3	35.0	6.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	96.3		
3/8"	90.0		
#4	82.3		
#10	70.2		
#20	58.2		
#40	41.9		
#60	24.3		
#100	12.3		
#200	6.9		

* (no specification provided)

Material Description
Light brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 9.5364 D₈₅= 6.5604 D₆₀= 0.9469
 D₅₀= 0.5693 D₃₀= 0.2974 D₁₅= 0.1741
 D₁₀= 0.1254 C_u= 7.55 C_c= 0.75

Remarks
As received MC = 4.2%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-96 **Depth:** 4-6'
Sample Number: S-3

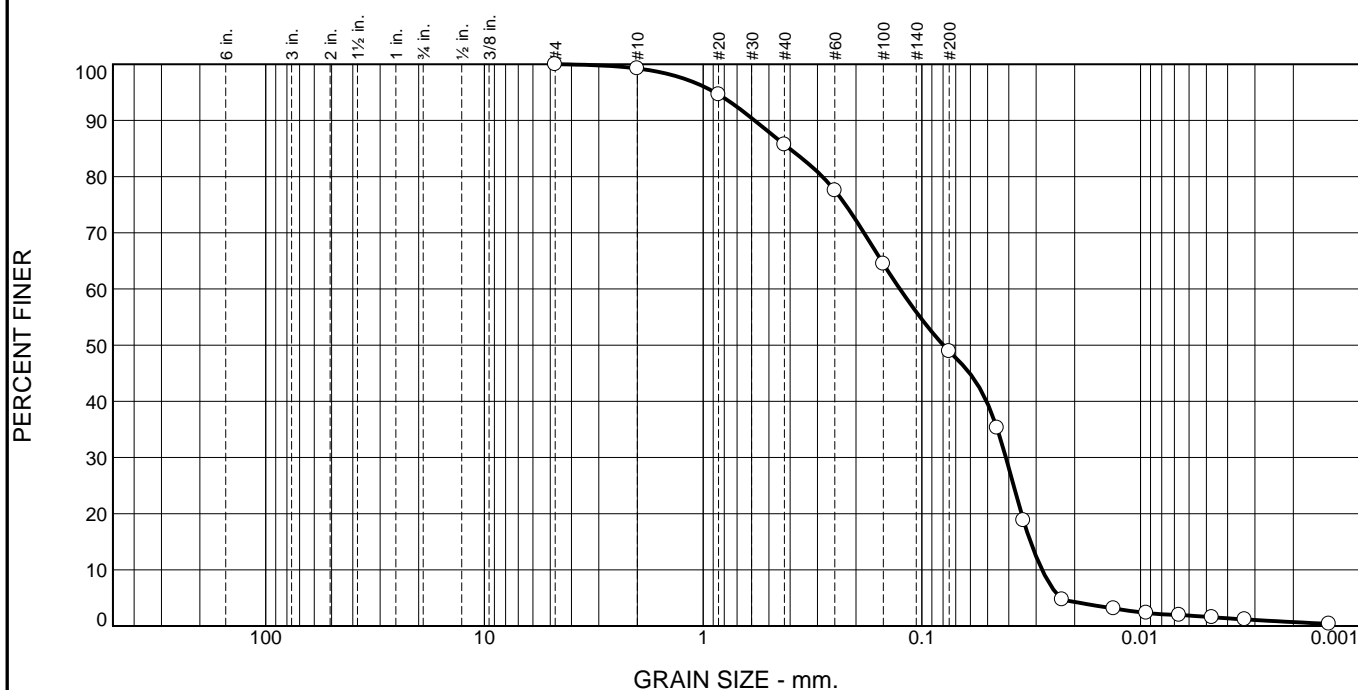
Date Sampled: 8/29/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	13.5	36.8	47.3	1.6

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.2		
#20	94.6		
#40	85.7		
#60	77.5		
#100	64.5		
#200	48.9		
0.0453 mm.	35.3		
0.0343 mm.	18.8		
0.0229 mm.	4.7		
0.0133 mm.	3.1		
0.0094 mm.	2.4		
0.0067 mm.	2.0		
0.0047 mm.	1.6		
0.0033 mm.	1.2		
0.0014 mm.	0.4		

* (no specification provided)

Material Description
Red-brown silty sand

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
D₉₀= 0.5815 D₈₅= 0.4029 D₆₀= 0.1260
D₅₀= 0.0796 D₃₀= 0.0412 D₁₅= 0.0319
D₁₀= 0.0282 C_u= 4.47 C_c= 0.48

Remarks
As received MC = 25.9%

Date Received: 10/5/2017 **Date Tested:** 10/10/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

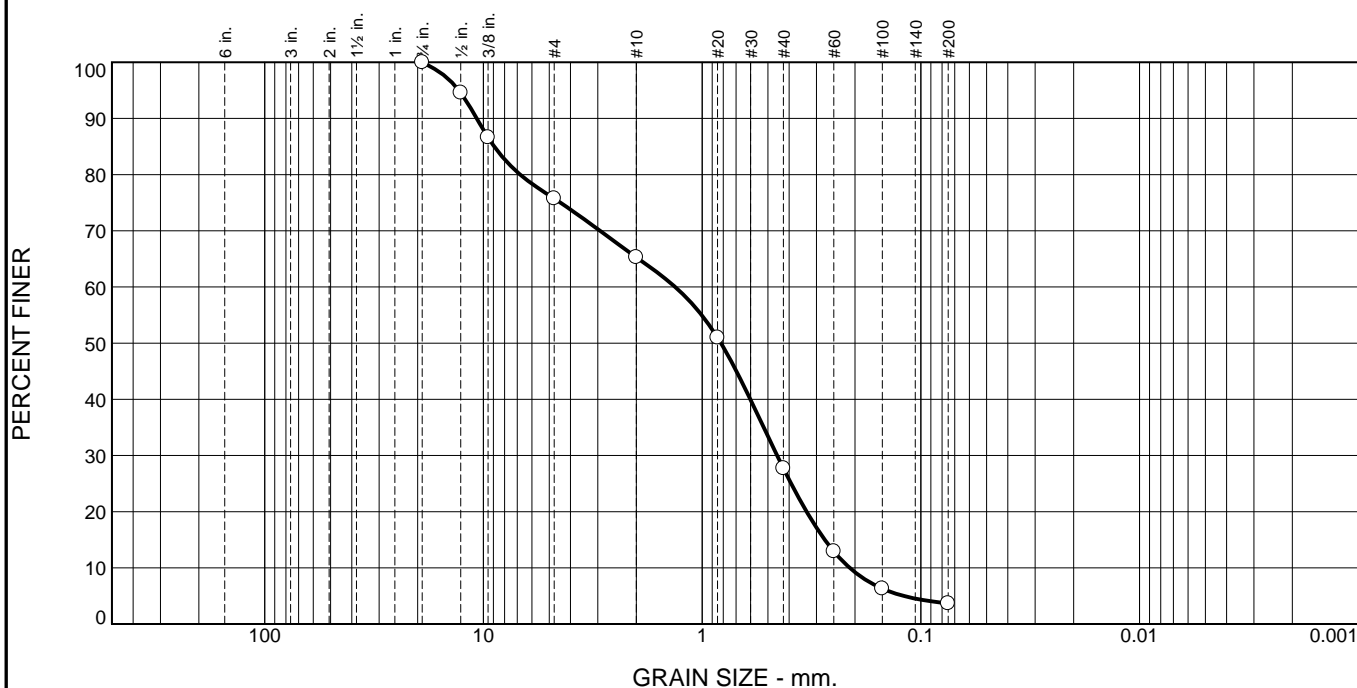
Source of Sample: B-97 **Depth:** 0.5-2'
Sample Number: S-1 (Bottom 6')

Date Sampled: 8/30/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	24.3	10.4	37.6	24.0	3.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	94.6		
3/8"	86.6		
#4	75.7		
#10	65.3		
#20	51.0		
#40	27.7		
#60	12.9		
#100	6.3		
#200	3.7		

* (no specification provided)

Material Description

Light brown poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 10.7328 D₈₅= 8.9223 D₆₀= 1.3283
D₅₀= 0.8203 D₃₀= 0.4541 D₁₅= 0.2750
D₁₀= 0.2114 C_u= 6.28 C_c= 0.73

Remarks

As received MC = 3.8%

Date Received: 10/5/2017 Date Tested: 10/9/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

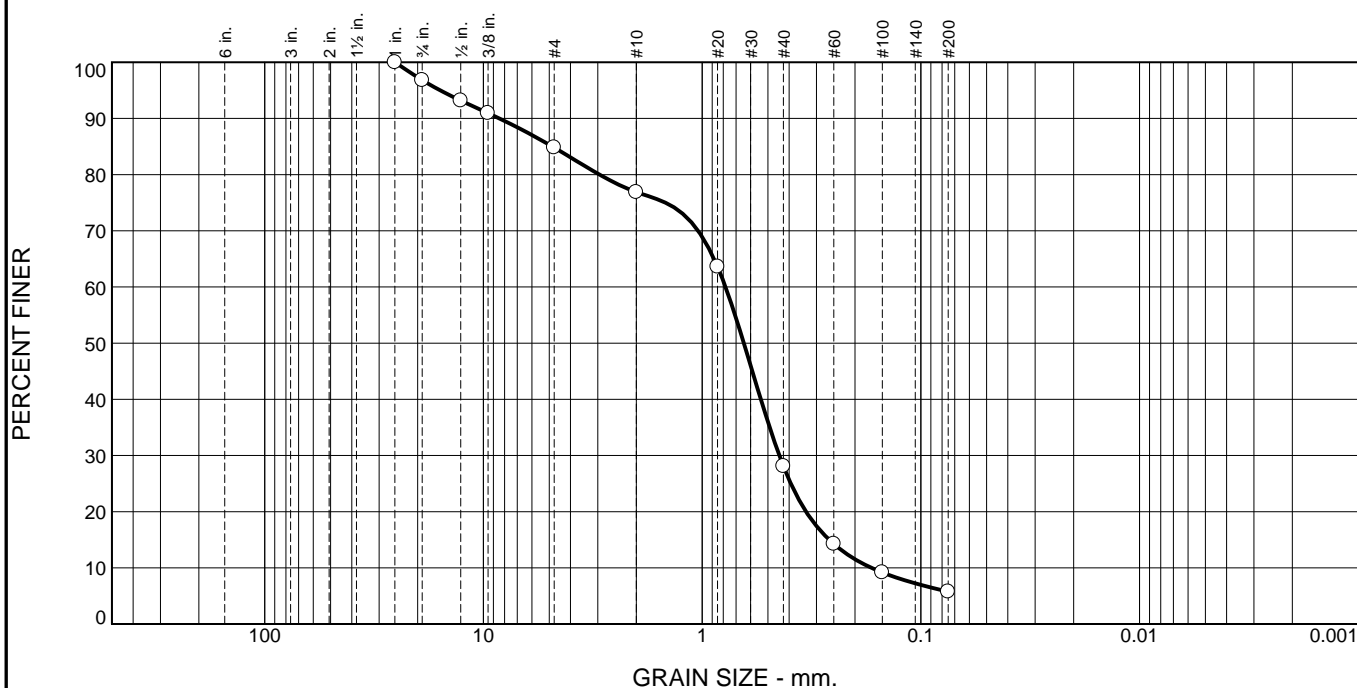
Source of Sample: B-97 Depth: 8-10'
Sample Number: S-5

Date Sampled: 8/30/2017

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.2	12.0	7.9	48.8	22.3	5.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	96.8		
1/2"	93.2		
3/8"	90.9		
#4	84.8		
#10	76.9		
#20	63.6		
#40	28.1		
#60	14.3		
#100	9.2		
#200	5.8		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 8.4630 D₈₅= 4.8376 D₆₀= 0.7820
 D₅₀= 0.6444 D₃₀= 0.4436 D₁₅= 0.2624
 D₁₀= 0.1682 C_u= 4.65 C_c= 1.50

Remarks
As received MC = 13.1%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-98 **Depth:** 5-7'
Sample Number: S-1

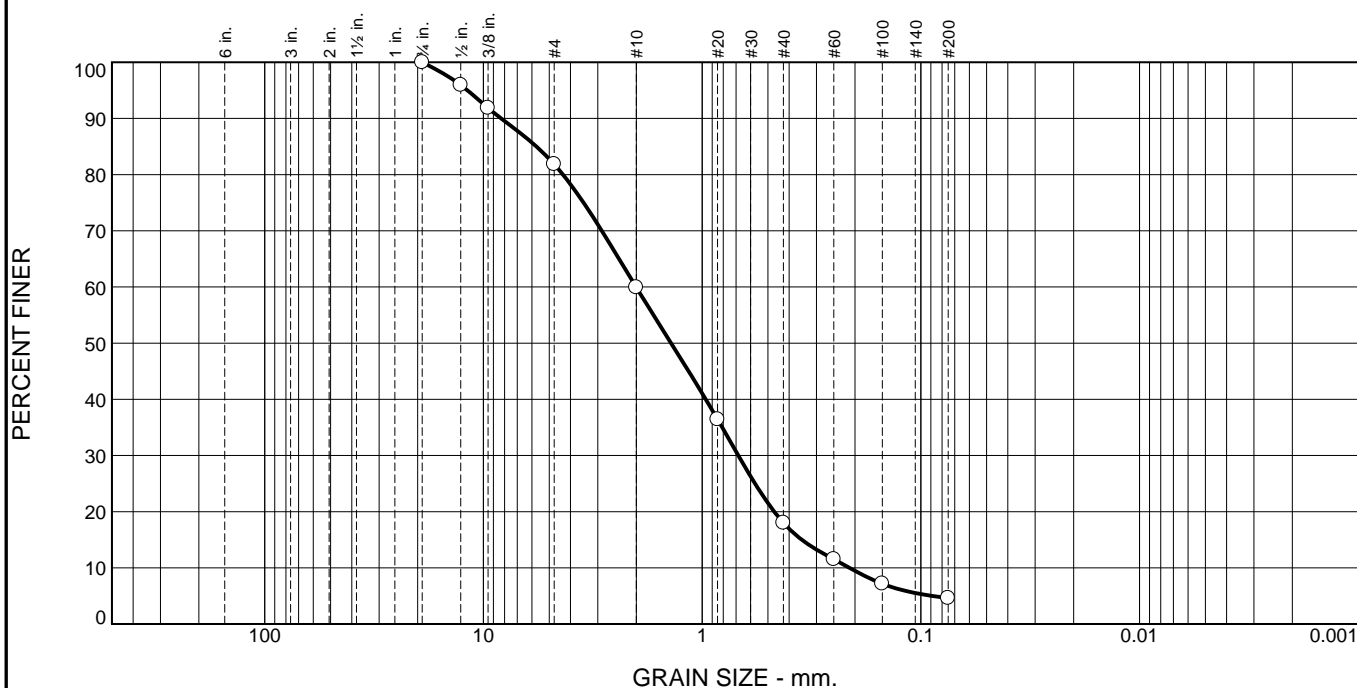
Date Sampled: 8/31/2017

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	18.1	22.0	41.9	13.4	4.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	95.9		
3/8"	91.9		
#4	81.9		
#10	59.9		
#20	36.4		
#40	18.0		
#60	11.5		
#100	7.2		
#200	4.6		

* (no specification provided)

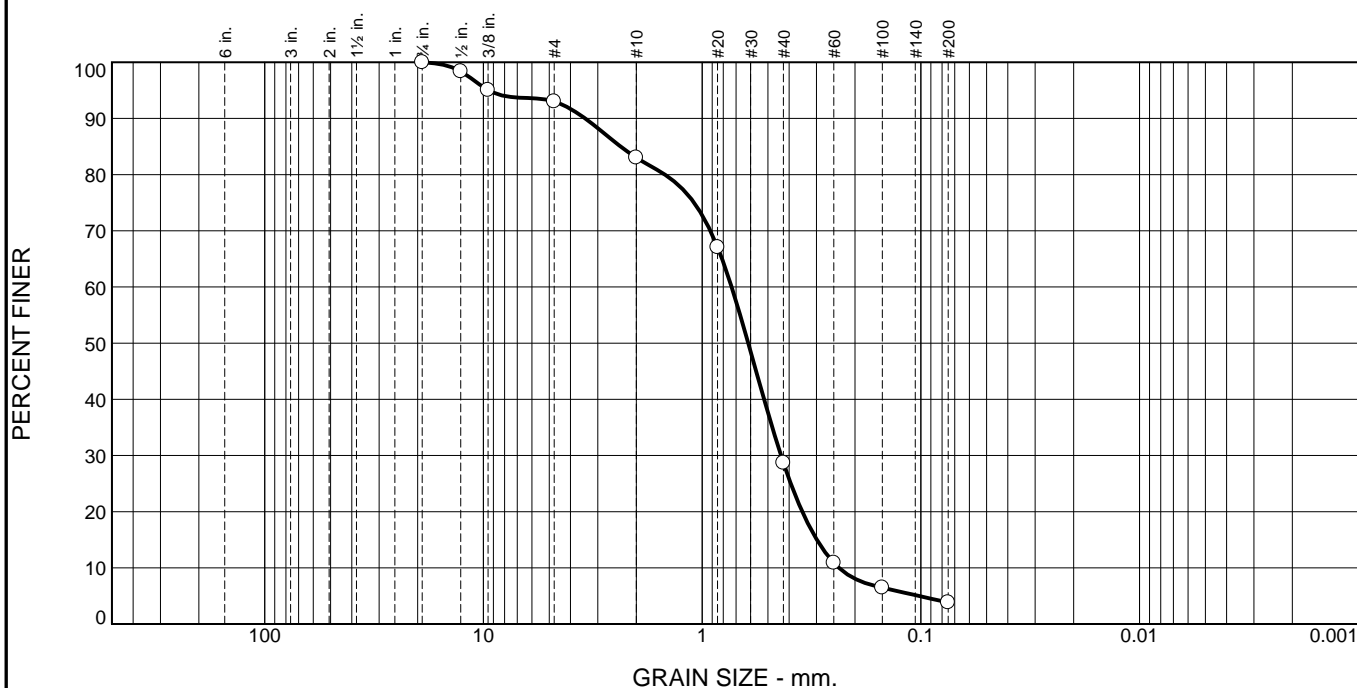
Material Description	
Brown well-graded sand with gravel	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SW	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 8.2995	D ₈₅ = 5.7264 D ₆₀ = 2.0050
D ₅₀ = 1.3867	D ₃₀ = 0.6832 D ₁₅ = 0.3500
D ₁₀ = 0.2121	C _u = 9.46 C _c = 1.10
Remarks	
As received MC = 9.1%	
Date Received: 10/5/2017	Date Tested: 10/9/2017
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-99 Depth: 7-9'
Sample Number: S-2

