Request for Bid
Phase 1 Sewer Rehab Group 2 CIPP Addendum No. 2 to
RFB No. 197640.71.0390
November 19, 2021

The following information encompasses Addendum No. 1 for the above referenced RFB. Bidders shall fully consider and acknowledge this Addendum in the preparation and submittal of its formal Bid. Failure to do so may result in the rejection of the Bid.

Section 1 – Questions Received to Date

Section 2 – Attachment for Question #1

Section 3 – Updates to Technical Specifications

All other conditions and requirements remain unchanged.

Section 1
Questions Received to Date

Q1: Are there any work restrictions on the major thoroughfares of the project, other than traffic control as performed in accordance with MUTCD?

SARP10: There are restrictions on certain streets where lanes can only be blocked from 9:00 am till 3:00 pm in the day and 10:00 pm – 5:00 am. The list of these sections is included in this addendum.

Q2: Pipe ID #NN022949S – Plans reflect the diameter is 10", while the Pipe Bid Schedule reflects the diameter is 8". Will the Owner please confirm the diameter?

SARP10: The MACP indicates this is a 10-inch line.

Q3: Pipe ID #NN022936S – Plans reflects the diameter is 10", while the Pipe Bid Schedule reflects the diameter is 8". Will the Owner please confirm the diameter?

SARP10: The MACP indicates this is a 10-inch line.

Q4: Pipe ID #NN010108S – Plans reflects the diameter is 18", while the Pipe Bid Schedule reflects the diameter is 21". Will the Owner please confirm the diameter?

SARP10: The MACP indicate this is an 18-inch line.

Q5: Pipe ID NN023214S– Plans reflects the diameter is 6", while the Pipe Bid Schedule reflects the diameter is 8". Will the Owner please confirm the diameter?

SARP10: The MACP indicates this is an 8-inch line.

Q6: Pipe ID FS045188.01S – Plans reflect a half bend/half-circular notation. What is the meaning of the bend/half-circular notation? Is this a siphon or bends?

SARP10: The bend reflects that this segment is above the other line that it is crossing.

Q7: Pipe ID's NN022530S, NN022530, NN010116S and NN010819S – appear to be within 25' of centerline of existing railroad tracks. Will these areas fall within the Railroad's ROW and jurisdiction? If any of the areas of this project fall within the railroad ROW, will the Owner please provide the operator of the railroad(s) in that area(s)? Given the proximity to the railroad tracks will railroad permits, insurance, personnel, flagging, etc. be required? If permits shall be required, will the Owner obtain these or know the cost? If the Owner currently has a permit underway, will they please provide a copy?

SARP10: NN010819S will be removed from scope. NN022530S and NN010116S appear to be within the 25-foot limit of the nearest Railroad tracks. It is the contractor's responsibility to coordinate and obtain any permits necessary to complete the work. SARP will assist if there are any issues with completing the work.

Section 2
Attachment for Question #1

LIST OF STREETS FOR 9:00 – 3:00 WORK ONLY

March 29, 2018

1. Germantown Pkwy (Wolf River to Hwy 64)
2. Poplar Ave. (I-240 to Kirby Pkwy)
3. Poplar Ave. (Perkins to I-240)
4. Lamar Ave. (Holmes to Winchester)
5. Ridgeway (Primacy Parkway to Poplar)
6. Park Ave. (Primacy Parkway to Massey)
7. Summer Ave. (Hwy 70) (Perkins to Sycamore View)
8. Shelby Dr. (Pleasant Hill to Mendenhall)
9. Walnut Grove (I-240 to Germantown Pkwy)
10. Walnut Grove (Perkins to I-240)
11. Hwy 64 (Appling to I-40)
12. Sycamore View (Summer Ave. to Macon)
13. Lamar (East Parkway S. to Airways)
14. Getwell (American Way to Park Ave.)
15. Park Ave. (Colonial to White Station)
16. Highland (Park to Walnut Grove)
17. Perkins (Park to Poplar)
18. Perkins (American Way to I-240)
19. Wolf River (Kirby to Germantown)
20. East Parkway (Poplar to Summer)
21. Covington Pike (Pleasant View to Summer)
22. Mendenhall (Park to Walnut Grove)
23. Bellevue (Union to Lamar)
24. Mullins Station (Farm to Appling)
25. Farm (Walnut Grove to Mullins Station)
26. Pauline (Union to Poplar)

Section 3
Updates to Technical Specifications
(addition of 02531, 02533, and Pipe Bid Schedule with an update to 02535)

SECTION 02531
INSTALLATION AND REPLACEMENT OF MANHOLES

PART 1 GENERAL

1.01 SCOPE

A. This Work shall consist of the removal and replacement of existing or installation of new manholes for sanitary sewers as shown on the Drawings, stipulated in the Contract Documents, or as directed by the Purchaser. The construction shall be accomplished by these Specifications and in conformity with the details shown on the Drawings or established by the Purchaser.

B. Where existing manholes are being replaced, the Subcontractor shall arrange the work such that sewage flow shall be maintained during the construction period with no discharge of sewage slowing into an open trench and provide necessary bypass pumping capacity to carry flow downstream of the manhole to be replaced. Additionally, the Subcontractor shall be responsible for properly removing and disposing of the existing manhole when replaced.

C. All new manholes shall be precast concrete. The top section of the manholes shall be either flat top or eccentric cones as shown on Drawings.

D. Cast iron frames shall be set at the required elevation and properly bonded to the flat top, eccentric cone, or grade rings with two rings of butyl mastic sealant and anchor bolts.

1.02 SUBMITTALS

A. Unless otherwise specified all sample submittals shall be delivered to the Program Manager within two weeks of the NTP.

B. Shop Drawings:

1. Precast Manholes: Details of construction.

2. Precast Base, Cones, and Top Slab Sections: Details of construction.

3. Manholes Over Existing Piping:

   a. Drawings and schedule for diverting flow.

   b. Certificate from manufacturer of castings indicating they meet applicable requirements of these Specifications.

   c. Precast Manhole Sections: Manufacturer’s results of tests performed on representative sections to be furnished.

   d. Certified load test data for precast manhole steps.

   e. Plan for diversion of flow during installation of manhole over existing piping

1.03 DELIVERABLES

A. Manhole Acceptance

1. All manholes shall be subject to visual inspection by the Purchaser’s Representative for faults, defects, or deviations from the Drawings and any such deviation or omission will

be corrected by the Subcontractor. All tests shall be made by the Subcontractor who will provide necessary equipment for testing in the presence of and under the supervision and instructions of the Purchaser's Representative.

B. Manhole Vacuum testing for Precast Manholes

1. The Subcontractor shall provide all labor and equipment for vacuum testing.

2. All manholes shall be vacuum tested following backfill and compaction. The ring and lid casting assembly shall be installed prior to testing. The testing equipment shall consist of a gasoline-powered vacuum pump with sufficient vacuum hose length and a test head of proper size to fit the inside opening of the manhole. The test head shall be equipped with an inflatable rubber bladder to affect the seal to the manhole, an air pressure gauge, and a safety valve for filling the bladder, a 30-inch Hg liquid-filled vacuum gauge, a double air exhaust manifold with quarter turn ball valves, three bolt-on feet, and a bridge assembly with height adjustment rod.

3. Subcontractor shall plug all pipe openings, taking care to securely brace the plugs and the pipe. The plugs shall be placed a minimum of 6 feet beyond the manhole wall.

4. With the vacuum tester in place, Subcontractor shall inflate the compression to affect a seal between the vacuum base and the structure. Subcontractor shall connect the vacuum pump to the outlet port with the valve open and evacuate the manhole to 10-inches Hg (0.3 bar) for 48 inch diameter manholes and 5-inches Hg (0.15 bar) for 60-inch and greater diameter manholes.

5. Subcontractor shall close vacuum inlet/outlet ball valve, disconnect the vacuum pump, and monitor the vacuum for the specified time period. If the vacuum does not drop in excess of 1-inch Hg over the specified time period, the manhole is considered acceptable and passes the test. If the manhole fails the test, the Subcontractor shall identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Once the leaks have been identified, Subcontractor shall complete all necessary repairs by sealing the leaks of the manhole to the satisfaction of the Purchaser, and repeat test procedures until satisfactory results are obtained.

Vacuum Test Timetable

Depth (Feet)	**Manhole Diameter (Inches)**		
	48"	**60"**	**72"**
4'	10 sec.	13 sec.	16 sec.
8'	20 sec.	26 sec.	32 sec.
12'	30 sec.	39 sec.	48 sec.
16'	40 sec.	52 sec.	64 sec.
20'	50 sec.	65 sec.	80 sec.
24'	60 sec.	78 sec.	96 sec.
*	5.0 sec.	6.5 sec.	8.0 sec.

*Add extra testing time "T", for each additional 2-foot depth. (The values listed above have been extrapolated for ASTM designation C924-85.

C. Warranty and Guarantee for Precast Manholes

1. The Subcontractor shall guarantee the rehabilitated manholes for ten (10) years after acceptance by the Owner to the extent that he will repair any leaks that may appear in them during this period because of faulty workmanship or materials furnished by him at no additional expense to the Owner.

D. Deliverables

1. The Subcontractor shall provide post-rehabilitation MACP inspections for each manhole in accordance with **Specification Section 00001 – Manhole GPS and MACP Inspection.**

PART 2 PRODUCTS

2.01 MATERIALS

A. Construction Material

1. All material furnished by the Subcontractor shall be new, high quality and free from defects. Previously used material in acceptable condition shall be allowed for bracing, forms, false work, and similar uses. Material not conforming to the requirements of the Specifications shall be considered defective and will be removed immediately from the site.

B. Qualification of Manufacturer

1. Manhole for sanitary sewers shall be the standard product of an established, reputable manufacturer made in a permanent plant. Suppliers for each material to be used by the Contractor shall be subject to the approval of the Purchaser. No material shall be delivered until the manufacturer and product have been approved by the Purchaser.

C. Mortar

1. Mortar shall be composed of one part Portland cement and two parts sand (volumetric measure) thoroughly mixed in a tight box, with water added gradually and mixed continually until mortar has attained the proper consistency for use in brick masonry; prepared only in such quantities as needed for immediate use; mortar mixed for more than 30 minutes, retempered, or previously set will not be allowed.

D. Cast Iron Castings

1. Castings shall be cast iron conforming to the Standard Drawings and the requirements of Class 30 ASTM A48; made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking, and such that they are in contact with frame flanges for the entire perimeter of the contact surfaces. Castings shall be obtained from Universal Scaffolding.

E. Manhole Steps

1. Manhole steps shall not be allowed in sewer structures.

F. Butyl Mastic Sealant

1. The sealant shall be used when joining the casting frame to the precast manhole to provide a watertight structure. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler,

and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space. The Subcontractor shall use two complete ropes at each joint. The sealing compound shall be protected by a suitable removable two-piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The sealant shall also meet the requirements of the following table:

Composition	**Test Method**	**Minimum**	**Maximum**
Bitumen (Petroleum Plastic Content)	ASTM D4	50	70
Ash Inert Mineral Matter	AASHTO T11	30	50
Volatile Matter	ASTM D6	---	2.0
Property	**Test Method**	**Minimum**	**Maximum**
Specific Gravity at 77 degrees F	ASTM D71	1.2	1.3
Ductility at 77 degrees F(cm)	ASTM D113	5.0	---
Softening Point	ASTM D36	320 degrees F	---
Penetration 77 degrees F (150 gms) 5 sec.	ASTM D217	50	120

G. Pre cast Manholes

1. All components shall meet the requirements of the Standard Drawings, ASTM C478, and ASTM C76 Class III. The mix design shall be:

Type I Portland Cement Content	615 Pounds per Cubic Yard
Fly Ash Content	85 Pounds per Cubic Yard
Coarse Aggregate Content	1,600 Pounds per Cubic Yard
Fine Aggregate Content	1,250 Pounds per Cubic Yard
Maximum Water/Cement Ration	0.40
Superplasticizer shall be added to create a workable slump.	

2. All cone sections and transition sections shall be eccentric. Barrel sections shall be custom made with openings to meet indicated pipe alignment and invert elevations.

3. The circumferential reinforcement for the manhole sections shall consist of welded wire fabric per ASTM C478.

4. Manholes shall be constructed with the minimum number of sections possible that the precaster can provide, to minimize the number of joints in the manhole. Minimum manhole section shall be 16 inches deep.

5. Each joint shall be a tongue and groove with two layers of butyl mastic sealant.

6. Pipe Connections:

a. Pipe connections to precast concrete manholes shall be with A-LOK cast in-place gaskets for new and replacement manholes. Grout shall not be allowed to encase A-LOK gaskets. Pipe connections for cured in place or for existing pipe shall be KOR N SEAL flexible connectors. Proper torque shall be applied to KOR-N-SEAL flexible connectors with a torque wrench per manufacturer's specifications.

