



Wisconsin Department of Transportation

**Division of Transportation Systems
Development**

Bureau of Project Development
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May 6, 2026

NOTICE TO ALL CONTRACTORS:

**Proposal #05: 5992-10-20, WISC 2026204
C Madison, Mineral Point Road
USH 12 to Hight Point Road
LOC STR
Dane County**

Letting of May 12, 2026

This is Addendum No. 01, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
66	Microtunneling Storm Sewer Pipe 108-Inch

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractor.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

ADDENDUM NO. 01

5992-10-20

May 6, 2026

Special Provisions

66. Microtunneling Storm Sewer Pipe 108-Inch, Item SPV.0090.02.

Replace entire article language with the following:

A Description

Furnish and install microtunneling storm sewer pipe specified in the plans and these specifications.

Work under this section provides for the trenchless installation of 108-inches in diameter storm sewer pipe. Installation shall be completed with an Earth Pressure Balance (EPB) Tunnel Boring Machine (TBM). Installation of the pipe, when completed, shall provide a watertight pipe of the specified alignment, slope, and depth specified in the plan set.

B Materials

Provide detailed information for all materials brought to the site which shall be approved by the engineer. The documentation shall include, where applicable, MSDSs, manufacturer's literature, testing documentation, and information detailing proper storage and handling. Provide the engineer documentation showing that materials meet the standards defined in section 608 of the standard specifications or here after.

Be responsible for transporting and storing all project materials in accordance with manufacturers or supplier's recommendations. All materials shall be stored within the project limits as defined on the plan set.

Any materials found to be defective shall be immediately marked, "DEFECTIVE – NOT FOR USE". The markings shall be clear from any point of view and shall be permanent. Transport defective material off-site for disposal.

Select Fiberglass Reinforced Polymer Mortar Pipe, Concrete Segments, or Reinforced Concrete Pipe.

Fiberglass Reinforced Polymer Mortar Pipe for jacking shall meet ASTM D3262. The pipe shall be manufactured with flush bell-spigot joints that conform to ASTM D4161 with elastomeric gaskets that meet ASTM F477. Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/16".

Fiberglass Reinforced Polymer Mortar Pipe shall be designed to withstand jacking loads as determined by the contractor and based on the means and methods of construction. The pipe shall be designed with a minimum factor of safety of 2.5 against jacking loads based on a straight alignment. The pipe shall have a minimum class of SN 72 psi with 0 psi internal pressure to withstand earth dead loads. The minimum pipe stiffness, when tested in accordance with ASTM D2412 shall normally be 140 psi.

Concrete Segments shall be constructed and in accordance with ASTM C1372. The segments shall be designed to withstand jacking loads as determined by the contractor based on the means and methods of construction. The pipe shall be designed with a minimum factor of safety of 2.3.

Reinforced Concrete Pipe shall be constructed and in accordance with ASTM C76. The pipe shall be a minimum Class III, shall be designed to withstand the jacking loads as determined by the contractor based on the means and methods of construction, and shall be manufactured with 6000 psi concrete. The pipe shall be designed with a minimum factor of safety of 2.3. Pipe shall be manufactured with a tongue and groove joint, which shall be fitted with an O-ring gasket meeting ASTM C361.

Be responsible for selecting a lubricant appropriate for the tunneling operations and soil conditions.

Be responsible for selecting a grout appropriate for the tunneling operations and soil conditions.

With the exception of reinforced concrete jacking pipe, all concrete used on in the storm installation shall have a minimum compressive strength at 28 days of 4000 psi. All other concrete parameters and installation

methodology shall comply with the City of Madison Standard Specifications for Public Works Construction, or as shown on the plan set.

Backfill placed in the launching and receiving pits shall conform to Article 202 of the Standard Specifications. Backfill material shall be free of boulders, masonry, organic matter, or other unsuitable fill material. Backfill shall be compacted in accordance with Article 202.3(c) Special Compaction to 90 percent of maximum density.

If compacting equipment cannot access all surfaces, slurry backfill shall be used. Type B Slurry, as defined in Article 301.9 of the Standard Specifications shall be used.

In areas where pipe is exposed, the contractor shall bed and backfill the pipe with Select Fill as defined in Article 202.2(b) of the Standard Specifications. Select Backfill shall be placed in accordance with Article 502 of the Standard Specifications and Standard Design Drawings 5.2.1 and 5.2.2.

