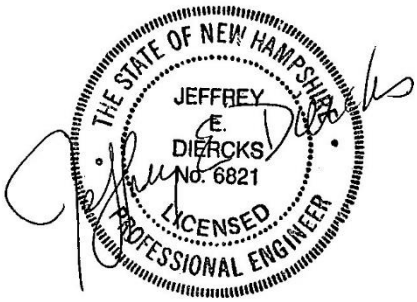
ADDENDUM NO. 2

MODIFICATIONS TO THE WATER MAIN DRAWINGS AND SPECIFICATIONS

AND MODIFICATIONS TO APPENDICES

January 29, 2018

Prepared by: CDM Smith Inc., Manchester, New Hampshire



29-JAN-2018

MODIFICATIONS TO THE WATER MAIN DRAWINGS

1. DELETE Note 5 on Sheets W-1 through W-5, and INSERT INSTEAD this new Note 5:

   "5. ALL WATER MAIN JOINTS TO BE RESTRAINED. ALL FITTINGS TO BE OF THE RESTRAINED MECHANICAL JOINT TYPE."

2. On the north side of Main Street, west of Broadway, Sheet W-5 shows an unlabeled water main. To that water main, add the label "Abandoned".

3. On the lower strip of Sheet W-5, INSERT a new boxed note which reads "REMOVE AND DISPOSE OF EXISTING 10" AND 12" CAST IRON MAIN WHERE NECESSARY FOR CONSTRUCTION OF NEW 12" DI MAIN."

4. In the lower strip of Sheet W-5, DELETE the boxed note which reads, "CROSS OVER EXISTING DRAIN AND ENCASE WITH CONCRETE, SEE NOTE 10". INSERT INSTEAD a boxed note which reads, "REDUCE COVER DEPTH TO 4.3 FT TO CROSS OVER EXISTING DRAIN, SEE NOTE 10".

5. In the "Water Main – Sewer and Drain Crossings" table on Sheet W-6, DELETE the entry in the righthand column which reads "<5.0", and INSERT INSTEAD "4.3".

6. On Sheet W-6, DELETE the TYPICAL CULVERT CROSSING DETAIL and the detail titled STEEL SLEEVE FOR WATER MAIN AT CULVERT CROSSINGS. INSERT INSTEAD the two culvert crossing details which follow the Addendum text.

MODIFICATIONS TO THE WATER MAIN SPECIFICATIONS

1. In Section W-01025, DELETE paragraph 1.05. INSERT INSTEAD the following new paragraph 1.05:

"1.05 Temporary Water Service (ITEMS W-5a THROUGH W-5d)

A. Measurement

1. Temporary water service pipe of the sizes specified in the Bid Form (Items 5a and 5b) will be measured in place on a linear foot basis.

2. Temporary hydrants (Item 5c) will be measured as the number actually installed in the temporary water system and accepted by the Engineer.

3. Type B temporary service connections (Item 5d) will be measured as the number actually installed in the temporary water system and accepted by the Engineer.

B. Payment

1. Payment for furnishing, installing and removing temporary service pipe of the sizes specified will be made for the respective quantities as above determined, at the applicable price per linear foot bid under Items 5a and 5b in the Bid Form. Such price and payment shall be full compensation for all labor, equipment, materials, and incidentals for submitting the plan for piping; furnishing and installing the temporary service pipe; connecting the temporary pipe to the existing water system; furnishing and installing Type A hose connections; furnishing and installing temporary valves; disinfecting all pipe and hose as specified; excavation and pavement restoration for street crossings; protection of driveways and of the temporary pipe; bagging out-of-service hydrants; maintaining the temporary piping system; temporary piping system removal; and surface restoration.

2. Payment for furnishing, installing and removing temporary hydrants will be made at the applicable unit price bid under Item 5c in the Bid Form. Such price and payment shall be full compensation for all labor, equipment, materials and incidentals for furnishing, installing, maintaining and removing temporary hydrants at locations approved by Engineer and Owner.

3. Payment for furnishing, installing and removing Type B service connections will be made at the applicable unit price bid under Item 5d in the Bid Form. Said price shall apply to 1-inch or 2-inch temporary service connections, connected to 1-inch or 2-inch existing services, at locations approved by Engineer and Owner. Such price and payment shall be full compensation for all labor, equipment, materials

and incidentals for excavation; tapping or otherwise connecting the existing service connection to the temporary piping system; temporary shutoff valve if needed; backfill; disinfection; maintaining the temporary service connection; removing the temporary service connection; repairing the permanent service connection as needed; and restoration of ground surface or pavement."

2. In Section W-01025, paragraph 1.06, DELETE "24-inch steel sleeve" wherever it appears and INSERT INSTEAD "20-inch steel sleeve".

3. At the end of Section 01170, INSERT the following new paragraph 1.11:

"1.11 STEEL SLEEVE FOR CULVERT CROSSINGS

A. Steel casing pipe shall be of leakproof construction and confirm to the requirements of ASTM A53. Steel casing pipe shall have a minimum yield strength of 35,000 psi, and shall be designed to withstand H-20 traffic loading. Steel casing shall be of nominal 20-inch diameter with a 0.50-inch wall thickness. The steel casing pipe shall be galvanized in accordance with AASHTO M 111. All hardware shall be A325 H.S. galvanized steel.

B. Steel pipe shall be furnished in lengths of the Contractor's choice. The casing shall have beveled ends with a single or double v-groove and shall be field joined by full-penetration butt welding all around. Alternatively, Permalok connectors may be used.

C. Casing spacers shall be Model CCS as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL, or approved equal. Casing spacer shall be a two-piece shell per carrier pipe and made from T304 stainless steel of a minimum 14-gauge thickness. Each shell section shall be lined with a 0.090" thick ribbed PVC extrusion with a retaining section that overlaps the edges of the shell and prevents slippage. PVC liner shall have a hardness of 85-90 durometer. Bearing surfaces (runners) shall be ultra-high molecular weight polyethylene to provide abrasion resistance and a low coefficient of fraction (0.12). The runners shall be attached to support structures (risers) at appropriate positions to properly support the carrier pipe within the casing pipe and to ease installation. The runners shall be mechanically bolted to the spacer. Risers shall be MIG welded to the shell, where applicable. Risers shall be made of T304 stainless steel of a maximum 10-gauge with bolt heads welded to the inside of the risers for strength. Bottom risers 6" and over in height shall be reinforced. All reinforcing plates shall be 10 gauge T304 stainless steel and shall be MIG welded to mating parts.

D. Casing spacers shall employ centered and restrained positioning within the casing pipe, and shall be installed in accordance with the manufacturer's instructions. Number and position of spacers shall be in accordance with the manufacturer's instructions.

E. Casing spacer end seals shall be a pull-over type construction and made from 0.090" (3/32") thick Neoprene with T304 stainless steel bands for securing the ends of the end seal to the casing pipe and carrier pipe. Casing spacer end seals shall be Model CCES as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL, or approved equal. Casing spacer end seals shall be installed in accordance with manufacturer's instructions."

4. In Section W-02616, DELETE paragraph 2.03C and INSERT INSTEAD the following new paragraph 2.03C:

"C. Contractor shall have at hand at the beginning of the work Viton gaskets of all needed sizes to be incorporated into restrained joints. The number of Viton gaskets of each size to be kept at hand shall be enough to assure the continued progress of Contractor's work. OWNER or ENGINEER may order the use of Viton gaskets based on conditions encountered in the field. Whenever any Viton gaskets are utilized, Contractor shall restore the stock in such as manner as to assure the continued progress of the work."

MODIFICATIONS TO THE APPENDICES

1. DELETE "Appendix A – Geotech (Subsurface) Information", and INSERT INSTEAD the attached "Appendix A – Geotechnical (Subsurface) Information".

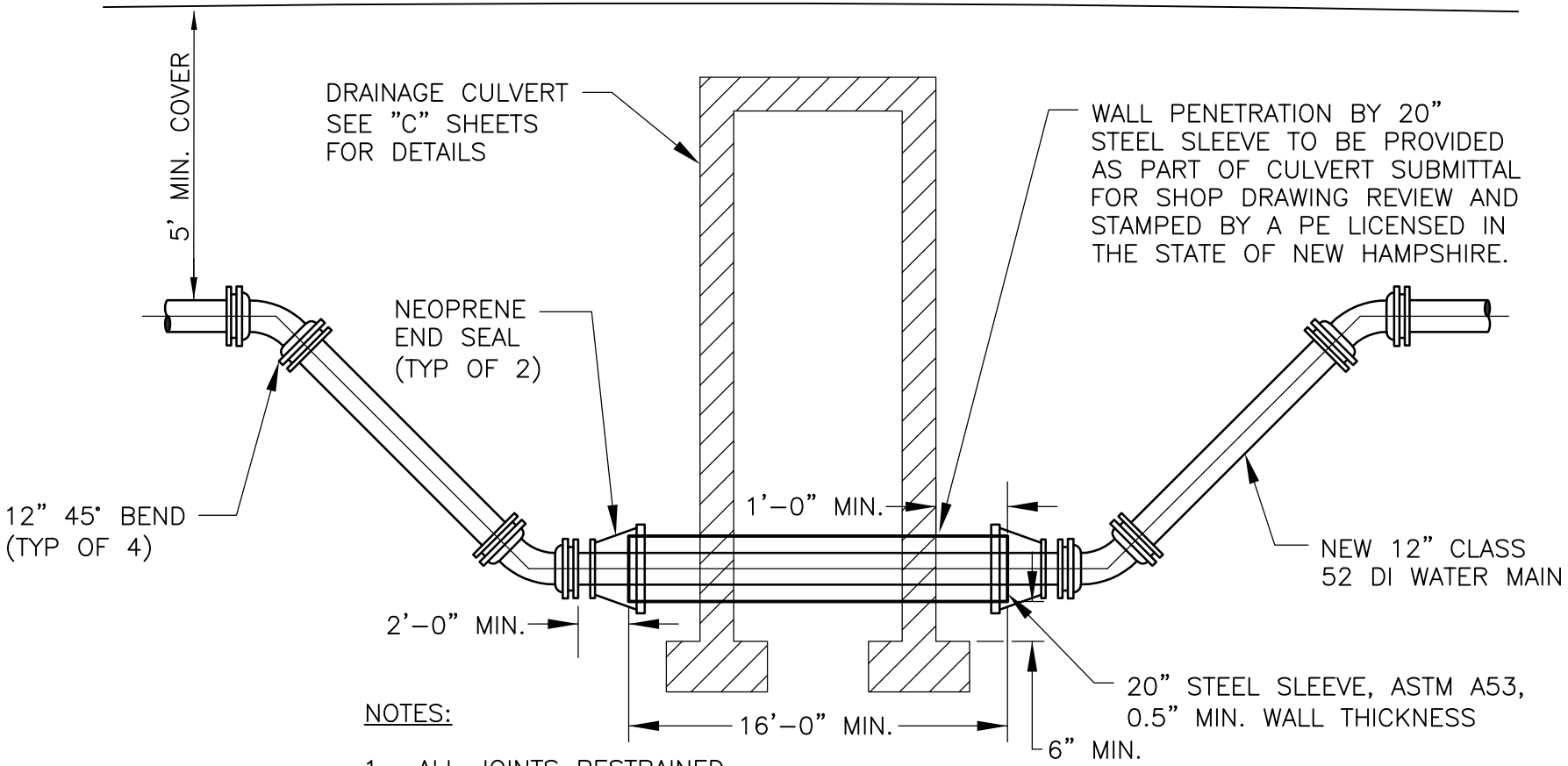
2. INSERT the attached new "Appendix G – Environmental Testing Results and Monitoring Well Water Levels".

3. INSERT the attached new "Appendix H – Summary of Meeting with GLSD".

ATTACHMENTS

- Two details for culvert crossings
- Replacement "Appendix A – Geotechnical (Subsurface) Information"
- New "Appendix G – Environmental Testing Results and Monitoring Well Water Levels"
- New "Appendix H – Summary of Meeting with GLSD"

END OF ADDENDUM



NOTES:

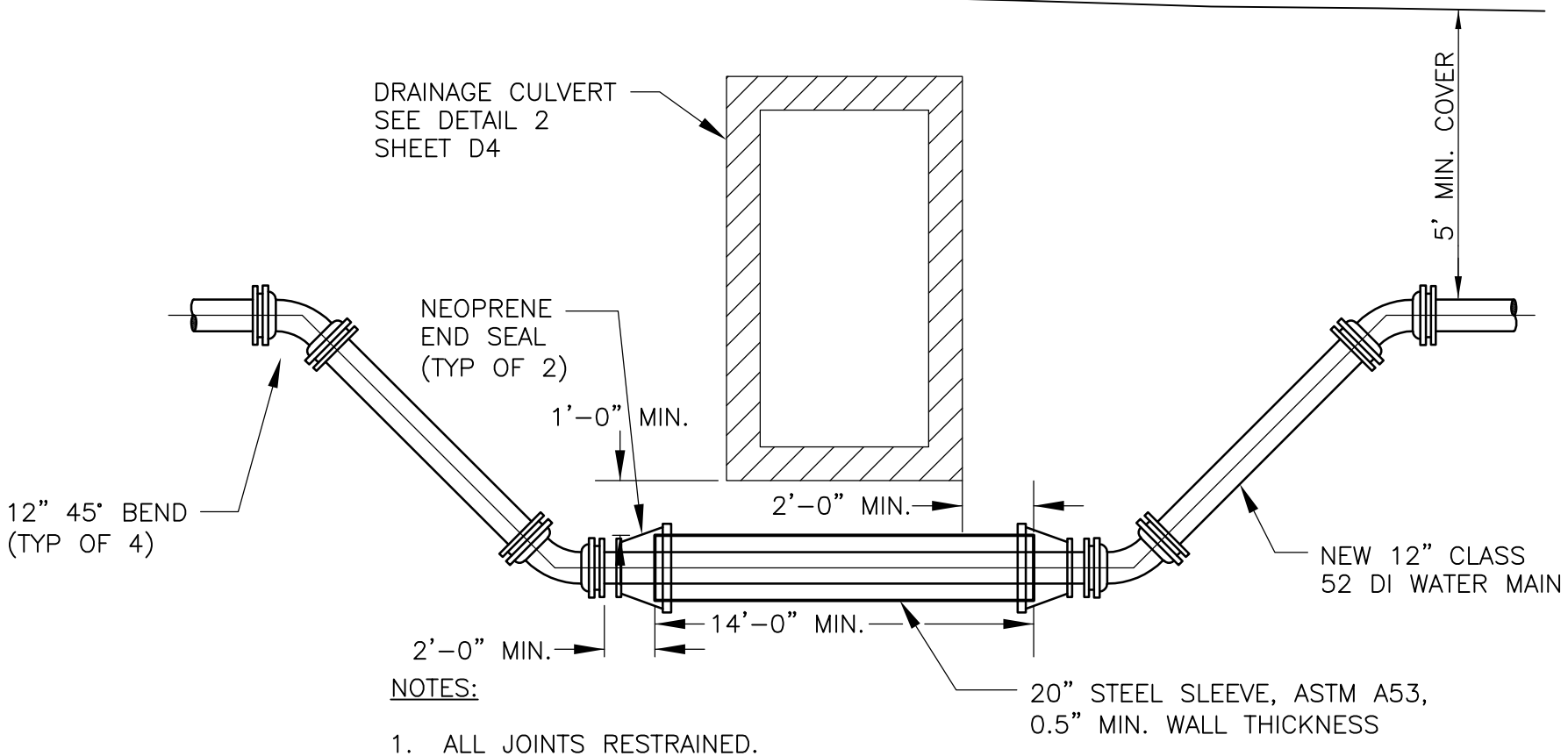
1. ALL JOINTS RESTRAINED.
2. SEE TABLE ON SHEET W-6 FOR APPROXIMATE DEPTH OF COVER.
3. STEEL SLEEVE SHALL BE CENTERED ON CENTERLINE OF CULVERT.
4. FURNISH COMPOSITE CASING SPACERS AS SPECIFIED AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

CULVERT CROSSING AT STATION 153+00

DETAIL

NTS

CDM Smith	DATE JANUARY 2018	SHEET NO. / LOCATION	ADDENDUM NO.	FIGURE NO.
			2	W-1



NOTES:

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CULVERT CROSSING AT STATION 170+15

DETAIL

NTS

CDM Smith	DATE JANUARY 2018	SHEET NO. / LOCATION	ADDENDUM NO.	FIGURE NO.
			2	W-2

APPENDIX A

GEOTECH (SUBSURFACE) INFORMATION

Memorandum

To: *Jeffrey Diercks, P.E.*

From: *Jennifer Todd*
Tyler Dunn, P.E.

Reviewed By: *Kathleen M. Murtagh, P.E.*

Date: *January 9, 2018*

Subject: *Summary of Geotechnical Field Exploration Program and Geotechnical Engineering Recommendations*
South Broadway Watermain and Sewer Replacement
Salem, New Hampshire

Introduction

This memorandum summarizes CDM Smith's field exploration and laboratory testing program, and provides geotechnical engineering recommendations for the design and construction for the South Broadway Watermain and Sewer Replacement, located in the Town of Salem, New Hampshire.

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

Existing Conditions

The project area includes the paved road South Broadway (Rte. 28) from Main Street (Rte. 97) to south of Cluff Crossing Road, also including some of Main Street and North Broadway around their intersection with South Broadway in Salem, New Hampshire.

South Broadway is a four-lane state highway with the Salem Rail Trail (former rail line) to the west and commercial areas to the east and west along most of the length from Main Street to Cluff Crossing Road. The area between Angelas Drive and Brookwood Drive is mainly residential, containing a mobile home park. The project area covers approximately 7,900 ft of South Broadway, and approximately 1,650 ft of Main Street, from Pleasant Street to Millville Street.

South Broadway runs generally north-south from Main Street in the north to Cluff Crossing Road in the south. The roadway elevation of South Broadway ranges from approximately El. 136 to approximately El. 123. Main Street runs generally east-west from Pleasant Street to Millville Street.

Utilities are present above and below ground in the project area. Subsurface utilities include water mains, gas mains, telecommunications conduits, sanitary sewers, and storm drains. The water line

and gas line are connected via services to structures on the east side of the street. Catch basins are present adjacent to the edge of the road on both sides of the street.

Proposed Construction

The proposed construction includes installing approximately 7000 feet of watermain pipe and about 7,700 feet of sanitary sewer pipe within the project area. The proposed gravity sanitary sewer designed by Underwood Engineers, Portsmouth, NH consists of PVC pipe ranging in size from 15- to 24-inch diameter. The smaller diameter pipe begins at the northern end near Main Street and incrementally increases in size toward the south. The proposed depth of the sewer pipe invert will range from about 10 to 16 feet below existing road grade. The proposed watermain consists of 12-inch-diameter ductile iron pipe. The watermain pipe will be installed with a minimum 5-foot cover below the existing road surface grade. Associated sewer manholes are anticipated to be prefabricated, but may be cast-in-place if site conditions warrant.

Purpose and Scope

The purpose of this study was to investigate the subsurface conditions at the project site and to provide geotechnical engineering recommendations and construction considerations as required for the project.

Specifically, the scope of work included the following:

- Review available existing information;
- Conduct twenty-eight (28) test borings to investigate subsurface conditions and to obtain soil samples for geotechnical laboratory testing;
- Conduct one (1) additional test boring for another project, far to the south along South Broadway to investigate subsurface conditions and to obtain soil samples for geotechnical laboratory testing;
- Install five (5) monitoring wells to investigate the subsurface water level;
- Conduct geotechnical laboratory tests on select soil samples to assist with the classification of soils encountered and development of engineering soil properties;
- Develop geotechnical engineering recommendations for design and construction of the proposed sewer line; and
- Prepare this memorandum presenting CDM Smith's recommendations, including data collected as part of the investigation.

Subsurface Exploration Program

Twenty-nine (29) test borings (B-1 through B-29) were performed as part of the subsurface exploration program.

The test borings were drilled by New England Boring Contractors of Derry, NH in two phases. Phase I was conducted from April 10 through April 13, 2017 using a track-mounted drill rig and Phase II was conducted from September 11 through October 4, 2017 using a truck-mounted drill rig. Test borings were advanced using drive and wash drilling techniques, except for test boring B-28 which was advanced using a 4-inch hollow stem auger (HSA). The test borings were advanced to depths that ranged from 7 ft. to 33 ft. below ground surface (bgs).

Soil sampling was conducted continuously from ground surface to approximately 10 ft. bgs at each boring location, and then at approximately 5-foot intervals thereafter. All sampling was conducted using a split spoon sampler in accordance with ASTM D1586 (2-inch diameter sampler driven 24 inches by blows from a 140-pound hammer falling freely for a 30-inch drop). A manual hammer was used during split spoon sampling. The number of blows required to drive the sampler each 6-inch increment was recorded and the Standard Penetration Resistance (N-value) was calculated as the sum of the blows over the second and third 6-inch intervals. Split spoon refusal was defined as less than 6 inches of penetration for 100 blows from a 140-pound hammer.

Rock coring was conducted at two boring locations (B-13A and B-20). Rock coring was conducted using an NX-size diamond bit, double-core barrel, system in general accordance with ASTM D-2113. NX-size rock core samples have a nominal diameter of 2-inches. Samples were classified in the field, the core recovery and RQD was determined as well. RQD is defined as the sum of all rock core pieces measuring over 4 inches in length divided by the total length of the core run and is expressed as a percentage.

When possible, groundwater levels at the test boring locations were estimated from the condition of the samples obtained and by the observed water levels within the test borings during and immediately following drilling activities. All test borings were backfilled with drill cuttings and the surface repaired with asphalt patch.

The test borings were located in the field by CDM Smith by tape measure and line-of-sight. The as-drilled locations of the test borings are shown on **Figure 1**. Logs of the test borings, prepared by CDM Smith, are included in **Attachment A**.

Monitoring Wells

Five (5) monitoring wells were installed at the site at test boring locations B-2, B-3, B-4, B-11, and B-15. The installed monitoring wells are open-standpipe wells. The standpipe monitoring wells were constructed using 2-inch diameter, Schedule 40 PVC pipe with machine-slotted screens. The screen interval was 15 feet in length in all wells. Screen slot size was 10-slot (0.010 inch). Prior to placement of the well screens, the boreholes were flushed with clean water. A threaded cap was attached to the bottom of the screen, which was then lowered down the borehole attached to lengths of solid 2-inch PVC riser pipe. Clean quartz sand was then poured slowly around the PVC to extend the filter pack approximately 0.5 to 1 foot above the top of the screen. A 1-foot layer of bentonite chips was used to seal off the filter pack. At each test boring locations, the PVC pipe was

cut off approximately 3 inches below the ground surface, the boreholes were grouted to the surface and were covered with a protective flush road box.

The monitoring well installation logs and respective monitoring well reports, prepared by CDM Smith, are included in **Attachment B**.

Subsurface Conditions

In general, subsurface conditions encountered during the recent test boring program consisted of Asphalt, Subbase, Concrete, Fill, Clayey Silt, Gravelly Sand, Silty Sand, Sand, Weathered Rock, and Bedrock. A summary of the subsurface conditions encountered is included in **Table 1**.

Asphalt

Asphalt was encountered at all but three (3) locations (B-2, B-3, and B-28). The asphalt was between 3 and 10 inches thick at the test boring locations.

Subbase

A discrete subbase was encountered four (4) locations (B-5, B-10, B-22, and B-26). The subbase was between 2.5 and 6 inches thick at the test boring locations.

Concrete

Concrete was encountered at thirteen (13) locations (B-6 through B-8, B-13, B-14, B-16, B-19 through B-21, and B-23 through B-26). The concrete was between 4 and 7 inches thick at the test boring locations.

Fill

Fill was encountered at two (2) test boring locations (B-5 and B-14). Where encountered, this layer was approximately 10 inches to 5 ft. thick, and typically consists of moist, loose to very dense, brown, fine SAND, little silt, little fine to coarse gravel. SPT N-values in the fill stratum ranged from 9 blows per foot (bl/ft) to 54 bl/ft, with an average of 31 bl/ft at the test boring locations.

Clayey Silt

A Clayey Silt stratum was encountered at three (3) test boring locations (B-3, B-9, and B-16A). The Clayey Silt stratum was fully penetrated at boring location B-5; at this location the layer was approximately 11 ft. thick. At the other boring locations, were this stratum was encountered, but not fully penetrated, the penetration depth ranged from approximately 8 ft. to 17 ft. The clayey silt stratum typically consists of moist, stiff to hard, SILT, with varying amounts of fine sand. SPT N-values in the clayey silt stratum ranged from 10 bl/ft to 34 bl/ft, with an average of 18 bl/ft at the test boring locations.

Gravelly Sand

A Gravelly Sand stratum was encountered at ten (10) test boring locations (B-3 (MW), B-4 (MW), B-13A, B-14, B-16, B-19 through B-20A, B-24, and B-29). The Gravelly Sand stratum was fully penetrated at boring locations B-3 (MW), B-4 (MW), B-13A, B-16, and B-19; at these locations the

layer was approximately 1.5 ft. to 12 ft. thick. At the other boring locations, where this stratum was encountered, but not fully penetrated, the penetration depth ranged from approximately 2 ft. to 13 ft. The Gravelly Sand stratum typically consists of moist, loose to very dense, fine to coarse SAND, some fine to coarse gravel, trace silt. SPT N-values in the gravelly sand stratum ranged from 6 bl/ft to over 100 bl/ft, with an average of 63 bl/ft at the test boring locations.

Silty Sand

A Silty Sand stratum was encountered at seventeen (17) test boring locations (B-1 through B-5, B-8, B-9, B-16, B-17 through B-20, B-21, and B-23 through B-26). At one location, B-2 (MW), organic material (wood, roots) was encountered in a surface Silty Sand stratum. The Silty Sand stratum was fully penetrated at boring locations B-1, B-9, B-19, B-20, B-23, and B-24; at these locations the layer was approximately 6 ft. to 22.5 ft. thick. At the other boring locations, where this stratum was encountered, but not fully penetrated, the penetration depth ranged from approximately 3 ft to 25 ft. The Silty Sand stratum typically consists of moist, very loose to very dense, fine SAND and SILT, trace fine gravel. SPT N-values in the silty sand stratum ranged from 2 bl/ft to over 100 bl/ft, with an average of 22 bl/ft at the test boring locations.

Sand

A Sand stratum was encountered at all but eleven (11) test boring locations. The eleven locations where the Sand stratum was not encountered include B-3 (MW) through B-5, B-16 through B-17, B-19 through B-20A, B-26, and B-29. The Sand stratum was fully penetrated at boring locations B-2 (MW), B-8, B-9, B-14, B-18, B-22, B-24, and B-25; at these locations the layer was approximately 1.8 ft. to 16.5 ft. thick. At the other boring locations, were this stratum was encountered, but not fully penetrated, the penetration depth ranged from approximately 1.8 ft. to approximately 24.2 ft. The Sand stratum typically consists of moist, very loose to very dense, fine to coarse SAND, little silt, trace fine gravel. SPT N-values in the sand stratum ranged from 2 bl/ft to over 100 bl/ft, with an average of 26 bl/ft at the test boring locations.

Weathered Rock

Weathered Rock was encountered at test boring location B-22. This layer was penetrated approximately 5.5 ft., and no material was recovered. The strata classification was based on the material that came up in the wash water and rig chatter during and speed of roller-bit advance. SPT N-values in the Weathered Rock stratum were both greater than 100 bl/ft at the test boring location.

Bedrock

Bedrock was encountered at test boring location CDM-13A. This layer was penetrated approximately 5 ft. and consists of hard, fresh, dark grey, fine- to medium-grained GRANITE; primary joint set horizontal, smooth, planar, fresh, tight. Depth to top of rock was approximately 28 ft. bgs at the exploration location. The percent recovery for the rock core was 57% and the RQD was 38% at the exploration location.

Groundwater Conditions

Groundwater level measurements were recorded during drilling and at the conclusion of drilling at each boring location. Additional measurements were taken at the monitoring well locations. All measurements were taken from the ground surface.

A groundwater measurement was taken at every boring location that was advanced using the drive and wash technique, which introduces fluid into the soil. The measured groundwater levels at these locations ranged from approximately 3.5 ft. to approximately 8.8 ft. bgs. A summary of groundwater levels encountered during the drilling program is presented in **Table 1**.

At the monitoring well locations, water levels were measured at five different times from April 13 to October 4, 2017. The measured groundwater levels at these locations measured during this period ranged from approximately 3.3 ft. bgs to 6.5 ft. bgs. A summary of water level depths measured at the monitoring wells is presented in **Table 2**.

Variation in Subsurface Conditions

Interpretation of general subsurface conditions presented herein is based on soil and groundwater conditions observed during the subsurface exploration program. However, subsurface conditions may vary between exploration locations. If conditions are found to be different than assumed, recommendations contained in this report should be reevaluated by CDM Smith and confirmed in writing.

Water levels in the explorations may not be representative of stabilized groundwater levels. In addition, water levels are expected to fluctuate with time due to season, temperature, climate, and construction in the area as well as other factors. Therefore, groundwater conditions at the time of construction may be different from those observed at the time of the explorations.

Geotechnical Laboratory Testing

Geotechnical laboratory tests were performed on select split spoon samples obtained from the test borings. Grain size analyses were performed on 59 samples in accordance with ASTM D6913, ASTM D7928, and ASTM D1140. The purpose of these tests was to assist with soil classification and evaluate engineering properties of the soil. Geotechnical testing was conducted at the CDM Smith Geotechnical Laboratory in Somerville, Massachusetts.

Results of the geotechnical laboratory testing are summarized in **Table 3**. The complete geotechnical laboratory test results are included in **Attachment C**.

Geotechnical Design Recommendations

Geotechnical Engineering Evaluation

Geotechnical engineering recommendations have been made related to the current understanding of the proposed utility upgrades within the proposed project area in Salem, New Hampshire. In general, these evaluations have been made and criteria established based on the results of the

subsurface investigation and geotechnical laboratory testing programs conducted for this study, and based on published correlations with soil properties and the minimum requirements of the 2015 New Hampshire Building Code and subsequent amendments (the Code). In addition, recommended design criteria are based on performance tolerances, such as allowable settlement, as understood to relate to similar structures.

Structure Foundations

Sewer manholes and associated structures should be constructed on mat foundations bearing on suitable soil that is prepared and protected in accordance with the recommendations herein, or on compacted structural fill placed after the removal of unsuitable soils. The foundations may be designed for a maximum net bearing pressure of 2 tons per square foot (tsf), provided the structures bear on suitable soil or structural fill placed after the removal of unsuitable soils.

Suitable soils include the sand, silty sand, gravelly sand, weathered rock or bedrock strata. Unsuitable soils include the fill strata, and any other organic, soft, loose or disturbed soil present at the foundation subgrade level. If boulders or bedrock are encountered above the subgrade level, the rock should be removed at least 12 inches below the bottom of the structure and replaced with compacted structural fill or screened gravel wrapped in filter fabric.

Where portions of the structures are founded on structural fill, the fill should extend at least 2 feet beyond the edge of the foundation, then outward and downward at a slope of one horizontal to one vertical (1H:1V) to the lowest subgrade elevation or the limit of steel sheet piling that is left in place.

Depth of Foundations

In accordance with Section 1809.5 of the New Hampshire State Building Code, all foundations supported on soil should bear at least 4 ft below any adjacent ground surface exposed to freezing.

Estimated Settlement

Settlement of the proposed structure, designed as recommended herein, is expected to be less than 1 inch with no more than 1/2 inch of differential settlement.

Design Groundwater Elevation

Groundwater levels measured during both the subsurface exploration program and period of monitoring well readings ranged between approximately El 115 and El 131. However, for the purposes of design, the groundwater level should be taken to be at ground surface.

Resistance to Buoyancy

Below grade structures that extend below the design groundwater elevation should be appropriately waterproofed and designed to resist hydrostatic uplift pressure (buoyancy).

The dead weight of the structure plus weight for earth placed directly over extensions to the structure foundation may be used to resist buoyancy. For the purpose of design against uplift, the soil used as backfill should be assumed to have a total unit weight, in place, of 120 pounds per cubic foot (pcf).

Lateral Pressure on Below-Grade Walls

Below-grade walls that are backfilled on one side and restrained against rotation or movement at the top should be designed for lateral pressures from soil and groundwater based on an equivalent fluid unit weight of 60 pcf above the design groundwater level and 90 pcf below the design groundwater level.

A lateral pressure equal to 0.5 times the surface vertical surcharge loads from building foundations, slabs or other loads should be applied over the full height of all walls. Earthquake induced pressures in accordance with the Code should be included in the design of all below-grade walls.

Earthquake-induced pressures should be included as applicable per the Code.

Earthquake Considerations

Based on the Section 1613.5 of the Code the site should be considered as Site Class "D".

Based on the subsurface investigation, the soils encountered below the proposed structure foundations at the site are not considered susceptible to liquefaction.

Piping

The proposed sanitary sewer piping and watermain piping are anticipated to be installed by cut and cover methods in excavated trenches.

Pipe Subgrade

The sand, gravelly sand, silty sand, and bedrock strata encountered at the proposed pipeline subgrades are considered suitable for support of the proposed piping, provided the subgrade remains undisturbed, firm, and stable. If soft clayey silt, loose sand or gravel, organic soils, or otherwise unsuitable soils are encountered at subgrade level, these soils should be excavated to the top of a suitable stratum or a maximum of 4 feet below the pipe invert and replaced with compacted structural fill.

Pipe Bedding

The pipes should be placed on a bedding of at least 6 inches of screened gravel or compacted structural fill on a soil subgrade, or 12 inches of screened gravel or compacted structural fill on a rock subgrade. The screened gravel should be wrapped in filter fabric to prevent migration of fine-grained soils into the pipe bedding material.

Trench Backfill

The pipe should be backfilled with screened gravel or structural fill to at least the level of the pipe crown. A minimum of 12 inches of compacted sand is recommended above the crown of the pipe, with filter fabric separating the sand layer and the screened gravel layer.

In paved areas, the remainder of the trench backfill, to the underside of the pavement section, should consist of select common fill and be placed and compacted to at least 95 percent of the maximum dry density as determined by laboratory test ASTM D1557.

Construction Considerations

Primary Construction Considerations

The primary geotechnical considerations related to the construction of the proposed utility piping and associated manholes include, but are not limited to:

- Proximity of the proposed piping and associated manholes to existing commercial properties and residential structures, utilities, and roadways.

Excavation

The anticipated excavation depth for the construction of the new sewer piping and associated manholes is expected to extend up to approximately 20 ft bgs. It is anticipated that the majority of the pipeline excavation can be made using conventional earthmoving equipment. However, it is possible that occasional boulders or weathered bedrock may be encountered above the sewer subgrade which may require rock excavation techniques such as hoe-rams, rock splitting, wedging or chemical expanders. Based on the results of the subsurface exploration program, rock removal utilizing blasting methods is not anticipated and is not recommended due to the proximity of existing commercial and residential structures and utilities in service..

It is anticipated that an excavation support system may be required for the excavation due to the excavation depth to limit excavation quantities and protect adjacent facilities and utilities from disturbance. Any excavation support system should be selected, designed and installed by the Contractor. Specific recommendations pertaining to excavation support systems are discussed herein. Undermining of existing foundations must not occur. Where open excavations are feasible, the side slopes should be designed and sloped in accordance with OSHA regulations.

Excavations within the zone of influence of existing structures or utilities should not be permitted unless the design of the excavation support includes an analysis of the stability of the structure foundation or utility and as necessary, incorporates required bracing. The zone of influence is defined as a line extending at least 2 feet beyond the bottom edge of the foundation or springline of the utility, then outward and downward at a slope of 1 horizontal to 1 vertical. Excavations within a line extending beyond the foundation or springline of the utility, then outward and downward at a slope of 1 horizontal to 2 vertical may require restraining or monitoring of the existing utility or structure.

Excavation Support Systems

The excavation for the construction of the sewer manholes may require the use of an excavation support system to limit excavation quantities, assist in the control of groundwater and to protect adjacent existing residential structures, utilities and roadways.

The design of the excavation support systems should be performed by a professional engineer registered in the State of New Hampshire employed by the Contractor. The design of the excavation support systems should be performed in conjunction with the design of the dewatering systems. The selection of the type of excavation support system will be performed by the Contractor. Selection of the temporary excavation support and dewatering system should consider the groundwater level, the susceptibility of the excavation subgrade to disturbance, and instability due to heaving and seepage gradients. If the subgrade becomes disturbed due to seepage inflow into the excavation, the disturbed material should be over-excavated and replaced with compacted structural fill.

In order to minimize construction impacts on nearby structures and utilities, support systems installed within 25 ft of existing structures or utilities that are to remain in service during or after construction shall be installed using non-vibratory methods.

Any vertical excavation support members installed within the zone of influence of any existing or new structures, utilities or pipelines should be left in place to avoid disturbing bearing soils. Any sheeting or soldier piles left in place should be cut off at least 5 feet below the adjacent finished grade.

Dewatering

Excavations for construction of the proposed structures are expected to extend up to approximately 20 ft below the existing ground surface. The Contractor will be required to design and implement a dewatering system that maintains a dry, undisturbed and stable subgrade. The dewatering system should be designed by a professional engineer registered in the State of New Hampshire employed by the Contractor. To avoid disturbance to the subgrade, the dewatering system should be designed to maintain a factor of safety of 1.5 against upward seepage gradients and against heaving of the bottom of the excavation and be capable of maintaining the water elevation at least 2 feet below the subgrade level during the entire period of excavation. In addition, the dewatering system should be designed to not adversely impact adjacent structures, utilities or other site features.

All dewatering, handling and disposal of pumped water and any special testing should be conducted in accordance with local regulations, permits and specified requirements.

If wet weather is encountered during construction, the Contractor should take care to schedule excavations to limit the duration of open cuts, slope the bottoms of the excavations to facilitate drainage and provide berms to limit runoff into the excavation. In addition, excavated material to

be reused as fill should be stockpiled in such a manner that promotes runoff and limits saturation of the materials.

Preparation and Protection of Foundation Subgrades

Care should be taken to avoid excess traffic on the excavated subgrades prior to placement of structural fill, or concrete foundations. Any unsuitable material present at the subgrade level should be removed and replaced with compacted structural fill. The exposed subgrade should be appropriately dewatered and protected against precipitation and freezing.

Granular soil subgrades should be proof rolled with at least four coverages of a vibratory compactor prior to placement of fill or concrete foundations.

Proof rolling should not be conducted where the subgrade consists of cohesive soil, however, a smooth edge bucket should be used for final excavation in such soil.

Protection of Existing Structures

Protection of existing utilities and structures is the responsibility of the Contractor. The Contractor will need to take adequate measures to protect existing structures, roadways and utilities from movement and/or damage.

Preconstruction Survey

Prior to start of excavation, installation of excavation support and start of dewatering work, a pre-construction survey of existing structures, utilities and roadways should be performed within 75 feet of the work to establish baseline conditions.

Settlement Monitoring

We recommend that settlement and deformation monitoring points be established on any existing structures and in-service utilities located within a horizontal distance from construction activities of 50 ft. at a minimum. Monitoring points should also be located along the exterior of excavation support systems.

Monitoring points on existing structures and utilities should be installed and baseline surveys taken prior to the start of the installation of the excavation support system. The points should be monitored during installation of any excavation support system, excavation dewatering, backfilling, and vibratory construction activities. Monitoring points on new utilities should be installed and baseline surveys taken immediately following the installation of the structure. Monitoring points on the excavation support should be installed and baseline surveys taken prior to the start of excavation. All monitoring points should be surveyed daily during excavation, and then twice weekly thereafter until all backfilling is complete.

The Contractor should be prepared to alter the excavation methods if settlements or deformations measured exceed any of the below threshold values. If settlements or deformations exceed any of

the limiting values, the Contractor should stop all construction activities, stabilize the excavation, and revise excavation methods to prevent additional settlement or deformation. These criteria may be altered by the Engineer as necessary on a case by case basis.

Monitoring Target Location	Threshold Value	Limiting Value
Structures	0.25 inch	0.5 inch
Utilities	0.5 inch	1.0 inch
Excavation Support System	1.0 inch	2.0 inch

Vibration Criteria

Ground vibrations due to construction can cause damage to adjacent structures, utilities and other facilities. To avoid or mitigate this potential damage, limits on ground vibrations in the form of ground displacement, velocity, or acceleration at given frequencies are typically established. The Bureau of Mines has established criteria to limit ground vibrations using the peak particle velocity (PPV) and frequency parameters. These limits have been established using the cracking of plaster walls in a residential house as a model.

The maximum peak particle velocities associated with vibration-inducing construction methods and at the ground surface at existing adjacent structures and utilities should be as follows:

Frequency (Hz)	Max. Peak Particle Velocity (in. per sec.)	
	Threshold	Limiting
Over 40	1.0	2.0
30 to 40	0.75	1.5
20 to 30	0.5	1.0
Less than 20	0.35	0.5

In no case should the maximum peak particle velocities caused by the use of vibratory or driving hammers exceed 2.0 inches per second at the closest facility (structure or utility) to the work. If the induced vibration criteria cannot be met at any existing structure, other means or non-vibration construction methods will be required (e.g. line drilling, chemical expansion, drill and socket soldier piles, etc.).

At least one seismograph should be located at adjacent/nearby structures and utilities during all vibratory construction activities to confirm compliance with the recommendations herein and record actual impact vibrations.

Backfill Materials and Compaction Requirements

Screened Gravel

Screened Gravel should be hard, durable, rounded, or subangular particles of proper size and gradation, and should be free from sand, loam, clay, excess fines, and other deleterious materials. The material should conform to the following gradation:

U.S. Standard Sieve Size	Percent Passing by Weight
5/8 in.	100
1/2 in.	40-100
3/8 in.	15-45
No. 10	0-5

Material conforming to Standard Stone Size #67, as defined in Table 703.1 of the New Hampshire DOT Standard Specifications for Road and Bridge Construction is also acceptable. Screened gravel shall be wrapped in filter fabric in order to prevent migration of fines into the material. Filter fabric shall be non-woven geotextile, Mirafi 140N or approved equivalent, and should be installed as required in the Specifications.

Structural Fill

Granular fill used as structural fill below footings, mat foundations, slabs-on-grade, and road pavement sections should consist of a mineral soil free of organic material, loam, debris, frozen soil or other deleterious material which may be compressible or which cannot be properly compacted. Structural fill should conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
3 inches	100
No. 4	20-70
No. 40	5-35
No. 200	0-10

Structural fill should be placed in layers no thicker than 8 inches, as placed, and compacted with suitable compaction equipment to at least 95 percent of maximum dry density as determined by ASTM D1557. Lift thickness should be reduced to 4 inches in confined areas accessible only to hand guided compaction equipment.

Common Fill

Common fill used as backfill around structures where passive pressure is not relied on, in parking areas, and landscaped areas should consist of granular soil free from organic material, debris, frozen soil, or other deleterious material. It should contain stones no larger than 6 inches and have no more than 30 percent of material passing the No. 200 sieve.

Common fill should be placed in layers not to exceed 12 inches, as placed, and compacted with suitable vibratory compaction equipment to at least 92 percent of maximum dry density as determined by ASTM D1557. Lift thickness should be reduced to 6 inches in confined areas accessible only to hand guided compaction equipment.

We anticipate that the some of the excavated soil may be suitable for reuse as common fill. Care should be taken to separate layers of topsoil encountered during the excavation.

Select Common Fill

Select common fill should be the same as common fill except that it should not contain stone larger than 2 inches. Select common fill should consist of soil, free from organic material, loam, debris, frozen soils or other deleterious material which may be compressible or which cannot be compacted properly.

Select common fill should be placed in layers no thicker than 8 inches, as placed, and compacted with suitable compaction equipment to at least 95 percent of maximum dry density as determined by ASTM D1557. Lift thickness should be reduced to 4 inches in confined areas accessible only to hand guided compaction equipment.

Construction Monitoring

It is recommended that a qualified Geotechnical Engineer or an experienced Resident Engineer be present during construction to confirm that the Contractor complies with the intent of these recommendations. Specifically, the field representative would undertake the following responsibilities:

- Confirm removal of unsuitable materials as recommended herein;
- Monitor the excavation and installation of excavation support system;
- Confirm that appropriate dewatering and surface water control methods are employed;
- Confirm that the subgrade conditions encountered are suitable for support of the proposed structures as required by the Code;
- Confirm that the subgrades are appropriately prepared and protected prior to placement of concrete or fill;
- Observe, test and document placement and compaction of fill and backfill material; and
- Observe the installation of geotechnical instrumentation and review site monitoring data collected.

In addition, the field representative would be present to identify and provide response should conditions encountered differ from those assumed during preparation of this report.

Closing

These recommendations have been prepared for the design and construction for the South Broadway Water and Sewer Improvements, located in the Town of Salem, New Hampshire as understood at this time and described in this memorandum. These recommendations have been prepared in accordance with generally accepted engineering practices. No other warranty, express or implied, is made. In the event that changes in the design or location of the alignment occur, the conclusions and recommendations contained herein should not be considered valid unless verified in writing by CDM Smith.

Figures

Figures 1 through 8 – Subsurface Exploration Location Plan

Tables

Table 1 – Summary of Subsurface Exploration Program
Table 2 – Summary of Water Level Readings in Monitoring Wells
Table 3 – Summary of Geotechnical Laboratory Test Results

Attachments

Attachment A – Test Boring Logs
Attachment B – Monitoring Well Installation Logs and Monitoring Well Reports
Attachment C – Geotechnical Laboratory Test Results

Figures

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

NOTES:

1. BASE PLAN PREPARED FROM A DRAWING ENTITLED "BASE PLAN OF SOUTH BROADWAY (NH ROUTE 28) & MAIN STREET" PREPARED BY UNDERWOOD ENGINEERS OF PORTSMOUTH, NEW HAMPSHIRE, SCALE 1"=40'.
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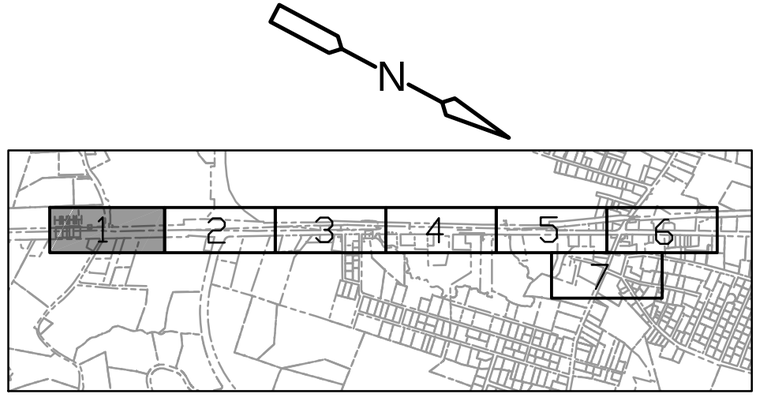
4. TEST BORINGS B–1 THROUGH B–29 WERE OBSERVED AND LOGGED ON A FULL TIME BASIS BY A CDM SMITH ENGINEER. THE TEST BORINGS WERE LOCATED IN THE FIELD BY TAPING AND LINE–OF–SITE FROM EXISTING SITE FEATURES.



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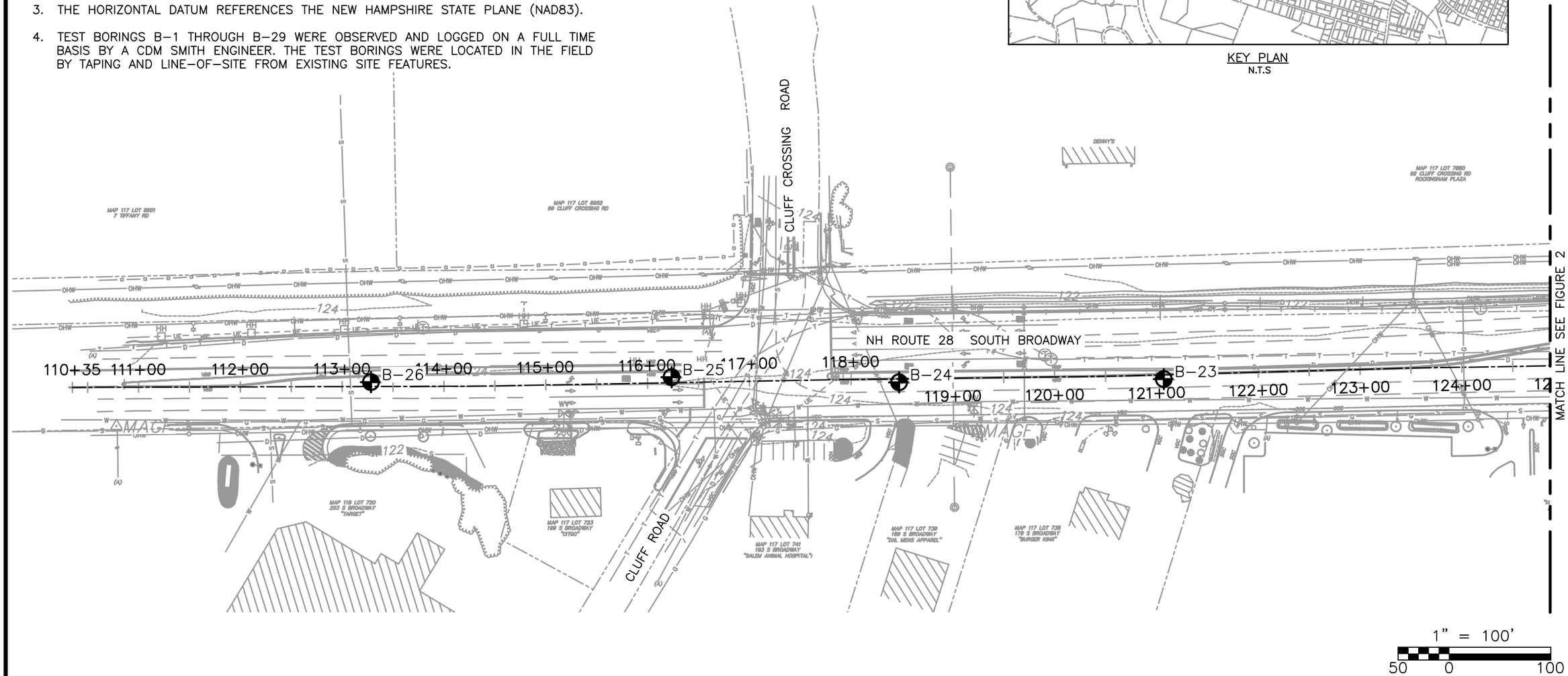

1" = 100'
50 0 100

CDM Smith

TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 1
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

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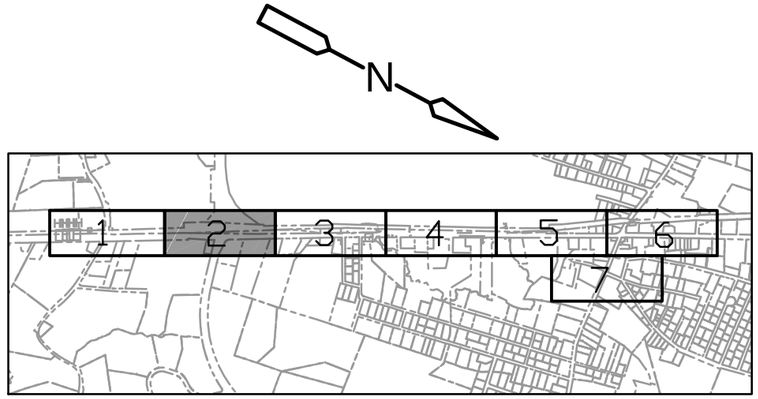

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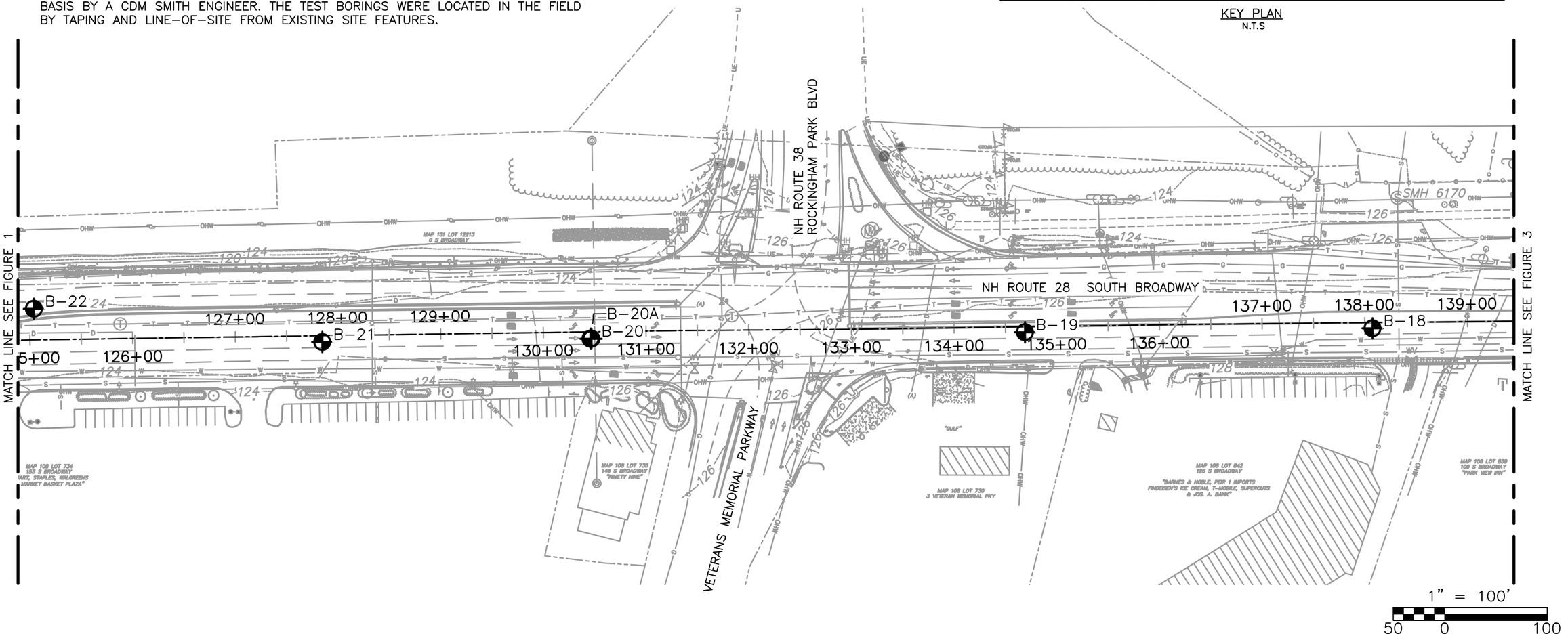

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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 2
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

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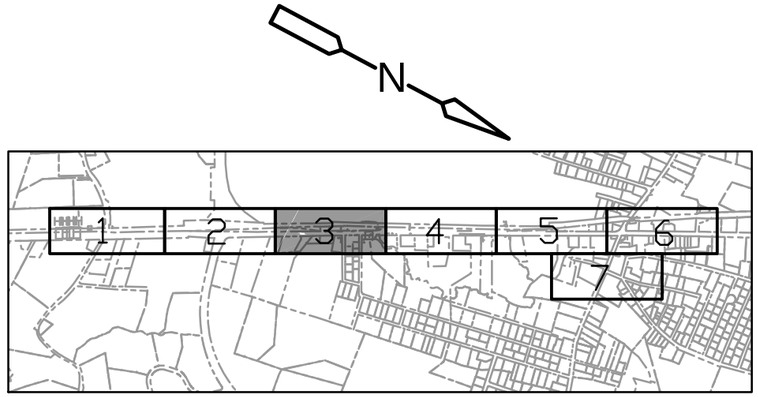

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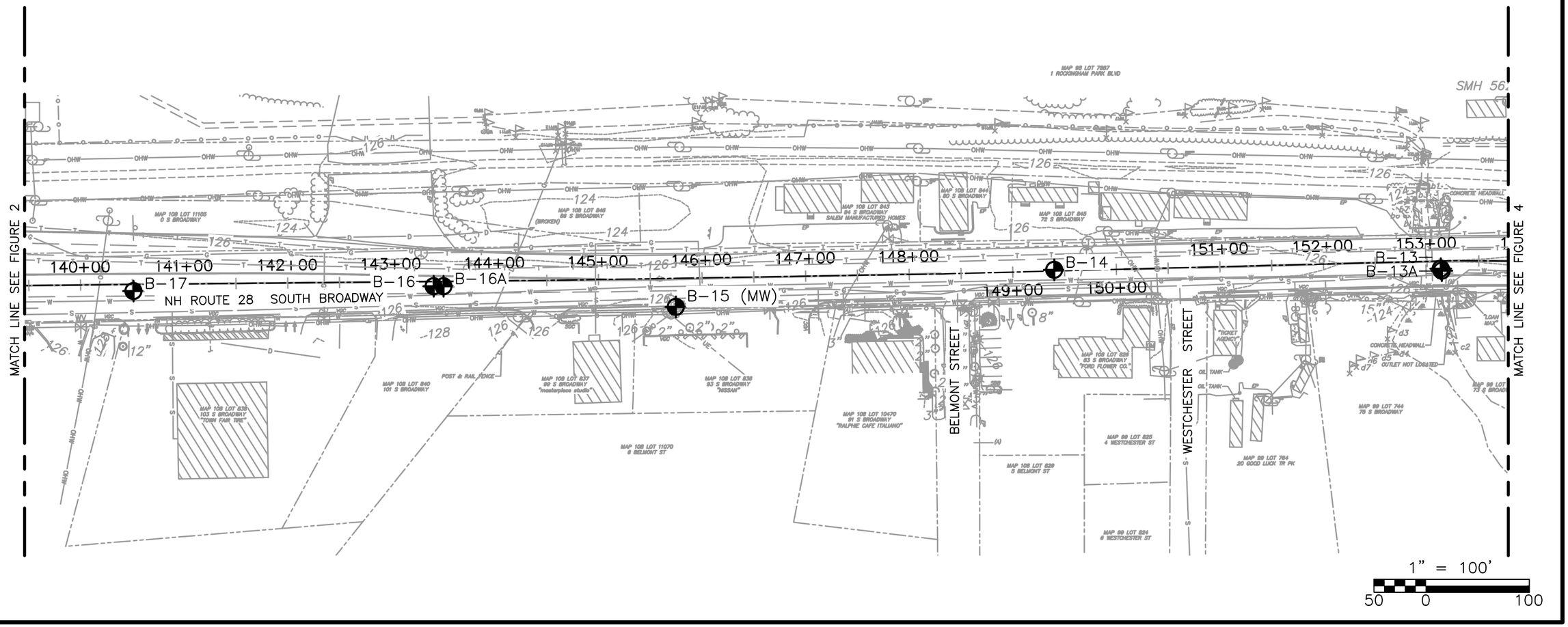