7. Channels and benches shall be factory grouted only. There shall be no field grouting of channels or benches.

8. Where possible a minimum line drop of 0.1 foot shall be provided across new manholes.

9. Where the difference in invert elevation of two intersecting sewers in a manhole is 2 feet or more, a drop connection shall be installed as directed by the Purchaser.

10. Where invert elevations are not shown on the Drawings, pipes of differing sizes enter and exit manholes, all pipe crowns shall be matched to the same elevation.

11. The bottom of all precast base sections 4 feet in diameter shall extend a minimum of 6-inches beyond the outside wall of the manhole riser. The bottom of all precast base sections and cast-in-place bases 5 feet in diameter shall extend a minimum of 7-inches beyond the outside wall of the manhole riser. The bottom of all precast base sections and cast-in-place bases 6 feet and larger in diameter shall extend a minimum of 8-inches beyond the outside wall of the manhole riser.

12. For manholes four to six feet in diameter and less than twenty feet deep, precast reinforced concrete manhole base sections shall be a minimum of 8 inches thick. For all others, base sections shall be a minimum of 12 inches thick. All precast manhole base sections shall be reinforced with Number 4 steel reinforcing bars placed 6 inches on center each way and at mid depth of the slab, unless shown otherwise on the Drawings.

13. The interior of the manhole sections shall be a smooth, cylindrical surface. Lifting holes, when provided, shall be filled with expanding grout, or other approved materials.

14. All precast reinforced concrete manhole sections specified herein shall be inspected by the Purchaser's Representative. All materials that fail to conform to these Specifications will be rejected. After delivery to the Site, any materials that have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the Site by the Subcontractor at no cost to the Purchaser.

2.02 EQUIPMENT

A. The Subcontractor shall furnish in good condition all equipment and facilities as required for the proper execution and inspection of the work. All equipment and facilities will be on site and approved by the Purchaser before work will be permitted to begin.

PART 3 EXECUTION

3.01 SITE PREPARATION AND RESTORATION

A. Rights-of-Way and Easements

1. The Subcontractor shall confine his construction activities to City of Memphis Rights-of-Way and Easements. The Subcontractor shall be responsible for obtaining written agreements for use of private property outside City acquired rights-of-way/easements for such purposes as storage of material and equipment and access to the construction site.

The Subcontractor shall immediately provide a copy of all such written agreements to the City and Purchaser upon obtaining the same.

B. Clearing of Rights-of-Way and Easements

1. The Subcontractor shall confine his clearing of rights-of-way and easements to the least area necessary for construction of facilities shown on the Drawings. The Subcontractor shall protect as many trees and shrubs within the area as possible. Where necessary for construction, the Subcontractor shall clear all live and dead vegetation and growth, pole stubs, logs, and other objectionable material. Cleared material shall be removed to within 3 inches of existing ground. This work shall be done well before excavation operations but only after erosion controls have been placed.

C. Location of Existing Obstructions

1. Locations of obstructions shown on the Drawings are approximate and are not intended as an accurate location of such obstructions. Obstructions not shown on the Drawings but encountered by the Subcontractor shall be removed and replaced in their original state or protected by the Subcontractor at no additional cost to the Purchaser.

D. Removal of Obstructions

1. The Subcontractor shall demolish and remove all structures and structure foundations, abandoned vehicles, appliances, and rubbish within the right of way/easement limits necessary for the performance of the work.

E. Protection of Obstructions Outside Easement Limits

1. The Subcontractor shall protect and avoid damage to all trees, shrubs, plants, fences, structures, and all other objects outside the right of way/easement limits shown on the Drawings and/or Plats due to construction operations. All damage shall be repaired or restored at the Subcontractor's expense. Particular attention shall be paid to avoid damage to trees, shrubs, bushes, and private property located next to rights of way/easements. No trees, plants, or other objects may be removed outside such limits without written permission of the property owner.

F. Special Protection of Obstructions Inside Easement Limits

1. Wherever the underground installation of sanitary sewer facilities will go through surface improvements previously made by the City, other governmental bodies, or property owners, the Subcontractor will be responsible for their protection and preservation. This responsibility includes the removal and storage of such improvements to allow replacement and restoration as close as possible to the undisturbed condition.

G. Disposal of Debris

1. All trees, brush, logs, snags, leaves, sawdust, bark, and refuse shall be collected and disposed of according to the City Code of Ordinances at the expense of the Subcontractor. There will be no separate pay item for disposal of debris. Debris shall be removed from the site when practical and shall not be left until the completion of the contract. Burning of debris shall not be allowed. When material is to be disposed of outside the easement, the Subcontractor shall first obtain written permission from the property owner on whose property the disposal is to be made and will file a copy with the Purchaser. Unless otherwise provided in the Contract Documents, the Subcontractor will arrange for disposing of such material outside the right of way/easement. No debris will be deposited in wetlands.

H. Replacement of Fences

1. Any fences disturbed inside the right of way/easement limits will be replaced or restored to their original or better condition. Any fences removed will be replaced in their original location. Fences in such poor condition that they cannot be taken down and rebuilt with the same material shall be replaced with new fence material similar in original quality, size, construction, and appearance to the removed fence. Exceptions to this requirement shall be allowed if written releases are obtained from the property owners by the Subcontractor and submitted to the Purchaser.

I. Restoration of Turfed Areas

1. All areas shall be restored as nearly as practicable to their original condition. Finished lawn areas where soil has been deposited shall be cleared to the level of the existing sod and then raked and watered. Areas where sod has been damaged, destroyed, or ruts have been filled shall be resodded. After final restoration of the settled trench surfaces, trench areas and areas regraded as part of the construction shall be resodded, unless otherwise shown on the Drawings or directed by the Purchaser. Sod must be living at the time of final acceptance of the project.

3.02 BACKFILLING

A. General

1. After sanitary sewer facilities have been bedded and installed according to these Specifications and upon permission of the Purchaser, the backfill may be placed. Backfilling operations shall continue following as closely behind manhole installation as practical. All backfill shall be placed in uniform horizontal layers. Pushing backfill material down a ramp into excavated areas shall not be permitted. No trash shall be allowed to accumulate in the space to be backfilled. Particular care shall be taken to avoid allowing wood to be included in the backfill, other than sheeting and shoring that has been approved to be left in place.

2. The Subcontractor shall be responsible for the condition of the trenches and filled areas during the contract and warranty period. The Subcontractor shall maintain frequent inspection of the same. If anytime during the 12-month warranty period the trenches or filled areas settle or sunken places appear, the Subcontractor shall be required to refill these sunken places when they are discovered with suitable material and shall replace all damaged curb, gutter, and sidewalk. All soft or dangerous trenches shall be marked, barricaded and caution lighted for the protection of the public.

3. Property with an existing dwelling located on it or lots within a developed subdivision or planned development are considered improved property.

B. Street Right of Way and Improved Property

1. Backfill Material:

a. Backfill for manhole excavations through pavements in street or highway right of way or where the Purchaser orders, shall be made with pit run gravel or other acceptable material as approved by the Purchaser. The backfill shall be from the top of the pipe embedment material or manhole foundation to the subgrade elevation of the pavement. Pea gravel or similar granular material approximately uniform in size and without bonding properties shall not be used.

2. Backfill for manhole excavations beyond pavements in street or highway right of way or outside public right of way shall be made with select earth from the top level of the pipe embedment material or foundation to the subgrade elevation in paved area, or within 1 inch of the surface in areas to be sodded, or to the surface in all other areas.

3. Select material shall be free from debris, organic matter, perishable compressible material and shall contain no stones or lumps larger than 6 inches. Rocks and lumps smaller than 6 inches shall not exceed an amount that will interfere with the consolidating properties of the fill material. Care shall be taken that stones and lumps are kept separated and well distributed, and that all voids are completely filled with fine material. No rocks or lumps shall come in direct contact with the pipe. The upper 3 feet of backfill in sodded or planted areas shall be free of rocks or lumps larger than 1 inch in diameter.

4. Placement and Compaction:

   a. Backfill material shall be placed by hand in 6 inch loose layers and tamped to a point 2 feet above the outside top of the pipe. Backfill shall be compacted with suitable mechanical tamping equipment with special care being taken not to damage the pipe or joints. Use of compaction equipment directly above semi-rigid and flexible pipe should be avoided until sufficient backfill has been placed to ensure that the equipment will not damage the pipe. A minimum of 36 inches of compacted backfill above the top of semi-rigid and flexible pipe shall be in place before wheel loading and a minimum of 48 inches of compacted backfill before use of pneumatic tampers. From these elevations to the subgrade elevation of the pavement, bottom of the sod, or to the original ground surface, suitable backfill shall be mechanically placed in 9 inch, maximum, loose layers. All backfill material shall be compacted to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698).

C. Open Areas and Unimproved Property

1. Backfill of excavations on unimproved property shall be made with select material from the top level of pipe embedment material or foundation to the surface. Non-granular select material to be used for backfill shall be free from debris, organic matter and perishable compressible material, and shall contain no stones or lumps or rock fragments larger than 6 inches. Rocks or lumps smaller than 6 inches in diameter shall not exceed an amount that will interfere with the consolidating properties of the fill material. No rocks or lumps shall come in direct contact with the pipe. Stones and lumps shall be kept separated and well distributed, and all voids shall be completely filled with fine material.

3.03 REMOVAL OF EXISTING MANHOLES

A. Existing manholes and structures to be removed shall be shown on the Drawings or as directed by the Purchaser. The City reserves the right to retain or reject salvage of any materials encountered. Unless otherwise specified, salvaged rims and covers remain the property of the City and shall be delivered by the Subcontractor to the City yard as directed by the Purchaser. All remaining materials become the property of the Subcontractor who shall be responsible for disposal.

3.04 GENERAL CONSTRUCTION REQUIREMENTS

A. New manholes and structures shall be constructed of plain or reinforced concrete. Where the top elevation is not shown on the Drawings, the manhole or structure shall be built to conform to the elevation of the existing final grade or as ordered by the Purchaser. Completion of the manhole shall include the installation of fittings, connections to pipes, placing of castings, testing, and other construction as shown on the Drawings.

B. Inlet and outlet pipes shall extend through the walls of manholes to allow for water tight connections with the manhole walls. The ends shall be cut off flush with the inside surface of the wall as shown on the Drawings, design standards, or otherwise directed by the Purchaser. The pipes shall intersect at the structures so the inlet pipe will be aligned in the direction of outlet pipe such that counter-flow is prevented. Water stops shall be installed around pipes as they pass through the sanitary manhole wall.

C. Inverts shall be of Class A concrete poured to conform to the shapes shown on the Plans or otherwise directed. The inverts shall be constructed as to cause the least possible resistance to flow. The shape of the inverts shall conform uniformly to inlet and outlet pipes. A smooth and uniform finish shall be required.

D. Dewatering

1. Subcontractor shall furnish, install and operate pumps, pipes, appurtenances, and all equipment of sufficient capacity required to remove any groundwater encountered in the excavation. Subcontractor shall conduct said groundwater away from the construction site in an approved manner. Generally, dewatering is considered to be incidental to the construction of sewer manholes.

E. Bypass Pumping

1. Subcontractor shall furnish, install, and operate pumps, pipes, appurtenances, and all equipment of sufficient capacity required to maintain sewage flow around the work area. Subcontractor shall conduct said bypass pumping in an approved manner. Generally, bypass pumping is considered to be incidental to the construction of sewer manholes.

F. Traffic Control

1. All traffic control shall be installed and maintained in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). At a minimum, the Subcontractor must have two trucks with flashing yellow lights on the work site. Traffic cones must also be placed downstream of the construction site to divert cars into the adjacent lane(s) per MUTCD requirements. On roads with heavy traffic volume, a flagman may also be needed to assist with traffic control. For bidding purposes, the Subcontractor should assume that a flagman will be needed on 30 percent of the setups.

3.05 INSTALLATION – PRECAST MANHOLES

A. Manhole Foundations

1. Precast concrete manholes shall be built according to the Drawings or as directed by the Purchaser. All precast manholes shall use either a concrete slab constructed of Class A concrete on a 12-inch thick No. 67 crushed limestone foundation and will be cast integrally with the base section and the inlet and outlet pipes as shown on the Drawings or the precast manhole shall use a precast base section conforming to this Specification. The stone base shall be fully encapsulated in a geotextile fabric as indicated on the plans or as directed by the Purchaser. The Subcontractor shall dewater sufficiently to maintain the ground water level at or below the bottom of the manhole foundation prior to and during placement of the foundation.