C Construction

Excavate and backfill for work shaft, sheeting and shoring, control, handling and disposal of water, grouting, removing boulder obstructions encountered, and lighting and ventilation; furnishing pipes; and shall be in accordance to the construction details on the plans and requirements of this special provisions and standard spec 608.

Installation shall be completed with a methodology that maintains a stable or pressurized excavation face and minimizes soil loss. The pipe installation, when completed, shall provide a watertight pipe of the specified alignment, slope, and depth shown in the plan set.

Employ a Project Superintendent or the on-site lead staff for the sub-contractor responsible for the work associated with the bid items shall have completed a minimum of five tunnel installations, each with a minimum drive length of 500 linear feet of installed pipe at least 36 inches in diameter. One documented drive shall be equal to or greater than the longest drive length proposed for this project. The Project Superintendent or sub-contractor responsible shall be able to document experience with tunneling equipment similar to that proposed for this project. All documented experience shall have occurred within the past 15 years. At least one of the referenced projects shall include installation and use of an Intermediate Jacking Station, if an Intermediate Jacking Station is proposed for this project.

Employ a Project Superintendent who shall also have a minimum of five years' experience installing pit shoring systems of similar type and equal complexity to the system proposed for this project. The Superintendent shall have completed a minimum of five successful installations of pit shoring systems that are of a similar type and equal complexity to the system proposed for this project.

Employ a TBM Operator who shall have successfully completed a minimum of five installation projects, each with a minimum drive of 500 linear feet of installed pipe at least 36 inches in diameter. The TBM Operator shall be able to document experience with tunneling equipment similar to that proposed for this project. All documented experience shall have occurred within the past 15 years. Additionally, the TBM Operator shall have experience installing the same pipe material as proposed for this project. The TBM Operator shall have successfully completed a project in similar subsurface ground conditions. If an Intermediary Jacking Station is proposed, the TBM Operator shall document applicable experience.

Employ a professional engineer licensed by the State of Wisconsin, with a documented experience record demonstrating qualifications for the designs and calculations to be performed. The PE responsible for tunneling design shall submit an experience record that includes the five most recent tunneling projects, including the name of project, contracting agency for the project, name of general contractor, and project specifics.

The PE responsible for the design of the pit shoring system shall submit an experience record that documents a minimum of five years' experience in the design of the proposed pit shoring system to be used on this project. The PE shall have designed a minimum of five successful pit shoring systems for projects of equal type, size, and complexity as the proposed project.

If using rebuilt tunneling equipment, supply a written letter from the original machine manufacturer certifying the Machine Rebuilder is authorized to refurbish and recondition the TBM.

Employ or contract personnel with not less than three years' experience in the installation of similar systems of equal complexity as the proposed system. The shoring system installer shall have documented experience with a minimum of three successful installations of shoring systems of similar type and equal complexity to the proposed system.

Submit all submittals a minimum of 15 working days prior to the start of construction. The engineer will review the submittals and provide a written approval or request for clarification within five working days of receipt.

Submit a detailed plan describing the construction methodology and sequence of operations, including proposed tunneling equipment, proposed pit shoring systems, set-up within pits, general work site plan, method of muck removal and disposal, disposal locations, methods of protection and maintenance of the project site, and surface water and groundwater control methods. The contractor shall also submit a detailed site safety plan.

Submit a plan showing the overall layout of launching and receiving pits, including general site layout at each pit location, locations of control cabin, back up plant, material storage areas, stockpile areas, muck containment area, and location of all ancillary equipment. Within each pit, the contractor shall show locations of the laser guidance equipment, jacking equipment, tunneling equipment, pumps, pipes, cables, and entrance/egress locations.

Submit a detailed plan of the pit shoring system that is stamped and signed by a Professional Engineer who meets the requirements defined in section 520 of the standard specifications. The pit shoring system plan shall define the proposed system, including, location, layout, depth, extent of different types of support relative to existing features or proposed structures, and methods and sequence of installation. List all equipment anticipated for pit and pit shoring system installation. The contractor shall state the minimum safe lateral distance from the shoring system for vehicles, equipment, and stockpiles.

If a tieback system is used, the plan shall include tieback installation procedures and criteria for acceptance of tiebacks based on performance and proof tests.

