

TECHNICAL MEMORANDUM

TO: City of Bozeman, MT
FROM: Brice Beisher, Travis Denham, Garrett Marsh, Will Najjar
DATE: April 29, 2020
RE: Trenchless Pipeline Technologies and Recommendations

The City of Bozeman has tasked engineering students from Montana State University attending the Stormwater Management and Engineering course with researching trenchless pipeline replacement technologies and providing a recommendation for which trenchless pipeline replacement technology to employ at two separate project sites. This Technical Memorandum is intended to describe available trenchless pipeline rehabilitation technologies, identify advantages and disadvantages of each technology, and recommend which technology be used at each project site.

Introduction

The City of Bozeman (COB) is in the process of rehabilitating 13.9 miles of storm sewer throughout the downtown core over a 15-year period. 4.3 miles of pipeline have been replaced during other large Public Works projects (water main replacements, sewer main replacements, etc.). However, future project coupling opportunities are limited, and rehabilitation of the storm system projects will need to be stand-alone.

The two project sites the COB has tasked our group with providing technical guidance for are the Downtown Trunk Line Rehabilitation and the South Willson Avenue Pipe Rehabilitation. Site-specific information is as follows:

Downtown Trunk Line Rehabilitation

- 564 LF of 36" diameter pipe made of vitrified clay tile
- Includes two concrete manhole structures
- City intends to extend service life of pipe by 50-75 years
- Located a half-block north of E. Main St., between N. Bozeman Ave. and Rouse Ave.
- Consideration: Pipe is buried very deeply below the ground surface with several additional buried utilities above and adjacent to

South Willson Avenue Pipe Rehabilitation

- 3,500 LF of 6" to 12" diameter pipe made of vitrified clay tile
- Pipe passes through several manhole structures
- City intends to extend service life of pipe by 50-75 years
- Located along S. Willson Ave. between W. Harrison Ave. and a half-block north of Main St.
- Considerations: Traffic flow of Willson Ave., newer asphalt pavement, system known to have hydraulic capacity issues, varying pipe sizes

Trenchless Pipeline Technologies

Before addressing project-specific concerns and recommendations, all trenchless pipeline rehabilitation technologies that can be reasonably considered are described and their advantages and disadvantages identified. This section of the TM provides the background information on available technologies and serves as the foundation for the site-specific recommendations.

Pipe Bursting

Description

Pipe bursting is a process of replacing an existing underground pipeline with a new pipe by exerting a radial force on the existing pipeline causing it to expand and break. A new pipe of similar or slightly larger diameter is pulled behind the bursting tool. A pulling rod or cable is pulled from the receiving pit and the new pipe and bursting head begin the process from the insertion pit. The existing pipe guides the bursting tool along its alignment.

Pipe bursting is divided into two systems, pneumatic and static, depending on the type of bursting tool used. Static pipe bursting relies on the pulling force of the equipment to burst the existing pipe and pull the new pipe in its place. Pneumatic pipe bursting uses additional pneumatic or hydraulic forces to break the existing pipe and pull the new pipe. Selection of the appropriate pipe bursting system depends on geotechnical conditions, upsizing required, type of new pipe, and depth of the existing pipeline. For in-depth descriptions of each system and suggestions when to use each, see *Guideline for Pipe Bursting* by the International Pipe Bursting Association.

In order to utilize pipe bursting, an access pit must be excavated at each end of the rehabilitation site to allow space for equipment. The insertion point, the access pit where the new pipe will be pulled from, is used to position the new pipe and bursting equipment into the existing pipe. The size of the insertion point depends on whether the rehabilitation project is using continuous pipe length (fused HDPE for example) or segmental lengths (analogous to bell and spigot). The continuous pipe method dictates the size of the insertion point by the bury depth and bending radius of the pipe to be used. The segmental method dictates the size of the insertion point by the length of each pipe segment, and the depth must be equal to that of the pipe being replaced.

The receiving point is the access point located at the end of the rehabilitated pipe section. This point is used to receive/remove bursting equipment. When using pneumatic pipe bursting the receiving point can simply be a manhole for pipes between 8" and 12". When using static pipe bursting the receiving point must be large enough to provide room for the pulling equipment.

There are other slight variations to the traditional pipe bursting technique. Additional variations were not researched extensively and do not appear to be feasible for either project site due to length of replacement or bury depth. The variations to pipe bursting identified include Expandit Pipe Bursting and Vermeer Air Impactor.

Limitations and Requirements

- Installation diameters range from 4" – 48"
- Maximum installation length of 750' – 1,000'
- Requires pipe laydown area near project site
- Process proceeds at a rate of 100 ft/hr
- Avoid pipe bursting when existing pipe is below the groundwater table
- Avoid pipe bursting when bury depth is less than 5.5'

Advantages

- Pipeline diameter can be increased
- The condition of the existing pipe does not affect the ability to perform pipe bursting

- Ability to reconnect existing service connections
- Provides structural integrity of a new pipe

Disadvantages

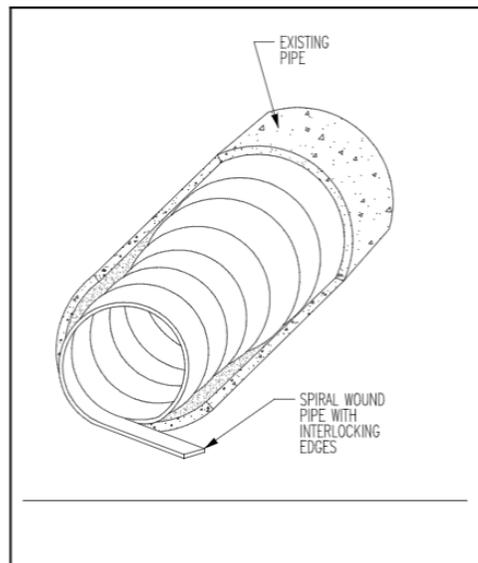
- Existing flows must be diverted or bypassed
- Excavation required for access pits at each end of the pipe to be replaced. Access pits must provide area for pipe bursting equipment and be excavated to existing pipeline depth
- Not recommended in rocky or sandy soils
- Ground heave can occur with shallow pipes
- Dynamic bursting heads can cause ground movement, influence adjacent utilities
- Difficulties can arise in the following conditions:
 - Expansive soils
 - Proximity of other service lines
 - A collapsed pipe along the pipeline

Splining/Slip-lining

Description

Splining/slip-lining is the process of inserting a smaller pipe into the existing pipe so that the new pipe may function as the new water conveyance system. The new pipe would have an outside diameter that is almost equivalent to the existing pipes inside diameter. The space that remained between the two pipes would be grouted to eliminate any space that would allow for water to travel between the two pipes. There are three methods of inserting the new pipe: spiral wound pipe insertion, segmental pipe insertion, and continuous pipe insertion.

Spiral wound pipe is inserted into the existing pipe by a device that unspools the new pipe material down an excavated access pit or manhole. The new pipe material is wound into the existing pipe in a corkscrew-like motion, threading the new pipe material inside the existing pipe. The edges of the spiral wound pipe are interlocked to prevent leaks. This method requires the least amount of excavation to insert the new pipe out of the three splining/slip-lining methods.



Source: Created by Parsons Engineering Science, Inc., 1999.

Figure 1. Spiral wound pipe demonstrating how the new pipe material interlocks and threads into the existing pipe.

Segmental pipe insertion involves digging a large access pit and placing sections of the new pipe in the existing pipe entrance. A machine or device then pushes the new pipe section into the existing pipe. The next section of the new pipe is then lowered into the access pit, fused to the new pipe already inserted in the existing pipe, then pushed into the existing pipe. This process is repeated until the new pipe is installed throughout the length of the existing pipe.

Continuous pipe insertion involves threading a continuous length of new pipe into the existing pipe through a large access pit. The new length of pipe is either pushed and/or pulled into the existing pipe. This requires more space than the other two methods and, in the case that the pipe is being pulled, a second access pit is dug at the opposite end of the existing pipe for the necessary equipment. This method also requires room for the continuous length of pipe to be placed down outside the access pit and room for the equipment used to thread the new pipe into place.

Limitation and Requirements

- Installation diameters range:
 - Spiral Wound: 4” – 158”
 - Segmental: 4” – 63”
 - Continuous: 6” – 100”
- Maximum installation length of 1,000’ for all methods
- Requires pipe laydown area near project site
 - Least: Spiral Wound
- There can be no major defects in the existing pipeline (e.g. disjointed sections)
- Excessive grouting pressure could lead to the new pipe being damaged
- Lack of grouting could lead to the pipe buckling in the void space that remains

Advantages

- Soil type does not interfere with any method
- Increased structural integrity of pipes after being properly grouted
- Does not require normal flows to be eliminated if it is low enough (existing flow is typically beneficial due to the lubrication it provides for the new pipe insertion)
- Can be applied to most types of storm sewer lines
- Minimal impact on surrounding soil and infrastructure
- Well suited for long sections of pipe
- Reduced roughness coefficient

Disadvantages

- Decreased pipe diameter
- Excavated access pits
- Not well suited for small diameter pipes
- Improper grouting can lead to the new pipe being damaged
- New pipe cannot be inserted if there are large disjoints in the existing line

Modified Cross-Section Liner

Description

Modified cross-section lining methods involve extruding a pipe liner typically made of PVC, HDPE, or MDPE and expanding it to conform to the existing pipe. Before the liner is extruded, its cross-sectional profile is modified, or its cross-sectional area is reduced in a way that allows the liner to be fed through the existing pipe easily. The liner is then pressurized with fluid whose temperature is dependent on pipe size and material. The liner is manufactured as a circular pipe, then deformed before reaching the project site. To extrude the liner, it is fed into the pipe through the manhole at the upstream end of the pipe, and out the manhole at the downstream end of the pipe.

There are several types of modified cross-section lining techniques including form and fold, deform/reform, drawdown, rolldown, and thin-walled lining. The techniques differ in their deformation methods and have different requirements and limitations, and the appropriate method should be determined on a project-specific basis.

Limitation and Requirements

- Installation diameters range from 3" – 30" with the most popular range being from 6" – 12"
- There is no maximum installation length, but equipment must be able to hold a roll of the entire pipe length

Advantages

- Slight increase in structural integrity
- Decrease in pipe roughness dependent on existing pipe material and condition
- Can be used for long lengths of pipe
- Minimal equipment required
- Good for corroded pipes
- Can increase service life by 50 years

Disadvantages

- Decreases pipe diameter by 10% – 30%
- Not optimal for large pipes
- Not optimal for pipes failing structurally

Spray In Place Pipe (SIPP)

Description

Material is applied by spray, trowel or roller to the host pipe and can be used as patching or for complete rehabilitation. Both structural and non-structural sprays can be applied, however, the minimum pipe diameter for structural sprays is 36". Non-structural sprays are typically epoxy or cement mortar and structural sprays are typically reinforced cement mortar. There are a variety of different mechanisms by which the spray can be applied. Cost increases as importance of uniform coating and access limitations increase. To achieve uniform coatings, a heated hose system is used. For precise applications with limited access, sewer robots can be used and are controlled remotely.

Limitation and Requirements

- Pipe diameters range from 3" – 180" for non-structural sprays
- Pipe diameters range from 36" – 180" for structural sprays

Advantages

- Can increase service life by 30 – 50 years
- If structural spray is used, structural integrity can be increased
- Minimal change to existing pipe diameter
- Negligible change in roughness for most pipe material
- Low cost compared to other trenchless rehabilitation methods
- Can be done in as little as one day

Disadvantages

- Low increase in service life compared to other trenchless rehabilitation methods

Mechanical Spot Repair

Description

Mechanical spot repair is a method of repairing specific locations within the pipe where it has deteriorated, broken, cracked, or become damaged. This rehabilitation technique is a point specific repair and does not function well for replacing an entire pipeline. A motorized vehicle is placed into the damaged pipe with a steel sleeve attached to it. The vehicle moves through the pipe to the point of damage. The vehicle expands the steel sleeve into the existing pipe to seal the damaged section. This sleeve increases the structural integrity at the point it is inserted and allows the pipe to continue functioning without a full replacement.

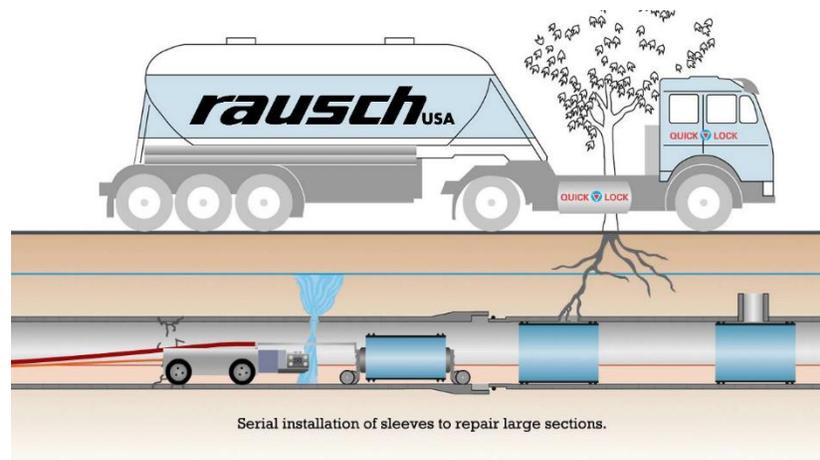


Figure 2. Diagram of the motorized vehicle transporting the steel repair sleeve (blue cylinder) and placing it a specific location within a pipe.

Limitation and Requirements

- Can only be used in a pipe that can fit the vehicle
- Installation diameter minimum of 6”

Advantages

- Increase structural integrity of the damaged section of pipe
- Low cost
- Does not require replacing an entire pipeline
- No excavation required

Disadvantages

- Sleeve is specific to one area in the pipe
- Does not fix the entire pipe

UV Cured-In-Place Pipe (UV CIPP)

Description

UV CIPP is a method of reinforcing an existing underground pipe by pulling a new sleeve made from a silicone bladder with a fiberglass-resin coating mixture through the existing pipe. The rehabilitation process begins with the installer cleaning the existing pipe to remove any loose debris. Next, a camera is sent down the pipe to ensure there are no major cave-ins or irregularities. The fiberglass-resin sleeve is then pulled into the existing pipe and once in place, the sleeve is inflated with air until it is formed to the shape of the host pipe. The resin liner is then cured with a UV light train that is pulled through the inflated liner. After curing, the silicone bladder is pulled out, leaving the hardened resin liner bonded to the host pipe, providing both structural support and a smoother interior surface.

There are two primary methods of installing CIPP, pull through and inversion, depending on if access to both ends of the pipe is available. Pull through CIPP is used when there is access to both ends and involves the silicone bladder being pulled through the pipe, inflated, and cured. The inversion method is used for pipes with access to only one end where the silicone liner is inversely “rolled” out into the pipe. Similar to the way a sock is unrolled, air is used to push the liner through the pipe. Both methods require that the existing pipe is thoroughly cleaned and all irregularities are removed or repaired before lining. Insertion and exit points only need to be large enough to pull the sleeve through, which doesn’t require much or any excavation if a manhole is present.

Limitations and Requirements

- Applicable diameters range from 8” - 36”
- Maximum installation length of over 1,000’ (using a single liner)
- Tee connections and inlets either need to be skipped over or cut-out after curing
- All connections need to be shut off during installation
- Cannot fix major structural, grade, or sagging issues in existing pipes
- Lack of exterior corrosion prevention

Advantages

- No excavation needed
- Minimal access required for lining to occur
- Increase in structural integrity and abrasion resistance
- Smoothens pipe and decreases roughness coefficient, which increases overall capacity

Disadvantages

- Decreases pipe diameter
- Requires no deformations in existing pipe
- No protection from exterior corrosion

Site-Specific Recommendations

In this section of the TM, recommendations for each of the two project sites are made.

Downtown Trunk Line Rehabilitation

It is recommended, UV CIPP be used for the Downtown Trunk Line Rehabilitation (Downtown) project. As a result of several telephone conversations with trenchless pipe rehabilitation contractors in the northwest, it became apparent UV CIPP has become the industry standard for trenchless pipe rehabilitation projects of similar size and scope as the Downtown project. Traditional felt CIPP methods can be included as a bid alternative during the bidding process and the bid document language can be authored to allow owner preference.

By installing UV CIPP as the trenchless pipeline rehabilitation technology for the Downtown project, the COB will accomplish the following goals:

- Extend service life of a critical infrastructure component 50+ years
- Limit surface restoration
- Limit traffic control requirements
- Maintain hydraulic capacity

UV CIPP provides a higher quality product due to more accurate quality control during the installation process when compared to other CIPP methods, modified cross-section, and splining/sliplining. The UV curing process is also less dependent on difficult to control field conditions (ambient temperature, humidity, premature activation, etc.) which created installation challenges when compared to felt CIPP. Being the new industry standard for trenchless rehabilitation projects, selecting UV CIPP for the Downtown project allows a greater number of contractors familiar with the scope of work to competitively bid for the project.