Date Sampled: 8/31/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.0	10.0	54.3	24.9	3.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	98.4		
3/8"	95.1		
#4	93.0		
#10	83.0		
#20	67.1		
#40	28.7		
#60	10.9		
#100	6.5		
#200	3.8		

* (no specification provided)

Material Description
Light brown poorly graded sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 3.4285 D₈₅= 2.3575 D₆₀= 0.7334
 D₅₀= 0.6152 D₃₀= 0.4359 D₁₅= 0.2989
 D₁₀= 0.2367 C_u= 3.10 C_c= 1.09

Remarks
As received MC = 4.2%

Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-100 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 8/29/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

CDM Smith

Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974)

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-100
Sample Number: S-1
Sample Depth (ft): 0.5-2'
Sample Date: 8/29/2017

Tested By: MP
Test Date: 10/9/2017

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.87
Wet Mass of Sample & Tin (g)	197.98
Dry Mass of Sample & Tin (g)	181.72
Mass of Water (g)	16.26
Mass of Dry Soil (g)	84.85
Moisture Content (%)	19.2

ASH CONTENT	
Porcelain Dish Mass (g)	96.87
Porcelain Dish + Oven Dried Soil (g)	181.72
Mass of Oven Dried Soil (g)	84.85
Mass of Dish & Burned Soil (g)	179.30
Mass of Burned Soil (g)	82.43
Mass of Organic Material (g)	2.42
Ash Content (%)	97.1
Organic Content (%)	2.9

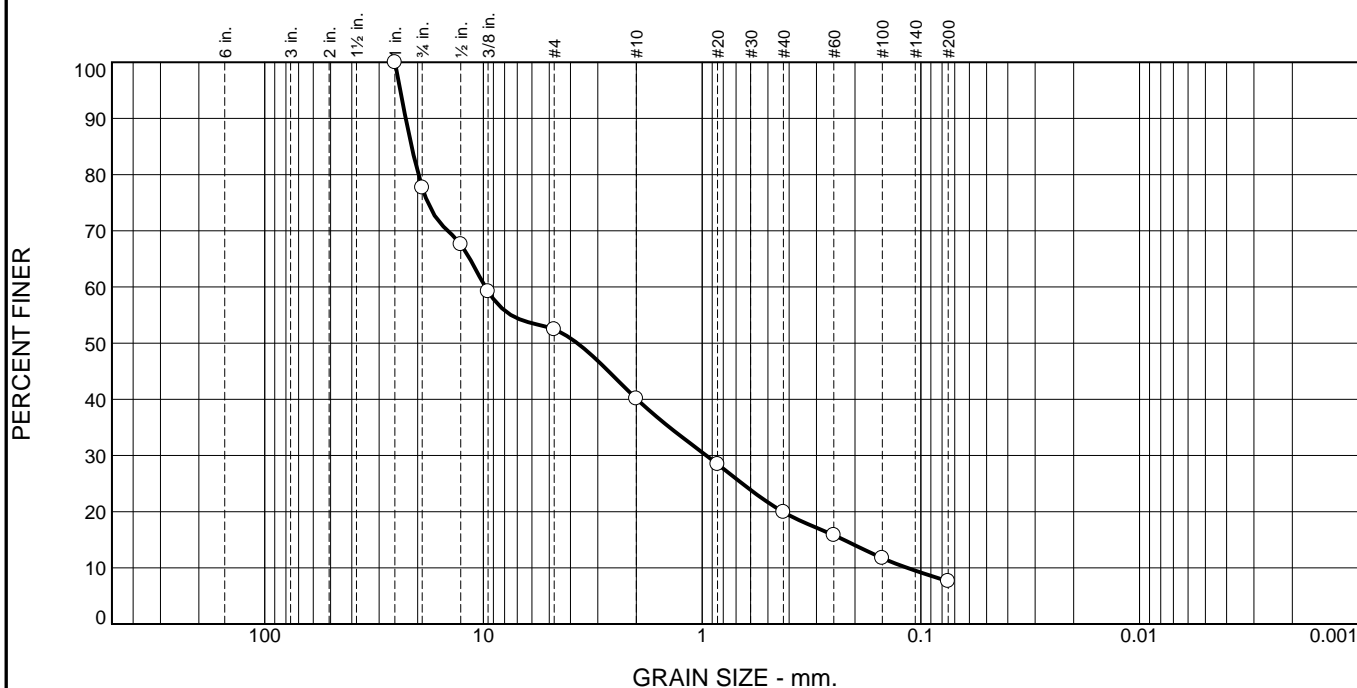
PERCENT FINER

Sieve Size	Percent Finer (%)
6 in.	100
3 in.	100
2 in.	87
1 1/2 in.	80
1 in.	71
3/8 in.	57
#4	43
#10	30
#20	21
#40	17
#60	14
#100	11
#200	11

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	86.6		
.5"	79.6		
.375"	70.5		
#4	56.6		
#10	42.7		
#20	30.0		
#40	20.8		
#60	16.9		
#100	13.9		
#200	10.6		

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.3	25.3	12.3	20.2	12.3	7.6	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	77.7		
.5"	67.6		
.375"	59.2		
#4	52.4		
#10	40.1		
#20	28.5		
#40	19.9		
#60	15.8		
#100	11.7		
#200	7.6		

* (no specification provided)

Material Description
Gray-brown poorly graded gravel with silt and sand with organics

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=
Classification
 USCS (D 2487)= GP-GM AASHTO (M 145)= A-1-a
Coefficients
 D₉₀= 22.6755 D₈₅= 21.3092 D₆₀= 9.8051
 D₅₀= 3.7232 D₃₀= 0.9576 D₁₅= 0.2253
 D₁₀= 0.1156 C_u= 84.83 C_c= 0.81

Remarks
As received MC = 25.5%

Date Received: 1/31/18 **Date Tested:** 2/5/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-102 **Depth:** 6-8'
Sample Number: S-4

Date Sampled: 10/4/18

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-102
Sample Number: S-4
Sample Depth (ft): 6-8
Sample Date: 12/21/2017

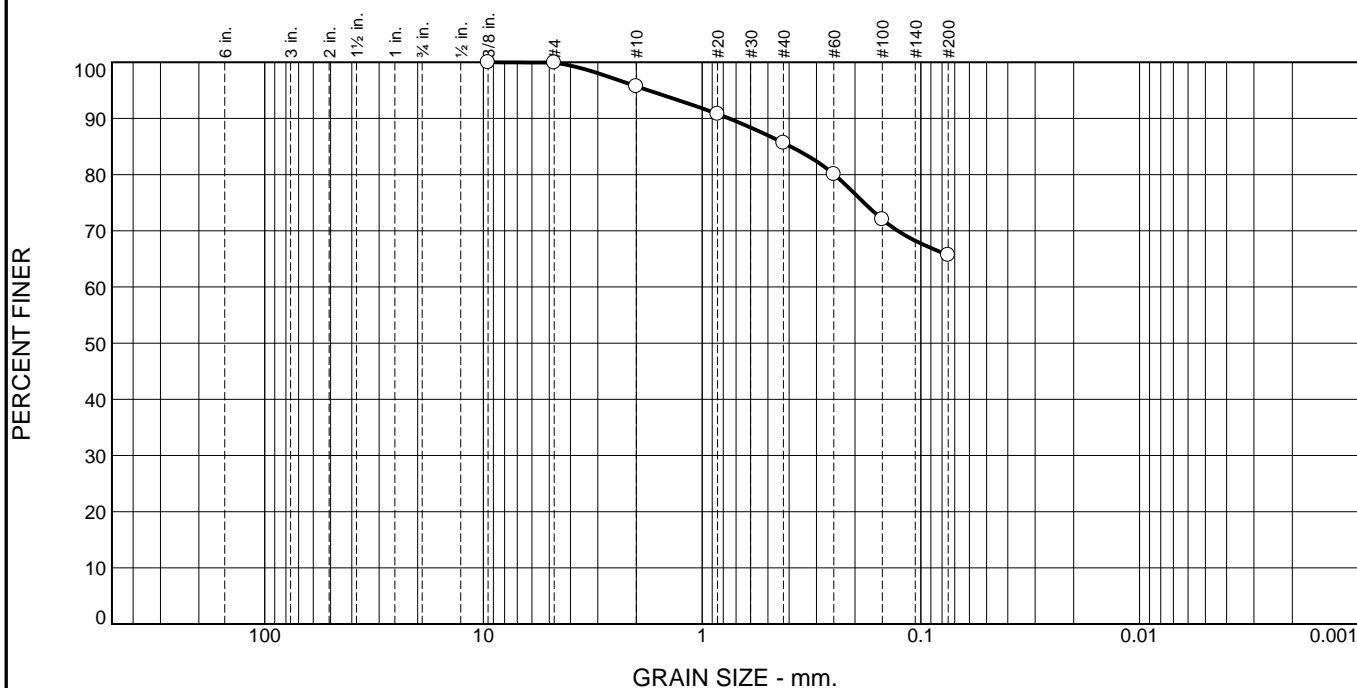
Tested By: AS
Test Date: 2/2/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	64.50
Wet Mass of Sample & Tin (g)	115.81
Dry Mass of Sample & Tin (g)	98.28
Mass of Water (g)	17.53
Mass of Dry Soil (g)	33.78
Moisture Content (%)	51.9

ASH CONTENT	
Porcelain Dish Mass (g)	64.50
Porcelain Dish + Oven Dried Soil (g)	98.28
Mass of Oven Dried Soil (g)	33.78
Mass of Dish & Burned Soil (g)	95.64
Mass of Burned Soil (g)	31.14
Mass of Organic Material (g)	2.64
Ash Content (%)	92.2
Organic Content (%)	7.8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	4.2	10.1	19.9	65.7	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.9		
#10	95.7		
#20	90.8		
#40	85.6		
#60	80.1		
#100	72.0		
#200	65.7		

* (no specification provided)

Material Description		
Gray-brown sandy organic silt		
Atterberg Limits (ASTM D 4318)		
PL=	LL=	PI=
Classification		
USCS (D 2487)= ML	AASHTO (M 145)= A-4(0)	
Coefficients		
D ₉₀ = 0.7536	D ₈₅ = 0.3936	D ₆₀ =
D ₅₀ =	D ₃₀ =	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 80.2%		
Date Received: 1/31/18		Date Tested: 2/5/18
Tested By: MP/SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-103 Depth: 6-8'
Sample Number: S-4

Date Sampled: 12/22/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-103
Sample Number: S-4
Sample Depth (ft): 6-8
Sample Date: 12/22/2017

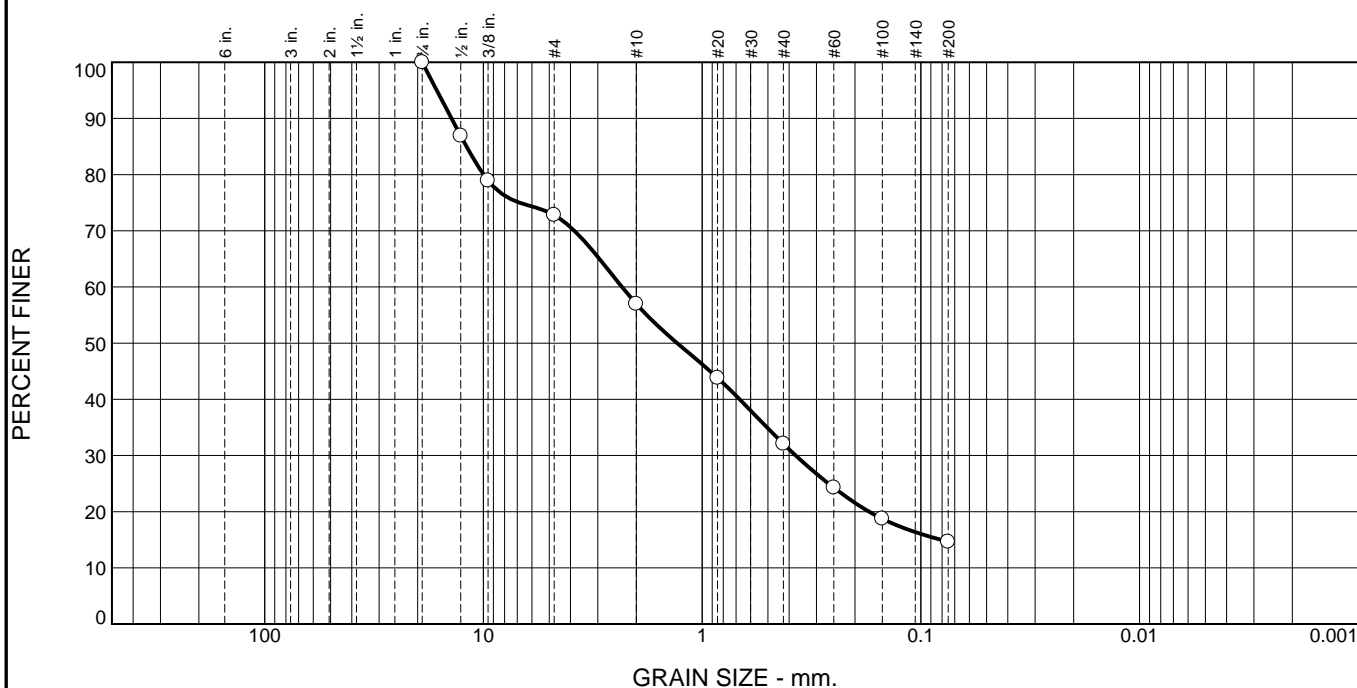
Tested By: MP
Test Date: 2/1/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	105.29
Wet Mass of Sample & Tin (g)	153.41
Dry Mass of Sample & Tin (g)	131.89
Mass of Water (g)	21.52
Mass of Dry Soil (g)	26.60
Moisture Content (%)	80.9

ASH CONTENT	
Porcelain Dish Mass (g)	105.29
Porcelain Dish + Oven Dried Soil (g)	131.89
Mass of Oven Dried Soil (g)	26.60
Mass of Dish & Burned Soil (g)	129.40
Mass of Burned Soil (g)	24.11
Mass of Organic Material (g)	2.49
Ash Content (%)	90.6
Organic Content (%)	9.4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	27.2	15.8	24.9	17.5	14.6	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	86.9		
.375	78.9		
#4	72.8		
#10	57.0		
#20	43.8		
#40	32.1		
#60	24.3		
#100	18.7		
#200	14.6		

* (no specification provided)

Material Description
Gray silty sand with gravel and organics

Atterberg Limits (ASTM D 4318)
PL= LL= PI=

Classification
USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
D₉₀= 13.9927 D₈₅= 11.9466 D₆₀= 2.3250
D₅₀= 1.3001 D₃₀= 0.3734 D₁₅= 0.0810
D₁₀= C_u= C_c=

Remarks
As recieved MC = 28.4%

Date Received: 1/30/18 **Date Tested:** 2/1/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-104 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 1/8/18

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-104
Sample Number: S-2
Sample Depth (ft): 8-10
Sample Date: 1/8/2018

Tested By: AS
Test Date: 2/1/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.31
Wet Mass of Sample & Tin (g)	150.87
Dry Mass of Sample & Tin (g)	137.48
Mass of Water (g)	13.39
Mass of Dry Soil (g)	47.17
Moisture Content (%)	28.4

ASH CONTENT	
Porcelain Dish Mass (g)	90.31
Porcelain Dish + Oven Dried Soil (g)	137.48
Mass of Oven Dried Soil (g)	47.17
Mass of Dish & Burned Soil (g)	135.48
Mass of Burned Soil (g)	45.17
Mass of Organic Material (g)	2.00
Ash Content (%)	95.8
Organic Content (%)	4.2

The graph illustrates the grain size distribution of a soil sample. The y-axis represents the percentage of soil finer than a given grain size, ranging from 0 to 100. The x-axis represents the grain size in millimeters on a logarithmic scale, ranging from 100 mm to 0.001 mm. The curve shows that approximately 100% of the soil is finer than 6 inches, and about 32% is finer than 0.075 mm (#200 sieve).