Submit a detailed plan for groundwater control and storm water management plan at each pit location.

Submit a detailed plan showing thrust block design, including calculations. If soil augmentation or keying the thrust block is necessary, these details shall be included in the plan. Ensure thrust block design produces uniform deflection, will not impart excessive force on the shaft, and will not damage the jacking frame.

Plan review by the engineer will be for informative purposes only.

Submit a monitoring plan and schedule that will monitor both ground vibration and ground deformation adjacent to the excavations. The monitoring plan shall include procedures and locations for vibration monitoring equipment, deformation monitoring points and inclinometers, and observation wells/piezometers if necessary.

Submit an extensive and detailed plan of tunneling operations. Plan review by the engineer will be for informative purposes only. Retain full responsibility for adequate design and successful installation of the storm pipe. The plan shall explain the following items:

1. Launch Procedure, including modifications to the shoring through the first pipe in ground, any soil augmentation required, and a detailed plan of the entrance seal
2. Ventilation System Details, proving it is adequate and that air exchange within the tunnel is capable of controlling air quality, temperature, and maintaining proper function between the laser and target
3. Electrical System Details, including lighting details and power generation or supply details
4. Grade and Alignment Control System Details, including mounting details, monitoring plan, and the method of grade and alignment adjustments.
5. Jacking System Details, including estimated jacking force, intermediate jacking stations and their proposed spacing if applicable, method of operation, thrust capacity, and sleeve details. The

contractor shall also submit a plan detailing the method of control to prevent exceeding the maximum allowable jacking force.

6. Lubrication and Contact Grout Procedure, including the mix and equipment to be used for lubricating the pipe during jacking operations, and grouting the pipe post installation. This submittal shall also include:
 - All Material Safety Data Sheets (MSDS)
 - Volume estimation that considers annular space and anticipated soils
 - Grout and lubricant port locations
 - Estimated pressures
 - Details demonstrating that the lubrication system shall have sufficient pressure and volume for lubrication to perform as intended
 - Proposed methodology for preventing inadvertent returns as well as damage to pipe
 - Sample lubrication and grout log sheet including time, date, sampler, pit location, pipe number, slurry additives type, quantity added, soil type, viscosity, specific gravity, water added, and system operating pressures and volumes.
7. Groundwater Management Plan, including a detailed plan describing groundwater control provisions for the tunneling equipment.
8. Retrieval Procedure, detailing the process required for readying the pit and tunneling equipment when the TBM is within 10 feet of the receiving pit or earlier. The plan shall include descriptions of any required shoring modifications necessary for receiving the TBM and when these modifications are to be in place. The plan shall detail the exit seal and the methods for guiding TBM into the seal.

Submit documentation stating the type and size of the proposed TBM, including documentation from the TBM manufacturer proving that the selected machine is capable of performing adequately within the anticipated soil conditions as described in the contract documents. For used equipment, provide certification in writing from the machine rebuilder proving the equipment has been refurbished or reconditioned to meet the requirements for project conditions, including live traffic loads. Submit descriptions of four similar projects on which a similar system by the same manufacturer has been used. Documentation proving adequacy shall include, but not be limited to, motors, jacks, hydraulics, mechanical components, bearings, seals, and electrical equipment. Include qualifications of machine rebuilder, if applicable.

Submit documentation on the proposed jacking equipment, including manufacturer's literature and proof that the proposed system is capable of generating the necessary forces, and applying them uniformly to the pipe.

Submit information detailing the spoils handling equipment that will be used on site. This shall include details and manufacturer's literature on conveyance systems and slurry separation systems (if necessary).

Submit information detailing the proposed survey and guidance systems.

Select tunneling technology that is appropriate for the soil conditions and installation. The tunneling equipment shall be specifically designed for excavating, transporting, and separating materials encountered along the sewer alignment as described in the soil data. Proposed tunneling equipment shall be designed to operate in conjunction with a pipe jacking system. All pipes shall be installed by tunneling equipment.

The proposed tunneling equipment shall meet the following requirements:

- Tunneling equipment shall be capable of maintaining tunnel face under wet, dry, and adverse soil conditions. Tunneling equipment shall provide satisfactory support of excavated face at all times, including temporary shutdowns during operations. Tunneling equipment shall be operated in closed mode, unless the contractor can prove that their proposed system provides equal face support.