Technical specifications for two separate projects and bid tabulations for a single project are included in Appendix A. Plan sets and complete specifications for the two projects can be made available upon request, allowing COB staff to compare the scope of each project.

The cost of installing UV CIPP, as with any construction project, is extremely variable and dependent on project specifics and contractor experience. Bid tabulations for a recent project in the City of Centralia, WA resulted in installation costs of a 36" diameter CIPP ranged from \$140 - \$254 per linear foot. This cost does not include mobilization, bypass pumping, erosion and sediment control, etc. After a cursory review of the low bidder on the bid tabs, by removing the cost for sales tax (\$27,941), 776' of 30" diameter CIPP (\$93,129), and reducing the CCTV length requirement to 564' (reduction of \$17,100), all other items remaining equal to the low bidder, the COB Downtown project cost estimate is roughly \$230,000. These projects are not identical and this cost should be viewed as a rough approximation.

As noted in the description of UV CIPP, the liner material provides abrasion resistance and structural integrity, adding 50 years to the service life of the pipeline. Due to the generally marginal decrease in diameter and decrease in surface roughness, the pipe capacity will not be negatively affected.

As displayed in the example technical specifications, the liner design should be the responsibility of the contractor and the manufacture, thus the exact decrease in diameter and liner characteristics can't be fully known at this time.

South Willson Avenue Pipe Rehabilitation

It is recommended that either pipe bursting or SIPP be used for the South Willson Avenue project depending on how the COB would like to approach the project. A hydraulic and hydrologic analysis (Appendix B) on the South Willson pipeline from Harrison Street to the downtown trunk line revealed that all pipe segments are undersized, and some pipe segments are considerably undersized when compared to the design storm

outlined in the COB Design Standards. It is recommended that the existing pipeline be replaced with new pipes of larger capacity.

By choosing pipe bursting as the trenchless pipeline rehabilitation technology for the South Willson Avenue project, the COB will accomplish the following goals:

- Replace the existing pipeline with all new pipe
- Reduce the total excavated area required to replace the pipeline completely
- Increase all pipe diameters by up to 6”
- Increase flow capacity of all pipe segments
- Meet the required design capacity for the majority of pipe segments

Pipe bursting increases pipe capacity by considerably more than any other trenchless rehabilitation technology. Although the need for trenches is eliminated, access pits will still need to be excavated on both sides of each pipe segment, requiring the COB to close one block of Willson Avenue to traffic at a time.

If design capacity is desired without the excavation of access pits, stormwater best management practices (BMPs) such as infiltration gardens, can be implemented in select locations within the pipeline’s contributing area. However, an additional analysis is required to determine the appropriate types, sizes, and locations of these BMPs.

The cost of pipe bursting will vary depending on the length, depth, and complexity of the pipe. To give an accurate estimate of cost, two bid tabs (Appendix C) were compared for projects with similar scopes. The first is a project from San Antonio, Texas where 10,800 feet of pipe of varying sizes was pipe-bursted and replaced. By using the lowest bid and adjusting for sales tax, approximate material cost differences, etc. the final cost was \$160 per foot.

The second bid tab was from the City of Gallatin, Tennessee. Here 17,860 feet of pipe of varying size was pipe-bursted and replaced. Using the lowest bid number and adjusting for differences in cost, the final cost was \$74 per foot of pipe installed. Averaging these costs per foot and applying them to our 3,500-foot pipe on Willson Avenue in Bozeman, an estimate cost for pipe bursting this project would be \$420,000 (\$120 per foot). These projects are not identical and this cost should be viewed as a rough approximation.

In order to achieve a greater hydraulic capacity, pipe bursting is the primary recommendation for the South Willson Avenue project. This recommendation increases the hydraulic capacity of the entire pipeline, yet only some of the individual segments meet the COB standards. See Appendix B for more information on the hydraulic capacity analysis.

By choosing SIPP as the trenchless pipeline rehabilitation technology for the South Willson Avenue project, the COB will accomplish the following goals:

- Extend the service life of the existing pipeline
- Minimize immediate cost to the COB
- Limit surface restoration
- Limit traffic control requirements
- Maintain current hydraulic capacity

SIPP is the most cost-effective of all trenchless technologies that alter the cross-section of the existing pipe (Splining/Slip-lining, Modified Cross-Section Liner, SIPP, CIPP). Although SIPP provides the lowest increase in the service life of any trenchless rehabilitation technology (30-50) years, it has the lowest installation cost. If the COB’s objective is for the Willson Avenue pipeline to eventually meet the COB’s design standards, SIPP will provide structural integrity until a future project allows for the entire pipeline to be replaced completely. This structural integrity can also be accomplished with other technologies, such as splining/slip-lining or CIPP, but to use funding in the most beneficial way, we recommend SIPP as the secondary recommendation.

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APPENDIX A

ITEM LABEL	TITLE
A	Northeast Sammamish Sewer and Water District: Division 7 Technical Specification
B	City of Centralia: Division 7 Technical Specifications
C	Example Specification provided by Allied Trenchless
D	City of Centralia: Bid Tabulations

APPENDIX A: ITEM A

Northeast Sammamish Sewer and Water District: Division 7 Technical Specification

**DIVISION 7
DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER
MAINS, AND CONDUITS**

7-05 MANHOLES, INLETS, CATCH BASINS, AND DRYWELLS (SCHEDULE B)

7-05.3 Construction Requirements

7-05.3(5) Rehabilitation of Manholes

New

7-05.3(5)A Quality Assurance

New

The following requirements apply to applications of coating products:

The Contractor shall adhere to the following quality assurance requirements:

1. Coating product(s) shall be capable of being installed and curing properly within a damp, manhole environment. Coating product(s) shall be resistant to all forms of chemical or bacteriological attack found in municipal sanitary sewer systems; and, capable of adhering to the manhole structure substrates.
2. Repair product(s) shall be fully compatible with coating product(s) including ability to bond effectively forming a composite system.
3. Contractor shall utilize equipment for the spray application of the coating product(s) which has been approved by the coating product manufacturer, and Contractor shall have received training on the operation and maintenance of said equipment from the coating product manufacturer.
4. Contractor shall be trained by, or have their training approved and certified by, the coating product manufacturer for the handling, mixing, application and inspection of the coating product(s) to be used as specified herein.
5. Contractor shall initiate and enforce quality control procedures consistent with the coating product(s) manufacturer recommendations and applicable NACE or SSPC standards as referenced herein.
6. Contractor shall have at least three (3) years' experience specializing in the application of the proposed coating products.

7-05.3(5)B Delivery, Storage, and Handling

New

Materials are to be kept dry, protected from weather and stored under cover.

Protective coating materials are to be stored between 50 degrees Fahrenheit and 90 degrees Fahrenheit. Do not store near flame, heat or strong oxidants. Protective coating materials are to be handled according to their material safety data sheets.

7-05.3(5)C Site Conditions*New*

Contractor shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA, and the EPA and any other applicable authorities. Confined space entry, flow diversion and/or bypass plans shall be presented by the Contractor as necessary to perform the specified work.

Contractor shall conform with all confined space entry training and permit requirements as necessary to perform the specified work.

7-05.3(5)D Special Warranty*New*

Contractor shall warrant all manhole rehabilitation work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. Contractor shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said five (5) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner.

7-05.3(5)E Existing Products*New*

The Contractor shall adhere to the following requirements:

1. Standard Portland cement or new concrete (not quick setting high strength cement) must be cured a minimum of twenty-eight (28) days prior to application of the coating product(s).
2. Remove existing coatings and any loose and unsound material prior to application of the coating product(s) which may affect the performance and adhesion of the coating product(s).
3. Thoroughly clean and prepare existing products to allow a seal with the coating product(s).

7-05.3(5)F Repair and Resurfacing Products*New*

The Contractor shall adhere to the following requirements:

1. Repair products shall be used to fill voids, bugholes, and/or smooth transitions between components prior to the installation of the coating product(s). Repair materials must be compatible with the specified coating product(s), if coating is to be applied, and shall be used and applied in accordance with the manufacturer's recommendations.
2. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and rebuild severely deteriorated structures.
3. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications, provided they are accepted by the coating manufacturer as compatible with the coating product, if a coating is to be applied:
 - a. One hundred percent (100%) solids, solvent-free epoxy grout specifically formulated for epoxy top coating compatibility.
 - b. Factory blended, rapid setting, high-early strength, non-shrink, calcium aluminate repair mortar to be trowel or pneumatically spray applied to the entire surface.

- i. Manufacturer: Raven Lining Systems, Broken Arrow, Oklahoma 800-324-2810 or 918-615-0140 fax.
- ii. Product: Raven 705CA – Cement Mortar having the following characteristics:
 - 1. Product Type: Calcium aluminate mortar
 - 2. Tensile Strength (ASTM C496): > 685 psi
 - 3. Compressive Strength (ASTM C109): > 9,200 psi @ 28 days
 - 4. Flexural Strength (ASTM C293): > 1,650 psi
 - 5. Shrinkage @ 90% R.H. (ASTM C596): 0%
 - 6. Adhesion to Concrete (ASTM C882): > 4,000 psi
 - 7. Freeze/Thaw (ASTM C666): 100 Cycles, no visible damage
 - 8. Density of wet mix: 129 – 139 lbs. /ft³
 - 9. Applied Density: 135 lbs. /ft³ (+/- 5 lbs. /ft³)
- c. Factory blended, rapid setting, high-early strength, non-shrink, Portland cementitious repair mortar to be trowel or pneumatically spray applied to the entire surface.
 - i. Manufacturer: Raven Lining Systems.
 - ii. Product: Raven 755 - Cement Mortar having the following characteristics:
 - 1. Product Type: Portland cement mortar
 - 2. Tensile Strength (ASTM C496): > 800 psi
 - 3. Compressive Strength (ASTM C109): >9,000 psi @ 28 days
 - 4. Flexural Strength, (ASTM C293): >1,500 psi
 - 5. Shrinkage @ 90% R.H. (ASTM C596): 0%
 - 6. Adhesion to Concrete (ASTM C882): > 2,000 psi
 - 7. Freeze/Thaw (ASTM C666): 100 Cycles, no visible damage
- d. Factory blended, High Performance Polymer Cement repair mortar to be spray, trowel or otherwise manually applied to the entire surface.
 - i. Manufacturer: Raven Lining Systems.
 - ii. Product: Raven 760HPPC – Polymer Cement Mortar having the following characteristics:
 - 1. Product Type: Polymer Cement Mortar
 - 2. Tensile Strength (ASTM C496): > 700 psi

3. Compressive Strength (ASTM C109): > 5,120 psi @ 28 days
 4. Compressive Strength (ASTM C579): > 5,210 psi @ 28 days
 5. Flexural Strength (ASTM C580): > 1,240 psi
 6. Shrinkage @ 90% R.H. (ASTM C596): 0%
 7. Adhesion to Concrete (ASTM D7234): > 200 psi
- e. Factory blended, non-shrink, hydraulic cement to be used for infiltration remediation.
- i. Manufacturer: As applicable
 - ii. Product: Hydraulic cement having the following characteristics:
 1. Product Type: Hydraulic cement
 2. Compressive Strength (ASTM C109): >1,000 psi @ 1 hour, > 2,500 psi @ 24 hours
 3. Shrinkage @ 90% R.H. (ASTM C596): 0%
- f. Hydrophobic or Hydrophilic injectable chemical grout to be used for the remediation of high volume infiltration or crack repair and/or soil stabilization and void filling.
- i. Manufacturer: As applicable
 - ii. Product: Chemical grout as appropriate for infiltration, crack repair and soil stabilization.
- g. (OPTIONAL) Fiberglass woven roving cloth using E-Glass, 9 oz/yd² minimum weight; typical of Hexcel or BFG Industries style #7500.

7-05.3(5)G Surface Preparation

New

The Contractor shall adhere to the following requirements:

1. Place covers over inverts to prevent extraneous material from entering the sewer lines before cleaning.
2. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be removed.
3. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that only sound substrate remains.
4. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the coating product(s).
5. Surface preparation method, or combination of methods, that may be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shotblasting, grinding, scarifying, detergent water cleaning, hot water blasting and others as described in NACE No. 6/SSPC SP-13.

Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface suitable for the specified coating product(s).

6. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for top coating with the coating product(s).
7. Manhole Chimney Joint and Casting: The area between the manhole and the manhole ring and the manhole casting shall be a termination point of the specified coating product(s).
8. Prior to the application of the coating product repairs shall be completed to ensure the following:
 - a. All inflow and infiltration shall be eliminated by use of appropriate repair material(s), such as hydraulic cements and/or chemical grouts as described in Section 7-05.3(5)F.
9. All repairs to joints, pipe seals, steps, mechanical penetrations, benches, inverts, pipes or other appurtenances to be coated shall be completed and repaired surfaces prepared according to this section.
10. Benches or other horizontal surfaces shall have adequate slope (1" rise per lineal foot minimum) to minimize the retention of debris following surcharge.
11. Inverts or flow channels shall be smooth without lips, rough edges or other features which may cause debris to collect; contoured to minimize turbulent flow; and be sloped to promote adequate flow from the inlet(s) to the outlet pipe.
12. All joints, pipe seals, steps or other penetrations shall be sealed against inflow, infiltration and exfiltration and be adequately filled, smoothed and contoured to promote monolithic coating application.

7-05.3(5)H Application of Repair and Resurfacing Products

New

The Contractor shall adhere to the following requirements:

1. Areas where rebar has been exposed shall be repaired in accordance with the Project Engineer's recommendations. Areas where rebar has been exposed and is corroded shall be first prepared in accordance with Section 7-05.3(5)G. The exposed rebar shall then be abrasive blasted and coated with coating product specified.
2. Repair products shall be used to fill voids, bugholes, and other surface defects which may affect the performance or adhesion of the coating product(s), if one is to be applied.
3. Resurfacing products shall be used to repair, smooth or rebuild surfaces with rough profiles to provide a concrete or masonry substrate suitable for the coating product(s), if one is to be applied. These products shall be installed to minimum thickness as recommended within manufacturers published guidelines. Should structural rebuild be necessary, these products shall be installed to a thickness as specified by the Project Engineer.
4. Repair and resurfacing products shall be handled, mixed, installed and cured in accordance with manufacturer guidelines.
5. All repaired or resurfaced surfaces shall be inspected for cleanliness and suitability to receive the coating product(s), if one is to be applied. Additional surface preparation may be required prior to coating application.

6. All manholes shall be vacuum tested after application of repair and resurfacing products, in accordance with ASTM C 1244-62, regardless of if coating is called for. The vacuum test shall take place after all repair work is completed, but before the coating is applied, if coating is called for on the Plans. If leakage is found, contractor shall repair leakage areas as required by the Engineer and vacuum test the manhole again, as necessary until the manhole passes the vacuum test.

The Contractor shall provide the manhole rim seal with appropriate fittings to enable a vacuum compressor (also provided by the Contractor) to draw a vacuum of 9 to 10 inches Hg in the manhole. Contractor shall also provide plugs for all manhole pipe penetrations. Manholes 8 feet and less shall lose no more than 1-inch Hg in 20 seconds to be considered acceptable. Five seconds shall be added to the acceptance test interval for each 2 feet of depth over 8 feet.

7-05.3(5)I Testing and Inspection

New

The Contractor shall adhere to the following requirements:

1. During application a wet film thickness gauge, meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Measurements shall be taken, documented and attested to by Contractor for submission to Owner.
2. Visual inspection shall be made by the Project Engineer and/or Inspector. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Contractor.
3. The municipal sewer system may be returned to full operational service as soon as the final inspection has taken place.

7-05.3(5)J Manhole Rehabilitation Bypassing Sewage

New

The Contractor, as necessary, shall provide labor and equipment to stop, bypass, or divert the flow of sewage around the section or sections of pipe designated for manhole rehabilitation or repairs. Bypass pumping may be done by plugging the line at an existing upstream manhole or cleanout and pumping the flow into a downstream manhole or adjacent system. Alternatively, the bypass may be done by plugging the inlet lines at a manhole with a flow-thru plug and conveying the flow through bypass pipe(s) into the outlet line that is plugged with a flow-thru plug. The plug(s), pump(s) and bypass line(s) through SSMH #1, #2, and #3 shall be of adequate capacity to accommodate sewage flow of up to 2,000 gpm, up to 200 gpm through SSMH LSS5 41, LSS 47, and LSS 48, up to 905 gpm in the Lift Station No. 3 Basin Interceptor, and up to 265 gpm through SSMH TL2-1.

Day time (6:00 a.m. to 10:00 p.m.) and night time (10:00 p.m. to 6:00 a.m.) sewer flows through the Lift Station No. 3 Basin Interceptor for July 2018 through October 2018 are shown below.

