

**CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS AND PARKS
Worcester, MA**

**CONTRACT DOCUMENT FOR THE
QUINAPOXET TRANSFER PIPELINE
CONTRACT 2**

MAYOR
Joseph M. Petty

ACTING CITY MANAGER
Eric Batista

**COMMISSIONER, DEPARTMENT OF
PUBLIC WORKS AND PARKS**
Jay J. Fink P.E.

WATER/SEWER OPERATIONS DIRECTOR
Philip D. Guerin



JUNE • 2022



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TECHNICAL SPECIFICATIONS

SECTION 01000

SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

- A. The Work includes the slip-lining of an existing 36-inch riveted steel raw water transfer main with 30-inch PVC pipe, including fittings and appurtenances, as specified and indicated.
- B. Work is located within the Town of Holden, Massachusetts.

1.02 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to construct the work. The work includes the following major items of work as indicated and specified:
 - 1. Installation of approximately 1,900 linear feet of 30-inch DR25 C905 PVC pipe to be slip-lined.
 - 2. Installation of approximately 4,325 linear feet of 30-inch DR25 C905 PVC pipe to be installed via open-cut trench.
 - 3. Installation of approximately 230 feet of Spray-In-Place Pipe (SIPP) lining within 36-inch existing riveted steel pipe in the vicinity of the Asnebumskit Brook.
 - 4. Removal and replacement of eight (8) blow-offs and five (5) combination air release vacuum valves.
 - 5. Installation of two (2) 36-inch butterfly valve, salvage of two (2) existing 36-inch BFV.
 - 6. Installation of new pitometer valve, and salvage of existing pitometer valve.
 - 7. Removal, handling, transportation, and disposal of earth along the pipeline route.
 - 8. Installation of fractionation tanks, oil-water separators, bag filtration systems, and other equipment necessary to comply with the requirements of all dewatering permits along the pipeline route.
 - 9. Restoration of all disturbed areas and utilities impacted by the work.
 - 10. Filling and pressure/leakage testing of all installed water mains.
 - 11. Relocation of homeowner light post.
 - 12. Staking of easements between Kendall Road and Main Street by Registered Professional Land Surveyor (refer to Section 01050).

13. Stone walls that cross the pipeline easement shall be removed and replaced.
14. Remove and replace Anna Maria Access Gate, DCR Easement Gate and Pump Station Road Gate.
15. Provide temporary fencing for laydown, staging, and DCR easement entrance.
16. Provide erosion and sediment control measures.
17. Provide construction mats for work and travel within DCR, Anna Maria, and City of Worcester Easements in accordance with the Contract Documents.
18. Pre and post construction condition surveys of existing buildings.

1.03 WORK SEQUENCE

- A. Submit a Construction Schedule in accordance with Section 01310.
- B. Arrange for utility owners to perform specified utility work.
- C. Owner valves shall only be operated by Owner personnel.
- D. Coordinate operation of existing valves and flushing of the water main with the Owner.
- E. Work Notification
 1. Notify the Owner in writing, at least three working days prior to the start of Work on site. No Work on site shall be performed prior to obtaining a Street Entry Permit and Trench Excavation Permit from the Town of Holden in accordance with Section 01060.
- F. Utilities
 1. Notify DIG SAFE at 811, at least seventy-two (72) hours before digging, trenching, rock removal, demolishing, boring, backfilling, grading, landscaping or other earthmoving operations.
- G. Notices to Owners and Authorities
 1. Contact utilities, local Town and State authorities at least three working days prior to cutting or closing streets or other traffic areas or excavating near underground or overhead utilities.
- H. Easements belonging to City of Worcester, Massachusetts Department of Conservation and Recreation (DCR), and Anna Maria College located between Kendall Road and Main Street shall be staked before any work begins, and environmental protection measures (compost filter tubes / strawbales / construction mats) shall be located within the easement.
 1. Notify the City of tree limbs that may impede construction access within the easement limits. No tree or limb shall be cut or removed without prior written approval from the City of Worcester and property owner.

I. Open Cut Excavation between Station 37+00 and Station 39+50

1. Installation of 30-inch diameter pipe from approximate stations 37+00 to 39+50 shall be the last item of work that the Contractor completes in accordance with Section 01310.
2. Restoration work at 1565 and 1567 Main Street shall begin immediately following completion of the pipe installation within the City of Worcester Easement and be completed within 30 calendar days. Restoration work includes paving, loaming and seeding, removal of easement stakes, etc.
3. No restoration work shall take place between October 30th and April 30th. All restoration work requires 14 calendar days' notice to the City of Worcester prior to any work occurring on private property or within the easement.
4. No vehicle, equipment or material shall travel beyond the City of Worcester Easement limits as indicated. All construction access shall be via the DCR and Anna Marie College Easements from Kendall Road.

1.04 CONSTRAINTS

- A. All operations and activities shall be confined within public right of ways, easements, and other areas as indicated.
- B. Any land and access thereto not furnished by the Owner that Contractor deems necessary for the Work, for temporary construction facilities, access and egress or for storage of materials shall be provided by Contractor. Contractor shall provide a copy of written agreement for any private property used for his purposes prior to use. Any privately obtained property shall be at no additional cost to the City. Contractor shall provide for the security of all his and his Subcontractor's materials and equipment.
- C. Do not store any apparatus, materials, supplies or equipment within 100 feet of wetlands.
- D. Do not store any apparatus, materials, supplies or equipment outside the staked easement.
- E. No equipment or material shall be stored in the City of Worcester Easement between Station 36+90 to Station 40+50.
- F. The Contractor is responsible for providing all necessary traffic controls, including the use of flag men, within the Anna Marie College Easement in accordance with Section 01570. Contractor shall maintain flow of traffic in both directions at all times during construction. No material or equipment shall be stored within the limits of the easement.
- G. All restoration work at 1567 Main Street requires 14 calendar days' notice to the City of Worcester prior to any work occurring on that property or within the WDPW Easement. All work shall be scheduled in accordance with Section 01310. No restoration work shall take place between October 30th and April 30th.
- H. Public Convenience:

1. Adhere to the Limits of Work indicated including the Construction Zone Safety Plans.
 2. Make temporary provisions for the use of sidewalks and maintain function of stormwater systems, drainage ditches, and culverts.
 3. Notify the Owner two (2) days in advance of any construction work that will affect property owners and businesses.
- I. No work will be allowed on the pipeline between May 15 and September 30.
- J. The Contractor shall not fuse pipe when the ambient temperature is below 40°F without following manufacturer's recommended precautions for weather, wind and temperature. Pipe to be fused should be maintained at a minimum temperature of 40°F or higher. If the pipe is colder than 40°F, it should be preheated before the fusion process begins. The Contractor shall ensure the fusion environment maintains a minimum temperature of 40°F during the entirety of the thermal butt fusion process. The Contractor shall refer to Underground Solutions Operational Bulletin OB-8-274 – "Cold Weather Fusion" for further information. Pipe OD surfaces must be clean, dry and free from ice, snow, frost, water, dirt and other contamination. Fusion operations shall be suspended if wind driven precipitation or airborne contamination cannot be kept away from fusion operations.
- K. No work shall be performed in the paved ways or ROW between November 15 and April 1. The Town of Holden Street Entry Permit dates shall govern if different. Pump Station Road is exempt from this requirement from Station 149+50 to Station 172+00.
- L. Kendall Road shall not be closed to traffic without prior written approval from the Town of Holden. Notify the Town seventy-two (72) hours in advance of anticipated road closure. Road closure shall not last more than 6 hours. ***The Contractor shall complete Pre-and Post-Construction videos of Kendall Road between Main Street and House #211 in accordance with Section 01405.***
- M. Contractor shall place temporary paving at the conclusion of each work week in roadways. Permanent paving shall be placed after ninety (90) days but no later than one hundred twenty (120) days after temporary paving installation.
- N. Contract restrictions regarding work hours, noise limits and control of pollution, dust, debris, sediment, and traffic shall apply to the Contractor's use of all private property.
- O. City of Worcester reserves the right to stop work with fourteen (14) calendar days' notice to the Contractor to reinstate the pipeline for use outside of the timeframe listed in Paragraph 1.04.H of this Section. Should this occur, the Contract will be extended by the number of days that the pipeline is in use. City of Worcester shall provide the Contractor with fourteen (14) calendar days' notice that the pipeline will be available for work prior to the pipeline being taken out of service.
- P. Hours of Construction:
1. Work may only occur between 7:00 am and 3:30 pm Monday through Friday, excluding Owner holidays listed below. When a holiday occurs on a Saturday, the City observes the holiday on the Friday preceding the holiday. When a

holiday occurs on a Sunday, the City observes the holiday on the following Monday.

a. Owner Holidays:

- 1) New Year's Day
- 2) Martin Luther King Jr. Day (3rd Monday in January)
- 3) President's Day (3rd Monday in February)
- 4) Evacuation Day
- 5) Patriot's Day (3rd Monday in April)
- 6) Memorial Day
- 7) Juneteenth
- 8) Independence Day
- 9) Labor Day
- 10) Columbus Day
- 11) Veteran's Day
- 12) Thanksgiving Day
- 13) Christmas Day

2. Work on Saturdays within the Town of Holden requires the following conditions to be met and shall not occur without written permission from the City of Worcester.

- a. Permission is requested from the City of Worcester at least ten (10) business days before the Saturday to be worked. Request must be submitted in writing to the Owner's Representative, provide location of work, and provide a reason why Saturday work is necessary.
- b. City of Worcester will work with the Town of Holden to obtain Town of Holden's written permission within five (5) business days after receipt of request.
- c. City of Worcester will notify the Contractor in writing if Saturday work will be permitted.
- d. Contractor will not be allowed to work on Saturdays on a regular basis.
- e. No Saturday work shall occur if there is a holiday on the Friday preceding the workday or if there is a holiday on the Monday following the Saturday to be worked.

Q. Work in wetlands

1. Work in the wetlands shall be done from construction mats. See Section 01567 for more information.
2. Work between Stations 33+00 and 36+00 shall be done in the dry or in frozen conditions insofar as is possible.

R. Unnamed Brook at Approximate Station 18+82

1. Site access has been provided such that the brook shall not be crossed by contractor, contractor's staff, equipment, vehicles, etc.
2. The brook shall not be covered with construction mats.
3. Erosion controls shall not be placed in the brook.
4. Work in this area is recommended to be completed in frozen conditions insofar as possible.

S. Pipe Connection at Contract 1 Limits, Approximate Station 75+00

1. Flanges to be welded to pipe and cutting of steel pipe for roundness shall be completed prior to SIPP lining being installed.

T. No dewatering or construction activities shall occur until dewatering plan has been approved in accordance with the requirements of Section 02240. Installation of erosion control measures and staking of easements are exempt from this constraint.

1.05 SITE CONDITIONS

A. Data regarding the geological and geotechnical testing conducted for the Work, are included in the boring logs in Appendix C. The subsurface conditions and the groundwater observations from the test borings and test reports apply only to the locations of the borings at the time of the explorations or readings.

B. No tree or limb shall be cut or removed other than those indicated or specified, without a permit in writing from the Town of Holden Tree Warden.

1. If the Contractor requests the removal of a town tree, it is first to be inspected by the Tree Warden and a Tree hearing will be needed at the Contractor's expense. The tree hearing must be advertised in the local paper and the Contractor will be required to compensate the town for the cost of the ad. If there are no objections at the hearing then the Contractor will be allowed to remove the tree in its entirety including wood, brush, stump and grindings, and reseedling (if necessary) at their expense. Before any work begins, the Contractor must notify the Tree Warden 72 hours in advance.
2. The Contractor will be responsible for replacing the tree with one from the Town of Holden Approved Urban Street Trees list, included as Attachment A to Section 02491. The replacement tree must be a shade tree of nursery stock

conforming to the Standards of the American association of Nurserymen. The tree species must be approved by the Tree Warden and be 2 inches in caliper measured 4 feet above the root flare, balled and wrapped or bare root only. The location of the new tree must be approved by the Tree Warden. Planting will be done in the spring or fall and will be supervised by the Tree Warden.

1.06 PROTECTION

- A. All equipment and structures, new and existing, shall be protected from deterioration from dust, moisture and physical damage at all times.

1.07 STAGING AREAS

- A. City of Worcester is providing staging areas as indicated on the plans and listed below.
 - 1. City of Worcester is providing staging areas off Pump Station Road, which will require strawbales / compost filter tubes against the edge of the paved area.
- B. Any staging areas not provided by the City are the responsibility of the Contractor. These areas shall conform with Paragraph 1.04B of this Section. The City of Worcester shall not pay for these areas.

1.08 1567 MAIN STREET

- A. Work at 1567 Main Street shall be as follows:
 - 1. Permanent paving of the entire driveway limits as indicated.
 - 2. Removal of dead and broken tree branches from trees along the easement near the Massachusetts Audubon Society land. City shall mark the limits of pruning.
 - 3. Removal of two trees, including removal and disposal of stumps, nearer to Main Street that have been identified by the City as posing a long-term fall risk. City shall mark the trees for the Contractor.
 - 4. Furnish and install twelve (12) emerald green arborvitae (18-24 inches in height) on the property. The City of Worcester shall work with the homeowner to mark the locations on the ground.
 - 5. Furnish and install two (2) no trespassing signs at the edges of the City of Worcester Easement near the property line. The City of Worcester shall mark the locations for the Contractor.
 - 6. All work shall be scheduled in accordance with Section 01310. No restoration work shall be allowed between October 30th and April 30th.
- B. Work in Paragraph 1.08A.1. shall be paid in a different line item than the work in Paragraphs 1.08.A.2. thru 1.08.A.5.
- C. Work in Paragraphs 1.08.A.2 thru 1.08.A.4 shall be overseen by a certified arborist. Contractor shall submit arborist qualifications in accordance with Section 01300.

1.09 DCR EASEMENT

- A. No work shall take place within Massachusetts Department of Conservation and Recreation (DCR) easement until the limits of the easement have been staked out and environmental protection measures (compost filter tubes / strawbales / construction mats) are installed.
- B. No vehicle or equipment shall travel, and no material shall be stored unless within the City of Worcester easement.
- C. The Contractor shall maintain DCR access to all sewer manholes within easement limits at all times. DCR is scheduled to complete inspections of their sewers within the Limits of Work. The Contractor shall provide access to DCR manholes within the easement limits at all times and shall coordinate with DCR's contractor to allow for the completion of CCTV inspections while construction mats are in place. All coordination with DCR and construction access shall be at no additional cost to the City of Worcester.
- D. Areas not designated for laydown may be used by the Contractor provided they are not within the wetlands and are subject to approval by DCR. Any storage of materials or laydown within the DCR easement requires the use of construction mats.

PART 2 PRODUCTS

2.01 MATERIALS SUPPLIED BY OWNER

- A. 444 LF of DR 25 C905 PVC Pipe. Pipe is being stored in a staging area on Pump Station Road.

2.02 ITEMS TO BE SALVAGED

- A. Two 36-inch butterfly valves. Valves shall be returned to the City of Worcester Yard.
- B. One pitometer valve. Valve shall be returned to the City of Worcester Yard.

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 01370 – Schedule of Values

1.02 EXTENT OF WORK

- A. Measurement. The quantities to be measured under the various items in the proposal will be those quantities of work completed in accordance with the drawings and specifications. The methods of measurement will be as stated hereinafter for the individual items.
 - 1. In the case of earth excavation and rock excavation, the method of measurement of quantities will consist of cross sections measured in the field at intervals determined by the Engineer and computations of volume by the method of average end areas.
 - 2. For the computation of quantities where geometric methods would be laborious, it is understood and agreed that the "planimeter" shall be considered an instrument of precision acceptable for the measurement of such quantities.
- B. Prices. The unit or lump sum prices for all items in the schedule of prices shall be full compensation for the work of the general contractor specified and shall include the cost of furnishing all materials, labor, tools and equipment and all work and expense incidental to and necessary to complete the work in accordance with the drawings and specifications.

1.03 WORK NOT PAID FOR SEPARATELY

- A. Stripping Topsoil. Payment for stripping topsoil, including stockpiling, is included in the prices for the various Items of Work in the Schedule of Prices and no separate payment will be made therefore.
- B. Clearing and Grubbing. Trees and stumps that have a shortest diameter less than 3-inches that fall within an area to be cleared and grubbed or selectively cleared and thinned shall not be measured separately for payment. Payment for clearing and grubbing, tree trimming and selective clearing and thinning, including disposal, is included in the prices for the various items of work in the Schedule of Prices and no separate payment will be made therefore. Only trees that have a shortest diameter of at least 3-inches and less than 2 ft shall be included in Items 31 and 33. Only trees that have a shortest diameter of 2 ft or more shall be included in the Item 32 and 34.
- C. Earth Excavation. Payment for earth excavation to the depths indicated on the Drawings or authorized by the Engineer for the construction of all structures, pipe lines and appurtenances, including disposal of the excavated materials in fills, backfills, embankments, designated stockpiles, or as spoil, as approved by the Engineer, is included

in the prices for the various items of work in the Schedule of Prices and no separate payment will be made therefor.

- D. Filling, Backfilling, Embankment, and Disposal of Surplus Materials. Payment for filling, backfilling for all structures, underground electric conduits and pipe lines, including appurtenances, construction of embankments, and disposal of surplus material is included in the prices for the various items of work in the Schedule of Prices and no separate payment will be made therefor, except for selected material if needed to complete the work.
- E. Sheeting, Shoring and Bracing. Payment for all necessary sheeting, shoring and bracing is included in the prices for the various items in the Schedule of Prices and no separate payment shall be made therefor.
- F. Pumping, Draining and Bailing. Payment for all necessary pumping, draining, bailing, etc., including the use of underdrains or well points, is included in the prices for the various items in the Schedule of Prices and no separate payment will be made therefor.
- G. Dust Control. Payment for dust control is included in the prices for the various items in the Schedule of Prices and no separate payment will be made therefor.
- H. Mobilization/Demobilization. Payment for preparation of site is included in the various items in the Schedule of Prices and no separate payment will be made therefor. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining and paying for necessary permits and licenses; general protection, temporary heat and utilities; providing shop and working drawings, certificates and schedules; sampling and testing materials; providing required insurance; cleaning up, and all other work regardless of its nature which may not be specifically referred to in the Schedule of Prices but is necessary for the complete construction of the project set forth by the contract.
- I. Gradation Testing and Compaction Testing. Payment for required testing to ensure that the backfilled materials and specified compaction has been achieved is included in the prices bid for the various Items in the Schedule of Prices and no separate payment will be made therefor. Payment may be withheld until passing test results are provided to the City and the Engineer.
- J. Work Time Premiums. Payment for work to be performed overnight, Saturday or Sunday as indicated in the Contract Documents is included in the various Items of work in the Schedule of Prices and no separate payment will be made therefore. Contractor is responsible for adhering to all State and Federal wage regulations for premium time.
- K. Delivery of City Materials to City Water Department. Payment for work necessary to excavate and deliver salvaged items as indicated and specified is included in the price in the various Items in the Schedule of Prices and no separate payment will be made therefor.
- L. Bonds. Payment for bonds required by the contract is included in the prices bid for the various items of work in the Schedule of Prices and no separate payment will be made therefore.

- M. Construction (Swamp) Mats and Crushed Stone (gravel fill) for use under Construction Mats (Section 01567) shall be considered part of the various items of work in the Schedule of Prices and no separate payment will be made therefor.
- N. Pitometer Tap. All work for furnishing and installing a new pitometer valve and appurtenances as Specified in Section 02666 shall be considered part of the various items of work in the Schedule of Prices and no separate payment will be made therefor.
- O. Control Density Fill. Payment for filling all structures and pipe lines with control density fill, is included in the prices for the various items of work in the Schedule of Prices and no separate payment will be made therefor, except for selected material if needed to complete the work.

1.04 LUMP SUM ITEMS

- A. Payment of the lump sums established in bid proposal shall be full compensation for all labor, materials, and equipment required to furnish, install, construct and test all Work covered under the lump sum bid item.
- B. Payment of the lump sum will be based on physical progress for each activity in accordance with the approved Schedule of Values.
- C. Ten (10) percent of the value of any items contained in the Contractor's Schedule of Values that require performance and/or hydrostatic testing will be withheld until the particular items have been successfully tested as specified by the Contractor and accepted by the Owner.

1.05 UNIT PRICE ITEMS

- A. Payment of a unit price shall be full compensation for all labor, materials, tools, and equipment required to furnish, install and test each unit of the Work covered under the applicable item.
- B. Payment of Unit Price items will only be made for the actual quantity of Work performed in accordance with the Contract Documents, and measured in the following manner:
 - 1. Unit Prices based on "Volume" will be calculated by the "average End Area Method" unless otherwise noted. The Contractor shall submit his calculations to the Owner's Representative for approval.
 - 2. Unit Prices based on "Area" shall be calculated by "Horizontal Projection" unless otherwise noted. The planimeter shall be conserved an instrument of acceptable precision. The Contractor shall submit calculations to the Owner's Representative for approval.

PART 2 COMPENSATION

2.01 SAND BORROW (ITEM 1)

- A. Measurement. The quantity of sand borrow to be paid for under Item 1 shall be the number of cubic yards of off-site sand borrow furnished, placed and compacted as

directed by the Engineer and measured in place in the work.

- B. Payment. Payment under Item 1 at the contract unit price per cubic yard shall be full compensation for furnishing, transporting, placing, compacting and providing compaction testing for sand borrow for fill as required.

2.02 ROCK EXCAVATION (ITEM 2)

- A. Measurement. The quantity of rock excavation to be paid for under Item 2 shall be the number of cubic yards of rock including ledge rock and boulders exceeding one cubic yard in volume in place, as measured before excavation, that would have been removed if the excavation had been made everywhere to a depth of 8 inches below the underside of the pipe, and to a width of 12 inches greater on each side than the outside dimensions of said pipe.
- B. Payment. Payment under Item 2 at the contract unit price per cubic yard shall be full compensation for furnishing all materials, labor, tools and equipment and for performing all work including the disposal of all materials excavated in embankments, fills, backfills, or off the site, as directed by the Engineer.

2.03 EARTH EXCAVATION BELOW GRADE (ITEM 3)

- A. Measurement. The quantity of earth excavation below grade to be paid for under Item 3 in the Schedule of Prices is the number of cubic yards of material so excavated by order of the Engineer, beyond what is typically required to complete the work, as measured before excavation.
- B. Payment. Payment under Item 3 at the contract unit price per cubic yard shall be full compensation for furnishing all materials, labor, tools and construction equipment and for performing all work required to be done under this Item, including the disposal of surplus materials in embankments, backfill, fills, or off site, as directed by the Engineer.

2.04 CRUSHED STONE (ITEM 4)

- A. Measurement. The quantity of crushed stone to be paid for under Item 4 in the Schedule of Prices is the number of cubic yards ordered by the Engineer, as measured in place in the work. Crushed stone used under manholes shall be paid for under Paragraph 2.10. Crushed stone used to replace excavated rock will be paid for to the same limits only as specified for Rock Excavation payments. Crushed stone placed to fill unauthorized excavations or during trench dewatering will not be paid for. No sperate payment shall be made for crushed stone used under construction mats as specified Paragraph 1.03.M above. Crushed stone placed for the work of DCR Easement Improvements shall be paid for as specified in Paragraph 2.33.
- B. Payment. Payment under Item 4 is full compensation for furnishing all materials, labor, tools and construction equipment and for performing all work required for placing and compacting crushed stone, including any incidental work and expense

2.05 GRAVEL BORROW (ITEM 5)

- A. Measurement. The quantity of gravel borrow to be paid for under Item 5 shall be the

number of cubic yards of off-site gravel borrow furnished, placed and compacted as directed by the Engineer and measured in place in the work. No sperate payment shall be made for gravel fill used under construction mats as specified in Paragraph 1.03.M above.

- B. Payment. Payment under Item 5 at the contract unit price per cubic yard shall be full compensation for furnishing, transporting, placing and compacting gravel borrow for fill or embankment, to replace unsuitable material, and elsewhere as the Engineer may require.

2.06 MISCELLANEOUS CONCRETE (ITEM 6)

- A. Measurement. The quantity of concrete to be paid for under Item 6 shall be the number of cubic yards of off-site concrete furnished and placed for thrust blocks as directed by the Engineer and as indicated on the Contract Drawings.
- B. Payment. Payment under Item 6 at the contract unit price per cubic yard shall be full compensation for furnishing, transporting and placing concrete for thrust blocks, and elsewhere as the Engineer may require.
- C. Payment under Item 6 at the contract unit price per cubic yard shall be full compensation for furnishing, transporting and placing additional control density fill not indicated as the Engineer may require. No sperate payment shall be made for control density fill used for the abandonment of pipes and structures as indicated on the Contract Drawings and as specified in Paragraph 1.03.O above.

2.07 2" COMBINATION AIR VALVES (ITEM 7)

- A. Measurement. The quantity of 2" combination air valves to be paid for under Item 7 shall be the number of 2" combination air valves installed complete in place as indicated on the Contract Drawings. Payment for manholes shall be as specified in Paragraph 2.10.
- B. Payment. The prices stated in Item 7 is full compensation for furnishing all tools, equipment, materials and labor, and performing all work required to install the valves on new and existing pipelines. Payment under these items shall also be full compensation for removing existing air valves and appurtenances; salvaging all air valves removed, furnishing and installing valves; for all handling and hauling of materials, cutting of pipe, and for all other work and expense incidental thereto.

2.08 36" BUTTERFLY VALVES (ITEM 8)

- A. Measurement. The quantity of butterfly valves and valve boxes to be paid for under Item 8 shall be the number of butterfly valves and valve boxes and covers installed and/or relocated, complete in place as indicated on the Contract Drawings.
- B. Payment. The prices stated in Item 8 is full compensation for furnishing all tools, equipment, materials including retainer glands and labor and performing all work required to install the valves on new and existing pipelines. Payment under these items shall also be full compensation for removing existing valves and appurtenances; salvage of existing valves and operators; furnishing and installing valves and valve boxes and covers; relocation of existing valves, for all handling and hauling of materials, cutting of pipe, and for all other work and expense incidental thereto.

2.09 6" GATE VALVES (ITEM 9)

- A. Measurement. The quantity of gate valves and valve boxes to be paid for under Item 9 shall be the number of gate valves and valve boxes and covers installed complete in place as indicated on the Contract Drawings.
- B. Payment. The prices stated in Item 9 are full compensation for furnishing all tools, equipment, materials including retainer glands and labor and performing all work required to install the valves on new and existing pipelines. Payment under these items shall also be full compensation for removing existing gate valves and appurtenances; furnishing and installing valves and valve boxes and covers; for all handling and hauling of materials, cutting of pipe, and for all other work and expense incidental thereto.

2.10 PRECAST MANHOLES (ITEM 10)

- A. Measurement. The quantity of precast manholes, including frames and covers, to be paid for under Item 10 shall be the number of manholes, frames and covers installed complete in place as indicated on the Contract Drawings.
- B. Payment. The prices stated in Item 10 is full compensation for furnishing all tools, equipment, materials and labor, and performing all work required to install the valves on new and existing pipelines. Payment under these items shall also be full compensation for removing existing manholes, frames and covers; salvaging all frames and covers; furnishing and installing manholes, frames and covers, crushed stone; for all handling and hauling of materials, cutting of pipe, and for all other work and expense incidental thereto.

2.11 TELEVISION INSPECTION (ITEM 11)

- A. Measurement: The quantity of television inspection to be paid for under Item 11 shall be the linear feet of host pipe televised as specified in Section 02600. Work under Section 02662 shall be covered under Item 26 (Paragraph 2.25 of this Section).
- B. Payment. The prices stated in Item 11 is full compensation for furnishing all tools, equipment, materials and labor, and performing all work required to televise the host pipe and providing DVDs as specified in Section 02600.

2.12 PIPE CLEANING (ITEM 12)

- A. Measurement: The quantity of pipe cleaning of host pipe to be paid for under Item 12 shall be the linear feet of host pipe cleaned, including removal and disposal of all materials as specified in Section 02600. Work under Section 02662 shall be covered under Item 26 (Paragraph 2.25 of this Section).
- B. Pipe to be cleaned shall only be pipe to be sliplined.
- C. Payment. The prices stated in Item 12 is full compensation for furnishing all tools, equipment, materials and labor, and performing all work required to clean the host pipe, remove and dispose of all materials as specified in Section 02600.

2.13 30" DR 25 PC C905 FUSIBLE PVC PIPE (ITEM 13)

- A. Measurement: The quantity of pipe to be paid for under Item 13 shall be full for the number of linear feet of 36" steel pipe slip lined with 30" fusible PVC pipe. The lengths paid for are to be the lengths in feet measured along the centerline of the pipe as laid. The water main shall be measured per linear foot to the nearest 0.5 of a foot.
- B. Payment: Payment under Item 13 shall be full compensation for all labor, equipment, apparatus, and material necessary for excavation, furnishing and installation of the pipe, dewatering, excavation dewatering, annular space grouting, and insulation.
- C. This item shall not be paid until the quantity of pipe supplied by the Owner is installed under Item 29.
- D. Proof pieces as specified in Section 02600 shall be included in the Contractor's unit price. Proof piece shall not be used as pipe that is installed. Contractor is responsible for disposal of proof pieces after use.

2.14 30" DR 25 C905 PVC PIPE (ITEM 14)

- A. Measurement. The quantity of pipe to be paid for under Item 14 shall be the number of linear feet of the pipe furnished and installed, by open-cut method, complete in place. The lengths paid for are to be the lengths in feet measured along the centerline of the pipe as laid. No deductions will be made for gate valves or standard fittings. The water main shall be measured per linear foot to the nearest 0.5 of a foot. Line item also includes 36" DR 25 C905 PVC Pipe.
- B. Payment. Payment Under Item 14 shall be full compensation for all earth excavation; removal and disposal of all types of surface materials and reclamation of pavements encountered including bituminous and/or reinforced concrete; removing and replacing traffic signs, curbing, guardrails, route markers, and similar items; for all temporary sheeting and bracing; pumping, draining and backfilling; cutting of pipes; furnishing all fittings and joint restraint indicated on the Contract Drawings; relocating and/or renewing, in part or whole, water, sewer and/or other service pipes where they interfere with the line and grade of the new water mains; connecting new pipes to existing pipes; furnishing and installing any solid sleeves, or restrained and/or flexible couplings necessary to connect new pipes to existing pipes; removal and disposal of all pipe and appurtenances; furnishing and installing tracer tape as shown on the details; and for all other pipeline work and appurtenances, except that for which a definite payment item is included in the Schedule of Prices.
- C. The prices stated in Item 14 shall also be full compensation for performing all field strength and leakage tests, including all labor, equipment, apparatus, and material necessary for making the tests; replacing materials damaged by the Contractor in handling or found to be defective after being installed.
- D. Hydrostatic testing of all new water mains shall occur regardless of location within the project limits (i.e. intersections, stubs, etc.) when Contractor is testing against newly installed valves.

- E. No additional payment will be provided for the installation of water main and appurtenances installed at night.

2.15 30" DR 25 C905 RJ PVC PIPE (ITEM 15)

- A. Measurement. The quantity of pipe to be paid for under Item 15 shall be the number of linear feet of restrained pipe, including fittings, couplings, adapters, and appurtenances furnished and installed by open-cut method, complete in place. The lengths paid for are to be the lengths in feet measured along the centerline of the pipe as laid. No deductions will be made for gate valves or standard fittings. The water main shall be measured per linear foot to the nearest 0.5 of a foot.
- B. Payment. Payment Under Item 15 shall be full compensation for all earth excavation; removal and disposal of all types of surface materials and reclamation of pavements encountered including bituminous and/or reinforced concrete; removing and replacing traffic signs, curbing, guardrails, route markers, and similar items; for all temporary sheeting and bracing; pumping, draining and backfilling; cutting of pipes; furnishing all fittings and joint restraint indicated on the Contract Drawings; relocating and/or renewing, in part or whole, water, sewer and/or other service pipes where they interfere with the grade of the new water mains; connecting new pipes to existing pipes; furnishing and installing any solid sleeves, or restrained and/or flexible couplings necessary to connect new pipes to existing pipes; removal and disposal of all pipe and appurtenances; furnishing and installing tracer tape as shown on the details; and for all other pipeline work and appurtenances, except that for which a definite payment item is included in the Schedule of Prices.
- C. The prices stated in Item 15 shall also be full compensation for performing all field strength and leakage tests, including all labor, equipment, apparatus, and material necessary for making the tests; replacing materials damaged by the Contractor in handling or found to be defective after being installed.
- D. Hydrostatic testing of all new water mains shall occur regardless of location within the project limits (i.e., intersections, stubs, etc.) when Contractor is testing against newly installed valves.
- E. No additional payment will be provided for the installation of water main and appurtenances installed at night.

2.16 36" PC 250 DUCTILE IRON PIPE (ITEM 16)

- A. Measurement. The quantity of pipe to be paid for under Item 16 shall be the number of linear feet of the pipe, including fittings, couplings, adapters, and appurtenances furnished and installed by open-cut method, complete in place. The lengths paid for are to be the lengths in feet measured along the centerline of the pipe as laid. No deductions will be made for gate valves or standard fittings. The water main shall be measured per linear foot to the nearest 0.5 of a foot.
- B. Payment. Payment Under Item 16 shall be full compensation for all earth excavation; removal and disposal of all types of surface materials and reclamation of pavements encountered including bituminous and/or reinforced concrete; removing and replacing traffic signs, curbing, guardrails, route markers, and similar items; for all temporary

sheeting and bracing; pumping, draining and backfilling; cutting of pipes; furnishing all fittings and joint restraint indicated on the Contract Drawings; relocating and/or renewing, in part or whole, water, sewer and/or other service pipes where they interfere with the grade of the new water mains; connecting new pipes to existing pipes; furnishing and installing any solid sleeves, or restrained and/or flexible couplings necessary to connect new pipes to existing pipes; removal and disposal of all pipe and appurtenances; furnishing and installing tracer tape as shown on the details; and for all other pipeline work and appurtenances, except that for which a definite payment item is included in the Schedule of Prices.

- C. The prices stated in Item 16 shall also be full compensation for performing all field strength and leakage tests, including all labor, equipment, apparatus, and material necessary for making the tests; replacing materials damaged by the Contractor in handling or found to be defective after being installed.
- D. Hydrostatic testing of all new water mains shall occur regardless of location within the project limits (i.e., intersections, stubs, etc.) when Contractor is testing against newly installed valves.
- E. No additional payment will be provided for the installation of water mains and appurtenances installed at night.

2.17 6" PC 250 DUCTILE IRON PIPE (ITEM 17)

- A. Measurement. The quantity of pipe to be paid for under Item 17 shall be the number of linear feet of the pipe, including fittings, couplings, adapters, and appurtenances furnished and installed complete in place. The lengths paid for are to be the lengths in feet measured along the centerline of the pipe as laid. No deductions will be made for gate valves or standard fittings. The water main shall be measured per linear foot to the nearest 0.5 of a foot.
- B. Payment. Payment Under Item 17 shall be full compensation for all earth excavation; removal and disposal of all types of surface materials and reclamation of pavements encountered including bituminous and/or reinforced concrete; removing and replacing traffic signs, curbing, guardrails, route markers, and similar items; for all temporary sheeting and bracing; pumping, draining and backfilling; cutting of pipes; furnishing all fittings and joint restraint indicated on the Contract Drawings; relocating and/or renewing, in part or whole, water, sewer and/or other service pipes where they interfere with the grade of the new water mains; connecting new pipes to existing pipes; furnishing and installing any solid sleeves, or restrained and/or flexible couplings necessary to connect new pipes to existing pipes; removal and disposal of all pipe and appurtenances; furnishing and installing tracer tape as shown on the details; and for all other pipeline work and appurtenances, except that for which a definite payment item is included in the Schedule of Prices.
- C. The prices stated in Item 17 shall also be full compensation for performing all field strength and leakage tests, including all labor, equipment, apparatus, and material necessary for making the tests; replacing materials damaged by the Contractor in handling or found to be defective after being installed.
- D. Hydrostatic testing of all new water mains shall occur regardless of location within the

project limits (i.e., intersections, stubs, etc.) when Contractor is testing against newly installed valves.

- E. No additional payment will be provided for the installation of water main, and appurtenances installed at night.

2.18 ADDITIONAL FITTINGS (ITEM 18)

- A. Measurement. The quantity to be paid for under Item 18 shall be the number of pounds of standard fittings, with the exception of flexible couplings and sleeves, furnished and installed by order of the Engineer in excess of the total weight of all fittings indicated by the Contract Drawings and/or Specifications. The weights paid for shall be the standard weights, excluding accessories and joint restraint, given by the specifications of the AWWA/ANSI Standards for the fittings as specified in Section 02665. Measurement and payment for accessories and joint restraint are included within the specific fitting item in the schedule of prices.
- B. Payment. Payment under Item 18 at the contract unit price per pound shall be full compensation for furnishing, handling, and installing additional pipe fittings and all other necessary work incidental thereto.

2.19 PAVEMENTS (ITEMS 19 AND 20)

- A. Measurement. The quantity of trench pavement to be paid for under Items 19 and 20 shall be the number of tons of trench pavement measured in place by order of the Engineer. Thickness of trench pavements shall be as hereinafter specified in Section 02510 and as indicated on Drawing C-501.
- B. Payment. Payment under Items 19 and 20 at the contract unit price per ton bid shall be full compensation for furnishing all materials, equipment, tools and labor and for performing all work required to install the trench pavement as specified. The work shall include, but is not limited to, cutting pavements; removing and disposing of surplus subsurface materials; reshaping, re-compacting and re-rolling subbase; placing and compacting bituminous roadway, driveway and sidewalk pavements; restoration of loop detectors and pavement markings; installation or replacement of Cape Cod berm; and for all other incidental work and expense. Payment under Items 19 and 20 shall also be full compensation for maintaining trench pavements for two years, including all work, additional materials and expense associated therewith.
- C. The City may withhold a portion of the payment for the pavement items to cover maintenance within the warrantee periods. MassDOT average bid prices may be used to evaluate pavements and maintenance needs.
- D. The City may withhold a portion of the payment for the pavement items if trench edges are not cut according to the requirements of Section 02510 and/or the backfill is not compacted according to the requirements of Section 02200.
- E. The City may withhold a portion of the payment for the pavement items if the traffic loops and/or the traffic paint have not been restored within 30 days of Substantial Completion of the work within the affected area.

- F. Item 19 – Temporary Pavement – shall include the work indicated on Drawing C-501, Detail 1. Item 20 – Permanent Pavement – shall include all work indicated on Drawing C-501, Details 2 thru 6.

2.20 GRAVEL BASE FOR PAVEMENT (ITEM 21)

- A. Measurement. The quantity to be paid for under Item 21 is the actual number of linear feet of off-site gravel base material measured in place and placed by order of the Engineer to the depths and widths indicated in the Contract Drawings. On-site material may be used as a pavement base course, provided the material is tested and approved to meet these specifications. On-site material re-used is not included for payment under this item. Gradation testing of such materials shall be completed under this item, at the expense of the Contractor.
- B. Payment. The price stated under Item 21 is full compensation for furnishing, hauling, installing grading, shaping and compacting and providing compaction testing for gravel base material for the construction of pavement foundations and for all other work and expenses incidental thereto.
- C. The price stated also includes any trench re-excavation necessary to install the gravel base material to the depth required to receive pavements.

2.21 EROSION CONTROL (ITEM 22)

- A. Measurement: The quantity to be paid for under Item 22 will be measured complete in place as a unit and shall include the work required to furnish, install and remove erosion control devices as indicated in the drawings and specified here within. This item shall include time for inspections of erosion control after installation(s) by the Holden Conservation Commission and will include site walk(s) with the Holden Conservation Commission for each separate installation.
- B. Payment: The lump sum stated under Item 22 in the Schedule of Prices is full compensation for all work associated with furnishing and installing all erosion control devices and site walk(s) with the Holden Conservation Commission.

2.22 SITE RESTORATION/VEGETATION RESTORATION (ITEM 23)

- A. Measurement: The quantity to be paid for under Item 23 will be measured complete in place as a unit and shall include the work required to furnish and install grasses, vegetation, trees and other plantings, loaming, seeding and all appurtenances thereto to restore site (including wetlands) to their original condition for all locations except for the work covered under Item 24, and under Items 31 thru 34. Work shall be in accordance with Specification Section 02930. This item shall not include restoration of pavements, walks, driveways, or curbs which shall be paid for under Items 19 and 20.
- B. Payment: The lump sum stated under Item 23 in the Schedule of Prices is full compensation for all work associated with furnishing and installing grasses, vegetation, loam and seed and all appurtenances thereto.

2.23 SITE RESTORATION – 1567 MAIN STREET (ITEM 24)

- A. Measurement: The quantity to be paid for under Item 24 will be measured complete in place as a unit and shall include the work required to furnish and install 12 arborvitae trees, no trespassing signs, removal and disposal of two trees near main street including removal of stumps, removal of dead and broken tree branches within the City of Worcester's easement, and all appurtenances thereto. Work shall be in accordance with Specification Section 01000, Paragraph 1.08. This item shall not include restoration of pavements, walks, driveways, or curbs which shall be paid for under Items 19 and 20.
- B. Payment: The lump sum stated under Item 24 in the Schedule of Prices is full compensation for all work associated with the restoration specified and indicated and all appurtenances thereto.

2.24 TRAFFIC CONTROL DEVICES (ITEM 25)

- A. Measurement. The quantity to be paid for under Item 25 will be measured complete in place as a unit and shall include the work required to furnish and install the traffic control devices as indicated in the Drawings and specified here within. This item shall not include police, which will be paid for by the City of Worcester via direct billing from the police.
- B. Payment. The lump sum stated under Item 25 in the Schedule of Prices is full compensation for all work associated with furnishing and installing traffic control devices.

2.25 SIPP LINING (ITEM 26)

- A. Measurement. The quantity to be paid for under Item 26 will be measured complete in place as a unit and shall include the work of Section 02662, inclusive of all excavation, backfilling, compaction, cleaning of pipe, televising and surface restoration.
- B. Payment. The prices stated in Item 26 is full compensation for furnishing all tools, equipment, materials and labor, excavation, backfilling, compaction, and pavement replacement for all work associated with Section 02662.

2.26 LICENSED PROFESSIONAL LAND SURVEYOR (ITEM 27)

- A. Measurement. The quantity to be paid for under Item 27 will be measured complete in place as a unit and shall include the work of Section 01050.
- B. Payment. The lump sum stated under Item 27 shall be full compensation for all work associated with furnishing all tools, equipment, materials, and labor, for all work associated with Section 01050.

2.27 FENCING AND GATES (ITEM 28)

- A. Measurement. The quantity to be paid for under Item 28 shall be measured complete in place as a unit and shall include the work of Section 02821. Item includes 110 LF of chain link fence, rail, fabric, and appurtenances, including but not limited to a man gate and swing gates, and 300 LF of three-strand barbed wire and support arms. This line

item includes the removal and resetting of the Anna Maria Access Gate. This line item includes the demolition of the existing gate and split rail fence at the entrance to the DCR Easement and replacement of the pipe gate and split rail fence as specified. This line item includes the demolition of the existing gate and at the entrance to Pump Station Road and replacement of the gate as specified

- B. Payment. The prices stated in Item 28 shall be full compensation for furnishing all tools, equipment, materials, and labor, for all work associated with Section 02821.

2.28 30" DR 25 PC C905 FUSIBLE PVC PIPE – INSTALL ONLY (ITEM 29)

- A. Measurement: The quantity of pipe to be paid for under Item 29 shall be the number of linear feet of 36" diameter steel pipe slip lined with 30" diameter fusible PVC pipe supplied by the Owner as specified in Section 02600. The lengths paid shall be the lengths in feet measured along the centerline of the pipe as laid. The water main shall be measured per linear foot to the nearest 0.5 of a foot.
- B. Payment: Payment under Item 29 shall be full compensation for all labor, equipment, apparatus, and material necessary for excavation, transportation and installation of the pipe, dewatering, excavation dewatering, annular space grouting, and insulation.
- C. The first 444 LF of slip lining installed shall not be used as proof pieces.
- D. The first 444 LF of slip lining installed shall be paid for under this item. No payment shall occur under Item 13 until this 444 LF of pipe is used.

2.29 PRE AND POST CONDITION SURVEY (ITEM 30)

- A. Measurement. The quantity of Pre and Post Condition Surveys to be paid for under Item 30 shall be the number of existing properties surveyed within the project site as directed by the Owner.
- B. Payment. The prices stated in Item 30 is full compensation for performing all work required to complete the pre and post construction surveys. Payment under these items shall also be full compensation for examination of interior and exterior of buildings, taking photographs and video recordings, and preparing and submitting detailed written reports.
- C. Videotaping of all locations as specified in Section 01405, including all work zones, streets, easements, laydown/access areas and private property shall be included in this item and no separate payment shall be made.

2.30 TREE REMOVED – CITY – DIAMETER UNDER 2 FEET (ITEM 31)

- A. Measurement. The quantity of trees to be paid for under Item 31 shall be the number actually removed by the Contractor as directed by the City of Worcester, in the completed and accepted work as determined by the Engineer. Only trees that have a shortest diameter of at least 3 in. and less than 2 ft shall be included in Item 31. Tree Removed (City) - Diameter Under 2 feet.

- B. Where the tree consists of a single trunk extending more than a 4 ft vertical height above the average natural ground line, the shortest diameter shall be measured at the 4-ft level above the average elevation of the original ground.
- C. Any tree whose main trunk separates into multiple trunks, or which has limbs or branches growing out from the main trunk below the 4-ft level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins
- D. Payment: Individual trees to be removed will be paid for at the contract unit price per each and shall include the stump and major root systems. Only trees having a shortest diameter of 3-inches and less than 2 ft as defined above shall be measured for payment.
- E. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations.

2.31 TREE REMOVED – CITY – DIAMETER 2 FEET AND OVER (ITEM 32)

- A. Measurement. The quantity of trees to be paid for under Item 32 shall be the number actually removed by the Contractor as directed by the City of Worcester, in the completed and accepted work as determined by the Engineer. Only trees that have a shortest diameter of 2 ft or more shall be included in Item 32. Tree Removed (City) - Diameter 2 feet and Over.
- B. Where the tree consists of a single trunk extending more than a 4 ft vertical height above the average natural ground line, the shortest diameter shall be measured at the 4-ft level above the average elevation of the original ground.
- C. Any tree whose main trunk separates into multiple trunks, or which has limbs or branches growing out from the main trunk below the 4-ft level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins
- D. Payment: Individual trees to be removed will be paid for at the contract unit price per each and shall include the stump and major root systems. Only trees having a shortest diameter of 2 ft as defined above shall be measured for payment.
- E. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations.

2.32 TREE REMOVED – TOWN – DIAMETER UNDER 2 FEET (ITEM 33)

- A. Measurement. The quantity of trees to be paid for under Item 33 shall be the number actually removed by the Contractor as approved by the Town of Holden Tree Warden, in the completed and accepted work as determined by the Engineer. Only trees that have a shortest diameter of at least 3-inches and less than 2 ft shall be included in Item 33. Trees Removed (Town) - Diameter Under 2 feet.
- B. Where the tree consists of a single trunk extending more than a 4 ft vertical height above the average natural ground line, the shortest diameter shall be measured at the 4-ft level above the average elevation of the original ground.

- C. Any tree whose main trunk separates into multiple trunks, or which has limbs or branches growing out from the main trunk below the 4-ft level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins
- D. Payment: Individual trees to be removed will be paid for at the contract unit price per each and shall include the stump and major root systems. Only trees having a shortest diameter of 3-inches and less than 2 ft as defined above shall be measured for payment.
- E. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations.
- F. No separate payment shall be made for trees indicated on the Contract Drawings or in the Specifications. Trees indicated on the Contract Drawings or in the Specifications shall be paid for under Items 23 and 24.
- G. The contract unit price shall include the cost of replacing each tree removed with one from the Town of Holden's accepted tree list, included as Attachment A to Section 02491. Included in the cost shall be reimbursement to the Town for all costs associated with the tree hearing, including advertisements, preparation of plans, attending public hearings, and removing the tree in its entirety including wood, brush, stump and grindings, loaming and reseedling (if necessary).

2.33 TREE REMOVED – TOWN - DIAMETER 2 FEET AND OVER (ITEM 34)

- A. Measurement. The quantity of trees to be paid for under Item 34 shall be the number actually removed by the Contractor as approved by the Town of Holden Tree Warden, in the completed and accepted work as determined by the Engineer. Only trees that have a shortest diameter of 2 ft or more shall be included in Item 34. Trees Removed (Town) - Diameter 2 feet and Over.
- B. Where the tree consists of a single trunk extending more than a 4 ft vertical height above the average natural ground line, the shortest diameter shall be measured at the 4-ft level above the average elevation of the original ground.
- C. Any tree whose main trunk separates into multiple trunks, or which has limbs or branches growing out from the main trunk below the 4-ft level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins
- D. Payment: Individual trees to be removed will be paid for at the contract unit price per each and shall include the stump and major root systems. Only trees having a shortest diameter of 2 ft as defined above shall be measured for payment.
- E. The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations.
- F. No separate payment shall be made for trees indicated on the Contract Drawings or in the Specifications to be removed. Trees indicated on the Contract Drawings or in the Specifications shall be paid for under Items 23 and 24.

- G. The contract unit price shall include the cost of replacing each tree removed with one from the Town of Holden's accepted tree list, included as Attachment A to Section 02491. Included in the cost shall be reimbursement to the Town for all costs associated with the tree hearing, including advertisements, preparation of plans, attending public hearings, and removing the tree in its entirety including wood, brush, stump and grindings, loaming and reseeded (if necessary).

2.34 ALLOWANCE FOR WORCESTER EMERGENCY PIPE USE (ITEM 35)

- A. Item 35 establishes an allowance for reinstatement of the Quinapoxet transmission pipeline by the City of Worcester. The Contractor will be reimbursed by the Owner complete as a unit on a time and materials basis.
- B. Payment. The quantity to be paid for under Item 35 shall be for demobilization and remobilization as a result of the City of Worcester reinstating the pipeline (See Section 01000, Paragraph 1.04.N). Demobilization and remobilization includes, but is not limited to all work associated with starting and stopping work, removal and reinstallation of temporary blow-up plug in Kendall Reservoir, temporary site restoration, and removal/installation/refurbishing of environmental controls. Item shall be considered all inclusive.
- C. The allowance for Item 35 assumes two (2) demobilization and remobilization requests by the City of Worcester.
- D. Item 35 shall not include the initial mobilization for the project or the demobilization at the end of the project.

2.35 ALLOWANCE FOR ELECTRICAL WORK (ITEM 36)

- A. Item 36 establishes an allowance for the relocation of the light post at 189 Kendall Road. The Contractor will be reimbursed by the Owner complete as a unit on a time and materials basis. All electrical work shall be in compliance with local and state electrical codes. The Contractor is required to provide billing for the electrical work including breakdown of hours by employee, materials slips / invoices for all materials used, and daily sign off by the Resident Engineer for time, materials, and equipment uses.

2.36 ALLOWANCE FOR PRICE ADJUSTMENT (ITEM 37)

- A. Item 37 establishes an allowance for the difference in cost of pipe (Items 13 thru 17) at the time of Bid versus at the time of Notice to Proceed. The Contractor will be reimbursed by the Owner complete as a unit based on the difference in material cost, excluding delivery, shipping and handling, and any other fees. The Contractor shall provide a copy of the pipe material cost as part of their bid package which will be the "bid" price baseline. A copy of the cost of the materials for Items 13 thru 17 at the time of order (within 60 calendar days after Notice to Proceed) shall be provided by the Contractor to be reimbursed under this allowance. A change in price of an item of material will be considered when the price of an item increases ten percent (10%) between the bid price and time of order. The amount of the increase shall be capped at five percent (5%) of the original price for the item.

- B. Item 37 also contains Base Prices for Diesel Fuel; Gasoline; Liquid Asphalt; and Portland Cement Contained in Cast-in-place Concrete and provisions for price adjustments for those commodities in accordance with Chapter 30, Section 38A of the Massachusetts General Laws. The Base Price(s) are specified below and will be updated five days prior to the final bid opening date.
1. The cost of Diesel Fuel, Gasoline, Liquid Asphalt, and Portland Cement contained in Cast-in-place Concrete shall be included in Bid Items 1 thru 36.
 2. Price adjustments will be paid only when the variance between the Base Price and the Period Price for the month during which the cost is incurred exceeds plus or minus five percent (5%). A price adjustment will either result in additional compensation to the Contractor or repayment to the City, depending on whether there is an increase or decrease.
 3. Price adjustments will be based on the actual quantity included in a monthly Application for Payment, as supported by paid invoices, and will be made after the work has been performed, using the applicable Period Price.
 4. The Contractor shall be paid from the is allowance. The City shall be repaid from retainage.
 5. The entire difference between the Base Price and the Period Price for the month in which the cost was incurred will be paid.
 6. Base Prices and Basis of Payment are as follows:
 - a. Diesel Fuel Base Price (including state tax): \$_____ PER GALLON
 - b. Gasoline Base Price (including state tax): \$_____ PER GALLON
 - 1) Price adjustments will be based on the Period Price of Gasoline, Diesel Fuel for each monthly period as it appears on the Massachusetts Department of Transportation (MassDOT) website (<https://www.mass.gov/service-details/massdot-current-contract-price-adjustments>)
 - 2) The price adjustment only applies to actual fuel usage during each month for site dedicated equipment requiring gasoline or diesel fuel, including but not limited to construction equipment, trucks, and bypass pumps.
 - 3) The price adjustment will be determined by multiplying the number of gallons used during the applicable monthly period times the difference between the Base Price and the Period Price of Diesel Fuel or Gasoline.
 - c. Liquid Asphalt Base Price: \$_____ PER TON
 - 1) Price adjustments will be based on the Period Price of Liquid Asphalt as it appears on the MassDOT website.

- 2) The Price Adjustment only applies to the actual virgin liquid asphalt content in the mixture placed.
 - 3) The Price Adjustment will be determined by multiplying the number of tons of hot mix asphalt mixtures placed during the applicable monthly period times the liquid asphalt content percentage times the difference between the Base Price and the Period Price of Liquid Asphalt.
- d. Portland Cement Contained In Cast-in-place Concrete Base Price: \$_____ PER TON
- 1) Price adjustments will only be made on contracts using greater than 100 cubic yards of concrete containing Portland cement.
 - 2) Price adjustments will be based on the Period Price of Portland cement for each monthly period as it appears on the MassDOT website.
 - 3) The price adjustment only applies to the actual Portland cement content in the mix placed based on the approved concrete mix design. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.
 - 4) The price adjustment will be based on the variance between the Base Price and the Period Price for the Portland cement component only and will not include transportation or other charges.
 - 5) The price adjustment will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each month times the Portland cement content percentage times the variance between the Base Price and the Period Price of Portland cement.

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01045

CUTTING, CORING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. This Section covers the cutting, coring, rough and finish patching of holes and openings in existing and new construction.
- B. Coordinate the work of all trades to ensure compliance with all requirements specified in this Section.

1.02 RELATED WORK

- A. Section 02047 – Pipe Penetrations.
- B. Section 02050 – Demolition

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete and grout for rough patching shall be as specified in Section 03300, Paragraph 2.01.

PART 3 EXECUTION

3.01 GENERAL

- A. All cutting and coring shall be performed in such a manner as to limit the extent of patching.
- B. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled. Structural members shall be cut only as indicated.
- C. Rough patching shall bring the cut or cored area flush with existing construction unless otherwise indicated. Finish patching shall match existing surfaces.

3.02 CORING

- A. All equipment shall conform to OSHA standards and specifications.
- B. Protect existing equipment, utilities and critical areas against water or other damage.
- C. Slurry or tailings resulting from coring operations shall be removed from the area following drilling.

3.03 CUTTING

- A. Provide for control of slurry generated by sawing operation on both sides of cut element.
- B. When cutting a reinforced concrete wall, do not damage the bond between the concrete and reinforcing steel left in structure. Steel shall not protrude from face of the cut.
- C. Brace area to be cut prior to start of cutting and prevent a partial release of cut area during sawing operations.

**** END OF SECTION ****

SECTION 01046
CONTROL OF WORK

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Control of work within the Limit of Work indicated.

1.02 RELATED SECTIONS

- A. Section 01000 – Summary of Work
- B. Section 01050 – Field Engineering
- C. Section 01060 – Permits and Regulatory Requirements
- D. Section 01310 – Construction Schedule
- E. Section 01500 – Temporary Construction Facilities
- F. Section 01567 – Environmental Protection

1.03 DIMENSION OF EXISTING STRUCTURES

- A. Verify the dimensions and locations of existing structures in the field before the fabrication, installation, or connection of any material or equipment that is dependent on the correctness of such information.

1.04 TEST PITS

- A. Test pits for the purpose of locating underground utilities, pipeline or structures in advance of the construction shall be backfilled immediately and the surface restored to its pre-existing condition. The number and location of test pits shall be as indicated. Test pits performed by the Contractor not indicated shall be considered for the Contractor's convenience and shall be performed at no additional cost to the Owner.

1.05 CARE AND PROTECTION OF PROPERTY

- A. Preserve and protect all public and private property and prevent damage thereto. Repair damage at no additional cost to the Owner.

1.06 INSPECTION OF WORK AWAY FROM THE SITE

- A. If work to be done away from the construction site is to be inspected on behalf of the Owner during its fabrication, manufacture, or testing, or before shipment, notice shall be provided to the Owner of the place and time where such fabrication, manufacture, testing,

or shipping is to be done, in writing, 30 days prior to fabrication, manufacture, testing, or shipping is to be done.

1.07 **CLEANUP AND DISPOSAL OF EXCESS MATERIAL**

- A. Keep the site neat and clean. Immediately dispose of all residue resulting from the construction work and remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations in accordance with all applicable laws, rules and regulations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 **CLEANING OF WORK SITE**

- A. Clean the work site prior to Substantial Completion.

**** END OF SECTION ****

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

- A. Requirements for Professional Land Surveyor.
- B. Requirements for easement staking.

1.02 DEFINITIONS

- A. Easement: Shall mean any construction easement, access easement, or permanent easement.

1.03 QUALITY CONTROL

- A. Planning and oversight of this Work shall be supervised by a Licensed Professional Engineer or Land Surveyor registered in the Commonwealth of Massachusetts and having experience with two projects of similar type and cost which required application of similar survey procedures and techniques within the last 5 years.
- B. Work shall be performed by a Licensed Professional Land Surveyor (Surveyor) registered in the Commonwealth of Massachusetts.
- C. Survey Accuracy Requirements: The land and underground surveys shall be compatible with excavation and pipe placement tolerances in accordance with 250 CMR 2.00 through 7.00: Rules and Regulations Governing Professional Engineers and Professional Land Surveyors.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Proof of Qualifications of Professional Engineer or Land Surveyor before starting survey Work.
 - 2. Detailed description of proposed survey method, network diagrams, and equipment type, accompanied by manufacturer's literature specifying probable accessories, calibration procedures, requirements, and frequencies.
 - 3. Within 14 days of completion of each survey, a copy of layout sketch signed and stamped by the Professional Engineer or Land Surveyor certifying that the elevations and locations of the Work are in conformance with Contract Documents.
 - 4. A complete and accurate log of control and survey Work, including documentation verifying accuracy of survey Work as it progresses, and upon

completion of the Work, including but not be limited to, survey field books, sketches, drawings and layouts.

5. As-built documents of completed work monthly. Upon completion of all work, provide complete set of as-built/red line documents as one package which addresses all comments from as-built information previously submitted.
6. All Surveyed or field measurements as-built data shall be submitted in Autodesk AutoCAD version 2014 and as an Adobe PDF.
7. All documents or data utilized or created during the survey as-built work shall be submitted in PDF format.

1.05 SURVEY LOG

- A. Maintain a complete and accurate log of control and survey Work as it progresses.
- B. Maintain during Work on site, one set of the following documents:
 1. Contract Drawings
 2. Specifications
 3. Addenda.
 4. Change Orders and other modifications to the Contract Documents
 5. Reviewed shop drawings, product data, and samples.
 6. Written interpretations and clarifications.
 7. Field Orders.
 8. Field Test Reports properly verified.
 9. Photographs.
 10. Permits.
- C. Maintain As-built/Red Line Documents concurrent with construction progress and separate from documents used for construction.
- D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name, address and telephone number and product model and serial number.
 2. Modifications.
 3. Cross references to equipment tag numbers.

- E. As-built Documents and Shop Drawings: The Owner will provide one set of reproducible contract drawings and electronic DWG file to the Contractor. The Contractor and Subcontractors shall legibly mark these reproducible drawings and all shop drawings to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities, structures and appurtenances, referenced to permanent surface improvements.
 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 3. Field changes of dimension and detail.
 4. Details not on original Contract Drawings.
 5. Field changes to manufacturer's shop drawings.
- F. Submit two prints of the marked documents to the Owner with each Application for Payment. Each submittal shall highlight changes made since the previous submittal by boldly encircling the change and by describing the change in the revision block at the bottom of the drawing.

1.06 EASEMENT STAKING

- A. Professional Land Surveyor shall stake the easement located between Kendall Road and Main Street, construction easements and access easements indicated on the Drawings.
- B. Easements shall be staked on both sides with stakes painted orange on the top (minimum of 6-inches). Stakes shall stick out of the ground a minimum of two (2) feet.
- C. Easement stakes shall be placed every 20-feet on each side of easement. Stakes shall be replaced by surveyor if broken or dislodged.
- D. Driveways:
1. Driveways shall not be staked.
 2. Easement line shall be painted across driveways in a color determined by the Contractor.
 3. Driveway markings shall be refreshed every 60 days, or when markings become faint, whichever occurs first. Markings shall be refreshed while work is taking place in that area.
 4. Driveway markings shall be discontinued once permanent pavement is laid.
- E. Remove all stakes at completion of work.

PART 2 PRODUCTS

2.01 MARKING PAINT

- A. Shall be water based.
- B. Color shall be orange for painting stakes, driveway markings shall be in a color determined by the Contractor.
- C. Paint shall be as manufactured by:
 - 1. Rust-Oleum
 - 2. Aervoe Industries, Inc.
 - 3. Krylon
 - 4. Or equal

2.02 STAKES

- A. Shall be wooden.
- B. Be a minimum of 1" x 1" square
- C. Minimum of four feet (4'-0") showing above ground after installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify locations of survey control points indicated on Drawings prior to starting Work.
- B. Verify horizontal and vertical position of reference points by field traverse to two other reference points prior to each use of reference point.
- C. Notify the Owner of any discrepancies immediately upon discovery.

3.02 SURVEY REFERENCE POINTS

- A. The Owner has established a basic survey control and reference point. These are indicated on the Drawings. Owner shall provide Drawings in AutoCAD and easement documentation.
- B. The horizontal control datum for survey for the site is indicated on the Drawings.
- C. Protect survey control points; preserve permanent reference points during construction.
- D. Report to the Owner immediately upon discovery of the loss or destruction of any reference point and replace based on original survey control at no additional cost to the Owner.

- E. Notify the Owner immediately if any field conditions are observed to be different from the Drawings and may require utility relocation.

3.03 SURVEY REQUIREMENTS

- A. Provide field engineering services using recognized engineering survey practices.
- B. Establish elevations, lines and levels and verify layout every three months. Locate and layout by instrument survey.
 - 1. Site improvements including pavement; stakes for grading, fill and topsoil placement; utility location, slopes, and invert elevations.
 - 2. Grid or axis for structures.
- C. Verify dimensions and locations of existing structures in the field before the fabrication or installation of any material or equipment.
- D. Prior to backfilling the pipe, fitting, structures or utilities, an instrument survey shall be performed to establish the x, y coordinates and the z elevations.
- E. The instrument survey locations shall be performed at the following locations:
 - 1. Every 25 feet along straight pipe sections.
 - 2. At every pipe joint with a deflection of 2 degrees or higher.
 - 3. All fittings.
 - 4. All valves
 - 5. All couplings and flange adapters.
 - 6. All changes in direction or intersection of piping including bends, tees and wye's.
 - 7. Center sump of below grade round structures and the top corners of rectangular structures.
 - 8. Corners of buildings.
 - 9. Establish finish floor elevations for all buildings.
 - 10. Establish semi-permanent benchmarks inside all buildings.
 - 11. All manhole covers, gate box covers vent caps and hand holes.
 - 12. Survey points shall be collected at each end of the slipline section that is pulled.

** END OF SECTION **

SECTION 01060

PERMITS AND REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Comply with permits and regulatory requirements as indicated and specified.
- B. This Section also specifies permits obtained by the Owner.

1.02 RELATED WORK

- A. Section 01100 – Hazardous Materials Abatement
- B. Section 01300 - Submittals
- C. Section 01567 - Environmental Protection
- D. Section 02240 - Excavation Dewatering

1.03 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Copies of all permits, licenses, certifications or approvals obtained by the Contractor.
 - 2. Copies of all written notifications submitted to regulatory agencies, where such notification is required by the permit, license, or agency regulations.
 - 3. Erosion and Sediment Control Plan.
 - 4. Storm Water Pollution Prevention Plan (SWPPP).
 - 5. National Pollutant Discharge Elimination System (NPDES) permit(s).

1.04 REGULATORY AGENCIES

- A. Comply with all applicable federal, state, and local laws, regulations and permits concerning environmental pollution control and abatement. The Work of this Contract is within the Town of Holden. Work shall not commence until all required permits have been obtained and all statutory appeal periods have expired.
 - 1. Copies of the permits and approvals obtained by the Owner are included in Appendix A of these Contract Documents. The Contractor shall obtain all other required permits and approvals prior to the commencement of construction, as indicated in Paragraph 1.06.

1.05 PERMITS OBTAINED BY THE OWNER

- A. The following permits have been obtained by the Owner. The permits and their location are listed below:
1. DCR Access Permit (Appendix A)
 2. Water Quality Certificate (Appendix B)
 3. Town of Holden Order of Conditions will be obtained for the wetlands replication, cross drains, French drain and crushed stone path to be installed in the DCR Easement under the DCR Easement Work Allowance. Order of conditions will be provided with the other allowance documents.
- B. Comply with all permits obtained by the Owner. Should the Contractor need to modify any work activity addressed by permits obtained by the Owner, the Contractor shall provide the required information to the Owner and the permitting agency to obtain approval for the modification, at no additional cost to the Owner.

1.06 PERMITS OBTAINED BY THE CONTRACTOR

- A. Obtain and pay for all permits, licenses, certifications or approvals that are not listed in Paragraph 1.05 but that are required for the Work. These include, but are not limited to, building, electrical and other permits required of its equipment, work force, and of particular operations (such as transportation of equipment, materials, chemicals, fuel, hazardous or contaminated materials, items removed from the sites; use and storage of chemicals, explosives, and other materials; fuel storage; air emission; discharge of dewatering and/or storm drainage, whether to water bodies or to storm drainage systems; and the like) in the performance of the Work or the construction and removal of temporary construction facilities (such as temporary utilities including the provision of backwater preventers on temporary water services, above or below ground tanks, piping installation, piping removal, and chemical handling). Proper equipment shall be installed, tested and maintained in accordance with local, state, and federal requirements.
1. Prepare and submit to the Town of Holden a Street Entry Permit. The street entry permit can be obtained at:
http://www.mapsonline.net/holdenma/forms/template_select.php?id=828965241
 2. A Permit for Trench Excavation, issued in accordance with M.G.L. c. 82A, §§1-5 and 520 CMR 14.00 et. seq., shall be obtained from the Town of Holden as part of the Street Entry Permit.
 3. A National Pollution Discharge Elimination System (NPDES) Construction General Permit is required for stormwater from construction activities disturbing more than one acre (under this permit, stormwater includes dewatering from trenches). Prior to commencing any construction, the Contractor shall be required to obtain a NPDES General Permit and prepare a Storm Water Pollution Prevention Plan. Prior to submitting the EPA Stormwater General Permit Notice of Intent Form to EPA, the form shall be reviewed by Owner.

