SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section includes the basic requirements and expectations of the Contractor in all work pertaining to subsurface conditions.

1.2 GENERAL REQUIREMENTS

A. The Contractor acknowledges that he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon groundwater table or similar physical conditions at the site; the characterization and conformation of subsurface materials to be encountered; and all other matters that can in any way affect the work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

1.3 SUBSURFACE DATA

A. The findings of recent subsurface investigations are provided in the boring log information (included in the Appendix to these Specifications) and the analytical results of samples collected for waste characterization analyses are available for review upon request.

B. Such data is offered in good faith solely for the purpose of placing the Contractor in receipt of information available. The Contractor shall interpret such data according to his own judgment, and acknowledges that he is not relying upon the same as accurately describing the actual subsurface conditions or quantities of materials that may be encountered. The Contractor further acknowledges that he assumes all risk contingent upon the nature of the subsurface conditions to be actually encountered in performing the work covered by the Contract, even though such actual conditions may result in the Contractor performing more or less work than originally anticipated. In the event that quantities of waste soil/fill and related work as established in this Contract vary significantly from estimates provided, the unit bid prices will be the basis for compensation.

C. Re-use of excavated soils on- or off-site is subject to local, state and federal regulations and as specified in Section 02080 – SOIL AND

WASTE MANAGEMENT and 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL.

D. Since individual disposal facilities will have different permit conditions and specific pre-characterization data requirements, the Contractor shall use the information provided for waste characterization; however the Contractor shall be responsible for final waste characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final waste characterization testing is the responsibility of the Contractor, and costs for any additional characterization shall be incorporated into the Contractor's lump sum bid price for Soil Management.

E. Additional subsurface investigation as may be warranted to satisfy a disposal facility's data requirements shall be the responsibility of the Contractor. Subsurface investigation activities shall not commence until a written work plan detailing the Contractor's approach for obtaining the data is approved by the Owner's Licensed Site Professional. The work plan must indicate the location and frequency of sampling; sampling parameters and sampling methodology. The Contractor shall allow a minimum of 14 days for review and comment.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02010

SECTION 02051

DEMOLITION, MODIFICATION, AND ABANDONMENT

2051.1	**DISPOSAL OF CONSTRUCTION DEBRIS AS SOLID WASTE**	**TON**
2051.2	**DISPOSAL OF BITUMINOUS CONCRETE**	**TON**
2051.3	**DEMOLITION OR REMOVAL OF LAMP HOLE, MANHOLE, CATCH BASIN OR OTHER STRUCTURE**	**EACH**
2051.4	**ABANDON IN PLACE MANHOLE, CATCH BASIN OR OTHER STRUCTURE**	**EACH**
2051.5	**ABANDON IN PLACE PIPE – GREATER THAN 15-INCH DIAMETER THROUGH 36-INCH DIAMETER**	**LINEAR FOOT**
2051.6	**MASONRY PLUG OR BULKHEAD FOR PIPE ABANDONMENT GREATER THAN THAN 15-INCH DIAMETER THROUGH 36-INCH DIAMETER**	**LINEAR FOOT**
2051.7	**DEMOLITION OR REMOVAL OF PIPE GREATER THAN 15-INCH DIAMETER THROUGH 36-IN DIAMETER**	**LINEAR FOOT**
2051.8	**REMOVAL OF 5-INCH MASONRY PLUG AND REPLACEMENT WITH 8-INCH MECHANICAL PLUG**	**EACH**

PART 1 – GENERAL

1.1 SUMMARY

A. The Contractor shall furnish all plant, labor, tools, equipment, materials, and supplies as required for utility and structure removal, demolition, modification, and/or abandonment as specified.

B. The Work of this Section shall include the following significant items; all other activity shown on the Drawings; and work necessary and defined herein pertaining to the project area: demolition of roadway and sidewalk; removal of existing catch basins and manholes; abandonment of existing catch basin laterals; removal of existing pipe and selective demolition.

1.2 RELATED DOCUMENTS

A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

B. Section 02590 – BRICK MASONRY

C. Section 03315 – GROUT

D. Section 02160 – TEMPORARY EXCAVATION SUPPORT SYSTEMS

E. Section 02080 – SOIL AND WASTE MANAGEMENT

F. Section 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Removal and abandonment procedures that shall provide for safe conduct of the Work, careful removal and disposition of materials and equipment, protection of utilities, structures, property, or other features which are to remain undisturbed and coordination with existing utilities or owners responsible for those nearby elements to remain in service.

2. A detailed work plan to include a list of items to be removed and/or abandoned, a sequence and schedule, and a list of salvageable materials and equipment.

3. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

B. Schedule of Selective Demolition, Modification and Abandonment Activities

1. The Schedule of Selective Demolition, Modification and Abandonment Activities shall be subject to approval by the Owner and Engineer.

Indicate the following:

a. Detailed sequence of selective demolition, modification and abandonment work, with starting and ending dates for each activity. Ensure the Owner's operations are uninterrupted.

b. Interruption of utility services.

c. Coordination for shutoff, capping, bulkheading and continuation of utility services.

d. Proposed materials, construction details, locations of temporary utilities, abandonment materials, and means of access.

e. Coordination of Owner's continuing use of portions of utilities, structures, property or other features and of Owner's partial occupancy of completed Work.

C. Additional Submittals for Selective Demolition, Modification, and Abandonment Activities

1. Inventory: After selective demolition or modifications are complete, submit a list of items that have been removed and salvaged.

2. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining utility construction and site improvements that might be misconstrued as damage caused by selective demolition or modification operations. Submit before Work begins.

3. Landfill Records: Indicate receipt and acceptance of all wastes by disposal facility licensed to accept the wastes to be disposed.

D. Plugs and Bulkheads

1. For each permanent and temporary bulkhead and masonry and mechanical plug, the Contractor, at a minimum, shall submit the following, prepared by a Massachusetts Registered Professional Civil or Structural Engineer:

a. Design Loads

b. Restraining Mechanisms

c. Method of Installation

d. Results of Field Inspection after Installation

e. Decommissioning Method

2. If temporary pneumatic or hydro plugs are proposed, in addition, the Contractor shall submit the method and procedure of maintaining bladder pressure.

1.4 REPAIR OF DAMAGE

A. Any damage to existing facilities to remain, as caused by the Contractor's operations shall be repaired at no additional cost to the Owner.

B. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract.

1.5 PROTECTION OF EXISTING WORK

A. Before beginning any cutting, trenching or demolition work, the Contractor shall carefully review the work sequence and examine the Drawings and Specifications to determine the extent of the Work. The Contractor shall take all necessary precautions to prevent damage to existing facilities, which are to remain in place, and be responsible for any damages to existing facilities, which are caused by the operations. Damages to such work shall be repaired or replaced to its existing condition at no additional cost to the Owner. The Contractor shall carefully coordinate the work of this Section with all other work and shall provide shoring, bracing, and supports, as required. The Contractor shall insure that structural elements are not overloaded or compromised and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract. The Contractor shall remove all temporary protection when the work is complete.

B. The Contractor shall carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, the Contractor shall consult with the Owner prior to the placement of such equipment or material.

1.6 JOB CONDITIONS

A. The Owner assumes no responsibility for actual condition of the facilities to be removed, abandoned or modified. The Contractor shall visit the site; inspect all facilities to get familiarized with all existing conditions and utilities.

B. The Owner may occupy portions of the utilities, structures, properties or other facilities immediately adjacent to selective demolition area. Conduct selective demolition, modification and abandonment so Owner's operations will not be disrupted. Provide not less than 24 hours notice to Owner of activities that will affect Owner's operations.

C. Owner assumes no responsibility for condition of the utilities, structures, properties or other facilities to be selectively demolished.

D. If materials suspected of containing hazardous or asbestos materials are encountered, do not disturb; immediately notify Engineer.

E. Storage or sale of removed items or materials on-site will not be permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition, modification and abandonment operations.

1.7 QUALITY ASSURANCE

A. Comply with Section 01400 - QUALITY CONTROL

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-Demolition, Modification, and Abandonment Conference: Conduct conference at Project site, which includes Owner and Engineer. Review methods and procedures related to selective demolition.

D. Review and finalize selective demolition, modification and abandonment schedule and verify availability of materials, labor, equipment, and facilities needed to make progress and avoid delays.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Comply with material and installation requirements specified in individual Specification Sections.

B. Mechanical Plug as indicated in the Contract Drawings shall be 8-inch diameter non-corrosive, cast aluminum mechanical plug. Plug shall expand to a minimum diameter of 8.46 inches.

2.2 MATERIALS OWNERSHIP

A. Coordinate with Engineer and Owner, who will make final determination as to whether an item is to be salvaged or removed. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

2.3 REPAIR MATERIALS

A. Use repair materials identical to existing materials. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 – EXECUTION

3.1 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

3.2 PREPARATION FOR WORK

A. Verify that utilities have been disconnected and capped, shut-off, or bulk headed. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition, modification and abandonment required. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Engineer.

C. Engage a professional engineer to survey condition of structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

E. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition, modification, and abandonment operations.

3.3 SITE ACCESS, TEMPORARY FACILITIES AND PROTECTION

A. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used utilities, structures, properties or facilities.

B. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

D. Protect existing site improvements, appurtenances, and landscaping to remain.

E. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

F. Temporary Facilities: Provide temporary barricades and other protection required for demolition security and to prevent injury to people and damage to adjacent utilities, structures, properties and facilities to remain.

G. Provide protection to ensure safe passage of people around the area.

H. Temporary Shoring: Provide and maintain in accordance with Section 02160 - TEMPORARY EXCAVATION SUPPORT SYSTEMS.

I. Strengthen or add new supports when required during progress of selective demolition.

J. Existing landscaping materials, structures, pipes and appurtenances, which are not to be removed/abandoned shall be protected and maintained as required by the Engineer and as specified.

3.4 POLLUTION CONTROL

A. Water sprinkling, temporary enclosures, and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. Comply with government regulations pertaining to environmental protection. Water shall not be used when it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.5 CLEANING

A. During and upon completion of work, the Contractor shall promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a clean, approved condition.

B. All areas shall be cleaned of dust, dirt, and debris caused by demolition, modification, or abandonment and adjacent areas returned to conditions existing prior to start of work.

3.6 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition, modification and abandonment operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

C. Provide at least 72 hours notice to Owner if shutdown of service is required during changeover.

D. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished or abandoned.

E. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition, relocation or abandonment, and that maintain continuity of service to other parts of building.

3.7 DEMOLITION AND ABANDONMENT PROCEDURES

A. Disposal of all materials shall be performed in compliance with applicable local, state, and federal codes and requirements. Provide labor, equipment, and materials to perform work as specified and indicated.

B. The Contractor shall flush all pipe and structures to be removed or abandoned to remove solids and objectionable material prior to commencing demolition, modification, or abandonment.

C. When existing pipe is removed, the Contractor shall plug all resulting abandoned connections whether or not shown. Where removed piping is exposed, the remaining piping shall be fitted with a removable cap or plug, or bulk headed. Where existing piping, to include catch basin laterals, is to be abandoned, the Contractor shall cut back the abandoned pipe for a distance of 5 feet from any connecting structures to remain. Pipes to be abandoned in structures to be abandoned may be capped, plugged or bulk headed from inside the structure. All holes at the existing structures shall be repaired. Abandoned pipe smaller than 15 inches diameter shall be capped or plugged at both ends prior to backfill. Abandoned pipe 15 inches diameter and larger shall be filled with Controlled Density Fill (CDF) prior to being capped, plugged, or bulk headed and backfilling unless otherwise noted. Each pipe reach to be abandoned with CDF shall be filled with CDF from the up gradient end of the pipe reach wherever

possible. The CDF shall completely fill each pipe reach and flow out the other end. The Contractor can aid the flow of the CDF in the pipe by providing a temporary structure at the access point to build up head or by pumping the CDF or by providing vibration in the pipe reach or access point. Requirements for Controlled Density Fill are described in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

D. Where existing drainage structures such as catch basins, drain manholes, sewer manholes, and combined sewer manholes are to be abandoned in place, the Contractor shall remove the frames, grates, and covers and cut the structures down a minimum of 2 feet below final grade. The Contractor shall put a minimum of four, 2-inch diameter drainage holes in the invert of each structure and then backfill the structure with flowable fill or sand as specified and as approved by the Engineer. Backfill around the structure shall be in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

E. Permanent plugs shall be constructed of Class B concrete, brick or other material approved by the engineer unless otherwise indicated on the Contract Drawings.

F. Fill excavations with solid fill resulting from earth removal operations and/or with select borrow material in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING. Final grade to be restored in kind unless otherwise noted.

G. Exercise precautions for fire prevention. Make fire extinguishers approved for Class A, B and C fires available at all times in areas where performing demolition or abandonment work with burning torches. Do not burn demolition debris on site.

3.8 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings, joints and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

3. Maintain adequate ventilation when using cutting torches.

4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

5. Dispose of demolished items and materials promptly.

6. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

7. Existing Facilities: Comply with Owner's requirements for using and protecting utilities, structures, properties and other facilities.

B. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide

connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.9 REHABILITATION/MODIFICATION PROCEDURES

A. Certain areas of existing piping, conduits, and the like will be affected by work necessary to complete modifications under this Contract. The Contractor shall be responsible to rehabilitate those areas affected by his construction activities.

B. When new piping is installed in existing manholes, catch basins or other structures, the Contractor shall accurately position core-drilled openings in the concrete as shown or otherwise required. Openings shall be of sufficient size to permit a final alignment of pipelines and fittings without deflection of any part and to allow adequate space for satisfactory installation of a flexible connector to ensure watertightness around openings so formed.

C. When new piping is to be connected to existing piping, the existing piping shall be cut square and ends properly prepared for the connection shown. Any damage to the lining and coating of the existing piping shall be repaired by the Contractor.

3.10 DISPOSAL OF REMOVED/DEMOLISHED MATERIALS

A. The Contractor shall prepare and transport all demolition debris, materials, refuse, and abandoned equipment to an approved disposal site as part of the work under this section. All costs associated with the proper performance of this work shall be included in the appropriate Bid Items and at no additional cost to the Owner.

B. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Demolition material shall be reused as fill to the extent possible. Removal of demolition debris, not utilized as fill, shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the Owner. Alternate routes shall be provided around closed or obstructed traffic ways.

C. Burning: Do not burn demolished materials.

D. Disposal: Transport demolished materials off Owner's property and legally dispose of them. See Sections 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL and 02080 – SOIL AND WASTE MANAGEMENT as they relate to the transportation and disposal of non-hazardous and hazardous solid waste.

3.11 REPAIR OF DAMAGE

A. Any damage to existing facilities to remain, as caused by the Contractor's operations shall be repaired at no additional cost to the Owner. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract.

B. Promptly repair damage to adjacent construction caused by selective demolition operations.

C. Patching: Comply with Section 01045 - CUTTING AND PATCHING.

D. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

E. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

3.12 MASONRY PLUGS AND BULKHEADS

A. Shall be designed by a Massachusetts Registered Professional Civil or Structural Engineer and shall be installed by a qualified mason having experience in the construction of temporary and permanent masonry plugs and bulkheads of the same general nature of those Specified and proposed.

PART 4 – COMPENSATION

Item 2051.1 - Disposal of Construction Debris as Solid Waste

METHOD OF MEASUREMENT:
Measurement for payment for Disposal of Construction Debris as Solid Waste shall be on the basis of Tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip. Solid Waste disposed of for which return manifests or certified weight slips have not been submitted will not be paid for.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Disposal of Construction Debris as Solid Waste shall be based on the per ton price bid for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Dispose of Construction Debris as Solid Waste. The work includes, but is not limited to; handle, load, transport, stockpile, weigh and dispose at an appropriately permitted facility; all cobbles, rail, timber, brick, cement concrete, metals, granite curb, edging, inlets and corners, plastic, or other construction debris; and all fees, permits, taxes, sampling, testing and analysis required by the facility.

SPECIAL NOTES ON EXCLUSIONS:
The excavation and removal of the items listed above for disposal are not included herein but are included for payment elsewhere. This is a disposal item only. Soils are not included for payment herein but are included for payment in the appropriate soil disposal item. Soil weight excavated and disposed with Construction Debris due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Disposal of bituminous concrete is not paid for herein but is included for payment elsewhere. Bituminous Concrete weight excavated and disposed with Construction Debris due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Payment for the disposal of abandoned or relocated existing gas, telephone, electric, cable TV, telecommunications, fire alarm and traffic signal utilities shall NOT be paid herein or separately elsewhere and are considered "incidental" to the Contract, with costs to be carried in the Contractor's base bid. Disposal of concrete and brick sidewalks, driveways, and handicap ramps removed and disposed of is not included herein but is carried under the unit price for the construction of the new sidewalks, driveways and handicap ramps.

Item 2051.2 - Disposal of Bituminous Concrete

METHOD OF MEASUREMENT:
Measurement for payment for Disposal of Bituminous Concrete shall be on the basis of Tons of bituminous concrete actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip. Bituminous Concrete disposed of for which return manifests or certified weight slips have not been submitted will not be paid for.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Disposal of Bituminous Concrete shall be based on the per ton price bid for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Dispose of Bituminous Concrete. The work includes, but is not limited to; handle, load, transport, stockpile, weigh and dispose at an appropriately permitted facility all bituminous concrete; and all fees, permits, taxes, sampling, testing and analysis required by the facility.

SPECIAL NOTES ON EXCLUSIONS:
The excavation and removal of bituminous concrete is not included herein. The excavation of bituminous concrete is considered incidental to the contract and is not included for separate payment unless otherwise specified. This is a disposal item only. Soils are not included for payment herein but are included for payment in the appropriate soil disposal item. Soil weight excavated and disposed with Bituminous Concrete Pavement due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Disposal of construction debris as solid waste is not included for payment herein but is included for payment elsewhere.

Item 2051.3 - Demolition or Removal of Lamp Hole, Manhole, Catch Basin, or Other Structure

METHOD OF MEASUREMENT:
Measurement for payment for Demolition or Removal Manhole, Catch Basin or Other Structure shall be on the basis of the number of individual manholes, catch basins or other structures demolished or removed complete as measured by the Engineer. Manholes, catch basins or other structures demolished or removed for the Contractor's convenience, not indicated to be removed or demolished, in the Contract, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Demolition and/or Removal of Manholes, Catch Basins or Other Structures shall be based on the number of individual manholes, catch basins or other structures demolished or removed complete for this item in the proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Demolish or Remove a Manhole, Catch Basin or Other Structure. The work includes, but is not limited to: saw cutting existing bituminous and cement concrete; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; removal or demolition of the manhole, catch basin or other structure; masonry plugs in the disconnected pipe not specified for payment elsewhere; remove and stack or remove and dispose existing castings as required; salvage of materials specified; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner.

SPECIAL NOTES ON EXCLUSIONS:
The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; demolition and removal of pipes; manholes, catch basins or other structures abandoned in place, not fully demolished or removed. The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered

incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.4 - Abandon In Place Manhole, Catch Basin, or Other Structure

METHOD OF MEASUREMENT:
Measurement for payment for Abandon in Place Manhole, Catch Basin or Other Structure shall be on the basis of the number of individual manholes, catch basins or other structures abandoned in place as specified herein and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Abandon in Place of Manholes, Catch Basins or Other Structures shall be based on the per number of individual manholes, catch basins or other structures abandoned in place complete for this item in the proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Abandon in Place a Manhole, Catch Basin or Other Structure. The work includes, but is not limited to; saw cutting existing bituminous or cement concrete; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; remove and stack or remove and dispose existing castings as directed; cutting and demolition of the manhole, catch basin or other structure sections 2-ft below finished grade; masonry plugs in the disconnected pipe not specified for payment elsewhere; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner; drill 2-in holes in invert of structure and furnish, install and compact Controlled Density Fill or Sand in the manhole, catch basin or structure to be abandoned.

SPECIAL NOTES ON EXCLUSIONS:
The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste and demolition and removal of pipes, manholes, catch basins or other structures. The abandonment-in-place of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.5 - Abandon In Place Pipe – 15-Inch Through 36-Inch Diameter

METHOD OF MEASUREMENT:
Measurement for payment for Abandon In Place Pipe – 15-Inch Diameter Through 36-Inch Diameter shall be on the basis of the linear foot of pipe within the diameter range indicated, abandoned in place using CDF, as specified herein and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Abandon In Place Pipe – 15-Inch Through 36-Inch Diameter shall be based on linear foot of pipe within the diameter range indicated, abandoned in place using bulkheads and CDF, complete for this item in the proposal. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Abandon In Place Pipe – 15-Inch Through 36-Inch Diameter. The work includes, but is not limited to; saw cutting existing bituminous and cement concrete; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; and furnish, install and compact Controlled Density Fill in the pipe to be abandoned.

SPECIAL NOTES ON EXCLUSIONS:
The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste and masonry plugs. The abandonment-in-place of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary. Abandonment in place of pipe smaller than 15-inch in diameter is not included for payment herein or elsewhere but is considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary. Abandonment of pipe for the modification of S75COM1905T (Sheet GC-3), CAM 001 (Sheet C-16 and C-18), CAM 002 (Sheet C-14, C-17, C-19, S-1, and S-2), CAM 400 (Sheet GC-3), and CAM 401B (Sheet C-15, C-18, C-20, and S-3) are not included for payment herein but are paid for elsewhere.

Item 2051.6 - Masonry Plug or Bulkhead for Pipe Abandonment Greater Than 15-inch Diameter through 36-inch Diameter

METHOD OF MEASUREMENT:
Measurement for payment for Masonry Plug or Bulkhead for Pipe Abandonment Greater Than 15-inch Diameter through 36-inch Diameter shall be on the base of the number of Masonry Plugs or Bulkheads for Pipe Abandonment, 15-inch through 36-inch in diameter, installed complete as measured by the Engineer. Masonry Plugs or Bulkheads for Pipe Abandonment installed for the Contractor's convenience, not indicated in the Contract to be installed, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Masonry Plug or Bulkhead for Pipe Abandonment Greater Than 15-inch Diameter through 36-inch Diameter shall be based on the unit price bid for each in this Proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install Masonry Plug or Bulkhead for Pipe Abandonment (15-inch through 36-inch) in diameter. The work includes, but is not

limited to; saw cutting; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; verify function of all existing connections including those that are abandoned or those to be transferred to an active and functioning pipe and the design and installation of masonry plugs or bulkheads in the disconnected pipe including but not limited to brick, concrete masonry units, other masonry, cement, mortar, grout, concrete, miscellaneous metals, and fasteners.

SPECIAL NOTES ON EXCLUSIONS:
Masonry Plugs or Bulkheads installed in pipe smaller than 15-in diameter is not included for payment herein, is not specifically included for payment elsewhere, but should be carried in the Contractor's Total Bid Price. Temporary Masonry Plugs or Bulkheads are not included for payment for herein but are rather included in the Flow Bypass Item. Bulkheads for the modification of S75COM1905T (Sheet GC-3), CAM 001 (Sheet C-16 and C-18), CAM 002 (Sheet C-14, C-17, C-19, S-1, and S-2), CAM 400 (Sheet GC-3), and CAM 401B (Sheet C-15, C-18, C-20, and S-3) are not included for payment herein but are paid for elsewhere.

Item 2051.7 - Demolition or Removal of Pipe 15-inch Diameter Through 36-inch Diameter

METHOD OF MEASUREMENT:
Measurement for payment for Demolition or Removal of Pipe Greater Than 15-inch Diameter Through 36-inch Diameter shall be on the basis of the linear feet of pipe, 15-inch through 36-inch diameter, demolished or removed complete as measured by the Engineer as measured from inside wall of structure or beginning of demolition to inside wall of structure or end of demolition. Pipe demolished or removed for the Contractor's convenience, not indicated to be removed or demolished in the Contract, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Demolition or Removal of Pipe Greater Than 15-inch Diameter Through 36-inch Diameter shall be based on the linear feet of pipe, greater than 15-inch through 36-inch diameter, demolished or removed complete for this item in the proposal. Under the per unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Demolish or Remove pipe greater than 15-inch diameter through 36-inch diameter. The work includes, but is not limited to; saw cutting; excavation; furnish and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; verify function of all existing connections including those that are abandoned or those to be transferred to an active and functioning pipe; demolition and removal of the pipe; salvage of materials specified; stockpile of salvaged

materials and delivery of materials identified as to be salvaged to a location designated by the Owner.

SPECIAL NOTES ON EXCLUSIONS:
The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; masonry plugs or bulkheads in abandoned pipe; and demolition and removal of manholes, catch basins or other structures. The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary. Demoltion or removal of pipe greater than 15-inch Diameter Through 36-inch Diameter for the modification of S75COM1905T (Sheet GC-3), CAM 001 (Sheet C-16 and C-18), CAM 002 (Sheet C-14, C-17, C-19, S-1, and S-2), CAM 400 (Sheet GC-3), and CAM 401B (Sheet C-15, C-18, C-20, and S-3) are not included for payment herein but are paid for elsewhere.