Percentile	Day Time Hourly Flow (gpm)	Night Time Hourly Flow (gpm)
100 th (Maximum Flow)	905	790
90 th	595	480
80 th	540	395
70 th	490	330
60 th	450	230
50 th	410	170

The maximum day time peak hour flow observed for July 2018 through October 2018 was 905 gpm. Ninety percent (90%) of the time the day time hourly flow was 595 gpm or less, eighty percent (80%) of the time the day time hourly flow was 540 gpm or less and so forth. The maximum night time peak hour flow observed for July 2018 through October 2018 was 790 gpm. Ninety percent (90%) of the time the night time hourly flow was 480 gpm or less, eighty percent (80%) of the time the night time hourly flow was 395 gpm or less and so forth. Peak hourly flows occurred in the morning hours and in the evenings.

There are two lift stations upstream of the Lift Station No. 3 Basin Interceptor: 1) flows discharged from Lift Station No. 5, which can pump up to 1,600 gpm, pass through SSMH T-26; and 2) flows discharged from Lift Station No. 10, which can pump up to 310 gpm, pass through SSMH TL2-1.

A detail of the bypass plan shall be submitted to the Owner for approval. The bypass plan shall include all equipment to be used for any plug(s), pump(s) and bypass line(s), including ramps and any other equipment used to protect the bypass line(s) in the roadway.

The submittal shall include a plan view map showing any temporary pipeline alignments, pump location (primary and backup for mainline bypasses), and all other appurtenances necessary for a reliable bypass system.

7-08 GENERAL PIPE INSTALLATION REQUIREMENTS (SCHEDULE A)

7-08.3(5) CIPP Pipe Construction

New

7-08.3(5)A Submittals

The Contractor shall submit documentation provided by the CIPP Manufacturer that the Contractor is qualified to properly install the proposed product. The documentation shall consist of evidence of Contractor training, testing, and/or certification of being trained to install the Manufacturer's product. The name, address, and phone number of the manufacturer's representative who issued certification to the contractor installing the CIPP shall also be submitted to the Engineer.

The CIPP Contractor shall provide a Superintendent/Foreman and Project Manager having a minimum of 2 years' experience and experience installing a minimum of 50,000 linear feet of CIPP, personally performing the work or directly supervising construction. Only UV-cured CIPP construction can be used for fulfilling this experience requirement. The name, address, phone number, and qualifications of the CIPP Contractor's Superintendent/Foreman and Project Manager; project descriptions, dates, and owner contacts for 3 projects in excess of \$100,000 in the last 5 years shall be submitted with the bid.

The above documentation of Contractor's training shall be hand carried, mailed, or faxed to the Engineer within fourteen (14) calendar days after the Notice to Proceed date.

An itemized list detailing the installation procedures to be used shall be submitted. This shall include the curing method to be used for the CIPP liners on this project (UV), estimated times for each task, the number of required excavations, and any other items unique to each process.

All related ASTM standards or any nationally recognized standards for installation of the product shall be submitted.

Detailed procedures shall be submitted for repairing the product in the event of failure or future damage. These procedures should not require specialized training and/or equipment for the Owner's maintenance crews.

Detailed procedures shall be submitted for future tapping of service connections into the product.

Detailed description and physical properties of the lubricant to be used during installation shall be submitted for the Engineer's review.

Detailed procedures for the construction of manhole transition sections along with description and physical properties of the bonding agent to be used shall be submitted for the Engineer's review.

Detailed information on existing pipe inside diameter, pipe material, and alignment of the host sewer pipe, and the condition of each manhole-to-manhole segment to be lined shall be submitted for the Engineer's review prior to ordering the CIPP liner.

Detailed Product Data: Resin, Tube material, Qualification testing results for laminate sample, resin enhancer, bond enhancer, sealant/ caulking material, resin curing schedule showing time and temperature for each reach, Manufacturer's recommended installation pressures, minimum and maximum for each reach.

Public Relations: Notification flyers for the Owner's customers that request limiting water use during construction.

7-08.3(5)B Installation of Liner

New

A list of previously completed CIPP projects shall be submitted. See Section 7-17.2(1)C of this specification for requirements.

Liner installation shall be in accordance with ASTM F1216-09, Section 7, or ASTM F2019-11 for UV cured liners, and with the following requirements:

1. Cleaning and Inspection

The sewer line shall be cleaned as necessary for the successful installation of the CIPP in accordance with the National Association of Sewer Service Companies (NASSCO) standards. Cleaning and video inspection records shall be provided to the Engineer before beginning the CIPP installation work. At a minimum, the Contractor shall remove all debris, accumulated grease, roots, intruding pipe gaskets, liquids, and other materials from the host pipe. All roots and intruding pipe gaskets shall be cut flush with the wall of the host pipe. All such debris resulting from cleaning operations shall be removed from the site and disposed in accordance with applicable laws and regulations. Precautions shall be taken to ensure that the cleaning operations will not cause any: 1) damage to the host pipe; 2) damage or flooding to public and/or private property; or 3) movement of settled sediments to the downstream system.

The Contractor shall be responsible for procuring the water supply for cleaning. If the District's water supply is used, a hydrant meter must be obtained from the District and all applicable water costs shall be borne by the Contractor.

The Contractor shall conduct a television inspection of the sewer pipe before the insertion of the liner to ensure that the pipe is clean, and existing pipe conditions are acceptable for lining. The interior of the pipe shall be carefully inspected to determine the location of any conditions that may prevent proper installation of the liner, and it shall be noted so that the condition(s) can be corrected. A remote-reading footage counter shall record the footages so that they can be seen while viewing the video. A USB flash drive of the video inspection, complete with a printed copy summary of the pipeline inspection report, shall be kept and submitted to the Engineer. All pipe characteristics observed and defects found shall be defined and classified in accordance with Pipeline Assessment and Certification Program (PACP) terms. CCTV operators shall be NASSCO PACP Certified.

The Contractor shall inspect the interior of the pipeline to determine the size, location, and activity of all service laterals and outside manhole drops connected to the host pipe. If the Contractor is unable to determine the activity of a service lateral, the Owner shall be notified and a dye test shall be conducted.

The Contractor shall clear the line of obstructions, such as protruding services, offset joints, mortar, liquids, and all other obstructions. The obstructions shall be trimmed to within ¼ inch of the host pipe wall. If the pre-installation inspection reveals an obstruction that cannot be cleared, such as a collapse or offset joint, and that reduces the effective pipe area by more than ten percent (10%), the Contractor shall notify the Engineer within 24 hours of recording the visual evidence of any structural problems, damage, or obstructions, that would prevent the completion of the CIPP lining process to allow time to schedule and perform emergency repairs. Also, the Owner will have the option of either:

- A) Correcting the problem with a point repair and proceeding with the work, or
- B) Terminating the project and paying the Contractor for work completed.

2. Resin Impregnation

- A) For UV cured liners, the tube shall be impregnated with resin (wet-out) in accordance with ASTM F2019-11. The resin shall be distributed uniformly throughout the tube.
- B) The liner will be vacuum-impregnated via factory wet-out prior to installation; field wet-out will **not** be allowed. The manufacturer shall allow the Engineer to inspect the materials and procedures used to vacuum-impregnate the tube.

3. Bypassing

- A) If bypassing of sewage flows is required around the sections of pipe designated for rehabilitation, the bypass shall be made in accordance with Section 7-08.3(5)D of the Special Provisions.
- B) Public advisory services shall be required to notify all parties whose service laterals will be affected and all connected residents to advise minimum water usage. The Contractor shall provide written notification of work activities to all local users fourteen (14) calendar days before interruption of service and provide interim sewer service. This notification shall include a description of the project, the method of construction, and the approximate date and duration that disruption of sewer service will occur. The notification shall also note the potential inconvenience from resin odor, noise, and lights. The Contractor shall maintain a notification log that will include the date and time of the notification, the contact

person's name, and if no contact was made, a notation that the information was left at the person's door. The notification shall be submitted to the Owner for approval at least fourteen (14) calendar days prior to being mailed to affected parties.

If authorized by the Owner, in-person verbal notification shall be acceptable in lieu of the above written notifications.

4. Insertion of Liner

- A) For UV cured liners, insertion shall be in accordance with ASTM F2019-11.
- B) Tube insertion forces or pressures shall be limited so as not to stretch the tube longitudinally by more than five percent (5%) of the original length.
- C) Before the insertion begins, the tube manufacturer shall provide values for the minimum pressure required to hold the tube tight against the existing conduit and the maximum allowable pressure so as not to damage the tube. Once the insertion has started, the pressure shall be maintained between the minimum and maximum pressures until the insertion has been completed. Should the pressure deviate from the required, the installed tube shall be removed from the host conduit at the Contractor's expense. The Contractor shall provide the Engineer with a continuous log of pressure during cure.
- D) Segments of liner that have been resin impregnated and placed in the host conduit and then are found to be too short, shall be removed without curing and properly discarded at the Contractor's expense. Removal of the uncured, resin impregnated liner shall be accomplished in such a way as to minimize the amount of resin allowed to escape. The Contractor shall be responsible for cleanup of all escaped resin and any odors that may result. The Contractor shall submit a plan to remove any odors and resin impregnated, uncured liner from the host conduit, including protection of the host system from escaping resin to the Engineer for approval a minimum of three (3) weeks prior to the first installation process.
- E) The existing sewer line shall be dewatered prior to liner insertion.
- F) For UV cured liners, the use of a slider tube during liner insertion is required to reduce friction. This slider tube shall be pulled into place prior to pulling the UV liner into place. A constant tension winch should be used to pull the glass fiber liner into position in the pipe. Once inserted, end plugs shall be used to cap each end of the glass fiber liner to prepare for pressurizing the liner. The end plugs should be secured with straps to prevent them from being expelled due to pressure.
- G) The tube shall not be exposed to ultraviolet light prior to curing.
- H) The tube shall not experience excessive (as defined in Section 7-08.3(5)B.6(A) of the specifications) bubbling or wrinkling during insertion.

5. Curing for UV Cured Liners

After insertion of the wetted-out tube is complete, the Contractor shall use suitable UV light chain equipment for a consistent cure of the resin. The curing temperatures shall comply with submittals and manufacturer's recommendations.

Liner cure schedule shall be adhered to per manufacturer's specifications. The fiberglass liner will then be inspected with a camera mounted on the UV light chain as it is pulled to the end of the liner. After inspection and compete inflation to the manufacturer's specifications, the UV light bulbs will be turned on. The curing will commence at a rate specified by the

manufacturer according to the total dimensions of the liner. As the liner is curing, the UV curing system shall record all curing data for the viewing of the owner. The initial cure shall be deemed to be complete when the UV Chain arrives at the initial entry point of insertion. The Contractor shall provide the Engineer with a continuous log of light temperatures and all gauges during curing.

Curing temperatures and duration shall comply with previously submitted data and information and be approved by the Engineer.

Curing shall be in accordance with ASTM F2019-11.

The inner film material should be removed and discarded after curing to provide optimal quality of the final product.

6. Finished Pipe

- A) The finished CIPP shall be continuous over the entire length of each installation run and be free of such defects as holidays, foreign inclusions, dry spots, lifts, delamination, buckling, creases, and other deformities. Wrinkles with a height that exceeds five percent (5%) of the inside diameter of the host pipe or that create voids between the liner and host pipe wall shall be considered unacceptable. Wrinkles in the lower third of the finished CIPP (based on depth of flow) shall be considered unacceptable if their height exceeds three percent (3%) of the inside diameter of the host pipe or 0.5 inches, whichever is smaller. If defects are present, the Contractor shall remove and replace the liner in these areas, using a method approved by the Engineer, at the Contractor's sole expense.
- B) At its termination point(s), the space between the liner and original pipe shall be sealed with an approved hydrophilic rubber gasket, such as Hydrotite, and/or by filling with a resin mixture compatible with both the CIPP and the original pipe. The sealing work performed at the pipe termination shall be guaranteed to be watertight for a period of five (5) years.

7-08.3(5)C Transition Sections

New

1. Transition sections shall be constructed to channelize the sewage flow and minimize entrance and exit losses as the flow passes through the existing manhole structures affected by the CIPP work.

For UV cured liners, the Contractor shall install a zippered safety cap around the pipe liner when the pipe liner is placed through manholes.

When the pipe liner is placed through manholes, the Contractor shall cut away the crown of the cured pipe liner (and safety cap for UV cured liners) to conform to the existing manhole walls. The Cured-in-Place liner shall make a tight seal at the manhole opening with no annular gaps. All sealing materials used shall be approved by the Engineer and shall be compatible with the manhole substrate. Contractor shall seal annular space between host pipe and CIPP liner watertight at manholes.

Existing benches and channels shall be built up with grout as needed to match the CIPP liner elevations. Smooth transitions shall be formed between the existing surfaces and the CIPP.

2. Prior to applying new concrete, the existing surfaces shall be adequately cleaned, scraped of loose concrete, and roughened. An approved concrete bonding agent shall be applied prior to the construction of the new channels, benches, and/or transition sections. The bonding

agent shall meet ASTM C-881 requirements for Type 1, Grade 3, epoxy resin adhesive. The bonding agent shall be Sikadur 31 Hi-Mod Gel or an approved equal.

3. The new channels, benches, and transition sections shall be formed using quick setting, high strength polymer modified Portland cement non-shrink grout. The grout shall meet ASTM C-293, flexural strength 1,900 psi 28-days, ASTM C-495, Splitting Tensile Strength, 750 psi 28-days, ASTM C-882, Bonding Strength 2,200 psi 28-days, and ASTM C-109, Compressive Strength 7,000 psi 28-days. The grout shall be added up to fifty percent (50%) by weight of clean, well graded aggregate conforming to 1 inch by No. 4 Coarse Aggregate grading. This quick-setting grout shall be mixed and applied as per manufacturer's specifications and the Standard Specifications. The grout shall be SikaTop 122 or an approved equal.

7-08.3(5)D CIPP Bypassing Sewage

New

The Contractor, as necessary, shall provide labor and equipment for the flow of sewage around the section or sections of pipe designated for CIPP lining or repair. Plugging the line at an existing upstream manhole or cleanout and pumping the flow into a downstream manhole or adjacent system. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate sewage flows up to 905 gpm in the Lift Station No. 3 Basin Interceptor and up to 265 pm through SSMH TL2-1. Day time (6:00 a.m. to 9:00 p.m.) and night time (9:00 p.m. to 6:00 a.m.) sewer flows through the Lift Station No. 3 Basin Interceptor for July 2018 through October 2018 are shown below.

Percentile	Day Time Hourly Flow (gpm)	Night Time Hourly Flow (gpm)
100 th (Maximum Flow)	905	790
90 th	595	480
80 th	540	395
70 th	490	330
60 th	450	230
50 th	410	170

The maximum day time peak hour flow observed for July 2018 through October 2018 was 905 gpm. Ninety percent (90%) of the time the day time hourly flow was 595 gpm or less, eighty percent (80%) of the time the day time hourly flow was 540 gpm or less and so forth. The maximum night time peak hour flow observed for July 2018 through October 2018 was 790 gpm. Ninety percent (90%) of the time the night time hourly flow was 480 gpm or less, eighty percent (80%) of the time the night time hourly flow was 395 gpm or less and so forth. Peak hourly flows occurred in the morning hours and in the evenings.

There are two lift stations upstream of the Lift Station No. 3 Basin Interceptor: 1) flows discharged from Lift Station No. 5, which can pump up to 1,600 gpm, pass through SSMH T-26; and 2) flows discharged from Lift Station No. 10, which can pump up to 310 gpm, pass through SSMH TL2-1.

A detail of the bypass plan shall be submitted to the Owner for approval. The bypass plan shall include all equipment to be used for the pump(s) and bypass line(s), including ramps and any other equipment used to protect the bypass line(s) in the roadway.

The submittal shall include a plan view map showing temporary pipeline alignments, pump location (primary and backup for mainline bypasses), and all other appurtenances necessary for a reliable bypass system.

7-17 SANITARY SEWERS (SCHEUDLE A)**7-17.1 Description****7-17.1(1)A Description of Project***Supplemental*

Sanitary sewer pipeline work in this Contract includes the lining of 15-inch and 18-inch-diameter concrete pipe with CIPP.

7-17.1(1)B Product Qualification*New*

For a CIPP product (combination of tube and resin) to qualify for use in the Project, a history of successful commercial viability shall be shown. Products not meeting the minimum requirements established by the Owner for successful commercial viability may be rejected. The Owner shall be the sole judge as to whether the requirements have been met. For a proposed CIPP product to qualify as a commercially acceptable product for the Project, the following requirements must be met:

A minimum of 10,000 linear feet of successful wastewater collection system installations in the U.S. shall be documented, for the proposed tube and resin used together as one product, to assure commercial viability of the materials and the process. In addition, the CIPP product shall have been in service within wastewater collection facilities in the United States for a minimum of three (3) years, unless otherwise approved by the Engineer. Installations of the proposed resin and tube used independently from each other may not be used to qualify the product for the linear footage and years of service requirements.