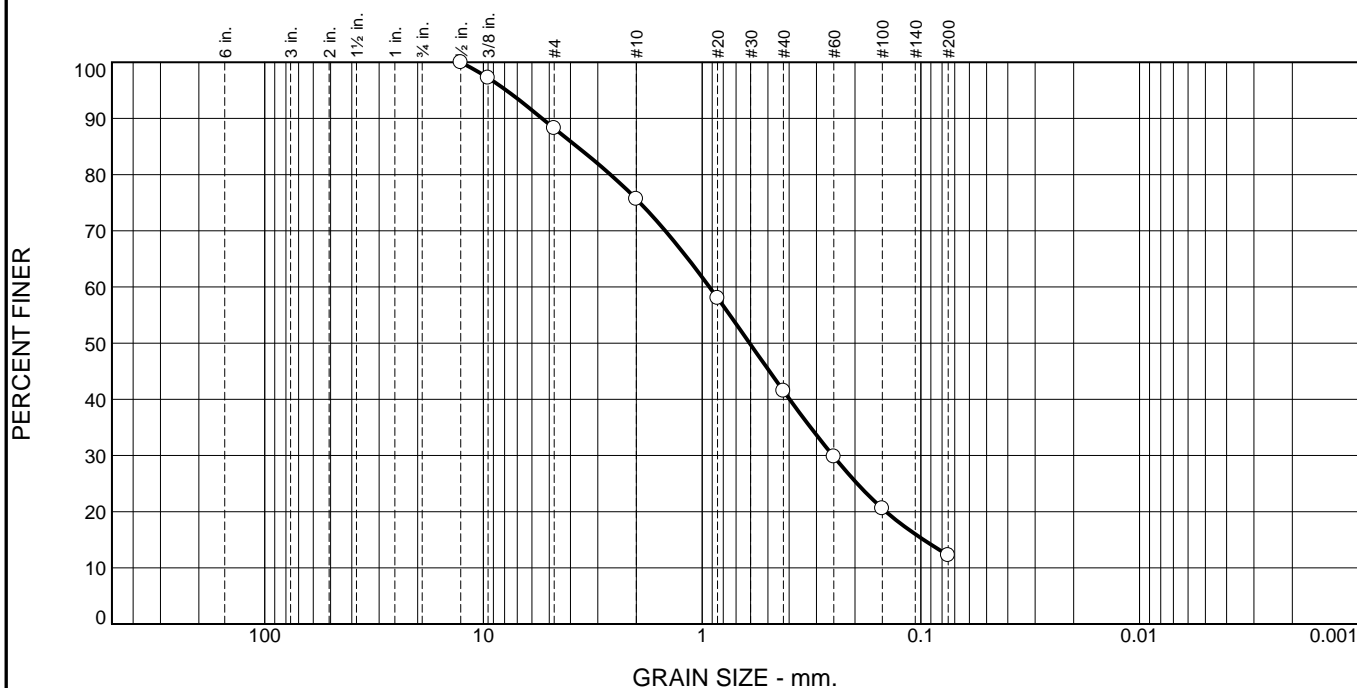
Grain Size (mm)	Grain Size (in.)	Percent Finer (%)
150	6 in.	100
75	3 in.	100
47.5	2 in.	100
37.5	1 1/2 in.	100
30	1 in.	100
25	1 in.	100
20	3/4 in.	100
15	3/8 in.	95
12.5	#10	88
10	#20	85
7.5	#4	80
4.75	#10	70
3.0	#60	58
2.5	#60	52
1.5	#100	42
0.75	#200	32

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	95.0		
3/8"	92.8		
#4	86.2		
#10	78.2		
#20	68.7		
#40	57.5		
#60	50.6		
#100	41.2		
#200	31.9		

Title: Laboratory Manager

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
Project No: 101038.102170 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.7	12.6	34.2	29.3	12.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	97.2		
#4	88.3		
#10	75.7		
#20	58.0		
#40	41.5		
#60	29.8		
#100	20.6		
#200	12.2		

* (no specification provided)

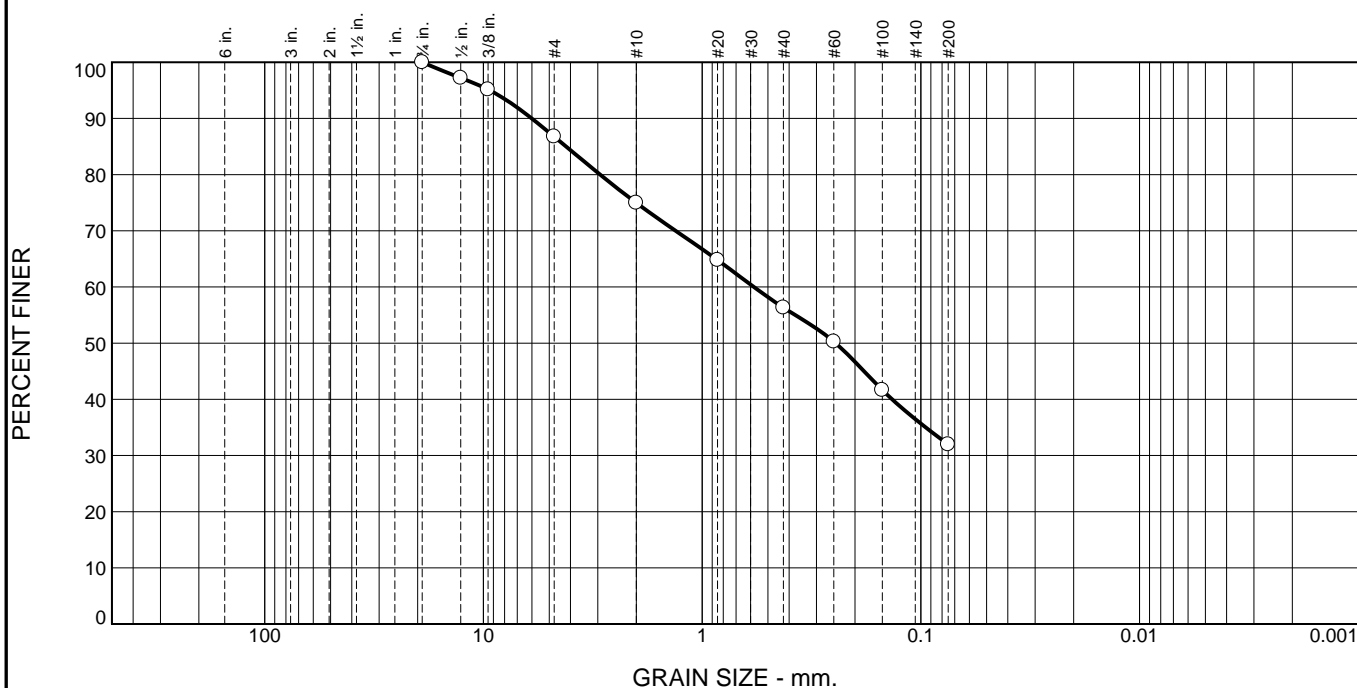
Material Description	
Dark brown silty sand	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= SM	AASHTO (M 145)= A-1-b
Coefficients	
D ₉₀ = 5.3927	D ₈₅ = 3.7382 D ₆₀ = 0.9261
D ₅₀ = 0.6064	D ₃₀ = 0.2525 D ₁₅ = 0.0971
D ₁₀ =	C _u = C _c =
Remarks	
As received MC = 14.6%	
Date Received: 10/5/2017	Date Tested: 10/9/2017
Tested By: RZ	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-107 Depth: 0.5-2'
Sample Number: S-1

Date Sampled: 9/12/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.2	11.8	18.7	24.3	32.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	97.2		
3/8"	95.2		
#4	86.8		
#10	75.0		
#20	64.8		
#40	56.3		
#60	50.3		
#100	41.7		
#200	32.0		

* (no specification provided)

Material Description
Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 6.0126 D₈₅= 4.1881 D₆₀= 0.5801
 D₅₀= 0.2454 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
As received MC = 9.6%

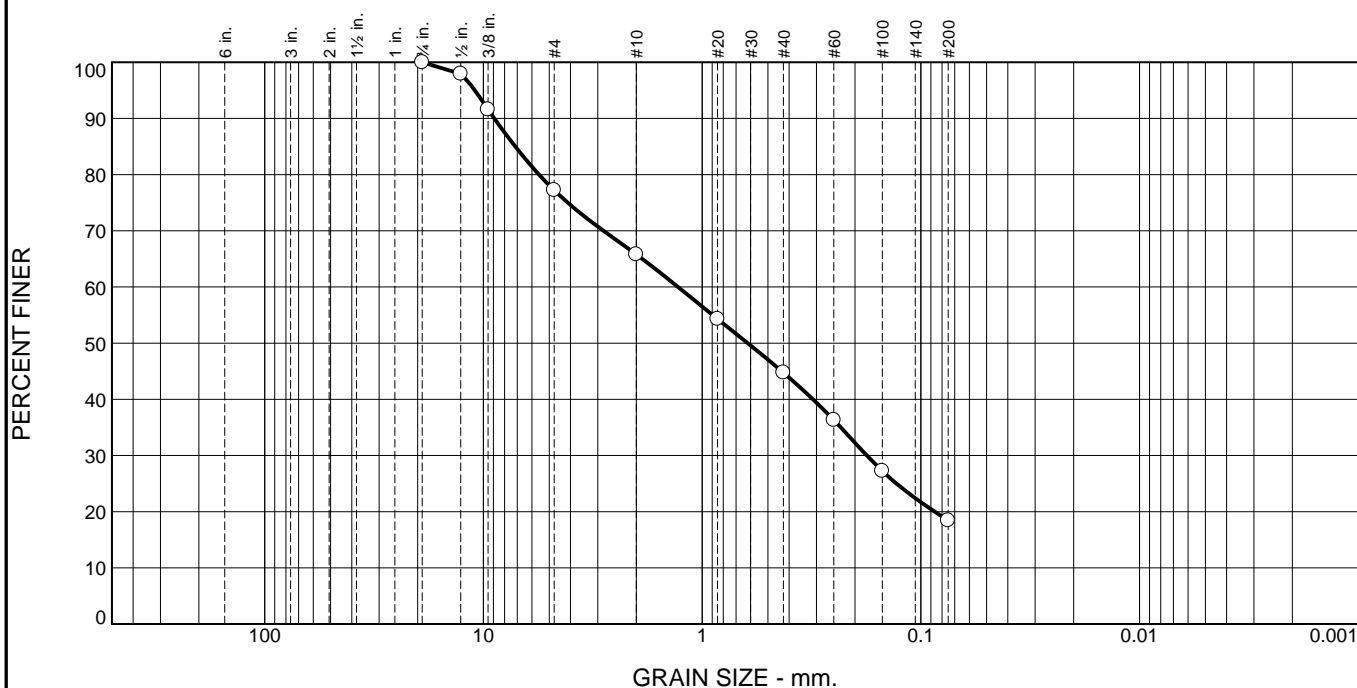
Date Received: 10/5/2017 **Date Tested:** 10/9/2017
Tested By: RZ
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-107 **Depth:** 6-8'
Sample Number: S-4

Date Sampled: 9/12/2017

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham and Weston, MA
	Project No: 101038.102170 Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.8	11.4	21.1	26.3	18.4	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	97.9		
.375"	91.6		
#4	77.2		
#10	65.8		
#20	54.3		
#40	44.7		
#60	36.3		
#100	27.2		
#200	18.4		

* (no specification provided)

Material Description
Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 8.9183 D₈₅= 7.1542 D₆₀= 1.2889
 D₅₀= 0.6190 D₃₀= 0.1765 D₁₅=
 D₁₀= C_u= C_c=

Remarks
As received MC = 16.2%

Date Received: 1/31/18 **Date Tested:** 2/5/18
Tested By: MP/SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-108 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 1/8/18

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-110
Sample Number: S-3
Sample Depth (ft): 4-6
Sample Date: 12/19/2017

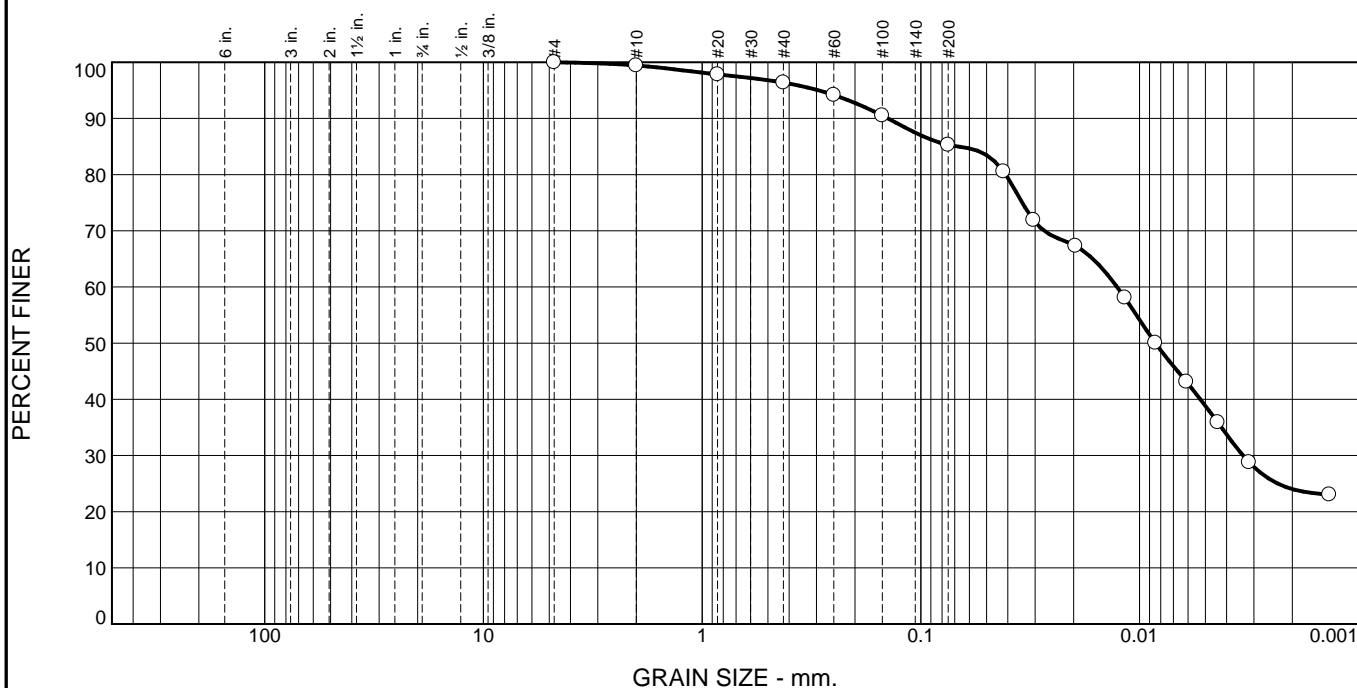
Tested By: AS
Test Date: 2/1/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.87
Wet Mass of Sample & Tin (g)	188.25
Dry Mass of Sample & Tin (g)	152.97
Mass of Water (g)	35.28
Mass of Dry Soil (g)	56.10
Moisture Content (%)	62.9

ASH CONTENT	
Porcelain Dish Mass (g)	96.87
Porcelain Dish + Oven Dried Soil (g)	152.97
Mass of Oven Dried Soil (g)	56.10
Mass of Dish & Burned Soil (g)	148.57
Mass of Burned Soil (g)	51.70
Mass of Organic Material (g)	4.40
Ash Content (%)	92.2
Organic Content (%)	7.8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	3.0	11.1	46.5	38.8

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.4		
#20	97.8		
#40	96.4		
#60	94.2		
#100	90.5		
#200	85.3		
0.0419 mm.	80.6		
0.0306 mm.	71.9		
0.0196 mm.	67.3		
0.0117 mm.	58.1		
0.0085 mm.	50.0		
0.0061 mm.	43.1		
0.0044 mm.	35.9		
0.0032 mm.	28.8		
0.0014 mm.	23.0		

* (no specification provided)

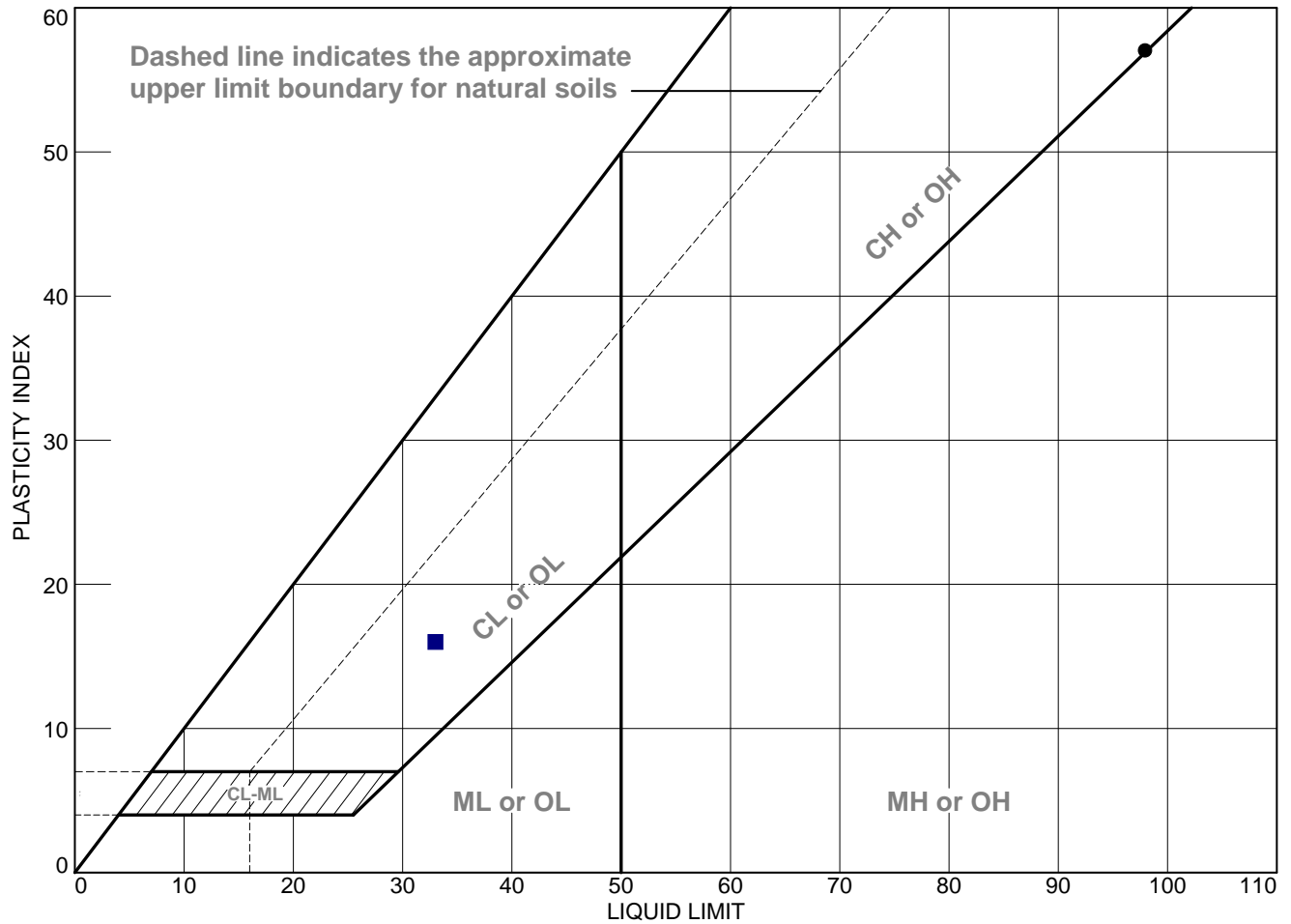
Material Description Dark brown organic clay with sand		
Atterberg Limits (ASTM D 4318) PL= 41 LL= 98 PI= 57		
Classification USCS (D 2487)= OH AASHTO (M 145)= A-7-5(57)		
Coefficients D ₉₀ = 0.1415 D ₈₅ = 0.0672 D ₆₀ = 0.0127 D ₅₀ = 0.0085 D ₃₀ = 0.0034 D ₁₅ = D ₁₀ = C _u = C _c =		
Remarks As received MC = 80.0%		
Date Received: 1/31/18		Date Tested: 2/6/18
Tested By: MP/SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-110 Depth: 8-10'
 Sample Number: S-5

Date Sampled: 12/19/18

CDM Smith Boston, Massachusetts		Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170
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LIQUID AND PLASTIC LIMITS TEST REPORT