Item 2051.8 – Removal of 5-Inch Masonry Plug and Replacement with 8-inch Mechanical Plug

METHOD OF MEASUREMENT:
Measurement for payment for Removal of 5-Inch Masonry Plug and Replacement with 8-Inch Mechanical Plug shall be basis of the lump sum item paid upon completion of the modifications as shown in the Contract Drawings.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Removal of 5-Inch Masonry Plug and Replacement with 8-Inch Mechanical Plug shall be based on the lump sum bid in the proposal. Under the lump sum price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and dispose of the existing 5-inch masonry plug and replace with an 8-inch mechanical plug as indicated on the Contract Drawings. The work includes, but is not limited to; water stop between the existing pipes and structures; removal of existing 5-inch masonry plug, saw cutting; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; furnish and install 8-inch mechanical plug; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02051

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SECTION 02080

SOIL AND WASTE MANAGEMENT

2080.1	**OHM - SOIL AND WASTE MANAGEMENT**	**LUMP SUM**
2080.2	**OHM - HANDLING ASBESTOS CONTAMINATED SOIL/FILL**	**CUBIC YARD**
2080.3	**OHM - HANDLING ASBESTOS CONTAMINATED (W.R. GRACE & CO. PROPERTY) SOIL/FILL**	**CUBIC YARD**
2080.4	**OHM - HANDLE AND CHARACTERIZE UNKNOWN MATERIAL**	**CUBIC YARD**

PART 1 – GENERAL

1.1 QUALIFICATIONS

A. The Contractor shall be experienced and knowledgeable and have the trained and qualified personnel needed to conduct the work as specified herein.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.Section 02082 Asbestos Removal and Related Work.

B. The following documents are available for review at the office of the Owner, 147 Hampshire St, Cambridge, MA 02139 and appended to the technical specifications in Appendices or the Attachment to the Special Conditions in Division 0.

1. Memorandum – Oil and Hazardous Materials Findings and Soil Management Recommendations, CAM 400 Sewer Separation Project, Cambridge, Massachusetts, dated October 20, 2009.

2. Summary of Analytical data and boring logs, completed October 2009.

3. City of Cambridge Asbestos Ordinance.

C. The following documents are available for review at the office of the Owner, 147 Hampshire St, Cambridge, MA 02139:

1. Notice of Activity & Use Limitation – W.R. Grace & Company, dated February 16, 2006.

2. Public Involvement Plan, December 1995.

1.3 OBJECTIVE and OVERVIEW

A. This Section includes furnishing all plant, labor, equipment, appliances, and materials, and performing all operations in connection with the handling, treating, stockpiling, transporting, and disposal and/or reuse of soil and associated fill and waste material resulting from the construction operations as specified.

B. This Section also includes requirements for handling spills of contaminated and/or hazardous materials.

C. The objective of soil management practices is to handle all soil and fill excavated during this contract in accordance with applicable state, federal and local regulations and bylaws and to implement off-site soil management in a cost-effective manner. The Contractor shall reuse excavated soils on-site to the maximum extent possible and minimize the volume of material to be disposed off-site.

D. Soils in the work area were preliminarily pre-characterized to allow for pre-construction off-site management planning. The results of the pre-characterization program are appended to this Specification.

1. Soil: The pre-characterization analyses identified oil and hazardous material (OHM) in soils at concentrations exceeding Massachusetts Contingency Plan (MCP) RCS-1 limits. Excavation and management of soil shall accordingly be conducted under a Utility-related Abatement Measure (URAM) Plan that will be prepared by the Owner's Licensed Site Professional (LSP).

2. For purposes of this Section, all excavated soils shall be managed as potentially contaminated until proven otherwise through laboratory chemical analysis.

E. Soils located on the property of W.R. Grace & Company have been determined to be impacted by asbestos. Excavation on the W.R. Grace properties, including parking lots on the north side of Whittemore Avenue, shall be conducted in conformance with all local, state and Federal regulatory requirements including but not limited to the City of Cambridge Asbestos Ordinance and the requirements established by the Activity & Use Limitation (AUL) recorded by W.R. Grace & Company (e.g., health & safety, excavation and soil management procedures). In the event that asbestos-impacted soils or asbestos containing building materials are encountered during construction on properties not owned by W.R. Grace & Company, the

work shall be conducted in accordance with all applicable local, state and Federal laws, regulations, policy and guidance.

F. This Section includes protocol for handling and management of waste materials, including, but not limited to, construction debris, municipal waste, boulders, soil, fill, ash, rubble, and empty or crushed drums and/or drum parts. The Contractor shall provide the services of an Environmental Professional qualified to coordinate all soil/fill-handling activities with the Owner or Engineer and/or their representative.

G. In the course of the work, it may be necessary to excavate and handle potentially contaminated soil/fill. The soil/fill management practices specified herein apply to all soil/fill excavated during the course of this contract. To the extent possible, the Contractor shall reuse geotechnically suitable excavated material prior to using imported backfill to reduce the volume of material to be disposed off-site. Imported backfill shall be used only as accepted by the Engineer.

H. All work shall be conducted in compliance with the following Contractor-prepared plans:

1. Site-Specific Health and Safety Plan;
2. Soil Management Plan;
3. Equipment and Personnel Decontamination Plan;
4. Dust, Vapor and Odor Control Plan;
5. Air Monitoring and Quality Control Plan; and
6. Spill and Discharge Control Plan.

1.4 DEFINITIONS

A. Area of Excavation: For the purposes of reusing soil/fill on-site, the *area of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristics as accepted by the Engineer. Soil/fill returned to the *area of excavation* shall be placed approximately in the same horizontal and vertical location from which it originated.

B. Excavation: The removal of materials encountered to the elevation and width limits indicated in the Contract Drawings, Specifications, or as directed by the Engineer.

C. Fill (Historic Fill): Fill, also known as historic fill or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Materials commonly associated with historic fill includes, but are not limited to; coal, glass, brick, ash, wood

fragments and other similar granular materials. Historic fill shall not include boulders, ledge, consolidated rock, asphalt pieces, concrete, railroad timbers, rail, cobblestones or other abandoned building materials that would preclude the disposal of the urban fill as daily cover at a landfill.

D. Hazardous Waste:

1. Defined in 310 CMR 40.0006; or

2. Defined in 40 CFR 261.3.

3. A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

   a. Cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or
   b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

E. Peat: A substance of vegetable origin, consisting of roots and fibers, moss, etc., in various stages of decomposition, and found as a kind of turf or bog. Peat shall be considered natural soil when it is encountered in small amounts (layers 1-foot (304.8 mm) or less in thickness) and when it is impractical to separate the peat from the natural soil or urban fill strata. Otherwise, peat shall be considered a distinctive stratum.

F. Sediment: All detrital and inorganic or organic matter situated on the bottom of lakes, ponds, streams, rivers, the ocean, or other surface water bodies.

G. Soil Classification Categories: Unless specifically stated otherwise terms used in this specification are as defined in the MCP, 310 CMR 40.0006. For purposes of this Section, sediments shall also be included as soil. The following definitions and soil classifications apply to these specifications:

1. (Class A-1) Background: Any soil or fill material which meets the regulatory definition of "background" as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in Section 02210 - Earth Excavation, Backfill, Fill and Grading. Excess soil/fill that meets the definition of background, shall be transported under a Material Shipping Record (MSR).

   Background soil may also be re-used off-site without restriction provided it is reused in an area where the excavated soils concentrations are equal to or less than the site-specific background determined at the off-site reuse location. The Contractor is responsible

for determining the background levels in the area of excavation. The Contractor shall identify one or more disposal facilities/locations with background levels appropriate to receive the material to be disposed. It is the Contractor's responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations.

2. (Class A-2) Impacted: Any soil or fill material which contains oil or hazardous materials (OHM) at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused in the area of excavation or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in Section 02210 - Earth Excavation, Backfill, Fill and Grading. Class A-2 soils requiring off-site transportation and disposal/reuse shall be transported using a Material Shipping Record (MSR).

3. (Class B) Contaminated: Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, except where the presence of the material is consistent with the regulatory definition of "background" as defined in 310 CMR 40.0006.

   Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials as accepted by the Engineer shall be handled as potentially contaminated soils. Soil which do not exhibit any evidence of contamination can be reused within the area of excavation without first performing laboratory analyses. Any excavated soil/fill material which is not reused within the area of excavation, must be characterized prior to reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill. Soil/fill which may be contaminated shall be set aside by the Contractor for assessment by the Contractor's Environmental Professional. Soil/fill which is staged and characterized can be reused within the area of excavation or elsewhere on site provided the material has been tested and has equal or less contamination than the point where it is to be reused and it is not reused beneath a permanent structure such as a building foundation.

4. Class B soil which cannot be reused on site shall be reused off-site, recycled, or disposed of at a permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR part 261 or contains detectable asbestos. Subcategories of Class B are defined as follows:

   a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., Massachusetts Department of Environmental Protection

(MassDEP) Policy # COMM 97-001 - Reuse and Disposal of Contaminated Soil at Massachusetts Landfills Policy, and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills. Note: per COMM 97-001, sediments may not be re-used as Class B-1.

b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.

c. Class B-3: Soil and Fill that meet all applicable criteria for in-state recycling at an asphalt batching plan and/or the specific licensing requirements for the proposed in-state recycling facility.

d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state recycling acceptance criteria, but meet the criteria for regional thermal treatment facilities or out-of-state recycling facilities, and are not classified as a RCRA Hazardous Waste.

e. Class B-5: Soil and Fill that contain concentrations of contaminants that require removal to regional disposal facilities and are not classified as RCRA Hazardous Waste.

f. Class B-6: Soil and fill which does not meet one of the designations above due to excessive foreign materials and/or debris that are not classified as a hazardous waste.

5. (Class C) Hazardous Waste: A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, subpart C and/or that is listed in 40 CFR 261, subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Subcategories of Class C shall be as follows:

a. Class C-1: Soils classified as hazardous waste that can be treated on-site to eliminate the toxicity characteristic (e.g., for lead).

b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be

treated on-site. This material must be transported to an out-of-state approved RCRA Subtitle C hazardous waste disposal or treatment facility under a Uniform Hazardous Waste Manifest.

H. Special Waste: means any solid waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the solid waste. Asbestos and PCB-contaminated soils/fill (at regulated concentrations) are examples of special waste categories.

I. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix.

J. Over Excavation: Consists of removal of materials beyond indicated elevations and width limits indicated in the Contract Documents without direction of the Engineer. Over-excavation material handling, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Over-excavations shall be backfilled and compacted as specified for excavations of the same class, unless otherwise directed by the Engineer.

K. Unknown Materials: Any material, that is not readily identifiable as non-hazardous waste, and which has not been previously characterized or encountered during site investigation activities. The Unknown Material classification is to be used in the event that an unexpected, unusual material is encountered for which special handling procedures shall be required in order to handle the material safely. Such wastes include but are not limited to:

1. Unlabelled drums or containers containing material which is not readily identifiable as a non-hazardous substance.

2. Any material which varies significantly from material previously observed on site and which cannot be readily identified as a non-hazardous.

3. Waste material of unusual color or odor or material with indications of hazardous levels (e.g. exceeding OSHA permissible exposure limits) of contaminants as evidenced on an organic vapor monitor or other similar instrument.

The Owner reserves the right to apply generator knowledge to classify and profile the material as a previously encountered waste or as a known waste. In the event that a material is encountered which the Contractor is uncertain as to its nature, the Owner or their representative shall assess the material with

the Contractor and direct the Contractor as to the nature of the material being known or unknown.

1.5 WORK INCLUDED

A. Managing excavated soil and fill material.

B. Excavating and managing asbestos contaminated soils.

C. Characterization of soil, fill, and unknown material for disposal/reuse purposes; field screening and soil management/segregation; temporary storage/staging; and characterization (as may be necessary for unknown materials and/or for compliance with receiving facility requirements); and disposal and/or reuse of excavated soil and fill material.

All laboratory chemical analyses conducted shall utilize currently accepted U.S. EPA and applicable state agency analytical protocols and procedures.

D. Management of contaminated groundwater: If groundwater potentially impacted by OHM, based on visual or olfactory evidence, is encountered in the course of the work, construction dewatering and discharge permits and groundwater treatment may be necessary depending upon the discharge method(s) and/or location(s) utilized by the Contractor. The Owner and Engineer shall be notified by the Contactor if groundwater potentially impacted by OHM is identified.

E. All work at the site must be performed in accordance with all applicable federal, state, and local regulations, permits and licenses, including, but not limited to:

1. The applicable parts of the Code of Federal Regulation (CFR) Title 40: Protection of Environment, pertaining to the Comprehensive Environmental Response and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA), RCRA, and the National Emission Standards for Hazardous Air Pollutants (NESHAPS) as regulated by the U.S. Environmental Protection Agency (U.S. EPA);

2. State regulations specified in the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000), and Massachusetts General Law 21E - Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, and applicable Massachusetts Department of Environmental Protection (MassDEP) guidelines and policies;

3. Department of Transportation (DOT) regulations 49 CFR, and state transportation licenses and permits;

4. OSHA regulations (including, but not limited to, 29 CFR 1910.1000, 29 CFR 1926, and CFR 1910.120), 40-hour Occupational Safety and

Health Administration (OSHA) training (plus 8-hour refresher training) and all other applicable state and federal regulations regarding health and safety requirements;

5. NIOSH/OSHA/USCG/EPA: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" October 1985, DHHS (NIOSH). Publ. No. 85-115;

6. Department of Transportation training;

7. U.S. Army Corps of Engineers Section 404 Programmatic General Permit, Commonwealth of Massachusetts;

8. General Contractor's license;

9. National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) to discharge and permits;

10. Regional and local Publicly Owned Treatment Works (POTW) pre-treatment and construction dewatering requirements and permits;

11. NPDES General Permits;

12. Excavation and/or grading permits;

13. Special use permits;

14. Special waste haulers certificate;

15. Massachusetts Wetlands Protection Act and associated Order of Conditions;

16. City of Cambridge asbestos regulations, ordinances and and bylaws; and

17. The Contractor's Soil Management Plan (SMP) and Health and Safety Plan to protect the workers and the public.

E. Implementation of the submitted HASP and other applicable monitoring and control plans includes establishing work zones (e.g., support zone, contamination reduction zone, exclusion zone), preparing a decontamination pad(s) and staging area(s), performing the appropriate environmental monitoring, training and medical monitoring of personnel, coordinating waste disposal and waste characterization as needed.

F. The Contractor's Environmental Professional shall characterize all excavated soil and fill material prior to reuse or disposal. Characterization requirements may vary depending on the site selected to receive soil suitable for reuse or the

disposal facility permits and policies. The Contractor is responsible for final waste characterization and shall determine if any additional waste characterization is required at no additional cost to the Owner.

G. The Contractor shall develop, implement, maintain, supervise, and be responsible for all soil management practices during the course of this contract. The Contractor's Environmental Professional shall be present during all field screening, segregating, handling, and characterization of all soils excavated in the course of completing this contract to ensure that soil is managed in accordance with applicable laws, regulations, and this Section.

Soil management activities shall include and be conducted as specified herein:

1. Providing and constructing a secure soil staging area sized to adequately segregate soils in accordance with the conditions specified without impeding construction-related activities. The Contractor is to use existing information and obtain additional information as may be needed at no additional cost to the Owner to minimize the need for a staging area. If a staging area is required to characterize unknown or excess material for any reason, the Contractor is responsible for locating, selecting, preparing and securing the area.

2. Excavated soil that cannot be re-used on site shall either be loaded directly into containers for off-site reuse or disposal (provided the material is consistent in visual, olfactory and chemical characteristics as observed in previous investigations) or be staged at a location determined and secured by the Contractor pending sampling and analytical characterization by the Contractor's Environmental Professional and covered prior to characterization and off-site reuse or disposal. Since individual disposal facilities have different permit conditions and specific pre-characterization data requirements, the Contractor is responsible for final soil characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final soil characterization is the responsibility of the Contractor and costs for securing a staging area and conducting waste characterization shall be incorporated into the Contractor's bid price for construction.

3. The Contractor shall control and contain runoff of free liquids drained from stockpiled soil/fill. Free liquids shall be managed in accordance with applicable regulations.

4. Soil that has been chemically stabilized shall be confirmed through laboratory chemical analysis to be characteristically non-hazardous pursuant to RCRA prior to off-site shipment and disposal.

5. Soil/fill shall not be staged within 100 feet (30.5 meters) of a Reservoir or Area of Critical Environmental Concern. Soil/fill shall not be staged in the work area over night.

6. Excavating unknown, previously uncharacterized material which may be classified as RCRA hazardous waste and disposing of it at an approved facility and/or on-site treatment of these materials to render it non-hazardous prior to and disposing of it at an approved facility.

7. Removing characterized on-site materials for off-site re-use or disposal.

8. Demobilizing the site, including, but not limited to, removing and disposing of construction-related equipment and materials used for personnel and equipment decontamination and related waste such as personal protective equipment (PPE), decontamination water/solids, temporary covers, and washwater storage tanks; disconnection of temporary utilities; and final clean-up to pre-construction conditions.

9. The Contractor shall manage unknown material separately and temporarily stage the material pending characterization.

H. All incidental, Contractor-generated waste (such as Personal Protective Equipment, decontamination wash water, etc.) resulting from the services hereunder are the property and responsibility of the Contractor and are to be disposed of by the Contractor under a Uniform Hazardous Waste Manifest and/or by a Massachusetts Bureau of Waste Site Cleanup Bill of Lading, as appropriate.

I. The Contractor is responsible for identifying potential hazards at the site and reviewing existing information. Copies of the report(s) are appended.

1.6 RELATED WORK

A. Section 01150 - Measurement and Payment

B. Section 01108 - Health and Safety Procedures

C. Section 01500 - Temporary Facilities and Controls

D. Section 02010 - Subsurface Investigation

E. Section 02082 – Asbestos Removal and Related Work

F. Section 02095 - Transportation and Disposal of Excess Soil and Fill

G. Section 02210 – Earth Excavation, Backfill, Fill and Grading

H. Section 02140 – Dewatering

1.7 EXISTING CONDITIONS

A. Asbestos-containing materials are present in areas of the W.R. Grace & Company property in which work under these specifications is to be conducted.

B. Limited chemical characterization of soil has been conducted, the results of which are presented in the reports and tables referenced in Paragraph 1.02 of this section. The Contractor is obligated to review existing environmental assessment reports and manage the soil and groundwater in accordance with applicable state and federal regulations.

1. Eight borings were advanced across the project area; soil samples were collected from three borings (B-4, B-7, and B-8) for laboratory chemical analysis. Visual assessment of subsurface soils indicates the presence of historic fill soils to an average depth of eight feet.

2. Semi-volatile organic compounds (SVOCs) were reported in all samples at concentrations above laboratory reporting limits. Of these, acenaphthylene was reported above the RCS-1 limit in boring B-4; benzo(a)pyrene was reported above the RCS-1 limit (2.0 µg/g) in borings B-4, B-7 and B-8 (4.4, 2.7, and 3.5 µg/g, respectively).Borings B-101: Benzo(a)pyrene and chromium were detected above RCS-1 limits in a sample collected from 0 – 6' below the ground surface (bgs). Excavation in proximity to B-101 shall be conducted under a URAM that shall be prepared by the Owner's LSP; all soils deemed surplus that are excavated from this area shall be shipped under a Massachusetts Bill of Lading. Further details are provided in the attached memoranda.

3. Other contaminants were also detected in one or more of the soil borings above laboratory reporting limits but at concentrations below RCS-1 limits. These analytes included arsenic, barium, cadmium, chromium, lead, mercury, naphthalene and petroleum hydrocarbons.

1.8 SUBMITTALS

A. The Contractor shall prepare a Work Plan that generally describes the work to be performed under Section 02080 Part 3 (Execution). The work plan shall include, but not be limited to detailing the submittal and implementation of the following:

1. Site-Specific Health and Safety;

2. Soil Management;

3. Dust, Vapor, and Odor Control;

4. Air Monitoring and Quality Control; and

5. Spill and Discharge Control.

The Work Plan shall be submitted to the Owner and Engineer for review and acceptance at least two weeks prior to beginning any intrusive work at the site.

B. The Contractor shall provide the qualifications of the Environmental Professional(s) to be assigned to this project. The Environmental Professional(s) shall be at a minimum certified, registered or licensed as an Environmental Professional or equivalent and hold a Bachelor of Science Degree in Environmental Science, Environmental Engineering, or Public Health or related degree and have sufficient experience in similar work to perform the responsibilities detailed herein.

C. Soil Management: The Contractor shall prepare a Soil Management plan that outlines measures for soil and fill sampling, field screening, laboratory chemical analysis, treatment, and disposal/reuse. At a minimum, this plan shall address the following:

1. Methods, procedures, and equipment used for treating, excavating, dewatering, characterizing, segregating, reusing/backfilling, loading, and transportation of contaminated soil/fill materials encountered during excavation operations;

2. A list of all transporters and waste facilities, complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor utilizes for waste disposal. In addition, a copy of a memorandum of understanding between the Contractor and each disposal facility shall be attached. The memorandum of understanding shall detail that the disposal facility agrees to accept a specified quantity of waste as characterized in the contract specifications and detail what, if any, restrictions may apply. The Contractor shall provide copies of the permits held by each disposal facility which the Contractor plans to use to dispose of non-hazardous solid waste; and if necessary to dispose of hazardous waste (due to lead toxicity), PCB-impacted waste and asbestos-containing waste;

3. A summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history;

4. Procedures for securing the staging area, controlling dust and soil/fill migration, preventing damage to uncontaminated areas via contaminant migration and for decontaminating vehicles and personnel exiting the staging area;

5. The means and methods for decontaminating all equipment and personnel, including provisions for installing an equipment decontamination pad if required or specified;

6. Methods and procedures for identifying stockpiled material (e.g., labeling, marking containers) and procedures for identification and tracking;

7. Methods, procedures, and equipment used for obtaining the necessary information needed to satisfy the off-site reuse/disposal facility requirements specified herein and/or by the facility;

8. Methods, procedures, and equipment proposed for assessing and handling Unknown Materials. The SMP shall indicate which laboratory(ies) the Contractor shall utilize for chemical analysis soil, groundwater and unknown materials:

    a. An Unknown Materials information sheet shall be developed as part of the Contractor's SMP, upon which the Contractor shall record information such as container type, size, and condition; and, any identifying characteristics of the unknown material. The format of the information sheet shall be as accepted by the Owner and/or its representatives;
    b. The Contractor's plan for notifying the Owner and Engineer in the event that an unknown material as defined in this specification is encountered. The plan shall include the phone numbers and names of the Owner's representative(s) that the Contractor will contact in such an event.

9. Provisions for separation of incompatible materials;

10. Protocol for over-packing drums (if encountered); and

11. Procedures for consolidating (i.e., bulking) compatible materials for disposal.

D. Soil Management/Tracking Documentation:

Prior to off-site disposal or reuse, the Contractor shall provide to the Engineer a letter from the disposal facility indicating that the facility has reviewed the available data relative to the soil/fill to be delivered and agrees that the soil/fill meets their acceptance criteria. The letter shall be signed by a duly authorized representative of the receiving facility.

Within the time constraints established in state and/or Federal laws and regulations, the Contractor shall submit to appropriate authority(ies), as applicable, Uniform Hazardous Waste Manifests and/or Bills of Lading for all soils and associated fill disposed or reused of off-site utilizing such documents. Copies of all manifests, Bills of Lading, and all other documents used to track and/or permit off-site transportation of soils shall be submitted to the Engineer within ten (10) days of shipment. The Contractor is responsible for preparation of all manifests, Bills of Lading, Material Shipping Records, and all other related documents completely, legibly, and accurately prior to submitting them to the Owner and/or its representative for generator and LSP signatures. The Contractor shall be responsible for paying for any and all fines associated with inaccurate, incorrect, or improperly completed manifests, Bills of Lading and all other related documents, including fines resulting from late or untimely submittals.

E. Spill and Discharge Control (SDC): The SDC program shall provide contingency measures and reporting responsibilities for potential uncontrolled spills and discharges of contaminated and/or hazardous materials, including, but not limited to, leachate, decontamination water, sewage, and other on-site waste materials. In addition to the above listed items, the SDC program shall specifically contain: procedures for containing dry and liquid spills; absorbent material available on site; storage of spilled materials; governmental reporting (i.e., notification) procedures; decontamination procedures; discharges of sanitary or combined sewers into storm drains either by flow handling/bypassing or accidental or unintentional discharge; and procedures for protecting wetlands and surrounding public and private property.