- Tunneling equipment shall be capable of advancement through heterogeneous soil conditions, including large cobbles and boulders.
- Tunneling equipment shall have articulated steering capabilities or be capable of steering in both the vertical and horizontal directions in order to maintain alignment within materials at tunnel level as described in the attached Soils Data.
- An appropriate seal shall be used between the lead jacking pipe and the TBM.
- The tunneling system shall be capable of synchronizing excavated material volume with the advancement rate of the TBM, to prevent excess ground loss and/or heave during operation.
- The tunneling system shall be equipped to efficiently move spoils or slurry from the excavation face to the launching pit.
- The tunneling system shall be capable of injecting lubricant around the exterior of the pipe being jacked.
- The tunneling system shall be capable of controlling heave and settlement by proper operation to acceptable tolerances as indicated.

The parameters listed above shall be logged in real time either manually or by a computer system. Data shall be provided to the engineer after each drive has been completed.

Select the appropriate cutter head that is most suitable for ground conditions.

Design the boring size such that steering capabilities are maintained throughout the pipe installation. Additionally, the overcut size shall prevent or minimize subsidence, water movement, jacking loads outside of the design range, and pipe failure. Overcut shall be no less than 0.25 inches and no more than 1.6 inches.

Provide a pipe jacking system with the following features:

- The main hydraulic cylinders shall be mounted in a jacking frame, located in the launching pit.
- The jacking system shall have sufficient jacking capacity to push the TBM and pipe segments between the pit locations, as shown on the plan set.
- The hydraulic cylinder extension rates shall be capable of being synchronized with the excavation rate of the tunneling equipment.
- The jacking system shall be configured such that jacking forces are uniformly distributed on pipe ends by the use of a thrust ring and packers.
- Hydraulic pressure and cylinder extension shall be capable of being monitored.

Provide a control system that allows the operator to monitor, in real-time, the position of the cutterhead or shield in relation to a design reference together with other information such as pitch, roll, yaw, complete guidance details, valve positions, thrust force, cutterhead torque, cutterhead RPM, rate of advance, and installed length. The control system shall also be able to provide real-time data on any deviation from the design line and grade by reference to the laser guidance system.

If a slurry system is used, the control system shall be able to provide real-time information on the volume of slurry flow in both the supply and return sides of the slurry loop, the slurry bypass valve position, and the pressure in the slurry chamber.

The control system shall be capable of integrating and monitoring excavation and spoil removal with simultaneous pipe installation. As each pipe segment is moved forward, the control system shall synchronize all operational functions of the system.

If a microtunneling system is to be used, the control system shall be fully remote and shall be capable of providing all information detailed above without the need for personnel to enter the tunnel.

Provide an active direction control system to be used during the tunneling process that has the following features:

- The tunnel line and grade shall be controlled by a guidance system.
- The guidance system shall be equipped with a high-intensity laser (maximum legal limit). The laser shall be securely mounted and protected from disturbance by personnel working within the launching pit.
- The guidance system shall be capable of maintaining the line and grade to the tolerances specified.
- The guidance system shall provide active steering information that is monitored and transmitted to the tunneling operator. At a minimum, this information shall include location of the laser beam on the target and the location of the cutterhead.
- The guidance system shall provide real-time positioning and operation information to the operator.
- The guidance system shall have a reference laser, or other submitted device, which indicates visually in the launching pit that the directional control laser has not been moved.
- The contractor shall provide adequate ventilation in order to maintain temperature control within the tunnel to minimize laser projection disturbance onto target.

The lubrication system shall be equipped with a pressure gauge, volumetric gauge, and a shut-off valve on the pump or at the point of injection. The lubrication system shall be capable of preventing over pressurization, which may cause damage to the pipe, heave, or inadvertent returns.

Provide and operate an annular space grout system suitable for any required grouting operations. Grouting operations shall not damage adjacent utilities or other properties. Grout shall not be injected at a pressure that will result in damage to the jacking pipe, pit shoring, and any existing structure or utilities. Prevent inadvertent returns.

The grout system shall be equipped with a pressure gauge, volumetric gauge, and shut-off valve at the point of injection. The grout system shall be capable of preventing over pressurization, which may cause damage to the pipe, heave, or inadvertent returns.