The above documentation of product qualification and Manufacturer's letter(s) shall be hand carried, mailed, or faxed to the Engineer within fourteen (14) calendar days after the Bid Opening date.

7-17.1(2)A CIPP Referenced Documents*New*

This Technical Provision references American Society for Testing and Materials (ASTM) and National Association of Sewer Service Companies (NASSCO) standards which are made part hereof by such reference, and shall be the latest edition and revision thereof. For UV cured liners, CIPP provisions, methods, tests, materials, etc., not addressed by this Technical Provision shall be governed by ASTM F1216-09 or F2019-11. In the event there is a conflict between the references and this Technical Provision, this Technical Provision shall govern.

7-17.1(3)A CIPP General*New*

Basic procedure for the sewer rehabilitation shall include an access shaft which may involve sewer flow control and bypassing, cleaning, pre- and post-rehabilitation television inspection, liner installation, testing, reconstruction, and restoration. After completion of the rehabilitation, the CIPP liner shall provide a continuous, watertight, corrosion resistant conduit within the existing sewer line.

Prior to ordering sewer rehabilitation materials, the Contractor shall be responsible for inspecting and confirming the inside dimension, alignment, pipe material, and condition of the existing sewer pipe segments to be lined with CIPP.

7-17.2 Materials*Supplement***7-17.2(1) CIPP Materials***New*

All materials and components, including resin, tube, and outside layer of tube, shall be compatible and suitable for providing a finished CIPP product which meets the requirements of the Contract Documents. The Contractor shall submit documentation within fourteen (14) calendar days of the Notice to Proceed date that the resin, tube, and outside layer of tube are compatible.

The design thickness of the CIPP wall is a function of multiple factors including, but not limited to, product materials and the condition of the existing sewer line. The materials used shall have the capability to vary wall thicknesses to address variations in existing pipe conditions (e.g., circumference, deterioration, and alignment due to pipe bends). The liner thickness shall be sized for a minimum hydrostatic and earth load as per design criteria or per ASTM F1216-09.

Tube – For UV cured liners, the material shall meet the requirements of ASTM F2019-11, be continuously woven along the entire tube circumference with an overlap for the tube to expand once inside the host pipe, and have an abrasion layer. The tube shall be compatible with the resin system used. The tube shall be fabricated to a size that, when installed, will fit the internal circumference and the length of the existing pipe. Allowance shall be made for circumferential and longitudinal stretch during installation. The minimum length of each section shall be the distance from the manhole to the next manhole. The Contractor shall verify the section lengths and inside dimensions of the existing sewer section before tube fabrication.

The flexible tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that can be subject to delamination in the cured flexible tube.

Resin for UV Cured Liners - The resin system shall be a corrosion resistant polyester UV curing resin and catalyst system compatible with the UV light curing process including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F2019-11 and these Special Provisions, whichever is most stringent. The resin shall produce a UV CIPP that will comply with the structural and chemical resistance requirements of this specification. The finished UV light cured fiberglass pipe lines will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 150 degrees Fahrenheit.

The wall color of the interior pipe surface of the CIPP after installation shall be a light reflective color. The color used shall not interfere with visual and/ or closed-circuit television (CCTV) inspection of the liner or its required properties.

Over Expansion Sleeves for UV Cured Liners – Jean caps shall be used in the following locations and as directed by the Engineer after cleaning and inspection.

- A) Each end of the pipe segment.
- B) At each section of pipe that has complete or significant wall loss.

7-17.2(1)A Design Parameters*New Section*

For UV cured liners, the installed CIPP liner design parameters shall meet or exceed the following requirements.

Minimum CIPP Resin Requirements:	
Flexural Modulus (long term)*	725,000 psi
Flexural Strength (ASTM D-790)	6,500 psi

* The long term flexural modulus is defined as fifty (50) years as determined by ASTM D2990 Test Method.

7-17.2(1)B Structural Requirements

New Section

For UV cured liners, the flexible tube shall be designed as per ASTM F2019-11, Appendix X1, for each pipe segment with the following additional requirements. For UV cured liners, the finished cured-in-place liner thicknesses shall meet ASTM F2019-11, and the finished cured-in-place liners shall have the following minimum thicknesses, including the non-structural layers (abrasion layer and outer foil).

- **6.0 mm for 15-inch pipe**
- **7.0 mm for 18-inch pipe**

The CIPP design shall include the following assumptions.

- The groundwater table is 2.0 feet above the ground surface.
- The wheel load is HS-20 or greater.
- The safety factor is 2.0 or greater.
- The ovality is 2.0% or greater.
- Soil density is 120 lb/ft³ or greater.
- Modulus of soil reaction (or soil modulus) is 1,000 psi.
- Poisson's ratio is 0.3.
- The enhancement factor is 7.
- No bonding to the existing pipe wall.
- Fully deteriorated host pipe.

With respect to external buckling and because the structural conditions of the existing sewer pipe walls are unknown, the flexible tube shall be designed to act as a standalone pipe within the existing pipe.

Acceptable third party testing, by an agency approved by the Engineer, and verification of the design analysis techniques (ASTM F2019-11, Appendix X1 for all installation methods of UV cured liners) shall be submitted for the Engineer to review prior to installation of the liner.

The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding fifty percent (50%) of the short-term test results shall not be applied unless substantiated by qualified third party test data to the Owner's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

The Enhancement Factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7.

The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.

The required structural CIPP wall thickness shall be based, as a minimum, on the design parameters in Section 7-17.2(1)A or greater values if substantiated by independent lab testing and in accordance with the design equations in the Appendix X1. Design Considerations of ASTM F1216-09. Thickness design shall assume fully deteriorated host pipe and the soil overburden depths shown on the Plans.

Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

7-17.2(1)C Product Qualification

New Section

For a CIPP product (combination of tube and resin) to qualify for use in the Project, a history of successful commercial viability shall be shown. Products not meeting the minimum requirements established by the Owner for successful commercial viability shall be rejected. The Owner shall be the sole judge as to whether the requirements have been met. For a proposed CIPP product to qualify as a commercially acceptable product for the Project, the following requirements must be met:

A minimum of 10,000 linear feet of successful wastewater collection system installations in the U.S. shall be documented, for the proposed tube and resin used together as one product, to assure commercial viability of the materials and the process. In addition, the CIPP product shall have been in service within wastewater collection facilities in the United States for a minimum of three (3) years, unless otherwise approved by the Engineer. Installations of the proposed resin and tube used independently from each other may not be used to qualify the product for the linear footage and years of service requirements.

The manufacturer(s) for both proposed resin and tube shall have successfully produced the material in the U.S. continuously for a minimum of three (3) years, unless otherwise approved by the Engineer. If the manufacturer(s) does not have this minimum three (3) years commercial experience in the U.S., the number of linear feet of product proposed to be installed under this Project shall not exceed three percent (3%) of the total footage (at time of bid) of the product that has been successfully installed in the U.S.

The Contractor shall submit documentation that the proposed product meets the above minimum linear footage and years of service requirements. The documentation shall include for each project the name, address, and reference telephone numbers of the owner of the pipe line system that was CIPP lined; date of owner acceptance of the completed product installation; length of CIPP installed; diameter of host pipe; and installer name, address, and reference telephone numbers. In addition, the Contractor shall submit documentation in the form of a letter(s) from the manufacturer(s) verifying that the proposed resin and tube materials have been manufactured for a minimum of three (3) years or the project's linear footage does not exceed three percent (3%) of the total footage of the product (at time of bid) that has been successfully installed in the U.S.

The above documentation of product qualification and Manufacturer's letter(s) shall be hand carried, mailed, or faxed to the Engineer within fourteen (14) calendar days after the Bid Opening date.

7-17.3(2) Cleaning and Testing

7-17.3(2)A General

Supplemental

Testing of all pipe materials may be required prior to installation at option of the Engineer. Such tests, if required, shall be conducted in accordance with the reference material specification for the material being used. Testing shall be performed on the new mainline and service laterals, simultaneously prior to the new sewer being placed in service.

Installation of the CIPP must be performed by a work force that is experienced in such installation work. At minimum, the Contractor's CIPP work force shall include a CIPP work supervisor and a work crew member experienced in liner wet-out and insertion and a remote cutter operator.

7-17.3(2)H Television Inspection

Supplement and Replacement

Delete paragraph 1.

Prior to the television inspection, the new sewer pipe shall be flushed to remove all debris and water no more than 12 hours before inspection and allowed to fill all pipe "bellies." The deviation from pipe grade (depth of pipe "bellies") shall be determined by towing a 2-inch ball ahead of the video camera while the water is stagnant in the pipe "bellies."

Once the television inspection has been completed the Contractor shall submit to the Engineer the written reports for the inspection plus the USB flash drive(s). Said recordings are to be in color and compatible with the Owner's viewing and recording systems. The Contractor shall notify the Owner at least 48 hours in advance of video-inspections. It shall be the Contractor's responsibility to confirm that the video file format is compatible with the Owner's viewing software and equipment.

Prior to ordering rehabilitation materials, the Contractor shall be responsible for inspecting and confirming the inside diameter, pipe material, and alignment of each segment of the host sewer pipe to be lined. The Contractor shall use the data and information collected from this inspection to finalize the liner size, refine the liner design, and refine the installation techniques. If unknown physical conditions in the work area are encountered during the investigation that materially differ from those ordinarily encountered, the Contractor shall notify the Engineer.

7-17.3(2)I CIPP Product Test Data

New

No product shall be installed without submittal, prior to construction, of test data supporting the product performance requirements listed below. Materials tested to provide the required test data shall be like those proposed for use in the Project. All test samples shall be prepared to simulate the conditions and procedures the product will experience during the Project. All testing shall have been performed by an independent third party qualified to perform such testing.

Chemical resistance – For UV cured liners, tests shall be conducted for domestic sewage with light-industrial discharges in accordance with ASTM F2019-11, and meet the minimum requirements listed therein.

Hydraulic capacity – Calculations shall be submitted which support that the finished in-place flexible tube shall be able to provide a minimum of one-hundred percent (100%) of the existing sewer line's original design capacity. (Original design capacity of the existing sewer line shall be calculated using a roughness coefficient "n" of 0.015.) The typical roughness coefficient "n" to be used for the proposed

flexible tube shall be verified by independent third party (hired by the product Manufacturer) test data, but shall not be less than 0.011, unless otherwise approved by the Engineer.

Flexural modulus and strength – To verify the proposed product's past performance, the Contractor shall submit detailed test results from a minimum of ten (10) previous successful installations of the proposed product. The test results of field samples from each of the ten (10) previous installations shall verify that the minimum requirements for short-term flexural modulus and flexural strength specified in this special provision had been achieved.

7-17.3(2)J CIPP Design Submittals

New

Provide sufficient detail to allow the Engineer to judge whether the proposed materials, equipment, and procedures will meet the Contract requirements. All design calculations and shop drawings shall be prepared and stamped by an Engineer licensed in the State of Washington. No materials shall be manufactured prior to approval of the submittals by the Engineer. The design submittals shall be sent to the Engineer within fourteen (14) calendar days following the Preliminary Investigation of Host Sewer Pipe (see section 7-17.3(2)H). Design submittals shall include the following:

1. Design Analysis

For UV cured liners, the CIPP shall be designed per ASTM F1216-09 or F1743-08. The thickness design used for the product shall be submitted for review and approval. Physical properties used in design equations shall be validated by independent testing.

2. Manufacturing and Quality Control

- A) Engineering design guides and detailed quality control procedures for rehabilitation materials, manufacturing, and installation shall be submitted for review. This shall include inspection requirements, testing procedures, and allowable manufacturing tolerance levels.
- B) The Contractor shall submit certification provided by the product Manufacturer as to the country of manufacture of all major components to be used to produce the final installed work.

7-17.3(2)K CIPP Tests for UV Cured Liners

New

The Contractor shall collect a minimum of one field sample of the CIPP and perform the tests listed below per each 1,000 linear feet of CIPP installed or as required by the Owner.

For all pipes, a constrained sample will be obtained by pulling through a like diameter section of a zippered safety cap. Samples for this test shall be provided from the following ASTM method:

- A) ASTM F2019-11, Section 7.1.2. If a length of CIPP is installed through intermediate manholes, samples may be taken at the intermediate manhole as well as at the termination point.

Where testing is performed on CIPP samples, the Contractor shall be responsible for providing the necessary samples and for hiring a qualified, independent third party to perform the required tests. This third party shall be approved by the Engineer. Immediately upon completion of the sample testing, the Contractor shall submit two (2) copies of a detailed report on the testing to the Engineer. The report shall outline test procedures, present data, provide diagrams as required, and summarize test results for each length of CIPP installed.

The layers of the CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe so that the layers separate cleanly. If separation of the layers occurs during testing of field samples, new samples will be cut from the manhole samples. Any reoccurrence may cause rejection of the work. Contractor shall provide all labor and material necessary to produce samples for laboratory and or field testing. Contractor to contract directly with certified laboratory for testing as required. Contractor shall contact testing lab prior to first insertion and determine sample size requirements. Samples shall be large enough to perform wall thicknesses, flexural strength, and modulus of elasticity test.

Samples used for testing shall be individually labeled to record the following:

1. Contract number and title
2. Sample Number
3. Date of Installation
4. Location of Installation
5. Contractor Name including person responsible for collecting samples
6. Upstream and downstream manhole numbers from where sample was taken

Lengths of CIPP which fail any of the required tests may be required by the Engineer to be removed and replaced at the Contractor's cost.

CIPP wall thickness will be measured in accordance with the applicable sections of ASTM Test Method D 5813 and D 3567. Flexural strength and flexural modulus of elasticity shall be determined in accordance with ASTM D-790.

Samples will be provided to the Engineer if requested.

7-17.3(2)L CIPP Inspection and Acceptance

New

The finished installation shall be inspected by the Contractor by closed-circuit television camera as specified in Section 7-17.3(2)H of the Special Provisions in the presence of the Owner, unless otherwise directed by the Owner. Variations from true line and grade will only be acceptable if proven by the Contractor that the variations existed under the original conditions of the existing sewer lines. The CIPP work will be deemed unacceptable if infiltration of groundwater is detected.

7-17.3(2)M CIPP Clean-Up

New

Upon acceptance of the CIPP installation, the Contractor shall restore the Project area to original conditions or as directed by the Owner.

END OF DIVISION 7

APPENDIX A: ITEM B

City of Centralia: Division 7 Technical Specifications

**DIVISION 5
SURFACE TREATMENTS AND PAVEMENTS**

5-04 HOT MIX ASPHALT

5-04.1 Description

Section 5-04.1 is supplemented with the following:

The asphalt roadway restoration work on this contract shall include paving the areas of asphalt excavated for pipe lining required with temporary cold-mix asphalt. The repair area width and length will vary at each location and will be determined by the extent of asphalt roadway disturbed during construction. Temporary asphalt repair shall be completed with straight lines perpendicular to the roadways. At no time will jagged or angled patches be allowed. The City representative will mark out limits for sawcutting and asphalt restoration before the restoration work takes place.

5-04.5 Payment

Section 4-04.5 is supplemented by the following:

Temporary Cold Mix Asphalt Patch, per Ton, All work associated with providing and placing the cold mix asphalt patch. Sawcutting, preparing the existing surface for paving and compaction shall be considered incidental to the work.

**DIVISION 7
DRAINAGE STRUCTURES, STORM SEWERS, SANITARY SEWERS, WATER
MAINS AND CONDUITS**

7-04 STORM SEWERS

7-04.2 Materials

Section 7-04.2 is supplemented with the following:

CURED-IN-PLACE LINER REQUIREMENTS

All aspects of the CIPP liner design, installation and testing shall adhere to the requirements of ASTM F 1216.

Liner Tube

The liner tube shall consist of one or more layers of flexible needled felt or an equivalent woven and/or nonwoven material capable of carrying resin, withstanding installation pressures and curing temperatures, and is compatible with the resin system used. The liner shall be fabricated to a size that, when

installed, will snugly fit the internal circumference of the existing pipe without any annular space between the liner and existing pipe wall, and provide the design thickness when cured with the liquid thermosetting resin.

The CIPP should be fabricated to a length that will span the entire length of the main being lined plus any additional length required for installation and testing purposes.

Resin

Unless otherwise specified, provide a general purpose, unsaturated, thermosetting, polyester, vinylester, or epoxy resin able to cure in the presence of water, and a catalyst system compatible with the insertion process. Resin shall not be subjected to ultraviolet light and shall form no excessive bubbling or wrinkling during lining.