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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 3
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

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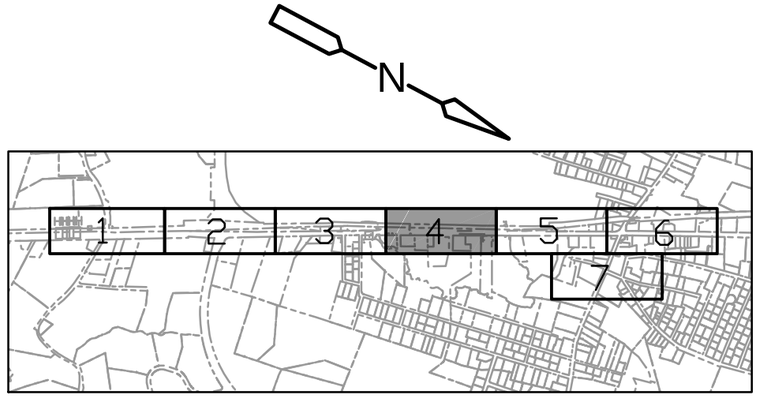

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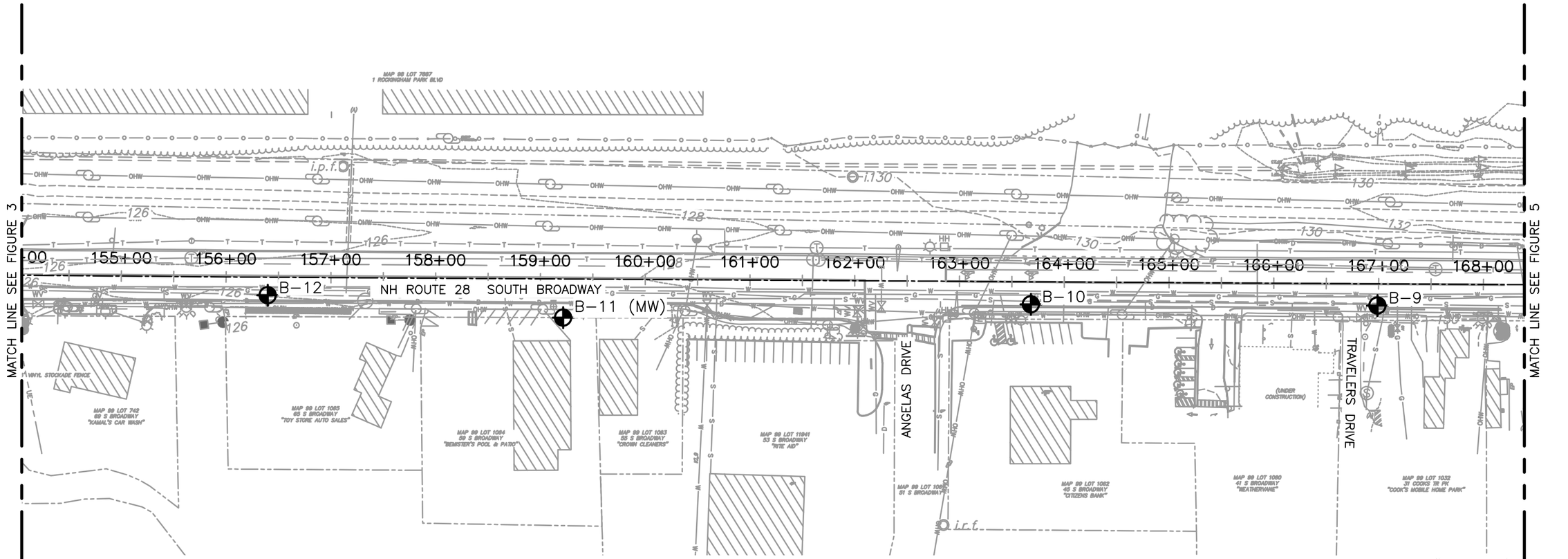

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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 4
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

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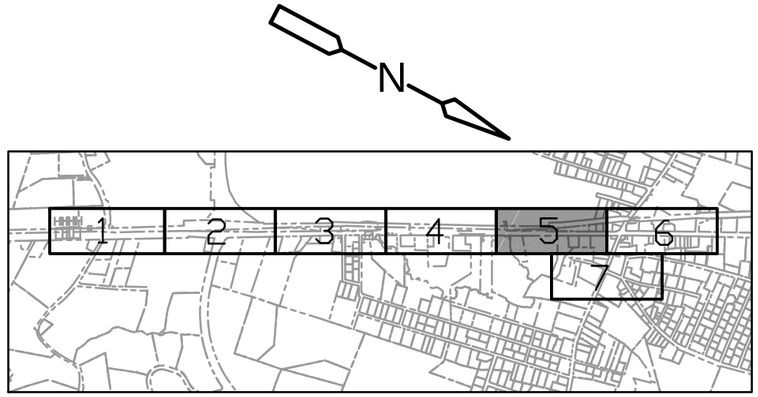

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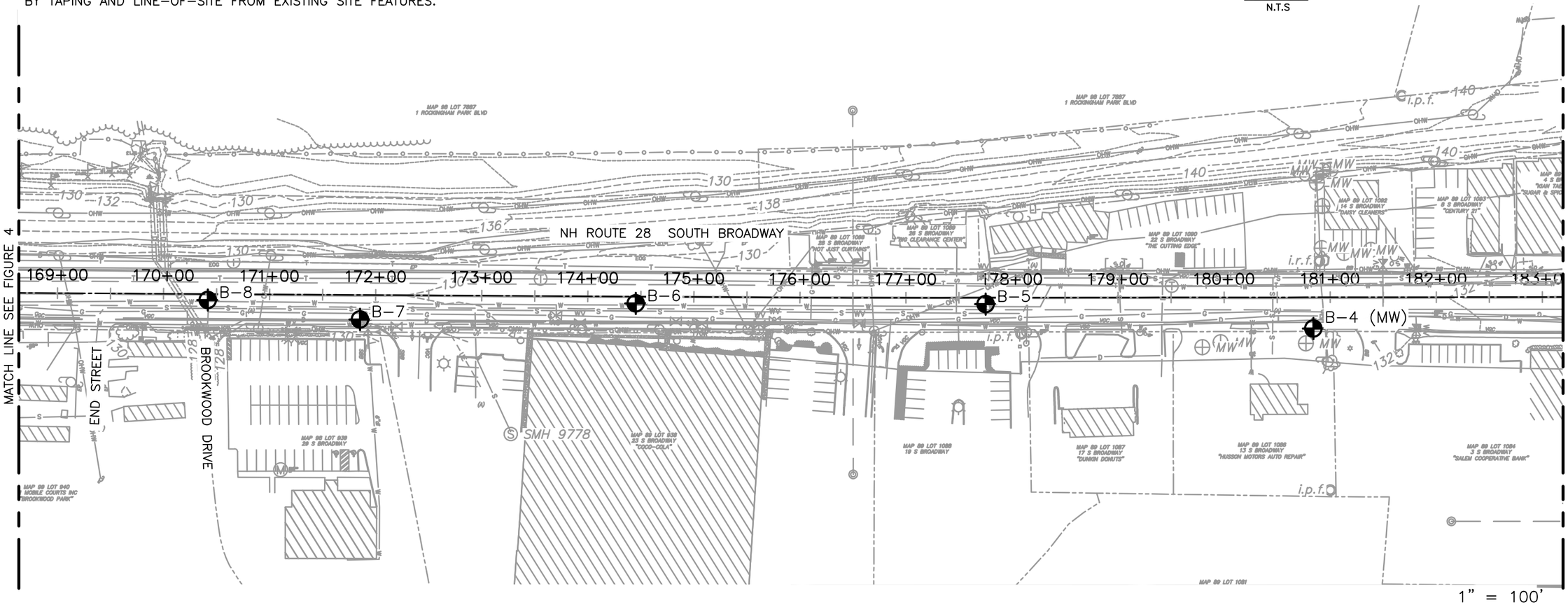

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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 5
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

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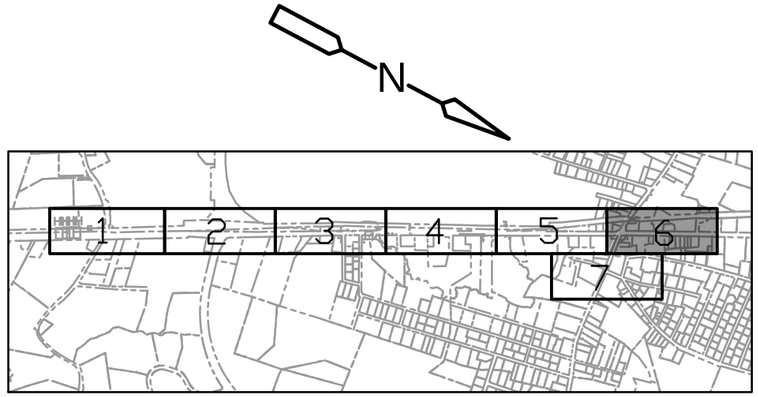

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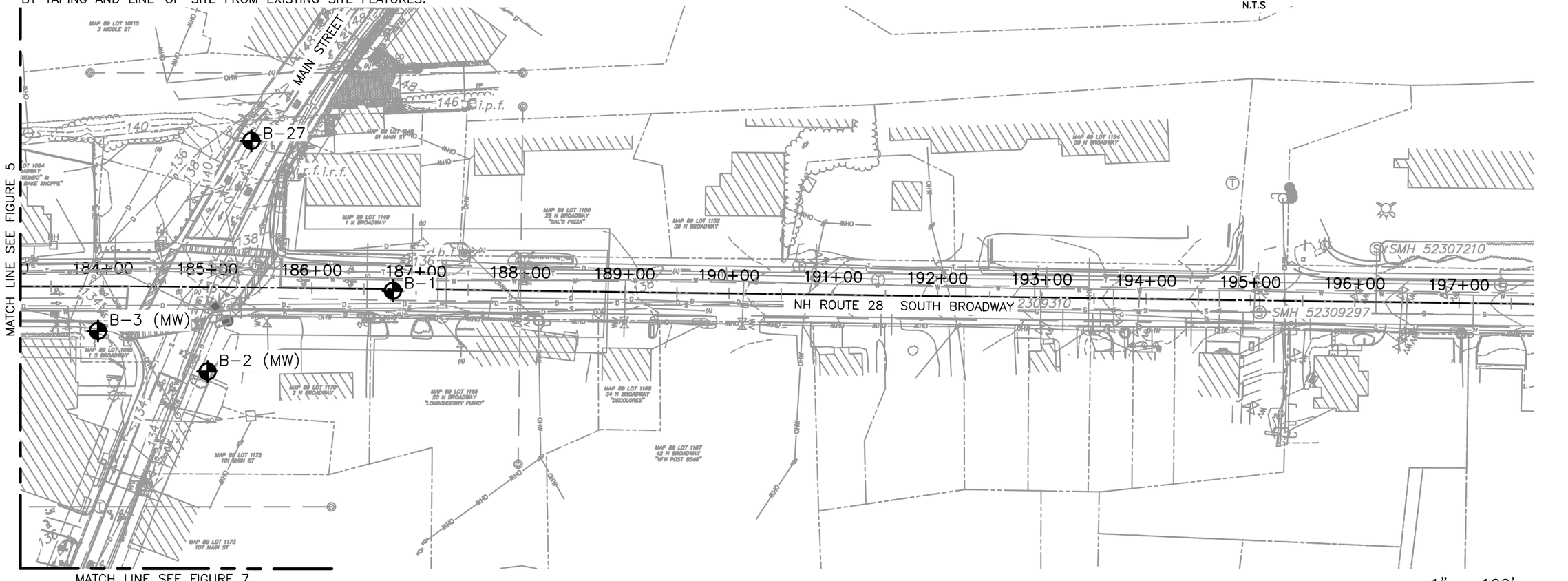

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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 6
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

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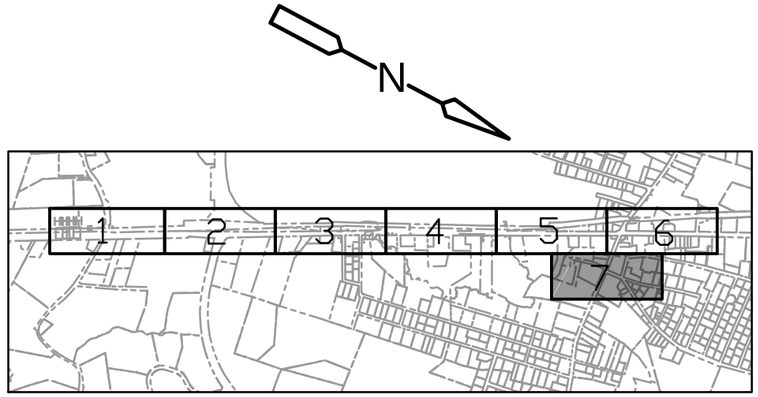

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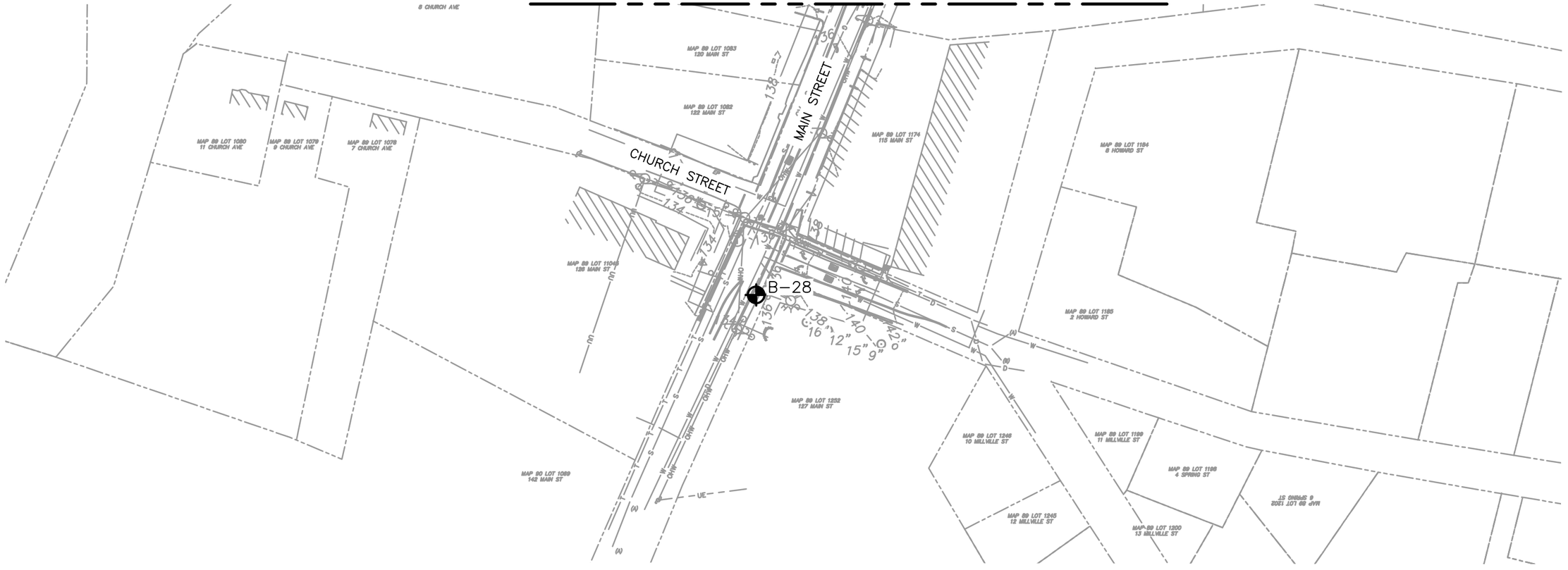
MATCH LINE SEE FIGURE 6



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TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 7
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

LEGEND:

B–1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORINGS DRILLED BY NEW ENGLAND BORING CONTRACTOR OF DERRY, NEW HAMPSHIRE FROM APRIL 10 TO OCTOBER 4, 2017.

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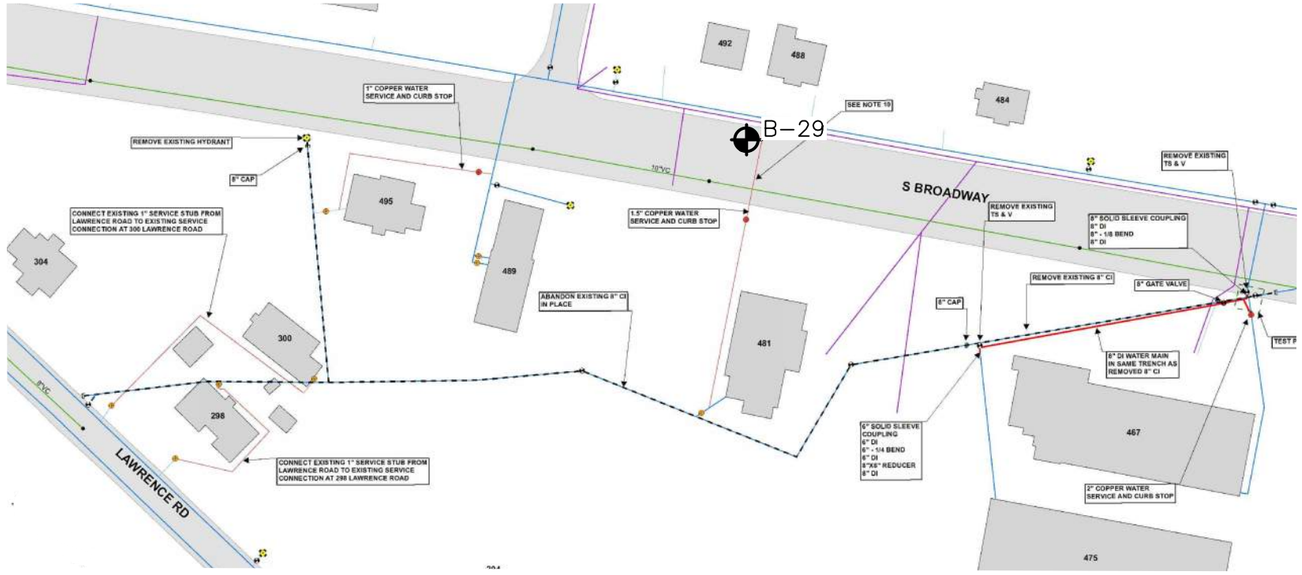


1" = 100'
50 0 100

TOWN OF SALEM
SOUTH BROADWAY WATERMAIN REPLACEMENT
SALEM, NEW HAMPSHIRE

FIGURE 8
SUBSURFACE EXPLORATION LOCATION PLAN
DECEMBER 2017

Tables

Town of Salem
South Broadway Watermain and Sewer Replacement
Salem, NH

Table 1
Summary of Recent Subsurface Exploration Program

Exploration Number	Approximate Ground Surface Elevation (ft)[1]	Exploration Depth (ft)	Stratum Thickness (ft)[2]										Depth to Top of Bedrock (ft)	Approximate Top of Bedrock Elevation (ft)	Depth to Groundwater (ft)[3]	Approximate Groundwater Elevation (ft)
			Asphalt	Subbase	Concrete	Fill	Clayey Silt	Gravelly Sand	Silty Sand	Sand	Weathered Rock	Bedrock				
B-1	135.3	20.0	0.4	NE	NE	NE	NE	NE	6.0	5.6, > 8	NE	NE	NE	NE	6.1	129.2
B-2 (MW)	135.0	21.0	NE	NE	NE	NE	NE	NE	8[4], > 9.0	4.0	NE	NE	NE	NE	7.3	127.8
B-3 (MW)	133.3	22.0	NE	NE	NE	NE	NE	12.0	> 10.0	NE	NE	NE	NE	NE	5.0	128.3
B-4 (MW)	131.2	21.0	0.4	NE	NE	NE	NE	7.6	> 13.0	NE	NE	NE	NE	NE	7.5	123.7
B-5	130.7	20.0	0.5	0.5	NE	5.0	11.0	NE	> 3.0	NE	NE	NE	NE	NE	6.0	124.7
B-6	130.1	21.0	0.4	NE	0.6	NE	NE	NE	NE	> 20	NE	NE	NE	NE	6.4	123.7
B-7	129.2	20.0	0.6	NE	0.4	NE	NE	NE	NE	> 19	NE	NE	NE	NE	5.7	123.5
B-8	128.1	40.0	0.6	NE	0.4	NE	NE	NE	> 22.5	16.5	NE	NE	NE	NE	7.0	121.1
B-9	129.1	20.0	0.7	NE	NE	NE	> 8.0	NE	8.0	3.3	NE	NE	NE	NE	4.9	124.2
B-10	126.1	8.0	0.7	0.3	NE	NE	NE	NE	NE	> 7.0	NE	NE	NE	NE	3.5	122.6
B-11 (MW)	126.4	19.0	0.5	NE	NE	NE	NE	NE	NE	> 18.5	NE	NE	NE	NE	3.1	123.3
B-12	126.1	25.0	0.8	NE	NE	NE	NE	NE	NE	> 24.2	NE	NE	NE	NE	5.0	121.1
B-13	125.2	28.0	0.6	NE	0.4	NE	NE	1.5, 8.0	NE	11.5, > 6.0	NE	NE	NE	NE	4.0	121.2
B-13A	125.2	33.0	Drilled directly to 28 ft to continue exploration from B-13.								NE	> 5.0	28.0	97.2	8.0	117.2
B-14	125.9	25.0	0.5	NE	0.5	0.8	NE	> 13.0	NE	10.2	NE	NE	NE	NE	5.0	120.9
B-15 (MW)	125.9	19.3	0.3	NE	NE	NE	NE	NE	NE	>19.0	NE	NE	NE	NE	5.0	120.9
B-16	125.5	8.0	0.5	NE	0.3	NE	NE	2.2	5.8[5]	NE	NE	NE	NE	NE	NE	NE
B-16A	125.5	25.0	NR	NR	NR	NE	> 17.0	NE	NE	NE	NE	NE	NE	NE	4.1	121.4
B-17	124.2	25.0	0.8	NE	NE	NE	NE	NE	> 24.2	NE	NE	NE	NE	NE	7.8	116.4
B-18	125.1	21.0	0.7	NE	NE	NE	NE	NE	> 22.5	1.8	NE	NE	NE	NE	8.2	116.9
B-19	125.3	25.0	0.6	NE	0.4	NE	NE	1.5	22.5	NE	NE	NE	NE	NE	5.8	119.5
B-20	123.2	13.0	0.4	NE	0.5	NE	NE	1.6, > 2.0	8.5	NE	NE	NE	NE	NE	4.2	119.0
B-20A	123.2	16.5	Drilled directly to 14 ft to continue exploration from B-20.					> 2.0	NE	NE	NE	NE	NE	NE	NR	NR
B-21	124.4	25.0	0.4	NE	0.4	NE	NE	NE	11.2	> 13.0	NE	NE	NE	NE	7.8	116.6
B-22	124.3	23.0	0.7	0.3	NE	NE	NE	NE	NE	16.5	> 5.5	NE	NE	NE	4.0	120.3
B-23	124.3	24.0	0.6	NE	0.4	NE	NE	NE	6.0	5.0, > 12.0	NE	NE	NE	NE	7.0	117.3
B-24	124.4	25.0	0.6	NE	0.4	NE	NE	> 13.0	6.0	5.0	NE	NE	NE	NE	7.2	117.2
B-25	123.5	26.0	0.5	NE	0.5	NE	NE	NE	> 18.0	7.0	NE	NE	NE	NE	7.4	116.1
B-26	123.5	26.0	0.4	0.2	0.4	NE	NE	NE	> 25.0	NE	NE	NE	NE	NE	8.8	114.7
B-27	143.1	10.0	0.4	NE	NE	NE	NE	NE	NE	> 9.6	NE	NE	NE	NE	NE	NE
B-28	136.2	10.0	NE	NE	NE	NE	NE	NE	NE	> 10.0	NE	NE	NE	NE	NE	NE
B-29	NR	7.0	0.3	NE	NE	NE	NE	> 6.7	NE	NE	NE	NE	NE	NE	NE	NE

Notes:
1. Elevations are referenced to North American Vertical Datum of 1988 (NAVD88) and are estimated from a topographic survey.
2. Commas indicate that a strata was encountered twice; the second value is the thickness of the lower strata
3. Groundwater depths were measured upon completion of test borings.
4. Results of Organic Content tests run on the samples in the upper Silty Sand strata in this boring were greater than 5%
5. An obstruction was encountered at 8 ft bgs.

Abbreviations:
> Indicates Strata not fully penetrated
NE indicates not encountered
NR indicates value not recorded
MW indicates a monitoring well

Town of Salem
South Broadway Watermain and Sewer Replacement
Salem, NH

Table 2
Summary of Water Level Readings in Monitoring Wells

Exploration Number	Ground Surface Elevation (ft)	Depth Below Ground Surface (ft)				
		4/13/2017	6/8/2017	6/29/2017	7/24/2017	10/4/2017
B-2 (MW)	135.0	3.90	5.68	6.20	6.09	6.50
B-3 (MW)	133.30	4.60	4.53	5.10	5.14	5.80
B-4 (MW)	131.20	3.80	4.08	4.60	4.62	5.30
B-11 (MW)	126.40	3.30	4.00	4.79	5.07	6.20
B-15 (MW)	125.90	5.00	3.21	4.30	4.61	5.30

Notes:
See Subsurface Exploration Location Plans for the locations of the monitoring wells.

Town of Salem
South Broadway Watermain and Sewer Replacement
Salem, NH

Table 3
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification [1]	Grain Size Analysis [2]							Moisture Content (%) [3]	Organic Content (%) [4]	Atterberg Limits [5]		
					Gravel (%)		Sand (%)			Fines (%)						
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			LL(%)	PL(%)	PI(%)
B-1	S-5	8 - 10	Silty Sand	ML	0.0	0.0	0.0	1.4	14.7	56.3	27.6	22.0	--	--	--	--
B-1	S-6	14 - 16	Sand	SP-SM	3.5	13.8	8.0	25.3	37.9	11.5		12.9	--	--	--	--
B-2	S-4	6 - 8	Organic Silty Sand	--	--	--	--	--	--	--		96.9	14.5	--	--	--
B-2	S-5	8 - 10	Sand	SP-SM	6.0	4.6	3.9	29.2	46.8	9.5		20.0	--	--	--	--
B-2	S-6	14 - 16	Silty Sand	ML	0.0	0.0	0.0	0.1	10.1	58.3	31.5	26.5	--	--	--	--
B-3	S-4	6 - 8	Gravelly Sand	OL/ML	0.0	0.0	0.4	14.0	22.8	46.8	16.0	92.3	13.0	--	--	--
B-4	S-5	8 - 10	Silty Sand	ML	0.0	0.0	0.0	1.4	12.1	68.3	18.2	24.0	--	--	--	--
B-5	S-5	8 - 10	Clayey Silt	ML	--	--	--	--	--	--		25.7	--	31	25	6
B-5	S-6	14 - 16	Clayey Silt	ML	0.0	0.0	0.0	0.6	8.7	90.7		21.1	--	NV	NP	NP
B-6	S-3	4 - 6	Sand	SP	0.0	2.8	2.5	35.6	54.3	4.8		18.9	--	--	--	--
B-6	S-5	8 - 10	Sand	SP-SM	0.0	0.4	0.1	13.5	80.5	5.5		23.0	--	--	--	--
B-6	S-6	14 - 16	Sand	SM	0.0	0.0	0.1	0.1	82.0	17.8		28.4	--	--	--	--
B-7	S-5	8 - 10	Sand	SP-SM	0.0	0.0	0.3	8.2	85.2	6.3		24.3	--	--	--	--
B-7	S-6	14 - 16	Sand	SP-SM	0.0	0.0	0.2	2.0	89.8	8.0		25.8	--	--	--	--
B-8	S-3	4 - 6	Sand	SP-SM	0.0	0.0	0.3	25.3	67.9	6.5		18.3	--	--	--	--
B-8	S-5	8 - 10	Sand	SM	0.0	0.0	0.2	8.9	59.0	31.9		23.8	--	--	--	--
B-8	S-8	24 - 26	Silty Sand	ML	0.0	0.0	0.0	0.2	32.3	62.6	4.9	26.3	--	--	--	--
B-9	S-1A	1 -2.5	Sand	SM	0.0	5.2	3.4	17.2	40.3	33.9		18.4	--	--	--	--
B-9	S-5	8 - 10	Silty Sand	ML	0.0	0.0	1.7	3.2	32.3	62.8		31.0	--	--	--	--
B-9	S-6	14 - 16	Clayey Silt	ML	--	--	--	--	--	--		32.2	--	NV	NP	NP
B-10	BAG (Subbase)	0 - 1	Subbase	GP	87.6	7.1	1.1	2.2	1.3	0.7		2.8	--	--	--	--
B-10	S-3	4 - 6	Sand	--	--	--	--	--	--	--		27.9	4.2	--	--	--
B-11	S-5	8 - 10	Sand	SP	11.4	4.0	6.2	25.8	48.9	3.7		14.3	--	--	--	--
B-12	S-5	8 - 10	Sand	SP-SM	0.0	0.0	1.3	5.8	85.4	7.5		25.0	--	--	--	--
B-12	S-6	14 - 16	Sand	SM	0.0	0.0	0.2	2.8	77.3	19.7		24.4	--	--	--	--
B-13	S-4	6 - 8	Sand	--	--	--	--	--	--	--		23.6	0.8	--	--	--
B-13	S-5	8 - 10	Sand	SP	0.0	0.1	0.3	21.0	76.5	2.1		23.1	--	--	--	--
B-14	S-5	8 - 10	Sand	SM	0.0	1.7	0.0	0.2	80.2	17.9		25.1	--	--	--	--
B-14	S-7	19 - 21	Clayey Silt	ML	0.0	0.0	0.1	0.2	3.4	96.3		31.5	--	30	27	3
B-15	S-1	5 - 7	Silty Sand	ML	0.0	0.0	0.0	0.7	35.4	48.2	15.7	23.2	--	--	--	--
B-15	S-3	9 - 11	Silty Sand	SM	0.0	10.5	2.0	2.5	47.5	37.5		21.0	--	--	--	--
B-15	S-4	14 - 16	Silty Sand	SM	11.7	25.3	5.3	6.4	26.0	25.3		12.7	--	--	--	--
B-16A	S-1	8 - 10	Clayey Silt	ML	0.0	0.0	0.0	0.6	4.9	84.3	10.2	28.1	--	--	--	--
B-16A	S-4	23 - 25	Clayey Silt	CL-ML	--	--	--	--	--	--		29.0	--	27	22	5
B-17	S-2	2.5 - 4	Silty Sand	--	--	--	--	--	--	--		25.5	2.0	--	--	--

Town of Salem
South Broadway Watermain and Sewer Replacement
Salem, NH

Table 3
Summary of Geotechnical Laboratory Test Results

Exploration Number	Sample Number	Sample Depth (ft)	Stratum	USCS Classification [1]	Grain Size Analysis [2]							Moisture Content (%) [3]	Organic Content (%) [4]	Atterberg Limits [5]		
					Gravel (%)		Sand (%)			Fines (%)						
					Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			LL(%)	PL(%)	PI(%)
B-17	S-5	8 - 10	Silty Sand	SM	0.0	0.0	0.0	0.2	79.5	19.0	1.3	25.0	--	--	--	--
B-17	S-7	19 - 21	Silty Sand	ML	0.0	0.0	0.0	0.5	7.2	82.4	9.9	29.7	--	--	--	--
B-18	S-4	6 - 8	Silty Sand	ML	0.0	0.0	0.0	0.1	17.9	78.5	3.5	24.5	--	--	--	--
B-18	S-6	14 - 16	Silty Sand	SM	0.0	0.0	0.0	0.1	66.6	32.1	1.2	25.8	--	--	--	--
B-19	S-2	4 - 6	Silty Sand	SM	0.0	0.0	0.9	5.1	55.7	38.3		25.5	--	--	--	--
B-19	S-5	14 - 16	Silty Sand	ML	0.0	0.0	0.0	0.4	2.6	80.3	16.7	27.1	--	--	--	--
B-21	S-3	4 - 6	Silty Sand	SM	0.0	0.0	1.2	14.5	71.0	13.3		30.1	4.4	--	--	--
B-21	S-5	8 - 10	Silty Sand	ML	0.0	0.0	0.0	0.1	4.1	66.6	29.2	26.8	--	NV	23	NP
B-21	S-6	14 - 16	Sand	SW-SM	0.0	6.6	12.8	35.7	37.4	7.5		17.3	--	--	--	--
B-21	S-7	19 - 21	Sand	SM	26.0	15.7	8.9	13.8	23.0	12.6		8.0	--	--	--	--
B-22	BAG (Subbase)	0 - 1	Sand	SM	0.0	26.0	12.7	26.9	18.4	16.0		11.8	--	--	--	--
B-22	S-5	8 - 10	Sand	SM	4.0	5.3	4.5	16.1	38.6	28.1	3.4	16.6	--	--	--	--
B-22	S-6	14 - 16	Sand	SM/SC	3.7	33.2	11.4	17.3	17.4	17.0		11.4	--	--	--	--
B-23	S-5	8 - 10	Silty Sand	ML	--	--	--	--	--	--		32.5	--	32	26	6
B-23	S-6	14 - 16	Sand	SM	0.0	16.6	7.9	16.1	34.3	22.5	2.6	13.7	--	--	--	--
B-24	S-5	8 - 10	Silty Sand	SM	0.0	0.0	1.4	12.2	43.5	32.6	10.3	22.3	--	--	--	--
B-24	S-6	14 - 16	Gravelly Sand	SM	22.6	16.4	8.1	13.0	20.4	19.5		8.7	--	--	--	--
B-24	S-7	19 - 21	Gravelly Sand	GP-GM	25.2	31.6	12.5	8.3	10.9	11.5		7.0	--	--	--	--
B-25	S-3	4 - 6	Sand	SP-SM	0.0	10.5	2.7	8.5	70.1	8.2		17.6	2.4	--	--	--
B-25	S-6	14 - 16	Silty Sand	ML	0.0	0.0	0.0	0.3	2.6	89.3	7.8	28.8	--	--	--	--
B-25	S-7	19 - 21	Silty Sand	ML	0.0	0.0	0.0	0.2	7.2	67.3	25.3	29.1	--	--	--	--
B-26	S-5	8 - 10	Silty Sand	SP-SM	0.0	0.0	0.1	0.1	94.6	5.2		24.8	--	--	--	--
B-26	S-6	14 - 16	Silty Sand	SM	0.0	0.0	0.0	0.1	79.7	20.2		27.5	--	--	--	--
B-26	S-7	19 - 21	Silty Sand	ML	0.0	0.0	0.0	0.1	5.9	94.0		26.5	--	--	--	--

Notes:

1. USCS classifications were performed in accordance with ASTM D2488.
2. Grain size analysis tests performed in accordance with ASTM D6913, ASTM D7928, and ASTM D1140.
3. Moisture content analysis performed in accordance with ASTM D2216.
4. Organic content analysis performed in accordance with ASTM D2974.
5. Atterberg Limit analysis performed in accordance with ASTM D4318.

Abbreviations:

ML: Silt
SP-SM: Poorly Graded Sand with Silt
OL: Low Plasticity Organic Silt
SP: Poorly Graded Sand
SM: Silty Sand
GP: Poorly Graded Gravel
CL-ML: Low Plasticity Silty Clay
SW-SM: Well-Graded Sand with Silt
GP-GM: Poorly Graded Gravel with Silt
SC: Clayey Sand
-- : Test not performed

Attachment A – Test Boring Logs

Boring Number: B-1

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/25/2017 **End:** 9/25/2017
N: 103227.01 **E:** 1101521.71

Surface Elevation (ft.): 135.3
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
6.1	9/25/2017	10:20 am

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
135.3										5" Asphalt	
0	SS	S-1	18	16 17 14	11	31	0.0		Sand	Moist, dense, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	24	6 5 4 3	12	9	0.0			Moist, loose, brown, fine to coarse SAND, some fine to coarse gravel, little silt	
130.3 5	SS	S-3	24	5 5 5 3	0	10	0.0			No Recovery	
	SS	S-4	24	5 1 1 7	14	2	0.0		Silty Sand	Top 12": Wet, soft, brown, SILT, trace fine sand, trace fine gravel, trace organics Bottom 2": Wet, medium dense, gray, fine SAND, some silt	
125.3 10	SS	S-5	24	27 18 9 9	12	27	0.0			Wet, very stiff, gray, Clayey SILT, little fine to medium sand	
									Sand		
120.3 15	SS	S-6	24	11 16 13 7	14	29	0.0			Wet, medium dense, brown, fine to coarse SAND, little fine to coarse gravel, little silt	
	SS	S-7	24	10 12 11 14	16	23	0.0			Wet, medium dense, gray, fine SAND, little silt, little fine gravel	
115.3										End of exploration at 20 ft bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-1**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-2 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / B. Raiche
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/11/2017 **End:** 4/11/2017
N: 103106.52 **E:** 1101673.3

Surface Elevation (ft.): 135.0
Total Depth (ft.): 21
Depth to Initial Water Level (ft):

Depth	Date	Time
7.25	4/11/2017	3:00 pm

Abandonment Method: Monitoring Well installed.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
135.0 0	SS	S-1	24	3 8 5 6	18	13	0.0		Organic Silty Sand	Grass at surface Moist, medium dense, light brown, fine to medium SAND, some silt, trace fine gravel	Composite analytical sample taken from 0 ft to 10 ft bgs.
	SS	S-2	24	6 5 1 1	13	6	0.0			Moist, loose, brown, fine to medium SAND, some silt, trace organic material (wood/roots)	
130.0 5	SS	S-3	24	1 1 1 1	14	2	0.0			Moist, very loose, dark brown, fine SAND and SILT, trace organic material (wood/roots)	
▼	SS	S-4	24	1 1 1 1	15	2	0.0			Moist, very loose, dark brown, fine Organic SAND and SILT	
125.0 10	SS	S-5	24	3 6 22 14	18	28	0.0		Sand	Moist, medium dense, dark brown, fine to medium SAND, little fine to coarse gravel, trace silt	
120.0 15	SS	S-6	24	6 12 17 24	16	29	0.0		Silty Sand	Moist, medium dense, tan, Clayey SILT, little fine sand	
115.0	SS	S-7	24	10 31	13	52	0.0			Moist, very dense, brown, fine to medium SAND, some silt, trace fine gravel	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-2 (MW)**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-2 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
115.0 / 20	SS	S-7	24	21 18	13	52	0.0				
										End of exploration at 21 ft bgs.	
110.0 / 25											
105.0 / 30											
100.0 / 35											
95.0 / 40											
90.0 / 45											

Boring Number: B-3 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / B. Raiche
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/11/2017 **End:** 4/11/2017
N: 102995.41 **E:** 1101688.44

Surface Elevation (ft.): 133.3
Total Depth (ft.): 22
Depth to Initial Water Level (ft):

Depth	Date	Time
5	4/11/2017	11:00 am

Abandonment Method: Monitoring Well installed.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
133.3 0	SS	S-1	24	3 6 19 39	7	25	0.0		Gravelly Sand	Moist, medium dense, brown, fine to coarse SAND and fine to coarse GRAVEL, little silt, trace organic material (grass/roots)	Composite analytical sample taken from 0 ft to 10 ft bgs.
	SS	S-2	24	15 11 4 15	2	15	0.0			Dry, medium dense, gray, fine GRAVEL, trace fine to medium sand, trace silt	
128.3 5	SS	S-3	24	17 8 5 3	15	13	0.0			Moist, medium dense, gray-brown, fine SAND and SILT, trace fine gravel	
	SS	S-4	24	3 2 4 4	14	6	0.0			Moist, medium stiff, dark gray, Organic Clayey SILT and fine to medium SAND	
	SS	S-5	24	6 7 6 8	<1	13	0.0			Wet, medium dense, dark gray, fine GRAVEL, trace silt	
123.3 10									Silty Sand	Moist, medium dense, tan, fine SAND, some silt	
118.3 15	SS	S-6	24	7 8 14 19	18	22	0.0				
113.3											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-3 (MW)**

Boring Number: B-3 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
113.3 20	SS	S-7	24	30 26 11 9	5	37	0.0		Silty Sand	Moist, dense, light brown, fine to medium SAND, little silt	
										End of exploration at 22 ft bgs.	
108.3 25											
103.3 30											
98.3 35											
93.3 40											
88.3 45											

Boring Number: B-4 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / B. Raiche
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/10/2017 **End:** 4/10/2017
N: 102714.69 **E:** 1101822.78

Surface Elevation (ft.): 131.2
Total Depth (ft.): 21
Depth to Initial Water Level (ft):

Depth	Date	Time
7.5	4/10/2017	2:30 pm

Abandonment Method: Monitoring Well installed.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
131.2										5" Asphalt Sidewalk	
0	SS	S-1	18	8 10 12	8	22	0.0		Gravelly Sand	Moist, medium dense, brown, fine to medium SAND, little fine to coarse gravel, little silt	Composite analytical sample taken from 0 ft to 10 ft bgs.
	SS	S-2	13	33 85 100/1"	4	>185	0.0			Moist, very dense, brown, fine to medium SAND, some fine to coarse gravel, trace silt	
126.2 5	SS	S-3	9	29 100/3"	3	>100	0.0			Moist, very dense, brown, fine to coarse GRAVEL, trace medium to coarse sand, trace silt	
▼	SS	S-4	24	3 26 40 36	5	66	0.0			Moist, very dense, dark gray and tan, fine to coarse SAND, some fine to coarse gravel, trace silt	
121.2 10	SS	S-5	24	8 13 15 14	14	28	0.0		Silty Sand	Moist, very stiff, tan, Clayey SILT, little fine to medium sand	
116.2 15	SS	S-6	24	24 29 27 28	5	56	0.0			Moist, very dense, tan, fine to medium SAND, some silt, little fine gravel	
111.2	SS	S-7	24	25 29	7	55	0.0			Moist, very dense, tan, fine to medium SAND, some silt, trace fine gravel	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-4 (MW)**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-4 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
111.2 20	SS	S-7	24	26 67	7	55	0.0				
										End of exploration at 21 ft bgs.	
106.2 25											
101.2 30											
96.2 35											
91.2 40											
86.2 45											

Boring Number: B-5

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/26/2017 **End:** 9/26/2017
N: 102431.17 **E:** 1101947.62

Surface Elevation (ft.): 130.7
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
6.0	9/26/2017	1:45 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
130.7										6" Asphalt	
0										6" Subbase: Wet, brown, fine to coarse SAND, little fine gravel, trace silt (possible weathered concrete)	
	SS	S-1	18	25 31 23	10	54	0.0		Fill	Moist, very dense, brown, fine to coarse GRAVEL, some fine to coarse sand, little silt	
	SS	S-2	18	8 5 4	15	9	0.0			Moist, loose, brown, fine SAND, little silt	
125.7 5	SS	S-3	24	6 10 13 12	0	23	0.0			No Recovery	
▼	SS	S-4	24	9 9 7 9	20	16	0.0		Clayey Silt	Wet, very stiff, brown, SILT, trace fine sand	
	SS	S-5	24	5 6 6 9	15	12	0.0			Wet, stiff, brown, SILT & CLAY	PP = 1.25 tsf.
120.7 10											
115.7 15	SS	S-6	24	7 14 20 19	16	34	0.0			Wet, hard, brown, SILT, trace fine sand	PP = 2.0 tsf. Sand in tip of split spoon.
	SS	S-7	24	15 21 12 11	12	33	0.0		Silty Sand	Wet, dense, gray-brown, fine SAND, some silt	
110.7										End of exploration at 20 ft bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-5**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-6

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/22/2017 **End:** 9/22/2017
N: 102139.63 **E:** 1102101.86

Surface Elevation (ft.): 130.1
Total Depth (ft.): 21
Depth to Initial Water Level (ft):

Depth	Date	Time
6.4	9/22/2017	11:00 am

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
130.1 0										5" Asphalt 7" Concrete	
	SS	S-1	18	16 9 9	4	18	0.0		Sand	Moist, medium dense, brown, fine SAND, little silt, trace fine gravel	
	SS	S-2	18	7 6 5	6	11	0.0			Moist, medium dense, brown, fine SAND, little silt, trace fine gravel	
125.1 5	SS	S-3	24	5 7 7 6	10	14	0.0			Wet, medium dense, brown, fine to medium SAND, trace silt, trace fine gravel	
▼	SS	S-4	24	9 9 12 10	12	21	0.0			Wet, medium dense, brown, fine to medium SAND, trace silt, trace fine gravel	
	SS	S-5	24	4 4 4 5	9	8	0.0			Wet, loose, brown, fine to medium SAND, trace silt, trace fine gravel	
120.1 10											
115.1 15	SS	S-6	24	2 3 2 2	18	5	0.0			Wet, loose, brown, fine SAND, little silt	
110.1	SS	S-7	24	4 5	18	11	0.0			Wet, medium dense, brown, fine SAND, little silt	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-6**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-6

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
110.1 / 20	SS	S-7	24	6 7	18	11	0.0		Sand		
										End of exploration at 21 ft bgs.	
105.1 / 25											
100.1 / 30											
95.1 / 35											
90.1 / 40											
85.1 / 45											

Boring Number: B-7

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/21/2017 **End:** 9/21/2017
N: 101917.13 **E:** 1102237.21

Surface Elevation (ft.): 129.2
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
5.7	9/21/2017	2:29 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
129.2 / 0										7" Asphalt	
										5" Concrete	
	SS	S-1	18	15, 28, 17	10	45	0.0		Sand	Moist, dense, dark brown to black, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-2	18	14, 14, 13	12	27	0.0			Moist, medium dense, brown, fine to medium SAND, little silt	
124.2 / 5 ▼	SS	S-3	24	7, 4, 4, 6	8	8	0.0			Moist, loose, brown, fine to coarse SAND, trace silt	
	SS	S-4	24	7, 7, 8, 8	10	15	0.0			Moist, medium dense, brown, fine SAND, trace silt	
	SS	S-5	24	3, 4, 4, 4	7	8	0.0			Moist, loose, brown, fine SAND, trace silt	
119.2 / 10											
114.2 / 15	SS	S-6	24	3, 3, 4, 4	14	7	0.0			Moist, loose, brown, fine SAND, trace silt	
	SS	S-7	24	4, 6, 7, 9	16	13	0.0			Moist, medium dense, brown, fine to medium SAND, some silt	
109.2										End of exploration at 20 ft bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-7**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-8

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/21/2017 **End:** 9/21/2017
N: 101781.74 **E:** 1102288.54

Surface Elevation (ft.): 128.1
Total Depth (ft.): 40
Depth to Initial Water Level (ft):

Depth	Date	Time
7	9/21/2017	11:52 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
128.1 0										7" Asphalt	
										5" Concrete	
	SS	S-1	18	19 18 12	7	30	0.0		Sand	Moist, dense, brown, fine to medium SAND, little fine to coarse gravel, trace silt	
	SS	S-2	18	10 11 13	13	24	0.0			Moist, medium dense, brown, fine to medium SAND, trace silt	
123.1 5	SS	S-3	24	9 7 8 9	6	15	0.0			Moist, medium dense, brown, fine to medium SAND, trace silt	
▼	SS	S-4	24	10 7 14 15	18	21	0.0			Moist, medium dense, brown, fine to medium SAND, little silt	
	SS	S-5	24	6 6 7 7	11	13	0.0			Moist, medium dense, light brown, fine to medium SAND, little silt	
118.1 10											
113.1 15	SS	S-6	24	2 3 3 3	1	6	0.0			Moist, loose, gray, fine to medium SAND, some silt	
									Silty Sand		
108.1	SS	S-7	24	3 3	12	7	0.0			Moist, loose, gray, fine to medium SAND, some silt	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-8**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-8

Client: Town of Salem
Project Location: Salem, NH
Project Name: S. Broadway Watermain Replacement
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
108.1 / 20	SS	S-7	24	4 4	12	7	0.0		Silty Sand		
103.1 / 25	SS	S-8	24	2 4 5 6	15	9	0.0			Moist, stiff, light brown, Clayey SILT, some fine sand	
98.1 / 30	SS	S-9	24	4 8 11 12	18	19	0.0			Moist, medium dense, light brown, fine SAND, some silt	
93.1 / 35	SS	S-10	24	7 11 14 17	18	25	0.0			Moist, medium dense, light brown, fine SAND and SILT	
88.1 / 40	SS	S-11	24	4 14 31 22	15	45	0.0			Moist, dense, light brown, fine SAND, some silt	
83.1 / 45										End of exploration at 40 ft bgs.	

Boring Number: B-9

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/27/2017 **End:** 9/27/2017
N: 101485.22 **E:** 1102460.87

Surface Elevation (ft.): 129.1
Total Depth (ft.): 20
Depth to Initial Water Level (ft):

Depth	Date	Time
4.9	9/27/2017	2:45 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
129.1 0										8" Asphalt	
	SS	S-1	18	15 9 8	12	17	0.0		Sand	Top 2": Moist, medium dense, gray, fine to medium SAND, some silt, trace fine gravel Bottom 10": Moist, medium dense, brown, fine SAND, little silt	
	SS	S-2	18	5 6 6	10	12	0.0			Moist, medium dense, brown, fine SAND, little silt	
124.1 5	SS	S-3	24	4 4 5 6	12	9	0.0		Silty Sand	Wet, stiff, brown, SILT and fine to medium SAND	
	SS	S-4	24	4 4 3 3	12	7	0.0			Wet, medium stiff, brown, SILT and fine to medium SAND	
	SS	S-5	24	3 1 1 2	9	2	0.0			Wet, soft, brown, SILT and fine to medium SAND	
119.1 10											
114.1 15	SS	S-6	24	3 5 6 6	18	11	0.0		Clayey Silt	Wet, stiff, gray-brown, SILT, little fine sand	
	SS	S-7	24	3 4 6 7	18	10	0.0			Wet, stiff, gray-brown, SILT, little fine sand	
109.1										End of exploration at 20 ft bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-9**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-10

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 10/4/2017 **End:** 10/4/2017
N: 101192.61 **E:** 1102615.18

Surface Elevation (ft.): 126.1
Total Depth (ft.): 8
Depth to Initial Water Level (ft):

Depth	Date	Time
3.5	10/4/2017	2:45 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
126.1 0										8" Asphalt	
	SS	S-1	18	10 12 13	14	25	0.0		Sand	Moist, medium dense, brown, fine to medium SAND, some fine gravel, little silt	~~Subbase:~~ Moist, gray, coarse GRAVEL, trace fine to coarse sand, trace silt
▼	SS	S-2	18	8 10 7	10	17	0.0			Moist, medium dense, brown, fine to medium SAND, some fine gravel, little silt, trace organics	
121.1 5	SS	S-3	24	9 6 3 2	10	9	0.0			Wet, stiff, dark brown, Slightly Organic SILT	
	SS	S-4	24	7 11 14 15	14	25	0.0			Top 6": Wet, medium dense, brown, fine SAND, trace silt Bottom 8": Wet, very stiff, gray-brown, SILT	An obstruction was encountered at 6 ft bgs while ~~driving the casing~~ to 8 ft bgs. Metal pieces were coming up in the drilling wash water. The casing was pulled out and a smooth 2 inch groove was observed inside of the soil. The driller terminated the boring at 8 ft bgs.
116.1 10										End of exploration at 8 ft bgs.	
111.1 15											
106.1											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-10**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-11 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / B. Raiche
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/12/2017 **End:** 4/13/2017
N: 100804.4 **E:** 1102835.99

Surface Elevation (ft.): 126.4
Total Depth (ft.): 19
Depth to Initial Water Level (ft):

Depth	Date	Time
3.1	4/13/2017	9:30 am

Abandonment Method: Monitoring Well installed.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
126.4 0										6" Asphalt	Composite analytical sample taken from 0 ft to 10 ft bgs.
	SS	S-1	18	11 7 5	12	12	0.0		Sand	Moist, medium dense, brown, fine to medium SAND, some silt, trace fine gravel	
▼	SS	S-2	24	6 6 6 8	18	12	0.0			Moist, medium dense, light brown, fine to coarse SAND, little silt, trace fine gravel	
121.4 5	SS	S-3	24	2 7 10 9	15	17	0.0			Moist, medium dense, light brown, fine to coarse SAND, little silt, trace fine gravel	
	SS	S-4	24	4 4 4 15	24	8	0.0			Moist, loose, light brown, fine to coarse SAND, little fine gravel, trace silt	
116.4 10	SS	S-5	23	14 12 20 80/5"	23	42	0.0			Moist, dense, light brown, fine to medium SAND, little fine to coarse gravel, trace silt	
111.4 15	SS	S-6	24	7 3 4 3	12	7	0.0			Moist, loose, light brown, fine to coarse SAND, little silt, trace fine gravel	Roller bit to 19 ft bgs. No sample taken at 19 ft bgs. Repeated attempts were made at getting the sampler to the correct depth, but the casing would be filled with soil to 17 ft by the time the sampler was placed.
106.4										End of exploration at 19 ft bgs.	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-11 (MW)**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-11 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
106.4 20											Monitoring well placed at 19 ft bgs.
101.4 25											
96.4 30											
91.4 35											
86.4 40											
81.4 45											

Boring Number: B-12

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/26/2017 **End:** 9/26/2017
N: 100545.41 **E:** 1102949.53

Surface Elevation (ft.): 126.1
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
5.0	9/26/2017	10:15 am

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
126.1 0										10" Asphalt	
	SS	S-1	18	26 28 22	4	50	0.1		Sand	Wet, dense, brown, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-2	18	7 12 7	6	19	0.0			Wet, medium dense, brown, fine to coarse SAND, little fine gravel, trace silt	
121.1 5	SS	S-3	24	5 1 1 5	3	2	0.0			Wet, very loose, brown, fine to coarse SAND, little fine gravel, trace silt	
	SS	S-4	24	5 4 4 3	12	8	0.0			Top 9": Wet, loose, brown, fine to coarse SAND, little fine gravel, trace silt Bottom 3": Wet, loose, brown, fine SAND, little silt, trace organics	
	SS	S-5	24	5 5 6 5	8	11	0.0			Wet, medium dense, gray-brown, fine SAND, trace silt	
116.1 10											
111.1 15	SS	S-6	24	4 4 3 3	12	7	0.0			Wet, loose, brown-orange to brown, fine SAND, little silt	
106.1	SS	S-7	24	3 4	14	8	0.0			Wet, loose, brown-orange to brown, fine SAND, little silt	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-12**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

CDM Smith

Boring Number: B-12

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
106.1 / 20	SS	S-7	24	4 4	14	8	0.0		Sand		
	SS	S-8	24	3 5 7 9	24	12	0.0			Wet, medium dense, brown-orange to brown, fine SAND, little silt	
101.1 / 25										End of exploration at 25 ft bgs.	
96.1 / 30											
91.1 / 35											
86.1 / 40											
81.1 / 45											

Boring Number: B-13

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/19/2017 **End:** 9/20/2017
N: 100251.5 **E:** 1103092.07

Surface Elevation (ft.): 125.2
Total Depth (ft.): 28
Depth to Initial Water Level (ft):

Depth	Date	Time
4	9/20/2017	12:00 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.2 0										7" Asphalt	
										5" Concrete	
	SS	S-1	18	11 23 10	12	33	0.0		Gravelly Sand	Moist, dense, gray, fine GRAVEL, trace fine to coarse sand, trace silt	
	SS	S-2	18	12 13 15	14	28	0.0			Moist, medium dense, gray-brown, fine to medium SAND, little silt, trace fine gravel	
▼ 120.2 5	SS	S-3	24	8 5 3 3	6	8	0.0			Moist, loose, dark gray, fine to medium SAND, some silt	Organic odor
	SS	S-4	24	7 10 10 9	12	20	0.0			Moist, medium dense, light brown, Slightly Organic fine to medium SAND, trace silt	Organic odor
	SS	S-5	24	4 5 7 6	13	12	0.0		Sand	Moist, medium dense, light brown, fine to medium SAND, trace silt, trace fine gravel	
115.2 10											
110.2 15	SS	S-6	24	4 7 8 9	0	15	0.0		Gravelly Sand	No Recovery	
											Rig chatter was observed approximately 18 ft to 19 ft bgs.
105.2	SS	S-7	24	4 5	3	9	0.0			Moist, loose, gray, fine GRAVEL, trace fine sand, trace silt	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-13**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-13

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.2 / 20	SS	S-7	24	4 6	3	9	0.0				
									Sand	Moist, very dense, gray, fine to medium SAND, some silt, trace fine gravel	Very dense material was encountered at approximately 22 ft bgs while advancing casing.
100.2 / 25	SS	S-8	11	80 100/5"	7	>100	0.0				
	SS	S-9	3	100/3"	3	>100	0.0			Moist, very dense, gray, fine to coarse SAND, little silt, trace fine gravel Casing broke in test boring and could not be recovered, boring was terminated at 28 ft bgs, and relocated to boring B-13A.	
95.2 / 30											
90.2 / 35											
85.2 / 40											
80.2 / 45											

Boring Number: B-13A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/20/2017 **End:** 9/20/2017
N: 100253.32 **E:** 1103093.37

Surface Elevation (ft.): 125.2
Total Depth (ft.): 33
Depth to Initial Water Level (ft):

Depth	Date	Time
8	9/20/2017	2:00 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.2 0										Continuation of boring B-13. Casing driven and rollerbit advanced directly to 28 ft bgs. Attempt to core rock.	
120.2 5											
▼											
115.2 10											
110.2 15											
105.2											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-13A**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-13A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.2 20											
100.2 25											
95.2 30	NX	C-1	60		34	--			Bedrock	See core log for description	Casing refusal at 28 ft bgs, attempt rock core.
90.2 35										End of exploration at 33 ft bgs.	
85.2 40											
80.2 45											