Should the engineer determine that additional grouting locations are required, provide equipment and materials to perform this work.

Provide adequate power generation equipment or arranging a power supply to the site. If the contractor proposes tunneling operations beyond the standard work hours of 7:00 am to 7:00 pm, the contractor shall have electricity supplied to the site and shall not use generators.

Contact Alliant Energy to discuss available electrical facilities. Payment for arranging power supply to the site shall be included with this bid item.

Install storm sewer pipe in the configuration shown on the plan set, via trenchless methods.

Maintain a safe and orderly work site for the duration of the project. The engineer shall have access to the site, equipment, materials, and construction data at all times. The engineer shall not be prohibited from recording any information at the site, including real-time tunneling data.

Maintain clean working conditions by removing muck, debris, equipment, and other materials that are not required for operations. Pipe and other materials shall be stored within the construction limits indicated on the plan set. Streets shall be kept clean at all times.

Provide suitable oil and gas containment basins to ensure no release of oil to the environment. All equipment shall be maintained and kept in proper repair. All oil, hydraulic fluid, or fuel leaks shall be repaired immediately. Any spill shall be cleaned up immediately and disposed of properly. If necessary, the contractor shall be responsible for filing a Spills Report with the Wisconsin Department of Natural Resources. Lost time due to the cleanup of fuel, oil, or hydraulic fluid releases shall not be compensated.

If damage to road surfaces, sidewalks, curb and gutter, private property, or other features occurs within the lay-down area or along the haul routes used in the project, repair this damage at no additional cost.

All work shall be performed in accordance with state and federal safety regulations. Provide a safety representative on site at all times.

At all times, the site shall be adequately secured to prevent vandalism or potential injury to passersby. The construction site shall be clearly marked as hazardous and closed to the public. All pits shall be fenced, barricaded, and clearly marked as dangerous and a fall hazard.

When working in contaminated soil and in pits where contamination is present, provide vapor testing equipment, and if necessary, ventilation equipment to assure a safe working environment.

If non-intrinsically safe equipment or pumps are required to run at locations where flammable vapors or materials are present, provide a fire watch during non-working hours.

Implement measures necessary to mitigate noise impacts caused by construction equipment and activities. Provide equipment with enclosures or construct portable sound barriers to minimize sound impact. If using generators, they shall be equipped with a "residential" silencer and acoustic enclosure. All equipment shall have mufflers, and the contractor shall arrange equipment in a manner that minimizes noise impact.

Be responsible for managing both groundwater and surface water throughout the construction site. This shall include management of disrupted storm water conveyance systems.

Manage storm water and groundwater in accordance with WDNR permits and regulations. If high-capacity dewatering, or Type II Dewatering, is deemed necessary, be responsible for obtaining the necessary DNR permits.

Non-contaminated groundwater and storm water may be discharged to the storm sewer system, provided appropriate sediment removal has taken place.

Groundwater from the S. High Point Road pit shall be discharged to the storm sewer system after appropriate sediment removal has taken place. If storm water from the S. High Point Road pit exhibits a sheen or any other signs of contamination, it shall be discharged to the sanitary sewer system. If storm water from this location does not exhibit signs of contamination, it may be discharged in a manner similar to other storm water throughout the project.

Prior to the disposal of contaminated water in the sanitary sewer system, obtain the necessary permits.

Work will be performed immediately adjacent to several utilities. Where marked on the plan set, be responsible for the protection and/or relocation of these utilities.

The allowable vertical and lateral movements shall not exceed one inch of movement at any location behind the pit shoring system.

Ground monitoring shall follow a procedure for reading and recording geotechnical instrumentation data that compares the current reading to the last reading collected to eliminate false readings.

The observed ground deformation shall be plotted over time. The plots shall be annotated with construction loading and excavation events that impact readings. The plots shall be evaluated by means of secondary rate-of-change plots to provide early warning of accelerating ground movements.

Be responsible for monitoring and maintaining adherence to the designed pipe alignment. Retain a licensed surveyor to check baseline and benchmarks prior to any tunneling work. The surveyor shall be responsible for reporting any errors or discrepancies to the engineer prior to construction.

Use the alignment and benchmarks shown on the plan set to furnish and maintain reference and control lines and grades for sewer pipe construction.