CURED-IN-PLACE PIPE DESIGN REQUIREMENTS

The design shall be in accordance with ASTM F 1216 and based on the following physical conditions:

Host Pipe Diameter	Per Plans (30" and 36")
Pipe Condition	Fully Deteriorated
Soil Density	130 lbs/ft ³
Safety Factor (N)	2
Modulus of Soil	1,000 psi
Water Table	Use half the depth of the deeper manhole associated with each main line segment to be lined.
Soil Depth	Use the deeper manhole associated with each mainline segment to be lined.
Ovality of Host Pipe	Varies (2% to 8% estimated)

The cured-in-place pipe liner shall conform to the following minimum structural requirements:

Structural Property	Minimum Value
	Polyester, Vinyl Ester or Epoxy Resin
Flexural Strength	4,500 psi
Flexural Mod. of Elasticity (initial)	250,000 psi
Flexural Mod. of Elasticity (long-term)	125,000 psi

HANDLING AND STORAGE

The general best practices of the industry and manufacturer's recommendations shall be observed.

7-04.3 Construction Requirements

Section 7-04.3 is supplemented with the following:

CLEANING OF SANITARY SEWER MAIN LINES

The Contractor shall clean all main lines to be lined before the work. Contractor shall anticipate main lines to be 1/3 full of debris. Completely remove all roots, solids, and other debris prior to lining. Best management practices (BMPs) shall be used for cleaning operations. BMPs include but are not limited to the following:

1. Cleaning equipment shall have a working pressure between 2,000 psi at a 65 gpm flow rate to 3,000 psi at a 30 gpm flow rate.
2. The upstream manhole lid should be removed.
3. All material removed from the storm sewer system shall be properly disposed of. The contractor may dispose of all debris free of charge at the Stormwater Decant facility located at 2600 W Reynolds Avenue in Centralia.

CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION

The Contractor shall complete pre- and post-lining CCTV inspections of all pipelines to be lined. The pre-lining CCTV shall be completed immediately before lining after the pipeline is cleaned in accordance with these specifications. The post lining CCTV shall be completed after all liners are cured.

The pre-and post-lining CCTV inspection videos shall be provided to the city.

STORM SEWER FLOW CONTROL

The contractor shall plug the main line or install bypass pumping equipment prior to completing the work. The lines upstream of the locations being repaired can be plugged as weather permits but shall be monitored to ensure no overflows occur upstream. If the Contractor does not feel they can accomplish the work without causing stormwater overflows upstream, then the Contractor shall provide flow diversion with pumps adequate in size and capacity to handle all flows generated during the work.

The Contractor shall coordinate flow control for storm sewers with the City of Centralia Inspector. The Contractor shall provide a 48 hour advance notice.

Plugging and storm sewer flow control measures shall be undertaken by the Contractor to insure lining can be completed in accordance with the manufacturer's recommendations. The Contractor shall prepare and submit a plan(s) of such diversion, bypass, or plugging to the Engineer for approval. The plans shall be detailed and at minimum include the number, size, and configuration of any bypass lines, and the size and configuration of any storage tank(s) to be used. Bypass pumping shall include a primary and backup pump. Each pump shall be capable of pumping two (2) times the estimated average dry weather flow.

The Contractor shall monitor the upstream surcharge level during plugging operations at all times. Bypass pumps must also be monitored.

INSTALLATION

The Contractor shall use the water curing inversion process for lining CIPP based on manufacturer's recommendations and in accordance with ASTM F 1216. The Contractor shall submit an installation plan outlining the insertion location(s), methods, and steps for disposing/discharging the water used for curing. The manhole cover and cone may be removed from the insertion manhole by the contractor if required for liner installation. Care shall be taken to protect the cone during removal and reinstalled after liner insertion is complete. If the riser or cone cannot be reinstalled after CIPP lining, a new cone and riser section(s) shall be installed per City Standards. Providing and installing new cone(s) or riser section(s), if required, will be paid for under the minor change bid item.

The Contractor may install, and is encouraged to install, CIPP lining in multiple segments of pipe at one time. The top half of the fully-cured CIPP liner in the intermediate manhole(s) shall be cut out and the void between the CIPP liner and the existing channel sealed with non-shrink grout.

1. The tube shall be fully impregnated with resin in accordance with the manufacturer's recommendations. The wet-out procedure shall be submitted to the Engineer prior to work.
2. The tube shall be properly oriented and loaded onto the Carrier Train for proper installation. The uncoated, saturated portion of the tube shall face outwards when installed on the carrier.
3. The installation shall follow the water curing inversion method in accordance with ASTM F 1216 through the existing manhole opening per manufacturer's requirements and written curing schedule. If at any time the manufacturer's recommendations differ from these Specifications, the manufacturer's recommendations shall be followed and the City notified of the conflict.
4. Testing of the installed CIPP liner shall be in accordance with ASTM F1216.
5. Based upon the approved process for disposing/discharging the curing water:
 - A. Discharge water when at ambient air temperature;
 - B. Discharge water when styrene concentration is confirmed to be at or below 25 ppm; or
 - C. Transport process water above these levels to the Centralia Wastewater Treatment Facility located at 1101 Goodrich Road in Centralia. Disposal will be free of charge.
6. Upon completion of the CIPP liner installation, the contractor shall ensure that the work area is clean and no debris is left in the pipe or around the work area.

CURING

- A. The Contractor shall maintain an on-site written log tracking temperature, pressure, and curing time during the CIPP curing process for each installation.
- B. Constant water pressure must be maintained until the liner has completed cured.

LINER DEFECTS

The finished liner shall be free from visual defects such as foreign inclusions, dry spots, fins, pinholes, delamination, and other deformities. Such defects and deformities shall be repaired at no additional cost to the City. The City anticipates that deformities may occur due to host pipe defects. These deformities do not require repair as long as the integrity of the CIPP liner is not compromised.

Defect	Tolerance	Accepted Remedy
Wrinkles, fins, folds bubbles, blisters, lumps or lifts	Repair if exceeding 3/8"	Trim or grind flush with liner wall.
Cracked liner	Repair all	CIPP spot repair, dig and replace, remove entire liner, or install second liner if approved by the District.

7-04.5 Payment

Section 7-04.5 is supplemented with the following:

Pre-Lining Cleaning of Storm Sewer Lines, Incl. Haul, Per Linear Foot, shall be full compensation for all materials, labor, equipment required to clean the main lines and dispose of any debris before the pre-lining CCTV is complete. The estimated bid quantity is for full runs of main line cleaning between the manhole structures.

Pre-Lining Closed Circuit Television (CCTV) Inspection, Per Linear Foot, shall be full compensation for all materials, labor, equipment required to complete the video inspection before the lining is complete and providing the video to the City. The estimated bid quantity is for full runs of main line video inspection between the manhole structures.

Post-Lining Closed Circuit Television (CCTV) Inspection, Per Linear Foot, shall be full compensation for all materials, labor, equipment required to complete the video inspection after the lining is complete and providing the video to the City. The estimated bid quantity is for full runs of main line video inspection between the manhole structures.

Flow Control (Plugging and Bypass Pumping Storm Sewer), per Lump Sum, shall be full payment for all labor, materials and equipment required for all storm sewer flow activities (plugging, pumping, monitoring, etc.) necessary to complete the CIPP installation in accordance with the manufacturer's recommendations and the project specifications.

Install ___-inch Diameter Cured-In-Place-Pipe (CIPP) Liner, per Linear Foot, shall be full payment for all labor, materials and equipment required to install water-cured CIPP in accordance with the manufacturer's recommendations and the Project Plans and specifications. This bid item will include removal and reinstallation of existing manhole riser rings or cones for the insertion of the CIPP liner and restoration of the insertion area(s). If new manhole rings, risers or covers are required, providing and installing those items will be paid for under the minor change bid item.

APPENDIX A: ITEM C

Example Specification provided by Allied Trenchless

UV Cured in Place Pipe Non-Proprietary Specification

SECTION

PIPE REHABILITATION BY UV CURED-IN-PLACE PIPE (CIPP) PROCESS

PART 1 - GENERAL

1.1 SCOPE

- A. Methods and materials for the rehabilitation by the pulled-in place installation of a resin-impregnated, glass reinforced flexible fabric tube into an existing conduit followed by inflation with compressed air for either partially and fully deteriorated pipelines by the UV Cured-In-Place Pipe (CIPP) process.

1.2 REFERENCES

- A. ASTM F-2019 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).
- B. ASTM D-543 Standard Test Method for Resistance of Plastics to Chemical Reagents.
- C. ASTM D- 638 Standard Test Method for Tensile Properties of Plastics
- D. ASTM D-790/ DIN EN ISO 178 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM D-1600 Terminology Method for Tensile Properties of Polymer Matrix Composite Materials
- F. D-3039/D-3039M Test Method for Tensile Properties of Polymer Matrix Composite Materials
- G. ASTM D-3567 Standard Practice for Determining Dimensions of Reinforced Thermosetting Resin Pipe (RTRP) and Fittings.
- H. ASTM D-5813 Standard Specification for Cured-in-Place Thermosetting Resin Sewer Pipe.
- I. ASTM F-1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- J. DIN EN 761 Plastic Piping Systems: Glass—Reinforced Thermosetting Plastics (GRP) Pipes -Determination of the Creep Factor under Dry Conditions.
- K. F-412 Terminology Relating to Plastic Piping Systems
- L. F-1417 Practice for Installation Acceptance of Plastic Non- pressure Sewer Lines Using Low-Pressure Air

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Resin; tube material, qualification testing results for laminate sample, resin enhancer, bond enhancer, certification of applicability of resin; sealant/caulking material, resin curing schedule showing time and temperature for each reach, Manufacturer's recommended installation pressures, minimum and maximum for each reach.
- C. Design Information: Wall thickness design calculations for each pipe section.
- D. Inspection Information: Video recordings (DVD/USB) of pre and post-insertion inspections and curing logs.
- E. Qualifications: Documentation for experience of lining manufacturer and installer.

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- F. Public Relations: Notification Flyers.
- G. Lateral Reinstatement: Products and Methods.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years' experience, or otherwise allowed prior to bid acceptance.
ISO-9001 manufacturer certification is required.
- B. Installer: Company specializing in performing the work of this section and who is licensed and approved by the manufacturer. Company shall have experience with projects of similar size and complexity as this project, and installed UV CIPP product within the last 3 years, or otherwise allowed prior to bid acceptance.
- C. Project Superintendent: Project Superintendent shall have a minimum of 2 years' experience as a CIPP Superintendent on similar projects.

1.5 Personnel

Personnel - Perform installations with installers who are qualified, fully licensed, and certified by the manufacturer of the UV-CIPP product system. In addition, the installers shall have installed, and experienced performing the proposed UV curing method in accordance with ASTM F2019. For each method of installation and curing used on this project, provide a full-time project foreman that has successfully supervised UV-CIPP work in the size range in accordance with ASTM F2019. The project foreman must be certified by the Manufacturer for the provided UV-cured CIPP. Staff this project with the key individuals who meet the requirements above and who will be available for the project duration.

The City OR Department reserves the right to temporarily relieve the Contractor of these requirements for the purposes of pilot testing new technologies on a case-by-case basis. If relieved of these qualification requirements, the following must be provided:

- A Manufacturer-authorized Representative who is experienced and certified by the Manufacturer in the technical application such as installation, curing, sampling, operation, and maintenance of the lining system and all of its components.
- The Manufacturer's Representative shall provide at least 5 full days of on-site observation and supervision during the installation of UV-CIPP.
- After the conclusion of the observation and supervision period, the Manufacturer's Representative shall be accessible to provide technical support and resolve field problems throughout the duration of the Work if required.
- The City reserves the right to require the Manufacturer's Representative to remain on site for a longer duration if the installer has not demonstrated the ability to install the CIPP per the Manufacturer's procedures, at no additional cost to the City.

UV Cured in Place Pipe Non-Proprietary Specification

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tube:

1. The tube material shall meet the requirements of ASTM F 2019-11 or the latest version respectively.
2. The tubes shall have a uniform thickness that when inflated at installation pressures will equal the designed nominal tube thickness.
3. Contractor shall present tube thickness design calculations based on structural requirements listed below.
4. The tube shall be fabricated to a size that when installed, will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during installation. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance between respective access points unless otherwise specified. The Contractor shall verify the lengths and diameters in the field before fabricating the tube. Individual insertion runs can be made over one or more manhole sections as determined in the field by the Contractor, as long as traffic control restrictions are adhered to.
5. The outside layer of the tube (before insertion) shall be plastic coated with a flexible material.
6. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers.
7. The wall color of the interior pipe surface of the CIPP after installation shall be a light reflective color so that a clear detail examination with closed circuit television inspection equipment may be made.
8. Over Expansion Sleeves shall be used in the following locations and as directed by the Engineer after the pipeline has cleaned and inspected via CCTV per the contract documents:
 - a. Each end of the pipe segment
 - b. At each section of pipe that has complete or significant wall loss.
 - c. in unprotected sections such as intermediate MH

B. UV Materials:

1. For UV products, the finished UV Light Cured Fiberglass pipe liner shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and in-frequent occurring peak temperatures up to 150F.
2. The liner thickness shall be sized for a minimum hydrostatic and earth load as per design criteria or per ASTM F1216. The earth load and hydrostatic load shall be increased to the manhole depth unless otherwise noted as shown on the Drawings.
3. The liner shall be structurally designed to the following standards:

(The following design parameters are considered typical and may vary. Actual site conditions take precedence)

 - a. minimum service life: 50 years
 - b. fully deteriorated host pipe/direct bury condition

UV Cured in Place Pipe Non-Proprietary Specification

- c. prism loading: 120 PCF soil
 - d. factor of safety: 2.0
 - e. ovality factor: 2%
 - f. Poisson's ratio: 0.3
 - g. soil modulus: 1000 PSI
 - h. maximum lining enhancement factor: 7
 - i. Live loading: HS20
 - j. Liner Design or Specific to actual liner performance
 - k. groundwater: determined as occurring on site
- 4. All UV cured-in-place fiberglass lining products shall comply with ASTM F 2019-11 or current valid version or the intent thereof as determined by the Engineer, minimum finished liner thickness as defined by design calculation.
 - 5. The Contractor shall furnish a general purpose polyester or vinyl ester UV curing resin and catalyst system compatible with the Ultra Violet Light Curing process that provides cured physical strengths specified herein
- C. Resin:
 - 1. Submit data certifying that resin system is not recycled.
 - D. Caulking Sealant:
 - 1. Sealant shall be a quick-set epoxy mortar or high viscosity epoxy with good adhesion to the liner and concrete.
 - E. Lateral Seals:
 - 1. ASTM F2561 compliant lateral sealing system shall be used to reconnect existing service laterals.

2.2 CHEMICAL RESISTANCE REQUIREMENTS

- A. CIPP samples for testing shall be of tube and resin system same as to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical-testing requirements.

2.3 STRUCTURAL REQUIREMENTS

- A. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers; nor shall separation of the layers occur during testing performed under the requirements of this specification.
- B. The cured CIPP for fiberglass reinforced tubes shall also conform to the minimum structural standards as listed below:
 - a. Flexural Strength (ASTM D-790):
13,000 PSI
 - b. Modulus of Elasticity (ASTM D-790)
725,000 PSI
 - c. Tensile Strength (ASTM D-638):
15,000 PSI

UV Cured in Place Pipe Non-Proprietary Specification

PART 3 - EXECUTION

3.1 PREPARATION

- A. Access Points - Contractor will locate and designate all manhole access points, open and make access points available for the Work.
- B. Cleaning of Sewer Lines - The Contractor shall remove all roots and internal debris (including grease), from the sewer line prior to CIPP installation by any means necessary.
- C. Inspection of Pipelines - Inspection of pipelines shall be performed by NASSCO PACP-certified personnel, experienced and trained in locating defects, breaks, obstacles and service connections by closed circuit television (CCTV).
- D. Infiltration - Minor infiltration is a normal condition sometimes encountered during the CIPP process. It is not a “changed condition” and should not be regarded as a reason for change orders. If in the opinion of the Engineer, infiltration is significant enough to adversely affect the curing process, chemical grouting or other remedies may be required. This additional work will be paid for by the Owner as a change order.
- E. Site Restoration - Areas damaged or modified by the work for this project shall be repaired or restored to a condition equal to or better than the original condition. Site restoration is incidental to the Work and shall not be regarded as a reason for change orders.
- F. Public Relations - A Public Information and Notification Program shall, as a minimum, require the Contractor to be responsible for contacting homeowners or businesses who will be affected by the construction activities and informing them of the Work to be done and the estimated timing for the Work. Written notice shall be delivered to each home or business 2 weeks prior to installation. Notice shall include a local telephone number of the Contractor they can call to discuss the project, and how the homeowner or business will be affected. The written notice must be reviewed by the Owner prior to the start of any work.
- G. Service connections - Determine by dye test, running water or visual inspection whether connections are active or abandoned and provide results to Engineer prior to insertion. Engineer and Contractor shall agree prior to insertion which services are to be reopened. Only reopened services will be paid for.