Boring Number: B-13A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

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
95.2 / 30.0	NX	C-1	60	57	38	4:36 4:19 6:30 5:07 5:10			Granofels	Hard, fresh, dark gray, fine to medium grained GRANOFELS; Primary Joint Set horizontal, smooth, planar, fresh, tight.	Drilled to 28 ft bgs, from ground surface. Top of bedrock encountered at approximately 28 ft bgs.
90.2 / 35.0										End of exploration at 33 ft bgs.	
85.2 / 40.0											
80.2 / 45.0											

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 discoloredand may be weaker externally than its fresh condition.
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.
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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-13A**

Boring Number: B-14

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/27/2017 **End:** 9/27/2017
N: 99922.7 **E:** 1103268.28

Surface Elevation (ft.): 125.9
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
5.0	9/27/2017	10:40 am

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.9 0										6" Asphalt	
										6" Concrete	
	SS	S-1	18	18 24 14	16	38	0.0		Fill	Top 10": Moist, dense, gray-brown, fine to coarse SAND, some fine to coarse gravel, little silt	
	SS	S-2	18	12 15 15	10	30	0.0		Sand	Bottom 6": Moist, dense, brown, fine SAND, trace silt	
										Moist, medium dense, brown, fine SAND, trace silt	
120.9 5	SS	S-3	24	5 7 10 11	14	17	0.0			Wet, medium dense, brown, fine SAND, little silt, trace fine gravel	
	SS	S-4	24	7 10 12 11	16	22	0.0			Wet, medium dense, brown, fine SAND, little silt, trace fine gravel	
	SS	S-5	24	5 6 7 8	14	13	0.0			Wet, medium dense, brown, fine SAND, little silt, trace fine gravel	
115.9 10											
									Clayey Silt	Wet, very stiff, brown, SILT, little fine sand	
110.9 15	SS	S-6	24	8 15 12 14	16	27	0.0				
105.9	SS	S-7	24	5 9	18	19	0.0			Wet, very stiff, gray, Clayey SILT, trace fine sand	PP = 1.5 tsf

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-14**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-14

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.9											
20	SS	S-7	24	10 10	18	19	0.0		Clayey Silt	Wet, very stiff, gray, Silty CLAY	PP = 1.5 tsf
	SS	S-8	24	6 10 8 8	18	18	0.0				PP = 0.25 tsf
100.9 25										End of exploration at 25 ft bgs.	
95.9 30											
90.9 35											
85.9 40											
80.9 45											

Boring Number: B-15 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / B. Raiche
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 4/13/2017 **End:** 4/13/2017
N: 99616.94 **E:** 1103471.51

Surface Elevation (ft.): 125.9
Total Depth (ft.): 19.25
Depth to Initial Water Level (ft):

Depth	Date	Time
5	4/13/2017	10:00 am

Abandonment Method: Monitoring Well installed.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.9 0	AS	A-1	60				0.0			3" Asphalt Sidewalk Moist, brown, fine to coarse SAND, some fine to coarse gravel, little silt, occasional cobbles.	Test boring hand cleared from ground surface to 5 ft bgs. Composite analytical sample taken from 4 ft to 5 ft bgs. From 4 ft to 16 ft bgs: Chemical odor in soil samples.
120.9 5	SS	S-1	24	2 4 5 11	13	9	0.0			Moist, stiff, gray-brown, SILT and fine SAND	
	SS	S-2	24	13 8 8 11	16	16	0.0			Moist, medium dense, gray-brown, fine SAND, some silt	
115.9 10	SS	S-3	24	11 10 9 13	8	19	0.0		Silty Sand	Moist, medium dense, gray, fine SAND and SILT, little fine gravel	
110.9 15	SS	S-4	24	5 78 39 41	15	117	0.0			Moist, very dense, gray, fine to coarse Sand and fine Gravel, some silt	
105.9	SS	S-5	3	100/3"	3	>100	0.0			Moist, very dense, brown-gray, fine to coarse SAND, some silt, little fine gravel	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-15 (MW)**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-15 (MW)

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.9 20										End of exploration at 19.25 ft bgs.	
100.9 25											
95.9 30											
90.9 35											
85.9 40											
80.9 45											

Boring Number: B-16

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/18/2017 **End:** 9/18/2017
N: 99409.56 **E:** 1103559.09

Surface Elevation (ft.): 125.5
Total Depth (ft.): 8
Depth to Initial Water Level (ft):

Depth	Date	Time
NE	9/18/2017	9:50 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.5										6" Asphalt	
0										4" Concrete	
	SS	S-1	18	15 17 39	10	56	0.0		Gravelly Sand	Moist, very dense, brown, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	4	100/4"	1	>100	0.0		Gravelly Sand	Moist, very dense, brown, fine GRAVEL, trace fine to coarse sand, trace silt	
120.5 5	SS	S-3	24	9 9 8 11	14	17	0.0		Silty Sand	Moist, medium dense, light brown, fine to medium SAND, some silt	
	SS	S-4	24	12 11 13 14	16	24	0.0		Silty Sand	Moist, medium dense, gray brown, fine SAND and SILT	
115.5 10										Obstruction encountered, boring offset 9.5 feet north to B-16A.	
110.5 15											
105.5											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-16**

Boring Number: B-16A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/18/2017 **End:** 9/18/2017
N: 99401.17 **E:** 1103563.55

Surface Elevation (ft.): 125.5
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
4.1	9/18/2017	11:49 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.5 0										Continuation of B-16, rollerbit directly to 8 ft bgs and continue sampling.	
▼ 120.5 5											
	SS	S-1	24	7 10 8 7	17	18	0.0		Clayey Silt	Moist, very stiff, light brown, SILT, trace fine to medium sand	
115.5 10											
	SS	S-2	24	4 6 6 6	16	12	0.0			Moist, stiff, gray, SILT & CLAY, some fine to medium sand	
110.5 15											
	SS	S-3	24	4 6	15	13	0.0			Moist, stiff, gray, SILT & CLAY, little fine sand	
105.5											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-16A**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

CDM Smith

Boring Number: B-16A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.5											
20	SS	S-3	24	7 8	15	13	0.0		Clayey Silt	Moist, stiff, gray, SILT & CLAY, little fine sand	
	SS	S-4	24	5 7 8 7	18	15	0.0				
100.5 25										End of exploration at 25 ft bgs.	
95.5 30											
90.5 35											
85.5 40											
80.5 45											

Boring Number: B-17

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/15/2017 **End:** 9/15/2017
N: 99147.47 **E:** 1103703.64

Surface Elevation (ft.): 124.2
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
7.8	9/15/2017	1:00 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
124.2 0										10" Asphalt	
	SS	S-1	18	18 16 11	9	27			Silty Sand	Moist, medium dense, brown, fine to medium SAND, little silt	
	SS	S-2	18	5 3 6	6	9				Moist, loose, brown, Slightly Organic fine to medium SAND, some silt	Odor of rotting organics.
119.2 5	SS	S-3	24	6 7 8 8	12	15				Moist, medium dense, brown, fine SAND and SILT	
▼	SS	S-4	24	13 11 11 10	19	22				Moist, medium dense, brown, fine SAND and SILT	
	SS	S-5	24	7 10 12 13	11	22				Moist, medium dense, brown-gray, fine SAND, some silt	
114.2 10											
109.2 15	SS	S-6	24	7 10 8 8	12	18				Moist, medium dense, gray, fine SAND, some silt	
104.2	SS	S-7	24	6 7	22	12				Moist, stiff, gray-brown, SILT, trace fine sand	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-17**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

CDM Smith

Boring Number: B-17

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
104.2 / 20	SS	S-7	24	5 6	22	12			Silty Sand	Moist, stiff, gray-brown, SILT, some fine sand	
	SS	S-8	24	4 3 6 8	22	9					
99.2 / 25										End of exploration at 25 ft bgs.	
94.2 / 30											
89.2 / 35											
84.2 / 40											
79.2 / 45											

Boring Number: B-18

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/15/2017 **End:** 9/15/2017
N: 98933.24 **E:** 1103819.38

Surface Elevation (ft.): 125.1
Total Depth (ft.): 21
Depth to Initial Water Level (ft):

Depth	Date	Time
8.2	9/15/2017	10:45 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.1 0										8" Asphalt	
	SS	S-1	18	20 25 23	4	48	1.1		Sand	Moist, dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
	SS	S-2	18	8 9 11	14	20	0.0		Silty Sand	Moist, medium dense, brown, fine SAND, some silt	
120.1 5	SS	S-3	24	9 14 13 11	13	27	0.0			Moist, medium dense, tan to brown, fine SAND and SILT	
	SS	S-4	24	10 10 11 11	20	21	0.0			Moist, medium dense, brown, SILT, little fine sand	
▼	SS	S-5	24	8 9 6 7	14	15	0.0			Moist, medium dense, brown, fine SAND and SILT	
115.1 10											
110.1 15	SS	S-6	24	7 6 6 6	14	12	0.0			Moist, medium dense, light brown, fine SAND, some silt	
105.1	SS	S-7	24	4 4	15	9	0.0			Moist, stiff, light brown, SILT, some fine sand	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-18**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-18

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.1											
20	SS	S-7	24	5 4	15	9	0.0		Silty Sand	Moist, stiff, brown, SILT and fine SAND	
	SS	S-8	24	4 5 6 5	15	11	0.0				
100.1											
25										End of exploration at 25 ft bgs.	
95.1											
30											
90.1											
35											
85.1											
40											
80.1											
45											

Boring Number: B-19

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/14/2017 **End:** 9/14/2017
N: 98636.17 **E:** 1103981.84

Surface Elevation (ft.): 125.3
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
5.8	9/14/2017	2:33 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
125.3 0										7" Asphalt	
										5" Concrete	
	SS	S-1	17	12 20 80/5"	5	>100	0.0		Gravelly Sand	Moist, very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt	
120.3 5 ▼	SS	S-2	24	11 8 9 8	8	17	0.0			Moist, medium dense, brown, fine SAND and SILT	
	SS	S-3	24	11 12 12 10	18	24	0.0			Moist, medium dense, light brown, fine to medium SAND and SILT	
	SS	S-4	24	6 8 11 10	13	19	0.0			Moist, medium dense, brown gray, fine SAND and SILT	
115.3 10									Silty Sand		
110.3 15	SS	S-5	24	3 4 5 5	15	9	0.0			Moist, stiff, gray, SILT, trace fine to medium sand	
105.3	SS	S-6	24	6 7	17	13	0.0			Moist, stiff, gray, SILT, some fine sand	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-19**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-19

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
105.3											
20	SS	S-6	24	6 6	17	13	0.0		Silty Sand		
	SS	S-7	24	6 9 11 11	18	20	0.0			Moist, medium dense, gray, fine SAND and SILT	
100.3 25										End of exploration at 25 ft bgs.	
95.3 30											
90.3 35											
85.3 40											
80.3 45											

Boring Number: B-20

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/13/2017 **End:** 9/14/2017
N: 98266.35 **E:** 1104185.53

Surface Elevation (ft.): 123.2
Total Depth (ft.): 13
Depth to Initial Water Level (ft):

Depth	Date	Time
4.2	9/14/17	8:00 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
123.2											
0										5" Asphalt	
										6" Concrete	
	SS	S-1	18	15 31 17	13	48	0.0		Gravelly Sand	Moist, dense, light brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
▼ 118.2 5	SS	S-2	24	76 15 13 13	14	28	0.0		Silty Sand	Moist, medium dense, light brown, fine to coarse SAND, some silt	
	SS	S-3	24	21 22 21 15	20	43	0.0			Moist, medium dense, light brown, fine SAND and SILT	
	SS	S-4	24	10 11 10 11	11	21	0.0			Moist, medium dense, light brown, fine to medium SAND, some silt	
113.2 10	SS	S-5	1	100/1"	0	>100	0.0		Gravelly Sand	No Recovery	Coring attempted at 11.8 ft bgs and 12.5 ft bgs, no recovery.
										Casing crimped while attempting to drive the casing to 13 ft bgs. Offset boring B-20 5 ft north to boring B-20A and continue sampling at 14 ft bgs.	
108.2 15											
103.2											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-20**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-20

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

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
	Core	C-1	12	0	0		NR		Boulders/Cobbles	Broke through hard material at approximately 11.8 ft bgs. More hard material was encountered at 12.5 ft bgs. No recovery on first rock core attempt, the driller needs to reseat the casing before attempting a second core at 12.5 ft bgs. The casing crimped while attempting to advance it to 13 ft bgs. Offset boring 5 ft north to B-20A.	
108.2 / 15.0											
103.2 / 20.0											
98.2 / 25.0											
93.2 / 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 discoloredand may be weaker externally than its fresh condition.
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.
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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-20**

ROCK CORING LOG S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/14/17

Boring Number: B-20A

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/14/2017 **End:** 9/14/2017
N: 98265.45 **E:** 1104185.96

Surface Elevation (ft.): 123.2
Total Depth (ft.): 16.5
Depth to Initial Water Level (ft):

Depth	Date	Time
NR		

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
123.2 0										Continuation of B-20, rollerbit directly to 14 ft bgs and continue sampling.	
118.2 5											
113.2 10											
108.2 15	SS	S-1	20	42 27 28 72/2"	7	55	0.0		Gravelly Sand	Moist, very dense, light brown, fine to coarse SAND, some fine to coarse gravel, trace silt	Casing stuck at 14 ft bgs. Rollerbit refusal at 16.5 ft bgs. Rollerbit was advanced into hard material for approximately 1 ft (15.5 to 16.5 ft).
										Casing stuck at 14 ft bgs, driller is unable to core rock. End of exploration at 16.5 ft bgs.	
103.2											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-20A**

Boring Number: B-21

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/13/2017 **End:** 9/13/2017
N: 98036.44 **E:** 1104311.34

Surface Elevation (ft.): 124.4
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
7.8	9/13/2017	10:34 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
124.4 0										5" Asphalt 5" Concrete	
	SS	S-1	18	10 13 11	7	24	0.0		Silty Sand	Moist, medium dense, light brown, fine to medium SAND, some silt, trace fine gravel	
	SS	S-2	18	13 10 10	8	20	0.0			Moist, medium dense, brown, Slightly Organic fine to medium SAND, little clayey silt, trace fine gravel	
119.4 5	SS	S-3	24	4 3 6 11	16	9	0.0			Moist, loose, dark brown to black, Slightly Organic fine to medium SAND, little clayey silt	
▼	SS	S-4	24	14 10 10 9	18	20	0.0			Moist, medium dense, brown, fine to coarse SAND, some silt	
	SS	S-5	24	7 6 7 6	14	13	0.0			Moist, medium dense, gray, SILT, trace fine sand	
114.4 10									Sand		
109.4 15	SS	S-6	24	7 5 6 10	13	11	0.0			Moist, medium dense, brown, fine to coarse SAND, trace silt, trace fine gravel	
104.4	SS	S-7	24	18 18	6	64	0.0			Moist, very dense, brown-gray, fine to coarse Sand and fine to coarse Gravel, little	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-21**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

CDM Smith

Boring Number: B-21

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
104.4											
20	SS	S-7	24	46 21	6	64	0.0		Sand	silt	
	SS	S-8	22	32 26 17 83/4"	6	43	0.0			Moist, dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
99.4 25										End of exploration at 25 ft bgs.	
94.4 30											
89.4 35											
84.4 40											
79.4 45											

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-22

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 10/4/2017 **End:** 10/4/2017
N: 97773.37 **E:** 1104414.74

Surface Elevation (ft.): 124.3
Total Depth (ft.): 23
Depth to Initial Water Level (ft):

Depth	Date	Time
4.0	10/4/2017	12:30 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
124.3 0										8" Asphalt	
	SS	S-1	18	27 32 38	12	70	0.0		Sand	4" Subbase: Fine to coarse SAND, some fine gravel, little silt Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	Obtained sample of subbase soil beneath asphalt.
	SS	S-2	18	18 52 45	10	97	0.0			Moist, very dense, brown, fine to coarse SAND, some fine gravel, little silt	
▼ 119.3 5	SS	S-3	24	20 22 28 52	12	50	0.0			Moist, very dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-4	24	28 34 26 22	16	60	0.0			Wet, very dense, light brown, fine SAND, some silt	
114.3 10	SS	S-5	24	19 16 11 10	12	27	0.0			Wet, medium dense, light brown, fine to medium SAND, some silt, trace fine to coarse gravel	
109.3 15	SS	S-6	24	11 16 30 32	8	46	0.0			Wet, dense, brown, fine to coarse Sand and fine to coarse Gravel, little silt	Casing refusal at 17.5 ft bgs, advance boring with rollerbit to 19 ft bgs. Advance rollerbit to 21.5 ft bgs.
	SS	S-7	0	100/0"	0	>100	0.0			No Recovery	
104.3											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-22**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-22

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
104.3 / 20									Weathered Rock		Attempt to core rock at 21.5 ft bgs. Core barrel plugged with fine sand, advance rollerbit to 23 ft bgs.
	SS	S-8	0	100/0"	0	>100	0.0			No Recovery	
99.3 / 25										End of exploration at 23 ft bgs.	
94.3 / 30											
89.3 / 35											
84.3 / 40											
79.3 / 45											

Boring Number: B-23

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/12/2017 **End:** 9/12/2017
N: 97443.66 **E:** 1104639.4

Surface Elevation (ft.): 124.3
Total Depth (ft.): 24
Depth to Initial Water Level (ft):

Depth	Date	Time
7	9/12/2017	3:08 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
124.3 0										7" Asphalt	
										5" Concrete	
	SS	S-1	18	8 27 17	4	44	0.0		Sand	Moist, dense, brown, fine to coarse SAND, little fine gravel, little silt	
	SS	S-2	18	9 9 9	3	18	0.0			Moist, medium dense, brown, fine to coarse SAND, little silt, trace fine gravel	
119.3 5	SS	S-3	24	9 11 9 9	1	20	0.0			Moist, medium dense, brown, fine to coarse SAND, trace fine gravel, trace silt	
▼	SS	S-4	24	13 13 14 11	13	27	0.0		Silty Sand	Moist, medium dense, light brown, fine SAND and SILT	
	SS	S-5	24	4 5 5 4	16	10	0.0			Moist, stiff, light brown, SILT & CLAY, little fine sand	
114.3 10											
									Sand		
109.3 15	SS	S-6	24	9 15 12 14	15	27	0.0			Moist, medium dense, light brown, fine to coarse SAND, some silt, little fine gravel	Hard drilling (rig chatter and slow advance) from 20 ft to 22 ft bgs. Rollerbit refusal at 24 ft bgs after 3 attempts to drive a split spoon to 24 ft bgs. The borehole repeatedly collapsed at 21 ft or less. Soil cuttings appear similar to sample
104.3	SS	S-7	12	76 100	2	100	0.0			Moist, very dense, gray, fine to coarse SAND, little silt, trace fine gravel	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-23**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-23

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
104.3 20									Sand		S-7.
99.3 25										End of exploration at 24 ft bgs.	
94.3 30											
89.3 35											
84.3 40											
79.3 45											

Boring Number: B-24

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/12/2017 **End:** 9/12/2017
N: 97215.59 **E:** 1104764.11

Surface Elevation (ft.): 124.4
Total Depth (ft.): 25
Depth to Initial Water Level (ft):

Depth	Date	Time
7.2	9/12/2017	10:52 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
124.4 0										7" Asphalt	
										5" Concrete	
	SS	S-1	18	15 20 13	12	33	0.0		Sand	Moist, dense, brown, fine to coarse SAND, some fine gravel, trace silt	
	SS	S-2	18	12 9 7	4	16	0.0			Moist, medium dense, brown, fine to coarse SAND, little fine gravel, little silt	
119.4 5	SS	S-3	24	8 10 8 8	14	18	0.0			Moist, medium dense, brown, fine to medium SAND, trace fine gravel, trace silt	
▼	SS	S-4	24	15 15 14 13	20	29	0.0		Silty Sand	Moist, medium dense, light brown to brown, fine to medium SAND, some silt	
	SS	S-5	24	4 10 9 9	16	19	0.0			Moist, medium dense, light brown, fine to medium SAND and SILT	
114.4 10											
109.4 15	SS	S-6	24	9 29 26 22	10	55	0.0		Gravelly Sand	Moist, very dense, light gray, fine to coarse Sand and fine to coarse Gravel, trace silt	
104.4	SS	S-7	24	23 61	4	140	0.0			Moist, very dense, gray, fine to coarse GRAVEL, some fine to coarse sand, little silt	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-24**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-24

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
104.4											
20	SS	S-7	24	79 24	4	140	0.0		Gravelly Sand		
	SS	S-8	10	60 100/4"	3	>100	0.0			Moist, very dense, gray, fine GRAVEL, some fine to coarse sand, trace silt	
99.4 25										End of exploration at 25 ft bgs.	
94.4 30											
89.4 35											
84.4 40											
79.4 45											

Boring Number: B-25

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/11/2017 **End:** 9/11/2017
N: 97015.81 **E:** 1104864.68

Surface Elevation (ft.): 123.5
Total Depth (ft.): 26
Depth to Initial Water Level (ft):

Depth	Date	Time
7.4	9/11/2017	2:22 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
123.5 0										6" Asphalt	
										6" Concrete	
	SS	S-1	18	14 26 16	15	42	0.0		Sand	Moist, dense, gray, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	18	15 11 7	14	18	0.0			Moist, medium dense, dark gray, fine to medium SAND, some clayey silt	
118.5 5	SS	S-3	24	37 14 10 19	13	24	0.0			Moist, medium dense, dark gray to black, Slightly Organic fine to medium SAND, little fine gravel, trace clayey silt	
▼	SS	S-4	24	28 41 25 25	24	66	0.0			Top 12": Moist, very dense, gray, fine to coarse SAND, some fine gravel, trace silt Bottom 12": Moist, very dense, brown, fine SAND, little silt	
113.5 10	SS	S-5	24	7 7 8 7	15	15	0.0		Silty Sand	Moist, medium dense, gray, fine SAND, some silt	
108.5 15	SS	S-6	24	3 4 5 5	14	9	0.0			Moist, stiff, gray, SILT, trace fine to medium sand	
103.5	SS	S-7	24	5 6	18	13	0.0			Moist, stiff, gray, SILT, trace fine sand	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-25**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-25

Client: Town of Salem
Project Location: Salem, NH
Project Name: S. Broadway Watermain Replacement
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
103.5											
20	SS	S-7	24	7 7	18	13	0.0		Silty Sand		
98.5	SS	S-8	24	4 6 6 7	20	12	0.0			Moist, medium dense, gray, fine SAND, some silt	
25										End of exploration at 26 ft bgs.	
93.5											
30											
88.5											
35											
83.5											
40											
78.5											
45											

Boring Number: B-26

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/11/2017 **End:** 9/11/2017
N: 96757.42 **E:** 1105007.64

Surface Elevation (ft.): 123.5
Total Depth (ft.): 26
Depth to Initial Water Level (ft):

Depth	Date	Time
8.8	9/11/2017	11:50 am

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
123.5 0										5" Asphalt 2.5" Subbase 5" Concrete	Void for approximately 2 inches around circumference of borehole. No subbase sample could be gathered.
	SS	S-1	18	9 13 13	12	26	0.0		Silty Sand	Moist, medium dense, brown, fine to coarse SAND, some fine to coarse gravel, trace silt	
	SS	S-2	18	10 11 9	9	20	0.0			Moist, medium dense, tan, fine SAND, some silt	
118.5 5	SS	S-3	24	9 10 10 12	13	20	0.0			Moist, medium dense, light brown, fine SAND, little silt	
	SS	S-4	24	13 15 15 16	15	30	0.0			Moist, dense, light brown, fine to medium SAND, little silt	
▼ 113.5 10	SS	S-5	24	7 8 8 9	13	16	0.0			Moist, medium dense, light brown, fine SAND, trace silt	
108.5 15	SS	S-6	24	2 3 3 4	12	6	0.0			Moist, loose, light brown, fine SAND, some silt	
103.5	SS	S-7	24	4 4	18	8	0.0			Moist, medium stiff, light brown to gray, SILT, trace fine sand	

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn | **Date: 11/15/2017** | **Boring Number: B-26**

Boring Number: B-26

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
103.5											
20	SS	S-7	24	4 6	18	8	0.0		Silty Sand		
98.5											
25	SS	S-8	24	4 4 5 6	18	9	0.0			Moist, loose, gray, fine to medium SAND, little silt End of exploration at 26 ft bgs.	
93.5											
30											
88.5											
35											
83.5											
40											
78.5											
45											

Boring Number: B-27

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/25/2017 **End:** 9/25/2017
N: 103039.88 **E:** 1101458.52

Surface Elevation (ft.): 143.1
Total Depth (ft.): 10
Depth to Initial Water Level (ft):

Depth	Date	Time
NE	9/25/2017	2:15 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
143.1 / 0										5" Asphalt	
	SS	S-1	18	14 14 11	14	25	0.0		Sand	Moist, medium dense, brown, fine to coarse SAND, little fine gravel, little silt	
	SS	S-2	24	5 5 8 8	12	13	0.0			Moist, medium dense, brown, fine SAND, little silt, little fine gravel, trace organics	
138.1 / 5	SS	S-3	24	3 5 2 2	14	7	0.0			Moist, loose, brown, fine SAND, little silt	
	SS	S-4	24	4 3 2 3	12	5	0.0			Moist, loose, dark brown, fine SAND, some silt, trace fine gravel, trace organics	
133.1 / 10	SS	S-5	24	3 8 14 15	16	22	0.0			Moist, medium dense, brown, fine to coarse SAND, little fine gravel, trace silt	
										End of exploration at 10 ft bgs.	
128.1 / 15											
123.1											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-27**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-28

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Hollow Stem Auger / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/18/2017 **End:** 9/18/2017
N: 103142.89 **E:** 1102177.13

Surface Elevation (ft.): 136.2
Total Depth (ft.): 10
Depth to Initial Water Level (ft):

Depth	Date	Time
NE	9/18/2017	1:55 pm

Abandonment Method: Backfilled with soil cuttings.
Logged By: J. Todd

Elev. Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
136.2 0	SS	S-1	24	3 6 8 8	16	14	0.0		Sand	Moist, medium dense, brown, Slightly Organic fine to medium SAND, little clayey silt, trace fine gravel	Grass was observed at ground surface.
	SS	S-2	24	6 8 7 7	14	15	0.0			Moist, medium dense, light brown, fine SAND, little fine gravel, little silt	
131.2 5	SS	S-3	24	6 8 8 6	11	16	0.0			Moist, medium dense, light brown, fine SAND, little fine gravel, little silt	
	SS	S-4	24	9 10 12 16	18	22	0.0			Moist, medium dense, light brown, fine SAND, little fine gravel, little silt	
	SS	S-5	24	10 11 24 30	15	35	0.0			Moist, dense, light brown, fine SAND, some fine to coarse gravel, little silt	
126.2 10										End of exploration at 10 ft bgs.	
121.2 15											
116.2											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-28**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

Boring Number: B-29

Client: Town of Salem
Project Name: S. Broadway Watermain Replacement
Project Location: Salem, NH
Project Number: 25972-215427

Drilling Contractor/Driller: New England Boring Contractors / P. Schofield
Drilling Method/Casing/Core Barrel Size: Drive and Wash / 4 in / NA
Hammer Weight/Drop Height/ Spoon Size: 140 lb / 30 in / 2 in O.D.
Bore Hole Location: See boring location plan
Drilling Date: Start: 9/22/2017 **End:** 9/22/2017
N: **E:**

Surface Elevation (ft.):
Total Depth (ft.): 7
Depth to Initial Water Level (ft):

Depth	Date	Time
NE	9/22/2017	2:50 pm

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	Organic Vapor Reading (ppm)	Graphic Log	Strata	Material Description	Remarks
0										4" Asphalt	
	SS	S-1	24	19 46 40 38	14	86	0.0		Gravelly Sand	Moist, very dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little silt	Obtained sample of subbase soil beneath asphalt, appears similar to sample S-1.
	SS	S-2	24	60 63 38 32	12	101	0.0			Moist, very dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt	
5	SS	S-3	24	20 15 21 34	16	36	0.0			Moist, dense, gray, fine to coarse SAND, some fine to coarse gravel, little silt	
										End of exploration at 7 ft bgs.	
10											
15											

Sample Types

AS - Auger/Grab Sample
CS - California Sampler
BQ - 1.5" Rock Core
NX - 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	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: T. Dunn **Date: 11/15/2017** **Boring Number: B-29**

BL S. BROADWAY SALEM NH - BORING LOGS.GPJ - 12/15/17

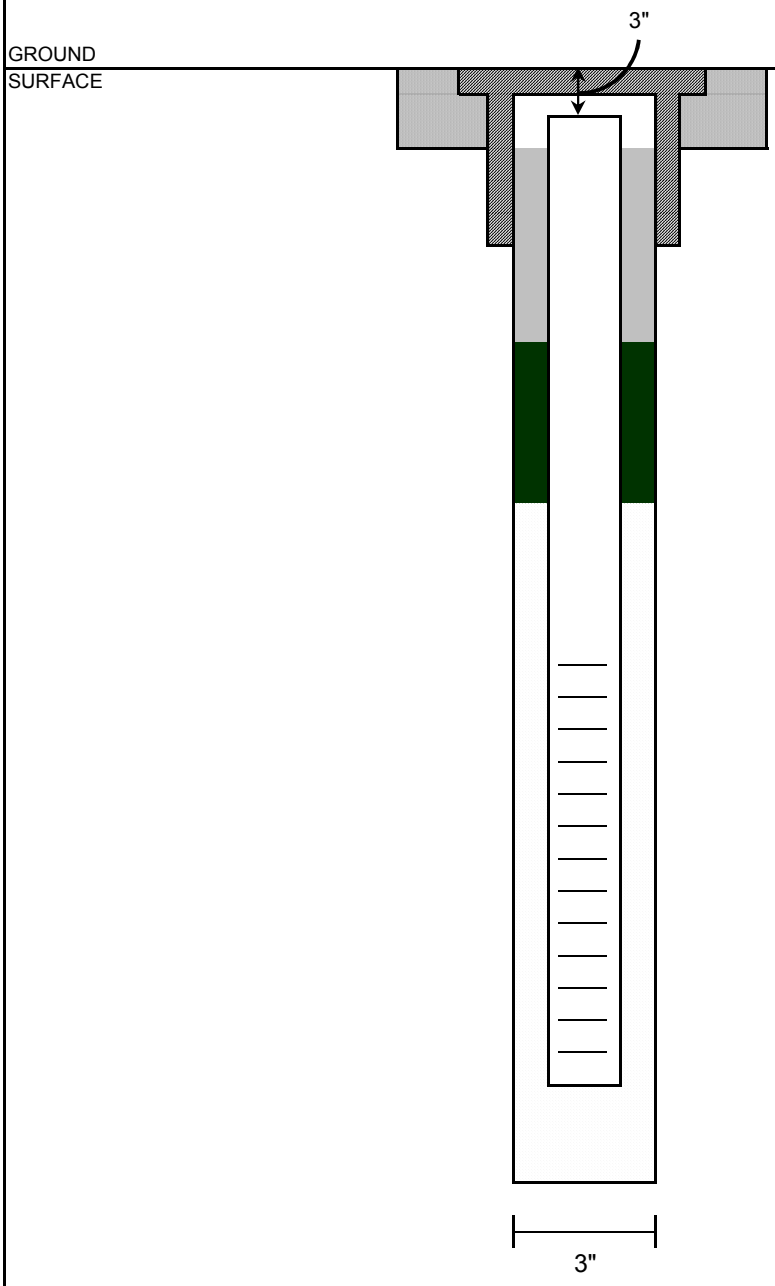
Attachment B – Monitoring Well Installation Logs and Monitoring Well Reports

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Town of Salem, NH	Contractor:	New England Boring Contractors	Boring/Well No.:	B-2 (MW)
Project Name:	S. Broadway Water Main Replacement	Driller:	B. Raiche	Date Installed:	4/12/2017
Project Location:	Salem, NH	Ground EL:	135.0	Logged By:	J. Todd
Project Number:	25972-215427	Riser EL:	134.8	Page:	1 of 2



ROADWAY BOX

SURFACE SEAL: (Thickness & Type)	8 in Concrete
BACKFILL MATERIAL: (Type)	Drill Cuttings & Sand
TOP OF SEAL:	2.5 ft bgs
SEAL CONSTRUCTION: (Thickness & Type)	1 ft Bentonite
TOP OF SANDPACK:	3.5 ft bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2 in
TOP OF SCREEN:	4 ft bgs
SANDPACK TYPE:	No. 2 Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 2 mil, 2 in
BOTTOM OF SCREEN:	19 ft bgs
BOTTOM OF BOREHOLE:	21 ft bgs
BOREHOLE DIAMETER:	3 in

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Monitoring well developed on 4/12/17 at 9:30 am.

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Report

Client:	Town of Salem, NH				
Project Name:	S. Broadway Water Main Replacement	Ground Surface EL:	135.0	Boring/Well No.	B-2 (MW)
Project Location:	Salem, NH	Riser EL:	134.8	Page:	2 of 2
Project Number:	25972-215427				

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
4/11/2017	2:40 PM	0	7.25	127.50	At end of boring, before well installation	JFT
4/12/2017	9:00 AM	1	4.75	130.00		JFT
4/13/2017	7:30 AM	2	3.65	131.10		JFT
6/8/2017	NR	58	5.43	129.32		PEN
6/29/2017	NR	79	5.95	128.80		PEN
7/24/2017	NR	104	5.79	128.96		PEN
10/4/2017	NR	176	6.25	128.50		ACS

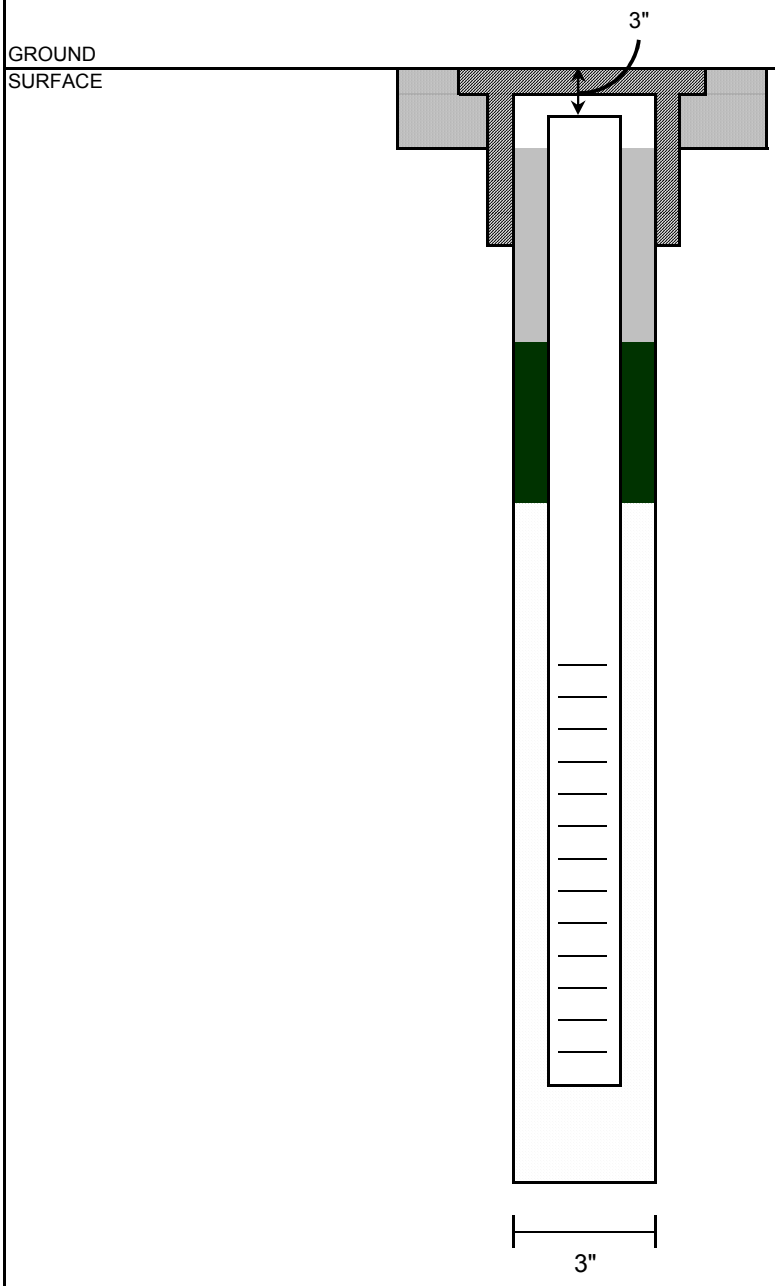
Remarks:

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Town of Salem, NH	Contractor:	New England Boring Contractors	Boring/Well No.:	B-3 (MW)
Project Name:	S. Broadway Water Main Replacement	Driller:	B. Raiche	Date Installed:	4/11/2017
Project Location:	Salem, NH	Ground EL:	133.3	Logged By:	J. Todd
Project Number:	25972-215427	Riser EL:	133.1	Page:	1 of 2



ROADWAY BOX

SURFACE SEAL: (Thickness & Type)	12 in Concrete
BACKFILL MATERIAL: (Type)	Drill Cuttings & Sand
TOP OF SEAL:	3.5 ft bgs
SEAL CONSTRUCTION: (Thickness & Type)	1 ft Bentonite
TOP OF SANDPACK:	4.5 ft bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2 in
TOP OF SCREEN:	5 ft bgs
SANDPACK TYPE:	No. 2 Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 2 mil, 2 in
BOTTOM OF SCREEN:	20 ft bgs
BOTTOM OF BOREHOLE:	22 ft bgs
BOREHOLE DIAMETER:	3 in

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Monitoring well developed on 4/11/17 at 12:00 pm.

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Report

Client:	Town of Salem, NH				
Project Name:	S. Broadway Water Main Replacement	Ground Surface EL:	133.3	Boring/Well No	B-3 (MW)
Project Location:	Salem, NH	Riser EL:	133.1	Page:	2 of 2
Project Number:	25972-215427				

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
4/11/2017	12:00 PM	0	7.75	125.55	After well development	JFT
4/12/2017	7:30 AM	1	2.45	130.85		JFT
4/13/2017	7:30 AM	2	4.35	128.95		JFT
6/8/2017	NR	58	4.28	129.02		PEN
6/29/2017	NR	79	4.85	128.45		PEN
7/24/2017	NR	104	4.89	128.41		PEN
10/4/2017	NR	176	5.55	127.75		ACS

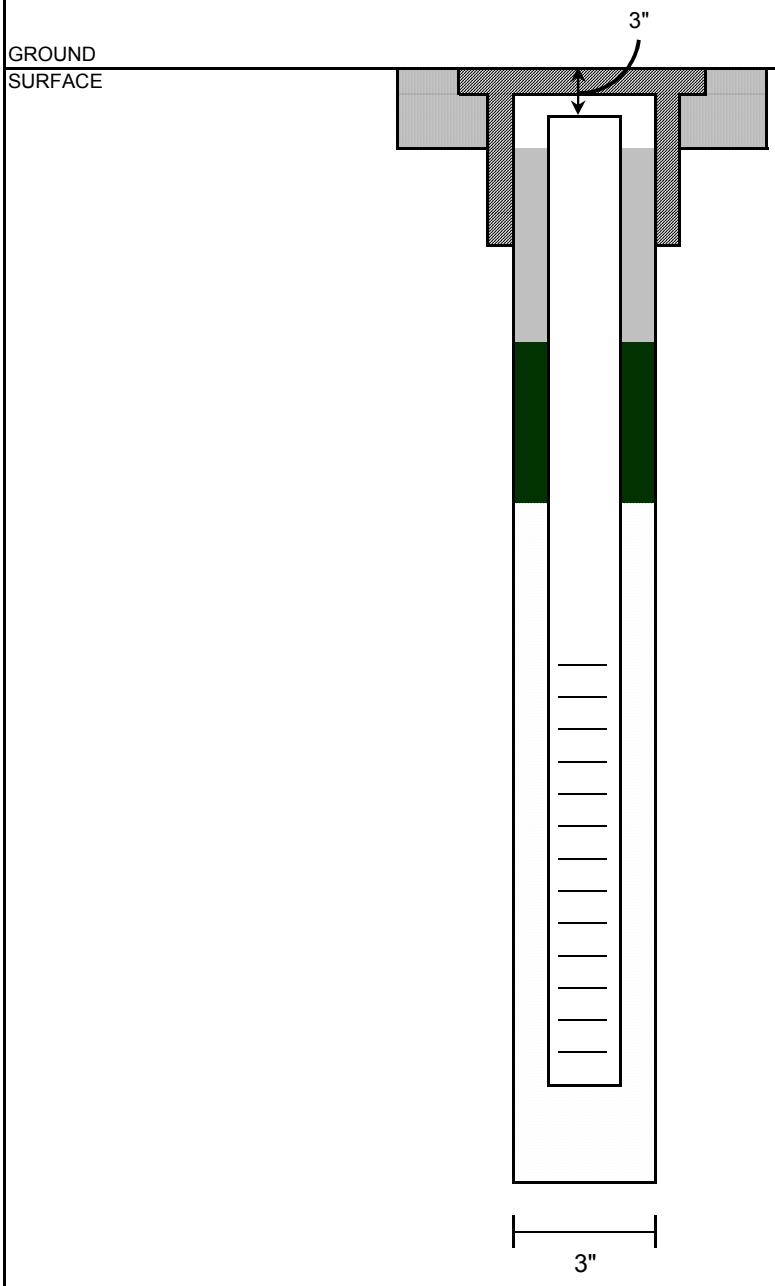
Remarks:

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Town of Salem, NH	Contractor:	New England Boring Contractors	Boring/Well No.:	B-4 (MW)
Project Name:	S. Broadway Water Main Replacement	Driller:	B. Raiche	Date Installed:	4/10/2017
Project Location:	Salem, NH	Ground EL:	131.2	Logged By:	J. Todd
Project Number:	25972-215427	Riser EL:	131.0	Page:	1 of 2



SURFACE SEAL: (Thickness & Type)	8 in Concrete
BACKFILL MATERIAL: (Type)	Drill Cuttings & Sand
TOP OF SEAL:	3 ft bgs
SEAL CONSTRUCTION: (Thickness & Type)	1 ft Concrete
TOP OF SANDPACK:	4 ft bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2 in
TOP OF SCREEN:	5 ft bgs
SANDPACK TYPE:	No. 2 Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 2 mil, 2 in
BOTTOM OF SCREEN:	20 ft bgs
BOTTOM OF BOREHOLE:	21 ft bgs
BOREHOLE DIAMETER:	3 in

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Monitoring well developed on 4/10/17 at 2:15 pm.

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Report

Client:	Town of Salem, NH				
Project Name:	S. Broadway Water Main Replacement	Ground Surface EL:	131.2	Boring/Well No	B-4 (MW)
Project Location:	Salem, NH	Riser EL:	131.0	Page:	2 of 2
Project Number:	25972-215427				

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
4/10/2017	2:30 PM	0	7.25	123.95	After well development	JFT
4/11/2017	7:15 AM	1	3.95	127.25		JFT
4/12/2017	7:15 AM	2	3.45	127.75		JFT
4/13/2017	7:15 AM	3	3.55	127.65		JFT
6/8/2017	NR	59	3.83	127.37		PEN
6/29/2017	NR	80	4.35	126.85		PEN
7/24/2017	NR	105	4.82	126.38		PEN
10/4/2017	NR	177	5.95	125.25		ACS

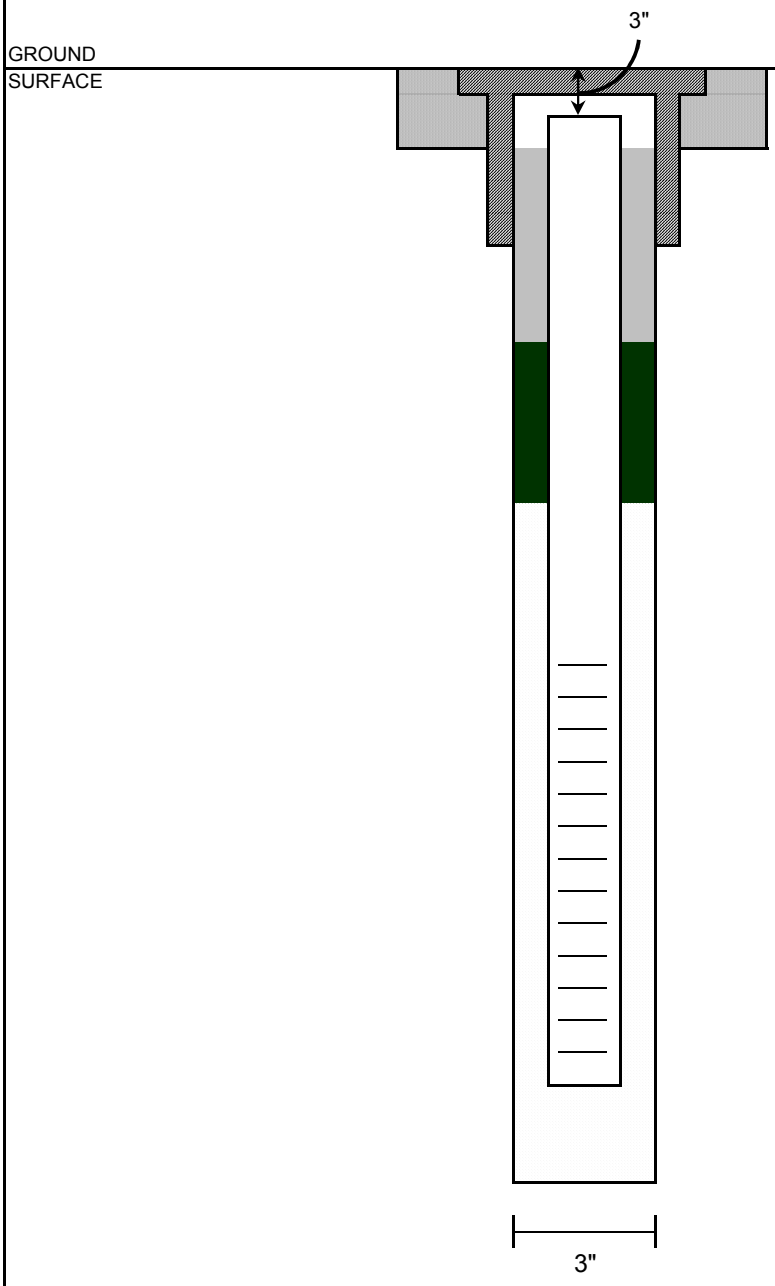
Remarks:

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Town of Salem, NH	Contractor:	New England Boring Contractors	Boring/Well No.:	B-11 (MW)
Project Name:	S. Broadway Water Main Replacement	Driller:	B. Raiche	Date Installed:	4/13/2017
Project Location:	Salem, NH	Ground EL:	126.4	Logged By:	J. Todd
Project Number:	25972-215427	Riser EL:	126.2	Page:	1 of 2



SURFACE SEAL: (Thickness & Type)	8 in Concrete, 2 in Asphalt
BACKFILL MATERIAL: (Type)	Drill Cuttings & Sand
TOP OF SEAL:	2.5 ft bgs
SEAL CONSTRUCTION: (Thickness & Type)	1 ft Bentonite
TOP OF SANDPACK:	3.5 ft bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2 in
TOP OF SCREEN:	4 ft bgs
SANDPACK TYPE:	No. 2 Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 2 mil, 2 in
BOTTOM OF SCREEN:	19 ft bgs
BOTTOM OF BOREHOLE:	19 ft bgs
BOREHOLE DIAMETER:	3 in

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Monitoring well developed on 4/13/17 at 9:00 am.

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Report

Client:	Town of Salem, NH				
Project Name:	S. Broadway Water Main Replacement	Ground Surface EL:	126.4	Boring/Well No	B-11 (MW)
Project Location:	Salem, NH	Riser EL:	126.2	Page:	2 of 2
Project Number:	25972-215427				

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
4/13/2017	9:30 AM	0	3.05	123.35	After well development	JFT
6/8/2017	NR	56	3.75	122.65		PEN
6/29/2017	NR	77	4.54	121.86		PEN
7/24/2017	NR	102	4.82	121.58		PEN
10/4/2017	NR	174	5.95	120.45		ACS

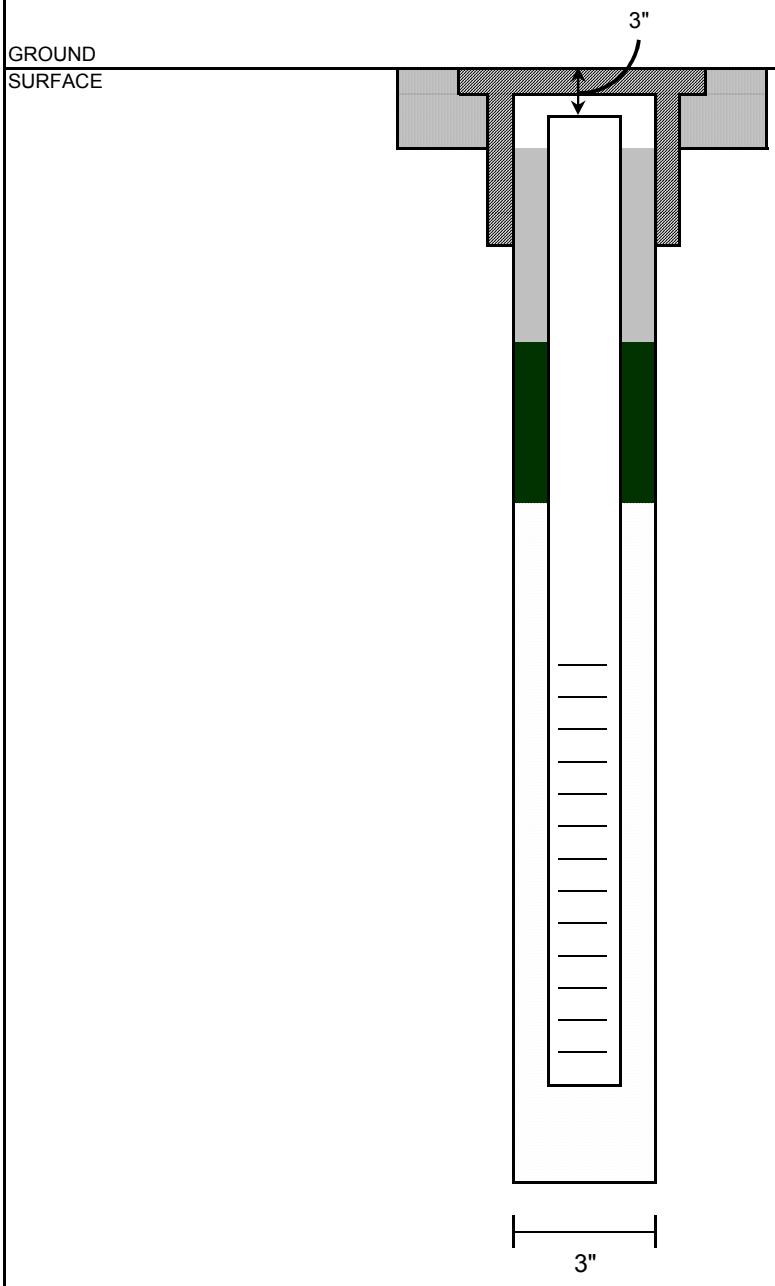
Remarks:

CDM Smith

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Installation Log

Client:	Town of Salem, NH	Contractor:	New England Boring Contractors	Boring/Well No.:	B-15 (MW)
Project Name:	S. Broadway Water Main Replacement	Driller:	B. Raiche	Date Installed:	4/13/2017
Project Location:	Salem, NH	Ground EL:	125.9	Logged By:	J. Todd
Project Number:	25972-215427	Riser EL:	125.7	Page:	1 of 2



SURFACE SEAL: (Thickness & Type)	8 in Concrete
BACKFILL MATERIAL: (Type)	Drill Cuttings & Sand
TOP OF SEAL:	2.75 ft bgs
SEAL CONSTRUCTION: (Thickness & Type)	1 ft Bentonite
TOP OF SANDPACK:	3.75 ft bgs
RISER CONSTRUCTION: (Type, Diameter Material)	PVC, 2 in
TOP OF SCREEN:	4 ft bgs
SANDPACK TYPE:	No. 2 Silica Sand
SCREEN MATERIAL: (Type, Slot, Diameter Material)	PVC, 2 mil, 2 in
BOTTOM OF SCREEN:	19 ft bgs
BOTTOM OF BOREHOLE:	19.25 ft bgs
BOREHOLE DIAMETER:	3 in

NOTE: All depths are in feet below ground surface, unless noted otherwise.

Remarks: Monitoring well developed on 4/13/17 at 2:00 pm.