- a. Submit NPDES General Permit to DCR for review and approval prior to start of construction.
- B. Schedule and coordinate inspections and receipt of permits/approvals/certifications for any tanks, piping and associated appurtenances which are constructed, installed, tested or removed as part of this Contract and approvals for storage and use of test chemicals/gasses.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Comply with all applicable regulatory requirements including, but not limited to, those issued by the Massachusetts Department of Environmental Protection, U.S. Army Corps of Engineers, U.S. EPA, MassDOT, Mass. Environmental Policy Act Unit, Massachusetts Historical Commission, and Department of Conservation and Recreation.
- B. Portions of the Work are within Resource Areas or the 100-foot Buffer Zone as defined by the Massachusetts Wetlands Protection Act regulations (310 CMR 10.00).
 - 1. Refueling and equipment maintenance areas shall be located 100 feet or more from wetland resource areas.
 - 2. Spill containment equipment shall be stored on-site in an easily accessible location.
 - 3. Used petroleum products shall be collected and legally disposed of off-site. No on-site storage or disposal of these items is allowed.
 - 4. Refer to Section 01100 for further requirements.
- C. Comply with Massachusetts air quality regulations (310 CMR 7.09). As part of compliance, the Contractor is responsible to maintain construction equipment to minimize emissions. Comply with Massachusetts Department of Environmental Protection Clean Air Construction Initiative.

1.08 SITE VISITS BY PERMITTING AGENCIES AND NOTIFICATION

- A. In situations where site visits by the permitting agency are required, the Contractor shall notify the permitting agency in compliance with requirements of such permit and shall not backfill or bury the work to be viewed until the representative of the permitting agency has viewed the work. This provision applies to permits listed in Appendix A and any permits obtained by the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01070

ABBREVIATIONS AND DEFINITIONS

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 01090 - Reference Standards

1.02 ABBREVIATIONS

- A. Wherever the following abbreviations are used on the Drawings or in these Specifications, they are to be construed the same as the respective expressions represented:

1.	AASHTO	American Association of State Highway and Transportation Officials
2.	ACI	American Concrete Institute
3.	AISC	American Institute of Steel Construction
4.	AISI	American Iron and Steel Institute
5.	ANS	American National Standard
6.	ANSI	American National Standards Institute
7.	API	American Petroleum Institute
8.	ASCE	American Society of Civil Engineers
9.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
10.	ASME	American Society of Mechanical Engineers
11.	ASTM	American Society for Testing and Materials
12.	AWG	American or Brown and Sharpe Wire Gage
13.	AWWA	American Water Works Association
14.	AWS	American Welding Society
15.	BWTF	Brutsch Water Treatment Facility
16.	CIH	Certified Industrial Hygienist
17.	CISPI	Cast Iron Soil Pipe Institute

18.	CRSI	Concrete Reinforcing Steel Institute
19.	CS	Commercial Standard
20.	DEP	Department of Environmental Protection
21.	DEP BWSC	Department of Environmental Protection Bureau of Waste Site Cleanup
22.	DFW	Department of Fish and Wildlife
23.	Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Services Administration, Washington, D.C.
24.	IBR	Institute of Boiler and Radiator Manufacturers
25.	IEEE	Institute of Electronic and Electrical Engineers
26.	ISA	Instrument Society of America
27.	JIC	Joint Industry Conference Standards
28.	MassDOT	Massachusetts Department of Transportation
29.	MDCR	Massachusetts Department of Conservation and Recreation
30.	MSS	Manufacturers Standardization Society of the Valve and Fitting Industry
31.	NBS	National Bureau of Standards
32.	NEC	National Electrical Code; latest edition
33.	NEMA	National Electrical Manufacturing Association
34.	NFPA	National Fire Protection Association
35.	NPT	National Pipe Thread
36.	NSF	National Sanitation Foundation
37.	OSHA	Occupational Safety and Health Act
38.	OS&Y	Outside Screw and Yoke
39.	SAE	Society of Automotive Engineers
40.	SHP	Safety and Health Plan
41.	SIPP	Spray-In-Place-Pipe

42.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association, Inc.
43.	SSPC	Structural Steel Painting Council
44.	STL. WG	U.S. Steel Wire, Washburn and Moen, American Steel and Wire or Roebling Gage
45.	STD	Somerville Transportation Department
46.	UL	Underwriters Laboratories, Inc.
47.	USS Gage	United States Standard Gage
48.	WOG	Water, Oil, Gas
49.	WSP	Working Steam Pressure
50.	125-lb. ANS	American National Standard for Cast-Iron Pipe Flanges and Flanged Fittings
51.	250-lb. ANS	Designated B16.1-1975 for the appropriate class

1.03 DEFINITIONS

- A. Wherever the words defined in this section or pronouns used in their stead occur in the Contract Documents, they shall have the meanings herein given.
1. As Indicated The phrase “as indicated” means as indicated on the Drawings.
 2. Elevation The figures given on the Drawings and in the other Contract Documents after the word “elevation” or abbreviation of it shall mean the distance in feet above or below the datum adopted by the Authority.
 3. Earth The word “earth”, wherever used as the name of an excavated material or material to be excavated, shall mean all kinds of material including rock.
 4. Provide The word “provide”, wherever used, shall mean the full purchase and complete installation and testing, if applicable, of referenced materials and equipment.
 5. Person Day The phrase “Person Day”, wherever used, shall mean one person available/or a full 8 hours to perform the specific Work and/or for assistance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Standards referenced, and abbreviations used in Contract Documents.

1.02 RELATED SECTIONS

A. Section 01070 - Abbreviations and Definitions

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO Standard Specifications for Highway Bridges

B. American Concrete Institute (ACI):

1. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete
2. ACI 214R Guide to Evaluation of Strength Test Results of Concrete
3. ACI 301 Specifications for Structural Concrete
4. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete
5. ACI 305 Specifications for Hot Weather Concreting
6. ACI 306R Guide to Cold Weather Concrete
7. ACI 308R Guide to Curing Concrete
8. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures
9. ACI 318 Building Code Requirements for Structural Concrete and Commentary
10. ACI SP-66 Detailing Manual

C. American National Standards Institute (ANSI):

1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings
3. ANSI 61 (Gray) Specifications for Colors
4. ANSI/NEMA 250 Enclosures for Electrical Equipment
5. ANSI/NEMA MG1 Motors and Generators
6. ANSI/NFPA 70 National Electrical Code
7. ANSI/NFPA 1963 Standards for Fire Hose Connections

D. American Society for Mechanical Engineers (ASME):

1. ASME B1.20.1 Pipe Threads, General Purpose, Inch.
2. ASME B16.1 Grey Iron Pipe Flanges and Flanged Fittings Class 25, 125, and 250
3. ASME B16.4 Grey Iron Threaded Fittings, Classes 125 and 250
4. ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
5. ASME B18.2.2 Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts
6. ASME B18.21.1 Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
7. ASME B.18.22.1 Plain Washers

E. American Society for Testing and Materials (ASTM):

1. ASTM A36 Specification for Carbon Structural Steel
2. ASTM A48 Standard Specification for Gray Iron Castings
3. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless
4. ASTM A65 Standard Specification for Steel Track Spikes
5. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

6.	ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
7.	ASTM A216	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
8.	ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
9.	ASTM A307	Standard Specification for Carbon Steel Bolts, and Studs, and Threaded Rod 60,000 PSI Tensile Strength
10.	ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
11.	ASTM A385	Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
12.	ASTM A403	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
13.	ASTM A436	Standard Specification for Austenitic Gray Iron Castings
14.	ASTM A497	Standard Specification for Steel Welded Wire Reinforcement, Plain for Concrete
15.	ASTM A512	Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
16.	ASTM A516	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
17.	ASTM A536	Standard Specification for Ductile Iron Castings.
18.	ASTM A564	Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
19.	ASTM A615	Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
20.	ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

21.	ASTM B3	Standard Specification for Soft or Annealed Copper Wire
22.	ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
23.	ASTM B85	Standard Specification for Aluminum-Alloy Die Castings
24.	ASTM B88	Standard Specification for Seamless Copper Water Tube
25.	ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
26.	ASTM B127	Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
27.	ASTM B154	Standard Test Method for Mercurous Nitrate Test for Copper Alloys
28.	ASTM B164	Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
29.	ASTM B174	Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
30.	ASTM B179	Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes
31.	ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles, and Tubes.
32.	ASTM B240	Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloys in Ingot Form for Foundry and Die Castings
33.	ASTM B429	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
34.	ASTM B633	Standard Specification for Silver-Tungsten Carbide Electrical Contact Material
35.	ASTM B776	Standard Specification for Hafnium and Hafnium Alloy Strip, Sheet and Plate
36.	ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field

37.	ASTM C33	Standard Specification for Concrete Aggregates.
38.	ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
39.	ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
40.	ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
41.	ASTM C94	Standard Specification for Ready-Mixed Concrete
42.	ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
43.	ASTM C144	Standard Specification for Aggregate for Masonry Mortar
44.	ASTM C150	Standard Specification for Portland Cement
45.	ASTM C207	Standard Specification for Hydrated Lime for Masonry Purposes
46.	ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
47.	ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
48.	ASTM C270	Standard Specification for Mortar for Unit Masonry
49.	ASTM C309	Standard Specification for Liquid Membrane – Forming Compounds for Curing Concrete
50.	ASTM C361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
51.	ASTM C426	Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units
52.	ASTM C476	Standard Specification for Grout for Masonry
53.	ASTM C478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
54.	ASTM C494	Standard Specification for Chemical Admixtures for Concrete

55.	ASTM C778	Standard Specification for Standard Sand
56.	ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
57.	ASTM C923	Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
58.	ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Performed Flexible Joint Sealants
59.	ASTM C1064	Standard Test method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
60.	ASTM D429	Standard Test Methods for Rubber Property—Adhesion to Rigid Substrates
61.	ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600kN-m/m ³))
62.	ASTM D751	Standard Test Methods for Coated Fabrics
63.	ASTM D1187	Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
64.	ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
65.	ASTM D1330	Standard Specification for Rubber Sheet Gaskets
66.	ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2.700 kN-m/m ³))
67.	ASTM D1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
68.	ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness.
69.	ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

70.	ASTM D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
71.	ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
72.	ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
73.	ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
74.	ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
75.	ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
76.	ASTM D3740	Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
77.	ASTM D3786	Standard Test Method for Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method
78.	ASTM D4253	Standard Test Methods for Maximum Index Density of Soils Using Vibratory Table.
79.	ASTM D4254	Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
80.	ASTM D4397	Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
81.	ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
82.	ASTM D4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile
83.	ASTM D5034	Standard Test Method for Breaking Strength and Elongation of Textile Fabrics

84.	ASTM D5035	Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
85.	ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
86.	ASTM E329	Standard Specification for Agencies Engages in Construction Inspection, Testing or Special Inspection
87.	ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F. American Water Works Association (AWWA):

1.	AWWA B300	Hypochlorites.
2.	AWWA B301	Liquid Chlorine
3.	AWWA C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
4.	AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
5.	AWWA C110	Ductile-Iron and Gray-Iron Fittings
6.	AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
7.	AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
8.	AWWA C116	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
9.	AWWA C150	Thickness Design of Ductile-Iron Pipe
10.	AWWA C151	Ductile-Iron Pipe, Centrifugally Cast
11.	AWWA C153	Ductile-Iron Compact Fittings
12.	AWWA C209	Cold-Applied Tape Coatings for the Exterior of Steel Water Pipe, Special Sections, Connections, and Fittings
13.	AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

14.	AWWA C219	Bolted, Sleeve-Type Couplings for Plain End Pipe.
15.	AWWA C500	Metal-Seated Gate Valves for Water Supply Service
16.	AWWA C504	Rubber-Seated Butterfly Valves, 3 In. (75mm) Through 72 In. (1,800 mm)
17.	AWWA C508	Swing-Check Valves for Waterworks Service, 2 inches through 24 inches (50-mm Through 600-mm) NPS
18.	AWWA C509	Resilient-Seated Gate Valves, for Water Supply Service
19.	AWWA C512	Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Services
20.	AWWA C515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
21.	AWWA C550	Protective Interior Coatings for Valves and Hydrants
22.	AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
23.	AWWA C651	Disinfecting Water Mains
24.	AWWA C655	Field Dechlorination
25.	AWWA C800	Underground Service Line Valves and Fittings
26.	AWWA M55	PE Pipe – Design and Installation
- G. American Wood Products Association (AWPA):
- | | | |
|----|---------|--------------------------------|
| 1. | AWPA U1 | Specification for Treated Wood |
|----|---------|--------------------------------|
- H. Federal Highway Administration:
- | | | |
|----|--|--|
| 1. | Manual on Uniform Traffic Control Devices (MUTCD). | |
|----|--|--|
- I. Federal Specifications (FS):
- | | | |
|----|---------|--------------------------------|
| 1. | 595 | Federal Standard 595 Colors |
| 2. | 0-F-241 | Fertilizers, Mixed, Commercial |

3. A-A-1923A Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
 4. A-A-2886A Paint, Traffic, Solvent Based
 5. TT-P-86 Paint, Red-Lead-Base, Ready-Mix.
 6. TT-P-636 Primer Coating, Alkyd, Wood and Ferrous Metal.
 7. TT-V-51 Rev. F Varnish: Asphalt
- J. Institute of Electrical and Electronics Engineers (IEEE)
1. C62.41 Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
 2. C62.45 Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (100V and less) AC Power Circuits
 3. 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
 4. 519 Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
- K. Massachusetts Department of Transportation (MassDOT):
1. MassDOT Standard Specifications Massachusetts Department of Transportation, Highway Division "Standard Specifications for Highways, and Bridges", hereinafter referred to as "Massachusetts Standard Specifications" (1988 Edition, and the "2015 Supplemental Specifications to the Standard Specifications for Highways and Bridges", and the "Interim Supplemental Specifications" dated 09-18-2015)
- L. National Sanitation Foundation
1. NSF 61 Drinking Water System Components – Health Effects
 2. NSF 372 Lead Contact Compliance (formerly) NSF 61G (formerly) NSF 61F

- M. Plastics Pipe Institute
 - 1. PPI Handbook of Polyethylene Pipe
- N. Product Standards:
 - 1. Product Standard 1 Structural Plywood
 - 2. Product Standard 17 Polyethylene Sheeting (Construction, Industrial, and Agricultural Applications)
 - 3. Product Standard 20 American Softwood Lumber Standard
- O. U.S. Department of Agriculture (USDA):
 - 1. Federal Seed Act
- P. Underwriter's Laboratories, Inc. (UL)
 - 1. U.L.-1 Standard for Flexible Metal Conduit
 - 2. U.L.-6 Electrical Rigid Metal Conduit - Steel
 - 3. U.L.-20 General-Use Snap Switches
 - 4. U.L.-44 Thermoset-Insulated Wires and Cables
 - 5. U.L.-67 Standard for Panelboards
 - 6. U.L.-83 Thermoplastic-Insulated Wires and Cables
 - 7. U.L.-94 Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
 - 8. U.L.-96 Standard for Lightning Protection Components
 - 9. U.L.-96A Standard for Installation Requirements for Lightning Protection Systems
 - 10. U.L.-198 Fuses
 - 11. U.L.-248 Low-Voltage Fuses
 - 12. U.L.-360 Standard for Liquid-Tight Flexible Metal Conduit
 - 13. U.L.-467 Grounding and Bonding Equipment
 - 14. U.L.-489 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
 - 15. U.L.-506 Standard for Specialty Transformers

16.	U.L.-651	Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
17.	U.L.-823	Standard for Electric Heaters For Use in Hazardous (Classified) Locations
18.	U.L.-854	Standard for Service-Entrance Cables
19.	U.L.-864	Standard for Control Units and Accessories for Fire Alarm Systems
20.	U.L.-1203	Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
21.	U.L.-1242	Standard for Electrical Intermediate Metal Conduit - Steel
22.	U.L.-1283	Standard for Electromagnetic Interference Filters
23.	U.L.-1449	Standard for Safety, 3 rd Edition
24.	U.L.-1479	Standard for Fire Tests of Penetration Firestops
25.	U.L.-1971	Standard for Signaling Devices for the Hearing Impaired

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01100 - HAZARDOUS MATERIALS ABATEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Procedures for preventing and abating the release of hazardous materials resulting from the Contractor's operations.

1.02 REFERENCES

- A.** The Contractor shall comply with all Federal, State and Local ordinances with regard to hazardous materials abatement.

1.03 HAZARDOUS SPILL PREVENTION AND RESPONSE PLAN

- A.** Prepare a hazardous spill prevention and response plan in accordance with local, state and federal requirements to cover all vehicle fueling, vehicle maintenance and storage of oils and hazardous materials. The minimum requirements for spill response and prevention equipment that the Contractor shall keep available on site are as follows:

1. Plastic Wading Pools - Three (3) plastic wading pools (inflatable or rigid) shall be available at the construction site.
2. Absorbent - Fifteen (15) 50-pound bags of industrial absorbent shall be available at the construction site. Spread absorbent on puddles of hazardous materials or use as damming material to contain spills.
3. Plastic Sheeting - A minimum 10-foot wide by 100-foot long roll of polyethylene plastic sheeting shall be available at the construction site. Use polyethylene plastic sheeting as a protective barrier between the ground and hazardous materials.
4. Shovels - Five (5) shovels shall be stored at the construction site exclusively to build dikes or clean up contaminated soils and absorbent.
5. Storage Drums - One 55-gallon steel or polyethylene open top drum or a vessel of equal capacity and construction shall be available at the construction site for disposal of contaminated materials.
6. Communication Device - A two-way radio or other communication device shall be available at the construction site to call for emergency aid.

- B.** During refueling and lubrication, the following spill prevention measures will be employed. A plastic barrier shall be placed beneath the nozzle where the refueling hose connects to the equipment. Two arrangements may be used:

1. Place an air-filled or rigid plastic wading pool under the filling area. The wading pool shall be approximately three feet in diameter with six-inch sides or longer.
2. Dig a depression in the ground under the filling area. Depression will be three feet

in diameter and a minimum of six inches deep at its center. The sides of the depression will slope towards the center. A single piece of polyethylene plastic shall then be placed over the depression such that the plastic completely covers the center of the depression. Center of the depression is approximately under the fuel fill inlet.

- C. During refueling and lubrication, spill response equipment shall be within 50 feet of the filling operation.
- D. All parked (for greater than 24 hours) mobile construction equipment and any stationary construction equipment containing hazardous substances shall be placed over polyethylene plastic sheeting.
- E. In the event of a release of a hazardous material, the Contractor will immediately clean up the hazardous material and contaminated soil and/or water. The following cleanup procedures will be followed:
 - 1. Immediately notify local and state officials of the spill or release.
 - 2. If a release occurs and is contained in the plastic barrier, absorb the liquid with industrial absorbent and dispose of plastic barrier and absorbent in accordance with federal, state, and local regulations. Do not re-use a contaminated barrier.
 - 3. Notify the City of Worcester Water Operations/Reservoir Division immediately when the spill or release occur near or within sensitive drinking water supply areas, streams, brooks, or other bodies of water. Notification is not required if release occurs and is completely contained in the plastic barrier.
- F. In the event of a large spill or release of hazardous material (>1000 gallons) to the environment, the following cleanup procedures apply:
 - 1. Immediately notify local and state officials of the spill or release. Notify the City of Worcester Water Operations/Reservoir Division immediately when the spill or release occur near or within sensitive drinking water supply areas, streams, brooks, or other bodies of water.
 - 2. Immediately contain spill with available emergency equipment. Use soil or industrial absorbent dikes to stop spills from running into surface waters. Soak up puddle spills with industrial absorbent.
 - 3. Eliminate and restrict all sources of ignition from spill.
 - 4. Determine exact source of leak or spill, amount and area affected by release.
 - 5. Stop flow of material to the ground if still leaking (i.e. divert spilling material into a container or wading pool).
 - 6. Position fire extinguishers within twenty-five (25) feet of clean-up area.
 - 7. Collect contaminated material (for example absorbent, rags, contaminated soil) into a recovery drum and label for legal off-site disposal in accordance with all applicable regulations.

8. Clean up, restore, and replace spill response equipment.

1.04 SECURITY MEASURES

A. The Contractor shall comply with the following Security measures as follows:

1. Lock all existing gates and doors at entrances to site to prohibit access to area during non-working hours.
2. All equipment shall have locking fuel tank caps. These caps shall be locked at all times. Fuel tank drain cocks or valves shall have handles or wheel operators removed.
3. Disable all construction equipment and vehicles left in the construction area during non-working hours.
4. The Contractor shall provide daily inspection of the project site during non-working days to ensure that site is secure and to check for vandalism.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 PROGRESS MEETINGS

- A. Attend general progress meetings twice each month through the completion of the Contract. Meeting dates shall be established by the Owner.
 - 1. The Owner will record the minutes of the progress meetings.
- B. The Contractor's delegates to the meeting shall be prepared and authorized to discuss the following items:
 - 1. Comments on minutes of previous meeting;
 - 2. Safety and security issues;
 - 3. Progress of Work in relation to Contract schedule;
 - 4. Proposed Work activities for upcoming period;
 - 5. Resources committed to Contract;
 - 6. Coordination of Work with others;
 - 7. Quality control;
 - 8. Status of procurement of equipment and material;
 - 9. Status of submittals;
 - 10. Changes, claims, delays;
 - 11. Outstanding actions, decisions, or approvals that affect Work;
 - 12. Other issues of concern.
- C. Within seven (7) working days after each progress meeting date, the Owner will forward copies of the minutes of the meeting to the Contractor.
- D. Immediately following each progress meeting where, in the opinion of the Owner, revisions to the Progress Schedule/Critical Path Schedule have been made or recognized:
 - 1. Revise the schedule.
 - 2. Reissue the revised schedule within 10 days after meeting.

1.02 SPECIAL MEETINGS

- A. Up to four (4) off-site meetings as scheduled and administered by the Owner shall be attended. Special off-site meetings include those related to public meetings and permitting issues and may occur in daytime, evening or on weekends. The Contractor's delegate to meetings shall be a senior management person who shall be prepared to discuss permitting, water quality, traffic control, environmental, Work of the Contract and construction activity issues, as appropriate. Contractor's delegate to the meetings shall be prepared to answer questions and address concerns raised at the meetings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Procedural requirements for submitting product data, shop drawings, samples, quality control submittals and working drawings.

B. Related Sections:

1. Section 01090 - Reference Standards
2. Section 01310 - Construction Schedule
3. Section 01400 - Quality Control
4. Section 01600 - Material and Equipment

1.02 DEFINITIONS

A. Shop Drawings will be returned and stamped with the following classifications:

1. Code 1 - No Exception Taken: No correction or marks.
2. Code 2 - Make Corrections Noted: Few minor corrections. All items may be fabricated as marked up without further resubmission. Resubmit corrected copies to the Owner.
3. Code 3 - Revise and Resubmit: Minor corrections. Items not noted to be revised and corrected may be fabricated at the Contractor's option. Resubmit shop drawings per original submission with corrections noted. Thirty (30) days will be allowed for checking and appropriate action by Owner.
4. Code 4 - Rejected – See Remarks: Major corrections or not in accordance with Contract Documents. No items shall be fabricated. Correct and resubmit shop drawings per original submission. Thirty-five (35) days will be allowed for checking and appropriate action by Owner.
5. Code 5 - Reviewed For Informational Purposes Only: Items not reviewed or items for which submittals are not required.

1.03 SYSTEM DESCRIPTION

A. Submittal Requirements:

1. General Requirements:

- a. Submit a schedule of shop drawing submittals within twenty days after receipt of Notice to Proceed. Make submittals promptly in accordance with the Contractor's schedule of shop drawings.
- b. Submittal shall utilize a Submittal Transmittal Form.
- c. Submit 4 copies of each submittal to the Owner once approved (Code 1 or Code 2). Submit electronic copy of each submittal in accordance with Paragraph 3.01A.9.
- d. Submittals shall be entirely in the English language and shall contain:
 - 1) Date of submission and the dates of any previous submissions.
 - 2) Contract title and Contract number.
 - 3) Submittal Identification Number consisting of the Specification Number, submittal number, and versions identification:

 XXXXX-YYY-Z

 where XXXXX = Specification Section No.

 YYY = submittal number (start with 001 within each Section)

 Z = letter indicating a resubmittal (initial submittal is blank, first resubmittal is "A", 2nd is "B", etc.)
 - 4) The names of the following
 - a) Contractor
 - b) Supplier
 - c) Manufacturer
 - 5) Identification of the product or process, with the specification section and paragraph number.
 - 6) Field dimensions, clearly identified as such.
 - 7) Relation to adjacent or critical features of the work or materials.
 - 8) Applicable standards, such as ACI, ASTM, AWWA, ANSI, ASME or FS numbers.
 - 9) Identification of deviations from the Contract Documents.
 - 10) Identification of revisions on resubmittals.

- 11) An 8-inch by 3-inch blank space for the Contractor's and Owner's stamps.
 - a) Contractor's stamp, shall be initialed or signed, certifying to the review of the submittal, verification of products, field measurements and field construction criteria, proposed construction methods, and coordination of the information within the submittal with requirements of the work and of the Contract Documents.
- 12) Identify Contract, Contractor, Subcontractor or supplier; pertinent Drawing number and detail number(s), and Specification Section number, as appropriate. Each drawing shall have an assigned drawing identification number, revision indicator and date. On standard drawings or data sheets, clearly indicate model and option being proposed and strike out all non-relevant data.
- 13) Revise and resubmit submittals within 14 calendar days. Identify all changes made since the previous submittal.

2. Shop Drawings:

- a. Drawings shall be complete, and shall show compliance with the Contract Documents.
 - 1) Details shall be identified by reference to applicable sheet and detail or schedule as shown on the Contract Drawings.
 - 2) Drawings shall show the kind, size, arrangement and function of component materials and devices.

3. Product Data:

- a. Preparation:
 - 1) Clearly mark each copy to identify pertinent products or models.
 - 2) Show performance characteristics and capacities.
 - 3) Show dimensions and clearances required.
 - 4) Show wiring or piping diagrams and controls.
 - 5) Show external connections, anchorages and supports required.
- b. Manufacturer's standard schematic drawings and diagrams.
 - 1) Modify drawings and diagrams to delete information which is not applicable to the Work.

- 2) Supplement standard information to provide information specifically applicable to the Work.
4. Samples:
 - a. Product samples shall clearly illustrate:
 - 1) Functional characteristics of the product, with integrally related part and attachment devices.
 - 2) Full range of color, texture and pattern.
5. Contractor's Responsibilities:
 - a. Review Shop Drawings and Product Data prior to submission to the Owner.
 - b. Determine and verify:
 - 1) Field measurements.
 - 2) Field construction criteria.
 - 3) Catalog numbers and similar data.
 - 4) Conformance with Contract Documents.
 - c. Coordinate each submittal with requirements of the Work.

1.04 SEQUENCING AND SCHEDULING

- A. Unless otherwise specified in individual specification sections, each submittal will be returned within the number of working days following receipt of submittal by the Owner in accordance with Paragraphs 3.02 and 1.02.
- B. Maintain an accurate updated submittal log and bring this log to each scheduled progress meeting. This log shall include the following items:
 1. Submittal-description and number assigned.
 2. Date sent to the Owner.
 3. Date returned to the Contractor (from Owner).
 4. Status of submittal (No Exception Taken, Make Corrections Noted, Revise and Resubmit, Rejected – see Remarks, Reviewed For Informational Purposes Only).
 5. Date of resubmittal and return (as applicable).
 6. Date material released for fabrication.
 7. Projected date of fabrication.

8. Projected date of delivery to site.
9. Status of O&M manuals submittal.
10. Specification Section.
11. Contract Drawing number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. General:

1. Each submittal is to be complete.
2. Each submittal is to be made both in printed hard copy form in the quantity specified in Paragraph 1.03.A.1.c. and electronically.
3. Consecutively number submittals in direct sequence of submittal without division by subcontracts or trades.
4. Stamp all submittals, regardless of origin, with the Contractor's approval and identify with:
 - a. Name and number of this Contract.
 - b. Name of Contractor, Subcontractor and Manufacturer.
 - c. References to applicable Specification Paragraphs and Drawings.
 - d. Date of submittal or resubmittal.
5. Clearly identify applicable items when catalog pages are submitted and indicate current revision, issue number, and date on all drawings and other descriptive data. Remove or cross out all information that is not pertinent. Identify applicable standards, such as ASTM number or Federal Specification Number.
6. Identify all deviations from Contract Documents on each submittal and tabulate in letter of transmittal.
 - a. Indicate essential details of all proposed changes (including modifications to other facilities that may result from deviation) as pertinent to deviation.
7. Submit working drawings for changes or substitutions proposed by the Contractor.
 - a. Working drawings to be submitted are to be stamped and signed by a Professional Engineer registered in the Commonwealth of Massachusetts

and must convey or be accompanied by information to completely explain proposed method of construction, including but not limited to type of machinery and method proposed.

8. Provide vacant space approximately 3 inches high by 4 1/2 inches wide adjacent to identification data to receive Owner's status stamp.
9. Electronic Submissions
 - a. Setup a file transfer protocol site (ftp) for this project for the electronic transfer of submittals. Site shall be unique to the project and be password protected. Provide the site address in one email to the Owner and the password in a separate email to the Owner.
 - b. Upload final electronic submittals for record purposes to the ftp site in the Submittals In folder. Email the Owner when submittals have been uploaded to the site.
 - c. Electronic submittals shall be in PDF format conforming to the following requirements
 - 1) PDF Version & Format: Adobe Version PDF 1.7 (ISO 32000-1), PDF/A-2b
 - 2) Resolution: 300 DPI or higher
 - 3) Color: Same as original document
 - 4) File Image: Text Searchable
 - 5) Reproducibility: PDF file shall provide a true copy of the original that contains all details of the document from which it was made.
 - 6) Engineering Plans: PDF page size shall be the same size as the original printed engineering drawing document.

B. Resubmittals

1. Make correction to shop drawings and data which are Code 3 or Code 4 or which have instructions to resubmit portions of a Code 2.
2. Resubmit submittal to the Owner in accordance with Paragraph 3.01.A.9.
 - a. Indicate sequence of resubmittals by using number of first submittal followed by a letter (A, B, etc.).
3. When corrected copies are resubmitted, direct specific attention to all revisions and separately list any revisions made other than those called for by the Owner on previous submissions.
4. Verify that all exceptions previously noted have been taken into account.

5. Resubmit electronically.

3.02 OWNER'S SUBMITTAL ADMINISTRATION

- A. The Owner will act on submittals within 30 days of receipt, except submittals requiring approval of other agencies, commissions or authorities are specifically excluded from this review time period. The Owner will act on Code 4 resubmittals in accordance with Paragraph 1.02A.4.
- B. Progress payments may be withheld if submittals, resubmittals or schedule updates are not presented to the Owner in a timely manner as specified.

** END OF SECTION **

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section includes:

1. Planning, scheduling, and execution of the Work presented in construction progress schedules.
2. Progress schedule planning and scheduling of the Work, indicating starting and completion dates of all Work.
3. A schedule of product data, shop drawings and samples related to the progress schedule as specified in Section 01300, Paragraph 1.03.

B. Related Sections:

1. Section 01000 – Summary of Work
2. Section 01025 – Measurement and Payment
3. Section 01046 – Control of Work
4. Section 01060 – Permits and Regulatory Requirements
5. Section 01300 – Submittals
6. Section 01370 – Schedule of Values
7. Section 01400 – Quality Control
8. Section 01500 – Temporary Construction Facilities
9. Section 01600 – Material and Equipment

1.02 SCHEDULE

A. The schedule shall incorporate the constraints specified in Section 01000, Paragraph 1.04.

B. Schedule the Work within City of Worcester Easement between Station 36+90 and 39+50 at 1567 Main Street to be completed at the end of the construction schedule with the following constraints:

1. All restoration work shall be completed within 30 calendar days of completion of the Work between Station 36+90 and 39+50.
2. No restoration work shall take place between October 30th and April 30th.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Within ten (10) calendar days after Notice to Proceed, submit for approval the Initial Construction Schedule listing all construction activities using the critical path method. Submittal shall include hard copy printouts of the bar graph schedule format, predecessor/successor report, and changes report along with executable electronic files (Primavera P3 format).
2. Submit updated Construction Schedule monthly with Application for Payment which shall:
 - a. reflect the actual work completed
 - b. indicate which activities have been started and their progress
 - c. indicate which activities have been completed
 - d. include written narrative to define problem areas, anticipated delays, recommended corrective actions, projections of progress and completion, and the effect of changes on Subcontractors.
 - e. if the progress is delayed beyond that indicated in the prior update, include plan for schedule recovery.

1.04 QUALITY ASSURANCE

- A. Progress schedules shall include information on activities and sequencing from each Subcontractor and Supplier.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01370

SCHEDULE OF VALUES

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Requirements for providing a Schedule of Values.

B. Related Sections:

1. Section 01300 - Submittals

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Within ten (10) calendar days after Notice to Proceed, submit for approval a Schedule of Values itemizing the Work of, and totaling to the sum of the Bid.
 - a. "Mobilization and Demobilization" item shall include separate line items for bond premium, temporary construction facilities and utilities.
 - b. Break down installed costs into:
 - 1) Delivered cost of product.
 - 2) Total installed cost with overhead and profit.
 - a) Do not list overhead and profit as separate items.
2. Revise and resubmit Schedule of Values until approved by the Owner. Approval of Schedule of Values is a condition of payment on the first Application for Payment.

B. Support the Schedule of Values with documentation that will substantiate progress.

C. Identify the Schedule of Values with:

1. Title of Contract.
2. Contract Number.
3. Name and Address of Contractor.
4. Date of Submission.

D. Identify Schedule of Values line items with respective specification number and title.

- E. Schedule of Values, when approved by the Owner, shall be used as the basis for the Contractor's Application for Payment.
- F. Ten (10) percent of the value of any items contained in the Schedule of Values that require performance testing will be withheld until the particular items have been successfully performance tested.
- G. An unbalanced Schedule of Values providing for overpayment on items of work performed first will be rejected.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01390

HEALTH AND SAFETY PLAN

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Prepare a site-specific Health and Safety Plan (HASP) specifying protection for all workers, including Subcontractors, onsite personnel, visitors and abutters from all potential hazards. During the performance of all Work, the Contractor shall furnish all labor, materials and equipment necessary to implement the HASP and to fulfill all applicable requirements under federal, state and local laws, ordinances, rules and regulations governing the safety of persons and protection of property. The HASP shall include a Site-Specific Safety Plan (SSSP) meeting all requirements applicable to the Work, including but not limited to, OSHA requirements.

B. Related Sections:

1. Section 01000 – Summary of Work
2. Section 01100 – Hazardous Materials Abatement

1.02 REFERENCES:

A. Occupational Safety and Health Administration (OSHA) regulations:

1. 29 CFR 1910 – Occupational Safety and Health Standards
2. 29 CFR 1926 – Safety and Health Regulations for Construction.

1.03 SYSTEM DESCRIPTION:

A. All Work shall be conducted in compliance with OSHA 29 CFR 1910 and 1926.

B. Safety:

1. The Contractor, Subcontractors, employees, agents and invitees shall comply with the Health and Safety Plan while on site.
2. No later than the fifth working day of each month the Contractor shall submit a monthly safety report providing statistical information on hours worked, number of accidents and injuries, and amount of time lost due to injuries.
3. The Contractor shall provide protection per the SSSP for all persons including, but not limited to, its employees and employees of other Contractors or Subcontractors; members of the public; and employees, agents, and representatives of the Owner and regulatory agencies that may be on or about the work areas.

4. The Contractor shall protect from damage all Owner owned property including, but not limited to, structures, pipes, and utilities, above and below ground.
5. No work on site shall be performed until the HASP, and SSSP, are reviewed by the Owner. Compliance with OSHA requirements for the control of the release of hazardous energy during the service and maintenance of equipment shall remain the responsibility of the Contractor.
6. Regulated, Hazardous, and Flammable materials stored in quantities greater than the federal, state, and local Reportable Quantities (RQ) require the Owner's review before they are brought on site. These materials must be stored in containers, cabinets, or containment structures designed for such storage. Keep any flammable materials such as cleaning solvents, thinners, or adhesive materials away from open flames, sparks or high temperatures. Drums containing regulated, hazardous or flammable materials shall be labeled in accordance with applicable law, not greater than 46 gallons in size, be grounded (if flammable), and shall be stored over full drum containment (110% capacity of largest single vessel).
7. The Contractor shall maintain clean work areas, free of recognized hazards, have readily accessible first aid kits with emergency equipment providing for the risks involved in the Contractor's work.
8. Smoking is not permitted at Owner facilities or on Owner property.

1.04 SUBMITTALS:

A. General:

1. SSHO Qualifications: Submit qualifications of a Site Safety and Health Officer (SSHO) who will be responsible for implementing, monitoring and enforcing the Health and Safety Plan during all Work, in the form of a resume demonstrating qualifications specified in Paragraph 1.05.D, within 10 calendar days after Notice to Proceed.
2. CIH Qualifications: If any of the Work is subject to the provisions of 29 CFR 1910.120, submit qualifications of a Certified Industrial Hygienist (CIH) who shall be responsible for preparation of the HASP, in the form of a resume demonstrating qualifications specified in Paragraph 1.05.A, within 10 calendar days after Notice to Proceed.
3. HASP, including the SSSP: Within 30 calendar days after Notice to Proceed, Contractor shall submit a project-specific HASP and SSSP prepared by the CIH, which identifies all known and potential hazards and describes the methods and procedures for protecting worker health and safety. If any of the Work is subject to the provisions of 29 CFR 1910.120, the HASP and SSSP shall be prepared by a CIH. No work shall be performed until the Owner has reviewed the HASP.
4. Daily Safety Logs: The Contractor shall maintain daily safety logs and reports covering the implementation of the HASP during the duration of the Work. The format shall be developed by the Contractor to include daily safety logs, weekly

reports, and a phase out report. Contractor shall submit copies of all logs and reports on a weekly basis. Daily Safety Logs shall include the following:

- a. Date
- b. Area (site specific) checked
- c. Employees in particular area
- d. Site visitors, name, affiliation, purpose of site visit
- e. Equipment being utilized by employees
- f. Protective clothing being worn by employees
- g. Protective devices being used by:
 - 1) Contractor's personnel
 - 2) Visitors
 - 3) Designated State and Federal Representatives
- h. Air monitoring data including description of area being monitored, equipment used, and readings taken
- i. SSHO signature and date

1.05 QUALITY ASSURANCE:

- A. If any of the Work is subject to the provisions of 29 CFR 1910.120, the Contractor shall provide a CIH who has performed at least 5 construction projects of similar or greater size and complexity within the past ten (10) years.
- B. The Contractor shall conduct a site reconnaissance to determine the appropriate safety procedures and level of worker safety equipment for use in preparation of the HASP which shall conform to current worker safety practices. If any of the Work is subject to the provisions of 29 CFR 1910.120, the site reconnaissance shall include hazardous waste safety practices and the HASP shall be stamped and signed by the CIH.
- C. All onsite workers shall have training and certification for health and safety and for confined space entry, if any is required to perform the Work, as required under OSHA regulations.
- D. The SSHO shall be trained and certified in accordance with OSHA regulations, including confined space entry requirements (29 CFR 1910.146), if any is required to perform the Work. The SSHO shall have performed at least 5 construction projects of similar or greater size and complexity within the past ten (10) years.
- A. The Contractor's SSHO shall be present on-site for all working hours to monitor health and safety requirements throughout the performance of Work. It shall be

the SSHO's responsibility to notify the Owner of any deviations from the HASP.

PART 2 PRODUCTS: N/A

PART 3 EXECUTION

3.01 PREPARATION OF HEALTH & SAFETY PLAN

A. The HASP shall be in compliance with the health and safety standards set forth by Occupational Safety and Health Administration (OSHA) as described in 29 CFR1910 and 1926. The site-specific HASP shall include but not be limited to the following:

1. Identification of Key Personnel
2. Understanding of Project Work
3. Identification of Chemical and Physical Hazards and Risks
4. Excavation Entry
5. Personal Protective Equipment (PPE)
6. Respiratory Protection Equipment (RPE)
7. Standard Operating Procedures
8. Worker Training and Medical Requirements
9. Emergency Response Plans and Procedures
10. Personnel Monitoring Program
11. Environmental Monitoring Program

3.02 PREPARATION OF CONFINED SPACE ENTRY PLAN- IF REQUIRED TO PERFORM THE WORK:

A. All entries into and exits out of the confined spaces shall be in accordance with the procedures described in OSHA Confined Space Pre-Entry Check List and Entry Permit. Entries and exits from the confined space shall be documented and kept on file. Contractor shall give copies of the checklist to the Owner following each entry/exit.

B. If Confined Space Entry is required to perform the Work, the SSSP shall include a Confined Space Entry Plan in compliance with 29 CFR 1910.146 which shall contain personnel, equipment and procedures for confined space entry, including but not limited to:

1. Scope of Confined Space Entry Work
2. Entry/Exit Procedures
3. Project Personnel and Training/Certification Requirements

4. Hazard Evaluation: Description of atmospheric, chemical, physical, biological and engulfment hazards which may be encountered, and the steps taken to reduce occurrence and/or protect personnel from the hazards.
 5. Equipment and PPE
 6. Air Monitoring and Atmospheric Testing
 7. Communication Procedures
 8. Emergency/Rescue Contacts
 9. Emergency/Rescue Team
 10. Permit Forms
 11. Ventilation Procedures
- C. A pre-entry conference will be required within 48 hours of initial confined space entry to review tasks, known and suspected hazards and individual responsibilities during the entry/exit. Within 72 hours of completion of all work requiring confined space entry procedures, the Contractor and Owner shall jointly conduct and attend a brief post-entry conference to review accidents, incidents, or safety concerns that occurred, if any and assess overall success of completed work.
- D. The Contractor shall document all entries and exits into confined space using the inspection checklists. Copies of CONFINED SPACE ENTRY permits and any incident reports and/or investigation forms shall be provided to the Owner and kept on file by the Contractor for the duration of the project.
- E. Site Specific Safety Plan Program:
1. Contractor's corporate safety plan may be used as the basis for the SSSP but the corporate plan must be adapted to address all site specific safety requirements.
 2. The SSSP shall include at least the following:
 - a. Site description including the limits of construction, special conditions, intrinsic hazards and a street address for responders.
 - b. A description of the site specific safety organization identifying who has on-site safety responsibilities, their qualifications as well as a description of all safety management reports.
 - c. Description of the Work being performed.
 - d. A Job Hazard Analysis (JHA) specific to the work and work area.
 - e. Hazard mitigation strategies.

- f. Identification of required procedures in accordance with all work plans and applicable regulations, including OSHA (e.g. Confined Space, Respirator Use).
- g. Training Matrix identifying the needed training and effected employees for hazard mitigation and procedural compliance.
- h. Documentation of the training process.

****END OF SECTION****

SECTION 01391

CONDITION SURVEY

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Work under this Section includes the performance of Pre and Post Construction Surveys of the condition of existing buildings, structures, driveways, fences, walls, trees and other surface features within the project site where directed by the Owner.
- B. The Work shall also include a certified field survey to determine elevations of existing buildings and structures in conjunction with the pre-construction and post-construction condition surveys. The Work shall be performed under the supervision of and shall be certified by a licensed Land Surveyor registered in the Commonwealth of Massachusetts.

1.02 RELATED SECTIONS

- A. Section 01050 – Field Engineering
- B. Section 01300 – Submittals
- C. Section 01405 – Construction Photographs/Videos

1.03 SUBMITTALS

- A. Submit Condition Survey Report in accordance with SECTION 01300 – SUBMITTALS.
 - 1. Three copies of the Pre-Construction and Post-Construction Building Survey reports shall be submitted to the Owner for review.
 - 2. After review, four copies of each report shall be made: two copies, one of which shall be the original for the Owner, one copy shall be delivered to the property owner and one copy shall be retained by the Contractor
 - 3. Separate reports shall be submitted for each property.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Pre- and Post- construction condition surveys shall be performed by licensed Professional Engineer(s) and licensed Professional Architect(s) all of whom shall be registered in the Commonwealth of Massachusetts and shall have not less than five (5) years' experience and a record of performance within the last (5) years in completing condition surveys of similar types of buildings and structures.

2. The pre-construction and post-construction condition surveys shall be completed in accordance with Section 01405 with narration by a licensed Professional Engineer(s) and licensed Professional Architect(s)

1.05 SCHEDULE

- A. Within 10 days of Notice to Proceed, submit the qualifications of Professional Structural Engineer(s) or Architect(s) that will perform the pre- and post-construction surveys and building inspections.
- B. Within 60 days of Notice to Proceed, submit ten (10) copies of pre-construction "Building Condition Survey" reports and videos (on DVD) of buildings and structures to the Owner along with one (1) copy of each report and video to the respective property owner in accordance with the requirements of Section 01405.
- C. Within 30 days after completion of the work, submit ten (10) copies of all post-construction "Building Condition Survey" reports and videos (on DVD) of buildings and structures along with one (1) copy of report and video to property owner in accordance with the requirements of Section 01405.

1.06 PROJECT/SITE CONDITIONS

- A. Before the start of the Work on site, the Contractor shall engage an independent professional engineer to conduct a pre-construction condition survey of all existing structures and conditions as directed by the Owner. The survey shall be conducted within 60 working days of the Notice to Proceed.
- B. Right of entry for building conditions survey:
 1. The Contractor shall obtain the right of entry for all structures to be surveyed.
 2. Prior to contacting the individual building owners, the Owner will provide a general notice describing the project and the need to obtain access to each building. The Contractor shall not contact individual building owners until at least 2 weeks after the Owner has provided notice to the building owners.
- C. Existing Conditions:
 1. Observations shall be recorded during the survey of the existing conditions for houses, garages, commercial buildings, trees outside the right of way and other structures which will be affected by the Work of the Contract.
 2. Interview owners and tenants of properties regarding existing conditions and structural faults, and determine dates and extent of recent repairs.
 3. Prepare and submit a detailed written report for each building and structure surveyed. The report shall include the location and description of the site and a record of the visual examination of the building or structure. It shall contain color photographs of the interior and exterior of each building or structure and a video recording. Points where deterioration has occurred or where deficiencies exist shall be noted and photographed. The absence of deficiencies shall also be

recorded. The report shall include sketches and a summary of the interviews. The Authority will examine said reports and may indicate that additional information is required.

4. Detailed examination of buildings shall include an interior and exterior visual survey of the property, buildings, on-site improvements, plantings, and other surface features may include but not be limited to retaining walls, architectural fences, gazebos, pools, decks, trees or monuments. Video recording shall be taken to thoroughly display the interior and exterior showing visually evident structural faults, and including but not limited to: locations and sizes of cracks in floors, ceilings, and exterior and interior walls, especially instances of cracked or missing plaster; damaged masonry or roofing; damaged windows and doorways; walls which are not vertical or floors which are not horizontal; damage to foundations, including interior and basement walls; tightness of fit of doors and windows in their respective jambs; and evidence of water damage. The Contractor shall furnish four copies of each recording in DVD format. Each DVD shall have permanently written on it a legible label with the video title, and the property owner and Contractor's names. A brief written summary/description of each DVD's contents and locations of buildings/structures/roads/easements shall be included in the Survey Reports.
 5. Thirty photographs shall be taken by a photographer acceptable to the Owner. Photographs shall be color prints, 5 x 7 inches, with a glossy finish. Photographs of the interior and exterior of the structures shall be included.
 6. Separate reports shall be submitted for each property owner.
 7. The Contractor shall request owners to sign the report before final submission to the Owner. If the building owner refuses to sign the report, the Contractor shall notify the Owner.
 8. Other surface features may include but not be limited to retaining walls, architectural fences, gazebos, pools, decks, tree or monuments.
- D. Field surveys shall be performed to determine elevations of existing buildings, structures, and other surface features. The minimum requirements shall be as follows:
1. Corners of buildings or structure foundations in both the front and rear of the building or structure.
 2. Intermediate points within the limits stated above, including doorways, construction and expansion joints, and other features that would be affected by the Work.
 3. The location of each elevation shall be fully described in words and located on the Plan.
 4. The field survey shall be performed under the supervision of a certified Massachusetts Registered Land Surveyor. This survey shall be included with the

submission of the Pre-Construction Survey. The survey shall comply with the requirements of Section 01050.

- E. The Contractor shall photograph all easements prior to construction and after the limits have been staked to document these areas for restoration. The photographs shall be provided in accordance with Paragraph 1.03 of this Section.
- F. Post-Construction Condition Surveys:
 - 1. Upon completion of the work, the Contractor shall perform a survey similar to the pre-construction condition survey of all properties, structures, trees and conditions where pre-construction surveys were performed. Give notice to all interested parties so that they may be present during the final examination. Records of the final examination shall be distributed the same as the original pre-construction condition survey. The surveys shall be performed no more than 14 days following completion of the work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section Includes:
1. Development of the Contractor's Quality Control (CQC) Program.
 2. Construction Work Plans.
 3. Services of testing laboratories.

1.02 RELATED WORK

- A. Section 01300 - Submittals

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO R18 Establishing and Implementing a Quality System for Construction Materials Testing Laboratories
- B. American Society for Testing and Materials (ASTM)
1. ASTM C1077 Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
 2. ASTM D3740 Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 3. ASTM E329 Evaluation of Testing and Inspection Agencies as Used in Construction.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
1. An outline of the CQC program shall be submitted within 15 calendar days of Notice to Proceed.
 2. The CQC program and implementing procedures for quality control of the Work shall be submitted to the Owner for approval 30 calendar days following Notice to Proceed.

- a. Submit resume of CQC Manager to demonstrate the experience required as specified in Paragraph 1.05 A.6. of this section.
3. Written reports of tests and engineering data for the Owner's review of materials and equipment proposed to be used in the Work in accordance with Section 01300.
4. Three copies of a written report of each test performed by laboratory personnel in field or in laboratory according to the Owner.
5. Qualifications of testing laboratory including state-issued licenses and certifications for personnel and equipment calibration, meeting the requirements in Paragraph 1.08 B.
6. Written testing laboratory reports within three (3) working days after each test is completed.
7. Engineering data for proposed materials and equipment.

1.05 CONTRACTOR'S QUALITY CONTROL (CQC) PROGRAM

A. General:

1. Control the quality of the Work including work of Subcontractors and Suppliers and assure that the specified quality is achieved. The Contractor and its Subcontractors, and Suppliers shall develop and maintain a quality control program which is responsive to the requirements herein and of this Project.
2. The CQC program shall explain the Contractor's and its Subcontractors' approach to on-site quality control, off-site quality control, the CQC organization, documentation of quality control activities, outline reporting procedures and report formats, and furnish all other information necessary to demonstrate to the Owner that the Contractor and its Subcontractors, and Suppliers will furnish quality control services that ensure compliance of the Work with the Contract Documents.
3. The CQC program shall identify the Contractor's individuals who shall execute the program and identify those Subcontractors and Suppliers who will conform to the CQC program. Procedures for tracking construction deficiencies from identification through corrective action shall be identified. The CQC program shall apply to the control of quality throughout all areas of Contract performance including, as appropriate, the procurement, identification, stocking and issue of material; the entire process of construction; and the installation and testing of equipment.
4. The CQC program shall list all construction activities that have critical quality control requirements and describe the actions that will be taken to ensure that these requirements have been met. A QC checklist shall be prepared for each activity having critical quality requirement and shall be completed and signed by the Contractor upon completion of each activity. The CQC program shall

describe how the CQC Manager will monitor and correct deficiencies in the inspection program that is performed by responsible production staff.

5. The CQC Program shall list the definable features of the Work. A definable feature of the Work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be Work by the same trade in a different environment. Although each section of the Specifications may generally be considered as a definable feature of the Work, there are frequently more than one definable feature under a particular section. This list will form the basis for the Contractor's development of inspection checklists.
6. The CQC Program shall be managed by a CQC Manager with a minimum of five (5) years' experience in field quality control of pipeline construction projects. The duties of the CQC Manager may be performed by Contractor's Project Manager or Superintendent. The CQC Manager shall have, but not be limited to, the following responsibilities:
 - a. Develop and submit written QA/QC Program.
 - b. Review testing results for compliance with specified standards.
 - c. Prepare inspection checklists in accordance with requirements herein.
 - d. Observe quality of the Work on selected activities. These activities shall be specifically identified in the QA/QC Program.
 - e. Inspect stored materials for compliance with the Contract Documents.
 - f. Observe site testing procedures periodically.
 - g. Attend Progress Meetings.
7. The occurrence of any of the following conditions will indicate to the Owner that the Contractor's QC program is deficient and shall correct all deficiencies.
 - a. More than one failure of the Contractor to completely and accurately perform in process and final inspections of the Work weekly and upon completion, respectively.
 - b. More than one failure by Contractor to identify and correct material, equipment, or Work that does not conform to the Contract Documents.
 - c. Failure by Contractor's staff to record inspection results on check lists and make them available to the Owner's inspector on a weekly basis.
 - d. Inspections which identify workmanship, test results, material, equipment, and storage not in compliance with the Contract Documents; or the failure to perform equipment maintenance.

8. Maintain control over construction and installation processes to assure compliance with specified requirements. In-process and final inspection and testing of construction shall be performed in accordance with written implementing procedures on testing and inspection to assure that Contract requirements have been met. The results of in-process and final inspections shall be recorded on inspection checklists developed by the Contractor and approved by the Owner.
9. Inspection checklists shall be developed by the Contractor to document in-process and final inspections for all construction. Checklists shall contain instructions for performing the required inspection or tests; contain acceptance and/or rejection criteria; and reference the source of the requirement, such as the Specification, Drawing, industry code, permit or license requirement. Inspect the Work as construction progresses, and record inspection results on the checklists. Checklists shall be kept current and submitted to the Owner on a weekly basis. Current checklist shall also be submitted with the monthly pay request. Checklists shall contain columns that can be used to document the results of any independent inspections performed by the Owner. Checklists shall be developed and tailored for definable features of the Work.
10. Control the quality of the Work performed by Subcontractors and Suppliers and perform the Quality Control inspections of the Subcontractors or Supplier's work and activities.

1.06 CONSTRUCTION WORK PLANS

- A. Develop Construction Work Plans (CWP)s for each phase of Work required under applicable Specification Sections referenced in Attachment 01400-A using the Sample Construction Work Plan Form (Attachment 01400-B). Do not start activities covered by CWPs until applicable Plan is approved by the Owner. Submit CWPs for approval 30 days before commencement of each phase of the Work listed in Attachment 01400-A. CWPs shall include as a minimum the following items:
 1. Identify the Scope of Work and applicable Contract Specification Section(s).
 2. Identify whether or not a hazard analysis is required for the activity.
 3. Identify any actions or "Special Work Activity" that may expose the general public to a high degree of danger, inconvenience, or risk.
 4. List of required submittals (and status of the submittals) to complete the Work activity.
 5. Individual(s) [name or position and organization] responsible for supervision and implementation of the Work and for ensuring the quality of the Work meets the contract document requirements.
 6. Planned start date of Work activity, progress rate expected, and any extended Work hours required, where permitted in Section 01000, Paragraph 1.04.
 7. Prerequisite activities and related safety issue.

8. Sequence of events and construction methods that define how Work is to be performed.
9. Identify special processes to be used.
10. Include inspection notification.
11. Identify inspection and tests to be performed by Contractor or Contractor's testing laboratory and testing equipment to be used.

B. Control of Materials, Equipment, Parts, Components and Services:

1. Establish CWP to ensure items and materials processed through Contractor's receiving operations are identified, free from damage, traceable to acceptance criteria and meet Contract Document requirements. Document provisions for stored items and materials consistent with expected duration and type of storage. Maintain records of item and material traceable to location of incorporation into Work.
2. Provide handling, storage and maintenance of materials and equipment in accordance with manufacturer's recommendations. Establish a CWP addressing handling, storage and maintenance. Ensure material and equipment are handled and stored to prevent damage and deterioration. Protect equipment from dust and other environmental elements by wrapping or covers. Perform maintenance in accordance with manufacturer's recommendations. Conduct and document equipment maintenance. Make maintenance records available to the Owner for review.

C. Control of Special Processes:

1. Establish CWP for control of special processes (e.g. welding, soldering, heat treating, non-destructive examination, testing) to be used to verify conformance to Contract Document requirements.
2. Provide names and qualifications of Contractor or Subcontractor personnel performing or inspecting special processes who are qualified in accordance with applicable codes, standards and specifications. Maintain qualification records of personnel performing and inspecting special processes in the site office files.
3. Submit names and qualifications of Contractor or Subcontractor personnel performing or inspecting special processes for acceptance by the Owner before they start Work on Project.

D. Records:

1. Records, as defined in this Section include documents that provide objective evidence of Safety, Quality, Reliability, Maintainability and Cost, in areas of Design, Procurement, Construction, Inspection, Test, Start-Up and Operations.

2. Develop and maintain an index of records based on requirements for document and data submittals in each Specification Section. Indicate records required to be furnished by Contractor.
3. Submit Contractor's Records Index to the Owner for acceptance. Index may be submitted in phases as Work progresses. First index submittal shall be due within 60 calendar days after Notice to Proceed. Subsequent submittals shall be due 30 calendar days before start of activity.
4. Do not start Work activities covered by specification Section requiring documentation and data until applicable index is accepted by the Owner.
5. Index, file and maintain records to provide timely retrieval, traceability, identification, and acceptability of material, items and services.
6. Provide records as defined in this Section to the Owner.

1.07 DOCUMENT CONTROL

- A. Establish a plan to provide controls for receipt, status, maintenance and transmittal of Project records and documents.
- B. Do not change or alter Contract records and documents accepted by Owner.
- C. Ensure current revisions of procedures, instructions, drawings and other applicable documents are provided at Work location(s).
- D. Identify and maintain records and documents in an organized manner. Make records available to the Owner upon request.
- E. Protect records and documentation from damage, deterioration and loss. Keep quality records as specified in fire-proof cabinets at Contractor's worksite office or maintain a duplicate set at another location.

1.08 TESTING

- A. Conduct tests where specifically required in Contract Documents. Quality control verification testing will be performed by Owner.
 1. Conduct required tests in accordance with the Owner accepted test instructions, procedures and plans.
- B. Testing Laboratory Services Furnished by Contractor:
 1. Qualifications of Testing Laboratory:
 - a. Employ services of an independent Testing Laboratory to perform material qualification and job control testing. The laboratory shall meet requirements of ASTM E329 for the type of work performed. Non-destructive examination, including visual inspection of metallurgy welds, is included in this requirement.

- b. Laboratories performing cement, concrete and aggregate testing shall possess a current Certificate of Accreditation to the latest edition of AASHTO R18, (or ASTM C1077), and a Certificate of Accreditation for each cement, concrete and aggregate test method to be used.
 - c. Laboratories performing soils testing shall possess a current Certificate of Accreditation to the latest edition of AASHTO R18, (or ASTM D3740), and a Certificate of Accreditation for each soils test method to be used.
 - d. Accreditation may be performed by AASHTO Accreditation Program (AAP), National Voluntary Laboratory Accreditation Program (NVLAP), American Association for Laboratory Accreditation (A2LA) or the Concrete Materials Engineering Council.
 - e. Field sampling and testing shall be performed by the laboratory and personnel that are licensed by the Commonwealth of Massachusetts State Board of Building Regulations and Standards in the manner indicated in Specifications.
 - f. Ensure that laboratory is:
 - 1) Certified by the Massachusetts Department of Environmental Protection for the analyses to be performed.
 - 2) Has been in business for a minimum of five years, providing applicable testing services.
2. Furnish all testing services required for the Owner's review of materials and equipment proposed to be used in the Work and quality control tests made in field, including:
- a. Bituminous concrete materials and mix designs.
 - b. Cement concrete materials and mix designs.
 - c. Moisture-density (Proctor) and relative density tests on:
 - 1) Backfill materials
 - d. Gradation tests for backfills.
 - e. In-place field density tests on:
 - 1) Backfill materials.
 - f. All other tests and engineering data as specified herein for the Owner's review of materials and equipment proposed to be used in the Work.
3. Obtain Owner's approval of testing laboratory before having services performed.
4. Arrangements for delivery of samples and test specimens to Testing Laboratory.

5. Do not replace the Testing Laboratory without prior approval by the Owner.
6. Field Testing:
 - a. Provide and schedule all field and laboratory testing and furnish written reports of each test within 48 hours of completion of testing to avoid delays.
 - b. Furnish all sample materials and field-testing activities.
 - c. Retest due to failure of original Work to meet the requirements of the Contract Documents at no additional cost to the Owner.
7. Notification:
 - a. Provide the Owner with a minimum of two (2) working days written notice prior to an identified inspection. Inspections/approvals required by outside agencies require a minimum of seven (7) working days' notification.
8. Document results of tests in report format and submit for review. Include the following:
 - a. Contract or Project Identification.
 - b. Identification of items tested.
 - c. Quantity.
 - d. Date test conducted.
 - e. Location of items tested.
 - f. Test procedure used.
 - g. Name of technician.
 - h. Acceptance Criteria.
 - i. Results - Acceptance or rejection.
 - j. Authorized signature.
9. Contractor Performed Tests - Witnessed by the Owner. Do not proceed with Work without Owner acceptance of test results.

C. Testing Laboratory Services Furnished by the Owner:

1. Provide for all testing laboratory services, however, the Owner reserves the right to hire its own testing laboratories for quality control tests made in field or laboratory on materials and equipment during and after their incorporation in the Work.

- D. Inspection and tests conducted by persons or agencies other than Contractor do not relieve Contractor of responsibility to meet Contract Document requirements.

1.09 CONTROL OF MEASURING AND TESTING EQUIPMENT

- A. Prepare and submit a procedure for control of Measuring and Test Equipment (M & TE) to ensure the accuracy and reliability of equipment are maintained for applicable inspection and test operations. Laboratory and subcontractor M & TE procedures shall meet the requirements of these Specifications.

1. Identification:

- a. Include provisions in procedure for unique identification of each piece of measuring and test equipment with a number or designation permanently affixed to device.
- b. Tag calibrated equipment with current calibration data and next scheduled calibration date.

2. Calibration:

- a. Calibrate M & TE in accordance with the Contractor's procedures or test laboratory's procedures. Calibrate in accordance with national standards. In the event that no national standards exist for calibration, document basis for calibration, traceable to National Institute of Standards and Technology (NIST). Submit records of calibration to the Owner.
- b. Document the Work performed with M & TE found to be out-of-tolerance on a Nonconformance Report. Work inspected or tested with out-of-tolerance or damaged equipment will not be considered acceptable until Nonconformance Report is dispositioned and resolved and characteristics previously inspected or tested have been verified as correct. This requirement will be imposed on the Contractor, Subcontractors and Suppliers where M & TE is used.

1.10 NONCONFORMANCE

- A. Complete Nonconformance Reports, and other documented reports of Nonconforming conditions addressed to Contractor within time period specified in the report. Contractor response - include a description of investigative actions, statement of problem cause, actions to correct problems and actions to prevent recurrence to the satisfaction of the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 ATTACHMENTS

4.01 Attachments 01400-A and 01400-B are on the following pages.

Attachment 01400-A

Work Activities to be Included in Construction Work Plans

Work Activity	Relevant Specification
Pre and Post Construction Surveys, photographs, and video recording	01391 and 01405
Environmental Protection	01567
Health and Safety Plan	01390
Earthwork – Excavation & Backfill	02200
Water Mains, Valves, and Appurtenances	02665
Cast In-Place Concrete	03300
Precast Concrete Manholes and Vaults	03450

Attachment 01400-B

SAMPLE CONSTRUCTION WORK PLAN FORM

Contractor _____ Revision _____		*CWP
Contract No. _____ Date _____		
1. Briefly describe the Scope of Work and applicable contract specification section:		
2. Is a hazard analysis required for this activity?	☐ Yes	☐ No
3. Does Work activity include any actions defined as a “Special Event” (may expose the general public to a high degree of danger, inconvenience or risk?)	☐ Yes	☐ No
4. List of required submittals to complete the Work Activity.		
5. The following are responsible for supervision and implementation of the Work, including that quality of Work meets Contract Document requirements.		
Name: _____	Position _____	Organization _____
Name: _____	Position _____	Organization _____
Name: _____	Position _____	Organization _____
6. Progress rate expected		

Contractor _____ Revision: _____		* CWP
Contract No. _____ Date: _____		
Start Date	Extended Hours Required ☐ Yes ☐ No Total extended hours _____	
7. Prerequisite activities and related safety issues:		
8. Brief overview on sequence of events and construction methods to be implemented to define new Work is to be performed:		
9. Identify special processes to be used:		
10. Identify inspection and tests required to be performed by the Contractor or Contractor's test lab and identify testing equipment to be used:		
11. Identify Inspection Points:		

** END OF SECTION **

SECTION 01405

CONSTRUCTION PHOTOGRAPHS/VIDEOS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section specifies the requirements for construction documentation using still photography and video.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Evidence that the construction photographer possesses the experience and qualifications specified in Paragraph 1.03 below, including references and certifications.
 - 2. Three different samples of construction photographer's photographs on past construction projects.
 - 3. One sample video in .mp3 format recorded by the construction photographer
 - 4. A pre-construction video within 30 days of Notice to Proceed on CD/DVD.
 - 5. A post-construction video 3 weeks after completing all Work on CD/DVD.
 - 6. Monthly progress photographs on CD/DVD or thumb drive.

1.03 QUALITY ASSURANCE

- A. The construction photographer shall have two (2) years of construction photography experience using IPTC Standards within the past (4) years.
- B. Construction photographer shall provide all necessary equipment to comply with the requirements specified in this section.
- C. The pre-construction and post-construction condition surveys shall be performed by the construction photographer in accordance with Part 3 below under the supervision of, and narrated by, a licensed Professional Engineer and licensed Professional Architect registered in the Commonwealth of Massachusetts with at least 5 years' experience in the past five years in performing condition surveys.

PART 2 PRODUCTS

2.01 DIGITAL PHOTOGRAPH FILE REQUIREMENTS

- A. .jpg format only.
- B. File naming: do not use duplicate file names.

1. File Name: ABCD####_YYYYMMDD_00001.jpg
 - a. ABCD: 3-4 letter acronym for project
 - b. ####: contract number
 - c. YYYYMMDD: date taken
 - d. 00001.jpg: Numbered images for that day
- C. Optimum, 300dpi
- D. Optimum, Image size: 8 Megapixels
- E. Optimum, Image Quality: Fine
- F. Optimum output size shall be 8x10
- G. Date & time set in camera shall be accurate.
- H. Use IPTC (International Press Telecommunications Council) Photo Metadata Standards, fields; description tab; description, description writer and keywords* fields only should be filled in with; image, site, and all project specific information using Photoshop or equivalent.
 1. *A list of suggested keywords will be supplied to the Contractor.
- I. Picture files shall be stored on separate media from videos and submitted on CD or thumb drive.

2.02 VIDEO REQUIREMENTS

- A. Format: MP3 only - on high-definition, high-grade, color, 8 hour DVDs, or thumb drive
- B. Video files shall be stored on separate media from photographs and submitted on DVD or thumb drive.