The Spill and Discharge Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries shall be performed in a designated area which has either secondary spill containment or an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

1. Notification Procedures: The Contractor shall prepare in advance of work activities a notification list, complete with phone numbers, addresses, and contact names for all parties to be notified in the event of a spill. This list shall include:

    a. Owner's designated representatives;
    b. Owner;
    c. Fire Department;
    d. Engineer; and

e. Massachusetts Department of Environmental Protection (as required per 310 CMR 40.0000).

The Owner shall be notified immediately of an uncontrolled spill or discharge. If human health or the environment are potentially threatened, the Contractor shall take immediate action to abate the conditions and notify emergency personnel.

2. Spill Incident Report(s): In the event of an uncontrolled spill or discharge, a written report detailing each uncontrolled spill or discharge shall include, at a minimum, the cause and resolution of incident, outside agencies involved, and date of occurrence. The report shall be submitted to the Owner within 48 hours of the incident. The Contractor shall document all spills on the as-built Drawings and submit the Drawings to the Owner at project completion. The Contractor shall be responsible for remediating any spills or releases of oil or hazardous materials as a result of the Contractor's activities. The site shall be remediated to pre-release conditions at no additional cost to the Owner.

F. Dust, Vapor and Odor Control (DVOC): The DVOC program shall include measures to control objectionable dust, vapors, and odors originating from the site. The DVOC Plan shall describe procedures to minimize the creation of dust, and the control of objectionable vapors and odors originating from the site. At a minimum, the DVOC program shall include air monitoring as specified in paragraph 3.6.

PART 2 – PRODUCTS

2.1 DUST CONTROL

A. Air monitoring shall include total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments.

2.2 SPILL CONTROL

A. At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials in sufficient quantity to address a release of fuel oil, hydraulic oil or other OHM that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site.

2.3 EQUIPMENT DECONTAMINATION PAD

A. The Contractor shall provide all materials and labor to complete an equipment decontamination pad. Liner materials and collection system shall be selected by the Contractor to perform as specified.

PART 3 – EXECUTION

3.1 GENERAL

A. All work in this section will be performed in accordance with the Contractor's Work Plan, SMP and Site-Specific HASP.

B. The primary concern of the Contractor in the excavating, handling, sampling, bulking, and on-site storage of soil/fill and/or drummed material (if encountered) will be to protect the health and safety of the site workers, the public, and the environment.

C. The Contractor shall keep a copy of the Health and Safety Plan (HASP) on site during all operations and shall conduct daily health and safety meetings. Failure to keep a copy of the HASP on-site, or any other breach of the Contractor's Plan, may be cause for stopping work at the cost of the Contractor. Delays caused by the Contractor's failure to comply with the health and safety regulations or any health and safety plan shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are accepted by the Engineer and/or their representative and implemented.

D. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site (who are subject to exposure to potentially contaminated soil) shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer and/or their representative.

3.2 SOIL/FILL MANAGEMENT

A. Soil and fill material that is managed under a Utility-related Abatement Measure (URAM) Plan pursuant to the MCP, which is staged off-site, and which is not characteristically hazardous, may be re-used within fourteen (14) calendar days of excavation. Any material which is suitable for re-use as ordinary borrow, based on analytical results and could have been placed on site, but was not, due to Contractor delay (i.e. analytical results were not available within 10 days following excavation) will be disposed in accordance with the applicable regulations by the Contractor at no cost to the Owner.

B. Soil and fill material that is managed under a Utility-related Abatement Measure (URAM) Plan pursuant to the MCP, which is staged off-site and which is determined at the staging area to be characteristically hazardous for lead may be treated (stabilized) within the "Area of Contamination" only and must be reused or disposed of within ninety (90) calendar days of excavation. No treatment may occur at the staging area.

C. Excavated materials shall be completely covered with a minimum 10-mil thick layer of plastic tarp at the end of each working day.

3.3 SOIL/FILL CHARACTERIZATION

A. Soil and fill material shall be classified based on the criteria established in the accepted SMP and these Specifications.

B. Initial Characterization of Soil/Fill Material: A summary of existing conditions and investigation findings performed by the Engineer during design, including a summary of analytical results, is appended to this section.

C. The Contractor shall review the information provided. The Contractor shall use the information appended and shall either perform independent sampling and characterization of soil/fill strata to be encountered during construction in advance of excavation such that excavated soil can be stabilized as required to render soils characteristically non-hazardous, segregated and directly transported to an appropriate facility or the Contractor shall make the necessary arrangements to secure a staging area(s) suitable for storing soil stockpiles pending analyses.

D. Soil shall be preliminarily segregated based on the Soil Classification Categories detailed in Sub-section 1.4, except as indicated below.

1. Potential Asbestos Containing Material (PACM): Soil/Fill suspected of containing asbestos as evidence by the presence of suspect asbestos-containing building debris such as cementitious (transite) piping, vinyl floor tiling, roofing paper or paper-like insulation materials or any other suspect asbestos containing material observed in the soil/fill shall be

segregated and stockpiled pending confirmatory analysis to determine appropriate disposal requirements. In the event that PACM is encountered the Contractor shall immediately halt work in that area and notify the Owner and Engineer who shall determine

2. Unknown Material. If unknown material is encountered during excavation, the Contractor or the Contractor-hired Environmental Professional shall immediately contact the Engineer to discuss the nature and extent of the unknown material and to assess potential hazards and appropriate handling procedures. Prior to handling and removing the unknown material from the excavation area, the Contractor and Owner and/or its representatives, shall visually assess the material and its potential hazards. Drums shall be assessed to determine whether they are leaking, bulging (evidence of reactive waste), crushed, or empty. Crushed, empty, and/or skeletal parts of drums shall be handled as solid waste, as specified. The Contractor shall record any identification or markings on the drummed material(s). Discovery and management of unknown materials shall be documented as required in the SMP.

E. Disposal Characterization: Waste characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the characterization requirements of each disposal facility in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements. Disposal or reuse of the material shall depend on sampling and characterization analytical results.

Stockpiles within the staging area shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner including the cost of imported fill material used in its place.

F. Characterization of Potential Asbestos-Containing Material:

1. Although asbestos-containing material has not been identified in soils within the project area on properties outside the limits of those properties identified in the W.R. Grace & Company AUL, such material may be encountered in historically developed areas. In the event that PACM is encountered in soil, the Contractor shall immediately halt work in that area and notify the Owner and Engineer. The Contractor Environmental Professional shall collect adequate samples of the suspect asbestos containing material for characterization for asbestos by Polarized Light Microscopy (PLM).

Work shall not re-commence in that area until the results of analyses are received and reviewed by the Owner and Engineer. The Contractor shall be responsible for all sampling and analyses.

2. Materials which test positive for asbestos (i.e. greater than 1% asbestos) shall be handled in accordance with the provisions set forth in Cambridge Ordinance 8.61.040 and applicable state and federal laws and regulations.

   No work in areas determined to contain asbestos shall be conducted until all required notifications to local, state and/or federal agencies have been made and an Asbestos Work Plan has been approved for the site by MassDEP. Asbestos-containing material shall be disposed at an appropriately permitted facility. Asbestos-containing material shall be segregated and not mixed with soils not impacted by asbestos. Workers handling suspect asbestos-containing materials shall be properly trained and equipped to handle asbestos materials.

3.4 STAGING AREAS

A. Prior to staging any materials the Contractor shall pre-characterize the surface soils (0-6") at the staging area(s) to document the existing conditions relative to contamination which may result from using the area to stage excess or unknown materials. A minimum of one composite surface soil sample, consisting of at least five grab samples, for every 2,500 square feet of staging area shall be collected by the Contractor prior to staging materials at the location unless the staging area is comprised of an impervious surface material such as asphalt or concrete. The samples will be submitted to a certified laboratory for analysis for:

   1. RCRA 8 total metals;
   2. Volatile organic compounds (EPA Method 8260B);
   3. Semi-volatile organic compounds (EPA Method 8270);
   4. Total petroleum hydrocarbons (EPA Method 8100M or equivalent); and
   5. Polychlorinated biphenyls (PCBs) (EPA Method 8082).

B. At the completion of the work, the Contractor shall replicate the pre-staging sampling and analysis protocol to assess impacts to the area from use as a staging area.

C. Stockpiles located within the soil staging areas shall be placed on a 20-mil HDPE liner/filter fabric and bermed to minimize the effects of contamination release. Each soil category shall be staged in separate areas with berms constructed a minimum of 2 feet above the existing grade with common fill, hay bales, concrete barriers, or functionally equivalent berm material. Waste characterized as RCRA hazardous waste shall not be stored on site for a

period greater than sixty (60) days. All other waste must be disposed off-site within ninety (90) days of excavation.

D. Excavated materials shall be completely covered with a minimum 10-mil thickness polyethylene tarp and secured with tires, ropes, anchors or equivalent material. The covered system shall be capable of resisting actual wind gusts at the site, with a minimum wind capacity of 40 miles per hour. The stockpile covers shall be installed and secured at the end of each working day and at all times when earthwork is not taking place on site. Stockpile covers shall be immediately recovered should wind forces expose any of the excavated materials. Stockpiles shall also be covered at times as directed by the Engineer.

E. Stockpiles are to be segregated based on a review of pre-characterization data and visual and olfactory conditions and field screening results obtained during excavation. Similar material may be stockpiled together. Each stockpile must be clearly separated from adjacent stockpiles.

F. Stockpiles shall be clearly designated by a sign post or marker which can be cross-referenced with samples collected from the pile for characterization purposes. The signs/markers are not to be moved, except by authorized personnel and not until the soil is ready to be either reused on site or loaded for off-site disposal.

G. Unknown, potentially hazardous soils/debris and drummed materials encountered during the project shall be located in a separate bermed location. The Contractor's Soil Management Plan shall provide construction details of the dimensions and protective measures proposed for the staging area(s). The construction details and protective measures are subject to the acceptance of the Owner and/or its representatives. The Contractor shall select the area to facilitate handling of the material and to minimize interference with other ongoing construction activities. The Owner or Engineer must agree with the location prior to construction.

3.5 EQUIPMENT AND PERSONNEL DECONTAMINATION

A. Equipment and personnel decontamination area(s), conforming with the Contractor's HASP and these Specifications, shall be constructed in such a manner to protect existing site surfaces, materials, and structures from contamination. Equipment decontamination areas shall be sized adequately to provide for the decontamination of the largest piece of equipment to be decontaminated. Filter fabric shall be placed over an impermeable liner to protect the liner from rips, punctures, or tears from traffic and heavy equipment. In the event that excavation of asbestos materials are required, decontamination activities shall be augmented by those asbestos-specific additional requirements and measures.

B. The Contractor shall establish a site-specific decontamination protocol and decontamination areas for personnel and equipment utilized at the subject site. Personnel and equipment decontamination shall be conducted in compliance with the HASP.

C. The decontamination protocol shall include (i) the means, methods, and materials for the proposed decontamination procedures; (ii) the procedures employed to contain and store the wash or rinse liquids/sludges; (iii) procedures used to sample, analyze, and characterize the contaminated wash or rinse liquids/sludges; (iv) procedures to contain or clean contaminated equipment and PPE; and (v) the procedures for handling and disposing of solid wastes generated from site decontamination activities. All sample analysis or sample compositing shall be completed by a certified laboratory. The Contractor shall be responsible for the cost of this analytical work. The Contractor shall submit a copy of the analytical results and laboratory certifications to the Owner for review prior to proceeding with disposal. The Contractor shall be responsible to properly manifest and dispose of all residual wastes generated from on-site activities in conformance with federal, state, and local environmental and transportation regulations. The Contractor shall be responsible for the manifests and procedures to be used to package and dispose of contaminated solid wastes, wash, or rinse liquids at an EPA or state-approved treatment or disposal facility. The Contractor shall be responsible for any releases from site or decontamination activities due to its work, and will remediate any release for which the Contractor is responsible to pre-existing conditions at the Contractor's expense.

D. Provisions for collecting decontamination water will be incorporated into the maintenance of the decontamination pad and will include placing an impermeable liner over a sloped surface such that water is directed, if necessary, into an area for subsequent pumping to 55-gallon drums or other appropriate tankage. Following completion of the work, the wash water shall be characterized by the Contractor and disposed off-site, in accordance with federal, state, and local regulations.

3.6 ENVIRONMENTAL FIELD MONITORING/DUST CONTROL

A. The Contractor shall hire an Environmental Professional to keep accurate documentation of all air monitoring, which will be made available to the Engineer or Owner upon request.

B. During excavation and construction, the Contractor shall monitor the air quality at and surrounding the areas where construction activities involve soil handling such as excavation, re-location, staging, loading or grading of soil/waste materials. Air monitoring shall involve appropriate techniques capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. If there are indications of contamination, the frequency of air monitoring shall be determined by the

Contractor's Industrial Hygienist or competent environmental health professional. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for assuring that monitoring is conducted in an appropriate manner, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.

C. The air monitoring program is to be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind, and two downwind conditions during periods of activity on the site and when there is a potential for dust being generated on the site. The air monitoring information including air monitoring in the vicinity of all site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health and Safety Plan. The Contractor shall submit his/her air quality monitoring program for review prior to commencement of site activities.

D. Air monitoring shall be performed by the Contractor during all soil handling operations. In contaminated areas, detectors for organic contaminants and dust should be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g. excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information by the Contractor. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions and personnel protection measures.

E. Dust shall be controlled during excavation of soil/fill material to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.

G. Ambient dust levels at the site shall be monitored by the Contractor prior to construction. During construction, real-time dust monitoring shall be conducted during any soil/fill handling activities. The monitoring shall consist of total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level, the Contractor shall perform additional measures to reduce the total dust concentrations.

H. Nuisance dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.

Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation if there is potential for nuisance dust generation. Additional water spray may be utilized only when any indication of excessive dust is observed. To the extent feasible, the Contractor shall minimize the use of water within the limits of excavation.

Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

I. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall monitor the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.

J. In the event that asbestos containing materials are encountered, dust control measures, which may include negative air containment, shall be instituted in accordance with all applicable local, state and federal laws and regulations.

3.7 VAPOR AND ODOR CONTROL

A. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's Vapor and Odor Control Plan. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants, or other methods to reduce off-site odors to acceptable levels. The Contractor shall not use soil suitable for on-site reuse as cover to control vapor and odors.

3.8 BULKING

A. Following characterization and compatibility testing of waste material, the Contractor shall place compatible materials into common containers to reduce transport and disposal costs. In addition, materials that are improperly contained shall be transferred into the appropriate containers. Drums and containers used during this project shall meet the appropriate DOT, OSHA, and U.S. EPA regulations for the materials contained. The Contractor shall describe the bulking procedures in the Soil and Fill Management Plan.

3.9 BACKFILLING AND COMPACTION

A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Imported backfill used in excavated areas shall have been analyzed and certified as free of contaminants and as specified in Section 02210 – Earth Excavation, Backfill, Fill, and Grading.

PART 4 – COMPENSATION

Item 2080.1 – OHM - Soil and Waste Management

METHOD OF MEASUREMENT:
Measurement for Payment shall be based on the following breakdown; A maximum of 3 percent of the lump sum will be paid upon the finished construction of the completed soil/fill staging area as specified and accepted by the Engineer. A maximum of 4 percent of the lump sum will be paid upon the submittal and acceptance of all related submittals, plans and shop drawings. A minimum of 3 percent of the lump sum will be paid at the complete removal and restoration of the staging area, as approved by the Engineer. The balance of the Lump Sum measurement for payment for will be on a percent of the Lump Sum bid remaining, calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer. Deducts for work not performed as specified shall be applied.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Soil and Waste Management shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Soil and Waste Management. The work includes, but is not limited to; Environmental Professional; dewatering Professional; soil/fill sampling; analytical services; development and implementation of all submittals and plans specified including, but not limited to: Health and Safety Plan; Equipment and Personnel Decontamination Plan; Soil and Waste Management Plan; Dust, Vapor, and Odor Plan; Air Quality Control Plan; and a Spill and Discharge Control Plan; submittal of all required certifications; coordination with all parties affected and maintaining proper documentation necessary; disposal of wastes, such as construction-related waste and by-products, and Contractor-generated waste material, such as personal protective equipment, excess materials, debris, wash water, and any other waste materials not specifically addressed in other payment items; waste characterization sampling and analysis costs for the waste referenced above; construct and maintain a secure (enclosed with 8 foot high fencing and gate) soil/fill staging area for soil/fill stockpiling pending analytical testing, reuse, or disposal; all permits and administration fees; collecting and testing surface soil samples pre- and post- use of staging area; placement of polyethylene liner under piles; additional placement of bituminous or cement concrete as may be needed at the staging area; construction of segregated soil/fill bays; signage and lighting at the staging area; installation of sedimentation and erosion control at the staging area; construction of a truck wash down area; construction of a decontamination area with wheel wash; maintenance including placement of daily polyethylene covers over existing stockpiles; performing dust control; street sweeping; vehicle wheel-washing in the staging areas as needed to control airborne dust and sediment from spreading beyond the staging area or presenting a health risk to the workers or public; day to day security measures; maintenance of the soil/fill stockpiles to avoid migration; and maintenance of the sedimentation and erosion control measures; and removal, hauling, and disposal of all items of which the staging area was constructed as well as the restoration of the site to pre-construction conditions.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material; re-use of soil and fill material on site as backfill; handling asbestos

contaminated material within the limits of the W. R. Grace & Co. property; handling unknown materials; sedimentation and erosion control for other uses besides soil management (at the staging area); and all work associated with a staging area for other uses beyond soil and waste management.

2080.2 – OHM - Handle Asbestos Contaminated Soil / Fill

METHOD OF MEASUREMENT:
Measurement for payment for Handling Asbestos Contaminated Soil/Fill shall be based on the actual in-place volume excavated, in cubic yards, as measured by the Engineer, within the horizontal and vertical trench pay limits indicated elsewhere in the Contract Documents.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Handling Asbestos Contaminated Soil/Fill shall be based on the cubic yard price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Handling Asbestos Contaminated Soil/Fill. The work includes, but is not limited to; segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; all controls necessary to maintain compliance with City of Cambridge ordinances relative to asbestos in soils; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; all fees, permits, and taxes; and construct, maintain, and remove a secure asbestos contaminated fill staging area for stockpiling pending analytical testing, reuse, or disposal.

EXCLUSIONS:
The following items are not included for payment under this item; activities within the limits of the W. R. Grace & Co. property; disposal of asbestos contaminated material; soil and waste management items covered under other bid items; and all work associated with a staging area for other uses beyond asbestos contaminated material staging.

2080.3 – OHM - Handle Asbestos Contaminated Soil / Fill (W.R. Grace & Co. Property)

METHOD OF MEASUREMENT:
Measurement for payment for Handling Asbestos Contaminated Soil/Fill shall be based on the actual in-place volume excavated, in cubic yards, as measured by the Engineer, within the horizontal and vertical trench pay limits indicated elsewhere in the Contract Documents.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Handling Asbestos Contaminated Soil/Fill shall be based on the cubic yard price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Handling Asbestos Contaminated Soil/Fill. The work includes, but is not limited to; segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; all controls necessary to maintain compliance with City of Cambridge ordinances relative to asbestos in soils. This shall include all aspects of conducting soil excavation, handling and management within a negative air containment; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; all fees, permits, and taxes; and construct, maintain, and remove a secure

asbestos contaminated fill staging area for stockpiling pending analytical testing, reuse, or disposal.

EXCLUSIONS:
The following items are not included for payment under this item; disposal of asbestos contaminated material; soil and waste management items covered under other bid items; and all work associated with a staging area for other uses beyond asbestos contaminated material staging.

2080.4 – OHM - Handle and Characterize Unknown Material

METHOD OF MEASUREMENT:
Measurement for payment for Handle and Characterize Unknown Material shall be based on the actual in-place volume excavated, in cubic yards, as measured by the Engineer, within the horizontal and vertical trench pay limits shown on the Contract Drawings.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Handle and Characterize Unknown Material shall be based on the cubic yard price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Handling and Characterizing Unknown Material. The work includes, but is not limited to; segregate, handle, stage, test and characterize any soil and fill material which is inconsistent with previous observations and is not readily identifiable as non-hazardous waste; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; and all fees, permits, and taxes. The staging area for handling unknown materials shall be constructed only after suspected materials are encountered, and the Owner is notified. The staging area shall be sized based on field observations and estimates of potential material volume.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of unknown material; soil and waste management items covered under other bid items; and all work associated with a staging area for other uses beyond staging unknown materials.

END OF SECTION 02080

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SECTION 02082

ASBESTOS REMOVAL AND RELATED WORK

2082.1 DEVELOP AND IMPLEMENT ASBESTOS SOIL SAMPLING PLAN FOR ACTIVITIES ON W.R. GRACE PROPERTY LUMP SUM

2082.2 DEVELOP AND IMPLEMENT ASBESTOS SOIL MANAGEMENT PLAN FOR ACTIVITIES ON W.R. GRACE PROPERTY LUMP SUM

2082.3 DEVELOP AND IMPLEMENT MCP SOIL MANAGEMENT PLAN AND HEALTH & SAFETY PLAN FOR ACTIVITIES ON W.R. GRACE PROPERY LUMP SUM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of Article IV of the CONTRACT AND GENERAL CONDITIONS.

1.2 RELATED WORK

A. Section 01108 – HEALTH AND SAFETY PROCEDURES

B. Section 01500 – TEMPORARY FACILITIES AND CONTROLS

C. Section 02010 – SUBSURFACE INVESTIGATION

D. Section 02080 – SOIL AND WASTE MANAGEMENT

E. Section 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

1.3 DESCRIPTION OF WORK

A. The Contractor shall be responsible for knowledge of and compliance with the following documents, which are available for review at the office of the Owner, 147 Hampshire St, Cambridge, MA 02139, and/or appended to this Specification.

1. City of Cambridge Asbestos Ordinance (appended to this Specification).
2. Notice of Activity & Use Limitation – W.R. Grace & Company, dated February 16, 2006 (available for review and excerpted herein).

3. Massachusetts Contingency Plan (MCP) Public Involvement Plan, December 1995 (available for review).

4. Notice of Activity and Use Limitation, W.R. Grace & Co.-Conn, DEP Release Tracking No.(s): 3-0277 (available for review).

B. This section covers the furnishing of all labor, materials, facilities equipment, services, employee training and testing, permits and agreements necessary to perform the work specified in this section. This work shall include removal of soils in which asbestos containing material has come to be located. This work shall be performed in accordance with these specifications, U.S. Environmental Protection Agency (EPA) and OSHA regulations, NIOSH recommendations, Massachusetts Department of Environmental Protection (MassDEP) and Department of Labor and Workforce Development (DLWD) regulations, local statutes, local ordinances including but not limited to the City of Cambridge Asbestos Ordinance (Chapter 8061 Asbestos Protection), the Activity and Use Limitation (AUL) recorded for the W.R. Grace & Co. property, local codes, and any other applicable federal, state and local government regulations, policies and guidelines. Whenever there is a conflict or overlap of the above referenced requirements, the strongest or more stringent provisions are applicable. Deviations from this specification shall be approved in writing by the Owner or the Owner's Engineer prior to the Contractor continuing work.

C. The Contractor shall subcontract with an Industrial Hygiene Consultant shall prepare and submit for approval an Asbestos Soil Sampling Plan and an Asbestos Soil Management Plan to the City of Cambridge Public Health Department prior to the start of work and in accordance with the City of Cambridge Asbestos Ordinance. The Contractor shall provide draft and final copies of these reports to the City and Engineer prior to submittal of the reports. The Contractor is advised that The Commissioner of Public Health shall approve the Asbestos Soil Sampling Plan prior to beginning sampling.

D. The Contractor shall implement the approved Asbestos Soil Sampling Plan in accordance with all applicable laws and regulations.

E. The Contractor shall subcontract with a Licensed Site Professional (LSP) who shall prepare a Soil Management Plan (SMP) in accordance with the MCP and the AUL recorded for the W.R. Grace & Co. property. The Contractor is advised that the SMP shall be submitted for public review and comment in accordance with the December 1995 PIP prepared for the W.R. Grace & Co. property (RTN 3-0277).

F. Contractor's LSP and Certified Industrial Hygienist (CIH) shall prepare a Health & Safety Plan (HASP) in accordance with the MCP and the AUL recorded for the W.R. Grace & Co. property. The Contractor is advised that the HASP shall be submitted for public review and comment in accordance with the December 1995 PIP prepared for the W.R. Grace & Co. property (RTN 3-0277).