3.2 INSTALLATION

- A. CIPP installation shall be in accordance with ASTM F2019 for UV light Curing Installations. Installation shall be in accordance with manufacturer’s recommendations, which shall be available for verification by the Engineer.

UV Cured in Place Pipe Non-Proprietary Specification

- B. Curing schedules shall be strictly adhered to, per manufacturer requirements.
- C. The CIPP liner shall make a tight fitting seal with the existing pipe(s) in the manholes. If the CIPP liner fails to make a tight seal, the Contractor shall apply a seal at that point using a sealant or caulking material that is compatible with CIPP materials, watertight, flexible and impervious to hydrogen sulfide. The top half of the CIPP through a manhole shall be neatly cut off and not broken or sheared off. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels. Void space between liner and channel wall shall be filled with non-shrink grout and sealed with sealant. CIPP and the existing pipe in the manhole must be sealed before proceeding on to the next manhole section and all manholes shall be individually inspected for CIPP cut-offs and sealing works. Liner shall be cut off at the pipes and all liner removed within intermediate manholes with deflection angles greater than 45 degrees.
- D. The finished CIPP shall be continuous over the entire length of an insertion run between two manholes and be free from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. If in the opinion of the Engineer, a portion of the liner is inadequate, the Contractor shall correct the defect(s) to the satisfaction of the Engineer.
- E. Contractor shall terminate and seal end of CIPP liner to structures using one of the following approved methods:
 - 1. Expanding Hydrophilic Rubber Joint Seal
 - 2. CIPP manufacturer-approved epoxy or mechanical liner end seals
- F. The liner shall be pulled into place via the manufacturer's instructions.
- G. The liner shall be inflated with air before curing with Ultra Violet light according to the manufacturer's specifications.
- H. The reconstruction tube will be impregnated to meet manufacturer specifications with UV Curing Resins in the manufacturing facility prior to installation. The Contractor shall allow the Owner to inspect the materials before installation.
- I. The Pre Impregnated UV Light Cured Fiberglass Liner shall be inserted through the existing manhole or other approved access by means of a pull in place process utilizing a winch which will fully extend it to the next designated manhole or termination point. The Fiberglass Liner shall be inflated in place slightly with air to the manufacturer's specification for installing the UV Chain. Liner cure schedule shall be adhered to per manufacturer's specifications. The Fiberglass liner will then be inspected with a camera mounted on the UV Chain as it is pulled to the end of the liner. After inspection and complete inflation to manufacturer's specifications, the UV light bulbs will be turned on. The curing will commence at a rate specified by the manufacturer according to the total dimensions of the liner.
- J. As the liner is curing, the UV Curing System shall record all curing data in DVD format for the viewing of the Owner.
- K. Initial cure shall be deemed to be complete when the UV Chain arrives at the initial entry point of insertion.

3.3 TESTING

Testing will be required for each insertion of CIPP lining. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe

UV Cured in Place Pipe Non-Proprietary Specification

so that the layers separate cleanly. If separation of the layers occurs during testing of field samples, new samples will be cut from the manhole samples. Any reoccurrence may cause rejection of the work. Contractor shall provide all labor and materials necessary to produce samples for laboratory and or field testing. Contractor to contract directly with certified laboratory for testing as required. Contact testing lab prior to first insertion and determine sample size requirements. Samples shall be large enough to perform wall thickness test, flexural strength and modulus of elasticity test on samples taken in radial direction.

A. Sample Preparation:

Samples will be submitted by the Contractor to an independent third party laboratory. The cured sample shall be tested by an independent testing laboratory approved by the Engineer. Final payment will not be made until acceptable test results are received by the Engineer.

The Contractor shall be responsible for any deviation from the specified physical properties. Failure to meet the specified physical properties will result in the liner being considered defective work. The Contractor shall be responsible for all costs associated with repair of defective work.

Samples used for testing shall be individually labeled to record the following:

1. Contract number and title
2. Sample number
3. Date of installation
4. Location of installation
5. Contractor Name including person responsible for collecting samples
6. Upstream and downstream manhole numbers from where the sample was taken
7. Type of restraint used

B. The wall thickness will be measured in accordance with the applicable sections of ASTM Test Method D5813 and D3567. Flexural strength and flexural modulus of elasticity shall be determined in accordance with ASTM D-790. Porosity test will be conducted in accordance with APS Water Porosity Standard. For pipe 15 inch and smaller, a constrained sample will be obtained by inverting through a like diameter inverted half-section of pipe which has been held in place by a suitable heat sink, such as sandbags. Sample location can be either the receiving manhole or an intermediate MH provided a straight through channel exists. For pipe greater than 15 inch but no greater than 24 inch a constrained sample will be obtained from an intermediate MH, if one exists.

C. A post-insertion CCTV log in a format acceptable to the Engineer shall be provided to the Engineer within two weeks of liner curing.

D. Wrinkle height shall not exceed 2% of the host pipe diameter.

E. Non-Conforming Work:

1. If the measured wall thickness of the installed UV CIPP is more than 5% less than specified, a minimum of 5% reduction in payment for that insertion will occur, or an additional liner sufficient to make up the deficiency must be installed, at the determination of the Engineer.
2. If the flexural strength, and/or flexural modulus of elasticity is more than 5% less than specified, a minimum 5% reduction in payment for that insertion will occur,

UV Cured in Place Pipe Non-Proprietary Specification

or an additional liner sufficient to make up the deficiency must be installed, at the determination of the Engineer.

3. If the liner fails the APS water porosity test (pass/fail test), a minimum 5% reduction in payment for that insertion will occur, or complete liner removal may be required or an additional liner sufficient to make up the deficiency must be installed, at the determination of the Engineer.
4. For all instances where the CIPP is deemed unacceptable, the Contractor shall submit a method of repair or replacement for review and approval by the Owner.
5. All Work required to remedy non-conforming work shall be at the sole cost of the Contractor.

4.1 PRIVATE PROPERTY

Care shall be taken to avoid damage to private property (i.e. sprinkler stems, lawn areas). If damage occurs, repairs shall be completed as soon as possible. Costs associated with repairs shall be the responsibility of the Contractor.

END OF SECTION

APPENDIX A: ITEM D

City of Centralia: Bid Tabulations

BID TABULATION SHEET												
				BID OPEN		4/15/2020						
PROJECT NAME												
Storm Sewer CIPP Pipe Lining Project												
PW 2020-05				<u>BID #1</u>		<u>BID #2</u>		<u>BID #3</u>		<u>BID #4</u>		
				<i>Allied Trenchless</i>		<i>Iron Horse, LLC</i>		<i>Insituform Technologies, LLC</i>		<i>Michels Corporation</i>		
				246 W Manson Hwy		PO Box 1472		17988 Edison Ave		1715 SE 16th St		
				Chelan, WA 98816		Fairview, OR 97024		Chesterfield, MO 63005		Salem, OR 97302		
ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL	UNIT PRICE	TOTAL	UNIT PRICE	TOTAL	UNIT PRICE	TOTAL	
1	1-09 Mobilization	LS	1	\$ 50,000.00	\$ 50,000.00	\$ 20,000.00	\$ 20,000.00	\$ 16,000.00	\$ 16,000.00	\$ 34,330.00	\$ 34,330.00	
2	1-04 Minor Change	Est	1	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	
3	1-10 Project Temporary Traffic Control	LS	1	\$ 5,000.00	\$ 5,000.00	\$ 4,000.00	\$ 4,000.00	\$ 26,600.00	\$ 26,600.00	\$ 2,735.00	\$ 2,735.00	
4	4-04 Crushed Surfacing Top Course	TN	5	\$ 10.00	\$ 50.00	\$ 50.00	\$ 250.00	\$ 85.00	\$ 425.00	\$ 42.10	\$ 210.50	
5	4-04 Crushed Surfacing Base Course	TN	15	\$ 10.00	\$ 150.00	\$ 50.00	\$ 750.00	\$ 80.00	\$ 1,200.00	\$ 42.10	\$ 631.50	
6	5-04 Temporary Cold Mis Asphalt Patch	TN	5	\$ 10.00	\$ 50.00	\$ 80.00	\$ 400.00	\$ 174.00	\$ 870.00	\$ 316.00	\$ 1,580.00	
7	7-04 Flow Control (Plugging and Bypass	LS	1	\$ 10,000.00	\$ 10,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,200.00	\$ 5,200.00	\$ 7,017.00	\$ 7,017.00	
8	7-04 Pre-Lining Closed Circuit Television	LF	1419	\$ 10.00	\$ 14,190.00	\$ 4.00	\$ 5,676.00	\$ 3.20	\$ 4,540.80	\$ 13.50	\$ 19,156.50	
9	7-04 Post-Lining Closed Circuit Television	LF	1419	\$ 10.00	\$ 14,190.00	\$ 2.00	\$ 2,838.00	\$ 0.90	\$ 1,277.10	\$ 1.00	\$ 1,419.00	
10	7-04 Pre-Lining Cleaning of Storm Sewer	LF	1,419	\$ 25.00	\$ 35,475.00	\$ 20.00	\$ 28,380.00	\$ 24.90	\$ 35,333.10	\$ 16.50	\$ 23,413.50	
11	7-04 Install 36-inch Diameter Cured-In-Place-	LF	643	\$ 140.00	\$ 90,020.00	\$ 254.00	\$ 163,322.00	\$ 201.00	\$ 129,243.00	\$ 235.00	\$ 151,105.00	
12	7-04 Install 30-inch Diameter Cured-In-Place-	LF	776	\$ 120.00	\$ 93,120.00	\$ 134.00	\$ 103,984.00	\$ 150.00	\$ 116,400.00	\$ 197.00	\$ 152,872.00	
13	8-01 Erosion and Sediment Control	LS	1	\$ 3,500.00	\$ 3,500.00	\$ 1,000.00	\$ 1,000.00	\$ 1,325.00	\$ 1,325.00	\$ 632.00	\$ 632.00	
<i>SUB-TOTAL BASE BID</i>					\$ 340,745.00		\$ 360,600.00		\$ 363,414.00		\$ 420,102.00	
<u>OPTION 1</u>												
Base Bid Subtotal					\$340,745.00		\$360,600.00		\$363,414.00		\$420,102.00	
Sales Tax (8.2%)					\$27,941.09		\$29,569.20		\$29,799.95		\$34,448.36	
Total					\$368,686.09		\$390,169.20		\$393,213.95		\$454,550.36	

APPENDIX B

HYDROLOGIC AND HYDRAULIC ANALYSIS

ITEM LABEL	TITLE
A	Contributing Area
B	Existing Conditions
C	Appropriate Sizing – Complete Replacement
D	Cross-Section Modifying Technologies
E	Pipe Bursting

APPENDIX B: ITEM A

Contributing Area

Hydrologic and hydraulic analyses were only performed for the Willson Avenue pipeline from Harrison Street to its intersection with the downtown trunk line. Hydrologic and Hydraulic analyses for all other pipelines were deemed unnecessary due to being appropriately sized or having the inability to be resized. Drainage areas were delineated using GIS software in conjunction with the COB's 2018 LiDAR DEM.

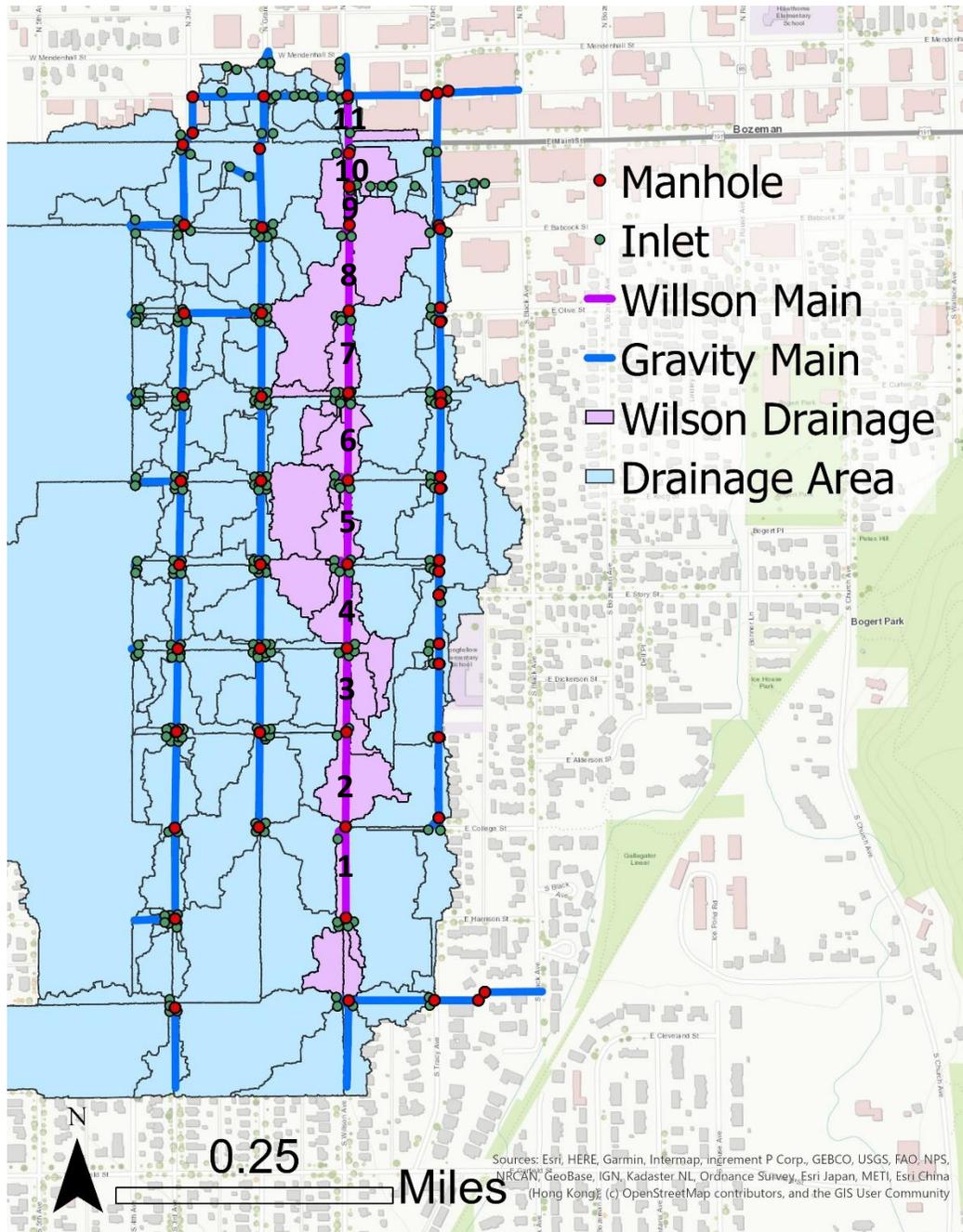


Figure B-1. The area and pipelines used for the hydrologic and hydraulic analyses.

APPENDIX A: ITEM B

Existing Conditions

The result of the analyses showed that the existing pipe system is undersized. The most upstream pipe segments, near Harrison Street, are marginally undersized. The most downstream pipe segments, near Main Street, are significantly undersized.