75 State Street
Boston, MA 02109
(617) 452-6000

Monitoring Well Report

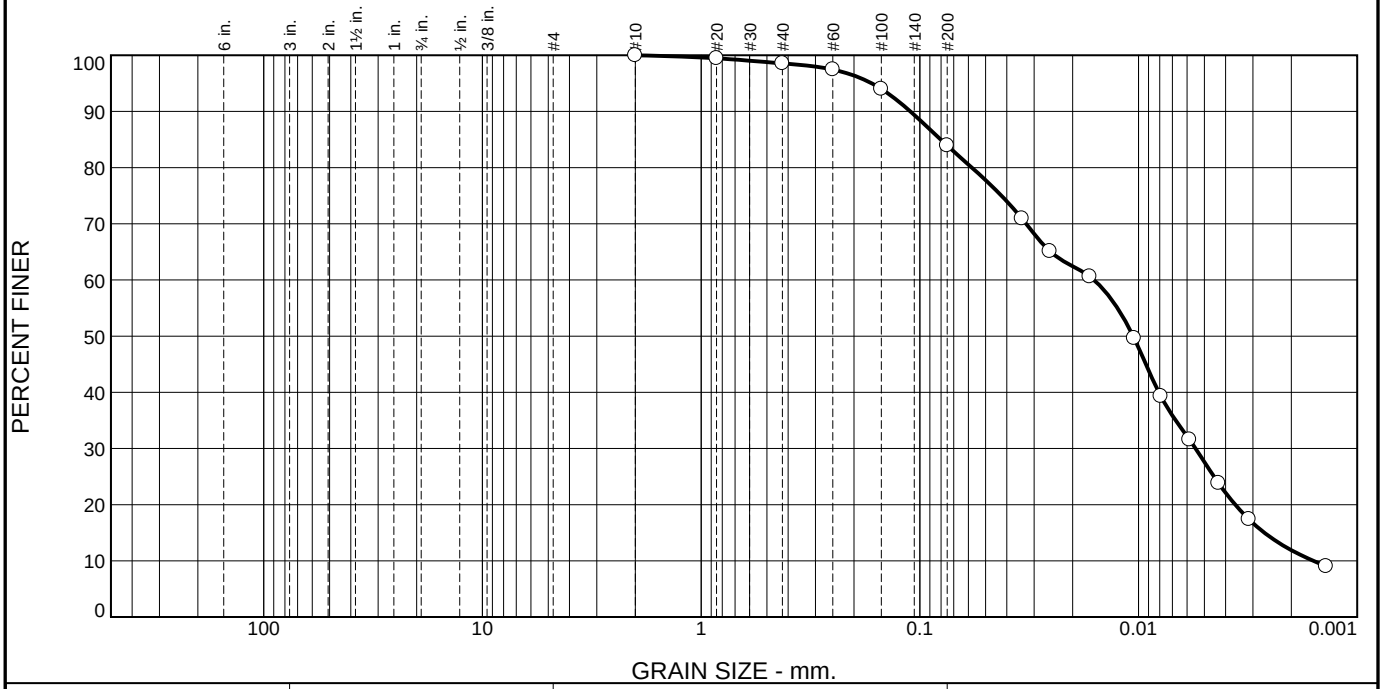
Client:	Town of Salem, NH				
Project Name:	S. Broadway Water Main Replacement	Ground Surface EL:	125.9	Boring/Well No	B-15 (MW)
Project Location:	Salem, NH	Riser EL:	125.7	Page:	2 of 2
Project Number:	25972-215427				

Date	Time	Elapsed Time (days)	Depth of Water From Top of Riser (ft)	Elevation of Water (ft)	Remarks	Read By
4/13/2017	2:30 PM	0	4.75	121.15	After well development	JFT
6/8/2017	NR	56	3.21	122.69		PEN
6/29/2017	NR	77	4.05	121.85		PEN
7/24/2017	NR	102	4.36	121.54		PEN
10/4/2017	NR	174	5.05	120.85		ACS

Remarks:

Attachment C – Geotechnical Laboratory Testing Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.4	14.7	56.3	27.6

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.5		
#40	98.6		
#60	97.5		
#100	94.0		
#200	83.9		
0.0341 mm.	70.9		
0.0255 mm.	65.1		
0.0167 mm.	60.6		
0.0105 mm.	49.7		
0.0079 mm.	39.3		
0.0059 mm.	31.6		
0.0043 mm.	23.9		
0.0031 mm.	17.4		
0.0014 mm.	9.0		

* (no specification provided)

Material Description

Light brown and gray 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}= 0.1105 D_{85}= 0.0802 D_{60}= 0.0160
D_{50}= 0.0106 D_{30}= 0.0055 D_{15}= 0.0027
D_{10}= 0.0016 C_u= 10.09 C_c= 1.19

Remarks

As received MC = 22.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-1 **Depth:** 8-10'
Sample Number: S-5

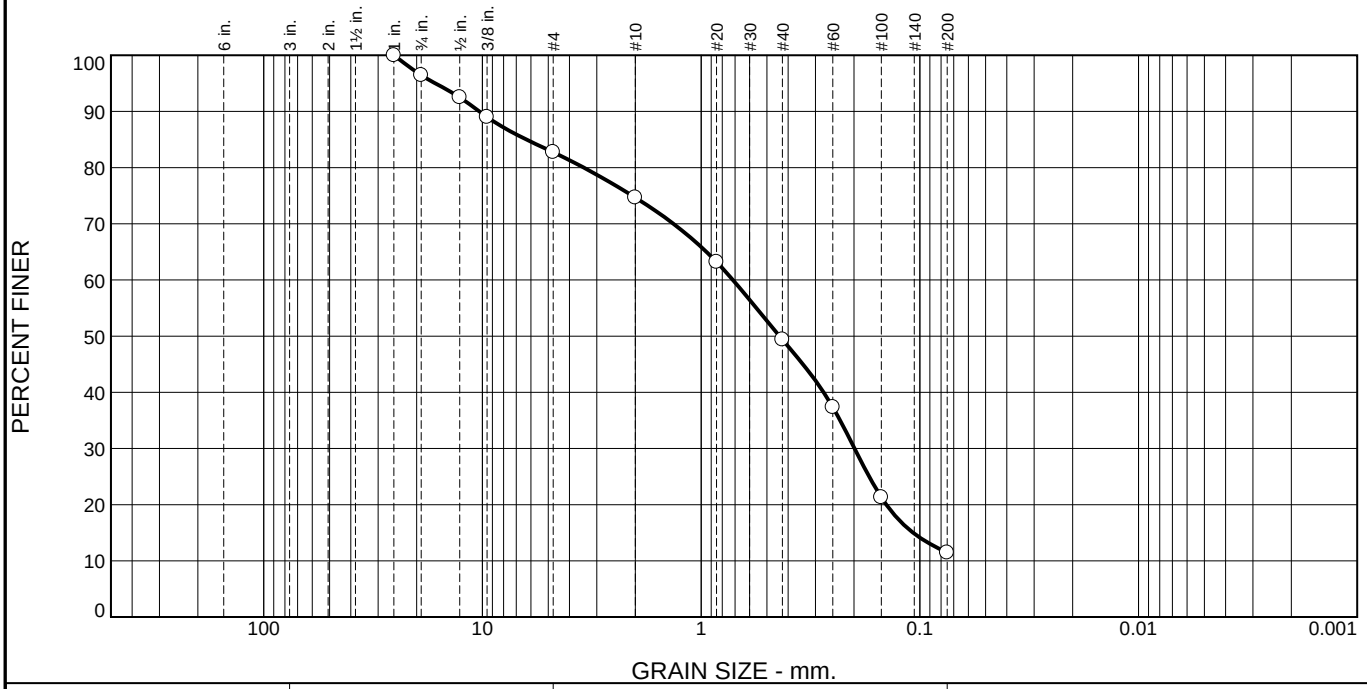
Date Sampled: 9/25/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.5	13.8	8.0	25.3	37.9	11.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	96.5		
.5"	92.5		
.375"	89.0		
#4	82.7		
#10	74.7		
#20	63.2		
#40	49.4		
#60	37.4		
#100	21.3		
#200	11.5		

* (no specification provided)

Material Description

Brown poorly graded sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= 0 **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 10.3351 D_{85}= 6.2960 D_{60}= 0.7157
D_{50}= 0.4382 D_{30}= 0.1987 D_{15}= 0.1073
D_{10}= C_u= C_c=

Remarks

As received MC = 12.9%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-1 **Depth:** 14-16'
Sample Number: S-6

Date Sampled: 9/25/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

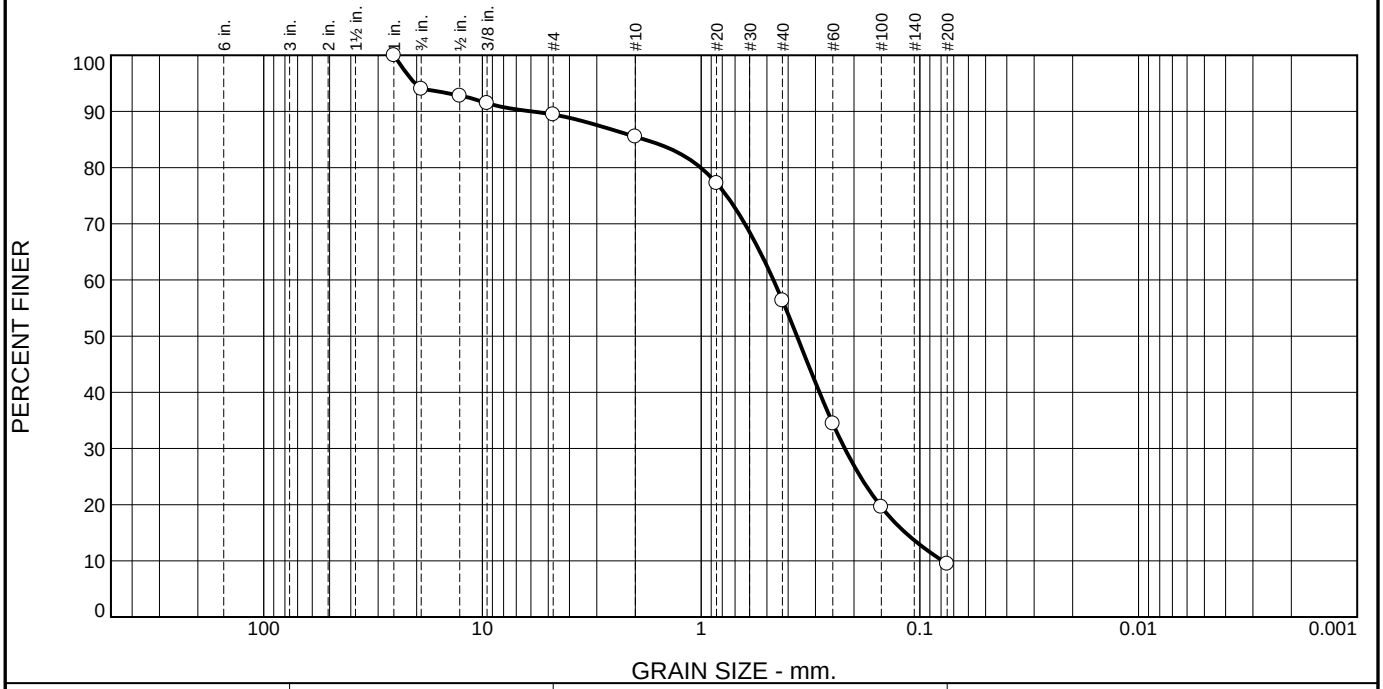
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/16/2017
Project Number:	25972-215427		
Boring Number:	B-2	Procedure:	C
Sample Number:	S-4	Temperature:	440° C
Sample Depth (ft):	6-8		
Sample Date:	4/11-12/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	126.56
Wet Mass of Sample & Tin (g)	164.78
Dry Mass of Sample & Tin (g)	145.97
Mass of Water (g)	18.81
Mass of Dry Soil (g)	19.41
Moisture Content (%)	**96.9**

ASH CONTENT	
Porcelain Dish Mass (g)	126.56
Porcelain Dish + Oven Dried Soil (g)	145.97
Mass of Oven Dried Soil (g)	19.41
Mass of Dish & Burned Soil (g)	143.15
Mass of Burned Soil (g)	16.59
Mass of Organic Material (g)	2.82
Ash Content (%)	85.5
Organic Content (%)	**14.5**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.0	4.6	3.9	29.2	46.8	9.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	94.0		
.5"	92.8		
.375"	91.5		
#4	89.4		
#10	85.5		
#20	77.2		
#40	56.3		
#60	34.4		
#100	19.6		
#200	9.5		

* (no specification provided)

Material Description

Dark 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

D_{90}= 5.9533 D_{85}= 1.8146 D_{60}= 0.4671
D_{50}= 0.3646 D_{30}= 0.2204 D_{15}= 0.1162
D_{10}= 0.0787 C_u= 5.94 C_c= 1.32

Remarks

As received MC = 20.0%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-2 **Depth:** 8-10'
Sample Number: S-5

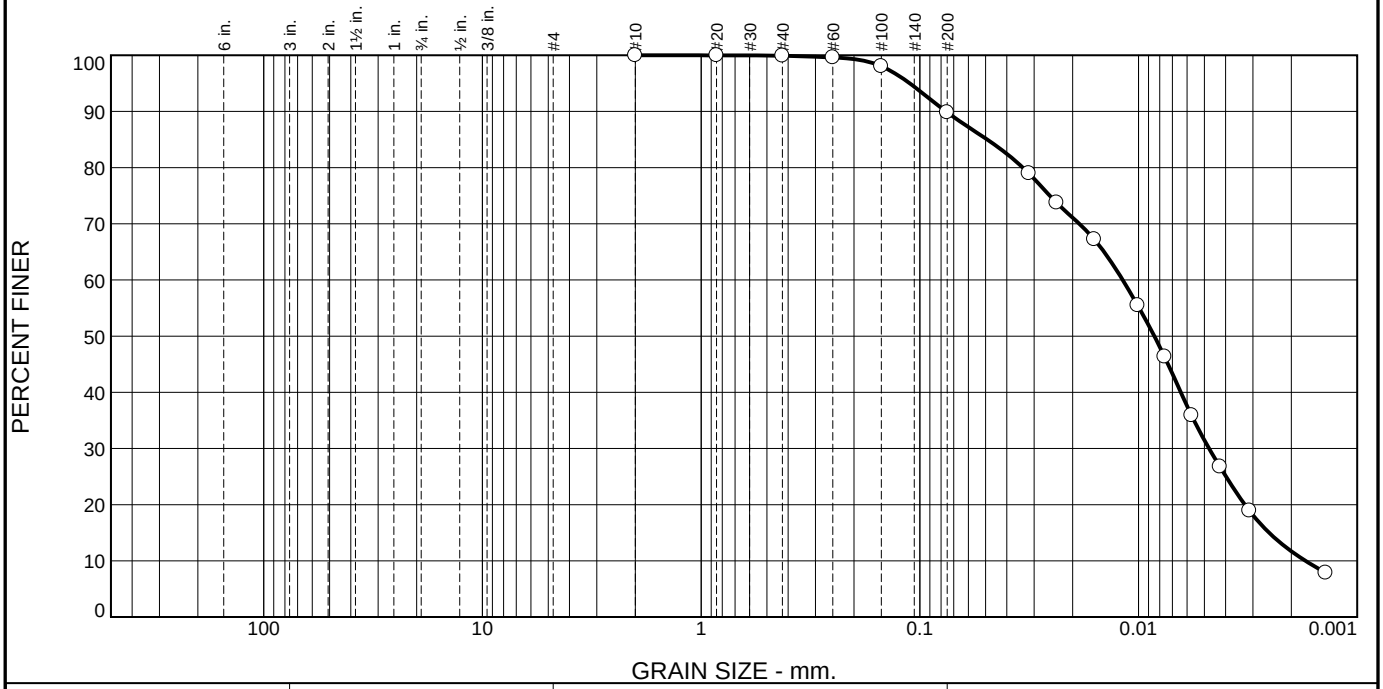
Date Sampled: 4/11-12/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	10.1	58.3	31.5

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.6		
#100	98.1		
#200	89.8		
0.0317 mm.	79.0		
0.0237 mm.	73.8		
0.0159 mm.	67.2		
0.0101 mm.	55.5		
0.0076 mm.	46.3		
0.0057 mm.	35.9		
0.0042 mm.	26.8		
0.0031 mm.	18.9		
0.0014 mm.	7.9		

* (no specification provided)

Material Description

Light brown silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.0759 D_{85}= 0.0492 D_{60}= 0.0118
D_{50}= 0.0085 D_{30}= 0.0048 D_{15}= 0.0025
D_{10}= 0.0017 C_u= 6.86 C_c= 1.11

Remarks

As received MC = 26.5%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-2 **Depth:** 14-16'
Sample Number: S-6

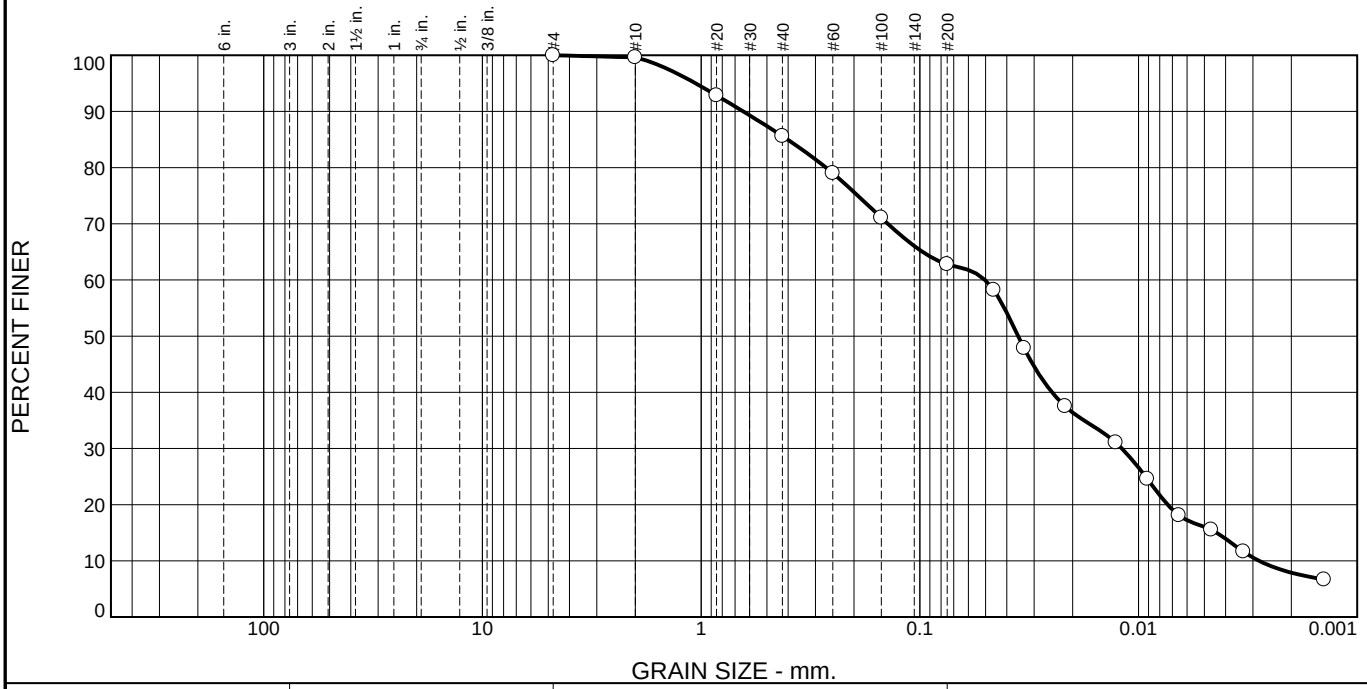
Date Sampled: 4/11-12/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	14.0	22.8	46.8	16.0

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.6		
#20	92.8		
#40	85.6		
#60	79.0		
#100	71.1		
#200	62.8		
0.0460 mm.	58.2		
0.0334 mm.	47.9		
0.0217 mm.	37.5		
0.0127 mm.	31.1		
0.0091 mm.	24.6		
0.0065 mm.	18.1		
0.0047 mm.	15.5		
0.0033 mm.	11.6		
0.0014 mm.	6.7		

* (no specification provided)

Material Description

Black and brown sandy organic silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= OL/ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.6416 D_{85}= 0.4030 D_{60}= 0.0503
D_{50}= 0.0355 D_{30}= 0.0119 D_{15}= 0.0044
D_{10}= 0.0028 C_u= 17.92 C_c= 1.00

Remarks

As received MC = 92.3%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-3 **Depth:** 6-8'
Sample Number: S-4

Date Sampled: 4/11/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

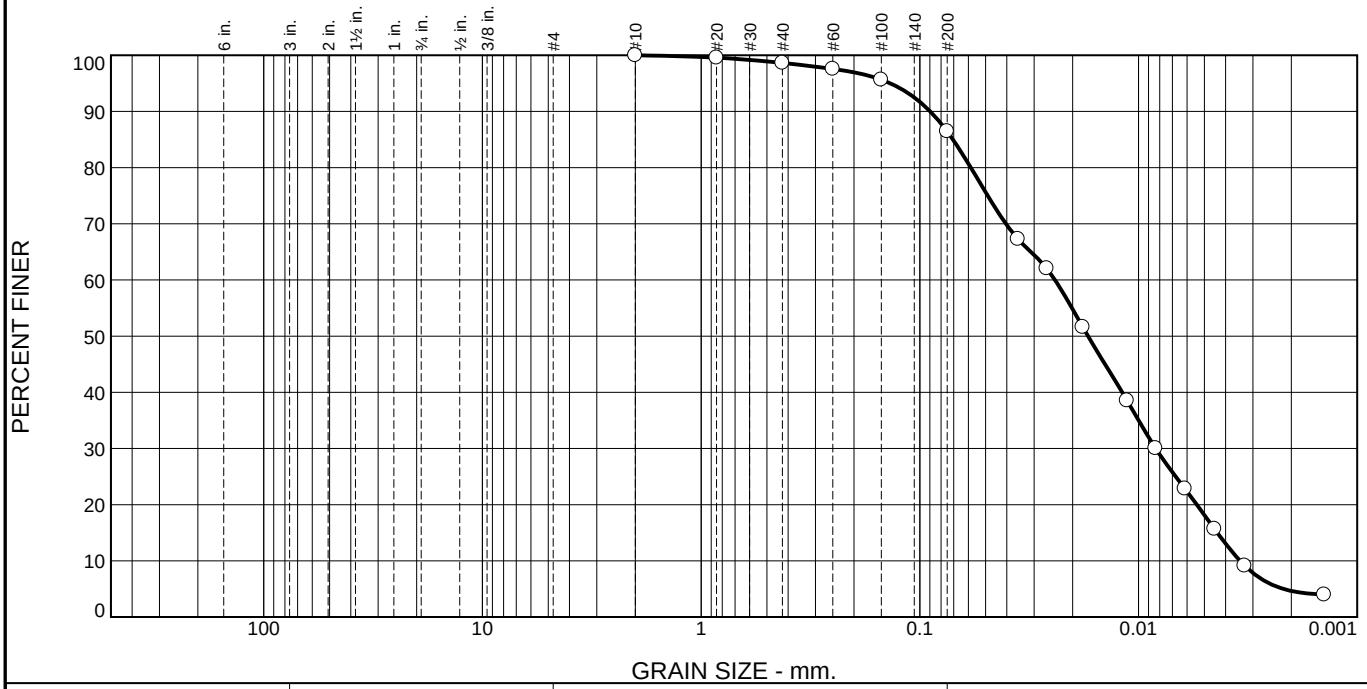
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/21/2017
Project Number:	25972-215427		
Boring Number:	B-3	Procedure:	C
Sample Number:	S-4	Temperature:	440° C
Sample Depth (ft):	6-8		
Sample Date:	4/11/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.37
Wet Mass of Sample & Tin (g)	135.78
Dry Mass of Sample & Tin (g)	114.00
Mass of Water (g)	21.78
Mass of Dry Soil (g)	23.63
Moisture Content (%)	**92.2**

ASH CONTENT	
Porcelain Dish Mass (g)	90.37
Porcelain Dish + Oven Dried Soil (g)	114.00
Mass of Oven Dried Soil (g)	23.63
Mass of Dish & Burned Soil (g)	110.92
Mass of Burned Soil (g)	20.55
Mass of Organic Material (g)	3.08
Ash Content (%)	87.0
Organic Content (%)	**13.0**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.4	12.1	68.3	18.2

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.6		
#40	98.6		
#60	97.6		
#100	95.6		
#200	86.5		
0.0356 mm.	67.3		
0.0263 mm.	62.1		
0.0180 mm.	51.6		
0.0113 mm.	38.5		
0.0084 mm.	30.1		
0.0061 mm.	22.9		
0.0045 mm.	15.7		
0.0033 mm.	9.1		
0.0014 mm.	4.0		

* (no specification provided)

Material Description

Light brown silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.0896 D_{85}= 0.0705 D_{60}= 0.0241
D_{50}= 0.0170 D_{30}= 0.0083 D_{15}= 0.0044
D_{10}= 0.0034 C_u= 7.01 C_c= 0.84

Remarks

As received MC = 24.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-4 **Depth:** 8-10'
Sample Number: S-5

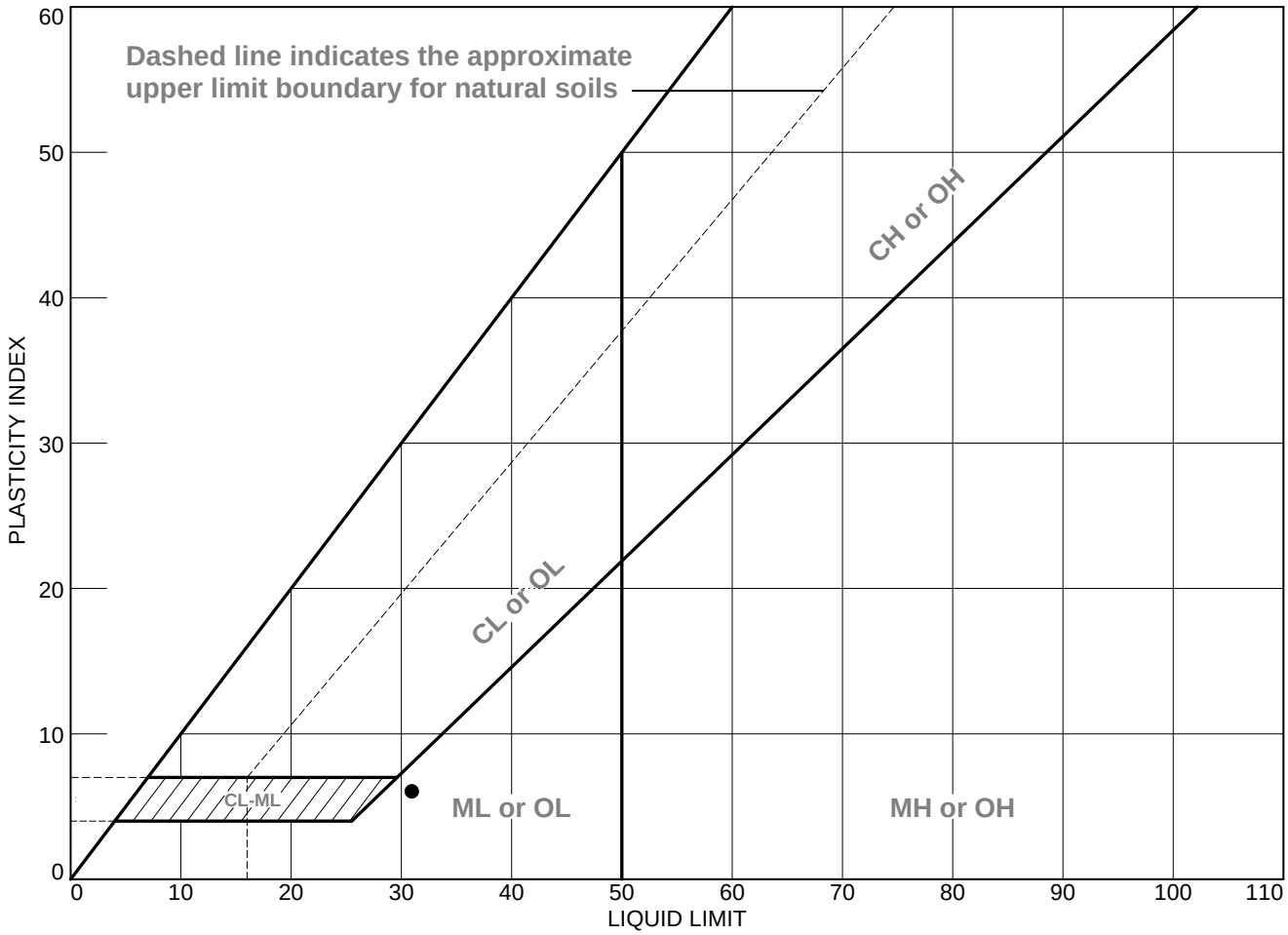
Date Sampled: 4/10/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **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-5	S-5	8-10'	25.7	25	31	6	ML

CDM Smith

Boston, Massachusetts

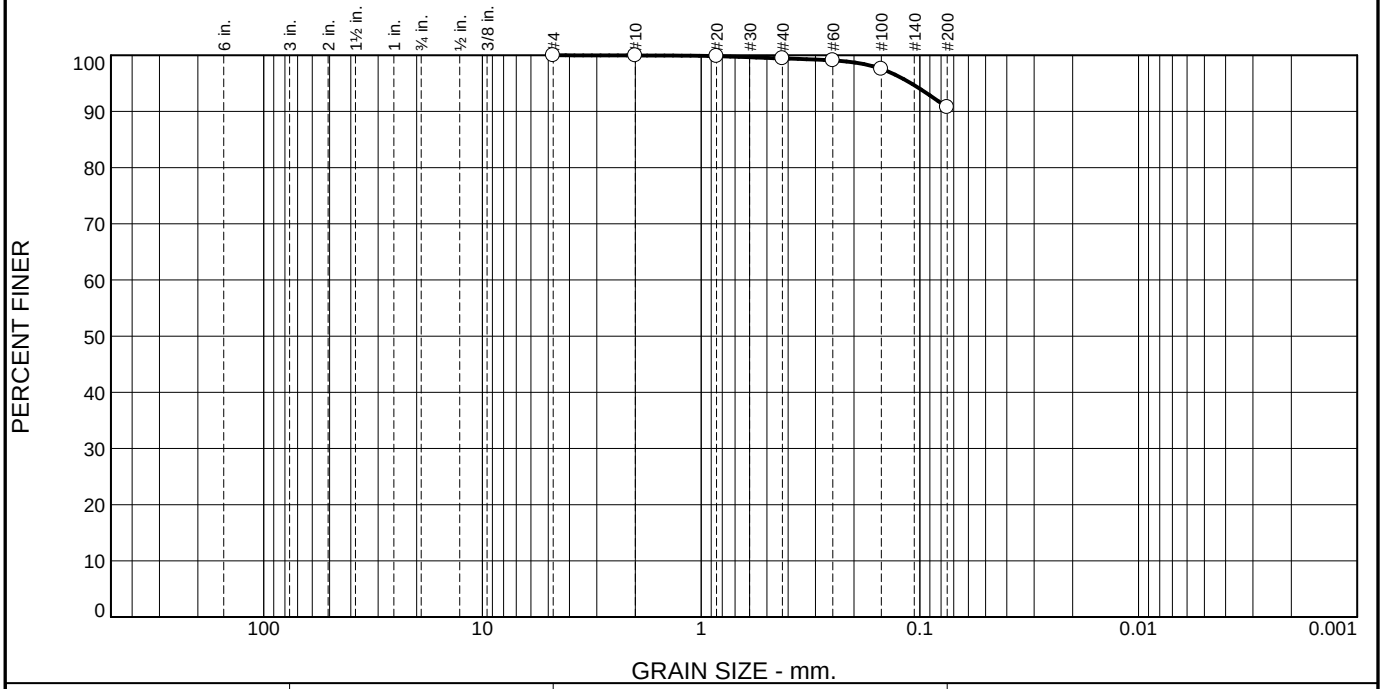
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **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	0.0	0.0	0.6	8.7	90.7	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.4		
#60	99.1		
#100	97.6		
#200	90.7		

* (no specification provided)

Material Description

Light 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

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 21.1%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-5 **Depth:** 14-16'

Sample Number: S-6

Date Sampled: 9/26/2017

CDM Smith

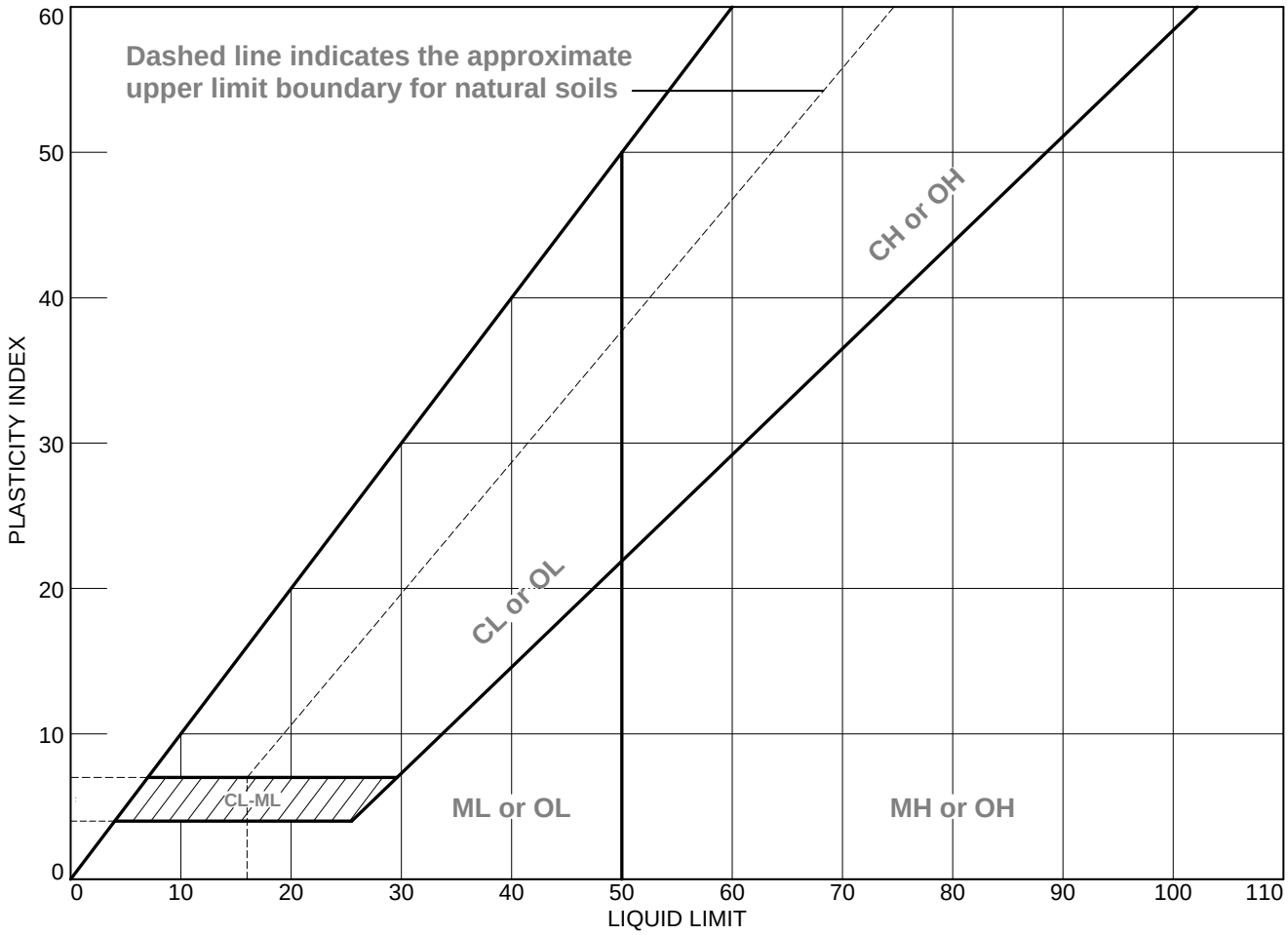
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **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-5	S-6	14-16'	21.1	NP	NV	NP	ML

CDM Smith

Boston, Massachusetts

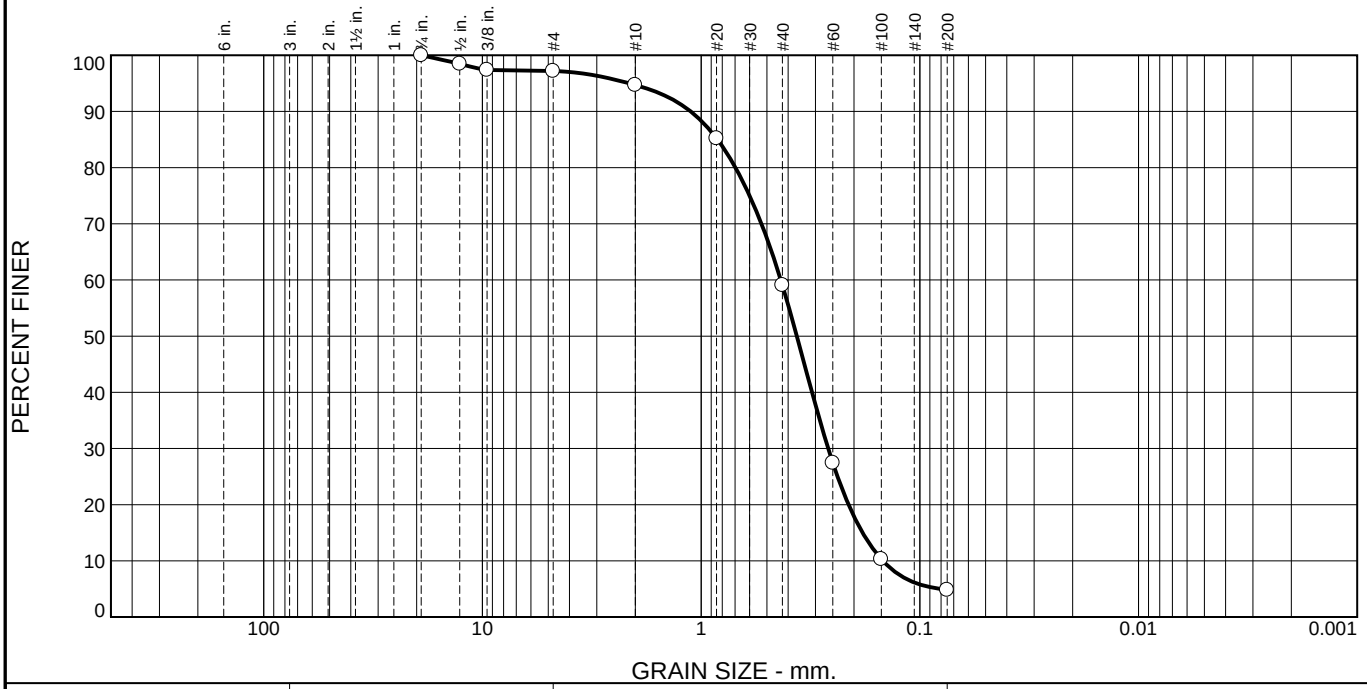
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **Figure**

Tested By: GW **Checked By:** MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.8	2.5	35.6	54.3	4.8	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	98.5		
.375"	97.4		
#4	97.2		
#10	94.7		
#20	85.2		
#40	59.1		
#60	27.4		
#100	10.3		
#200	4.8		

* (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-3

Coefficients

D_{90}= 1.1165 D_{85}= 0.8422 D_{60}= 0.4322
D_{50}= 0.3650 D_{30}= 0.2625 D_{15}= 0.1827
D_{10}= 0.1475 C_u= 2.93 C_c= 1.08

Remarks

As received MC = 18.9%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-6 **Depth:** 4-6'
Sample Number: S-3

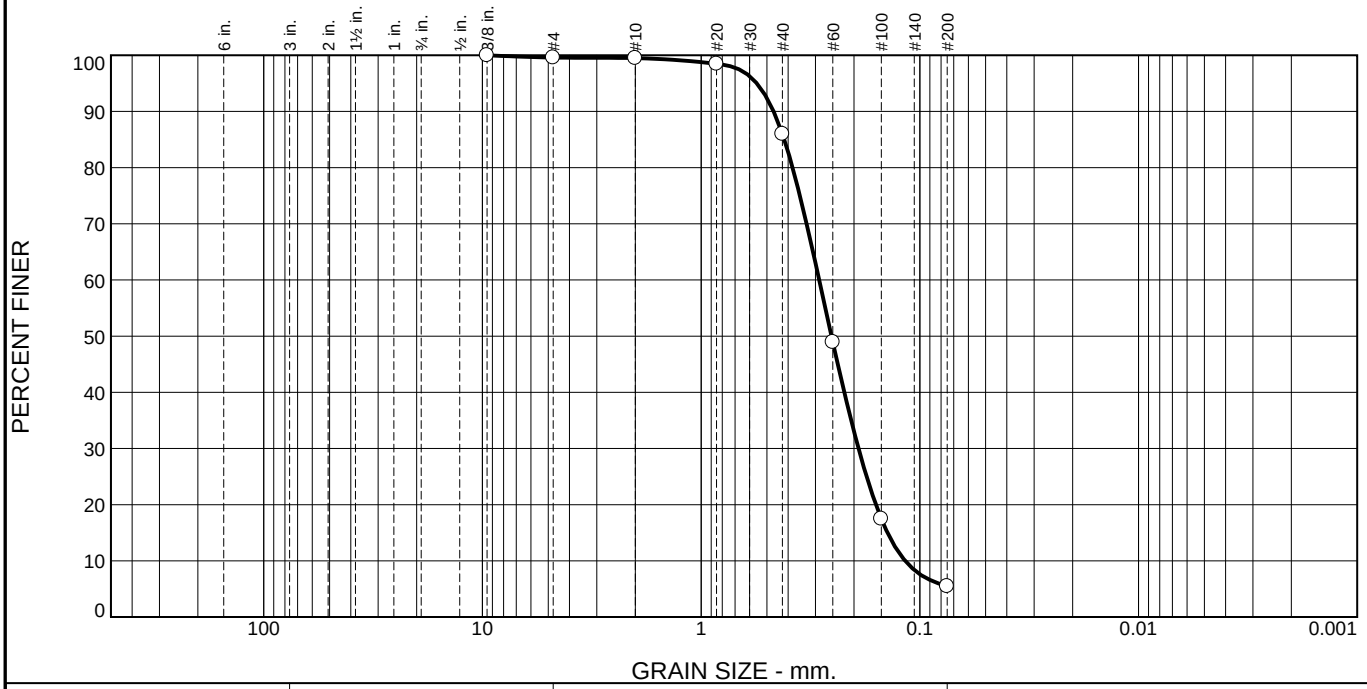
Date Sampled: 9/22/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.1	13.5	80.5	5.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.6		
#10	99.5		
#20	98.5		
#40	86.0		
#60	48.9		
#100	17.5		
#200	5.5		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.4663 D_{85}= 0.4167 D_{60}= 0.2886
D_{50}= 0.2535 D_{30}= 0.1906 D_{15}= 0.1405
D_{10}= 0.1167 C_u= 2.47 C_c= 1.08

Remarks

As received MC = 23.0%

Date Received: 10/4/2017 **Date Tested:** 10/16/201

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-6 **Depth:** 8-10'
Sample Number: S-5

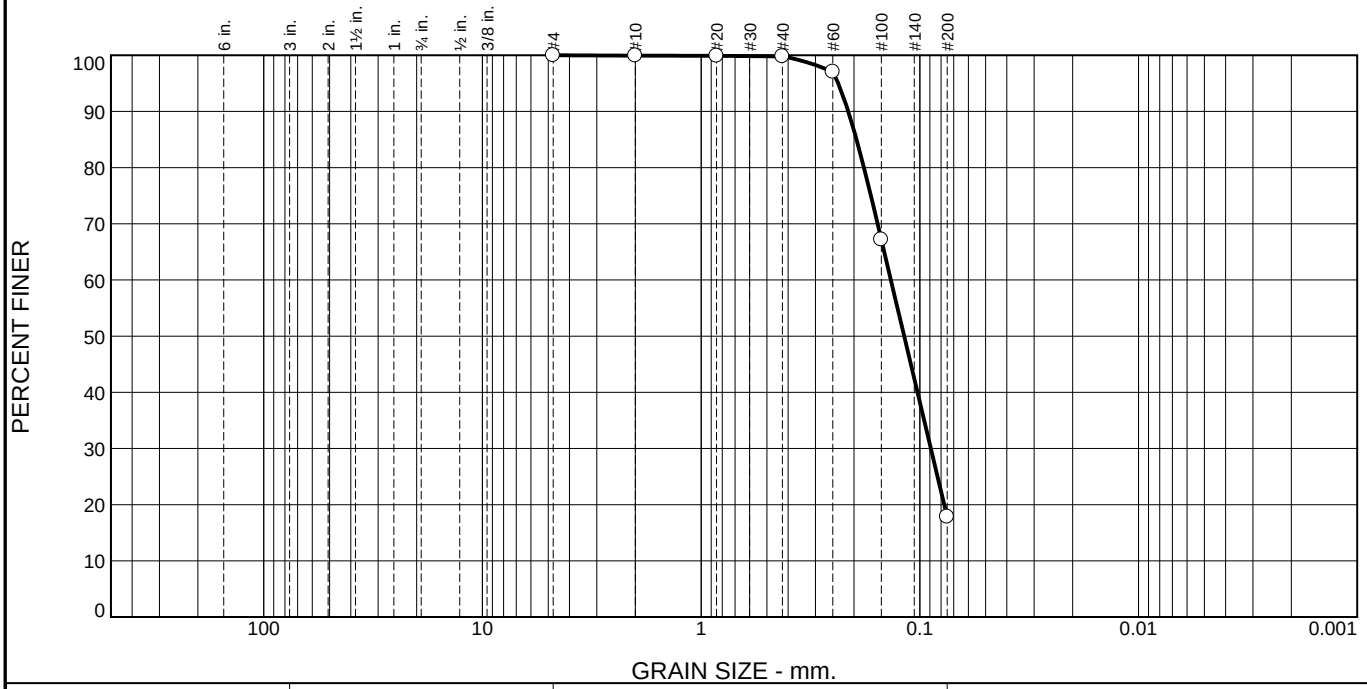
Date Sampled: 9/22/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	82.0	17.8	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.8		
#60	97.0		
#100	67.2		
#200	17.8		

* (no specification provided)

Material Description

Light brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2123 D_{85}= 0.1946 D_{60}= 0.1356
D_{50}= 0.1179 D_{30}= 0.0890 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 28.4%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-6 **Depth:** 14-16'
Sample Number: S-6

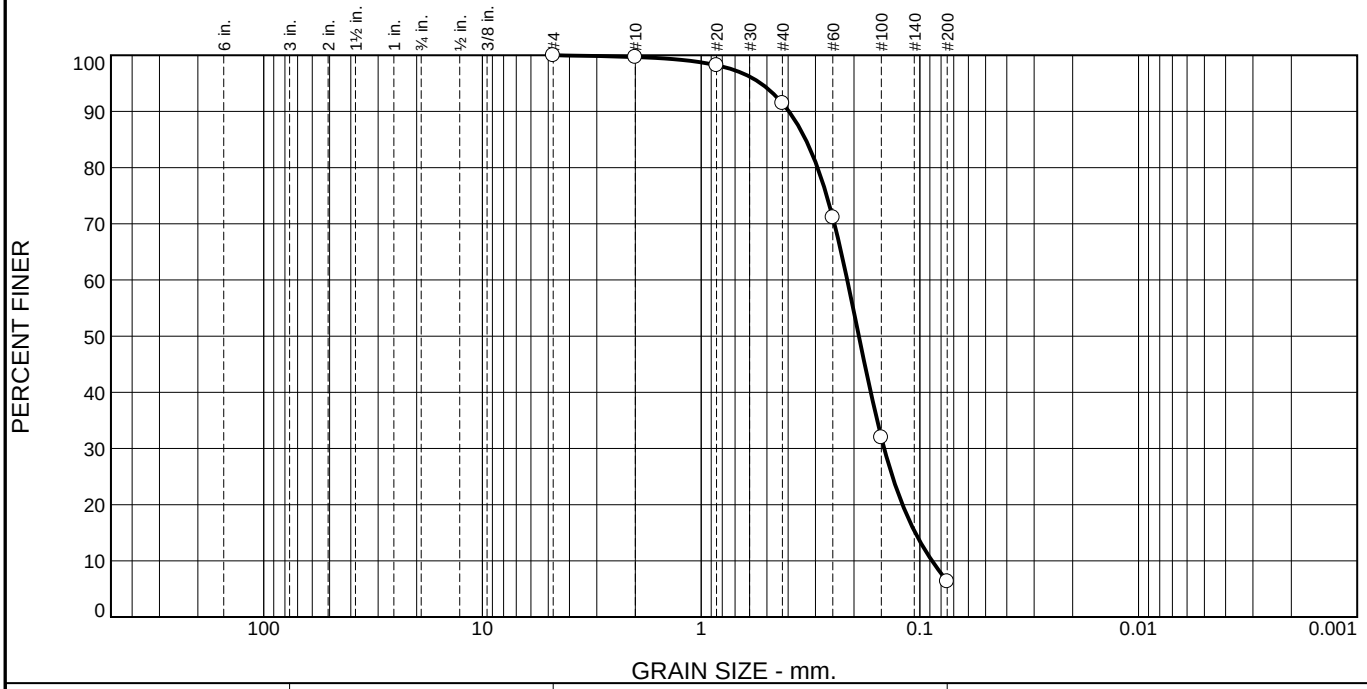
Date Sampled: 9/22/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	8.2	85.2	6.3	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#20	98.2		
#40	91.5		
#60	71.1		
#100	32.0		
#200	6.3		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.3966 D_{85}= 0.3324 D_{60}= 0.2147
D_{50}= 0.1899 D_{30}= 0.1455 D_{15}= 0.1050
D_{10}= 0.0879 C_u= 2.44 C_c= 1.12

Remarks

As received MC = 24.3%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-7 **Depth:** 8-10'
Sample Number: S-5

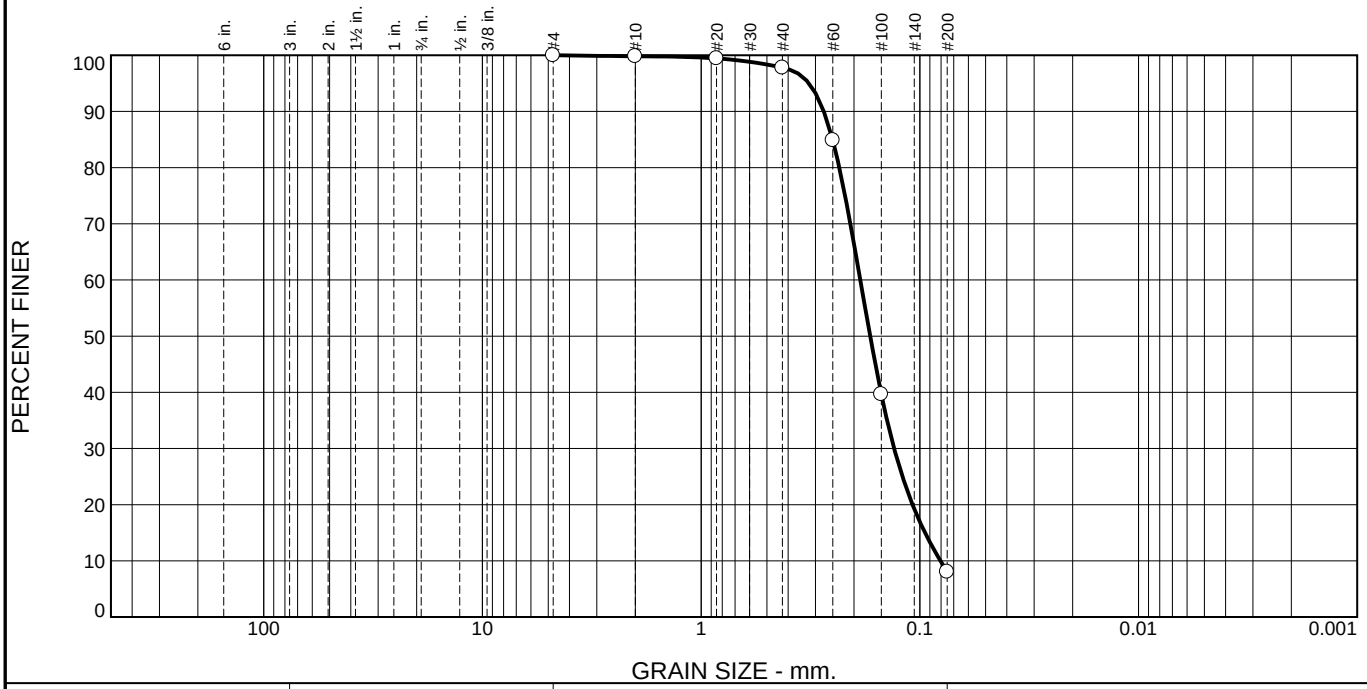
Date Sampled: 9/21/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	2.0	89.8	8.0	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#20	99.4		
#40	97.8		
#60	84.9		
#100	39.6		
#200	8.0		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.2749 D_{85}= 0.2505 D_{60}= 0.1871
D_{50}= 0.1686 D_{30}= 0.1310 D_{15}= 0.0947
D_{10}= 0.0804 C_u= 2.33 C_c= 1.14

Remarks

As received MC = 25.8%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-7 **Depth:** 14-16'
Sample Number: S-6

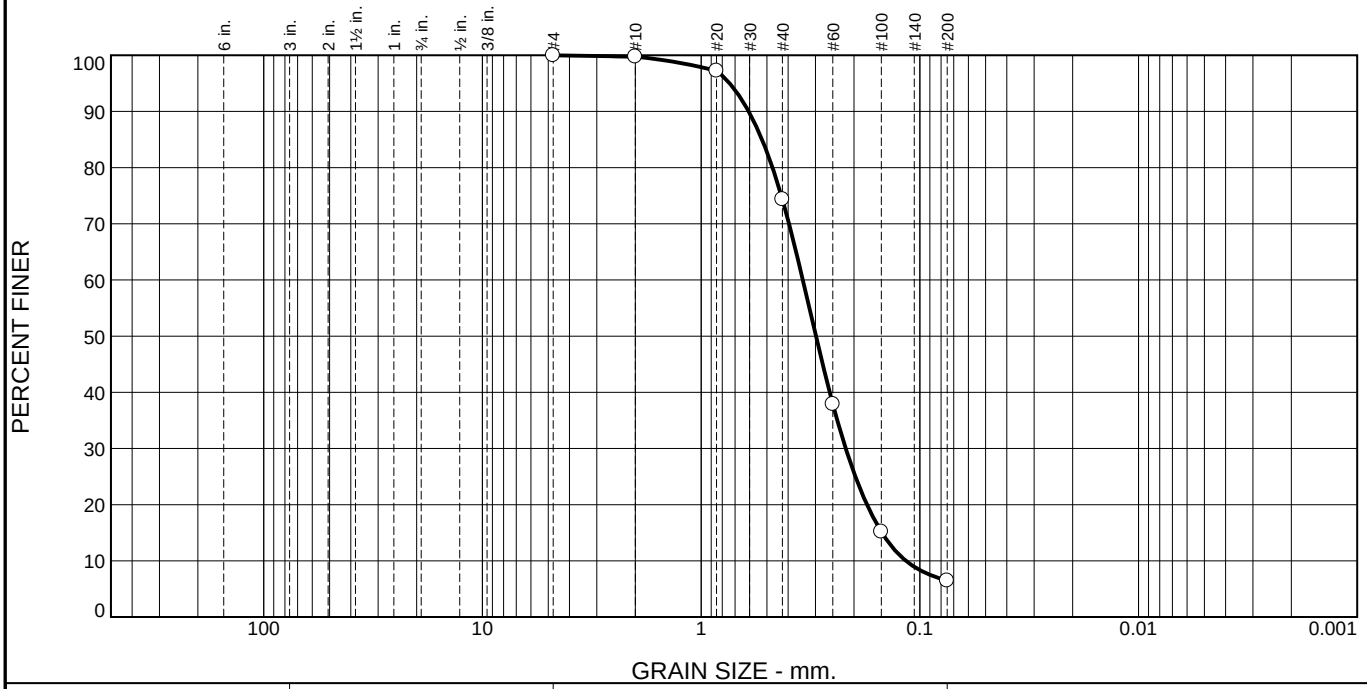
Date Sampled: 9/21/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	25.3	67.9	6.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#20	97.2		
#40	74.4		
#60	37.9		
#100	15.2		
#200	6.5		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.6057 D_{85}= 0.5266 D_{60}= 0.3427
D_{50}= 0.2984 D_{30}= 0.2181 D_{15}= 0.1490
D_{10}= 0.1157 C_u= 2.96 C_c= 1.20

Remarks

As received MC = 18.3%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-8 **Depth:** 4-6'
Sample Number: S-3

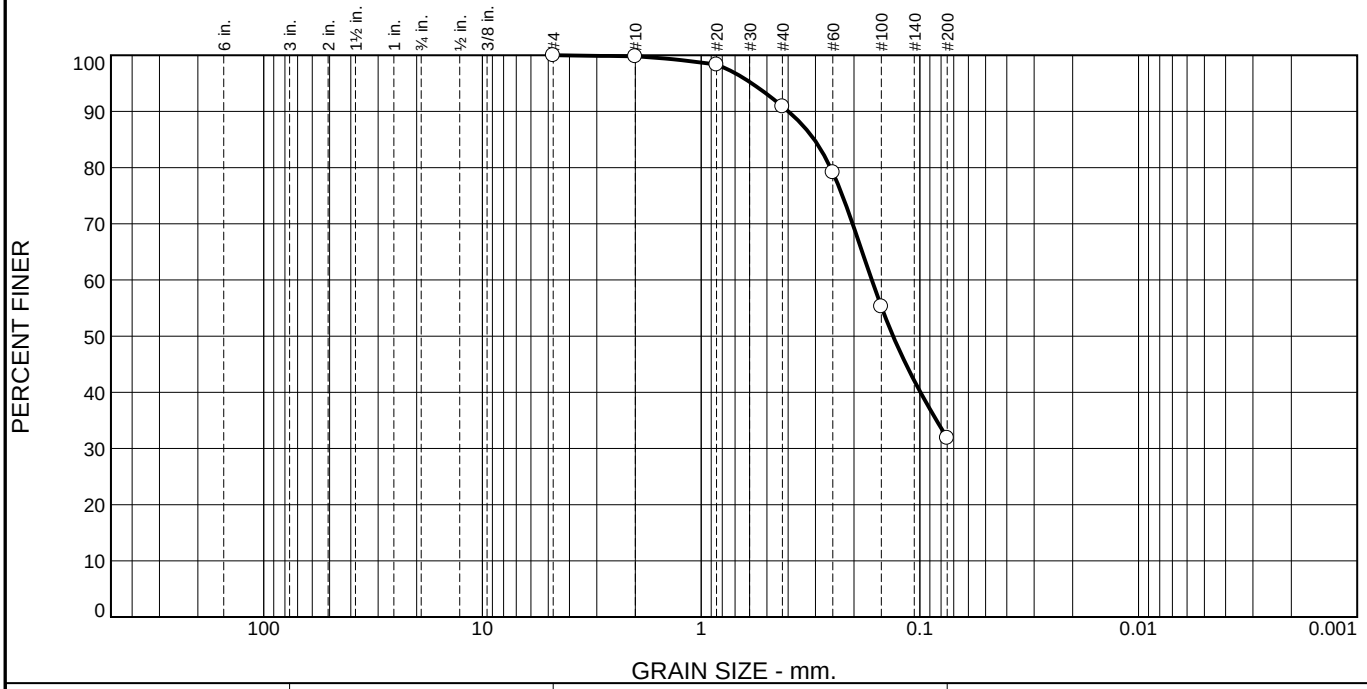
Date Sampled: 9/21/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	8.9	59.0	31.9	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#20	98.3		
#40	90.9		
#60	79.1		
#100	55.3		
#200	31.9		

* (no specification provided)

Material Description

Light brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3993 D_{85}= 0.3039 D_{60}= 0.1658
D_{50}= 0.1325 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 23.8%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-8 **Depth:** 8-10'
Sample Number: S-5

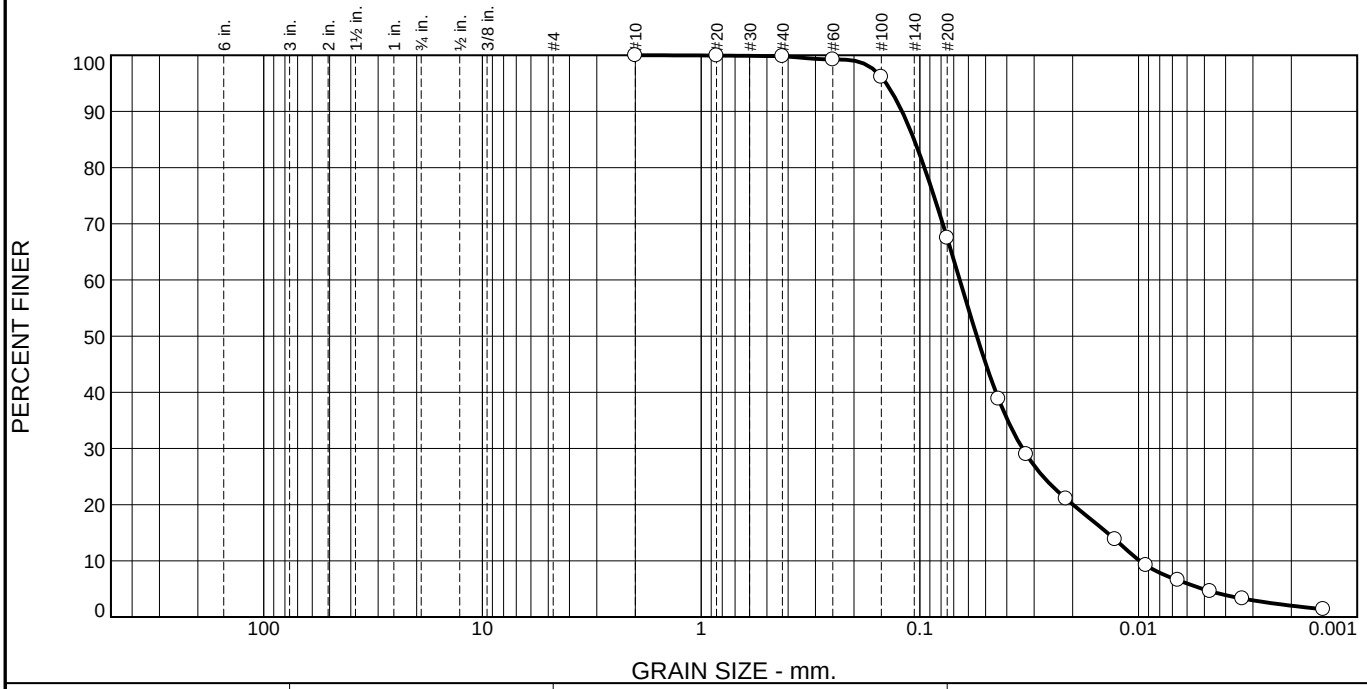
Date Sampled: 9/21/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	32.3	62.6	4.9