B. Manhole Installation on Existing Lines

1. For all lines 12 inches in diameter or less, a section of pipe shall be removed and a complete precast manhole installed. The existing pipes shall be joined by a flexible

coupling to pipe extensions from the manhole. Minimum 4-foot pipe extension shall be required from manhole to connect to existing pipe.

C. Manhole Diameters

1. In general, the internal diameter of manholes shall be 4 feet.

2. Manhole diameter sizing, however, is contingent upon limitations of manufacturer due to pipe sizes and pipe deflections at manhole. Subcontractor shall verify proper manhole diameter is provided based on proposed manhole pipe configuration and pipe sizes indicated. Manhole sizing shall be approved by the Purchaser.

D. Frames and Covers

1. Cast iron frames and covers shall be set at the required elevation and properly bonded to the masonry with two rings of butyl mastic sealant and anchor bolts.

2. City Standard watertight frames and covers shall be used in flood prone areas, and areas where water ponds or could pond, including traffic areas.

   a. Where shown on the Drawings, vent stacks shall be installed in long runs of sewers, potentially with watertight frames and covers. Vents shall be designed and constructed to preclude water entering the sewer system during storm events through the vents.

3. City Standard frame and cover obtained from Universal Scaffolding shall be used in all other areas.

4. Manhole rim elevations shall be set at grade in traffic areas and finished landscaped areas (finished grade is at the top of mulch in finished landscape areas), shall be set at 3 inches above grade in non-finished landscaped areas, and to be set at 2 feet or more above finish grade in non-traffic and non-landscaped areas.

5. Wherever manholes are constructed in paved areas, the top surface of the frame and cover shall conform to the exact slope, crown, and grade of the existing adjacent pavement.

3.06 PROTECTION OF DOWNSTREAM FACILITIES

A. The Subcontractor must take all steps necessary to assure that no material is allowed to fall into the line during his installation process. The Subcontractor shall bear all cost of repairs resulting from any damages to downstream facilities resulting from failure to abide by this stipulation.

3.07 WASTEWATER SPILLS

A. Should the Subcontractor spill any wastewater, such that the sewage either immediately or ultimately enters the waters of the State of Tennessee, then the Subcontractor shall be completely responsible for any fines or penalties imposed on the Purchaser or the Subcontractor by the USEPA or the State of Tennessee.

PART 4 MEASUREMENT & PAYMENT

4.01 MEASUREMENT

A. Precast Manhole Replacement

1. Precast manhole replacement will be measured per vertical foot of manhole from the downstream invert up to the bottom of the frame casting.

B. Precast Manhole Installation

1. Precast manhole installation will be measured per vertical foot of manhole from the downstream invert to the bottom of the frame casting.

C. Pavement Backfill

1. Pit run gravel or other acceptable material used for backfill under pavements or other areas directed by the Purchaser will be measured by the cubic yard. The backfill will extend 12 inches around the outside of the masonry or concrete work to allow for proper placement. No payment will be made for additional backfill used outside of 12 inches unless approved prior to completion by the Purchaser.

D. Traffic Control

1. Traffic control will be measured per Crew Day for each manhole installation/replacement including all appurtenances required to comply with MUTCD Standards. Traffic control does not apply to manholes being installed/replaced in alleys or other locations where traffic is not impacted.

E. Dewatering

1. Dewatering is considered to be an incidental to sewer manhole rehabilitation.

F. Bypass Pumping

1. Bypass pumping is considered to be an incidental to sewer manhole installation and replacement.

4.02 PAYMENT

A. Precast Manhole Replacement

1. Precast Manhole replacement will be paid at the contract unit price per vertical foot, which shall be full compensation for thebase, precast sections, adjusting rings, as needed, gaskets, steps, cast-in or core drilled pipe openings, pipe connectors, grout, manhole rims, frames, and covers, and vacuum testing, and removal and approved offsite disposal of materials, including manhole being replaced.

B. Precast Manhole Installation

1. Precast Manhole installation will be paid at the contract unit price per vertical foot, which shall be full compensation for the base, precast sections, adjusting rings, as needed, gaskets, steps, cast-in or core drilled pipe openings, pipe connectors, grout, manhole rims, frames, and covers, and vacuum testing, and removal and approved offsite disposal of materials.

C. Pavement Backfill

1. Accepted quantities of pit run gravel or other acceptable material used for backfill under pavements or other areas designated by the Purchaser will be paid for at the contract unit price per cubic yard furnished and placed, which will be full compensation for furnishing, placing and compacting the selected material.

D. Traffic Control

1. Traffic Control will be paid per Crew Day for each manhole installation/replacement including all appurtenances required to comply with MUTCD Standards. Traffic control does not apply to manholes being installed/replaced in alleys or other locations where traffic is not impacted

4.03 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02531-4.01.A	PRECAST MANHOLE REPLACEMENT	VERTICAL FOOT
02531-4.01.B	PRECAST MANHOLE INSTALLATION	VERTICAL FOOT
02531-4.01.C	PAVEMENT BACKFILL	CUBIC YARD
02531-4.01.D	TRAFFIC CONTROL	CREW DAY

END OF SECTION 02531

SECTION 02533
REHABILITATION AND REPAIR OF EXISTING MANHOLES

PART 1 GENERAL

1.01 SCOPE

A. This work shall consist of the repair and rehabilitation of existing sanitary sewer manholes as shown on the Drawings, stipulated in the Contract Documents, or as directed by the Purchaser. The construction will be accomplished by these Specifications and in conformity with the details shown on the Drawings or established by the Purchaser. The Subcontractor shall perform all work necessary to complete the Contract with the best modern practice. Unless otherwise provided, the Subcontractor is required to furnish all labor, materials, equipment, and incidentals required to rehabilitate or repair manholes as noted on the Drawings or directed by the Purchaser.

B. Accurately field measure and size each individual manhole. Each existing sewer manhole designated to be repaired or rehabilitated may have a different configuration and varying field dimensions.

C. Each manhole to be rehabilitated shall be thoroughly cleaned of all loose or missing bricks, loose mortar, holes, etc. shall be repaired. All leaks shall be plugged with active leak-stop material prior to manhole rehabilitation. The material for stopping leaks and repairing nonleaking holes, cracks, etc. in concrete and masonry manholes shall be compatible with the coating system used for rehabilitation.

D. The presence or absence of leakage through manhole walls noted on the manhole inspection reports and as seen in the Subcontractor's independent manhole inspections prior to bidding or construction depend on the groundwater levels and conditions at the time of the inspections. High groundwater levels in the project area typically occur in the dormant season (December through May) but will vary with rainfall in any given year and sewer location. Under certain circumstances, the groundwater currently entering the leaking sewer mains and laterals may migrate to the manholes after the sewer mains and laterals are rehabilitated or replaced. The Subcontractor shall reflect assumptions and judgments on leakage through manhole walls based on this information in the unit prices bid for lining manholes. All leakage shall be stopped prior to lining manholes. No additional payment will be made for repairing leaks not visible prior to bidding or sewer rehabilitation.

E. When applicable, the manhole lining shall not be installed until all main sewer lining and other manhole rehabilitation work is complete.

F. Where existing manholes are being repaired or rehabilitated, the Subcontractor shall arrange his work so that sewage flow will be maintained during the construction period with no discharge of sewage into an open trench, and no backup of sewage into the existing line. The Subcontractor shall provide necessary bypass pumping capacity to carry flow downstream of the manhole to be rehabilitated or repaired.

G. Replacement Manholes shall conform to Specification Section 02531.

H. Cast iron frames shall be set at the required elevation and properly bonded to the flat top, eccentric cone, or grade rings with two rings of butyl mastic sealant and anchor bolts as specified in Section 02532 Sanitary Sewer Manhole Adjustments.

I. Definitions/Standards

1. ASTM D-638: Test Method for Tensile Properties of Plastics.

2. ASTM D-695: Test Method for Compressive Properties of Rigid Plastics.

3. ASTM D-790: Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

4. ASTM D-4541: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

5. ASTM D-412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

6. ASTM D-2240: Standard Test Method for Rubber Property Durometer Hardness

7. ASTM D-522: Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

8. ICRI03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

J. Quality Assurance

1. The subcontractor shall furnish materials of quality required by the American Society for Testing and Materials (ASTM) standards and industry approved standards and specifications.

2. Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications.

K. Sequencing

1. All required interruptions of flow through manholes or any other portion of the sanitary sewer system shall be coordinated with the Owner and Purchaser, and approval must be received from the Purchaser prior to the interruption.

L. Substitutions

1. Should the Subcontractor wish to use any brand or type of material other than as specified herein, he shall so state in writing to the Purchaser naming the proposed substitution and manufacturer. This statement shall be accompanied by a certificate of compliance from an approved independent testing laboratory that the proposed substitute meets or exceeds the specified requirements and has been tested in accordance with the specified test standards. The statement shall also include documented proof that the proposed brand or type of material has a proven record of performance when used in the intended application as confirmed by actual field test or successful installations.

M. Samples

1. The Subcontractor shall apply the manhole lining system material on a sample area not less than four square feet (4 ft^2) in size. When approved, the sample area shall serve as a standard of acceptance for all further work.

1.02 SUBMITTALS

A. Unless otherwise specified, all sample submittals shall be delivered to the Purchaser within two weeks of the NTP.

B. Site Subcontractor emergency phone numbers.

C. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following with daily AM email updates of approximate crew locations each day. Weekly schedule format shall contain a map, with sufficient streets labeled and identified at a scale to provide clarity, along with the nature and type of crew located by map area

D. Product Data on the following:

1. Crack and hole repair products

2. Cementitious plug material

3. Active leak-stop material

4. Frame and cover seals

5. Cementitious coating system including application requirements and chemical resistance data
6. Gasket polymer properties

E. Manufacturer's Certificate of Compliance for each type of product that product furnished meets requirements of this Section.

F. Manufacturer's written recommendations for product handling and installation.

G. Confined space entry plans.

H. Subcontractor shall submit to the Purchaser evidence indicating that the proposed applicators are fully qualified to perform the work, and any proposed applicator found to be not qualified shall (at the written request of the Purchaser) be removed forthwith by the Subcontractor.

I. The Coating Manufacturer shall warranty the entire project to include any and all aspects of the surface preparation, base material installation and protective coating applications for a period of ten (10) years from the date of acceptance by the Purchaser. The warranty shall make no distinction between installation practices and material performance and shall not be prorated with respect to elapsed time for the entire warranty period. Manufacturer shall, within a reasonable period of time after receipt of written notice thereof by the Purchaser [period not to exceed sixty (60) calendar days], repair defects in materials or workmanship during said TEN (10) year period, and any damage to other work caused by such defects or repairing of same at his own expense and without cost to the Purchaser.

1.03 DELIVERABLES

A. The Subcontractor shall provide post-rehabilitation MACP inspection for each manhole. Refer to Section 02544 Manhole GPS & MACP Inspection.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Lining System

1. The manhole lining system shall be spray applied or centrifugally cast lightweight structurally reinforced cement manhole coating.

2. The material applied onto the surface of brick or concrete manholes shall be a cementitious system formulated for application within a sanitary sewer environment. For concrete manholes in good structural condition, the Subcontractor shall install the lining to a minimum ½-inch thickness. For all other concrete manholes and for all brick manholes, the Subcontractor shall install the lining to a minimum 1-inch thickness. The coat of material shall be used to smooth the walls, benches, and inverts of the manhole and, as necessary, prepare the manhole for a final coat of a urethane or epoxy resin system when directed by the Purchaser. When a urethane or epoxy resin system is used, the base coat (cementitious layer) shall be 1/2-inch for epoxy systems and 1/8-inch thick for urethane systems. The Subcontractor can request to not use a base coat but must provide to the Owner and Purchaser evidence of successful installations of the product without using a base coat and its capability to properly adhere to the manhole wall and form a smooth finish on the wall, bench, and invert. In cases where the base coat is not used, the thickness of the top coating shall be increased by the base coat thickness listed above.

3. The material applied to the surface of the manhole shall be a cementitious blend of acid resistant binders, siliceous aggregates, non-metallic fibers and other additives for constructing a coating that is impervious to the flow of water, is resistant to sulfide attack, and restores structural integrity to existing manhole walls. The product shall be Quadex QM-1S Restore, Madewell Mainstay ML-72 or approved equal, unless otherwise specified for urethane or epoxy resin coating top coat.

4. A monolithic liner shall be formed which covers all interior manhole surfaces and shall have the following minimum requirements at 28 days:

    a. Compressive Strength (ASTM C-109) 3000 PSI

    b. Tensile Strength (ASTM C-496) 300 PSI

    c. Flexural Strength (ASTM C-293) (Modified) 600 PSI

    d. Shrinkage (ASTM C-596) 0% at 90% R.H.

    e. Bond (ASTM C-882) 130 PSI

    f. Density, when applied 130 ± PCF

5. The installer shall warrant and save harmless the Owner and his Purchaser against all claims for patent infringement and any loss thereof. The Subcontractor shall handle and store all material and shall dispose of all wastes in accordance with applicable regulations.