PART 3 EXECUTION

3.01 REQUIREMENTS

- A. Notify the Owner five (5) days in advance of any photographic sessions.
- B. Coordinate with the Owner on what views are to be taken.
- C. Some shots shall be taken consecutively from a variety of selected locations at each visit to show progress when images are shown in secession.
- D. All broad views shall contain a general reference that is easily recognizable to provide scale and position on site (i.e., people, equipment, landmarks).

- E. All close shots shall have similar references for scale (i.e., ruler, coin or tool).
- F. Color photographs shall be taken at site locations chosen by the Owner.
 - 1. Prior to commencement of work on site: 150 photographs in one submission.
 - 2. During construction submitted monthly with application for, and as a condition of, progress payments:
 - a. 4 photographs per 100 feet of water main installation; and
 - b. 8 photographs at each connection with steel pipe; and
 - c. 2 photographs per 100 feet of environmental control; and
 - d. 8 photographs of staging and laydown areas.
 - 3. At the completion of project: 150 photographs in one submission.
- G. General Surface Pre-Construction Video Recording. Provide route video recording as follows:
 - 1. Water Main Route:
 - a. Take video of surface conditions along the baseline of the water main route. Start at one end of route and progress to the other end, and then reverse progressive video recording back to the point of beginning.
 - 2. Construction Staging and Laydown Areas: take video of entire site.
 - 3. Kendall Road:
 - a. Take video of surface conditions along Kendall Road from Main Street to 150' past the driveway to #211. Start at one end of route and progress to the other end, and then reverse progressive video recording back to the point of beginning.
 - 4. Easements:
 - a. Take video of surface conditions along all easements after limits of easements have been staked. Perform condition survey in accordance with Section 0139.
- H. Post-Water Main Construction Operations Video Recording
 - 1. Surface: Perform video recording of the route from the same locations and perspectives as the pre-construction video recording.
- I. Post- Construction Video Recording at Construction Staging and Laydown Areas: Provide video recording of the site from the same locations and perspectives as the pre-construction video recording.

J. Post- Construction Video Recording of Kendall Road: Provide video recording of Kendall Road from the same locations and perspectives as the pre-construction video recording.

K. Post- Construction Video Recording of Easements: Provide video recording of all Easements from the same locations and perspectives as the pre-construction video recording.

3.02 PRE-CONSTRUCTION AND POST-CONSTRUCTION CONDITION SURVEYS

A. Refer to Section 01391.

**** END OF SECTION ****

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Provide all temporary facilities for the completion of the Work, as specified and indicated.

1.02 SANITARY REGULATIONS

- A. Provide sanitary facilities for the use of those employed on the Work within the Limit of Work indicated. Such facilities shall be made available when the first employees arrive on the site of the Work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the Work in suitable numbers and at such points to accommodate all workers at all locations where the Work is being performed.
- B. Maintain the sanitary facilities in a sanitary condition at all times and enforce their use.
- C. There are no septic or sanitary sewer systems in the vicinity. The Contractor shall provide and maintain sanitary units. Sanitary units shall be provided for all persons employed on the Work, at the rate of one unit for each 15 persons, beginning with the first workman at the site. A minimum of two sanitary units shall be provided. Sanitary units shall be located near the Work at locations approved by the Owner. Facilities shall be a chemical or incinerator type unit. If an incineration type, provide capacity to incinerate one-third of the waste each day. Provide screens so as to be inaccessible to flies. They shall be in a clean, sanitary condition at all times.

1.03 WATER SUPPLY

- A. Provide bottled water for drinking.
- B. Water for construction purposes shall be purchased from the Town of Holden. Rates can be obtained from the Town of Holden Department of Public Works. Water for pipe filling shall be raw water and provided by the City of Worcester at no charge to the Contractor.

1.04 ELECTRICAL POWER SERVICES

- A. Coordinate with Town of Holden Municipal Light Department to provide temporary power.

1.05 CONTRACTOR'S FIELD OFFICE

- A. Contractor's Project Office
 - 1. Provide storage space for all shop drawing submittals, project samples, field and laboratory test data and analyses, and other project related information.

2. Store all documents in fireproof, lockable cabinets.

1.06 SNOW PLOWING AND REMOVAL

- A. Provide snow plowing, roadway sanding and salting, de-icing, and snow shoveling service within the staging area and project area until completion of Work on site. Project area is defined as: Areas owned by the City of Worcester, which includes all off road areas and Pump Station Road.
- B. Plowing shall be done when snow reaches a depth of 2 inches or within 3 hours of the beginning of snowfall, whichever is sooner within staging and project area.
- C. Sanding and salting shall begin within 1 hour of the start of any storm where the predicted depth is 2 inches or greater. Salt shall not be used in Worcester owned areas without prior approval.

1.07 TEMPORARY CONSTRUCTION FENCING

- A. Install, maintain, and remove at completion of Work on site temporary construction fencing around the perimeter of the Limit of Work as indicated.
 1. Fence shall be chain link fence with fabric, 8 foot high, in 10-foot sections, with end posts on each section. The posts shall be set into precast concrete blocks. Provide chain link gates at the paved entrance to the site.
 2. The fence shall be 1-inch mesh.
 3. Fence shall have 3-strands of barbed wire on top.
 4. Color of fabric shall be selected by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Contractor's Project Office
 1. Install office within 5 miles of site of work. Office to be headquarters of authorized representative to receive drawings, instruction or other communication or articles.
 2. Contractor shall keep copies of Drawings, Specifications and other Contract Documents at Contractor's Project Office and make available for use at all times.
 3. Provide smoke detectors in accordance with local building codes.

3.02 PROTECTION

- A. Chain link gates shall be located at all times the Contractor is not on site. Provide ability for multiple locks. In addition to Contractor's lock, DCR and City of Worcester shall provide locks until permanent fencing is installed.

**** END OF SECTION ****

SECTION 01530

SAFETY AND PROTECTION OF PROPERTY

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Perform Work within rights-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
- B. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, drains, sewers, poles and overhead power, and all other utilities encountered along the line of Work, unless other arrangements satisfactory to owners of said utilities have been made.
- C. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
- D. Notify property owners and utility offices which may be affected by the construction operation at least 2 days in advance.
- E. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible.
- F. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures. Maintain original site drainage wherever possible.

1.02 BARRICADES AND LIGHTS

- A. Provide barricades and lights in areas other than roadways to:
 - 1. prevent unauthorized entry to construction areas,
 - 2. provide for public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work,
 - 3. protect existing facilities and adjacent properties from potential damage, and
 - 4. enable access by facility operators and property owners.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01567

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes

1. Furnishing and installing compost filter tubes and/or sedimentation fencing for sediment control.
2. Furnishing and installing siltation fabric in catch basins for sediment control.
3. Furnishing and installing a vehicle tracking pads at all construction entrances and at the entrance/exit to any staging areas for sediment control.
4. Furnishing and installing a dewatering system for sediment control.
5. Maintenance of erosion and sediment controls.
6. Furnishing of all physical plant, labor, equipment and materials and performing all operations in connection with the provision of general environmental controls.
7. Removal and disposal of sediment and erosion controls.

B. Related Sections

1. Section 01000 – Summary of Work
2. Section 01060 – Permits and Regulatory Requirements
3. Section 01090 – Reference Standards
4. Section 01300 – Submittals
5. Section 01500 – Temporary Construction Facilities
6. Section 02200 – Earthwork

1.02 REFERENCES

A. Work under this Section shall comply with the following standards in effect at bid.

1. American Society for Testing and Materials (ASTM)
 - a. ASTM D3786 Hydraulic Bursting Strength of Knitted Goods in Non-Woven Fabrics – Diaphragm Bursting Strength Tester Method

2. Corps of Engineers (COE)
 - a. COE CW02215 Geotextiles Used as Filters
3. Massachusetts Wetlands Protection Act (310 CMR 10.00)

1.03 DEFINITIONS

- A. The term professional nurseryman shall refer to a person certified by the Massachusetts Nursery and Landscape Association or equivalent with five years of landscaping experience involving landscaping similar to the landscaping to be furnished under this Contract.

1.04 NOTIFICATION TO CONSERVATION COMMISSIONS

- A. Portions of the work are within and adjacent to resource areas as defined in the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00).
- B. Notify the Owner 48 hours prior to commencement of work on site. The Owner will notify the Town of Holden Conservation Commissions.
- C. Comply with all construction impact mitigation measures specified and indicated in the Order of Conditions. See Appendix A.

1.05 SUBMITTALS

- A. Submit the following in accordance with Sections 01300 and 01060:
 1. Erosion and Sediment Control Plan.
 2. Product Data:
 - a. Manufacturer's data for erosion control blankets, compost filter tubes, silt fence material and filter fabric.
 3. Location and details of proposed vehicle tracking pads.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Compost Filter Tubes
 1. Compost filter tubes shall comply with the requirements of MassDOT Standard Specification Section M1.06.0, except that no manure or bio-solids shall be used. In addition, no kiln-dried wood or construction debris shall be allowed. Particle size analysis: 98% shall pass through a 3-inch (75mm) sieve; 30-50% shall pass 3/8 inches (10mm) sieve.
 2. Tubes for compost filters shall be a minimum of 12 inches (300 mm), a maximum of 18" (450mm) in diameter. Tube material shall be a knitted mesh with 1/8" - 3/8" (3-10 mm) openings and made of biodegradable (cotton or jute)

materials. Photodegradable fabric may be used; however, photodegradable fabric must be removed and disposed of by the Contractor at the end of the contract, at no additional cost to the Owner.

3. Stakes for anchors, if required, shall be nominal 2 x 2 stakes.

B. Straw Bales

1. Straw bales shall consist of straw from grasses and legumes, free from weeds, reeds, twigs, chaff, debris, other objectionable material or excessive amounts of seeds and grain. Straw shall be free from rot or mold and the moisture content shall not exceed fifteen percent by weight.
2. The straw shall be baled with wire which will withstand rusting and rehandling when the bale is in a saturated condition. Individual bales shall be of a longitudinal shape not exceeding one hundred (100) pounds when weighed.

C. Sedimentation Fence

1. Filter fabric for sedimentation fence shall consist of pervious sheets of woven polypropylene, nylon, polyester, or ethylene yarn. Material shall be certified by the manufacturer to meet the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
Tensile Strength	ASTM D5035 Grab Test	100 lbs (min)
Grab Elongation	ASTM D5034 Grab Test	30% $\pm$ 10%
Equivalent Opening Size	Corps of Engineers CW 02215	100 sieve (min) 40 sieve (max)
Bursting Strength	ASTM D751 Diaphragm Bursting Tester	175 psi (min)

2. The filter fabric shall contain a stabilizer and/or inhibitors to make the filaments resistant to deterioration resulting from exposure to sunlight or heat to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 degrees to 120 degrees F. The filter fabric shall be 36 inches wide, cut from a continuous roll to finish fence length to avoid the use of seams. Splice filter fabric together only at a support post, with a minimum 6-inch overlap and securely sealed. The filter fabric shall be free of defects or flaws which affect its physical and/or filtering properties.
3. Wire fence reinforcement for fabric sedimentation fences shall be 30 inches in height, 14 gauge and shall have a mesh spacing of 6 inches or less. The wire fence reinforcement shall be used with all filter fabrics except those approved for use without a wire fence reinforcement by the manufacturer.
4. Posts shall be of wood or steel and of 5 feet 6 inches long for wood and 4 feet 6 inches long for steel. Wood posts shall be at least 4 inches in diameter, or

nominal 2 x 4 inches. Steel posts shall be round, or U, T, or C shaped with a weight of at least 1.3 pounds per foot and have projections for fastening the wire to the fence.

5. Wire staples for attaching filter fabric to wooden posts shall be No. 9 gauge and shall be at least one inch long.

D. Siltation Fabric

1. Siltation fabric shall comply with the requirements of MassDOT Standard Specification Section M9.50.0, Table 1 – Type 1 Fabric.
2. To be used as indicated for:
 - a. Temporary Sediment Trap
 - b. Catch Basin Treatment
 - c. Siltation Control Check Dams

E. Sedimentation Basins

1. Sedimentation basins shall provide retention time and filtration of the water as required by NPDES permit.
2. Dewatering Filter Bag for Sedimentation Basins
 - a. Bag shall be composed of a UV resistant, non-woven geotextile sewn into a completely enclosed bag. Seams shall be stitched with high strength double stitching.
 - b. Bags shall have a sewn-in sleeve to receive the pump discharge hose.
 - c. The minimum properties are below.

Property	Test Method	Value
Weight (oz/yd ²) (typical)	ASTM D5261	10 oz.
Grab Tensile Strength (MD)	ASTM D4632	250 lbs.
Mullen Burst	ASTM D3786	350 psi
UV Resistance	ASTM D4355	70% @ 500 hrs
Flow Rate (Gal/Min/Ft ²)	ASTM D4491	70
Filtering Efficiency	ASTM D5141	80%

- d. Submittal shall include the peak flow rate generated from the dewatering pump in gallons per minute. Filter bag shall pass a minimum of two times the peak flow rates generated from the dewatering pump.
3. Flocculation Logs
 - a. Shall be a blended gel polyacrylamide and mineral block.

- b. To determine proper flocculation log type, soil sample shall be sent to manufacturer for testing. As part of the submittal for flocculation log, include soil sample results.

4. Jute Netting

- a. Shall be of a uniform, open, plain weave, undyed and unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than one-half the normal diameter. Netting shall be furnished in rolls and shall meet the following minimum requirements.

- 1) Width – Minimum 48-inches.
- 2) Seventy-eight (78) warp ends per forty-eight (48) inches of cloth width.
- 3) Weight shall average 1.22 pounds per linear yard (based on a 48-inch width) with a tolerance of 5%.
- 4) Forty-one waft (weft) ends per yard.
- 5) All material shall be new and unused, and the length shall be marked on each roll.

- b. Staples

- 1) “U” shaped wire staples of 0.12-inch in diameter (No. 11 wire gauge) or greater, with a minimum leg length of six (6) inches and a minimum crown of one-inch shall be used. In sandy soils the minimum leg length of staples shall be nine (9) inches.

F. Erosion Control Blankets

1. Erosion control blankets shall meet the following requirements:

- a. S1 - 100% straw fibers stitch-bonded to a biodegradable net on the top side. Suitable for low flow to moderate flow runoff conditions.
- b. S2 - 100% straw fibers stitch-bonded to a biodegradable net on both top and bottom. Suitable for moderate flow runoff conditions.
- c. SC2 – 70% straw, 30% coconut fiber, with biodegradable netting on both sides. For use on 2:1 – 1:1 slopes with heavy run-off conditions. Suitable for steep slide rehabilitation, drought area revegetation, long slope cut and fill, mine land, landfill reclamation, bridge abutments, ski runs, and channel shoulders.
- d. C2 – 100% coconut fiber with biodegradable netting on both sides for use as a liner in channels with high velocity intermittent flows, center runs on grassed waterways, drainage ditch lining, and stream bank

rehabilitation. Also used as an erosion control blanket on steep slopes and very harsh sites.

G. Swamp Mats (Construction Mats)

1. Erosion control blankets shall meet the following requirements:
 - a. Comply with Army Corp of Engineers Construction Mat Best Management Practices (BMPs), attached.
 - b. Crane Mats, Laminated Mats, and Eco Mats are acceptable for use.
 - c. Mats may be made of timber, plastic, or composite.
 - d. Mats shall be rated for the equipment to be used on it.
 - e. Mats may be new or used.
2. As manufactured by:
 - a. Northeast Crane Mat Corp (www.northeastmatcorp.com), Glen Falls, NY
 - b. Oxford Timber Mats (www.oxfordtimber.com), Oxford, ME
 - c. Qmat (www.qmat.com)
 - d. Yakmat (www.yakmat.com)

H. Sheeting for Wetland Spoils

1. Wetland spoils shall be placed on sheeting placed on Construction Mats. All material shall be returned to the trench.
2. Sheeting shall be such that the material does not have gaps or holes greater than 1/4-inch in width.

I. Vehicle Tracking Pads

1. Mats shall be made of compression molded HDPE or similar material. Length shall be 50 feet minimum. Refer to sample included in Attachment A to this section.
2. As manufactured by:
 - a. FODS LLC
 - b. RubberForm Recycled Products, LLC
 - c. Tracking Pads LLC
 - d. Or Equal.

PART 3 EXECUTION

3.01 GENERAL

- A. In any roadway where storm water is directed from a work area to a catch basin, the Contractor shall install and maintain sediment controls (compost filter tubes, straw bales and/or inlet protection siltation fabric) to intercept sediment before it enters the storm drain line.
- B. All land-side areas disturbed during construction shall be stabilized upon completion of the installation of near-surface piping, conduit and structures.
 - 1. If disturbed soils will be left in place for longer than 60 days, a temporary cover of rye or other grass shall be established. If the season is not appropriate for plant growth, then exposed surfaces shall be stabilized by straw, snow fence, or other U.S. Natural Resources Conservation Service recommended methods.

3.02 PROTECTION OF LAND RESOURCES AND TREES

- A. The land resources within the project boundaries and outside the limits of Work performed under this Contract shall be restored to a condition after completion of construction that will reflect the existing condition prior to commencement of construction.
 - 1. Construction activities shall be confined to the limits of Work indicated on the contract drawings.
- B. The Contractor shall destroy and/or remove and properly dispose of all signs of temporary construction facilities such as Work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other indication of construction. Excavation, filling, grading, loaming and planting will be required to restore the areas to conditions that will permit the growth of vegetation thereon. Finish grades shall conform to original grades.

3.03 HAZARDOUS MATERIAL AND WASTE CONTROL

- A. Disposal of volatile fluid wastes (such as hydraulic fluids, waste oil, gasoline, fuel or paint thinner) onto the ground, in storm or sanitary sewer systems or into streams or waterways shall not be permitted. In the event that any such waste is spilled, the Contractor shall immediately clean up the spillage and all contaminated soil, and dispose of the cleanings as hazardous waste material. If a spill occurs, the clean-up activities shall take precedence over normal construction activities in order that damage to the environment is minimized. Disposal of hazardous wastes shall be at no additional cost to the Owner.
- B. All hazardous materials containers shall be marked and their contents identified. All fuel oil, lubricant, gasoline, and hydraulic fluid containers shall be fixed in place on the transport vehicle when the vehicle is in motion.
- C. The Work shall be in compliance with all federal, state, and local laws with respect to hazardous materials and all clean-up and disposal operations shall comply with all

applicable federal, state, and local statutes, regulations, ordinances and anti-pollution laws.

3.04 INSTALLATION

A. Temporary Erosion and Sediment Controls:

1. Within the 100-foot buffer of wetland resource areas, compost filter tubes shall be installed per the contract drawings. Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil. Stakes shall not puncture compost tubes.
2. Within mapped wood turtle habitat in the 200-foot Riverfront Area of the Swift River and 100-foot buffer of Wetland A, compost filter tubes with sedimentation fence shall be installed as sediment controls and wood turtle barrier per the contract drawings.
3. Within mapped wood turtle habitat outside of jurisdictional wetland resource areas, sedimentation fence shall be installed per the contract drawings when the work will be performed outside of the period extending from November 15 to March 1. The work shall be completely surrounded by sedimentation fence to prevent turtles from entering the work site as they become active in the spring and move during the summer and fall.

3.05 MAINTENANCE

A. Maintain erosion and sediment control devices in accordance with the Erosion and Sediment Control Plan as specified in Paragraph 1.05A.1 above and the following:

1. The Contractor shall inspect all erosion and sediment controls daily, before an anticipated storm greater than 0.5 inches, and following a significant storm event (0.5 inches or greater total rainfall).
2. Any temporary erosion and sediment controls that become damaged shall be repaired or replaced immediately at no additional cost to the Owner.
3. Silt fences, compost filter tubes, and straw bales shall have sediment removed as necessary to maintain the controls in working condition.
4. Remove built up debris and sediment where devices are used for catch basin protection, so that ponding or flooding does not occur.
5. Dispose of sediment deposits off-site, in accordance with all applicable laws.

3.06 SEDIMENTATION BASIN INSTALLATION AND MAINTENANCE

A. The Contractor shall construct basins that are sized to prevent overtopping and shall provide filtering.

- B. The Contractor shall construct outlet area from all sedimentation basins to prevent erosion of the area surrounding the basin.
- C. The Contractor shall maintain sedimentation basins as follows: Inspect at least twice daily during dewatering operations. Provide any repairs immediately at no additional cost to the Owner. Clean clogged sections daily. Remove sediment when deposits reach 6 inches below the top of the straw bales. Dispose of sediment deposits off-site in accordance with DEP regulations for disposal of surplus material.

3.07 REMOVAL

- A. Erosion control should be removed as soon as disturbed areas are stabilized.
 - 1. Stabilized shall mean that the following is accomplished: trenches are backfilled and compacted, and the finish surface materials installed including sod, pavement (bituminous concrete or cement concrete), warning track mix, or crushed stone surface treatment.
 - 2. All biodegradable compost filter tube fabric shall be cut and laid flat in place to decompose on-site at the direction of the Owner. Tube fabric that is not decomposing satisfactorily shall be removed and disposed off-site by the Contractor at no additional cost to the Owner. At the direction of the Owner, the Contractor may rake out and seed compost so that it is no greater than 2 inches (50 mm) in depth on soil substrate.

3.08 VEHICLE TRACKING PADS

- A. Provide vehicle tracking pads at construction entrances as indicated. Install in accordance with the manufacturer's instructions.
- B. Ensure that all vehicles leaving the construction site are free of soil material that otherwise may be transported off site. All vehicles leaving the construction site shall have their wheel and other parts cleaned as required to prevent transportation of soil materials or dust off-site.
- C. Remove mud and sediment tracked or washed onto public road immediately.
- D. Vehicle wash tracking pads shall be inspected by the Contractor once every seven days and after rain activities. Inspections shall be documented, and records shall be maintained by the Contractor, to be made available for review upon request. Records shall include, at a minimum, the date, the inspector's name, the maintenance and corrections needed based on this inspection, and the status of previously identified deficiencies. Any evidence of erosion problems in unutilized areas shall be repaired within 48 hours after inspection or as directed. Sediment shall be removed as approved and disposed of outside the floodplain, wetlands and buffer areas in an approved disposal site or fill area and then stabilized.
- E. All vehicle track pads shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized

PART 4 ATTACHMENTS

4.01 ATTACHMENT A – VEHICLE TRACKING PADS

ATTACHMENT A - VEHICLE TRACKING PAD



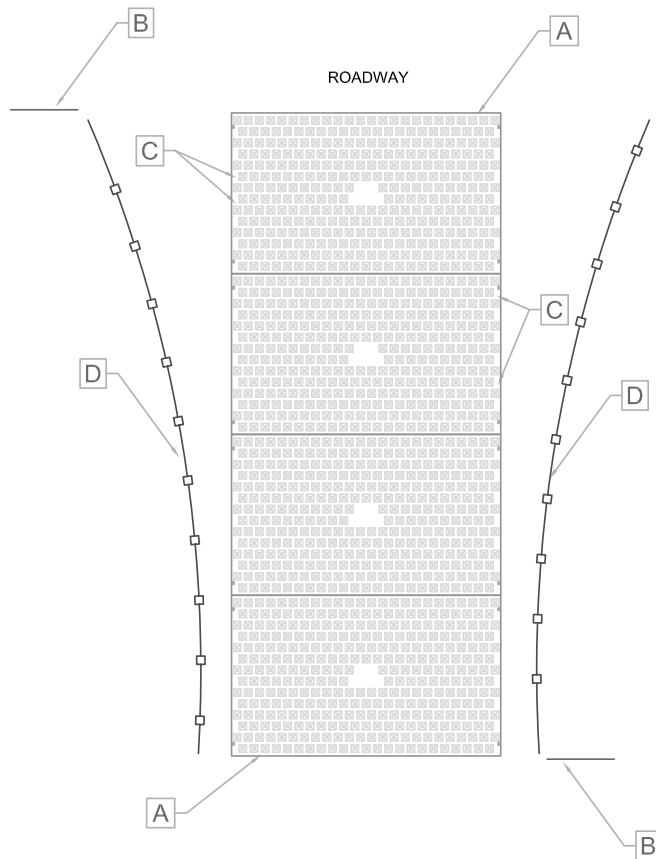
FODS TRACKOUT CONTROL SYSTEM INSTALLATION

THE PURPOSE AND DESIGN OF THE FODS TRACKOUT CONTROL SYSTEM IS TO EFFECTIVELY REMOVE MOST SEDIMENT FROM VEHICLE TIRES AS THEY EXIT A DISTURBED LAND AREA ONTO A PAVED STREET. THIS MANUAL IS A PLATFORM FROM WHICH TO INSTALL A FODS TRACKOUT CONTROL SYSTEM. (NOTE: THIS IS NOT A ONE SIZE FITS ALL GUIDE.) THE INSTALLATION MAY NEED TO BE MODIFIED TO MEET THE EXISTING CONDITIONS, EXPECTATIONS, OR DEMANDS OF A PARTICULAR SITE. THIS IS A GUIDELINE. ULTIMATELY THE FODS TRACKOUT CONTROL SYSTEM SHOULD BE INSTALLED SAFELY WITH PROPER ANCHORING AND SIGNS PLACED AT THE ENTRANCE AND EXIT TO CAUTION USERS AND OTHERS.

KEY NOTES:

- A. FODS TRACKOUT CONTROL SYSTEM MAT.
- B. FODS SAFETY SIGN.
- C. ANCHOR POINT.
- D. SILT OR ORANGE CONSTRUCTION FENCE.

SAMPLE



TYPICAL ONE-LANE LAYOUT

INSTALLATION:

1. THE SITE WHERE THE FODS TRACKOUT CONTROL SYSTEM IS TO BE PLACED SHOULD CORRESPOND TO BEST MANAGEMENT PRACTICES AS MUCH AS POSSIBLE. THE SITE WHERE FODS TRACKOUT CONTROL SYSTEM IS PLACED SHOULD ALSO MEET OR EXCEED THE LOCAL JURISDICTION OR STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS.
2. CALL FOR UTILITY LOCATES 3 BUSINESS DAYS IN ADVANCE OF THE OF FODS TRACKOUT CONTROL SYSTEM INSTALLATION FOR THE MARKING OF UNDERGROUND UTILITIES. CALL THE UTILITY NOTIFICATION CENTER AT 811.
3. ONCE THE SITE IS ESTABLISHED WHERE FODS TRACKOUT CONTROL SYSTEM IS TO BE PLACED, ANY EXCESSIVE UNEVEN TERRAIN SHOULD BE LEVELED OUT OR REMOVED SUCH AS LARGE ROCKS, LANDSCAPING MATERIALS, OR SUDDEN ABRUPT CHANGES IN ELEVATION.
4. THE INDIVIDUAL MATS CAN START TO BE PLACED INTO POSITION. THE FIRST MAT SHOULD BE PLACED NEXT TO THE CLOSEST POINT OF EGRESS. THIS WILL ENSURE THAT THE VEHICLE WILL EXIT STRAIGHT FROM THE SITE ONTO THE PAVED SURFACE.
8. AFTER THE FIRST MAT IS PLACED DOWN IN THE PROPER LOCATION, MATS SHOULD BE ANCHORED TO PREVENT THE POTENTIAL MOVEMENT WHILE THE ADJOINING MATS ARE INSTALLED. ANCHORS SHOULD BE PLACED AT EVERY ANCHOR POINT (IF FEASIBLE) TO HELP MAINTAIN THE MAT IN ITS CURRENT POSITION.
9. AFTER THE FIRST MAT IS ANCHORED IN ITS PROPER PLACE, AN H BRACKET SHOULD BE PLACED AT THE END OF THE FIRST MAT BEFORE ANOTHER MAT IS PLACED ADJACENT TO THE FIRST MAT.
10. ONCE THE SECOND MAT IS PLACED ADJACENT TO THE FIRST MAT, MAKE SURE THE H BRACKET IS CORRECTLY SITUATED BETWEEN THE TWO MATS, AND SLIDE MATS TOGETHER.
11. NEXT THE CONNECTOR STRAPS SHOULD BE INSTALLED TO CONNECT THE TWO MATS TOGETHER.
12. UPON PLACEMENT OF EACH NEW MAT IN THE SYSTEM, THAT MAT SHOULD BE ANCHORED AT EVERY ANCHOR POINT TO HELP STABILIZE THE MAT AND ENSURE THE SYSTEM IS CONTINUOUS WITH NO GAPS IN BETWEEN THE MATS.
13. SUCCESSIVE MATS CAN THEN BE PLACED TO CREATE THE FODS TRACKOUT CONTROL SYSTEM REPEATING THE ABOVE STEPS.

USE AND MAINTENANCE

1. VEHICLES SHOULD TRAVEL DOWN THE LENGTH OF THE TRACKOUT CONTROL SYSTEM AND NOT CUT ACROSS THE MATS.
2. DRIVERS SHOULD TURN THE WHEEL OF THEIR VEHICLES SUCH THAT THE VEHICLE WILL MAKE A SHALLOW S-TURN ROUTE DOWN THE LENGTH OF THE FODS TRACKOUT CONTROL SYSTEM.
3. MATS SHOULD BE CLEANED ONCE THE VOIDS BETWEEN THE PYRAMIDS BECOME FULL OF SEDIMENT. TYPICALLY THIS WILL NEED TO BE PERFORMED WITHIN TWO WEEKS AFTER A STORM EVENT. BRUSHING IS THE PREFERRED METHOD OF CLEANING, EITHER MANUALLY OR MECHANICALLY.
4. THE USE OF ICE MELT, ROCK SALT, SNOW MELT, DE-ICER, ETC. SHOULD BE UTILIZED AS NECESSARY DURING THE WINTER MONTHS AND AFTER A SNOW EVENT TO PREVENT ICE BUILDUP.

REMOVAL

1. REMOVAL OF FODS TRACKOUT CONTROL SYSTEM IS REVERSE ORDER OF INSTALLATION.
2. STARTING WITH THE LAST MAT, THE MAT THAT IS PLACED AT THE INNERMOST POINT OF THE SITE OR THE MAT FURTHEST FROM THE EXIT OR PAVED SURFACE SHOULD BE REMOVED FIRST.
3. THE ANCHORS SHOULD BE REMOVED.
4. THE CONNECTOR STRAPS SHOULD BE UNBOLTED AT ALL LOCATIONS IN THE FODS TRACKOUT CONTROL SYSTEM.
5. STARTING WITH THE LAST MAT IN THE SYSTEM, EACH SUCCESSIVE MAT SHOULD THEN BE MOVED AND STACKED FOR LOADING BY FORKLIFT OR EXCAVATOR ONTO A TRUCK FOR REMOVAL FROM THE SITE.

****END OF SECTION****

SECTION 01570

CONSTRUCTION ZONE SAFETY PLAN

PART 1 GENERAL

1.01 SUMMARY

- A. Comply with the Construction Zone Safety Plan (the "Plan") including without limitation installing and maintaining traffic control devices and employing Police details, all as are required by the Plan. Traffic control devices shall include but are not limited to channelizing devices, signs, barricades, temporary pavement markings, lighting devices, variable message boards, and hand signal devices in the amounts and locations indicated in the Plan.
- B. Comply with all aspects of the Plan in the maintenance, support, adjustment, and relocation of all utility systems.

1.02 SEQUENCING AND SCHEDULING

- A. Schedule implementation of all traffic maintenance equipment and procedures required by the Plan.

1.03 REFERENCE STANDARDS

- A. U.S. Department of Transportation, Federal Highway Administration "Manual of Uniform Traffic Control Devices for Streets and Highways" (MUTCD), latest edition.
- B. Massachusetts Department of Transportation (MassDOT), "Standard Specifications for Highways and Bridges."
- C. Code of Massachusetts Regulations 701 CMR 7.00 "Use of Road Flaggers and Police Details on Public Works Projects."
- D. Other standards, if any, indicated in the Plan.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Shop drawings and product data for all traffic control devices indicated, including barriers, fencing, barrels, cones, flashing arrows, and signs.

PART 2 PRODUCTS

2.01 TRAFFIC CONTROL DEVICES

- A. Provide all interim traffic signage and traffic control devices in accordance with the Plan. All barriers, barrier fences, traffic signs, and other traffic control devices shall conform to the MUTCD and other standards, if any, indicated in the Plan.

- B. Portable Changeable Message Signs shall be temporary traffic control devices programmable to display messages meeting the requirements of the MUTCD, Section 6F-52. When in operating mode, minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which should be mounted as high as possible.
- C. Temporary Impact Attenuators shall be in accordance with MHD Highway Design Manual Section 9.5.

PART 3 EXECUTION

3.01 GENERAL

- A. Vehicular and pedestrian traffic shall be maintained in accordance with the Plan.
- B. Notify all abutters with respect to work that may impede traffic at least one week prior to beginning Work at the site.
- C. Provide at least 72 hours notice of detours, lane closures, and street closures indicated in the Plan to the Owner, all property owners abutting the street closure, and other governing authorities with jurisdiction as indicated on the Plan.

3.02 LANE CLOSURES AND TRAFFIC DETOURS

- A. General:
 - 1. Provide and erect all traffic control devices, lighting and signage as indicated in the Plan.
 - 2. Cover all traffic control devices at the end of the workday, or when work is not in progress, as required.
- B. Construction in Public Streets without full street closure:
 - 1. Maintain clear passage for emergency vehicles at all times.
 - 2. Excavations adjacent to travel lanes, parking spaces and driveways shall also be protected by concrete median barriers and as required by 520 C.M.R. 14.00.
 - 3. Any street, road, walk, driveway, private way or land area, public or private, that has not indicated to be closed shall be maintained passable and safe by the Contractor. If any street, road or private way shall be rendered unsafe by the Contractor's operations as determined by the Owner's Authorized Representative, or if the Contractor is not in compliance with the Plan, provide additional personnel and traffic control devised as directed by the Owner or other governing authorities, at no additional cost to the Owner.
- C. Street Closures:
 - 1. The closing of streets or roadways shall only occur where indicated on the Plan.

2. Use battery or solar powered barricades with warning signs to protect all streets and roadways which are closed to traffic.

3.03 INSTALLATION

A. General

1. Conduct work in manner to interfere as little as possible with public travel, whether vehicular or pedestrian.
2. Provide and maintain steel cover plates for accommodation of public and private travel whenever it is necessary to cross, obstruct, driveways, and walks, whether public or private.
 - a. Installation of temporary steel plates shall be in accordance with 520 C.M.R. 14.00.
3. When indicated in the Plan widen shoulder on opposite side of the work site and provide temporary surfacing on shoulders.
4. Detours. If indicated in the Plan, construct and maintain a detour around construction work to maintain traffic, including all indicated traffic control devices.
5. Illuminate all barricades and obstructions with warning lights from sunset to sunrise.

3.04 TRAFFIC CONTROLLER SERVICES

- A. Provide traffic controllers consisting of Police Details for the direction and control of pedestrian and vehicular traffic in accordance with the Plan.

3.05 RESTORATION

- A. Remove all traffic control devices, signage, and pavement markings upon completion of Work in the area and restore the area, including pavement markings and signage, to its original condition.

** END OF SECTION **

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section includes general requirements for materials and equipment.
- B. Related Sections:
 - 1. Section 01090 - Reference Standards
 - 2. Section 01300 - Submittals

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Proposed Manufacturers List: With the schedule of shop drawing submittals specified in Section 01300, Paragraph 1.03A.1.a, include a list of the names of proposed manufacturers, materials, suppliers for review prior to making shop drawing submittals.
 - 2. Manufacturer's written instructions as specified in Paragraph 1.03.B.
 - 3. Three copies of a detailed report of the installation and inspection of all equipment rehabilitated/refurbished from the manufacturer's representative including:
 - a. Description of calibration and adjustments if made.
 - b. Description of any parts replaced and reason for replacement.
 - c. Type, brand name, and quantity of lubrication used, if any.
 - d. General condition of equipment.
 - e. Description of problems encountered, and corrective action taken.

1.03 QUALITY ASSURANCE

- A. Furnish and install material and equipment manufactured and fabricated in accordance with the following:
 - 1. Design, fabricate, and assemble in accordance with best engineering and shop practices.
 - 2. Manufacture like parts of duplicate units to standard sizes and gauges, and to be interchangeable.
 - 3. Two or more items of the same kind shall be by same manufacturer.

4. Materials and equipment shall be suitable for service conditions.
 5. Adhere to equipment capabilities, sizes, and dimensions shown or specified.
 6. Working parts shall be readily accessible for inspection and repair, able to be duplicated and replaced.
 7. Use material or equipment only for the purpose for which it is designed or specified.
- B. Manufacturers' Instructions: When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instructions, obtain and distribute printed copies of such instructions to parties involved in installation, including a copy to Owner via electronic submission in accordance with Section 01300.
1. Maintain one set of complete instructions at job site during storage and installation, and until completion of work.
- C. Manufacturer's Requirements: Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturers written instructions and in conformity with Contract Documents. Do not omit preparatory steps or installation procedures.

1.04 DELIVERY, STORAGE AND HANDLING

- A. The Contractor is responsible for the security of all materials until they are incorporated in the work.
- B. Coordination with Schedule: Arrange deliveries of materials and equipment in accordance with Construction Progress Schedule. Coordinate to avoid conflict with work and conditions at site.
1. Deliver materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Protect bright machined surfaces, such as shaft and valve faces, with a heavy coat of grease prior to shipment.
 3. Protect painted surfaces against impact, abrasion, discoloration and other damage.
 - a. Repaint all damaged painted surfaces at no additional cost to the Owner.
 4. Immediately upon delivery, inspect shipments to determine compliance with requirements of Contract Documents and submittals and that material and equipment are protected and undamaged.
 5. Include complete packing lists and bills of materials with each shipment.
- C. Handling: Provide equipment and personnel to handle material and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

- D. Immediately upon discovery, remove from the jobsite all damaged materials and equipment and replace with new material and equipment at no additional cost to the Owner.
- E. All equipment and materials shall be stored in locations indicated on the Drawings.
- F. Onsite storage areas and buildings: locate within staging areas inside the existing fence line.
 - 1. Store products on site in accordance with Contract Documents.
 - a. Protect the site from contamination.
 - 2. Arrange on site storage areas for access to and protection and segregation of stored materials and equipment with drainage.
 - 3. Store fabricated materials and equipment to prevent soiling, staining, and to prevent soiling, staining, and to provide ventilation.
 - 4. All mechanical and electrical equipment and instruments shall be stored indoors.
 - a. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
 - b. Lubricants shall be changed upon completion of installation and during the period between installation and Substantial Completion. New lubricants shall be put into the equipment at Substantial Completion.
 - c. After installation and testing, the Contractor shall have the manufacturer inspect the equipment in accordance with Paragraph 3.01. Equipment that does not receive manufacturer's certification shall be removed and replaced at no additional cost to the Owner.

1.05 STAINLESS STEEL

- A. Where stainless-steel type is not specified or indicated, stainless steel shall be Type 316.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Conform to specified referenced standards.
- B. Comply with size, type, and standard of quality specified.
- C. Use only new materials and equipment in permanent construction.

2.02 FABRICATION

- A. Design, fabricate, and assemble products in accordance with engineering and shop practices as recommended by the manufacturer.
- B. Do not use material or equipment for any purpose other than that for which it is designed or specified.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Installation Inspection and Adjustments:
 - 1. Provide technical representatives of equipment manufacturers to inspect the completed installation as follows:
 - a. Verify that each piece of equipment has been checked for lubrication, rotation, or for other conditions which may cause damage.
 - b. Certify that equipment or system is installed in accordance with the manufacturer's recommendations, shop drawings and the Contract Documents.
 - c. Certify that nothing in the installation voids any warranty.
 - 2. Provide manufacturer's representatives to perform initial equipment adjustment and calibration confirming to the manufacturer's recommendations and instructions, shop drawings and the Contract Documents.
 - 3. Obtain report from manufacturer's representative as specified in Paragraph 1.02 A.

**** END OF SECTION ****

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Requirements for closing out the work.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. When the Contractor considers work is complete, the Contractor shall submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been inspected for compliance with Contract Documents.
 - c. Work has been completed in accordance with Contractor Documents.
 - d. Equipment and systems have been tested in the presence of the Owner and are operational.
 - e. Work is complete and ready for final inspection.
2. At contract close-out the Contractor shall, deliver the following to the Owner
 - a. Project Record Documents:
 - 1) Drawings.
 - 2) Specifications.
 - 3) Addenda.
 - 4) Change Orders and other modifications to the Contract.
 - 5) Field Orders or written instructions.
 - 6) Approved Shop Drawings and Product Data.
 - 7) Construction photographs and videotapes.

- b. Operating and maintenance data, and instructions to the Owner's personnel.
 - c. Spare parts and maintenance manuals.
 - 1) Provide spare parts, maintenance manuals, and special tools as specified.
 - d. Evidence of Payment and Release of Liens.
 - e. Two copies of each warranty and consent of surety for payment as specified.
- 3. Submit to the Owner a Final Statement of Accounting that shall reflect all adjustments to the contract sum.
 - a. Original contract sum.
 - b. Additions and deletions resulting from:
 - 1) Change orders.
 - 2) Deductions for uncorrected work.
 - 3) Deductions for liquidated damages.
 - 4) Deductions for re-inspection payments.
 - 5) Other adjustments.
 - c. Total contract sum, as adjusted.
 - d. Previous payments.
 - e. Amount remaining due.
- 4. Submit final application for payment.
- 5. Final payment will not be made until all requirements contained in Paragraph 1.03A.1-3 have been met and all spare parts, maintenance materials, and special tools as specified have been delivered to the Owner in a new and undamaged condition.
- 6. Accompany submittal with transmittal letter in duplicate containing:
 - a. Date.
 - b. Project title and number.
 - c. Contractor's name and address.
 - d. Title and number of each Record Document.

e. Signature of Contractor or authorized representative.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. At or prior to the time of inspection for Substantial Completion, deliver all required items to the Owner at the Owner's Construction Field Office.
 - 1. The Contractor and the Owner shall inspect and inventory all items delivered.
- B. Submit to the Owner a detailed invoice of all items delivered.
 - 1. Organize invoice by specification sections.
 - 2. Indicate on invoice any items delivered which were damaged or unsatisfactory.
 - 3. The Contractor and the Owner shall sign the invoice certifying that all items listed were delivered, and that unless otherwise noted on invoice, all items were in good condition at the time of delivery to the Owner.
- C. The Owner will review the invoice for completeness and inform the Contractor promptly of any deficiencies therein.
- D. The Contractor will deliver all additional items identified by the Owner and replace, at no additional cost to the Owner, all damaged and unsatisfactory items noted on original invoice before requesting final inspection.
- E. Invoices for additional and replacement items, signed by the Contractor and the Owner, shall be submitted.
- F. Store items in a clean, dry, heated, storage shed or bonded warehouse.
- G. Protect all items from damage during storage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 RELATED WORK

- A. Section 01300 – Submittals
- B. Section 01400 – Quality Control
- C. Section 01700 – Contract Closeout

1.03 OPERATING AND MAINTENANCE INSTRUCTIONS AND PARTS LISTS

- A. Where reference is made to operating and maintenance instructions and spare parts lists, furnish for each piece of equipment one (1) manual including the information listed below.
 - 1. The manual for each piece of equipment shall be a separate document with the following specific requirements:
 - a. Contents:
 - 1) Table of contents and index
 - 2) Routine maintenance procedures
 - 3) Clean and concise manufacturer's printed operating and maintenance instructions, adjustment, lubrication and other maintenance of equipment including: parts list, illustrations, and diagrams
 - 4) One copy of each shop drawing
 - 5) List of spare parts, manufacturer's price, and recommended quantity
 - 6) Name, address, and telephone numbers of local service representatives
 - 7) Manufacturer's warranty

b. Submittals to the Owner:

- 1) One preliminary copy of manuals shall be submitted via electronic submittal in accordance with Section 01300, no later than 60 days following review of the shop drawings for each piece of equipment. Submit one (1) PDF of each manual.
- B. Such instructions and parts lists shall be annotated so that only the specific equipment and features furnished are indicated. References to other sizes and types or models of similar equipment shall be deleted or lined out.
- C. If a submittal is reviewed without comment, Owner will instruct Contractor to provide one electronic copy. If deficiencies are found, Owner will request resubmittal via electronic submission in accordance with Section 01300.

1.04 CONTENTS, EACH VOLUME

- A. Table of Contents: Provide title of Project, names, addresses, and telephone numbers of Owner, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product: List names, addresses and telephone number of Subcontractors and suppliers; including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. A list of all parts for the equipment with each part identified by a functional name, the part manufacturer's name and a unique part number (normally the part manufacturer's alpha-numeric designation). A list of parts keyed by non-unique item numbers to a sectional drawing will not be adequate to fulfill this requirement.
- E. Drawings: Supplement product data to illustrate relations of component parts and data applicable to installation. Delete inapplicable information.
- F. Type Text: To supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's printed instructions specified.

1.05 MANUAL FOR EQUIPMENT

- A. For each Item of Equipment provide the following:
1. Description of unit, and component parts.
 2. Maintenance Requirements:
 - a. Route procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - b. Servicing and lubrication schedule, with list of lubricant type, frequency and method of lubrication. Any components which do not require

lubrication or any expendable components which are not normally serviced shall be clearly noted as such.

- c. Manufacturer's printed operation and maintenance instructions.
 - d. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- 3. List of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - 4. Additional Requirements: As specified in individual sections.

PART 2 PART 2 – PRODUCTS (NOT USED)

PART 3 PART 3 - EXECUTION (NOT USED)

**** END OF SECTION ****

SECTION 02047

PIPE PENETRATIONS

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section includes pipe penetration assemblies as indicated.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Manufacturers' literature on all items to be furnished, installation instructions, and where applicable, fire rating and certified test results of the various components.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Pipe sleeves shall be Schedule 40 hot-dipped galvanized steel pipe conforming to ASTM A53.
 - 1. Ends of sleeves shall be cut, ground smooth, and shall be flush with the wall or ceiling and extend 2-in. above finished floors. Do not use threaded nipples for sleeves.
 - 2. Sleeves to be sealed by caulking shall be sized to provide annular space in accordance with the caulking manufacturers recommendations.
 - 3. Sleeves to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations.
 - 4. Sleeves for insulated piping shall be sized in accordance with the insulation manufacturer's recommendations.
 - 5. Sleeves in exterior walls below ground shall have a 2-inch annular fin of 1/8-in. plate welded with a continuous weld completely around the sleeve at mid-length.
 - a. Hot dip galvanize sleeves after the fins are attached.

2.02 WALL CASTINGS

- A. Wall castings shall be ductile iron conforming to AWWA C151, thickness Class 53, diameter as required.
 - 1. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall.
 - 2. Castings shall be provided with an intermediate 2-in. minimum circumferential flange/waterstop, integrally cast with or welded to the casting.

- a. Castings which extend through wall shall have waterstop located within the middle third of the wall.

2.03 SEALING MATERIALS

- A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve.
 1. Seals shall be rated by the manufacturer for 40 feet of head or 20 psig.
 2. Where pipes are indicated to penetrate a fire rated wall, mechanical seals shall be fire rated by the manufacturer.
- B. Caulking for iron, steel and copper piping shall consist of braided oakum packing followed by poured molten soft virgin lead.
 1. Minimum length of lead segment shall be one half of pipe diameter, or six inches, whichever is less.
 2. Lead shall be flush with the end of sleeve.
 3. Cooled lead shall be expanded to form a water seal.
- C. Caulking for PVC pipe shall be as specified in Paragraph 2.03.B above except that lead wool, compacted to form a watertight seal, shall be used in place of molten lead.
- D. Sealant shall be a two-part foamed silicone elastomer as manufactured by:
 1. Dow Corning Co., product No. 3-6548 silicone R.T.V.;
 2. 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303;
 3. Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corporation;
 4. or equal.
- E. Packing shall be a fire-retardant pliable material.
 1. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.04 MISCELLANEOUS MATERIALS

- A. Epoxy bonding compound shall be as manufactured by:
 1. Sika Corporation,
 2. Euclid Chemical Corporation,
 3. Master Builders Company,
 4. or equal.

- B. Non-shrink, non-metallic grouts shall be as specified in Section 03300.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies as indicated.

**** END OF SECTION ****

SECTION 02050

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes

1. Work to be done under this Section includes demolition of existing sections of steel pipe, and manholes as indicated. Demolition includes the removal and disposal of all materials as indicated and performing all environmental cleanup resulting from the demolition work.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. The procedures proposed for demolition.
 - a. The procedures shall provide for safe conduct of the Work; careful removal, as indicated; protection of property which is to remain undisturbed; and any coordination with any other Work in progress.
 - b. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.03 GENERAL

- A. The Contractor shall remove and dispose of reinforced concrete, concrete block, or brick components as indicated.
- B. Rubbish and debris shall be removed from the Owner's property daily.

1.04 PROTECTION

- A. Protection of Existing Work: Before beginning any cutting or demolition, the Contractor shall survey the existing conditions and examine the Contract Documents. Damage shall be repaired or replaced, as directed by the Owner and at no additional cost to the Owner. Demolition shall not interfere with the use of adjacent equipment, structures, and buildings or the free and safe passage to and from the same.
- B. Contractor shall prevent debris from entering any water bodies, including wetlands.
- C. Contractor shall coordinate the Work of this Section with all other Work and construct and maintain shoring, bracing and supports. Structural elements shall not be overloaded. The Contractor shall increase structural supports or add new supports as required as a result of any cutting, removal, or demolition.

1.05 USE OF EXPLOSIVES

- A. Use of explosives will not be permitted for demolition.

1.06 BURNING

- A. Burning at the project site for the disposal of refuse and debris will not be permitted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 COORDINATION OF DEMOLITION WORK

- A. Contractor shall notify the Owner of discrepancies between existing conditions and Drawings before proceeding with demolition.
- B. Protect all concrete and brick surfaces and reinforcing steel exposed by the demolition.
- C. Temporary hoists, staging, scaffolding and other similar appurtenances required for the execution of the Work shall not stain or damage existing items to remain.
- D. All apparatus, storage, and the operation of workmen in connection with activities under this Section shall be confined to the Limit of Work and shall not encumber the premises at any time.

3.02 DISPOSAL OF MATERIAL

- A. All concrete, brick, masonry, and other materials removed shall be the property of the Contractor and shall be legally disposed of off the site.

3.03 CLEAN-UP

- A. Clean adjacent structures of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing before demolition operations began.
- B. Debris Control. Debris shall be removed and transported without spillage on streets or adjacent areas.

**** END OF SECTION ****

SECTION 02065

ANNULAR SPACE GROUT

PART 1 GENERAL

1.01 GENERAL

- A. The annular space, defined as the space between a host pipe and a liner pipe, shall be filled with grout. This section provides the basis for filling this annular space with grout to replace the soil/pipe interface.

PART 2 PRODUCTS

2.01 GROUT MATERIAL

- A. The grout shall be a cement/fly ash/water mix or equal.
- B. The additives to the mix should include a high level of air entrainment and plasticizers or other additives to promote flowability of the material.
- C. The grout shall be a low-density material in the 40 to 60 PCF range
- D. The compressive strength of the grout should be 100 psi $\pm$ 5 psi range after curing.

PART 3 EXECUTION

3.01 GROUT INSTALLATION

- A. Bulkheads shall be built at each end of the section to be grouted consisting of waterplug material and, if the annular space is sufficiently large enough, standard building bricks to fill the void space.
 - 1. One bulkhead shall incorporate a vent to release air as the grout is introduced and to provide a visual inspection point to show that grout has filled the annular space.
 - 2. The other bulkhead shall provide an inlet for the grout. On the downstream side of the grout line inlet valve, a pressure gage shall be installed to monitor pressure in the annular space.
- B. Alternatively, tap saddles or other devices can be installed on the host pipe just inside the bulkheads to provide the inlet and vent.
- C. The newly sliplined pipe shall be maintained full of water during the grout installation and initial curing in accordance with manufacturers written instructions.
- D. The installation contractor shall set the length of pipeline to be grouted at one time.

- E. The installation contractor shall recommend and supply any additional vent points along the annular space to be grouted. These shall be installed prior to the sliplining of the new pipe.

3.02 OTHER

- A. The grout contractor shall supply project descriptions and references that demonstrate successful completion of similar volume and length projects.
- B. The grout contractor shall submit the recommended grout mix for the project prior to mobilization.
- C. The grout contractor will make and supply a sufficient number of grout test samples.
- D. The grout contractor shall furnish compressive strength results samples after grout samples have properly cured.

** END OF SECTION **

SECTION 02115

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes:

1. Furnishing all materials, labor, tools, and equipment, and performing operations necessary to complete clearing, grubbing, cutting, pruning, removal and disposal of all vegetation and debris from areas within the Limits of Work as indicated.

B. Related Sections:

1. Section 01060 - Permits and Regulatory Requirements
2. Section 01090 – Reference Standards
3. Section 01567 - Environmental Protection
4. Section 02200 - Earthwork
5. Section 02930 - Loaming and Seeding

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A.** This work shall consist of clearing, grubbing, cutting, selective trimming, removal and disposal of all brush, vegetation and debris from areas as shown on the plans or designated by the Engineer. The work shall also include the preservation from injury or defacement of all vegetation and objects designated by the Engineer to remain.
- B.** This work shall also consist of removing and resetting all fencing, guardrails, posts, curbing, and signs which interfere with progress of the work. When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.
- C.** Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures will be required between successive construction stages in accordance with Section 01567.

3.02 CLEARING

- A.** Clearing shall include removal of all brush, major roots and trees. Replace any trees indicated to remain, if damaged or killed, at no additional cost to the Owner. Replace any replanted or new trees that fail to take root at no additional cost to the Owner.

- B. Any clearing operations beyond the limits set by the City or City's Representative shall be done with the written approval of the Owner and at the Contractor's expense. All such areas shall be restored to a condition acceptable to the City including necessary mulching, seeding, and planting without additional compensation.

3.03 GRUBBING

- A. Grubbing shall consist of the removal and disposal of roots, matted roots, and stumps of all trees. Excavate this material together with logs, organic debris, brush, and refuse and remove from the site. Where topsoil or seeding is indicated, fill depressions made by grubbing with acceptable material and compact in accordance with the requirements of Section 02200, Paragraphs 3.12 and 3.17. In no case will grubbing be permitted beyond the Limits of Work.
- B. Stumps shall not be removed by blasting.

3.04 TREE TRIMMING AND SELECTIVE CLEARING AND THINNING

- A. Trimming and pruning shall consist of the removal of hazardous growth and dead, dying or diseased plant material; and the removal of groups and individual plants which interfere with the work. All trimming and pruning shall conform to ANSI A300 For Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices.
- B. All limbs and branches which require removal and all stubs regardless of age must be cut flush either to a union with the next larger sound limb or branch or flush to the trunk of the tree.
- C. The cutting shall be performed by arborists with the ISA Tree Worker Climber Specialist certification. Care shall be exercised by the Contractor to prevent injury to trees and shrubs designed to be preserved. Any injury to limbs, bark or roots of such plants shall be repaired by the Contractor, as directed, or the plants replaced at no additional cost to the Owner. Injury to limbs, bark or roots of such plants shall be repaired or the plants replaced by the Contractor, at the discretion of the Owner, without additional compensation for such repair or replacement.
- D. The Contractor may dispose of cut material by processing into a wood chip mulch as described in Paragraph 3.05.A below and spreading uniformly throughout the cleared and thinned areas as directed by the City.

3.05 DISPOSAL

- A. All brush up to 4 inches in diameter and cut material shall be chipped as specified in Subsection M6.04.3 of the MassDOT Standard Specifications.
- B. The burning of trees, brush, stumps, etcetera, shall not be permitted. All materials obtained from clearing and grubbing operations shall be legally disposed of offsite by the Contractor without additional compensation.
- C. No stumps shall be used for backfilling.
- D. All areas cleared and grubbed shall be left clean and protected from erosion run-off in accordance with Section 01567.

3.06 PROTECTION

- A. Provide barricades for trees, shrubs, and existing facilities designated to remain in areas to be cleared and grubbed. Erect barricades for trees, shrubs, and existing facilities before commencing clearing and grubbing operations. No traffic or storage shall be permitted within the barricaded area. Remove when work on site is substantially complete.

3.07 CLEARING AND GRUBBING WITHIN WETLANDS AND BUFFER ZONE

- A. Clearing of vegetation within the wetlands and buffer zone shall be in accordance with Section 01567.

**** END OF SECTION ****

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY OF WORK:

- A. Section includes earth excavation, backfill, fill and grading as indicated and specified.

1.02 RELATED WORK

- A. Section 01046 – Control of Work
- B. Section 01300 – Submittals
- C. Section 01400 – Quality Control
- D. Section 01567 – Environmental Protection
- E. Section 01600 – Material and Equipment
- F. Section 02050 – Demolition
- G. Section 02665 – Water Mains, Valves and Appurtenances
- H. Section 03300 – Cast-In-Place Concrete
- I. Section 03450 – Precast Concrete Manholes

1.03 REFERENCE STANDARDS

- A. Work under this Section shall comply with the following standards and latest updates:
 - 1. American Society for Testing and Materials (ASTM) Publications:
 - a. C33: Specification for Concrete Aggregates.
 - b. C136: Sieve Analysis of Fine and Coarse Aggregates.
 - c. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
 - d. D422: Test Method for Particle-Size Analysis of Soils.
 - e. D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 μ m) Sieve.
 - f. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - g. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (600 kN-m/m³)).

- h. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - i. D2922: Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods. (Shallow Depth).
 - j. D3017: Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - k. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - l. D4718: Practice for Correction of Unit Weight and Water Content for Soils Containing Oversized Particles.
 - m. D4944: Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Pressure Tester Method.
 - n. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.
 - o. D5080: Test Method for Rapid Determination of Percent Compaction.
- 2. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.
 - 3. 520 Code of Massachusetts Regulations (CMR) 14.00 et. seq.
 - 4. Massachusetts DEP Policy #WSC 13-500: Similar Soils Provision Guidance
 - 5. MassDOT Standard Specifications
 - a. 1988 English/1995 Metric Standard Specification for Highways and Bridges, as amended
 - b. Supplemental Specifications to the 1988 English/1995 Metric Standard Specifications for Highways and Bridges dated June 15, 2012

1.04 DEFINITIONS

- A. Percentage of Compaction: The ratio of the field dry density, as determined by ASTM D1556 and ASTM D2922 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.
- B. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inch in diameter or exceeding 40 percent by weight of the backfill material, porous biodegradable matter, loose or soft fill, demolished and excavated pavement, construction debris, or refuse.
- C. Unacceptable Materials: Materials which do not comply with the definition of Acceptable Material or which cannot be compacted to the density specified in Paragraph 3.12.

- D. Rock: All igneous, metamorphic, sedimentary, and conglomerate rock, stone, parts of stone, brick or cement concrete pavement, parts of cemented stone walls or masonry structures measuring one (1) cubic yard or more.

1.05 SUBMITTALS

- A. Submit the following in accordance with Section 01300:

1. Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.06 B.
2. Excavation, backfilling, and filling plan including:
 - a. Detailed sequence of work.
 - b. General description of construction methods.
 - c. Numbers, types, and sizes of equipment proposed to perform excavation and compaction.
 - d. Details of dust control measures.
 - e. Proposed locations of stockpiled excavation and/or backfill materials.
 - f. Proposed surplus excavated material off-site disposal areas and required permits.
 - g. Details of erosion and sedimentation control measures which will prevent erosion and sedimentation during the earth moving activities.
3. For each off-site source of backfill material, name and location of the source and the date when sample was taken, and testing results from a laboratory meeting the qualifications specified in Paragraph 1.06.B for:
 - a. Sand Borrow
 - b. Screened Gravel
 - c. Bank-run Gravel
 - d. Select Borrow
 - e. Crushed Stone
 - f. Other Acceptable Materials: Laboratory testing results of gradation and moisture-density relationship. Submittal shall include specific location of the source and the date when sample was taken.
4. Modified Proctor Test (ASTM D1557) results and soil classification (ASTM D2487) for all proposed backfill materials at the frequency specified in Paragraph 2.04C.
5. Compaction Test Results (ASTM D6938 or ASTM D1556) at a frequency specified in Paragraph 2.04.

6. Filter fabric: The Contractor shall submit a two-foot square sample of fabric to be used along with technical data, certified test reports, materials certificates, and certificates of compliance.
7. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and Percentage of Compaction before placing the next lift or constructing foundations. Provide the Owner with survey information to verify compliance with tolerances specified in Paragraph 1.06 F.

1.06 QUALITY ASSURANCE AND CONTROL

- A. Provide as specified in Section 01400.
- B. Employ an independent testing laboratory with the following qualifications to perform particle size and gradation analyses in accordance with ASTM D422, and to determine compatibility in accordance with ASTM D1557 for all the proposed backfill and fill materials, and monitoring field compaction operations:
 1. Be accredited by the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program.
 2. During the past five (5) years, shall have performed sampling, testing, and analysis of soil and aggregates on at least five (5) projects similar in size to this Contract.

PART 2 PRODUCTS

2.01 GENERAL

- A. Material from excavations may be reused in accordance with Paragraph 3.08 if it meets the definition of Acceptable Materials.
- B. Fill excavations with screened gravel, bank-run gravel, select borrow, and crushed stone as specified and indicated.
- C. Flowable fill (controlled density fill) shall meet the requirements of Section M.4.08.0, Type 2E Flowable (Excavatable) Fill of the MassDOT 1988 English/1995 Metric Standard Specifications for Highways and Bridges, as amended, and the Supplemental Specifications dated June 15, 2012.
 1. Compressive strength of the flowable fill shall be 30 to 80 psi at 28 days and 100 psi at 90 days.
- D. Support and protect from damage, existing pipes, conduits, ductbanks, poles, wires, fences, curbing, property line markers, and other structures, which are indicated to be preserved in place.
- E. Where damaged by the work, restore existing property or structures immediately, at no additional cost to the Owner.
- F. Haul away and dispose of surplus excavated materials in a legal and responsible manner.

2.02 MATERIAL

A. Screened Gravel.

1. Gradation and physical property requirements of screened gravel shall conform to ASTM C33, Coarse Aggregate number 67.
2. Screened gravel shall be free from roots, leaves, and other organic materials, and free of ice, snow, frost, and frozen soil particles.

B. Bank Run Gravel.

1. Bank-run gravel shall be obtained from natural deposits and unprocessed except for the removal of deleterious materials and stones larger than the maximum size permitted.
2. Bank-run gravel shall be unfrozen and substantially free from vegetation, roots, loam and other organic matter, clay, snow, frozen particles and other fine or harmful substances.
3. Bank-run gravel: Inorganic granular material meeting the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
6 in.	100
2 in.	80 - 100
No. 4	20 - 65
No. 200	0 - 12

C. Select Borrow.

1. Use only material free from roots, leaves, and organic matter, and free of ice, snow, frost, and frozen soil particles.
2. Select borrow shall meet the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
3 in.	100
1-1/2 in.	70 - 100
3/4 in.	50 - 85
No. 4	30 - 50
No. 50	10 - 25
No. 200	0 - 5

3. Soil particles shall conform to the physical property requirements of ASTM C33.

D. Gravel Base Course.

1. Gravel base for pavement shall comply with Massachusetts Department of Transportation Highway Division Standard Specifications Section 405.

E. Crushed Stone.

1. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Percent Passing by Weight		
<u>Sieve Size</u>	<u>¾ inch stone</u>	<u>1 ½" stone</u>
2-inch	-	100
1-½ inch	-	95-100
1-inch	100	35-70
¾-inch	90-100	0-25
5/8-inch	-	-
½-inch	10-50	-
3/8-inch	0-20	-
No. 4	0-5	-

2. Crushed stone shall be used where specified as bedding under pipelines and structures. The ¾-inch crushed stone will be used for pipe bedding. The 1-1/2-inch crushed stone will be used as bedding for precast or cast in place reinforced concrete structures.

F. Sand.

1. Sand shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay and surface coatings. Sand shall meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
½-inch	100
3/8-inch	85-100
No. 4	60-100
No. 16	35-80
No. 50	10-55
No. 100	2-10

G. On-Site Excavated Material

1. On site excavated material free from organic materials, shall be used as backfill except where otherwise indicated. Compaction shall be in accordance with Part 3 of this Section.

H. Common Fill

1. Common Fill shall not contain granite blocks, broken concrete, masonry rubble, asphalt pavement, or any material larger than 6-inches in any dimension. Common Fill shall have a plasticity index of less than 15 and shall conform to the following gradation limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
No. 40	75
No. 200	30

2. Select Common Fill shall conform to the requirements of Common Fill except that the material shall not contain any materials larger than 2-inches in largest dimension.

2.03 FILTER FABRIC

- A. Filter fabric used as a drainage medium and to prevent intrusion of subgrade soils shall consist of a non-woven fabric made from polyethylene, polyester, or polypropylene filaments or yarns. The fabric shall be non-rotting, acid, and alkali resistant, and inert to organic chemicals commonly encountered in the soil.

1. All geotextile fabric shall be a nonwoven fabric having sufficient strength and permeability for use as filter fabric and shall meet the following minimum standards:

<u>Property</u>	<u>ASTM Std</u>	<u>Requirements</u>
Puncture Strength	ASTM D4833	>80 lbs.
Mullen Burst Strength	ASTM D3786	>290 psi
Trapezoid Tear Strength	ASTM D4533	>50 lbs.
Grab Strength	ASTM D4632	>180 lbs.
Apparent Opening Size (AOS)	ASTM D4751	50-70

- B. Torn or punctured fabric shall not be used. Only commercially available fabric that is certified in writing by the manufacturer for the purpose intended shall be used. The brand name shall be labeled on the fabric or the fabric container. Fabrics that are susceptible to damage from sunlight or heat shall be so identified by warning information on the packaging material. Fabrics susceptible to sunlight damage shall not be used in any installation where exposure to light will exceed 30 days.

- C. Materials incidental to installation of the filter fabric shall conform to the requirements of the manufacturer of the filter fabric.

- D. The filter fabric shall be placed in accordance with the manufacturer's recommendations and as indicated.

2.04 TESTING

A. Field Testing and Inspections:

1. shall be performed by Contractor's independent testing laboratory.
2. Location of tests shall be mutually acceptable to testing laboratory and the Owner.
3. In the event compacted material does not meet density specified in Paragraph 3.12, the Contractor shall recompact material and retest this area until results specified in Paragraph 3.12 are obtained. All such work shall be at no additional cost to the Owner.
4. Testing laboratory shall perform field testing and inspection at least once daily to confirm lift thickness and compaction for entire fill area.

B. Methods of Field Testing:

1. In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922.
2. In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959.

C. Modified Proctor Test (ASTM D1557)

1. For suitable soil materials removed during excavation, perform one test for every 1,000 cubic yards of similar soil type. Similarity of soil types will be as determined by the Engineer.
2. For borrow materials; perform one test every 1,000 cubic yards per type of material.

D. Compaction Testing (ASTM D6938 or ASTM D1556)

1. Frequency of one test for every 100 cubic yards of material backfilled or at a minimum of one test per lift. Engineer will determine the locations and lifts to be tested. Contractor shall plan operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.
2. Additional compaction testing may be required when there is evidence of a change in the quality of moisture control or the effectiveness of compaction.
 - a. Any costs associated with correcting and re-testing as a result of a failure to meet compaction requirements shall be borne by the Contractor.
3. If all compaction test results within the initial 25% of the total anticipated number of tests indicate compacted field densities equal to or greater than the project requirements, the Engineer may reduce frequency of compaction testing. In no case will the frequency be reduced to less than one test for every 500 cubic yards of material backfilled.