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	99.2		
#100	96.1		
#200	67.5		
0.0437 mm.	38.8		
0.0326 mm.	29.0		
0.0215 mm.	21.1		
0.0128 mm.	13.8		
0.0092 mm.	9.2		
0.0066 mm.	6.6		
0.0047 mm.	4.6		
0.0034 mm.	3.3		
0.0014 mm.	1.4		

* (no specification provided)

Material Description

Light brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1206 D_{85}= 0.1063 D_{60}= 0.0657
D_{50}= 0.0549 D_{30}= 0.0339 D_{15}= 0.0139
D_{10}= 0.0099 C_u= 6.66 C_c= 1.77

Remarks

As received MC = 26.3%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-8 **Depth:** 24-26'

Sample Number: S-8

Date Sampled: 9/22/2017

CDM Smith

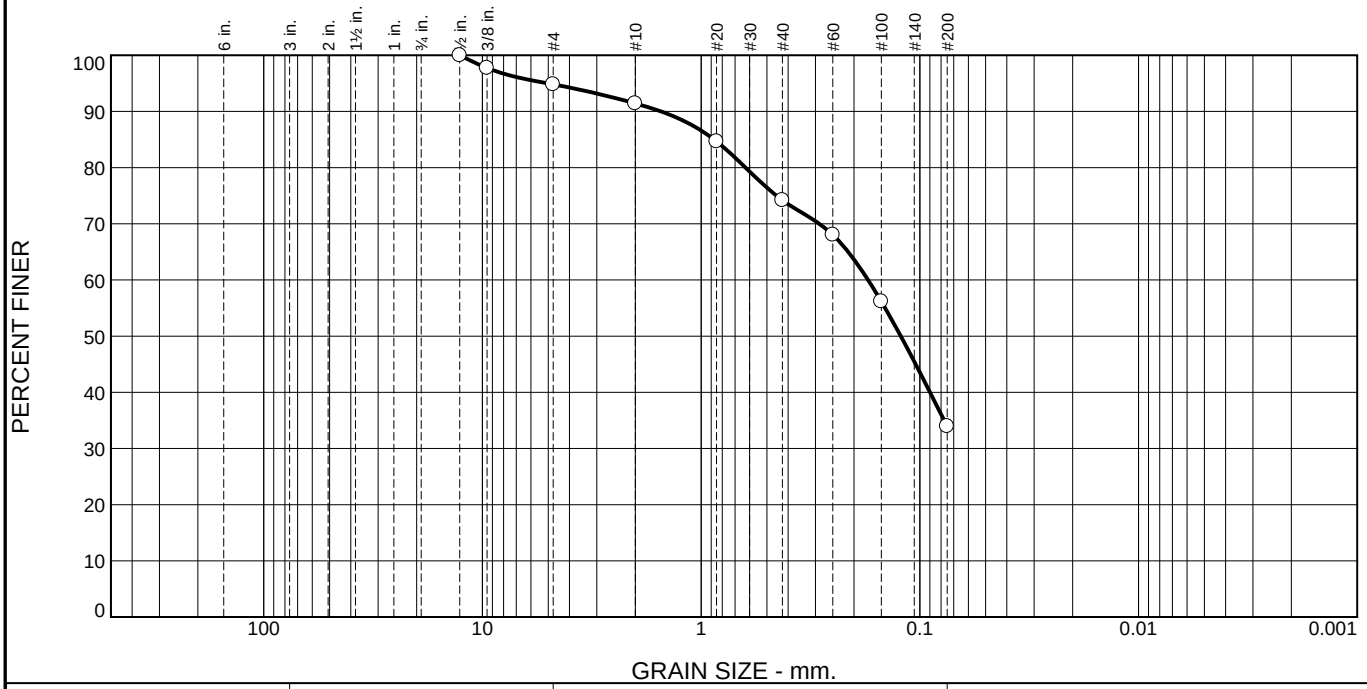
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.2	3.4	17.2	40.3	33.9	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5"	100.0		
.375"	97.7		
#4	94.8		
#10	91.4		
#20	84.7		
#40	74.2		
#60	68.0		
#100	56.2		
#200	33.9		

* (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-2-4(0)

Coefficients

D_{90}= 1.5251 D_{85}= 0.8728 D_{60}= 0.1724
D_{50}= 0.1222 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 18.4%

Date Received: 10/4/2017 **Date Tested:** 10/16/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-9 **Depth:** 1-2.5'
Sample Number: S-1A(TOP)

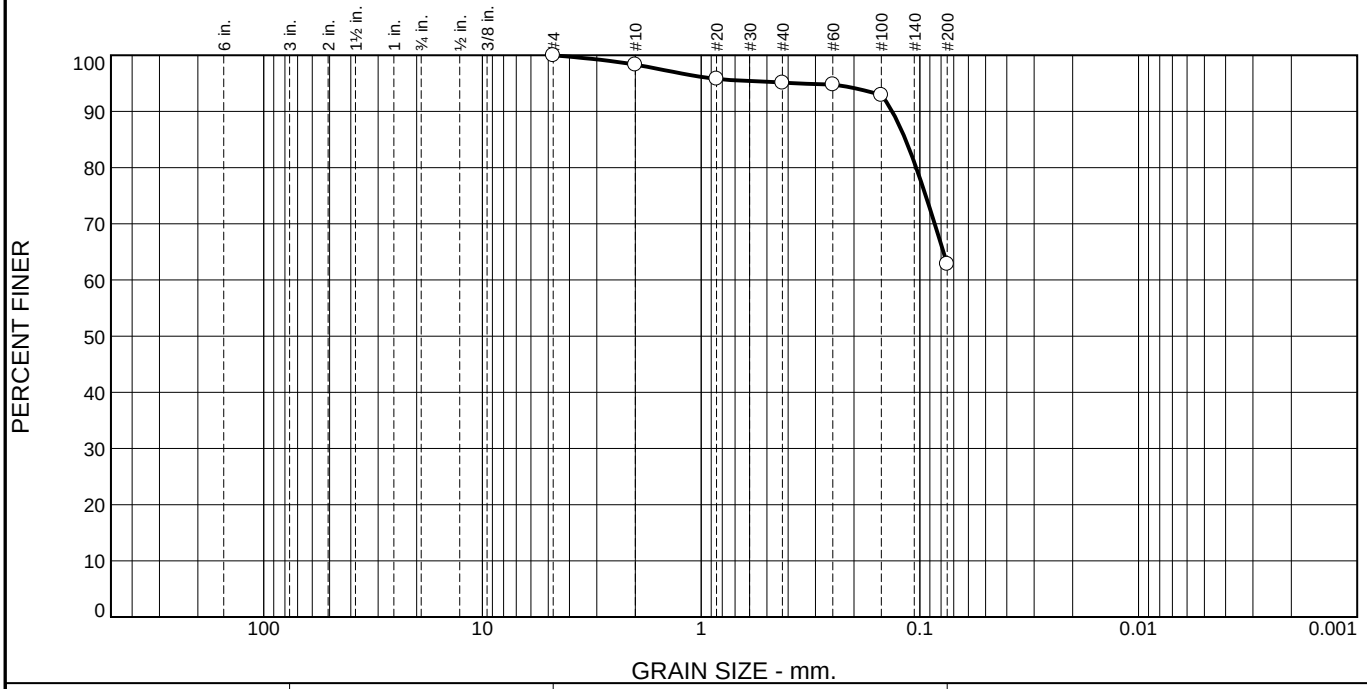
Date Sampled: 9/27/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.7	3.2	32.3	62.8	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	98.3		
#20	95.8		
#40	95.1		
#60	94.8		
#100	92.9		
#200	62.8		

* (no specification provided)

Material Description

Light brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1337 D_{85}= 0.1163 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 31.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-9 **Depth:** 8-10'
Sample Number: S-5

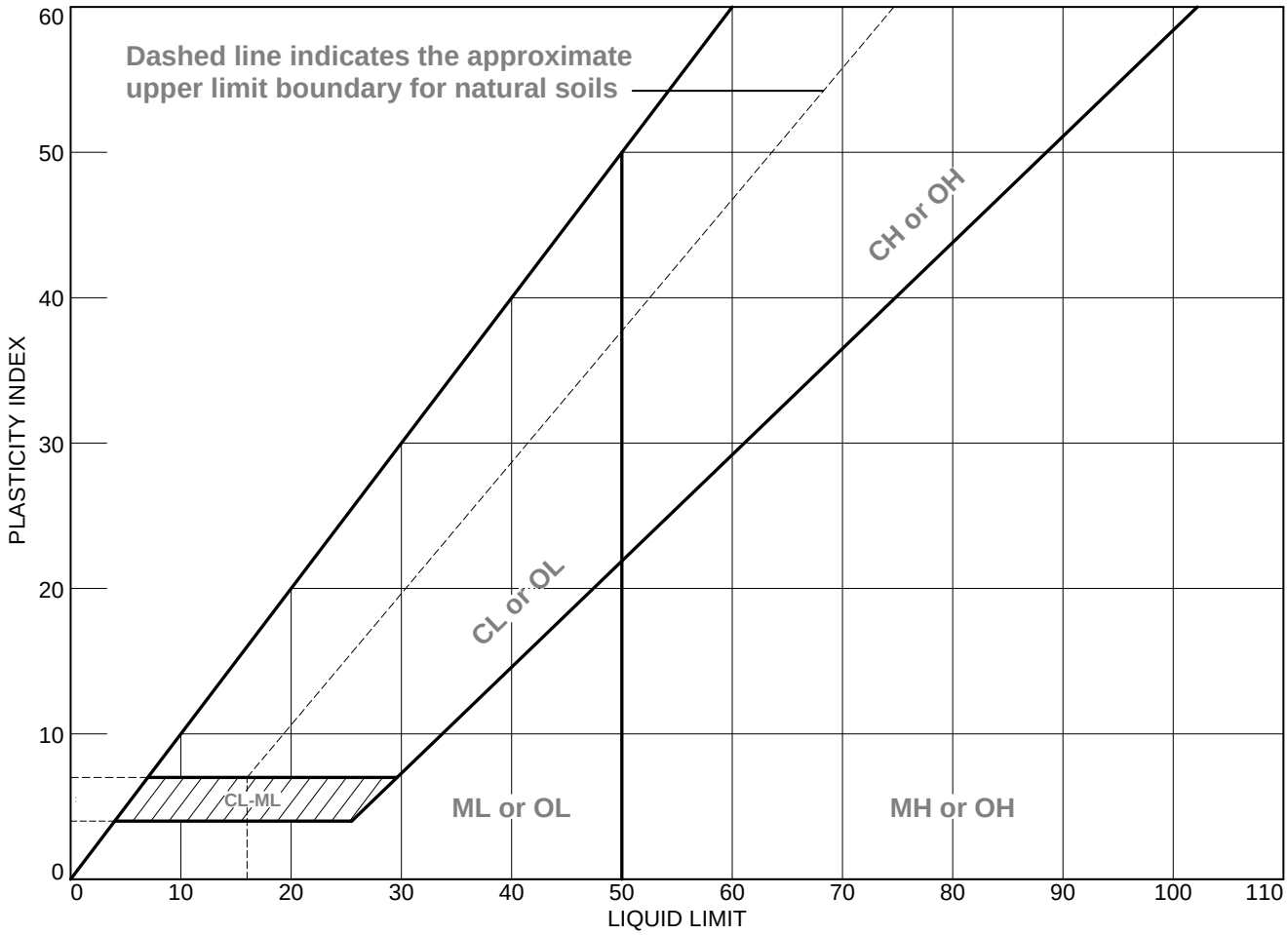
Date Sampled: 9/27/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **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-9	S-6	14-16'	32.2	NP	NV	NP	ML

CDM Smith

Boston, Massachusetts

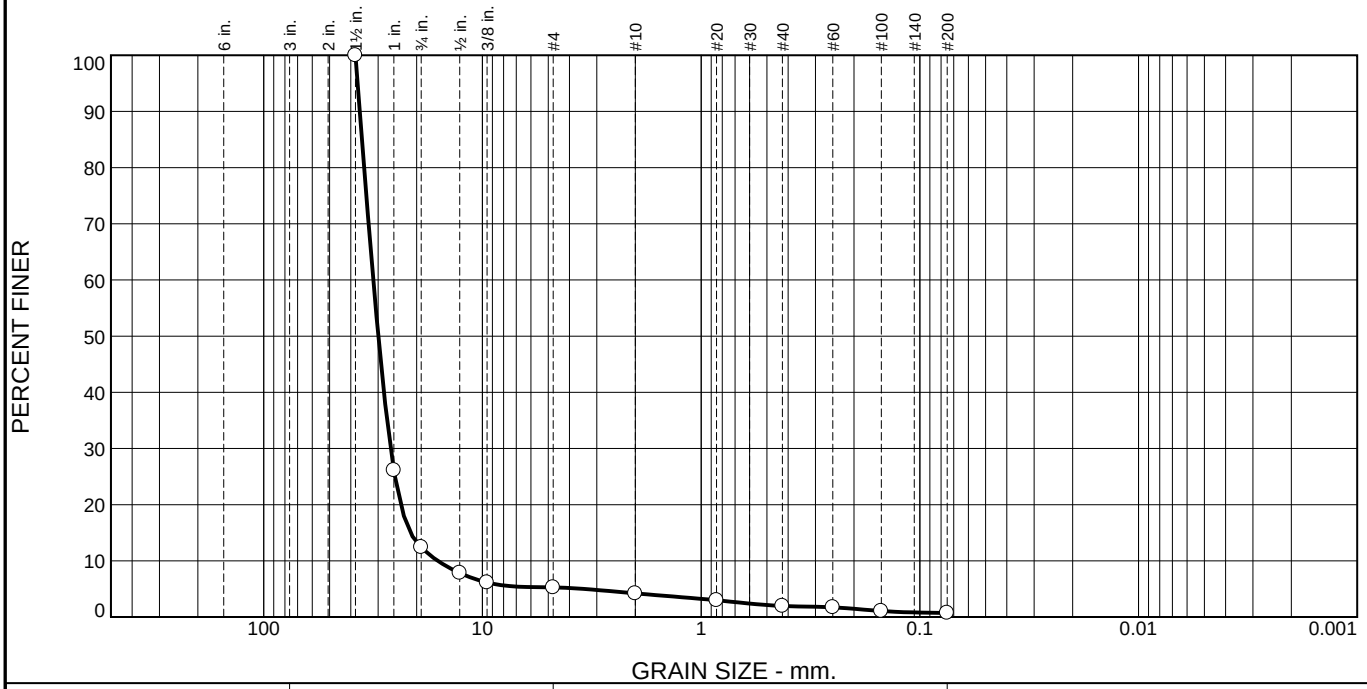
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **Figure**

Tested By: RZ **Checked By:** MP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	87.6	7.1	1.1	2.2	1.3	0.7	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	26.1		
.75"	12.4		
.5"	7.8		
.375"	6.1		
#4	5.3		
#10	4.2		
#20	3.0		
#40	2.0		
#60	1.7		
#100	1.1		
#200	0.7		

* (no specification provided)

Material Description

Gray poorly graded gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 36.4115 D_{85}= 35.5888 D_{60}= 31.5692
D_{50}= 29.9359 D_{30}= 26.2793 D_{15}= 21.3363
D_{10}= 16.0093 C_u= 1.97 C_c= 1.37

Remarks

As received MC = 2.8%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-10 **Depth:** 0-1'

Sample Number: BAG (Subbase)

Date Sampled: 10/4/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

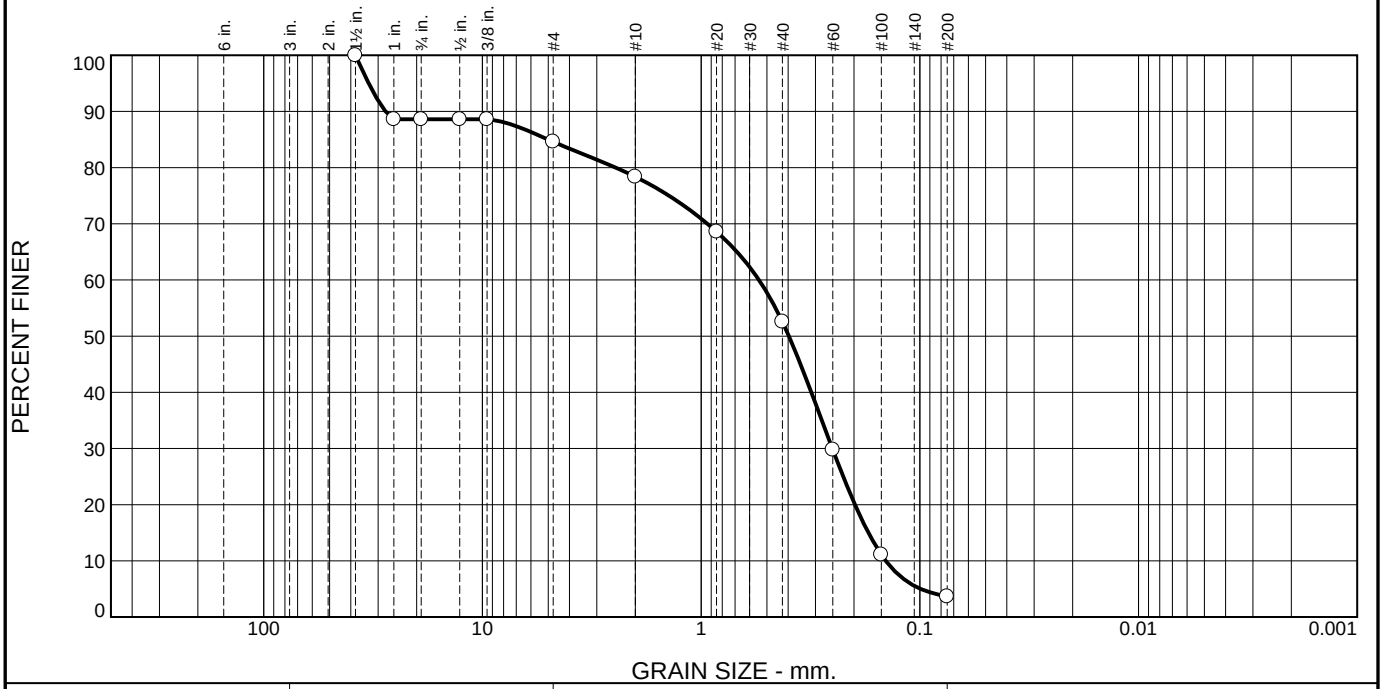
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/16/2017
Project Number:	25972-215427		
Boring Number:	B-10	Procedure:	C
Sample Number:	S-3	Temperature:	440° C
Sample Depth (ft):	4-6		
Sample Date:	10/4/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.23
Wet Mass of Sample & Tin (g)	143.79
Dry Mass of Sample & Tin (g)	132.12
Mass of Water (g)	11.67
Mass of Dry Soil (g)	41.89
Moisture Content (%)	**27.9**

ASH CONTENT	
Porcelain Dish Mass (g)	90.23
Porcelain Dish + Oven Dried Soil (g)	132.12
Mass of Oven Dried Soil (g)	41.89
Mass of Dish & Burned Soil (g)	130.34
Mass of Burned Soil (g)	40.11
Mass of Organic Material (g)	1.78
Ash Content (%)	95.8
Organic Content (%)	**4.2**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.4	4.0	6.2	25.8	48.9	3.7	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	88.6		
.75"	88.6		
.5"	88.6		
.375"	88.6		
#4	84.6		
#10	78.4		
#20	68.6		
#40	52.6		
#60	29.8		
#100	11.1		
#200	3.7		

* (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-3

Coefficients

D_{90}= 27.7200 D_{85}= 5.0101 D_{60}= 0.5440
D_{50}= 0.3968 D_{30}= 0.2513 D_{15}= 0.1718
D_{10}= 0.1431 C_u= 3.80 C_c= 0.81

Remarks

As received MC = 14.3%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-11 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 4/12-13/2017

CDM Smith

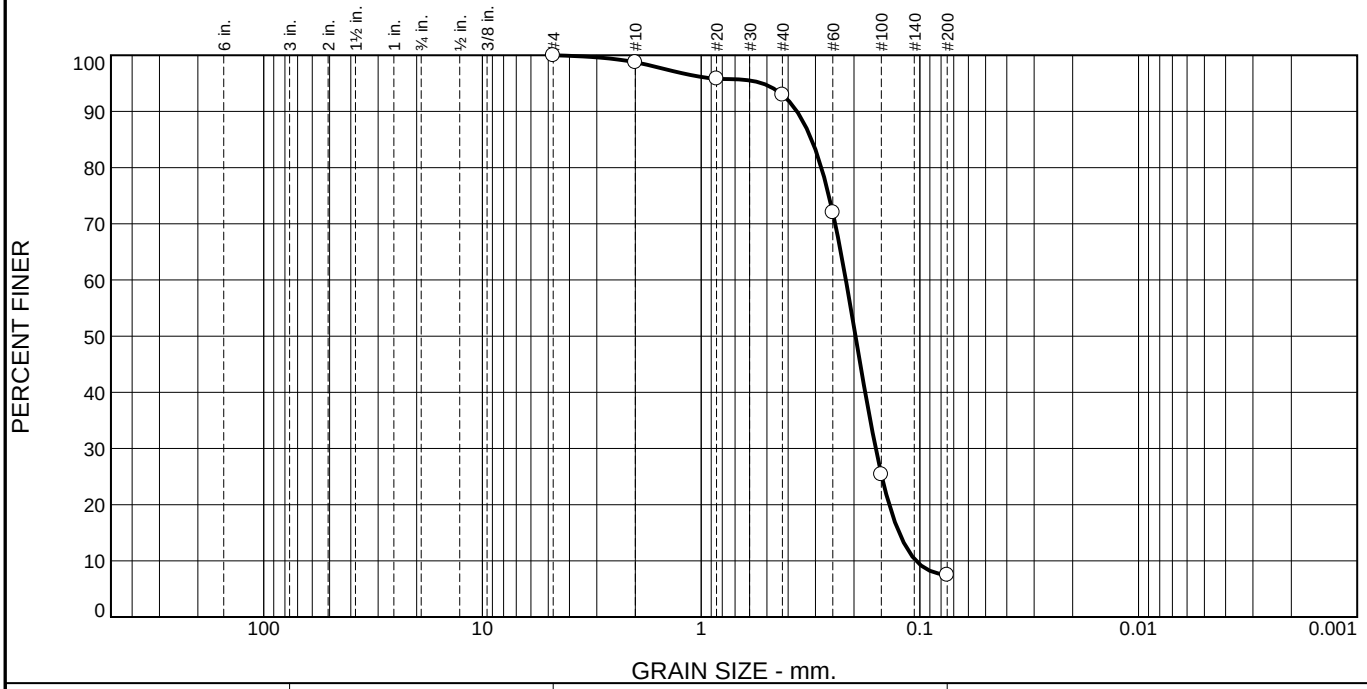
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.3	5.8	85.4	7.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	98.7		
#20	95.8		
#40	92.9		
#60	72.0		
#100	25.4		
#200	7.5		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.3641 D_{85}= 0.3126 D_{60}= 0.2178
D_{50}= 0.1967 D_{30}= 0.1591 D_{15}= 0.1243
D_{10}= 0.1041 C_u= 2.09 C_c= 1.12

Remarks

As received MC = 25.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-12 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 9/26/2017

CDM Smith

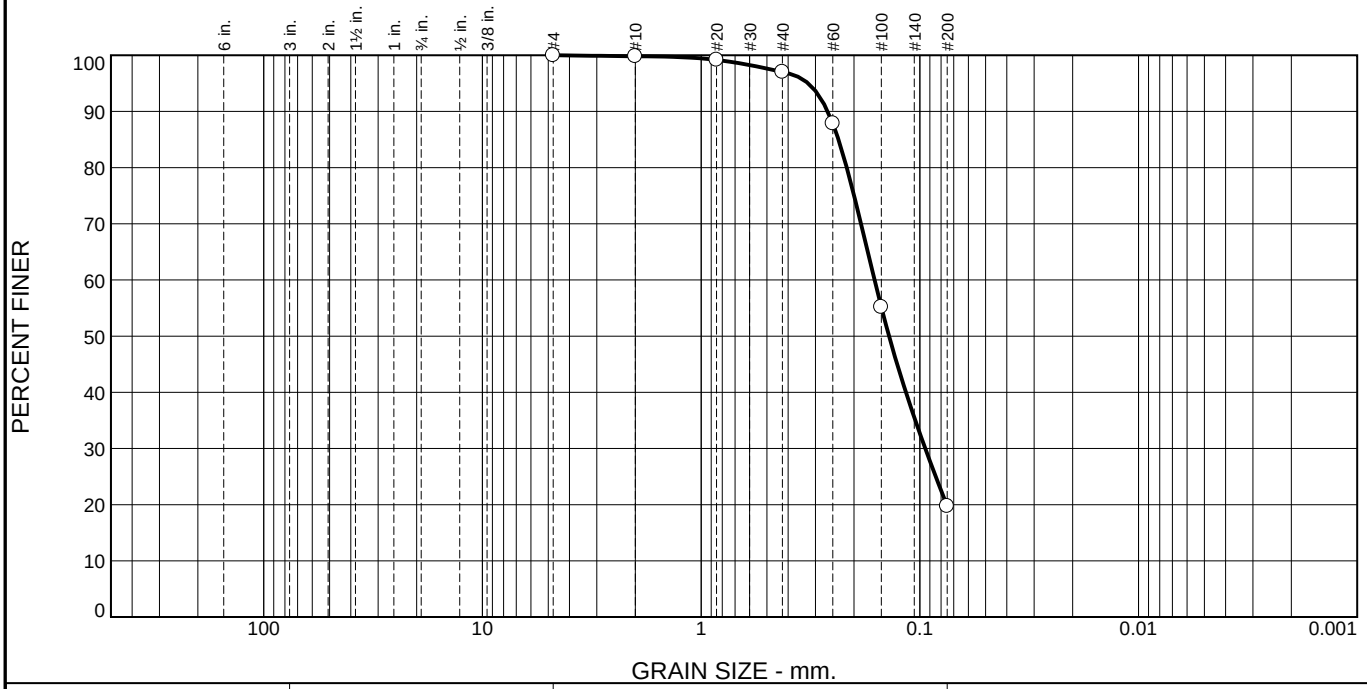
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	2.8	77.3	19.7	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#20	99.2		
#40	97.0		
#60	87.9		
#100	55.2		
#200	19.7		

* (no specification provided)

Material Description

Reddish-brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2637 D_{85}= 0.2356 D_{60}= 0.1611
D_{50}= 0.1382 D_{30}= 0.0944 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 24.4%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-12 **Depth:** 14-16'
Sample Number: S-6

Date Sampled: 9/26/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

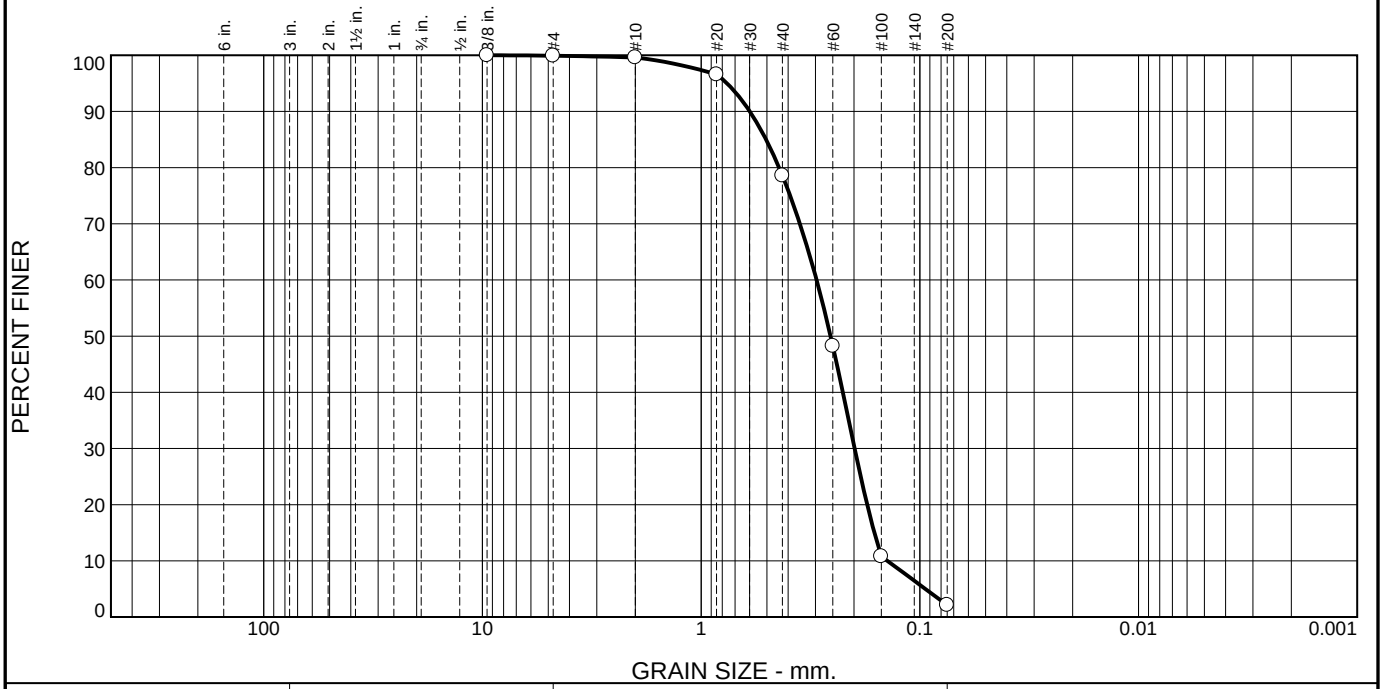
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/16/2017
Project Number:	25972-215427		
Boring Number:	B-13	Procedure:	C
Sample Number:	S-4	Temperature:	440° C
Sample Depth (ft):	6-8		
Sample Date:	9/19-20/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	96.80
Wet Mass of Sample & Tin (g)	177.54
Dry Mass of Sample & Tin (g)	162.12
Mass of Water (g)	15.42
Mass of Dry Soil (g)	65.32
Moisture Content (%)	**23.6**

ASH CONTENT	
Porcelain Dish Mass (g)	96.80
Porcelain Dish + Oven Dried Soil (g)	162.12
Mass of Oven Dried Soil (g)	65.32
Mass of Dish & Burned Soil (g)	161.63
Mass of Burned Soil (g)	64.83
Mass of Organic Material (g)	0.49
Ash Content (%)	99.2
Organic Content (%)	**0.8**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.3	21.0	76.5	2.1	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375"	100.0		
#4	99.9		
#10	99.6		
#20	96.6		
#40	78.6		
#60	48.3		
#100	10.8		
#200	2.1		

* (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-3

Coefficients

D_{90}= 0.5987 D_{85}= 0.5048 D_{60}= 0.2966
D_{50}= 0.2560 D_{30}= 0.1986 D_{15}= 0.1615
D_{10}= 0.1407 C_u= 2.11 C_c= 0.94

Remarks

As received MC = 23.1%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-13 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 9/19-20/2017

CDM Smith

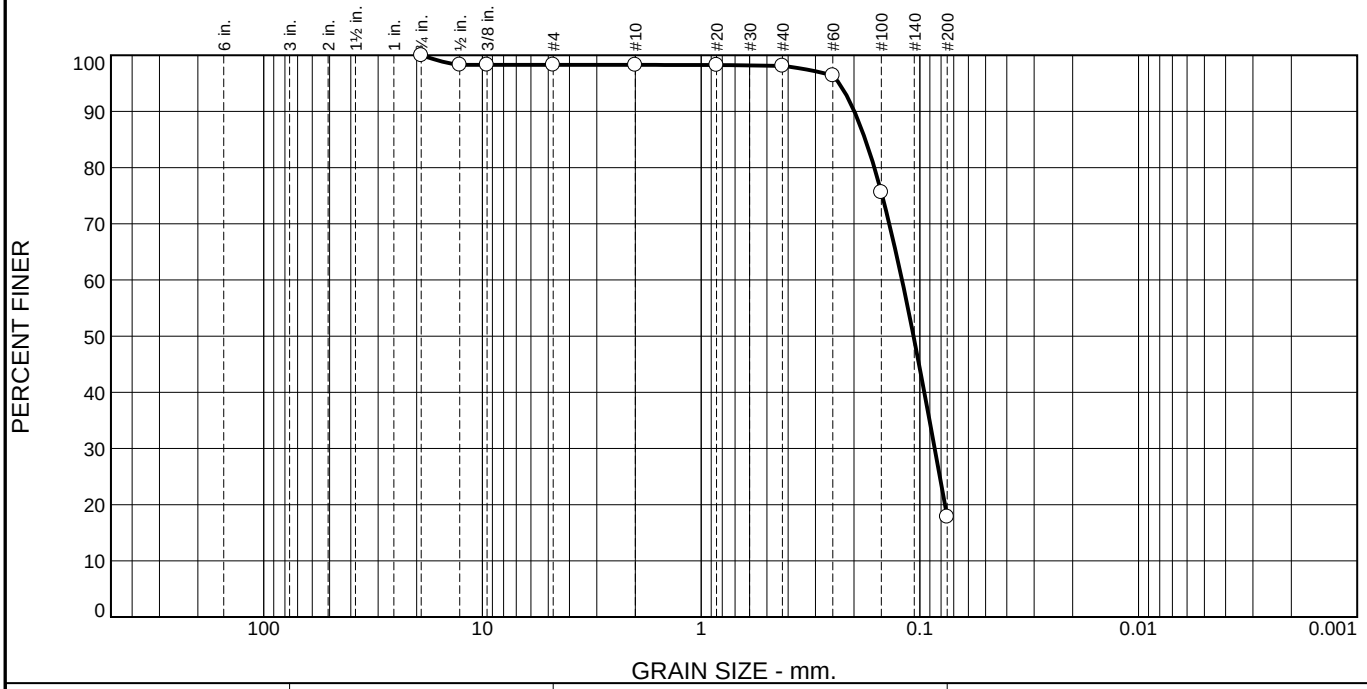
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	0.0	0.2	80.2	17.9	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	98.3		
.375"	98.3		
#4	98.3		
#10	98.3		
#20	98.3		
#40	98.1		
#60	96.4		
#100	75.6		
#200	17.9		

* (no specification provided)

Material Description

Light brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.1991 D_{85}= 0.1774 D_{60}= 0.1206
D_{50}= 0.1069 D_{30}= 0.0855 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 25.1%

Date Received: 10/4/2017 **Date Tested:** 10/17/207

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-14 **Depth:** 8-10'
Sample Number: S-5

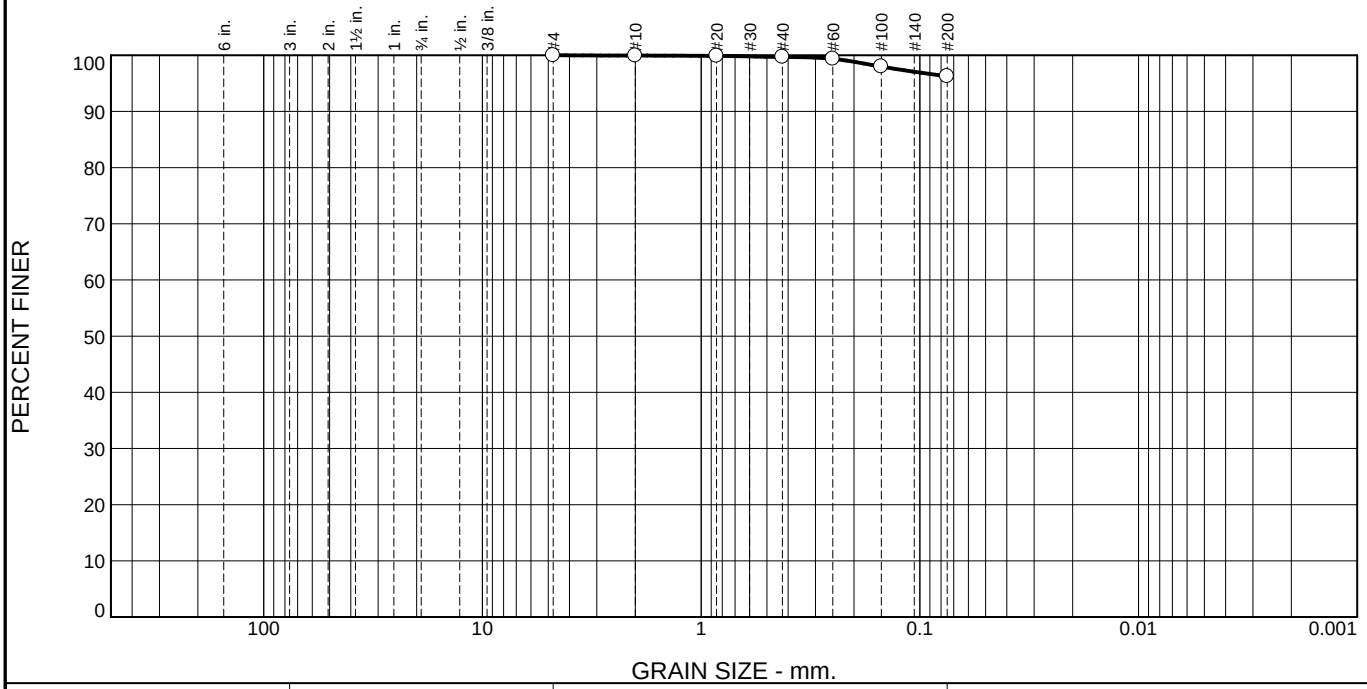
Date Sampled: 9/27/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.2	3.4	96.3	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.7		
#60	99.4		
#100	98.0		
#200	96.3		

* (no specification provided)

Material Description

Gray silt

Atterberg Limits (ASTM D 4318)

PL= 27 **LL=** 30 **PI=** 3

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(3)

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 31.5%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-14 **Depth:** 19-21' **Date Sampled:** 9/27/2017

Sample Number: S-7

CDM Smith

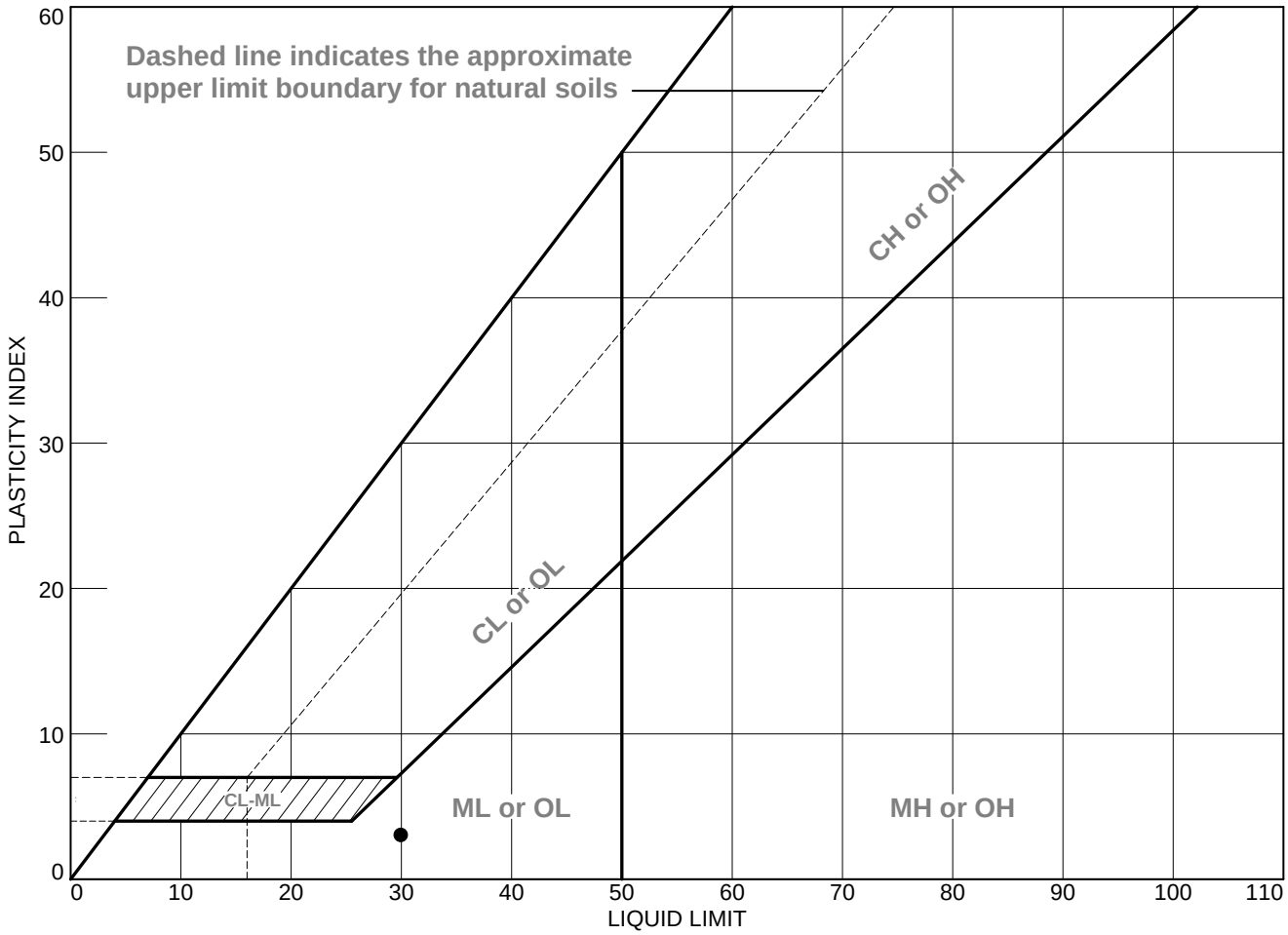
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **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-14	S-7	19-21'	31.5	27	30	3	ML

CDM Smith

Boston, Massachusetts

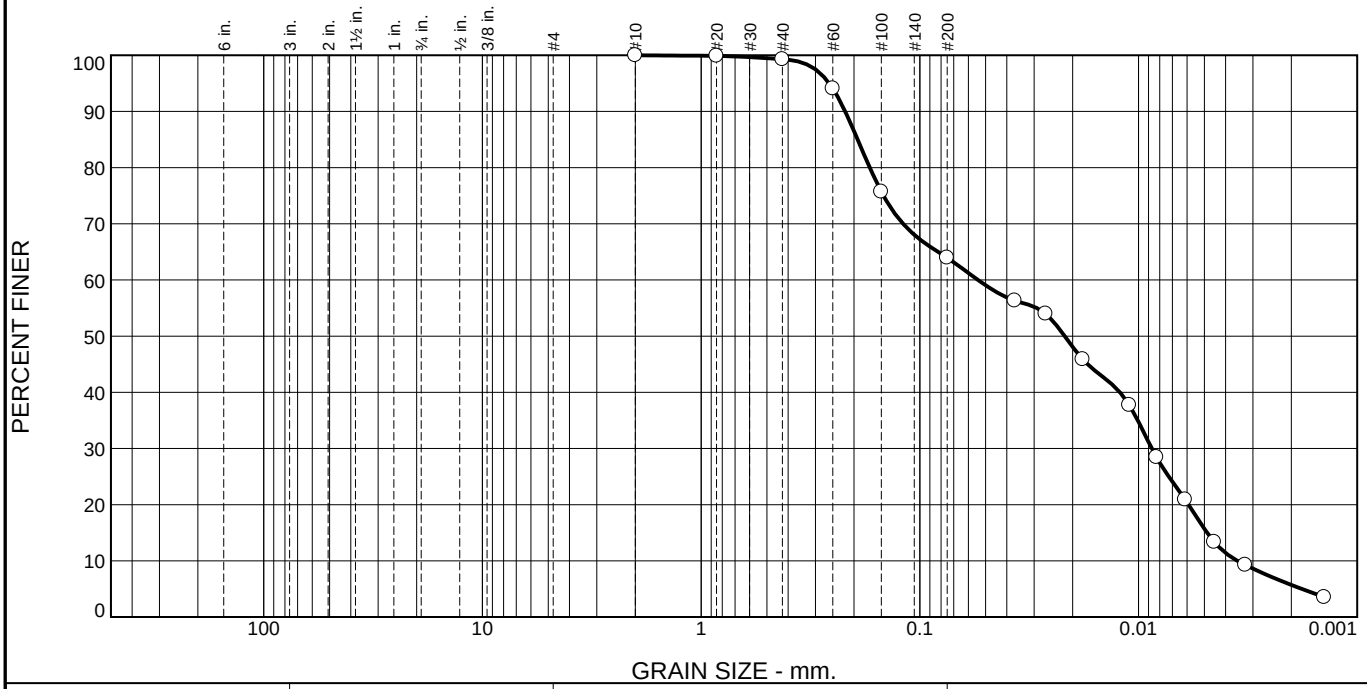
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **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	0.0	0.0	0.7	35.4	48.2	15.7

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.3		
#60	94.1		
#100	75.7		
#200	63.9		
0.0368 mm.	56.3		
0.0266 mm.	54.0		
0.0180 mm.	45.9		
0.0110 mm.	37.7		
0.0083 mm.	28.4		
0.0061 mm.	20.9		
0.0045 mm.	13.4		
0.0033 mm.	9.3		
0.0014 mm.	3.5		

* (no specification provided)

Material Description

Light brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.2195 D_{85}= 0.1924 D_{60}= 0.0542
D_{50}= 0.0217 D_{30}= 0.0087 D_{15}= 0.0049
D_{10}= 0.0035 C_u= 15.37 C_c= 0.40

Remarks

As received MC = 23.2%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-15 **Depth:** 5-7'
Sample Number: S-1

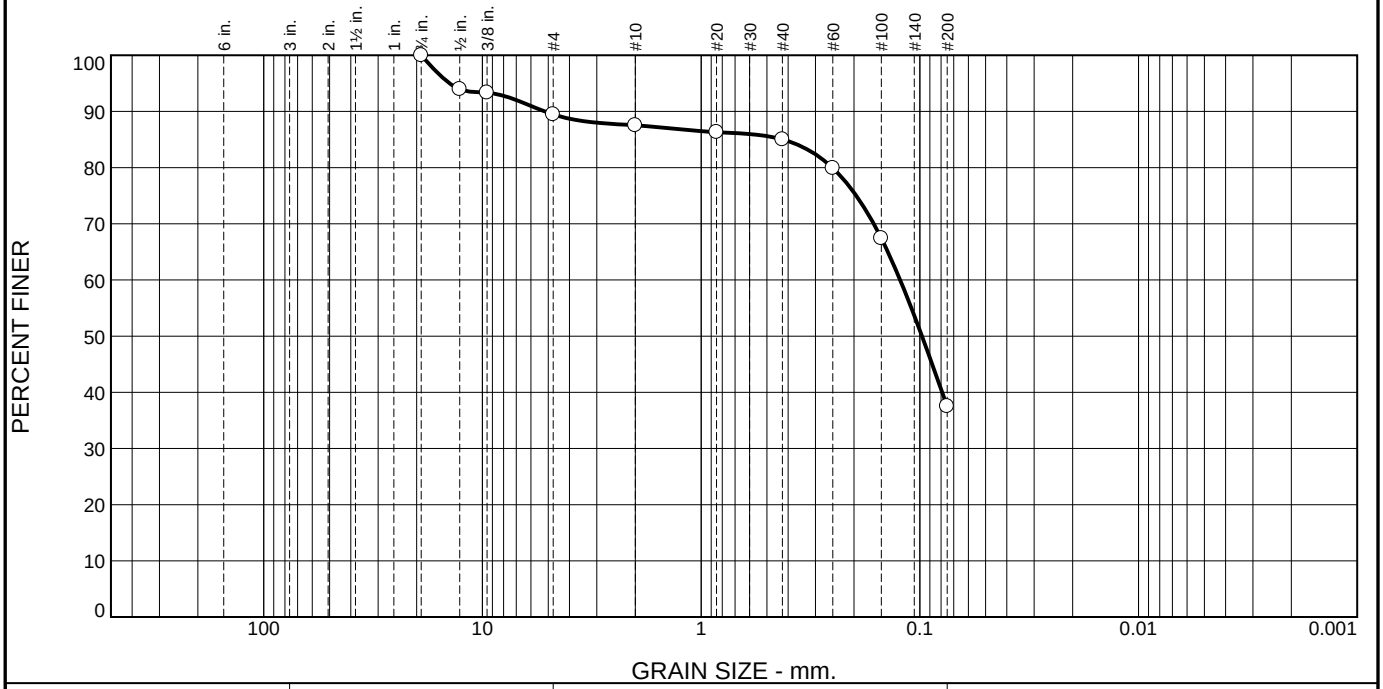
Date Sampled: 4/13/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.5	2.0	2.5	47.5	37.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	94.0		
.375"	93.4		
#4	89.5		
#10	87.5		
#20	86.3		
#40	85.0		
#60	79.9		
#100	67.4		
#200	37.5		

* (no specification provided)

Material Description

Gray silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 5.1850 D_{85}= 0.4236 D_{60}= 0.1230
D_{50}= 0.0977 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 21.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-15 **Depth:** 9-11'
Sample Number: S-3

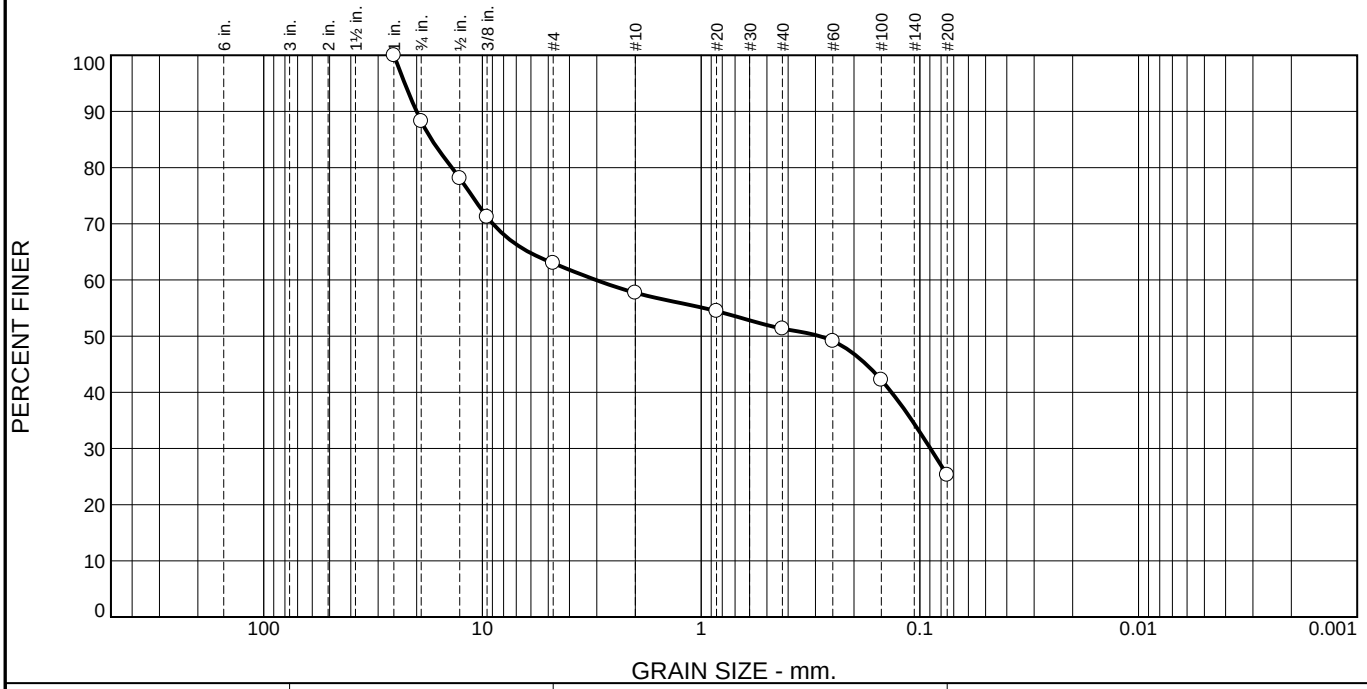
Date Sampled: 4/13/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.7	25.3	5.3	6.4	26.0	25.3	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	88.3		
.5"	78.1		
.375"	71.2		
#4	63.0		
#10	57.7		
#20	54.5		
#40	51.3		
#60	49.1		
#100	42.2		
#200	25.3		

* (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-2-4(0)

Coefficients

D_{90}= 20.0112 D_{85}= 17.0797 D_{60}= 3.0312
D_{50}= 0.2873 D_{30}= 0.0894 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 12.7%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-15 **Depth:** 14-16'
Sample Number: S-4

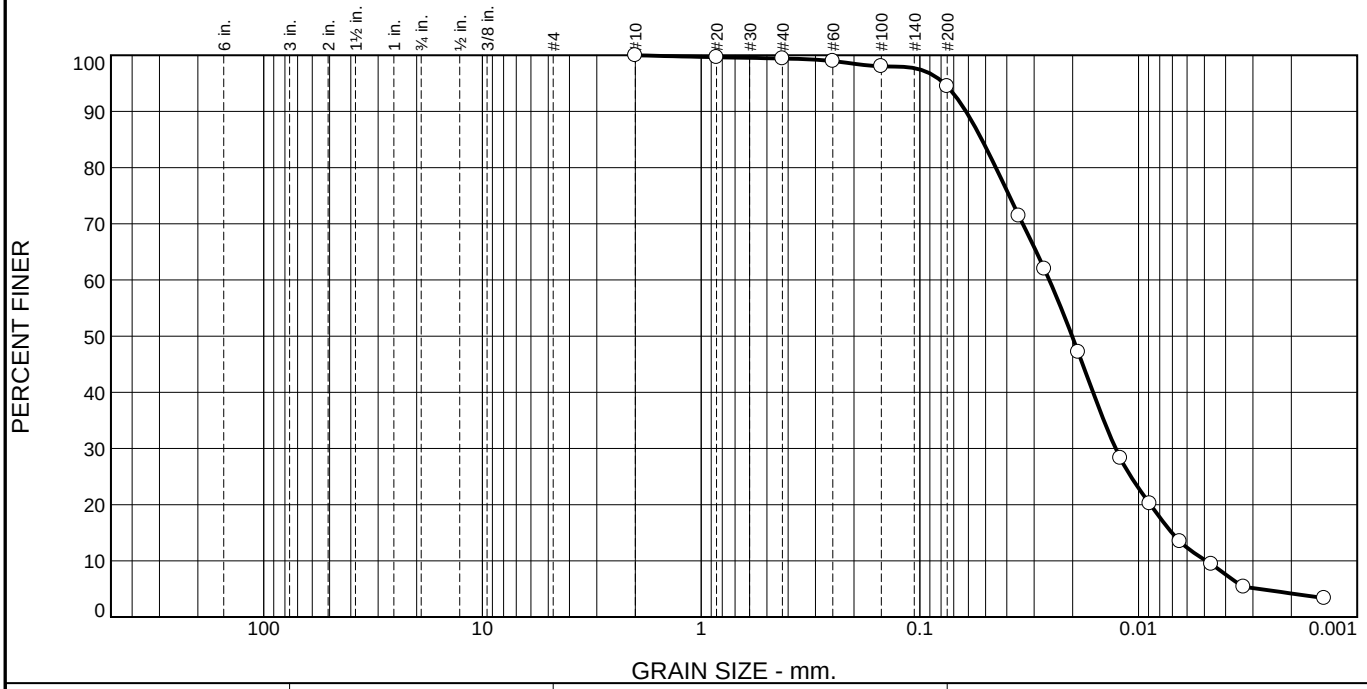
Date Sampled: 4/13/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **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	4.9	84.3	10.2

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.6		
#40	99.4		
#60	99.0		
#100	98.0		
#200	94.5		
0.0353 mm.	71.4		
0.0270 mm.	62.0		
0.0189 mm.	47.2		
0.0121 mm.	28.3		
0.0089 mm.	20.2		
0.0065 mm.	13.5		
0.0047 mm.	9.4		
0.0033 mm.	5.4		
0.0014 mm.	3.4		

* (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}= 0.0615 D_{85}= 0.0521 D_{60}= 0.0256
D_{50}= 0.0201 D_{30}= 0.0127 D_{15}= 0.0070
D_{10}= 0.0049 C_u= 5.23 C_c= 1.29

Remarks

As received MC = 28.1%

Date Received: 10/5/2017 **Date Tested:** 10/18/2017

Tested By: MP/GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-16A **Depth:** 8-10' **Date Sampled:** 9/18/2017