6. Each system shall be designed for application over damp (but not active running water) surfaces without degradation of the final product and the bond between the product and the manhole surfaces. Active leaks shall be stopped using a premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsum, plasters, iron particles, aluminum powder or gas-forming agents, or promote corrosion of steel it may come in contact with. Set time shall be approximately 1 minute. Ten-minute compressive strength shall be approximately 500 PSI.

7. All invert channels shall be coated with cementitious mortar to prevent infiltration and to build up the invert channel to the new sewer main invert elevations, where applicable; to fill all voids, cracks, and holes and to form a smooth flow channel. The entire channel shall be coated. The coating shall be a minimum ¼-inch to ½-inch thick.

B. Mortar

1. Mortar shall be composed of one part Portland cement and two parts sand (volumetric measure) thoroughly mixed in a tight box, with water added gradually and mixed continually until mortar has attained the proper consistency for use in brick masonry; prepared only in such quantities as needed for immediate use; mortar mixed for more than 30 minutes, re-tempered, or previously set will not be allowed.

C. Butyl Mastic Sealant

1. The sealant shall be used when joining the casting frame to the existing manhole and for all manhole adjustments to provide a watertight structure. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space. Use two complete ropes at each joint. The sealing compound shall be protected by a suitable removable two-piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The sealant shall also meet the requirements of the following table:

Composition	**Test Method**	**Minimum**	**Maximum**
Bitumen (Petroleum Plastic Content)	ASTM D4	50	70
Ash Inert Mineral Matter	AASHTO T11	30	50
Volatile Matter	ASTM D6	---	2.0
Property	**Test Method**	**Minimum**	**Maximum**
Specific Gravity at 77 degrees F	ASTM D71	1.2	1.3
Ductility at 77 degrees F(cm)	ASTM D113	5.0	---
Softening Point	ASTM D36	320 degrees F	---
Penetration 77 degrees F (150 gms) 5 sec.	ASTM D217	50	120

2.02 EQUIPMENT

A. The Subcontractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work. All equipment and facilities shall be on site and approved by the Purchaser before work will be permitted to begin.

PART 3 EXECUTION

3.01 PRELIMINARY AND GENERAL ITEMS

A. Notification of Work

1. The Subcontractor shall notify all property owners who discharge sewage directly to the manhole being rehabilitated that their service will be discontinued while the work is completed. The Subcontractor shall notify individual property owners at least 72 hours in advance, giving the date, start time, and estimated completion time for the work being conducted. This notification shall be coordinated with the door hanger distribution.

B. Traffic Control

1. All traffic control shall be installed and maintained in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). At a minimum, the Subcontractor must have two trucks with flashing yellow lights on the work site. Traffic cones must also be placed downstream of the construction site to divert cars into the adjacent lane(s) per MUTCD requirements. On roads with heavy traffic volume, a flagman may also be needed to assist with traffic control. For bidding purposes, the Subcontractor should assume that a flagman will be needed on 30 percent of the setups.

C. Fall Protection

1. The Subcontractor shall install and maintain all fall protection measures in accordance with OSHA standards and the SARP10 Loss Control Manual. The Subcontractor shall construct a controlled access zone around the manhole being rehabilitated, repaired or adjusted. At a minimum, the fall protection zone shall include traffic cones encircled with pennant tape. The controlled access zone must have one point of access with an entrance log.

D. Cleaning/Surface Prep

1. All manholes to be rehabilitated shall be thoroughly cleaned before rehabilitation. All grease, oil, laitance, coatings, loose bricks, mortar, unsound concrete and other foreign materials shall be completely removed. Debris resulting from cleaning shall be removed from the manhole and not allowed to be carried downstream.

E. Flow Control

1. The Subcontractor shall be responsible for plugging or diverting the flow of sewage as needed for repair and coating of manhole inverts and benches.

F. Bypass of Flow

1. As required for acceptable completion of the work and/or to avoid damages due to sewer spills or overflows, the Subcontractor shall provide for sewer flow maintenance around the manholes designated for rehabilitation. The bypass shall typically be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent sanitary sewer system. The pump and bypass lines shall be of adequate capacity and size to handle the anticipated flow. Bypassing of sanitary sewage into the storm water system will not be allowed. For all bypass pumping, pump noise shall be kept to a minimum to the satisfaction of the Purchaser. The Subcontractor shall be required to contact all residential and commercial customers whose service lines connect to the sewer main being bypassed and inform them that they will be temporarily out of service. The Subcontractor shall also advise those customers against water usage until the mainline is back in service. After completing the necessary work on the main line, the Subcontractor shall advise those customers that the sewer main is back in service.

2. Bypass pumping is defined as providing pumps, standby pumps, piping, elevated structural support for aerial crossings, manpower to operate, routine maintenance and repair capability, pipe plugs, fuel, route and pump site clearing and any other work necessary to provide a complete bypass pumping operation. Any structures proposed by the Subcontractor for construction over or penetration into the interceptor piping for the purpose of performing the bypass operations must be approved by the Purchaser prior to implementation. The Subcontractor shall submit design drawings and details that are signed and sealed by a professional engineer licensed in the State of Tennessee. All bypass pump schemes must be submitted to and approved by the Purchaser in advance.

3. Public advisory services shall be required to notify all parties whose service laterals will be out of service and to advise against water usage until the mainline is back in service.

4. The Subcontractor shall be required to provide businesses with temporary service, as needed, and will be responsible for all necessary bypass pumping flows.

G. Wastewater Spills

1. Should the Subcontractor spill any wastewater, such that the sewage either immediately or ultimately enters the waters of the State of Tennessee, then the Subcontractor shall be completely responsible for any fines or penalties imposed on the Purchaser or the Subcontractor by the USEPA or the State of Tennessee.

3.02 MANHOLE REHABILITATION – CEMENTITIOUS COATINGS

A. The surface prior to spraying shall be damp without noticeable water droplets or running water. Materials shall be spray applied to a minimum uniform thickness to ensure that all cracks, crevices, and voids are filled, and a smooth surface remains after light troweling. The Subcontractor shall perform light troweling to compact the material into voids and to set the bond, where applicable.

B. Existing manhole steps shall be cut and removed prior to coating. Manhole steps are not to be replaced.

C. The first application shall have begun to take an initial set (disappearance of surface sheen which could be 15 minutes to one hour depending upon ambient conditions) before the second application to ensure a minimum total finished thickness of 1/2 inch. The final finished thickness may need to be greater than 1/2 inch in accordance with the manufacturer's recommendations to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface then shall be troweled to smooth finish with care taken not to over trowel so as to bring additional water to the surface and weaken it. Manufacturer's recommendation shall be followed whenever more than 24 hours have elapsed between applications.

D. The bench covers used to catch debris shall be removed and the bench and invert sprayed such that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2 inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

E. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24 hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F, using ice if necessary.

F. The final application shall have a minimum of four (4) hours cure time before subjected to actual flow.

3.03 INVERT AND BENCH REPLACEMENT

A. Remove all loose grout and rubble from existing channel. Replace the invert and bench by removing the existing invert and bench and reconstructing with concrete conforming to Section 03050 Portland Cement Concrete. Work shall include aligning inflow and outflow ports in such a manner as to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will

permit, but shall be shaped to allow easy entrance of maintenance equipment including buckets, T.V. camera, etc. Benches shall be constructed to the highest pipe crown elevation and sloped to drain toward the flow-through channel.

B. Apply a minimum ½-inch finished thickness of cementitious liner material over the surface of the replaced invert and bench where cementitious coating is noted on Drawings or directed by the Purchaser. Allow the liner material to cure for a minimum of four hours before being subjected to flow.

3.04 RESET AND RESEAL MANHOLE FRAME AND COVER

A. If the existing manhole frame is misaligned on the manhole, the Subcontractor shall remove the existing manhole frame and cover and, if they are not being reused, dispose of them as directed by the Purchaser. It shall be the responsibility of the Subcontractor, at no additional cost to the Purchaser, to repair any damage to the chimney or corbel caused by the removal of the existing manhole frame. Existing frames and covers that are to be reused shall be thoroughly cleaned before reinstallation.

B. If the manhole frame is to be raised, the work shall be performed in conformance with Section 02532 of the City of Memphis Standard Construction Specifications modified by the SARP10 Program.

C. The manhole frame for the cover shall be set on the manhole sidewall in a full bed of flexible butyl resin gasket material at the required elevation. In addition, the frame shall be bolted to the grade rings. Where manholes are constructed in paved areas or fill slopes, the surface of the frame and cover shall be tilted so as to conform to the exact slope, crown, and grade of the existing pavement or area adjacent thereto.

D. Any new manhole frame and cover replacement shall result in a minimum 24 inches diameter clear opening to the manhole.

3.05 SEWER MANHOLE DROP CONSTRUCTION

A. Inside drop structures shall be installed in existing manholes at the locations shown on the Drawings and/or as directed by the Purchaser. Drop construction shall conform to the details shown on *Sanitary Manhole Drop Construction* Detail. The Subcontractor shall cut a hole in the manhole wall to permit inserting the inlet pipe at the required flow line elevation, horizontal angle, and slope, and to allow two (2) inches space around the pipe for bedding and filling solidly with non-shrinking grout. Care shall be used to avoid unnecessary damage to the existing masonry or concrete. Drop structure construction shall be installed before cementitious coating is applied where shown on the Drawings or directed by the Purchaser.

B. All loose material shall be removed from the cut surfaces, which shall be completely coated with grout before setting the pipe. Before inserting the pipe and flexible connector, a sufficient thickness of grout shall be placed at the bottom and sides of the opening for proper bedding of the pipe. After setting, all spaces around the pipe shall be solidly filled with grout and neatly pointed up on the inside to present a smooth joint, flush with the inner and outer wall surface. Any necessary modifications to the existing invert shall be made to provide a smooth, plastered surface for properly channeled sewage flow from the new connection. All drop construction shall be constructed of either ductile iron pipe with push on or mechanical joints or PVC pipe. Solvent cement joints may be used on PVC for drop construction. The vertical drop construction shall have the dead weight held by suitable means until the steel support straps are secured in place and tightened. The pipe mechanical joint bolts, if used, shall not be positioned against the manhole wall. The steel support straps shall be fastened to the manhole wall with two bolts per strap set in expansion sleeves in drilled holes.

3.06 MANHOLE REHABILITATION ACCEPTANCE

A. After the manhole rehabilitation work has been completed, the manhole shall be visually inspected by the Subcontractor in the presence of the Purchaser's Representative, and the work shall be accepted if found satisfactory to the Purchaser's Representative. When a cementitious coating is applied, the finished surface shall be free of blisters, "runs" or "sags" or other indications of uneven coating thickness. No evidence of visible leaks shall be allowed.

B. Vacuum Testing will be required for all manholes that receive a cementitious coating. The vacuum testing method shall be conducted as follows:

1. Subcontractor shall plug all pipe openings, taking care to securely brace the plugs and the pipe. The plugs shall be placed a minimum of 6 feet beyond the manhole wall.

2. With the vacuum tester in place, the Subcontractor shall inflate the compression to affect a seal between the vacuum base and the structure. The Subcontractor shall connect the vacuum pump to the outlet port with the valve open and evacuate the manhole to 10-inches Hg (0.3 bar) for 48 inch diameter manholes and 5-inches Hg (0.15 bar) for 60-inch and greater diameter manholes.

3. Subcontractor shall close vacuum inlet/outlet ball valve, disconnect the vacuum pump, and monitor the vacuum for the specified time period. If the vacuum does not drop in excess of 1-inch Hg over the specified time period, the manhole is considered acceptable and passes the test. If the manhole fails the test, The Subcontractor shall identify the leaking areas by removing the head assembly, coating the interior surfaces of the manhole with a soap and water solution, and repeating the vacuum test for approximately thirty seconds. Once the leaks have been identified, the Subcontractor shall complete all necessary repairs by sealing the leaks of the manhole to the satisfaction of the Purchaser's Representative, and repeat test procedures until satisfactory results are obtained.

Vacuum Test Timetable			
	Manhole Diameter (Inches)		
Depth (Feet)	**48"**	**60"**	**72"**
4'	10 sec.	13 sec.	16 sec.
8'	20 sec.	26 sec.	32 sec.
12'	30 sec.	39 sec.	48 sec.
16'	40 sec.	52 sec.	64 sec.
20'	50 sec.	65 sec.	80 sec.
24'	60 sec.	78 sec.	96 sec.
*	5.0 sec.	6.5 sec.	8.0 sec.
*Add extra testing time "T", for each additional 2-foot depth. (The values listed above have been extrapolated for ASTM designation C924-85.			