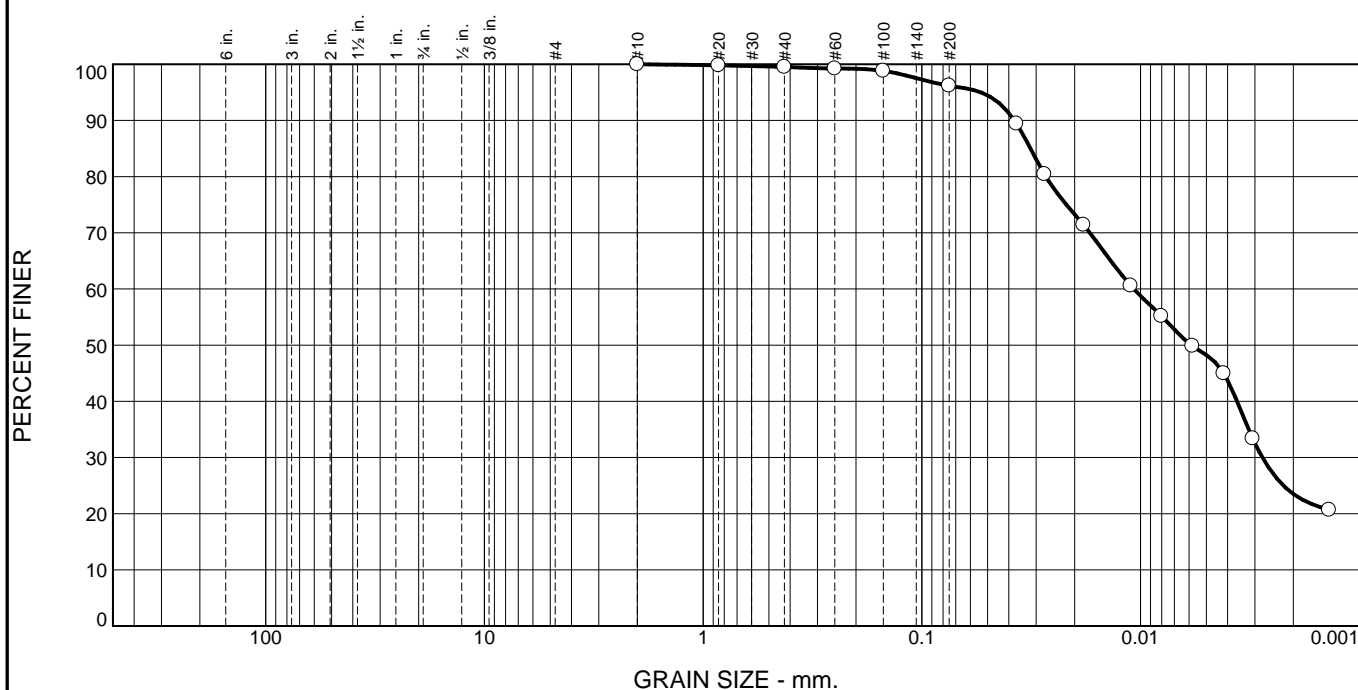
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-110	S-5	8-10'	80.0	41	98	57	OH
■	B-110	S-7	19-21'	31.8	17	33	16	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	3.3	47.9	48.3

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.8		
#40	99.5		
#60	99.2		
#100	98.8		
#200	96.2		
0.036 mm.	89.4		
0.025 mm.	80.4		
0.018 mm.	71.4		
0.011 mm.	60.6		
0.008 mm.	55.2		
0.005 mm.	49.9		
0.004 mm.	45.0		
0.003 mm.	33.4		
0.001 mm.	20.7		

* (no specification provided)

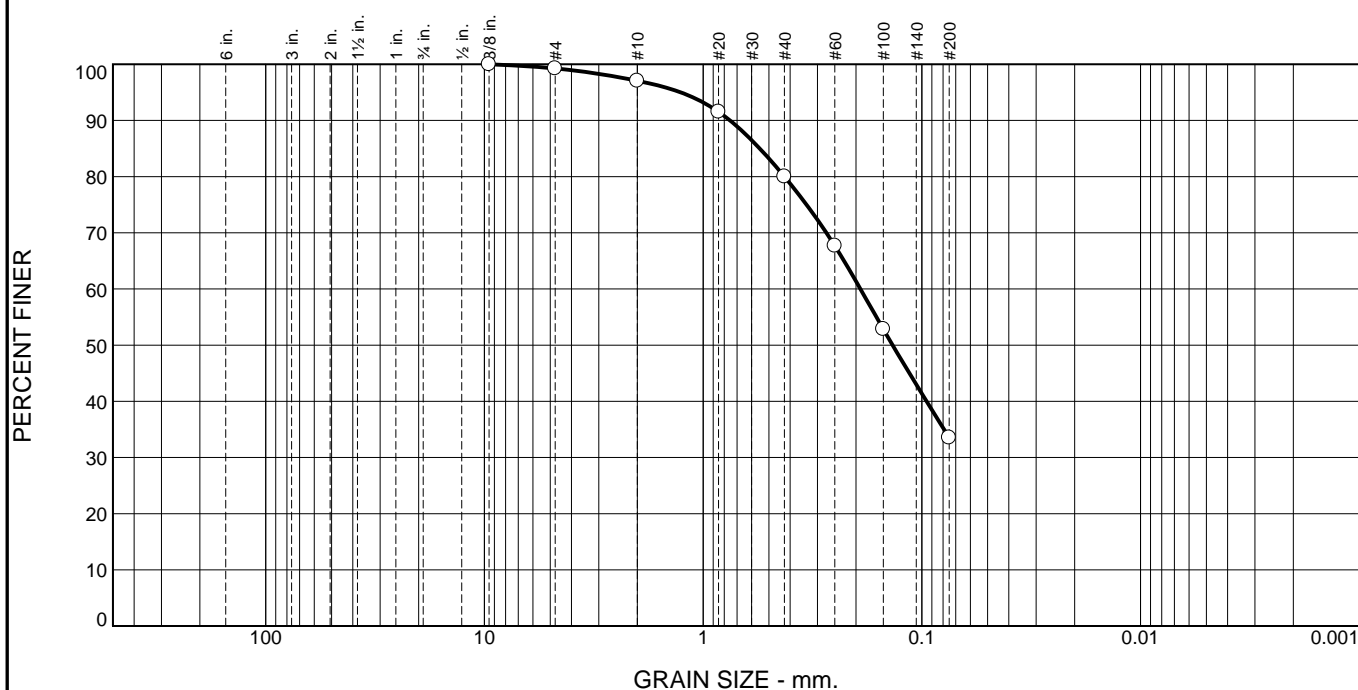
Material Description		
Gray lean clay		
Atterberg Limits (ASTM D 4318)		
PL= 17	LL= 33	PI= 16
Classification		
USCS (D 2487)= CL	AASHTO (M 145)= A-6(15)	
Coefficients		
D ₉₀ = 0.0377	D ₈₅ = 0.0318	D ₆₀ = 0.0107
D ₅₀ = 0.0059	D ₃₀ = 0.0028	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 31.8%		
Date Received: 1/31/18		Date Tested: 2/5/18
Tested By: MP/SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-110 Depth: 19-21'
Sample Number: S-7

Date Sampled: 12/19/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	2.2	17.1	46.5	33.5	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.3		
#10	97.1		
#20	91.5		
#40	80.0		
#60	67.7		
#100	52.9		
#200	33.5		

* (no specification provided)

Material Description
 Brown silty sand

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients
 D₉₀= 0.7540 D₈₅= 0.5510 D₆₀= 0.1909
 D₅₀= 0.1360 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
 As received MC = 26.2%

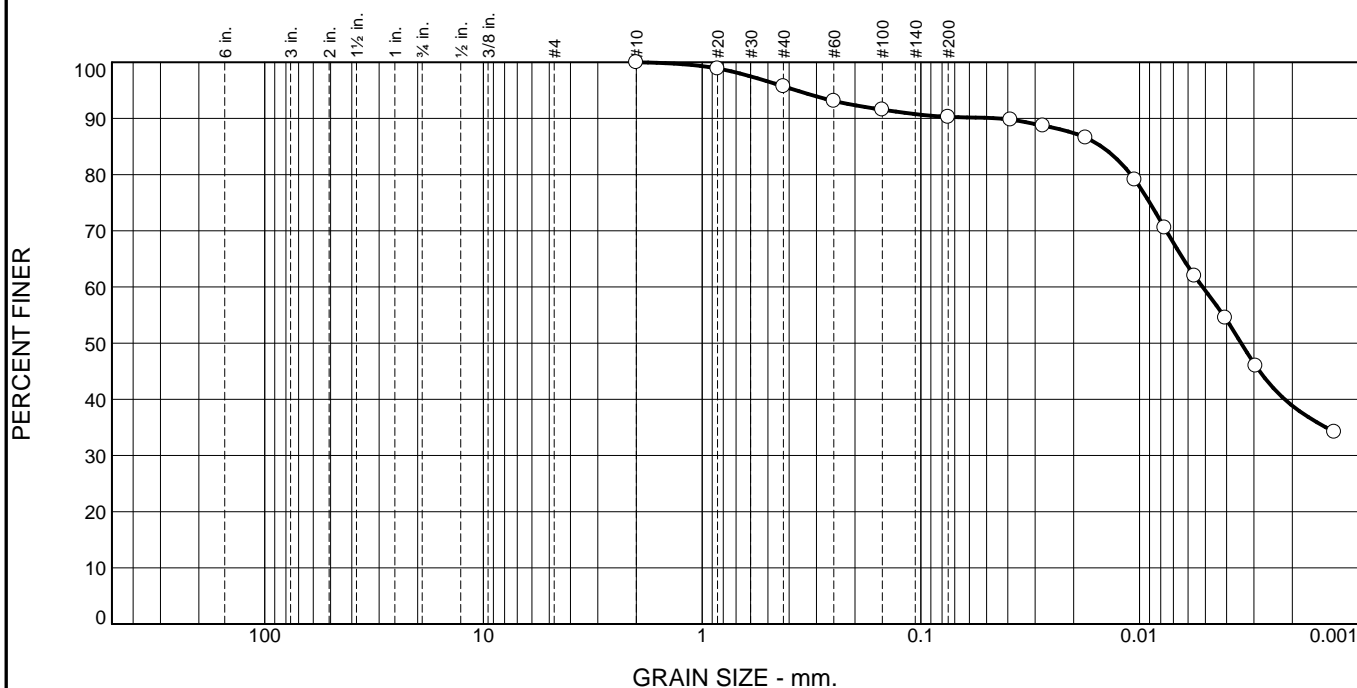
Date Received: 1/31/18 Date Tested: 2/5/18
 Tested By: MP/SB
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-111 Depth: 5.5-6'
 Sample Number: S-3B

Date Sampled: 12/18/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	4.3	5.4	31.0	59.3

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	98.9		
#40	95.7		
#60	93.1		
#100	91.6		
#200	90.3		
0.0389 mm.	89.8		
0.0276 mm.	88.7		
0.0176 mm.	86.6		
0.0105 mm.	79.1		
0.0077 mm.	70.6		
0.0056 mm.	62.0		
0.0041 mm.	54.5		
0.0029 mm.	46.0		
0.0013 mm.	34.2		

* (no specification provided)

Material Description	
Dark gray lean clay with organics	
Atterberg Limits (ASTM D 4318)	
PL=	LL= PI=
Classification	
USCS (D 2487)= CL	AASHTO (M 145)= A-7-6
Coefficients	
D ₉₀ = 0.0440	D ₈₅ = 0.0149
D ₅₀ = 0.0034	D ₃₀ =
D ₁₀ =	D ₆₀ = 0.0051
	D ₁₅ =
	C _u =
	C _c =
Remarks	
As received MC = 55.7%	
Date Received: 1/31/18	Date Tested: 2/6/18
Tested By: MP/SB	
Checked By: MP	
Title: Laboratory Manager	

Source of Sample: B-112 Depth: 2-4'
Sample Number: S-2

Date Sampled: 12/18/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-112
Sample Number: S-2
Sample Depth (ft): 2-4
Sample Date: 12/18/2017

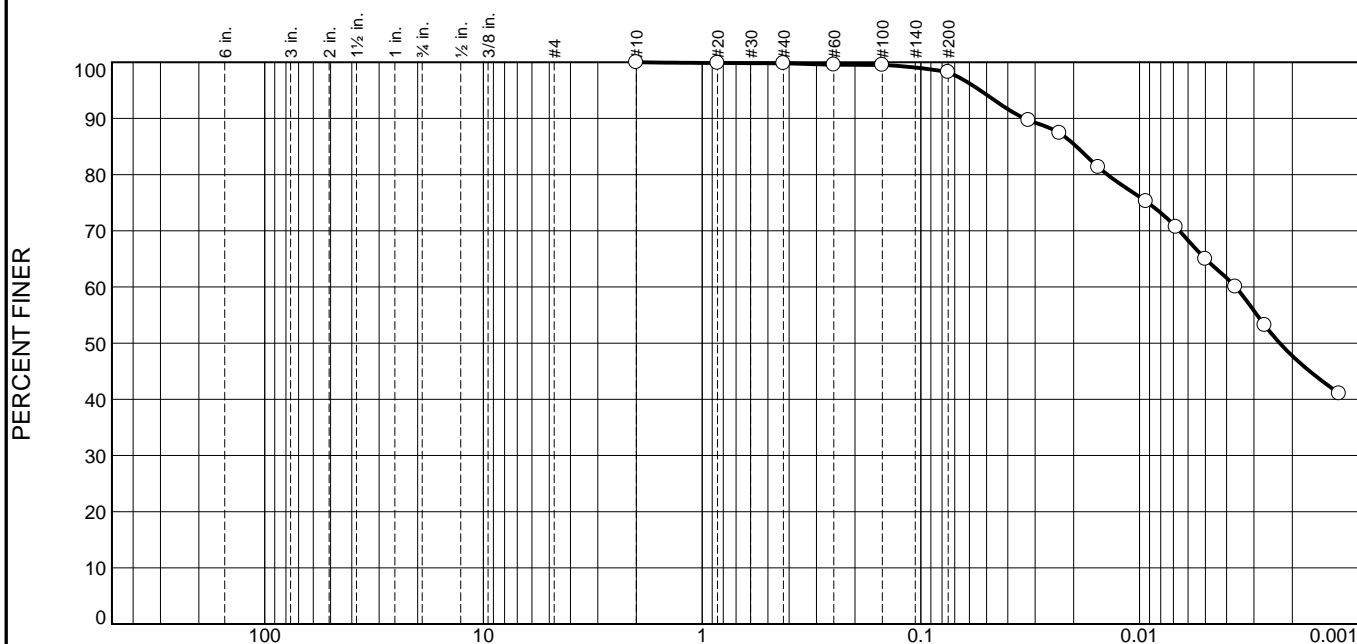
Tested By: AS
Test Date: 2/5/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.67
Wet Mass of Sample & Tin (g)	187.92
Dry Mass of Sample & Tin (g)	166.01
Mass of Water (g)	21.91
Mass of Dry Soil (g)	39.34
Moisture Content (%)	55.7

ASH CONTENT	
Porcelain Dish Mass (g)	126.67
Porcelain Dish + Oven Dried Soil (g)	166.01
Mass of Oven Dried Soil (g)	39.34
Mass of Dish & Burned Soil (g)	163.68
Mass of Burned Soil (g)	37.01
Mass of Organic Material (g)	2.33
Ash Content (%)	94.1
Organic Content (%)	5.9

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	1.6	33.2	65.0

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.6		
#100	99.5		
#200	98.2		
0.0322 mm.	89.7		
0.0232 mm.	87.4		
0.0154 mm.	81.3		
0.0093 mm.	75.2		
0.0068 mm.	70.7		
0.0050 mm.	65.0		
0.0036 mm.	60.0		
0.0027 mm.	53.2		
0.0012 mm.	41.0		

* (no specification provided)

Material Description
Gray lean clay

Atterberg Limits (ASTM D 4318)
PL= 21 LL= 46 PI= 25

Classification
USCS (D 2487)= CL AASHTO (M 145)= A-7-6(27)

Coefficients
D₉₀= 0.0335 D₈₅= 0.0194 D₆₀= 0.0036
D₅₀= 0.0023 D₃₀= C_u= D₁₅= C_c=

Remarks
As recieved MC = 38.7%

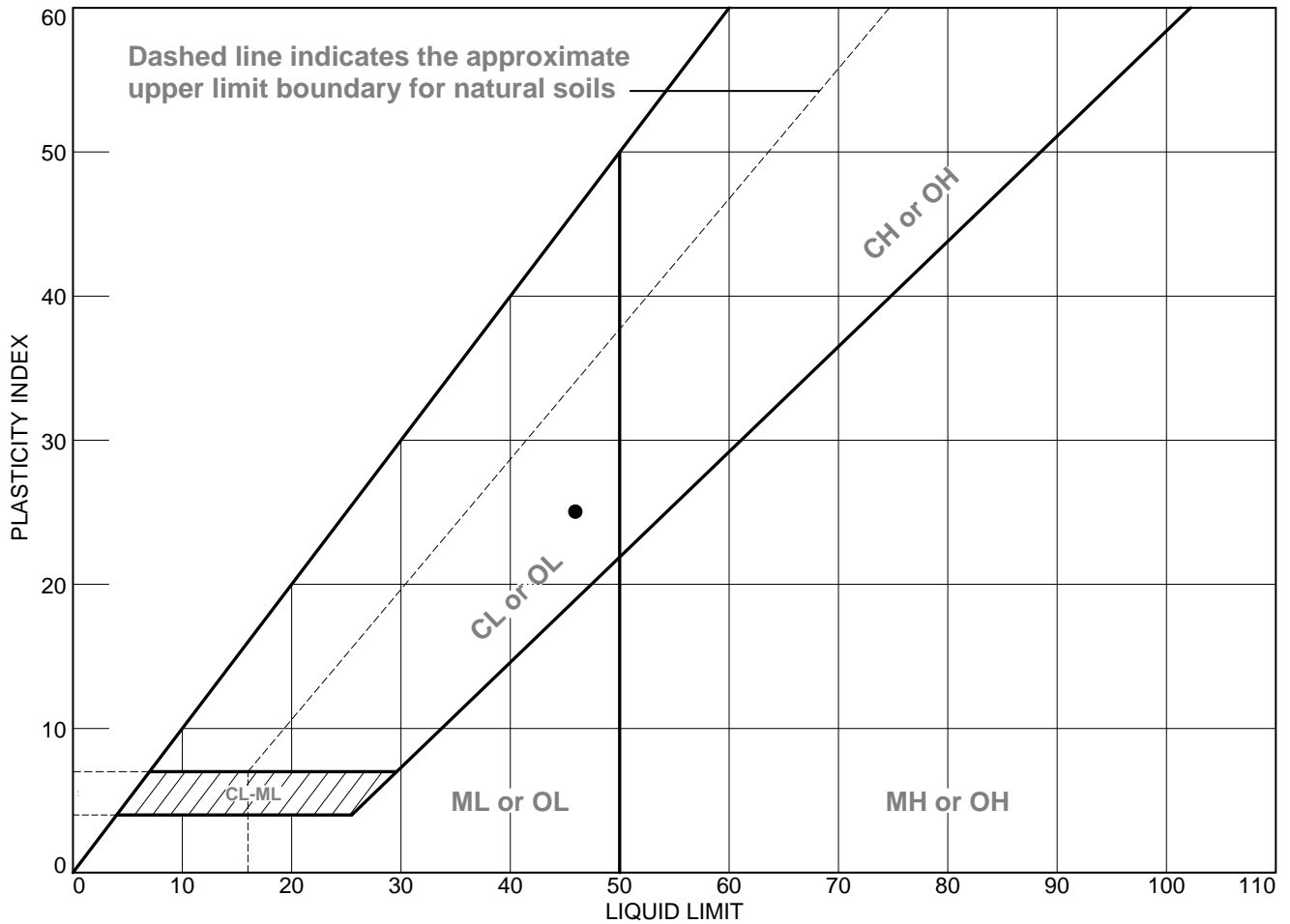
Date Received: 1/30/18 **Date Tested:** 2/2/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-112 **Depth:** 14-16'
Sample Number: S-6