G. The Contractor is advised that the 20-day public comment period on the Asbestos Soil Management Plan is required by the Cambridge Asbestos Ordinance and by the Public Involvement Plan under the MCP prior to beginning excavation of soils within the W.R. Grace property. The Contractor is further advised that a 20-day public comment period on the MCP Soil Management Plan and Health and Safety Plan are required. Public comment periods shall be extended if requested by the public or as determined by the City of Cambridge Commissioner of Public Health. The Contractor shall be responsible for becoming familiar and full compliance with all applicable public notification requirements.

H. The Contractor shall retain the services of a licensed Asbestos Removal Contractor who shall furnish all labor, material, supervision, construction tools, transport vehicles and equipment necessary to perform the following work:

1. Worker training, respiratory protection and medical examination.

2. Provide access, support and protection to all authorized visitors and inspectors.

3. Filing of and/or obtaining all required notifications, permits, and payment of all required associated costs and fees.

4. Application for, and obtaining of waivers and exemptions which may be required by various regulatory agencies to bulk load soils in which asbestos-containing materials are present.

5. Regulated work area preparation and work practices.

6. Proper removal, packaging, transport and disposal of all asbestos-containing materials as specified herein. Note that vehicles transporting bulk-loaded soils containing a reportable quantity (greater than 1 pound) of asbestos shall be properly placarded in accordance with DOT regulations. All drivers shall be appropriately trained and licensed to transport this material.

I. The Contractor shall be responsible for the removal and disposal of soils in which asbestos has come to be located as required to complete the work as specified herein.

J. Contractor's Industrial Hygiene Consultant shall prepare and submit a Work Plan to the MassDEP that describes the methodology to be used to protect human health and the environment during all phases of excavation, load-out, transport and disposal of all debris generated from the site. The Contractor shall provide the Owner the following information a minimum of 2 weeks prior to submitting notification to the MA DEP:

1. Name of any sub-contractors working at the site and a description of their responsibilities;

2. Name of the waste transporter;
3. Name of the landfill;
4. Anticipated mobilization and estimated completion dates.

1.4 SUBMITTALS

All submittals shall be submitted to the Engineer prior to the start of work.

A. City of Cambridge documents and plans required under the Cambridge Asbestos Ordinance.

1. Asbestos Soil Sampling Plan: The minimum requirement for an Asbestos Soil Sampling Plan is composite sampling to a depth of at least three (3) feet, or to the maximum depth of proposed soil-disturbing activities, using thirty-five (35) foot on-center sample locations distributed across the site in all areas where soil disturbing activities are proposed or anticipated. The Commissioner must approve the Asbestos Soil Sampling Plan before sampling at the site begins. Once completed, the data generated under the sampling plan shall be submitted to the Commissioner and maintained by the Commissioner as a public record. Areas of asbestos-contaminated soil which are to be subject to soil-disturbing activities may require further characterization as determined by the Commissioner.

2. Asbestos Soil Management Plan: Upon completion of all required asbestos analysis provisions, the Contractor shall undertake precautions to prevent fugitive dust from being generated and/or escaping during any soil-disturbing activities. These measures shall be detailed in an Asbestos Soil Management Plan.

a. This plan shall be submitted to the Commissioner for prior approval and shall include one or more of the following particulate dust mitigation and assurance measures:

(i) assuring that the soil is adequately wet during soil disturbing activities;
(ii) erecting wind fences around the area containing asbestos-contaminated soil during the entire time that it is being disturbed;
(iii) conducting hourly air monitoring for particulate dust and continuous air monitoring for airborne asbestos around the perimeter of the soil-disturbing activity;
(iv) covering the site with a layer of clean fill, which must be of sufficient depth such that the proposed disturbance of the soil would occur in and affect only that clean fill layer;

(v) erecting a permanent or temporary structure maintained at partial vacuum sufficient to contain all fugitive dust, with off gas from the evacuation system treated with HEPA filtration (**required on the W.R. Grace & Co. property**);

b. The Asbestos Soil Management Plan shall include a contingency plan for immediate work stoppage in the event that dust standards established in the Asbestos Soil Management Plan are exceeded in any two hourly field tests over a 24-hour period. The Asbestos Soil Management Plan shall also include a contingency plan for work stoppage in the event that the airborne asbestos standard established in the Asbestos Soil Management Plan is exceeded after continuous daily testing has been completed, no later than 24 hours after the cumulative daily samples have been collected. Work may recommence when containment measures deemed sufficient by the Commissioner to prevent further exceedances have been implemented. Any further exceedances shall result in immediate work stoppage.

c. Prior to the final decision on the Asbestos Soil Management Plan, the Commissioner shall make available for public review for a period of 20 calendar days all data resulting from the Asbestos Soil Sampling Plan, the proposed Asbestos Soil Management Plan, and the Commissioner's draft decision. The Owner shall provide written notice of the availability of the documents to abutters and to any person who otherwise requests notice and shall provide copies of the soil sampling results, proposed Asbestos Soil Management Plan, and Commissioner's draft decision upon request. A copy of the documents shall be available for public viewing at the Commissioner's office and the main branch of the Cambridge Public Library. Public comments shall be submitted in writing to the Commissioner and shall be received by the Commissioner prior to the end of the 20-calendar day period in order to be considered.

Mitigation measures (a) (iv) and/or (a) (v) shall be included in the soil management plan if any of the following conditions are present:

(i) the level of contamination is serious, i.e. at least one 5% asbestos sample and a mass of asbestos greater than 20,000 pounds;
(ii) the proposed soil disturbance is extensive, i.e. 20,000 sq. ft. footprint or greater;
(iii) the proposed soil disturbance is in close proximity to residential areas or children's play areas, i.e. within 500 feet.

B. A Soil Management Plan (SMP) shall be prepared by the Contractor's LSP as required by, and in accordance with, the AUL recorded for the W.R. Grace & Co. property, to wit: "At a minimum, the SMP shall describe the soil excavation, handling, storage, transport, and disposal procedures, as well as the engineering controls and air monitoring procedures, necessary to ensure that the potential impact of fugitive asbestos fibers and volatile emissions to workers, nearby residents, and other receptors in the vicinity are taken into account to ensure compliance with applicable standards." The Contractor is advised that the SMP shall be submitted for public review and comment in accordance with the December 1995 PIP prepared for the W.R. Grace & Co. property (RTN 3-0277).

C. Layout of project execution showing the excavation in stages reflecting the most recent schedule, corresponding to the qualified personnel employed and the configuration of the regulated area.

D. Copy of notification to MassDEP, police department, fire department, Commissioner of Public Health and local ambulance and hospital.

E. Standard Operating Procedure showing how workmen, visitors, and employees will be protected from exposure and how spaces outside the regulated exclusion zone will be protected from contamination.

F. Sample literature of disposable protective clothing.

G. A Health and Safety Plan (HASP) shall be prepared by an LSP and a Certified Industrial Hygienist (CIH) prior to commencement of activities that remove the "Protective Cover" and/or activities that are likely to disturb soil beneath the Protective Cover on the W.R. Grace & Co. property. The Contractor is advised that the HASP shall be submitted for public review and comment in accordance with the December 1995 PIP prepared for the W.R. Grace & Co. property (RTN 3-0277).

H. Detailed plans for personnel decontamination facilities and toilets.

I. Certification of compliance with OSHA requirements including but not limited to medical surveillance, record keeping and personal monitoring.

J. Documentation of certification in accordance with 453 CMR 6.00 for each employee, as applicable.

K. Final landfill destination and copies of transporter and Landfill permits as well as Waste Shipment Records

L. Copies of all Notifications made to Massachusetts Asbestos Program and local Board of Health, Local Fire Department, and any other agencies, as required.

M. Materials Safety Data Sheets (MSDS) for all products used on the project.

1.5 SCHEDULING

A. The Contractor is advised of public comment periods on the Soil Management Plan and under the MCP Public Involvement Plan prior to the start of work involving excavation of asbestos.

B. The Contractor shall develop an abatement schedule for review by the Owner and Engineer. The Owner and Engineer may choose to alter the work sequence as needed.

C. The Contractor shall update the schedule and submit any schedule changes for review by the Engineer at the weekly construction meetings.

D. Work shall only be permitted between the hours of 7:00 AM to 5:00 PM Monday through Friday.

1.6 PERIOD OF PERFORMANCE

A. The Contractor shall complete all asbestos removal work as specified in the contract documents

1.7 AUTHORITY TO STOP WORK

A. The Owner has the authority to stop the work at any time the Owner determines either personally or through the services of the Owner's Consultants that conditions do not conform with the requirements of the specifications and/or applicable regulations. The stoppage of work shall continue until conditions have been corrected and corrective steps have been taken to the satisfaction of the Owner. Standby time required to resolve violations shall be at the Contractor's expense, and any fines, etc., for hazardous conditions or non-compliance shall be at the Contractor's expense, and shall not be grounds for change orders or time extension.

B. The Contractor's Industrial Hygiene consultant shall notify the Owner when airborne fiber levels measured at the perimeter of the exclusion zone exceed 0.010 fibers per cubic centimeter of air (f/cc) or established background levels, at which time the Contractor shall stop work, determine the cause of the elevated fiber levels and implement corrective actions.

C. Stop work orders may be issued for, but not limited to the following:

1. Fiber concentrations exceed 0.010 f/cc for any one sample.

2. If the Contractor disregards laws or regulations of any regulatory or governing body having jurisdiction.

3. If the Contractor's work presents a risk to adjacent buildings, to the general public or to the environment as determined by the Owner or Owner's Engineer.

D. The absence of a stop work order by the Owner or the Consultant shall not in any way be construed as an approval or acceptance of the Contractor's work.

1.8 CONTRACTOR QUALIFICATIONS

A. Approval by the Owner shall be based upon submittal by Contractor of the following:

1. Insurance and bonding as stated in the Contract Documents.

2. Licensing by the MA DLWD (Department of Labor and Workforce Development) as an Asbestos Abatement Contractor.

3. Names and locations of at least three projects similar in scope and size to this project completed by the Asbestos Removal Contractor. Provide the name and phone number of a contact person for each referenced project.

1.9 PERSONNEL QUALIFICATIONS

A. All personnel of the Contractor or any approved subcontractors involved with contaminated soil shall meet the following minimum qualifications:

1. 40 hours of hazardous waste operations training including all appropriate refresher training in accordance with 29 CFR 1910.120 or appropriate training as asbestos abatement workers and supervisors.

2. A minimum of two hours of site specific asbestos-related training for all persons involved in operations conducted within areas where asbestos contamination is present. This training shall include general information such as the health effects associated with exposure to asbestos, historic uses of asbestos, and site-specific information such as a review of the types of asbestos-containing materials identified at the site to date as well as site-specific work practices and engineering controls.

3. All personnel conducting removal activities that may involve direct contact with existing asbestos, including the lining, loading, and sealing of the loads, decontamination of vehicles, hand excavation, etc., shall have, at minimum, 32 hours of asbestos abatement worker's training and be certified by the Massachusetts Department of Occupational Safety (DOS) as asbestos abatement workers. All removal activities where direct contact with asbestos materials is possible shall be overseen by a DOS-certified asbestos abatement supervisor.

4. Notification of asbestos abatement activities (removal and disposal of asbestos materials in soils) on Form ANF-001 to the Massachusetts Asbestos Program at least 10 working days prior to beginning any activities that may disturb asbestos-containing materials at this site.

5. Asbestos worker medical examination within the past year in accordance with OSHA 1926.1001 with a physician's written opinion that the worker has no condition that would preclude him/her from working with asbestos or wearing a respirator.

6. Current certification by the MA DLWD as an asbestos supervisor or asbestos worker.

7. Experience with projects involving the excavation and disposal of soils in which asbestos containing material are present as evidenced through participation in at least five previous projects of similar scope.

1.10 AVAILABILITY OF TRAINED PERSONNEL

A. There shall be a sufficient number of trained and qualified workers, foremen and superintendents to accomplish the work within the required schedule. No untrained nor fully qualified and pre-approved person shall be employed to speed up completion of the abatement work.

1.11 DEFINITIONS

A. All terms not defined herein shall have the meaning given in the applicable publications and regulations.

B. Authorized Visitors: Any visitor authorized by the Owner, the Engineer or any representative of a regulatory agency or other agency having jurisdiction over the project.

1.12 EMERGENCY PRECAUTIONS

A. Local emergency medical personnel, fire department, both ambulance crews and hospital emergency room staff, shall be notified prior to commencement of soil removal operations as to the possibility of having to handle contaminated, injured workers, and shall be advised on safe decontamination. The Contractor shall submit copies of such notifications to the Engineer.

B. The Contractor shall have a written safety plan. When an injury occurs the Contractor shall stop work until the injured person has been removed from the exclusion zone.

C. Before the Contractor starts actual removal of the asbestos material, Contractor shall notify the local police and fire departments as to the proper personal protective

equipment required by persons providing emergency response services. The Contractor shall make every effort to help these agencies form plans of action should their personnel need to enter contaminated areas.

1.13 RESPIRATORY SYSTEMS

A. Minimum respiratory protection required shall be compliant with current OSHA and Mass DLWD regulations including 453 CMR 6.00 and TITLE 29 CFR 1926.1101.

B. Provide their employees with NIOSH approved respirators compliant with OSHA regulations and a sufficient quantity of disposable filters where applicable, so that workers can change filters during the workday. Store the respirator filters at the job site and protect them from exposure to asbestos or other hazardous materials prior to their use.

C. Workers shall always wear a respirator properly fitted on the face while within the regulated exclusion zone and decontamination areas. Any worker failing to wear his/her respirator or in any way performing his/her work in an unsafe manner shall be restricted from working at this site.

D. Instruct and train workers in proper respirator use.

1.14 PROTECTIVE CLOTHING

A. Provide to all workers, foremen, superintendents and authorized visitors and inspectors protective disposable clothing consisting of full body coveralls, head covers, gloves and 18-inch high boot type covers or reusable footwear whenever appropriate or as required by site conditions.

B. Provide eye protection and hard hats as required by job conditions and safety regulations.

C. All disposable protective clothing shall be discarded and disposed of as asbestos waste every time the wearer exits from the regulated exclusion zone.

1.15 SHOWERS AND TOILET FACILITIES

A. Provide decontamination facilities located in an area agreed upon with the Owner's designated representative. The decontamination facilities shall include a Decontamination System for workers and visitors and a Decontamination System for vehicles and equipment.

B. The Decontamination System for workers and visitors shall consist of the following: Clean Room at entrance followed by Shower Room followed by an Equipment Room leading to the exclusion zone.

C. Provide lockers for storage of workers' street clothes in the clean room. Provide in the same room uncontaminated disposable protective clothing and gear prior to entering into the contaminated area and to dress into street clothing after they have showered and dried in the shower room as they exit from the contaminated area.

D. Provide shower room facilities so arranged as to provide complete showering of workers and visitors as they exit from the contaminated area. Make provisions to prevent any contaminated run-off from the shower room. The shower room facilities and size shall be adequate to allow decontamination and thorough washing of all the workers and visitors within a ten-minute period. The hot and cold water shower shall be functional at all times while workers are within the regulated exclusion zone. Shower water temperature shall be controlled at the tap.

E. Provide the Equipment Room with storage for contaminated clothing and equipment. In this room, workers and visitors dispose of their disposable protective clothing except the respirator as they prepare to enter the shower room.

1.16 PERSONNEL PROTECTION AND DECONTAMINATION

A. Provide all personnel throughout the abatement process with the specified protective clothing and gear. Ensure that all personnel entering and leaving the workspace use the following procedures:

1. Entering from the outside: Change from street clothes into protective clothing and wear clean protective gear. Go through shower room into Dirty Equipment Room, pick up equipment and tools and enter the exclusion zone.

2. Exiting from The Exclusion Zone: Dispose of all protective clothing into labeled plastic bags for asbestos waste. Do not take off the Respirator, but still wearing the respirator enter the shower and shower thoroughly. Remove respirator and wash and wipe thoroughly to decontaminate the respirator. After drying, enter the Clean Room, store the decontaminated respirator in the assigned space and dress into street clothes.

3. Post written procedures in the workplace and train all personnel on the procedures for the evacuation of the injured. Provide aid to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations. Exceptions to normal, routine-exiting procedures shall be made for emergencies such as, but not limited to, serious personal injury.

4. The Contractor shall instruct all employees and workers in the proper care of their personally issued respiratory equipment, including daily maintenance, sanitizing procedures, etc.

5. All respiratory equipment shall be inspected by Contractor's personnel at the beginning of each work period, including breaks and lunch periods.

1.17 EQUIPMENT DECONTAMINATION

A. The Contractor shall construct a vehicle wash pad for the decontamination of equipment that comes into contact with soils in which asbestos containing materials are present. The wash pad shall be constructed using 40-mil HDPE roofing membrane placed into a shallow excavation onto which a minimum of 6 inches of crushed concrete shall be placed. The wash pad shall be graded and constructed such that wash water shall flow through crushed concrete (or ¾" stone), onto the membrane and into a capture basin where the water can be collected and filtered. The wash water shall, at minimum, be filtered through a 5-micron filter prior to discharge.

1.18 DISPOSAL ACTIVITIES

A. It shall be the responsibility of the Contractor to determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The Engineer shall approve the landfill destination. The Contractor shall comply fully with these documents and all U. S. Department of Transportation and EPA requirements.

B. The Contractor, transporter and landfill shall document generation, transport and disposal of the waste at the designated landfill by completing a Waste Shipment Record and forwarding the original along with the Bill of Lading to the Owner within the time period specified by the EPA.

C. The "contaminated materials" including debris, soils, contaminated vegetation, etc. shall be handled, loaded, transported and disposed of as regulated asbestos waste, in accordance with 310 CMR 7.15 (c) as well as other applicable federal, state and local requirements.

D. All cargo areas of transport vehicles shall be lined with two, 10-mil liners prior to loading. The liners shall be prefabricated with chemically-bonded or heat-welded seams and shall be sized to fit the cargo area of the vehicle being used. Field fabrication of liners using flat stock and duct tape or other sealants shall not be allowed.

E. After the asbestos-containing materials are loaded into a lined transport vehicle but prior to the vehicle leaving the site, the liners shall be sealed over the loads using spray glue/duct tape.

F. Warning labels as regulated by OSHA 29 CFR 1926.1101 shall be posted on all loads after the load is sealed and before the load leaves the site. "Generator Labels" shall also be posted on all loads after the load is sealed and before the load leaves the site.

The Industrial Hygiene Consultant shall then inspect the loads. The road cover shall then be secured.

G. The four sides of the transport vehicle shall be labeled in accordance with U.S. Department of Transportation (DOT) requirements for reportable quantities of bulk loaded asbestos (identified by type as required) before the vehicle leaves the site.

H. The landfill where material is disposed of shall be licensed to accept friable, bulk-loaded asbestos waste by the state where the landfill is located. All transporters and/or drivers shall be duly licensed to transport this material on all roads and in all states where the load is driven to reach the disposal facility.

1.19 DUST CONTROL

A. The Contractor is advised that use of negative air pressure containment during soil excavation and handling shall be required on the W.R. Grace & Company properties, as established by the Asbestos Soil Management Plan approved by the City of Cambridge Commissioner of Public Health.

B The primary form of dust control to be utilized to control fugitive emissions at the site shall be the application of water. All debris shall be maintained wet throughout the handling process. WORKSHALL BE HALTED IF VISIBLE EMISSIONS ARE OBSERVED EMANATING FROM SUSPECT ASBESTOS-CONTAINING MATERIALS OR FROM ASBESTOS-CONTAMINATED MATERIALS AS A RESULT OF THIS WORK.

C. The Contractor shall install a meteorological monitoring station at the site to document the wind speed and wind direction. Wind speed and direction observations shall be recorded hourly and this information shall be forwarded to the DEP NERO daily along with daily air sample analytical results.

PART 2 - MATERIALS AND EQUIPMENT

2.1 MATERIALS

A. Deliver all materials in original packages, containers or bundles bearing the name of the manufacturer.

B. Damaged, deteriorating, contaminated or previously used products or equipment shall not be used on this project, and shall be removed from the work-site and disposed of properly.

PART 3 – EXECUTION

3.1 COORDINATION AND SCHEDULING

A. The Asbestos Contractor shall coordinate all work with the Engineer and the General Contractor.

C. The Contractor shall submit to the Engineer prior to contract performance, a schedule of work including sequencing of asbestos removal.

D. The Contractor shall make all required notifications and obtain all permits including, but not limited to City of Cambridge, MA DEP, MA DLWD. All associated costs and fees shall be paid for by the Contractor and included in the base bid price.

F. The Contractor shall coordinate with Dig Safe prior to commencing mobilizing at the site.

G. The Contractor shall complete documentation and associated public comment periods pursuant to the City of Cambridge Asbestos Ordinance, the MCP, and the AUL Recorded for the W.R. Grace & Co. property prior to start of work.

3.2 MONITORING, TESTING AND INSPECTION

A. All air monitoring, with the exception of Abatement Contractor personnel monitoring, shall be performed by the Contractor's Industrial Hygiene Consultant. The Contractor shall be responsible for personnel monitoring, including but not limited to, safety compliance and record keeping in compliance with OSHA regulations. Personal monitoring results from the previous day shall be posted each day at a location chosen by the Owner, and copies of the results forwarded to the Industrial Hygiene Consultant. The Contractor's Industrial Hygienist may, at his discretion, also conduct personnel monitoring on Contractor personnel. Monitoring, if any, by the Owner's representative shall not relieve the contractor of obligation to perform personal exposure assessments.

B. Continuous air monitoring around the perimeter to document the concentrations of airborne fibers during asbestos-related activities shall be performed and consist of a minimum of four air samplers placed around the exclusion zone. In general, samplers shall be placed within 100 feet of asbestos-related activities while these activities are being performed. Contractor's Industrial Hygiene Consultant shall locate the samplers in conspicuous locations and take reasonable measures necessary to protect the samplers from damage. Samples shall be analyzed using NIOSH Method 7400 or equivalent approximately two hours from their start time. Sampling cassettes shall be immediately replaced so that sampling continues throughout the workday. Samples shall be analyzed onsite or at a local analytical laboratory at the completion of each workday. Contractor's Industrial Hygiene Consultant shall forward results to the MA DEP Northeast Regional Office (NERO) daily upon receipt of the results. Samples

indicating greater than 0.010 f/cc using NIOSH Method 7400shall be analyzed using Transmission Electron Microscopy (TEM) Asbestos Hazard Emergency Response Act (AHERA) protocol. Turn-around-time for this analysis shall be as soon as practicable (typically six to twelve hours). Results of these analyses, should they be required, shall be forwarded to the DEP NERO as soon as they become available. In addition, approximately one of every ten samples analyzed in the field (using NIOSH Method 7400)shall also be re-analyzed using the TEM AHERA protocol. Turn-around-time for these analyses shall be approximately forty-eight hours from sample delivery to the laboratory

C. If, at any time, air sample results indicate airborne fiber concentrations in excess of 0.010 f/cc, the contractor shall stop work and the MassDEP shall be notified. Contractor shall take direction from the Owner or its representatives and/or the MassDEP regarding steps that shall be taken to reduce the airborne fiber concentrations. Such steps may include working slower or more cautiously, additional wetting or other methods. Contractor shall at all times use methods that maintain airborne fiber concentrations below 0.010 f/cc. All costs incurred for maintaining airborne fiber concentrations below 0.010 f/cc or for maintaining approval of MassDEP during the removal process shall be considered part of the work and the responsibility of the Contractor.

3.4 RESPONSIBILITY FOR DAMAGES

A. Any damages at the site that has been the result of actions by the Contractor personnel shall be repaired to their original condition without any additional cost to the Owner. A comparison of the pre-construction inspection report shall be the basis for the assessment of damages to be addressed.

3.5 GENERAL APPLICABILITY OF CODES, REGULATIONS, LAWS AND STANDARDS

A. Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, laws and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

3.6 CONTRACTOR RESPONSIBILITY

A. The Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling and disposal of asbestos containing materials (ACM), and protection of workers and visitors to the site, and persons occupying areas adjacent to the site. The Contractor shall hold the Owner's consultants harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of himself, his employees or his subcontractors.

PART 4 – COMPENSATION

2082.1 – Develop and Implement Asbestos Soil Sampling Plan for Activities on W.R. Grace & Property

METHOD OF MEASUREMENT:
Measurement for Payment shall be based on the following breakdown: 50 percent of the lump sum shall be paid upon the submittal and acceptance of all related submittals, plans and shop drawings. The remaining 50 percent of the Lump Sum measurement for payment shall be on a percent of the Lump Sum bid remaining, calculated by dividing the elapsed time to date by the analysis and sampling time as submitted in the Asbestos Sampling Plan approved by the Commissioner and accepted by the Engineer. In the event that an Asbestos Soil Sampling Plan is not required by the Commissioner, payment for this item shall not be provided.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Develop and Implement Asbestos Soil Sampling Plan for Activities on W.R. Grace & Property shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Asbestos Soil Sampling. The work includes, but is not limited to; soil/fill sampling; analytical services; development and implementation of all submittals and plans specified, prepared and implemented by an appropriately certified Professional(s) as required in the Specifications; submittal of all required certifications; coordination with all parties affected and maintaining proper documentation necessary; disposal of Contractor-generated waste material, such as personal protective equipment, excess materials, debris, wash water, and any other waste materials not specifically addressed in other payment items; waste characterization sampling and analysis costs for the waste referenced above; all permits and administration fees; installation of sedimentation and erosion control; construction of a decontamination area with wheel wash; performing dust control and air monitoring;; day to day security measures; and maintenance of the sedimentation and erosion control measures; and removal, hauling, and disposal of all items of which were generated during the sampling and analysis activities.