Sample Number: S-1

CDM Smith

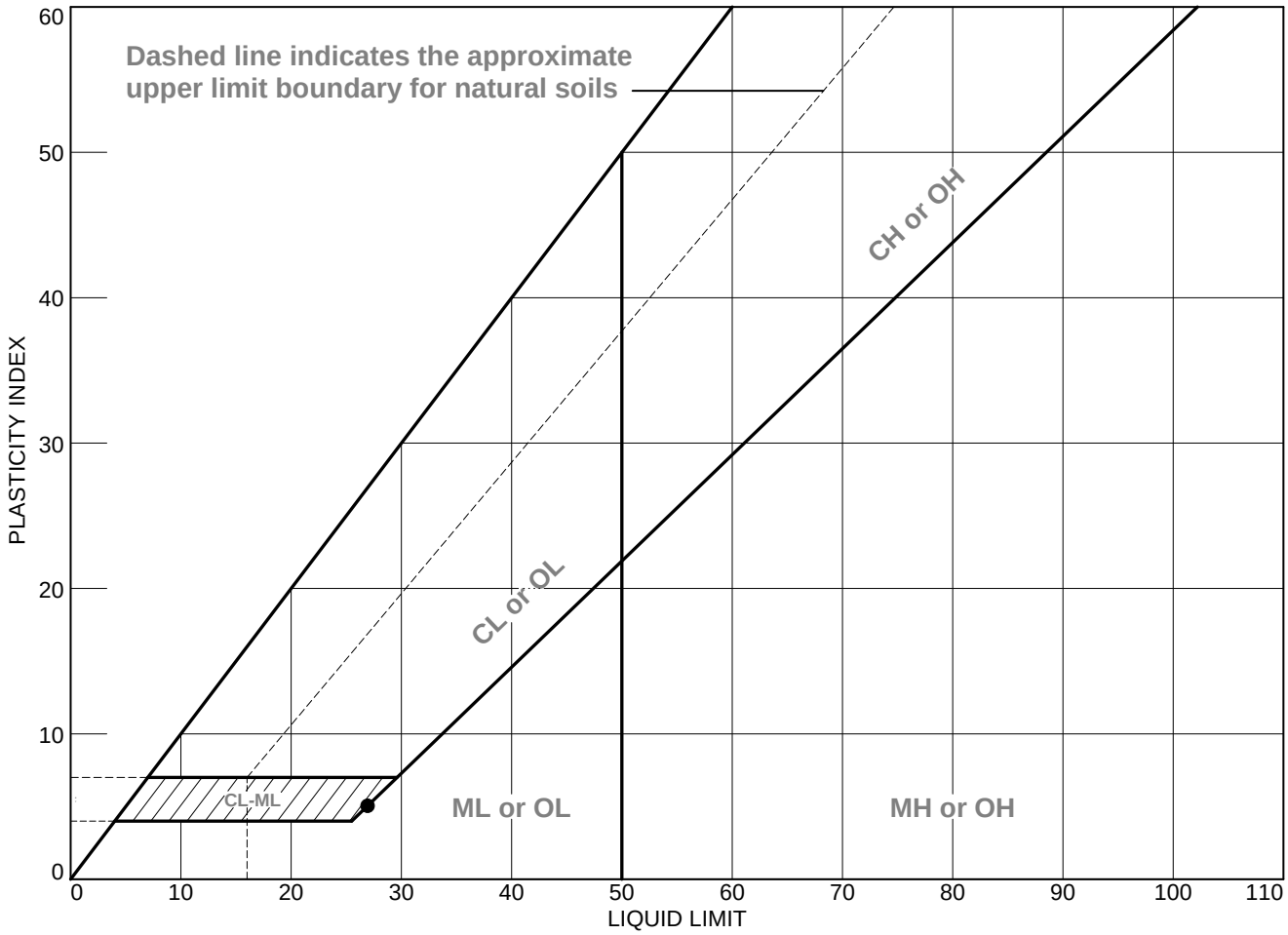
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **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-16A	S-4	23-25'	29.0	22	27	5	CL-ML

CDM Smith

Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **Figure**

Tested By: RZ **Checked By:** MP

CDM Smith

Geotechnical Engineering Laboratory

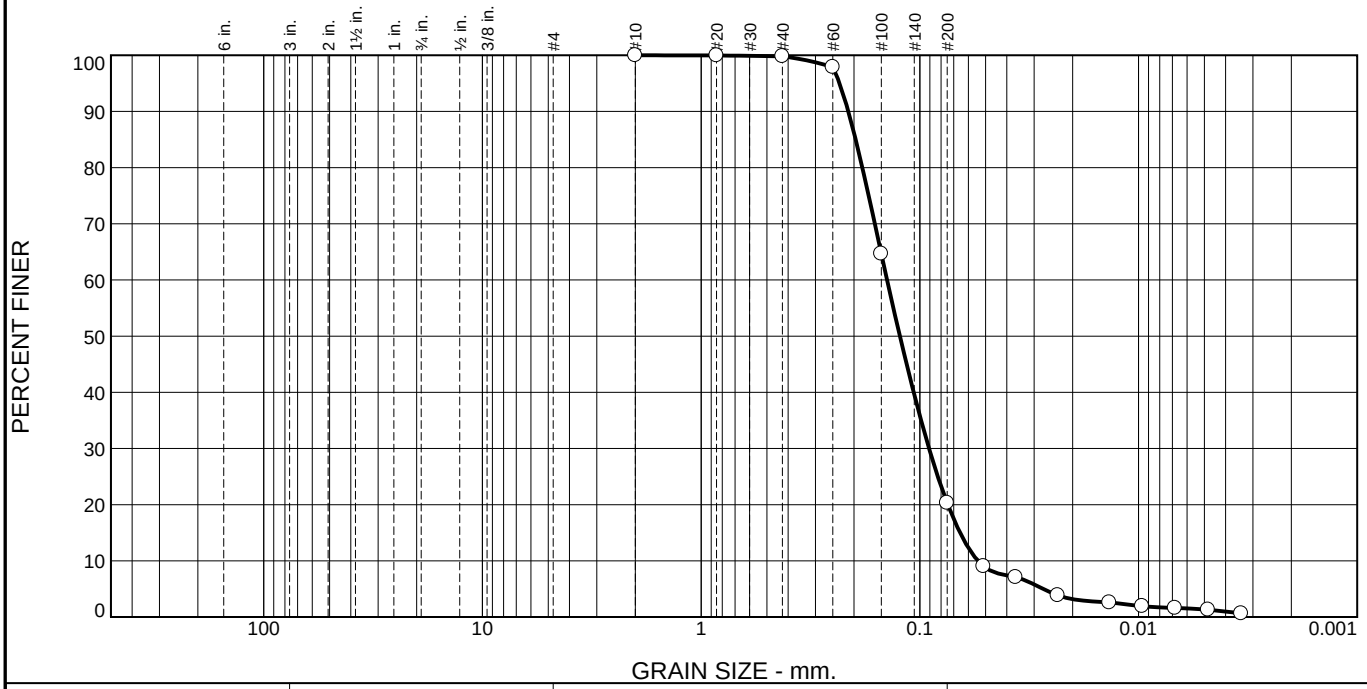
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/17/2017
Project Number:	25972-215427		
Boring Number:	B-17	Procedure:	C
Sample Number:	S-2	Temperature:	440° C
Sample Depth (ft):	2.5-4'		
Sample Date:	9/15/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	105.23
Wet Mass of Sample & Tin (g)	183.81
Dry Mass of Sample & Tin (g)	167.84
Mass of Water (g)	15.97
Mass of Dry Soil (g)	62.61
Moisture Content (%)	**25.5**

ASH CONTENT	
Porcelain Dish Mass (g)	105.23
Porcelain Dish + Oven Dried Soil (g)	167.84
Mass of Oven Dried Soil (g)	62.61
Mass of Dish & Burned Soil (g)	166.59
Mass of Burned Soil (g)	61.36
Mass of Organic Material (g)	1.25
Ash Content (%)	98.0
Organic Content (%)	**2.0**

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	79.5	19.0	1.3

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.8		
#60	97.9		
#100	64.7		
#200	20.3		
0.0511 mm.	9.0		
0.0365 mm.	7.1		
0.0234 mm.	3.9		
0.0136 mm.	2.6		
0.0096 mm.	1.9		
0.0068 mm.	1.6		
0.0048 mm.	1.3		
0.0034 mm.	0.6		

* (no specification provided)

Material Description

Light brown and gray silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.2122 D_{85}= 0.1964 D_{60}= 0.1412
D_{50}= 0.1233 D_{30}= 0.0907 D_{15}= 0.0655
D_{10}= 0.0543 C_u= 2.60 C_c= 1.07

Remarks

As received MC = 25.0%

Date Received: 10/5/2017 **Date Tested:** 10/18/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-17 **Depth:** 8-10'
Sample Number: S-5

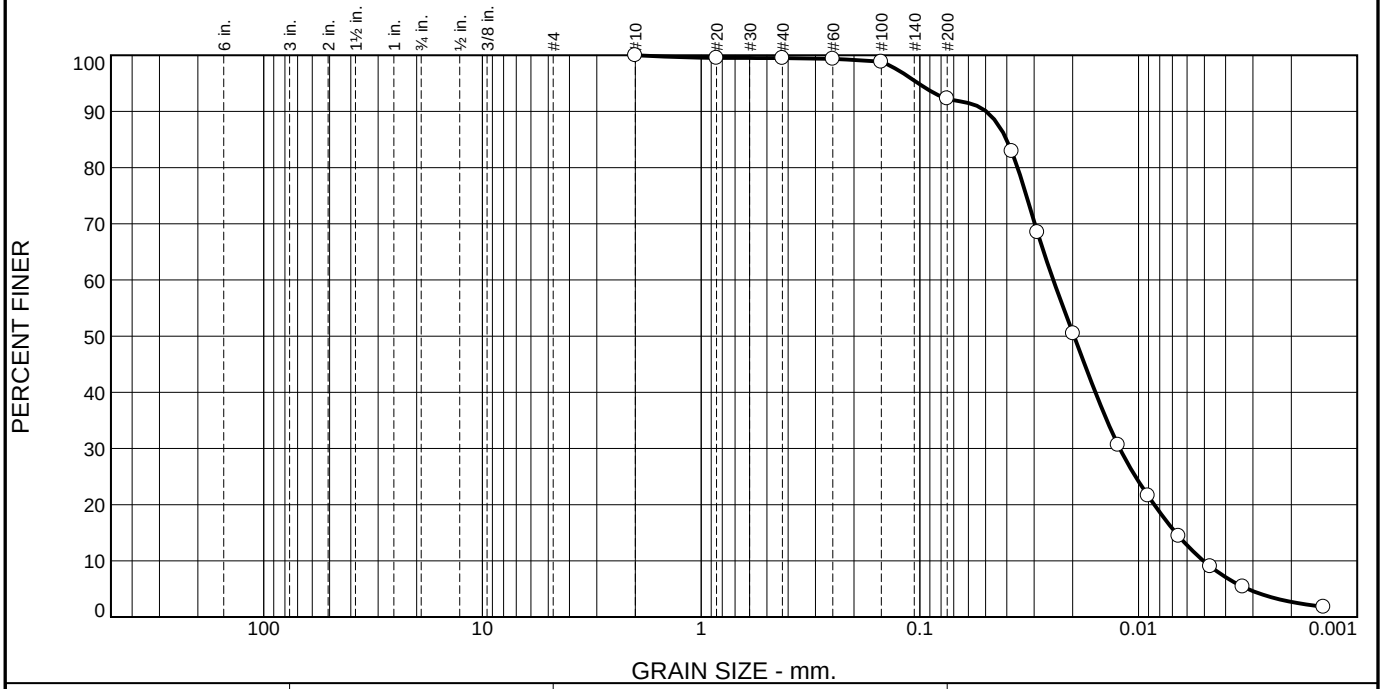
Date Sampled: 9/15/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	7.2	82.4	9.9

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.5		
#40	99.5		
#60	99.3		
#100	98.8		
#200	92.3		
0.0380 mm.	82.9		
0.0290 mm.	68.5		
0.0199 mm.	50.5		
0.0124 mm.	30.6		
0.0091 mm.	21.6		
0.0066 mm.	14.4		
0.0047 mm.	9.0		
0.0033 mm.	5.4		
0.0014 mm.	1.8		

* (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}= 0.0496 D_{85}= 0.0401 D_{60}= 0.0245
D_{50}= 0.0197 D_{30}= 0.0122 D_{15}= 0.0068
D_{10}= 0.0050 C_u= 4.86 C_c= 1.20

Remarks

As received MC = 29.7%

Date Received: 10/5/2017 **Date Tested:** 10/18/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-17 **Depth:** 19-21'

Sample Number: S-7

Date Sampled: 9/15/2017

CDM Smith

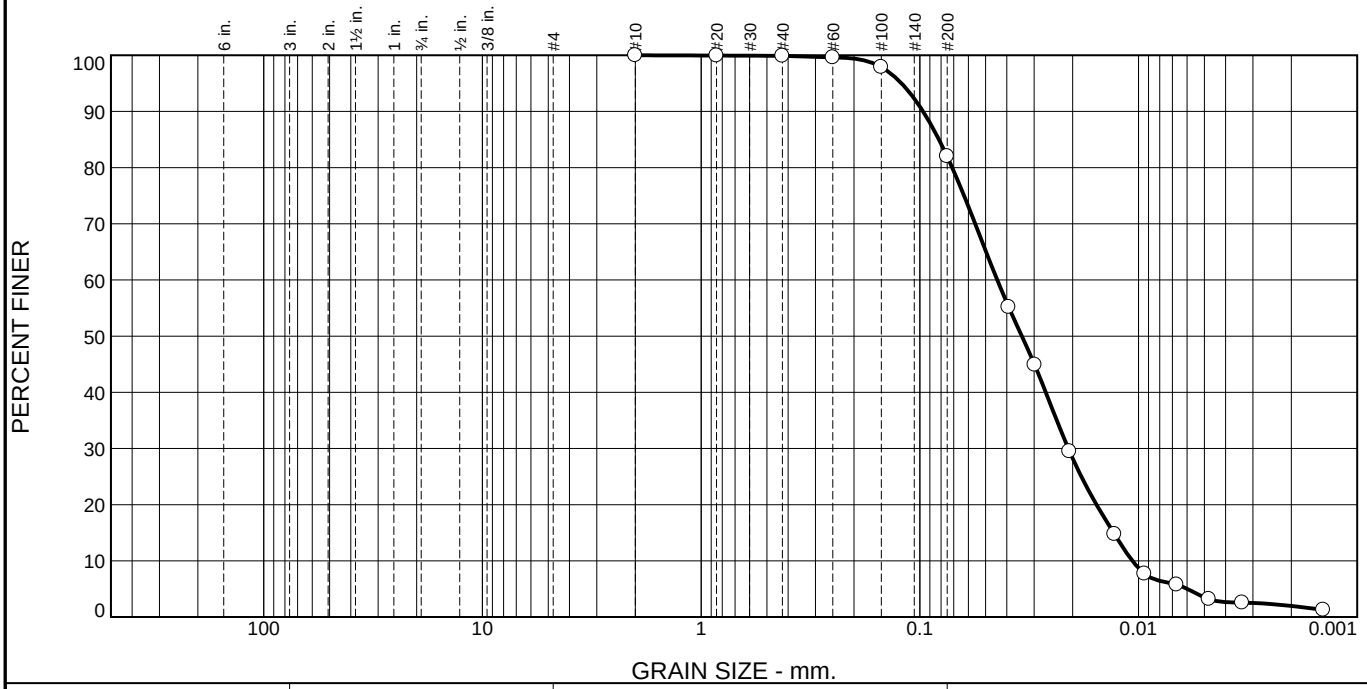
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	17.9	78.5	3.5

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.9		
#60	99.6		
#100	97.9		
#200	82.0		
0.0393 mm.	55.2		
0.0298 mm.	44.9		
0.0207 mm.	29.5		
0.0129 mm.	14.8		
0.0094 mm.	7.7		
0.0067 mm.	5.8		
0.0048 mm.	3.2		
0.0034 mm.	2.6		
0.0014 mm.	1.3		

* (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

D_{90}= 0.0967 D_{85}= 0.0817 D_{60}= 0.0443
D_{50}= 0.0342 D_{30}= 0.0210 D_{15}= 0.0130
D_{10}= 0.0107 C_u= 4.15 C_c= 0.93

Remarks

As received MC = 24.5%

Date Received: 10/5/2017 **Date Tested:** 10/18/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-18 **Depth:** 6-8'

Sample Number: S-4

Date Sampled: 9/15/2017

CDM Smith

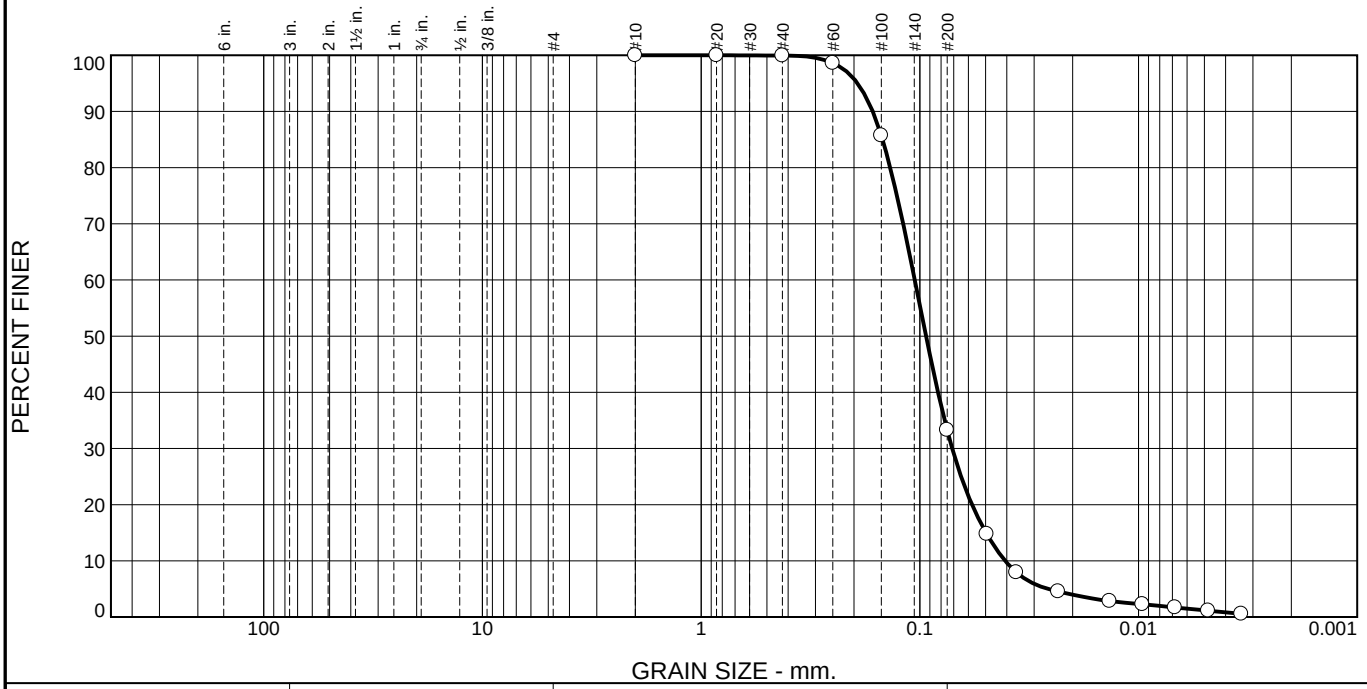
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	66.6	32.1	1.2

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	98.6		
#100	85.7		
#200	33.3		
0.0494 mm.	14.8		
0.0362 mm.	8.0		
0.0233 mm.	4.5		
0.0136 mm.	2.8		
0.0096 mm.	2.3		
0.0068 mm.	1.7		
0.0048 mm.	1.1		
0.0034 mm.	0.6		

* (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

D_{90}= 0.1642 D_{85}= 0.1481 D_{60}= 0.1055
D_{50}= 0.0936 D_{30}= 0.0711 D_{15}= 0.0498
D_{10}= 0.0407 C_u= 2.59 C_c= 1.18

Remarks

As received MC = 25.8%

Date Received: 10/5/2017 **Date Tested:** 10/18/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-18 **Depth:** 14-16'

Sample Number: S-6

Date Sampled: 9/15/2017

CDM Smith

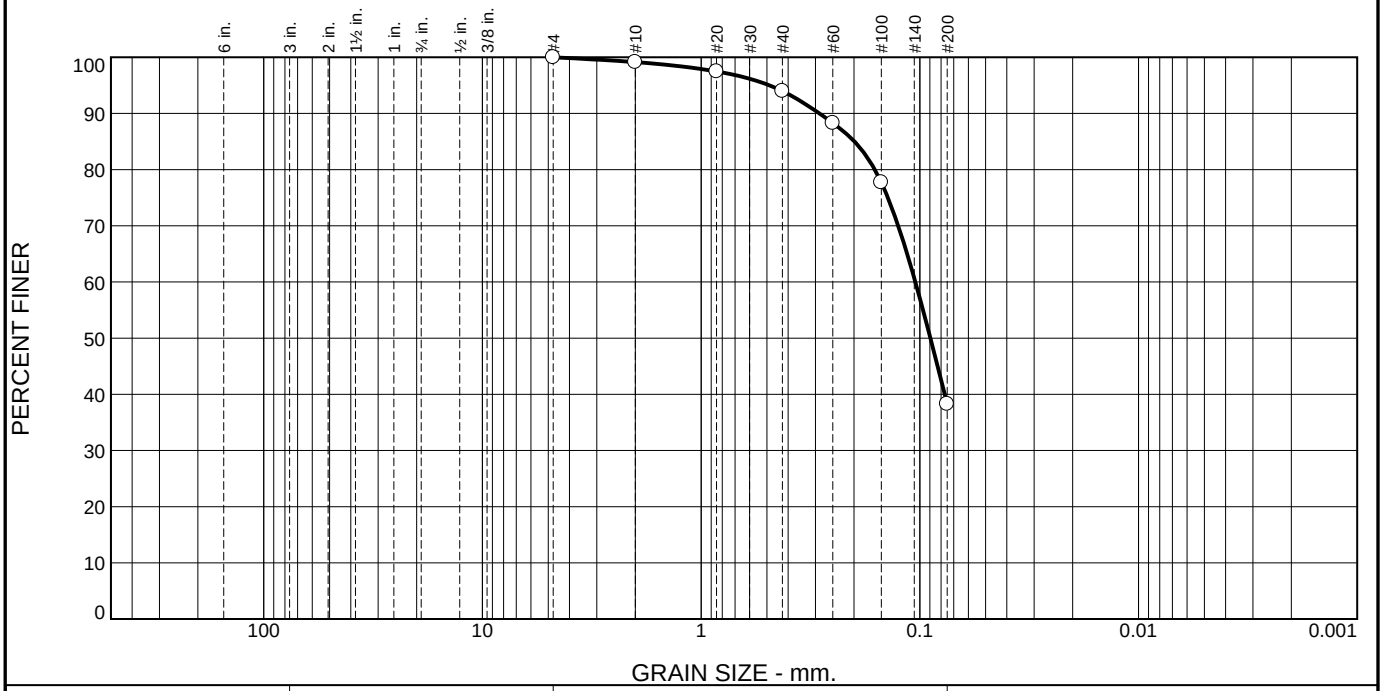
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	5.1	55.7	38.3	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.1		
#20	97.5		
#40	94.0		
#60	88.3		
#100	77.7		
#200	38.3		

* (no specification provided)

Material Description

Light brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.2879 D_{85}= 0.1988 D_{60}= 0.1048
D_{50}= 0.0894 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 25.5%

Date Received: 10/5/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-19 **Depth:** 4-6'
Sample Number: S-2

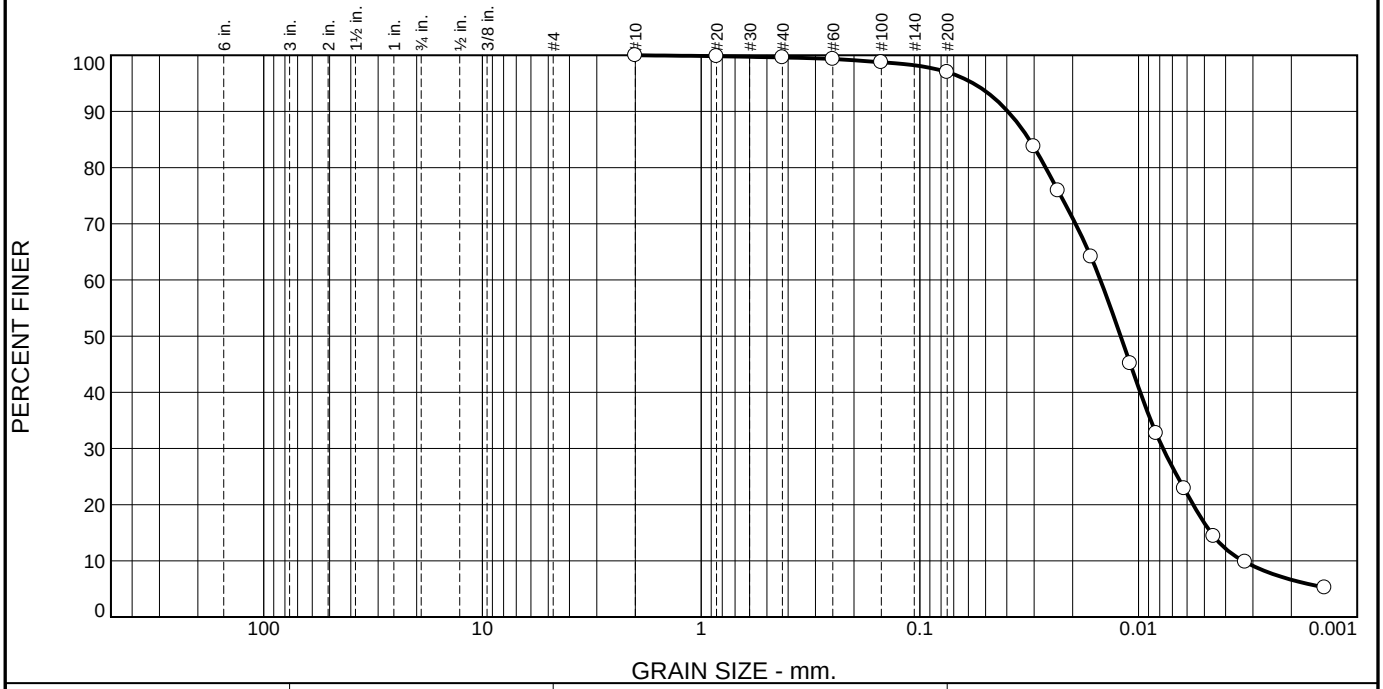
Date Sampled: 9/14/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	2.6	80.3	16.7

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.8		
#40	99.6		
#60	99.3		
#100	98.8		
#200	97.0		
0.0302 mm.	83.8		
0.0234 mm.	75.9		
0.0165 mm.	64.1		
0.0109 mm.	45.2		
0.0083 mm.	32.7		
0.0062 mm.	22.9		
0.0045 mm.	14.4		
0.0033 mm.	9.8		
0.0014 mm.	5.2		

* (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}= 0.0396 D_{85}= 0.0316 D_{60}= 0.0149
D_{50}= 0.0121 D_{30}= 0.0077 D_{15}= 0.0047
D_{10}= 0.0033 C_u= 4.50 C_c= 1.21

Remarks

As received MC = 27.1%

Date Received: 10/5/2017 **Date Tested:** 10/15/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-19 **Depth:** 14-16'

Sample Number: S-5

Date Sampled: 9/14/2017

CDM Smith

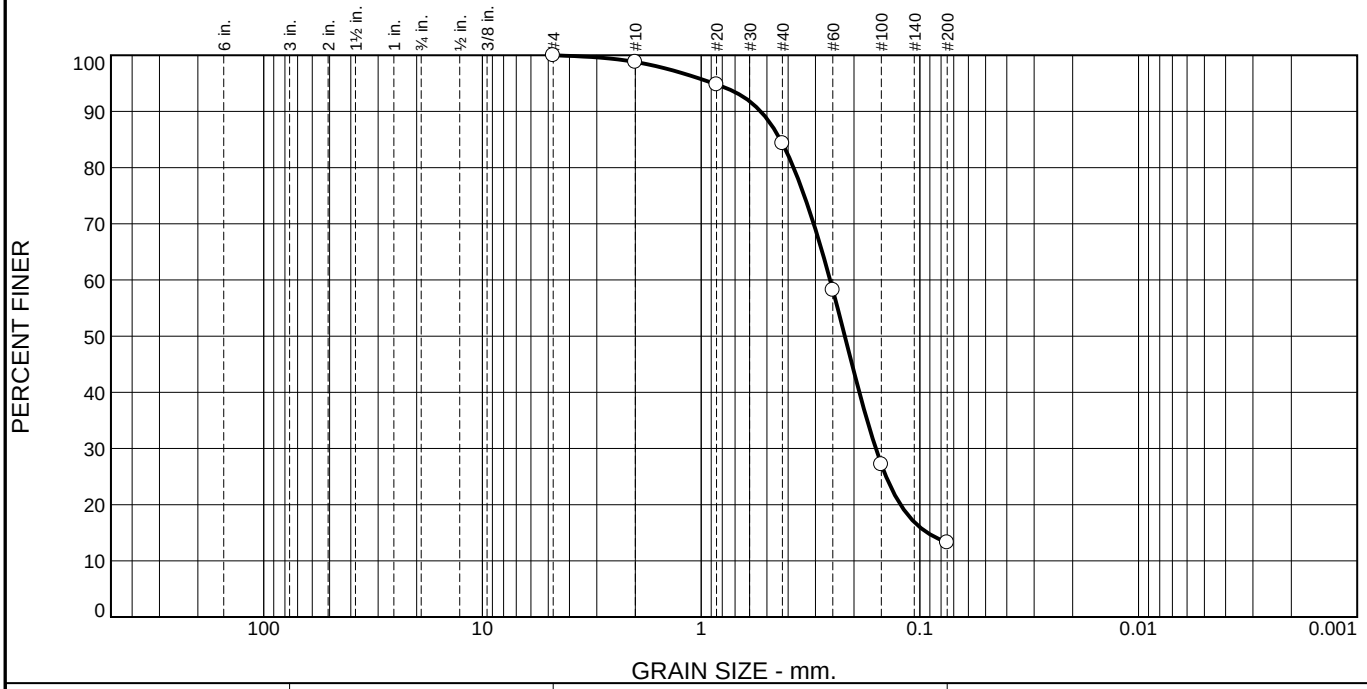
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.2	14.5	71.0	13.3	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	98.8		
#20	94.8		
#40	84.3		
#60	58.2		
#100	27.2		
#200	13.3		

* (no specification provided)

Material Description

Black and brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.5338 D_{85}= 0.4342 D_{60}= 0.2572
D_{50}= 0.2203 D_{30}= 0.1590 D_{15}= 0.0922
D_{10}= C_u= C_c=

Remarks

As received MC = 30.1%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-21 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 9/13/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

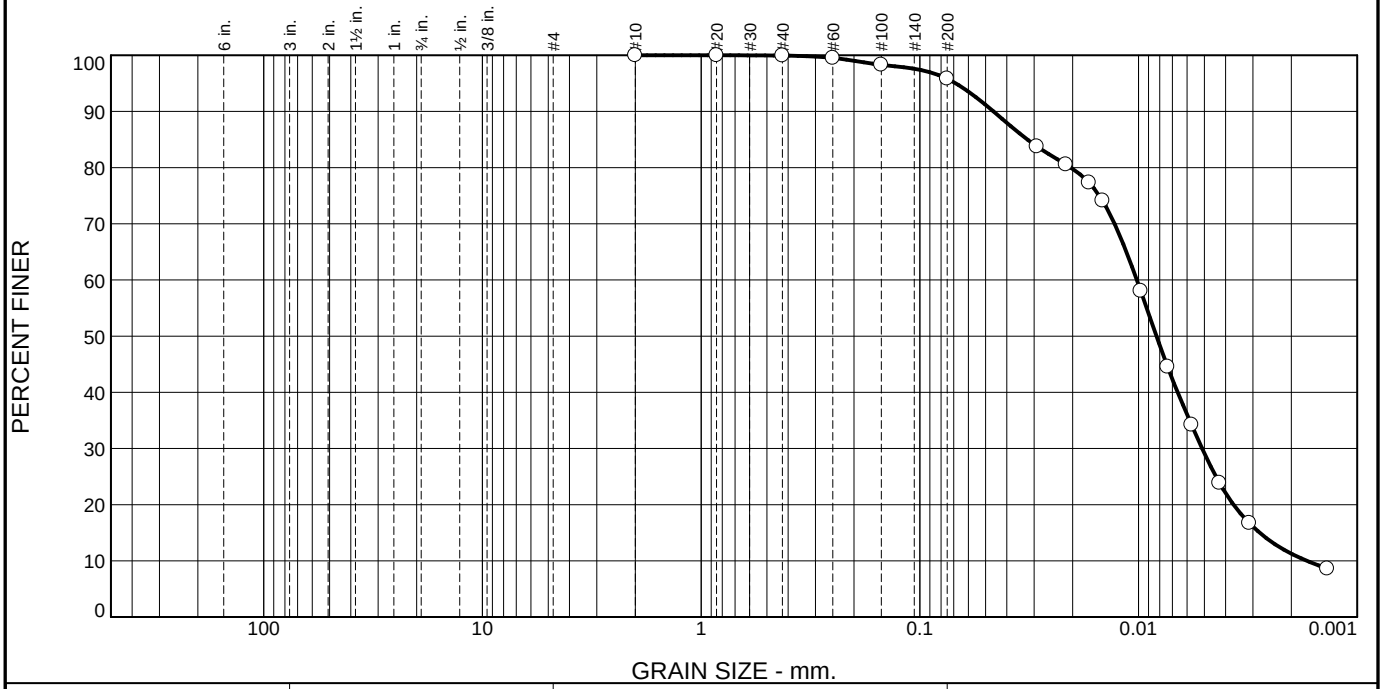
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/17/2017
Project Number:	25972-215427		
Boring Number:	B-21	Procedure:	C
Sample Number:	S-3	Temperature:	440° C
Sample Depth (ft):	4-6'		
Sample Date:	9/13/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	78.10
Wet Mass of Sample & Tin (g)	137.76
Dry Mass of Sample & Tin (g)	123.96
Mass of Water (g)	13.80
Mass of Dry Soil (g)	45.86
Moisture Content (%)	**30.1**

ASH CONTENT	
Porcelain Dish Mass (g)	78.10
Porcelain Dish + Oven Dried Soil (g)	123.96
Mass of Oven Dried Soil (g)	45.86
Mass of Dish & Burned Soil (g)	121.92
Mass of Burned Soil (g)	43.82
Mass of Organic Material (g)	2.04
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	0.0	0.0	0.0	0.1	4.1	66.6	29.2

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.5		
#100	98.3		
#200	95.8		
0.0291 mm.	83.8		
0.0215 mm.	80.5		
0.0169 mm.	77.3		
0.0146 mm.	74.1		
0.0098 mm.	58.1		
0.0074 mm.	44.5		
0.0057 mm.	34.2		
0.0043 mm.	23.9		
0.0031 mm.	16.7		
0.0014 mm.	8.6		

* (no specification provided)

Material Description

Gray silt

Atterberg Limits (ASTM D 4318)

PL= 23 **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.0461 D_{85}= 0.0322 D_{60}= 0.0102
D_{50}= 0.0083 D_{30}= 0.0051 D_{15}= 0.0028
D_{10}= 0.0017 C_u= 6.00 C_c= 1.52

Remarks

As received MC = 26.8%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: RZ/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-21 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 9/13/2017

CDM Smith

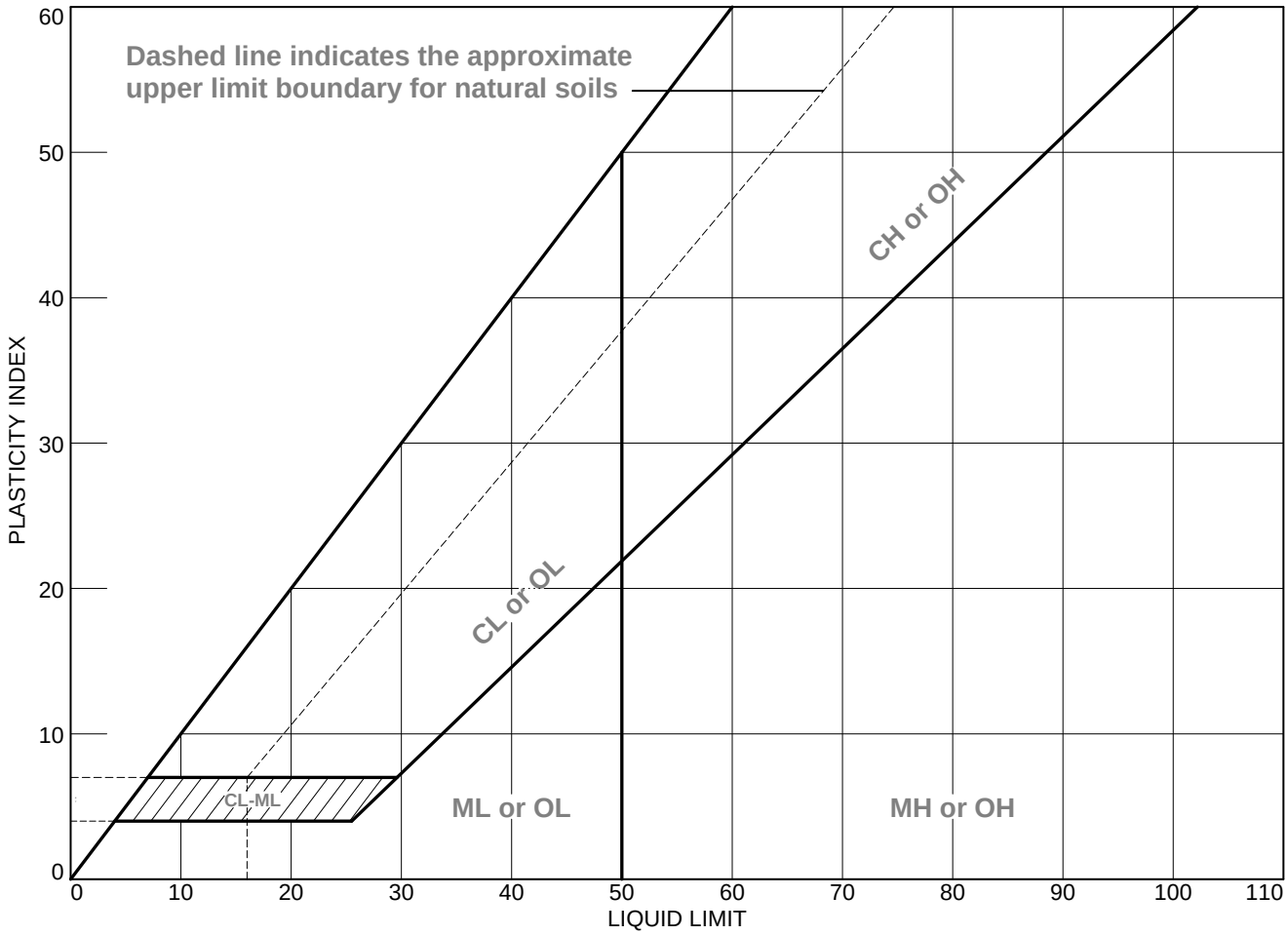
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **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-21	S-5	8-10'	26.8	23	NV	NP	ML

CDM Smith

Boston, Massachusetts

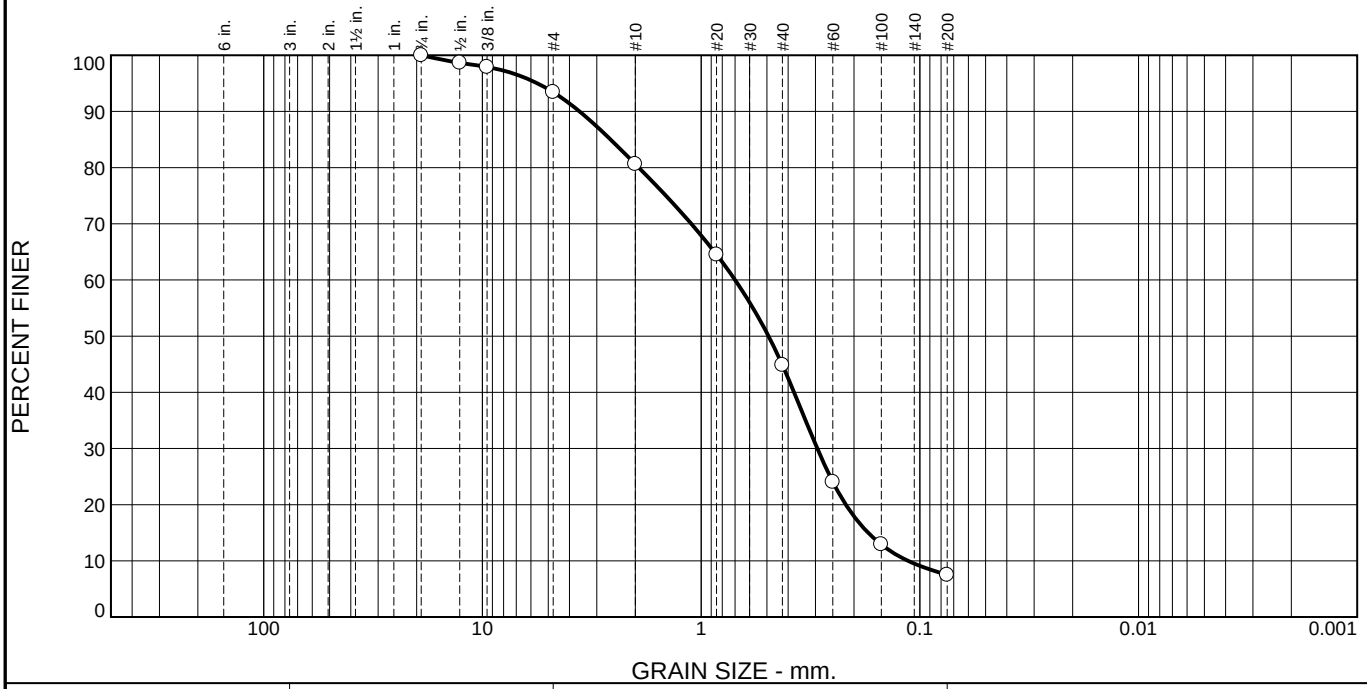
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **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	6.6	12.8	35.7	37.4	7.5	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	98.7		
.375"	97.9		
#4	93.4		
#10	80.6		
#20	64.5		
#40	44.9		
#60	24.0		
#100	12.9		
#200	7.5		

* (no specification provided)

Material Description

Light brown well-graded sand with silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SW-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 3.5978 D_{85}= 2.5943 D_{60}= 0.6995
D_{50}= 0.4917 D_{30}= 0.2944 D_{15}= 0.1723
D_{10}= 0.1132 C_u= 6.18 C_c= 1.09

Remarks

As received MC = 17.3%

Date Received: 10/5/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-21 **Depth:** 14-16'

Sample Number: S-6

Date Sampled: 9/13/2017

CDM Smith

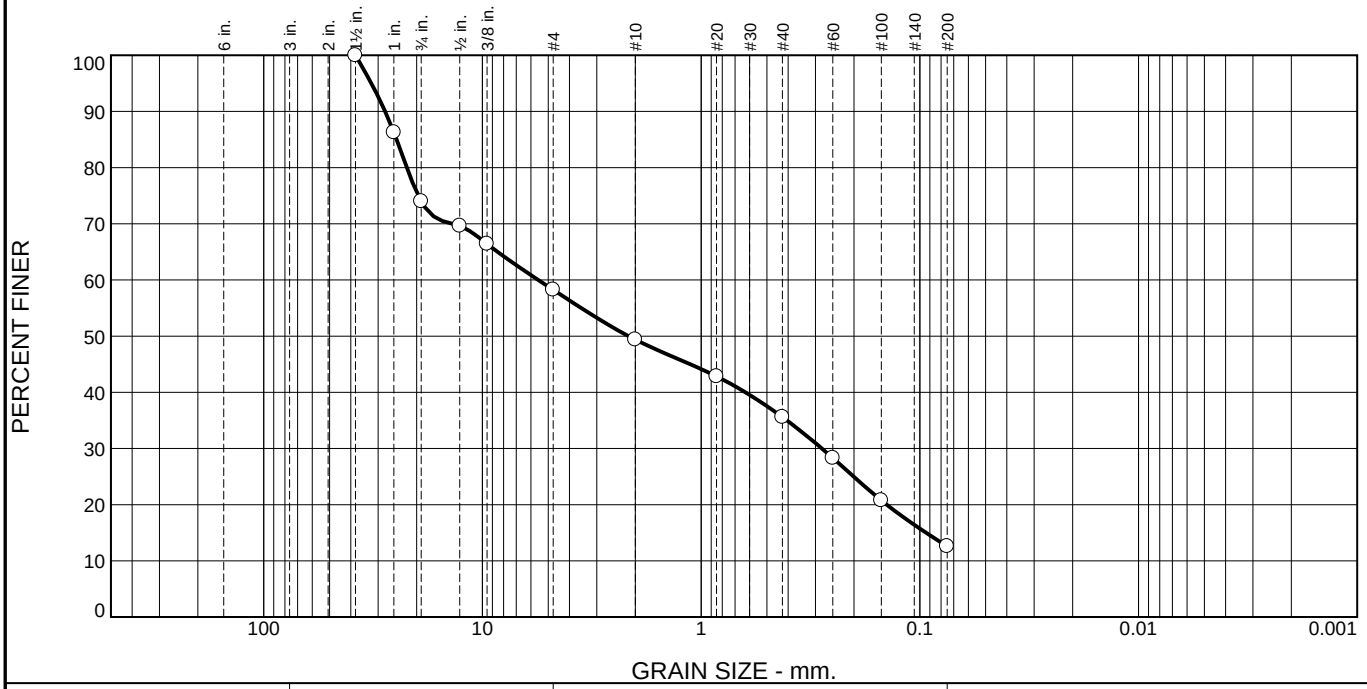
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.0	15.7	8.9	13.8	23.0	12.6	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	86.3		
.75"	74.0		
.5"	69.6		
.375"	66.4		
#4	58.3		
#10	49.4		
#20	42.8		
#40	35.6		
#60	28.3		
#100	20.8		
#200	12.6		

* (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

D_{90}= 27.8495 D_{85}= 24.6923 D_{60}= 5.5558
D_{50}= 2.1456 D_{30}= 0.2804 D_{15}= 0.0935
D_{10}= C_u= C_c=

Remarks

As received MC = 8.0%

Date Received: 10/5/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-21 **Depth:** 19-21' **Date Sampled:** 9/13/2017

Sample Number: S-7

CDM Smith

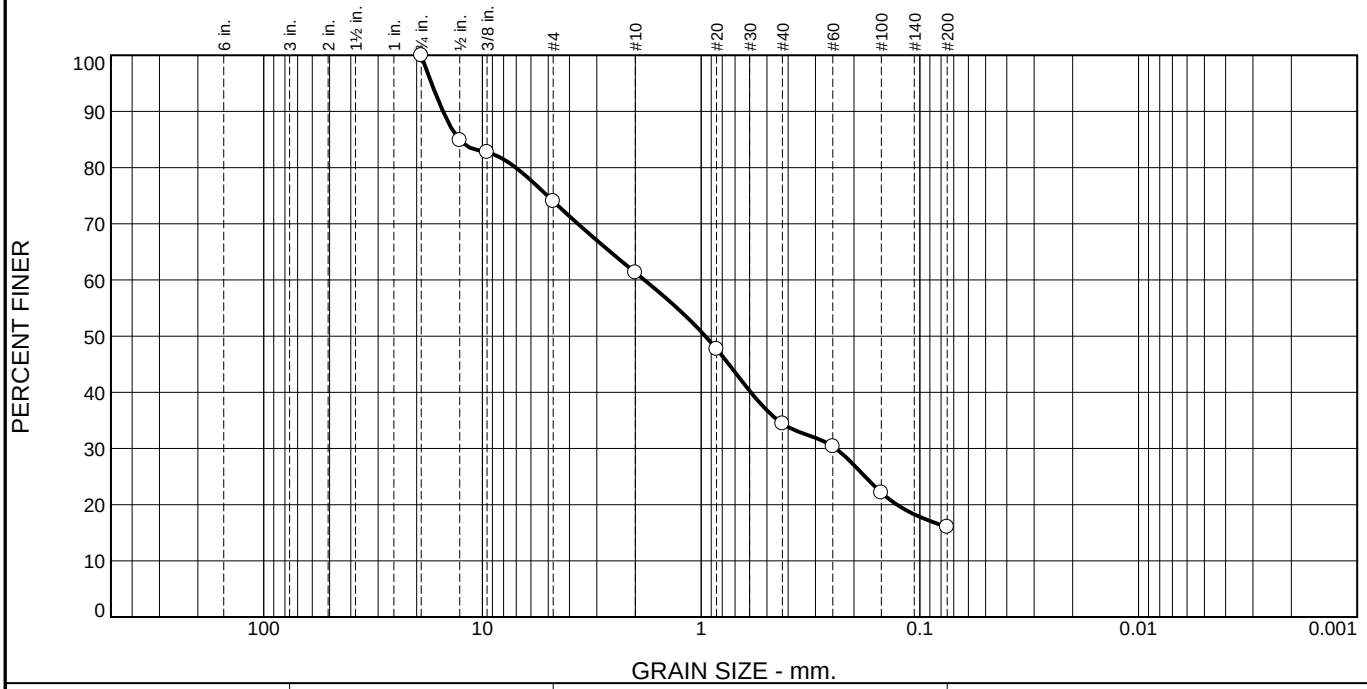
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	26.0	12.7	26.9	18.4	16.0	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	84.9		
.375"	82.8		
#4	74.0		
#10	61.3		
#20	47.7		
#40	34.4		
#60	30.4		
#100	22.1		
#200	16.0		

* (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

D_{90}= 15.1470 D_{85}= 12.7840 D_{60}= 1.8179
D_{50}= 0.9565 D_{30}= 0.2424 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 11.8%

Date Received: 10/5/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-22 **Depth:** 0-1' **Date Sampled:** 10/4/2017

Sample Number: BAG (Subbase)

CDM Smith

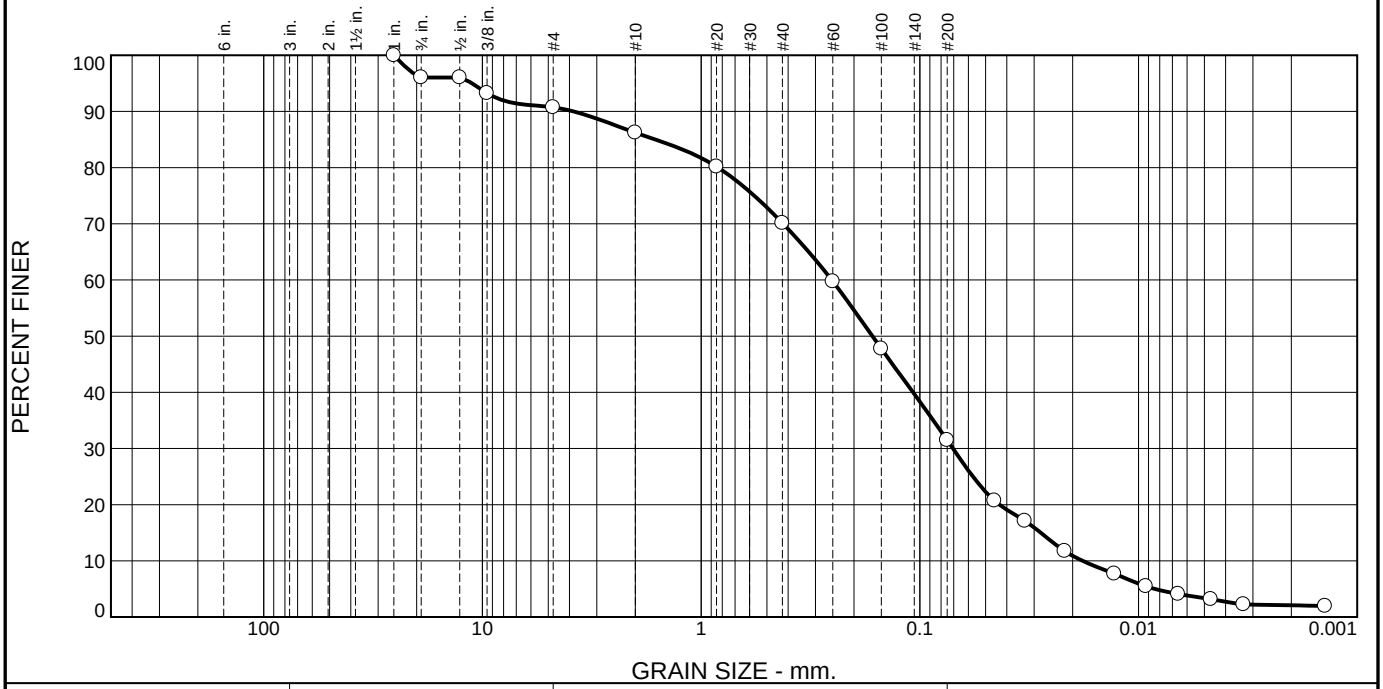
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.0	5.3	4.5	16.1	38.6	28.1	3.4

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	96.0		
.5"	96.0		
.375"	93.2		
#4	90.7		
#10	86.2		
#20	80.2		
#40	70.1		
#60	59.7		
#100	47.8		
#200	31.5		
0.0455 mm.	20.7		
0.0331 mm.	17.1		
0.0217 mm.	11.7		
0.0129 mm.	7.7		
0.0092 mm.	5.5		
0.0066 mm.	4.1		
0.0047 mm.	3.2		
0.0033 mm.	2.2		
0.0014 mm.	2.0		

* (no specification provided)

Material Description

Light brown silty sand

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 3.8364 D_{85}= 1.6187 D_{60}= 0.2529
D_{50}= 0.1647 D_{30}= 0.0705 D_{15}= 0.0280
D_{10}= 0.0180 C_u= 14.03 C_c= 1.09

Remarks

As received MC = 16.6%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-22 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 10/4/2017

CDM Smith

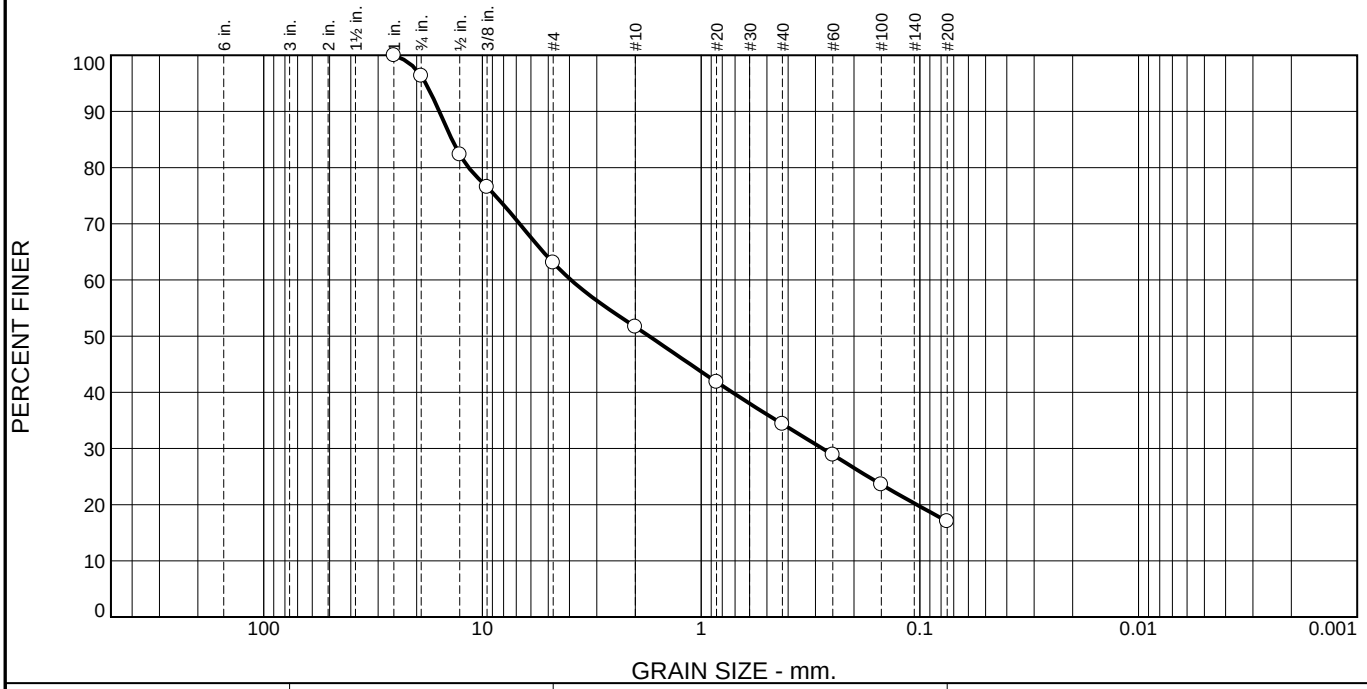
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.7	33.2	11.4	17.3	17.4	17.0	

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
.75"	96.3		
.5"	82.3		
.375"	76.6		
#4	63.1		
#10	51.7		
#20	41.8		
#40	34.4		
#60	28.9		
#100	23.6		
#200	17.0		

* (no specification provided)

Material Description

Brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM/SC **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 15.7423 D_{85}= 13.7887 D_{60}= 3.9340
D_{50}= 1.7293 D_{30}= 0.2786 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 11.4%

Date Received: 10/5/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-22 **Depth:** 14-16'
Sample Number: S-6

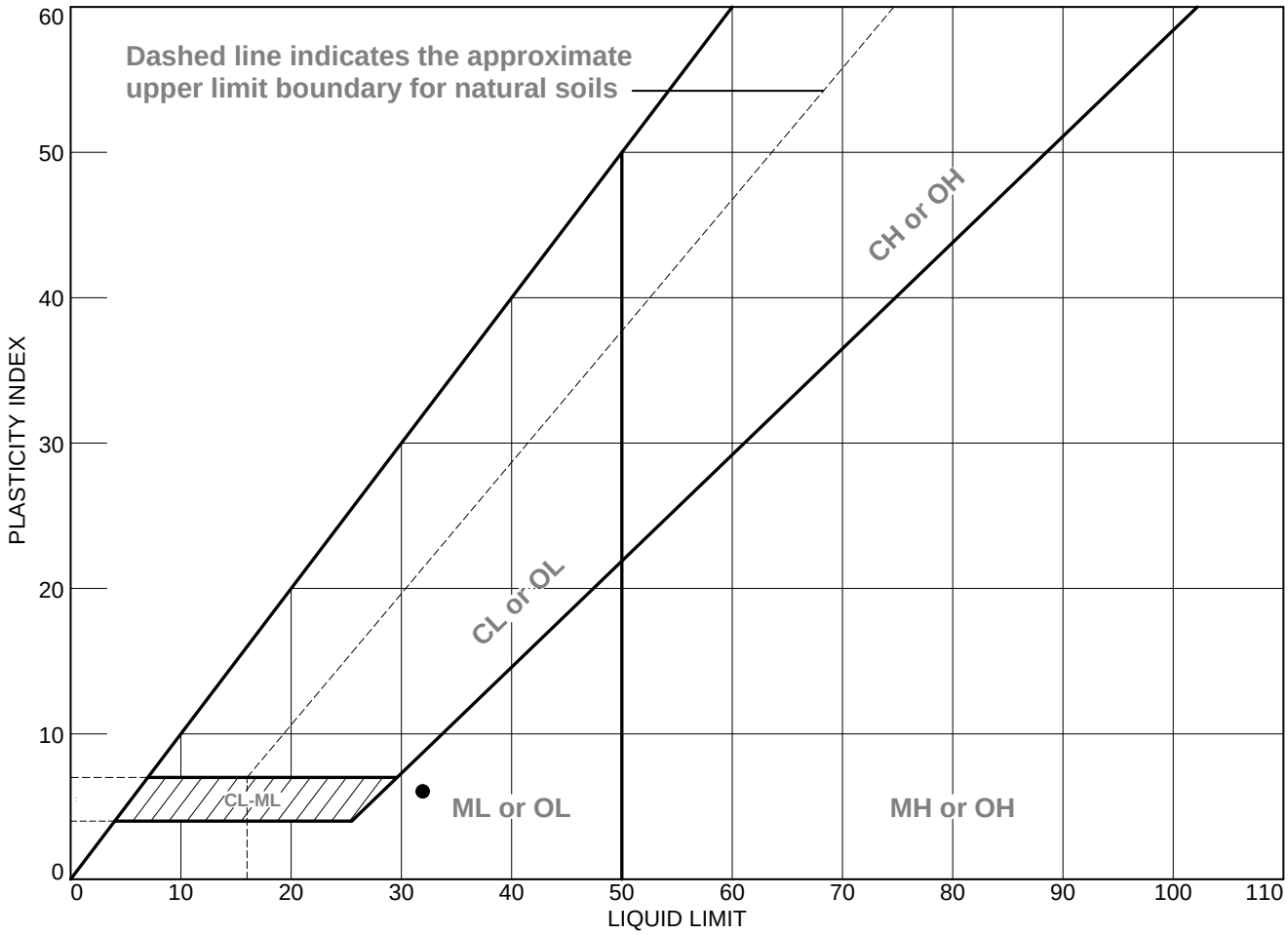
Date Sampled: 10/4/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **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-23	S-5	8-10'	32.5	26	32	6	ML