- E. Material Testing Frequency: The following testing frequencies are required for all structural and non-structural fill, and grading.
1. Field In-Place Density and Moisture Content - Screened gravel, select borrow, bank-run gravel and crushed stone shall be compacted as specified in Paragraph 3.12. For other backfill and fill materials, test frequency shall be as follows, and no less than one test per day:
 - a. Foundation preparation: Every lift
 - b. Trenches in areas without structures or roadways: Once per alternate lift.
 - c. Around Structures: Once per alternate lift.
 2. Moisture Density - One per source, except for screened gravel and crushed stone. Repeat the moisture density test for every 5,000 cubic yards of material use, and whenever visual inspection indicates a change in material gradation.
 3. Gradation Analysis - One per source and for each moisture density test and whenever visual inspection indicates a change in material gradation.
 4. Liquid Limit, Plastic Limit and Plasticity Index - One test per 5,000 cubic yards of soil for use as fill material and whenever visual inspection indicates a change in classification of material.
- F. Construction Tolerances:
1. Construct finished surfaces to plus or minus 1 inch of the elevations indicated.
 2. Grade, cut and fill areas to plus or minus 2½ inches of the grades indicated.

PART 3 EXECUTION

3.01 EXCAVATION

- A. Excavation shall not commence until the related dewatering, excavation support systems, and backfill and fill materials submittals are reviewed and approved.
- B. Comply with all applicable laws, rules, and regulations governing excavation, trenching, sheeting, and bracing including 29 CFR Part 1926 Subpart P and 520 CMR 14.00 et. seq. (see Attachment A). Where conflicts between regulations exist, the more stringent requirements shall apply.
- C. Excavate test pits to locate underground pipelines or structures in advance of the Work. Backfill and restore test pits to pre-existing condition. The number and location of test pits shall be as indicated on the Contract Drawings.
- D. Excavations shall be performed in the dry, and kept free from water, snow, and ice. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.

- E. Excavation, dewatering, excavation support systems, backfilling, and filling shall not undermine or disturb foundations of partially and fully completed structures and pipelines or existing structures and pipelines.
- F. Excavate only to lines, grades, elevations, and widths indicated.
 - 1. Preserve material below and beyond the lines of excavations.
 - 2. If Unacceptable Material as defined in Paragraph 1.04C. is found at or below the grade to which excavation would be carried as indicated, promptly notify the Owner.
- G. Do not place excavated material within 3 feet from edge of excavations at the ground surface.

3.02 SEPARATION OF EXCAVATED MATERIALS

- A. Saw cut only to the extent indicated, demolish, and dispose of pavement and bituminous curbing prior to excavation. Do not damage paved surfaces indicated to remain.
- B. Remove loam and topsoil from excavated areas. Store for re-use.
- C. Remove Rock within the excavation limits. **Blasting will not be permitted.**
- D. Remove Acceptable Materials from excavated areas and store for re-use as specified in Paragraph 3.08.
- E. Protect excavated clay from absorbing moisture.

3.03 TRENCH EXCAVATION

- A. Excavate trench only to indicated subgrade. Re-compact disturbed material remaining at bottom of trench. Where subgrade materials become unstable during dewatering operations, remove and replace with materials meeting Paragraph 2.02 at no additional cost to the Owner.
- B. The Contractor shall secure all unattended trenches in accordance with the provisions of the Summary of 520 CMR 14.00 et.seq. attached hereto as Attachment A.
- C. Town of Holden Street Entry Permit and the permit for trench excavation (issued as a part of the street entry permit) shall be applied for in accordance with Section 01060, Paragraph 1.06.A.1.

3.04 TRENCH EXCAVATION IN FILL

- A. Place and compact material to top of fill or to a minimum height of one (1) foot above top of pipe, whichever is less, when pipe is to be laid in recently filled material. Consolidate pipe bedding to 95%.

3.05 EXCAVATION NEAR EXISTING STRUCTURES

- A. Dig by hand when excavation exposes pipes, conduits, or other underground structures.

- 3.06 REMOVAL OF SUBSURFACE OBSTRUCTIONS
- A. Remove indicated subsurface structures and related obstructions to extent shown.
 - B. Promptly notify the Owner when any subsurface facilities that are not indicated on the drawings are encountered during excavation.
- 3.07 UNAUTHORIZED EXCAVATION
- A. Trenches and excavations cut wider than the maximum widths indicated will be considered for Contractor's convenience for which the Contractor will not receive compensation.
- 3.08 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS
- A. Reuse excavated Acceptable Materials for backfill.
- 3.09 SUBGRADE PREPARATION AND PROTECTION
- A. Remove loam and topsoil, loose vegetable matter, stumps, and large roots from areas upon which material will be placed for grading. Shape subgrade as indicated, and prepare by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.
 - B. Compact the foundation subgrade prior to backfilling and filling operation, or placing foundation concrete.
 - C. Compact the pipe trench foundation subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.
- 3.10 CARE AND RESTORATION OF PROPERTY
- A. Prevent injury to overhanging branches and limbs and to trees not indicated to be cut.
 - B. Restore surfaces damaged to a condition at least equal to that in which they were found immediately before work commenced as directed by and at no additional cost to the Owner.
- 3.11 BACKFILLING - GENERAL
- A. Do not place frozen materials in backfill or place backfill upon frozen material. Remove previously frozen material or thaw before new backfill is placed.
 - B. Do not place, spread, roll, or compact fill material during heavy rain events. If interrupted by heavy rain, do not resume until verifying that the moisture content and density of the previously placed soil are as specified in Paragraph 3.12.
 - C. Do not use puddling, ponding, or flooding as a means of compaction.
- 3.12 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS
- A. Sand Borrow:
 - 1. Dump and spread in layers not to exceed 8 inches. uncompacted thickness.

2. Compact to not less than 95 percent the fill and backfill under structures and the bedding for pipes from below pipe to spring line. Compact to 90 percent from spring line to one foot above top of pipe. Compact to not less than 90 percent in other areas unless otherwise indicated.
 3. Compact over excavated areas for removal of Unacceptable Material under pipe to 95 percent.
- B. Screened Gravel and Crushed Stone:
1. Dump and spread in layers not to exceed 8 inches uncompacted thickness.
 2. Compact to not less than 95 percent.
- C. Bank-run Gravel and Acceptable Materials for use as non-structural fill:
1. Dump and spread in layers not to exceed 12 inches uncompacted thickness.
 2. Compact to not less than 90 percent unless otherwise indicated.
- D. Backfilling and filling operation shall be suspended in areas where density tests are being performed until those tests are completed and the Contractor's testing laboratory has advised the Owner that above specified densities are obtained.

3.13 STRUCTURAL FILL AND BACKFILL UNDER STRUCTURES

- A. Compact fill and backfill under structures with screened gravel, crushed stone, or select borrow, as specified in Paragraph 3.12.

3.14 NON-STRUCTURAL BACKFILL AROUND STRUCTURES

- A. Use bank-run gravel for non-structural backfill around structures and compacted as specified in Paragraph 3.12.
- B. Conduct hydraulic testing after structures are constructed and other necessary work has been done. Backfill immediately after completion of tests.
- C. Deposit material evenly around structure to prevent unequal soil pressure.
- D. Do not place backfill on or against structures until the structures have attained specified strength to support the loads, including construction loads, to which those structures will be subjected, without distortion, cracking, or other damage.

3.15 BACKFILLING PIPE TRENCHES

- A. General:
1. Begin backfilling and proceed until completed after the pipes and conduits have been laid, joints have been connected, pipelines and conduits have successfully passed inspections, and concrete or masonry structures within the trench have reached their design strength to support all loads.
 2. Backfill and compact specified material under, around, and above pipes, conduits, and other structures to the compaction density requirement specified in

Paragraph 3.12 without damage to the pipe, conduit, or structure within the trench.

- a. Do not drop backfill material into trench from a height of more than 5 feet.

3. Backfill and compact over excavated trench subgrades as specified in Paragraph 3.12.

B. Pipe Trenches:

1. Materials:

- a. From below pipe to one (1) foot above crown: Use screened gravel, or crushed stone, as indicated.
- b. One (1) foot above pipe crown to finished grade: Use bank-run gravel or Acceptable Materials, unless otherwise indicated.

2. Compacting Around Pipes: Compact material around circumference of pipe and the area between the trench wall and the pipe by hand tamping in 6-inch layers.

3. Compacting Above Pipe: Compact material by hand tamping. Rollers or other mechanical compaction equipment may be used if the compacted material over the pipe will support the load of the equipment without damage to the pipe.

3.16 PLACING AND COMPACTING MATERIAL

- A. Compact fill material as specified in Paragraph 3.12- and as indicated.
- B. Moisture content of fill material in stockpile area shall be as specified prior to placement.
- C. Place fill on surfaces which are free of Unacceptable Materials.
- D. Begin filling in lowest section of work area. Grade surface of fill approximately horizontal with longitudinal and transverse slope to allow for runoff of surface water from every point and for drainage during periods of wet weather.
 1. During wet weather and upon suspension of filling operations for any period in excess of 12 hours, roll the surface of fill until it is smooth. Prior to resuming compaction operations, remove muddy material off surface to expose firm, compacted material.
 2. Conduct filling so that no obstruction to drainage from other sections of fill area is created at any time.
 3. Install temporary dewatering sumps in low areas during filling operation where rain runoff collects.
- E. Compact uniformly. Keep surfaces of fill smooth and free from humps and hollows. Prevent over-compaction in localized areas. Obtain specified compaction at edges of fill.

- F. When fill is placed against previously placed fill or against in-situ material under and around structures, including around piping beneath structures or embankments, slope junction between two sections of fill, 1 vertical to 1.5 horizontal. Bench edge of existing fill 24-inch to form a serrated edge of compact stable material against which to place the new fill. Ensure that rolling extends over junction between fills.
- G. When fill is placed directly upon previously placed fill, clean surface of debris, remove any loose material, and compact the entire surface prior to placement of additional fill.
- H. After spreading each loose lift and adjusting its moisture content, compact each lift to obtain the specified compaction.
- I. When fill or backfill sinks and creates waves and the specified compaction is not being obtained, reduce the moisture content. If such sinking and waving produces surface cracks, suspend operations until the area dries and is stabilized.
- J. If compaction obtained over any area is less than that specified, remedy condition at no additional cost to the Owner. If condition cannot be remedied to produce specified results, remove material in that area down to a level where specified density has been achieved. Removal, replacement, rerolling, and retesting shall be at no additional cost to the Owner.

3.17 COMPACTION CONTROL OF BACKFILL AND FILL

- A. Compact to density specified in Paragraph 3.12 for various types of material.
- B. The Contractor's soil testing laboratory shall inspect the work during filling and backfilling operations to verify specified compaction of screened gravel and crushed stone and to record compaction equipment in use.

3.18 SITE MAINTENANCE

- A. Grade site to maintain a level unrutted condition and to eliminate puddling of surface and subsurface water.
- B. Control moisture at pits and of backfill.

3.19 ALLOWANCE FOR SHRINKAGE

- A. Backfill to allow for shrinkage and consolidation of material to the indicated grade with an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.
- B. Grade and maintain surfaces to meet finished grades indicated until Substantial Completion.

PART 4 ATTACHMENTS

- 4.01 Attachment A – Summary of 520 CMR 14.00 et. seq.

ATTACHMENT A

Summary of 520 CMR 14.00, et.seq.

All Unattended Trenches in public ways and at fixed work sites other than on a public way shall be secured with covers or barriers to prevent unauthorized entry and provide protection for the General Public in accordance with the provisions specified herein. The Owner may require any additional, site-specific provisions it deems necessary to protect the General Public as a condition to any permit issued.

1. Trenches on Public Ways:

- A. Covers: $\frac{3}{4}$ inch thick steel metal plates, placed over the Trench, recessed, level and physically secured
- B. Barriers shall be:
 - 1. continuous and surround the entire Trench perimeter
 - a. barriers with multiple sections shall have no more than four inches between each section
 - b. adjacent sections shall be securely fastened to each other
 - 2. not less than six feet in height
 - a. openings between the ground and barrier shall not exceed four inches
 - b. openings greater than four inches may be protected by solid guards of suitable materials including plywood or wood planks
 - 3. strong with stable support
 - a. barriers adjacent to high speed traffic may include traffic control barrels ballasted by sandbags or temporary pre-cast concrete barriers as components
 - 4. easily visible to motorists
 - 5. a sufficient distance from the Trench to be unaffected by changing conditions of the Trench site

2. Trenches at Fixed Work Sites Other than on a Public Way:

- A. Covers: $\frac{3}{4}$ inch thick steel metal plates, placed over the Trench, recessed, level and physically secured
- B. Barriers and Gates:
 - 1. Barriers shall be:
 - a. continuous and surround the entire Trench perimeter
 - i. barriers with multiple sections shall have no more than four inches between each section
 - ii. adjacent sections shall be securely fastened to each other

- b. not less than six feet in height
 - i. openings between the ground and barrier shall not exceed four inches
 - ii. openings greater than four inches may be protected by solid guards of suitable materials including plywood or wood planks
 - c. clearly marked on all sides with signs indicating "Danger-Do Not Enter", "Authorized Personnel Only" or equivalent warning
 - d. a sufficient distance from the Trench to be unaffected by changing conditions of the Trench site
2. Fence-type barriers shall be secured by vertical support members not more than ten feet apart
- a. fencing spaces shall not exceed four inches when measured as mesh size or between slats
 - b. all horizontal support members shall be located on the Trench side of the barrier
3. Solid barriers shall not contain holes or indentations larger than four inches
- a. the wall of a dwelling or other permanent structure of a height of not less than six feet may serve as part of the barrier provided it complies with all of the provisions specified herein
4. Gates and other means of egress shall:
- a. comply with the size and strength provisions of specified above
 - b. be securely fastened to adjacent barrier components
 - c. allow not more than four inches between gates and barrier components
 - d. be securely locked with a padlock, combination lock, or other suitable locking device

3. Alternative Provisions

Continuous personal monitoring of the Unattended Trench by the Permit Holder or by person(s) under the control and direction of the Permit Holder may be substituted for the provisions specified herein.

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**** END OF SECTION ****

SECTION 02240

EXCAVATION DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Furnish, maintain and remove temporary surface water and groundwater control measures to prevent damage to adjacent structures and completed portions of the Work.
2. Collect, treat and dispose of all discharge water from the dewatering and drainage systems in accordance with applicable regulations.
3. Design, furnish, install, operate, and maintain a dewatering system to lower and control groundwater levels to permit construction in the dry, to preserve the undisturbed bearing capacity of subgrade soils, to maintain stable soil conditions, and to prevent damage to adjacent structures and completed work.

B. Description of Work

1. Design dewatering system and site drainage management. Discharge and/or dispose of groundwater and surface water in accordance with all federal, state and local Rules and Regulations.
2. Dewatering procedures shall not cause damage to new or existing facilities.
3. Install and maintain the system to intercept and/or remove and dispose of all water entering trenches, and other excavations. Excavations shall be kept dry until the structures, pipes and appurtenances to be built or installed therein have been completed, tested and backfilled.
4. Lower and maintain groundwater a minimum of 1-foot below excavation bottom during excavation and subgrade preparation.
5. Install and mount standby pumping equipment, including backup power source, for immediate use in case of emergencies. Repair any damage to permanent work or existing property resulting from the failure of dewatering system at no additional cost to the Owner.
6. Contractor's groundwater control supervisor meeting qualifications specified in Paragraph 1.06.B shall be at the site during the installation, operation, maintenance, and removal of the groundwater control system.
7. Should unspecified hazardous material contamination of the groundwater discharge be discovered during the operation of the groundwater control system, immediately notify Owner and cease all dewatering work until the Owner has taken steps to report and implement corrective actions in

accordance with the Massachusetts Contingency Plan (310 CMR 40.0000).

8. Existing Conditions:

- a. Samples of groundwater were not taken during design. Take samples to determine treatment needed (if any). A copy of sample results shall be provided to Owner.
- b. Obtain a NPDES RGP prior to the start of Work on site. Comply with and perform all testing required under the NPDES RGP.
- c. Collect, treat, recycle, and discharge groundwater and surface water at the sites as part of construction and in compliance with all applicable provisions of federal, Commonwealth, and local laws, regulations, and bylaws.
- d. Treat the dewatering effluent prior to discharge per the NPDES RGP.
- e. Contractor's QEP shall coordinate sampling and chemical analysis and include data in RGP reports for work conducted in areas where RGP reporting is required.
- f. Contractor's QEP shall prepare all draft NPDES reports per Section 01060 and shall finalize reports once reviewed by the LSP-of-Record.

1.02 RELATED SECTIONS:

- A. Section 01060 – Permits and Regulatory Requirements
- B. Section 01090 – Reference Standards
- C. Section 01300 – Submittals
- D. Section 01390 – Health and Safety Plan
- E. Section 01400 – Quality Control
- F. Section 01530 – Safety and Protection of Property
- G. Section 01567 – Environmental Protection
- H. Section 02200 – Earthwork

1.03 DEFINITIONS

- A. MassDEP: Massachusetts Department of Environmental Protection.
- B. EPA: U.S. Environmental Protection Agency.
- C. MCP: Massachusetts Contingency Plan, 310 CMR 40.0000.
- D. BRP: Bureau of Resource Protection

- E. NPDES: National Pollutant Discharge Elimination System.
- F. URAM: Utility-Related Abatement Measure
- G. QEP: Qualified Environmental Professional
- H. CFR: Code of Federal Regulations.
- I. CMR: Code of Massachusetts Regulations.
- J. RCGW-2: DEP Reportable Concentration in Groundwater Category 2.
- K. DOT: U.S. Department of Transportation.
- L. IDW: Investigation Derived Waste.
- M. LSP of Record: A Licensed Site Professional, as defined in 310 CMR 40.000, engaged by the Owner who will perform LSP-of-Record services and regulatory interaction/coordination for the project.
- N. "In-the-dry": An excavation subgrade where the groundwater level has been lowered to at least 1-foot below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.
- O. Construction General Permit (CGP): EPA NPDES permit which includes discharge requirements of uncontaminated water for construction dewatering to control groundwater intrusion and/or stormwater accumulation for sites equal to or greater than one acre and establishes notice of intent requirements, effluent limitations, standards, prohibitions and best management practices. Comply with all CGP conditions. Prepare a site-specific Stormwater Pollution Prevention Plan (SWPPP) and submit a completed Notice of Intent to EPA Region 1.
- P. Dewatering General Permit (DEP): EPA NPDES permit which includes discharge requirements of uncontaminated water for construction dewatering to control groundwater intrusion and/or stormwater accumulation and establishes eligibility conditions, notice of intent requirements, effluent limitations, standards, prohibitions and best management practices. Comply with all DEP conditions. Prepare a dewatering plan and submit a completed Notice of Intent to EPA Region 1.
- Q. Remediation General Permit (RGP): EPA NPDES permit which includes discharge requirements for construction dewatering of contaminated sites to control groundwater intrusion and/or stormwater accumulation and establishes notice of intent requirements, effluent limitations, standards, prohibitions and best management practices. Comply with all RGP conditions. Submit a completed Notice of Intent to EPA Region 1.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300:

1. Within 14 days of the Notice to Proceed,
 - a. Evidence of license and registration of the Contractor's Professional Engineer as specified in Paragraph 1.06.A
 - b. Groundwater and Storm Water Control Plan, designed and stamped by Contractor's Professional Engineer, to control groundwater and surface runoff during excavations, including the point(s) of effluent discharge that will be used, and shall include the following:
 - 1) Types and sizes of groundwater control systems to be used, including backup power and equipment to run the dewatering system without interruption.
 - 2) Plans showing the locations and arrangements of recharge pits, discharge piping, frac tanks, and other groundwater control system components.
 - 3) Location plan showing discharge piping and all other discharge components.
 - 4) Provisions for limiting siltation, separating oil or fuel from discharge, and for meeting discharge requirements.
 - 5) Calculations indicating that the dewatering system will control surface and groundwater.
 - 6) Procedures and drawings for abandoning the dewatering system left below grade and below structures.
 - 7) Permit(s) for disposal/discharge of treated dewatering effluent and other treatment system wastes.
 - 8) Proposed method for abandonment of the dewatering system including a schedule, which details the phasing out of the system with relationship to the new construction.
 - c. Written Treatment System Plan, designed and stamped by a licensed Professional Engineer registered in the Commonwealth of Massachusetts, for the dewatering effluent and decontamination water designed to meet the permitted discharge requirements at least thirty (30) days prior to the commencement of Work on site including:
 - 1) Layout drawings and site location plan including equipment sizes and capacities.
 - 2) Operating plan including monitoring and maintenance schedule, and screening and sampling program meeting the sampling requirements of the permit(s).
 - 3) Name(s) of transporters and disposal facilities who will be

transporting and/or receiving waste collected from the Treatment System.

- 4) Type of flow meter to be used to measure volume of treated water discharged from the Treatment System including calibration plan and methods.
 - d. Draft NOI for the RGP
 - e. Copy of the Draft NPDES Remediation General Permit application
 - f. Record of volume of treated water discharged from the Groundwater Treatment System.
 - g. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material proposed for dewatering purposes.
 - h. The results of the dewatering effluent testing for NPDES Remediation General Permit discharges within five (5) days of the samples being collected including a record of the sampling event including the date, precise sampling locations and time, name of individual performing the sampling, methods of sampling and sampling preservation techniques (or procedures), on-going construction activities at the time the sample was collected, and the chain-of-custody for each sample
2. Coordinate dewatering and drainage submittals with the excavation and support of excavation submittals. The submittal shall show the areas and depths of excavation to be dewatered.
 3. Do not proceed with any excavation or dewatering activities until the dewatering submittals have been reviewed and approved.
 4. The Contractor's LSP shall prepare all draft NPDES reports and shall finalize reports once reviewed by the Owner and LSP of Record.
 5. The LSP of record will review all draft documentation prepared by the Contractor's LSP and will sign stamp, and submit documentation once finalized by the Contractor's LSP.
 6. The Contractor's submittal of the proposed groundwater control and treatment systems will outline and record the Contractor's proposed means and methods. Review of the submittals by the Owner does not relieve the Contractor from the responsibility for the adequacy of the system.

1.05 PROJECT/SITE CONDITIONS

A. Existing Conditions:

1. Work between Kendall Reservoir Dam and Main Street contain areas of work

in and near wetlands, and some of the work is adjacent to Eagle Lake.

2. Work on Pump Station Road is adjacent to the Quinapoxet Reservoir.
3. Groundwater levels are anticipated to be high, however, no monitoring wells or borings were taken in these areas.
4. Kendall Reservoir and Quinapoxet Reservoir are drinking water sources belonging to the City of Worcester.

1.06 QUALITY CONTROL

- A. A Licensed Professional Engineer registered in the Commonwealth of Massachusetts who has completed dewatering system design on five (5) projects of similar type and complexity to the work of this contract within the last five (5) years shall design the dewatering system and supervise its installation. If the dewatering system is a well-point system, the Engineer shall be present during startup and shall visit the site weekly to monitor its operation.
- B. The Contractor's groundwater control supervisor shall have a minimum of five years of experience in the last ten years with similar types of groundwater control systems in similar soil conditions.
- C. The Contractor's QEP shall supervise all aspects of soil and groundwater sampling, testing, and management; Contractor health and safety, and coordination with the Owner, as specified herein.
- D. The LSP-of-Record will review all draft documentation prepared by the Contractor's QEP and will sign, stamp, and submit documentation once finalized by the Contractor's QEP.

1.07 REGULATORY REQUIREMENTS

- A. Perform the Work specified in this section in accordance with all applicable laws, rules, and regulations, including:
 1. DEP Regulation 14 CMR 3.00: "Massachusetts Surface Water Quality Permit Program."
 2. DEP Regulation 314 CMR 5.00: "Ground Water Discharge Permit Program."
 3. DEP Regulation 310 CMR 40.0000: "Massachusetts Contingency Plan."
 4. Remediation General Permit under the EPA National Pollutant Discharge Elimination System (NPDES) for Discharges in Massachusetts General Permit, Permit No. MAG910000.

1.08 SUBSURFACE DATA

- A. Soil boring data are included in Appendix I.
- B. Chemical Testing Results: Groundwater Samples are included in Appendix J.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Fractionation tanks, oil-water separators, and bag filtration systems, and other equipment necessary to comply with the requirements of the NPDES Permit. Treatment system shall be equipped, or be adaptable, to process dewatering effluent containing non-aqueous phase liquids.
- B. Storage units to handle quantities of water in excess of the treatment unit capacity.
- C. Flow meters installed at discharge locations to allow accurate measurement of the flow rate and total volume of treated dewatering effluent discharged.
- D. Complete standby equipment and power sources such that in the event that any part of the dewatering system becomes inoperable or in the event of a power failure, dewatering will continue uninterrupted.

2.02 MATERIALS

- A. Provide and store standby power sources and auxiliary dewatering equipment, including pumps and hoses on the site, such that in the event that any part of the dewatering system becomes inadequate or in the event of a power failure, dewatering will continue uninterrupted.
- B. Provide DOT approved 55-gallon drums for storage of IDW generated during installation of observation wells.

PART 3 EXECUTION

3.01 GENERAL

- A. Prepare and submit to the Environmental Protection Agency a Notice of Intent for a National Pollution Discharge Elimination System (NPDES) Remediation and Miscellaneous Contaminated Sites General Permit (RGP) prior to commencing ground water dewatering activities.
- B. Discharge locations shall be reviewed by the Town of Holden and shall comply with all applicable provisions of federal, state, and local laws, regulations, and bylaws and the NPDES Remediation General Permit, as required by Section 01060.
- C. Obtain approvals from the City of Worcester for locations of fractionation tanks and dewatering basins prior to the start of dewatering operations.
- D. Prepare fractionation tank or tanks to store water and to allow sedimentation of silt and fine sand and separation of oil.
- E. Prepare treatment system including oil-water separator, bag filtration system, carbon adsorption system to comply with the requirements of the NPDES permit.
- F. Grade and ditch the site to direct surface runoff away from open excavations.

- G. Control surface water and groundwater such that excavation to final grade is made in-the-dry. Construction and backfilling shall proceed in-the-dry and flotation of completed portions of the work shall be prohibited.
- H. Dewatering units used in the work shall be equipped with a filtering device so that no fine soil particles are removed from excavations by pumping.
- I. Any damage resulting from dewatering operations or resulting from the failure of the Contractor to maintain all the areas of Work in a dry condition, shall be repaired by the Contractor, at no additional cost to the Authority. The Contractor's pumping and dewatering operations shall be carried out in such a manner as to prevent damage to the Work and adjacent utilities, structures, and so that no settling of adjacent ground will result from these operations. The Contractor shall protect new Work from flooding during storms or from other causes. Pumping shall be continuous to protect the Work and/or to maintain Work progress.
- J. Pipe, masonry, and concrete shall not be placed in water or be submerged within 24 hours after being installed. Water shall not flow over new masonry or concrete within four days after placement.
 - 1. The groundwater within the area to be excavated shall be lowered to maintain the excavation entirely clear of water while the structures and pipelines are being built. If a quickening condition of the bottom and/or walls of the excavation occurs preventing the construction of the pipelines or structures, the Contractor shall lower the water level to a depth below the bottom of the excavation to remedy the condition. The Contractor shall utilize deep wells and/or well points, sumps, to lower the water level below the bottom of the excavation, to keep trenches and other excavations entirely clear of water while pipelines and structures and their foundations are being built and to maintain the soils at and below subgrade level in their natural, undisturbed condition. Dewatering shall be continuous until the structure is in place, backfilled and is secure from flotation.
- K. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill. If the subgrade of the trench or excavation becomes disturbed due to inadequate dewatering or drainage, excavate and backfill as directed by and at no additional cost to the Owner.
- L. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

3.02 DISCHARGE OF DEWATERING WATER – GENERAL

- A. Dewatering discharge, including surface runoff, shall:
 - 1. be in accordance with the Groundwater and Storm Water Control Plan.
 - 2. not damage adjacent properties, pavements and other surfaces, buildings, structures, utilities, and the environment.

3. not be discharged into sanitary sewers or combined sewers.

- B. Provide sedimentation and erosion controls, materials, and equipment to facilitate the discharge of the construction dewatering effluent, to comply with NPDES permits and Town of Holden Conservation Commission Order of Conditions. In wetland areas discharge of effluent shall be a minimum of 50 feet upland from the wetlands edge.
- C. Do not discharge any dewatering effluent until the proposed dewatering procedures, and discharge locations have been reviewed by the City of Worcester. The City of Worcester shall be notified a minimum of four (4) days prior to any discharge.

3.03 DEWATERING AND TREATMENT

- A. Construct and operate dewatering system in accordance with the Dewatering Plan.
- B. Store, sample and dispose of all dewatering effluent and decontamination water generated during construction in accordance with the Treatment System Plan and NPDES Remediation General Permit requirements. Provide laboratory analysis and reporting as required by the permits.
- C. Provide continuous dewatering 7 days per week, 24 hours per day, during construction until the excavation is backfilled.
- D. Leave all pipes used for drainage purposes clean and free of sediment.
- E. Backfill trenches so that water will not accumulate in unfilled or partially filled trenches.
- F. The pumping and dewatering operations shall be executed in a manner which will prevent damage to the Contract work and will result in no loss of ground from these operations. Protect new work from flooding due to storms. Repair any damage at no additional cost to the Owner.
- G. Provide personnel on site 24 hours per day, 7 days a week to monitor and maintain equipment during dewatering.
- H. Provide standby pumps of the same capacity as the operating pumps and standby power to maintain the dewatering operations on site at all times during dewatering.

3.04 DISCHARGE OF UNCONTAMINATED DEWATERING WATER TO SURFACE WATER OR STORM DRAINS

- A. Comply with all applicable regulations.
- B. Obtain and comply with all applicable permits.
- C. Sample and provide analyses of the dewatering system discharge to monitor permit compliance.
- D. Operate and maintain the system in compliance with regulations and permit requirements.

3.05 DISCHARGE OF CONTAMINATED DEWATERING WATER TO SURFACE WATER OR STORM DRAINS

- A. On-site discharge of the construction dewatering effluent shall be performed in accordance with requirements of the NPDES Remediation General Permit (RGP), EPA, Conservation Commissions Order of Conditions and other permits, and be in accordance with all federal, Commonwealth, and local codes, ordinances, and regulations.
- B. Discharge water as required by discharge permit and in a manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.
- C. The Owner shall be notified four (4) days prior to any discharge.
- D. Dispose of contaminated water and any recovered non-aqueous phase liquid, as determined by 310 CMR 40.0000 in accordance with Section 02280.

3.06 REMOVAL OF SYSTEMS

- A. At the completion of dewatering operations, remove all dewatering equipment and restore site to pre-construction conditions. Seal wells with grout and cut off a minimum of 3-feet below finished ground level or 1-foot below foundation level.
- B. Leave in place any casings for deep wells, well points or observation wells located within the plan limits of structures and pipelines and within the zone below 1H:1V planes extending downward and out from the edges of foundation elements, or where removal would otherwise result in ground movements causing settlement to adjacent ground surface, utilities or existing structures.

3.07 ABANDONMENT OF DEWATERING SYSTEM

- A. Tremie grout wells, well points, or piping left below grade after abandoning the system.
- B. Tremie grout observation wells at the completion of dewatering work.

** END OF SECTION **

SECTION 02941

TREES, PLANTS AND GROUNDCOVER

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Work Included:

1. Engage the services of a reputable nursery in the area to furnish and plant such trees and shrubs as shown on the drawings and as approved by the Owner.

B. Work Specified Elsewhere:

1. Loaming and Seeding is specified in Section 02935.

1.02 QUALITY ASSURANCE

- A. All trees and shrubs shall conform to the requirements of the current edition of the "American Standard for Nursery Stock" sponsored by the American Association of Nurserymen, Inc., unless otherwise shown on the Drawings.

1.03 SUBMITTALS

- A. The Contractor shall submit a plan by the nursery outlining the location of proposed landscaping.
- B. Any recommended changes to the landscape plan or trees and shrubs specified should be noted in the submittal.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Ball and burlap or grow and deliver in approved containers. Secure root balls by strong, tight, heavy wrapping. Trees must come from a soil that will hold a firm root ball.
- B. Handle all plants so that the roots are adequately protected at all times. See that balls of balled or burlapped plants are well protected immediately upon delivery. Do not plant such plants if the ball is cracked or broken either before or during the process of plantings.
- C. Keep all balled or burlapped plants constantly moist from the time of arrival until planting. If plants must be stored more than two days before planting, completely cover the root balls with at least a 6-inch-thick layer of moist hay, leaves or loam, to protect against drying.

1.05 GUARANTEE

- A. The Contractor shall be responsible for all plants for a period of one full growing season following the final acceptance of the planting work, and during that period, shall promptly replace all plants that, in the opinion of the Owner, have died, or have made unsatisfactory growth. Replace with plants of the same variety and size, plant and maintain at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

1. Trees and Plants:
2. All Trees: First class representatives of their species or varieties.
3. All Plants: Good, healthy, well-formed upper growth and a large, fibrous, compact root system.
4. Large Deciduous Trees: Straight trunks and a single leader, or as may be characteristics of the species. Tops shall be fully branched, densely foliated, well balanced, and in good proportion to the height of the tree. Trees with weak trunks, thinly or irregularly branched, or with unnatural shape or proportion due to undesirable pruning practices or for any other cause, will be rejected. Trees with leaders or branches too severely cut back or with bottom limbs trimmed too high will be rejected.
5. Small Growing Deciduous Trees: Well branched, natural shape. Plants which are poorly furnished or have been grown or pruned into unnatural shapes will be rejected.
6. Coniferous (Evergreen) Trees: Uniformly and thickly branched from the ground up, with a shape characteristic of the species.
 - a. Emerald Green Arborvitae
 - 1) Size: 6-7 ft tall
 - 2) Supplier: Connecticut Tree Sales or approved equal.
- B. All trees shall have been grown under climatic conditions similar to this in the locality of the project site of have been acclimated to such conditions for at least two years.
- C. All trees must be healthy, vigorous, and free from disease, injurious insect, and their eggs or larvae, mechanical wounds, broken branches, decay, or any other defects.
- D. Planting soil: Mixed in the following ratio: 4 cubic yards of loam, one cubic yard rotted cattle manure, 15 pounds 6-10-4-part organic commercial fertilizer.
- E. Stakes:
 1. Material: Good quality spruce or fir
 2. Size: 2 inches x 3 inches x 8 feet
 3. Apply a heavy coat of oil painting before setting
- F. Hose:
 1. Material: 2-ply fabric bearing rubber

2. Size: Not less than 1/2 inch inside diameter
- G. Wire
1. Material: Zinc-coated iron.
 2. Type: 10-gauge double strand twisted.
- H. Wrapping Materials:
1. Material: Waterproof crinkly Kraft paper or approved equal.
 2. Size: Not less than 6 inches nor more than 10 inches wide.

PART 3 EXECUTION

3.01 GENERAL

- A. All plants shall be accompanied by state nursery inspection certificates. The Contractor shall submit certificates to the Town prior to planting. Inspection and selection of plants before digging shall be at the option of the Town. The Contractor or his representative shall be present if requested by the Town for inspection of plants at the nursery.
- B. All plants shall be subject to inspection and approval by the Town upon their delivery to the site. Plants must conform to requirements of this Section as to quality and size. No materials shall be planted until approval is received.
- C. All Work under this section shall be performed by experienced workmen familiar with planting procedures and under the full-time supervision of a qualified foreman.
- D. The locations for all trees shall be staked on the ground for approval of the Town. Approval shall be obtained by the Contractor prior to excavation of planting pits. Adjustments in locations shall be made with the approval of the Town. The Contractor shall verify the location of underground utility lines, structures and other known obstructions prior to locating plant material.

3.02 PREPARATION

- A. Perform all site work, including all excavation and disposal of surplus material, prior to the delivery of plants to the site.
- B. All excavations shall have as near to vertical sides as possible.
- C. Dispose of surplus soil.
- D. Construct planting pits one foot wider in diameter than the root mass with a depth of six inches deeper than the root mass.
- E. Have all planting soil, stakes, hose, and other necessary materials on the site prior to delivery of the plants.

3.03 INSTALLATION

- A. Remove all boulders encountered in the excavation to the depths necessary to permit the proper excavation of pits for plants. Fill the resulting spaces with suitable compacted earth.
- B. Planting:
 - 1. Set all plants at a level that, after settlement, a natural relationship of the crown of the plant with the ground surface will be established.
 - 2. Set all trees and shrubs in the center of individual pits or pockets.
 - 3. Carefully and thoroughly tamp planting soil under and around the base of each ball to fill all voids. Do not use frozen or muddy soil.
 - 4. Pull all ropes, wires, and other such material from under the root balls without pulling out the burlap.
 - 5. Form a shallow depression at each plant by placing a mound of topsoil around the edge of each pit or pocket.
- C. Prune all new plant materials at the site in accordance with standard, modern practices. Paint cuts over 1/2 inch in diameter with suitable a tree paint.
- D. Guy all plants or stake and wrap as required immediately after planting. Do not twist stakes or pull in any manner which might cause injury to root balls or roots. Set all stakes vertically. Draw taut all wires used to guy trees to the upper end of each stake and securely fasten. Encase all guy wires in hose to prevent contact with the bark of the plant. Drive stakes for guying 30 inches deep into the ground. Drive all stakes plumb and free from splitting.
- E. Wrap the trunks of all trees spirally to the height of the lowest branches. Hold the wrapping material in place by a suitable cord. All wrapping shall be neat and snug.

3.04 MAINTENANCE

- A. Immediately upon completion of planting, begin to provide all operations of maintenance as required to keep the plants in a healthy growing condition including the repair or replacement of all staking and wrapping materials.

3.05 FIELD QUALITY CONTROL

- A. The Owner shall have the right to reject all trees and shrubs that are unsatisfactory as to growth or condition, or do not meet the Specifications.

PART 4 ATTACHMENTS

4.01 ATTACHMENT A - TOWN OF HOLDEN APPROVED URBAN STREET TREES

ATTACHMENT A

TOWN OF HOLDEN APPROVED URBAN STREET TREES

Flowering pear – *Pyrus calleryana* ‘*Aristocrat*’ is an excellent urban street tree that produces white flowers in April. It holds its leaves late and colors to bronze purple tones. Avoid the “Bradford” variety because of the tight branching exhibited by this variety.

The Silver Linden – *Tilia tomentosa* is an outstanding street tree. It is, however, somewhat difficult to obtain in quantity. Unlike the little Leaf Linden it is not attacked by the woolly aphid, which secretes a sticky substance that can coat cars and walks.

The Scholar tree – *Sophora japonica* is an attractive street tree that has leaves similar to the honey locust, It, however, produces flowers in the summer.

The Zelkova – *Zelkova serrata* is an excellent street tree. It was once promoted as a substitute for the Elm. It disappoints if one expects an elm because it does not have the majestic quality of the American Elm, but it is a very attractive tree in its own right and is very hardy as a street tree.

The London Plane tree – *Platanus acerifolia x hybrida* ‘*Bloodgood*’ has a leaf similar to the maple tree but the bark sheds, showing white patches. This is a common street tree with a wide canopy.

The Sycamore Maple – *Acer pseudoplatanus*, is a very salt tolerant street tree.

The Maidenhair tree – *Ginkgo biloba*, ‘*Magyar*’ or ‘*Sentry*’ varieties is one of the most tolerant shade trees. It however has an unusual form and is very slow growing. It is especially suitable for planting on streets with overhead wires because the architecture of the branches allows the wires to pass through the canopy without heavy pruning. Only male varieties must be planted. The fruit from this tree has a very foul odor.

Thornless Honey Locust – *Gleditsia triacanthos* var. *inermis* is one of the most tolerant shade trees for street planting. The foliage is fernlike. It leafs out late in the Spring and drops its leaves early in the Fall, making it a very good tree for passive solar applications.

Red Maple – *Acer rubrum* is the maple best planted in the City for Autumn color. They are among the most drought tolerant of the maples. Maples are in general not tolerant of drought conditions.

**If desired tree is not on the list, permission must be obtained from the Tree Warden before planting.*

**** END OF SECTION ****

SECTION 02510

PAVEMENT, WALKS, AND CURBS

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. The Work to be done under this Section consists of furnishing all materials, labor, tools and equipment, and performing all operations to maintain and complete replacement of existing pavement, bituminous and concrete walks, driveways, and curbing, as indicated and as specified.
- B. Pavement, walks, driveways and curbing shall include all base pavement courses above the subgrade prepared under Section 02200.
- C. Bituminous concrete trench paving shall include temporary and permanent replacement of pavement removed for trench excavation inclusive of all sawcutting for matching existing pavements.
- D. All materials and methods of constructing the trench pavements, walks, curbs and driveways specified in this Section shall conform to the applicable requirements of the Commonwealth Of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges, 2021 edition.

1.02 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 01400 – Quality Control
- C. Section 02200 – Earthwork

1.03 REFERENCE STANDARDS

- A. Work under this Section shall comply with the following standards in effect at bid.
 - 1. Commonwealth Of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges forms a part of these Specifications to the extent of the references thereto.
 - 2. Americans with Disabilities Act Standards for Accessible Design
 - 3. Massachusetts Architectural Access Board Regulations.
 - 4. American Association of State Highway and Transportation Officials (AASHTO)
 - a. AASHTO T99 Moisture Density Relations of Soils using a 5.5 lb. Rammer and 12-inch Drop.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300.

1. Product data shall be submitted.
2. Certification of mix from production plant.

PART 2 PRODUCTS

2.01 GRAVEL BORROW FOR SUB-BASE COURSE

A. Gravel borrow for sub-base course for all pavements, driveways and walks shall conform to the requirements for gravel borrow for sub-base in Section 02200, Paragraph 2.02.D.

2.02 BITUMINOUS CONCRETE

A. Bituminous concrete shall conform to Subsection M3.11.00 of the Massachusetts Standard Specifications.

1. For roadways, walks and driveways – base course, intermediate course, and surface course.
2. For curbing - dense mix modified in accordance with Subsection M9.17.1 of the Massachusetts Standard Specifications.

2.03 BITUMINOUS EMULSION FOR TACK COAT

A. Bituminous emulsion for tack coat shall be in accordance with the Massachusetts Standard Specifications, Section M3.

PART 3 EXECUTION

3.01 GENERAL

A. No pavement shall be constructed when it is raining, when the temperature is below 32°F, or during the period from December 1 to March 15. During this time period, no castings shall be left above existing grade.

1. Work in Pump Station Road (between Stations 149+50 to Station 172+00) shall be allowed during the time period of December 1 to March 15, provided that the temperature is above 32°F, and it is not raining or snowing.

B. Pavement replacement shall conform to the requirements specified herein and indicated on Drawing C-501.

C. WARRANTY:

1. The Contractor hereby warrants to the Owner that the permanent pavement within the MassDOT Right-of-Way (approximate Stations 40+00 to 51+20) conforms to these specifications and is free from defects in materials and workmanship.

2. For a period of one year from the date of Substantial Completion (“Correction Period”), the Contractor shall repair or replace, at the sole option of and at no cost to the Owner, any work found to be defective. Such repair or replacement shall include the cost of removal and reinstallation.

3.02 GRAVEL BORROW FOR SUB-BASE COURSE

- A. Sub-base course for all pavements, driveways and walks shall be placed and compacted on subgrade to the depth of 12-inches for all pavements, 8-inches for driveways, and 6-inches for walks. The sub-base shall be compacted to at least 95 percent of maximum dry density as determined by the Standard AASHTO test T 99-Method C. The gravel borrow shall be spread and rolled in layers not exceeding 4 inches in compacted thickness as specified in Subsection 405.60 of the Massachusetts Standard Specifications. The surface of 12-inch gravel borrow base shall be shaped to the cross section of the road. Sub-base courses shall be placed only after the subgrade has been compacted.

3.03 BITUMINOUS CONCRETE PAVEMENT

- A. Bituminous concrete pavement for roadways and driveways, shall be constructed in accordance with Subsections 405.60, 460.21, 460.61 and 460.63 of the Massachusetts Standard Specifications. The course thickness shall be as indicated.

3.04 WALKS

- A. Bituminous Concrete Walks shall be placed where existing bituminous concrete walks are disturbed by construction. Walks shall be constructed in accordance with Subsection 701.62 of the Massachusetts Standard Specifications. The surface and base courses shall have compacted thicknesses as indicated.
- B. Concrete Walks shall be replaced to match existing concrete walks and shall be constructed in accordance with Subsection 701.61 and 701.68 of the Massachusetts Standard Specification. Welded wire mesh to be 6-inch x 6-inch No. 10 gauge per ASTM A185. Only sheet mesh shall be used. Mesh shall be installed at mid-depth in the slab and rest on reinforcement chairs or cement concrete bricks spaced a maximum of 36-inches in every direction.

3.05 BITUMINOUS CONCRETE CURB

- A. Bituminous concrete curb disturbed during construction shall be replaced to existing lines and shapes in accordance with Subsection 501.64 of the Massachusetts Standard Specifications.

3.06 TRENCH PAVING

- A. Temporary Trench Pavements. After the trenches have been backfilled and compacted, the Contractor shall install pavement, in accordance with the detail on Drawing C-501, upon a prepared subgrade or gravel base. Prior to installation, the original pavement on either side of the trench shall be cut back as necessary to achieve clean, straight lines. All loose material shall then be removed to depth as indicated and legally disposed of off-site and the trench subgrade rerolled, reshaped and recompacted as specified in Section 02200 to receive temporary pavements. The edges of abutting pavements shall be coated with an asphalt

emulsion to bond new and existing pavements. The finished grade of pavements shall match the adjoining undisturbed pavement. The Contractor shall maintain the temporary pavement so that it is suitable for travel until such time as the permanent paving is installed.

- B. Permanent Trench Pavements. Prior to permanent trench pavement installation, the Contractor shall mill the pavement of the existing trench in accordance with Drawing C-501. The edges of abutting pavements shall be coated with an asphalt emulsion to assure a satisfactory watertight bond between the new and existing pavements. Permanent pavement shall be installed as described hereinafter.
- C. The gravel borrow base and bituminous concrete pavement shall be placed in order to facilitate traffic movement and to minimize tracking and dust. Contractor shall be required to place temporary trench pavement at the end of work each night. Temporary trench pavement shall be removed and permanent trench pavement installed after sixty days but no later than ninety days of temporary trench pavement installation.
- D. Compaction:
 - 1. After the paving mixture has been spread as specified, compaction shall be obtained by the use of power rollers of acceptable design and weight per inch of roller.
 - 2. Along curbs, structures and all places not accessible with a roller, the mixture shall be thoroughly compacted. The surface of the mixture after compaction shall be smooth and true to the established line and grade.
 - 3. The densities of the completed pavement shall be not less than 95 percent of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions.
- E. All areas of finished paving shall pitch to drain. Where finished paving begins to unravel at joints where preconstruction paving meets new paving, the joints shall be fused using infrared equipment to bond the old to the new.
- F. All new bituminous pavement shall be backed by compacted gravel borrow or topsoil depending upon the material the pavement abuts.
- G. No vehicular traffic of any kind shall be allowed to pass over the newly finished surface until it has had time to set.

3.07 MAINTENANCE PERIOD OF ROADWAY SURFACE

- A. The Contractor shall maintain the surface of any excavated area in accordance with the requirements of the City of Worcester, Town of Holden, or MassDOT as applicable.
- B. The Contractor shall maintain trench pavement between the placement of temporary and permanent patching of the trench. Promptly refill and repair areas which have settled or are otherwise unsatisfactory for pedestrian and vehicular traffic, at no additional cost to the Owner.

** END OF SECTION **

SECTION 02575

PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Section Includes

1. Furnish and install thermo-plastic reflectorized pavement markings.

1.02 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 01570 – Construction Zone Safety Plan
- C. Section 02510 – Pavement, Walks and Curbs

1.03 REFERENCE STANDARDS

- A. Work under this Section shall comply with the following standards in effect at bid.
 1. Massachusetts Standard Specifications forms a part of these Specifications to the extent of the references thereto.
 2. U.S. Department of Transportation, Federal Highway Administration:
 - a. Manual on Uniform Traffic Control Devices

1.04 SYSTEM DESCRIPTION

- A. Pedestrian crosswalks, stop lines, lane lines, centerlines, word and symbol markings removed by construction operations shall be replaced with thermo-plastic reflectorized pavement markings.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements
 1. Pavement marking installations shall be performed during dry weather with temperatures of at least 45 degrees F.
 2. Environmental conditions for temporary pavement marking installation shall conform to Sub-section 860.62 of Massachusetts Standard Specifications.

1.06 SEQUENCING AND SCHEDULING

- A. Permanent pavement markings shall be installed subsequent to final pavement replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. White Thermoplastic Reflectorized Pavement Markings shall meet the requirements Massachusetts Standard Specifications, Division III, Materials M7.01.03.
- B. Yellow Thermoplastic Reflectorized Pavement Markings shall meet the requirements of Massachusetts Standard Specifications, Division III, Materials M7.01.04.
- C. White and yellow temporary reflective lane tape shall meet the requirements of Massachusetts Standard Specifications, Division III, Materials M7.01.16.

2.02 EQUIPMENT

- A. Equipment shall include devices necessary for the application of the reflectorized pavement markings.

2.03 COMPONENTS

- A. Pedestrian Crosswalks
 - 1. Crosswalk lines shall be solid white, 12-inches wide.
- B. Stop Lines
 - 1. Stop lines shall be solid white. Stop lines installed in combination with a marked crosswalk shall be 12-inches wide. Stop lines installed without a marked crosswalk shall be 24-inches wide.
- C. Lane Lines
 - 1. Lane lines shall be solid white, 4-inches wide.
- D. Centerlines
 - 1. Centerlines shall be double yellow, 4-inches wide.
- E. Word and Symbol Markings
 - 1. Word and symbol markings shall be solid white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Determine that the conditions are acceptable to receive reflectorized pavement markings.

3.02 PREPARATION

- A. Protection

1. The surrounding areas and surfaces shall not be defaced.

B. Surface Preparation

1. The surface shall be dry and free of sand, grease, oil or other foreign substances prior to the application of reflectorized pavement markings.

3.03 INSTALLATION

A. General

1. The Contractor shall replace all pavement markings, legends, lane arrows and other markings as indicated.

B. Lanes Lines

1. Lane line shall begin at the stop line and shall extend perpendicular thereto for 60 feet prior to the intersection. The center-to-center dimension shall match the existing spacing.

C. Centerlines

1. Centerlines shall be placed at the locations in the roadway where they existed prior to the start of construction.

3.04 APPLICATION

- A. Reflectorized pavement markings shall be applied in accordance with the Massachusetts Standard Specifications Section 860.62.

3.05 PROTECTION

- A. Installed reflectorized pavement markings shall be protected from vehicles until dry.

** END OF SECTION **

SECTION 02600

FUSIBLE POLYVINYLCHLORIDE PIPE FOR INSTALLATION BY SLIPLINING

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope

1. This section specifies fusible polyvinylchloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by sliplining.

B. Requirements

1. Contractor shall provide fusible polyvinylchloride (PVC) pipe conforming to all standards and procedures and meeting all testing and material properties as described in this specification for installation by sliplining.
2. Contractor shall be responsible for all installation processes and procedures associated with the installation by sliplining, in accordance with this specification.

C. Pipe Description

1. Owner is supplying 444 LF of fusible polyvinylchloride pipe that meets the requirement of this Section.
2. Pipe Supplier shall furnish fusible polyvinylchloride pipe conforming to all standards and procedures and meeting all testing and material properties as described in this specification.
3. Pipe shall conform to the following dimensionality and general characteristics table:

a.	Pipe Description	30 inches
b.	Average Outside Diameter	32.00 inches
c.	DR	25
d.	Color	Blue
e.	Pressure Class	160 psi
f.	Nominal Inner Diameter	29.29-inches

1.02 RELATED SECTIONS

A. Section 01000 – Summary of Work

- B. Section 01300 – Submittals
- C. Section 02665 – Water Mains, Valves and Appurtenances
- D. Section 02675 - Testing

1.03 QUALITY ASSURANCE

A. References

1. This Section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
3. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

a.	ANSI/AWWA C110/A21.10	American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
b.	ANSI/AWWA C111/A21.11	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
c.	ANSI/AWWA C153/A21.53	AWWA Standard for Ductile-Iron Compact Fittings for Water Service
d.	AWWA C605	Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
e.	AWWA C651	Standard for Disinfecting Water Mains
f.	AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution

g.	AWWA C905	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm Through 1200mm), for Water Distribution and Transmission
h.	AWWA M23	AWWA Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition
i.	ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
j.	ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
k.	ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
l.	ASTM D2152	Test Method for Degree of Fusion of Extruded Poly (Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
m.	ASTM D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
n.	ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
o.	ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
p.	ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
q.	ASTM F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
r.	ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique

s.	ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
t.	UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
u.	UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
v.	NSF-14	Plastics Piping System Components and Related Materials
w.	NSF-61	Drinking Water System Components--Health Effects
x.	PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

4. Underground Solutions

- a. OB-8-273 – Recommended Cutting Procedure for Fusible PVC Pipe
- b. OB-8-274 – Recommended Cold Weather Fusion Procedures for Fusible PVC Pipe
- c. OB-8-275 – Recommended Intermediate Fusion Procedures for Fusible PVC Pipe

B. Manufacturer Requirements

- 1. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

C. Fusion Technician Requirements

- 1. Fusion Technician shall be fully licensed and trained by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

D. Specified Pipe Suppliers

- 1. Fusible polyvinylchloride pipe shall be used as manufactured under the trade names Fusible C-900®, Fusible C-905®, and FPVC®, by Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051. Owner and engineer are aware of no other supplier of fusible polyvinylchloride pipe that is an equal to this specified pipe supplier and products.

E. Warranty

1. The pipe shall be warranted for one year per the pipe supplier's standard terms.
2. In addition to the standard pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.

F. Pre-Construction Submittals

1. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:
 - a. Pipe Size
 - b. Dimensionality
 - c. Pressure Class per applicable standard
 - d. Color
 - e. Recommended Minimum Bending Radius
 - f. Recommended Maximum Safe Pull Force
 - g. Fusion technician qualification indicating conformance with this specification
2. The following WORK PLAN AND INFORMATION is required from the Contractor and/or slipline installer. This WORK PLAN AND INFORMATION shall also be supplied to the pipe supplier, should it be requested:
 - a. WORK PLAN shall include for each sliplining installation all excavation locations, interfering utilities, excavation dimensions, flow bypass and traffic control schematics.
 - b. At least 2 weeks prior to the start of work, the Contractor shall submit its sliplining schedule identifying daily work hours and working dates for each installation.
 - c. Grout design mixes, installation plan, and contingency plan for the annular space grout to be used, if grout is to be used, shall be submitted for review and approval.

G. POST-CONSTRUCTION SUBMITTALS

1. The following AS-RECORDED DATA is required from the Contractor and/or fusion provider to the Owner or pipe supplier upon request:
 - a. Approved datalogger device reports
 - b. Fusion joint documentation containing the following information:

- 1) Pipe Size and Thickness
 - 2) Machine Size
 - 3) Fusion Technician Identification
 - 4) Job Identification
 - 5) Fusion Joint Number
 - 6) Fusion, Heating, and Drag Pressure Settings
 - 7) Heat Plate Temperature
 - 8) Time Stamp
 - 9) Heating and Cool Down Time of Fusion
 - 10) Ambient Temperature
2. The following AS-RECORDED DATA is required from the contractor and/or slipline installer to the Owner or pipe supplier upon request:
- a. Grout testing reports.

PART 2 PRODUCTS

2.01 FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER

- A. Fusible polyvinylchloride (PVC) pipe shall conform to AWWA C900, AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.
- B. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
- C. Fusible polyvinylchloride pipe shall be manufactured in a standard 40-foot nominal length, or custom lengths as specified.
- D. Fusible polyvinylchloride pipe shall be blue in color for potable water use.
- E. Pipe shall be marked as follows:
 1. Nominal pipe size
 2. PVC
 3. Dimension Ratio, Standard Dimension Ratio, or Schedule
 4. AWWA pressure class, or standard pressure rating for non-AWWA pipe, as applicable

5. AWWA standard designation number, or pipe type for non-AWWA pipe, as applicable
 6. NSF-61 mark verifying suitability for potable water service
 7. Extrusion production-record code
 8. Trademark or trade name
 9. Cell Classification 12454 and/or PVC material code 1120 may also be included
- F. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
- G. HDPE Pipe shall not be allowed.
- 2.02 FUSION JOINTS
- A. Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.
- 2.03 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS
- A. Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.
- 2.04 DUCTILE IRON MECHANICAL AND FLANGED FITTINGS
- A. Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.
1. Connections to fusible polyvinylchloride pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
 2. Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
 3. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.
 4. Ductile Iron fittings and pipe shall be provided as specified in Section 02665.
- 2.05 PVC GASKETED, PUSH-ON FITTINGS
- A. Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C905.

1. Fittings for use joining fusible polyvinylchloride pipe to other sections of fusible polyvinylchloride pipe or other sections of PVC pipe shall include gasketed PVC and push-on type couplings.
2. All other fitting shall be ductile iron and are specified in Section 02665.

2.06 SLEEVE-TYPE COUPLINGS

- A. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe and shall be restrained.
- B. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

2.07 EXPANSION AND FLEXIBLE COUPLINGS

- A. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and shall be restrained.
- B. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

2.08 CONNECTION HARDWARE

- A. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

2.09 PROOF PIECE

- A. Proof piece shall be made of a stick of fusible PVC pipe used on the project. The proof piece shall be a minimum of forty (40) feet in length.

2.10 GROUT

1. Grout shall be in accordance with Section 02065.

2.11 PIPE PULL HEADS

1. Pipe pull heads shall employ a positive through-bolt design assuring a smooth walled bolt against the pipe cross-section at all times.
2. Pipe pull heads shall be specifically designed for use with fusible polyvinylchloride pipe and shall be as recommended by the pipe supplier.

2.12 PIPE ROLLERS

- A. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.
- B. A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and resist excessive sagging of the product pipe.

PART 3 EXECUTION

3.01 DELIVERY AND OFF-LOADING

- A. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- B. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- C. Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all the pipe supplier's guidelines shall be followed.
- D. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
- E. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
- F. If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

3.02 HANDLING AND STORAGE

- A. Any length of pipe showing a crack shall be marked as rejected; any pipe which has received a blow that may have caused an incident fracture, whether visible or not, shall be marked as rejected. Rejected pipe shall be removed at once from the work. Confirmed or possible damaged areas may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Engineer.
- B. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Owner or Engineer.
- C. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, shall be kept free from dirt and foreign matter.
- D. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
- E. If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque

material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

- F. Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.03 FUSION PROCESS

A. General

1. If ambient temperature drops below 40 degrees Fahrenheit refer to Underground Solutions Operational Bulletin for Cold Weather Installation (OB-8-274).
2. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
3. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
4. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.
5. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
 - a. HEAT PLATE – Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
 - b. CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
 - c. GENERAL MACHINE – Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
 - d. DATA LOGGING DEVICE – An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.
6. Other equipment specifically required for the fusion process shall include the following:

- a. Pipe rollers shall be used for support of pipe to either side of the machine
- b. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.
- c. An infrared (IR) pyrometer for checking pipe and heat plate temperatures shall be provided.
- d. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
- e. Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.

B. Joint Recording

- 1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.04 PIPE CLEANING

- A. Host pipe shall be cleaned in accordance with all applicable standards and guidelines. Unless otherwise specified, all interior pipe surfaces shall be cleaned per AWWA M28.
- B. Hazardous materials shall be removed and disposed of per all applicable regulations.
- C. All pipelines shall be cleaned with as many passes as necessary to create a uniform interior host pipe surface free of all loose material and sharp edges. Any potentially deleterious areas of the host pipe should be removed or secured in place, prior to the insertion of the fusible polyvinylchloride pipe.

3.05 TV INSPECTION

- A. The host pipe shall be inspected by TV after or during the cleaning process in accordance with these specifications.
 - 1. TV inspection after host pipe cleaning shall indicate condition of host pipe and suitability of host pipe for fusible polyvinylchloride pipe insertion.
 - 2. Obstructions such as corporation taps, valves and valve bodies, and collapsed piping shall be remedied prior to insertion. Spot repairs shall be made in accordance with the drawings and these specifications.

3. Two (2) copies of the inspection DVD shall be provided to the Owner for their records.

3.06 FUSIBLE POLYVINYLCHLORIDE PIPE INSERTION AND INSTALLATION

A. Excavation and Access Pits

1. Access pit length shall be such that the minimum bending radius for the fusible polyvinylchloride pipe is maintained in accordance with the pipe supplier's recommendations. Sheeting, shoring and bracing requirements shall be in accordance with these specifications and applicable jurisdictional standards.
2. Access pit excavations shall be performed at all points where the fusible polyvinylchloride pipe will be inserted into the existing pipeline. When possible, access pit excavations shall coincide with host pipe lateral connection points or the installation of other appurtenances.

B. Proof Piece

1. A proof piece of 40-feet shall be pulled through the pipe prior to the actual sliplining operations commencing. Proof piece shall have a 10% gouge allowance. Owner or Owner's representative shall make final determination on gouges on pipe. Pull piece shall be tethered at both ends for retrieval if necessary.
2. Proof piece shall not be used as pipe that is installed. Contractor shall include enough lengths of proof pieces in his pipe bid.

C. Pulling Equipment

1. The pulling mechanism shall be properly connected to the end of the fusible polyvinylchloride pipe by means of a pulling head or arrangement approved by the pipe supplier.
2. The maximum pulling tension on the fusible polyvinylchloride pipe shall not exceed the pipe supplier's safe pulling force as submitted for this project.
3. Immediately following the completion of an installation by sliplining, the pipe should be pushed back into the location of the insertion, at the pulling head, until movement is realized at the insertion pit on the other side of the installation from the pulling equipment.

D. Fusible Polyvinylchloride Pipe Care

1. The fusible polyvinylchloride pipe shall be handled with care to minimize the possibility of it being cut, kinked, gouged, or otherwise damaged. The use of cables or hooks will not be permitted.
2. Sections of the fusible polyvinylchloride pipe that have been damaged, cut, or gouged shall be repaired by cutting out the section of damaged pipe and rejoining.

3.07 ANNULAR SPACE GROUTING

- A. The annular space between the outside of the fusible polyvinylchloride pipe and the inside of the existing host pipe shall be filled with a flowable grout in accordance with these contract documents and Section 02065.
- B. Samples of grout shall be obtained in accordance with ASTM C495. One set of four standard cylinders shall be cast for each batch. Special handling and sampling procedures shall be followed if indicated by the grout manufacturer. The samples must meet the design compressive strength of the grout as outlined in this specification and per the grout manufacturer. Samples shall be tested in accordance with ASTM C495.
- C. Grouting of the annular space shall be done in such a manner as to prevent damage, floating, or collapse of the fusible polyvinylchloride pipe. Grouting operations shall be properly vented. If the distance between grout points exceeds the Contractor's pumping capability additional grouting points shall be excavated. The fusible polyvinylchloride pipe at access pits, service connections, and grouting points shall not be grouted above the springline of the existing host pipe.
- D. The fusible polyvinylchloride pipe shall be filled with water prior to the grouting procedure. This shall aid in keeping the fusible polyvinylchloride pipe from floating or collapsing during grouting operations and aid in dissipating the heat of hydration and its effects on the fusible polyvinylchloride pipe as the grout cures. This may be done in coordination with the testing performed on the fusible polyvinylchloride pipe.

3.08 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

- A. Approximate locations for existing piping systems are shown in these construction documents. Prior to making connections into existing piping systems, the Contractor shall:
 - 1. Field verify location, size, piping material, and piping system of the existing pipe.
 - 2. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
 - 3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.
- B. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.09 PIPE SYSTEM CONNECTIONS

- A. Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

3.10 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

- A. Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with the use of tapping saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.
- B. All connections requiring a larger diameter than that which is recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.
- C. Equipment used for tapping shall be made specifically for tapping PVC pipe:
 - 1. Tapping bits shall be slotted “shell” style cutters, specifically made for PVC pipe. ‘Hole saws’ made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
 - 2. Manually operated or power operated drilling machines may be used.
- D. Taps may be performed while the pipeline is filled with water and under pressure (‘wet’ tap,) or when the pipeline is not filled with water and not under pressure (‘dry’ tap).

3.11 TESTING

- A. Testing shall be in accordance with Section 02675.

PART 4 ATTACHMENTS

4.01 ATTACHMENT A - RECOMMENDED COLD WEATHER FUSION PROCEDURES FOR FUSIBLE PVC PIPE

Fusible C-900® • Fusible C-905® • FPVC®

Operational Bulletin



www.undergroundsolutions.com

Recommended Cold Weather Fusion Procedures for Fusible PVC™ Pipe

What is Cold Weather Fusion?:

Underground Solutions (UGSI) defines Cold Weather Fusion (CWF) as the fusion and installation of Fusible PVC™ pipe products when pipe temperatures (as measured with the IR pyrometer used for fusion) are below 40 degrees Fahrenheit. Fusion can be completed at colder ambient temperatures (fusion has been completed at temperatures as low as -20 degrees Fahrenheit), but a few additional steps must be taken to maintain the pipe temperature at or above the recommended minimum of 40° F so that the quality of the fusion joints will meet the expected requirements.

Preparing the Pipe:

All PVC piping materials, including Fusible PVC™ pipe, are stiffer at lower temperatures. Handling of all PVC pipe, including Fusible PVC™ pipe in low temperature conditions requires increased awareness and precautions, particularly in relation to possible impact damage. Fusion of pipe at low temperatures may negatively affect the butt fusion process. The thermal profile of the pipe and the butt fusion joint area being fused must be maintained above 40°F to enable proper fusion. Very cold pipe will not heat properly nor will it maintain the required heat during the fusion process. For these reasons, the ENTIRE PIPE LENGTH must be warmed to 40° F before the start of the fusion process. It is not sufficient to only raise the outer wall surface temperature of the pipe, since butt fusion involves the entire wall thickness for a given depth into the end of the pipe. Also, it is not acceptable to only heat the pipe near the end being fused, as the lower temperature of the remaining pipe can artificially accelerate the cooling of the joint area resulting in a sub-par fusion joint.

The pipe is typically shipped in bundles that are banded together. The bundles that are going to be used for fusion should be tarped completely the evening prior to being fused. A heater or heaters, depending on the outside overnight temperature, should be set up to force heated air under the tarp. The heater(s) should be set to keep the pipe temperature above 40° F, but should also be set to not burn or overheat the pipe nearest to the heater(s). If the pipe is preconditioned the night before and the heat is kept on the pipe during the day, there should be no loss of production or joint quality. Please see the reference pictures included with this bulletin.

Preparing the Fusion Machine and Fusion Area:

Once the pipe is preconditioned, the fusion machine must also be protected from excessively low temperatures and other elements (wind, snow, ice, etc.). If the temperature of the pipe falls below 40° F during the fusion process, the pipe cannot be fused. Typically a tent or portable carport with sides, depending on the size of the fusion machine, is the best way to enclose the machine. Similar to the pipe, heater(s) can then be set up to blow heat into the enclosure keeping the temperature

ATTACHMENT A - RECOMMENDED COLD WEATHER FUSION PROCEDURES FOR FUSIBLE PVC PIPE

above 40°F. The preconditioned pipe can then be fed into the temperature controlled fusion machine enclosure.

Each pipe length that is to be joined by fusion should be verified for minimum temperature with an IR pyrometer prior to the fusion procedure taking place. Verify that the inner surfaces near the end of the pipe; outer surface along the length of the pipe; and cross-sectional surfaces of the pipe end are indeed greater than 40°F. If any readings indicate that the pipe temperature is less than 40°F, return the pipe to the conditioning area and allow it to come up to the required 40°F temperature prior to beginning the fusion process.