2082.2 – Develop and Implement Asbestos Soil Management Plan for Activities on W.R. Grace Property

METHOD OF MEASUREMENT:
Measurement for Payment shall be based on the following breakdown: a maximum of 10 percent of the lump sum shall be paid upon the finished implementation of the initial/pre-construction protections and provisions as specified, submitted in an approved plan, and accepted by the Engineer. A maximum of 15 percent of the lump sum shall be paid upon the submittal and acceptance of all related submittals, plans and shop drawings. A minimum of 25 percent of the lump sum shall be paid at the complete removal and closeout of all protections and provisions, as specified; submitted in an approved plan; and as approved by the Engineer. The balance of the Lump Sum measurement for payment shall be on a percent of the Lump Sum bid remaining, calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the

Engineer. In the event that an Asbestos Soil Management Plan is not required by the Commissioner, payment for this item shall not be provided.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Develop and Implement Asbestos Soil Management Plan for Activities on W.R. Grace & Property shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment and incidentals required for preparation and implementation of said Asbestos Soil Management Plan. The work includes, but is not limited to development and implementation of all submittals and plans specified, prepared and implemented by an appropriately certified Professional as required in the Specifications; submittal of all required certifications; coordination with all parties affected and maintaining proper documentation necessary;, all permits and administration fees; and all controls necessary to maintain compliance with City of Cambridge ordinances relative to asbestos in soils including but not limited to construction and operation of a negative air pressure containment(s). For cost estimating purposes, Contractor shall assume that soils excavated from the W.R. Grace & Co. property shall be staged on same prior to shipment to landfill.

2082.3 – Develop MCP Soil Management Plan and Health & Safety Plan for Activities on W.R. Grace Property

METHOD OF MEASUREMENT:
Measurement for Payment shall be based on the following breakdown; A maximum of 10 percent of the lump sum shall be paid upon the finished implementation of the initial/pre-construction protections and provisions as specified, submitted in an approved plan, and accepted by the Engineer. A maximum of 15 percent of the lump sum shall be paid upon the submittal and acceptance of all related submittals, plans and shop drawings. A minimum of 25 percent of the lump sum shall be paid at the complete removal and closeout of all protections and provisions, as specified; submitted in an approved plan; and as approved by the Engineer. The balance of the Lump Sum measurement for payment shall be on a percent of the Lump Sum bid remaining, calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer. In the event that an MCP Soil Management Plan and/or Health and Safety Plan is not required by the Commissioner, payment for this item shall not be provided.
BASIS OF PAYMENT / INCLUSIONS:

Payment for Develop MCP Soil Management Plan and Health & Safety Plan for Activities on W.R. Grace & Property shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all labor, and incidentals required for preparation and submittal of an MCP Soil Management Plan and Implementation of the submitted and Health & Safety Plan. The work includes, but is not limited to development and implementation of all submittals and plans specified, prepared and implemented by an appropriately certified Professionals as required in the Specifications; submittal of all required certifications; coordination with all parties affected and maintaining proper documentation necessary.

END OF SECTION 02082

SECTION 02095

TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

2095.1	**OHM - DISPOSAL OF SOIL – DAILY COVER UNLINED LANDFILL (CLASS B-1)**	**TON**
2095.2	**OHM - DISPOSAL OF SOIL – DAILY COVER LINED LANDFILL (CLASS B-2)**	**TON**
2095.3	**OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE ASPHALT BATCHING IN-STATE (CLASS B-3)**	**TON**
2095.4	**OHM - DISPOSAL OF SOIL - NON-HAZARDOUS SOLID WASTE THERMAL TREATMENT (CLASS B-4)**	**TON**
2095.5	**OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE (CLASS B-5)**	**TON**
2095.6	**OHM - TREATMENT OF RCRA CHARACTERISTICALLY HAZARDOUS SOIL TO DECHARACTERIZE & DISPOSAL OF SOIL AS NON-HAZARDOUS WASTE(CLASS C-1)**	**TON**
2095.7	**OHM - DISPOSAL OF SOIL – RCRA HAZARDOUS WASTE (CLASS C-2)**	**TON**
2095.8	**OHM - DISPOSAL OF ASBESTOS WASTE**	**TON**

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals required to transport waste material off site, and dispose, reuse or recycle excess soil or waste materials at a licensed facility approved by the Owner.

B. All personnel involved in the transportation of waste from the site shall have the required Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) training.

1.2 RELATED WORK

A. Section 01108 – HEALTH AND SAFETY PROCEDURES

B. Section 01500 – TEMPORARY FACILITIES AND CONTROLS

C. Section 02010 – SUBSURFACE INVESTIGATION

D. Section 02080 – SOIL AND WASTE MANAGEMENT

E. Section 02082 – ASBESTOS REMOVAL AND RELATED WORK

F. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. A list of all transporters, destination/receiving sites and waste facilities, complete with license numbers and permit numbers (as appropriate), contact person, and address and telephone number that the Contractor utilizes for soil management and waste disposal. In addition, a copy of a memorandum of understanding between the contractor and each facility that will receive excess soil and/or waste material shall be attached to the Waste Management Plan. The memorandum of understanding shall detail the terms under which the facility agrees to accept a specified quantity of soil or waste and detail what if any restrictions may apply.

2. Where appropriate the Contractor shall submit waste manifests and bills of lading for all waste disposed off site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Copies of all waste manifests shall be provided to the Owner within 10 days. It is the responsibility of the Contractor to complete all waste manifests and bills of lading completely and accurately prior to submitting them to the Owner. The Contractor shall be responsible for preparing Licensed Site Professional (LSP) opinion letters to disposal facilities and providing Qualified Environmental Professional signatures on Material Shipping Records and coordinating disposal documentation with all parties. The Owner's LSP and the Owner shall the sign any MassDEP Bill of Lading forms where required only after the Contractor has properly prepared and submitted the MassDEP forms. The Contractor shall reimburse the Owner for any and all fines associated with inaccurate, incorrect, or improperly completed waste manifests, including fines resulting from late or untimely submittals.

3. Disclose a summary of the history of compliance for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation

waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.

4. Prior to transporting any soils or fill material to a disposal facility the Contractor shall submit a letter from the disposal facility indicating that the facility has reviewed the available data and the generator's profile of the material and the facility agrees that it meets the facility's acceptance criteria.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide completed Bills of Lading, Material Shipping Records, manifests, certificates of disposal, weight slips and all other documentation relative to disposal, reuse or recycling of soil and waste material.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall reuse, recycle or dispose of all excess soil and wastes resulting from excavation activities in accordance with federal, state and local regulations and these specifications. Transport shall be by a permitted and licensed waste transporter. The Contractor shall be responsible for supplying the proper manifests to be approved and signed by a representative of the Owner.

B. Prior to disposal, it shall be the responsibility of the Contractor to maintain segregated waste stockpiles in conformance with all applicable federal, state, and local waste disposal regulations and as specified in Section 02080 - SOIL AND WASTE MANAGEMENT.

C. The Contractor shall be responsible for preparing and keeping in proper order all waste manifests, and shall designate one person who shall be made available to sign all transportation documentation. The Contractor shall be responsible for obtaining the generator's signature and all other signatures required for the proper completion of the manifests. The Contractor shall allow a minimum of five working days from the date of the submittal for any documents requiring the signature of the Owner and/or the LSP. The manifests shall document the handling of the waste from the time it is generated until the time it is properly disposed.

D. The Contractor shall be responsible for obtaining all federal, state, and local permits and variances to allow transport of materials on public roadways.

E. The Contractor shall be responsible to inform the Owner if hazardous waste disposal will not be performed within 60 days of hazardous waste characterization. This notification shall take place a minimum of 30 days prior to the 60-day deadline. No hazardous waste stockpiled at the site shall remain on site more than 60 days after it is characterized.

F. The Contractor shall obtain certificates of disposal for all disposed waste.

G. Transportation of solid wastes shall be in compliance with any relevant federal, state and local special waste requirements, and such as to assure that waste material is not released during transit.

3.2 SOLID WASTES

A. Transporters of solid wastes that include, but are not limited to, contaminated soil/fill (including oil-contaminated soil/fill), construction and demolition debris, non-hazardous laboratory wastes, bottles, tires, metal parts, asbestos cement, tree stumps, brush, and grass cuttings will utilize truck or dumpsters specifically designed to ensure that material, dust, or liquid is not released in transit. No truck shall be allowed to exit the site until all free liquids are drained from soil/fill being transported off-site. Material shall be covered at all times. The vehicle in which the waste is transported shall be driven directly to the intended destination without any stops or detours in between, except those necessary in response to road conditions, vehicle service needs, or emergencies. Discharge or release of material during transport shall be immediately reported to the Owner. Transporters shall clean up any discharge that occurs in transit, at the Contractor's expense.

B. The disposal site shall be permitted by the state in which the facility is located to receive and dispose of solid waste, and shall be approved for use by the Owner. The Contractor shall provide copies of the disposal facility's operating permit.

C. Manifesting of solid waste shall be required and shall include vehicle identification; date of loading and disposal; tonnage, as measured at the disposal site; and signature of the Owner and/or its representative, transporter, and disposal facility's representative. Transportation of the wastes shall be accompanied by the appropriate manifests such as a Massachusetts DEP Bill of Lading, as required in the Code of Massachusetts Regulations (CMR) 310 CMR 40.0030, a Waste Material Shipping Record or by a Uniform Hazardous Waste Manifest. The original shall be returned to the Owner, and/or their representative, within ten (10) working days of disposal.

D. All solid waste shall be disposed in accordance with all applicable federal, state and local laws and regulations, as well as all other state laws through which the waste material is being transported.

E. Transport of soils in which asbestos containing materials have come to be located shall be transported and disposed of in accordance with Section 02082 and all applicable local, state and federal laws and regulations.

3.3 HAZARDOUS WASTES

A. Transporters of hazardous wastes shall be in conformance with Code of Federal Regulations (CFR) 40 CFR, Part 171, all other federal laws and regulations, 310 CMR 30.400, and all other state laws through whose boundaries the waste material is being transported. The transporter shall provide copies of its EPA identification number, Massachusetts transporter's license, and proof of driver training in transporting hazardous waste.

B. The disposal site shall be in conformance with 40 CFR, Part 264 and relevant laws of the state in which the facility is located. The Contractor shall provide copies of the disposal facility's EPA and state treatment and disposal permit.

C. Manifesting of hazardous wastes shall be in conformance with 40 CFR, Part 264, Subpart E and 310 CMR 30.405.

3.4 DUST CONTROL

A. Dust control measures shall be implemented during loading and transport of waste material from the site in accordance with the contractor's Dust Control Plan, as specified in Section 02080 – SOIL AND WASTE MANAGEMENT and, where applicable, in Section 02082 – ASBESTOS REMOVAL AND ASSOCIATED WORK.

PART 4 – COMPENSATION

4.1 GENERAL

A. Measurement and Payment for Transportation and Disposal of Soil and Fill items shall be as listed below. Payment for lump sum items and unit price items shall constitute full payment for all fees, labor, materials and equipment required to perform the work; all supervision; all overhead items including but not limited to bonds, insurance, labor burden, profit, protections and cautions are also included. Payment for unit price items shall be as detailed below and as measured by the Engineer. The Contractor shall be made aware that for Transportation and Disposal of Soil and Fill unit price items, the actual quantities encountered may vary significantly from the estimated quantities presented in the Bid Schedule. The estimated quantities presented have been established for bid comparison purposes only and do not represent a warranty of work. In the event of quantity changes, the unit bid price shall be the basis for compensation or credit.

B. The following unit price payment items are for transporting and disposing excess soils and fill material encountered during the course of this contract. Management of soil/fill shall be in accordance with applicable regulations and technical specifications. The costs associated with disposing excess soil and fill other than allowed for in the following payment items shall be incorporated into the contractor's lump sum bid price for soil and fill management. A minimum unit bid cost has been established for each unit price bid item. The Contractor is required to review the minimum unit bid price and increase it within the bid table as the Contractor sees fit. The Contractor is not obligated to accept the minimum unit price indicated but shall not be able to reduce it. The minimum unit price established may be below actual market cost and is provided to avoid unbalanced bidding. The Contractor is required to review the minimum unit price presented and develop a competitive unit price for inclusion in the bid table. Any bids received which do not present a unit price entered by the Contractor within the bid table or present a unit price below the minimum unit price established, shall be rejected as non-responsive.

C. The quantity of any pay item expressed as tons shall be subject to verification by the Engineer by calculation of the in-place weight using the horizontal and vertical trench pay limits defined in the Contract Drawings, a bulking factor applicable to the soil type, and in place density tests supplied from a certified soil testing lab, hired by the Contractor. Should the quantity presented by the Contractor on the certified weight slips, be significantly more (i.e. greater than 10%) than that as determined through the Engineer's calculations, the Contractor shall be compensated for the lesser tonnage. The Contractor shall receive no additional compensation for material removed outside of the approved pay limits. The Owner, and/or their representative, shall have the right to perform independent weighing of trucks. No payments will be made in cases of incomplete documentation of disposal. Payment will be at the unit price established set in the FORMS FOR GENERAL BID.

D. The quantity of any pay item expressed as cubic yards shall be as measured by the Engineer, per the horizontal and vertical trench pay widths established in the Drawings, and confirmed through field engineering surveys performed by the Contractor. The Contractor shall receive no additional compensation for material removed outside of the approved pay limits. Payment will be at the unit price established set in the FORMS FOR GENERAL BID.

E. Preference is to be given to the most cost effective option of either reusing excavated material on-site as fill or disposal off-site.

2095.1 – OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill which is unsuitable for on-site reuse and is defined as a non-hazardous solid waste suitable for reuse as daily cover at an unlined Massachusetts Landfill (as defined in MassDEP Policy #COMM-97-001); placing, grading and compacting the material at the disposal site as specified; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1 or A-2 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.2 – OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill which is unsuitable for on-site reuse or disposal at one of the lesser unit price options and is defined as a non-hazardous solid waste suitable for reuse as daily cover at a lined Massachusetts Landfill (as defined in MassDEP Policy #COMM-97-001); placing, grading and compacting the material at the disposal facility as specified; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2 or B-1 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.3 – OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, asphalt batching plant, all soil/fill which is suitable for recycling at an asphalt batching plant (as defined in MassDEP Policy WSC-94-400) and which is unsuitable for on-site reuse or off-site reuse or as daily cover at a Massachusetts Landfill; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, or B-2 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.4 – OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4). The work includes, but is not limited to; handle, load, transport, and dispose soil/fill which is unsuitable for in-state recycling, on-site reuse, off-site reuse or as daily cover at a Massachusetts Landfill, at an appropriately permitted out-of-state, recycling or thermal treatment facility; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, or B-3 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.5 – OHM - Disposal of Soil – Non-Hazardous Solid Waste Disposal (Class B-5)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste (Class B-5) shall be on the basis of tons of waste actually disposed, as measured at the disposal

facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Disposal (Class B-5) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste Disposal (Class B-5). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill (including embedded debris or foreign objects), which is not hazardous waste but is unsuitable for other non-hazardous recycling and disposal options listed above; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, or B-4levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.6 – OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Dispose of Soil as Non-Hazardous Waste (Class C-1)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Dispose of as Non-Hazardous (Class C-1) shall be on the basis of tons of waste actually treated and disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Dispose of as Non-Hazardous (Class C-1) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the

Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (Class C-1). The work includes, but is not limited to: treat on-site all soil/fill determined through testing to be characteristically hazardous waste due to lead toxicity to render the material characteristically non-hazardous; handle, load, transport, and dispose at an appropriately permitted facility, all soil/fill determined through testing to be hazardous waste due to lead toxicity which has been treated on-site and subsequently determined through laboratory testing to be characteristically non-hazardous; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, B-4, or B-5 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.7 – OHM - Disposal of RCRA Hazardous Waste (Class C-2)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of RCRA Hazardous Waste (Class C-2) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified. scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of RCRA Hazardous Waste (Class C-2) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of RCRA Hazardous Waste (Class C-2). The work includes, but is not limited to; handle, load, transport and dispose at an approved RCRA-permitted hazardous waste facility all soil and fill determined through testing to be hazardous waste; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, B-4, B-5 or C-1 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.8 - OHM - Disposal of Asbestos Waste

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Asbestos Waste shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Asbestos Waste shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Asbestos Waste. The work includes, but is not limited to; handle, load, haul, and dispose all soil and fill material defined as asbestos-containing waste; procuring all health and safety items; compliance with local ordinances and preparing appropriate waste manifests; and all fees, permits, and taxes.

EXCLUSIONS:
The following items are not included for payment under this item; transportation and disposal of soil and fill material which does not meet the definition of soil of this classification; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; disposal of construction debris; segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; protecting the excavation from accidental entry; and controlling windblown litter and the spread of airborne contaminants.

END OF SECTION 02095

SECTION 02100

SITE PREPARATION AND TREE PRUNING

2100.1 TREE PROTECTION AND MAINTENANCE LUMP SUM

PART 1 – GENERAL

1.1 SUMMARY

A. The work to be done under this section consists of instituting and maintaining positive measures to protect and maintain public and private shade trees within and adjacent to the limits of work.

1.2 DESCRIPTION

A. Clear and grub City and private trees designated for removal within the limit of work as required and prune City trees within the limit of work and private trees as needed within the limit of work, under the direction of a Massachusetts Certified Arborist. Provide protection of existing trees and vegetation not designated for removal within the limits of work and along truck routes outside the limit of work. Temporarily stump or stockpile as applicable topsoil, shrubs, and vegetation within the limits of work that will interfere with construction and as required.

B. Conduct site clearing and pruning operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

C. Public trees are protected by Massachusetts state law, Chapter 87. Section 12 states that a fine of up to five hundred dollars, ($500.00) per incident of damage to public shade trees can be levied. Each branch broken or improperly pruned, each improper wounding of the trunks of the trees, and each root improperly pruned shall constitute an infraction. Section 12 further provides that anyone who negligently or willfully damages a tree will be liable to the City for all damages.

D. The "Tree Assessment" dated September 29, 2009 in the Appendix C includes an evaluation of the existing trees within the project limits and tree requirements during construction.

E. The Contractor shall take the utmost care to avoid unauthorized, unnecessary or improper wounding of public or private shade trees. Prior

to construction, the Contractor shall provide a tree protection and maintenance plan and work schedule. A Massachusetts or International Certified Arborist shall be sub-contracted by the Contractor to provide a protection and maintenance plan and perform specified work. All plans and schedules shall be subject to review and approval by the City Tree Warden. Infraction of Massachusetts state law Chapter 87 or failure to provide a protection plan and work schedule will result in fines or the immediate cancellation of the contract.

F. The work shall consist of the provision of all labor, materials, equipment, and transportation required to complete the pruning as required by the engineer strict accordance with the conditions and specifications of these Contract Documents. The work shall include, but is not necessarily limited to, the following:

1. Initial site visit and assessment with City representatives
2. Securing necessary permits and approvals before commencement of work
3. Posting work areas for parking restrictions
4. Securing police details, if necessary
5. Marking work zones for traffic and pedestrian control
6. Providing a schedule of work for City review and approval
7. Meeting with City staff on a periodic basis
8. Visual assessment of each tree to be pruned
9. Determination of pruning objectives.
10. Pruning cuts
11. Wound care
12. Wood waste and debris consolidation & disposal
13. Site cleanup

1.3 RELATED WORK

A. Division 1 – GENERAL REQUIREMENTS

B. Section 01570 – MAINTENANCE AND PROTECTION OF TRAFFIC

C. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING

D. Section 02900 – LANDSCAPING

PART 2 – PRODUCTS

2.1 PROTECTION OF EXISTING TREES AND IMPROVEMENTS

A. Provide protection necessary to prevent damage to existing trees and improvements indicated to remain in place inside or outside of the limit of work. Existing trees and shrubbery to remain shall be protected from injury. Except as otherwise approved, cutting and trimming of existing tree limbs and roots will not be permitted. Existing trees to remain, and which can potentially be damaged by construction operations, shall be boxed and protected. Protection shall be maintained until completion of the work of the Contractor. Tree protection requirements are described in City of Cambridge Department of Public Works, Division of Urban Forestry regulation "Tree Protection During Construction" which is included in the Special Conditions.

B. Protect trees and improvements on adjoining properties and on Owner's property. Restore improvements damage by Contractor's clearing and construction activities to their original condition, at no additional expense to the Owner. Remove and replace trees damaged by Contractor's clearing and construction activities at no additional expense to the Owner.

2.2 PROTECTION OF EXISTING TREES

A. Protect existing trees and other vegetation indicated to remain in place or outside of the clearing/grading limit lines indicated on the drawings in accordance with Article 56 of the Special Conditions.

B. Erect and maintain temporary rigid fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. At sidewalk tree pits, the entire perimeter of the tree pit shall be fenced. At a minimum, and only if the Engineer determines that the preceding measures are not feasible, wrap the trunks of all trees with a durable material such as two by four lumber sufficient to protect tree trunks from mechanical damage. Remove fence and wrapping when construction is complete.

2.3 EQUIPMENT

A. The following equipment and vehicles shall be available on-site for use. All gas-powered equipment and vehicles must be five years old or less and in good condition as determined by the Engineer.

1. Two (2) aerial lift trucks with an articulating boom that have a working height of not less than sixty (60) feet. with Contractor's name painted on each side.
2. Two (2) chipper dump trucks with a minimum capacity of nine (9) cubic yards, with Contractor's name painted on each side.
3. Two (2) wood chippers with a capacity for 16" diameter limbs.

4. All relevant traffic control devices as prescribed by the Manual of Uniform Traffic Control Devices (MUTCD) of the U.S. Department of Transportation.

PART 3 – EXECUTION

3.1 GENERAL

A. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions that interfere with installation of new construction and as required. Removal includes digging out stumps in their entirety and grubbing roots to at least 2.5 feet below existing grades shown on the Drawings.

3.2 TREE PROTECTION

A. Roots that cannot be avoided during construction shall be carefully and cleanly cut or shaved. Only hand methods for grubbing roots will be accepted inside drip lines of trees to be left standing. All root pruning and shaving must be completed under the supervision of the City Arborist. Root pruning shall include application of root treatment or fertilizer as required.

B. Trucks and heavy equipment shall not pass over or park on roots of public shade trees; nor shall construction materials, debris, or excavated material be stored within drip line of trees or within tree pits. For occasional or one time access over roots, ½-inch plywood overlapped may be used. Permeable materials such as gravel or wood chips shall be placed over root systems of trees which are not covered by hardscape and over which trucks and heavy equipment must travel during construction operations, when such travel is unavoidable, to prevent soil compaction and root damage. Material shall be replaced as needed.

C. During sidewalk construction adjacent to trees, suitable soil shall be maintained within tree wells. Moist soil or mulch shall also be maintained around surface roots outside of tree wells which may become exposed during construction. Such covering shall be placed as soon as possible after roots are exposed. If roots are going to be exposed for more than one hour, cover roots with damp burlap. Burlap shall be kept moist until most soil and mulch can be used for permanent cover.

D. Tunneling shall be the preferred method of excavation adjacent to tree roots to avoid root pruning. If root pruning is unavoidable, a certified arborist shall be onsite to execute or oversee the operation with sufficiently sharpened hand tools and in such a fashion as to have minimum negative impact on tree health and safety.

3.3 PRUNING SAFETY STANDARDS

A. Tree pruning shall be performed only by certified arborists or arborist trainees who, through related training or on-the-job experience, or both, are familiar with the practices and hazards of arboriculture and the equipment used in such operations.

B. One certified arborist (as defined in the section labeled "Quality Requirements," and as identified in the "Statement of Bidder's Qualifications" of these Contract Documents) must be present at all times as the on-site project manager while tree pruning is performed.

C. Tree pruning operations shall comply with the American National Standard for Tree Care Operations—Safety Requirements (ANSI Z133.1), as approved by the American National Standards Institute, and published by the National Arborists Association. Operations shall also comply with applicable Occupational Health and Safety Administration (OSHA) standards.