Date Sampled: 12/18/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA)
	Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-112	S-6	14-16'	38.7	21	46	25	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-113
Sample Number: S-3A
Sample Depth (ft): 4-5
Sample Date: 12/20/2017

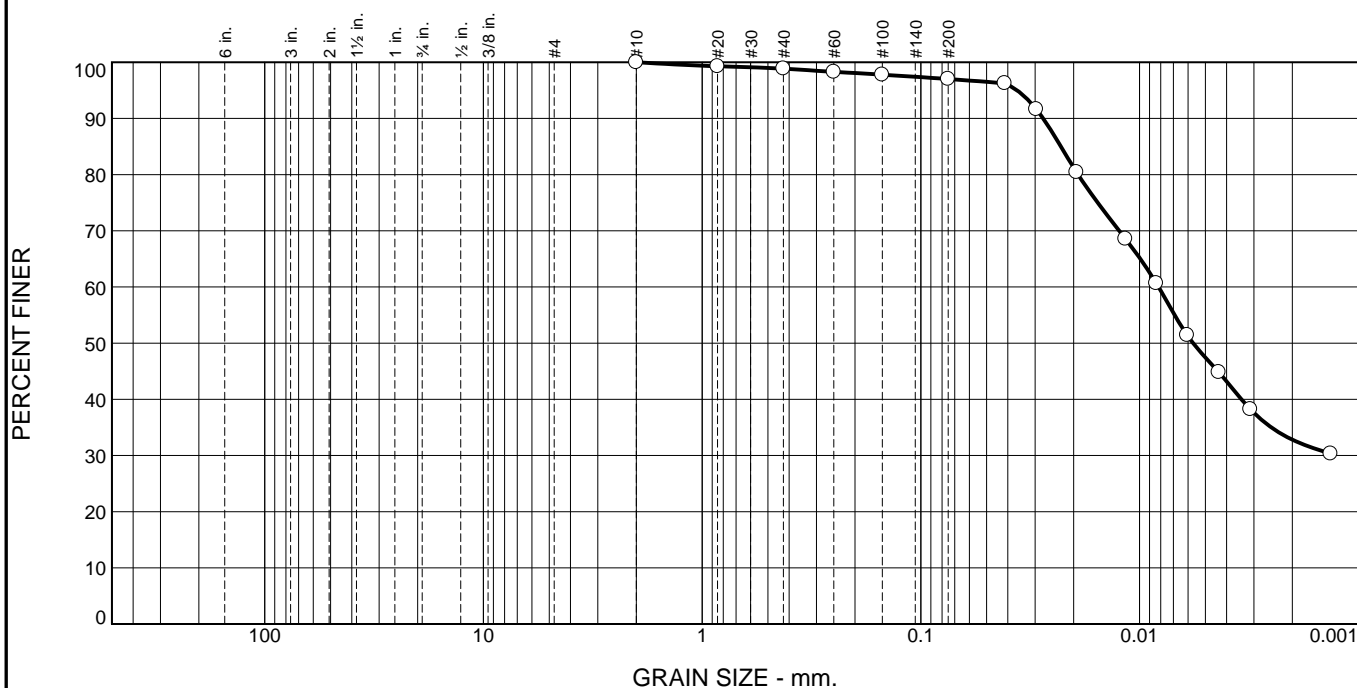
Tested By: AS
Test Date: 2/2/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.89
Wet Mass of Sample & Tin (g)	166.50
Dry Mass of Sample & Tin (g)	121.24
Mass of Water (g)	45.26
Mass of Dry Soil (g)	24.35
Moisture Content (%)	185.9

ASH CONTENT	
Porcelain Dish Mass (g)	96.89
Porcelain Dish + Oven Dried Soil (g)	121.24
Mass of Oven Dried Soil (g)	24.35
Mass of Dish & Burned Soil (g)	116.10
Mass of Burned Soil (g)	19.21
Mass of Organic Material (g)	5.14
Ash Content (%)	78.9
Organic Content (%)	21.1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.1	1.9	49.6	47.4

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.3		
#40	98.9		
#60	98.3		
#100	97.8		
#200	97.0		
0.0413 mm.	96.3		
0.0296 mm.	91.6		
0.0194 mm.	80.4		
0.0116 mm.	68.6		
0.0084 mm.	60.7		
0.0061 mm.	51.4		
0.0043 mm.	44.8		
0.0031 mm.	38.2		
0.0013 mm.	30.3		

* (no specification provided)

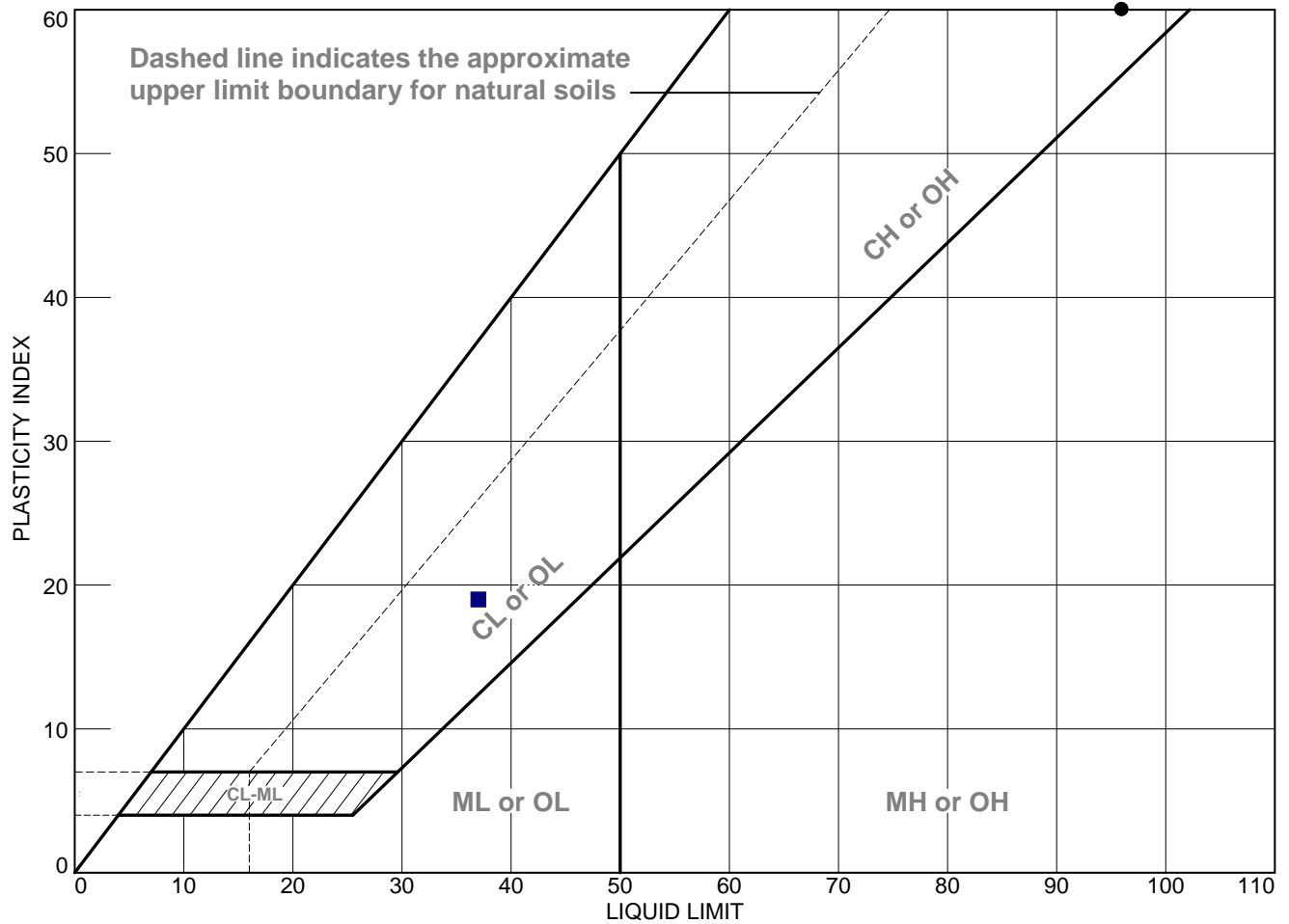
Material Description Dark gray fat clay with organics		
Atterberg Limits (ASTM D 4318) PL= 36 LL= 96 PI= 60		
Classification USCS (D 2487)= CH/OH AASHTO (M 145)= A-7-5(71)		
Coefficients D ₉₀ = 0.0276 D ₈₅ = 0.0229 D ₆₀ = 0.0082 D ₅₀ = 0.0057 D ₃₀ = D ₁₅ = D ₁₀ = C _u = C _c =		
Remarks As received MC = 85.5%		
Date Received: 1/31/18		Date Tested: 2/6/18
Tested By: MP/SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-113 Depth: 9-11'
 Sample Number: S-5

Date Sampled: 12/20/17

CDM Smith Boston, Massachusetts		Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170
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LIQUID AND PLASTIC LIMITS TEST REPORT



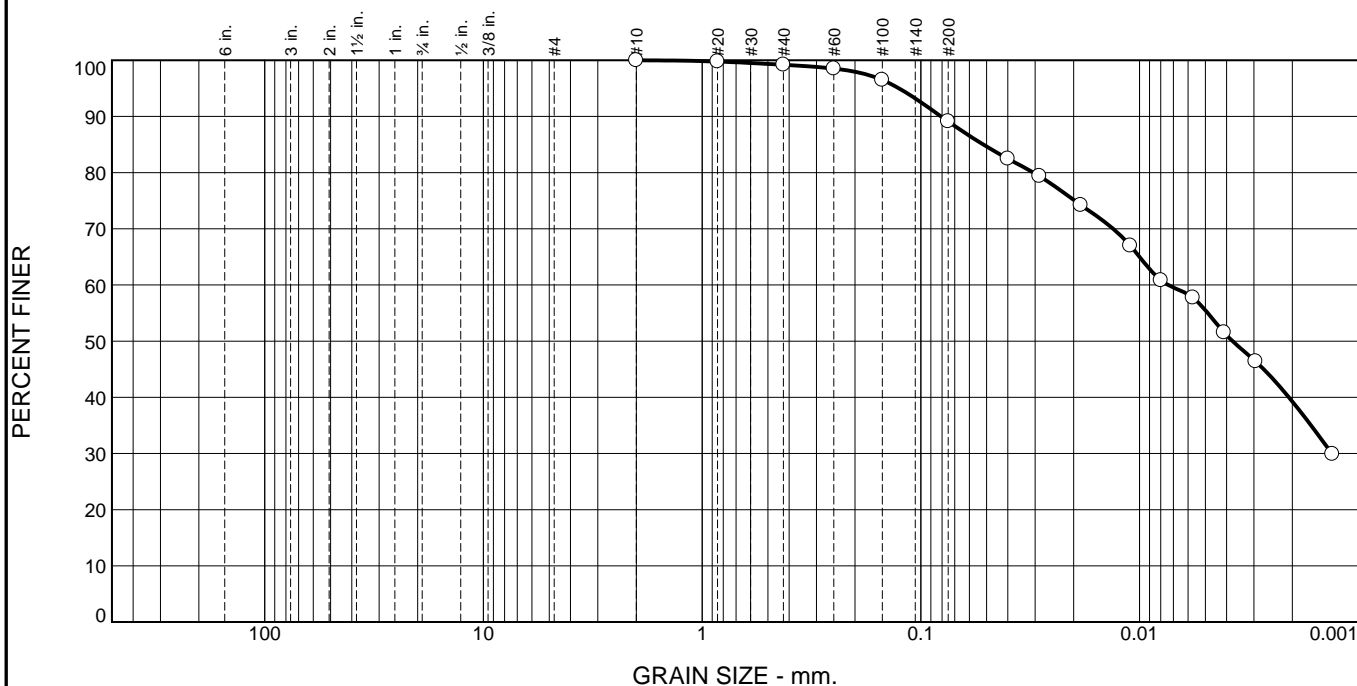
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-113	S-5	9-11'	85.5	36	96	60	CH/OH
■	B-113	S-6B	14.5-16'	35.3	18	37	19	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	10.1	33.6	55.5

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.8		
#40	99.2		
#60	98.5		
#100	96.5		
#200	89.1		
0.0400 mm.	82.5		
0.0287 mm.	79.4		
0.0185 mm.	74.2		
0.0110 mm.	67.0		
0.0080 mm.	60.8		
0.0057 mm.	57.7		
0.0041 mm.	51.5		
0.0029 mm.	46.4		
0.0013 mm.	29.9		

* (no specification provided)

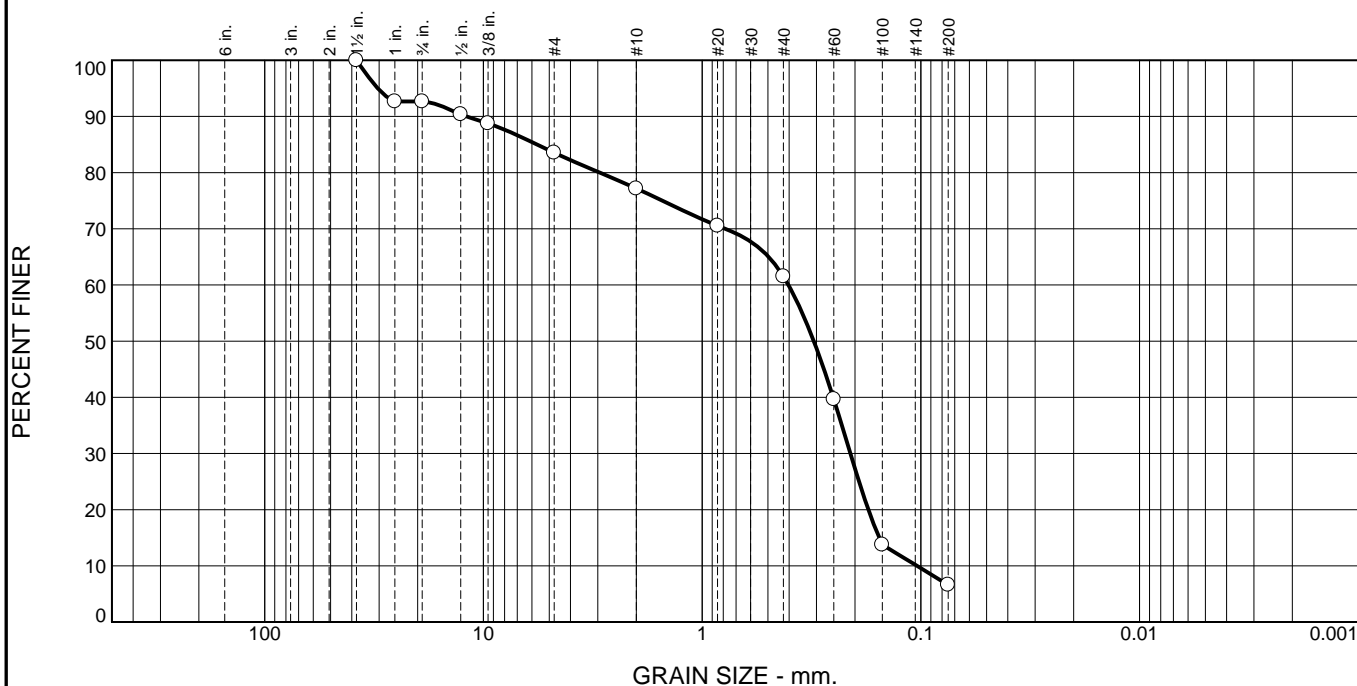
Material Description		
Gray lean clay		
Atterberg Limits (ASTM D 4318)		
PL= 18	LL= 37	PI= 19
Classification		
USCS (D 2487)= CL	AASHTO (M 145)= A-6(17)	
Coefficients		
D ₉₀ = 0.0808	D ₈₅ = 0.0518	D ₆₀ = 0.0074
D ₅₀ = 0.0038	D ₃₀ = 0.0013	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
As received MC = 35.3%		
Date Received: 1/31/18		Date Tested: 2/6/18
Tested By: MP/SB		
Checked By: MP		
Title: Laboratory Manager		

Source of Sample: B-113 Depth: 14.5-16'
Sample Number: S-6B

Date Sampled: 12/20/17

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.3	9.2	6.3	15.7	54.9	6.6	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1	92.7		
.75	92.7		
.5	90.4		
.375	88.8		
#4	83.5		
#10	77.2		
#20	70.5		
#40	61.5		
#60	39.7		
#100	13.8		
#200	6.6		

* (no specification provided)

Material Description
Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-3

Coefficients
 D₉₀= 11.9549 D₈₅= 5.6922 D₆₀= 0.4030
 D₅₀= 0.3086 D₃₀= 0.2099 D₁₅= 0.1550
 D₁₀= 0.1042 C_u= 3.87 C_c= 1.05