Installation of the Fusible PVC™ pipe:

Once the pipe is fused and cooled inside of the above described enclosure, it can be pulled through the machine and into the pipe alignment. It is a recommended precaution to cover the pipe ends on any section exposed to the ambient outdoor weather conditions to prevent wind from prematurely cooling the pipe or joint at the fusion machine from the inside.

Care must be exercised in staying within the recommended bend radius of the pipe as the pipe will be stiffer at lower temperatures. Successful installations at -20°F were straight pull-ins, directly in line with the fusion machine. The pipe was fused and pulled in a straight line. If there are any concerns about the alignment, the pipe can be tarped and warmed, or the fusion machine can be repositioned. Please contact UGSI for recommended bend radius adjustments when the pipe string temperature will be less than 40°F.



ATTACHMENT A - RECOMMENDED COLD WEATHER FUSION PROCEDURES FOR FUSIBLE PVC PIPE



Underground Solutions, Inc. (UGSI) provides infrastructure technologies for water/wastewater applications, and conduit for applications ranging from electrical to fiber optics. UGSI's Fusible PVC™ products, including **Fusible C-900®**, **Fusible C-905®** and **FPVC®**, contain a proprietary PVC formulation that, when combined with UGSI's patented fusion process, results in a monolithic, fully restrained, gasket-free, leak-free piping system. UGSI's **Duraliner™** is a patented, close-fit pipeline renewal system creating a stand-alone structural liner.

OB-8-274 Rev 0 01/24/11

SECTION 02607

RUBBERIZED SEALING SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rubberized sealing materials

1.02 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 03450 – Precast Structures

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
2. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
3. ASTM D638 – Standard Test Method for Tensile Properties of Plastics
4. ASTM D1002 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-To-Metal).
5. ASTM D1044 – Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
6. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness.

1.04 SYSTEM DESCRIPTION

- ###### **A. Furnish all labor, material, equipment and incidentals to install rubberized sealing materials in the frame and corbel area of new and existing chambers as indicated.**

1.05 SUBMITTALS

- ###### **A. Submit the following information to the Owner for review in accordance with Section 01300:**

1. Data Sheets
 - a. Composition and installation of the rubberized sealing system.

1.06 QUALITY ASSURANCE

- A. Rubberized sealing system shall be installed in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Rubberized Sealing System
 - 1. WrapidSeal by Canusa (A Shaw Industries Co.).
 - 2. Riser Wrap by Pipeline Seal & Insulation, Inc.
 - 3. Infi-Shield by Sealing System, Inc.
 - 4. Or equal.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean frame and corbel surface area free of dirt and sharp points. Preheat surface area to remove moisture.

3.02 INSTALLATION

- A. Apply primer over all areas to be covered with heat shrink sealing material and let dry.
- B. Cut a length of rubberized sealing material that will allow a 3-to-4-inch overlap. The self adhering closure seal shall be installed at the overlap.
- C. Heat overlap area and ensure bonding prior to heating other areas. Heat entire area until entire rubberized sealing material has recovered. Smooth out all wrinkles.
- D. Allow material to cool prior to backfilling excavation to allow adhesive to set. Quenching material with water will be allowed to quicken cooling process.
- E. If the top of the heat shrink sealing material is exposed to the elements, a stainless-steel adjustable band shall be installed to eliminate the movement of material during hot and cold temperatures.

**** END OF SECTION ****

SECTION 02662

SPRAY IN PLACE PIPE LINING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Work includes all services, material, preparation, application and equipment as required for the installation and testing of the unique spray in place pipe lining system. Work includes, but is not limited to, the following:

1. Pre-construction activities
2. Site work, OSHA compliance
3. Inspection & Diagnosis
4. Pipe cleaning and Surface Preparation
5. Video inspection
6. Pipe drying
7. Lining
8. Re-Inspection
9. Testing
10. Return to Service

1.02 Related Sections

- A. Section 01000 - Summary of Work
- B. Section 01046 - Control of Work
- C. Section 01090 - Reference Standards
- D. Section 01300 - Submittals
- E. Section 02675 - Testing

1.03 DEFINITIONS

- A. The following are industry abbreviations for piping lining materials:
1. AWWA- American Water Works Association
 2. Aerobic Bacteria- Bacteria that grows in the presence of oxygen.

3. Anaerobic Bacterial- Bacteria that grows in the absence of oxygen.
4. ANSI- American National Standards Institute
5. ASME- American Society of Mechanical Engineers.
6. ASTM- American Society for the Testing of Materials
7. CCTV- Closed Circuit Television
8. CFM- Cubic feet per minute
9. MIC- Microbiologically-influenced corrosion
10. MIL- Unit of Measurement equal to 0.001 inches
11. MSDS- Material Safety Data Sheets
12. NPS- Nominal Pipe Size
13. SIPP- Spray in Place Pipe
14. WT- Wall Thickness
15. MM- Unit of measurement- millimeter equal to 40 mils

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 1. Product Data
 - a. Protection Equipment
 - b. Surface Preparation Equipment
 - c. Epoxy Lining Material
 - d. Epoxy Lining Equipment
 - e. Dust Collection
 2. MSDS for the following
 - a. Lining material
 3. Reports
 - a. Two copies of the final inspection report and DVD's

1.05 QUALITY ASSURANCE

A. SIPP System Installer's Qualifications

1. A firm that has the skills required to install a spray in place pipe lining application systems and with at least three years of successful pipe lining installation experience on three (3) projects within five (5) years with work similar in size and scope to that which are required for this Project. The work of this Section shall be performed by a firm of established reputation which is regularly engaged in and which maintains a regular force of workmen skilled in the installation of the type of work specified in this Section.

B. CCTV Video Inspection

1. Provide Video Inspections for the following:

- a. Pre-cleaning
- b. After cleaning
- c. After lining application

- C. Applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced with the necessary skills required to perform all tasks enclosed within this specification.
- D. Applicator shall use approved specialty equipment adequate in size, capacity, and quantity to accomplish the work of this specification within a timely manner.
- E. Applicator shall implement and enforce quality control procedures consistent with applicable industry standards, as well as the engineering recommendations.
- F. Applicator will maintain computerized controls that log material flow, mix ratio, material temperatures and pressures for the duration of the lining in no more than 20 second intervals.
- G. Applicator will have adequate safeties enabled to automatically abort a lining in the case of ratio or pump failures.
- H. Applicator shall install SIPP lining in accordance with the manufacturer's recommendations.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver the SIPP lining epoxy material in the manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Protect stored materials from moisture and dirt. Elevate above grade.
- C. Protective spray in place epoxy and associated materials are to be handled in accordance with their respective MSDS data.

- D. Do not store materials near flame, excessive heat or cold or strong oxidants.

1.07 WARRANTY

- A. Standard Warranty/Guarantee: All work shall be warranted/ guaranteed for five (5) year from date of installation against all defects in material, equipment and workmanship.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials throughout the SIPP system shall be new. Submit complete list of materials that are proposed for installation. Quantities of materials and equipment need not be included.

2.02 SPRAY IN PLACE LINING SYSTEM

- A. SIPP Epoxy Lining Spray application method which uses centrifugal force to apply a plural component epoxy to the interior of piping systems. The SIPP Lining System shall be able to accommodate varying pipe diameters as well as be able to accommodate elbows and bends within the pipes, while applying an even, smooth lining throughout the entire length of pipe that is required within the specified scope of Work.

2.03 EPOXY LINING MATERIALS

- A. All SIPP epoxy lining materials shall be 2-part components consisting of a base and activator, which shall be stored in separate tanks, with their temperatures regulated in accordance with the epoxy manufacturers recommendations.
- B. Manufacturer shall be:
 - 1. A&W Maintenance and Coatings LLC, Carver, MA. Contact Michael Shannon at 631-463-2952.
 - 2. Belco Pipe Restoration, Commack, NY
 - 3. Triton Lining Systems, Saint James, NY. Contact Gary Sorohan at 407-928-9339
 - 4. or approved equal.
- C. The project specific thickness required for each lining shall be in installments of 3 MM applications at 1 pass.
- D. Material shall be stored in accordance with manufacturer's guidelines, any previously opened material needs to be thoroughly inspected prior to use.
- E. Material must be NSF-61 potable water certified.

2.04 SPRAY IN PLACE LINING SYSTEM

- A. SIPP Pipe Lining Rig shall be a computerized and fully automated capable of lining up to 500 feet in one lining application. SIPP Lining rig shall be model BELCO VLM- 459 as manufactured by Belco Pipe Restoration Inc. or approved equal.
- B. SIPP Pipe Lining spray head shall be able to spray material at 10,000 rpm and apply an epoxy coating evenly throughout the entire length of pipe that is in the contracted scope of work. Model to be proprietary and capable of lining varying pipe sizes during one lining pass applying an even thickness throughout each varying pipe dimension, as manufactured by Belco Pipe Restoration., or approved equal.
- C. The Pipe Lining Equipment will be controlled with a computer operated system control that will monitor the flow characteristics of the lining material as it flows through the machine for constant quality control. The system will have automatic alarms in place to allow the machine to abort lining should and abnormalities occur during the process.

2.05 HOT AIR-DRYING SYSTEM

- A. A heated air blower shall be able to dry a pipe up to 500 feet in length within a reasonable amount of time, providing a dry surface to begin cleaning. Hot air dryer shall be mobile and capable of producing up to 150 degree of heated air to blow through the pipe, as manufactured by Sonic Air Systems, or approved equal.
- B. Ambient air drying shall be allowed if the conditions warrant. Ambient air drying shall not be used if the pipe has standing water or infiltration.
- C. Steam and/or water curing systems shall not be allowed.

2.06 DUST COLLECTION SYSTEM

- A. An industrial vacuum shall be able to collect all media and removed corrosion from interior of the pipe and be able to have enough power to collect dust from up to 800 feet away without allowing excess dust from escaping into workspace areas, as manufactured by Industrial Vacuum or approved equal.

2.07 VIDEO INSPECTION EQUIPMENT

- A. A CCTV Camera shall be able to enter the pipe of varying sizes larger than 1-1/4 inches, and travel throughout recording video, images and profiles to be used in programming of the lining rig for the lining application. The camera shall be in full color and have adjustable light to be able to see all areas of the interior of the pipe to be lined.

2.08 SAFETY

- A. All SIPP Installation processes shall adhere to all MSDS sheets, manufacturer's safety guidelines and be performed within strict conformance of all Federal, State and Local agencies having jurisdiction.
- B. All Proper and recommended protective equipment and clothing shall be worn at all times to ensure the safety of all working on the project.

- C. All related work shall be expedited by trained teams. All employees are to be confined space certified with a minimum 10-hour OSHA training certification. All OSHA standards must be strictly adhered to.

PART 3 EXECUTION

3.01 PRE-CONSTRUCITON

- A. Logistical meeting shall be scheduled with contractor's field supervisors and with the Owner's Representative to review the plans and scheduling that will be previously submitted for review.
- B. Logistics to be discussed are to include but not limited to site safety, traffic control and bypass systems.
- C. The project team inclusive of the Owner's Representative shall mutually develop and implement a community relations plan for residents affected by construction activity.

3.02 SITE WORK

- A. All related work shall be expedited by trained teams. All employees are to be confined space certified with a minimum 10-hour OSHA training certification. All OSHA standards must be strictly adhered to.
- B. SIPP lining shall not be installed when ambient temperature is below 35 degrees Fahrenheit

3.03 INSPECTION AND DIAGNOSIS

- A. The Pipe matrix is to be inspected by a CCTV Camera.
- B. The inspection shall be recorded and analyzed by engineers who are part of the firm qualified in Paragraph 1.05.A.1. to determine the proper cleaning method and lining material to be used for specified project. This diagnosis shall be shared with water system operator, to perform SIPP process will be agreed upon prior to commencement of work.

3.04 PIPE CLEANING AND SURFACE PREPRATION

- A. An opening at both ends of the subject pipe is required to allow access and egress for cleaning equipment.
- B. Surface preparation methods shall be based upon the conditions of the substrate and the requirements of the spray in place pipe lining system.
- C. Available methods include but are not limited to Hydro – jetting, pigging and brushing.
- D. Upon completion of the cleaning process the pipe shall be showered with compressed air to remove any leftover debris.

3.05 PIPE DRYING

- A. A heated air blower shall be utilized to dry the subject pipe providing a dry surface to begin cleaning. Hot air dryer shall be mobile and capable of producing up to 150 degree of heated air to blow through the pipe, as manufactured by Sonic Air Systems, or approved equal.

3.06 LINING

- A. The pipe matrix will be entered into the computer control system, mapping any abnormalities and or imperfection into the pipe. This will allow the controls of the system to apply more or less epoxy material at the particular points noted.
- B. The pipe is to be lined using the entrance and exit as needed along the matrix.
- C. The SIPP Lining Rig shall have the umbilical pulled the length of the pipe to be lined where the spray head will be attached, capable of lining up to 500 feet in one pass.
- D. The lining head will be implemented in an enclosure at the exit of the pipe matrix. The material flow and mix ratio will be checked for abnormalities as a final physical quality control measure prior to the lining heads entry.
- E. The lining head is entered into the pipe matrix and is then left to automated controls of the SIPP Lining Machine. The computer control system is monitored by a pipe lining engineer during the entire process. The system is monitored at the opening of the pipe as well as monitored from the pipe entrance.
- F. During the lining process the computer control system shall provide a quality assurance report at a minimum of every 20 seconds. This report must include Current mix ratio of material, pressure at which the material is applied, temperature of material, flow rate of material, distance currently in pipe and thickness of material currently being applied to the pipe.

3.07 RE-INSPECTION OF LINED PIPE

- A. The pipe will be inspected by camera when lining is complete. It will then be reviewed by the lining engineer and by the site manager for any irregularities.
- B. This will be recorded and reviewed with the SIPP Pipe lining machines quality control report which is capable of showing irregularities or inconsistencies. Submit final reports of pipe inspection in accordance with Paragraph 1.04.A.3.

3.08 PRESSURE TESTING AND RETURN TO SERVICE

- A. The pipe matrix will be pressure tested at 1.5 times operating pressure by the owner's representative. Should pressure maintain this will serve as the final element of quality control for the systems lining and its material strength.
- B. Submit two copies of the report and DVD to the Owner in accordance with Paragraph 1.04.A.3.

3.09 FINAL REVIEW AND ACCEPTANCE

- A. All elements of quality control will be submitted to the Owner or Owners Representative. This will be reviewed with SIPP Lining engineers and site manager.

**** END OF SECTION ****

SECTION 02665

WATER MAIN, VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Furnishing and installing ductile iron pipe, valves, fittings, jointing material, restrained joints and piping accessories.

B. Related Sections

1. Section 01000 – Summary of Work
2. Section 01046 – Control of Work
3. Section 01090 – Reference Standards
4. Section 01300 – Submittals
5. Section 02675 – Testing
6. Section 03300 – Cast-In-Place Concrete

C. Reference Sections

1. American Iron and Steel Institute (AISI) 1080 – Carbon Steel
2. American Welding Society (AWS)
 - a. AWS D1.1 Structural Welding Code - Steel
3. American Water Works Association
 - a. C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - b. C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water
 - c. C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - d. C116/A21.16 Protective Fusion-Bonded Epoxy Coating Interior and Exterior, Ductile Iron/Gray-Iron Fittings
 - e. C150/A21.50 Thickness Design of Ductile-Iron Pipe

f.	C151/A21.51	Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
g.	C153/A21.53	Ductile-Iron Compact Fittings for Water Service, 3-inch through 64-inch, for Water Service
h.	C-504	Rubber-Seated Butterfly Valves
i.	C-509	Resilient-Seated Gate Valves for Water Supply Service
j.	C-515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
k.	C-550	Protective Epoxy Interior Coatings for Valves and Hydrants
l.	C-600	Installation of Ductile-Iron Water Mains and Their Appurtenances
m.	C-605	Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
n.	C-905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. Through 48 In. for Water Transmission and Distribution

1.02 SUBMITTALS

- A. The Drawings are diagrammatic and the locations of connections are approximate, but the Drawings shall be followed as closely as actual conditions permit. The Contractor is responsible for field verifying dimensions. Prepare working drawings which shall be submitted to the Owner for review thirty (30) days after Notice to Proceed.
- B. Submit the following in accordance with Section 01300:
 1. Product Data
 - a. Specifications for all ductile iron pipe, fittings, jointing material, thrust anchors, and piping accessories.
 2. Shop Drawings
 - a. Complete layout drawings and details for ductile iron pipe.
 - b. Tabulated layout schedule as follows:
 - 1) Order of installation and closures.

- 2) Pipe invert station and elevation at each change of grade and alignment.
- 3) Elements of curves and bends, both in horizontal and vertical alignment, including elements of the resultant true angular deflections in cases of combined curvature.
- 4) Limits of each reach of pipe thickness class and of restrained joints.
- 5) Limits of each reach of concrete encasement.
- 6) Locations of closures for length adjustment.
- 7) Locations of valves and other mechanical equipment.
- 8) Methods and locations of supports.

c. Details of fittings.

3. All physical and chemical test results along with the identification number for each mechanical joint restraint device.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. Ship pipe to site with wood lagging between pipes to prevent contact of pipe surfaces and coating.
2. Deliver piping with factory applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris and moisture.
3. Pack fittings, jointing materials and piping accessories to prevent damage.
4. Prevent entry of foreign matter into pipe and fittings during shipping.
5. Pack and ship coated pipe and fittings in accordance with recommendations of coating manufacturer and applicator.

B. Acceptance at Site

1. Examine pipe and related materials delivered to site. Reject all pipe, fittings, and materials not in compliance with Contract Documents, remove from the site and replace at no additional cost to the Owner.

C. Storage and Protection

1. Unload and store pipe, fittings, and accessories to prevent damage and weathering before installation.

2. Replace pipe and fittings in which lining has been damaged at no additional cost to the Owner.
3. Repair damaged exterior coatings to all ductile iron before installation of pipe, fittings, specials or appurtenances at no additional cost to the Owner.
4. Store joint lubricant in closed containers and keep clean.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ductile Iron Pipe, fittings, and accessories

1. American Cast Iron Pipe Company, Birmingham, Alabama
2. U.S. Pipe and Foundry Company, Birmingham, Alabama
3. McWane Ductile, Phillipsburg, New Jersey
4. Or equal

B. C905 PVC Pipe

1. J M Eagle, Los Angeles, CA
2. National Pipe, Vestal, NY
3. AVEM Water, Jupiter, FL
4. Or Equal

C. Insulated Couplings

1. Dresser Style 39
2. Smith-Blair 416
3. Smith-Blair 417 (Insulated Transition Coupling)
4. Ford FIB
5. Or equal

2.02 MATERIALS

A. Pipe

1. All pipe and fittings furnished shall be accompanied by the Manufacturer's Certificate of Compliance.

2. Pipe shall be NSF 61 approved.
3. Ductile iron conforming to AWWA C150 and AWWA C151.
 - a. Minimum pipe thickness class
 - 1) For new water main
 - a) Thickness Class 51 for push-on, or mechanical joint pipe, 16-inches in size and larger.
 - b) Thickness Class 52 for push-on, or mechanical joint pipe, for sizes 4-inch through 14-inch.
 - c) Thickness Class 53 for flanged pipe.
 - b. Supply pipe in lengths not exceeding 20 feet.
 - c. Buried pipe
 - 1) Restrained rubber-ring type push-on or mechanical joints with mechanical restraint joint devices unless otherwise indicated.
 - 2) Insulating flanges with wax tape coating.
 - d. Provide restrained joints where indicated.
 - e. Exposed pipe shall have flanged joints.
 - f. All ductile-iron pipe to be jointed with flexible couplings or flanged coupling adaptors shall have plain ends
4. PVC Pipe
 - a. Shall conform to AWWA C905.
 - b. Shall be DR25.
 - c. Supply pipe in lengths not exceeding 20 feet.
 - d. Shall be push on pipe with SBR gaskets.
 - e. Shall use mechanical joint restraint device. See Paragraph 2.02F.

B. Fittings

1. Ductile iron conforming to AWWA C110, AWWA C111.
2. Minimum pressure rating:
 - a. Push-on and mechanical joint

- 1) 350 psi for 24 inch and smaller
 - 2) 250 psi for 30 inch and larger
 - b. Flanged joint
 - 1) 250 psi minimum.
- C. Shop coating and lining for ductile iron pipe and fittings
 1. Linings shall be
 - a. Liquid epoxy shall be 100% solids liquid epoxy, Tnemec "Epoxyline Series FC22" or equal.
 - b. Double thick cement lining shall not be used.
 2. Exterior primer for exposed pipe with diameter less than 48 inches: Cook "391-N-167 Barrier Coat", Koppers "No. 10 Inhibitive Primer", Tnemec "77 Chem-Prime", Valspar "13-R-28 Chromox Primer", or equal.
 3. Asphaltic coating for buried pipe with diameter less than 48 inches: Manufacturer's standard.
 4. Rust-preventive compound for flange faces: Houghton "Rust Veto 344", Rust-Oleum "R-9", Devoe Paint "Devrin 201", or equal.
- D. Field coating for ductile iron pipe
 1. Coal tar coating for buried steel anchors: Thixotropic coal tar, MIL-C-18480; as manufactured by: Koppers "Bitumastic No. 50", Tnemec "46-450 Heavy Tnemecol", Devoe Paint "Devtar 5A", or equal.
- E. Joints (Ductile Iron)
 1. Push-on and mechanical joints: AWWA C111.
 - a. Gaskets for ductile iron pipe joints shall be SBR gaskets.
 - b. Natural rubber gaskets are not acceptable.
 2. Restrained push-on joints: American "Flex-Ring", Clow "Super-Lock"; U.S. Pipe "TR Flex"; or equal.
 3. Flanged joints: AWWA C115
 - a. Flanges: Ductile iron, flat faced
 - b. Bolts: ASTM A307, chamfered or rounded ends projecting 1/4 to 1/2 inch beyond outer face of nut.

- c. Nuts: ASTM A307, hexagonal, ASME B18.2.2, heavy semi-finished pattern.
 - d. Gaskets: ASTM D1330, Grade I rubber, full face type, 1/8 inch thick, except that gaskets for buried flanges other than insulating flanges shall be oil-resistant synthetic rubber.
 - e. Pipe Flanges: All pipe flanges shall be drilled, or tapped for stud bolts, as required, with dimensions of ASTM standard for 125-pound working steam pressure. Flanges shall be faced accurately at right angles to the axis of the pipe and coated with a protective coating immediately after being faced and drilled.
- 4. Mechanical joints with tie rods
 - a. Tie rods: ASTM A307.
 - b. Washers: ASME B18.22.1, plain steel.
 - 5. Threaded connections for tapping of pipe wall: ASME B1.20.1, NPT.
 - a. Threaded connections shall only be permitted where wall thickness minus foundry tolerance is equal to or greater than that required for 4-thread engagement as set forth in AWWA C151. Otherwise, provide boss or tapping saddle.

F. Mechanical Joint Restraint Device

- 1. The device shall impart multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of AWWA C110.
- 2. Ductile iron heat treated to a minimum hardness of 370 BHN.
- 3. Working pressure of at least 250 psi with a minimum safety factor of 2:1.
- 4. Flexibility of the joint shall be maintained after burial.
- 5. Retainer Glands: Ductile iron conforming to ASTM A536. Dimensions which permit use with mechanical joint bell and tee head bolts conforming to AWWA C110 and AWWA C153 latest revision.
- 6. Twist off nuts shall be installed and result in actuating of the restraining device.
- 7. Device shall be as made by EBAA Iron Series 2000PV or equal for PVC pipe.
- 8. Device shall be as made by EBAA Iron Series 1100 or equal for ductile iron pipe.

G. Insulating Couplings

- 1. Insulating Type.

2. Gaskets: Oil-resistant synthetic rubber.
3. Conform to AWWA C219.
4. Minimum pressure rating: 250 psi.
5. Coating: Flexi-Coat Fusion Bonded Epoxy
6. Sleeves shall be ductile iron solid sleeves with mechanical joints.
7. Materials for insulated couplings shall conform to AWWA C219
8. Bolts shall be in accordance with ASTM F593.
9. Nuts shall be in accordance with ASTM F594.
10. Steel sleeve and followers shall be epoxy coated inside and outside as specified in AWWA C213.

H. Tapping saddles

1. Ductile iron with steel straps and rubber sealing gasket.
2. Minimum pressure rating: 250 psi.

I. Friction Clamps:

1. Pipes 16-inch diameter or less
 - a. High strength ductile iron meeting ASTM A536 Grade 65-45-12.
 - b. Internal serrations shall be machined to provide 360° contact and support of the pipe wall.
 - c. Safety factor of 2:1 over the pressure rating.
 - d. T-Bolts/Rods/Hex Nuts: Low alloy steel per AWWA C111
 - e. Clamping Bolts: SAE J429 Grade 5
2. Pipes larger than 16-inch diameter
 - a. Galvanized carbon steel meeting ASTM A36 and ASTM A123.
 - b. Size: 1 inch thick and 6 inches wide for 24-inch and 30-inch diameter pipes and 1.5-inch thick and 8-inch wide for 36-inch diameter pipes.

2.03 FABRICATION

A. Flange by mechanical joint pieces

1. Mark top for horizontal pieces and side for vertical pieces at foundry.
- B. Push-on joint pipe
 1. Bevel each spigot end.
- C. Flanged joint pipe
 1. Extend pipe completely through screwed-on flanges.
 2. Machine finish the pipe end and flange face in a single operation.
 3. Fabricate flange faces flat and perpendicular to the pipe center line.
- D. Mechanical Joint Restraint Device
 1. An identification number consisting of year and day, plant designation and shift number, shall be cast into each gland body.
 - a. All physical and chemical test results shall be recorded with the identification number on the casting.
 - b. Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregated inventory until all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.
 2. The coating system shall consist of two coats of liquid fluoropolymer coating with heat curing to follow each coating.
 - a. All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application.
 - b. All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying.
 - c. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder and provide corrosion, impact and UV resistance.
- E. Mechanical couplings
 1. Prepare inner and exterior surfaces of couplings for painting in accordance with the recommendations of paint manufacturer.
 2. Paint with liquid epoxy in accordance with AWWA C210.
 3. Clean and shop prime other surfaces with the standard rust-inhibitive primer of the manufacturer.

4. Do not paint flange mating surfaces on flanged coupling adapters.
 5. Flanged coupling adapters shall have anchor studs.
- F. Insulated Couplings
1. Prepare and cover each direct buried, insulated coupling with AWWA C217 cold applied tape as indicated on the Drawings.
- G. Outlets
1. Furnish factory welded-on boss under following conditions:
 - a. Branch outlet is 12 inch or smaller.
 - b. Diameter of pipe is at least twice diameter of branch.
 - c. Either tee or tapping saddle are not used.
 - d. Working pressure 250 psi.
- H. Reducers
1. Furnish concentric pattern reducers.
- I. Gaskets
1. Gasket for potable water service shall be certified as suitable for chlorinated potable water (NSF 61), compatible with joint specified herein and the specified field test pressure service conditions and provided by pipe manufacturer.

2.04 WELDED FLANGES

- A. All mating flange steel plates shall conform to AWWA C207, Class D.
- B. Provide flanged end pipe fitted with slip-on steel ring flanges. Provide longitudinal or spiral welds ground flush to accommodate type of flanges provided.
1. Provide bolts and bolt-studs in accordance with ASTM A 307 and ANSI B1.1 with hexagonal or square heads, coarse thread fit, threaded full length with ends chamfered or rounded.
 2. Project bolt ends ¼-inch beyond surface of nuts.
 3. Provide hexagonal nuts with dimensions in accordance with ANSI B18.2 and coarse threads in accordance with ANSI B1.1.
- C. Provide face and finish flanges flat to a plane surface.
- D. Provide flanges attached normal to axis of pipe for alignment.

- E. Provide flanges tested, after welding to pipe, for true plane and reface, to bring them within specified tolerances.
- F. Gaskets:
 - 1. Provide ring-type flange gaskets made from compressed non-asbestos material, in accordance with AWWA C207.
- G. Welding:
 - 1. Preheat flanges before welding. A minimum preheat and interpass temperature shall be 300 degrees Fahrenheit for the plates greater than 1½ inches in thickness in accordance with requirements of AWS D1.1, Table XI-2.
 - 2. Provide post weld heat treatment for flanges. A minimum normal post weld heat treatment holding temperature shall be 1000 degrees Fahrenheit for plates greater than 1½ inches in thickness. Minimum holding time at normal temperature shall be 2 hours plus 15 minutes for each additional inch over 1½ inches in thickness in accordance with requirements of ASME Boiler and Pressure Vessel Code, Section VIII, Table UCS-56.

2.05 FLANGED ADAPTER COUPLINGS

- A. Flanged adapter couplings shall be a gasketed sleeve type, with diameter to properly fit the pipe, joining plain-end of the cut pipe to flanged fittings and conforming to the requirements of AWWA C219. The Flanged Couplings shall be designed for 150 psi working pressure and a temperature range of -20F to 160F.
- B. Each flanged adapter shall consist of a main body flange, one follower ring and follower rubber compounded wedge section gasket and sufficient track-head steel bolts to properly compress the gaskets. Flange ring shall conform to the 125-pound ANSI standard. The couplings shall be assembled on the job in a manner to permanently tighten joints under all reasonable conditions of expansion, contraction and shifting. Flanged adapters shall be Dresser Style 128, Rockwell "Type 913", Baker "Series 604" or approved equal.

2.06 COMBINATION AIR VALVES

- A. Conform to AWWA C512
- B. Float-operated, hydromechanical device to automatically release accumulated air or to admit air. Include 300 psig working pressure design.
- C. Combination air valves shall be as manufactured by Crispen, Model C-21, 1/4-inch (150 psig) orifice option. **THIS IS PROPRIETARY ITEM. SUBSTITUTION OF PRODUCTS FROM OTHER MANUFACTURERS WILL NOT BE PERMITTED.**

2.07 BUTTERFLY VALVES

- A. Butterfly valves shall be of the rubber-seated tight-closing type, Class 150B, conforming to AWWA C504.

1. Suppliers shall have a minimum of five-years' experience within the last five years in the manufacture of butterfly valves for the type of service specified herein, and in the manufacture of butterfly valves per AWWA C504 standards. Butterfly valves shall be manufactured by Henry Pratt Co., American-Darling; SPX/DeZurik; Mosser Valve division of Olson Technologies, Inc., or equal.
2. The valve body shall be ASTM-A48, Class 40 or A126, Class B cast iron, or ductile iron ASTM A536. Body shall have integral hubs for housing shaft bearings and seals. Body ends shall be:
 - a. Valves for direct bury installation shall have mechanical joint ends.
3. The butterfly valve disc shall be of the "off-set" design to provide a full 360° seating surface uninterrupted by shaft holes. Disc shall be constructed of cast iron ASTM A-48 Class 40 or ductile iron ASTM A536. There shall be no external ribs transverse to the flow. Non-metallic discs are not acceptable to the Owner.
4. The resilient seat shall be Buna-N rubber designed to provide tight shut-off at the specified pressures. The rubber seat can be on the disc edge or in the valve body but in either case, must be retained by positive mechanical means with corrosion-resistant hardware. Seats must be capable of mechanical adjustment in either direction without the use of the special tools. They should also be capable of complete replacement in the field without chipping, grinding, or burning out of the old seat or its retaining substance. The rubber mating surface in all cases must be 316 stainless steel.
5. Valve shafts shall be of the two-piece "stub" type extending into the disc hubs for a distance of at least 1-1/2 shaft diameters or of the single piece "through" type. In either case shaft shall be of round Type 316 or better stainless steel.
6. Valve shafts shall be securely attached to the disc by means of bolts, dowel pins, taper pins, or any combination of the three. Attaching hardware shall be 316 stainless steel.
7. Shaft bearings shall be contained in the valve body integral hubs. Bearings shall be of the extended shafts self-lubricated, sleeve type.
8. The valve assembly shall be furnished with a single 2-way thrust bearing designed to center the disc in the body at all times and to absorb thrust forces.
9. The drive end shaft seal shall be of the cartridge type with O-rings to provide positive sealing.
10. Each valve shall be tested per AWWA C504, including hydrostatic, performance, and leakage tests.
11. All ferrous parts of the valves except for finished or bearing surface shall be given two coats of epoxy coating conforming to AWWA C550.

12. Valves shall be equipped with overtorque protectors. Overtorque protectors shall be manufactured by Aunspach Controls Company, Inc., High Ridge, MO.
- B. All valves shall be manually operated and shall meet the following requirements:
1. The valve actuator shall be integrally mounted on the valve mounting flange and shall be of the self-locking traveling nut type in complete accordance with AWWA C504 requirements. The housing and housing cover shall be sealed or gasketed to prevent water entry to a 25-foot head pressure and shall be suitable for buried service. Valve actuator shall withstand an input torque of 450 ft. - lbs.
 2. Actuator design must permit repositioning of actuator in 90° increments and must permit adjustment of the valve disc seating.
 3. Valves for direct bury installation shall have steel extension stems with diameter not smaller than shaft of valve actuator. Extension stem shall be connected to valve stem by universal joint with grease filled protective boot. All stem connections shall be pinned. Extensions shall have 2-inch square operating nut and stem guide. Extension stems shall be provided with valve position indicator.

2.08 GATE VALVES

- A. Gate valves shall be furnished in accordance with the latest ANSI/AWWA Standards' Designation C509 for "Resilient-Seated Gate Valves for Water Supply Service," or C515 for "Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service," but shall meet the specific requirements and exceptions to the aforementioned specifications, which follow:
1. Gate valves shall open by turning **clockwise (right)**. They shall be of the resilient seat, wedge type with iron body and shall have a non-rising high strength bronze stem mounted with a thermoplastic cartridge stem seal incorporating "O" rings packed and ready for use. Valves 12-inch diameter and under shall be designed for vertical setting. Valves 16-inch diameter and over shall be designed for horizontal mounting and horizontal operational setting.
 2. Operating nuts shall be 2-inches square at the base and shall be loosely fitted on the stem. Gate valves shall have mechanical joints.
 3. All gate valves shall be suitable for working water pressure of 200 pounds per square inch and shall be tested under a hydrostatic pressure of 400 pounds per square inch and show no leak.
 4. All ferrous surfaces of the valve body waterway and vane, shall be given a fusion-bonded epoxy coating in compliance with AWWA C550. This coating shall be applied prior to assembly to ensure that all exposed interior and exterior surfaces receive the epoxy coating.
 5. All surfaces of the iron gate, including stem hole shall be encapsulated in rubber tightly bonded to the gate. Design and machining of valves shall permit packing of valves without undue leakage while they are wide open and in service.

6. The guide slots of the gate shall have thermoplastic inserts.
7. Gate valves shall be American Flow Control, Waterous #500, U.S. Pipe or Mueller; and be manufactured in the U.S.A.

2.09 VALVE BOXES AND COVERS

- A. Valve boxes shall be furnished and installed for all valves except as otherwise shown by the Contract Drawings. All materials shall be manufactured in the U.S.A.
- B. Boxes for valves shall be 5 1/2-inch inside diameter, shaft, sliding type. The bell end of the lower section shall have a minimum inside diameter of 8-inches.
- C. Valves in general which require valve boxes shall be set to conform to the pipeline depth indicated on the Standard Construction Details or as required by the Owner.
- D. The castings shall be made of light gray cast iron true to pattern and free from flaws. The valve boxes shall be thoroughly coated with two coats of asphaltum varnish.
- E. The covers shall have the word WATER cast in the top.

2.10 UNDERGROUND WARNING TAPE

- A. All water main installations shall also include the installation of metallic underground warning tape.
- B. Tape shall be blue, 4-inches to 6-inches in width
- C. Tape marking shall read "CAUTION BURIED WATER MAIN BELOW" labeled in accordance with the American Public Works Association.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Alignment
 1. Lay piping to lines and grades indicated. Transfer all lines and grades from basic survey control points.
 2. Deflections from straight line or grade shall not exceed values stipulated in Table 4 or Table 5 of AWWA C600.
 3. Install either shorter pipe sections or fittings to conform to alignment or grade indicated on the Drawings.
- B. Laying pipe
 1. Protect pipe from lateral displacement by placing granular embedment material.
 2. Lay pipe with bell ends facing direction of laying.

C. Cutting pipe

1. Cut pipe without damage to pipe or lining.
2. Provide smooth, straight cuts at right angles to pipe axis.
3. Remove all roughness and sharp edges from cut end of pipe.
4. Bevel cut ends of push-on joint pipe.
5. Do not cut pipe with hydraulic squeeze type cutters, portable guillotine saw, or oxyacetylene torch.
6. Do not cut tapping holes with an oxyacetylene torch.

D. Cleaning

1. Clean all foreign material from interior of pipe and fittings before installation.
2. Wipe clean all joint contact surfaces before jointing pipe and fittings.
3. Prevent all material from entering pipe or joints during installation.
4. Seal open end of pipe with watertight plug when pipe laying is stopped.
5. Keep interior of installed pipe clean until the pipeline is placed into service.

E. Inspection

1. Examine pipe and fittings for cracks and other defects immediately before installation.
2. Examine the spigot ends of pipe.
3. Remove and replace all pipe and fittings that are damaged, cracked or otherwise not in conformance with the Contract Documents at no additional cost to the Owner.

F. Welding

1. Perform field welding where indicated in accordance with AWWA C206. Provide weld type as specified in Paragraph 2.04. Repair tape or coating damaged by welding at no additional cost to the Owner.

G. Field Joints

1. Assemble field joints in accordance with the recommendations of the manufacturer.
2. Mechanical Joints:

- a. If mechanical joint fails to seal, disassemble, clean, and reassemble joint at no additional cost to the Owner.
 - b. Tighten bolts to torque values listed in AWWA C111.
 - c. Do not over tighten bolts.
 - d. Align holes in harnessed mechanical joints with tie rods to permit installation of tie rods.
 - e. When installing flange and mechanical joint pieces, align holes in mechanical joint bell and flange to straddle top center line for horizontal piping and side centerline for vertical piping.
3. Push-On Joints
- a. Lubricate all joint surfaces before joint is made with lubricant certified to meet NSF 61 for potable water service.
 - b. Install restrained joint pipe in accordance with recommendations of pipe manufacturer.
4. Flanged Joints
- a. Do not restrain opposite end of pipe or fitting in any direction when tightening flange bolts.
 - b. Tighten bolts gradually and at uniform rate to provide uniform compression of gasket.
 - c. Do not over stress flanges.
 - d. Allow one flange to move in any direction while tightening flange bolts.
 - e. Insulate flanges shown on Drawings.
5. Couplings
- a. Provide space of 1/4 inch to one inch between pipe ends.
 - b. Clean and remove foreign material from pipe and coupling surfaces which contact gaskets during assembly.
 - c. Install coupling with all parts square and symmetrical with the pipe in strict accordance with coupling manufacturer's recommendations.
 - d. Uniformly tighten assembly bolts so coupling is free from leaks.
 - e. Couplings shall be installed with heat shrinkable sleeve for corrosion protection.

H. Field Repair of Protective Coatings and Linings

1. Entry into pipe for application of interior linings to unlined ends shall be from open ends or through access manholes.
2. Field Repair of Shop-Applied Coatings and Linings
 - a. For Flanged Joints: Extend cement mortar lining to ends of pipe.
 - b. For Push-On and Restrained Joints
 - 1) Cement Mortar: Line to end of pipe on spigot end. Hold back lining in bells one inch beyond the point of nominal full joint engagement. Field repair in accordance with ANSI/AWWA C104/A21.4.
 - c. For Coupled Joints
 - 1) Interior Linings: Cement Mortar Lining shall extend to end of pipe.
 - 2) Exterior Coatings: Repair damaged areas of shop coatings on pipe and coupling after installation at no additional cost to the Owner.

I. Reducers

1. All reducers shall be concentric pattern, unless indicated.

J. Concrete Encasement

1. Install concrete encasement as indicated.
2. Provide concrete and reinforcing steel as specified in Section 03300.
3. Support, block, and anchor all pipe to be encased to prevent flotation.

K. Reaction Anchorage

1. Anchor all pipe, fittings, and valves subject to internal pressure to prevent separation of joints.
2. Provide joint anchors on all push-on and mechanical joint tees, Wye branches, bends, plugs, and valves.
3. Provide restrained joints on pipes where indicated.
4. Provide mechanical joints with tie rods for joint anchorage, as indicated.

3.02 BUTTERFLY VALVES

- A. All butterfly valves shall be installed in accordance with manufacturer's recommendations.
- B. Overtorque protectors will be factory set to slip at 400 ft - lbs.
- C. Overtorque protectors will be designed to fit over 2-inch by 2-inch nut and will be equipped with a 2-inch by 2-inch top nut.

3.03 VALVES AND VALVE BOXES

- A. Gate valves and butterfly valves shall be set with valve shafts in a vertical position and provided with a 2-inch square operating nut and valve box as hereinbefore specified. Valve boxes shall be set on well-compacted earth around the valve without resting on the valve or pipeline.
- B. All valves shall be installed in accordance with manufacturer's recommendations.

3.04 UNDERGROUND WARNING TAPE

- A. Metallic underground warning tape shall be installed 1-foot to 2-feet from the crown of the pipe.
- B. Tape shall be installed in accordance with the manufacturer's recommendations.
- C. Any tape damaged during shipment or installation shall be immediately replaced prior to backfilling the trench.

** END OF SECTION **

SECTION 02666

PITOMETER CONNECTIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. The work under this section shall include furnishing and installing all materials for Pitometer stop connections as specified herein at locations shown on the plans, or as directed by the Owner.

PART 2 PRODUCTS

2.01 FIELD ASSEMBLED PITOMETER CONNECTIONS

- A. All brass fittings used to assemble Pitometer Connections in the field or on site shall conform to ANSI / AWWA C800 as latest revised and shall be manufactured by Ford Meter Box Company or equal as specified below unless otherwise approved by the Owner:

1. Corporations:

- a. For new taps – F800 (one) 1 inch with 1" cc thread x 1-1/4" male iron pipe thread outlet.

2. Ball Valves:

- a. B11-455 one (1) inch with 1-1/4" female iron pipe thread both ends equipped with the HP-4 special angled lever handle for Pitometer connections.

3. Riser Pipe:

- a. All riser pipes shall be 1-1/4 inch brass with male iron pipe thread on both ends. All brass pipes shall be seamless red brass pipe conforming to ASTM B43, Specification for Seamless Brass Pipe, Standard Sizes.

4. Valve boxes:

- a. Twelve (12) inch cast iron top box and cover in accordance with Section 02665

PART 3 EXECUTION

3.01 PITOMETER TAPS

- A. Taps shall be installed in the top of the main so that the corporation stop, ball valve, brass pipe and standpipe are all in a vertical position. All taps shall be made in the main by

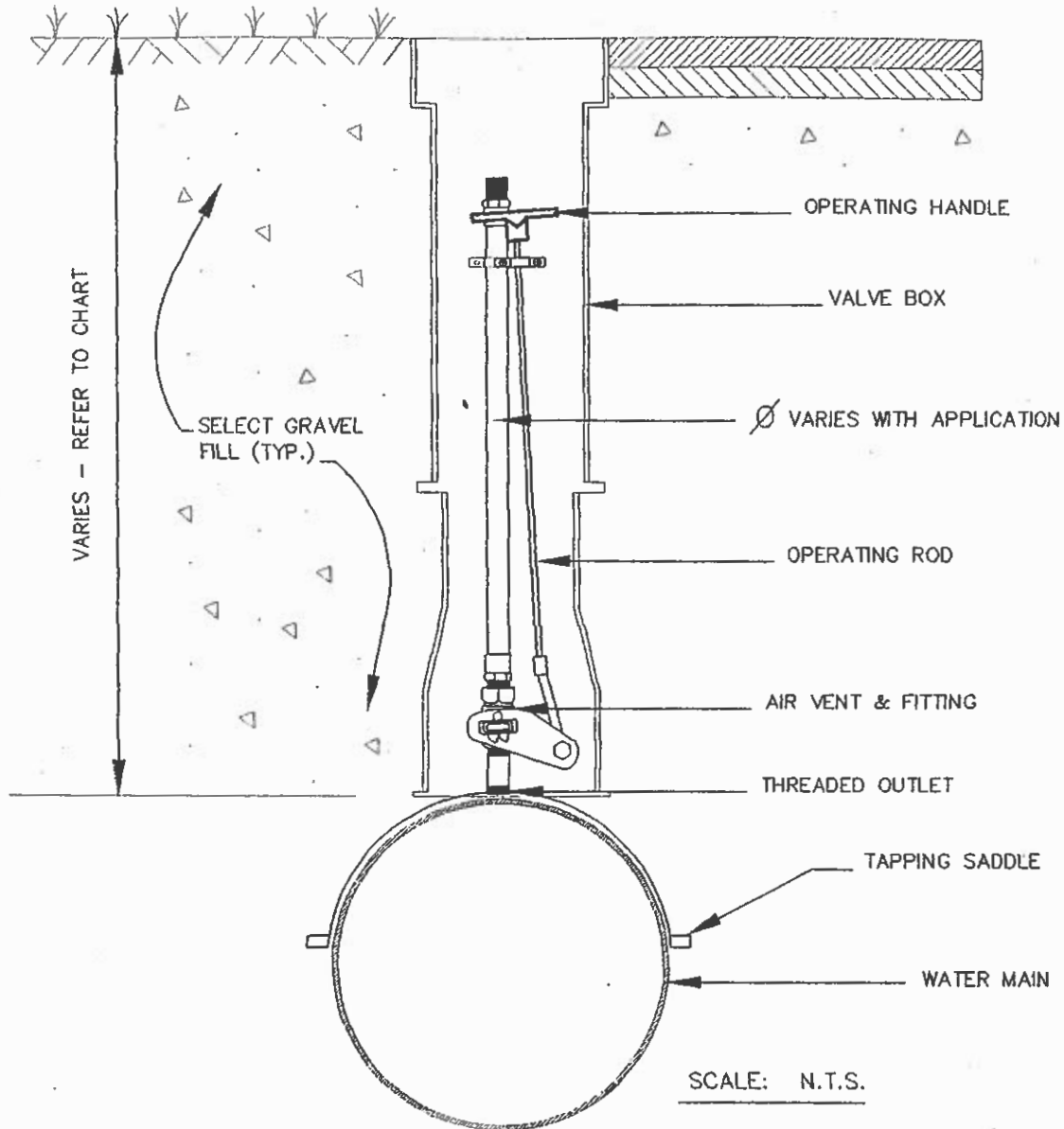
means of a tapping machine manufactured for this purpose and supplied by the Contractor. The tap and drill shall be kept sharp and shall have standard threads unless otherwise approved by the Owner.

- B. All Pitometer connections shall be threaded on to an appropriately sized corporations stop that is threaded into the tap
- C. The one-inch corporation stop shall be left in the OPEN position.
- D. A minimum of one-half cubic yard of 3/4" stone shall be placed under and around the Pitometer connection prior to the setting of the valve box to drain the valve box. A layer of 8 mil. Polyethylene shall cover the pea stone prior to backfilling to prevent clogging of the drainage
- E. There shall be a threaded connection on the top of the riser pipe to allow for the Pitometer instrument to be attached to the top of the riser pipe. When not in use, the riser pipe shall be covered with a cap to prevent foreign material from entering the pipe.
- F. The total distance from the bottom of the water main to the top of the riser pipe shall not exceed 5.5 feet unless otherwise approved by the Owner.
- G. The top of the riser pipe shall be twelve (12) inches below finished grade on Pitometer connection set on a water main in a public street.
- H. The lower section of the valve box that shall be placed over the Pitometer connection shall consist of ten (10) inch PVC pressure pipe. The top section and cover of the valve box shall consist of a twelve (12) inch top box and cover.
- I. The drainage stone shall be firmly compacted around the Pitometer connection to prevent settling. The lower section of the valve box shall enclose the ball valve and riser pipe. The valve box shall rest above the pipe so the weight of traffic passing over the street will not be transferred to the Pitometer connection or the pipe. The valve box shall be securely held vertical and plumb straight during backfilling. Covers shall be set to finish grade as directed by the Owner.

PART 4 ATTACHMENTS

4.01 ATTACHMENT A –TYPICAL PITOMETER TAP AND AIR RELEASE VALVE

ATTACHMENT A - TYPICAL PITOMETER TAP AND AIR RELEASE VALVE



VALVE DIAMETER	PIPE LENGTH	REQUIRED COVER
3/4"	30"	4.0'
3/4"	36"	4.5'
3/4"	42"	5.0'
1"	30"	4.0'
1"	36"	4.5'
1"	42"	5.0'
1 1/4"	30"	4.0'
1 1/4"	36"	4.5'
1 1/4"	42"	5.0'
1 1/2"	30"	4.0'
1 1/2"	36"	4.5'
1 1/2"	42"	5.0'
2"	30"	4.0'
2"	36"	4.5'
2"	42"	5.0'
CUSTOM	CUSTOM	AS REQUIRED BY ENGINEER

****END OF SECTION****

SECTION 02675

TESTING

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section Includes:
 - 1. Pressure testing of pipelines.
 - 2. Flush water.
- B. All water required for startup and testing will be provided by the Owner at no charge.

1.02 RELATED SECTIONS

- A. Section 01000 – Summary of Work
- B. Section 01300 – Submittals
- C. Section 02600 – FPVC Sliplining
- D. Section 02665 – Water Mains, Valves and Appurtenances

1.03 REFERENCE STANDARDS

- A. Work under this Section shall conform with the following standards in effect at bid.
 - 1. American Water Works Association (AWWA):
 - a. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances
 - b. AWWA C905 – Polyvinylchloride (PVC) Pressure Pipe and Fabricated Fittings, 14-IN. through 48 IN. for Water Transmission and Distribution.

1.04 SYSTEM DESCRIPTION

- A. The Contractor shall perform filling, flushing, and testing of all pipelines and appurtenant piping, complete and installed, in accordance with this Section and applicable requirements of AWWA C600.
- B. During filling and flushing, the Contractor shall lock out and tag out all valves in the appropriate position. The Contractor shall monitor all blow-offs, and air release valves within the pipeline section to ensure there are no unintended discharges of water. Owner will operate all existing valves to fill and flush prior to bringing pipeline into service.
- C. The Contractor shall limit the rate of flushing to 600 gpm or less.

- D. Water discharged into separate storm drains or surface waters shall be discharged in accordance with regulatory requirements. Prior to discharge the Contractor shall notify the local Conservation Commission.
- E. Water discharged into waterways shall be in accordance with the requirements of the EPA NPDES permit and the Massachusetts DEP.
- F. Water main flushing shall be accomplished using new blow-offs. The Contractor shall arrange for traffic control and police details for flushing operations.
- G. Flush and test to the full limits of the new pipeline.

1.05 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. A proposed plan and schedule for pipeline filling, pressure testing, and flushing, shall be submitted a minimum of three (3) weeks before filling is to start. The plan shall include a detailed plan including a pipeline schematic, valve detail record sheets, lockout/tag out (LOTO) signature sheets detailing/documenting each valve position for each activity, procedure for monitoring plan, location of discharge and ultimate destination of water. This plan shall apply to all pipeline flushing activities. The plan shall address all work items included in this Section and in the applicable sections of AWWA C600.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate operation of existing valves, and flushing of the water main with the Owner, including notification of the following prior to starting the work:
 - 1. Valve Operations: In accordance with Section 01000, Paragraph 1.03C.
 - 2. Flushing: In accordance with Section 01000, Paragraph 1.07.A.2.
 - 3. Notification shall include location of work, length and diameter of the pipe and other pertinent information.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Provide test equipment as follows:
 - 1. Piping connections between:
 - a. pipe tested and water source
 - b. pipe tested and discharge location.
 - 2. Equipment, materials, and facilities required to perform specified tests including but not limited to the following:

- a. Pumping equipment
- b. Water meter
- c. Pressure gauges
- 3. Sectionalizing devices required including but not limited to the following:
 - a. Flanges
 - b. Valves
 - c. Bulkheads
 - d. Bracing
 - e. Blocking

PART 3 EXECUTION

3.01 PREPARATION

A. Testing:

- 1. Prior to testing, pipelines shall be flushed. The Contractor shall test all pipelines either in sections or as a unit. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall ascertain that all test bulkheads are restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. The Contractor shall provide temporary air tappings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. All air valves shall be open during the filling.
- 2. The Contractor shall insure that exposed appurtenant piping is fully restrained during all activities when the pipe is under pressure including filling, pressure testing, and flushing.
- 3. After installation, both sides of each new valve shall be tested in the closed position individually for valve tightness in both directions.
- 4. Prior to the activation of the pipe, the pH of the water shall be the same pH as the raw water supply. Contractor shall flush the pipe up to two pipe volumes to achieve the desired pH.

3.02 INSTALLATION

A. Water:

- 1. Dispose test water in accordance with the Contractor's Plan.

B. Venting:

1. Ensure that air release valves and other venting devices are installed per contract and placed in open position when filling the pipe with water.
2. Provide vents in test bulkheads to expel air from the pipe being tested.
3. Do not close hand-operated air valves until water flows in an uninterrupted stream from each valve.
4. Ensure that the rate at which each pipe is filled with water does not exceed venting capacity of installed air vent valves and devices.

C. Gauge Connections:

1. Install permanent gauge connections at each location where test gauges are connected to pipe during performance of tests.
2. Fit each gauge connection with removable plug or cap upon completion of work.

3.03 APPLICATION

A. Strength and Leakage Test:

1. The pipeline shall be filled at a rate that will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures shall be taken to satisfy the requirements of this specification at no additional cost to the Owner.

2. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 2 hours. The test pressure for pipelines shall be 150 psi.

3. The maximum allowable leakage for pipelines shall be according to the following formula:

$$L = S \times D \times P^{1/2} / 133,200$$

where:

L = leakage (gallons per hour)

S = length (feet), the lesser of the actual length being tested or the maximum length for determining leakage. Maximum length for determining leakage is 2,000 feet.

D = pipe diameter (inches)

P = test pressure (psi)

4. Pipelines that fail to pass the prescribed leakage test will be considered defective. The Contractor shall determine the cause of the leakage, take corrective measures

necessary to repair the leaks, and shall retest the pipelines, all at no additional cost to the Owner.

3.04 FIELD QUALITY CONTROL

A. Tests:

1. Locate leaking joints and pipe materials during pressure testing and repair at no additional cost to the Owner.

** END OF SECTION **

SECTION 02821

FENCING AND GATES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Chain-Link Fences: Industrial
 - 2. Gates: Swing
 - 3. Split Rail Fences
 - 4. Triangular Pipe Gate
- B. Related Section s include the following:
 - 1. Section 02200 - Earthwork
 - 2. Section 03300 - Cast-in-Place Concrete

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
 - a. Wind Speed: **80 mph**
 - b. Fence Height: **8 feet**
 - c. Line Post Group: **IA**
 - d. Wind Exposure Category: **B**
 - 2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.
- B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.04 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
 - 4. Gate operators, including operating instructions.
 - 5. Accessories: Barbed wire
- B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
- C. Samples for Verification: For each type of chain-link fence and gate indicated.
 - 1. Polymer-coated steel wire (for fabric) in 6-inch lengths.
 - 2. Polymer coating, in 6-inch lengths on shapes for posts, rails, wires.
- D. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1043.
- E. Qualification Data: For Installer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eastern Fence
2. Chainlink Fence
3. Master Halco
4. Or equal

2.02 CHAIN-LINK FENCE FABRIC

- A. General: 8'-0" height. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.192 inch.
 - a. Mesh Size: 2-1/8 inches
 - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. (610 g/sq. m) with zinc coating applied after weaving.
2. Selvage: Twisted top and knuckled bottom.

2.03 INDUSTRIAL FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40
2. Fence Height: 8 feet.
3. Strength Requirement: Heavy industrial according to ASTM F 1043.
4. Post Diameter and Thickness: According to ASTM F 1043.
 - a. Swing Gate Post: According to ASTM F 900
5. Coating for Steel Framing:
 - a. Metallic Coating:
 - 1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.
6. Aluminum Finish: Mill finish complying with ASTM B 429.

2.04 TENSION WIRE

- A. General: Provide horizontal tension wire at the following locations:
 - 1. Location: Extended along top and bottom of fence fabric.
 - 2. Location: Extended along top of barbed wire arms and top of fence fabric for supporting barbed tape.
- B. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:
 - 1. Metallic Coating: Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.

2.05 INDUSTRIAL SWING GATES INCLUDING MAN GATES

- A. General: Comply with ASTM F 900 for single and/or double swing gate types.
 - 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
- B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:
 - 1. Gate Fabric Height: 2 inches less than adjacent fence height
 - 2. Leaf Width: match existing
 - 3. Frame Members:
 - a. Tubular Steel 2 inches rectangular.
- C. Frame Corner Construction:
 - 1. Welded or assembled with corner fittings and 5/16-inch- diameter, adjustable truss rods for panels 5 feet wide or wider.
- D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame to match existing as required to attach barbed **wire** assemblies.
- E. Hardware: Latches permitting operation from both sides of gate, hinges, **center gate stops** and keepers for each gate leaf more than 5 feet (1.52 m) wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
 - 1. Owner to furnish padlocks and chains

2.06 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Post and Line Caps: Provide for each post.
 - 1. Line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 - 1. Top Rail Sleeves: Round-steel tubing not less than 6 inches long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts, integral with post cap; for each post, unless otherwise indicated, and as follows:
 - 1. Line posts with arms that accommodate top rail or tension wire.
 - 2. Corner arms at fence corner posts, unless extended posts are indicated.
 - 3. Type I, single slanted arm.
- I. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
 - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- J. Finish:
 - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.

2.07 BARBED WIRE

- A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121 Chain-Link Fence grade for the following two-strand barbed wire:

1. Standard Size and Construction: 0.099-inch- diameter line wire with 0.080-inch-diameter, 2-point round barbs spaced not more than 4 inches o.c.

2.08 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M.]
 1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.
- B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.09 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.10 TRIANGULAR PIPE GATE

- A. Frames and Bracing:
 1. Top Bar: 6-Inch Sch 40 Pipe
 2. Bottom Bar: 4-Inch Sch 40 Pipe
 3. Steel Post: 8-Inch Sch 40 Pipe
 4. Steel/Aluminum Ball Bearing Hinges with Grease Fittings
 5. Stainless-Steel Lock Pin
- B. Paint:
 1. Five coats of High-Performance Protective Enamel Gloss Safety Yellow Oil-Based Interior/Exterior Metal Paint.
 2. Manufactured by Rust Oleum Professional.

2.11 SPLIT RAIL FENCES

- A. All wood materials shall be treated wood, or wood of a natural resistance to decay. Materials shall be free from loose knots, cracks, and other imperfections.
 - 1. 2-rail "American Style" split rail system shall be used.
 - 2. Posts shall be 18-inch girth (approx.. 25 square inches). Any deviations shall be approved by the Owner.
 - 3. 2-rail posts shall be approximately 64-inches in height. Any deviations shall be approved by the Owner.
 - 4. Posts shall be buried 30-inches into ground.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Owner.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.03 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.04 CHAIN-LINK FENCE INSTALLATION

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete with mechanical anchors at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

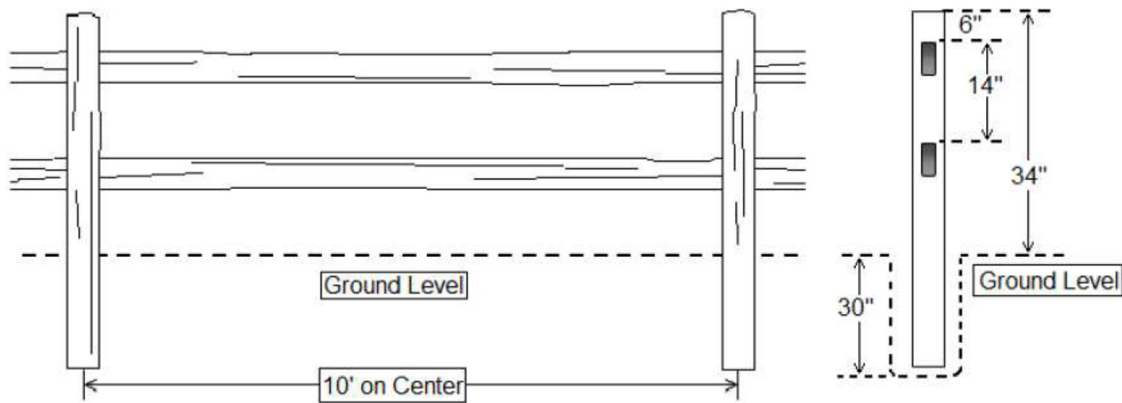
- a. Concealed Concrete: Top 2 inches below grade to allow covering with surface material.
- 3. Mechanically Driven Posts: Drive into soil to depth of 36 inches. Protect post top to prevent distortion.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more.
- D. Line Posts: Space line posts uniformly at 10 feet o.c.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at $\frac{2}{3}$ fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric.
 - 1. Top Tension Wire: Install tension wire through post cap loops.
 - 2. Bottom Tension Wire: Install tension wire within 6 inches (150 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Bottom Rails: Install, spanning between posts.
- I. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
 - L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
 - M. Barbed Wire: Install barbed wire uniformly spaced angled toward security side of fence. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.
- 3.05 GATE INSTALLATION
- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for chain link fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- 3.06 ADJUSTING
- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
 - B. Lubricate hardware and other moving parts.
- 3.07 SPLIT RAIL FENCE INSTALLATION
- A. Posts shall be set true to line and grade. Line posts do not require concrete footings. Corner or end posts do require 12-inch diameter concrete footings extending at least 24-inches into undisturbed natural ground or properly compacted fill. Typical split rail fence installation can be found in Attachment A to this specification section. Installation of fence shall be as per fence manufacturer's recommendations.

PART 4 ATTACHMENTS

- 4.01 Attachment A – Split Rail Fence Detail

Attachment A – Split Rail Fence Detail



****END OF SECTION ****

SECTION 02930

LOAMING AND SEEDING

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Section includes topsoiling and seeding as indicated and specified.

1.02 SUBMITTALS

- A. Submit the following in accordance with Section 01300:
 - 1. Composition of seed mixture, with the percentage of the purity weed content, and germination, the net weight and date of shipment of each variety.
 - 2. Evidence that the loam proposed meets the requirements specified in Paragraph 2.01.G.
 - 3. Test results for loam as specified in Paragraph 2.01.G.
 - 4. Duplicate copies of invoices for fertilizer and lime showing quantities of each grade of fertilizer, percentage of calcium carbonate or magnesium carbonate, and the percentages of limestone that pass the sieves.
 - 5. Manufactured mulch: Manufacturer's literature and one sample.
 - 6. Duplicate copies of seed invoices and a certification from the seed vendor that each container of seed delivered is labeled in accordance with the Federal Seed Act and is as specified in this Section furnished on or with all copies of seed invoices.

1.03 REFERENCE STANDARDS

- A. Work under this Section shall conform with the following standards in effect at bid:
 - 1. ASTM D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).

PART 2 PRODUCTS

2.01 NON-WETLANDS MATERIALS

- A. Non-petroleum tackifier commercially available for spray applications.
- B. Fertilizer shall be of 10-6-4, uniform in composition, free-flowing, equipment, delivered to the site in bags or containers, fully labeled, conforming to Massachusetts Fertilizer Laws MGL Chapter 128, Section 64-83, and bearing the name, trade name or trademark, and warranty of the producer.
- C. Lime shall be agricultural grade limestone ground so that 95 percent of the material will pass a No. 20 sieve and 50 percent will pass a No. 100 sieve.

- D. Manufactured Mulch shall be cellulose-fiber or wood-pulp mulch with non-toxic temporary green dye for visual metering, commercially available for use in spray applications.
- E. Mulch shall be threshed straw of cereal grain such as oats, wheat, barley or rye.
- F. Seed – Lawn Areas:
 - 1. Mixture shall be fresh, clean, new crop seed, mixed by a dealer. No seed shall be sown until seed certificates specified in Paragraph 1.02 are submitted. Damaged and moldy seed shall be removed from the site and replaced at no additional cost to the Owner.
 - 2. Seed shall be of the previous year's crop with weed content not exceeding one (1%) percent by weight, conforming to the following:

<u>Species</u>	<u>Percent by Weight</u>	<u>Germination Minimum</u>	<u>Purity Minimum</u>
For Hydroseeding Grass			
Kentucky Bluegrass	10%	85%	90%
Merion Bluegrass	20%	85%	92%
Penlawn Red Fescue	50%	85%	95%
Manhattan Perennial Rye	20%	90%	98%

- G. Topsoil shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis and based on the USDA classification system, of uniform composition, without admixture of subsoil, free of stones greater than one inch, lumps, plants and their roots, debris and other extraneous matter over 1/2 inch in diameter, containing no toxic substances, obtained from naturally well drained areas which have never been stripped before and have a history of vegetative growth.
 - 1. Loam shall have an acidity range of pH 6.2 to pH 6.5, shall contain not less than 5 percent nor more than 12 percent organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.
 - 2. Loam stripped from the site may be used and amended to meet the above specifications.

2.02 WETLANDS MATERIALS

- A. Soil
 - 1. Shall be soils excavated from impacted wetland area.
 - 2. Soils shall not be compacted or grubbed for the top 18-inches.
- B. Seed – Wetland Areas:

1. Wetlands Seed Mix shall be used within wetlands areas as indicated, however, they shall not be applied to standing water.
2. Mixture shall be fresh, clean, new crop seed, mixed by a dealer. No seed shall be sown until seed certificates specified in Paragraph 1.02 are submitted. Damaged and moldy seed shall be removed from the site and replaced at no additional cost to the Owner.
3. Seed shall be of the previous year's crop with weed content not exceeding one (1%) percent by weight, and shall consist of the following species:
 - a. Fox Sedge (*Carex vulpinoidea*)
 - b. Lurid Sedge (*Carex lurida*)
 - c. Blunt Broom Sedge (*Carex scoparia*)
 - d. Sensitive Fern (*Onoclea sensibilis*)
 - e. Blue Vervain (*Verbena hastata*)
 - f. Hop Sedge (*Carex lupulina*)
 - g. Green Bulrush (*Scirpus atrovirens*)
 - h. Nodding Bur Marigold (*Bidens cer-nua*)
 - i. Bristly Sedge (*Carex comosa*)
 - j. Fringed Sedge (*Carex crinita*)
 - k. American Mannagrass (*Glyceria grandis*)
 - l. Wool Grass (*Scirpus cyperinus*)
 - m. Soft Rush (*Juncus effusus*)
 - n. Spotted Joe Pye Weed (*Eupatorium maculatum*)
 - o. Boneset (*Eupatorium perfoliatum*)
 - p. Mud Plantain (*Alisma subcordatum*)
 - q. New England Aster (*Aster novae-angliae*)
 - r. Rattlesnake Grass (*Glyceria canadensis*)
 - s. Purplestem aster (*Aster puniceus*)
 - t. Soft Stem Bulrush (*Scirpus validus*)
 - u. Blueflag (*Iris versicolor*)

- v. Swamp Milkweed (*Asclepias incarnata*)
- w. Monkey Flower (*Mimulus ringens*)
- 4. Wetlands Seed Mixes as manufactured by:
 - a. “New England Wetmix”, New England Wetland Plants, Inc., 820 West Street, Amherst, MA, Phone: 413-548-8000, www.newp.com
 - b. “New England Wetland’s Mix”, Allen Seed, 693 S. County Trail, Exeter, RI, Phone: 800-527-3898, www.allenseed.com
 - c. “FACW Meadow Mix”, Ernst Conservation Seeds, Meadville, PA, Phone: 800-873-3321, www.ernstseed.com
- 5. Wetlands Seed Mixes shall be placed in accordance with manufacturer’s written instructions and recommended time of year for placement of seeds.