4. The Purchaser reserves the right to reject any and all manholes that do not pass vacuum testing requirements, and replacement shall be at the Subcontractor's expense. A significant number of leaks on a single manhole or significant number of manholes leaking shall be considered as a basis for rejection and replacement of manholes.

5. Where vacuum testing is not applicable, the Subcontractor shall be directed by the Purchaser to conduct a high-voltage holiday test.

3.07 WARRANTY AND GUARANTEE FOR REHABILITATED MANHOLES

A. The Subcontractor shall guarantee the rehabilitated manholes for ten (10) years after acceptance by the Purchaser to the extent that he will repair any leaks that may appear in them during this period because of faulty workmanship or materials furnished by him at no additional expense to the Owner. As required by 2.01.A.9, the Subcontractor shall also have written documentation that the Coating Manufacturer provides a ten (10) year warranty for all manholes receiving a cementitious coating.

PART 4 MEASUREMENT & PAYMENT

4.01 MEASUREMENTS

A. Manhole Rehabilitation – Cementitious Coating

1. Cementitious coating will be measured per vertical foot of manhole from the downstream invert up to the bottom of the frame casting.

B. Sewer Manhole Drop Construction

1. Drop construction in existing manholes will be measured per vertical foot as measured from the upper inlet pipe flowline to the flowline of drop pipe elbows at the bottom of the drop construction

C. Invert and Bench Replacement

1. Invert and bench replacement will be measured per each.

D. Reset and Reseal Manhole Frame and Cover

1. Manhole frame and cover rehabilitation will be measured per each.

E. Sewer Manhole Drop Construction

1. Drop construction in existing manholes will be measured per vertical foot as measured from the upper inlet pipe flowline to the flowline of drop pipe elbows at the bottom of the drop construction.

F. Traffic Control

1. Traffic control will be measured per Crew Day for each manhole rehabilitated including all appurtenances required to comply with MUTCD Standards. Traffic control does not apply to manholes being rehabilitated in alleys or other locations where traffic is not impacted

G. Bypass Pumping

1. Bypass pumping is considered to be an incidental to the sewer manhole rehabilitation.

H. Dewatering

1. Dewatering is considered to be an incidental to sewer manhole rehabilitation.

4.02 PAYMENTS

A. Manhole Rehabilitation - Cementitious Coating

1. Cementitious coating of manholes will be paid for at the contract unit price per vertical foot which shall be compensation for surface preparation, sprayed on lining, removal and disposal of manhole steps, and vacuum testing.

B. Sewer Manhole Drop Construction

1. The accepted quantities of sewer manhole drop construction will be paid for at the contract unit price per vertical foot, complete in place for drop construction in new manholes or drop construction in existing manholes, which will be full compensation for materials and materials testing, excavation, special protection, maintenance of sewage flow during construction, construction of drop pipe, pipe fitting and connections, installation of steel support straps, placement, curing, and protection of concrete from the manhole base to the top of drop construction, cleaning and inspection, and backfilling outside of pavement areas. Payment for drop construction for new manholes will be in addition to payment for standard depth manhole and extra depth construction (if required).

C. Invert and Bench Replacement

1. The accepted quantities of invert and bench replacement will be paid for at the contract unit price per each. It shall include all work and material to install new inverts in existing manholes, as directed by the Purchaser.

D. Reset and Reseal Manhole Frame and Cover

1. The accepted quantities for frame and cover rehabilitation will be paid for at the contract unit price per each.

E. Traffic Control

1. Traffic Control will be paid per Crew Day for each manhole rehabilitated including all appurtenances required to comply with MUTCD Standards. Traffic control does not apply to manholes being rehabilitated in alleys or other locations where traffic is not impacted

4.03 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02533-4.01.A	CEMENTITIOUS MANHOLE COATING	VF
02533-4.01.B.1	DROP CONSTRUCTION IN EXISTING MANHOLE (<5’)	VF
02533-4.01.B.2	DROP CONSTRUCTION IN EXISTING MANHOLE (5’ – 10’)	VF
02533-4.01.C	INVERT AND BENCH REPLACEMENT	EACH
02533-4.01.D	RESET/RESEAL MANHOLE FRAME AND COVER	EACH
02533-4.01.E	TRAFFIC CONTROL	CREW DAY

END OF SECTION 02533

1. ASTM D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents

2. ASTM D638 – Standard Test Method for Tensile Properties of Plastics

3. ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and

4. ASTM F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

5. ASTM F1743 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

6. ASTM D5813 – Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems

7. ASTM D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

C. Any approved process shall strictly adhere to this specification with regard to all standards and requirements. Where discrepancies exist, or any latitude is either inferred or interpreted between this specification and ASTM product and process standards, this Specification shall govern

1.04 SUBSTITUTIONS

A. Alternate materials and/or methods must be approved by the Purchaser not less than 10 calendar days prior to bid date. The purpose for these submittals is to allow the Purchaser the opportunity to conduct a complete, thorough and objective evaluation of the proposed alternative CIPP products to determine if the submitted products meet all quality and utility standards provided by the specified products. Products submitted for approval must provide independent, third party test data supporting the long term performance and structural strength of the product and such data shall be satisfactory to the Purchaser. The Purchaser will evaluate only the alternate CIPP Product submittal(s) received by the stipulated time frame and provide review response(s) to all bidders by issuing addenda a minimum of 3 calendar days prior to the bid date. Any and all bids received that are not based on a listed acceptable CIPP product or a Purchaser reviewed and approved alternative CIPP product will be rejected. The decision of the Purchaser relative to pre-approval or subsequent approval of manufacturers, contractors and/or installers, qualifying superintendents and crews shall be final and without recourse.

1.05 QUALITY ASSURANCE

A. Acceptable CIPP Manufacturers

1. Pre-approved resin-impregnated cured-in-place pipe (CIPP) products shall be Insituform® (Insituform Technologies), MooreLiner (Moore Construction), products of Inland Pipe Rehabilitation, LLC (Improved Technologies Group/Texas Repipe), products of Spiniello Companies, SAK Construction LLC, **Granite** Inliner, A&H Contractors, Inc., Suncoast Infrastructure Inc., Visu-Sewer, or approved equal.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
FS045118S	F19	FS045118 [15.8]	FS045117 [10.2]	18	Vitrified Clay Pipe	392.9	13.0	6	CIPP	
FS045121S	G19	FS045121 [7.4]	FS045120 [5.5]	15	Vitrified Clay Pipe	185.7	6.5	1	CIPP	
FS045181S	E21	FS045181 [5.6]	FS045180 [7.1]	10	Vitrified Clay Pipe	211.8	6.4	1	CIPP	
FS045187S	E21	FS045187 [9.6]	FS045186 [7.3]	10	Vitrified Clay Pipe	See Notes	8.5	15	Point Repair Only	Point Repair @ 416.3' DS from 5187 for 10' for HSV.
FS045188.01S	E21	FS045188.01 [7.6]	FS045188 [9.8]	10	Vitrified Clay Pipe	701.4	8.7	5	CIPP	
FS045197S	H21	FS045197 [11.8]	FS045196.02 [8.2]	10	Vitrified Clay Pipe	206.7	10.0	1	CIPP	Point Repair @ 98.8' DS from 5197 for 10' for B.
FS045198S	H21	FS045198 [13.6]	FS045197 [11.8]	10	Vitrified Clay Pipe	153.6	12.7	1	CIPP	
FS045231S	G20	FS045231 [7.2]	FS045230 [8]	12	Vitrified Clay Pipe	338.3	7.6	7	CIPP	
FS045236S	I20	FS045236 [4.7]	FS045235 [6.2]	6	Vitrified Clay Pipe	See Notes	5.5	9	Point Repair Only	Point Repair @ 118.1' DS from 5236 for 10' for B, Point Repair @ 150.7' DS from 5236 for 10' for HSV.
FS045244S	H19	FS045244 [3.4]	FS045243 [4]	12	Vitrified Clay Pipe	433.0	3.7	14	CIPP	
FS045246S	H19	FS045246 [4.1]	FS045245 [3.3]	12	Vitrified Clay Pipe	319.1	3.7	8	CIPP	
FS045249S	I18	FS045249 [5.7]	FS045248.01 [6.7]	12	Vitrified Clay Pipe	59.1	6.2	0	CIPP	
FS045250S	I18	FS045250 [8.6]	FS045249 [5.7]	12	Not Specified	221.0	7.2	5	CIPP	
FS045271S	F19	FS045271 [12.1]	FS045270 [9.4]	10	Vitrified Clay Pipe	See Notes	10.8	6	Point Repair Only	Point Repair @ 224.9' DS from 5271 for 10' for BSV.
FS045273S	E19	FS045273 [7.3]	FS045272 [6.8]	8	Vitrified Clay Pipe	See Notes	7.1	3	Point Repair Only	Point Repair @ 78'-98' DS from 5272 for MWLS.
FS045275S	E19	FS045275 [7.1]	FS045274 [8.1]	8	Vitrified Clay Pipe	150.2	7.6	0	CIPP	Point Repair @ 87.9' US from 5274 for 10' for JOM.
FS045286.04S	D19	FS045286.04 [9.2]	FS045286.01 [6.3]	8	Not Specified	171.7	7.8	5	CIPP	
FS045295S	E19	FS045295 [9.8]	FS045291 [8.6]	8	Vitrified Clay Pipe	432.8	9.2	3	CIPP	Point Repair @ 66.2' US from 5291 for 10' for H, Point Repair @ 278.2' DS from 5295 for 10' for HSV, Point Repair @ 294.3' DS from 5295 for 10' for OBI.
FS045301S	F19	FS045301 [7.8]	FS045300.02 [4.2]	8	Vitrified Clay Pipe	See Notes	6.0	18	Point Repair Only	Point Repair @ 31.5' DS from 5301 for 10' for B.
FS045307S	C18	FS045307 [12.5]	FS045289 [12.2]	8	Vitrified Clay Pipe	427.3	12.4	11	CIPP	Point Repair @ 145.8' US from 5289 for 20' for BSV.
FS045319S	C19	FS045319 [Dead End]	FS045288 [5.9]	6	Vitrified Clay Pipe	See Notes	5.9	14	Point Repair Only	Point Repair @ 406' US from 5288 for 10' for BSV.
FS045331S	J17	FS045331 [10.8]	FS045330 [-.-]	8	Vitrified Clay Pipe	See Notes	10.8	3	Point Repair Only	Point Repair @ 120.8' US from 5330 for 10' for HSV.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
FS045332S	J17	FS045332 [8.8]	FS045331 [10.8]	8	Vitrified Clay Pipe	848.7	9.8	46	CIPP	Point Repair @ 218.1' DS from 5332 for 10' for HSV, Point Repair @ 252.9' DS from 5332 for 10' for HSV, Point Repair @ 535.8' DS from 5332 for 10' for JOM.
FS045337S	C20	FS045337 [5.4]	FS045150 [8.3]	8	Vitrified Clay Pipe	See Notes	6.9	5	Point Repair Only	Point Repair @ 246.3' DS from 5337 for 10' for B.
FS045375S	F20	FS045375 [0]	FS045374 [6]	8	Vitrified Clay Pipe	356.9	3.0	2	CIPP	
FS045376S	B18	FS045376 [Dead End]	FS045314 [9.3]	6	Vitrified Clay Pipe	See Notes	9.3	5	Point Repair Only	Point Repair @ 306.2' US from 5314 for 20' for B.
FS045377S	C18	FS045377 [13.8]	FS045307 [12.5]	8	Polyvinyl Chloride	See Notes	13.2	5	Point Repair Only	Point Repair @ 25.8' DS from 5377 for 10' for BSV.
FS045389S	H19	FS045389 [3.1]	FS045244 [3.4]	8	Concrete Pipe (non-reinforced)	222.5	3.3	2	CIPP	Point Repair @ 50.9' DS from 5389 for 10' for JOL.
FS045390S	H18	FS045390 [7.4]	FS045389 [3.1]	8	Vitrified Clay Pipe	683.5	5.3	8	CIPP	
FS045391S	G18	FS045391 [9.5]	FS045390 [7.4]	8	Vitrified Clay Pipe	310.0	8.5	5	CIPP	
FS045409S	E20	FS045409 [3.8]	FS045408 [7.3]	8	Vitrified Clay Pipe	398.3	5.6	14	CIPP	
FS045415S	D20	FS045415 [Dead End]	FS045414 [6.7]	6	Vitrified Clay Pipe	See Notes	6.7	7	Point Repair Only	Point Repair @ 180.7' US from 5414 for 15' for JSL
FS045420S	E20	FS045420 [Dead End]	FS045114 [13.5]	6	Not Specified	See Notes	13.5	1	Point Repair Only	Point Repair @ 47.7' US from 5114 for 20' for OBP.
FS045427S	F20	FS045427 [13.6]	FS045581 [6.6]	6	Vitrified Clay Pipe	See Notes	10.1	0	Point Repair Only	Point Repair @ 10' US from 5581 for 20' for B.
FS045433S	H17	FS045433 [10.2]	FS045432 [6.9]	6	Vitrified Clay Pipe	See Notes	8.6	2	Point Repair Only	Point Repair @ 120'-140' US from 5432 for BSV.
FS045434S	I18	FS045434 [8.6]	FS045250 [8.6]	8	Vitrified Clay Pipe	245.0	8.6	7	CIPP	
FS045435S	I18	FS045435 [11.2]	FS045434 [8.6]	8	Vitrified Clay Pipe	846.6	9.9	24	CIPP	
FS045460S	D19	FS045460 [11.8]	FS045107 [7.6]	8	Vitrified Clay Pipe	See Notes	9.7	5	Point Repair Only	Point Repair @ 118.2' DS from 5460 for 10' for OBI.
FS045471S	F22	FS045471 [8.3]	FS045470 [9.1]	8	Concrete Pipe (non-reinforced)	372.0	8.7	8	CIPP	
FS045486S	H22	FS045486 [2.8]	FS045485 [-.-]	8	Concrete Pipe (non-reinforced)	See Notes	2.8	4	Point Repair Only	Point Repair @ 213.6' DS from 5486 for 10' for JOL.
FS045487S	H22	FS045487 [2.8]	FS045486 [2.8]	8	Vitrified Clay Pipe	44.0	2.8	0	CIPP	
FS045493S	G22	FS045493 [5.1]	FS045492 [6.3]	8	Concrete Pipe (non-reinforced)	See Notes	5.7	1	Point Repair Only	Tap Replacement @ 66.8' US from 5492 for 15' for TFD.
FS045495S	G22	FS045495 [Dead End]	FS045494 [7.7]	8	Concrete Pipe (non-reinforced)	238.0	7.7	3	CIPP	