Remarks
As recieved MC = 14.6%

Date Received: 1/30/18 **Date Tested:** 2/5/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-114 **Depth:** 6-8'
Sample Number: S-1

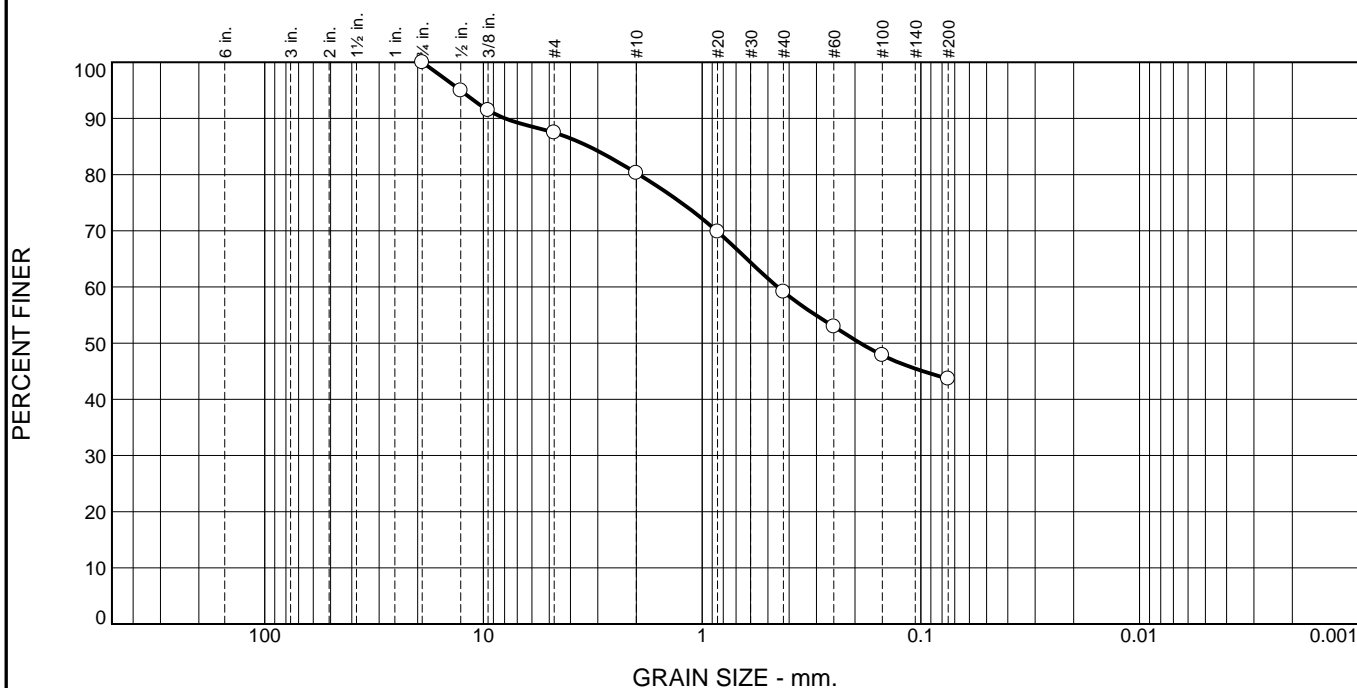
Date Sampled: 1/9/18

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	7.2	21.2	15.4	43.7	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	95.0		
.375	91.5		
#4	87.5		
#10	80.3		
#20	69.8		
#40	59.1		
#60	53.0		
#100	47.9		
#200	43.7		

* (no specification provided)

Material Description
Dark gray silty sand with organics

Atterberg Limits (ASTM D 4318)
 PL= _____ LL= _____ PI= _____

Classification
 USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients
 D₉₀= 7.9661 D₈₅= 3.2948 D₆₀= 0.4517
 D₅₀= 0.1889 D₃₀= _____ D₁₅= _____
 D₁₀= _____ C_u= _____ C_c= _____

Remarks
As recieved MC = 63.4%

Date Received: 1/30/18 **Date Tested:** 2/5/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-115 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 1/10/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA Project No: 101038.102170

CDM Smith
Geotechnical Engineering Laboratory

**Standard Test Method for Moisture, Ash, and Organic Matter of Peat and
Other Organic Soils (ASTM D2974)**

Client: Massachusetts Water Resources Authority
Project Name: Weston Aqueduct Supply Main 3
Project Location: MWRA line, MA
Project Number: 101038-102170
Boring Number: B-115
Sample Number: S-2
Sample Depth (ft): 8-10
Sample Date: 1/10/2018

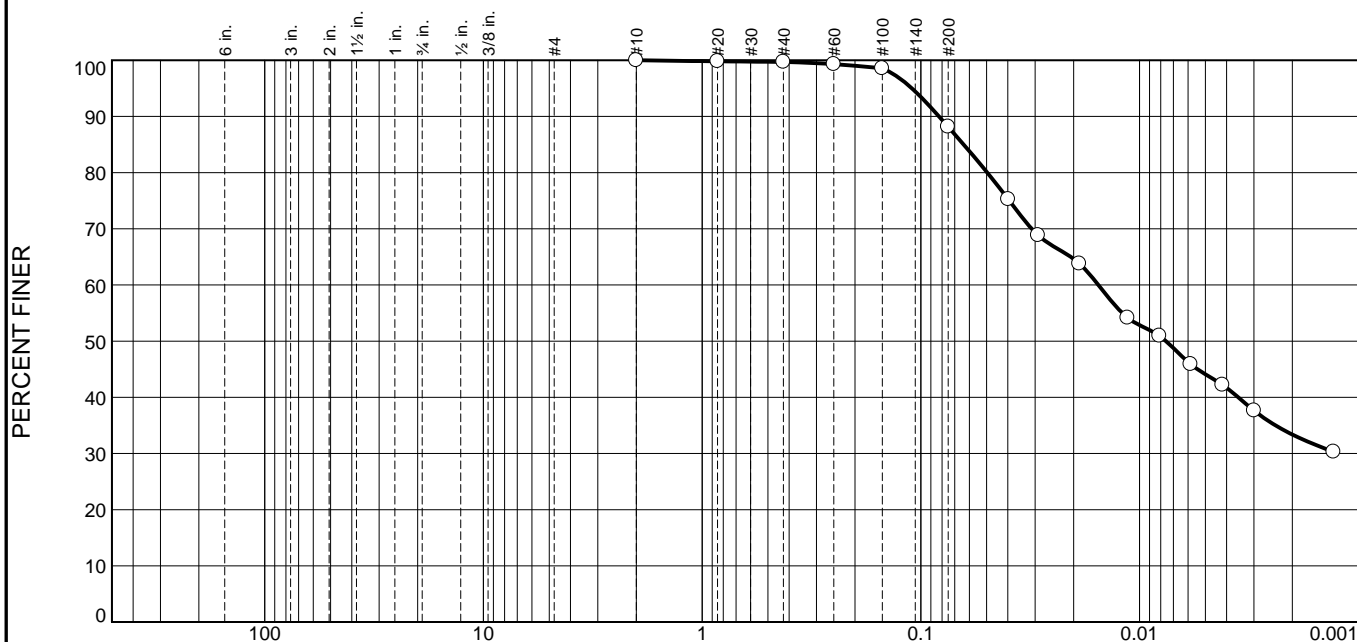
Tested By: AS
Test Date: 2/5/2018

Procedure: C
Temperature: 440° C

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.88
Wet Mass of Sample & Tin (g)	158.98
Dry Mass of Sample & Tin (g)	134.88
Mass of Water (g)	24.10
Mass of Dry Soil (g)	38.00
Moisture Content (%)	63.4

ASH CONTENT	
Porcelain Dish Mass (g)	96.88
Porcelain Dish + Oven Dried Soil (g)	134.88
Mass of Oven Dried Soil (g)	38.00
Mass of Dish & Burned Soil (g)	132.82
Mass of Burned Soil (g)	35.94
Mass of Organic Material (g)	2.06
Ash Content (%)	94.6
Organic Content (%)	5.4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	11.5	44.1	44.1

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.8		
#40	99.7		
#60	99.3		
#100	98.6		
#200	88.2		
0.0398 mm.	75.3		
0.0291 mm.	68.8		
0.0188 mm.	63.8		
0.0113 mm.	54.2		
0.0081 mm.	50.9		
0.0058 mm.	45.9		
0.0042 mm.	42.2		
0.0030 mm.	37.6		
0.0013 mm.	30.3		

* (no specification provided)

Material Description
 Gray lean clay

Atterberg Limits (ASTM D 4318)
 PL= 18 LL= 38 PI= 20

Classification
 USCS (D 2487)= CL AASHTO (M 145)= A-6(17)

Coefficients
 D₉₀= 0.0826 D₈₅= 0.0637 D₆₀= 0.0154
 D₅₀= 0.0076 D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Remarks
 As received MC = 32.5%

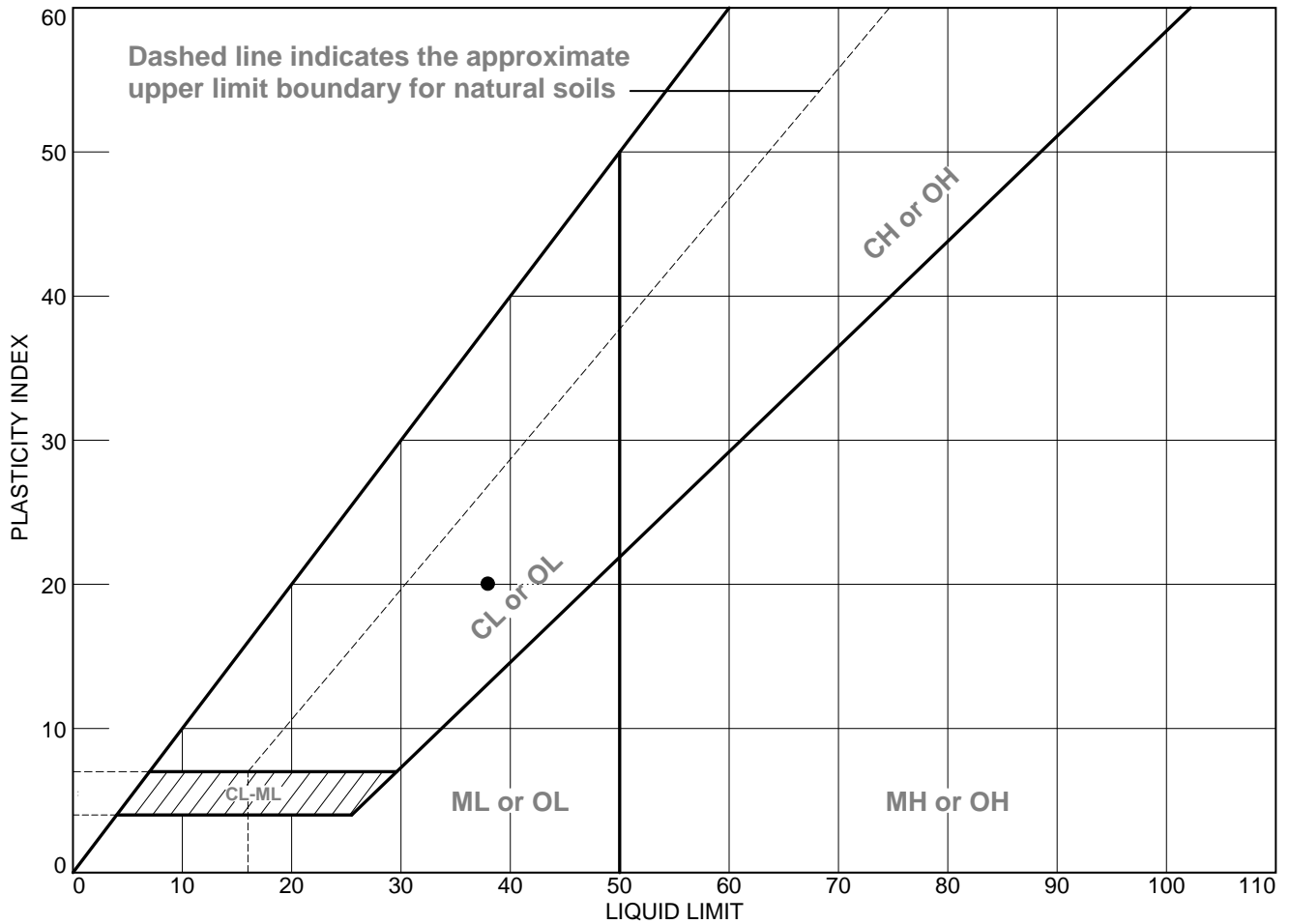
Date Received: 1/31/18 Date Tested: 2/6/18
 Tested By: MP/SB
 Checked By: MP
 Title: Laboratory Manager

Source of Sample: B-115 Depth: 19-21'
 Sample Number: S-4

Date Sampled: 1/10/18

CDM Smith Boston, Massachusetts	Client: Massachusetts Water Resources Authority (MWRA) Project: Weston Aqueduct Supply Main 3 (WASM3) Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
	Project No: 101038.102170

LIQUID AND PLASTIC LIMITS TEST REPORT



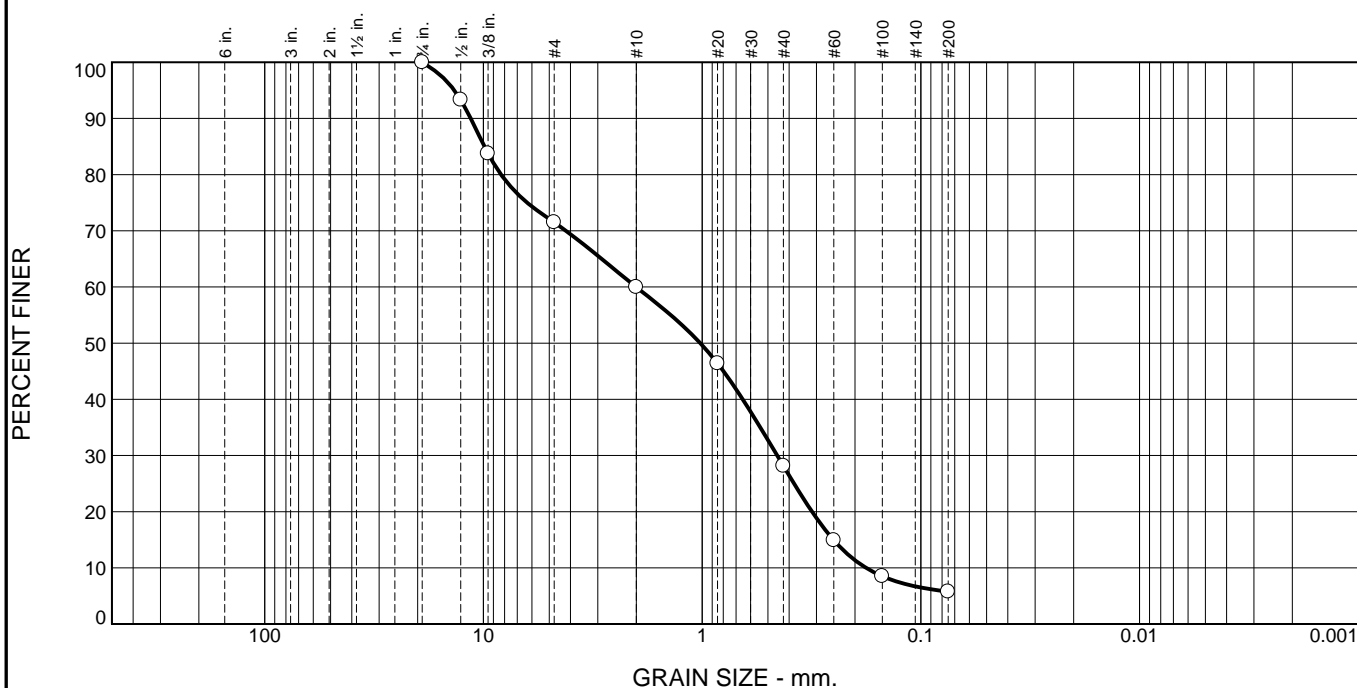
SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-115	S-4	19-21'	32.5	18	38	20	CL

CDM Smith
Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	28.5	11.5	31.9	22.4	5.7	

Test Results (ASTM D6913 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	93.3		
.375	83.8		
#4	71.5		
#10	60.0		
#20	46.4		
#40	28.1		
#60	14.9		
#100	8.5		
#200	5.7		

* (no specification provided)

Material Description
Dark gray poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)
 PL= LL= PI=

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= A-1-b

Coefficients
 D₉₀= 11.4343 D₈₅= 9.8979 D₆₀= 2.0042
 D₅₀= 1.0198 D₃₀= 0.4538 D₁₅= 0.2513
 D₁₀= 0.1778 C_u= 11.27 C_c= 0.58

Remarks
As recieved MC = 11.0%

Date Received: 1/30/18 **Date Tested:** 2/5/18
Tested By: SB
Checked By: MP
Title: Laboratory Manager

Source of Sample: B-116 **Depth:** 8-10'
Sample Number: S-2

Date Sampled: 1/9/18

CDM Smith

Boston, Massachusetts

Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No: 101038.102170

The graph displays the grain size distribution of a soil sample. The y-axis represents the percentage of soil finer than a given size, ranging from 0 to 100. The x-axis represents the grain size in inches on a logarithmic scale, ranging from 100 to 0.001. The curve shows that 100% of the soil is finer than 0.075 inches (No. 20 sieve). The distribution is well-graded, with a significant portion of the soil falling between 0.075 and 0.0075 inches (No. 20 to No. 200 sieves).