2.03 INSPECTION AND TESTS

- A. Fertilizer and Lime. Upon completion of the Project, a final check of total quantities of fertilizer and limestone used (based on invoices) will be made against total area treated, and if minimum rates of application have not been met, additional quantities of these materials shall be distributed to make up minimum application at no additional cost to the Owner.
- B. Each lot of seed will be sampled and tested, in accordance with latest Rules and Regulations under the Federal Seed Act.
- C. Topsoil shall be tested by an independent testing laboratory.

PART 3 EXECUTION

3.01 GENERAL

- A. Grassed areas indicated shall be topsoiled and seeded.
- B. After the areas to be seeded have been brought to the final grades, the soil shall be tilled to a depth of 4 inches and seeded.

3.02 PLACING TOPSOIL

- A. Prior to spreading of loam, subgrades shall be compacted, unless otherwise specified or indicated, to not less than 90% of maximum density in accordance with ASTM D698.
- B. Topsoil shall be distributed uniformly and spread and uniformly compacted to a minimum depth of 6 inches with a smooth surface.
- C. Surface irregularities resulting from topsoiling or other operations shall be leveled to prevent depressions.

- D. Topsoil shall not be placed where the subgrade is frozen, excessively wet, extremely dry, excessively compacted, or in a condition detrimental to the proposed planting or grading.
- E. Soil compacted by construction equipment or soil on compacted cut slopes or grades shall be pulverized to a minimum depth of 4 inches before applying topsoil.

3.03 LIMING, FERTILIZATION AND SEEDING.

- A. The quantities of materials to be used are as follows:

Grass Seed	1 pound per 150 square feet
Fertilizer	1 pound per 130 square feet
Lime	as required to obtain PH value of soil of 6.5 for grass and 7.2 for trefoil areas

- B. Seed shall be sown between April 1 and June 1 or between August 15 and October 15.
- C. Fertilizer and limestone shall not be mixed together prior to their application, but may be worked into the soil together to a depth of two-inches. Do not hydroseed for 24 hours after installation of fertilizer.
- D. If inspection shows areas that have been left unplanted or poor growth after two weeks, additional seed shall be sown.

3.04 APPLYING AND ANCHORING MULCH

- A. Oak straw mulch shall be spread uniformly by hand on seeded areas in a continuous blanket, using 2 tons per acre.
- B. Manufactured mulch, if used, shall be spread uniformly on seeded areas at the minimum rate of 1,400 pounds per acre.

3.05 CARE AND MAINTENANCE

- A. Maintenance of Seeded Areas:
 - 1. Maintain and mow hydroseeded areas to a height of two and one-half (2-1/2) inches until Substantial Completion.
 - 2. All areas and parts of areas that do not show a uniform stand of grass at Substantial Completion: Areas shall be reseeded at no additional cost to the Owner.
- B. Watering of Hydroseeded Areas:
 - 1. First Week: In the absence of rainfall, watering shall be performed daily during the first week to maintain moist soil to a depth of two (2) inches.
 - 2. Second and Subsequent Weeks: Water to maintain moisture in the upper two (2) inches of soil.

3. Watering shall provide uniform coverage, prevent erosion and prevent damage to the finished surface. Watering equipment shall apply one (1) inch of water for complete coverage to the seeded areas in an eight (8) hour period.

** END OF SECTION **

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Provide, finish, protect, and cure cast-in-place concrete as indicated and specified in this Section.
 - 1. Thrust blocks, reinforced concrete pipe collars, reinforced concrete bridge abutments and wingwalls and other incidental concrete work.
 - 2. CDF Concrete to replace removed concrete base.
 - 3. All forms, staging, bracing and other equipment necessary and required to produce the concrete in place and the removal of same.
 - 4. Reinforcing steel, including accessories and supports, cement finishes, anchor bolts, and leveling plates, non-shrink grout and curing materials and methods.

1.02 RELATED SECTIONS

- A. Section 01090 - Reference Standards
- B. Section 01300 - Submittals
- C. Section 01400 - Quality Control Testing
- D. Section 01600 – Control of Materials
- E. Section 02320 – Earthwork
- F. Section 03450 – Precast Structures

1.03 STANDARDS

- A. Commonwealth of Massachusetts Department of Transportation, Highway Division Standard Specifications for Highways and Bridges

1.04 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300:
 - 1. Owner shall provide the services of a testing laboratory.
 - 2. Concrete design mixes and results of strength tests from trial concrete mixes by the Contractor's testing laboratory firm.

3. Mill test reports for each shipment of cement, regardless of quantity, prior to incorporation into the work.
4. Manufacturer's specifications and instructions for all admixtures, curing materials, adjustable inserts and non-shrink non-metallic grout.
5. Manufacturer's fly ash chemical analysis and results of physical test reports for each shipment of fly ash, prior to incorporation into the work.

1.05 JOBSITE CONDITIONS

- A. Do not place concrete until conditions and facilities for making and curing control test specimens are in compliance with ASTM C 31.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete

1. All concrete reinforced or nonreinforced shall have a 28 day compressive strength of 3500 psi unless otherwise noted on the drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.
2. Concrete shall conform to ASTM C94. The Contractor shall design concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.
3. Admixtures shall be as specified in Paragraph 2.01F.
4. No additional water, except for the amount indicated by the design mix, shall be added to the concrete without the prior permission of the engineer.
5. Concrete mix for bridge abutments and wingwalls shall be 4,000 psi, 1.5in 565 cement concrete per Section 901 of the MassDOT Standard Specifications.

B. Reinforcing

1. Reinforcing as shown on the contract drawings shall conform to ACI 318 and ASTM A615 and shall be detailed in accordance with ACI SP-66. All steel reinforcing bars shall be grade 60.
2. Reinforcing for bridge abutments and wingwalls shall be epoxy coated per Section M8.01.7 of the MassDOT Standard Specifications.

C. Cement

1. The cement shall be a brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

D. Water

1. Use water for concrete that is potable and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances, and conforms to the requirements for water in ASTM C 94.
2. The maximum water-soluble chloride ion in the water shall not exceed 0.060 percent by weight of cement.
3. Heat or cool water to obtain concrete temperatures in conformance with ACI 305 and ACI 306R.

E. Aggregates

1. Aggregate shall conform to the requirements of ASTM C33.
2. Maximum size aggregate shall be 3/4 -inch

F. Admixtures

1. General Requirements

- a. Maintain compressive strength and maximum water-cement ratios indicated in Table 03300-1 in Attachment A when using admixtures. Include all admixtures in solution form in the water-cement ratio calculations.
- b. Do not use calcium chloride, admixtures containing chloride ions or other admixtures causing accelerated setting of cement. Do not use combinations of admixtures and cements producing erratic or otherwise undesirable results with aggregates.
- c. Reject admixtures that have been in storage for longer than six months or which have been subjected to freezing.
- d. Do not use admixtures in greater dosages than recommended by manufacturer.
- e. Insure that strength of concrete with proposed admixture after 48 hours is not less than strength of similar concrete without admixture.
- f. Insure that air content is within the percentages specified in Paragraph 2.01 D. 2. below after addition of the admixture.
- g. All admixtures to be obtained from one manufacturer.

2. Air-Entrainment

- a. Air entrain all concrete. Use admixtures conforming to ASTM C 260.

- b. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.
- c. Chemical admixtures to act as water-reducing agents, retarders, or accelerators, when required, shall conform to ASTM C494. Calcium chloride shall not be used as an admixture.
- d. Mid-Range Water Reducer: Use admixture conforming to ASTM C494, Type A.
- e. High Range Water Reducer (Super Plasticizer): Use admixture conforming to ASTM C494, Type F, extended slump life.

G. Control Density Fill (CDF)

1. The ingredients shall comply with the following:

Portland Cement	AASHTO M85
Fly Ash	AASHTO M295
Class F Sand	MassDOT M4.02.02
Water	MassDOT M4.02.04
Air Entraining Admixtures	MassDOT M4.02.05

2. Excavatable, Types 1E and 2E shall meet the following requirements

	28 DAYS	90 DAYS
Compressive Strength	30 – 80 psi	100 psi
Slump	10-12 inches	-
Air	1-30%, Adjusted for Fly Ash Content	

3. A typical 1E mix design is as follows

Portland cement	50 pounds
Sand	2700 pounds
Water	60 gallons
Fly Ash	253 pounds, coordinated with air content

4. A typical 2E mix design shall not include fly ash.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Before placing concrete and forms, the space to be occupied by the concrete shall be thoroughly cleaned and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or any material which would tend to reduce the bond.
- B. Concrete shall not be placed against water permeable materials that are not thoroughly saturated.
- C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected by the Owner.

3.02 THRUST AND ANCHOR BLOCKS

- A. Minimum bearing areas for thrust blocks and dimension of anchor blocks shall be as shown on the drawings.
- B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.03 CONCRETE PLACED DURING COLD WEATHER

- A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40 degrees F, or is expected to fall below 40 degrees F within 72 hours, and the concrete after placing shall be protected by covering, heat or both.
- B. All handling and protecting of concrete during freezing weather shall be in accordance with provisions of ACI 306R, and all of the work is subject to review by the Owner.

3.04 CONCRETE PLACED DURING HOT WEATHER

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall minimize delays that will result in mixing of the concrete after arrival on the job.
- B. During periods of hot weather (90 degrees F or above), ingredients in the concrete shall be cooled and cold mixing water shall be used to maintain the temperature of the concrete at levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90 degrees F, when ready for placement, will be rejected.

3.05 FIELD QUALITY CONTROL

- A. Concrete inspection shall be by the Owner. Concrete testing shall be by the Contractor's laboratory. Testing equipment shall be supplied by the laboratory and the preparation of samples and all testing shall be performed by laboratory personnel. Full assistance and

cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

- B. Four standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. Four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders does not achieve the specified level, the Owner may elect to test the fourth cylinder immediately or test it after 56 days.
- C. The Owner shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification.

3.06 TESTING

A. General:

- 1. The Contractor's testing laboratory firm will use concrete samples provided by the Contractor at the point of agitator or mixer truck discharge to perform slump, air content, and temperature tests and for field control test specimens.

B. Notification of Delivery

- 1. Notify the Owner of concrete deliveries a minimum of 48 hours in advance of the scheduled placement. Include within this notification, the class and quantity of concrete, method and location of placement, frequency of trucks, ordered slump and time of initial delivery.
- 2. Place concrete during normal working hours.
- 3. Furnish delivery batch ticket to the Owner's representative in the field with each batch delivered to the discharge locations in conformance with ASTM C94. Batch tickets shall be written in ink or computer printed and to include:
 - a. Load number, truck number and driver's name
 - b. Strength of concrete (compression strength)
 - c. Amount of concrete (cu. yds. [cu. meters])
 - d. Time truck is charged with cement
 - e. Revolution counter reading at first addition of water
 - f. Type, brand and amount of cement
 - g. Type, brand and amount of admixtures

- h. Information necessary to calculate total mixing water
 - i. Maximum size of aggregate
 - j. Weights of fine and coarse aggregates
 - k. Signature of ready-mix representative
 - l. Concrete temperature at batching plant
 - m. Type and amount of fly ash
- 4. The Owner will notify the testing laboratory firm of scheduled concrete deliveries.

C. Test Measurements at Discharge

- 1. The Owner's testing laboratory firm will take measurement of concrete slump, air content and temperature for each 50 cubic yards of each class of concrete but not less than once a day. The laboratory firm will conduct the slump, air content and temperature test measurements in conformance with ASTM C143, ASTM C231, and ASTM C1064, respectively.
- 2. The Owner's testing laboratory firm will immediately submit test reports of concrete field measurements specified above.
- 3. The Owner may also take measurements of concrete slump, air content and temperature.

3.07 FINISHES

A. Locations

- 1. Steel-trowel finish all top, horizontal and inclined surfaces not otherwise indicated.
- 2. Hand steel-trowel finish all surfaces shaped with or without forms and over which liquids will flow.
- 3. Rough finish floors scheduled to receive concrete fills and toppings.
- 4. Broom finish exterior walkways.
- 5. Use smooth forms for all structures.
- 6. Finish other concrete surfaces as indicated, and as specified below.

B. Descriptions

1. Steel-Trowel Finish: Remove excess laitance from surfaces by tamping, screeding, and magnesium or bull-floating. Compact surface with motor-driven floats when slab has hardened so that water and fine material will not work to top and trowel smooth. Dusting with dry cement or other mixtures or sprinkling with water is not permitted in finishing. Leave surfaces with smooth hard finish free of blemishes.
2. Rough Finish: Prepare surfaces by tamping with special tools to force coarse aggregate away from surface, screeding with straight edges to bring surfaces to required line and then magnesium or bull-float.
3. Broom Finish: Steel-trowel surface then broom normal to direction of travel with fine hair stable broom to produce non-slip surface of uniform appearance.
4. Smooth Form Finish: Remove fins, finish flush with parent concrete and make necessary repairs. Wet and rub finned and repaired areas with carborundum stone or other abrasive until uniform color and texture are produced. Complete rubbing not later than 24 hours after the curing period.

PART 4 - ATTACHMENTS

4.01 Attachment A – Table 03300-1

ATTACHMENT A

TABLE 03300-1

Minimum compressive strength at 28 days (psi)	Minimum compressive strength at 28 days (MPa)	Maximum water cement ratio*
1,500	10	0.76
3,000	20	0.53
4,000	28	0.44
5,000	35	0.40
5,500	38	0.39

*Total water in mix at time of mixing, including free water in the aggregates and liquid admixtures.

**** END OF SECTION ****

SECTION 03450

PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Furnishing and installation of precast manholes for air release valves, blowoff valves and gate/butterfly valves.

1.02 RELATED SECTIONS

- A. Section 01090 – Reference Standards
- B. Section 01300 – Submittals
- C. Section 02200 – Earthwork
- D. Section 02607 – Rubberized Sealing System
- E. Section 02665 – Water Main, Valves and Appurtenances
- F. Section 03300 – Cast-In-Place Concrete

1.03 STANDARDS

- A. ASTM A48 Specification for Gray Iron Castings.
- B. ASTM A536 Specification for Ductile Iron Castings.
- C. ASTM A615 Specification for Deformed and Plain Billet – Steel Bars for Concrete Reinforcement.
- D. ASTM C150 Specification for Portland Cement
- E. ASTM C260 Specification for Air-Entraining Admixtures for Concrete
- F. ASTM C361 Specification for Reinforced Concrete Low-Head Pressure Pipe
- G. ASTM C478 Specification for Precast Reinforced Concrete Manhole Sections
- H. ASTM C923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
- I. ASTM D2240 Test Method for Rubber Property – Durometer Hardness
- J. Federal Specification SS-S-210 Sealing Compound, Preformed Plastic for Expansion Joints and Pipe Joints

- K. Commonwealth of Massachusetts Department of Transportation, Highway Division Standard Specifications for Highways and Bridges
 - L. Federal Specification TT-C-494 Asphalt Varnish
- 1.04 SUBMITTALS
- A. Product Data
 - 1. Submit drawings and data covering precast concrete sections and castings in accordance with Section 01300.
 - B. Shop Drawings and Computations
 - 1. Submit computations and drawings prepared and stamped by a Massachusetts registered professional engineer for precast concrete structures.
 - 2. Manufacturer's product data for manhole frames and covers, manhole steps, non-shrinking grout, resilient pipe connections, and waterproofing.
 - 3. Provide detailed drawings of underground structures, connections, and manholes.
 - 4. Certified load test results indicating castings are capable of withstanding the specified loading.
- 1.05 QUALITY ASSURANCE
- A. General
 - 1. Contractor to field verify grade of pipe and appurtenances prior to ordering precast manholes.
 - B. Shop cast by manufacturer engaged in the fabrication of precast concrete products. Manufacturer shall have been continuously engaged in the manufacture of precast concrete products for the past five years.
 - C. Design Responsibility
 - 1. Submit the following support data.
 - a. Certification, signed by Massachusetts Registered Professional Engineer, stating that members, elements and connections are designed to withstand loads and forces shown on the Drawings.
 - b. Codes and specifications to which structural design conforms.
 - D. Requirements. Precast concrete units shall withstand loads indicated on the Drawings and impact loads imposed during shipping and erecting, including flotation and waterproofing criteria.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. Cast and finish to following tolerances:
 - a. Overall length - $\pm 1/4$ inch
 - b. Overall height - $\pm 1/4$ inch
 - c. Overall width - $\pm 1/4$ inch
 - d. Wall, floor, and roof thickness - $\pm 1/4$ inch, - $1/8$ inch
 - e. Position of handling devices - $\pm 1/2$ inch
 - f. Squareness of ends (vertical and horizontal alignment) - $\pm 1/4$ inch
 - g. Face width of joint - $\pm 3/16$ inch
 - h. Anchors and inserts - $\pm 1/4$ inch
2. Check each unit for compliance with these tolerances before shipment to site.
3. Where surface repairs are required, repaired surfaces shall match adjacent surfaces. Precast manholes which require surface repairs to more than 25 percent of interior or exterior surfaces will not be accepted by the Owner and shall not be delivered to site.
4. Precast structures with cracks or imperfections will not be accepted by the Owner, and shall not be delivered to site. Cracks are hereby defined as any crack which is greater than $1/16$ inch wide and 12 inches in length.

B. Acceptance at Site

1. Inspect precast concrete sections when delivered.
2. Reject cracked or otherwise defective units. The Contractor shall remove rejected units from the site and replace with new units at no additional cost to the Owner.

C. Storage and Protection

1. Do not bump or drop.
2. Do not allow hooks to come in contact with joint surfaces.

1.07 SEQUENCING AND SCHEDULING

- A. Do not deliver precast concrete sections until representative concrete control cylinders have attained a strength of at least 80 percent of minimum specified herein.

- B. Deliver units to the job site and store off the ground on supports, and protect from the weather and on-site damage by the use of a tarpaulin protective covering.
- C. Carefully handle units using web slings for lifting.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Precast Concrete
 - 1. Rotondo & Sons, Inc., Rehoboth, MA
 - 2. Concrete Systems, Inc., Londonderry, NH
 - 3. Ray Precast Company, Marshfield, MA
 - 4. Or equal
- B. Manhole Frames and Covers
 - 1. East Jordan Iron Works, East Jordan, MI
 - 2. Neenah Foundry, Needham, MA
 - 3. Ethridge Foundry, Portland, ME
 - 4. Quality Water Products, Inc., South Barre, MA
 - 5. Or equal
- C. Frost Proof Frames and Covers
 - 1. Quality Water Products, South Barre, MA
 - 2. East Jordan Iron Works, East Jordan, MI
 - 3. Neenah Foundry Company, Neenah, WI
 - 4. Or equal
- D. Locking, Watertight Frames and Covers
 - 1. Neenah Foundry Company, Neenah, WI
 - 2. Campbell Foundry Company, Harrison, NJ
 - 3. East Jordan Iron Works, East Jordan, MI
 - 4. Or equal
- E. Non-shrinking Grout

1. Gifford-Hill
2. L&M Concrete Forms, Inc., Omaha, NE
3. Master Builders
4. Sauereisen Cements Co., Pittsburgh, PA
5. U.S. Grout Corporation, Fairfield, CT
6. Or equal

F. Coal Tar Coating

1. Carboline Company, Kop-Coat Division
2. Tnemec
3. Valspar Corp.
4. Or equal

G. Insulation

1. Pittsburgh Corning
2. Upjohn Manufacturing
3. Dow Chemical
4. Or equal

H. Flexible Sleeve Connectors

1. Lock Joint Flexible Manhole Sleeve
2. Kor-n-Seal Connector
3. PSX Press-Seal Gasket
4. Or equal

2.02 MATERIALS

A. Concrete Sections

1. Precast concrete manhole and vault riser and base sections
 - a. General

- 1) Reinforcement shall conform to ASTM C478. Minimum concrete compressive strength shall be 4000 psi.

- 2) Manholes minimum wall thickness: 1/12 of inside diameter, plus one inch.
 - 3) Manholes shall be designed to support AASHTO HS-20 traffic loading.
 - 4) Manholes shall be capable of supporting lateral earth pressure.
- b. Riser and base sections
 - 1) Circular Sections shall have uniform outside diameter.
 - 2) Rectangular Sections shall have square corners and true sides.
- c. Flat Slab Tops for Manholes
 - 1) Top section shall conform to the Contract Drawings.
- d. Conical Reducing Sections for Manholes
 - 1) Conical reducing sections generally will not be used. If used, reducing section shall have a wall thickness not less than five inches at the bottom and a wall thickness of eight inches at the top. Minimum vertical height of conical reducing section shall be four feet for manholes.

B. Manhole Gaskets

1. Mastic

- a. Federal Specification SS-S-210.
- b. Use cross-sectional area as recommended by manhole manufacturer.
- c. Snyder “Ram-Nek”, Hamilton-Kent “Kent-Seal No. 2”, Sheller-Globe “Tac-Tite”, or equal.

2. Rubber

- a. ASTM C361, except use synthetic gasket with hardness of 40 plus or minus 5 when measured by ASTM D2240.

C. Castings

1. General

- a. Cast Iron – ASTM A48, Class 30B or better.
- b. Ductile Iron – ASTM 536-77.

- 1) Locking, watertight ductile iron manhole frames and covers, nominal 30-inch diameter, shall be used on all venturi meter chambers.
 - 2) Frames and covers shall be for heavy duty use suitable for H-20 loads.
2. Manhole Frames and Covers
 - a. Cast Iron
 - 1) E.L. LeBaron Foundry Company “No. LB-268-100”, Neenah Foundry “1878-A5G”, Ethridge Foundry “SA 248-O”, or equal.
3. Frost Proof Frames and Covers
 - a. Where noted on the Drawings, the Contractor shall supply and install watertight, ductile iron frames and covers matching the Owner’s standard manhole cover design as indicated on the Drawings.
 - b. Frost proof frames shall have a maximum 24-inch clear opening. Covers shall weigh no more than 175 pounds. The frame and cover shall withstand AASHTO HS-20 loadings.
 - c. Frames and covers shall have a shop coat of Asphalt Varnish, Federal Specification TT-V-51.
4. Locking, Watertight Meter Manhole Frames and Covers
 - a. General
 - 1) Ductile Iron ASTM A536, Grade 65-45-12 or better.
 - 2) Frame and cover shall be as shown on Drawings.
 - b. Frame and Cover
 - 1) Shall have six (6) cam-type bolts equally spaced around the cover.
 - 2) Cover shall weigh no more than 150 pounds.
 - 3) Frame and cover shall be designed for H20 loading.
 - c. Gasket
 - 1) Frame and cover shall have neoprene gasket such that the frame and cover are watertight when cover is locked in place.
 - d. Coating

- 1) Frames and covers shall have a shop coat of Asphalt Varnish, Federal Specification TT-V-51.

D. Waterproofing

1. The outside surface of all buried precast manholes, valve structures, and air release structures shall be coated with a waterproof protective membrane. Membrane material shall be a single component cold applied, coal tar free, liquid polyurethane membrane which shall form a seamless, impermeable, non-deteriorating rubber membrane. Properties of cured materials shall be as follows:

<u>Property</u>	<u>Vertical</u>
Tensile Strength per ASTM D412	170 psi
Die C Dumbbell	760-1172 kPa
Elongation, per ASTM D412	700%
Hardness Shore A per ASTM D412, Ply Up Method	35-45
Resilience (Recovery %) per ASTM D412 Die C Dumbbell	
At 100% elongation	100%
Moisture Vapor Transmission	
gm/hr/ft ²	0.002-0.129

2. The inside surface of all buried precast revenue meter structures shall be coated with a non-toxic, moisture vapor barrier and waterproofing barrier. Barrier coating shall be DP-36 by Pro-Seal, Inc., Conseal 1000 by WET, UGL Drylock, or equal. Installation shall be done in accordance with manufacturer instructions.

E. Flexible Pipe-To-Manhole Connector with Flexible Annular Space Filler

1. General
 - a. ASTM C923.
 - b. Band and clamp non-magnetic Series 304 stainless steel.
 - c. Nitrile and PVC cavity O-ring.
 - d. Do not furnish connectors using castings and bolts with non-resilient bearings.

F. Non-shrinking Grout

1. Non-shrink, Non-metallic Grout: Provide non-metallic cement-based grout requiring only the addition of water, with minimum 28-day compressive strength of 7,5000 psi, with shrinkage compensation characteristics in both the plastic and

hardened states, conforming with ASTM C1107, “Grade C”. Provide one of the following products:

- a. Five Star Grout 100 by five Star Products Inc.
- b. SikaGrout 212 as manufactured by Sika Corporation.
- c. Masterflow 928 by Master Builders, Inc.
- d. Or equal.

G. Miscellaneous Materials

- 1. Precast concrete adjusting rings.
- 2. Circular rings with shear keys.
- 3. ASTM C478.
- 4. Non-shrinking grout: Gifford-Hill “Supreme”, L&M “Crystex”, Sauereisen Cements “F-100 Level fill Grout”, U.S. Grout “Five Star Grout”, or equal.
- 5. Mastic fill:
 - a. Butyl rubber compatible with resilient connector material.
- 6. Insulation:
 - a. Two inch thick (minimum) insulation.
 - b. “R value” shall be at least 17.0.
 - c. Pittsburgh-Corning Foamglass, Upjohn Mfg. Urethane, Dow Styrofoam, or equal.
 - d. Insulation adhesive and coating as recommended by insulation manufacturer.
 - e. Coating and insulation shall not be damaged during placement and compaction of backfill.
- 7. Coal tar coating: Koppers “Bitumastic SuperService Black”, Tnemec “46-465 Heavy Duty Black”, Valspar “35-J-10”, or equal.
- 8. Expandable plugs: rubber, air tight to 8 psi with wing nut type expansion mechanism.
- 9. Connector between sewer manhole and pipe: rubber seal system meeting the requirements of ASTM C923 and recommended by the manhole manufacturer for the type of connection.

2.03 FABRICATION

A. Concrete Sections

1. If boxouts for grouting are used, groove or roughen surfaces to improve grout bond.
2. Provide lifting notches on inside faces of precast section walls to facilitate handling
 - a. Do not make notches more than 3 inches deep.
 - b. Do not extend hole through wall.
3. Dampproof precast units in shop.
 - a. Apply one coat of coal tar coating to outside surfaces of each section.
 - b. All surfaces shall be dry, firm and free of voids, projection, loose materials, oil, grease, asphalt, curing compounds and other foreign matter. ACI 301-1104 (b) float finished surfaces shall be considered as the minimum acceptable finish.
 - c. Waterproof membrane shall be applied to precast concrete in a single application using a smooth edge trowel at the rate of 4 gallons per 100 square feet to achieve a dry film thickness of 60 mils or as recommended by the manufacturer. Joints and cracks shall be filled and reinforced per manufacturer's recommendations.
 - d. Coat removable precast concrete panels with cementitious waterproof membrane. Membrane may be field or shop applied.

B. Castings

1. Standard dimensions for manhole frames and covers are shown on the Drawings.
2. The bearing surfaces of frames and covers and frames and grates against each other shall be machined to give continuous contact throughout their entire perimeter.
3. All iron castings shall be cleaned at foundry.
4. The ductile iron castings shall be even-grained ductile iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended.

PART 3 EXECUTION

3.01 PREPARATION

A. Cementitious Waterproofing

1. Comply with manufacturer's instructions and recommendations except where more restrictive requirements are specified in this section.
2. Remove all grease, oil dust, laitance, paint, coatings, curing compounds, unsound and weak concrete and all foreign materials from concrete surfaces to which cementitious waterproofing is to be applied. Use blast cleaning, wet or dry sandblasting, acids or concrete cleaners and degreasers to clean the concrete and remove unsound and weak concrete.
3. Roughen surfaces where cementitious waterproofing is to be applied to produce a firm granular surface with a minimum surface profile of medium grade sandpaper.
4. Repair cracks spalled areas and patch holes at no additional cost to the Owner.
 - a. Rout cracks to a minimum width of 1-inch and patch with non-shrink cementitious membrane waterproofing.
 - b. Seal crack with active water leaks using waterproofing plug or an injectable polyurethane grout designed to stop the flow of water.
 - c. Patch all honey combed or spalled concrete areas with cementitious waterproofing.
5. Surface Wetdown: Saturate surfaces using potable water prior to application of waterproofing. Remove all standing water prior to application. No water gloss shall be visible prior to applications.

3.02 INSTALLATION

A. Bases

1. Construct manholes with precast concrete (developed) bases.
 - a. Precast bases:
 - 1) Excavate subgrade materials to undisturbed earth and uniform elevation allowing installation and dynamic compaction of at least 12 inches of granular embedment material, as specified in Section 02200, Paragraph 2.02.B.
2. Grade surface of granular material and set base section so connecting pipes will be on line and grade.
3. Adjust elevation of granular material until grade and alignment of base section is attained.
4. Do not wedge or block under precast concrete bases.

B. Riser Sections for Manholes

1. Provide circular precast sections with rubber or mastic gasket to seal joints between sections.
 - a. Only use mastic gaskets at temperature recommended by manufacturer.
 2. Fill lifting notches in manhole walls with non-shrinking grout.
 3. Cast in or grout in manhole steps into prepared holes with non-shrinking grout.
 - a. Cut embedded legs to prevent protruding through manhole wall.
- C. Connecting Piping for Manholes
1. Drains: fill space between connecting pipes and wall of precast sections with non-shrinking grout.
 2. Sewers: use rubber seal system in accordance with ASTM C923.
- D. Waterproofing
1. Shop applied:
 - a. Apply one trowel-applied coat of membrane as specified in Paragraph 2.02.D and as recommended by shop manufacturer.
 2. Field applied:
 - a. If shop applied waterproofing has been damaged during construction, paint outside surface of each manhole with one coat of waterproofing protective membrane as specified herein and as recommended by manufacturer before backfilling at no additional cost to the Owner.
 3. Cementitious Waterproofing:
 - a. Comply with manufacturer's instructions and recommendations except where more restrictive requirements are specified in Paragraphs 2.02.D and 3.01.A of this Section.
 - b. Apply waterproofing in the presence of a manufacturer's authorized representative.
 - c. Mix in accordance with the manufacturer's written instructions using potable water.
 - d. Apply waterproofing in a uniform coating by brush or trowel in accordance with manufacturer's instructions and recommendations. Provide minimum in-place thickness of 1/8-inch completely filling voids, holes, and cracks, leaving no pinholes or holidays.
 - e. Provide cants of waterproofing at all corners, changes of plane, and other locations as recommended by the manufacturer.

- f. Protect and cure membrane in accordance with the manufacturer's instructions and recommendations.

E. Painting Castings

- 1. If castings arrive on job without a foundry coating, apply one coat of asphalt varnish as specified herein.
 - a. Clean castings and support before painting.
 - 1) Remove loose rust by wire brushing.
 - b. Do not handle castings until paint is dry and hard.
- 2. Non-Shrink Grout: Non-shrink grout shall be installed in accordance with manufacturer's written instructions.

F. Castings

- 1. Frames shall be set in full mortar beds. All void beneath the bottom flange shall be completely filled to make a watertight fit. A ring of mortar not less than 1-inch thick shall be placed around the outside of the bottom flange extending to the outer edge of the masonry all around the circumference.

** END OF SECTION **

APPENDIX

APPENDIX A

DCR CONSTRUCTION ACCESS PERMIT

Construction Access Permit

Instructions for Online Filing



Construction Access Permit

- ☐ How to create an account on ePLACE
- ☐ How to file an online application
- ☐ How to pay the application fee
- ☐ How to check your permit status
- ☐ How to get help

Register for an Account

Create or Log-in to your account in ePlace

First time users click [here](#)

Be sure to provide your full name, address, and contact information when setting up your account. This information will be used for your application.

The screenshot shows the EEA ePLACE Portal website. The top navigation bar includes links for "State Offices & Courts", "State A-Z Topics", "State Forms", and "Accessibility FAQs". The main header features the "Mass.gov" logo and the "EEA ePLACE Portal" title, with a subtitle "An Official website of the Commonwealth of Massachusetts". The navigation bar also includes links for "Announcements", "Accessibility Support", "Register for an Account", and "Login".

The main content area is divided into several sections:

- Need Help?** For technical assistance in using this web application, please call the ePLACE Help Desk Team at (844) 733-7522 or (844) 733-ePLACE between the hours of 7:30 AM-5:00 PM Monday-Friday, with the exception of all Commonwealth and Federally observed holidays. If you prefer, you can also e-mail us at ePLACE_helpdesk@state.ma.us. For assistance with non-technical questions, please contact the issuing Agency directly using the links below.
- Contact:** Energy and Environmental Affairs, MASSDEP; Energy and Environmental Affairs, MDAR; Energy and Environmental Affairs, DCR.
- For DPL, DCAMP and ABCC permits or licenses, please click here.**
- Convenience Fee:** Please note there will be a convenience fee for all online credit card transactions. There is also a nominal fee for online payment by check.

A "Home" button is located at the bottom of the main content area.

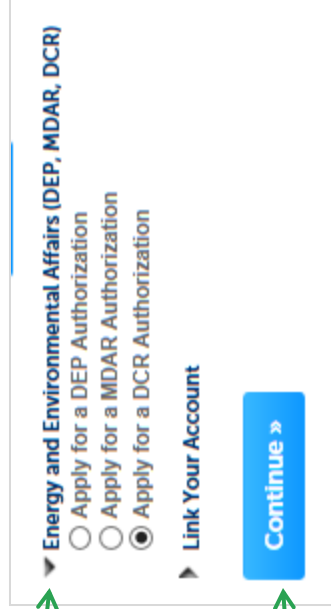
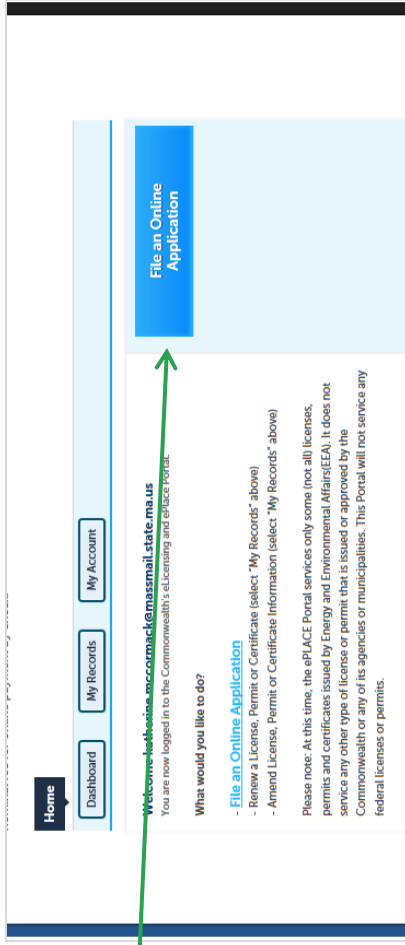
The right sidebar contains a "Login" section with fields for "User Name or E-mail" and "Password", and a "Login" button. Below this is a checkbox for "Remember me on this computer I've forgotten my password" and a link for "New Users: Register for an Account". A "Please note" section states: "At this time, the ePLACE Portal services only some (not all) licenses, permits and certificates issued".

File an Online Application

Click [here](#) to file an online application and follow the pages accordingly

Expand the EEA list by clicking on the ► to the right

Select 'Apply for a DCR Authorization' and click Continue



File an Online Application

Click the
“Construction and
Vehicle Access
Permits” to see
available
applications

Select Construction
Access Application
and Click “Continue
Application”

Home

DCR Applications

Select a Record Type

Choose one of the following available record types. For assistance or to apply for a record type not listed below please contact us.

Search

Construction and Vehicle Access Permits

Annual Commercial Vehicle Application

Boylston Street September 1st Moving Application

Construction Access Application

Emergency Construction Notification

Short-Term Vehicle or POD Application

Special Use Permits

Continue Application »

1. Contact Information – Permittee

If you are completing this application on behalf of the Permittee, Look up and select the Permittee

If you are the Permittee, select I'm Permittee

Note: Permittee will need to be registered in the EEA ePlace Portal prior to starting this application so they can be selected from the list.

Home

DCR Applications

Construction Access Application

1 Contact Information	2 Application Information	3 Documents	4 Review	5 Record Submitted

Step 1: Contact Information > Page 1 of 1

Permittee

Permittee is the person or signatory authority whom is responsible for signing and accepting all conditions of the Permit. If you are the Permittee, please select "I'm Permittee".

If you are preparing the application on behalf of the Permittee, click on "Look Up", search and select the appropriate Permittee.

Note – If you are unable to find the correct Permittee, click on "save and resume later" button. Advise the Permittee to create an account in the EEA ePLACE Portal and then resume the application.

I'm PermitteeLook Up

Look Up Contact

First:Middle:Last:

E-mail:

Look UpClearCancel

1. Contact Information – Permittee Company

If applicable, Add

the Permittee

Company. This

information is for

the company that

has requested this
application

Click Add New to
enter the

information, once the
information has been

entered click

Continue

Permittee Company

If applicable, please add the company information that the Permittee is affiliated with.

Add New

Contact Information

* Individual/Organization:

Organization

* Name Of Organization

Contact Person

* Country:

United States

* Address Line / P.O.Box:

* City:

* State:

--Select--

* Zip:

E-mail:

Telephone #

Continue

Clear

Discard Changes

1. Contact Information – Application Contributors

If you are going to have prepares help you fill out this application, please Look up and select them in this section

Note: All Prepares will need to register in the EEA ePlace Portal, so that you are able to select them from the list

Click “Continue Application” to go to the next page

Application Contributors/Prepares

If multiple prepares will be part of filling out this application, you will need to add them below.

Note – If you are unable to find the correct Preparer, click on “save and resume later” button. Advise the Preparer to create an account in the EEA ePLACE Portal and then resume the application.

Look Up

Showing 0-0 of 0

Full Name	Business Name	Contact Type	Work Phone	Fax	E-mail	Action
No records found.						

Continue Application »

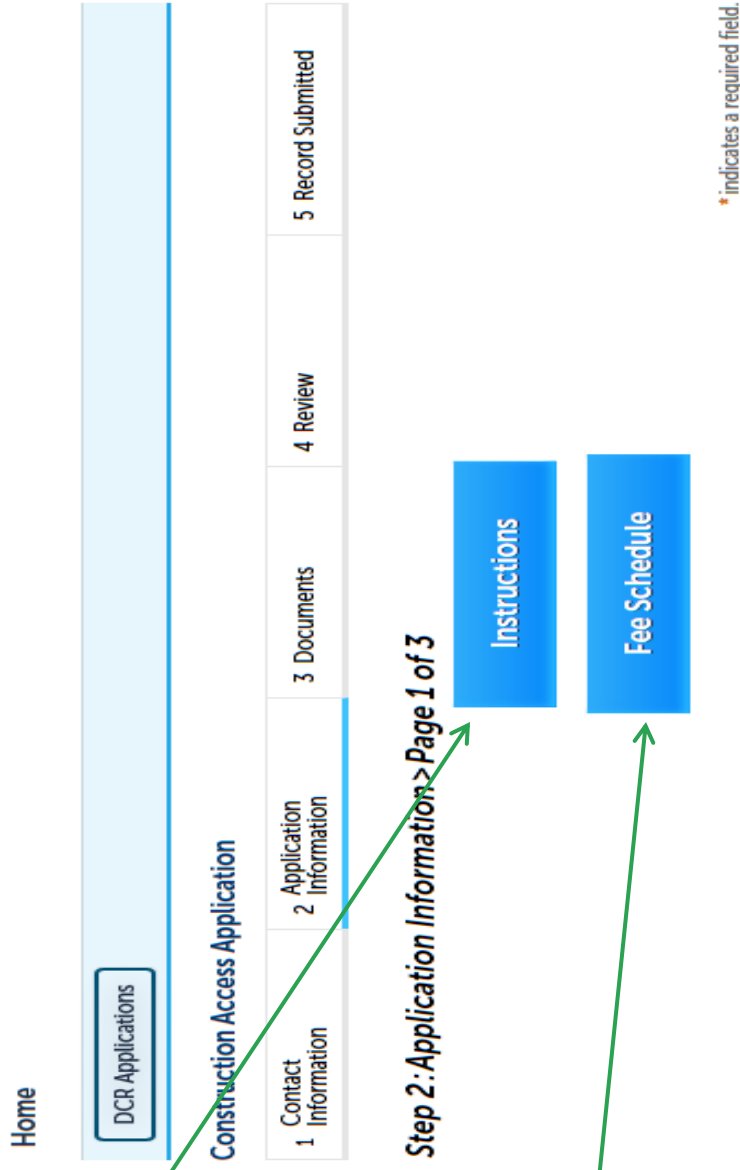
Save and resume later

2. Application Information

Click on
“Instructions” for
more information
about this permit

Click “Fee
Schedule” of
more information
on the calculation
of the
constructions
fees

*Note: Additional
Construction fees
may apply and will
be assessed at a
later time, by the
agency*



2. Application Information – Project Location

Enter Project
Location of where
the construction
will take place

Latitude and
Longitude are
required, to find
that information,
please click the ?
mark

Click “Continue
Application” to go
to the next page

Project Location

Name the DCR property or properties; Park and/or Parkway, plus specific location and municipality the access and/or construction is sought, address of work site.

• DCR Property Affected :

• Latitude (If you need help finding the correct information, please click on the questions mark) : ?

• Longitude (If you need help finding the correct information, please click on the questions mark) : ?

Provide detailed locations if multiple DCR locations are affected:

• Address Line 1 :

Address Line 2 :

• City :

State :

• Zip :

Continue Application »

Save and resume later

Appendix A

2. Application Information

If this application is a follow up of a prior notified Emergency, please enter that record number here

Enter your construction dates. These dates are not guaranteed and are subject to Agency approval

Enter your operating hours and days. These are not guaranteed and are subject to Agency approval

Construction Access Application

1 Contact Information	2 Application Information	3 Documents	4 Review	5 Record Submitted

Step 2: Application Information > Page 2 of 3

Emergency Notification

* indicates a required field.

If you previously completed an Emergency Construction Notification for this project, please enter the number below.

ECN Number:

Construction Dates

Requested dates are subject to DCR approval and are not guaranteed.

* Requested Start Date:

* Requested End Date:

Operating Hours

Requested hours are subject to DCR approval and are not guaranteed.

* Requested operating hours and days:

2. Application Information

Enter your general contractor or sub-contractor information

If you don't have this information at time of filling out this application, please provide it to the agency once known

- App A - 12

Click "Continue Application" to go to the next page

GC or Sub. Information

If the contractor changes throughout the project, please notify the agency.

Company Name :	
Primary Contact Name :	
Office Phone:	
Mobile Phone:	
Email :	
Address Line 1 :	
Address Line 2 :	
City :	
State :	
Zip :	

Continue Application »

Appendix A

Save and resume later

2. Application Information – Project Information

Enter the project information and answer to all the questions accordingly

Note: Some additional documentation will be required depending on the answers of the questions

Click “Continue Application” to go to the next page

Construction Access Application

1 Contact Information	2 Application Information	3 Documents	4 Review	5 Record Submitted

Step 2: Application Information > Page 3 of 3

Project Information

Describe the Purpose of the Project :

Company Project Number/Work Order (If this is not applicable, please enter N/A):

Do you have a detailed project schedule? :

☐ Yes ☐ No

Is a trench required for this project? :

☐ Yes ☐ No

Will this project use trucks that are over 40 tons in weight? :

☐ Yes ☐ No

Will a crane be set up on DCR property? :

☐ Yes ☐ No

Is this request for a lay-down area? :

☐ Yes ☐ No

Will this project impact roadway or pedestrian traffic? :

☐ Yes ☐ No

Are there other environmental permits or licenses that are needed for this project? :

☐ Yes ☐ No

Continue Application »

Save and resume later

3. Documents

Attach all the required documents in order to move forward with the application

To upload the documents, click ADD and select from your list and click Continue

Note: You will not be able to move forward until these documents have been added. For description on what these documents are, please go to back to the Mass.gov page



Construction Access Application

1 Contact Information	2 Application Information	3 Documents	4 Review	5 Record Submitted

Step 3: Documents > Page 1 of 1

* indicates a required field.

List of Documents

Please upload 3 Required Document(s) which are mandatory to Submit this Application:

- 1. Construction and Engineering Plans
- 2. Locus Plan of the Area
- 3. Photo of Existing Work Location Conditions

Attachment

When uploading file document(s) the maximum file size allowed is 50 MB. The 'File Name' (including file extension) MUST NOT exceed 71 characters. The document 'Description' MUST NOT exceed 50 characters. Documents that exceed any of these limits will be removed by the system, and cannot be retrieved, which may delay the review process. .exe;.dll;.js;.msi;.bat;.vbs;.bin;.sql are disallowed file types to upload.

Name	Type	Size
No records found.		

Add

Continue Application »

File Upload

When uploading file document(s) the maximum file size allowed is 50 MB. The 'File Name' (including file extension) MUST NOT exceed 75 characters in length. The document 'Description' MUST NOT exceed 50 characters in length. Documents that exceed any of these limits will be removed by the system, and cannot be retrieved, which may delay the review process. .exe;.dll;.js;.msi;.bat;.vbs;.bin;.sql are disallowed file types to upload.

Desert.jpg

100%

Continue

Add

Remove All

Cancel

Appendix A

3. Documents

List of Documents

Please upload 3 Required Document(s) which are mandatory to Submit this Application:

1. Construction and Engineering Plans

2. Locus Plan of the Area

3. Photo of Existing Work Location Conditions

Attachment

When uploading file document(s) the maximum file size allowed is 50 MB.
The 'File Name' (including file extension) MUST NOT exceed 75 characters in length.
The document 'Description' MUST NOT exceed 50 characters in length.
Documents that exceed any of these limits will be removed by the system, and cannot be retrieved, which may delay the review process.
.exe;.dll;.js;.msi;.bat;.vbs;.bin;.sql are disallowed file types to upload.

Name	Type	Size	Latest Update	Action
Desert.jpg	Construction and Engineering Plans	826.11 KB	03/11/2019	Actions ▼
Jellyfish.jpg	Photo of Existing Work Location Conditions	757.52 KB	03/11/2019	Actions ▼
Hydrangeas.jpg	Locus Plan of the Area	581.33 KB	03/11/2019	Actions ▼

Add

Continue Application »

Save and resume later

Upload all the required types as displayed. There could be more required documents depending on your project

Note: Name of document should not exceed 75 characters. Please read the instructions

Click “Continue Application” to go to the next page

4. Review and Certification

Review the application information to make sure it is correct

Click “Edit Application” to change any information

If all information is correct, click the checkbox and agree

Click “Continue Application” to go to the next page

Review and Certification

Edit Application

Permittee

I certify that I have read and understand the instructions that accompany this application:

- a. I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification statement;
- b. The information contained in this submittal is, to the best of my knowledge, true, accurate, and complete and that no material information has been omitted;
- c. I am aware that there are significant penalties for submitting false information including, but not limited to, possible administrative and civil penalties.

By checking the box below, I understand and agree that I am electronically signing and filing this application.

☐ By checking this box, I agree to the above certification.

Date:

Continue Application »

Save and resume later

Appendix A

5. Pay Fees

You have two options to pay the application fee, Pay Online or Pay by Mail

If you select Pay by Mail, your application will be submitted and you will need to send a check to the Agency, instructions on where to send the check will be emailed

Note: The agency will start the review of the application once the application fee has been paid. We encourage you make this payment online

Construction Access Application

1	2 Application Information	3 Documents	4 Review	5 Pay Fees	6 Record Submitted

Step 5: Pay Fees

Listed below is the fee for the authorization that you are applying for. The following screen will display your total fees.

Payment may be made by electronic check or credit card for a nominal processing fee. The electronic check fee is \$0.35 per transaction. Credit card payments are 2.35% per transaction. Clicking on the PAY ONLINE button will bring you to the secure online payments portal. Once you have made payment, you will receive a payment confirmation.

Payment may also be made by mail. Instructions on how to make a payment will be included in your email notification.

NOTE - If your permit requires additional costs, they will be accessed at a later date.

Application Fees/Costs

Fees	Amount
Construction Access Application Fee	\$50.00

TOTAL FEES

\$50.00

Pay Online »

Pay by Mail»

5. Pay Online

If you select “Pay Online” you will be redirected to a third party payment page.

Provide the information required on this page and click on “I accept” to indicate your acceptance of the Commonwealth of Massachusetts Terms of Agreement and nCourt Terms Agreement.

At the bottom of the page is the button to “submit Payment” or, if you wish to change your mind and pay by mail, Click the “Back” button to return to the application

Payment

Receipt

Payment

You have elected to pay for the following item(s).

Description	Attendee	Service Fee	Amount
DCR/CAP/Construction Access Permit/Application	19TMP-003398	\$1.18	\$50.00
		\$1.18	\$50.00

Total Amount Due: \$51.18

Billing Information

☐ Same As Previous Information

First Name

test

Last Name

tester

Street

1 test rd

City

boston

State/Territory

Massachusetts

Zip

02108

Phone Number

(111) 111-1111

Email

test@test.com

Confirm Email

test@test.com

Back

Payment Information

Credit/Debit Card

Electronic Check/ACH

Card Type

VISA

Card Number

11111111111111111111

CVV Code

000

Expiration

01

2020

Check to accept both the Commonwealth of Massachusetts and nCourt Terms Agreements.

☒ I Accept

Commonwealth of Massachusetts Terms Agreement

I authorize the charge to my credit card for the amount shown above. I agree to pay the total amount above according to the card issuer agreement. By checking the box below, I certify that I am an authorized user for the above referenced credit card account.

nCourt Terms Agreement

Appendix A

Please Verify above information before the Submit Payment Button is pressed. Do not click Submit Payment button more than one time.

Submit Payment

6. Record Issuance

- Once your application is submitted you will receive a Record number. Please keep this number as reference to check the status

Construction Access Application

1	2 Application Information	3 Documents	4 Review	5 Pay Fees	6 Record Issuance

Step 6: Record Issuance

Successfully Completed.

Thank you for using our online services for your submission.
Your Record Number is 19-CP-0005-APP.

Please note that you will be receiving email notifications for your submission and the progress of your application. If you did not receive a confirmation email for your submission please contact the HelpDesk service, contact information provided above.

- You will receive two notifications after submission. A Proof of Record, which is a copy of your application and successful submission email.

- *Note: If you Pay Online, you will receive a payment receipt from the payment vendor nCourt*

7. Status of application

- To Check status of your application, please click on My Records tab

Date	Identifying Number	Record Type	Category	Expiration Date	Status	Action
☐ 03/11/2019	19-CP-0005-APP	Construction Access Application	Construction Access Application		In Review	
☐ 03/11/2019	19-CP-0004-APP	Construction Access Application	Construction Access Application		Payment Pending	Pay Fees Due

- A list of all your applications will be displayed here
- *Note: If you have any questions about your application status please call the DCR agency*

To Get Help

Questions about your ePLACE Account (account set up, password, find a form, make payment, My Records) or any technical issues, please call the HelpDesk services:

ePLACE_helpdesk@state.ma.us or call (844) 733-7522 (7:30 am –5pm, M-F)

Acceptance Form

Instructions for Online Filing



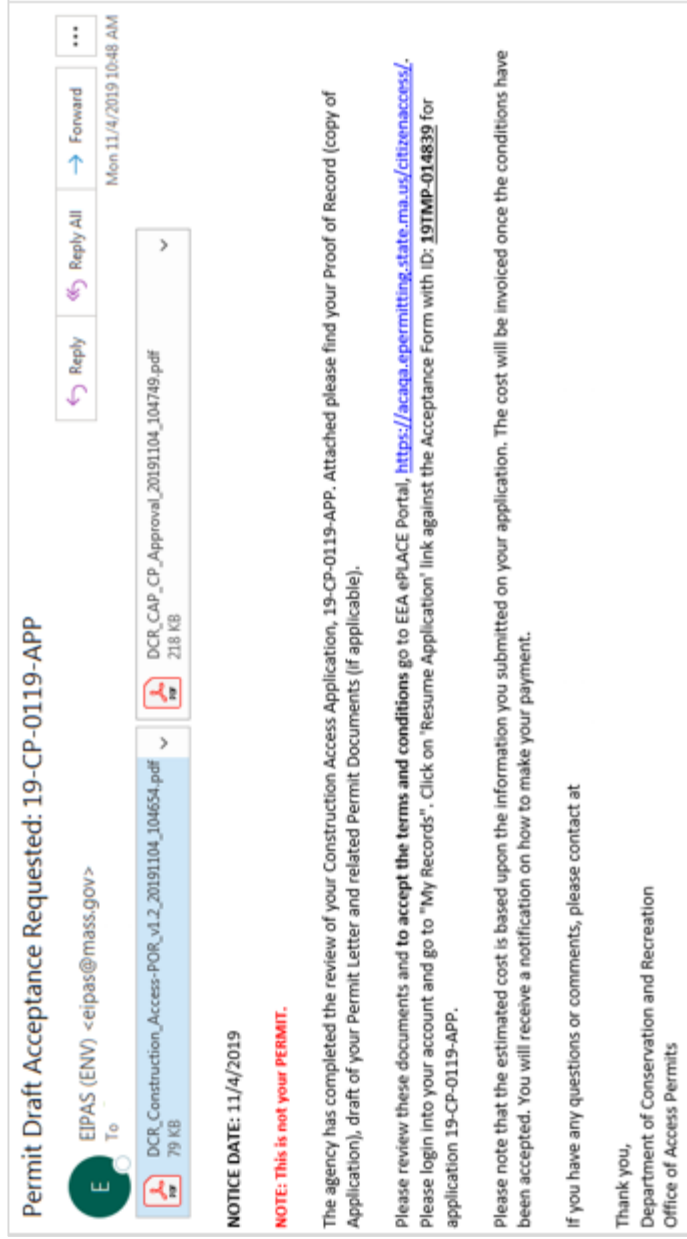
Acceptance Form Instructions Guide - Contents

CONTENTS OF THIS GUIDE	PAGES
<i>HOW TO FIND YOUR ACCEPTANCE FORM</i>	3
<i>HOW TO REVIEW THE ACCEPTANCE FORM AND ACCEPT OR REJECT THE CONDITIONS/TERMS</i>	4-6
<i>HOW TO CHECK THE STATUS OF APPLICATION</i>	7
<i>WHAT HAPPENS NEXT</i>	8
<i>GET HELP</i>	9

How to find your acceptance form

Upon the agency's review of your application/amendment form, an Acceptance Form maybe requested additionally

When an Acceptance Form is requested, you will receive an email indicating the same



Appendix A

How to find your acceptance form

- Log-in to your account and go to the 'My Records' tab for the Acceptance Form

- Look for the 'Resume Application' link next to the Acceptance Form

- Click on the link to view the contents of the form

▼ DCR

Showing 1-10 of 18 | [Download results](#) | [Add to collection](#)

☐	Date	Identifying Number	Record Type	Category	Expiration Date	Status	Action
☐	10/11/2019	19TMP-014778	Acceptance Form	Permit Approval for 19-CP-0020-AMD			Resume Application
☐	10/10/2019	19TMP-014763	Acceptance Form	Permit Approval for 19-CP-0110-App			Resume Application

Review Acceptance Form

Step 1. Acceptance Information

Please answer the question with a 'Yes' or 'No'. If you select 'No', please explain in the text box below

Click 'Continue Application' to proceed to the next page

Acceptance Form

1 Acceptance Information

2 Review

3 Record Submitted

Step 1: Acceptance Information > Page 1 of 1

Project Description

Record ID:
19-CP-0119-ADP

Record Name:
Construction Access Application

Project Description:

Acceptance Information

Do you (the Permittee) approve the draft of the permit, including all conditions within?:

☐ Yes ☒ No

If no, please describe your reasons for not approving:

Permittee

To View your contact, click the View link.

Applicant Information:
JOHN DOE
1 WINTER ST
BOSTON, MA 02108
Telephone #: 111-111-1111 Email: JOHNDOE@TEST.COM

Continue Application »

Save and resume later

Review Acceptance Form

Step 2. Review and Certification

Review the application information to make sure all the information provided is correct

Click 'Edit Application' to make changes to your application

If the information is correct, click the checkbox to agree

Click 'Continue Application' to submit the form

Acceptance Form

1 Acceptance Information	2 Review	3 Record Submitted

Step 2: Review

[Continue Application »](#)

Please review all information below. Click the "Edit" buttons to make changes to sections or "Continue Application" to move on.

Review and Certification

[Edit Application](#)

Permittee

JOHN DOE
1 WINTER ST
BOSTON, MA, 02108
United States

Telephone #111-111-1111
E-mail:JOHNDOE@TEST.COM

I certify that I have read and understand the instructions that accompany this application:

a. I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification statement;

b. The information contained in this submittal is, to the best of my knowledge, true, accurate, and complete and that no material information has been omitted;

c. I am aware that there are significant penalties for submitting false information including, but not limited to, possible administrative and civil penalties.

By checking the box below, I understand and agree that I am electronically signing and filing this application.

☒ By checking this box, I agree to the above certification.

Date: 10/15/2019

[Continue Application »](#)

[Save and resume later](#)

Review Acceptance Form

Step 3. Record Issuance

Once your application is submitted you will receive a record number

- You will receive notifications regarding the status of your submission

Acceptance Form		
1 Acceptance Information	2 Review	3 Record Issuance
Step 3 : Record Issuance		
 Successfully Completed.		
Thank you for using our online services for your submission. Your Record Number is ACPT-0057. Please note that you will be receiving email notifications for your submission and the progress of your application. If you did not receive a confirmation email for your submission please contact the HelpDesk service, contact information provided above.		

Appendix A

Status

Home

Dashboard

My Records

My Account

Advanced Search

▼ DCR

Showing 1-10 of 17 | Download results | Add to collection

☐	Date	Identifying Number	Record Type	Category	Expiration Date	Status	Action
☐	10/11/2019	19-CP-0020-AMD	Construction Access Scope Change Amendment	CP Scope Change Amendment		Accepted	
☐	10/11/2019	19-CP-0019-AMD	Construction Access New Date Request Amendment	CP Date Change Amendment		Approved	
☐	10/10/2019	19TMP-014763	Acceptance Form	Permit Approval for 19-CP-0110-App			Resume Application
☐	10/10/2019	CP-00060	Construction Access Authorization	Construction Access Application	10/11/2019	Amendment In Progress	
☐	10/09/2019	19-CP-0110-App	Construction Access Application	Construction Access Application		Approved	

Go to the 'My Records' tab to check the status of your notification/application

A list of all your applications will be displayed here

Note: If you have any questions about your application status please call the DCR agency

What Happens Next

Once the acceptance form is submitted, the agency will review the application/amendment to make a decision

If you (the permittee) have disagreed with the conditions of the permit on the acceptance form, the agency may contact you to understand your concerns

Once the final review is done, the agency will make a decision and you will be notified

To Get Help

Questions about your ePLACE Account (account set up, password, find a form, make payment, My Records) or any technical issues, please call the HelpDesk services:

ePLACE_helpdesk@state.ma.us or call (844) 733-7522 (7:30 am –5pm, M-F)

GENERAL CONDITIONS

A. CONDITION OF PREMISES

1. The Permittee acknowledges that it has made an inspection of the Premises and that the Premises are in a satisfactory condition, suitable for the purposes of this Permit in the Premises' existing condition and that it has not relied upon representations or statements of the DCR, its officers, employees or agents with respect to these conditions. The Permittee expressly agrees that the DCR has no obligation to make any alterations, repairs, additions, or improvements to the Premises. The Permittee acknowledges and agrees for itself and its contractors, subcontractors, officers, servants, agents, employees, representatives and invitees that it accepts the Permitted Area in 'as is', 'where is' and 'with all defects' condition; that DCR is under no obligation to make any repairs, renovations or alterations to the Permitted Area; that DCR has made no representations or warranties regarding the adequacy, operability, safety or fitness of the Permitted Area for any particular purpose or use; and that DCR has made no representations that the Permitted Area complies with applicable laws, ordinances, rules and regulations of government authorities. The Permittee further acknowledges and agrees that entry and activities upon the Permitted Area by the Permittee and its contractors, subcontractors, officers, servants, agents, employees, representatives and invitees shall be at the sole risk and sole expense of the Permittee.
2. At the Permittee's expense DCR property shall be restored/ returned to its original or better condition, in accordance with standards and specifications of the DCR and this permit.
3. Upon the expiration, termination, or revocation of this Permit, the Permittee shall promptly vacate and surrender the Permitted Area and remove all of its personal property from the Permitted Area. Any property not so removed shall, at the option of DCR and at the sole expense of the Permittee, either become the property of DCR or be removed by DCR and disposed of without any liability in DCR for such removal and disposition.

B. PERMIT TERM

1. The term for the use authorized herein is specified in the Special Conditions, subject to review of the Permittee's performance and compliance with all terms and conditions of this Permit.
2. All obligations required of the Permittee under the terms of this Permit shall expressly survive the given termination/ expiration date until such obligations are completed to the satisfaction of the DCR, unless the DCR has exercised its option to terminate the agreement.
3. If the Permittee is found to be noncompliant with any term and or requirement of this Permit, and does not remedy or cure the noncompliance matter promptly or within a time frame set by DCR, the DCR may immediately revoke this Permit.

C. ADMINISTRATION FEE; RESTORATION, CONSIDERATION; & MITIGATION; **[in accordance with 801 CMR 4.02]**

1. The Permittee shall pay the Commonwealth a fifty dollar administration/application fee.
2. In addition to the administration fee (C.1. above), and required work. The permittee will compensate DCR for the disruption to the DCR properties including parkway, boulevard, road and/or recreational facilities by doing mitigation and or the payment of Parkway/Roadway Excavation Fee, Sidewalk and Parkland modification fees.
3. See the Special Conditions of this permittee for the details of the compensation to DCR for the disruption to the DCR parkway and/or recreational facilities which may include fees or mitigation or a combination of both.
4. If mitigation is allowed as an alternate for the fees, the cost of the mitigation must equal or exceed the Parkway Excavation Fee, Sidewalk and Parkland modification fees: should the mitigation work not exceed the fee amount the difference shall be paid to DCR.

**SEE THE SPECIAL CONDITIONS AND THE PAYMENT TRANSMITTAL INVOICE FOR DETAILS ON FEES,
PAYMENT SCHEDULE AND MITIGATION APPROVED FOR THIS PERMIT.**

5. Payments, shall be made online or in the form of a money order, cashier's check or certified bank check payable to the Department of Conservation and Recreation (exclusively), accompanied by a DCR "Payment Transmittal Form," Exhibit 1 attached to this permit. Indicate your Permit Number on your check, all correspondence and on the mailing envelope; mail to the following address:

Department of Conservation and Recreation
Construction Access Permits
Application or Permit No: _____
 251 Causeway Street, Suite 700
 Boston, Massachusetts 02114

D. REQUIREMENTS

1. The Permittee shall keep a copy of this Permit at the Premises (on site and visible) and shall be solely responsible for maintenance, care, repair or replacement of all work, improvements or installations related to the permitted work placed or situated on the Premises at all times.
2. The Permittee shall be solely responsible for all expenses arising under this Permit.
3. The Permittee will not use any DCR utilities or resources without express permission from DCR. If the Permittee and or its representative or contractor uses any DCR utilities any expenses associated with that use is the responsibility of the Permittee.
4. The Permittee shall conform to all provisions of state, federal and local laws, rules and regulations applicable to the exercise of the rights and the performance of work under the Permit. Such provisions include, but are not limited to, all health, environmental, noise and sanitary standards and conditions required by Commonwealth of Massachusetts statutes; rules and regulations, including DCR regulations, local bylaws, engineering standards and administrative and executive orders.
 - a. Prior to the commencement of any work involving excavation or disturbance of any soils and or vegetation under this Construction / Access Permit:
 - i. Dig Safe must be notified for field mark-out of utilities (1-888-DIG-SAFE).
 - ii. The Permittee will comply with M.G.L. Chapter 254 requiring approval by the Massachusetts Historical Commission
 - b. The Permittee shall adhere to all OSHA Standards for Safety during the construction period.
 - c. The Permittee will comply with local noise regulations, exercising care to subject neighborhood abutters to the least amount of noise and vibration pollution during working and non-work hours.
5. All correspondence with the DCR regarding permitted activities should indicate the DCR Construction Permit Number associated with this permit.
6. If the work herein authorized is for a driveway entrance, this Permit is granted and accepted on the condition that if the ownership of the land to which the driveway is appurtenant shall at any time become united with that of any adjoining lot fronting on the roadway and also having an entrance on said roadway, then the DCR may revoke the right to maintain any or all of such entrances and grant a single entrance in place thereof. The entrance hereby granted shall be used only for the Premises shown on the Plan.
7. Within thirty (30) days, after completion of the project or a date specified herein, by the DCR in the Special Conditions, the Permittee shall submit a Mylar copy and pdf of as-built plan(s) for the Project as it relates to DCR property. This information shall be sent to Construction Access Permits, Department of Conservation & Recreation, 251 Causeway Street, Suite 700, Boston, Massachusetts 02114. In addition to the standard title box the permittee will list/add the DCR Construction Permit Number associated with this permit.
8. Within thirty (30) days, after completion of the project or a date specified by DCR in the Special Conditions, the Permittee shall submit two (2) copies of all final environmental reports generated for the Permittee's Project related to DCR property if applicable. One (1) copy each of the information will be sent (see Notices and Contacts) to the attention of the Environmental Section Head and the Regional Director.
9. The Permittee shall keep the Premises in a clean and orderly manner at all times.
10. The Permittee shall be solely responsible for ice and snow removal during the winter months and street sweepings during the spring, summer and fall on all DCR property associated with this permit and/or impacted by the permit, per DCR protocol (inclusive of all area where public access is possible, as well as but not limited to all roadways, sidewalks and walking paths), inclusive of any and all associated costs and labor. This responsibility will remain in place until the work area(s) are closed and all obstacles that would interfere with DCR's regular maintenance are removed, leaving the area unencumbered.

E. INSPECTIONS, ACCESS, AND PERMITS

1. The Permittee shall arrange for inspections by local health officials, utilities engineers, building inspectors and others as may be required.
2. The Permittee shall take prompt action to correct any condition that is found not compliant with any federal, state, or local regulation, code or statute.
3. The Permittee agrees at its own expense, to file for; obtain and comply with all applicable federal, state and local permits, licenses and approvals necessary for the work to be performed which is the subject of this Permit. Failure to obtain any required permits, licenses and or approvals, prior to the commencement of work, or failure to maintain such legal obligations in full effect throughout the term of this Permit shall be cause for revocation of this Permit by the DCR.
4. The DCR shall be provided full and unrestricted access to and upon the Premises at all times during the Term of this Permit to inspect the Premises and to review the operations and inspect the Permittee's equipment.
5. The permittee shall maintain adequate abutter access at all times.