CDM Smith

Boston, Massachusetts

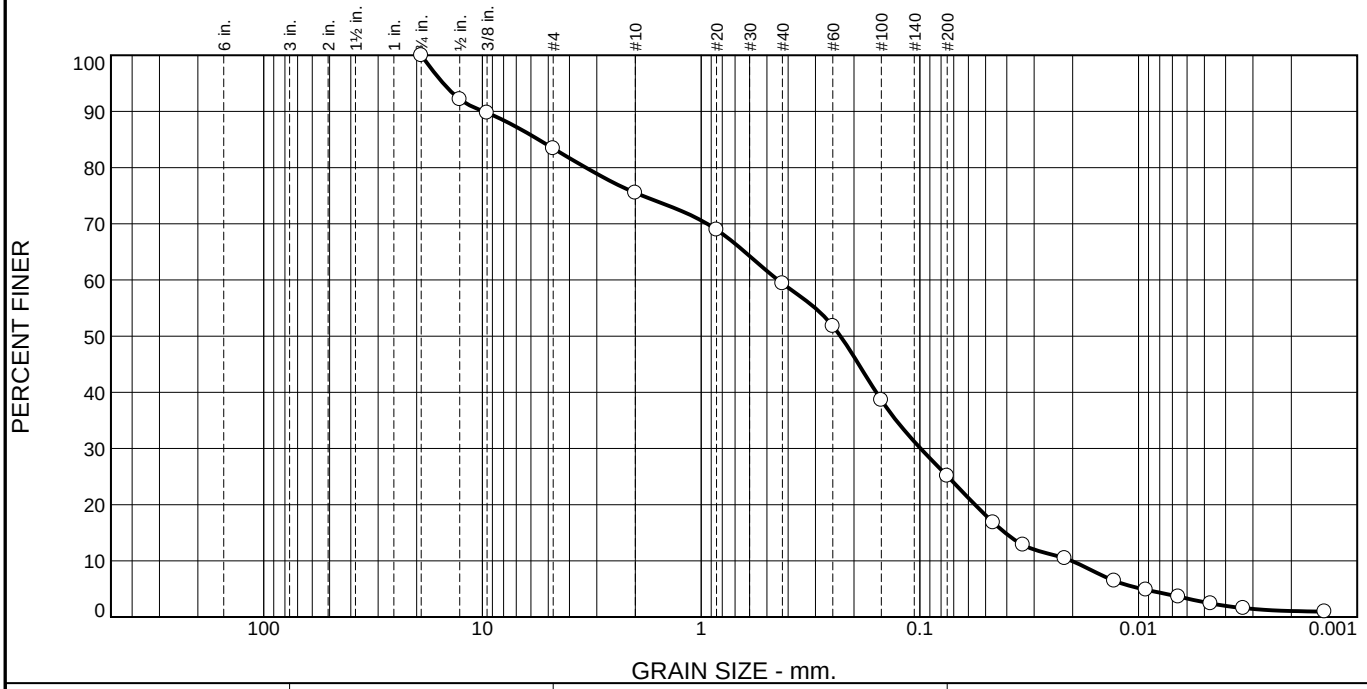
Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No.: 25972-215427 **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	16.6	7.9	16.1	34.3	22.5	2.6

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75"	100.0		
.5"	92.2		
.375"	89.8		
#4	83.4		
#10	75.5		
#20	68.9		
#40	59.4		
#60	51.8		
#100	38.6		
#200	25.1		
0.0462 mm.	16.8		
0.0337 mm.	12.9		
0.0217 mm.	10.5		
0.0129 mm.	6.5		
0.0092 mm.	4.9		
0.0066 mm.	3.6		
0.0047 mm.	2.4		
0.0033 mm.	1.6		
0.0014 mm.	1.0		

* (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-2-4(0)

Coefficients

D_{90}= 9.8642 D_{85}= 5.5485 D_{60}= 0.4454
D_{50}= 0.2307 D_{30}= 0.0992 D_{15}= 0.0408
D_{10}= 0.0202 C_u= 22.00 C_c= 1.09

Remarks

As received MC = 13.7%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: MP/GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-23 **Depth:** 14-16'
Sample Number: S-6

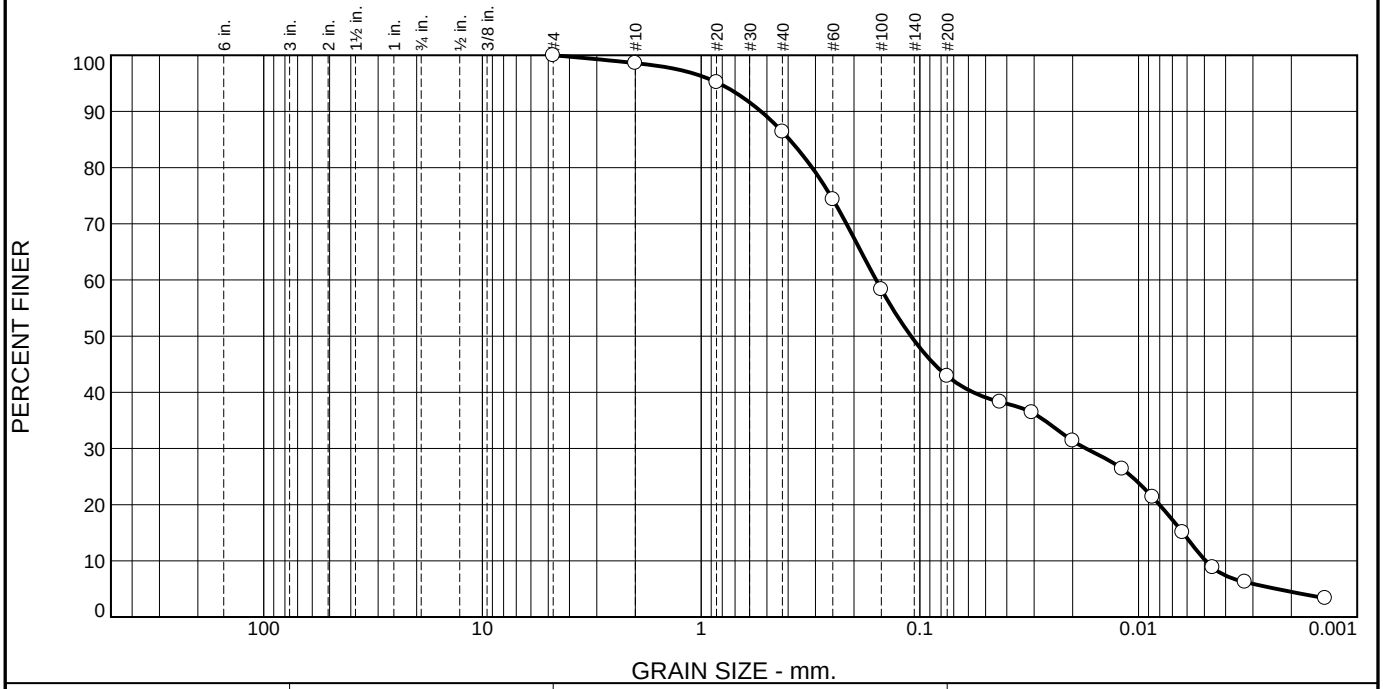
Date Sampled: 9/12/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	12.2	43.5	32.6	10.3

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	98.6		
#20	95.2		
#40	86.4		
#60	74.3		
#100	58.3		
#200	42.9		
0.0430 mm.	38.3		
0.0308 mm.	36.4		
0.0200 mm.	31.4		
0.0119 mm.	26.4		
0.0086 mm.	21.4		
0.0063 mm.	15.1		
0.0046 mm.	8.8		
0.0033 mm.	6.3		
0.0014 mm.	3.4		

* (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-4(0)

Coefficients

D_{90}= 0.5324 D_{85}= 0.3940 D_{60}= 0.1584
D_{50}= 0.1098 D_{30}= 0.0174 D_{15}= 0.0063
D_{10}= 0.0049 C_u= 32.16 C_c= 0.39

Remarks

As received MC = 22.3%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: MP/GW

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-24 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 9/12/2017

CDM Smith

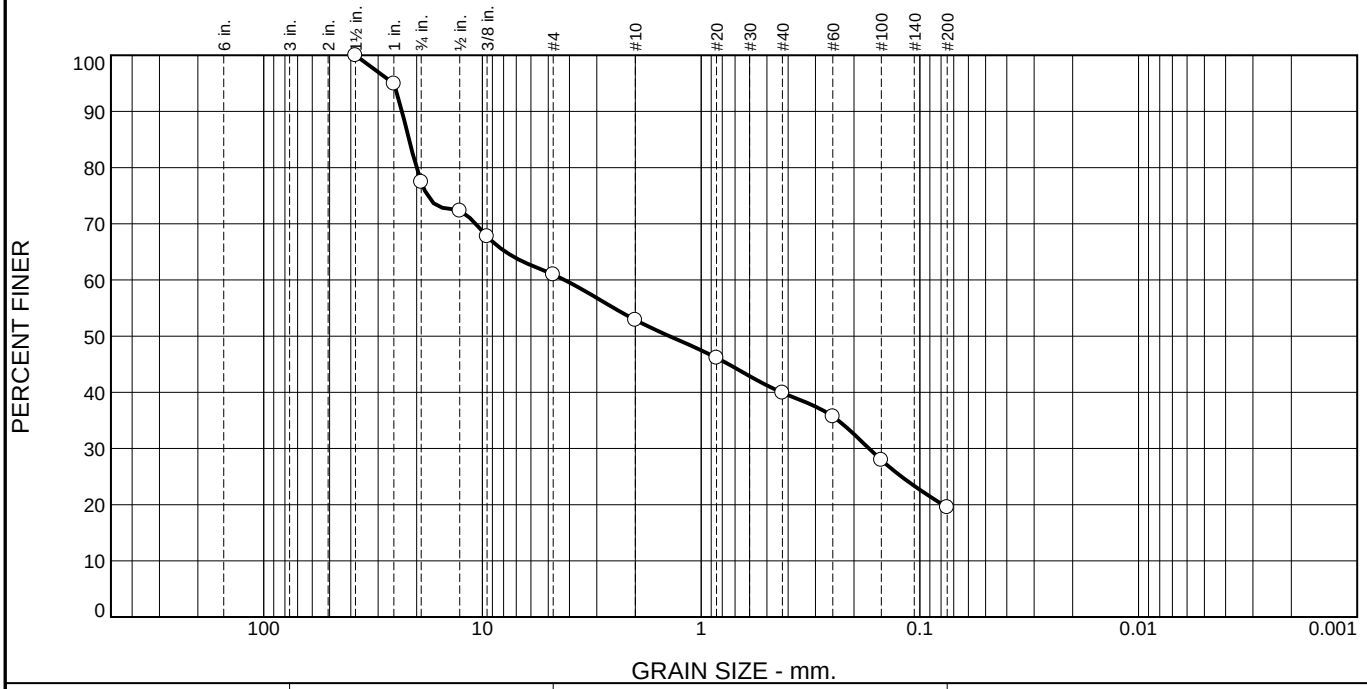
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.6	16.4	8.1	13.0	20.4	19.5	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	94.9		
3/4"	77.4		
1/2"	72.3		
3/8"	67.8		
#4	61.0		
#10	52.9		
#20	46.1		
#40	39.9		
#60	35.7		
#100	27.9		
#200	19.5		

* (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

D_{90}= 23.3370 D_{85}= 21.6582 D_{60}= 4.2093
D_{50}= 1.3954 D_{30}= 0.1708 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 8.7%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-24 **Depth:** 14-16'
Sample Number: S-6

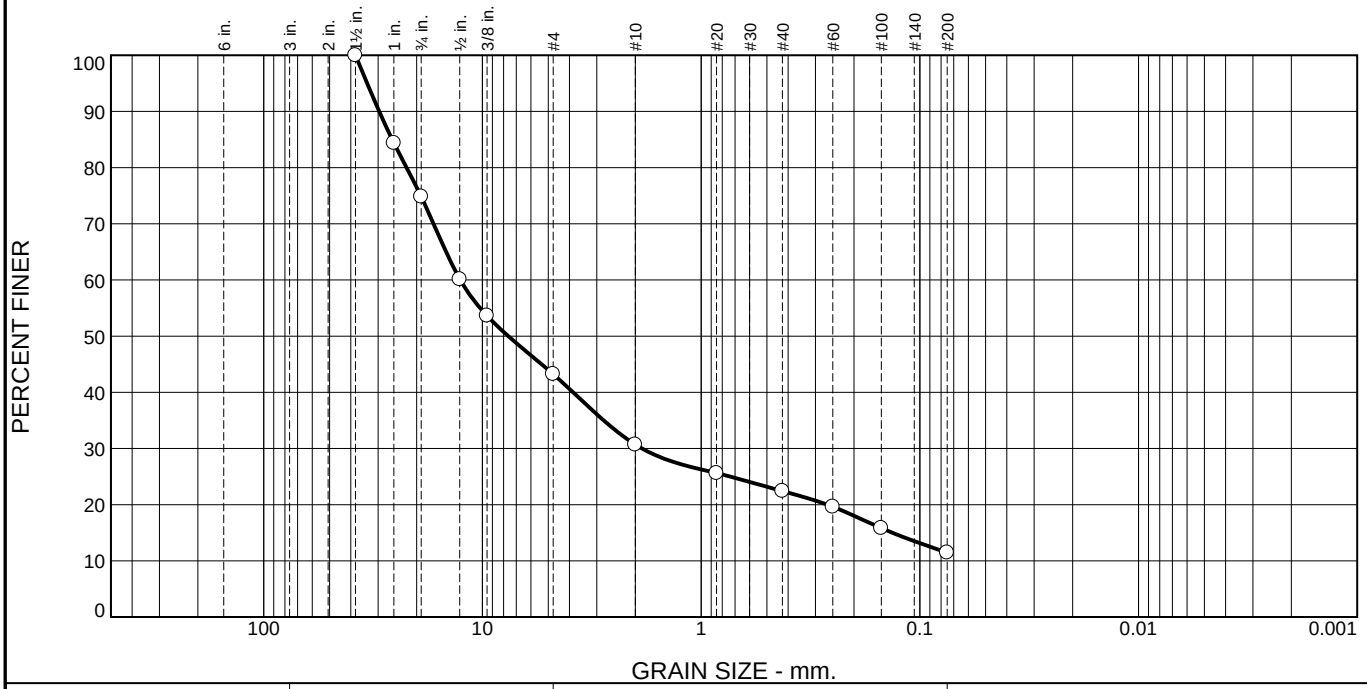
Date Sampled: 9/12/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.2	31.6	12.5	8.3	10.9	11.5	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	84.4		
3/4"	74.8		
1/2"	60.1		
3/8"	53.6		
#4	43.2		
#10	30.7		
#20	25.6		
#40	22.4		
#60	19.6		
#100	15.8		
#200	11.5		

* (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

D_{90}= 29.6476 D_{85}= 25.8668 D_{60}= 12.6451
D_{50}= 7.6160 D_{30}= 1.8652 D_{15}= 0.1335
D_{10}= C_u= C_c=

Remarks

As received MC = 7.0%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-24 **Depth:** 19-21' **Date Sampled:** 9/12/2017

Sample Number: S-7

CDM Smith

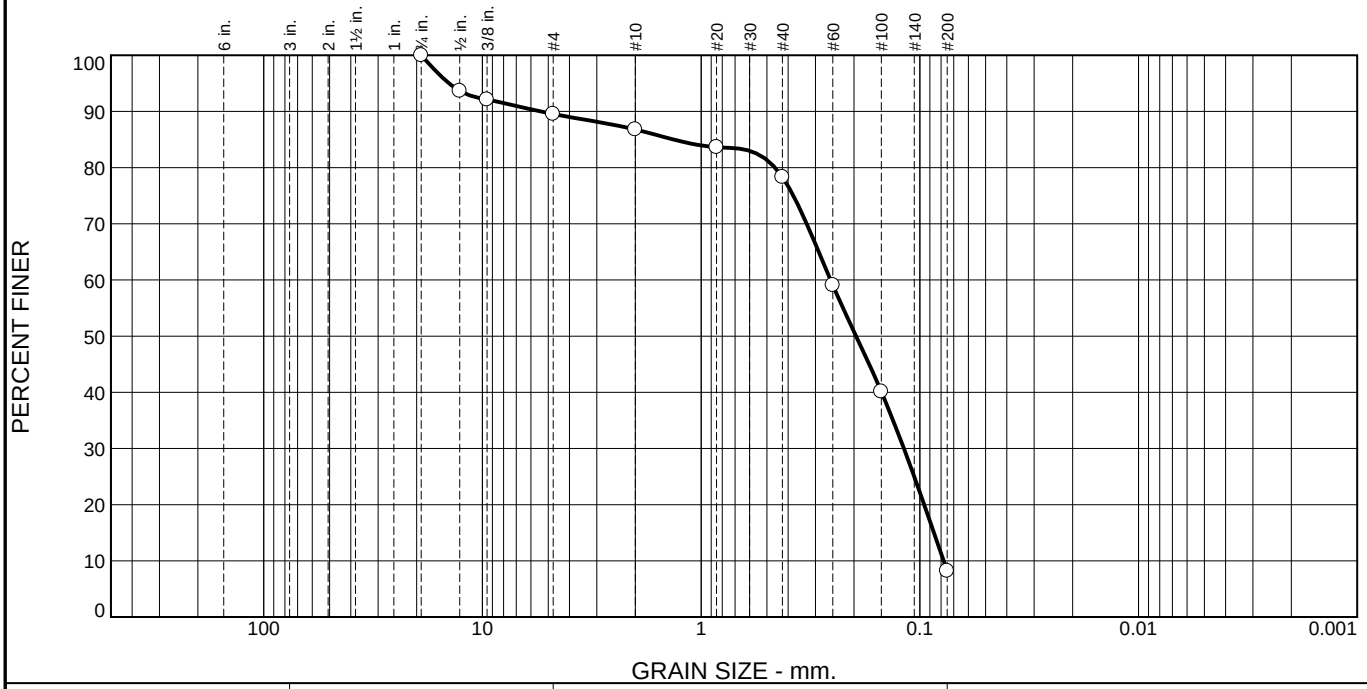
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.5	2.7	8.5	70.1	8.2	

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"	92.1		
#4	89.5		
#10	86.8		
#20	83.6		
#40	78.3		
#60	59.1		
#100	40.1		
#200	8.2		

* (no specification provided)

Material Description

Black and redish 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

D_{90}= 5.4079 D_{85}= 1.3352 D_{60}= 0.2560
D_{50}= 0.1956 D_{30}= 0.1183 D_{15}= 0.0861
D_{10}= 0.0778 C_u= 3.29 C_c= 0.70

Remarks

As received MC = 17.6%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-25 **Depth:** 4-6'
Sample Number: S-3

Date Sampled: 9/11/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

CDM Smith

Geotechnical Engineering Laboratory

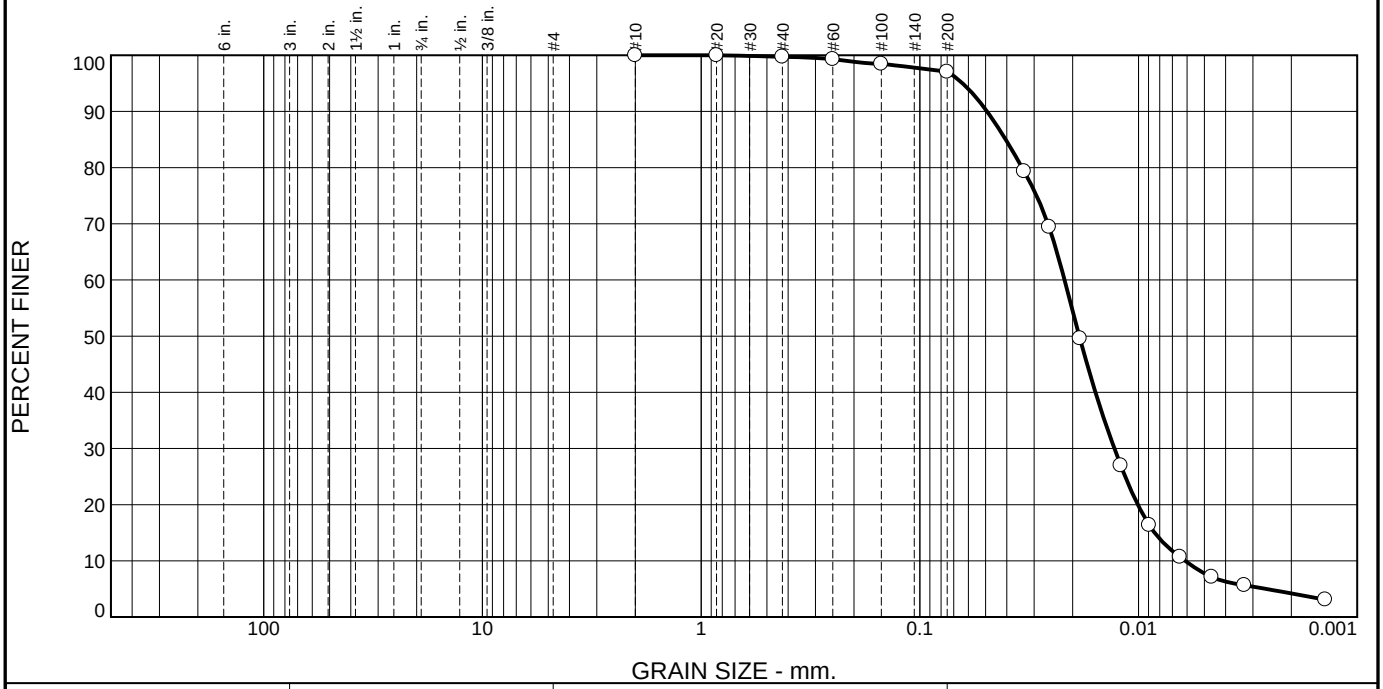
Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Town of Salem		
Project Name:	South Broadway WM Replacement	Tested By:	MP
Project Location:	Salem, NH	Test Date:	10/17/2017
Project Number:	25972-215427		
Boring Number:	B-25	Procedure:	C
Sample Number:	S-3	Temperature:	440° C
Sample Depth (ft):	4-6'		
Sample Date:	9/11/2017		

AS RECEIVED MOISTURE CONTENT	
Tin Mass (g)	90.27
Wet Mass of Sample & Tin (g)	164.43
Dry Mass of Sample & Tin (g)	153.35
Mass of Water (g)	11.08
Mass of Dry Soil (g)	63.08
Moisture Content (%)	**17.6**

ASH CONTENT	
Porcelain Dish Mass (g)	90.27
Porcelain Dish + Oven Dried Soil (g)	153.35
Mass of Oven Dried Soil (g)	63.08
Mass of Dish & Burned Soil (g)	151.86
Mass of Burned Soil (g)	61.59
Mass of Organic Material (g)	1.49
Ash Content (%)	97.6
Organic Content (%)	**2.4**

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	2.6	89.3	7.8

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.7		
#60	99.3		
#100	98.5		
#200	97.1		
0.0334 mm.	79.3		
0.0256 mm.	69.4		
0.0185 mm.	49.6		
0.0121 mm.	27.0		
0.0089 mm.	16.4		
0.0065 mm.	10.7		
0.0046 mm.	7.1		
0.0033 mm.	5.7		
0.0014 mm.	3.1		

* (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}= 0.0493 D_{85}= 0.0405 D_{60}= 0.0218
D_{50}= 0.0186 D_{30}= 0.0129 D_{15}= 0.0084
D_{10}= 0.0061 C_u= 3.56 C_c= 1.25

Remarks

As received MC = 28.8%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-25 **Depth:** 14-16'

Sample Number: S-6

Date Sampled: 9/11/2017

CDM Smith

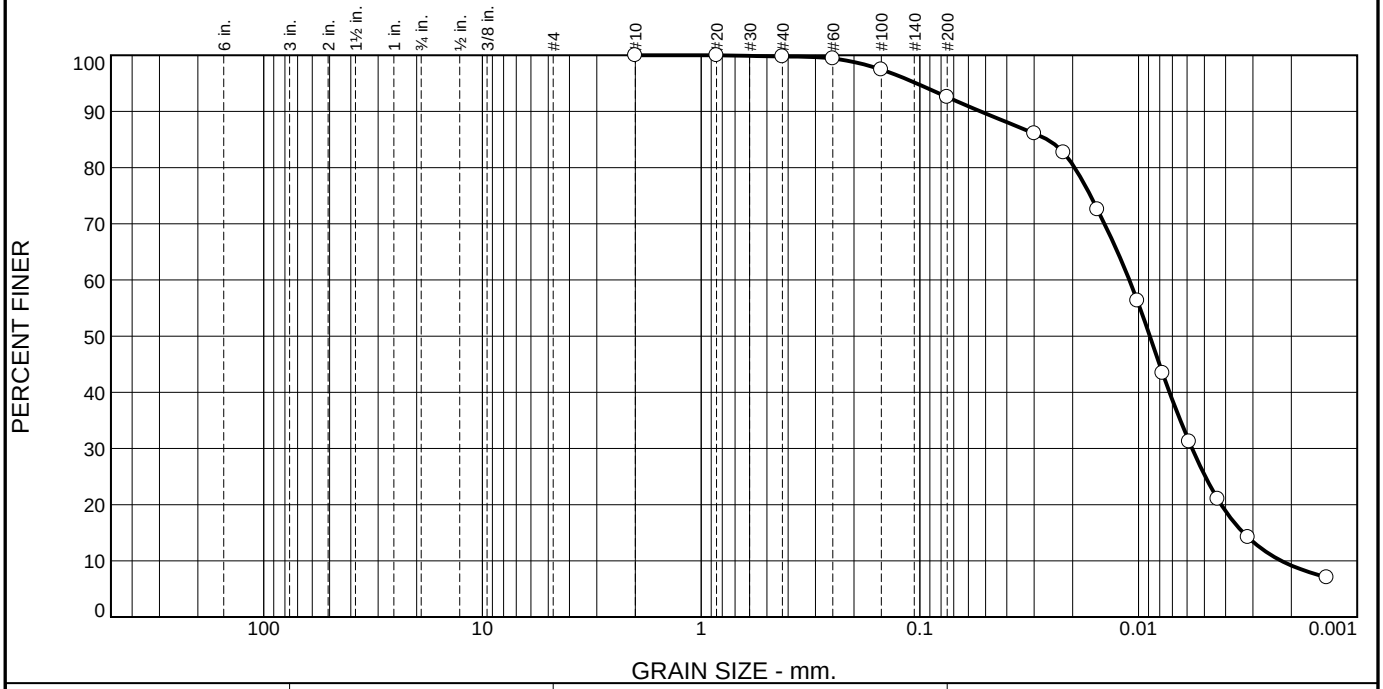
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	7.2	67.3	25.3

Test Results (ASTM D422 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.8		
#60	99.4		
#100	97.5		
#200	92.6		
0.0300 mm.	86.1		
0.0220 mm.	82.7		
0.0154 mm.	72.5		
0.0101 mm.	56.3		
0.0078 mm.	43.4		
0.0059 mm.	31.2		
0.0043 mm.	21.0		
0.0032 mm.	14.2		
0.0014 mm.	7.0		

* (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}= 0.0527 D_{85}= 0.0261 D_{60}= 0.0110
D_{50}= 0.0089 D_{30}= 0.0057 D_{15}= 0.0033
D_{10}= 0.0022 C_u= 4.95 C_c= 1.32

Remarks

As received MC = 29.1%

Date Received: 10/5/2017 **Date Tested:** 10/19/2017

Tested By: GW/MP

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-25 **Depth:** 19-21' **Date Sampled:** 9/11/2017

Sample Number: S-7

CDM Smith

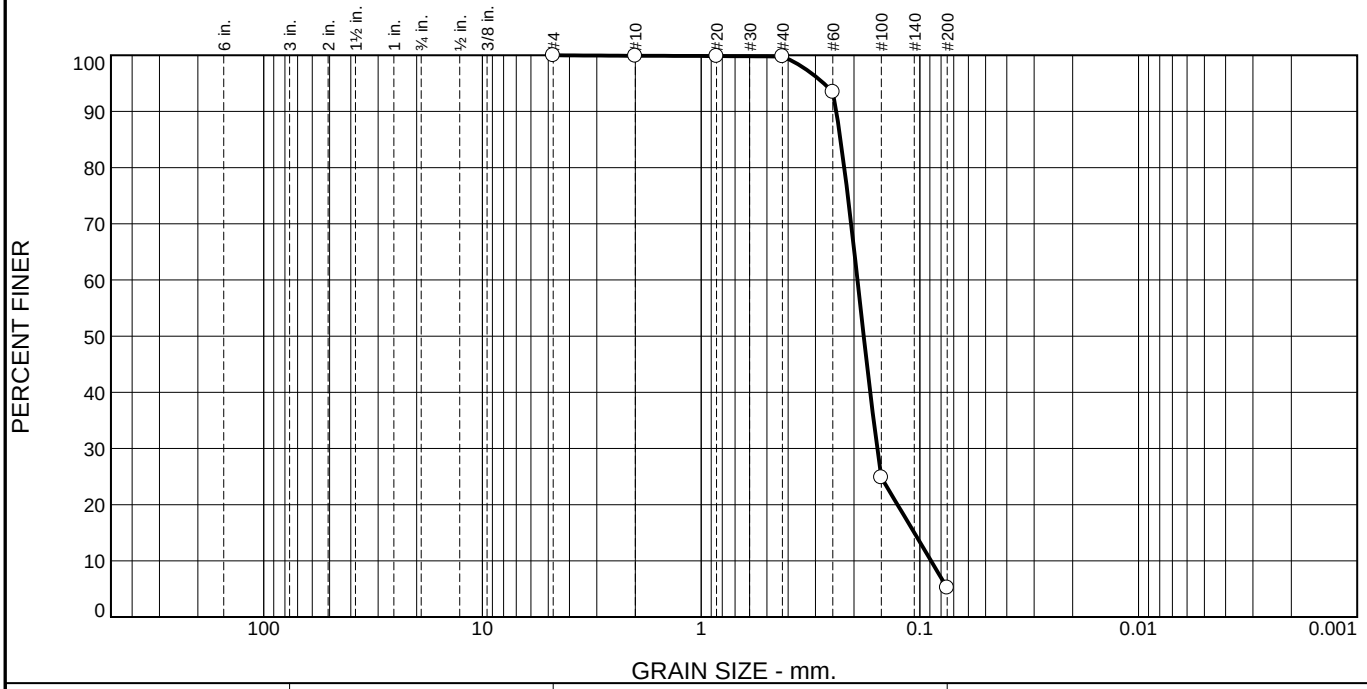
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	94.6	5.2	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.8		
#60	93.5		
#100	24.8		
#200	5.2		

* (no specification provided)

Material Description

Light 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

D_{90}= 0.2410 D_{85}= 0.2304 D_{60}= 0.1927
D_{50}= 0.1804 D_{30}= 0.1566 D_{15}= 0.1060
D_{10}= 0.0888 C_u= 2.17 C_c= 1.43

Remarks

As received MC = 24.8%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-26 **Depth:** 8-10'

Sample Number: S-5

Date Sampled: 9/11/2017

CDM Smith

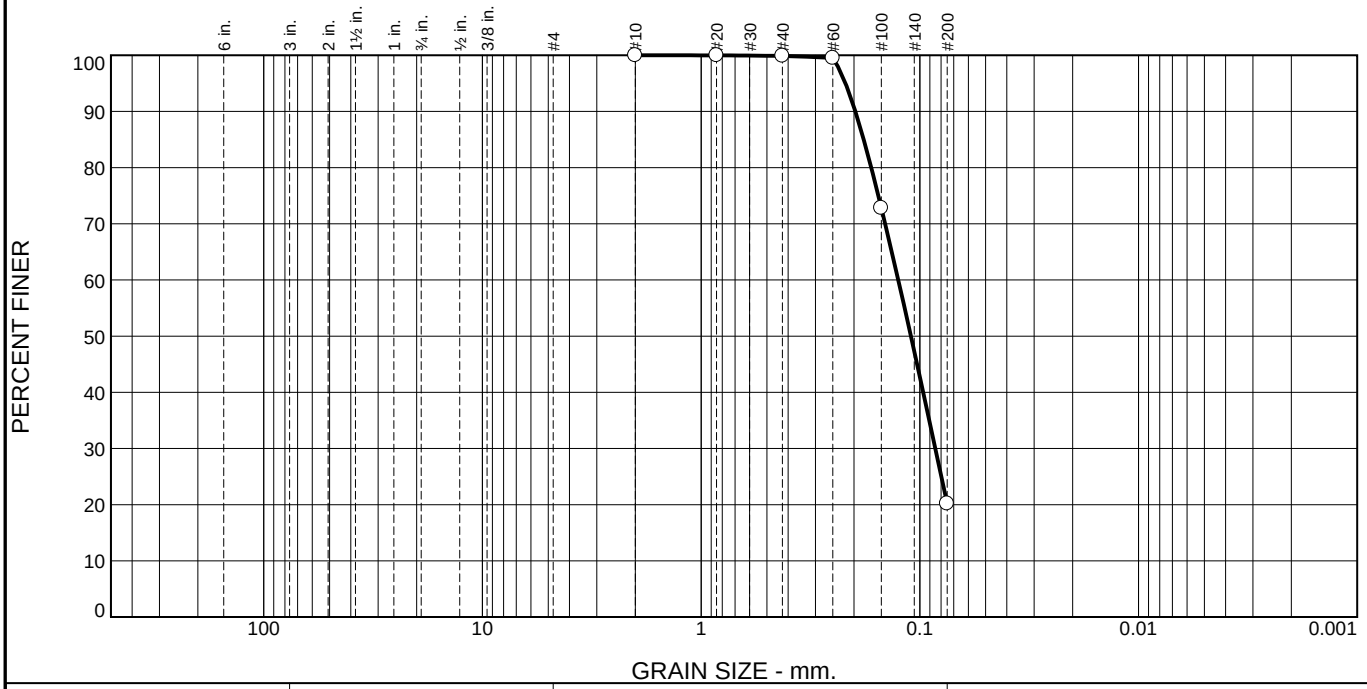
Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	79.7	20.2	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.5		
#100	72.8		
#200	20.2		

* (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

D_{90}= 0.1970 D_{85}= 0.1805 D_{60}= 0.1255
D_{50}= 0.1099 D_{30}= 0.0849 D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 27.5%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-26 **Depth:** 14-16'
Sample Number: S-6

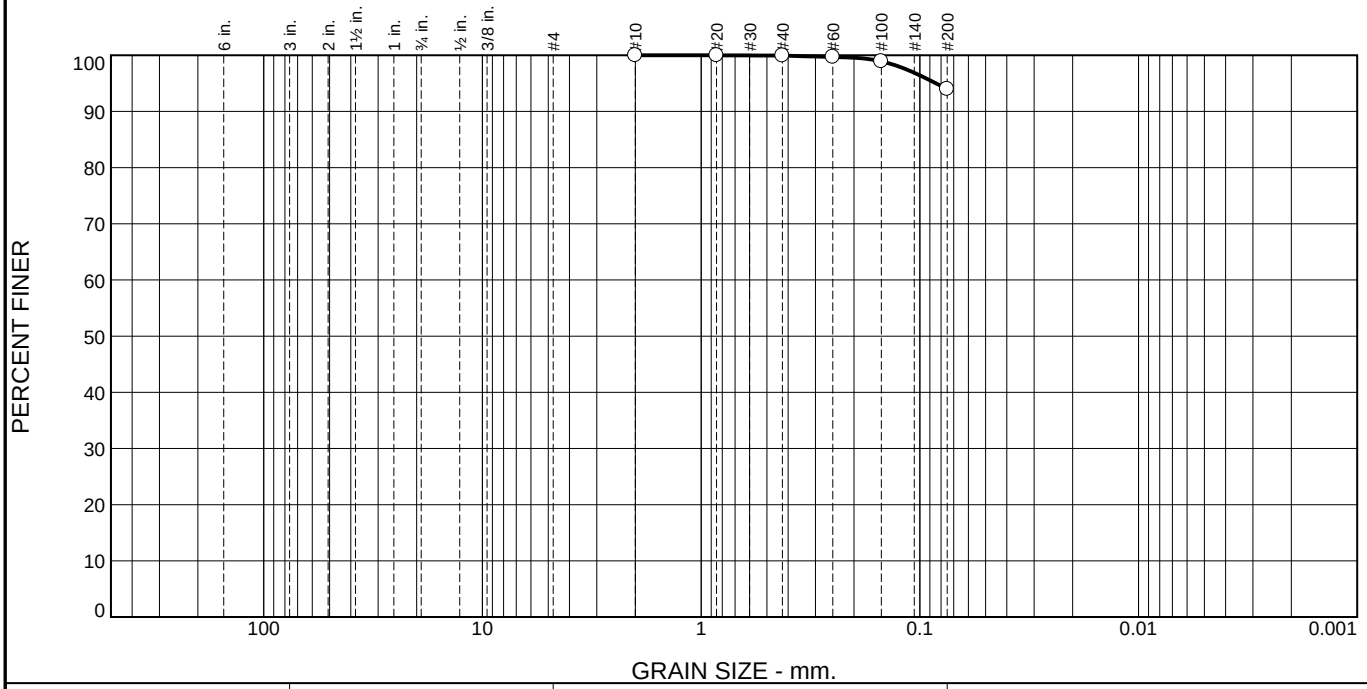
Date Sampled: 9/11/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem
Project: South Broadway Watermain Replacement
Salem, NH
Project No: 25972-215427 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	5.9	94.0	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.7		
#100	98.9		
#200	94.0		

* (no specification provided)

Material Description

Brown and gray silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

As received MC = 26.5%

Date Received: 10/4/2017 **Date Tested:** 10/17/2017

Tested By: RZ

Checked By: MP

Title: Laboratory Manager

Source of Sample: B-26 **Depth:** 19-21'

Sample Number: S-7

Date Sampled: 9/11/2017

CDM Smith

Boston, Massachusetts

Client: Town of Salem

Project: South Broadway Watermain Replacement
Salem, NH

Project No: 25972-215427 **Figure**

APPENDIX G

ENVIRONMENTAL TESTING RESULTS AND MONITORING WELL WATER LEVELS

TEST BORING SOIL ANALYTICAL RESULTS

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER & SEWER REHABILITATION

LOCATION						B-2_S-1_0'-10'		B-3_S-1_0'-10'		B-4_S-1_0'-10'		B-11_S-1_0'-10'		B-15_S-1_4'-5'	
SAMPLING DATE						4/11/2017		4/11/2017		4/10/2017		4/12/2017		4/13/2017	
LAB SAMPLE ID						L1711282-02, L1711580-01		L1711282-01		L1711074-01 L1711576-01		L1711530-01		L1711656-01	
	CasNum	Units	COMM-97[2] Unlined Landfill	COMM-97[2] Lined Landfill	Table 600-2 Soil Remediation Standards[1]	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
General Chemistry															
Solids, Total	NONE	%	NE	NE	NE	73.7		74.8		81.8		86.6		72.6	
Total Metals															
Arsenic, Total	7440-38-2	mg/kg	40	40	11	9		7.1		3.9		2.2		2.7	
Barium, Total	7440-39-3	mg/kg	NE	NE	1000	63		38		23		13		8.7	
Cadmium, Total	7440-43-9	mg/kg	NE	NE	33	0.57		0.53	U	0.48	U	0.45	U	0.54	U
Chromium, Total	7440-47-3	mg/kg	1000	1000	NE	26		21		18		8.7		6.8	
Lead, Total	7439-92-1	mg/kg	1000	2000	400	240		50		120		21		9.7	
Mercury, Total	7439-97-6	mg/kg	10	10	7	0.19		0.1		0.08	U	0.07	U	0.09	U
Selenium, Total	7782-49-2	mg/kg	NE	NE	180	1	U	1.1	U	0.96	U	0.89	U	1.1	U
Silver, Total	7440-22-4	mg/kg	NE	NE	89	0.53	U	0.53	U	0.48	U	0.45	U	0.54	U
TCLP Metals by EPA 1311															
Lead, TCLP	7439-92-1	mg/l	5	5	NE	0.5	U	-	-	0.5	U	-	-	-	-
PCB by GC															
Aroclor 1016	12674-11-2	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1221	11104-28-2	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1232	11141-16-5	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1242	53469-21-9	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1248	12672-29-6	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1254	11097-69-1	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1260	11096-82-5	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1262	37324-23-5	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Aroclor 1268	11100-14-4	mg/kg	NE	NE	NE	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
PCBs, Total	1336-36-3	mg/kg	NE	NE	1	0.0448	U	0.0428	U	0.0385	U	0.0376	U	0.0432	U
Petroleum Hydrocarbon Quantitation															
TPH	NONE	mg/kg	2500	5000	10000	121		74.1		39	U	75.4		44.2	U
Semivolatile Organics by GC/MS															
1,2,4-Trichlorobenzene	120-82-1	mg/kg	NE	NE	19	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
1,2-Dichlorobenzene	95-50-1	mg/kg	NE	NE	88	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
1,3-Dichlorobenzene	541-73-1	mg/kg	NE	NE	150	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
1,4-Dichlorobenzene	106-46-7	mg/kg	NE	NE	7	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
1-Methylnaphthalene	90-12-0	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2,4,5-Trichlorophenol	95-95-4	mg/kg	NE	NE	24	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2,4,6-Trichlorophenol	88-06-2	mg/kg	NE	NE	0.7	0.13	U	0.13	U	0.12	U	0.11	U	0.14	U
2,4-Dichlorophenol	120-83-2	mg/kg	NE	NE	0.7	0.2	U	0.2	U	0.18	U	0.17	U	0.2	U
2,4-Dimethylphenol	105-67-9	mg/kg	NE	NE	4	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2,4-Dinitrophenol	51-28-5	mg/kg	NE	NE	0.7	1.1	U	1	U	0.97	U	0.9	U	1.1	U
2,4-Dinitrotoluene	121-14-2	mg/kg	NE	NE	0.7	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2,6-Dinitrotoluene	606-20-2	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2-Chloronaphthalene	91-58-7	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2-Chlorophenol	95-57-8	mg/kg	NE	NE	2	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2-Methylnaphthalene	91-57-6	mg/kg	NE	NE	96	0.27	U	0.26	U	0.24	U	0.22	U	0.27	U
2-Methylphenol	95-48-7	mg/kg	NE	NE	0.9	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2-Nitroaniline	88-74-4	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
2-Nitrophenol	88-75-5	mg/kg	NE	NE	NE	0.48	U	0.48	U	0.44	U	0.4	U	0.49	U
3,3'-Dichlorobenzidine	91-94-1	mg/kg	NE	NE	0.7	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
3-Methylphenol/4-Methylphenol	108-39-4	mg/kg	NE	NE	NE	0.32	U	0.32	U	0.29	U	0.27	U	0.33	U
3-Nitroaniline	99-09-2	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
4,6-Dinitro-o-cresol	534-52-1	mg/kg	NE	NE	NE	0.58	U	0.57	U	0.53	U	0.48	U	0.59	U
4-Bromophenyl phenyl ether	101-55-3	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
4-Chloroaniline	106-47-8	mg/kg	NE	NE	1.3	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
4-Chlorophenyl phenyl ether	7005-72-3	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
4-Nitroaniline	100-01-6	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
4-Nitrophenol	100-02-7	mg/kg	NE	NE	NE	0.31	U	0.31	U	0.28	U	0.26	U	0.32	U
Acenaphthene	83-32-9	mg/kg	NE	NE	340	0.18	U	0.18	U	0.16	U	0.15	U	0.18	U
Acenaphthylene	208-96-8	mg/kg	NE	NE	490	0.36		0.18	U	0.16	U	0.22		0.18	U
Aniline	62-53-3	mg/kg	NE	NE	NE	0.27	U	0.26	U	0.24	U	0.22	U	0.27	U
Anthracene	120-12-7	mg/kg	NE	NE	1000	0.23		0.17		0.12	U	0.11	U	0.14	U
Azobenzene	103-33-3	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Benzidine	92-87-5	mg/kg	NE	NE	0.01	0.74	U	0.73	U	0.67	U	0.62	U	0.76	U
Benzo(a)anthracene	56-55-3	mg/kg	NE	NE	1	0.76		0.72		0.12	U	0.25		0.14	U
Benzo(a)pyrene	50-32-8	mg/kg	NE	NE	0.7	0.92		1.5		0.16	U	0.36		0.18	U
Benzo(b)fluoranthene	205-99-2	mg/kg	NE	NE	1	1.4		1.2		0.12	U	0.46		0.14	U
Benzo(ghi)perylene	191-24-2	mg/kg	NE	NE	NE	0.62		1.8		0.16	U	0.28		0.18	U
Benzo(k)fluoranthene	207-08-9	mg/kg	NE	NE	12	0.48		0.31		0.12	U	0.15		0.14	U
Benzoic Acid	65-85-0	mg/kg	NE	NE	350	0.73	U	0.71	U	0.66	U	0.6	U	0.74	U
Benzyl Alcohol	100-51-6	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Biphenyl	92-52-4	mg/kg	NE	NE	125	0.51	U	0.5	U	0.46	U	0.43	U	0.52	U
Bis(2-chloroethoxy)methane	111-91-1	mg/kg	NE	NE	NE	0.24	U	0.24	U	0.22	U	0.2	U	0.25	U
Bis(2-chloroethyl)ether	111-44-4	mg/kg	NE	NE	0.7	0.2	U	0.2	U	0.18	U	0.17	U	0.2	U
Bis(2-chloroisopropyl)ether	108-60-1	mg/kg	NE	NE	5	0.27	U	0.26	U	0.24	U	0.22	U	0.27	U
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	NE	NE	72	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Butyl benzyl phthalate	85-68-7	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Carbazole	86-74-8	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Chrysene	218-01-9	mg/kg	NE	NE	120	1		0.83		0.12	U	0.26		0.14	U
Di-n-butylphthalate	84-74-2	mg/kg	NE	NE	2600	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Di-n-octylphthalate	117-84-0	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Dibenzo(a,h)anthracene	53-70-3	mg/kg	NE	NE	0.7	0.16		0.28		0.12	U	0.11	U	0.14	U
Dibenzofuran	132-64-9	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Diethyl phthalate	84-66-2	mg/kg	NE	NE	1000	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Dimethyl phthalate	131-11-3	mg/kg	NE	NE	700	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Fluoranthene	206-44-0	mg/kg	NE	NE	960	1.6		1.1		0.12	U	0.35		0.14	U
Fluorene	86-73-7	mg/kg	NE	NE	77	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Hexachlorobenzene	118-74-1	mg/kg	NE	NE	0.8	0.13	U	0.13	U	0.12	U	0.11	U	0.14	U
Hexachlorobutadiene	87-68-3	mg/kg	NE	NE	17	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Hexachlorocyclopentadiene	77-47-4	mg/kg	NE	NE	200	0.64	U	0.63	U	0.58	U	0.53	U	0.65	U
Hexachloroethane	67-72-1	mg/kg	NE	NE	0.7	0.18	U	0.18	U	0.16	U	0.15	U	0.18	U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	NE	NE	1	0.66		1.2		0.16	U	0.27		0.18	U
Isophorone	78-59-1	mg/kg	NE	NE	1	0.2	U	0.2	U	0.18	U	0.17	U	0.2	U
n-Nitrosodi-n-propylamine	621-64-7	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
n-Nitrosodimethylamine	62-75-9	mg/kg	NE	NE	NE	0.45	U	0.44	U	0.4	U	0.37	U	0.46	U
Naphthalene	91-20-3	mg/kg	NE	NE	5	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
NDPA/DPA	86-30-6	mg/kg	NE	NE	NE	0.18	U	0.18	U	0.16	U	0.15	U	0.18	U
Nitrobenzene	98-95-3	mg/kg	NE	NE	NE	0.2	U	0.2	U	0.18	U	0.17	U	0.2	U
p-Chloro-m-cresol	59-50-7	mg/kg	NE	NE	NE	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Pentachlorophenol	87-86-5	mg/kg	NE	NE	1	0.18	U	0.18	U	0.16	U	0.15	U	0.18	U
Phenanthrene	85-01-8	mg/kg	NE	NE	3	0.91		0.6		0.12	U	0.11	U	0.14	U
Phenol	108-95-2	mg/kg	NE	NE	56	0.22	U	0.22	U	0.2	U	0.19	U	0.23	U
Pyrene	129-00-0	mg/kg	NE	NE	720	1.4		1.4		0.12	U	0.35		0.14	U
Pyridine	110-86-1	mg/kg	NE	NE	NE	0.24	U	0.24	U	0.22	U	0.2	U	0.25	U
Total VOCs	-	mg/kg	100	100	NE	10.5		11.11		ND		2.95		ND	
Volatile Organics by GC/MS-5035															
1,1,1,2-Tetrachloroethane	630-20-6	mg/kg	NE	NE	0.8	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,1,1-Trichloroethane	71-55-6	mg/kg	NE	NE	78	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	NE	NE	4	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,1,2-Trichloroethane	79-00-5	mg/kg	NE	NE	0.1	0.06	U	0.07	U	0.042	U	0.038	U	0.043	U
1,1-Dichloroethane	75-34-3	mg/kg	NE	NE	3	0.06	U	0.07	U	0.042	U	0.038	U	0.043	U
1,1-Dichloroethene	75-35-4	mg/kg	NE	NE	14	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,1-Dichloropropene	563-58-6	mg/kg	NE	NE	NE	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,2,3-Trichlorobenzene	87-61-6	mg/kg	NE	NE	NE	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,2,3-Trichloropropane	96-18-4	mg/kg	NE	NE	0.1	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
1,2,4-Trichlorobenzene	120-82-1	mg/kg	NE	NE	19	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,2,4-Trimethylbenzene	95-63-6	mg/kg	NE	NE	130	0.2	U	0.23	U	0.14	U	0.12	U	0.18	
1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	NE	NE	0.1	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,2-Dibromoethane	106-93-4	mg/kg	NE	NE	0.1	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
1,2-Dichlorobenzene	95-50-1	mg/kg	NE	NE	88	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,2-Dichloroethane	107-06-2	mg/kg	NE	NE	0.1	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,2-Dichloroethene, Total	540-59-0	mg/kg	NE	NE	NE	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,2-Dichloropropane	78-87-5	mg/kg	NE	NE	0.1	0.14	U	0.16	U	0.098	U	0.088	U	0.1	U
1,3,5-Trichlorobenzene	108-70-3	mg/kg	NE	NE	NE	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
1,3,5-Trimethylbenzene	108-67-8	mg/kg	NE	NE	96	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,3-Dichlorobenzene	541-73-1	mg/kg	NE	NE	150	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,3-Dichloropropene, Total	542-75-6	mg/kg	NE	NE	NE	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
1,4-Dichlorobenzene	106-46-7	mg/kg	NE	NE	7	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
1,4-Dioxane	123-91-1	mg/kg	NE	NE	5	1.6	U	1.9	U	1.1	U	1	U	1.2	U
2,2-Dichloropropane	594-20-7	mg/kg	NE	NE	NE	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
2-Butanone	78-93-3	mg/kg	NE	NE	51	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
2-Hexanone	591-78-6	mg/kg	NE	NE	NE	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
4-Methyl-2-pentanone	108-10-1	mg/kg	NE	NE	29	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
Acetone	67-64-1	mg/kg	NE	NE	75	1.4	U	1.7	U	1	U	0.9	U	1	U
Benzene	71-43-2	mg/kg	NE	NE	0.3	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Bromobenzene	108-86-1	mg/kg	NE	NE	NE	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Bromochloromethane	74-97-5	mg/kg	NE	NE	NE	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Bromodichloromethane	75-27-4	mg/kg	NE	NE	0.1	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Bromoform	75-25-2	mg/kg	NE	NE	0.1	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
Bromomethane	74-83-9	mg/kg	NE	NE	0.3	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Carbon disulfide	75-15-0	mg/kg	NE	NE	460	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
Carbon tetrachloride	56-23-5	mg/kg	NE	NE	12	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Chlorobenzene	108-90-7	mg/kg	NE	NE	6	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Chloroethane	75-00-3	mg/kg	NE	NE	-	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Chloroform	67-66-3	mg/kg	NE	NE	3	0.062		0.07	U	0.042	U	0.038	U	0.043	U
Chloromethane	74-87-3	mg/kg	NE	NE	3	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
cis-1,2-Dichloroethene	156-59-2	mg/kg	NE	NE	2	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
cis-1,3-Dichloropropene	10061-01-5	mg/kg	NE	NE	NE	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Dibromochloromethane	124-48-1	mg/kg	NE	NE	1	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Dibromomethane	74-95-3	mg/kg	NE	NE	NE	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
Dichlorodifluoromethane	75-71-8	mg/kg	NE	NE	1000	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
Ethyl ether	60-29-7	mg/kg	NE	NE	3900	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Ethyl-Tert-Butyl-Ether	637-92-3	mg/kg	NE	NE	0.7	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
Ethylbenzene	100-41-4	mg/kg	NE	NE	120	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Hexachlorobutadiene	87-68-3	mg/kg	NE	NE	17	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Isopropyl Ether	108-20-3	mg/kg	NE	NE	10	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
Isopropylbenzene	98-82-8	mg/kg	NE	NE	330	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Methyl tert butyl ether	1634-04-4	mg/kg	NE	NE	0.2	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Methylene chloride	75-09-2	mg/kg	NE	NE	0.1	0.4	U	0.47	U	0.28	U	0.25	U	0.29	U
n-Butylbenzene	104-51-8	mg/kg	NE	NE	110	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
n-Propylbenzene	103-65-1	mg/kg	NE	NE	85	0.04	U	0.047	U	0.028	U	0.025	U	0.078	
Naphthalene	91-20-3	mg/kg	NE	NE	5	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
o-Chlorotoluene	95-49-8	mg/kg	NE	NE	15	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
o-Xylene	95-47-6	mg/kg	NE	NE	NE	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
p-Chlorotoluene	106-43-4	mg/kg	NE	NE	680	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
p-Isopropyltoluene	99-87-6	mg/kg	NE	NE	NE	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
p/m-Xylene	179601-23-1	mg/kg	NE	NE	NE	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
sec-Butylbenzene	135-98-8	mg/kg	NE	NE	130	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Styrene	100-42-5	mg/kg	NE	NE	17	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Tert-Butyl Alcohol	75-65-0	mg/kg	NE	NE	2	4	U	4.7	U	2.8	U	2.5	U	2.9	U
tert-Butylbenzene	98-06-6	mg/kg	NE	NE	100	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Tertiary-Amyl Methyl Ether	994-05-8	mg/kg	NE	NE	3	0.16	U	0.19	U	0.11	U	0.1	U	0.12	U
Tetrachloroethene	127-18-4	mg/kg	NE	NE	2	0.04	U	0.047	U	0.028	U	0.028		0.029	U
Tetrahydrofuran	109-99-9	mg/kg	NE	NE	NE	0.8	U	0.94	U	0.56	U	0.5	U	0.58	U
Toluene	108-88-3	mg/kg	NE	NE	100	0.06	U	0.07	U	0.042	U	0.038	U	0.043	U
trans-1,2-Dichloroethene	156-60-5	mg/kg	NE	NE	9	0.06	U	0.07	U	0.042	U	0.038	U	0.043	U
trans-1,3-Dichloropropene	10061-02-6	mg/kg	NE	NE	NE	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Trichloroethene	79-01-6	mg/kg	NE	NE	0.8	0.04	U	0.047	U	0.028	U	0.025	U	0.029	U
Trichlorofluoromethane	75-69-4	mg/kg	NE	NE	1000	0.2	U	0.23	U	0.14	U	0.12	U	0.14	U
Vinyl chloride	75-01-4	mg/kg	NE	NE	1	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Xylenes, Total	1330-20-7	mg/kg	NE	NE	500	0.08	U	0.094	U	0.056	U	0.05	U	0.058	U
Total VOCs	-	mg/kg	4	10	NE	0.062		ND		ND		0.028		0.258	

Notes:
Shaded values exceed the NH Soil Remediation Standards
mg/kg - milligrams per kilogram
1. New Hampshire Code of Administration Rules
2. Policy # COMM-97-001: Reuse & Disposal of Contaminated Soil at Massachusetts Landfills

STOCKPILE SOIL SAMPLING RESULTS

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER & SEWER REHABILITATION PROGRAM