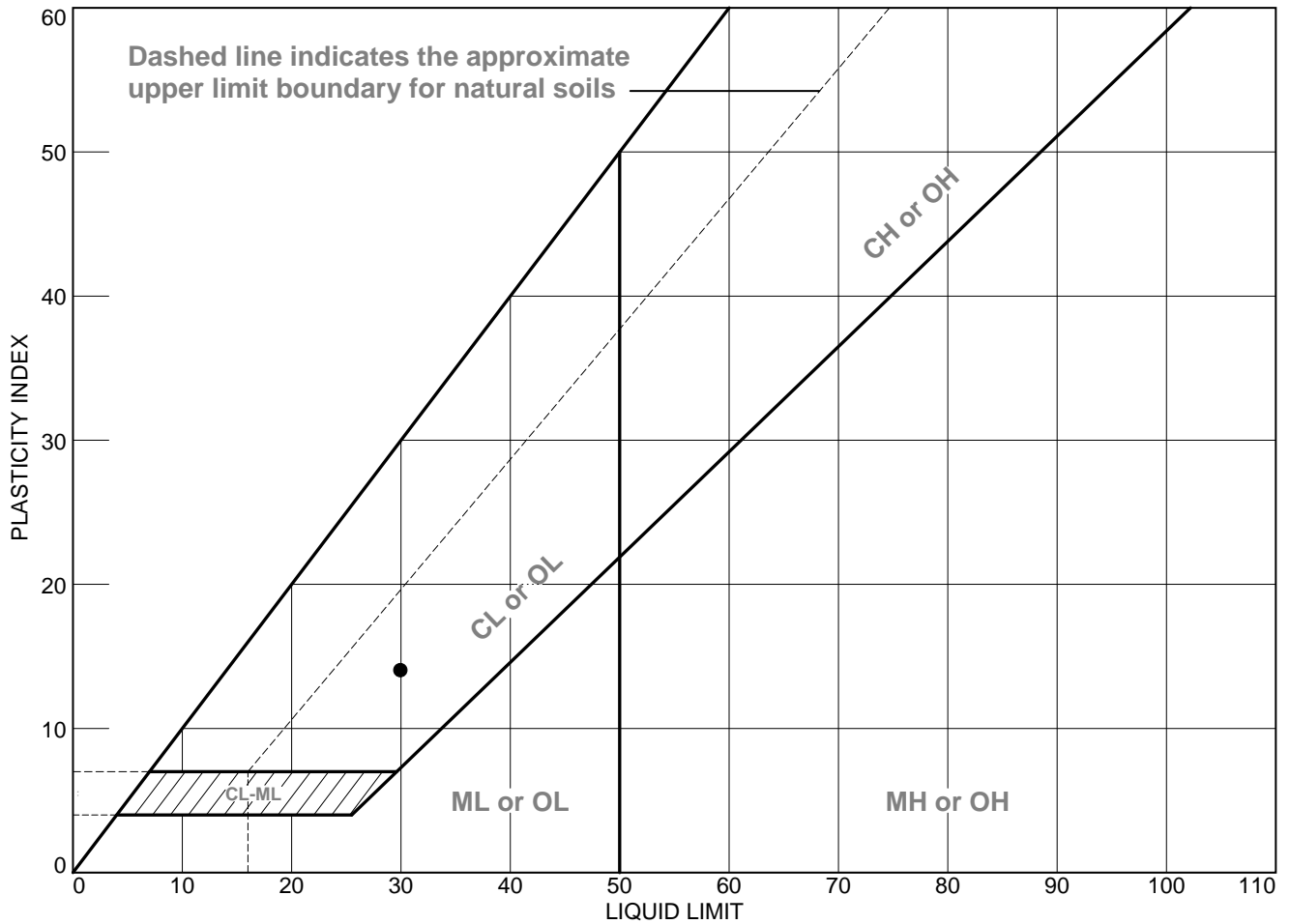
Grain Size (inches)	Grain Size (mm)	Sieve No.	Percent Finer (%)
6.0	150	-	100
3.0	75	-	100
2.0	50	-	100
1.5	37.5	-	100
1.0	25	-	100
0.75	19	No. 20	100
0.6	15	No. 30	100
0.425	10.6	No. 40	100
0.3	7.6	No. 60	100
0.25	6.3	No. 75	100
0.2	5.0	No. 100	100
0.15	3.7	No. 140	95
0.106	2.5	No. 200	83
0.075	1.9	No. 250	80
0.06	1.5	No. 300	71
0.0425	1.0	No. 400	63
0.03	0.75	No. 600	58
0.025	0.63	No. 700	54
0.02	0.50	No. 850	50
0.015	0.37	No. 1000	45
0.0106	0.25	No. 1400	35

Test Results (ASTM D6913 & D7928 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.3		
#20	99.1		
#40	99.0		
#60	98.8		
#100	98.5		
#200	93.6		
0.0382 mm.	82.4		
0.0274 mm.	79.7		
0.0182 mm.	70.7		
0.0109 mm.	63.0		
0.0079 mm.	58.0		
0.0057 mm.	53.4		
0.0040 mm.	49.8		
0.0029 mm.	44.4		
0.0013 mm.	35.3		

Title: Laboratory Manager

Boston, Massachusetts

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-116	S-3	14-16'	29.9	16	30	14	CL

CDM Smith
Boston, Massachusetts

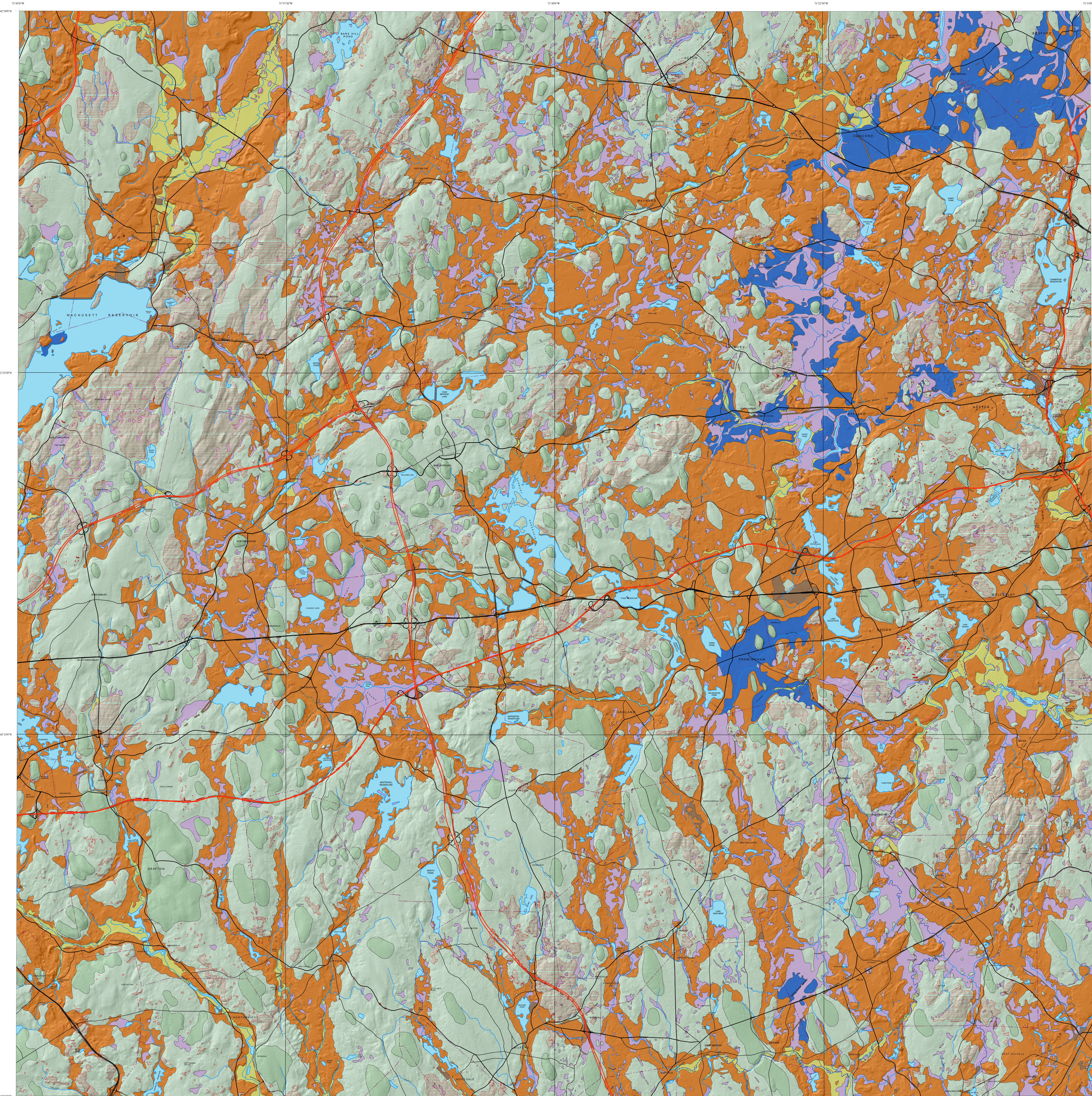
Client: Massachusetts Water Resources Authority (MWRA)
Project: Weston Aqueduct Supply Main 3 (WASM3)
 Medford, Somerville, Arlington, Belmont, Waltham & Weston, MA
Project No.: 101038.102170

Tested By: AS Checked By: MP

Appendix E

Regional Geology Maps

Surficial Geologic Map of the Clinton-
Concord-Grafton-Medfield 12-Quadrangle
Area in East Central Massachusetts, 2006



SURFICIAL GEOLOGIC MAP OF THE CLINTON-CONCORD-GRAFTON-MEDFIELD
12-QUADRANGLE AREA IN EAST CENTRAL MASSACHUSETTS

Compiled by Janet R. Stone and Byron D. Stone
2006

DESCRIPTION OF MAP UNITS

POSTGLACIAL DEPOSITS

- Artificial fill**—Earth materials and manmade materials that have been artificially emplaced, primarily in highway and railroad embankments, and in dams; may also include landfills, urban development areas, and filled coastal wetlands.
- Floodplain alluvium**—Sand, gravel, silt, and some organic material, stratified and well sorted to poorly sorted, beneath the floodplains of modern streams. The texture of alluvium commonly varies over short distances both laterally and vertically, and generally is similar to the texture of adjacent glacial deposits. Along smaller streams, alluvium is commonly less than 5 ft thick. The most recent deposit of alluvium on the map is along the Charles, Assabet, and Concord Rivers where the texture is predominantly sand, fine gravel, and silt, and total thickness is as much as 25 ft. Alluvium typically overlies thicker glacial stratified deposits.
- Swamp deposits**—Organic muck and peat that contain minor amounts of sand, silt, and clay, stratified and poorly sorted, in kettle depressions or poorly drained areas. Most swamp deposits are less than about 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits.

GLACIAL STRATIFIED DEPOSITS

Sorted and stratified sediments composed of gravel, sand, silt, and clay (as defined in particle size diagram) deposited in layers by glacial meltwater. These sediments occur as four basic textural units—gravel deposits, sand and gravel deposits, sand deposits, and fine deposits. On this interim map, gravel, sand and gravel, and sand deposits are not differentiated and are shown as *Coarse Deposits* where they occur at land surface. *Thin Deposits* also are shown where they occur at land surface. **Textural changes occur both areally and vertically (fig. 2), however subsurface textural variations are not shown on this interim map.**

- Coarse deposits** include: *Gravel deposits* composed mainly of gravel-sized clasts; cobbles and boulders predominate; minor amounts of sand and silt. Gravel beds, and sand comprises few separate layers. Gravel layers generally are poorly sorted and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* composed of mixtures of gravel and sand within individual layers and as alternating layers. Sand and gravel layers generally range from 25 to 50 percent gravel particles and 50 to 75 percent sand particles. Layers are well to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay.
- Fine deposits** include very fine sand, silt, and clay that occurs as a well-sorted, thin layer of alternating silt and clay, or thicker layers of very fine sand and silt. Very fine sand commonly occurs at the surface and grades downward into rhythmically bedded silt and clay varves. Locally, this map unit may include areas underlain by fine sand.

GLACIAL TILL DEPOSITS

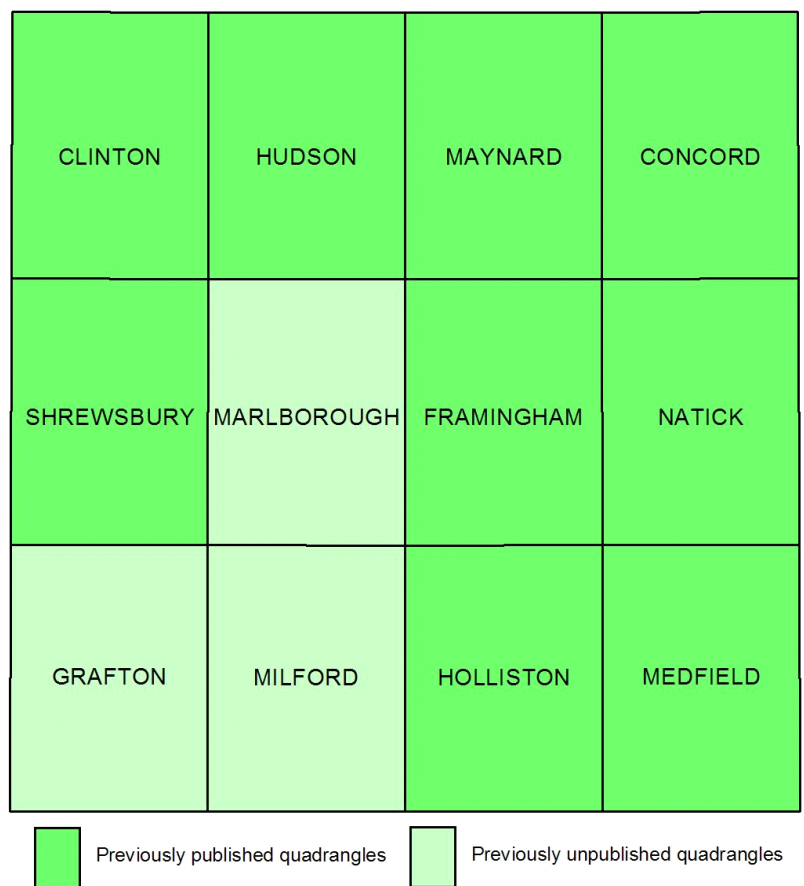
- Thin till**—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10-15 ft thick and including areas of bedrock outcrop where till is absent. Predominantly upper till of the last glaciation; hence to moderately compact, generally sandy, commonly stony. Two facies are present in some places; a looser, coarser-grained ablation facies, melted out from supraglacial position; and an underlying more compact, finer-grained lodgement facies deposited subglacially. In general, both ablation and lodgement facies of upper till derived from fine-grained bedrock are finer grained, more compact, less stony and have fewer surface boulders than upper till derived from coarser grained crystalline rocks. Fine-grained bedrock sources include the red Mesozoic sedimentary rocks of the Connecticut River lowland, marble in the western river valleys, and fine-grained schists in upland areas.
- Thick till**—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders at the surface; in the shallow subsurface, compact, nonsorted matrix of silt, very fine sand, and some clay containing scattered small gravel clasts in areas where till is greater than 10-15 ft thick, chiefly in drumlin landforms in which till thickness commonly exceeds 100 ft (maximum recorded thickness is 230 ft). Although upper till is the surface deposit, the lower till constitutes the bulk of the material in these areas. Lower till is moderately to very compact, and is commonly finer-grained and less stony than upper till. An oxidized zone, the lower part of a soil profile formed during a period of interglacial weathering, is generally present in the upper part of the lower till. This zone commonly shows closely spaced joints that are stained with iron and manganese oxides.

BEDROCK AREAS

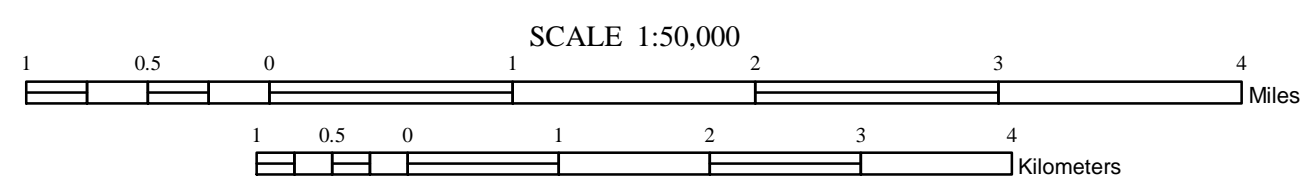
- Bedrock outcrops and areas of abundant outcrop or shallow bedrock**—Solid color shows extent of individual bedrock outcrops; line pattern indicates areas of shallow bedrock or areas where small outcrops are too numerous to map individually; in areas of shallow bedrock, surficial materials are less than 5 ft thick.

PARTICLE DIAMETER											
10	2.5	0.16	0.06	0.04	0.02	0.01	0.005	0.0025	0.0015	in.	
256	64	4	2	1	0.5	0.25	0.125	0.063	0.032	mm	
Boulders	Cobbles	Pebbles	Gravels	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay	
GRAVEL PARTICLES				SAND PARTICLES			FINE PARTICLES				

Grain-size classification used in this report, modified from Wentworth (1922)



7.5-minute quadrangles in this compilation



Surficial Geologic Map of the Natick
Quadrangle, Middlesex and Norfolk
Counties, Massachusetts, 1974

INTRODUCTION

The Natick quadrangle is an area of about 55 square miles in eastern Massachusetts centered about 12 miles west of Boston. Although much of the topography is controlled by lithology and structure of the bedrock, a considerable part of the topography has been modified by glaciation. Bedrock, most of which is concealed by a cover of surficial deposits, is principally exposed in the northern half of the quadrangle. Glacial features include drumlins, eskers or ice-channel fillings, kames, kame terraces, gently sloping kame deltas, and flat-lying lake-bottom deposits. A thin veneer of till covers a large part of the hills in the quadrangle, and most of the younger stratified glacial deposits lie at the lower levels, having been deposited in or graded to glacial lakes formed during deglaciation, when melt waters were temporarily dammed by ice.

Most of the quadrangle is drained by the Charles River, which flows northeastward and empties into Boston Harbor. A smaller area in the northwestern and western parts is drained by the Sudbury River, which flows northward into the Concord River, hence to the Merrimack River, and finally to the Atlantic Ocean at the northeast corner of the state.

SURFICIAL DEPOSITS

Till

Poorly sorted and mostly nonstratified loose to well-compacted till is widely dispersed throughout the quadrangle. It is most prevalent in the northern, central, and eastern parts, where it forms a thin veneer of variable thickness over much of the bedrock. A large part of the till is concealed by overlying stratified surficial material.

Glacial-lake and glacial-stream deposits

Most of the stratified deposits in the quadrangle were laid down in or graded to the various stages of glacial Lake Charles (Clapp, 1904, p. 188) and Sudbury (Goldthwait, 1955, p. 274). These deposits, which are widespread, particularly in the southern half and western part of the map area, have been grouped chronologically; the deposits are successively younger northward. The older deposits were laid down in Lake Charles, which formed as the glacial meltwaters were dammed by earlier deposits and ice. With time, as the ice front retreated northward and successively lower outlets were utilized, younger deposits were laid down in or graded to successively younger stages of Lake Charles and Sudbury. The idea of the distribution of glacial deposits according to their chronological relationships was proposed by Johns (1941, 1953).