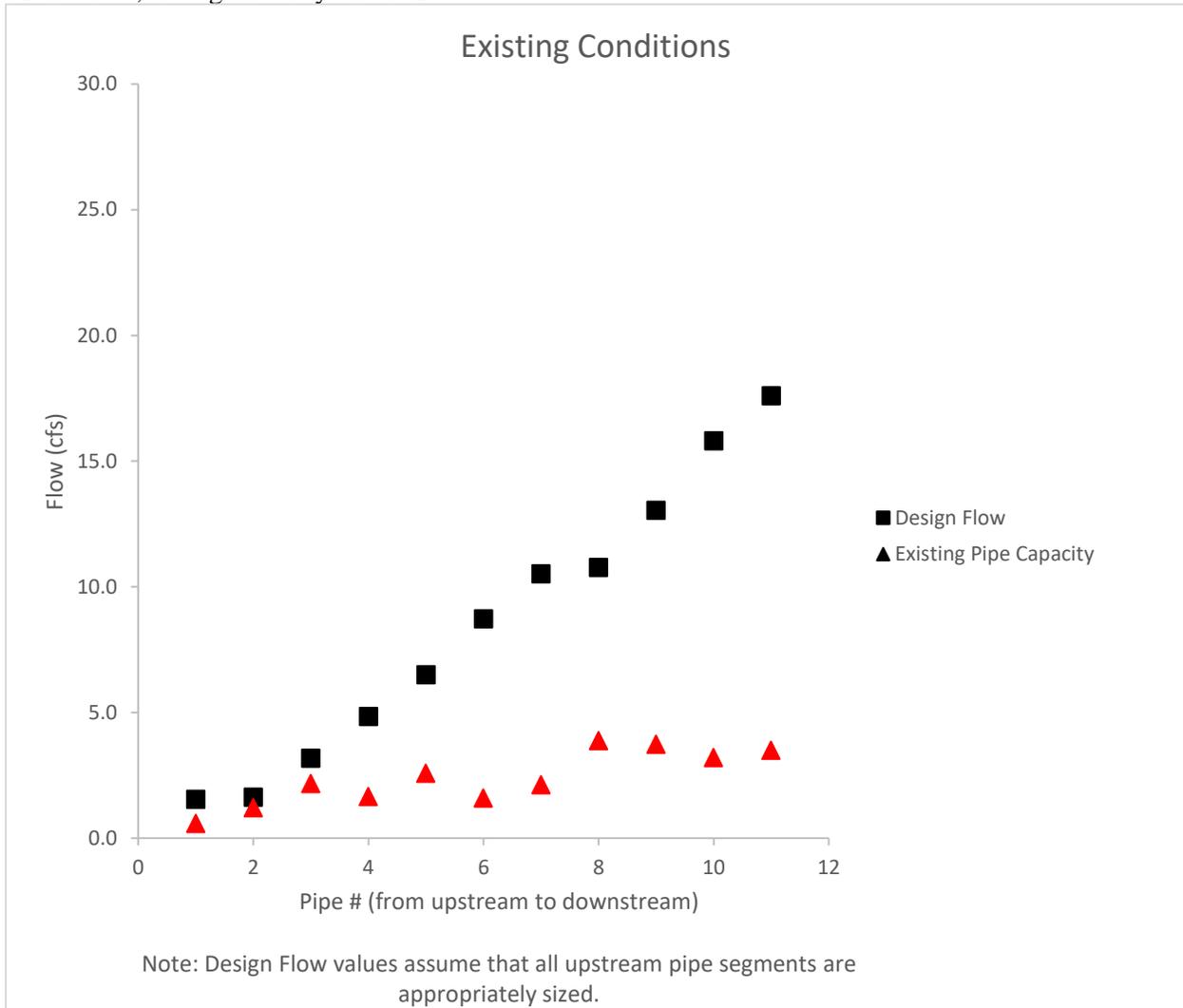


Figure B-2. The current pipe capacity compared to the design flow of a 25-year 24-hour event. Pipe capacities in red are below design capacity.

Note: The COB’s design standards require that the minimum pipe size for gravity drains is 15”. These analyses do not consider this minimum and only focus on design flow capacity.

APPENDIX A: ITEM C

Appropriate Sizing – Complete Replacement

Figure 3. below displays the flow capacity of each pipe segment had it been sized appropriately (only standard pipe sizes were considered).

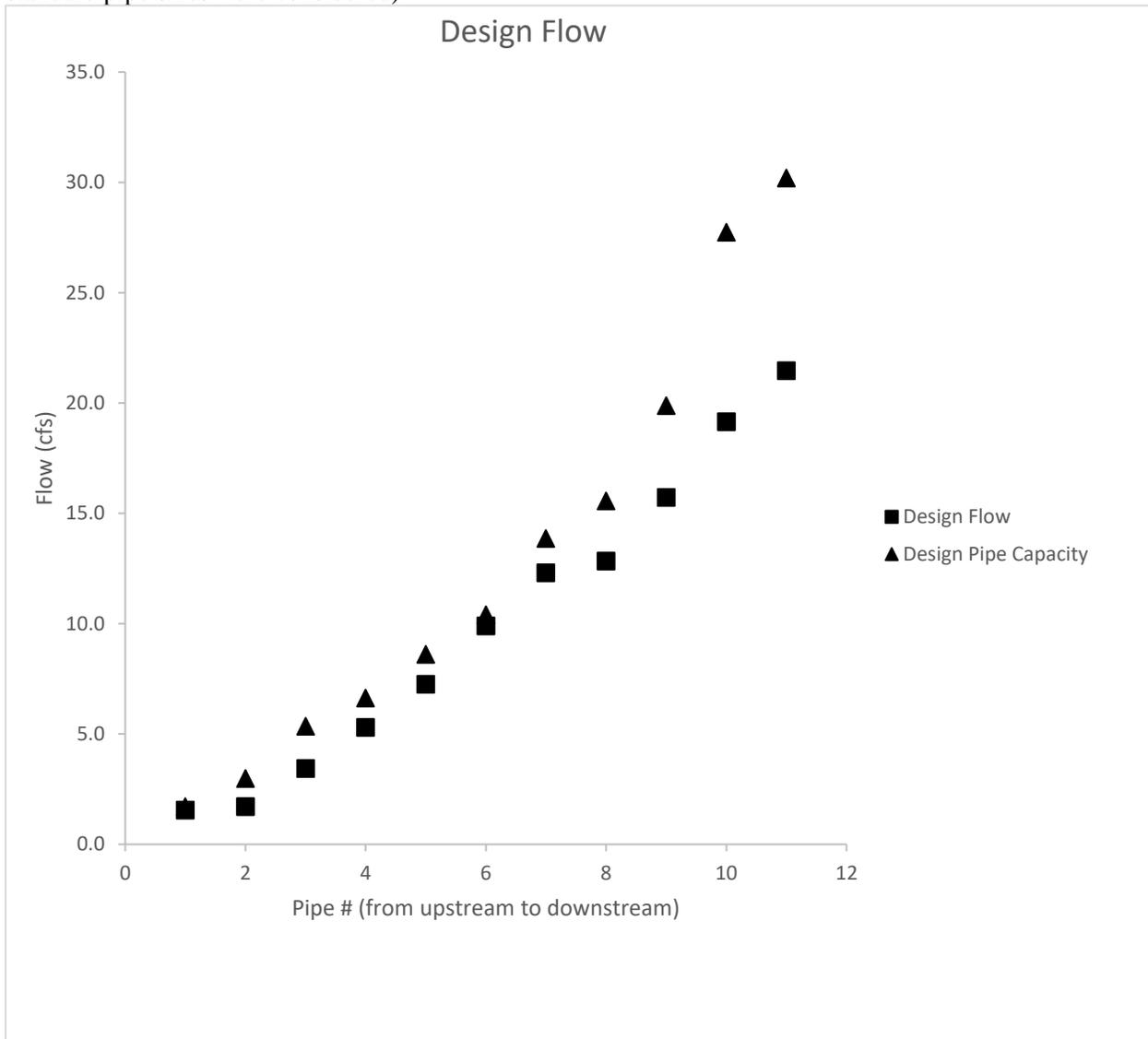


Figure B-3. The design pipe capacity compared to the design flow of a 25-year 24-hour event.

Note: The COB’s design standards require that the minimum pipe size for gravity drains is 15”. These analyses do not consider this minimum and only focus on design flow capacity.

APPENDIX A: ITEM D

Cross-Section Modifying Technologies

The hydrologic and hydraulic analyses of the pipe system if a cross-section modifying technologies (modified cross-section liner, SIPP, CIPP, Splining/sliplining) was implemented showed that although pipe capacity would increase slightly, the design flow rate would also increase slightly. These would both increase due to the smoother pipe surface allowing water to reach faster speeds.

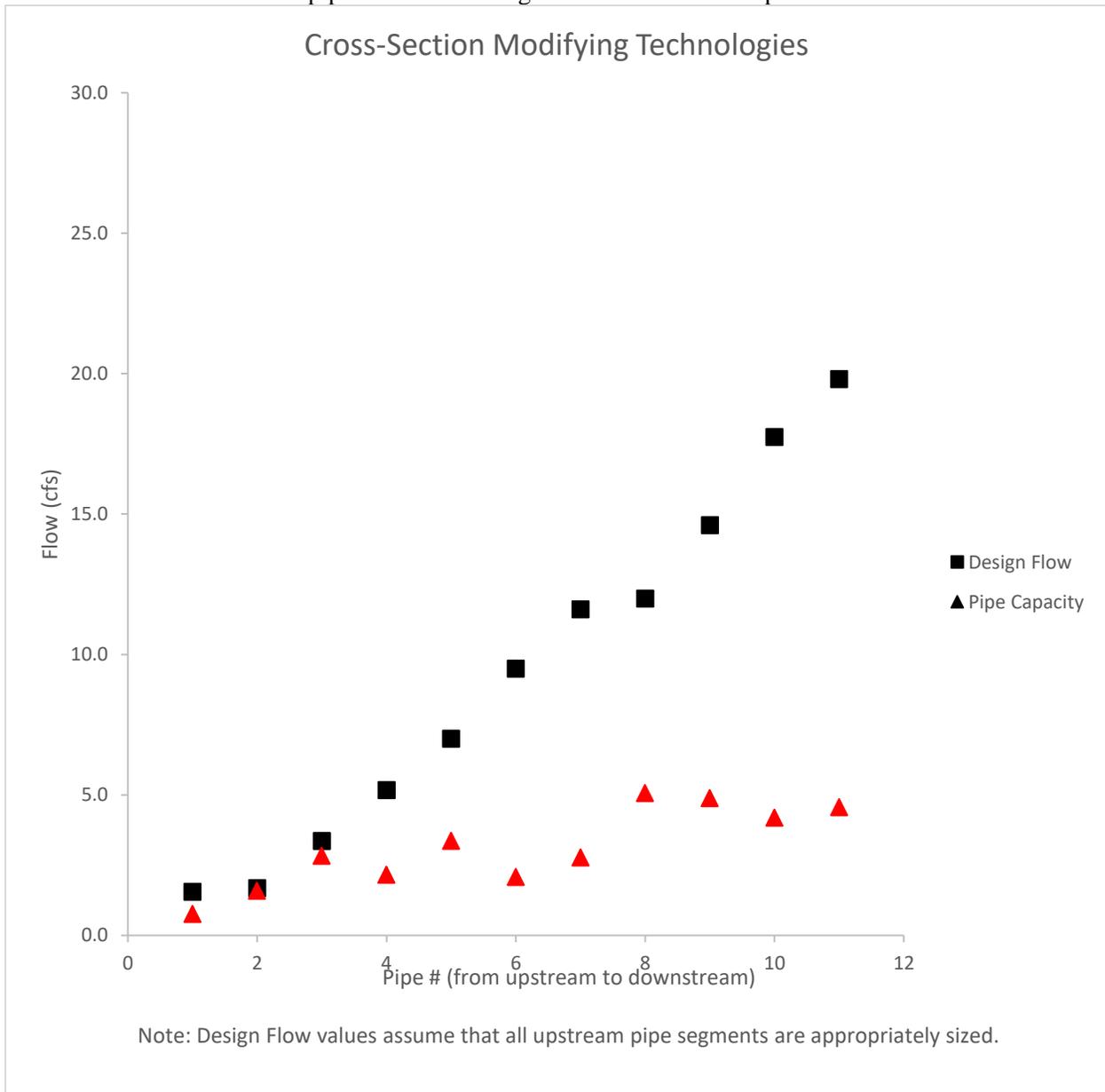


Figure B-4. The pipe capacity if a cross-section modifying technology was implemented compared to the design flow of a 25-year 24-hour event. Pipe capacities in red are below design capacity.

Note: The COB’s design standards require that the minimum pipe size for gravity drains is 15”. These analyses do not consider this minimum and only focus on design flow capacity.

APPENDIX A: ITEM E

Pipe Bursting

The hydrologic and hydraulic analyses of the pipe system if pipe bursting was implemented showed a significant increase in pipe capacity. Seven of the eleven pipe segments were able to convey the design capacity.

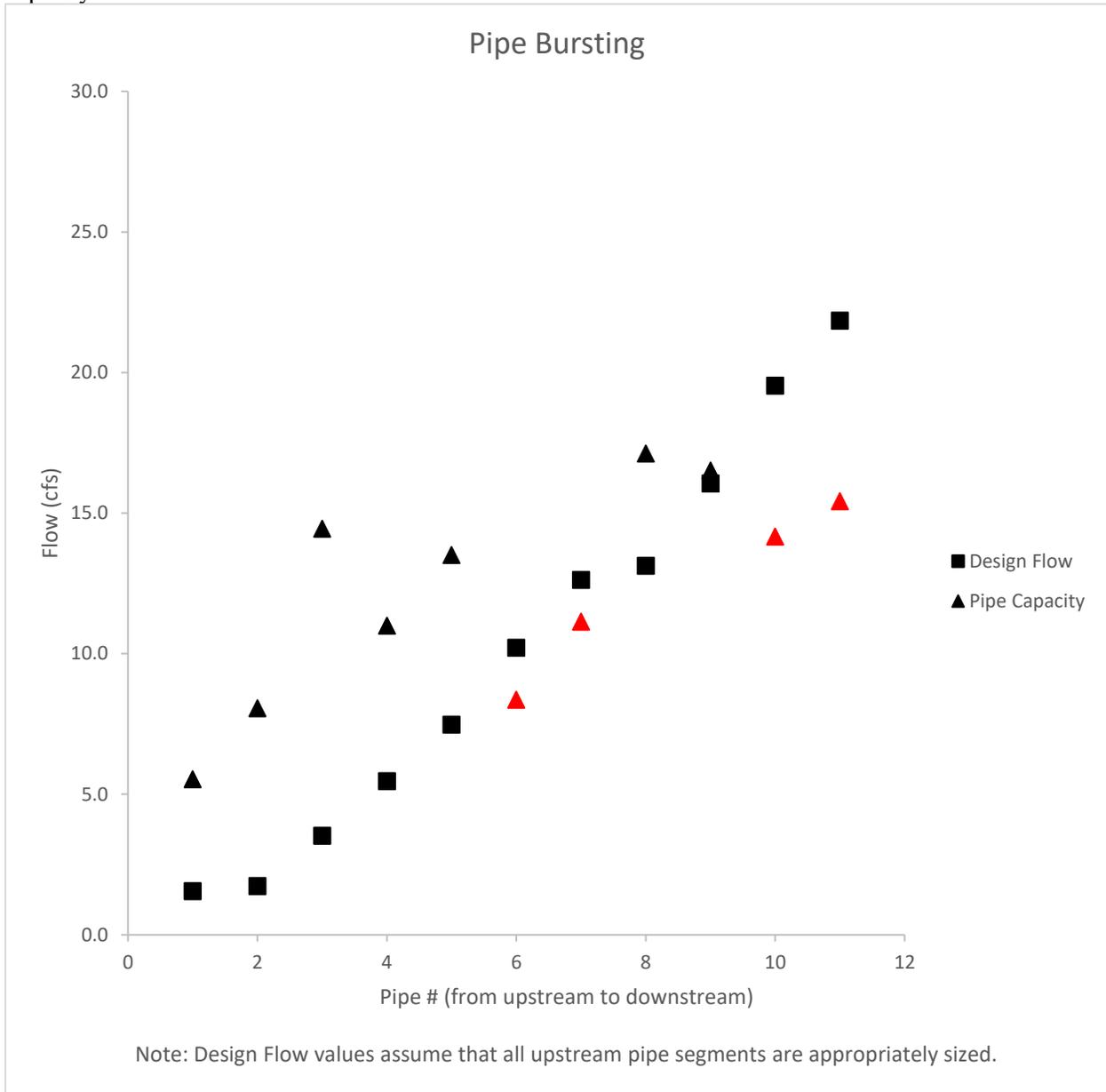


Figure B-5. The pipe capacity if pipe bursting was implemented compared to the design flow of a 25-year 24-hour event. Pipe capacities in red are below design capacity.

Note: The COB’s design standards require that the minimum pipe size for gravity drains is 15”. These analyses do not consider this minimum and only focus on design flow capacity.

Note: This model assumes that a diameter increase of 6” can be achieved for all pipe segments.