	LOCATION							**ANGELASSTOCKPILE_COMPOSITE**			
	SAMPLING DATE							**9/13/2017**			
	LAB SAMPLE ID							**L1732389-01**			
			COMM-97								
			Unlined Landfill	**Lined Landfill**							
		CasNum			**NH-S1**	**NH-S2**	**NH-S3**	**NH-SRS**	**Units**	**Results**	**Qual**
Extractable Petroleum Hydrocarbons											
	C9-C18 Aliphatics	C9-C18-ALPHA-UJ							mg/kg	6.58	U
	C19-C36 Aliphatics	C19-C36-ALPHA-UJ							mg/kg	19.8	
	C11-C22 Aromatics	C11-C22-ALPHA-UJ							mg/kg	30.3	
	C11-C22 Aromatics, Adjusted	C11-C22-ALPHA-J							mg/kg	21.9	
General Chemistry											
	Solids, Total	NONE							%	98.6	
PCB by GC											
	Aroclor 1016	12674-11-2			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1221	11104-28-2			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1232	11141-16-5			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1242	53469-21-9			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1248	12672-29-6			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1254	11097-69-1			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1260	11096-82-5			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1262	37324-23-5			1	10	25	1	mg/kg	0.0333	U
	Aroclor 1268	11100-14-4			1	10	25	1	mg/kg	0.0333	U
	PCBs, Total	1336-36-3			1	10	25	1	mg/kg	0.0333	U
Petroleum Hydrocarbon Quantitation											
	TPH	NONE	2500	5000	10000	10000	10000	10000	mg/kg	64.2	
Semivolatile Organics by GC/MS											
	Acenaphthene	83-32-9			340	340	340	340	mg/kg	0.13	U
	Benzidine	92-87-5			0.01	0.01	0.01	0.01	mg/kg	0.55	U
	1,2,4-Trichlorobenzene	120-82-1			19	19	19	19	mg/kg	0.17	U
	Hexachlorobenzene	118-74-1			0.8	3	27	0.8	mg/kg	0.1	U
	Bis(2-chloroethyl)ether	111-44-4			0.7	0.7	0.7	0.7	mg/kg	0.15	U
	2-Chloronaphthalene	91-58-7							mg/kg	0.17	U
	1,2-Dichlorobenzene	95-50-1			88	88	88	88	mg/kg	0.17	U
	1,3-Dichlorobenzene	541-73-1			150	150	150	150	mg/kg	0.17	U
	1,4-Dichlorobenzene	106-46-7			7	7	7	7	mg/kg	0.17	U
	3,3'-Dichlorobenzidine	91-94-1			0.7	0.7	0.7	0.7	mg/kg	0.17	U
	2,4-Dinitrotoluene	121-14-2			0.7	0.7	0.7	0.7	mg/kg	0.17	U
	2,6-Dinitrotoluene	606-20-2							mg/kg	0.17	U
	Azobenzene	103-33-3			1	4	4	1	mg/kg	0.17	U
	Fluoranthene	206-44-0			960	2500	5000	960	mg/kg	0.81	
	4-Chlorophenyl phenyl ether	7005-72-3							mg/kg	0.17	U
	4-Bromophenyl phenyl ether	101-55-3							mg/kg	0.17	U
	Bis(2-chloroisopropyl)ether	108-60-1			5	5	5	5	mg/kg	0.2	U
	Bis(2-chloroethoxy)methane	111-91-1							mg/kg	0.18	U
	Hexachlorobutadiene	87-68-3			17	53	120	17	mg/kg	0.17	U
	Hexachlorocyclopentadiene	77-47-4			200	1800	1800	200	mg/kg	0.48	U
	Hexachloroethane	67-72-1			0.7	0.7	0.7	0.7	mg/kg	0.13	U
	Isophorone	78-59-1			1	1	1	1	mg/kg	0.15	U
	Naphthalene	91-20-3			5	5	5	5	mg/kg	0.17	U
	Nitrobenzene	98-95-3							mg/kg	0.15	U
	NDPA/DPA	86-30-6							mg/kg	0.13	U
	n-Nitrosodi-n-propylamine	621-64-7							mg/kg	0.17	U
	Bis(2-ethylhexyl)phthalate	117-81-7			72	220	2300	72	mg/kg	0.17	U
	Butyl benzyl phthalate	85-68-7							mg/kg	0.17	U
	Di-n-butylphthalate	84-74-2							mg/kg	0.17	U
	Di-n-octylphthalate	117-84-0							mg/kg	0.17	U
	Diethyl phthalate	84-66-2			1000	2500	5000	1000	mg/kg	0.17	U
	Dimethyl phthalate	131-11-3			700	700	700	700	mg/kg	0.17	U
	Benzo(a)anthracene	56-55-3			1	4	52	1	mg/kg	0.91	
	Benzo(a)pyrene	50-32-8			0.7	0.7	5	0.7	mg/kg	1.6	
	Benzo(b)fluoranthene	205-99-2			1	4	52	1	mg/kg	2.3	
	Benzo(k)fluoranthene	207-08-9			12	36	520	12	mg/kg	0.55	
	Chrysene	218-01-9			120	360	5200	120	mg/kg	1.1	
	Acenaphthylene	208-96-8			490	490	490	490	mg/kg	0.13	U
	Anthracene	120-12-7			1000	2500	5000	1000	mg/kg	0.1	U
	Benzo(ghi)perylene	191-24-2							mg/kg	1.3	
	Fluorene	86-73-7			77	77	77	77	mg/kg	0.17	U
	Phenanthrene	85-01-8							mg/kg	0.21	
	Dibenzo(a,h)anthracene	53-70-3			0.7	0.7	5	0.7	mg/kg	0.29	
	Indeno(1,2,3-cd)pyrene	193-39-5			1	4	52	1	mg/kg	1.2	
	Pyrene	129-00-0			720	2500	5000	720	mg/kg	0.86	
	Biphenyl	92-52-4			125	174	174	125	mg/kg	0.38	U
	Aniline	62-53-3							mg/kg	0.2	U
	4-Chloroaniline	106-47-8			1.3	1.3	1.3	1.3	mg/kg	0.17	U
	1-Methylnaphthalene	90-12-0							mg/kg	0.17	U
	2-Nitroaniline	88-74-4							mg/kg	0.17	U
	3-Nitroaniline	99-09-2							mg/kg	0.17	U
	4-Nitroaniline	100-01-6							mg/kg	0.17	U
	Dibenzofuran	132-64-9							mg/kg	0.17	U
	2-Methylnaphthalene	91-57-6			96	100	100	96	mg/kg	0.2	U
	n-Nitrosodimethylamine	62-75-9							mg/kg	0.33	U
	2,4,6-Trichlorophenol	88-06-2			0.7	0.7	0.7	0.7	mg/kg	0.1	U
	p-Chloro-m-cresol	59-50-7							mg/kg	0.17	U
	2-Chlorophenol	95-57-8			2	2	2	2	mg/kg	0.17	U
	2,4-Dichlorophenol	120-83-2			0.7	0.7	0.7	0.7	mg/kg	0.15	U
	2,4-Dimethylphenol	105-67-9			4	4	4	4	mg/kg	0.17	U
	2-Nitrophenol	88-75-5							mg/kg	0.36	U
	4-Nitrophenol	100-02-7							mg/kg	0.23	U
	2,4-Dinitrophenol	51-28-5			0.7	0.7	0.7	0.7	mg/kg	0.8	U
	4,6-Dinitro-o-cresol	534-52-1							mg/kg	0.43	U
	Pentachlorophenol	87-86-5			3	3	3	3	mg/kg	0.13	U
	Phenol	108-95-2			56	56	56	56	mg/kg	0.17	U
	2-Methylphenol	95-48-7			0.9	0.9	0.9	0.9	mg/kg	0.17	U
	3-Methylphenol/4-Methylphen	108-39-4			0.7	0.7	0.7	0.7	mg/kg	0.24	U
	2,4,5-Trichlorophenol	95-95-4			24	24	24	24	mg/kg	0.17	U
	Benzoic Acid	65-85-0			350	350	350	350	mg/kg	0.54	U
	Benzyl Alcohol	100-51-6							mg/kg	0.17	U
	Carbazole	86-74-8							mg/kg	0.17	U
	Pyridine	110-86-1							mg/kg	0.18	U
	Total VOCs		100	100				NE	mg/kg	11.13	
Total Metals											
	Antimony, Total	7440-36-0			9	74	74	9	mg/kg	1.97	U
	Arsenic, Total	7440-38-2	40	40	11	11	47	11	mg/kg	3.4	
	Barium, Total	7440-39-3			1000	2500	5000	1000	mg/kg	53.5	
	Beryllium, Total	7440-41-7			12	89	100	12	mg/kg	0.197	U
	Cadmium, Total	7440-43-9			33	280	280	33	mg/kg	1.08	
	Chromium, Total	7440-47-3	1000	1000				NE	mg/kg	67.8	
	Lead, Total	7439-92-1	1000	2000	400	400	400	400	mg/kg	37.4	
	Mercury, Total	7439-97-6	10	10	7	52	52	7	mg/kg	0.07	U
	Nickel, Total	7440-02-0			400	2500	3100	400	mg/kg	63.5	
	Selenium, Total	7782-49-2			180	1600	1600	180	mg/kg	0.789	U
	Silver, Total	7440-22-4			89	690	690	89	mg/kg	0.395	U
	Thallium, Total	7440-28-0			10	10	10	10	mg/kg	0.789	U
	Vanadium, Total	7440-62-2							mg/kg	14.2	
	Zinc, Total	7440-66-6			1000	2500	5000	1000	mg/kg	35.5	
Volatile Organics by GC/MS-5035											
	Methylene chloride	75-09-2			0.1	0.1	0.1	0.1	mg/kg	0.0074	U
	1,1-Dichloroethane	75-34-3			3	3	3	3	mg/kg	0.0011	U
	Chloroform	67-66-3			3	3	3	3	mg/kg	0.0011	U
	Carbon tetrachloride	56-23-5			12	12	12	12	mg/kg	0.00074	U
	1,2-Dichloropropane	78-87-5			0.1	0.1	0.1	0.1	mg/kg	0.0026	U
	Dibromochloromethane	124-48-1			1	1	1	1	mg/kg	0.00074	U
	1,1,2-Trichloroethane	79-00-5			0.1	0.1	0.1	0.1	mg/kg	0.0011	U
	Tetrachloroethene	127-18-4			2	2	2	2	mg/kg	0.00074	U
	Chlorobenzene	108-90-7			6	6	6	6	mg/kg	0.00074	U
	Trichlorofluoromethane	75-69-4			1000	2500	5000	1000	mg/kg	0.0037	U
	1,2-Dichloroethane	107-06-2			0.1	0.1	0.1	0.1	mg/kg	0.00074	U
	1,1,1-Trichloroethane	71-55-6			78	78	78	78	mg/kg	0.00074	U
	Bromodichloromethane	75-27-4			0.1	0.1	0.1	0.1	mg/kg	0.00074	U
	trans-1,3-Dichloropropene	10061-02-6			0.1	0.1	0.1	0.1	mg/kg	0.00074	U
	cis-1,3-Dichloropropene	10061-01-5			0.1	0.1	0.1	0.1	mg/kg	0.00074	U
	1,3-Dichloropropene, Total	542-75-6			0.1	0.1	0.1	0.1	mg/kg	0.00074	U
	1,1-Dichloropropene	563-58-6							mg/kg	0.0037	U
	Bromoform	75-25-2			0.1	0.1	0.1	0.1	mg/kg	0.003	U
	1,1,2,2-Tetrachloroethane	79-34-5			4	4	4	4	mg/kg	0.00074	U
	Benzene	71-43-2			0.3	0.3	0.3	0.3	mg/kg	0.00074	U
	Toluene	108-88-3			100	100	100	100	mg/kg	0.0011	U
	Ethylbenzene	100-41-4			120	140	140	120	mg/kg	0.00074	U
	Chloromethane	74-87-3			3	3	3	3	mg/kg	0.0037	U
	Bromomethane	74-83-9			0.3	0.3	0.3	0.3	mg/kg	0.0015	U
	Vinyl chloride	75-01-4			1	7	9	1	mg/kg	0.0015	U
	Chloroethane	75-00-3							mg/kg	0.0015	U
	1,1-Dichloroethene	75-35-4			14	14	14	14	mg/kg	0.00074	U
	trans-1,2-Dichloroethene	156-60-5			9	9	9	9	mg/kg	0.0011	U
	Trichloroethene	79-01-6			0.8	0.8	0.8	0.8	mg/kg	0.00074	U
	1,2-Dichlorobenzene	95-50-1			88	88	88	88	mg/kg	0.0037	U
	1,3-Dichlorobenzene	541-73-1			150	150	150	150	mg/kg	0.0037	U
	1,4-Dichlorobenzene	106-46-7			7	7	7	7	mg/kg	0.0037	U
	Methyl tert butyl ether	1634-04-4			0.2	0.2	0.2	0.2	mg/kg	0.0015	U
	p/m-Xylene	179601-23-1							mg/kg	0.0015	U
	o-Xylene	95-47-6							mg/kg	0.0015	U
	Xylenes, Total	1330-20-7			500	1000	1500	500	mg/kg	0.0015	U
	cis-1,2-Dichloroethene	156-59-2			2	2	2	2	mg/kg	0.00074	U
	1,2-Dichloroethene, Total	540-59-0							mg/kg	0.00074	U
	Dibromomethane	74-95-3							mg/kg	0.0074	U
	1,2,3-Trichloropropane	96-18-4			0.1	0.1	0.6	0.1	mg/kg	0.0074	U
	Styrene	100-42-5			17	17	17	17	mg/kg	0.0015	U
	Dichlorodifluoromethane	75-71-8			1000	2500	5000	1000	mg/kg	0.0074	U
	Acetone	67-64-1			75	75	75	75	mg/kg	0.027	U
	Carbon disulfide	75-15-0			460	460	460	460	mg/kg	0.0074	U
	2-Butanone	78-93-3			51	51	51	51	mg/kg	0.0074	U
	4-Methyl-2-pentanone	108-10-1			29	29	29	29	mg/kg	0.0074	U
	2-Hexanone	591-78-6							mg/kg	0.0074	U
	Bromochloromethane	74-97-5							mg/kg	0.0037	U
	Tetrahydrofuran	109-99-9							mg/kg	0.015	U
	2,2-Dichloropropane	594-20-7							mg/kg	0.0037	U
	1,2-Dibromoethane	106-93-4			0.1	0.1	0.1	0.1	mg/kg	0.003	U
	1,1,1,2-Tetrachloroethane	630-20-6			0.8	0.8	0.8	0.8	mg/kg	0.00074	U
	Bromobenzene	108-86-1							mg/kg	0.0037	U
	n-Butylbenzene	104-51-8			110	110	110	110	mg/kg	0.00074	U
	sec-Butylbenzene	135-98-8			130	130	130	130	mg/kg	0.00074	U
	tert-Butylbenzene	98-06-6			100	100	100	100	mg/kg	0.0037	U
	1,3,5-Trichlorobenzene	108-70-3							mg/kg	0.003	U
	o-Chlorotoluene	95-49-8			15	15	15	15	mg/kg	0.0037	U
	p-Chlorotoluene	106-43-4			680	5900	5900	680	mg/kg	0.0037	U
	1,2-Dibromo-3-chloropropane	96-12-8			0.1	0.1	0.1	0.1	mg/kg	0.0037	U
	Hexachlorobutadiene	87-68-3			17	53	120	17	mg/kg	0.0037	U
	Isopropylbenzene	98-82-8			330	330	330	330	mg/kg	0.00074	U
	p-Isopropyltoluene	99-87-6							mg/kg	0.00074	U
	Naphthalene	91-20-3			5	5	5	5	mg/kg	0.0037	U
	n-Propylbenzene	103-65-1			85	85	85	85	mg/kg	0.00074	U
	1,2,3-Trichlorobenzene	87-61-6							mg/kg	0.0037	U
	1,2,4-Trichlorobenzene	120-82-1			19	19	19	19	mg/kg	0.0037	U
	1,3,5-Trimethylbenzene	108-67-8			96	96	96	96	mg/kg	0.0037	U
	1,2,4-Trimethylbenzene	95-63-6			130	130	130	130	mg/kg	0.0037	U
	Ethyl ether	60-29-7			3900	3900	3900	3900	mg/kg	0.0037	U
	Isopropyl Ether	108-20-3			10	10	10	10	mg/kg	0.003	U
	Tert-Butyl Alcohol	75-65-0			2	2	2	2	mg/kg	0.074	U
	Ethyl-Tert-Butyl-Ether	637-92-3			0.7	0.7	0.7	0.7	mg/kg	0.003	U
	Tertiary-Amyl Methyl Ether	994-05-8			3	3	3	3	mg/kg	0.003	U
	1,4-Dioxane	123-91-1			5	5	5	5	mg/kg	0.03	U
	Total VOCs		4	10				NE	mg/kg	0.0	

NE = Not Established
COMM-97 = Policy # COMM-97-001: Reuse & Disposal of Contaminated Soil at Massachusetts Landfills
*NH-S1: NH S-1 Method 1 Soil Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NH-S2: NH S-2 Method 1 Soil Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NH-S3: NH S-3 Method 1 Soil Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NH-SRS: NH Soil Remediation Standards Criteria per NH Soil Remediation Standards, Effective June 1, 2015.
Highlight indicates exceedance of NH-SRS standard

GROUNDWATER QUALITY DATA

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER & SEWER REHABILITATION PROGRAM

	LOCATION								B-2		B-3		B-4		B-11		B-15		B-2		B-3		B-4		B-11		B-15	
	SAMPLING DATE								6/8/2017		6/8/2017		6/8/2017		6/8/2017		6/8/2017		7/24/2017		7/24/2017		7/24/2017		7/24/2017		7/24/2017	
	LAB SAMPLE ID								L1719160-01		L1719160-02		L1719160-03		L1719160-04		L1719160-05		L1725406-01		L1725406-02		L1725406-03		L1725405-01		L1725406-04	
		CasNum	NH-AGQS	NHGW-1	NHGW-2	MA GW-3	GLSD	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
PCB by GC																												
	Aroclor 1016	12674-11-2	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1221	11104-28-2	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1232	11141-16-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1242	53469-21-9	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1248	12672-29-6	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1254	11097-69-1	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1260	11096-82-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1262	37324-23-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	Aroclor 1268	11100-14-4	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
	PCBs, Total	1336-36-3	0.5	0.5		10		ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U										
Misc.																												
	pH	---					5.5-10.5	pH units																				
Petroleum Hydrocarbon Quantitation																												
	TPH	NONE				5000		ug/l	200	U	200	U	200	U	200	U	200	U										
Semivolatile Organics																												
	Acenaphthene	83-32-9	420	420		10000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Benzidine	92-87-5	0.8	0.8				ug/l	20	U	20	U	20	U	20	U	20	U										
	1,2,4-Trichlorobenzene	120-82-1	70	70	150			ug/l	5	U	5	U	5	U	5	U	5	U										
	Hexachlorobenzene	118-74-1	1	1		6000		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U										
	Bis(2-chloroethyl)ether	111-44-4	10	10		50000		ug/l	2	U	2	U	2	U	2	U	2	U										
	2-Chloronaphthalene	91-58-7						ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U										
	1,2-Dichlorobenzene	95-50-1	600	600	14000			ug/l	2	U	2	U	2	U	2	U	2	U										
	1,3-Dichlorobenzene	541-73-1	600	600				ug/l	2	U	2	U	2	U	2	U	2	U										
	1,4-Dichlorobenzene	106-46-7	75	75	80			ug/l	2	U	2	U	2	U	2	U	2	U										
	3,3'-Dichlorobenzidine	91-94-1	1.3	1.3		2000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2,4-Dinitrotoluene	121-14-2	10	10		50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2,6-Dinitrotoluene	606-20-2						ug/l	5	U	5	U	5	U	5	U	5	U										
	Azobenzene	103-33-3	10	10				ug/l	2	U	2	U	2	U	2	U	2	U										
	Fluoranthene	206-44-0	280	280		200		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	4-Chlorophenyl phenyl ether	7005-72-3						ug/l	2	U	2	U	2	U	2	U	2	U										
	4-Bromophenyl phenyl ether	101-55-3						ug/l	2	U	2	U	2	U	2	U	2	U										
	Bis(2-chloroisopropyl)ether	108-60-1	300	300		50000		ug/l	2	U	2	U	2	U	2	U	2	U										
	Bis(2-chloroethoxy)methane	111-91-1						ug/l	5	U	5	U	5	U	5	U	5	U										
	Hexachlorobutadiene	87-68-3	0.5	0.5		3000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Hexachlorocyclopentadiene	77-47-4	50	50				ug/l	20	U	20	U	20	U	20	U	20	U										
	Hexachloroethane	67-72-1	1	1		50000		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U										
	Isophorone	78-59-1	100	100				ug/l	5	U	5	U	5	U	5	U	5	U										
	Naphthalene	91-20-3	20	20	1700	20000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Nitrobenzene	98-95-3						ug/l	2	U	2	U	2	U	2	U	2	U										
	NDPA/DPA	86-30-6						ug/l	2	U	2	U	2	U	2	U	2	U										
	n-Nitrosodi-n-propylamine	621-64-7						ug/l	5	U	5	U	5	U	5	U	5	U										
	Bis(2-ethylhexyl)phthalate	117-81-7	6	6		50000		ug/l	3	U	3	U	3	U	3	U	3	U										
	Butyl benzyl phthalate	85-68-7						ug/l	5	U	5	U	5	U	5	U	5	U										
	Di-n-butylphthalate	84-74-2						ug/l	5	U	5	U	5	U	5	U	5	U										
	Di-n-octylphthalate	117-84-0						ug/l	5	U	5	U	5	U	5	U	5	U										
	Diethyl phthalate	84-66-2				9000		ug/l	5	U	5	U	5	U	5	U	5	U										
	Dimethyl phthalate	131-11-3	50000	50000		50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	Benzo(a)anthracene	56-55-3	0.1	0.1		1000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Benzo(a)pyrene	50-32-8	0.2	0.2		500		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Benzo(b)fluoranthene	205-99-2	0.1	0.1		400		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Benzo(k)fluoranthene	207-08-9	0.5	0.5		100		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Chrysene	218-01-9	5	5		70		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Acenaphthylene	208-96-8	420	420		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Anthracene	120-12-7	2100	2100		30		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Benzo(ghi)perylene	191-24-2	210	210		20		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Fluorene	86-73-7	280	280		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Phenanthrene	85-01-8	210	210		10000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Dibenzo(a,h)anthracene	53-70-3	0.1	0.1		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Indeno(1,2,3-cd)pyrene	193-39-5	0.1	0.1		100		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Pyrene	129-00-0	210	210		20		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	Biphenyl	92-52-4	350	350		50000		ug/l	2	U	2	U	2	U	2	U	2	U										
	Aniline	62-53-3						ug/l	2	U	2	U	2	U	2	U	2	U										
	4-Chloroaniline	106-47-8	28	28		300		ug/l	5	U	5	U	5	U	5	U	5	U										
	1-Methylnaphthalene	90-12-0	160					ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	2-Nitroaniline	88-74-4						ug/l	5	U	5	U	5	U	5	U	5	U										
	3-Nitroaniline	99-09-2						ug/l	5	U	5	U	5	U	5	U	5	U										
	4-Nitroaniline	100-01-6						ug/l	5	U	5	U	5	U	5	U	5	U										
	Dibenzofuran	132-64-9						ug/l	2	U	2	U	2	U	2	U	2	U										
	2-Methylnaphthalene	91-57-6	280	280		20000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U										
	n-Nitrosodimethylamine	62-75-9						ug/l	2	U	2	U	2	U	2	U	2	U										
	2,4,6-Trichlorophenol	88-06-2	5	5		500		ug/l	5	U	5	U	5	U	5	U	5	U										
	p-Chloro-m-cresol	59-50-7						ug/l	2	U	2	U	2	U	2	U	2	U										
	2-Chlorophenol	95-57-8	35	35		7000		ug/l	2	U	2	U	2	U	2	U	2	U										
	2,4-Dichlorophenol	120-83-2	21	21		2000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2,4-Dimethylphenol	105-67-9	140	140		50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2-Nitrophenol	88-75-5						ug/l	10	U	10	U	10	U	10	U	10	U										
	4-Nitrophenol	100-02-7						ug/l	10	U	10	U	10	U	10	U	10	U										
	2,4-Dinitrophenol	51-28-5	14	14		20000		ug/l	20	U	20	U	20	U	20	U	20	U										
	4,6-Dinitro-o-cresol	534-52-1						ug/l	10	U	10	U	10	U	10	U	10	U										
	Pentachlorophenol	87-86-5	1	1		200		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U										
	Phenol	108-95-2	4000	4000		2000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2-Methylphenol	95-48-7	40	40				ug/l	5	U	5	U	5	U	5	U	5	U										
	3-Methylphenol/4-Methylphenol	108-39-4	40	40				ug/l	5	U	5	U	5	U	5	U	5	U										
	2,4,5-Trichlorophenol	95-95-4	700	700		3000		ug/l	5	U	5	U	5	U	5	U	5	U										
	Benzoic Acid	65-85-0	28000	28000				ug/l	50	U	50	U	50	U	50	U	50	U										
	Benzyl Alcohol	100-51-6						ug/l	2	U	2	U	2	U	2	U	2	U										
	Carbazole	86-74-8						ug/l	2	U	2	U	2	U	2	U	2	U										
	Pyridine	110-86-1						ug/l	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U										
Total Metals																												
	Arsenic, Total	7440-38-2	10	10		900	310	ug/l	7		7		5	U	5	U	27											
	Barium, Total	7440-39-3	2000	2000		50000		ug/l	61		339		98		35		49											
	Cadmium, Total	7440-43-9	5	5		4	160	ug/l	5	U	5	U	5	U	5	U	5	U										
	Chromium, Total	7440-47-3	100	100		300	1650	ug/l	10	U	19		10	U	10	U	10	U										
	Copper, Total	7440-50-8					1500	ug/l											10	U	10	U	10	U	10	U	10	U
	Lead, Total	7439-92-1	15	15		10	290	ug/l	10	U	51		10	U	10	U	10	U										
	Mercury, Total	7439-97-6	2	2		20	4.8	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U										
	Molybdenum, Total	7439-98-7					430	ug/l											50	U	50	U	50	U	50	U	50	U
	Nickel, Total	7440-02-0					1740	ug/l											25	U	25	U	25	U	25	U	25	U
	Selenium, Total	7782-49-2	50	50		100		ug/l	10	U	10	U	10	U	10	U	10	U										
	Silver, Total	7440-22-4	100	100		7	227	ug/l	7	U	7	U	7	U	7	U	7	U										
	Zinc, Total	7440-66-6					2000	ug/l											50	U	50	U	50	U	50	U	50	U
Dissolved Metals																												
	Arsenic, Dissolved	7440-38-2						ug/l																			25	
	Lead, Dissolved	7439-92-1						ug/l													10	U						
Volatile Organics by GC/MS																												
	Methylene chloride	75-09-2	5	5	24000	50000		ug/l	3	U	3	U	3	U	3	U	3	U										
	1,1-Dichloroethane	75-34-3	81	81	130	20000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U										
	Chloroform	67-66-3	70	70	70	20000		ug/l	0.75	U	0.98		0.75	U	0.75	U	0.75	U										
	Carbon tetrachloride	56-23-5	5	5	10	5000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	1,2-Dichloropropane	78-87-5	5	5	50	50000		ug/l	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U										
	Dibromochloromethane	124-48-1	60	60		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	1,1,2-Trichloroethane	79-00-5	5	5	20	50000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U										
	Tetrachloroethene	127-18-4	5	5	240	30000		ug/l	0.5	U	0.5	U	72		26		0.5	U										
	Chlorobenzene	108-90-7	100	100	1500	1000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Trichlorofluoromethane	75-69-4	2000	2000				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,2-Dichloroethane	107-06-2	5	5	50	20000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.55											
	1,1,1-Trichloroethane	71-55-6	200	200	27000	20000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Bromodichloromethane	75-27-4	0.6	0.6		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	trans-1,3-Dichloropropene	10061-02-6	0.5	0.5				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	cis-1,3-Dichloropropene	10061-01-5	0.5	0.5				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	1,3-Dichloropropene, Total	542-75-6	0.5	0.5		200		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	1,1-Dichloropropene	563-58-6						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Bromoform	75-25-2	4	4	2800	50000		ug/l	2	U	2	U	2	U	2	U	2	U										
	1,1,2,2-Tetrachloroethane	79-34-5	2	2	120	50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Benzene	71-43-2	5	5	2900	10000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	3.2											
	Toluene	108-88-3	1000	1000	50000	40000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U										
	Ethylbenzene	100-41-4	700	700	1500	5000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	3.6											
	Chloromethane	74-87-3	30	30				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Bromomethane	74-83-9	10	10	10	800		ug/l	1	U	1	U	1	U	1	U	1	U										
	Vinyl chloride	75-01-4	2	2	4	50000		ug/l	1	U	1	U	1	U	1	U	1	U										
	Chloroethane	75-00-3						ug/l	1	U	1	U	1	U	1	U	1	U										
	1,1-Dichloroethene	75-35-4	7	7	630	30000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	trans-1,2-Dichloroethene	156-60-5	100	100	560	50000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U										
	1,2-Dichloroethene, Total	540-59-0				50000		ug/l	0.5	U	0.5	U	23		0.5	U	2.4											
	Trichloroethene	79-01-6	5	5	20	5000		ug/l	0.5	U	0.5	U	21		0.5	U	0.99											
	1,2-Dichlorobenzene	95-50-1	600	600	14000	2000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,3-Dichlorobenzene	541-73-1	600	600		50000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,4-Dichlorobenzene	106-46-7	75	75	80	8000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Methyl tert butyl ether	1634-04-4	13	13	2600	50000		ug/l	1	U	1	U	1	U	1	U	1	U										
	p/m-Xylene	179601-23-1						ug/l	1	U	1	U	1	U	1	U	1	U										
	o-Xylene	95-47-6						ug/l	1	U	1	U	1	U	1	U	1	U										
	Xylenes, Total	1330-20-7	10000	10000	17000	5000		ug/l	1	U	1	U	1	U	1	U	1	U										
	cis-1,2-Dichloroethene	156-59-2	70	70				ug/l	0.5	U	0.5	U	23		0.5	U	2.4											
	Dibromomethane	74-95-3						ug/l	5	U	5	U	5	U	5	U	5	U										
	1,2,3-Trichloropropane	96-18-4	0.5	40				ug/l	5	U	5	U	5	U	5	U	5	U										
	Styrene	100-42-5	100	100	43000	6000		ug/l	1	U	1	U	1	U	1	U	1	U										
	Dichlorodifluoromethane	75-71-8	1000	1000				ug/l	5	U	5	U	5	U	5	U	5	U										
	Acetone	67-64-1	6000	6000		50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	Carbon disulfide	75-15-0	70	70				ug/l	5	U	5	U	5	U	5	U	5	U										
	2-Butanone (MEK)	78-93-3	4000	4000	50000	50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	4-Methyl-2-pentanone	108-10-1	2000	2000	50000	50000		ug/l	5	U	5	U	5	U	5	U	5	U										
	2-Hexanone	591-78-6						ug/l	5	U	5	U	5	U	5	U	5	U										
	Bromochloromethane	74-97-5						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Tetrahydrofuran	109-99-9	600	154				ug/l	5	U	5	U	5	U	5	U	5	U										
	2,2-Dichloropropane	594-20-7						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,2-Dibromoethane	106-93-4	0.05	0.05	35	50000		ug/l	2	U	2	U	2	U	2	U	2	U										
	1,1,1,2-Tetrachloroethane	630-20-6	70	70		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Bromobenzene	108-86-1	60					ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	n-Butylbenzene	104-51-8	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	sec-Butylbenzene	135-98-8	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	tert-Butylbenzene	98-06-6	260	260				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	o-Chlorotoluene	95-49-8	100	100				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	p-Chlorotoluene	106-43-4	100					ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,2-Dibromo-3-chloropropane	96-12-8	0.2	0.2				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Hexachlorobutadiene	87-68-3	0.5	0.5		3000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Isopropylbenzene	98-82-8	800	800				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.85											
	p-Isopropyltoluene	99-87-6	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U										
	Naphthalene	91-20-3	20	20	1700	20000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	n-Propylbenzene	103-65-1	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.86											
	1,2,3-Trichlorobenzene	87-61-6						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,2,4-Trichlorobenzene	120-82-1	70	70	150	50000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,3,5-Trimethylbenzene	108-67-8	330	330				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	1,3,5-Trichlorobenzene	108-70-3	40					ug/l	2	U	2	U	2	U	2	U	2	U										
	1,2,4-Trimethylbenzene	95-63-6	330	330	1300			ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Ethyl ether	60-29-7	1400	1400				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U										
	Isopropyl Ether	108-20-3	120	120				ug/l	2	U	2	U	2	U	2	U	2	U										
	Tert-Butyl Alcohol	75-65-0	40	40				ug/l	10	U	10	U	10	U	10	U	10	U										
	Ethyl-Tert-Butyl-Ether	637-92-3	40	40				ug/l	2	U	2	U	2	U	2	U	2	U										
	Tertiary-Amyl Methyl Ether	994-05-8	140	140				ug/l	2	U	2	U	2	U	2	U	2	U										
	1,4-Dioxane	123-91-1	3	3		50000		ug/l	250	U	250	U	250	U	250	U	250	U										

Notes:
U = Not detected
ug/L = micrograms per liter

*NH-AGQS: NH Ambient GW Quality Standards Criteria per NH Ambient Groundwater Quality Standards, Effective June 1, 2015.
*NHGW-1: NH GW-1 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NHGW-2: NH GW-2 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*MA GW-3: MassDEP MCP Method 1 Groundwater Standard, accessed online 7/17/2017

GROUNDWATER QUALITY DATA -- PERFLUORINATED COMPOUNDS

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER & SEWER REHABILITATION PROGRAM

	LOCATION							B-2		B-3		B-4		B-11		B-15		FIELD BLANK		DUP-1	
	SAMPLING DATE							6/29/2017		6/29/2017		6/29/2017		6/29/2017		6/29/2017		6/29/2017		6/29/2017	
	LAB SAMPLE ID							L1722254-01		L1722254-02		L1722254-03		L1722254-04		L1722254-05		L1722254-06		L1722254-07	
		CasNum	NH-AGQS	NHGW-1	NHGW-2	MA GW-3	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Perfluorinated Alkyl Acids by Isotope Dilution																					
	Perfluorobutanoic Acid (PFBA)	375-22-4					ug/l	0.00596		0.00899		0.00367		0.00185	U	0.00459		0.00192	U	0.002	U
	Perfluoropentanoic Acid (PFPeA)	2706-90-3					ug/l	0.00465		0.00392		0.00373		0.0023		0.00309		0.00192	U	0.0024	
	Perfluorobutanesulfonic Acid (PFBS)	375-73-5					ug/l	0.00353		0.00398		0.00348		0.00185	U	0.00185	U	0.00192	U	0.002	U
	Perfluorohexanoic Acid (PFHxA)	307-24-4					ug/l	0.00406		0.00503		0.00378		0.00185	U	0.00294		0.00192	U	0.002	U
	Perfluoroheptanoic Acid (PFHpA)	375-85-9					ug/l	0.00272		0.00379		0.00358		0.00185	U	0.0023		0.00192	U	0.002	U
	Perfluorohexanesulfonic Acid (PFHxS)	355-46-4					ug/l	0.00185	U	0.00509		0.00524		0.00208		0.00185	U	0.00192	U	0.002	U
	Perfluorooctanoic Acid (PFOA)	335-67-1	0.07				ug/l	0.00877		0.0115		0.0202		0.0022		0.00514		0.00192	U	0.00277	
	Perfluorononanoic Acid (PFNA)	375-95-1					ug/l	0.00185	U	0.00185	U	0.00185	U	0.00185	U	0.00185	U	0.00192	U	0.002	U
	Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.07				ug/l	0.00567		0.00526		0.00732		0.00412		0.00185	U	0.00192	U	0.00236	

*NH-AGQS: NH Ambient GW Quality Standards Criteria per NH Ambient Groundwater Quality Standards, Effective October 22, 2016.
*NHGW-1: NH GW-1 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NHGW-2: NH GW-2 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*MA GW-3: MassDEP MCP Method 1 Groundwater Standard, access online 10/3/2017.

TOWN OF SALEM, NEW HAMPSHIRE

SOUTH BROADWAY WATER MAIN REPLACEMENT

pH READINGS

Location	6/8/2017	6/29/2017	7/24/2017
B-2	6.36	6.50	5.74
B-3	6.00	6.58	5.74
B-4	6.39	6.46	6.07
B-11	6.31	6.43	4.79
B-15	6.43	6.68	6.92

Notes:

The GLSD discharge standard is for the pH to be between 5.5 and 10.5. One of the readings from B-11 was outside that range. GLSD was willing to let the discharge proceed for the Post Office intersection work, on the basis of the average of the three readings being within the range.

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER MAIN REPLACEMENT

WATER LEVEL READINGS IN MONITORING WELLS
(All readings in feet below road surface)

Well:	**B-2**	**B-3**	**B-4**	**B-11**	**B-15**
Development:	4/12/2017	4/11/2017	4/10/2017	4/13/2017	4/13/2017
4/13/2017	3.90	4.60	3.80	3.30	5.00
6/8/2017	5.68	4.53	4.08	4.00	3.21
6/29/2017	6.20	5.10	4.60	4.79	4.30
7/24/2017	6.09	5.14	4.62	5.07	4.61
10/4/2017	6.50	5.80	5.30	6.20	5.30

Locations:
B-2 is on the north side of East Main Street, near the Depot intersection.
B-3 is on the east side of S. Broadway, near the Depot intersection.
B-4 is on the east side of S. Broadway, downgradient of Daisy Cleaners.
B-11 is on the east side of S. Broadway, downgradient of Crown Cleaners site.
B-15 is on the east side of S. Broadway, downgradient of Nissan site.

Notes:
Water level may still have been recovering in some of the 4/13/2017 readings

APPENDIX H

SUMMARY OF MEETING WITH GLSD

Memorandum

To: *Dan Hudson, Town of Salem*

From: *Jeff Diercks and Steve Carey*

Date: *July 21, 2017*

Subject: *Minutes of Meeting with GLSD*

These notes summarize a meeting held on July 18, 2017, at the Greater Lawrence Sanitary District (GLSD) headquarters in North Andover, MA.

The three of us met with Cheri Cousens, Executive Director, and Colleen Spero, Monitoring Manager, to discuss the potential discharge to the sewer of water from dewatering operations during the South Broadway utilities reconstruction.

Minutes

CDM Smith introduced the project, using a map to show the extent of the sewer and water work. We indicated most of that work would be done in 2018-19. We also focused attention on the Post Office Intersection area, explaining that road and water main construction in this area would be initiated very soon.

We provided a plan of the monitoring well locations, and a table of the laboratory analytical results to date. Jeff pointed out that there were no exceedances of either GLSD's Section 2.4 discharge regulations or of the Massachusetts DEP's GW-3 groundwater standards, with one exception. The exception was the lead level in monitoring well B-3, but that level met the GLSD standard, which supersedes the GW-3 standard. GLSD uses the GW-3 standards for guidance in cases where there is no GLSD standard.

CDM Smith and GLSD agreed that there were additional parameters that needed to be analyzed in samples from the monitoring wells to verify compliance with all GLSD standards. The parameters had been focused on NHDES discharge standards. The additional parameters are pH and four metals – copper, molybdenum, nickel and zinc. CDM Smith will make arrangements for those analyses and another round of water level readings.

Dan requested that the table of analytical results also include the GLSD Section 2.4 discharge standards. These have been added to the version of the table attached to this memorandum.

CDM Smith brought up the possibility of discharging the water into the sewer along with a similar discharge being planned for this summer and fall at the Town's former wastewater treatment facility. At that location, treatment facilities will be in place to remove volatile organic compounds

before discharge to the sewer. This would address the dry cleaning solvent (tetrachloroethylene) that will be encountered in B-11's water. CDM Smith asked if any treatment was needed, given that there were no exceedances. GLSD confirmed that no treatment was needed, and that the water could be discharged into any manhole, provided the upcoming sampling results are favorable.

GLSD asked if we knew what the flow rate from the trench would be. We indicated that we had not prepared an estimate, but that the work would be done during a low-groundwater season. We said that the June 29 reading from B-11, located in the Post Office Intersection area, was 4.8 feet below the road surface. This corresponds to the water table being only about 1.7 feet above the bottom of the trench. It likely will be even lower during construction, thereby limiting the amount of trench dewatering needed. GLSD noted that, whatever the actual flow may prove to be, it will be measured by the existing meter for payment purposes.

We asked GLSD what sampling would be required for the water being discharged to the sewer. After a discussion of options, GLSD determined the following:

- Monthly sampling will be required.
- Analyses should be performed for:
  - Total petroleum hydrocarbons (TPH).
  - The ten metals in GLSD's list of pollutant limitations (arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, silver, zinc). Analyses for total metals, not dissolved metals, should be conducted.
  - Volatile organic chemicals (VOCs). Of particular interest are total BTEX, benzene, MTBE, and tetrachloroethylene. All of these parameters are addressed in the typical comprehensive VOC analysis.

GLSD requested advance notice from Salem regarding when the discharge will begin. This is for the purpose of allowing their pretreatment inspectors to visit the site of the discharge. This request applies to both the upcoming Post Office Intersection work and to the larger program in 2018-19.

With respect to the larger program in 2018-19, GLSD requested to be sent the relevant specification sections that address the discharge. They will review and comment on the spec before the project bidding begins. GLSD requested that the specifications require the contractor to have a frac tank on site in case unforeseen contamination is encountered.

We asked if there was a formal permit application form that we should fill out, for the upcoming Post Office Intersection work. GLSD indicated that it would be satisfactory for Salem to submit the remaining analytical results by email, and that GLSD would reply to that email. No further formal documentation is needed.

cc: Roy Sorenson/Town of Salem
Cheri Cousens, Colleen Spero/GLSD

PROVISIONAL GROUNDWATER QUALITY DATA

DRAFT

TOWN OF SALEM, NEW HAMPSHIRE
SOUTH BROADWAY WATER & SEWER REHABILITATION PROGRAM

	LOCATION								B-2		B-3		B-4		B-11		B-15	
	SAMPLING DATE								6/8/2017		6/8/2017		6/8/2017		6/8/2017		6/8/2017	
	LAB SAMPLE ID								L1719160-01		L1719160-02		L1719160-03		L1719160-04		L1719160-05	
		CasNum	NH-AGQS	NHGW-1	NHGW-2	MA GW-3	GLSD	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
PCB by GC																		
	Aroclor 1016	12674-11-2	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1221	11104-28-2	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1232	11141-16-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1242	53469-21-9	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1248	12672-29-6	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1254	11097-69-1	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1260	11096-82-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1262	37324-23-5	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	Aroclor 1268	11100-14-4	0.5	0.5				ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
	PCBs, Total	1336-36-3	0.5	0.5		10		ug/l	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
Misc.																		
	pH	---					5.5-10.5	pH units										
Petroleum Hydrocarbon Quantitation																		
	TPH	NONE				5000		ug/l	200	U	200	U	200	U	200	U	200	U
Semivolatile Organics																		
	Acenaphthene	83-32-9	420	420		10000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Benzidine	92-87-5	0.8	0.8				ug/l	20	U	20	U	20	U	20	U	20	U
	1,2,4-Trichlorobenzene	120-82-1	70	70	150			ug/l	5	U	5	U	5	U	5	U	5	U
	Hexachlorobenzene	118-74-1	1	1		6000		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
	Bis(2-chloroethyl)ether	111-44-4	10	10		50000		ug/l	2	U	2	U	2	U	2	U	2	U
	2-Chloronaphthalene	91-58-7						ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	1,2-Dichlorobenzene	95-50-1	600	600	14000			ug/l	2	U	2	U	2	U	2	U	2	U
	1,3-Dichlorobenzene	541-73-1	600	600				ug/l	2	U	2	U	2	U	2	U	2	U
	1,4-Dichlorobenzene	106-46-7	75	75	80			ug/l	2	U	2	U	2	U	2	U	2	U
	3,3'-Dichlorobenzidine	91-94-1	1.3	1.3		2000		ug/l	5	U	5	U	5	U	5	U	5	U
	2,4-Dinitrotoluene	121-14-2	10	10		50000		ug/l	5	U	5	U	5	U	5	U	5	U
	2,6-Dinitrotoluene	606-20-2						ug/l	5	U	5	U	5	U	5	U	5	U
	Azobenzene	103-33-3	10	10				ug/l	2	U	2	U	2	U	2	U	2	U
	Fluoranthene	206-44-0	280	280		200		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	4-Chlorophenyl phenyl ether	7005-72-3						ug/l	2	U	2	U	2	U	2	U	2	U
	4-Bromophenyl phenyl ether	101-55-3						ug/l	2	U	2	U	2	U	2	U	2	U
	Bis(2-chloroisopropyl)ether	108-60-1	300	300		50000		ug/l	2	U	2	U	2	U	2	U	2	U
	Bis(2-chloroethoxy)methane	111-91-1						ug/l	5	U	5	U	5	U	5	U	5	U
	Hexachlorobutadiene	87-68-3	0.5	0.5		3000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Hexachlorocyclopentadiene	77-47-4	50	50				ug/l	20	U	20	U	20	U	20	U	20	U
	Hexachloroethane	67-72-1	1	1		50000		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
	Isophorone	78-59-1	100	100				ug/l	5	U	5	U	5	U	5	U	5	U
	Naphthalene	91-20-3	20	20	1700	20000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Nitrobenzene	98-95-3						ug/l	2	U	2	U	2	U	2	U	2	U
	NDPA/DPA	86-30-6						ug/l	2	U	2	U	2	U	2	U	2	U
	n-Nitrosodi-n-propylamine	621-64-7						ug/l	5	U	5	U	5	U	5	U	5	U
	Bis(2-ethylhexyl)phthalate	117-81-7	6	6		50000		ug/l	3	U	3	U	3	U	3	U	3	U
	Butyl benzyl phthalate	85-68-7						ug/l	5	U	5	U	5	U	5	U	5	U
	Di-n-butylphthalate	84-74-2						ug/l	5	U	5	U	5	U	5	U	5	U
	Di-n-octylphthalate	117-84-0						ug/l	5	U	5	U	5	U	5	U	5	U
	Diethyl phthalate	84-66-2				9000		ug/l	5	U	5	U	5	U	5	U	5	U
	Dimethyl phthalate	131-11-3	50000	50000		50000		ug/l	5	U	5	U	5	U	5	U	5	U
	Benzo(a)anthracene	56-55-3	0.1	0.1		1000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Benzo(a)pyrene	50-32-8	0.2	0.2		500		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Benzo(b)fluoranthene	205-99-2	0.1	0.1		400		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Benzo(k)fluoranthene	207-08-9	0.5	0.5		100		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Chrysene	218-01-9	5	5		70		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Acenaphthylene	208-96-8	420	420		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Anthracene	120-12-7	2100	2100		30		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Benzo(ghi)perylene	191-24-2	210	210		20		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Fluorene	86-73-7	280	280		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Phenanthrene	85-01-8	210	210		10000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Dibenzo(a,h)anthracene	53-70-3	0.1	0.1		40		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Indeno(1,2,3-cd)pyrene	193-39-5	0.1	0.1		100		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Pyrene	129-00-0	210	210		20		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	Biphenyl	92-52-4	350	350		50000		ug/l	2	U	2	U	2	U	2	U	2	U
	Aniline	62-53-3						ug/l	2	U	2	U	2	U	2	U	2	U
	4-Chloroaniline	106-47-8	28	28		300		ug/l	5	U	5	U	5	U	5	U	5	U
	1-Methylnaphthalene	90-12-0	160					ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	2-Nitroaniline	88-74-4						ug/l	5	U	5	U	5	U	5	U	5	U
	3-Nitroaniline	99-09-2						ug/l	5	U	5	U	5	U	5	U	5	U
	4-Nitroaniline	100-01-6						ug/l	5	U	5	U	5	U	5	U	5	U
	Dibenzofuran	132-64-9						ug/l	2	U	2	U	2	U	2	U	2	U
	2-Methylnaphthalene	91-57-6	280	280		20000		ug/l	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
	n-Nitrosodimethylamine	62-75-9						ug/l	2	U	2	U	2	U	2	U	2	U
	2,4,6-Trichlorophenol	88-06-2	5	5		500		ug/l	5	U	5	U	5	U	5	U	5	U
	p-Chloro-m-cresol	59-50-7						ug/l	2	U	2	U	2	U	2	U	2	U
	2-Chlorophenol	95-57-8	35	35		7000		ug/l	2	U	2	U	2	U	2	U	2	U
	2,4-Dichlorophenol	120-83-2	21	21		2000		ug/l	5	U	5	U	5	U	5	U	5	U
	2,4-Dimethylphenol	105-67-9	140	140		50000		ug/l	5	U	5	U	5	U	5	U	5	U
	2-Nitrophenol	88-75-5						ug/l	10	U	10	U	10	U	10	U	10	U
	4-Nitrophenol	100-02-7						ug/l	10	U	10	U	10	U	10	U	10	U
	2,4-Dinitrophenol	51-28-5	14	14		20000		ug/l	20	U	20	U	20	U	20	U	20	U
	4,6-Dinitro-o-cresol	534-52-1						ug/l	10	U	10	U	10	U	10	U	10	U
	Pentachlorophenol	87-86-5	1	1		200		ug/l	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
	Phenol	108-95-2	4000	4000		2000		ug/l	5	U	5	U	5	U	5	U	5	U
	2-Methylphenol	95-48-7	40	40				ug/l	5	U	5	U	5	U	5	U	5	U
	3-Methylphenol/4-Methylphenol	108-39-4	40	40				ug/l	5	U	5	U	5	U	5	U	5	U
	2,4,5-Trichlorophenol	95-95-4	700	700		3000		ug/l	5	U	5	U	5	U	5	U	5	U
	Benzoic Acid	65-85-0	28000	28000				ug/l	50	U	50	U	50	U	50	U	50	U
	Benzyl Alcohol	100-51-6						ug/l	2	U	2	U	2	U	2	U	2	U
	Carbazole	86-74-8						ug/l	2	U	2	U	2	U	2	U	2	U
	Pyridine	110-86-1						ug/l	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Total Metals																		
	Arsenic, Total	7440-38-2	10	10		900	310	ug/l	7		7		5	U	5	U	27	
	Barium, Total	7440-39-3	2000	2000		50000		ug/l	61		339		98		35		49	
	Cadmium, Total	7440-43-9	5	5		4	160	ug/l	5	U	5	U	5	U	5	U	5	U
	Chromium, Total	7440-47-3	100	100		300	1650	ug/l	10	U	19		10	U	10	U	10	U
	Copper, Total	7440-50-8					1500	ug/l										
	Lead, Total	7439-92-1	15	15		10	290	ug/l	10	U	51		10	U	10	U	10	U
	Mercury, Total	7439-97-6	2	2		20	4.8	ug/l	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
	Molybdenum, Total	7439-98-7					430	ug/l										
	Nickel, Total	7440-02-0					1740	ug/l										
	Selenium, Total	7782-49-2	50	50		100		ug/l	10	U	10	U	10	U	10	U	10	U
	Silver, Total	7440-22-4	100	100		7	227	ug/l	7	U	7	U	7	U	7	U	7	U
	Zinc, Total	7440-66-6					2000	ug/l										
Volatile Organics by GC/MS																		
	Methylene chloride	75-09-2	5	5	24000	50000		ug/l	3	U	3	U	3	U	3	U	3	U
	1,1-Dichloroethane	75-34-3	81	81	130	20000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Chloroform	67-66-3	70	70	70	20000		ug/l	0.75	U	0.98		0.75	U	0.75	U	0.75	U
	Carbon tetrachloride	56-23-5	5	5	10	5000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,2-Dichloropropane	78-87-5	5	5	50	50000		ug/l	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
	Dibromochloromethane	124-48-1	60	60		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1,2-Trichloroethane	79-00-5	5	5	20	50000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Tetrachloroethene	127-18-4	5	5	240	30000		ug/l	0.5	U	0.5	U	72		26		0.5	U
	Chlorobenzene	108-90-7	100	100	1500	1000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Trichlorofluoromethane	75-69-4	2000	2000				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,2-Dichloroethane	107-06-2	5	5	50	20000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.55	
	1,1,1-Trichloroethane	71-55-6	200	200	27000	20000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromodichloromethane	75-27-4	0.6	0.6		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,3-Dichloropropene	10061-02-6	0.5	0.5				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	cis-1,3-Dichloropropene	10061-01-5	0.5	0.5				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,3-Dichloropropene, Total	542-75-6	0.5	0.5		200		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	1,1-Dichloropropene	563-58-6						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Bromoform	75-25-2	4	4	2800	50000		ug/l	2	U	2	U	2	U	2	U	2	U
	1,1,2,2-Tetrachloroethane	79-34-5	2	2	120	50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Benzene	71-43-2	5	5	2900	10000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	3.2	
	Toluene	108-88-3	1000	1000	50000	40000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	Ethylbenzene	100-41-4	700	700	1500	5000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	3.6	
	Chloromethane	74-87-3	30	30				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Bromomethane	74-83-9	10	10	10	800		ug/l	1	U	1	U	1	U	1	U	1	U
	Vinyl chloride	75-01-4	2	2	4	50000		ug/l	1	U	1	U	1	U	1	U	1	U
	Chloroethane	75-00-3						ug/l	1	U	1	U	1	U	1	U	1	U
	1,1-Dichloroethene	75-35-4	7	7	630	30000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	trans-1,2-Dichloroethene	156-60-5	100	100	560	50000		ug/l	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
	1,2-Dichloroethene, Total	540-59-0				50000		ug/l	0.5	U	0.5	U	23		0.5	U	2.4	
	Trichloroethene	79-01-6	5	5	20	5000		ug/l	0.5	U	0.5	U	21		0.5	U	0.99	
	1,2-Dichlorobenzene	95-50-1	600	600	14000	2000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3-Dichlorobenzene	541-73-1	600	600		50000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,4-Dichlorobenzene	106-46-7	75	75	80	8000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Methyl tert butyl ether	1634-04-4	13	13	2600	50000		ug/l	1	U	1	U	1	U	1	U	1	U
	p/m-Xylene	179601-23-1						ug/l	1	U	1	U	1	U	1	U	1	U
	o-Xylene	95-47-6						ug/l	1	U	1	U	1	U	1	U	1	U
	Xylenes, Total	1330-20-7	10000	10000	17000	5000		ug/l	1	U	1	U	1	U	1	U	1	U
	cis-1,2-Dichloroethene	156-59-2	70	70				ug/l	0.5	U	0.5	U	23		0.5	U	2.4	
	Dibromomethane	74-95-3						ug/l	5	U	5	U	5	U	5	U	5	U
	1,2,3-Trichloropropane	96-18-4	0.5	40				ug/l	5	U	5	U	5	U	5	U	5	U
	Styrene	100-42-5	100	100	43000	6000		ug/l	1	U	1	U	1	U	1	U	1	U
	Dichlorodifluoromethane	75-71-8	1000	1000				ug/l	5	U	5	U	5	U	5	U	5	U
	Acetone	67-64-1	6000	6000		50000		ug/l	5	U	5	U	5	U	5	U	5	U
	Carbon disulfide	75-15-0	70	70				ug/l	5	U	5	U	5	U	5	U	5	U
	2-Butanone (MEK)	78-93-3	4000	4000	50000	50000		ug/l	5	U	5	U	5	U	5	U	5	U
	4-Methyl-2-pentanone	108-10-1	2000	2000	50000	50000		ug/l	5	U	5	U	5	U	5	U	5	U
	2-Hexanone	591-78-6						ug/l	5	U	5	U	5	U	5	U	5	U
	Bromochloromethane	74-97-5						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Tetrahydrofuran	109-99-9	600	154				ug/l	5	U	5	U	5	U	5	U	5	U
	2,2-Dichloropropane	594-20-7						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,2-Dibromoethane	106-93-4	0.05	0.05	35	50000		ug/l	2	U	2	U	2	U	2	U	2	U
	1,1,1,2-Tetrachloroethane	630-20-6	70	70		50000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Bromobenzene	108-86-1	60					ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	n-Butylbenzene	104-51-8	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	sec-Butylbenzene	135-98-8	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	tert-Butylbenzene	98-06-6	260	260				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	o-Chlorotoluene	95-49-8	100	100				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	p-Chlorotoluene	106-43-4	100					ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,2-Dibromo-3-chloropropane	96-12-8	0.2	0.2				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Hexachlorobutadiene	87-68-3	0.5	0.5		3000		ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Isopropylbenzene	98-82-8	800	800				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.85	
	p-Isopropyltoluene	99-87-6	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
	Naphthalene	91-20-3	20	20	1700	20000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	n-Propylbenzene	103-65-1	260	260				ug/l	0.5	U	0.5	U	0.5	U	0.5	U	0.86	
	1,2,3-Trichlorobenzene	87-61-6						ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,2,4-Trichlorobenzene	120-82-1	70	70	150	50000		ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3,5-Trimethylbenzene	108-67-8	330	330				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	1,3,5-Trichlorobenzene	108-70-3	40					ug/l	2	U	2	U	2	U	2	U	2	U
	1,2,4-Trimethylbenzene	95-63-6	330	330	1300			ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Ethyl ether	60-29-7	1400	1400				ug/l	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
	Isopropyl Ether	108-20-3	120	120				ug/l	2	U	2	U	2	U	2	U	2	U
	Tert-Butyl Alcohol	75-65-0	40	40				ug/l	10	U	10	U	10	U	10	U	10	U
	Ethyl-Tert-Butyl-Ether	637-92-3	40	40				ug/l	2	U	2	U	2	U	2	U	2	U
	Tertiary-Amyl Methyl Ether	994-05-8	140	140				ug/l	2	U	2	U	2	U	2	U	2	U
	1,4-Dioxane	123-91-1	3	3		50000		ug/l	250	U	250	U	250	U	250	U	250	U

*NH-AGQS: NH Ambient GW Quality Standards Criteria per NH Ambient Groundwater Quality Standards, Effective June 1, 2015.
*NHGW-1: NH GW-1 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*NHGW-2: NH GW-2 Method 1 Groundwater Standards Criteria per NH Risk Characterization & Management Policy, Revised February 2013.
*MA GW-3: MassDEP MCP Method 1 Groundwater Standard, accessed online 7/17/2017
= Exceedance with respect to MA GW-3