F. PUBLIC SAFETY

1. The Permittee will hire as many safety and/or law enforcement details, as needed to ensure the general public (including but not exclusive of pedestrian, cyclists, and vehicular traffic) safety at all times during all permitted activities on and near the Premises. Advanced notice of starting work shall be provided to the appropriate authority.
 - a. For vehicle traffic management and public safety, in and/or on DCR property excluding parkways, boulevards, skating rinks, and or water sheds, the Permittee shall contact and hire as many Environmental Police Officers, as needed to ensure the safety of park users at all times.
 - b. For vehicle traffic management and public safety, in and/or on DCR Parkways, Boulevards, skating rinks, and or state water sheds the Permittee shall hire as many Massachusetts State Trooper details as necessary to ensure the public safety at all times during all activities on and/or near the Premises.
 - c. For work inside DCR Parks excluding motor vehicle traffic management on Chapter 90 Roadways (parkways and public ways), the Permittee may hire Park Rangers, to ensure the wellbeing of the public in low use situations, within the confines of the park (i.e. playing fields, bike-paths, parking lots, gardens etc.--).
 - d. For projects impacting both DCR property and municipal roadways, for safety and/or traffic management on the municipal roadways the Permittee may hire as many local safety and/or law enforcement details, or certified flagmen as needed to ensure public safety.
2. The Permittee shall barricade excavations with safety fencing and reflectorized drums with "Type A" flashers to guide personnel and eliminate free access to the work area on, in, or near the Premises. All flashers and "steady-burn" lights on drums must be in good working order. From dusk through dawn, the Permittee shall place sufficient working lights to protect the public from injury or damage.
3. Signage indicating the name of the Permittee, and including contact names and telephone numbers shall be on the premises (permitted work site) in plain view or erected during the duration of the Project.
 - a. Additional signage may be required by DCR; See Notice paragraph 2 and the Special Conditions.

G. RESTORATION OF PREMISES

1. See SPECIAL CONDITIONS for additional information specific to this permit.
2. At the Permittee's sole expense, DCR property shall be restored/returned to its original or better condition, or otherwise improved in accordance with this permit, and in accordance with standards and specifications of the DCR. The Permittee is responsible for repairing, replacing and restoring any and all damage to the DCR real or personal property, its infrastructure improvements and appurtenances, or any other property of third-parties, caused or necessitated by the Permittee by operation of this Permit, regardless of whether such damage occurs within or without the layout of the Premises itself.

- a. Any/all DCR utilities (storm drainage, electrical services, plumbing, sprinklers, sanitary services, dam and flood control structures, traffic signals and/or street lighting) worked on, damaged or altered (installation, change, relocation, modification, or adjustment) shall be replaced by the Permittee at their expense, unless specifically addressed in this permit.
 - b. Temporary service for the impacted utility shall be provided by the Permittee. The Permittee must provide adequate and safe services.
 - c. Temporary operating expenses for the impacted utility starting at the time of the disruption and/or installation, through DCR acceptance shall be the responsibility of the Permittee.
 - d. All utilities/equipment shall be replaced or reinstalled to working order by the Permittee at their expense unless specifically addressed in this permit or its attachments.
 - e. The appropriate DCR section chief, engineer and/or designee shall with assessment review and consultation, determine if the part(s)/fixture(s) may be reused and/or replaced. If the part(s)/fixture(s) need to be replaced, DCR shall supply the specifications.
 - f. All DCR utilities worked on by the Permittee shall be reviewed and/or inspected by DCR prior to acceptance.
3. Abandonment of existing underground utilities, pipes, chambers, etc.; The Permittee, its agents, contractor or representative shall take all appropriate measures to properly close, fill and cap all underground structure(s) to guard against future sinkholes and eliminate the possibility of future collapse of these abandoned structures. Pipe abandonment under DCR owned or controlled property shall be managed as follows:
 - a. Located under DCR roadways: All pipes, underground utilities, chambers etc. that are under the roadway must be completely filled with grout or high slump 500 psi concrete and abandoned in place.
 - b. Not located under DCR roadways: All pipes, underground utilities, chambers etc. that are 18-in. in diameter or greater must be completely filled with grout or high slump 500 psi concrete and abandoned in place. (Specification §.02650, ¶ 3.01 D.3).
 - c. All pipes that are less than 18-in. in diameter shall be securely plugged with brick, mortar, concrete and/or masonry plugs in both ends at least 12-in. thick and abandoned in place.
 4. Any and all parkways, boulevards, roadways, parking areas and/or driveways repairs including trench patches that remain in place for one year or longer will be reviewed by the Permittee and the DCR annually, until such time as the road is permanently repaved from curb to curb. Should the patch fail or prove to be inadequate, the Permittee will be responsible for removal and restoration of the failing area.
 5. All opening(s) shall be covered by steel plates when not in use. The Permittee shall not use steel plates that are vulnerable to flexing, or lateral movement due to vehicular traffic. Where any gaps exist between the plate and the roadway surface, “cold-patch” asphalt mix shall be used to fill those voids.
 6. In non-trench areas of roadways or sidewalks requiring repairs, the subgrade material shall be Massachusetts Department of Transportation – Highway Division (hereinafter MassDOT -HD) “Type C” Gravel (2” maximum aggregate size) and it shall be mechanically compacted in six-inch (6”) lifts.
 7. Pavement trimming: Only saw cutting (without overcuts) shall be allowed as a means of creating the final, permanent edge between existing and new hot-mix asphalt or cement concrete on any roadway or sidewalk. All accidental overcuts shall be filled with bituminous joint sealer. The standard “cutback” for all permanent pavement patches shall be twenty-four inches (24”) beyond the original pavement cuts made to perform the work allowed by this permit. If curbing does not allow for twenty-four inches (24”), then the face of the curbing will serve as the edge of the permanent pavement patch.
 8. Controlled-density fill (hereinafter the CDF) shall be used for backfilling trenches made in roadway or sidewalk pavement. The CDF shall conform to MassDOT -“Type 2E,” “Flowable and Excavatable.” (If the Permittee needs to use backfill materials with higher strength characteristics than MassDOT -“Type 2E” CDF, then the Permittee can request a waiver from the DCR to substitute that higher strength backfill.)
 - a. The Permittee shall place the CDF so as to allow enough room for a depth of pavement replacement that matches existing pavement thickness

- b. The Permittee is responsible for allowing sufficient curing time for the CDF prior to installing pavement material. The Permittee shall exercise extra caution in areas of high water table.
9. If the Permittee cannot use MassDOT -“Type 2E” CDF, trenches and other excavations shall be back-filled with DCR-approved gravel. The use of previously excavated material as backfill is acceptable, providing that the previously excavated material is suitable for sub-base with no stones larger than 3” in diameter, and is free of all clays and organic matter. However, immediately below any sidewalk or roadway surface, there must be a minimum of twelve inches (12”) of clean gravel borrow (MassDOT #M1.03.0 – Type “C” two-inch [2”] maximum stone size) for the sub-base.
10. All sub-base shall be mechanically compacted in six-inch (6”) lifts to ninety-five percent (95%) compaction, as tested by nuclear compaction equipment, and verified by the DCR on site.
11. The permanent pavement patch of bituminous concrete for roadway sections shall consist of the following minimum measurements: four inch (4”) base, two inch (2”) binder, one and three-quarter inch (1-3/4”) of “State Top” (one-half-inch (1/2”) stone size) top course. Pavement replacement thickness must match the existing pavement thickness, or conform to Figure # 1 “TYPICAL ROADWAY TRENCH REPAIR” whichever pavement depth is deeper.
12. All mixes shall conform to MassDOT “Type I” mixes: Base, Binder, “State Top” [with one-half inch (1/2”) stone size] for roadway use & “Dense Top” [with three-eighths inch (3/8”) stone size] for sidewalk use. The permanent hot-mix asphalt patch shall extend over the original trench cut, and act as a “bridge” twenty-four inches (24”). All hot-mix asphalt surfaces (vertical and horizontal) shall be coated with emulsion tack coat immediately prior to placing any new hot-mix asphalt layer.
13. The Permittee shall be responsible for the adequacy and performance of the trench pavement patch (roadway and/or sidewalk) and restoration of all affected curbing in the work zone. DCR reserves the right to have the trench patches repaired or replaced completely and curbing reset at the expense of the applicant as a result of incomplete or inadequate work by the Permittee.
14. All pavement markings removed and/or damaged during the course of construction must be replaced with markings matching the configuration, color, width and type (thermoplastic, paint, etc.) of the markings removed.
15. Any sidewalk replacement shall conform to the most recent Americans with Disabilities Act (hereinafter the ADA) or Architectural Access Board (hereinafter the AAB) handicapped accessibility standards, whichever is more stringent.
16. Any fine-grading of subgrade soils required before sidewalk installation shall be accomplished with MassDOT -M1.03.0 “Type C” Gravel Borrow (two-inch (2”) maximum stone size).
17. Any sidewalk damaged must be replaced with a material matching the existing sidewalk surface (hot-mix asphalt or cement concrete), and the replacement shall conform with the following;
 - a. The limits of the sidewalk repair shall include the entire work area and extend to the nearest sidewalk control joint. Sawcuts shall be made along those joints and only full, complete concrete sidewalk panels shall be removed. All demolished concrete walkways shall be removed from the DCR property and legally disposed of off-site.
 - b. All cement concrete sidewalk shall contain welded wire mesh. Welded wire mesh for cement concrete walks must meet ASTM Specification A185 and be 6 gauge wire with six-inch by six-inch (6” x 6”) squares. Only sheet mesh shall be permitted (no rolls). The mesh must be installed at mid-depth in the slab and rest on reinforcement “chairs” or cement concrete bricks spaced at 36” maximum in every direction to keep the mesh from deforming during cement concrete placement.
18. For all edgestone/curbing being reset or replaced, on both the front and back of the curbing/edgestone, 2,000 p.s.i. cement concrete (with a six-inch by six-inch (6” x 6”) profile) shall be installed for the entire length of the curbing/edgestone being reset or replaced, and the top surface of both the front and back sections of this cement concrete shall be one and three-quarter inches (1 ¾”) lower than the finished roadway elevation.

19. Detectable warning panels are required for any pedestrian ramp. The detectable warning panels for cement concrete pedestrian ramps shall be “brick-colored” and “safety yellow” for hot-mix asphalt pedestrian ramps. Exceptions to this are possible with the prior approval of DCR’s Chief Engineer, if, for example, the Permittee is trying to match the color of existing nearby pedestrian ramp warning panels. This work must be MUTCD, ADA and AAB compliant.

- a. Detectable warning panels can be precast concrete, cast-in-place concrete or other suitable material permanently applied to the ramp.

H. TRAFFIC MANAGEMENT

1. Traffic Management, including both Vehicle and Pedestrian management; the Permittee must provide safe passage to the public including but not limited to motorists, cyclists, pedestrians, workers, and others affected by the Permittee activities and are the sole responsibility of the Permittee.
2. The Permittee assumes full liability and responsibility for Traffic Management, and shall plan for traffic control on a case by case basis to adjust for the varying conditions among work locations in cooperation with the detail officer.
3. All work done on DCR roadways must conform to the **2009** U.S. Department of Transportation, Federal Highway Administration’s Manual on Uniform Travel Control Devices Guidelines (“MUTCD”) and the **April 28th 2009 Governors Executive Order 511**. Including recently updated Federal Regulations (the FHWA’s **Rule on Work Zone Safety and Mobility**) emphasize the importance of providing safe work areas for motorists, workers, and others affected by the maintenance/ utility/ construction activities; whenever the need is indicated the permittee should expand or improve traffic controls.
4. **For additional and permit specific Traffic Management requirements see the Special Conditions.**
5. Without limiting any of Permittee's obligations under this or any other Section of this Permit, the Permittee is responsible for proper Traffic Management, including the planning and installation of temporary traffic controls in maintenance, utility, or construction work areas, including, but not limited to, responsibility for ensuring that the pedestrian and vehicular safety is properly and safely performed according to all applicable federal, state, and local laws, regulations and governmental requirements.
6. The Permittee shall submit a site specific Traffic and Pedestrian Management Plan stamped by P.E. (hereinafter the TMP) for DCR’s review, comment, and subsequent approval.
7. The site specific **TRAFFIC MANAGEMENT PLANS** DCR approved will be strictly adhered to during field operations.
(see the Special Conditions, Item H for Approved Plan)
 - a. At the discretion of the DCR Chief Engineer or his designee, all TMPs must be prepared and stamped by a Massachusetts Licensed Engineer, specializing in traffic management.
 - b. The Permittee will notify and coordinate with the District Manager, the facility supervisor and / or the Regional Engineer regarding the TMP, as listed in the Special Conditions and/or Notices and Contacts Section of this Permit.
 - c. Any subsequent changes to the approved plan (**See the Special Conditions, item H**) by any party other than DCR must be resubmitted to DCR and are subject to DCR's review and subsequent approval before any construction activities may commence.
 - d. The TMP will be followed and precautions will be taken to protect the public, the environment and any cultural resource in the area.
8. If the work associated with this Permit potentially impacts other parties, the contractor/ permittee is responsible for notification, and cooperative coordination with all parties, (including but not exclusive of DCR, contractors and representatives, Federal, State and local entities; police fire and ambulance, public transportation and utilities) working in the permitted locations. The coordination is to assure such that all disruptions of vehicular and/or pedestrian traffic is minimized.

- a. If this is not done to the satisfaction of DCR this permit will be revoked by a DCR representative during field operations and all associated work will stop until the deficiencies are resolved to the satisfaction of DCR traffic and or permit engineers.
9. In order to reduce the effects on the public who use the DCR's recreational areas, parks, campgrounds, parkways, boulevards and/or roadways, the Permittee will minimize construction work during peak use periods.
10. Pedestrian and vehicular traffic flow and safety shall be maintained at all times. Detours shall conform to the 2009 U.S. Department of Transportation, Federal Highway Administration's Manual on Uniform Travel Control Devices Guidelines ("MUTCD").
11. The Permittee will leave sidewalk areas clear and open to permit unimpeded pedestrian traffic passage at all times during construction. A minimum of three feet (3') clearance will be maintained to permit public access to alternate passage by the affected portion of the Premises.
12. All deliveries shall be made in such a manner as to have the least negative impact on the visiting public, the Premises and the environment.

I. ENVIRONMENTAL IMPACTS AND REPORTING

1. Prior to any construction work for a project in or adjacent to an environmentally sensitive resource area(s), the Permittee will contact appropriate Federal, State, and local agencies and or authorities, obtain any licenses, permits and or Certificates necessary and will comply with all applicable laws, rules and regulations. The Permittee will supply copies of all applicable documentation to DCR when applying for this permit, and or as they are granted, including but not limited to:
 - a. Executive Office of Energy and Environmental Affairs, Offices of Massachusetts Environmental Policy Act and Coastal Zone Management
 - b. The Massachusetts Department of Fish and Game regarding wildlife and/or plant impacts.
 - c. MassGIS data on any Priority Habitat of Rare Species.
 - d. The Massachusetts Department of Environmental Protection's Wetland, Waterways, and Water Management Sections
 - i. During all construction phases the Permittee will minimize any potential impacts to flora, fauna and natural resources and habitats on, in, or near the Premises; including the preparation and execution of a management plan for resource protection, erosion and sedimentation control, to minimize the potential impacts to environmentally sensitive resources.
 - ii. Special care will be used when permitted work area borders wetlands or waterways resource area(s), including but not limited to installation and maintenance of staked "salt hay" straw bales and silt fences to prevent sediment erosion and siltation from entering resource areas, and protect adjacent resources in accordance with the management plan. Erosion control measures will be in place prior to the start of any earthwork. The Permittee is responsible for inspecting all control measures twice weekly and after every rainfall event, and will maintain the erosion controls such that they operate properly. All erosion control measures will be maintained throughout the construction season until slopes have been stabilized and will be removed upon completion of the project, or stabilization of the area, whichever is last. All silt collected shall be removed and properly managed before the fences and straw bales are removed.
2. This permit in **NO** way should be construed as approval of any other applicable permits, notices or findings issued by Federal, State, and local agencies and/or authorities including but not limited to the Massachusetts Department of Fish and Game, and the Department of Environmental Protection.
3. The Permittee shall protect and maintain drainage and other structures against damage.
 - a. Any drainage structures damaged or altered will be replaced by the Permittee at their expense. All catch basins should be deep-sump unless utilities or site conditions interfere with the installation, as determined by DCR storm water engineer(s).
 - b. Absolutely no bitumen, asphalt, concrete or brick debris shall be dumped into drainage structures during the construction period. All storm water structures within the limits of work shall be

- cleaned prior to the conclusion of the project. This work shall include removing any accumulated dirt, refuse and other debris from each structure, including the gutter mouth of curb inlets. All removed materials shall be properly handled and transported to an approved disposal facility. The Permittee shall incur all cleanup costs.
- c. For NPDES MS4 requirements, the following activities shall continue throughout the construction period:
 - i. Street Sweeping
 - ii. Catch Basin Cleaning
 - d. If applicable, construction projects shall provide the DCR Storm Water Manager, Robert Lowell with a copy of the Storm Water Pollution Prevention Plan for the site.
 - e. If applicable, construction projects shall provide the DCR Storm Water Manager, Robert Lowell with a copy of site dewatering permits.
4. The Permittee shall protect and maintain all existing trees against damage.
- a. If applicable, air excavation tools shall be used on DCR property to ensure tree root protection within the drip line. (ref: Special Conditions)
 - b. If applicable, a Certified Arborist shall be required on-site during excavations that are located within the drip line. (ref: Special Conditions)
5. Should the permitted work area be located adjacent to an environmentally sensitive area (i.e. wetlands, protected habitat, waterway, and/or coastal shoreline), the Permittee shall notify the DCR Landscape Architect and/or DCR Ecologist, (see Notices and Contacts) a minimum of seventy-two (72) hours prior to any tree or shrub removal. (see Notices and Contacts).
- a. Should the Permittee disturb any vegetation, the disturbed areas will, upon DCR's approval, be filled, groomed, and planted with native vegetation to blend in with the natural landscape at or before 95% project completion.
 - b. The Permittee will monitor the areas of replaced vegetation to make sure that they are established. If the vegetation dies, the Permittee will consult with DCR Landscape Architect (see Notices and Contacts) to work out replacement details.
6. The Permittee will minimize the impact on trees and shrubs on, in and near the Premises.
- a. The Permittee will remove and replace trees and shrubs only if absolutely necessary to the integrity of the construction and only if such removal is approved by DCR Landscape Architect prior to start of construction.
 - b. Any tree removed, damaged and or distressed by the proximity of the construction allowed by this permit will be replaced and warranted for two (2) years at the permittee's cost.
 - c. A second notice will be made to the DCR Landscape Architect (see Notices and Contacts) a minimum of 72 hours before any tree is removed.
 - i. If the removal of a tree is approved, the Permittee is responsible for disposal/elimination of all associated vegetation materials, above and below ground including but not exclusive of leaves, branches, trunk, and the stump, and restoration of the area.
 - d. In locations where tree removal/loss are unavoidable, the specific field placement of replacement vegetation will be at a location(s) as directed by DCR; planting locations may include areas outside the permit premises.
 - e. The Permittee will replace all trees removed for construction, the replacement will be based on caliper inch removed and/or cash equivalent. DCR's Landscape Architect and or designee will have the choice of species, size and location;
 - i. One caliper inch (1") for every caliper inch of lost/removed trees in **suburban areas**, as deemed practical by DCR.

- ii. Two caliper inches (2”) for every caliper inch of lost/removed trees in **urban areas**, as deemed practical by DCR.
 - iii. Any deficiency to the total required replacement caliper inch(es) shall be paid as restitution to the Conservation Trust and Urban Parks Trust Fund. (See the Special Conditions for details).
- f. All replacement trees shall be tagged at the approved nursery by the DCR Landscape Architect, before being shipped to the work site.
- g. All replacement trees shall be planted by an approved Landscape Contractor, supervised by a Massachusetts Certified Arborist and by standard arboricultural practices. They will be planted within the planting season during which the work is completed. If this cannot be done, planting shall be done in the next planting season. Planting seasons are April 1 through June 15 and September 15 through October 31.

J. OPERATING SCHEDULE

1. DCR roadways shall not be occupied between the hours of 6:30 a.m. and 9:30 a.m. and the hours of 3:30 p.m. and 6:30 p.m. Monday through Friday, or as otherwise described **in the Special Conditions**. This provision includes time for the placements of traffic equipment to set up the Traffic Management Plan.
2. The Permittee shall shut down all work at 12:00 p.m. (noon) on the eve of major holidays, which include Memorial Day, Independence Day, Labor Day, Thanksgiving, Christmas and New Year’s Day or as otherwise described in the Special Conditions.
3. During periods of closing due to inclement weather or any other cause not within the control of the DCR, all other obligations of the Permittee shall not be waived. The DCR shall not be responsible for any costs incurred or revenue lost due to closing or re-opening of facilities or roadways under the provisions of this section.
4. Should a Special Event occur on the premises during the active duration of this permit, the Permittee will minimize any impacts on the park patrons. Any permitted work on DCR properties associated with the special event location, will cease and or shutdown at 10:00 p.m. prior to the start of the special event permit, and shall only resume after the area impacted by the special event has been cleared, cleaned and maintained.

K. TAXPAYER IDENTIFICATION NUMBER

1. Upon request by DCR, the Permittee shall remit to the DCR a Department of Revenue Certification of Good Standing; complete and remit a Taxpayer Identification Number and/or a Certification (Massachusetts Substitute W-9 Form) prior to the execution of this Permit. (as noted in the Special Conditions)

L. RISK OF OPERATION AND INDEMNIFICATION

1. The Permittee shall assume all risk in connection with any and all activities engaged in on the Premises, and shall be solely responsible and answerable in damages and any other remedies for all accidents or injuries to all persons or property caused by the Permittee and/or its contractors, agents, representatives, employees, licensees, guests and invitees.
2. The Permittee shall be responsible for the security of the Premises and the protection of the assets and property of the DCR. The Commonwealth shall not be responsible for property of the Permittee, its contractors, agents, representatives, employees, licensees, guests and invitees.
3. The Permittee shall agree to defend, hold harmless, and indemnify the Commonwealth of Massachusetts, the DCR, and its agents, officers and employees from any claims regardless of fault, arising out of any violation of any law, ordinance or regulation affecting the activities authorized herein by this Permit, from any claims for personal injury or death or damage to personal property, of whatever kind or nature, arising from the Permittee’s activities on the Premises, including claims arising from the intentional, reckless or negligent acts or omissions of the Permittee, its contractors, agents, representatives, employees, Permittee’s, licensees, guests and invitees,

as authorized under this Permit and claims arising from the Permittee's failure to provide adequate security on the Premises.

4. The Permittee shall not make any claims against the Commonwealth or the DCR for any injury, loss, or damage to persons, including bodily injury or death, or damage to property or costs or liabilities arising out of or in connection with this Permit, the obligations thereunder and the Permitted Uses, such as without limitation response actions engaged in or required under law or this Permit, including any acts or omissions of the Permittee, its contractors, agents, representatives, employees, licensees, guests and invitees, except for claims arising solely from the reckless conduct of the DCR.
5. The Permittee shall waive any and all claims for compensation for any and all loss or damage sustained by reason of any interference by any public agency or official in the operation of this Permit.
6. The risk of loss resulting from any natural weather phenomena or occurrences remains with the Permittee.
 - a. Compensation due to the DCR shall not be reduced or abated in any manner due to natural weather phenomena or other occurrences.

M. INSURANCE

1. The Permittee, its employees, contractors or agents shall hold the appropriate valid license(s) as required by law to perform the construction work associated with this Permit for the duration of the Permit.
2. The Permittee and or their contractor shall carry insurance in the types and amounts as described in this section of the Permit at its own expense.
3. The Permittee shall maintain said policies for the full Term of this Construction permit. Failure to maintain insurance coverage shall be deemed a material breach of the Permittee's duties under this Construction permit.
4. If the Permittee's insurance provisions, terms, and coverage, are amended, changed, suspended, expired or cancelled in any fashion, the Permittee shall, to the extent practicable, provide DCR with at least 30 days advance notice thereof.
5. The Permittee shall furnish Certificates of Insurance issued by an insurer or insurers qualified to do business in the Commonwealth. Said Certificates of Insurance upon request must be provided for review and approval to the address listed below anytime up to the expiration of the Permit.

Department of Conservation and Recreation

Construction Access Permits

Permit No: _____

251 Causeway Street, Suite 700
Boston, Massachusetts 02114

6. Failure to furnish said Certificates of Insurance and/or policies shall be deemed a material breach of the Permittee's duties under this Permit but in no way shall release Permittee of its obligations herein.
7. The Commonwealth of Massachusetts, including its DCR, shall be named as an additional insured on all policies specified herein, except that in regard to section M.12 the Commonwealth shall be named as an additional insured only on the contractors pollution liability portion of the professional/contractors pollution liability policies per policy endorsements.
8. **General Liability:** The Permittee shall carry General Liability Insurance in the minimum amount of \$1,000,000 per occurrence, \$2,000,000 in the aggregate.
9. **Public/Products Liability Insurance.** The Permittee shall carry public liability insurance as to third persons, and products liability insurance against claims based upon the services provided, in the minimum amount of One Million Dollars (\$1,000,000) in the event of death or injury to one individual, and a minimum of Two Million Dollars (\$2,000,000) in the event of death or injury to more than one individual, or such other amounts of liability insurance coverage the DCR shall reasonably require from time to time.

10. **Fire and Casualty Insurance.** The Permittee and or their contractor shall carry fire and casualty liability insurance in a minimum amount equal to the fair market value of the structure(s) located upon the Premises, if required by DCR.
11. **Professional/Environmental Impairment Liability Insurance:** Unless specifically excluded in writing in the Special Conditions of this Permit, the Permittee shall carry, or shall cause its contractor to carry, Environmental Impairment Liability Insurance, and shall cause its consultants to carry Professional Liability Insurance, that includes coverage for environmental contamination, bodily injury and/or property damage arising out of acts, errors and omissions of Permittee or its contractors, employees or agents in the performance of the Permitted Uses or any other activities or failures to act at or with respect to the Premises in the amount of one million dollars (\$1,000,000) for each claim and three million dollars (\$3,000,000) in the aggregate. Coverage includes claims based upon or arising out of underground storage tanks. Notwithstanding any contrary provisions section, said Professional Liability and Environmental Impairment Liability Insurance may be written on a "claims made" basis provided that the insurance coverage is maintained during the full term of this Permit and for at least three (3) years after the expiration of the Term.
12. **Automobile Bodily Injury and Property Damage Liability Insurance** in an amount not less than the compulsory coverage required in Massachusetts. Such insurance shall extend to owned, non-owned and hired automobiles used in the performance of the activities under this License. The limits of liability of such insurance shall be not less than one million dollars (\$1,000,000) combined single limit.
13. If the Permittee's and/or their contractor's insurance provisions, terms, coverage, etc. are amended, changed, suspended, expired or cancelled in any fashion, the Permittee must notify the DCR verbally immediately and shall notify the DCR in writing within five (5) business days.

N. HAZARDS ~ PHYSICAL, ENVIRONMENTAL AND CHEMICAL

1. The Permittee shall periodically inspect all areas used by the public in and around the Premises for the presence of unsafe or hazardous conditions and shall promptly remedy such conditions when found and shall promptly report the conditions to the DCR. The Permittee shall develop an accident reporting system and shall ensure that all employees understand and comply with said system. The Permittee shall make and preserve records of all accidents, emergencies and administration of medical aid on the Premises.
2. The Permittee shall immediately verbally notify DCR of any injuries, property damage or related incidents that occur on the Premises and shall provide written notice to the DCR Regional Engineer within five (5) calendar days of said incident. The written notice shall provide a detailed account of the incident, including, but not limited to, the nature of the incident, the names of any individuals involved and the names of any and all witnesses, all phone numbers, addresses, and contact information of affected individuals and witnesses, and the names of any agencies (federal, state, and/or local) that responded to the incident.
3. If the Permittee is notified by any regulatory agency having authority over the Premises that the Premises operations are in violation of an applicable rule, regulation or statute, the Permittee shall take immediate action to cure said violation. If the Permittee fails to take prompt remedial measures, the DCR may suspend the operations on any part or all of the Premises.
4. The Permittee shall not release, discharge or similarly dispose of hazardous substances, chemicals or materials.
5. Without limiting any of Permittee's obligations under this or any other Section of this Permit, Permittee agrees that it shall not cause any hazardous materials to be used, (with the exception of oil and other petroleum products contained within and necessary for the equipment utilized during the Permitted Uses), generated, stored or disposed of on, under or about, or transported to, from or through the Premises, except for soil, groundwater or any other material originating on the Premises and removed from the Premises by Permittee as required for the Permitted Uses (e.g., drill cuttings and soil samples, and excavated soil). Permittee assumes full liability and responsibility for such soil, groundwater or other material removed from and not replaced on the Premises including, but not limited to, responsibility for ensuring that the handling, treatment, transport, storage and/or disposal of these materials is properly and safely performed according to all applicable federal, state, and local laws, regulations and governmental requirements.

6. If Permittee's use of the Premises results in the need for a further response action under applicable environmental laws (other than the c. 21E response actions being undertaken as described in the Scope of Work), the Permittee shall give immediate telephone notice to DCR by calling the Environmental Section Head, Robert Lowell at (617) 626-1340. Without limiting any other provision of this Permit, completion of any such response action shall be the sole responsibility of the Permittee, shall be performed in accordance with applicable environmental laws at Permittee's sole expense, and shall not be performed without the prior approval of DCR unless an emergency situation exists and approval cannot be obtained. DCR reserves the right to supervise Permittee's contractor(s) implementing any such response action, and all submittals required to be made to any regulatory agency must be reviewed and approved by DCR.
7. For the purposes of this Permit, "hazardous materials" shall include, but not be limited to, substances defined as "hazardous substances", "toxic substances", "hazardous wastes", "hazardous materials", "oil" or "asbestos" in any federal or state statute concerning hazardous substances, wastes or materials now or hereafter enacted, including all regulations adopted or publications promulgated hereunder.
8. Pesticide applications may be allowed with written permission by DCR. If allowed, only those materials approved and registered by the U.S. Environmental Protection Agency for the specific purpose planned shall be considered for use on the Premises. Label instructions shall be strictly followed in the preparation and application of pesticides and other hazardous substances and disposal of excess materials and containers. Any and all applicators shall be duly licensed by the Commonwealth and the U.S. Environmental Protection Agency. Use of said materials must have prior authorization from DCR.
9. The Permittee assumes all risk associated with any environmental condition within the subject property and shall be solely responsible for all costs associated with evaluating, assessing and remediating, in accordance with all applicable laws, any environmental contamination (1) discovered during the Permittee's work or activities under this permit to the extent such evaluation, assessment or remediation is required for Permittee's work, or (2) resulting from Permittee's work or activities under this permit. Permittee shall notify DCR of any such assessment and remediation activities for review and approval of proposed activities; except for emergency containment. The Permittee is hereby held solely responsible for obtaining and maintaining any and all environmental compliance permits required by local, state and federal laws and regulations when regular or emergency work is proposed within, or in close proximity to, any wetland area.
10. In the event the Permittee learns of any release of oil or hazardous material or any other emergency within or from the Permitted Area, in addition to providing any regulatory notice required by any local, state or federal law or regulation, the Permittee shall provide notice of any such release or other emergency to DCR as soon as practicable thereafter, but not more than three (3) hours following any such release or emergency. Notice shall be given orally by telephone to the DCR Operations Control Center at (617) 946-3150. In the case of a release or other environmental emergency, notice must also be given in writing within twelve (12) hours, please indicate your Permit Number on all correspondence and on the mailing envelope and deposit in the United States mail; certified, return receipt requested, postage prepaid to:

Department of Conservation and Recreation
21 Causeway St., Suite 700
Boston, MA 02114
ATTN: Robert Lowell

11. In the event that the Permittee may impact contaminated soil and/or groundwater through permitted activities, the result may require site characterization under the supervision of a Licensed Site Professional (LSP). In this instance, the Permittee shall cease work and obtain from the Massachusetts Department of Environmental Protection (MassDEP) a written approval of a Response Abatement Measure (RAM) Plan (per 310 CMR 40) for the Permitted Uses to continue. The Permittee and its LSP shall oversee work in the Permitted Area to ensure that:
 - a. Worker health and safety is protected.
 - b. Soil generated and to be removed, if any, is properly disposed of in accordance with M.G.L. c. 21E / Massachusetts Contingency Plan and other applicable state and federal law

- c. The RAM is properly implemented and completed. Disposal, if any, of such soil shall be done under the supervision of an LSP and certified by the LSP to MassDEP.

O. LAND MARKERS AND MONUMENTS

1. The Permittee shall take reasonable precautions to protect all public land survey monuments, public land boundary markers and private property corners.
2. In the event that any such markers or monuments are disturbed or destroyed, the Permittee shall take appropriate action to reestablish them in accordance with specifications of the town or county surveyor, or the DCR.

P. TERMINATION

1. The nature of this Permit is a revocable license. As such, the DCR may terminate, with or without cause, upon written or oral notice to the Permittee, at which time all work associated with the permit will immediately end. If applicable, thereafter, the Permittee may cure or remedy such matter within no more than twenty four (24) hours. If the Permittee does not satisfactorily remedy or cure said matter, this Permit will be deemed terminated. If this Permit is revoked or terminated, Permittee shall not be relieved of liability to DCR or the Commonwealth for arrears in any fees or for any other injury, cost, liability or damage sustained or for any response action required or identified as needed as result of a Permittee's entry and/or use of the Premises, whether occurring before or after such termination.
2. All obligations required of the Permittee under the terms of this Permit shall expressly survive the given termination/expiration date until such obligations are completed to the satisfaction of the DCR.

Q. NON-DISCRIMINATION

1. The Permittee acknowledges that there shall be no discrimination against any employee who is employed in the work covered by this Permit, or against any applicant for such employment, based on race, color, religion, sex, sexual orientation, age, national origin, veterans' status, or physical or mental handicap.
2. The Permittee shall comply with all applicable federal and state statutes, and rules and regulations promulgated there-under prohibiting discrimination in employment.

R. STATUS OF PERMITTEE

1. The relationship of the Permittee to the Commonwealth of Massachusetts and the DCR is that of a Licensee. The Permittee covenants and agrees that it will conduct itself consistent with such status, that it will neither hold itself out as, nor claim to be, an officer or employee of the Commonwealth by reason hereof, and that it will not, by reason hereof, make any claim, demand or application to, or for any right or privilege applicable to an officer or employee of the Commonwealth of Massachusetts, including, but not limited to, Worker's Compensation Coverage, unemployment insurance benefits, Social Security coverage or retirement membership or credit.
2. Nothing herein contained shall create or be construed as creating a co-partnership between the DCR and the Permittee or to constitute the Permittee as an agent of the DCR.
3. The Permittee acknowledges that this Permit does not confer any rights in real property to the Permittee. As a licensee, the Permittee may enter and use the Premises solely for those purposes contained in this Permit. Any use of the Premises by the Permittee that is inconsistent with the terms of this Permit shall be deemed a material breach of the Permittee's rights and obligations under this Permit.

S. MERGER

1. All Attachments or Exhibits to this Permit are hereby incorporated by reference and become part of this Permit. Any failure to comply with the terms and conditions contained in any Attachment or Exhibit by either party constitutes a breach of this Permit. The Attachments and Exhibits are intended to be used to clarify the terms of this Permit. In the event there is an irreconcilable conflict between the terms of this Permit and those contained in an Attachment or Exhibit, the term contained in this Permit shall supersede.
2. Plans and documents, including, but not limited to, TMP, pedestrian and vehicle plans, and MUTCD specifications, which are submitted to and approved by the DCR, are hereby incorporated by reference and become part of this Permit.

T. WAIVER

1. No waiver during the term of this Permit, by either party, of any term, condition or covenant of this Permit shall be deemed a waiver at any time thereafter of the same provision or of any other provision contained herein, or of the strict and prompt performance thereof.

U. FORCE MAJEURE

1. Neither party shall be liable to perform its part of this Permit when such failure is due to fire, flood, war, riot, insurrection and/or other catastrophe beyond the control of the parties.

V. SEVERABILITY

1. If any provision of this Permit, or portion of such provision, is held invalid, the remainder of this Permit shall continue in full effect.

W. MODIFICATIONS OR AMENDMENTS

1. Modifications or amendments to this Permit shall be in writing and duly executed by both parties hereto to be effective.

X. ASSIGNMENT AND SUBLETTING

1. Except with the consent of the DCR, this Permit is not transferable.
2. The Permittee shall not assign, sublease, transfer or otherwise dispose of its management responsibilities or of any right, interest or use of the Premises covered by this Permit to anyone other than its contractor or parties specifically named in this permit, without the prior written consent of the DCR.
3. Any such disposition without the written consent of the DCR shall constitute a material breach of this Permit, which shall be cause for immediate termination of the Permit by the DCR.
4. The DCR shall not be obligated to recognize any right of any person or entity to any interest in this Permit or to any rights, equipment, structures, or property of the Permittee at the Premises. Any assignments of rights under this Permit are void.
5. The Permittee may not enter into any agreement with any entity or person, except employees of the Permittee, and/or its contractor or parties specifically named in this permit and/or their contractors, to exercise substantial management responsibilities for operation of the Premises without the prior non-electronic written consent of the DCR Commissioner or designee.
6. In the event of any unapproved or prohibited transfer or encumbrance by the Permittee, or in the event of any default of its obligations to persons or entities which are not a Party to the Permit, such person or entity shall not be deemed to have acquired operating rights, privileges, or title to the Premises or real or personal property of the DCR.
7. Any third-party beneficiaries have no enforceable rights under this Permit.

Y. ATTACHMENT

1. The Permittee is not authorized to permit and shall not permit any liens, mortgages or other security interests for any purpose to be attached to the Permitted Area in connection with the Permittee's use of, occupancy of, and/or activities in, around or near the Permitted Area under this Permit, including without limitation any repairs, renovations, alterations, additions, betterments, fixtures and/or improvements to the Permitted Area. The Permittee shall, upon request of DCR, furnish such waivers of any liens, mortgages, and/or any other security interests, as DCR may require and in a form that is satisfactory to DCR. The Permittee shall, upon the request of DCR, furnish such surety bonds as DCR may request and require, as it relates to said waivers. In the event that any liens, mortgages, or other security interests are attached to the Permitted Area or any part thereof or improvement thereto, the Permittee shall forthwith cause such liens, mortgages, and/or security interests to be released of record without cost to DCR.

Z. NOTICE

1. For purposes of this Permit, the parties hereto shall, unless otherwise indicated below, be deemed duly notified of any information or issues arising from the operation of this Permit in accordance with the terms and provisions hereof only if written notices are provided by first class mail, overnight mail or hand delivered or fax delivery with confirmation to the parties noted in the Notices and Contacts section, (DCR Construction Permits Director; DCR Region Manager, and (DCR Chief Engineer) subject to change upon notice in writing to that effect;
2. If the permitted work site encompasses and or encroaches upon designated parking spaces and or parking areas, the permittee will install additional **signage** indicating the parking restriction.
 - a. The "TEMPORARY PARKING RESTRICTIONS" signage must be installed at least 48 hours prior to the start of each portion of the permitted work. A copy of the parking restriction along with the date and time it was posted must be emailed to DCR Parking Clerk for contact information (see Notices and Contacts). Should the permittee not post within the specified time, they will be responsible for any towing reimbursement that may occur.
 - b. Should the parking spaces and/or parking areas be located in a residential neighborhood the permittee will provide written notice (mailed or posted) to area residents who may be impacted, at least 72 hours prior to use of the parking space. This notice may include leafleting all cars and mailboxes within 150 feet of the restricted parking area. A description of how you notified the neighbors plus a copy of the parking restriction including the date and time it was posted must be emailed to the parking clerk for contact information (see Notices and Contacts).
3. Before any work is started, the Permittee will provide notice to parties indicated in the Special Conditions and the Notices and Contacts section.
4. The Permittee will supply a written work schedule prior to the commencement of work, and will update the schedule at the time of 50% and 80% completion to parties indicated in the Special Conditions and Notices and Contact section.

At least seventy-two (72) hours prior to removing any vegetation from the Premises, notice shall be provided to the DCR Landscape Architect (as specified in the Notices and Contacts section)

APPENDIX B

WATER QUALITY CERTIFICATION



Department of Environmental Protection

Central Regional Office • 8 New Bond Street, Worcester MA 01606 • 508-792-7650

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

October 12, 2021

City of Worcester Department of Public Works & Parks
18 East Worcester Street
Worcester, MA 01604

Re: WATER QUALITY CERTIFICATION
Application for: BRPWW10: Major Project Certification
Transmittal Number: X286675

At: Kendall Reservoir to Pump Station Road/Quinapoxet Reservoir
Holden, MA

Dear City of Worcester:

The Massachusetts Department of Environmental Protection (“MassDEP”) has reviewed the application for Water Quality Certification (the “Application”) submitted on behalf of the City of Worcester Department of Public Works & Parks (the “Applicant”) on November 10, 2020 by LEC Environmental Consultants, Inc. (“LEC”) in accordance with the provisions of MGL c. 21, §§ 26-53 and § 401 of the Federal Clean Water Act as amended, 33 U.S.C. §1251 et seq. MassDEP has determined that there is reasonable assurance the project will be conducted in a manner which will not violate the Massachusetts Surface Water Quality Standards 314 CMR 4.00 as implemented by 310 CMR 9.00.

The proposed project encompasses the maintenance of the Quinapoxet Transfer Pipeline (the “Pipeline”), between the Kendall Reservoir and Pump Station Road adjacent to the Quinapoxet Reservoir in Holden, Massachusetts. The Pipeline serves as drinking water system infrastructure, and maintenance of the Pipeline is exempt from the *Wetlands Protection Act Regulations* under 310 CMR 10.02(2)(a)(2). Proposed work includes sliplining of existing pipe, replacement of sections of steel pipe with PVC pipe, and replacement of Pipeline components, including manholes, valves, and blow off assemblies.

While the majority of the project is located beneath existing paved public roadways, the section of Pipeline between Main Street and Kendall Reservoir runs off-road. Bordering Vegetated Wetlands and streams within the off-road section of the Pipeline easement and associated maintenance access routes, are tributary to the Wachusett Reservoir and Kendall

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.
TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

Reservoir, and are classified as Outstanding Resource Waters in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00.

The proposed culvert replacements will result in unavoidable temporary impacts to BVW at the locations of three open cut excavations with cumulative temporary BVW impacts of 4,275 square feet, and along access routes along the Pipeline and Massachusetts Department of Conservation and Recreation easements where swamp maps will temporarily alter 19,875 square feet of BVW. All areas of proposed temporary BVW impacts are within cleared easements where vegetation currently consists primarily of herbaceous species. Temporary impacts to BVW will be mitigated by segregating and restoring wetland soils within excavated areas and by applying a native wetland seed mix to disturbed areas upon the completion of construction.

The proposed project has been designed to minimize impacts to wetland resource areas during construction activities. Prior to any ground disturbance, approved erosion control barriers will be installed at the downgradient limits of work along the roadway.

Based on information currently in the record, the MassDEP grants a 401 Water Quality Certification for this project subject to the following conditions, pursuant to 314 CMR 9.09(1)(d), to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law:

1. Pursuant to 314 CMR 9.05(1), all work shall be performed in accordance with the following documents and plans which accompanied the Application. This condition is necessary as these documents outline how the execution of the project will meet the criteria of 314 CMR 9.06 and thereby protect water quality and prevent degradation to wetlands and waters. To the extent that the subsequent conditions modify or differ from the plans, specifications or other proposals submitted with the Application, the conditions shall control.

Plan Title: QUINAPOXET
TRANSFER PIPELINE
CONTRACT 2
Drawing Nos. C-001, C-101, C-102, C-103, C-502, and T-102

Prepared by: Stantec

Date: JUNE 2021

2. Pursuant to 314 CMR 9.06(2), prior to the start of construction, erosion and sedimentation controls shall be properly installed between all work areas and the wetland resource areas that are to remain undisturbed in a manner that prevents the flow of silt and sedimentation into those resource areas. Such controls shall be maintained until all disturbed areas are permanently stabilized. The installation and placement of all erosion and sedimentation controls shall be supervised by an individual competent in such matters. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.

3. This project could result in a violation of water quality standards adopted by the MassDEP's Division of Water Pollution Control. Therefore, reasonable care and diligence shall be taken to ensure that the proposed activity will be conducted in a manner which will minimize violations of said standards. This condition is necessary to assure that any discharge from the project complies with the Massachusetts Surface Water Quality Standards, as provided in 314 CMR 9.00, to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.
4. There shall be no other fill or any other material discharged or deposited into Waters of Commonwealth other than that fill and construction material necessary to complete the project shown on the approved plans and described in the Application. This condition is necessary to assure that any discharge from the project complies with the Massachusetts Surface Water Quality Standards, as provided in 314 CMR 9.00, to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.
5. Pursuant to 314 CMR 9.06(2), at all times, any water generated from the project shall be effectively filtered or settled to remove sediment and turbidity prior to its being discharged to any Waters of the Commonwealth. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
6. Following the installation of erosion and sedimentation controls and as provided by 314 CMR 9.06(2), the Applicant shall notify MassDEP at least two business days before the start of construction, so that MassDEP will have the opportunity to inspect the erosion and sedimentation controls. Contact Judith Schmitz at (508) 767-2722 or Judith.Schmitz@mass.gov. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
7. MassDEP shall be notified in writing of any plan changes for this project which might affect Waters of the Commonwealth. MassDEP will determine whether the changes require a revision to this Water Quality Certification or the filing of a new Water Quality Certification Application. This condition, pursuant to 314 CMR 9.06(1) and 314 CMR 9.09(2), is necessary to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.
8. Pursuant to 314 CMR 9.06(2), any contractor, on-site foreman, directing engineer, or designated construction manager, shall be provided with a copy of this Water Quality Certification prior to commencing work at the project, and shall be held jointly responsible for conducting the work in compliance with the conditions of the Water Quality Certification. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.

9. Pursuant to 314 CMR 9.06(2), a qualified professional shall be designated as an Erosion Control Monitor to oversee the installation, inspection, maintenance, and replacement of erosion and sedimentation controls. The Erosion Control Monitor must be available to be contacted in an emergency during any 24-hour period, including weekends. The name and phone number of the Erosion Control Monitor must be provided to MassDEP prior to the start of construction. The Erosion Control Monitor shall have authority to stop construction if necessary to ensure that erosion and sedimentation from the project are controlled. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
10. Pursuant to 314 CMR 9.06(2), at the close of each construction day, areas subject to this Water Quality Certification shall be left in a stable condition, and erosion controls shall be monitored by the Erosion Control Monitor and maintained or reinforced if necessary. An adequate stockpile of erosion control materials shall be maintained at the project site at all times for emergency and routine maintenance and replacement. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
11. Pursuant to 314 CMR 9.06(2), erosion and sedimentation controls shall not be limited to what is depicted on the plans. Best Management Practices shall be employed during construction to prevent unauthorized discharges of fill material due to erosion and sedimentation coming from the construction site. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
12. Pursuant to 314 CMR 9.09(1) and 9.09(2), MassDEP reserves the right to impose additional conditions on this project as necessary to ensure that the work will not result in any violation of the Massachusetts Surface Water Quality Standards 314 CMR 4.00 as implemented by 310 CMR 9.00. This condition is necessary to assure that any discharge from the project complies with the Massachusetts Surface Water Quality Standards, as provided in 314 CMR 9.00, to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.
13. Pursuant to 314 CMR 9.06(2), wetland resource areas shall be visibly flagged in order to prevent unpermitted intrusion into these resource areas. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
14. Pursuant to 314 CMR 9.06(2), wetland restoration shall commence immediately upon completion of maintenance and access activities within the vicinity of each area of wetland alteration. This condition is necessary to assure that any discharge from the project complies with the Massachusetts Surface Water Quality Standards, as provided in 314 CMR 9.00, to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.

15. Pursuant to 314 CMR 9.06(2), a qualified wetland specialist shall monitor and supervise all aspects of wetland restoration and shall monitor the areas over two growing seasons. At least 75 % of the surface area of the wetland restoration areas shall be established with indigenous wetland plant species within two growing seasons. A detailed written report shall be provided to MassDEP describing the progress and function of the restored wetlands after each growing season. If the wetland restoration areas are not re-vegetated with indigenous wetland plant species after two growing seasons, the applicant, owner, or his designee shall submit a supplemental planting plan to be approved by MassDEP. This condition is necessary to assure that any discharge from the project complies with the Massachusetts Surface Water Quality Standards, as provided in 314 CMR 9.00, to protect the public health and restore and maintain the chemical, physical, and biological integrity of the water resources of the Commonwealth.
16. Pursuant to 314 CMR 9.06, monitoring for invasive species shall also be conducted by a wetland specialist. If any invasive species are found growing in wetland restoration areas, measures shall be taken to eliminate them as soon as possible before the invasive species become widespread and established. This condition is necessary to prevent the spread or introduction of invasive species which would affect water quality and biological resources. It is necessary to sustain aquatic resource functions, as well as characteristics of the waters and surrounding areas.
17. Pursuant to 314 CMR 9.06(2), once the site is stabilized, all synthetic or fabric sedimentation fencing shall be removed and disposed of properly. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.
18. Pursuant to 314 CMR 9.06(2), the project must comply with MassDEP Solid Waste and Air Pollution Control regulations pursuant to M.G.L. c. 40 § 54 during construction, and must be conducted in a manner that avoids, minimizes, and/or mitigates construction period impacts including but not limited to land disturbance, noise, dust, odor, nuisance, vehicle emissions, construction and demolition debris, and construction-related traffic. Signage must be employed to limit vehicle idling to less than five minutes. If oil or hazardous materials are identified during the implementation of this project, notification to MassDEP pursuant to 310 CMR 40.0000, the Massachusetts Contingency Plan, must be made. This condition is necessary to ensure that construction practices are implemented in such a manner as to prevent degradation to wetlands and waters.

END OF CONDITIONS

This Water Quality Certification does not relieve the Applicant of the obligation to comply with other applicable state or federal statutes or regulations. The Applicant is reminded of the requirement to comply with all requirements and conditions of the U.S. Army Corps of Engineers Programmatic General Permit (available from the U. S. Army Corps of Engineers at 1-800-362-4367).

The Applicant or property owner; or any person aggrieved by this decision who has submitted written comments during the public comment period; any ten persons, or any governmental body or private organization with a mandate to protect the environment who has submitted written comments during the public comment period have a right to appeal this certification. The full text of the appeal rights is attached along with the fee transmittal form.

No activity may begin prior to the expiration of the appeal period 21 days from the date of this Water Quality Certification, or until a final decision is issued by MassDEP if an appeal is filed, whichever is later.

Failure to comply with this Water Quality Certification is grounds for enforcement, including civil and criminal penalties, under MGL c.21 §42, 314 CMR 9.00, MGL c. 21A §16, 310 CMR 5.00, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

If you have any questions regarding this decision, please contact Judith Schmitz at 508-767-2722 or Judith.Schmitz@mass.gov .

Sincerely,

/s/ Judith B. Schmitz

Judith Schmitz
Wetlands Program Section Chief
Bureau of Water Resources

Enclosures: Notice of Appeal Rights
Adjudicatory Hearing Fee Transmittal Form
Communication for Non-English Speaking Parties

cc: Holden Conservation Commission by email at gwilliamson@holdenma.gov
US Army Corps of Engineers by email at bettina.m.chaisson@usace.army.mil
Andrea Kendall, LEC by email at AKendall@lecenvironmental.com
Vincent Vignaly, DCR by email at Vincent.vignaly@state.ma.us

NOTICE OF APEAL RIGHTS – WATER QUALITY CERTIFICATION

A) Appeal Rights and Time Limits

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by MassDEP when an application is required: (a) the applicant or property owner; (b) any person aggrieved by the decision who has submitted written comments during the public comment period; any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or (d) any governmental body or private organization with a mandate to protect the environment which has submitted written comments during the public comment period. Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to MassDEP, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Docket Clerk
MassDEP Office of Administrative Appeals
One Winter Street, 3rd Floor
Boston, MA 02108.

A copy of the request shall at the same time be sent by certified mail or hand delivery to the issuing office of the Wetlands and Waterways Program at:

MassDEP Central Regional Office
8 New Bond Street
Worcester, MA 01606

B) Contents of Hearing Request

A Notice of Claim for Adjudicatory Hearing shall comply with the MassDEP's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

- (a) the 401 Certification Transmittal Number and DEP Wetlands Protection Act File Number;
- (b) the complete name of the applicant and address of the project;
- (c) the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
- (d) if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
- (e) a clear and concise statement that an adjudicatory hearing is being requested;
- (f) a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with MassDEP's Water Quality Regulations, 314 CMR 9.00, and (3) the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and
- (g) a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Environmental Management (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

C) Filing Fee and Address

The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars (\$100) must be mailed to:

MassDEP
Commonwealth Master Lockbox
P.O. Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. MassDEP may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

APPENDIX C

BORING LOGS

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Stantec
Site: Quinapoxet Pipeline Project
Holden, MA

BORING B-1

PROJECT NO. 16-0915

DATE: September 13, 2016

Ground Elevation: 808.0
Date Started: September 12, 2016
Date Finished: September 12, 2016
Driller: PG

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Soil Engineer/Geologist:

Depth Ft.	Casing bl/ft	Sample				Strata	Visual Identification of Soil and / or Rock Sample
		No.	Pen/Rec	Depth	Blows/6"		
1		1	12"	0"-2'0"	3-45-78-100/2"	12'0"	Dry, brown, very dense coarse sand, some gravel, little coarse sand, trace fine sand.
5		2	20"	5'0"-7'0"	5-9-11-16		Dry, brown, medium dense fine and medium sand, trace coarse sand, trace gravel, trace silt.
10		3	21"	10'0"-12'0"	9-16-25-26		Dry, brown, dense, medium and coarse sand, little gravel, little fine sand, trace silt.
15							End of boring at 12'0". No water encountered.
20							
25							
30							
35							
39							

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

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace 0 to 10% Little 10 to 20% Some 20 to 35% And 35% to 50%	ID SIZE (IN) HAMMER WGT (LB) HAMMER FALL (IN)	CASING	SAMPLE SS 140 lb. 30"	CORE TYPE

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Stantec
Site: Quinapoxet Pipeline Project
Holden, MA

BORING B-3

PROJECT NO. 16-0915

DATE: September 13, 2016

Ground Elevation: 758.9
Date Started: September 12, 2016
Date Finished: September 12, 2016
Driller: PG

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Soil Engineer/Geologist:

Depth Ft.	Casing bl/ft	Sample				Strata	Visual Identification of Soil and / or Rock Sample
		No.	Pen/Rec	Depth	Blows/6"		
						4"	Asphalt.
1		1	12"	0"-2'0"	4-9-12-100/1"		Dry, brown, very dense coarse and medium sand, some gravel, little fine sand.
5		2	5"	5'0"-7'0"	3-1-2-2		Dry, brown, very loose, coarse and medium sand, some gravel, little fine sand.
10		3	12"	10'0"-12'0"	3-2-3-3		Moist, brown, loose, medium and fine sand, some gravel, little silt.
15		4	8"	15'0"-17'0"	8-16-31-25		Wet, brown, dense, coarse sand and gravel, little medium sand, trace fine sand, trace silt.
20		5	10"	20'0"-22'0"	10-10-9-11	22'0"	Wet, grey, medium dense, coarse sand and gravel, little medium sand, trace fine sand, trace silt.
25							End of boring at 22'0". Groundwater table at 16'0".
30							
35							
39							

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

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace 0 to 10% Little 10 to 20% Some 20 to 35% And 35% to 50%	ID SIZE (IN) HAMMER WGT (LB) HAMMER FALL (IN)	CASING	SAMPLE SS 140 lb. 30"	CORE TYPE

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Stantec
Site: Quinapoxet Pipeline Project
Holden, MA

BORING B-5

PROJECT NO. 16-0915

DATE: September 13, 2016

Ground Elevation: 759.2
Date Started: September 12, 2016
Date Finished: September 12, 2016
Driller: PG

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Soil Engineer/Geologist:

Depth Ft.	Casing bl/ft	Sample				Strata	Visual Identification of Soil and / or Rock Sample
		No.	Pen/Rec	Depth	Blows/6"		
1		1	12"	0"-2'0"	8-12-13-100/4"	4"	Asphalt.
5		2	NR	5'0"-7'0"	8-8-9-7		Dry, brown, very dense coarse and medium sand, some gravel, little fine sand.
10		3	4"	10'0"-12'0"	5-4-2-2		Dry, brown, loose, coarse and medium sand, some gravel, little fine sand.
15		4	5"	15'0"-17'0"	3-2-5-3		Wet, brown, loose coarse sand, some gravel, little medium sand, trace fine sand, trace silt.
20		5	12"	20'0"-22'0"	14-25-24-26	22'0"	Wet, grey, dense, coarse and medium sand, some coarse gravel, little fine sand, trace silt.
25							End of boring at 22'0". Groundwater table at 16'0".
30							
35							
39							

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

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 - 30 M Dense, 30 - 50 Dense, 50+ V Dense.	Trace	0 to 10%	CASING	SAMPLE	CORE TYPE
Cohesive: 0 - 2 V Soft, 2 - 4 Soft, 4 - 8 M Stiff	Little	10 to 20%	ID SIZE (IN)	SS	
8 - 15 Stiff, 15 - 30 V. Stiff, 30 + Hard.	Some	20 to 35%	HAMMER WGT (LB)	140 lb.	
	And	35% to 50%	HAMMER FALL (IN)	30"	

APPENDIX D

HOLDEN WATER-SEWER SPECIFICATIONS (Reference document)

Town of Holden List of Approved Materials for Water System Infrastructure January 2006:

Castings: All castings and fittings shall be manufactured In North American as required by Holden DPW.

Water Mains: shall be ductile iron centrifugally cast with push-on joints conforming to AWWA/ANSI C151. Pipe shall be Class 52, double cement lined and bituminous coated conforming to AWWA/ANSI C104. No Manufacturer Specified.

Gate Valve: (12-inch diameter or less): Shall be 200 psi working pressure, non-rising stem, "O" ring, open left, mechanical joint, two-inch ductile iron operating nut with stainless steel bolt, resilient seated (resilient wedge) gate valve conforming to ANSI/AWWA C509 – Kennedy, Clow or Mueller. Valves shall be epoxy coated and supplied with mechanical joint accessories, high strength alloy steel bolts and heavy hexagon nuts conforming to ANSI/AWWA C111.

Gate Valve Boxes: shall be cast iron, two piece, sliding type with a non-flange top section, no inside stops, and an outside shaft diameter of six inches. Bottom section shall be belled base. Length of top section shall be minimum of 24 inches. Middle and bottom section length as needed. Boxes shall have the word "WATER" cast into cover. No Manufacturer Specified.

Ductile Iron Fittings: Pipe fittings shall have mechanical joint ends conforming to ANSI/AWWA C1/A21.11, double cement lining and bituminous coating conforming to ANSI/AWWA C104.A21.4. fittings shall be supplied with mechanical joint accessories unless specified others, with high strength low alloy steel bolts and heavy hexagon nuts conforming to ANSI/AWWA C111.A21.11. Long body fittings shall be Class 350 ductile iron conforming to ANSI/AWWA C110/A21.10. Compact body fittings shall be Class 350 ductile iron conforming to ANSI/AWWA C153/A21.53.

Hydrants: All Hydrants must be Eddy Model F-2640, open left, with break flange. Hydrants are to be factory painted yellow with reflective white on bonnet and cops with oil based paint.

Service Line from Main to Curb: Type K Copper (ASTM 888), minimum size 1".

Service Line from Curb to House: Type K Copper (ASTM 888) or plastic with minimum pressure rating of 200 psi.

Corporation: Ball valve type construction with inlet CC thread and compression pack joint on the outlet, heavy patterns, and conforming to AWWA/ANSI C800 – McDonald, Ford or approved equal. Inlet iron pipe threads are required for 1-1/2" and larger corporations. Brass shall have minimum lead content; Town may request lead content of any brass or copper materials.

Curb Stop: McDonald ball valve type construction with inlet compression and compression pack joint on the outlet, heavy patterns, and conforming to AWWA/ANSI C800 - Brass shall have minimum lead content, Town may request lead content of any brass or copper materials.

Curb Box: Shall be Erie style with arch pattern, one-inch in diameter, constructed from SC #40 Black Steel, adjustable in length from five feet to six feet, and have 5/8-diameter stainless steel rod 36-inches in length with heavy brass pins.

One-inch caps shall be extra heavy with brass pentagon plug and coarse "rope" thread to fit a one-inch Erie style box.

Two-inch caps shall be a #3 cover, cast iron with brass bushing and brass pentagon plug to fit a two-inch Erie style box.

All caps shall be constructed of magnetic material and have the word "WATER" cast into cover – Made in North America.

Holden Sewerage Specifications:

Sewer pipes and related equipment, such as manholes and connecting Y's shall be constructed in conformity with the specifications of the Town of Holden Public Works Department.

The installation of water and sewer pipes and related equipment shall not be backfilled until inspected by the proper authority.

Sewer mains shall be minimum 8" SDR 35 PVC laid to a minimum slope of one-half (1/2) foot per 100 feet. All sewer laterals shall be 6" SDR 35 PVC laid at a minimum pitch of one-quarter (1/4) inch per foot. All sewers, including house services, shall be laid in on envelope of three-quarter (3/4) inch washed gravel. Deflections in line or grade in excess of one-half (1/2) inch will be cause for rejection.

Line and grade shall be controlled by the use of laser instruments.

All castings and fitting shall be manufactured in North America.

All sewer manholes shall be vacuum tested in accordance with ASTM C1244.

EXFILTRATION/INFILTRATION, AIR TESTS AND TV INSPECTION

Time for Making Tests: After the pipe has been laid and backfilled, an infiltration, exfiltration or low pressure air test shall be made on each section of pipeline between manholes. When no groundwater exists at the time of the test, the pipeline shall be subjected to an exfiltration test or an air test. Testing shall be completed based upon DEP Requirements below.

TV Inspection: When the pipe lines pass an exfiltration/infiltration or air test, they shall be subject to a TV inspection performed under the supervision of the Engineer. A recording of the TV inspection shall be provided to the Town Engineer. Any sections found to be damaged or blocked shall be repaired to the satisfaction of the Town Engineer or retested

Minimum Standards for Watertight construction for Sewer Piping

Allowable infiltration or exfiltration should not exceed 100 gpd/inch-diam/mile of sewer. Leakage test shall be specified in the specification and may include water or low pressure air testing. Watertight construction consists of the use of ductile iron, mechanical joint pipe, prestressed concrete cylinder pipe, and solvent welded joint PVC pipe and any combination of the above. Pressure testing should be performed by the owner after completion of construction, prior to startup and after on year of natural settling in order to ensure the watertightness of the affected collection systems, manholes and pump station wet wells.

Acceptable air testing procedures are presented in American Society of Testing and Material Standard C828-90T "Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe". In Lieu of that Standard the following test procedure is acceptable:

Plug all openings in the section of sewer piping to be tested

Pressurize the system to be tested to an air pressure of 5 psig. Shut off the pressurized air source.

Allow the pressure to stabilize for a minimum of 5 minutes

Record the stabilized pressure in the test section. Record the test start time. The minimum test pressure is 4 psig. The minimum test time is 5 minutes. At the end of the pressure testing time period record the test pressure and the test termination time. If the pressure drop is greater than 2 psig during the duration of the test, the tested section has failed the test.

If the testes are failed, repairs must be made to the affected sewer pipe and retested.

INSPECTIONS WILL ONLY BE MADE DURING THE HOURS OF 8:00 AM TO 4:00 PM MONDAYS THROUGHT THURSDAYS AND 8:00 AM TO NOON ON FRIDAYS EXCEPT HOLIDAYS. PLEASE NOTE: A minimum two (2) hour notification shall be given by the contractor for requested inspections.

The following is a list of requirements for house connections to the sanitary sewer lines:

1. A valid permit must be issued prior to the start of work to install a particular sewer connection. Lack of an approved permit may result in suspension or revocation of your drainlayers license.
2. Proper notification to all required agencies must be made within required time periods. Notification to Dig-safe (888-344-7233) must be made 72 hours prior to the start of work. The Holden Water Department (508-210-5550) must be notified 48 hours prior to the start of work for information and location marking of water lines.
3. The contractor is responsible to comply with all applicable OSHA open trench safety requirements. It is not the Town's responsibility to inspect each site for compliance.
4. Each particular sewer shall be laid directly to the building sewered. Not more than one building can be connected with a particular sewer through the same pipe.
5. Six inch (6") Schedule 35 PVC pipe as approved by the DPW Director will be used to make connections of all particular sewers to within five feet of the foundation wall of the building to be sewered. A four-inch (4") heavy cast iron pipe or equivalent PVC pipe (Schedule 40) shall be used through the foundation wall.
6. Minimum allowable slope is 2% or 1/4 inch per foot.
7. Cleanouts shall be provided every three (3) bends or 100 feet.
8. All pipes shall be laid with the bell end toward the outlet at the foundation (bell end uphill). Pipes shall not be reversed to eliminate fittings.
9. All joints shall be push on rubber type fittings. No glued PVC joints will be allowed outside the Foundation walls. The connection to be made from the six-inch (6") PVC pipe to the four-inch (4") heavy cast iron pipe shall be made with a rubber boot adapter. This adapter shall be of an approved type with stainless steel compression rings designed to create a water-tight seal.

APPENDIX E

BEST MANAGEMENT PRACTICES – CONSTRUCTION MATS



**US Army Corps
of Engineers®**
New England District

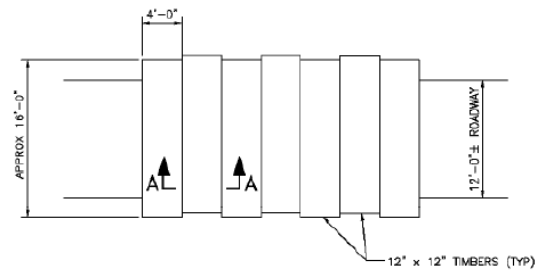
Construction Mat Best Management Practices (BMPs)

Installation	
	• Mats should be in good condition to ensure proper installation, use and removal. • Operating heavy equipment in wetlands shall be minimized, and such equipment other than fixed equipment (drill rigs, fixed cranes, etc.) shall not be stored, maintained, fueled or repaired in wetlands unless the equipment is broken down and cannot be easily removed. • An adequate supply of spill containment equipment shall be maintained on site. • General Permits in New England do not authorize dragging construction mats into position in waters of the U.S. • Woody vegetation (trees, shrubs, etc.) shall be cut at or above ground level and not uprooted in order to prevent disruption to the wetland soil structure and to allow stump sprouts to revegetate the work area. • Where feasible, place mats in a location that would minimize the amount needed for the wetlands crossing. • Minimize impacts to wetland areas during installation, use, and removal. • Install adequate erosion and sediment controls at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, swamp mats. • In most cases, construction mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Place mats far enough on either side of the resource area to rest on firm ground. • Provide standard construction mat BMP details to work crews (examples provided below).
Wetland/Stream Channel Crossing	
	• At “dry” crossings where no flow is present or anticipated during project construction, the mats may be placed directly onto the ground in order to prevent excessive rutting, provided stream banks and bottoms are not adversely altered. • Construction mats may be used as a temporary bridge over a stream to allow vehicles access to the work site. Small sections of mat are placed within and along the stream parallel to the flow of water. Mats may then be placed perpendicular to the stream, resting on top of the initial construction mat supports. It may be necessary to place additional reinforcement for extra stability and to minimize the amount of sediment that could fall between the spaces of each timber. • In areas where wildlife passage or migration is a consideration, mats may be installed in accordance with the diagram “Typical Stream Crossing with Swamp Mats.” • Mats should not be placed so that they restrict the natural flow of the stream. • Minimize number of stream/wetland crossings. Where feasible, locate crossing site where stream channel is narrow for the shortest possible clear span and where stream banks are stable and well defined. For large wetland complexes, consider accessing structures from opposite sides where possible to avoid crossing the entire wetland. • More than one layer of mats may be necessary in areas which are inundated or have deep organic wetland soils.