The distribution of materials is somewhat heterogeneous throughout the area underlain by lake deposits, because of the coalescing and overlapping of deltas and the many ice-front positions from which the sand and gravel originated. Sorting and degree of stratification of the deposits, as well as the textures, vary widely. The deltaic deposits most commonly have south-dipping forest beds of silt, sand, and pebbly sand with minor gravelly beds; these are overlain by gently north-dipping topset beds of coarse pebbly to cobbly gravel. The gravel has large clasts (boulders and cobbles) which are mostly granitic in composition, ranging from granitic to granodioritic. Lesser amounts of siliceous gneiss, quartzite, metamorphosed volcanic rock of intermediate to mafic composition, and gabbro also are present.

Lake-bottom deposits of well-sorted and thin stratified beds of fine-grained silt and clay are present in the northwestern part of the quadrangle. Clay may be present below the beds of sand and silt but was not seen in the Natick quadrangle. Kottoff (1964) reports that some silty clay is present in lake-bottom deposits in the adjoining Concord quadrangle to the north.

Glacial-stream deposits

Glacial-stream deposits (or outwash) forming valley fill that are not clearly graded to any lake level are present in the north-central and northeastern parts of the quadrangle. In part, these deposits form kames and kame terraces deposited in contact with stagnant ice.

GLACIAL AND POSTGLACIAL HISTORY

Glacial ice moved across the Natick quadrangle in a generally south to southeast direction. This direction is recorded in the alignment of drumlins, together with grooves and striae in the bedrock whose orientations range from 160° to 180° true bearing. The effects of glacial erosion are small. The surficial deposits in the area between Cochituate and Wellesley are at least 165 feet thick, and it is possible that a preglacial valley in this area (Clapp, 1904, p. 201) was slightly overdeepened by ice movements and later filled up with glacial material. This valley is outlined on the map by bedrock contours. These contours are based on well depths and show the altitude of the bedrock surface under the thick cover of glacial deposits. The valley trends southeast from near Cochituate toward Wellesley; near Lake Waban it turns northeast. The northeast part of the valley follows the trend of and is obviously controlled by a major fault in the bedrock (Nelson, unpubl. data) which divides pre- from Devonian rock. This covered valley probably represents the preglacial drainage for the Sudbury River (Clapp, 1904, p. 201).

Till (Qt), deposited directly by the ice, is the oldest glacial deposit, and, although relatively thin, it is widespread over much of the quadrangle. Hansen (1956, p. 61) and Kottoff (1964) both report that till in two stages is present in adjoining quadrangles to the northwest and north, respectively. Only one till has been observed in the Natick quadrangle, and it matches the description of the till given by Kottoff (1964); if the older till is present, it is buried by younger deposits. The till mapped in the Natick quadrangle probably correlates with youngest till of Wisconsin age that Kottoff (1964) described in the Concord quadrangle.

During retreat of the ice from the Natick and adjacent quadrangles, melt waters were dammed by hills to the west, south, and east and by the ice front to the north, and glacial Lakes Charles and Sudbury were formed. Cols in drainage divides to the south and east served as spillways and controlled the lake levels. As the ice retreated farther north, lower spillways were uncovered and the lakes were successively lowered to the altitudes of the new spillways. Each successive level represents a lake stage, and gravel and sand were deposited in or graded to each level.

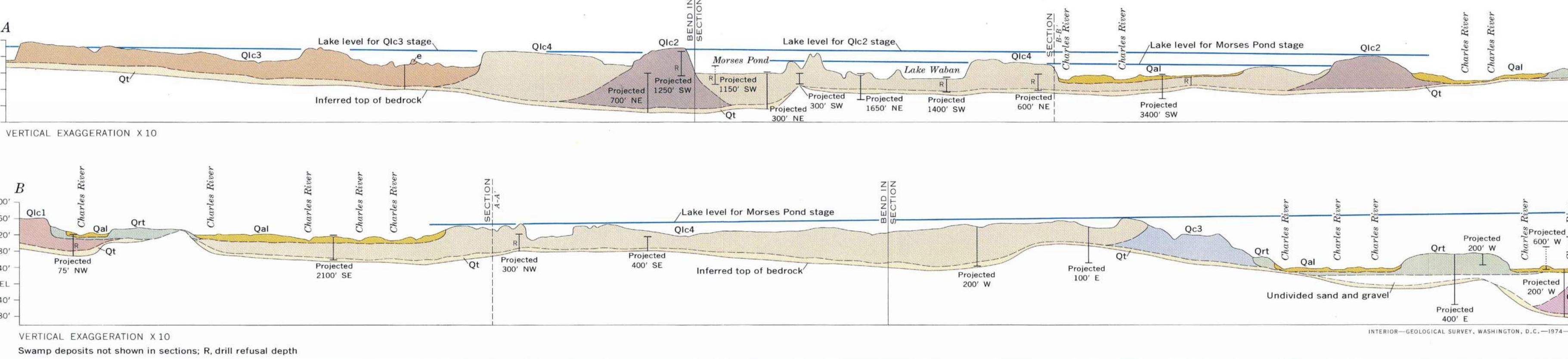
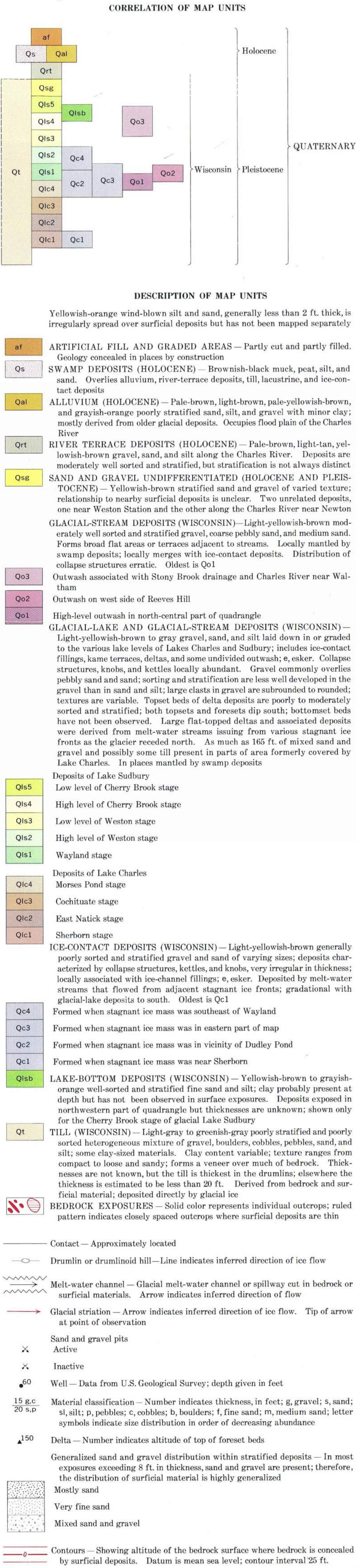
Commonly, sand and gravel were deposited in contact with the stagnant ice front, as well as around and over isolated stagnant ice blocks that became separated from the main ice sheet. When sand and gravel were deposited directly into the lakes, deltas were formed. Relatively loose sand and gravel plains formed in places where deltas coalesced and elsewhere where groups of deltas are closely spaced.

Both Lakes Charles and Sudbury occupy parts of the Natick quadrangle. Lake Charles, the older of the two lakes, has a complex history that is represented by five stages in the Natick quadrangle. During each successively lower stage, glacial deposits were laid down. Although the spillways that controlled the stage levels of the lakes are located outside the map area, the lake stage levels can be determined within the quadrangle by the altitudes of the tops of forest beds in deltas. Four such altitudes have been obtained within the map area and one altitude from a nearby delta in the adjoining Framingham quadrangle. The locations of the deltas and the altitudes of the tops of forest beds are: just north of Sherborn in the southwest part of the quadrangle, altitude 178 feet; near East Natick in the west-central part of map, altitude 179 feet; near Cochituate close to the west edge of map, altitude 178 feet; just west of Happy Hollow in the Framingham quadrangle, altitude 179 feet; and just east of Moses Pond in the center of the map area, altitude 150 feet.

Because the delta positions are widespread throughout the quadrangle, it is necessary to know what the postglacial tilt of the land has been, before the altitude differences between the various lake stages can be determined. Kottoff (1963) found that postglacial tilt in the adjoining Concord quadrangle was between 5 and 6 feet per mile; therefore, using Kottoff's tilt value and projecting the known lake levels, the relative levels of the different stages of the lake stages, named after geographic locations near the deltas and listed in order of decreasing altitude, are the Sherborn, East Natick, Cochituate, Happy Hollow, and Moses Pond stages.

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SURFICIAL GEOLOGIC MAP OF THE NATICK QUADRANGLE, MIDDLESEX AND NORFOLK COUNTIES, MASSACHUSETTS

By
Arthur E. Nelson
1974

Massachusetts (Natick)
cop. 1
11/24/1974
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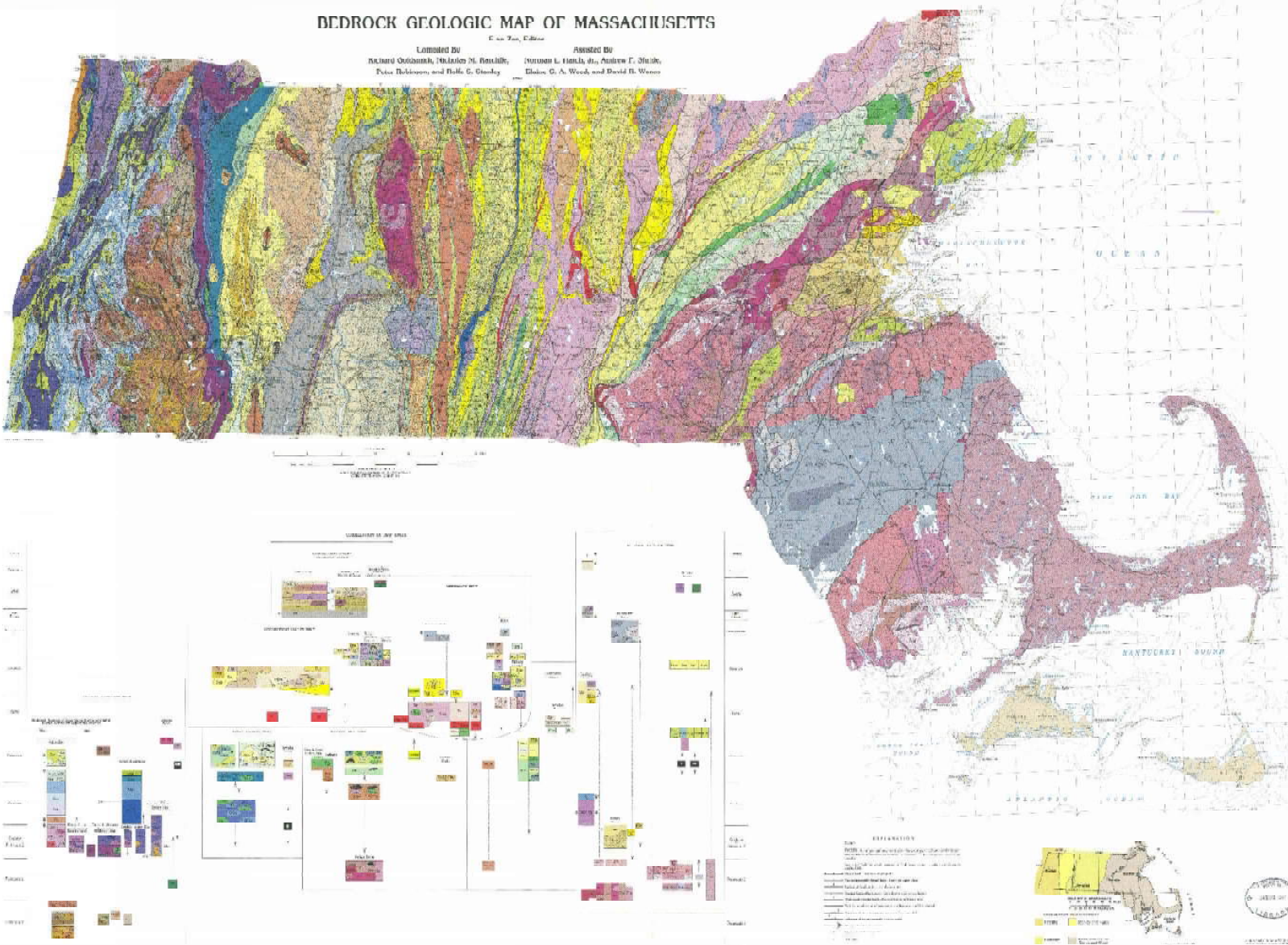
Bedrock Geologic Map of Massachusetts, 1983

BEDROCK GEOLOGIC MAP OF MASSACHUSETTS

C. W. TAYLOR, Editor

Compiled by
NORMAN C. CHAMBERLAIN, Frederick M. FORTNEY,
Peter Robinson, and Ralph G. STODOLY

Assisted by
MURRAY L. HARRIS, JR., Andrew F. SHIPLEY,
Charles G. A. WOOD, and David B. WOOD



Geological Formations

Formation	Color
Quaternary	White
Pleistocene	Light Gray
Glacial	Dark Gray
Post-glacial	Light Blue
Proterozoic	Dark Blue
Ordovician	Light Blue
Silurian	Dark Blue
Devonian	Light Blue
Carboniferous	Dark Blue
Permian	Light Blue
Triassic	Dark Blue
Jurassic	Light Blue
Cretaceous	Dark Blue
Tertiary	Light Blue
Quaternary	Dark Blue

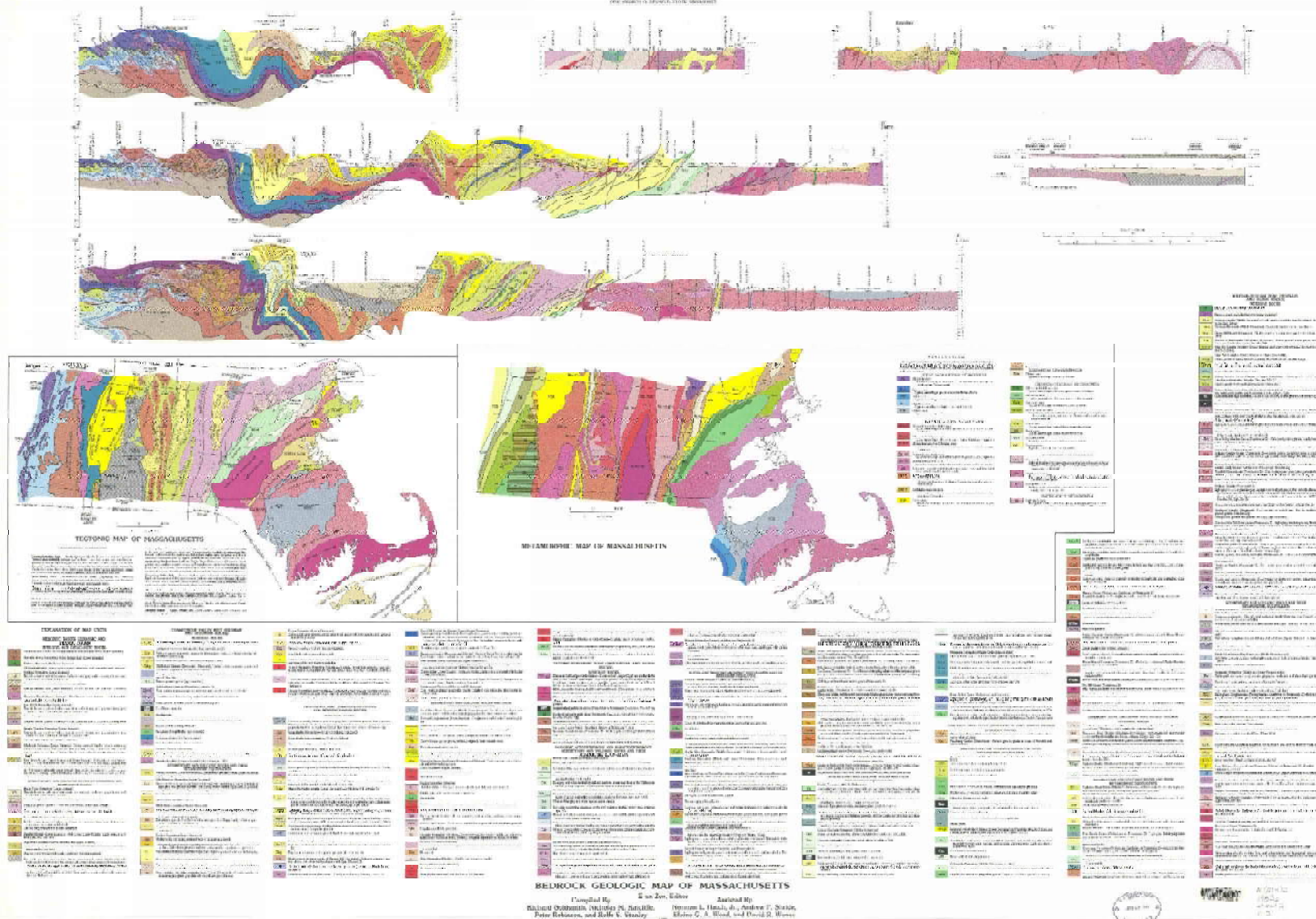
Geological Features

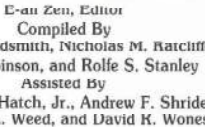
Feature	Symbol
Geological Boundary	Thick black line
Geological Contact	Thin black line
Geological Fault	Dashed black line
Geological Structure	Thin black line with dots
Geological Symbol	Thin black line with dots

EXPLANATION

THIS MAP IS A GENERALIZED BEDROCK GEOLOGIC MAP OF MASSACHUSETTS. IT IS NOT A DETAILED MAP OF THE STATE'S GEOLOGY. THE MAP IS BASED ON THE BEDROCK GEOLOGIC MAP OF MASSACHUSETTS, WHICH WAS COMPILED BY NORMAN C. CHAMBERLAIN, FREDERICK M. FORTNEY, PETER ROBINSON, AND RALPH G. STODOLY. THE MAP IS ASSISTED BY MURRAY L. HARRIS, JR., ANDREW F. SHIPLEY, CHARLES G. A. WOOD, AND DAVID B. WOOD.







U.S. GEOLOGICAL SURVEY

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