3.4 PRUNING OBJECTIVES

A. The pruning operation shall focus on the following types of pruning:

1. **Cleaning**. Cleaning shall consist of selective pruning to remove one or more of the following parts—dead, diseased, and/or broken branches. All deadwood that is two (2) inches or greater in diameter shall be removed. Branches with splits, large cavities or any defect that may result in failure shall be reduced, or removed to the trunk if reduction is not feasible.

2. **Thinning**. Thinning shall consist of selective pruning to reduce density of live branches. Thinning shall result in an even distribution of branches on individual limbs and throughout the crown.

3. **Raising**. Raising shall consist of selective pruning to provide vertical clearance. All branches extending lower than fifteen (15) feet above a public roadway and ten (10) feet above a public sidewalk shall be removed.

4. **Reducing**. Reduction shall consist of selective pruning to decrease height and/or spread. Consideration shall be given to the ability of a tree species to tolerate this type of pruning. All branches obstructing park signs. street signs, traffic signs, traffic lights, and park or street lighting shall be removed. Branches shall be pruned away from all houses and buildings a minimum of five (5) feet, or more if appropriate to the tree shape and structure.

5. **Specialty (Young Trees).** For young yet established trees, branches that are rubbing or poorly attached shall be removed. A central leader or leaders as appropriate to the species should be developed. A strong, properly spaced scaffold branch structure should be selected. For newly planted trees, pruning shall be limited to cleaning.

3.5 PRUNING PRACTICES

A. A certified arborist (the on-site project manager) shall visually inspect each tree before commencing work.

B. If a condition is observed requiring attention beyond the original scope of work, the condition should be reported to the City within 24 hours. Such conditions may include structural weakness, rot or decay that cannot be corrected by cleaning, and dead trees.

C. Equipment and work practices that damage living tissue and bark beyond the scope of work shall be avoided. Climbing spurs shall not be used when climbing and pruning trees.

D. Pruning tools (e.g. chain saws, pole saws, hand saws, pole pruners, etc.) shall be sharp and regularly sharpened and maintained throughout the Contract Term.

E. Not more than 25% of the foliage of an individual tree should be removed within an annual growing season. The percentage and distribution of foliage to be removed shall vary according to the tree species, age, health and site, in accordance with the types of pruning identified above.

F. Not more than 25% of the foliage of a branch or limb shall be removed when it is cut back to a lateral. The lateral shall be large enough to assume apical dominance.

G. Heading shall be permitted only by the expressed permission of the City, when needed to reach a defined objective.

H. Topping and lion tailing shall be considered unacceptable pruning practices.

I. All pruning cuts shall be made in accordance with the American National Standard for Tree Care Operations—Standard Practices (ANSI A300 Part 1), as approved by the American National Standards Institute, and published by the National Arborists Association (revised 2001). All terminology included in these Technical Specifications shall be defined by ANSI A300 Part 1.

J. When tracing wounds, only loose, damaged tissue should be removed. No other wound treatments shall be used.

3.6 TEMPORARY REMOVAL OF TOPSOIL, SHRUBS AND VEGETATION

A. Topsoil, shrubs, and vegetation to be temporarily removed shall be carefully removed over all areas to be excavated, and over all other areas to be disturbed as a result of the Contractor's operations in the performance of the Contract work. The topsoil shall be transported and deposited in storage piles convenient to the areas which are subsequently to receive the application of topsoil, separate from other excavated materials, and in approved locations. The topsoil shall be stockpiled free of roots, stones and other undesirable material. The Contractor shall take all necessary precautions to prevent other excavated material or other objectionable material from becoming intermixed with the topsoil, either before or after the stripping and stockpiling operations. Shrubs and other vegetation shall be balled and burlaped and then transported and stored until they can be replaced after construction has been completed in that area. The shrubs and vegetation must be watered and maintained to remain healthy while being temporarily stored. Any shrubs and vegetation that do not remain healthy during storage shall be replaced by the Contractor at no additional cost to the Owner.

3.7 DISPOSAL OF WASTE MATERIALS

A. Remove waste materials and unsuitable topsoil from Owner's property and dispose of off site in a legal manner. Waste materials shall include but not be limited to timber, brush, refuse, stumps, roots, vines, debris and other objectionable matter. Removal includes raking and sweeping after completion of clearing and pruning operations.

B. Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree, or to surrounding people and property. Where necessary, ropes or other equipment shall be used to lower large branches to the ground.

C. All severed limbs shall be chipped, hauled away from the site, and disposed of in a legal manner. All wood waste, sawdust, leaves, and associated organic debris shall be collected from both public ways and adjacent private property, hauled away from the site, and disposed of in a legal manner.

D. Site cleanup shall follow as closely as possible to the pruning operation.

3.8 SPECIAL REQUIREMENTS

A. The Contractor is required to notice of the City of Cambridge Department of Public Works, Division of Urban Forestry regulation "Tree Protection During Construction". This regulation contains specific measures and remedies should the Contractor fail to abide the Owner's requirements. See Special Conditions.

B. For definitions and pruning standards, the Contractor is required to the enclosed ANSI A300, American National Standard for Tree Care Operations "Tree, Shrub and Other Woody Plant Maintenance Standard Practices". See Exhibits of these Specifications.

PART 4 – COMPENSATION

Item 2100.1 --- Tree Protection and Maintenance

METHOD OF MEASUREMENT:
Measurement for payment for Tree Protection and Maintenance will be based on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the original Contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT:
Payment for work under Tree Protection and Maintenance will be based on the Lump Sum price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to protecting trees; tree maintenance; root and branch pruning; furnishing, installing, maintaining, and removing drip line or tree pit fencing and/or tree wrap; and covering exposed roots with moist burlap, mulch, or soil.

END OF SECTION 02100

SECTION 02140

DEWATERING

2140.1 TREATMENT OF CONSTRUCTION DEWATERING DAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to maintain stable, undisturbed subgrades, and allow work to be performed under dry and stable conditions: and comply with permit and other regulatory requirements. Work to be done as part of dewatering includes, but is not limited to:

a. Lower the groundwater level within excavations to at least 12 inches below the bottom of the excavation.

b. Lower hydrostatic pressure.

c. Prevent surface water from entering the excavation during construction.

d. Limit settlement of utilities and adjacent structures.

e. Implement erosion and sedimentation control measures for disposing of discharge water.

f. Provide treatment system to treat all water removed from excavations, except water that is re-infiltrated to the ground on site in a manner that does not result in negative on- or off-site impacts.

g. Provide an Environmental Site Professional/Dewatering Specialist/Field Representative (hereinafter referred to as the Dewatering Professional) who will be responsible for

dewatering, reinfiltration, treatment and discharge of dewatering flows as specified and in compliance with all applicable permits and regulations.

h. Common dewatering methods include, but are not limited to, sump pumping, deep wells, well points, vacuum well points or any combinations thereof.

2. The Contractor shall be aware of groundwater under drains that may exist under all existing sanitary, storm, or combined piping. The Contractor shall identify such drains, bypass pump and dewater in accordance with the dewatering permits, and relocate and reconnect under drains upon completion of the work in the area.

3. Water removed from excavations shall be reinfiltrated to the ground if feasible. If reinfiltration is not feasible, treated water shall be directly or indirectly discharged to a surface water in accordance with a National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency (EPA). If neither reinfiltration nor surface water discharge is feasible, treated water shall be discharged to the Massachusetts Water Resources Authority (MWRA) or local sewer system in accordance with the appropriate permit and regulations. In no case shall dewatering flows be directly or indirectly released to surface waters or storm drains prior to settling and appropriate additional treatment.

1.3 SUBMITTALS

A. Shop Drawing: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Qualification of the both the Contractor's dewatering specialist or firm's qualifications (installation) and the Dewatering Professional (all other responsibilities) a minimum of four (4) weeks prior to execution of any dewatering. The submittal shall include, but not be limited to:

a. Qualifications of specialist or firm's Registered Professional Engineer as specified below.

b. Qualifications of the Dewatering Professional who shall oversee the installation, operation and maintenance of the dewatering system.

2. Submit a dewatering plan including design calculations at least four (4) weeks prior to start of any dewatering operation. The review will be only for the information of the Owner and third parties for an

overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:

a. Dewatering plan and details stamped and signed by a Massachusetts Registered Professional Engineer that conform to the requirements of the dewatering permit(s), the Wetlands Protection Act Order of Conditions, and all other applicable regulations and permits including, but not limited to, requirements for equipment, monitoring, sampling and reporting.

b. Certificate of Design: Found attached to these documents.

c. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.

d. A description of the proposed method of dewatering; water reinfiltration; containment; treatment and discharge; and installation, monitoring, maintenance, and system removal procedures.

e. A groundwater monitoring plan shall be developed by the Professional Engineer retained by the Contractor and that designs the dewatering system. The monitoring plan shall address groundwater control within the excavations and address settlements of utilities and adjacent structure.

f. A description of erosion/sedimentation control measures.

g. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.

3. Data for the required discharge reports shall be collected by the Contractor's Dewatering Professional. It shall consist of periodic sampling and analysis of system influents, midfluents and/or effluents and discharge quantities and other requirements of the relevant permits. The Contractor's Dewatering Professional shall also coordinate analysis of samples at an appropriately certified analytical laboratory and shall comply with all permit reporting requirements.

4. A modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines or softening of the ground.

1.4 QUALITY ASSURANCE

A. Employ the services of a Dewatering Professional and a Massachusetts Registered Professional Engineer in firms having the following qualifications:

1. The Massachusetts Registered Professional Civil Engineer shall have completed the design of at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years consisting of deep wells, well points, vacuum well points, and sump pumping for heavy Civil projects of similar size, type, and complexity in urban areas with soldier pile and lagging, timber sheeting support and secant pile support of excavation systems.

2. The dewatering systems installer supervisor shall have a minimum of 5 years experience in installation of well points, deep wells, recharge systems, or equal systems.

3. The Dewatering Professional responsible for day to day operation of the system shall have the following minimum qualifications:

a. Completion of at least 5 successful dewatering projects of equal size and complexity with equal systems within the last five (5) years consisting of system operation and troubleshooting, collection of readings, maintenance of logs and other required documents, collection of samples, coordination of analysis of samples, and compliance with reporting requirements during pumping for heavy Civil projects of similar size, type, and complexity in urban areas.

b. Valid certification from DEP to operate the proposed treatment system.

B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.

C. Notify the Engineer immediately if any settlement or movement is detected on any adjacent structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.

D. If oil and/or other hazardous materials are encountered after dewatering

begins, immediately notify the Engineer.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide groundwater monitoring wells in accordance with the submitted dewatering plan or as specified.

B. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.

C. Provide sand and gravel filter around the well screen. Wrapping geotextile fabric directly around the well screen shall not be allowed.

D. When deep wells, well points, or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.

E. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.

F. Provide dewatering equipment, including an appropriately sized settling tank, and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.

G. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.

H. Provide cement grout having a water cement ratio of 1 to 1 by volume.

PART 3 – EXECUTION

3.1 GENERAL

A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed, the geotechnical instrumentation has been installed, and the Dewatering Professional is on site and has begun the duties specified herein.

B. Furnish, install, operate, and maintain dewatering, reinfiltration, treatment and discharge systems as indicated or specified and in accordance with the dewatering plan. As no dewatering flows shall be discharged to surface

waters either directly or indirectly without appropriate settling, at a minimum, the Contractor shall provide a settling tank with a capacity of 10,000 gallons, so that if pumping rates exceed discharge rates, sufficient storage capacity is available. Delays due to insufficient storage capacity will be at no additional cost to the Owner. The Contractor is responsible to evaluate available data and determine the necessary storage capacity so as no to impede construction activities.

C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.

D. Do not excavate until the dewatering system is operational.

E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below groundwater level have been completed such that they will not be floated or otherwise damaged by an increase in groundwater elevation.

F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Engineer at no additional cost to the Owner.

G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING at no additional cost to the Owner.

3.2 DEWATERING DISCHARGE

A. Water to be infiltrated need not be treated. Contractor shall provide infiltration that complies with relevant local, state and federal regulations.

B. Transport pumped or drained water to discharge location in compliance with applicable permits and without interference to other work; damage to or contamination of pavement, other surfaces, or property; erosion; or siltation.

C. Provide separately controlled pumping lines.

D. Immediately notify the Engineer if groundwater is encountered that is suspected to be contaminated with substances other than those for which the treatment system has been designed. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.

3.3 COMPLIANCE WITH DEWATERING AND RELATED PERMITS AND REGULATIONS

A. Discharging groundwater and allowing for natural infiltration may not be a viable option for controlling groundwater in the project area. Should dewatering activities be required where the Contractor needs to discharge groundwater to a location other than the point of origin, then the Contractor shall be prepared to store, treat and discharge the water in accordance with applicable permits and regulations. Periodic sampling, as may be required to demonstrate treatment effectiveness and compliance with pretreatment standards specified in any local, state, or federal discharge permit required shall be the responsibility of the Contractor and its Dewatering Professional. Water that cannot be infiltrated is anticipated to be discharged to the existing City of Cambridge Storm Drain system which discharges to Alewife Brook. The Contractor shall be responsible for seeking coverage under the appropriate EPA/NPDES permit. At a minimum, the Contractor shall be prepared to comply with the following periodic testing requirements: of the effluent for Total Toxic Organics (TTO) (VOA), TTO (ABN Extractables), petroleum hydrocarbons (MADEP EPH), pH, total metals, and total suspended solids (TSS); and with standard NPDES permit conditions including periodic testing of the treatment system influent, midfluent and effluent for benzene, tolulene, ethylbenzene, xylenes, TPH, metals, and TSS. The Dewatering Plan shall include a description of procedures and information related to the collection of readings, maintenance of logs and other required documents. At a minimum, the dewatering plan shall describe compliance with relevant provisions of the EPA/NPDES Stormwater General Permit for Construction Activities, EPA/DEP NPDES Permit and Plan Approval for Construction Site Dewatering, and the Cambridge Conservation Commission Order of Conditions.

B. The Contractor, through its Dewatering Professional:

1. Shall furnish all labor, equipment and materials necessary to obtain accurate representative samples of the groundwater and for analysis for the set of analytical parameters specified above and as required by local, state and federal permits and regulations.

2. Shall coordinate sampling activities with the Engineer. The engineer reserves the right to sample treated and untreated dewatering flows at any time.

3. Shall take readings from the treatment system in accordance with the dewatering plan.

4. Shall collect an initial sample of untreated and treated groundwater at the beginning of dewatering activities within the construction area.

5. Shall prepare and keep in proper order all records required by regulatory authorities and permits.

6. Shall maintain logs and other records in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan.

7. Shall coordinate analysis of samples by an appropriately certified analytical laboratory in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan, and ensure that laboratory detection limits meet permit requirements.

8. Shall comply with reporting requirements in a timely manner and in the format required by the relevant permit. Reporting in compliance with permit requirements includes, but is not limited to, notification to the appropriate regulators and the Owner and Engineer prior to discharge; submittal of laboratory analytical reports for each sampling event; submittal of reports for each reporting period during which no discharge occurs; notification of non-compliant discharges; notification of termination of discharge; and response to permit-related questions posed by regulators or the Owner and Engineer.

    a. Water will be discharged under a National Pollutant Discharge Elimination System (NPDES) permit. The Contractor shall submit notifications and reports to both the Environmental Protection Agency (EPA) and the appropriate regional office of the Massachusetts Department of Environmental Protection (DEP). Comply with pre-discharge notification, discharge reporting, notification of no discharge, and termination of discharge notification requirements; and respond to inquiries or correspondence from EPA or DEP regarding permit issues.

    b. If water will be discharged under a local permit, submit notifications and reports as required in the permit.

    c. For monthly or less frequent reporting deadlines, provide the Engineer with copies of all reports fourteen (14) days prior to the reporting deadline, and submit reports to the appropriate agency(ies) at the same. Provide copies of other dewatering documents to the Engineer immediately.

9. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.

10. The Contractor shall obtain all federal, state, county, and local permits and variances to allow transport of materials on public roadways, should such transport be necessary.

11. The Contractor shall dispose of all wastes resulting from construction dewatering activities in accordance with local, federal and state regulations.

12. The Contractor is solely responsible for the implementation of the permit requirements, and is solely responsible for any punitive action resulting from any violation of the permit. The actual permit issued by EPA/DEP shall become part of this Contract by either addendum or by change order. If the actual permit is included by change order, no additional costs for implementing the permit will be considered by the Owner, when the actual permit is issued.

3.4 REMOVAL

A. Do not remove dewatering system without written approval from the Engineer.

B. Backfill and compact sumps or ditches with crushed stone wrapped with geotextile fabric in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

C. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

PART 4 – COMPENSATION

2140.1 - Treatment of Construction Dewatering

METHOD OF MEASUREMENT:
Measurement for payment for Treatment of Construction Dewatering will be on a per day basis for treatment of dewatering, as measured by the Engineer. The Contractor shall be paid per day that the dewatering treatment system(s) is onsite and operational, as defined by this Section, as required by the applicable dewatering permits, and as required by the Owner or Engineer. The Contractor shall not be compensated when the dewatering treatment system is onsite when not required by the Engineer or not required by the applicable dewatering permits. A dewatering treatment system shall include a settling tank, granular activated carbon (GAC) unit, filters, meters, hose connections, hoses and other treatment apparatus.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Treatment of Construction Dewatering will be based on the unit price bid for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for treatment of construction dewatering complete, as required and as required by the Engineer. The work includes but is not limited to mobilization and demobilization of the complete system(s);

design of the system(s); furnishing and installing treatment system(s); maintenance of the treatment system(s); "breakdown", transportation and set-up of the treatment system(s) between on-site areas requiring treatment; sampling; reporting; maintenance of all logs and other documentation required; laboratory testing; coordination with permitting agencies and the Owner and Engineer; compliance with all permit requirements; removal, transportation, stockpiling, testing and disposal of all collected sediment; Dewatering Professional services; Dewatering Specialist services and all incidental work not included for payment elsewhere.

EXCLUSIONS

The Contractor shall not be compensated for construction dewatering under this item; including but not limited to re-infiltrated construction dewatering; providing, installing and maintaining pumps and hoses; installation and maintenance of well points, deep wells and pump filters and screens; temporary power sources and all incidental work. Construction dewatering shall be covered in the Contractor's base bid, at no additional cost to the Owner. This is a Treatment Item only.

END OF SECTION 02140

SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to the allowable limits indicated, and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, and other facilities.

   The location, configuration, design, construction and maintenance of the excavation support walls and internal bracing shall be the sole responsibility of the Contractor.

2. The temporary excavation support system to be used on this project may include singular or multiple stages comprised of internally braced timber or steel sheeting, soldier piles and timber lagging or trench box. Temporary excavation support system is, at a minimum, required at excavation locations within 25 feet of building walls. Within 25 feet of existing building walls, the soldier piles and timber or steel sheeting shall be drilled or hydraulically pushed in place. At excavation locations along the alignment outside 25 feet of existing building walls, other approved methods of excavation support system installation may be determined as acceptable after submittals by the Contractor have been submitted and reviewed, for informational purposes only, by the Engineer.

3. Wherever the word "sheeting" is used in this section or on the Contract Drawings, it shall be in reference to steel soldier piles and timber lagging or steel and timber sheeting support systems.

4. Construction of the temporary excavation support system shall not disturb the existing structures or the completed proposed structures. The Contractor, at no additional cost to the Owner, shall repair damage to such structures.

5. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the Owner.

6. Monitoring movement of the lateral support systems by optical survey techniques is required by an independent geotechnical monitoring consultant until installation and backfilling is complete. Additional survey monitoring of the lateral support system may be required if movement (lateral or vertical) is measured following backfilling to the existing grade.

7. If, in the Engineers judgment, the performance of the excavation support system is unacceptable, the Owner may instruct the Contractor to stop work and implement remedial measures to arrest further movements or restore groundwater levels to pre-construction levels. The Contractor shall take immediate steps to implement the remedial measures designed by the Contractor and reviewed by the Engineer. The costs for these measures shall be at no additional cost to the Owner.

8. Temporary excavation support systems shall be designed and installed in accordance with OSHA excavation safety standards.

1.2 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS.

1. Submit the following qualifications three weeks prior to the construction:

a. Qualifications of Contractor's temporary excavation support system designer as specified below.

b. Qualifications of Contractor's temporary excavation support system installer as specified below.

2. Submit a temporary excavation support plan stamped and signed by a Registered Professional Civil Engineer at least two weeks prior to start of the construction. Submit design calculations for review that will be only for the information of the Owner and third parties for an overall understanding of the project relating to

access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:

a. Drilled or hydraulically pushed in place excavation support system, details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.

b. Certificate of Design

c. Requirements of dewatering during the construction.

d. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.

e. List of equipment used for installing the excavation support systems.

3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is exceeded.

4. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:

   a. Survey locations of the temporary excavation support systems, including coordinates of the ends and points of change in direction.

   b. Type of the temporary excavation support system.

   c. Elevations of top and bottom of the excavation support systems left in place.

5. Estimates of the lateral and vertical displacements of the excavation lateral support systems under applied loads at critical stages.

1.3 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.

B. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.

C. All welding shall be performed in accordance with AWS D1.1.

D. Prepare design, including calculations and drawings, under a Professional Civil Engineer registered in the Commonwealth of Massachusetts and having the following qualifications:

1. Not less than five years experience in the design of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.

2. Completed not less than five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of comparable type, size, and complexity as this project within the last five years.

E. Temporary Excavation Support System Installer's Qualifications:

1. Not less than five years experience in the installation of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.

2. Completed not less than five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of comparable type, size, and complexity as this project within the last five years.

F. Install all temporary excavation support systems under the supervision of a supervisor having the following qualifications:

1. Not less than five years experience in installation of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.

2. Completed at least five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of

comparable type, size, and complexity as this project within the last five years.

1.4 DESIGN CRITERIA

A. Design of temporary excavation support systems shall meet the following minimum requirements:

1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, traffic, temporary stockpiles, construction loads, and other surcharge loads.

2. Design internal bracing to provide sufficient reaction to maintain stability.

3. Limit movement of ground adjacent to the excavation support system to not more than 1-inch.

4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet below the bottom of the excavation.

5. Design temporary excavation support system shall withstand an additional 3 feet of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.

6. Maximum width of pipe trench excavation shall be as indicated on the Drawings.

7. Permanent structure walls shall not be directly cast against excavation support walls.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT and as specified.

B. Store sheeting and bracing materials to prevent sagging, which would produce permanent deformation. Keep concentrated loads, which occur, during stacking or lifting below the level, which would produce permanent deformation of the material.

1.6 PROJECT/SITE CONDITIONS

A. Subsurface investigation data are available as referenced in Section 02010 – SUBSURFACE INVESTIGATION. The geotechnical data is made available to the Contractor for informational purposes only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, boring logs, or other data.

B. Prior to submitting a bid, the Contractor shall review and understand the information contained in the geotechnical data and all Contract Documents.

C. The Contractor shall draw his own conclusions regarding site conditions based upon site visit(s) and from available sources, for which the Owner and its Consultants assume no responsibility. The Contractor shall assume that subsurface conditions between subsurface explorations could differ from conditions shown in the records of the explorations.

D. The Contractor shall notify the Engineer immediately if obstructions are determined to conflict with the location of the excavation support system. Cobbles and boulders within dense well-bonded soils or other competent naturally deposited soils will not be considered obstructions.

E. The Contractor shall protect adjacent structures above ground and buried from damage associated with lateral support of excavation operations and other operations. Damage due to lateral excavation support operations or other Contractor activities shall be repaired immediately by the Contractor at his own expense.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Structural Steel

1. All soldier piles, Wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.

2. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

B. Timber Lagging Left-in-Place

1. Structural grade having a nominal thickness of 3 inches and a minimum allowable working stress of 1100 psi.

C. Timber Sheeting Left-in-Place

1. Structural grade having a nominal thickness of 4 inches and a minimum allowable working stress of 1100 psi.

D. Other Materials

1. Tamping tools adapted for backfilling voids after removal of the excavation support system.

2. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's 29 CFR Part 1926 Subpart P.

PART 3 – EXECUTION

3.1 GENERAL

A. Installation of the temporary excavation support system shall not commence until the Engineer has reviewed the related earth excavation and dewatering submittals with all Engineers' comments satisfactorily addressed.

B. Install excavation support system in accordance with the Contractor's temporary excavation support plan.

C. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.

D. Perform preparatory work to discover, protect, maintain and restore, or remove utilities, foundations or other facilities located in close proximity of the proposed excavation lateral support system.

E. Conduct pre-excavation as necessary to remove obstructions and identify exiting utilities along the alignment of the excavation lateral support system which will interfere with installation in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

F. The Contractor shall provide fully equipped rig(s) and appropriate tools in full-time operation at the site during the work, and shall mobilize additional equipment, if necessary, to complete the work on schedule.