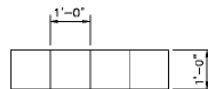
Maintenance	
	Matted wetland crossings should be monitored to assure correct functioning of the mats. Inspect mats after use. Look for any defects or structural problems. Mats which become covered with soils or construction debris should be cleaned and the materials removed and disposed of in an upland location. The material should not be scraped and shoveled into the resource area. Mats which become imbedded must be reset or layered to prevent mud from covering them or water passing over them.
Removal	
	- Matting should be removed by “backing” out of the site, removing mats one at a time. Any rutting or significant indentations identified during mat removal should be regraded immediately, taking care not to compact soils. - Mats should be cleaned before transport to another wetland location to remove soil and any invasive plant species seed stock or plant material. - Mats shall be cleaned of soil and any invasive plant species seed stock or plant material from before installation. - Cleaning methods may include but are not limited to shaking or dropping mats in a controlled manner with a piece of machinery to knock off attached soil and debris, spraying with water or air, and sweeping. - Crossings should be inspected following mat removal to determine the level of restoration required.
Restoration	
	Special precautions should be taken to promptly stabilize areas of disturbed soil located near wetlands and streams. Matted areas within wetlands shall be restored to their original condition and elevation. This may involve natural revegetation from existing root and seed stock of native plant species. Conditions may warrant planting and the broadcast of a wetland seed mix over the matted area to supplement the existing seed and rootstock. Seed mixes and vegetation shall contain only plant species native to New England. The use of mulch in wetlands shall consist of weed-free mulch to mitigate the risk of the spread of invasive plant species.

Example Mat Diagrams -

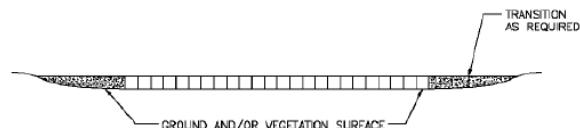
Best Management Practices Manual for Utility Maintenance
In and Adjacent to Wetlands and Waterbodies in New Hampshire
Interim January 2010.



TYPICAL PLAN VIEW



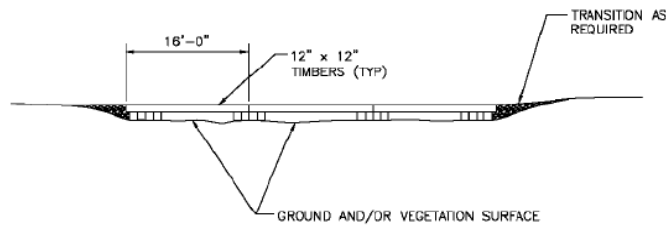
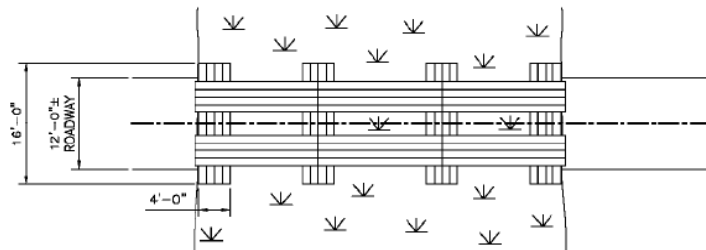
SECTION A-A
TYPICAL MAT SECTION
BOLTED TOGETHER



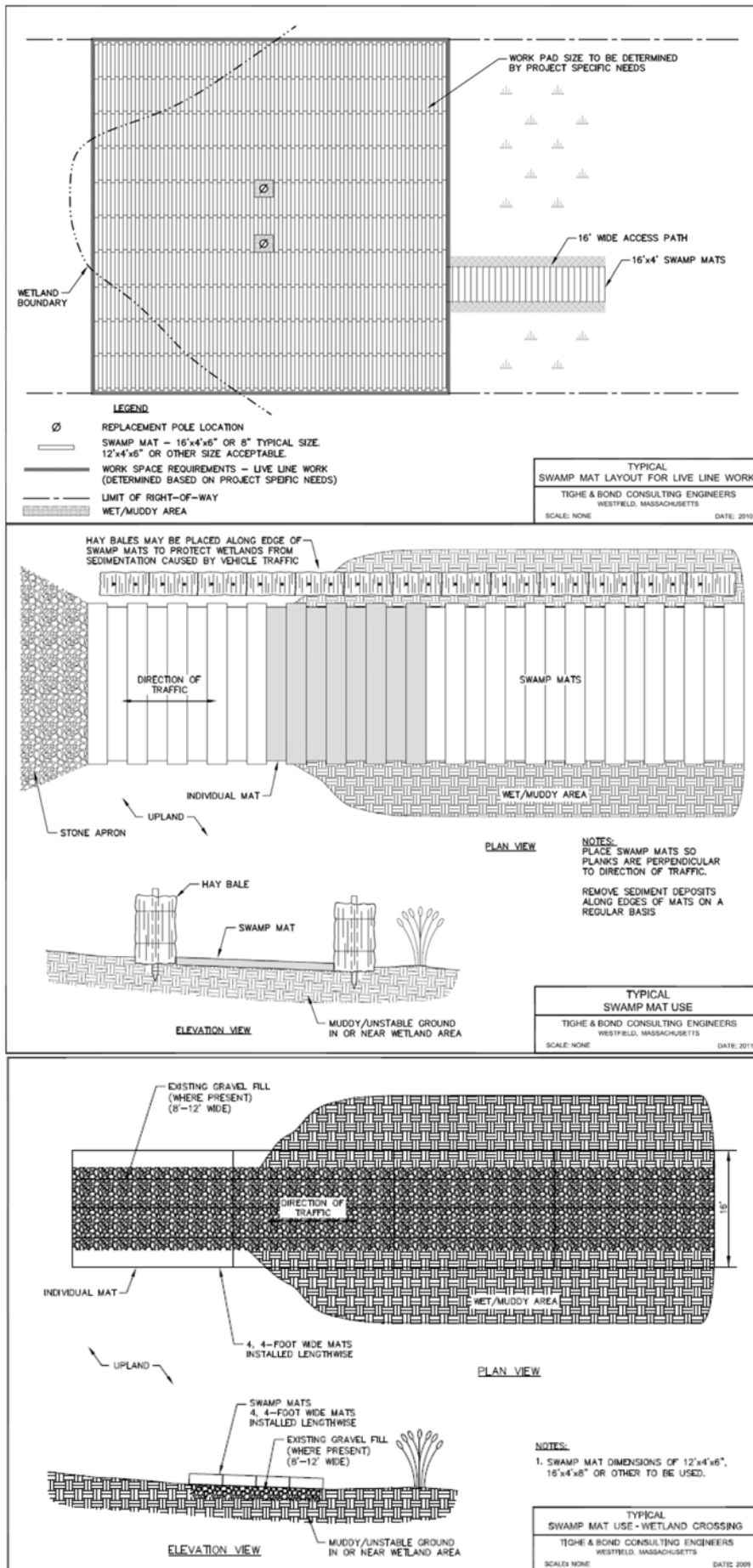
TYPICAL SECTION VIEW

NOTE:
1. TO BE INSTALLED IF NECESSARY TO PREVENT RUTTING TO ACCESS STRUCTURES.
2. THIS DETAIL SHOWS TYPICAL DIMENSIONS. SOME CONTRACTORS SWAMP MATS ARE DIMENSIONALLY DIFFERENT FROM WHAT IS SHOWN HERE.
3. DEPENDENT ON SITE CONDITIONS, MULTIPLE LAYERS OF SWAMP MATS MAY BE INSTALLED.

Best Management Practices Manual for Utility Maintenance
In and Adjacent to Wetlands and Waterbodies in New Hampshire
Interim January 2010.



TYPICAL STREAM CROSSING
WITH SWAMP MATS



APPENDIX F

SITE ACCESS LICENSE AGREEMENT

Site Access License Agreement

WHEREAS, Massachusetts Audubon Society, Inc. ("Licensor"), a non-profit organization, having a principal place of business located at 208 South Great Road, Lincoln, MA 01773, owns that certain real property known as Eagle Lake Wildlife Sanctuary, a portion of which is identified as Assessor's Parcels 25 and 61 on the Town of Holden Assessor's Map 114 (the "Property"); and

WHEREAS, there are restrictions on the Property, held by certain Stakeholders, identified below (collectively identified as "the Parties" when referred to along with the Licensor and Licensee) who have assented to this Agreement; and

WHEREAS, White Oak Land Conservation Society, Inc., a non-profit organization, having a principal place of business located at 22 Windy Ridge Road, Jefferson, MA 01522 with a mailing address of PO Box 346, Holden, MA 01520 (a stakeholder, referred to collectively with other Stakeholders, the Licensor and the Licensee as the "Parties"), holds a conservation restriction on a portion of the Eagle Lake Wildlife Sanctuary, identified as Assessor's parcel 61 on the Town of Holden's Assessor's Map 114 and recorded at the Worcester Registry of Deeds in Book 41920, Page 131; and

WHEREAS, Commonwealth of Massachusetts's Division of Water Supply Protection, having a principal place of business located at 251 Causeway Street, Suite 900, Boston, MA 02114 (a stakeholder, referred to collectively with other Stakeholders, the Licensor and the Licensee as the "Parties"), holds a conservation easement on a portion of the Eagle Lake Wildlife Sanctuary, identified as Assessor's parcel 25 on the Town of Holden's Assessor's Map 114 and recorded at the Worcester Registry of Deeds in Book 44508, Page 304; and

WHEREAS, Commonwealth of Massachusetts's Department of Conservation and Recreation having a principal place of business located at 251 Causeway Street, Suite 900, Boston, MA 02114 holds sewer line easements on a portion of the Eagle Lake Wildlife Sanctuary; said easement being recorded at the Worcester Registry of Deeds in Book 2586, Page 1, and Book 7812, Page 212; and

WHEREAS, Anna Maria College, a non-profit organization, having a principal place of business located at 50 Sunset Lane, Paxton, MA 01612 (a stakeholder, referred to collectively with other Stakeholders, the Licensor and the Licensee as the "Parties"), holds a sewer line easement on a portion of the Eagle Lake Wildlife Sanctuary; said easement being recorded at the Worcester Registry of Deeds in Book 35825, Page 344; and

WHEREAS, City of Worcester, acting through its Department of Public Works and Parks, Water Division, ("Licensee" individually a "party" and when referred together with Licensor, the Licensor and Stakeholders the "Parties"), desires to use a portion of the Property consisting of an area of land located off of Kendall Road on the southeast side of Eagle Lake, as shown on Exhibit A, attached hereto and consisting of

approximately 74,000 square feet of land on which the Department of Conservation and Recreation (DCR) holds a Sewer Easement; approximately 5,000 square feet of land on which Anna Maria College holds a Sewer Easement, and four dewatering areas totaling approximately 1,330 square feet (collectively comprising the "Licensed Area"), for purposes of rehabilitating an existing 36-inch 1930's raw water transmission main, subject to the terms and conditions of this Agreement;

NOW, THEREFORE, the Licensor, in consideration of the mutual promises contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, grants to the Licensee a non-exclusive license, revocable at the will of the Licensor, to enter upon the Licensed Area for the sole purpose of rehabilitating the existing 36-inch 1930's raw water transmission main during the Term of this Agreement, subject to the following terms and conditions:

1. The Licensee, and any and all of its personnel, invitees, employees, agents, servants, contractors, subcontractors, and/or representatives acknowledge and agree that their entry upon the Licensed Area under this License is at their own risk, that access to the Licensed Area is being afforded on an as-is basis only, and that the Licensor makes no representation or warranty as to the condition of the Property.

2. All work to be undertaken by the Licensee pursuant to the right in this License shall be completed by qualified contractors, engineers, surveyors, and/or consultants with the requisite experience and qualifications to perform the activities undertaken pursuant to this License. Any alteration, demolition, work, construction or improvement undertaken by the Licensee in the Licensed Area shall be performed in a good and workmanlike manner with reasonable protections for the Licensed Area. All work shall be conducted in compliance with all federal, state, or municipal laws, rules, orders, regulations, health and safety procedures, and requirements which may be applicable to the activities conducted on the Property under this License. At the Licensor's request, Licensee shall provide the Licensor with a copy of all permits, licenses, approvals, determinations, insurance certificates as specified below, or other documentation demonstrating such compliance before entry onto the Property.

3. The Licensee is self-insured. However, Licensee shall ensure its contractors (hereinafter referred to as "Contractors") obtain and maintain in force at all times during the term of this License, occurrence basis insurance coverages pertaining to commercial liability, property damage and motor vehicle in at least the following amounts:

- a. Commercial General Liability - \$1,000,000 per occurrence/\$2,000,000 aggregate
- b. Excess/Umbrella Liability - \$2,000,000
- c. Automobile Liability/Combined Single Limit - \$1,000,000
(for all owned, scheduled, hired, and non-owned autos)

The Contractors shall also obtain and maintain in force at all times during the term of this License, Workers Compensation insurance satisfying the Massachusetts statutory requirements.

4. The Licensee may enter onto the Property for the limited purposes specified herein for a period of two (2) years commencing on the day the Notice to Proceed letter is issued to the contractor ("Term"). Licensee may enter onto the Property for purposes specified herein only during the Term of this License. The Licensor reserves the right to be present and observe first-hand all activities conducted by the Licensee on the Property under this License.

5. Licensee agrees to plan and execute its activities in the Licensed Area so as not to unreasonably interfere with the use and occupancy of the Licensed Area, disrupt the transaction of business conducted on the Licensed Area, and/or jeopardize the safety of persons or property located on the Licensed Area.

6. Licensee agrees that its activities on the Licensed Area are to be conducted at its sole cost and expense.

7. Except as may be allowed by this or subsequent license, the Licensee agrees to promptly and peaceably vacate the Licensed Area upon expiration or revocation of this License.

8. Any item of value located on the Property which is damaged or destroyed or materially disrupted in the course of conducting the activities authorized by this License shall be repaired or replaced by the Licensee to the same condition prior to the damage.

9. The Licensee acknowledges that the Licensed Area is within an area afforded outstanding resource water (ORW) protection under the Massachusetts Surface Water Quality Standards. The Licensee agrees to design and implement erosion control measures and dewatering systems to minimize impacts to the ORW. Measures will include, but are not limited to, siting dewatering areas as far from resource areas as possible and utilizing frac tanks as settling basins.

10. Licensee agrees to maintain access to DCR's sewer mains at all times. This includes, if necessary, access with heavy truck equipment for emergency repairs and/or extensive inspections.

11. Licensee, through its contractors, agrees to implement all of the agreements detailed on the Quinapoxet Transfer Pipeline Contract 2 Plans dated September 2021 (Exhibit A).

12. Licensee reserves the right to relocate the dewatering basins if they are deemed to be negatively impacting water quality. Licensee shall obtain prior approval of Licensor and the Parties prior to relocating any of the dewatering basins.

13. Notices and notifications required under this License shall be given certified mail, return receipt requested, to the following parties:

If to Licensor:

Stephen Hutchinson
Senior Regional Director
Mass Audubon
208 South Great Road
Lincoln, MA 01773

If to Licensee:

City Manager
City Hall – Room 301
455 Main Street
Worcester, MA 01608

With a copy to:

Director, Water Division
Worcester DPW & P
18 East Worcester Street
Worcester, MA 01604

If to Stakeholders at the following:

Scott Morrison
Vice President
White Oak Land Conservation Society
22 Windy Ridge Road
Jefferson, MA 01522

John Scannell, Division Director
Department of Conservation and Recreation
251 Causeway Street Suite 900
Boston, MA 02114

Michael Miers
Executive Vice President
Anna Maria College
50 Sunset Lane
Paxton, MA 01612

Danielle Almeida
WPR Coordinator
Department of Conservation and Recreation
180 Beaman Street
West Boylston, MA 01583

14. Any amendments to this License shall be agreed upon, in writing, by the Parties.

15. All obligations assumed and agreements made by the Parties hereunder shall survive the expiration or revocation of this License and shall continue to bind the representatives, successors and assigns of the above named parties.

16. This License shall not be recorded or registered.

17. This License shall be of no force and effect unless and until it is accepted by execution of all the duly authorized representatives.

18. The persons signing this License represent and warrant that they have full power and authority to execute and deliver this License on behalf of the party for whom they have signed.

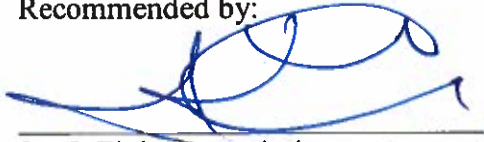
19. This License may be executed in counterparts.

[Signature pages to follow]

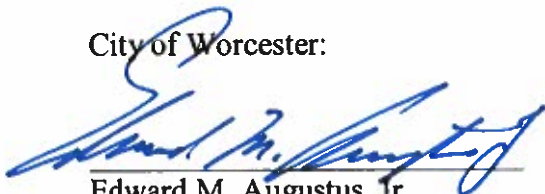
In Witness Whereof, the parties hereto, intending to be legally bound, have set their hands and seals this 13th day of April, 2022.

LICENSEE: CITY OF WORCESTER

Recommended by:


Jay J. Fink, Commissioner
Department of Public Works & Park

City of Worcester:


Edward M. Augustus, Jr.
City Manager

Approved as to form:


Alexandra H. Kalkounis
Deputy City Solicitor

In Witness Whereof, the parties hereto, intending to be legally bound, have set their hands and seals this 3rd day of March, 2022.

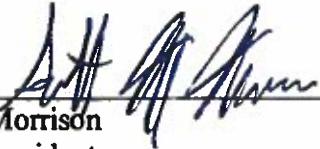
**LICENSOR
MASSACHUSETTS AUDUBON SOCIETY**

A handwritten signature in blue ink, appearing to read "Bancroft R. Poor", is written over a horizontal line.

Bancroft R. Poor
Assistant Treasurer/Chief Financial Officer

In Witness Whereof, the parties hereto, intending to be legally bound, have set their hands and seals this 30 day of March, 2022.

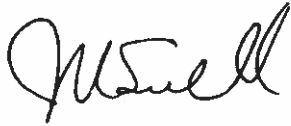
White Oaks Land Conservation Society



Scott Morrison
Vice President

In Witness Whereof, the parties hereto, intending to be legally bound, have set their hands and seals this 5th day of April, 2022.

Department of Conservation and Recreation:

A handwritten signature in black ink, appearing to read "J. Scannell", written over a horizontal line.

John M. Scannell, Director
Division of Water Supply Protection

In Witness Whereof, the parties hereto, intending to be legally bound, have set their hands and seals this 17 day of February, 2022.

Anna Maria College



Michael Miers

Executive Vice President & Chief Information Officer



February 23, 2022

Mr. Kevin Scherer
Department of Public Works & Parks
55 Moy Ranch Road
Holden, MA 01520

Re: Approval of dewatering basin on Massachusetts Audubon Society WPR/WSR

Dear Mr. Kevin Scherer,

Thank you for submitting a request for approval to the Department of Conservation and Recreation (DCR) to install a dewatering basin on Mass Audubon's Eagle Lake property in Holden, MA over which DCR-Division of Water Supply Protection holds a Watershed Supply Restriction (WSR).

It is our understanding from your request that:

- The City of Worcester is repairing the water line that runs through an easement on Mass Audubon's property and wishes to temporarily locate a 450 square foot dewatering basin outside the easement on land protected by a WSR.
- Locating the dewatering basin outside the water line easement is necessary to protect water quality.
- No trees will be cut, and the ground will not be disturbed during installation.
- Mass Audubon supports this request.

The WSR "prohibits any activity or use not permitted herein without express written consent of the Commonwealth stating that such activity or use is consistent with the watershed protection and management purposes of the WSR..."

After reviewing your request and the terms of the WSR, DCR agrees that temporarily locating a dewatering basin on the WSR is consistent with the watershed protection and management purposes of the WSR. Please accept this letter as DCR approval to install the dewatering basin in accordance with the details submitted and the following conditions:

- Any areas of the WSR that are disturbed during the project will be restored to original condition and;
- Any exposed soil will be seeded with a conservation grass seed mix to prevent erosion.
- The City will notify DCR if the dewatering basin needs to be relocated from the location described in the provided Plan or if additional basins are needed.

COMMONWEALTH OF MASSACHUSETTS · EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS

Department of Conservation and Recreation
180 Beaman Street
West Boylston, MA 01583
508-792-7423 508-792-7805 Fax
www.mass.gov/orgs/department-of-conservation-recreation



Charles D. Baker
Governor

Karyn E. Polito
Lt. Governor

Kathleen A. Theoharides, Secretary, Executive
Office of Energy & Environmental Affairs

Stephanie Cooper, Acting Commissioner
Department of Conservation & Recreation

Please notify me once the project is complete and the dewatering basin has been removed and don't hesitate to reach out if you have any questions about this approval or the WSR.

Sincerely,



Danielle Almeida
Watershed Preservation Restriction Coordinator
Danielle.Almeida@mass.gov
617-571-0065

CC (email): Stephen Hutchinson
Ken MacKenzie
John Scannell
Kelley Freda

EXHIBIT A
LICENSED AREA & CONSTRUCTION PLANS





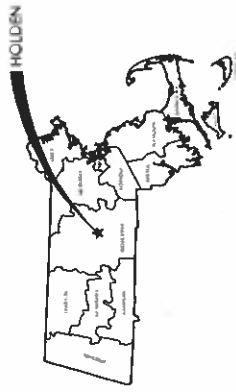
DEPARTMENT OF PUBLIC WORKS AND PARKS CITY OF WORCESTER, MA



QUINAPOXET TRANSFER PIPELINE CONTRACT 2



SEPTEMBER 2021
Project Number: 195150275



LOCATION MAP



PROJECT LOCATION

VICINITY MAP
NOT TO SCALE

MAYOR
JOSEPH M. PETTY
CITY MANAGER
EDWARD M. AUGUSTUS, JR.
COMMISSIONER OF PUBLIC WORKS
JAY J. FINK
WATER/SEWER OPERATIONS DIRECTOR
PHILIP D. GUERIN
BID DOCUMENTS

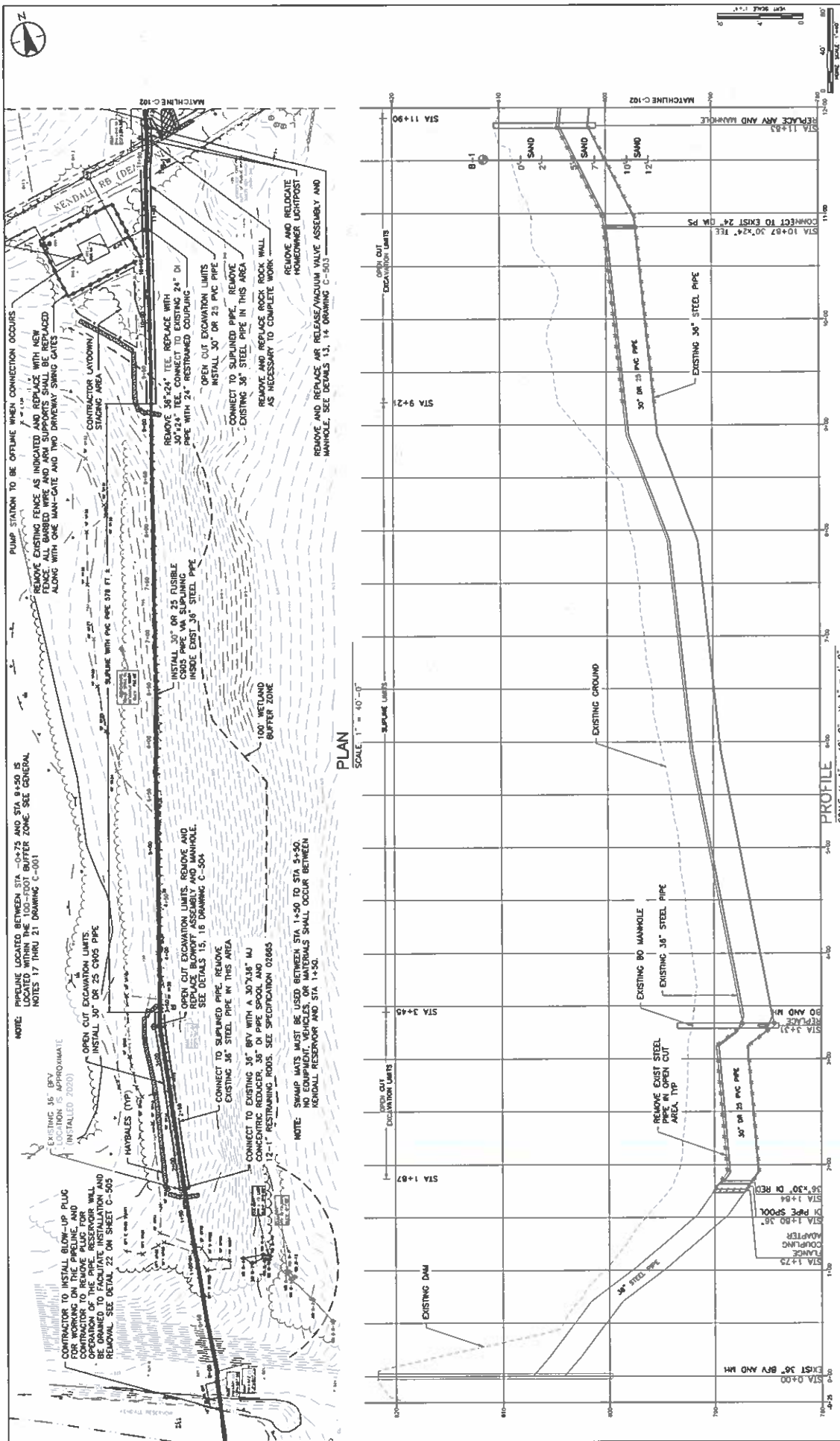
INDEX OF SHEETS

SHEET NO.	DRAWING NO.	TITLE
1	G-001	COVER SHEET
2	C-001	GENERAL NOTES, LEGENDS AND ABBREVIATIONS
3	C-101	PLAN AND PROFILE - PART 1
4	C-102	PLAN - PART 2
5	C-103	PLAN - PART 3
6	C-104	PROFILE - PART 2 AND PART 3
7	C-105	PLAN AND PROFILE - PART 4
8	C-106	PLAN AND PROFILE - PART 5
9	C-107	PLAN AND PROFILE - PART 6
10	C-401	PUMP STATION RD LARGE SCALE VIEW
11	C-402	PUMP STATION RD PAVING LIMITS
12	C-501	PAVING AND TRENCH DETAILS
13	C-502	EROSION CONTROL NOTES AND DETAILS
14	C-503	MISCELLANEOUS DETAILS - PART 1
15	C-504	MISCELLANEOUS DETAILS - PART 2
16	C-505	MISCELLANEOUS DETAILS - PART 3
17	T-101	TEMPORARY TRAFFIC CONTROL DETAILS
18	T-102	KENDALL ROAD TRAFFIC PLAN

- [illegible]

- [illegible]

[illegible]



Stantec

1000 Peachtree Street, Suite 200
Atlanta, Georgia 30309
Phone: 404.511.8800
Fax: 404.511.8801
www.stantec.com

City of Worcester
DEPARTMENT OF PUBLIC WORKS AND PARKS
QUINAPOXET TRANSFER PIPELINE
CONTRACT 2

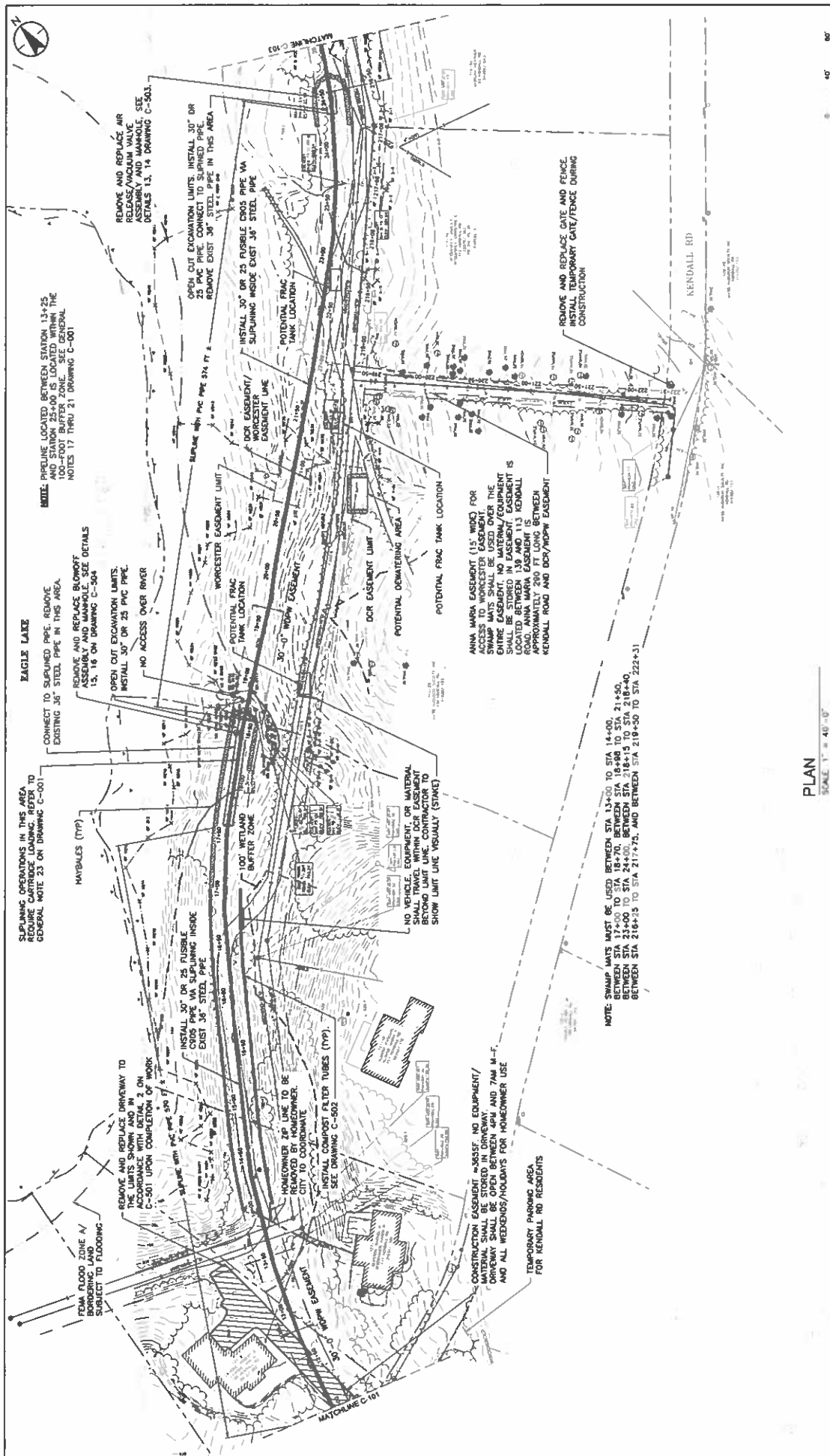
HOUSHI, JASAKI, CHUETSU

PLAN AND PROFILE - PART 1

Project No. 195150275
Drawing No. C-101
Scale: AS SHOWN
Sheet: 3 of 8

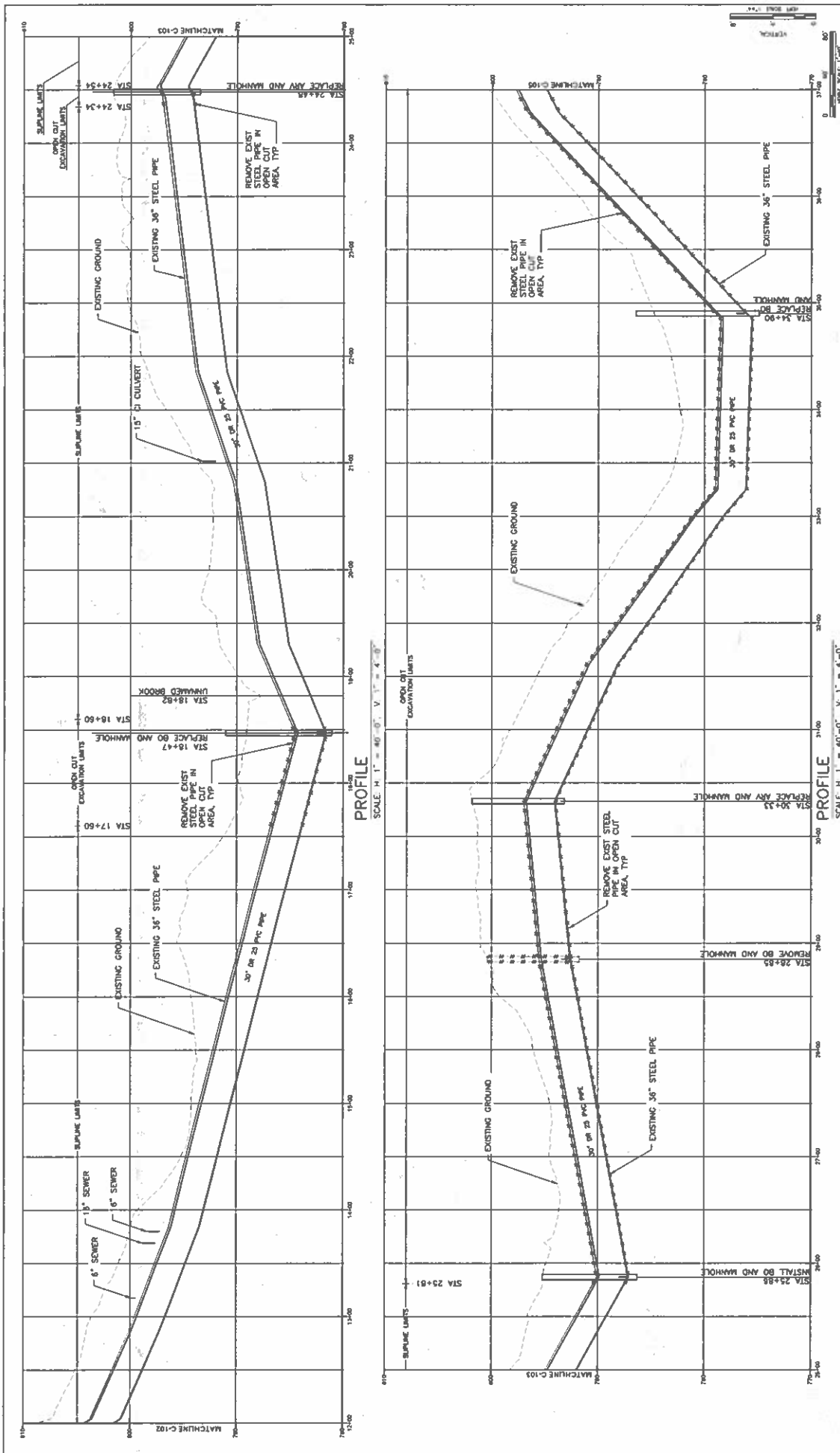
Revision

No.	Description	Date
1	AS SHOWN	06/20/22



PLAN
SCALE 1" = 40'-0"

 45 Newell Drive, 2nd Floor Burlington, MA 01803 www.stantec.com © 2012 Stantec Consulting, Inc. All rights reserved.	Client/Project CITY OF WORCESTER DEPARTMENT OF PUBLIC WORKS AND PARKS QUINAPOXET TRANSFER PIPELINE CONTRACT 2 HOUSTON, MASSACHUSETTS	Title PLAN - PART 2
	Project No. 195150275	Scale AS SHOWN
Revision 4 of 18		



Client/Project
CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS AND PARKS
QUINAPOXET TRANSFER PIPELINE
CONTRACT 2
HOLDEN, MASSACHUSETTS

Project No. 195150275
Scale AS NOTED
Drawing No. 5-101
Revision

Sheet C-104
6 of 18

Title
PROFILE - PART 2 AND PART 3

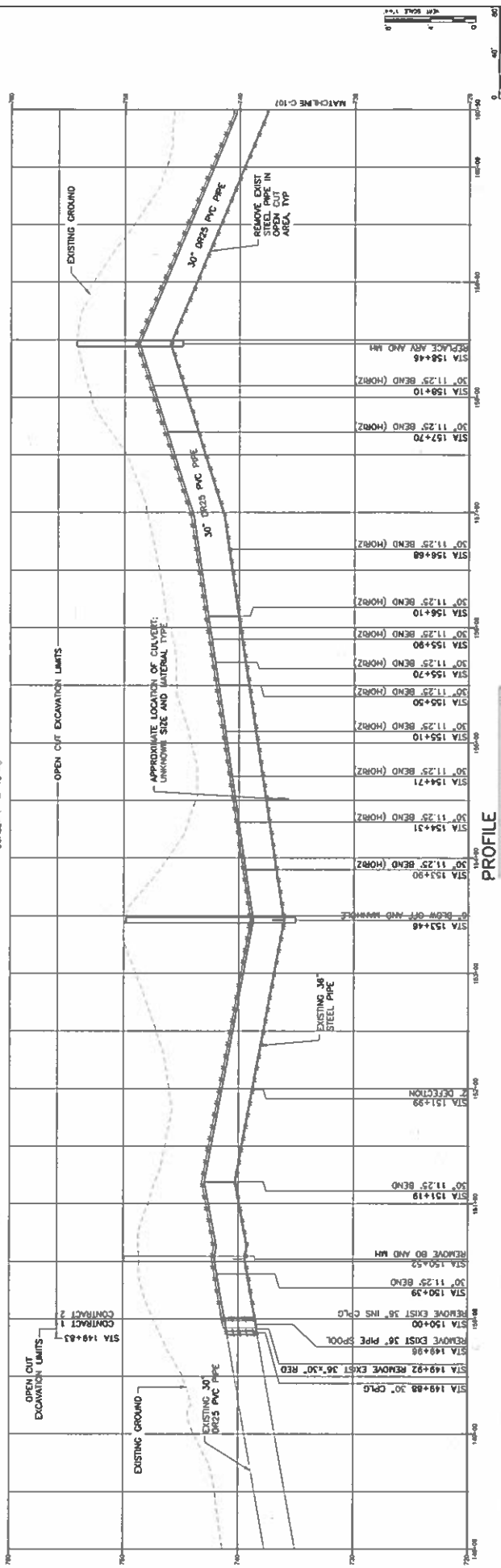
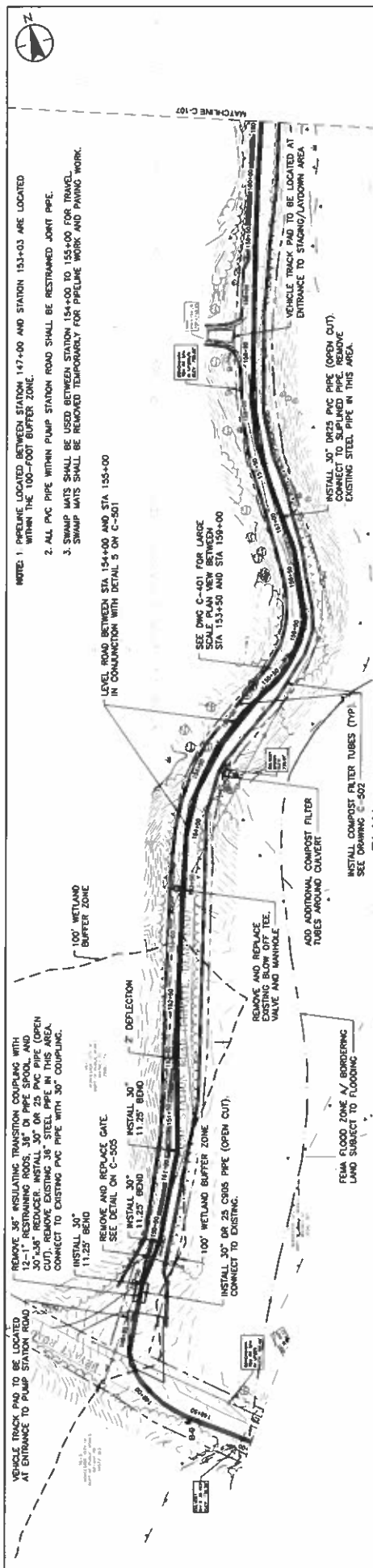
Stantec

45 North Drive, 2nd Floor
Worcester, MA 01608
Phone: 508.853.3000
Fax: 508.853.3001
Email: info@stantec.com
www.stantec.com

Consultant

Permit/Local

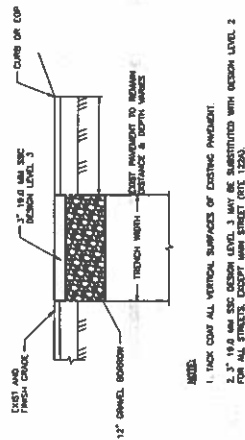
Approval



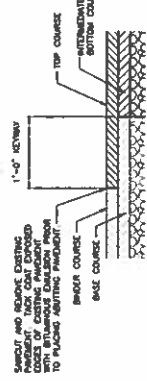
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Drawing No.		C-106	
Scale		AS SHOWN	
Sheet		8 of 18	
Revision			

Client/Project		CITY OF WORCESTER DEPARTMENT OF PUBLIC WORKS AND PARKS QUINAPOXET TRANSFER PIPELINE CONTRACT 2 HOLDEN, MASSACHUSETTS	
By: [Signature]		Date: 05/11/2011	
Checked: [Signature]		Date: 05/11/2011	
Reviewed: [Signature]		Date: 05/11/2011	

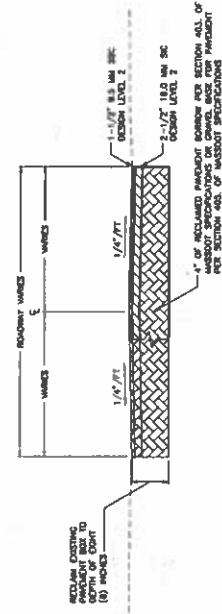
Consultant		Stantec	
1000 Main Street, Suite 200 Worcester, MA 01608 www.stantec.com		Stantec Corporation is an equal opportunity employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. Minorities and women are encouraged to apply. Stantec is an Equal Opportunity Employer. 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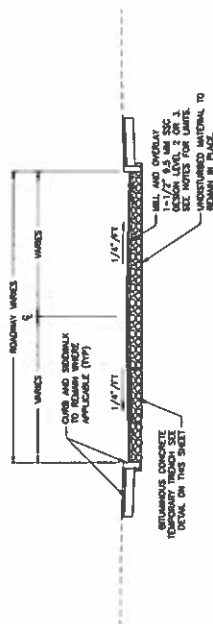
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TEMPORARY TRENCH PAVEMENT
SCALE: NOT TO SCALE



2
TRANSVERSE KEYWAY DETAIL FOR
CONNECTION TO EXISTING PAVEMENT
SCALE: NOT TO SCALE



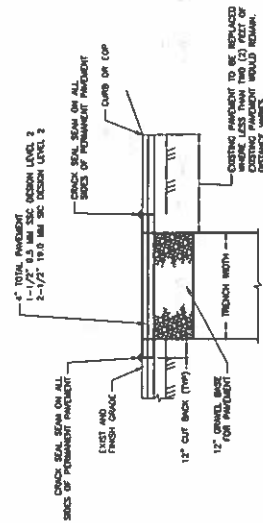
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RESTORATION (PUMP STATION ROAD)
SCALE: NOT TO SCALE



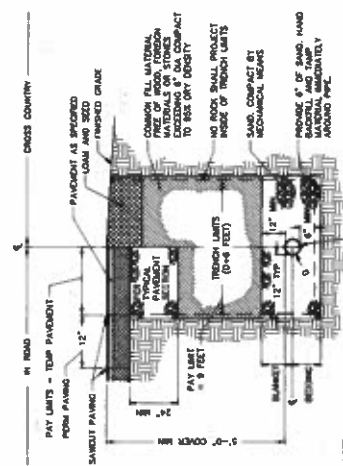
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PAVEMENT MILL AND OVERLAY
(PRINCETON STREET)
SCALE: NOT TO SCALE

PAVING REQUIREMENTS			
STATION FROM	STATION TO	STREET NAME	USE PAVING DETAILS
11+33	11+63	KENDALL ROAD	1, 2, 4
40+50	51+20	MAIN STREET (ROUTE 122A)	1, 3, 4
51+74	52+50	HIGH STREET	1, 2, 4
71+30	71+88	PRINCETON STREET	1, 2, 4
75+50	107+00	PRINCETON STREET	1, 6
107+00	149+50	WHITNEY STREET	1, 2, 4
149+50	171+70	PUMP STATION ROAD	5

5



5
PERMANENT TRENCH PAVEMENT (HOLDEN)
SCALE: NOT TO SCALE



6
PERMANENT TRENCH PAVEMENT (MASSDOT)
SCALE: NOT TO SCALE

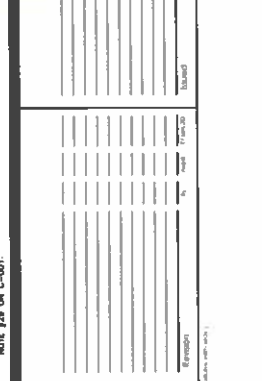
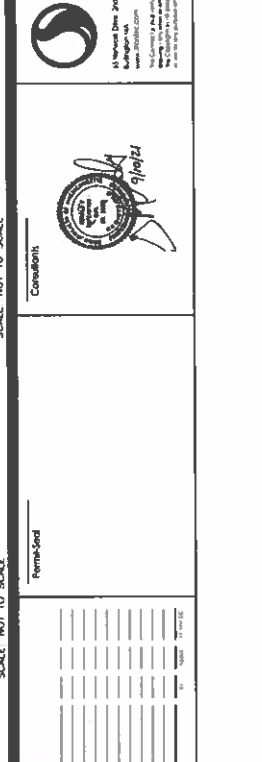
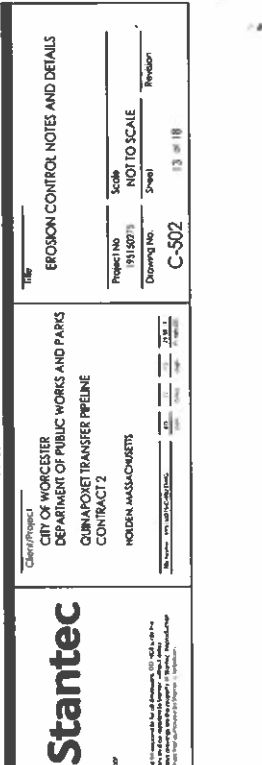
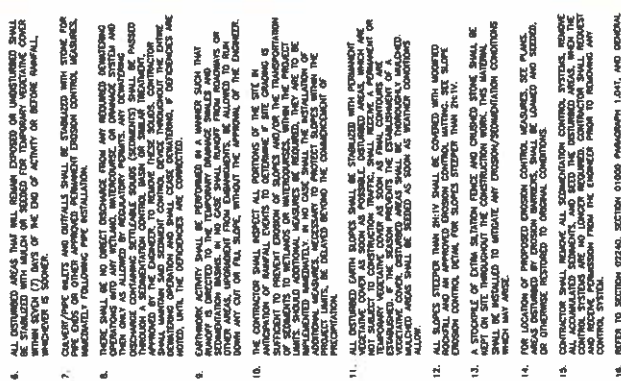
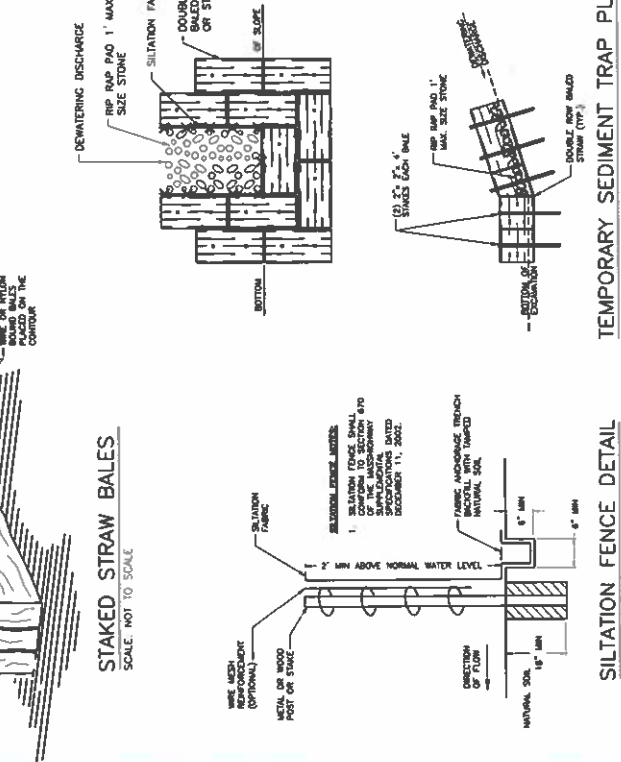
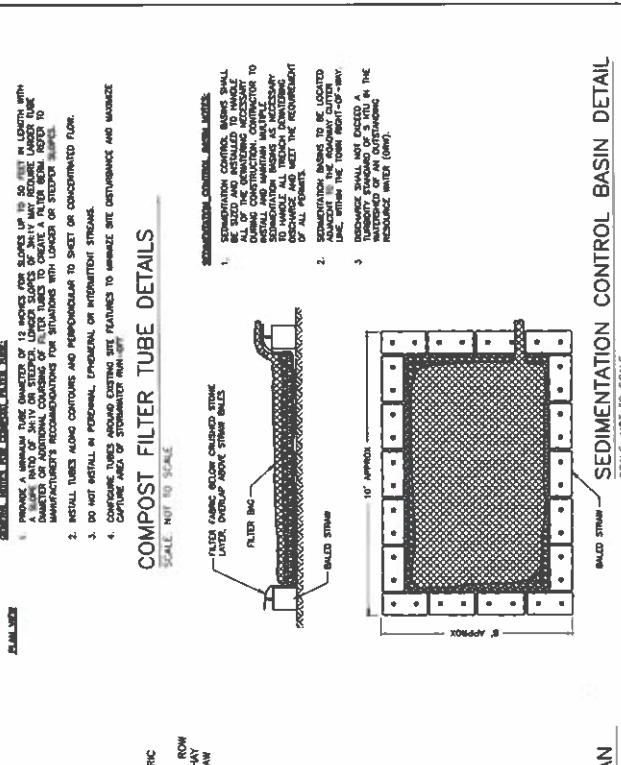
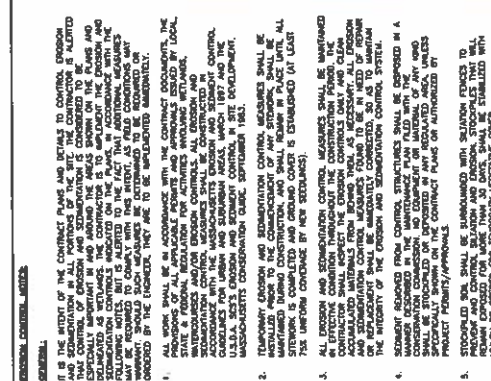
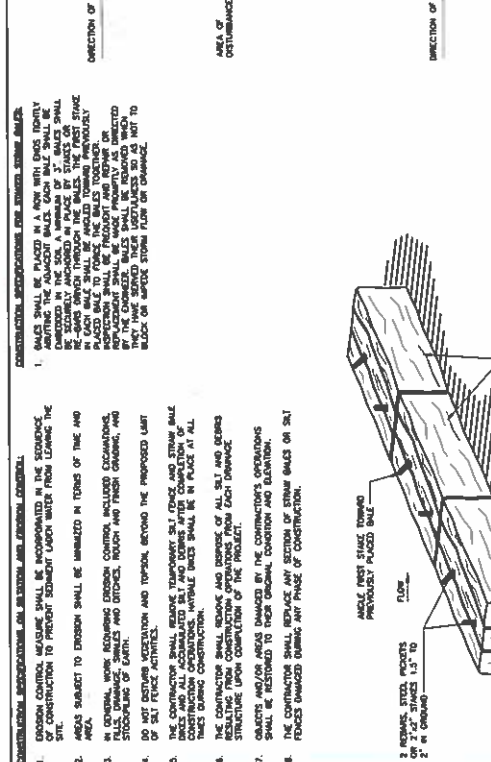
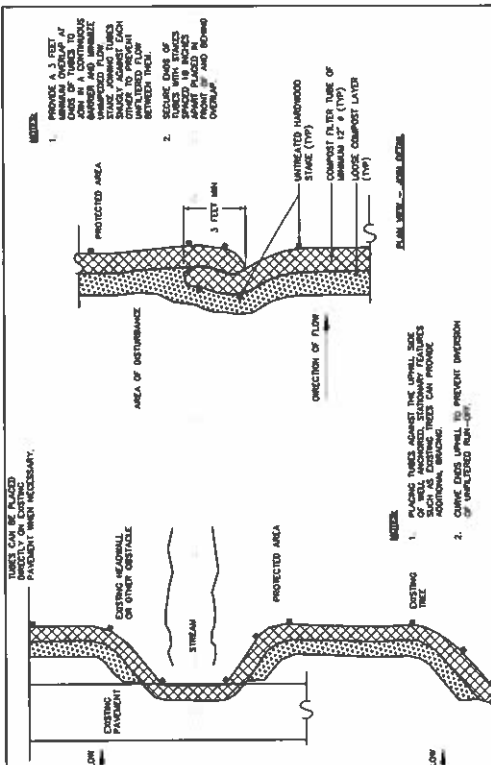
7
PVC TRENCH DETAIL
SCALE: NOT TO SCALE

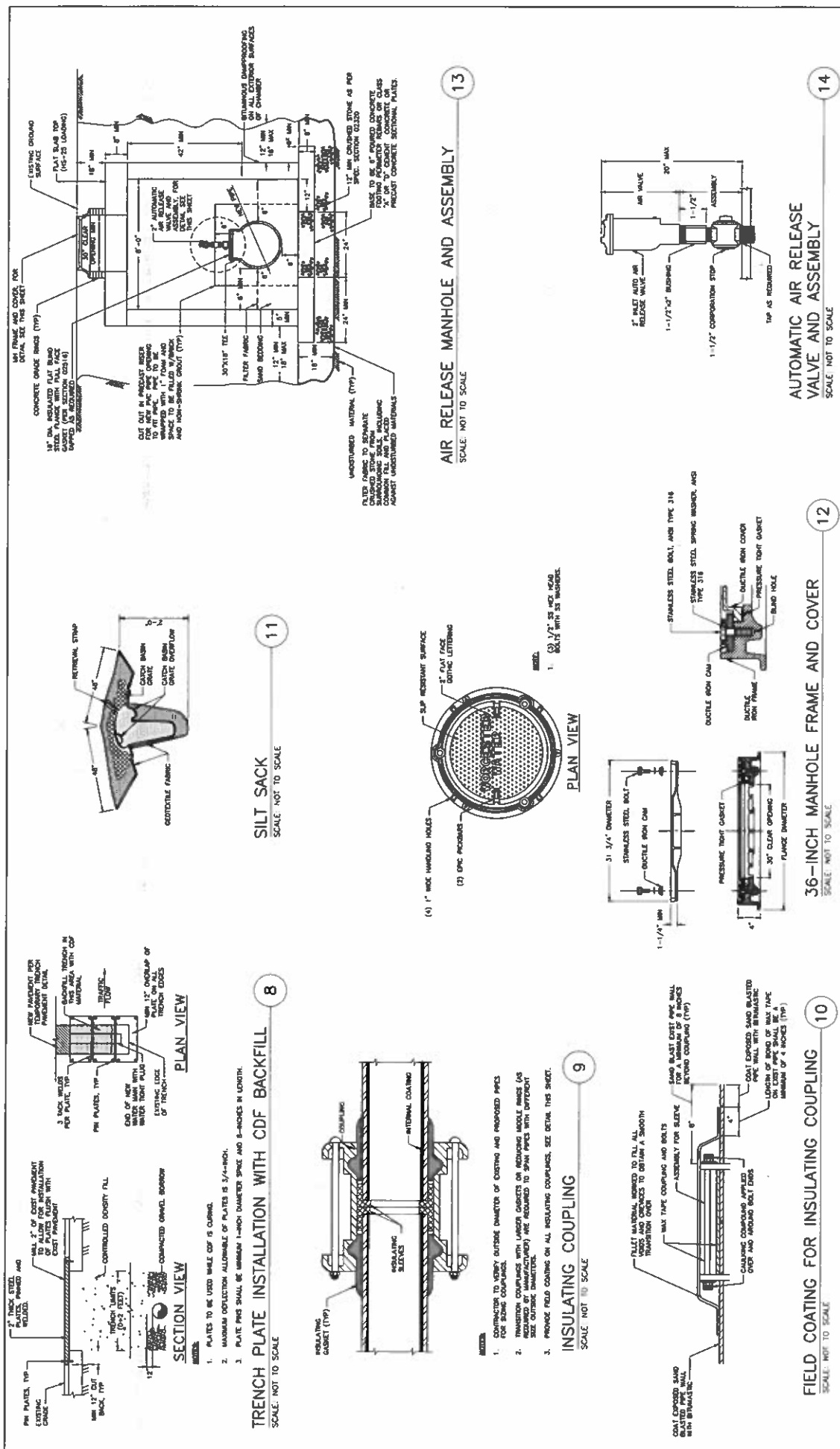
Stantec

11 Veterans Drive, 2nd Floor
Burlington, MA 01803
Phone: 802.244.4000
Fax: 802.244.4001
Email: info@stantec.com

Project No.	Scale	Revision
19150275	NOT TO SCALE	1
C-501	12" = 18'	2

Client/Project
CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS AND PARKS
QUINAPOXET TRANSFER PIPELINE
CONTRACT 2
HOUSON MASSACHUSETTS





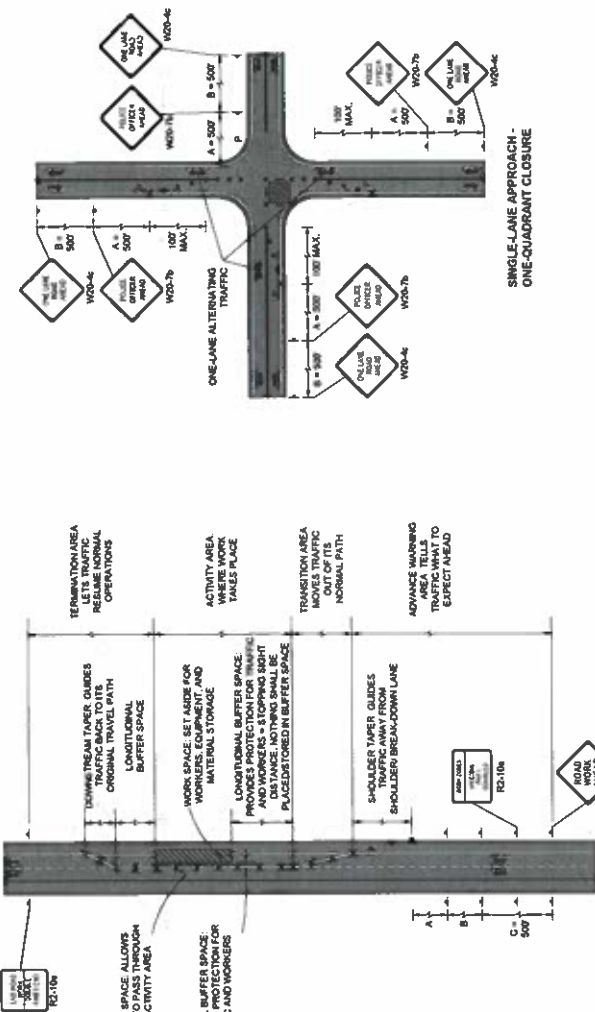


NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- CONSTRUCTION BARRIERS AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRIERS, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVEL LANE MUST PASS THE CRITERIA SET FORTH IN "MANUAL FOR ASSESSING SAFETY HARDWARE" (MAASH).
- CONTRACTORS SHALL NOTIFY EACH AMBULANCE AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF THE HIGHWAY OR THE TEMPORARY CLOSURE OF THE HIGHWAY FOR MORE THAN 24 HOURS. THESE NOTIFICATIONS SHALL BE IN WRITING AND SHALL BE SUBMITTED TO THE ENGINEER.
- THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH, UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MAINTAINED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

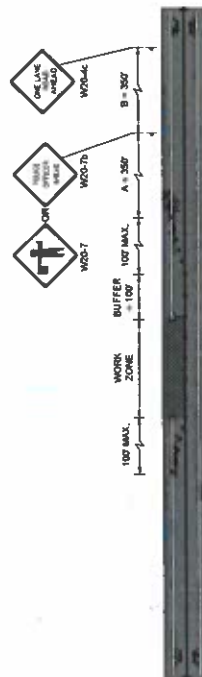
LEGEND:

- REFLECTORIZED PLASTIC DRUM OR 3" CONE
- POLYFLUORIDE DETAIL
- TYPE III BARRIERS
- CHANGEABLE MESSAGE SIGN
- ARROW BOARD
- WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR
- IMPACT ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK ZONE
- DIRECTION OF TRAFFIC
- TRUCK MOUNTED ATTENUATOR
- IMPACT ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS

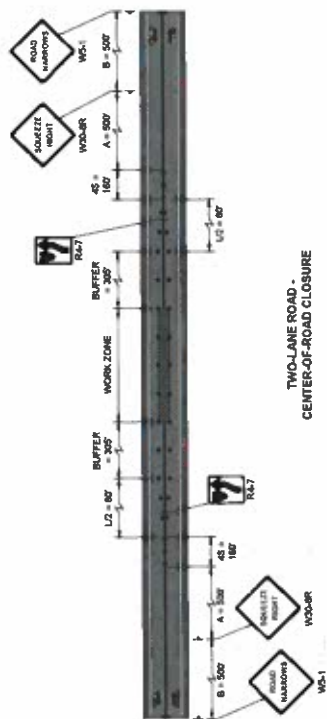


SINGLE-LANE APPROACH - ONE-QUADRANT CLOSURE

COMPONENT PARTS OF A TEMPORARY TRAFFIC CONTROL (TTC) ZONE



TWO-LANE ROAD - ONE LANE ALTERNATING TRAFFIC



TWO-LANE ROAD - CENTER-OF-ROAD CLOSURE

Stantec

1000 Main Street, Suite 200
Boston, MA 02111
www.stantec.com

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Client/Project:

CITY OF WORCESTER
DEPARTMENT OF PUBLIC WORKS AND PARKS
QUINAPOXET TRANSFER PIPELINE
CONTRACT 2
HOLDEN, MASSACHUSETTS

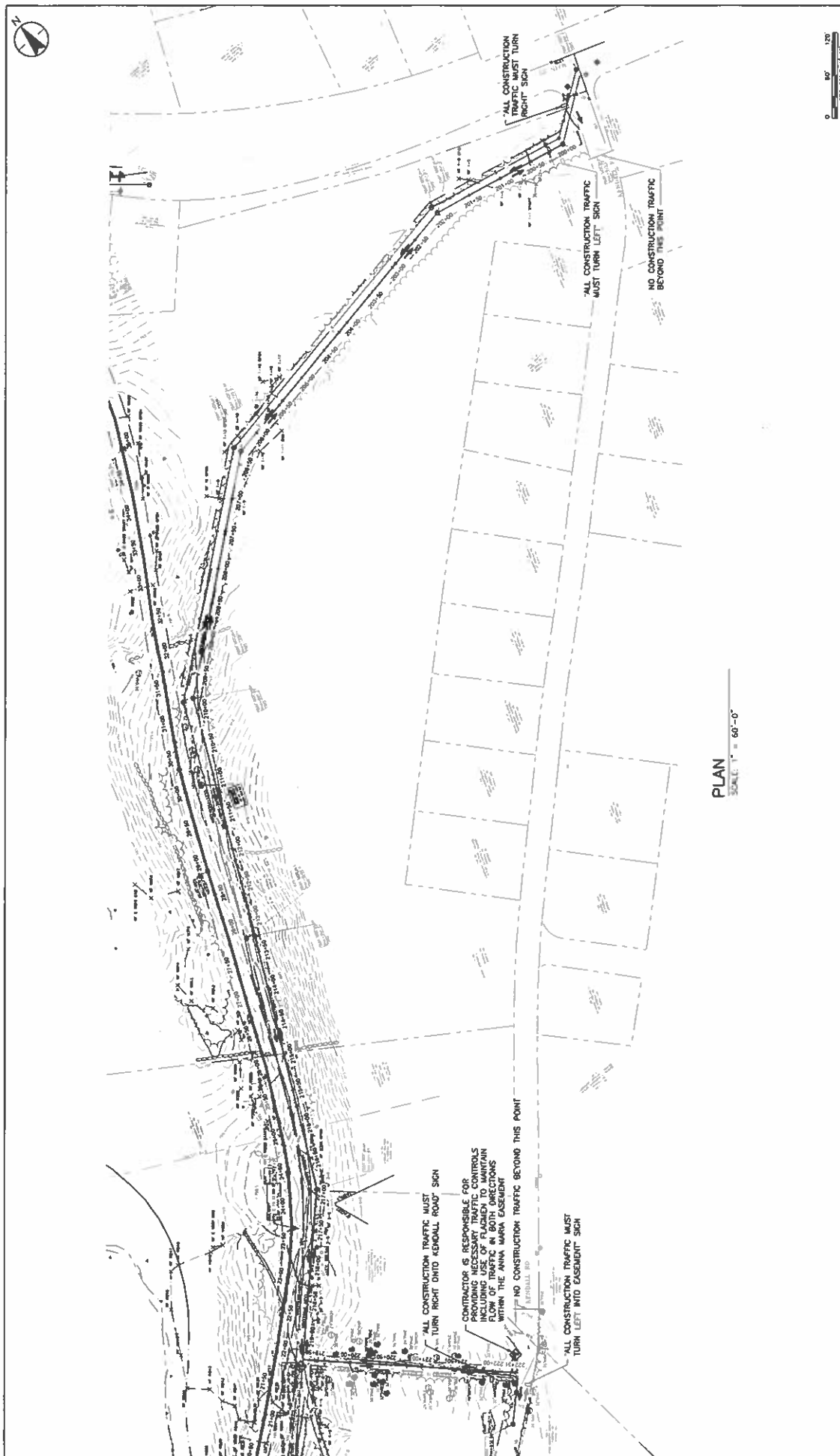
Drawn By: J. J. J.

Checked By: J. J. J.

Scale: NOT TO SCALE

Sheet: 1-101

Revision: 18



PLAN
SCALE: 1" = 60'-0"

Client/Project CITY OF WORCESTER DEPARTMENT OF PUBLIC WORKS AND PARKS QUINAPOXET TRANSFER PIPELINE CONTRACT 2 HOUSTON, MASSACHUSETTS		TITLE KENDALL ROAD TRAFFIC PLAN								
Project No. 195150275	Scale AS SHOWN	Revision 18 of 18								
Stantec 44 Waterville Drive, Suite 200 Waterville, ME 04901 Tel: 207.875.1234 Fax: 207.875.1235 Email: info@stantec.com www.stantec.com										
Consultants 										
Revised <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> <th>REVISION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>7/10/21</td> <td>MM</td> <td>ISSUED FOR PERMIT</td> </tr> </tbody> </table>			NO.	DATE	BY	REVISION	1	7/10/21	MM	ISSUED FOR PERMIT
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