The pipe installation shall not vary more than 2.0 feet horizontally, or 0.1 feet vertically from any point along the alignment. The installed pipe shall be free draining along the entire pipe length.

Record the exact position of tunneling equipment at 10-foot intervals, or a minimum of three times per shift to ensure alignment is within specified tolerances. The contractor shall be prepared to immediately correct any misalignment before allowable tolerances are exceeded. The tunnel guidance system may be allowed to measure and record tunnel advancement; however, the contractor shall measure and record information

after the air temperatures have stabilized throughout the entire length of the pipe to ensure accurate readings.

If the pipe installation is found to be offline or grade, immediately notify the engineer and shall develop a plan to return the installation to the design location over the remaining portion of the drive at a rate of not more than 1 inch per 25 feet. If allowable tolerances are exceeded, pay all costs for correction, including redesign and reinstallation if necessary.

Perform a verification survey with a total station of the installed pipe from the launching pit to the receiving pit. Document measured conformance to the design line and grade of the installation and note locations of deviation, both direction and distance, of any non-conforming locations.

Ground deformation from tunneling activities shall not exceed 0.5 inches.

The pits shall be designed and constructed in a manner, and to a size that is appropriate to each pit location. The pit design shall include groundwater and surface water control measures or procedures.

If pit installation results in ground vibration, monitor adjacent structures for excessive vibration with seismic monitoring equipment. Be responsible for repairing any damage to adjacent structures that was caused by pit excavation, pipe installation, or pit backfilling.

Do not begin excavation on any pit until the related earth excavation and dewatering submittals have been approved by the engineer.

The pit shoring system shall be installed in accordance with the approved plan.

The pit shoring system and installation procedures shall be designed by a Professional Engineer with a current registration in the State of Wisconsin. The shoring shall be designed and installed in a manner that maintains lateral support, prevents loss of ground, limits soil movements to acceptable limits, and protects adjacent utilities and structures from damage.

Be fully responsible for pit design, installation, maintenance, and restoration. Be responsible for correcting any failure, damages, subsidence, upheaval, or cave-ins as a result of improper installation, maintenance, or design of the excavation support system. Pay for all claims, costs, and damages that arise as a result of the work performed.

Pits shall be secured with fence and concrete barriers. The fence shall be 9-gauge, galvanized, welded, chain-link material and shall have no gaps greater than 3 inches. The fence shall be a minimum of 8 feet high. Appropriate warning signs shall be placed on the fence including No Trespassing and fall warnings. The pit shall be protected from traffic by temporary concrete barriers. The barriers shall be designed, placed, and anchored in accordance with standard specifications Section 603, CMM 1-45, and FDM 11-50-35.

The pit shoring system shall be removed in a manner that does not endanger constructed or adjacent structures, utilities, or property. All voids shall be immediately backfilled in accordance with section 520 of the standard specifications.

If tiebacks are used, the tieback tension shall be released as the excavation is backfilled. The contractor shall not leave tensioned tiebacks in place at completion of the work.

No portion of the shoring systems shall be left in place.

A request to leave portions of the shoring system in place on S. High Point Road may be possible. If approved by the engineer, provide survey documentation of the horizontal and vertical extents of remaining items. Provide the engineer with a written description of what components were left in place, including the material, gauge, size, etc. Any portion of the shoring system left in place shall be cut off a minimum of two feet below the bottom of the most proximal building foundation and/or bottom of the box culvert, or a minimum of ten feet below finished grade in the launching and receiving areas.

Be responsible for the complete installation of the storm sewer pipe. Make themselves aware of the existing soil conditions within the plans set and as described in the geotechnical reports and understand that the existence of bed rock is expected. Make the geotechnical reports available to the tunneling operator.

Conduct microtunneling operations in accordance with all applicable safety rules and regulations and use methods that include due regard for safety of workers and the public, and protection for adjacent structures and utilities.

Perform all launching and retrieval operations in accordance with submitted documents and work plans. The contractor shall notify the engineer immediately upon implementation of any contingency plan.

No tunneling shall commence until the receiving pit is completed for retrieval of tunneling equipment.

Maintain the tunnel excavation within the rights-of-way, easements, and construction limits as defined in the plan set. The contractor shall maintain alignment and grade within the specified tolerances.