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
FS045496.01S	G21	FS045496.01 [6.8]	FS045496 [8.1]	6	Vitrified Clay Pipe	See Notes	7.5	9	Point Repair Only	Point Repair @ 68.3' DS from 5496.01 for 10' for BSV.
FS045496S	G21	FS045496 [8.1]	FS045426.04 [7.6]	8	Vitrified Clay Pipe	278.1	7.9	6	CIPP	Point Repair @ 218.1' DS from 5496 for 10' for B.
FS045497.01S	G21	FS045497.01 [3.9]	FS045497 [5.6]	8	Vitrified Clay Pipe	See Notes	4.8	10	Point Repair Only	Point Repair @ 6' US from 5497 for 20' for BSV, Point Repair @ 359.3' US from 5497 for 10' for BSV, Point Repair @ 545.7' US from 5497 for 10' for BSV.
FS045518S	H22	FS045518 [12.7]	FS045517 [15]	8	Vitrified Clay Pipe	See Notes	13.9	6	Point Repair Only	Tap Replacement @ 56.7' DS from 5518 for 15' for TFD, Tap Replacement @ 263.7' DS from 5518 for 15' for TFD, Tap Replacement @ 272.8' DS from 5518 for 15' for TFD
FS045533S	F21	FS045533 [Dead End]	FS045191 [8.4]	6	Polyvinyl Chloride	See Notes	8.4	6	Point Repair Only	Tap Replacement @ 96.9' US from 5191 for 15' for TFD, Point Repair @ 161.2' US from 5191 for 10' for JOL.
FS045561S	B22	FS045561 [10.6]	FS045559 [10.8]	8	Vitrified Clay Pipe	377.4	10.7	3	CIPP	
FS045575S	E20	FS045575 [6.3]	FS045115 [7.6]	6	Polyvinyl Chloride	See Notes	7.0	7	Point Repair Only	Point Repair @ 242.9' DS from 5575 for 15' for B.
FS045577S-1	G21	FS045577 [2.6]	FS045497 [5.6]	6	Vitrified Clay Pipe	See Notes	4.1	0	Point Repair Only	Point Repair @ 53' DS from 5577 for 20' for BSV.
FS045592S	H17	FS045592 [Dead End]	FS045432 [6.9]	8	Not Specified	See Notes	6.9	1	Point Repair Only	Point Repair @ 79.3' US from 5432 for 10' for HSV.
NN010108S	Z2	NN010108 [7]	NN010107.02 [6.4]	18	Not Specified	94.6	6.7	0	CIPP	
NN010116S	AA2	NN010116 [13.7]	NN010137 [13.1]	8	Not Specified	486.3	13.4	0	CIPP	
NN010145.02S	X2	NN010145.02 [9.7]	NN010145 [11.2]	8	Concrete Pipe (non-reinforced)	See Notes	10.5	5	Point Repair Only	Point Repair @ 139.7' US from 0145 for 10' for B.
NN010150.01S	V2	NN010150.01 [10.4]	NN010150 [12]	8	Vitrified Clay Pipe	See Notes	11.2	20	Point Repair Only	Point Repair @ 105' DS from 0150.01 for 10' for OBI.
NN010154.01S	U2	NN010154.01 [0]	NN010154 [11.4]	8	Vitrified Clay Pipe	See Notes	5.7	32	Point Repair Only	Point Repair @ 18'-28' US from 0154 for HSV, Point Repair @ 504.2' US from 0154 for BVV for 10'.
NN010163S	W2	NN010163 [10]	NN010147 [12.1]	8	Vitrified Clay Pipe	See Notes	11.1	7	Point Repair Only	Point Repair @ 111.5' DS from 0163 for 10' for HVV.
NN010171S	V3	NN010171 [Dead End]	NN010170 [9.2]	8	Vitrified Clay Pipe	See Notes	9.2	5	Point Repair Only	Point Repair @ 10.5' US from 0170 for 10' for JSM.
NN010220S	Z3	NN010220 [7.1]	NN010109 [6.5]	8	Not Specified	See Notes	6.8	11	Point Repair Only	Point Repair @ 21.9' US from 0109 for 10' for B, Point Repair @ 70.4' US from 0109 for 10' for HSV, Point Repair @ 115' US from 0109 for 10' for B, Point Repair @ 195.4' US from 0109 for 10' for B.
NN010221S	Z3	NN010221 [Dead End]	NN010220 [7.1]	8	Not Specified	See Notes	7.1	3	Point Repair Only	Point Repair @ 13' - 28' US from 0220 for JSL.
NN010229.01S	AA1	NN010229.01 [3.6]	NN010229 [10.5]	8	Not Specified	349.0	7.1	1	CIPP	

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN010236S	W2	NN010236 [9.5]	NN010148 [12.2]	8	Vitrified Clay Pipe	581.4	10.9	18	CIPP	Point Repair @ 449.6' for 10' for JOL.
NN010238.01S	W1	NN010238.01 [Dead End]	NN010238 [16.2]	8	Concrete Pipe (non-reinforced)	355.3	16.2	13	CIPP	Tap Replacement @ 16.4' US from 0238 for 15' for TFD, Point Repair @ 352.9' US from 0238 for 10' for JOL.
NN010249.01S	T2	NN010249.01 [7.2]	NN010249 [7.6]	8	Not Specified	309.6	7.4	8	CIPP	Point Repair @ 88.1' DS from 0249.01 for 10' for JOL, Tap Replacement @ 183.5' DS from 0249.01 for 15' for TFD.
NN010249S	T2	NN010249 [7.6]	NN010248 [10.7]	8	Not Specified	237.7	9.2	10	CIPP	
NN010254S	R2	NN010254 [7.3]	NN010253 [7.3]	8	Concrete Pipe (non-reinforced)	287.5	7.3	0	CIPP	
NN010256S	AA3	NN010256 [6.6]	NN010107 [11.3]	8	Not Specified	See Notes	9.0	14	Point Repair Only	Point Repair @ 217.2' DS from 0256 for 10' for JOL, Point Repair @ 345.4' DS from 0256 for 10' for BSV.
NN010295S	W3	NN010295 [7]	NN010294 [6.2]	8	Concrete Pipe (non-reinforced)	See Notes	6.6	12	Point Repair Only	Point Repair @ 185.1' US from 0294 for 10' for OBC.
NN010314S	U3	NN010314 [0]	NN010313 [12.4]	8	Vitrified Clay Pipe	557.9	6.2	12	CIPP	Point Repair @ 184.1' US from 0313 for 10 for BSV.
NN010338S	Y1	NN010338 [12]	NN010337 [6.5]	8	Concrete Pipe (non-reinforced)	See Notes	9.3	5	Point Repair Only	Tap Replacement @ 186.4' DS from 0338 for 15' for TFD.
NN010346S	V1	NN010346 [Dead End]	NN010278 [9]	8	Not Specified	See Notes	9.0	3	Point Repair Only	Point Repair @ 137.6' US from 0278 for 10' for H.
NN010356S	Y2	NN010356 [Dead End]	NN010355 [9.7]	8	Not Specified	See Notes	9.7	17	Point Repair Only	Point Repair @ 201.9' IS from 0369 for 10' for BSV.
NN010361S	T1	NN010361 [8.9]	NN010349 [15.6]	8	Not Specified	See Notes	12.3	3	Point Repair Only	Point Repair @ 208.6' DS from 0361 for 10' for B.
NN010362S	U1	NN010362 [7.1]	NN010361 [8.9]	8	Not Specified	See Notes	8.0	2	Point Repair Only	Point Repair @ 256.1' US from 0361 for 10' for OBZ.
NN010365S	U2	NN010365 [7.1]	NN010366 [10.5]	8	Not Specified	252.2	8.8	2	CIPP	
NN010370S	U1	NN010370 [Dead End]	NN010369 [11]	8	Not Specified	See Notes	11.0	4	Point Repair Only	Point Repair @ 201.9' US from 0369 for 10' for BSV.”
NN010374.01S	R3	NN010374.01 [10.4]	NN010374 [8.2]	8	Not Specified	401.6	9.3	21	CIPP	
NN010385S	S2	NN010385 [10.4]	NN010384 [8.7]	8	Vitrified Clay Pipe	429.3	9.6	15	CIPP	Point Repair @ 172.6' DS from 0385 for 10' for JOL.
NN010386S	R2	NN010386 [11.1]	NN010385 [10.4]	8	Vitrified Clay Pipe	305.5	10.8	0	CIPP	
NN010397S	R2	NN010397 [Dead End]	NN010387 [7.1]	8	Vitrified Clay Pipe	551.1	7.1	16	CIPP	
NN010402S	S2	NN010402 [Dead End]	NN010385 [10.4]	8	Not Specified	270.9	10.4	12	CIPP	
NN010406S	R2	NN010406 [Dead End]	NN010386 [11.1]	8	Vitrified Clay Pipe	270.6	11.1	11	CIPP	