G. Excavation shall not proceed more than 2 ft below the bracing level,

anywhere within the excavation support limits, until the entire level of bracing is completely installed, including prestressing.

H. Notify utility owners if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility owner's permission or have the utility owner make the modifications at no additional cost to Owner.

3.2 SOLDIER PILES AND TIMBER LAGGING

A. Install steel soldier piles before starting excavation. Install soldier piles by impact or vibratory hammers, drilling or hydraulically pushing to the design tip elevation. Drilled methods shall prevent loss of ground around the hole. Each soldier pile shall be installed in its drilled hole within 2 hours after drilling is completed to the required depth.

B. The Contractor shall have equipment on-site able to advance the drilled hole, for installation of the soldier piles, through sand below the water table, through concrete, and through large boulders and other obstructions which may be encountered.

C. Space soldier piles at intervals indicated on the Shop Drawings. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

D. Within the same day of seating the soldier piles in the drilled holes, encase the piles with MHD (1995) M4.08.0 – Controlled Density Fill, Type 1E from the tip elevations to the currently existing ground surface. Crushed stone or other granular materials are not acceptable.

E. Prior to completion of the final backfilling operations, soldier piles shall be cut off five feet below the final ground surface.

F. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. As installation progresses, backpack the voids between the excavation face with sand and on-site soils to establish a tight contact. Pack louver openings between lagging with hay or other porous material to allow free drainage of groundwater without loss of retained soil or backpacking. In no case shall the louvered openings be allowed to exceed 1-inch.

G. Beginning at the top of the soldier piles, the maximum permissible height of unlagged face of excavation shall not exceed 2-feet in all soil types encountered at the site. If water is flowing from the face of the excavation, or if soil to be retained moves toward the excavation, the

maximum height of unlagged face shall not exceed 8-inches.

H. If unstable ground is encountered, take suitable measures (grouting behind the lagging or other approved method) to retain the material in place and prevent loss of ground or movements, which may cause damage to adjacent structures or utilities.

3.3 INSTALLATION – STEEL OR TIMBER SHEETING

A. Length Markings: Before installation is started each steel or timber section shall be marked so that the depth of the tip can be readily determined. This shall be accomplished by a method that is approved by the Engineer.

B. Sheeting shall be installed by means of impact or vibratory hammers or hydraulically pushing each sheet piling to the required design depth. The Contractor shall take all precautions against excessive vibrations in all areas. The Contractor shall be solely responsible for any damages caused directly or indirectly to structures, sewer and other utilities, and shall repair any such damage occurring due to his operations to the requirements of the Owner.

C. All sheeting shall be protected from damage during installation.

D. All sheeting shall be driven or hydraulically pushed to its full depth ahead of the excavation so as to avoid the loss of material from behind the sheeting; where voids occur outside of the sheeting, they shall be filled immediately with structural fill and thoroughly compacted.

E. Requirements for the sheeting include the following:

1. Install sheeting in the plumb position.

2. Install sheeting such that the piling is in direct contact with the material to be retained.

3. Install sheeting to the depths indicated on approved Shop Drawings.

4. Methods and equipment used in pushing, setting, cutting and splicing shall conform to approved Shop Drawings.

5. Use templates or other temporary alignment facilities to maintain piles plumb and on line.

6. Control vibrations and noise associated with installation.

7. Pre-excavate as necessary to remove existing structures along alignment of the sheeting.

8. Sheeting shall be positioned within 3 inches of the design plan location along its length from top down to bottom of excavation grade. Design plan locations are to be established by the Contractor's Professional Engineer and submitted to the Engineer for review.

F. The Contractor shall provide all inspection equipment to determine whether the sheeting has been started in their planned location, are vertical, and are within the allowable tolerance for position after installation.

3.4 INTERNAL LATERAL WALL BRACING (WALES AND STRUTS)

A. Use wales and struts as necessary to provide support of the excavation lateral support walls as required. Include web stiffeners, plates, brackets, or angles as required to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. Allow for eccentricities due to fabrication and assembly. Consider effects of temperature changes.

B. Install and maintain all support members in continuous tight contact with each other and with the wall being supported.

C. Coordinate locations of all bracing and components thereof for temporary lateral excavation support with locations of permanent structures.

D. Control rate of excavation and installation of support members to minimize movement of adjacent ground surface.

E. Excavation shall proceed in accordance with the detailed sequence submitted by the Contractor and reviewed by the Engineer. It shall be the responsibility of the Contractor to schedule and sequence the work accordingly.

3.5 REMOVAL OF EXCAVATION SUPPORT SYSTEM

A. Except as otherwise noted on the Drawings or specified herein, leave in place the excavation lateral support system outside the limits of the permanent structure with the exception of the top 5 ft. of excavation support wall below final grades.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02160

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SECTION 02210

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

2210.1	**TEST PITS**	**CUBIC YARD**
2210.2	**CONTROL DENSITY FILL FOR BACKFILL**	**CUBIC YARD**

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. The Work shall consist of excavation of all materials removed within the limits of the Contract in accordance with the Specifications and in close conformity with the lines, grades, thickness and cross sections shown on the plans or established by the Engineer.

2. The Contractor shall comply with all applicable laws, rules, ordinances, and general regulations of the Federal Government, the Commonwealth of Massachusetts, the City of Cambridge, the Cambridge Department of Public Works, MassDEP, EPA, OSHA, and other regulatory agencies having jurisdiction over the Work.

3. Provide materials for backfilling excavations as indicated and specified.

4. Grade surfaces to meet finished grades indicated. Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.

1.2 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Submit an Excavation, Backfilling, Grading and Compaction plan at least two weeks prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy

and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:

a. Detailed sequence of work.

b. General description of construction methods.

c. Numbers, types, and sizes of equipment proposed to perform excavation, backfilling, grading 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. Erosion and sedimentation control measures, which will prevent erosion and sedimentation during the earth moving and soil stockpile activities.

2. Backfill Materials: Submit a 20 lb. sample, grain size analysis and moisture density curve performed in accordance with ASTM D422 and compaction test results (ASTM D1557 Procedure C) for each proposed source of backfill, imported material and on-site material to be reused, for review by the Engineer at least, one week prior to use of the material. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.

a. In addition, a certification statement and analytical results shall accompany each physical sample of earth materials to be imported onto the site, including but not limited to crushed stone, loam, bedding sand, gravel sub-base, common fill and structural backfill. At a minimum the certification shall state the point of origin and that the material is free of contaminants. The certification shall include representative sample analysis from each point of origin of backfill to be used on the site. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082). On-site soils defined as suitable

for reuse in this Section and in Section 02080 – SOIL AND WASTE MANAGEMENT can be used as backfill without providing the certification required above.

b. All sampling of soils for chemical testing shall be performed by a person experienced in sample collection and shall be either: 1) a Licensed Site Professional registered in the Commonwealth of Massachusetts; 2) a Professional Engineer registered in the Commonwealth of Massachusetts; 3) a professional Geologist registered in the Commonwealth of Massachusetts; 4) a certified groundwater/environmental professional; or 5) an authorized representative of the one of the persons listed above. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection.

c. Submit additional samples and geotechnical and analytical test data and certifications for every 1000 cubic yards (every 200 cubic yards for moisture density curves) of material imported or reused on-site or anytime consistency of material changes in the opinion of the Engineer. Submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the consistency of the source or process, at no additional cost to the Owner.

d. Controlled Density Fill Mix Design: Prior to beginning the work the Contractor shall submit for review, controlled density fill mix designs which shall show the proportions and gradations of all materials proposed for each class and type of controlled density fill specified herein.

e. Filter Fabric: Submit shop drawings and product data sheets.

3. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.

4. Submit Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.5.K, three weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.

1.3 DEFINITIONS

A. 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; porous biodegradable matter; loose or soft fill; excavated pavement; or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material. Clay or silt content shall not exceed 25 percent by weight of the backfill material.

B. Unacceptable Materials: Materials that do not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

C. Percentage of compaction is defined as the ratio of the field dry density, as determined by ASTM D1556 or ASTM D2922 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.

D. Proof Roll: Compaction with a minimum of four passes of a vibratory steel drum roller. Vibratory plate compactors shall be used in small areas where a vibratory steel drum roller cannot be used.

1.4 REGULATIONS

A. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

B. Comply with all applicable laws, rules, ordinances, and general regulations of the Federal Government, the Commonwealth of Massachusetts, the City of Cambridge, the Cambridge DPW, DEP, EPA, OSHA, and other regulatory agencies having jurisdiction over the Work.

1.5 QUALITY ASSURANCE

A. Dewatering and Groundwater Control: Provide and maintain as specified in Section 02140 - DEWATERING.

B. Excavations shall be performed in the dry, and kept free from standing water, snow and ice during construction.

C. Temporary Excavation Support Systems: Provide and maintain as specified in Section 02160 – TEMPORARY EXCAVATION SUPPORT SYSTEMS

D. Do not excavate or fill until the Engineer has reviewed all the required submittals.

E. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

F. Cut pavement and all surface materials to the top of the existing fill material with a saw to prevent damage to remaining pavement without extra compensation. Surface materials may include concrete slabs, cobblestones, rails and other miscellaneous materials. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

G. Dig test pits considered separate to the normal excavation as required to locate underground utilities, obstructions or water table.

H. If material for foundation support is found to be unacceptable, as defined in these Specifications, at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, remove such material to the required width and depth as required by the Engineer and replace it with crushed stone.

I. During progress of work, conduct earth-moving operations and maintain work site so as to minimize the creation and dispersion of dust.

J. 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.

K. Employ an independent testing laboratory to perform particle size and gradation analyses, in accordance with ASTM D422, as well as compaction testing. The independent testing laboratory shall have the following qualifications:

1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program;

2. Have three years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations;

3. Able to provide three references from previous work.

1.6 AVAILABLE INFORMATION

A. Prior to submitting his bid, the Contractor shall review and understand all available information possible. Test boring logs prepared by the Engineer, are included in the Contract Documents and are made available to the Contractor for informational purposes only and shall not be interpreted as a warranty of the subsurface conditions. The subsurface data represent conditions only at the sampling locations at the times the explorations were conducted.

B. Neither the Owner nor Engineer shall be liable for any error or discrepancy in the subsurface information provided, nor for the Contractor's use or interpretation of the information. Additional test borings, test pits or other exploratory operations may be made by the Contractor with the written approval of the Owner, at no additional cost to the Owner.

1.7 MATERIAL TESTING

A. Moisture Density - One per source, except for crushed stone. Repeat the moisture density test for every 200 cubic yard of material used, and whenever visual inspection indicates a change in material gradation as required shall be as determined by the Engineer.

B. Gradation Analysis - A minimum of one per source, for each moisture density test, for every 100 cubic yards of material used, and whenever visual inspection indicates a change in material gradation. For on-site fill soil, the Engineer shall determine frequency of tests required.

C. Construction Tolerances: Construct finished surfaces to plus or minus 0.5 inches of the elevations indicated. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

1.8 FIELD TESTING

A. Field Testing and Inspections: By Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense as specified. Location of tests shall be mutually acceptable to testing laboratory and the Engineer or as required by the Engineer. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained at no additional cost to the Owner.

B. Methods of Field Testing: In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922; In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959; Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill materials.

C. Field In-Place Density and Moisture Content - Crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than two tests per lift:

1. Trenches under structures, foundation preparation, or roadways subbase: Every 30 liner ft. per lift.

2. Trenches in areas without structures or roadways: Every 50 lin. ft. per lift

3. Under Structure: Every 300 sq. ft. per lift.

4. Around Structures: Every 100 sq. ft. per lift.

PART 2 – PRODUCTS

2.1 SAND BORROW

A. Sand borrow shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock free from clay and loam or other deleterious or organic material. Sand borrow shall be used as pipe bedding for all pipe with the exception of Reinforced Concrete Pipe, placed between 6 inches below pipe invert to 6 inches above pipe crown. The sand borrow shall conform to Massachusetts Highway Department (MHD) Specification Designation, M1.04.1, and the following gradation:

Sieve Size	Percent Passing by Weight
½-inch (12.7mm)	100
3/8-inch (9.525mm)	85-100
No. 4	60-100
No. 16	35-80
No. 50	10-55
No. 200	2-10

2.2 COMMON FILL AND ON-SITE MATERIAL GEOTECHNICALLY SUITABLE FOR REUSE ON-SITE AS BACKFILL:

A. Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall consist of sand and gravel consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic matter. Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall be used from the top of the sand borrow or crushed stone and below the gravel subbase layer.

Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
6-inch (152.4mm)	100
No. 4	30-80
No. 40	30-50
No. 200	0-25

2.3 CRUSHED STONE

A. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. Crushed stone shall be used as Reinforced Concrete Pipe bedding between 6 inches below pipe invert to 6 inches above pipe crown and initial 12 inches of backfill under structures, as a working mat or as a filter around perforated drain pipe.

Crushed stone shall be wrapped in filter fabric, placed in maximum 6-inch thick layers, loose measure, and compacted with a minimum of four passes of a vibratory plate or roller compactor. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Sieve Size	Percent Passing by Weight
1-inch (25.4 mm)	100
3/4-inch (19.05 mm)	90-100
5/8-inch (15.875 mm)	---
½-inch (12.7 mm)	10-50
3/8-inch (37.5 mm)	0-20
No. 4	0-5
No. 8	---

2.4 CONTROLLED DENSITY FILL (CDF)

A. Controlled density fill shall consist of a cementatious hard excavatable mixture of aggregate, Portland Cement, and air entraining admixtures. The material shall be of the type specified in Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, as amended, Type 2E. Controlled density fill shall be used as trench backfill material around structures (not including manholes and catch basins) between the top of the crushed stone layer and the top of the structure. Controlled density fill shall also be used to fill abandoned utilities and around the excavation support systems as required by the Engineer.

2.5 STRUCTURAL FILL

A. Structural fill shall consist of gravel and sand consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic and deleterious or organic matter. Structural fill shall be used for replacement of soft organic soils below pipe inverts and below structures. Structural fill shall conform to the following gradation requirements.

Sieve Size	Percent Passing by Weight
3-inch (76.2 mm)	100
No. 4	40-80
No. 40	10-30
No. 200	0-8

2.6 FILTER FABRIC

A. Filter Fabric used, as a drainage medium shall consist of a nonwoven fabric made from polypropylene or polyethylene filaments or yarns. The fabric shall be inert to organic chemicals commonly encountered in the soil. The fabric shall conform to the following recommended property tests:

Property	Unit	Test Method	Minimum Value
Weight	oz/sy	ASTM D-3776	4.5
Grab Strength	Lbs	ASTM D-4632	120
Grab Elongation	percent	ASTM D-4632	55
Trapezoid Tear Strength	Lbs	ASTM D-4533	50
Mullen Burst Strength	Psi	ASTM D-3786	210
Puncture Strength	Lbs	ASTM D-4833	70

Edges and ends of filter fabric shall overlap a minimum of two feet.

2.7 GRAVEL SUBBASE

A. Gravel subbase shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The gravel subbase shall be used in the upper one foot of trench backfill material immediately below pavements and graded in accordance with Massachusetts Highway Department (MHD) specification section M1.03.1 as indicated below:

Sieve Size	Percent Passing by Weight
3-inch	100
1-1/2-inch	70-100
3/4-inch	50-85
No. 4	30-60
No. 200	0-10

PART 3 – EXECUTION

3.1 GENERAL

A. Do not excavate or fill until the Engineer has reviewed all the required submittals.

3.2 SITE MAINTENANCE

A. Roadway and Site Leveling: Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.

3.3 SUBGRADE PREPARATION AND PROTECTION

A. Proof roll the subgrade prior to backfilling and filling operation, or placing crushed stone or sand borrow.

B. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation.

C. Over excavate all organic soil at subgrade and replace with compacted structural fill material.

3.4 COMPACTION EQUIPMENT

A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:

1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.

2. Vibratory steel drum roller weighing at least 12,000 pounds.

3. Water jetting and puddling will not be allowed.

3.5 COMPACTION REQUIREMENTS

A. The degree of compaction is expressed as a percentage of the maximum dry density at optimum moisture content as determined by ASTM Test D1557, Procedure C. The compaction requirements are as follows:

Area	**ASTM Density Degree of Compaction**
Natural subgrade	Proof roll
Crushed stone	As specified herein
Sand Borrow	As specified herein
Gravel subbase	95%
General backfill with CDF adjacent to structures	As specified herein
Trench backfill (on-site fill) - below pavements - below landscaped areas	 95% 90%
Other areas	90%

B. Moisture Control: Fill that is too wet for proper compaction shall be desiccated, harrowed, or otherwise dried to a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill at no additional cost to the Owner.

C. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

D. Unfavorable Conditions: In no case shall fill be placed in standing water, over organic silt or peat or material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

E. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.

F. Compaction Control: In-place density tests shall be made at the Contractor's expense in accordance with ASTM D1556, D2922 or D2167 as the work progresses, to determine the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner.

G. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing performed by him shall excuse the Contractor from defects discovered in his work at that time or subsequent to the testing.

H. Placement: All fill shall be placed in horizontal layers. Fill shall not be placed following the natural contours of the ground. Fill shall be placed starting in the lowest areas working up to finish grades in horizontal layers in the manner specified herein. Each layer of fill should be benched into the existing slope in order to avoid the formation of a shear plane.

I. Surfaces: After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill area in good condition so as to present a smooth surface at all times level with adjacent surfaces. The Contractor shall repair any subsequent settling over backfilled area immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.

J. The finished subgrade of the fills and filled excavations upon which topsoil is to be placed, or pavements are to be constructed, shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.

3.6 SEPARATION OF EXCAVATED MATERIAL FOR REUSE

A. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material or for disposal or immediately reuse at the area of excavation as backfill.

B. Reuse surplus acceptable excavated materials for backfill as indicated and in accordance with Section 02080 – SOIL AND FILL MANAGEMENT; deposit neatly and grade.

3.7 BACKFILL MATERIAL SELECTION

A. Backfill Material Selection: Unless otherwise specified or required, material used for filling and backfilling shall meet the requirements specified under Backfill materials. In general, the material used for backfilling trench excavations within the zone above structures and 6 inches above pipe crowns shall be material removed from the excavation provided that the reuse of these materials result in the required trench compaction and meets the gradation requirements specified for on-site fill. In areas where the bottom of the excavation is in silt and clay, and is below the groundwater table, a working mat and drainage layer of 12 inches of compacted crushed stone wrapped in filter fabric shall be placed.

B. Place backfill to a maximum loose lift thickness of 9 inches except where used as pipe bedding. Maintain backfill material with a uniform moisture content, with no visible wet or dry streaking, between plus 2 percent and minus 3 percent of optimum moisture content. The final filled soil mass shall be as uniform as possible in lift thickness, moisture content, and effort required to compact soil mass.

3.8 STRUCTURE AND TRENCH BACKFILL

A. The trenches shall be backfilled as soon as practicable with the material specified herein. All trench backfilling shall be done with special care, in the following manner and as required by the Engineer.

B. Backfill material for pipe bedding shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench as indicated on the drawings. Sand borrow bedding shall be placed by hand shovels, in layers not more than 4-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids. Crushed stone bedding material shall be placed in layers not more than 6-inches thick in loose measure, and compacted with at least 4 passes using a vibratory plate or roller compactor.

C. The balance of trench backfill around structures (not including manholes or catch basins) shall be CDF material from the crushed stone layer at the bottom of the structure to the common fill layer at the top of the structure. The common fill material shall be spread in layers not exceeding 9-inches in loose depth and each layer thoroughly compacted by mechanical methods and shall contain no rock, stones or boulders larger than 6-inches in their greatest dimension. The balance of the trench with no structures shall be common fill material placed in 9-inch think lifts and compacted up to the bottom of the gravel subbase layer.

D. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time if necessary, timber grillage or other suitable method shall be used to break the fall of material. The moisture content of the backfill material shall be such that proper compaction will be obtained. Backfill shall be made to grades required to establish the proper subgrade for the placement of topsoil or pavement base courses.

E. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density as specified herein, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining earth to provide the required bearing value.

F. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.

G. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied to meet Engineer and Owner requirements at no additional cost to the Owner.

3.9 BACKFILLING AGAINST STRUCTURES

A. Backfilling against masonry or concrete shall not be done until permitted by the Engineer. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, the Contractor, as required by the Engineer, shall make special leakage tests of the structures. After the satisfactory completion of leakage tests and the satisfactory completion of any other

required work in connection with the structures, the backfilling around the structures shall proceed using CDF Material.

B. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures.

C. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be remedied by the Contractor at no additional expense to the Owner.

3.10 CDF QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Slump: ASTM C143; one test at point of discharge for each day's placement; additional tests when CDF consistency seems to have changed.

B. Compression Test Specimen: ASTM C31; one set of four (4) standard cylinders for each compression strength test, plus additional sets for each 100 cu yds more than the first 50 cu yds placed in any one day unless otherwise required.

C. Compressive Strength Tests: ASTM C39; one set for each day's pour plus additional sets for each 100 cu. yds more than the first 50 cu. yds placed in any one day; two specimens tested at 28 days, and two specimens tested at 90 days.

D. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of placement, name of testing service, fill type and class, location of fill batch along route, design compressive strength limits at 28 days and 90 days, fill mix proportions and materials, compressive breaking strength, and type of break for both 28 day tests and 90 day tests.

3.11 TRENCH EXCAVATION

A. For pipe installation in a cradle or within bedding, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.

B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated by use of hand tools just before placing of pipe. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and

continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

C. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.

D. Make trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.

E. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. above top of pipe.

3.12 EXCAVATION NEAR EXISTING STRUCTURES

A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.

B. Excavate test pits when determination of exact location of pipe utilities or other underground structures is necessary for doing work properly.

C. Execution of any earth excavation shall not commence until the related dewatering, soil and fill management, excavation support systems, and required backfill and fill materials submittals are reviewed by the Engineer and all Engineers' comments addressed.

D. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or utilities of the work previously completed under this contract.

E. Excavate to widths that give suitable room for constructing structures or laying and jointing piping.

F. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.

G. Excavate to lines and grades indicated in an orderly and continuous program.

H. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.

I. Excavate to elevations indicated, or deeper, as required by the Engineer, to remove unacceptable subgrade material.

J. Exercise care to preserve material below and beyond the lines of excavations.

K. Boulders, rock fragments, and concrete less than one-half cubic yard encountered during excavation shall not be included for payment as rock.

3.13 REMOVAL OF SUBSURFACE OBSTRUCTIONS

A. Remove indicated or approved subsurface structures and related obstructions to complete the work.

B. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

3.14 UNAUTHORIZED EXCAVATION

A. When the bottom of any excavation is excavated beyond limits indicated or specified, backfill with crushed stone wrapped with non-woven geotextile fabric. No additional payment will be made for the excavation of backfill or unauthorized excavation.

3.15 SUBGRADE PREPARATION AND PROTECTION

A. As required by the Engineer, over-excavate any unacceptable materials below the subgrade, and replace with compacted structural fill.

B. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench subgrade to avoid disturbance of the bearing surface.

C. Backfill the overexcavation with structural fill and compact as previously indicated.

D. Proof roll with a vibratory plate compactor or double drum roller (4 passes) the exposed subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.

3.16 CARE AND RESTORATION OF PROPERTY

A. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

3.17 POLLUTION CONTROL

A. During progress of work, conduct earth-moving operations and maintain work site so as to minimize the creation and dispersion of dust.

B. Separation of Excavated Material for Reuse: Remove only existing pavement and all other surface materials, which may include concrete slabs, cobblestones, rail ties, by saw cutting that is necessary for prosecution of work.

PART 4 – COMPENSATION

Item 2210.1 - Test Pits

METHOD OF MEASUREMENT:
Measurement for payment for Test Pits will be based on the actual cubic yards of material displaced during test pit excavation as required and measured by the Engineer. Depth of excavation will be measured to the average depth of the excavation. Irregularly deep parts of the exaction will not be used as the excavation depth. The width of the excavation will be measured to an average width across the excavation. Irregularly wide parts of the excavation will not be considered the width of the excavation. Test Pits, completed for the Contractor's convenience, not approved by the Engineer, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Test Pit shall be based on the cubic yards excavated complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Test Pits. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavate and backfill such materials as necessary to locate pipe, utilities and other possible obstructions as indicated on the Drawings, as required by the Owner or Engineer, or as approved by the Owner or Engineer prior to performing the test pit; temporary excavation support; furnishing and placing backfill per one of the approved methods; compaction and compaction testing; coordination with utility companies/owners; survey of existing conditions including horizontal and vertical utility alignments and reflecting the actual conditions on the Project's As-built Drawings; and construction dewatering and all work incidental thereto and all work not specifically included for payment under other items.