Operate the tunneling system in accordance with the manufacturer's operating parameters, parameters established in the specifications, and the parameters defined in the submittals. The rate of tunnel advancement shall be synchronized with the rate of muck removal to prevent excess ground loss or heave. Fluid jetting in advance of the pipe is prohibited.

The tunnel excavation shall be the minimum sufficient size to permit pipe installation via tunneling, with allowance for injection of lubricant. Maintain an envelope of lubricant around the exterior of the pipe during the entire jacking and excavation operation in order to minimize potential surface settlements from soil entering into the annular space and to reduce the exterior friction acting against the pipe, creating the possibility of pipe seizure.

If the pipe seizes in place, a rescue pit may be permitted with the location and operations subject to review by the engineer. Obtain written approval from the engineer prior to construction of this pit. Any rescue pit shall take into consideration impact to private property and public inconvenience. Rescue operations for seized tunneling equipment and pipe, including repairs to private property and reparations to property owners.

Be responsible for any soil modification procedures that may be necessary to maintain a stable excavation face, both during launching procedures and throughout the entire tunneling process. Soil stabilization procedures shall be approved by the engineer prior to implementation.

In the event a section of pipe is damaged during tunneling operations, or in the event of joint failure as evidenced by visible ground water inflow or other observations, use one of the following procedures to correct the damage at no additional cost to the project. The proposed method of repair shall be approved by the engineer prior to implementation.

- If the pipe is only minimally damaged, passes a leakage test, and maintains barrel and joint structural integrity, it may be repaired in place by a method approved by the pipe manufacturer and engineer.
- If the pipe is severely damaged, or the pipe shows evidence of joint failure, it shall be removed from the excavation by tunneling it through the length of the tunnel and removing it at a receiving pit. If at that time the removed pipe is found to be without defect, it may be placed back into the pipe string and jacked a second time.

Fill all annular space with contact grout in a manner that controls settlement and heave.

Manage, remove, and dispose of clean spoils produced during pit excavation and tunneling.

If a slurry TBM system is used, provide a slurry separation system that is capable of the following:

- The selected system shall provide adequate separation of muck from slurry, such that slurry has a sediment content within the limits defined in the approved submittals and can be returned to the cutting face for reuse.
- The slurry separation system shall use a mechanical separation plant, including scalping screens, shaker screens, desanding and desilting cones, and a centrifuge if deemed necessary. The separation system shall contain all muck on-site prior to disposal at an approved location.
- The slurry separation system and operating plant shall be appropriately sized for the size of the tunnel, soil conditions, and workspace available.

- The contractor shall diligently monitor the composition of the slurry to maintain slurry weight, gel strength, and viscosity limits as defined in the approved submittals.

Submit a daily log of the jacking operations at intervals of not more than one pipe length. The log shall contain the following information:

- Position of tunneling machine in relation to the design line and grade
- Jacking forces exerted on pipe at each jacking station
- Date, starting time, and finish time of the jacking operation
- Inclination
- Cutter head torque
- Slurry flow rates in both the supply (charge) and return (discharge) lines (if applicable)
- Slurry chamber pressure (if applicable)
- Spoils generated vs. anticipated spoils
- Position of steering jacks
- Amount of lubricant used (in gallons), its viscosity and pumping pressure
- Volume of spoil removed from the site
- Number of pipes installed or distance tunneled
- Important observations, e.g. settlement

Submit a log of ground vibration and deformation monitoring data, including horizontal and vertical movements of geotechnical instruments and ground water readings.

Submit a contingency plan that provides detailed plans should the following occur:

- Damage to pipe structural integrity and repair
- Obstructions
- Steering corrections
- Loss of ground
- Inflows at the shafts
- Slurry migration to the ground surface
- Excessive thrust wall deflection
- Excessive settlement or heave

D Measurement

The department will measure Microtunneling Storm Sewer Pipe (size) by the linear foot, acceptably completed, measured along the centerline of the pipe.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER DESCRIPTION UNIT

SPV.0090.02 Microtunneling Storm Sewer Pipe LF

Payment is full compensation for all required excavation for work shaft including rock excavation; for backfilling work shaft; for sheeting and shoring; for compaction and compaction testing; for control, handling

and disposal of water; for grouting; for removing boulders encountered; for compressed air; for lighting; for ventilation; for temporary support; for protection of existing utilities; and for furnishing storm sewer pipe.

END OF ADDENDUM