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN010411S	S2	NN010411 [0]	NN010252 [7.9]	8	Concrete Pipe (non-reinforced)	See Notes	4.0	9	Point Repair Only	Point Repair @ 116.6' DS from 0411 for 10' for OBP.
NN010422S	U2	NN010422 [Dead End]	NN010153 [10.1]	8	Vitrified Clay Pipe	540.5	10.1	27	CIPP	
NN010425S	U1	NN010425 [Dead End]	NN010424 [8.9]	8	Not Specified	393.0	8.9	17	CIPP	
NN010438S	V2	NN010438 [7.7]	NN010151 [15.2]	8	Vitrified Clay Pipe	398.8	11.5	18	CIPP	Tap Replacement @ 46.3' US from 0151 for 15' for TF, Point Repair @ 15.6' DS from 0438 for 10' for JOM, Point Repair @ 186' for 20', Point Repair @ 257.5' DS from 0438 for 10' for B.
NN010442.01S	V2	NN010442.01 [7.9]	NN010442 [9.7]	8	Not Specified	239.0	8.8	2	CIPP	
NN010451S	V1	NN010451 [Dead End]	NN010450 [7.9]	8	Not Specified	See Notes	7.9	8	Point Repair Only	Point Repair @ 147.2' US from 0450 for 10' for JSM, Tap Replacement @ 149.8' US from 0450 for 10' for TFD.
NN010459S	X1	NN010459 [7]	NN010477 [8.1]	8	Not Specified	See Notes	7.6	7	Point Repair Only	Tap Replacement @ 143.3' DS from 0459 for 15' for TFD.
NN010460S	W1	NN010460 [8.3]	NN010275 [17.7]	8	Concrete Pipe (non-reinforced)	553.0	13.0	22	CIPP	Tap Repalcement @ 137.4' DS for 0460 for 15' for TF, Point Repair @ 381.2' DS for 0460 for 10' for JOL.
NN010539S	U4	NN010539 [11.3]	NN010538 [11]	10	Not Specified	472.0	11.2	5	CIPP	
NN010569S	S6	NN010569 [8]	NN010568 [7.9]	8	Not Specified	213.2	8.0	6	CIPP	
NN010570S	S6	NN010570 [8.4]	NN010569 [8]	8	Not Specified	213.9	8.2	11	CIPP	Point Repair @ 106.9' DS from NN010570 for 20' for JOL.
NN010577S	T5	NN010577 [6.9]	NN010552 [8.6]	8	Not Specified	402.1	7.8	18	CIPP	Point Repair @ 150.2' US from 0552 for 10' for JOM.
NN010578S	T5	NN010578 [8.1]	NN010577 [6.9]	8	Not Specified	554.0	7.5	21	CIPP	
NN010579S	S5	NN010579 [6.9]	NN010578 [8.1]	8	Not Specified	559.3	7.5	25	CIPP	
NN010581S	T5	NN010581 [6.1]	NN010554 [16.5]	8	Not Specified	307.8	11.3	11	CIPP	Tap Replacement @ 9.5' DS for 0581 for 15' for TF, Tap Replacement @ 79.3' DS for 0581 for 15' for TBI, Tap Replacement @ 163' DS for 0581 for 15' for TFD.
NN010583S	S5	NN010583 [9.8]	NN010582 [8.9]	8	Not Specified	See Notes	9.4	18	Point Repair Only	Point Repair @ 258.9' DS from 0583 for 10' for HSV.
NN010590S	U7	NN010590 [7.6]	NN010589 [7.7]	8	Not Specified	295.9	7.7	10	CIPP	Point Repair @ 101.7' DS from 0590 for 10' for JOL.
NN010594S	S6	NN010594 [18]	NN010593 [9.4]	8	Not Specified	351.4	13.7	1	CIPP	
NN010605S	T6	NN010605 [Dead End]	NN010604 [8.9]	8	Not Specified	See Notes	8.9	17	Point Repair Only	Tap Replacement @ 126.4' US from 0604 for 15' for TFD, Spot Repair @ 342.6' US from 0604 for 20' for ID.
NN010606S	S6	NN010606 [7.8]	NN010593 [9.4]	8	Not Specified	148.5	8.6	6	CIPP	Point Repair @ 105.6' US from 0593 for 10' for BVV.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN010621S	U5	NN010621 [5.6]	NN010553.01 [21.7]	8	Not Specified	245.9	13.7	5	CIPP	Point Repair @ 1' DS from 0621 for 10' for B, Tap Replacement @ 77.7' DS from 0621 for 15' for TB.
NN010624S	U5	NN010624 [15]	NN010553 [21.5]	8	Not Specified	See Notes	18.3	2	Point Repair Only	Point Repair @ 103.3' US from 0553 for 10' for FM, Point Repair @ 299.6' US from 0553 for 10' for OBZ, Point Repair @ 94.5' DS from 0624 for 10' for B.
NN010636S	T5	NN010636 [5.9]	NN010551 [10.2]	8	Not Specified	611.5	8.1	27	CIPP	Point Repair @ 266.3' for 10' for JOL, Point Repair @ 291.9' for 10' for JOL, Point Repair @ 331 for 10' for B, Tap Replacement @ 446.1' for 15' for TBI, Point Repair @ 544.7' for 10' for JOL.
~~NN010819S~~	~~AD2~~	~~NN010819 [18.0]~~	~~NN010818 [..]~~	~~8~~	~~Not Specified~~	~~241.9~~	~~18.0~~	~~0~~	~~CIPP~~	~~Point Repair @ 3' DS from 0819 for 10' for B, Point Repair @ 227.3' DS from 0819 for 10' for HVV.~~
NN010822S	AC2	NN010822 [14]	NN010821 [16]	8	Not Specified	See Notes	15.0	0	Point Repair Only	Point Repair @ 292.5' DS from 0822 for 20' for D.
NN021818S	Y22	NN021818 [8.8]	NN021817 [10.9]	10	Not Specified	See Notes	9.9	11	Point Repair Only	Point Repair @ 288.9' US from 1817 for 10' for HVV.
NN021821S	Z23	NN021821 [8.2]	NN021820 [8.1]	10	Not Specified	354.0	8.2	14	CIPP	Point Repair @ 169.8' DS from 1821 for 10' for HSV.
NN021827.05S	Y24	NN021827.05 [6.2]	NN021827.03 [6.2]	8	Not Specified	237.3	6.2	2	CIPP	Point Repair @ 163.9' US from 1827.03 for 15' for JSL, Point Repair @ 231.6' US from 1827.03 for 10' for JSL.
NN021868S	W22	NN021868 [Dead End]	NN021867 [10.2]	8	Not Specified	See Notes	10.2	16	Point Repair Only	Point Repair @ 300.2' US from 1867 for 10' for BSV, Tap Replacement @ 359.5' US from 1867 for 10' for TFD.
NN021884S	Y22	NN021884 [Dead End]	NN021861 [7]	8	Not Specified	See Notes	7.0	12	Point Repair Only	Point Repair @ 64.3' US from 1861 for 10' for HSV, Point Repair @ 356.3' US from 1861 for 10' for JOL.
NN021904S	W23	NN021904 [Dead End]	NN021903 [10]	8	Not Specified	139.7	10.0	1	CIPP	
NN021917S	Y23	NN021917 [10.6]	NN021862 [7.9]	8	Not Specified	See Notes	9.3	16	Point Repair Only	Point Repair @ 17.2' DS from 1917 for 10' for HVV, Tap Replacement @ 30.1' DS from 1917 for 15' for TFD.
NN021918S	Y23	NN021918 [7.6]	NN021917 [10.6]	8	Not Specified	See Notes	9.1	19	Point Repair Only	Point Repair @ 232.8' DS from 1918 for 10' for HVV.
NN021919S	X23	NN021919 [8.8]	NN021918 [7.6]	8	Not Specified	359.3	8.2	3	CIPP	Point Repair @ 12.8' DS from 1919 for 10' for JOL.
NN021922S	X23	NN021922 [9]	NN021921 [10]	8	Not Specified	See Notes	9.5	7	Point Repair Only	Point Repair @ 83.3' US from 1921 for 10' for HSV, Point Repair @ 229.3' US from 1921 for 10' for JOL, Tap Replacement @ 111' DS from 1922 for 15' for TFD.
NN021924S	X22	NN021924 [9.7]	NN021863 [7.9]	8	Not Specified	See Notes	8.8	15	Point Repair Only	Point Repair @ 396.5' US from 1863 for 10' for H.
NN021937S	X24	NN021937 [6.7]	NN021936 [5.9]	8	Not Specified	238.2	6.3	0	CIPP	
NN021945S	Y22	NN021945 [7.3]	NN021862 [7.9]	8	Not Specified	See Notes	7.6	0	Point Repair Only	Point Repair @ 130.5' US from 1862 for 10' for JSM.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN021947S	V24	NN021947 [7.7]	NN021833 [11.8]	8	Not Specified	See Notes	9.8	9	Point Repair Only	Point Repair @ 326.3' DS from 1947 for 10' for BVV.
NN021949S	U24	NN021949 [Dead End]	NN021948 [7.9]	8	Not Specified	146.4	7.9	7	CIPP	
NN022017S	V22	NN022017 [10.1]	NN021893 [11.5]	8	Not Specified	450.8	10.8	4	CIPP	Point Repair @ 156.4' DS from 2017 for 10' for HSV
NN022027S	W23	NN022027 [9.7]	NN022026 [10.4]	8	Not Specified	413.8	10.1	3	CIPP	
NN022036S	X23	NN022036 [Dead End]	NN021863 [7.9]	8	Not Specified	See Notes	7.9	13	Point Repair Only	Point Repair @ 216.2' US from 1863 for 10' for HSV.
NN022175S	AG10	NN022175 [10.9]	NN022174 [9.3]	8	Not Specified	425.5	10.1	10	CIPP	Point Repair @ 178.9' DS from 2175 for 10' for HSV.
NN022189S	N13	NN022189 [0]	NN022793 [6]	6	Vitrified Clay Pipe	See Notes	3.0	14	Point Repair Only	Point Repair @ 187.4' US from 2793 for 10' for HSV, Tap Replacement @ 253.1' US from 2793 for 15' for TFD.
NN022219S	P11	NN022219 [12.4]	NN022220 [-.-]	8	Concrete Pipe (non-reinforced)	220.6	12.4	0	CIPP	
NN022324S	R14	NN022324 [17.4]	NN022323 [17]	15	Vitrified Clay Pipe	81.9	17.2	0	CIPP	Point Repair @ 2.5' DS from 2324 for 10' for B.
NN022329S	Q14	NN022329 [6.6]	NN022328.01 [9.4]	8	Vitrified Clay Pipe	183.9	8.0	7	CIPP	Tap Replacement @ 38.8' US from 2328 for 15' for TFD, Point Repair @ 87.2' US from 2328 for 10' for JOL, Point Repair @ 172.9' US from 2328 for 10' for HSV.
NN022340S	R14	NN022340 [12.3]	NN022322 [15.6]	10	Vitrified Clay Pipe	674.1	14.0	0	CIPP	Point Repair @ 8.1' DS from 2340 for 10' for HVV, Point Repair @ 82.6' DS from 2340 for 10' for RPPD.
NN022350S	P15	NN022350 [10]	NN022349.02 [6.8]	8	Vitrified Clay Pipe	360.5	8.4	4	CIPP	
NN022351S	P15	NN022351 [8.2]	NN022350 [10]	8	Vitrified Clay Pipe	429.0	9.1	3	CIPP	Point Repair @ 1.5' US from 2350 for 10' for JSL, Point Repair @ 35.1' DS from 2351 for 10' for HVV.
NN022356S	S15	NN022356 [5.2]	NN022316 [7.5]	8	Vitrified Clay Pipe	287.0	6.4	11	CIPP	
NN022366S	R15	NN022366 [9.4]	NN022341.01 [10.4]	8	Vitrified Clay Pipe	295.5	9.9	4	CIPP	Point Repair @ 12.9' DS from 2366 for 10' for HSV.
NN022381S	O13	NN022381 [19.6]	NN022380 [-.-]	12	Vitrified Clay Pipe	264.6	19.6	0	CIPP	
NN022395S	S13	NN022395 [7.3]	NN022394 [15.8]	8	Concrete Pipe (non-reinforced)	See Notes	11.6	18	Point Repair Only	Point Repair @ 272.4' DS from 2395 for 10' for HVV.
NN022416S	R16	NN022416 [10.9]	NN022415 [7.1]	8	Vitrified Clay Pipe	244.6	9.0	2	CIPP	
NN022467S	P14	NN022467 [12.8]	NN022466 [13.1]	12	Vitrified Clay Pipe	See Notes	13.0	0	Point Repair Only	Point Repair @ 245.6' US from 2466 for 10' for JOL.
NN022484S	Q14	NN022484 [8.5]	NN022324.01 [11.2]	10	Vitrified Clay Pipe	233.4	9.9	4	CIPP	