EXCLUSIONS:
Test Pits completed for the purpose of soil characterization shall not be paid for under this item. Pre-trenching prior to the installation of temporary support of excavation or for any other purpose shall not be paid for herein unless approved by the Owner and Engineer prior to the pre-trenching or test pitting.

Item 2210.3 - Controlled Density Fill for Backfill

METHOD OF MEASUREMENT:
Measurement for payment for Controlled Density Fill for Backfill shall be made on the basis of cubic yards placed within the trench width pay limits shown indicated elsewhere in the Construction Documents or as otherwise approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Controlled Density Fill for Backfill shall be based on the cubic yards installed complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Controlled Density Fill for Backfill. The work includes, but is not limited to; furnish and install controlled density fill for backfill under existing utilities, in areas of difficult compaction, and where required by the Engineer; temporary bulkheads and forms; furnishing and installing filter fabric; and material testing.

EXCLUSIONS:
Controlled Density Fill used for the abandonment of pipes and structures will not be paid for under this item.

END OF SECTION 02210

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SECTION 02252

MANHOLES

2252.1.1	**MANHOLE -PRECAST 4-FOOT DIAMETER TYPE 1 OR 2**	**VERTICAL FOOT**
2252.1.2	**MANHOLE - PRECAST 5-FOOT DIAMETER TYPE 1 OR 2**	**VERTICAL FOOT**
2252.1.3	**MANHOLE – PRECAST 4-FOOT DIAMETER TYPE 6**	**VERTICAL FOOT**
2252.1.5	**COMBINED SEWER MH REPLACEMENT PRECAST – 8-FOOT DIAMETER (MAGOUN STREET AND MASS AVE)**	**LUMP SUM**
2252.2	**CONVERT COMBINED SEWER MANHOLES TYPE 5**	**EACH**
2252.3	**CONVERT S75COM1905T (PIT SEPARATION – WR GRACE)**	**LUMP SUM**
2252.3A	**CONVERT S75COM19000 (WR GRACE)**	**LUMP SUM**
2252.4	**REMOVE AND REPLACE MANHOLE FRAME AND COVER AND CATCH BASIN FRAME AND GRATE**	**EACH**
2252.5	**MANHOLE INSERT**	**EACH**

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes all labor, equipment, appliances, and materials required for construction of precast concrete sanitary sewer manholes and storm drain manholes, including manhole drops and drop over manholes, complete and in place, in accordance with the Drawings and Specifications and as required.

1.2 RELATED WORK

A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND

GRADING

B. Section 02590 – BRICK MASONRY

C. Section 03300 – CONCRETE

D. Section 03315 – GROUT

E. Section 03411 – PRECAST CONCRETE VAULTS AND STRUCTURES

F. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

A. General: Submit the following in accordance with General Conditions of Contract and Section 01300 – SUBMITTALS:

1. Complete shop drawings for all precast manhole sections, cast iron frames and covers and appurtenances.

2. Prior to fabrication, submit shop drawings showing details of precast monolithic base sections, risers, eccentric cone manhole tops and flat slab manhole tops, joints and gaskets, construction details, tolerances, and other information as required by the Owner.

3. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Precast Bases and Risers:

1. Precast reinforced concrete manhole bases, risers and top sections shall be of the sizes and types indicated or as required.

2. Manhole sections shall conform to the requirements of ASTM C478, latest revision, except as modified herein and/or on the drawings.

3. Each manhole section shall be constructed with a bell-and-spigot or tongue-in-groove joint.

4. The manhole sections shall be manufactured by the centrifugal, roller suspension or vertical cast process; workmanship and methods shall be in accordance with the best practices of modern shops for this type of work.

5. The height and diameter of manhole bases shall be as required to accommodate size of pipe used, as approved. The manhole risers shall be available in 2, 3, and 4-foot lengths.

6. Manhole tops of the eccentric cone type shall be 3 or 4 foot lengths with 30-inch inside diameter opening at top, unless otherwise noted as shown in the details.

8. Manhole tops of the flat slab type, where space restrictions exist or where required, shall be not less than 8 inches thick and reinforced as indicated, and shall have an opening having an inside diameter of 30-inches.

9. Manhole bases and risers shall have the wall thicknesses as stated in the Drawings; cone type units shall taper to a minimum wall thickness of 8-inches at top.

10. All exterior concrete surfaces shall be coated with bituminous dampproofing as per Section 07160 – BITUMINOUS DAMPPROOFING.

11. Precast machine-made solid segments shall conform to ASTM C139.

B. Concrete:

1. All concrete shall conform to the requirements of Section 03300-CONCRETE and Section 03411 – PRECAST CONCRETE VAULTS AND STRUCTURES.

2. Not less than two concrete strength tests shall be made for each 100 vertical feet of manhole sections used and the test results submitted to the Owner and Engineer. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.

C. Frames and covers shall be heavy-duty Type A Massachusetts Standard and conform to the "Construction Standards" and "Standard Specifications for Highways and Bridges", of the Commonwealth of Massachusetts. All

frames shall have a minimum clear opening of 24 inches unless otherwise noted. Submit shop drawings to Owner for approval before fabrication. Cast iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under seasonable temperature changes.

1. Unless otherwise noted on the Contract Drawings, the Contractor shall install heavy duty frames and covers that shall be product numbers 00200628C03, or 00211123C02 as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), or approved equal from Neenah Foundry Company or Campbell Foundry Company.

2. Pressure Type Frames and Covers :

   a. Where noted on the Drawings, the Contractor shall furnish and bolted frames and covers that shall be product numbers 00211122W02 as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), or approved equal from Neenah Foundry Company or Campbell Foundry Company.

   b. Pressure type frames shall have a clear opening of 24 inches or 30 inches opening as indicated in the Contract Drawings. Covers shall be secured with a stainless steel bolt and cam system. The cover shall have gaskets that provide a watertight seal. The frame and cover shall withstand H20 loadings.

   c. Castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under seasonable temperature changes.

3. Covers for all structures shall have the word "DRAIN", "SEWER" or other appropriate designation cast upon them.

D. Jointing:

1. Ends of each length of manhole riser, the bottom end of manhole tops of the cone type, base slabs, and the tops of monolithic bases

shall be provided with bell-and-spigot or tongue-and-groove ends of concrete formed on machined rings to insure accurate joint surfaces.

2. Jointing shall be O-ring gaskets or butyl rubber molded sealants. All joints shall be provided so as to be watertight under all conditions of service. The ends of base, riser, and cone sections to be jointed using neoprene "O-ring" type joints shall be designed to enclose the gasket on four surfaces when the joint is in its final position.

E. Gaskets:

1. Gaskets for sealing joints using the "O-ring" type gaskets shall conform to ASTM C443, latest revision, and shall be of rubber of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of neoprene gaskets for pipe joints, or shall be vulcanized butyl rubber sealants meeting or exceeding Federal Specifications SS-S-210.

2. Each gasket shall be a continuous ring of round solid cross-section having smooth surfaces free from blisters, porosity and other imperfections. The joint sealing gasket shall be of a composition and texture which shall be resistant to sewage, industrial wastes including gasoline, oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,200 psi. The elongation shall be such that 2-inch gauge marks shall stretch to not less than 9 inches. The compression set (constant deflection) shall not exceed 25 percent of the original gauge length. The tensile strength after accelerated aging shall be not less than 80 percent of the original strength.

3. The butyl rubber sealant shall have a self adhesive nature and shall have a diameter of 1 inch and shall be furnished in coils. The sealant shall meet the following properties:

DESCRIPTION	SEALANT PROPERTY
Base	Vulcanized Butyl Rubber
Percent of solids	100%
Shore "A" Durameter:	
Initial	10
Aged	20
Adhesion to clean surfaces	Excellent
Temperature Range:	
Application	-20 degrees F to 120 degrees F
Service	-65 degrees F to 200 degrees F
Water Absorption after 14 days immersion:	Less than 5%
Chemical Resistance after 7 days immersion in 5% Potassium Hydroxide and 5% Hydrochloride Acid	Excellent
Resistance to Water and Organic Solvents	Excellent
Resistance to Shock, Heat, and Cold	Excellent
Color	Black
Shelf Life	Excellent
Elongation	
Initial	30%
2 weeks at 190 deg F, drying	250%
2 weeks in water	300%
Weather Resistance	Excellent
Moisture Diffusion Resistance	Excellent
Specific Gravity	1:18
Flash Point	None
Fire Point	Over 620 degrees F

F. Grout for Sealing Joints:

1. Grout for sealing grout-type joints or grouting field made pipe openings, shall be a non-shrink type grout, factory-mixed ready-to-use product, containing especially prepared aggregate, cement and sand and other components which will produce a grout with properties to counteract shrinkage, increase density, withstand impact, improve workability, produce watertight joints, and which will be suitable for jointing around pipes entering manholes.

G. Mortar for Brickwork:

1. Per Section 02590 – BRICK MASONRY

2. Mortar and Brick for Raising Castings is prohibited.

H. Brick

1. Per Section 02590 – BRICK MASONRY

2. Mortar and Brick for Raising Castings is prohibited.

I. Bituminous Dampproofing

1. Per Section - 07160 – BITUMINOUS DAMPPROOFING

J. Flexible Manhole Seals

1. Flexible manhole seals shall be "New Lok Joint Flexible Sleeve" by Interpace, "A-Lok Manhole Sleeve" by L & L Concrete Products, "Press Wedge II" by Pre-Seal Basket Corporation, or approved equivalent.

2. Field applied seals shall be flexible rubber boots manufactured by Kor-N-Seal, Interpace, Pre-Seal Basket Corporation, L&L Concrete Products, or approved equivalent.

3. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

4. All flexible manhole seals shall be capable of meeting a 10 psi internal hydraulic pressure.

K. Manhole Inserts

1. Manhole inserts shall be installed in existing and proposed sewer and drain manholes located within the floodplain which is shown on sheets C-2 through C-20 in the Contract Drawings.

2. Manhole inserts shall prevent surface water inflow through manhole covers. The insert shall prevent grit, sand, salt, chemical spills, etc from entering the manhole through the manhole cover.

3. Manhole inserts shall be manufactured from corrosion proof material suitable for atmospheres and conditions typically found sanitary and storm drain systems.

4. Manhole inserts shall be manufactured from a durable High Density Polyethylene Copolymer material that meets ASTM Specification Designation D-1248 Class A, Category 5, Type III.

5. Manhole inserts shall have a minimum impact brittleness temperature of -105 degrees Fahrenheit in accordance with ASTM D746-70.

6. The thickness of the manhole insert shall be a uniform 1/8".

7. The inserts shall have one of the following systems for relieving gas and/or vacuum pressure from the manhole:

   a. Two (2) 3/16" holes are installed 180 degrees apart, approximately 1" from the top of the insert, to allow for constant ventilation. This "no valve" method of ventilation should not be affected by grit accumulation, nor have any moving parts subject to corrosion. The venting system shall not allow water to completely fill the insert, which during cold weather could freeze
   and lift the manhole cover.
   b. An alternative ventilation system utilizes one valve manufactured of Polypropylene Ethylene compound. The valve material shall be unaffected by temperatures within a range of -70°F to 350°F. The valve body and components shall be corrosion and wear resistant
   and be designed to release gas pressure at approximately 1 psi.

8. Manhole Inserts shall be manufactured to fit the manhole frame rim upon which the manhole cover rests.

9. Manhole Inserts shall have a corrosion resistant polypropylene strap installed for easy removal and re-installation into the manhole frame.

PART 3 – EXECUTION

3.1 HANDLING:

A. Manhole sections shall not be shipped for at least five days after manufacture.

B. All manhole sections which have been damaged after delivery, and manhole sections installed in the work which are found to be damaged will

be rejected and shall be removed and replaced, by the Contractor, with new, sound and approved material, at no additional expense to the Owner. At the time of inspection, the surfaces of the sections shall be dense and close-textured. Cores shall serve as a basis for rejection of manhole sections if poor bond or reinforcement is exposed.

C. Each manhole section shall be handled into its position in the trench only in such manner and by such means as recommended by the manufacturer of the manhole sections, and as approved. Provide all necessary slings, straps and other devices for the safe and satisfactory handling and support of the manhole sections during lifting, installation and final positioning of the sections. Lifting holes may be permitted provided suitable rubber or concrete stopper or other approved devices are provided for plugging and sealing the holes and watertight, all as approved.

3.2 INSPECTION

A. All manhole sections will be inspected upon delivery; manhole sections which do not conform to specification requirements will be rejected and shall be removed immediately from the site and replaced by the Contractor at no additional cost to the Owner. The Contractor shall furnish all labor and facilities necessary to assist the Owner in inspecting the material.

B. The quality of all materials, processes of manufacture, and the finished manhole sections shall be subject to inspection and approval of the Owner. Such inspection may be made at the place of manufacture and/or on the site, and the manhole sections shall be subject to rejection at any time because of failure to meet any of the specification requirements, even though sample manhole sections may have been accepted as satisfactory.

3.3 INSTALLATION

A. Manhole sections shall be installed using approved type neoprene "O-Ring" type gasket or butyl rubber sealants for sealing joints of manhole sections; jointing shall be performed in accordance with the pipe manufacturer's recommendations, and as approved.

B. Manhole sections shall be installed level and plumb.

C. Manholes shall be constructed on a 12-inch compacted crushed stone or gravel base as indicated.

D. Water shall not be permitted to rise over newly made joints until after inspection as to their acceptability. All jointing shall be done in a manner to insure watertight joints.

E. The manhole frames shall be set with tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings utilizing precast concrete risers and rings only. Brick and mortar shall not be used. Precast concrete manhole riser rings or approved equal shall be used. Interior and exterior joints shall be mortared. Frames shall be set in a full bed of mortar so that the space between the top of the brick and mortar and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to a height of 4-inches above the flange.

F. Opening in precast manhole sections to extent indicated on the drawings to receive entering pipes shall be made at the place of the manufacturer; where opening cannot be determined they shall be cut in the field. Depending upon the type of pipe seals to be furnished, pipe openings shall be provided with manhole seals of proper sizes to accommodate pipe sizes and shall be cast into the manhole at the time of manufacture. When openings are made in the field, the openings for entering pipes shall be of a size to provide a uniform annular space between the outside of pipe wall and the opening in the manhole section of 3/4 inch, and after the pipe is in position the annular space shall be solidly filled with non shrink grout. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Openings which are cut in the manhole sections in the field shall be carefully made so as not to damage the sections; damaged sections will be rejected and shall be replaced at no additional expense to the Owner. Field cut openings shall be circular, not square and shall be made by the appropriate cutting or coring operation.

G. Manhole inverts shall be brick masonry or concrete and shall have a cross-section shaped to conform to connecting pipes; changes in size shall be made gradually and evenly. Concrete and brick masonry for manhole inverts shall conform to Section 03300 - CONCRETE and Section 02590 – BRICK MASONRY, constructed as indicated and as specified.

3.4 BACKFILLING

A. Conduct backfill operations of open cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed, all in accordance with Section 02210 - EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

3.5 INSPECTION AND TESTING

A. Acceptance of precast reinforced concrete manhole sections will be made on the basis of plant tests, material tests, and inspection of the completed product, in accordance with the requirements of ASTM C478, latest revision, with the following modifications.

C. Manhole sections shall not be shipped for at least five days after manufacture when cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 150 degrees F for a period of not less than 8 hours, or when necessary, for such additional time as may be required to enable the manhole sections to meet specification requirements.

D. Leakage Tests

1. The manholes shall be made as nearly watertight as practicable.

2. The Contractor shall perform leakage tests on each manhole installed using an approved low air pressure testing system. This type of test shall be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each manhole shall be tested under 10-inch Hg vacuum. The test shall pass if the vacuum remains at 10-inch Hg or drops no lower than 9-inch Hg after 60 seconds for 4 or 5 foot manholes from 0 to 10 feet deep; 75 seconds for 4 or 5 foot manholes from 10 to 15 feet deep and for 6 or 8 foot manholes from 0 to feet deep; or 90 seconds for 4 or 5 foot manholes from 15 to 25 feet deep, 6 ot 8 foot manholes 10 to 15 feet deep, and 10 foot manholes 0 to 10 feet deep; and 120 seconds for 4 or 5 foot manholes over 25 feet deep, 6 or 8 foot manholes 15 to 25 feet deep, and 10 foot manholes 10 to 15 feet deep.

E. Manhole inserts shall be testing after installation. The complete unit shall not allow more than 5 gallons of inflow over a 24 hour period.

PART 4 – COMPENSATION

Item 2252.1.1 – Manhole - Precast 4-Foot Diameter Type 1 or 2

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 4-Foot Diameter Type 1 or 2shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the

inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 4-Foot Diameter Type 1 or 2 shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 4-Foot Diameter Type 1 or 2. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade, where required or directed; furnish, install and compact bedding; bituminous dampproofing; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required to raise frames and covers to grade; and connections to new and existing pipes and laterals; and all incidental work not specifically included for payment elsewhere.

Item 2252.1.2 – Manhole - Precast 5-Foot Diameter Type 1 or 2

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 5-Foot Diameter Type 1 or 2 shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 5-Foot Diameter Type 1 or 2 shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 5-Foot Diameter Type 1 or 2. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; saw cutting bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade, where required or directed; furnish, install and compact bedding; bituminous dampproofing; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required to raise frames and covers to grade; and connections to new and existing pipes and laterals; and all incidental

work not specifically included for payment elsewhere.

Item 2252.1.3 – Manhole - Precast 4-Foot Diameter Type 6

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 4-Foot Diameter Type 6 shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade. Payment will be the same whether the Contractor elects or is required to furnish a Precast or a Cast-in-place Base.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 4-Foot Diameter Type 6 shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 4-Foot Diameter Type 6. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; saw cutting bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade, where required or directed; furnish, install and compact bedding; bituminous dampproofing; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required to raise frames and covers to grade; and connections to new and existing pipes and laterals; and all incidental work not specifically included for payment elsewhere.

Item 2252.1.5 – Combined Sewer MH Replacement – Precast-8-Foot Diameter (Magoun Street and Mass Ave)

METHOD OF MEASUREMENT:
Measurement for Combined Sewer MH Replacement – Precast 8-Foot Diameter (Magoun Street and Mass Ave) shall be per the lump sum bid for this item in the proposal and as shown on the Contract Drawings (Sheet C-16) or as required by the Engineer except those items listed below in the exclusions and shall be payable upon completion of work under this bid item.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Combined Sewer MH Replacement – Precast 8-Foot Diameter (Magoun Street and Mass Ave) shall be bid lump sum for this item in the proposal. Under the lump sum price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Combined Sewer MH Replacement – Precast 8-Foot Diameter (Magoun Street and Mass Ave). The work includes, but is not limited

to; excavation, removal, and disposal of existing junction manhole and disconnecting of existing pipes; excavation and removal of existing brick combined sewer as indicated in the contract drawings; furnish and install Pre-cast Concrete Manhole complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; selective demolition of the existing pipe; removal of orifice; water stop between the existing pipe and precast structure; furnish and install 36-inch diameter ductile iron pipe; furnish and install sectional liner; saw cutting bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or directed; furnish, install and compact bedding; bituminous dampproofing; cast-in-place field closures formwork, concrete, rebar and appurtenances; flexible pipe sleeves; concrete; mortar; brick masonry; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals; and all incidental work not specifically included for payment elsewhere.

EXCLUSIONS:
The following items are not included for payment herein but are included for payment elsewhere; utility support and relocations, catch basins, drop inlets and precast 4-foot Diameter Manhole – Type 1 or 2, 12-inch ductile iron pipe, water relocations, and flow bypass.

Item 2252.2 – Convert Combined Sewer Manholes Type 5

METHOD OF MEASUREMENT:
Measurement for Convert Combined Sewer Manholes Type 5 shall be based on each combined manhole converted to a complete and functional sewer manhole by the Contractor, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Convert Combined Sewer Manholes Type 5 shall be based on each complete for this item in the proposal. Under each unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Convert Combined Sewer Manholes Type 5. The work includes, but is not limited to; removal and disposal of steel plate in existing manhole, install brick and mortar in base of manhole to rebuild sewer channel and shelf; install masonry plugs; furnish and install frames and covers; and all incidental work not specifically included for payment elsewhere.

Item 2252.3 – Convert S75COM1905T (Pit Separation – WR Grace)

METHOD OF MEASUREMENT:

Measurement for Convert S75COM1905T (Pit Separation – WR Grace Property Site 2) (SheetGC-3 and C-13) shall per the lump sum bid for this item in the proposal as shown on the Contract Drawings or as required by the Engineer and shall be payable upon completion of work under this bid item.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Convert S75COM1905T (Pit Separation – WR Grace) shall be bid lump sum for this item in the proposal. Under the lump sum bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Convert S75COM1905T (Pit Separation – WR Grace). The Contractor shall include in his lump sum price for each subdivision of this item, the cost of Work required for a complete and functional installation to include, but not be limited to; excavate pit and install 8-inch PVC sewer, pre-fabricated channel and sectional CIPP liner; core basin wall and install 8-inch DI pipe with watertight seal; remove and dispose of wood column at basin and replace with pipe supports, bolts, and appurtenances; abandon existing upstream 8-inch sewer with bulkheads and CDF; plug existing upstream 18-inch drain; line existing downstream 18-inch x 26-inch drain with CIPP liner; remove existing masonry invert and backfill with concrete; install sloped floors with grout fill; cast-in-place concrete divider wall and top cover; install frames and covers; cutting and reuse of existing steel plates; testing of the separated manhole chambers; and all incidental work not specifically included for payment elsewhere.

Item 2252.3A – Convert S75COM19000 (WR Grace)

METHOD OF MEASUREMENT:
Measurement to Convert S75COM1900 (WR Grace Property Site 1) (Sheet C-13) shall per the lump sum bid for this item in the proposal as shown on the Contract Drawings or as required by the Engineer and shall be payable upon completion of work under this bid item.

BASIS OF PAYMENT / INCLUSIONS:
Payment to Convert S75COM19000 (WR Grace) shall be bid lump sum for this item in the proposal. Under the lump sum bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Convert S75COM1905T (Pit Separation – WR Grace). The Contractor shall include in his lump sum price for each subdivision of this item, the cost of Work required for a complete and functional installation to include, but not be limited to; remove existing common manhole; install proposed drain and sewer manholes complete with all pre-case bases, riser sections, cones and top slabs; install frames and covers; install 8-inch PVC sewer and flexible couplings; install 24-inch PVC drain with cast-in-place field closures; redirect existing drain lateral to new drain manhole; deflect existing sewer laterals at new sewer manhole; saw cut bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off

below grade, where required or directed; furnish, install and compact bedding; bituminous dampproofing; testing of the manholes; and all incidental work not specifically included for payment elsewhere.

Item 2252.4 – Remove and Replace Manhole Frame and Cover and Catch Basin Frame and Grate

METHOD OF MEASUREMENT:
Measurement for Remove and Replace Manhole Frame and Cover and Catch Basin Frame and Grate shall be based on each manhole frame and cover removed and installed by the Contractor not included for payment elsewhere as shown on the Contract Drawings or as required by the Engineer. The Contractor shall not be compensated for providing and installing new frames and covers to replace frames, covers, and grates on existing or new manholes broken by the Contractor during construction.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Remove and Replace Manhole Frame and Cover and Catch Basin Frame and Grate shall be based on the unit bid price for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the removal of the existing manhole frames and covers and for the complete installation of frames and covers as shown in the Contract Drawings, at the requirements of the Engineer and as specified. The work includes, but is not limited to the following; furnishing and installing frames and grates; removal, disposal, or salvage of existing frames ,covers, and grates; transportation of salvaged frames, grates, and covers to Cambridge Department of Public Works storage facility; sawcutting; excavation, backfill and compaction of backfill; grading; installation of sub-base and concrete aprons as required; furnishing and installing brick, mortar, precast rings and grout to raise castings to finished grade; removal of existing brick, mortar, and grout; and all incidental work not included for payment elsewhere required to furnish and install new frames and covers whether states here or not.

SPECIAL NOTES ON EXCLUSIONS:
Manhole Frames and Covers for new structures and converted structures shall be paid for elsewhere.

Item 2252.5 – Manhole Insert

METHOD OF MEASUREMENT:
Measurement for Manhole Insert shall be based on each manhole insert installed by the Contractor not included for payment elsewhere as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole insert shall be based on each manhole insert installed by the Contractor. Under each unit price for this item, the Contractor shall furnish all labor,

materials, tools, equipment, and incidentals required for the installation of manhole inserts. The work includes, but is not limited to; furnish and install manhole inserts to fit the manhole frame upon which the manhole cover rests; cleaning manhole frame of all dirt and debris; testing, and all incidental work not included for payment elsewhere required to furnish and install new manhole inserts whether states here or not.

END OF SECTION 02252

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