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN022503S	O13	NN022503 [7.1]	NN022384 [-.-]	8	Vitrified Clay Pipe	See Notes	7.1	7	Point Repair Only	Point Repair @ 234.4' DS from 2503 for 10' for HSV, Point Repair @ 24.5' US from 2384 for 10' for HSV, Point Repair @ 91.5' US from 2384 for 10' for TBI.
NN022512S	S14	NN022512 [8.7]	NN022511 [7.8]	8	Concrete Pipe (non-reinforced)	257.3	8.3	6	CIPP	Point Repair @ 0' US from 2511 for 10' for HVV, Point Repair @ 221.7' US from 2511 for 15' for DSGV.
NN022529S	O14	NN022529 [2.8]	NN022528 [-.-]	8	Vitrified Clay Pipe	395.7	2.8	7	CIPP	
NN022530S	O14	NN022530 [8.2]	NN022529 [2.8]	8	Vitrified Clay Pipe	338.2	5.5	4	CIPP	
NN022537S	N15	NN022537 [4.3]	NN022536 [6.4]	8	Vitrified Clay Pipe	539.4	5.4	18	CIPP	Point Repair @ 11.9' DS from 2537 for 10' for HSV, Point Repair @ 25.9' DS from 2537 for 10' for MMC, Point Repair @ 82.2' DS from 2537 for 10' for HSV, Point Repair @ 210.6' DS from 2537 for 10' for HVV, Point Repair @ 478.6' DS from 2537 for 10' for B, Point Repair @ 536.7' DS from 2537 for 10' for HSV.
NN022552S	R15	NN022552 [Dead End]	NN022551 [6.4]	6	Vitrified Clay Pipe	See Notes	6.4	3	Point Repair Only	Point Repair @ 7.3' US from 2551 for 10' for HVV.
NN022560S-1	N14	NN022560 [0]	NN022793 [6]	8	Vitrified Clay Pipe	270.3	3.0	2	CIPP	Point Repair @ 275.2' US from 2793 for 10' for JOL.
NN022561S	O13	NN022561 [4.6]	NN022333 [12.2]	8	Vitrified Clay Pipe	See Notes	8.4	35	Point Repair Only	Point Repair @ 10.8' US from 2333 for 15' for IG, Tap Replacement @ 142.5' US from 2333 for 15' for TFD.
NN022628S	Q16	NN022628 [8.2]	NN022521 [5.4]	8	Vitrified Clay Pipe	See Notes	6.8	5	Point Repair Only	Point Repair @ 75.7' US from 2521 for 10' for OBI.
NN022672S	N13	NN022672 [9.6]	NN022385 [6.6]	6	Vitrified Clay Pipe	See Notes	8.1	8	Point Repair Only	Point Repair @ 78.7' DS from 2672 for 10' for IG.
NN022675S	P15	NN022675 [Dead End]	NN022350 [10]	8	Vitrified Clay Pipe	See Notes	10.0	4	Point Repair Only	Point Repair @ 121' US from 2350 for 10' for OBI.
NN022686S	S14	NN022686 [10.1]	NN022578 [9.3]	8	Concrete Pipe (non-reinforced)	264.8	9.7	3	CIPP	Point Repair @ 180' US from 2578 for 10' for HSV.
NN022766S	P16	NN022766 [Dead End]	NN022522 [5.5]	6	Vitrified Clay Pipe	See Notes	5.5	0	Point Repair Only	Point Repair @ 19.9' US from 2522 for 10' for BSV.
NN022792S	N13	NN022792 [5.5]	NN022580 [5.2]	8	Vitrified Clay Pipe	See Notes	5.4	0	Point Repair Only	Point Repair @ 15.8' US from 2580 for 10' for HSV, Point Repair @ 101.6' US from 2580 for 10' for HSV.
NN022793S	N14	NN022793 [6]	NN022792 [5.5]	8	Vitrified Clay Pipe	349.0	5.8	3	CIPP	Point Repair @ 254.8' DS from 2793 for 10' for HSV.
NN022801S	P16	NN022801 [Dead End]	NN022771 [4.9]	6	Vitrified Clay Pipe	See Notes	4.9	0	Point Repair Only	Point Repair @ 51.2' US from 2771 for 10' for HVV.
NN022804S	N14	NN022804 [6.9]	NN022533 [2.7]	8	Vitrified Clay Pipe	257.2	4.8	4	CIPP	Tap Replacement @ 8.2' DS from 2804 for 15' for TFD.
NN022830S	O15	NN022830 [10.1]	NN022445 [8.6]	8	Vitrified Clay Pipe	339.9	9.4	2	CIPP	
NN022936S	R12	NN022936 [6.7]	NN022935 [8.8]	10	Not Specified	270.4	7.8	14	CIPP	Tap Replacement @ 26' DS from 2936 for 10' for TBI.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN022946S	R11	NN022946 [Dead End]	NN022941 [7.8]	8	Not Specified	See Notes	7.8	6	Point Repair Only	Point Repair @ 10'-25' US from 2941 for Sag and HSV.
NN022949S	R11	NN022949 [7.3]	NN022948 [8.2]	10	Not Specified	129.5	7.8	0	CIPP	
NN022955S	Q12	NN022955 [10.3]	NN022953 [9.8]	8	Vitrified Clay Pipe	489.5	10.1	2	CIPP	Point Repair @ 121.3' DS from 2955 for 15' for B, Point Repair @ 147.3 DS from 2955 for 10' for B.
NN022961S	R12	NN022961 [10.1]	NN022960 [13.7]	8	Not Specified	See Notes	11.9	4	Point Repair Only	Point Repair @ 26.5' DS from 2961 for 10' for D.
NN022981S	P11	NN022981 [7.6]	NN022980 [7.6]	8	Vitrified Clay Pipe	245.6	7.6	3	CIPP	
NN022991S	Q12	NN022991 [9.5]	NN022990 [9.7]	6	Vitrified Clay Pipe	See Notes	9.6	19	Point Repair Only	Point Repair @ 176.9' US from 2990 for 10' for HVV.
NN022993S	R12	NN022993 [6]	NN022992 [13.1]	8	Not Specified	See Notes	9.6	23	Point Repair Only	Point Repair @ 222.6' DS from 2293 for 10' for D.
NN023000S	R12	NN023000 [7.1]	NN022934 [7.2]	8	Not Specified	See Notes	7.2	10	Point Repair Only	Point Repair @ 71.9' US from 2934 for 10' for ISGT.
NN023019S	P11	NN023019 [9.2]	NN022979 [8.6]	8	Vitrified Clay Pipe	427.2	8.9	16	CIPP	Point Repair @ 232.9' DS from 3019 for 10' for BSV.
NN023170S	R9	NN023170 [13.5]	NN023169 [10.5]	8	Vitrified Clay Pipe	315.7	12.0	13	CIPP	Tap Replacement @ 63.2' US from 3169 for 15' for TFD, Tap Replacement @ 86.9' US from 3169 for 15' for TF, Tap Replacement @ 115' US from 3169 for 15' for TFD.
NN023173S	R8	NN023173 [9.8]	NN023172 [10.7]	8	Not Specified	See Notes	10.3	4	Point Repair Only	Point Repair @ 76.4' DS from 3173 for 10' for B, Point Repair @ 325.5' DS from 3173 for 10' for JOL.
NN023214S	T8	NN023214 [8.9]	NN023162 [18.1]	8	Vitrified Clay Pipe	472.6	13.5	20	CIPP	Point Repair @ 45.8' US from 3162 for 10' for JOL, Tap Replacement @ 55.4' US from 3162 for 15' for TFA, Point Repair @ 96.8' US from 3162 for 10' for HVV, Tap Replacement @ 154.1' US from 3162 for 15' for TBI, Point Repair @ 182.9' US from 3162 for 10' for OBJ.
NN023232S	U7	NN023232 [6.5]	NN023231 [14]	8	Vitrified Clay Pipe	476.7	10.3	19	CIPP	Point Repair @ 34.8' DS from 3232 for 10' for OBJ.
NN023233S	T7	NN023233 [8.8]	NN023232 [6.5]	8	Vitrified Clay Pipe	241.3	7.7	7	CIPP	
NN023234S	T7	NN023234 [Dead End]	NN023233 [8.8]	8	Not Specified	514.8	8.8	15	CIPP	
NN023239S	T9	NN023239 [6.8]	NN023238 [6.5]	8	Not Specified	444.3	6.7	11	CIPP	Point Repair @ 44.2' DS from 3239 for 10' for B, Point Repair @ 70.1' DS from 3239 for 10' for B, Point Repair @ 127.6' DS from 3239 for 10' for B, Point Repair @ 184.2' DS from 3239 for 10' for OBJ, Tap Replacement @ 150.4' US from 3238 for 15' for OBB.
NN023270S	T9	NN023270 [8.9]	NN023269 [5.1]	8	Not Specified	See Notes	7.0	11	Point Repair Only	Point Repair @ 101.9' US from 3269 for 10' for B, Point Repair @ 155' US from 3269 for 10' for B, Point Repair @ 421.3' US from 3269 for 20' for JSL, Point Repair @ 1' DS from 3270 for 20' for B.

Group 2 CIPP Project - Pipe Bid Schedule

Pipe ID	Sheet	US MH [Approx. Depth (ft)]	DS MH [Approx. Depth (ft)]	Diameter (in.)	Material	Approx. Repair Length (ft)	Approx. Repair Depth (ft)	Approx. # of Taps	Repair Method	Notes
NN023297S	T8	NN023297 [8.1]	NN023369 [7.5]	8	Not Specified	See Notes	7.8	18	Point Repair Only	Point Repair @ 138.9' US from 3369 for 10' for HVV, Point Repair @ 323.1' US from 3369 for 10' for RPD.
NN023365S	T10	NN023365 [8.5]	NN023261 [9.2]	10	Not Specified	626.3	8.9	23	CIPP	Point Repair @ 493' US from 3261 for 10' for JOL.
NN023375S	S9	NN023375 [Dead End]	NN023222 [10.4]	8	Not Specified	See Notes	10.4	5	Point Repair Only	Point Repair @ 106.5' US from 3222 for 10' for JOL.
NN023544S	Z7	NN023544 [7.3]	NN023550 [-.-]	10	Not Specified	See Notes	7.3	0	Point Repair Only	Point Repair @ 123'-143' DS from 3544 for BSV.
NN023546S	Z7	NN023546 [5.5]	NN023545 [6.8]	8	Not Specified	See Notes	6.2	4	Point Repair Only	Point Repair @ 187.8' DS from 3546 for 10' for JSL, Point Repair @ 265' DS from 3546 for 10' for HSV.
NN023592S	W7	NN023592 [7.5]	NN023591 [6.8]	8	Not Specified	See Notes	7.2	0	Point Repair Only	Point Repair @ 18.4' DS from 3592 for 10' for OBP.
NN023596S	X7	NN023596 [Dead End]	NN023595 [7.5]	8	Not Specified	See Notes	7.5	3	Point Repair Only	Point Repair @ 62.2' US from 3595 for 10' for HSV.
NN023617S	Y6	NN023617 [7.9]	NN023616 [9.4]	8	Not Specified	See Notes	8.7	5	Point Repair Only	Point Repair @ 23.4' US from 3616 for 10' for HSV.
NN023693S	AA7	NN023693 [4.6]	NN023692 [6.1]	6	Not Specified	See Notes	5.4	14	Point Repair Only	Point Repair @ 284.2' US from 3692 for 10' for HSV.
NN023701.01S	V7	NN023701.01 [7.6]	NN023701 [7]	8	Not Specified	See Notes	7.3	6	Point Repair Only	Tap Replacement @ 17.9' DS from 3701.01 for 15' for TFD, Tap Replacement @ 140.8' DS from 3701.01 for 15' for TFD, Point Repair @ 234.8' DS from 3701.01 for 10' for H.
NN023718S	V6	NN023718 [9.1]	NN023717 [9.4]	8	Not Specified	See Notes	9.3	7	Point Repair Only	Point Repair @ 61.7' DS from 3718 for 10' for B, Point Repair @ 82.3' DS from 3718 for 10' for B, Point Repair @ 241.8' DS from 3718 for 10' for H.
NN023745S	X4	NN023745 [0]	NN023744 [5.8]	10	Not Specified	See Notes	2.9	2	Point Repair Only	Point Repair @ 263.4' US from 3744 for 10' for JOL.
NN023766.01S	W7	NN023766.01 [8.6]	NN023766 [8.1]	8	Not Specified	See Notes	8.4	10	Point Repair Only	Tap Replacement @ 124.4' DS from 3766.01 for 15' for TFD.
NN023771S	V7	NN023771 [7.1]	NN023770 [7.2]	8	Not Specified	482.3	7.2	16	CIPP	Point Repair @ 36' DS from 3771 for 10' for HSV, Point Repair @ 122.7' DS from 3771 for 10' for H.
NN023966S	AC10	NN023966 [7.5]	NN023965 [9.2]	8	Not Specified	See Notes	8.4	11	Point Repair Only	Point Repair @ 206.8' DS from 3966 for 15' for TFD.
NN024002S	W9	NN024002 [9.3]	NN024001 [17.8]	8	Not Specified	See Notes	13.6	9	Point Repair Only	Point Repair @ 60.8' US from 4001 for 10' for BSV.
FS045178S	D20	FS045178 [7.4]	FS045177 [9.6]	10	Vitrified Clay Pipe	406.0	8.5	2	CIPP	Point Repair @ 150.5' DS from 5178 for 10' for DV.
NN023658S	Exhibit A	NN023658 [8]	NN023657 [8.3]	6	Vitrified Clay Pipe	80.0	8.0	0	CIPP	
NN020586S-1	Exhibit B	NN020586 [6.9]	NN020585.02 [7.2]	12	Concrete Pipe (non-reinforced)	43.0	7.0	0	CIPP	Double Barrel Siphon
NN020586S-2	Exhibit B	NN020586 [6.9]	NN020585.02 [7.2]	12	Concrete Pipe (non-reinforced)	43.0	7.0	0	CIPP	Double Barrel Siphon