APPENDIX C

ITEM LABEL	TITLE
A	City of Gallatin, TN: 2012 Sewer System Rehab – Phase I Bid Tabulations
B	City of San Antonio, TX: 2019 Pipe Bursting Sanitary Sewer Package Tabulation of Bids

APPENDIX C: ITEM A

City of Gallatin, TN: 2012 Sewer System Rehab – Phase I Bid Tabulations

BID TABULATION
CITY OF GALLATIN
CONTRACT 212 - 2012 SEWER SYSTEM REHAB - PHASE I

CITY OF GALLATIN
239 Hancock Street
Gallatin, TN 37066

BID DATE: 6/26/12

JAMES C. HAILEY & COMPANY
Consulting Engineers
7518 Highway 70 South, Suite 100
Nashville, TN 37221

Project No. 11196

BID SECURITY			BID BOND		BID BOND		BID BOND		BID BOND		BID BOND	
BIDDER AND ADDRESS			STAGGS ENVIRONMENTAL 5715 Lagrange Rd. Leighton, AL 35646		A & M CONTR P.O. Box 1013 Tullahoma, TN 37388		PORTLAND UTIL P.O. Box 510 Portland, TN 37148		MORGAN CONT 6575 Hwy. 189, No. Baker, FL 32531		LTS CONST 104 Kenmore Ave. Manchester, TN 37398	
BASE BID			UNIT PRICE	TOTAL AMOUNT	UNIT PRICE	TOTAL AMOUNT	UNIT PRICE	TOTAL AMOUNT	UNIT PRICE	TOTAL AMOUNT	UNIT PRICE	TOTAL AMOUNT
ITEM	QUAN.	UNIT DESCRIPTION										
1	570	L.F. F & I 24" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 24" VCP	160.00	91,200.00	235.00	133,950.00	193.83	110,483.10	180.00	102,600.00	258.00	147,060.00
2	120	L.F. F & I 24" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 21" VCP	165.00	19,800.00	235.00	28,200.00	193.83	23,259.60	236.00	28,320.00	258.00	30,960.00
3	1,460	L.F. F & I 16" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 15" VCP	53.50	78,110.00	90.00	131,400.00	79.90	116,654.00	81.00	118,260.00	128.00	186,880.00
4	3,200	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 12" VCP	45.00	144,000.00	52.00	166,400.00	64.50	206,400.00	65.00	208,000.00	74.00	236,800.00
5	1,950	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 10" VCP	45.00	87,750.00	52.00	101,400.00	64.50	125,775.00	66.00	128,700.00	77.00	150,150.00
6	3,360	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	50.00	168,000.00	52.00	174,720.00	64.50	216,720.00	68.00	228,480.00	86.00	288,960.00
7	6,700	L.F. F & I 8" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	35.00	234,500.00	40.00	268,000.00	45.92	307,664.00	42.00	281,400.00	46.00	308,200.00
8	500	L.F. F & I 8" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	38.00	19,000.00	40.00	20,000.00	45.92	22,960.00	48.00	24,000.00	46.00	23,000.00
9	5,000	L.F. F & I 6" HDPE SERVICE PIPE MAIN TO C.O.	10.00	50,000.00	22.00	110,000.00	20.70	103,500.00	20.00	100,000.00	28.00	140,000.00
10	107	EA. F & I 8" x 6" SERVICE TEES	625.00	66,875.00	1,000.00	107,000.00	969.75	103,763.25	518.00	55,426.00	1,047.00	112,029.00
11	68	EA. F & I 12" x 6" SERVICE TEES	750.00	51,000.00	1,250.00	85,000.00	1,201.31	81,689.08	552.00	37,536.00	1,247.00	84,796.00
12	325	EA. F & I 6" TRANSITION BENDS TO C.O.	20.00	6,500.00	50.00	16,250.00	14.66	4,764.50	205.00	66,625.00	65.00	21,125.00
13	175	EA. F & I 6" CLEANOUT & TRANSITION TO EXISTING SERVICE	150.00	26,250.00	350.00	61,250.00	344.04	60,207.00	330.00	57,750.00	300.00	52,500.00
14	5	EA. F & I STANDARD 5' MANHOLES	3,000.00	15,000.00	6,000.00	30,000.00	6,804.15	34,020.75	4,500.00	22,500.00	5,500.00	27,500.00
15	49	EA. F & I STANDARD 4' MANHOLES	2,400.00	117,600.00	3,000.00	147,000.00	3,936.77	192,901.73	3,400.00	166,600.00	3,600.00	176,400.00
16	66	V.F. F & I MANHOLE EXTRA DEPTH	200.00	13,200.00	300.00	19,800.00	198.02	13,069.32	400.00	26,400.00	160.00	10,560.00
17	435	V.F. F & I MANHOLE REHABILITATION	125.00	54,375.00	210.00	91,350.00	219.52	95,491.20	218.00	94,830.00	242.00	105,270.00
18	1	EA. F & I STANDARD CASTING ON REHAB'D MANHOLE	300.00	300.00	600.00	600.00	701.15	701.15	720.00	720.00	450.00	450.00
19	5	EA. F & I WATERTIGHT CASTING ON REHAB'D MANHOLE	600.00	3,000.00	850.00	4,250.00	772.38	3,861.90	780.00	3,900.00	750.00	3,750.00
20	9	EA. F & I WATERTIGHT CASTING ON NEW MANHOLE	500.00	4,500.00	750.00	6,750.00	426.88	3,841.92	700.00	6,300.00	750.00	6,750.00
21	10	C.Y. F & I CLASS "A" CONCRETE FOR DRIVEWAY REPAIRS	100.00	1,000.00	300.00	3,000.00	163.57	1,635.70	260.00	2,600.00	500.00	5,000.00
22	10	C.Y. F & I CLASS "B" CONCRETE	75.00	750.00	300.00	3,000.00	170.59	1,705.90	370.00	3,700.00	150.00	1,500.00
23	425	C.Y. F & I FLOWABLE FILL	75.00	31,875.00	120.00	51,000.00	97.25	41,331.25	140.00	59,500.00	125.00	53,125.00
24	100	TN. F & I CRUSHED STONE	18.00	1,800.00	30.00	3,000.00	33.65	3,365.00	100.00	10,000.00	25.00	2,500.00
25	900	S.Y. F & I PAVEMENT REPLACEMENT	50.00	45,000.00	50.00	45,000.00	50.56	45,504.00	60.00	54,000.00	40.00	36,000.00
26	1	L.S. REMOVE ABANDONED PUMP STATION TO BELOW GRADE	500.00	500.00	5,000.00	5,000.00	6,819.40	6,819.40	25,000.00	25,000.00	4,000.00	4,000.00
27	1	L.S. FURNISH & MAINTAIN TRAFFIC CONTROL	1,000.00	1,000.00	5,000.00	5,000.00	5,683.38	5,683.38	30,000.00	30,000.00	5,000.00	5,000.00
TOTAL BASE BID				1,332,885.00		1,818,320.00		1,933,772.13		1,943,147.00		2,220,265.00

BID SECURITY			BID BOND		BID BOND	
BIDDER AND ADDRESS			IMPROVED TECHNOLOGIES 2640 Byington Solway Rd. Knoxville, TN 37931		NORRIS BROS 1007 Rodgers Rd. Crossville, TN 38572	
BASE BID			UNIT PRICE	TOTAL AMOUNT	UNIT PRICE	TOTAL AMOUNT
ITEM	QUAN.	UNIT DESCRIPTION				
1	570	L.F. F & I 24" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 24" VCP	428.00	243,960.00	320.00	182,400.00
2	120	L.F. F & I 24" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 21" VCP	428.00	51,360.00	310.00	37,200.00
3	1,460	L.F. F & I 16" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 15" VCP	127.00	185,420.00	110.00	160,600.00
4	3,200	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 12" VCP	84.00	268,800.00	98.00	313,600.00
5	1,950	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 10" VCP	88.00	171,600.00	94.00	183,300.00
6	3,360	L.F. F & I 12" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	80.00	268,800.00	92.00	309,120.00
7	6,700	L.F. F & I 8" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	51.00	341,700.00	38.00	254,600.00
8	500	L.F. F & I 8" DR 17 DIPS HDPE BY PIPE BURSTING EXISTING 8" VCP	51.00	25,500.00	40.00	20,000.00
9	5,000	L.F. F & I 6" HDPE SERVICE PIPE MAIN TO C.O.	21.00	105,000.00	24.00	120,000.00
10	107	EA. F & I 8" x 6" SERVICE TEES	1,709.00	182,863.00	985.00	105,395.00
11	68	EA. F & I 12" x 6" SERVICE TEES	1,967.00	133,756.00	1,200.00	81,600.00
12	325	EA. F & I 6" TRANSITION BENDS TO C.O.	127.00	41,275.00	1,000.00	325,000.00
13	175	EA. F & I 6" CLEANOUT & TRANSITION TO EXISTING SERVICE	274.00	47,950.00	900.00	157,500.00
14	5	EA. F & I STANDARD 5' MANHOLES	5,035.00	25,175.00	6,500.00	32,500.00
15	49	EA. F & I STANDARD 4' MANHOLES	3,000.00	147,000.00	2,800.00	137,200.00
16	66	V.F. F & I MANHOLE EXTRA DEPTH	395.00	26,070.00	285.00	18,810.00
17	435	V.F. F & I MANHOLE REHABILITATION	259.00	112,665.00	180.00	78,300.00
18	1	EA. F & I STANDARD CASTING ON REHAB'D MANHOLE	441.00	441.00	300.00	300.00
19	5	EA. F & I WATERTIGHT CASTING ON REHAB'D MANHOLE	792.00	3,960.00	600.00	3,000.00
20	9	EA. F & I WATERTIGHT CASTING ON NEW MANHOLE	675.00	6,075.00	600.00	5,400.00
21	10	C.Y. F & I CLASS "A" CONCRETE FOR DRIVEWAY REPAIRS	170.00	1,700.00	180.00	1,800.00
22	10	C.Y. F & I CLASS "B" CONCRETE	117.00	1,170.00	130.00	1,300.00
23	425	C.Y. F & I FLOWABLE FILL	114.00	48,450.00	130.00	55,250.00
24	100	TN. F & I CRUSHED STONE	25.00	2,500.00	32.00	3,200.00
25	900	S.Y. F & I PAVEMENT REPLACEMENT	69.00	62,100.00	27.00	24,300.00
26	1	L.S. REMOVE ABANDONED PUMP STATION TO BELOW GRADE	12,435.00	12,435.00	40.00	40.00
27	1	L.S. FURNISH & MAINTAIN TRAFFIC CONTROL	41,055.00	41,055.00	10,000.00	10,000.00
TOTAL BASE BID				2,558,780.00		2,621,715.00

I, Matthew R. Tucker, certify that the above Bid Tabulation reflects the actual bids submitted with errors corrected for Contract 212 - 2012 Sewer System Rehab b - Phase I



APPENDIX C: ITEM B

City of San Antonio, TX: 2019 Pipe Bursting Sanitary Sewer Package Tabulation of Bids



San Antonio Water System
Solicitation Vendor Price List

Run Date 03/29/2019

Prepared By : Jessica Goforth

Solicitation No : CO-00211

Job # : 18-4527

Contract No : CO-00211-01

SAN ANTONIO WATER SYSTEM

PO Box 2994
San Antonio, Texas, 78208-2449
TABULATION OF BIDS

Proposal : 2019 Pipe Bursting Sanitary Sewer Package (Unspecified)

Time And Date : March 29, 2019 at 10:00 AM

Price List

Line No	Item No	Quote Category	SOV Item	Item Description	Unit	CO-00211 - 1. TEXAS PRIDE UTILITIES LLC			CO-00211 - 2. PM CONSTRUCTION & REHAB LP			CO-00211 - 3. T CONSTRUCTION LLC		
						Unit Price	Quantity	Total Amount	Unit Price	Quantity	Total Amount	Unit Price	Quantity	Total Amount
1	100	General Sanitary Sewer Bid Items		MOBILIZATION	ALW	\$100,000.00	1	\$100,000.00	\$100,000.00	1	\$100,000.00	\$100,000.00	1	\$100,000.00
2	103.1	General Sanitary Sewer Bid Items		REMOVE CONCRETE CURB (COSA SPEC)	LF	\$5.00	20	\$100.00	\$5.50	20	\$110.00	\$5.00	20	\$100.00
3	103.3	General Sanitary Sewer Bid Items		REMOVE CONCRETE SIDEWALKS AND DRIVEWAYS (COSA SPEC)	SF	\$5.00	1,638	\$8,190.00	\$2.50	1,638	\$4,095.00	\$6.00	1,638	\$9,828.00
4	103.4	General Sanitary Sewer Bid Items		REMOVE MISCELLANEOUS CONCRETE (COSA SPEC)	SF	\$5.00	30	\$150.00	\$7.50	30	\$225.00	\$6.00	30	\$180.00
5	200.1	General Sanitary Sewer Bid Items		FLEXIBLE BASE (10" COMPACTED DEPTH) (COSA SPEC)	SY	\$72.00	500	\$36,000.00	\$55.50	500	\$27,750.00	\$86.00	500	\$43,000.00
6	203.1	General Sanitary Sewer Bid Items		TACK COAT (COSA SPEC)	GAL	\$20.00	100	\$2,000.00	\$9.50	100	\$950.00	\$20.00	100	\$2,000.00
7	205.3	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE C (3" COMP. DEPTH) (COSA SPEC)	SY	\$52.00	500	\$26,000.00	\$67.00	500	\$33,500.00	\$56.00	500	\$28,000.00
8	205.4	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE D (2" COMP. DEPTH) (COSA SPEC)	SY	\$45.00	500	\$22,500.00	\$61.00	500	\$30,500.00	\$52.00	500	\$26,000.00
9	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (10" COMPACTED DEPTH) (COSA SPEC)	SY	\$65.00	500	\$32,500.00	\$67.00	500	\$33,500.00	\$86.00	500	\$43,000.00
10	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (12" COMPACTED DEPTH) (COSA SPEC)	SY	\$74.00	500	\$37,000.00	\$78.00	500	\$39,000.00	\$87.00	500	\$43,500.00
11	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (2" DEPTH)	SY	\$22.00	500	\$11,000.00	\$22.50	500	\$11,250.00	\$27.00	500	\$13,500.00
12	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (3" DEPTH)	SY	\$24.00	500	\$12,000.00	\$24.50	500	\$12,250.00	\$27.00	500	\$13,500.00
13	413.1	General Sanitary Sewer Bid Items		FLOWABLE FILL (LOW STRENGTH)	CY	\$112.00	60	\$6,720.00	\$208.00	60	\$12,480.00	\$136.00	60	\$8,160.00
14	413.2	General Sanitary Sewer Bid Items		FLOWABLE FILL (HIGH STRENGTH)	CY	\$140.00	30	\$4,200.00	\$207.00	30	\$6,210.00	\$145.00	30	\$4,350.00
15	500.1	General Sanitary Sewer Bid Items		CONCRETE CURB (COSA SPEC)	LF	\$30.00	20	\$600.00	\$44.50	20	\$890.00	\$22.00	20	\$440.00
16	500.4	General Sanitary Sewer Bid Items		CONCRETE CURB AND GUTTER (COSA SPEC)	LF	\$30.00	20	\$600.00	\$55.50	20	\$1,110.00	\$25.00	20	\$500.00
17	502.1	General Sanitary Sewer Bid Items		CONCRETE SIDEWALKS (COSA SPEC)	SY	\$60.00	25	\$1,500.00	\$117.00	25	\$2,925.00	\$65.00	25	\$1,625.00
18	503.1	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY (COSA SPEC)	SY	\$90.00	90	\$8,100.00	\$128.00	90	\$11,520.00	\$84.00	90	\$7,560.00
19	503.2	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL (COSA SPEC)	SY	\$120.00	67	\$8,040.00	\$139.00	67	\$9,313.00	\$88.00	67	\$5,896.00
20	503.4	General Sanitary Sewer Bid Items		ASPHALTIC CONCRETE DRIVEWAY (COSA SPEC)	SY	\$60.00	25	\$1,500.00	\$75.00	25	\$1,875.00	\$78.00	25	\$1,975.00
21	505.1	General Sanitary Sewer Bid Items		CONCRETE RIPRAP (5" THICK) (COSA SPEC)	SY	\$40.00	20	\$800.00	\$128.00	20	\$2,560.00	\$95.00	20	\$1,900.00
22	506.1	General Sanitary Sewer Bid Items		CONCRETE RETAINING WALLS - COMBINATION TYPE (COSA SPEC)	CY	\$400.00	8	\$3,200.00	\$1,105.00	8	\$8,840.00	\$200.00	8	\$1,600.00
23	507.1	General Sanitary Sewer Bid Items		CHAIN LINK WIRE FENCE (4 FT. HIGH) (COSA SPEC)	LF	\$20.00	35	\$700.00	\$22.50	35	\$787.50	\$30.00	35	\$1,050.00
24	507.4	General Sanitary Sewer Bid Items		GATES - PEDESTRIAN (COSA SPEC)	EA	\$400.00	2	\$800.00	\$608.00	2	\$1,216.00	\$450.00	2	\$900.00
25	507.6	General Sanitary Sewer Bid Items		NEW RESIDENTIAL WOODEN PRIVACY FENCE (6 FT. HIGH) (COSA SPEC)	LF	\$20.00	100	\$2,000.00	\$22.00	100	\$2,200.00	\$36.00	100	\$3,600.00
26	513.1	General Sanitary Sewer Bid Items		REMOVING AND RELOCATING MAIL BOXES (COSA SPEC)	EA	\$400.00	5	\$2,000.00	\$727.00	5	\$3,635.00	\$1,378.00	5	\$6,890.00
27	515.1	General Sanitary Sewer Bid Items		TOPSOIL (COSA SPEC)	CY	\$20.00	20	\$400.00	\$28.00	20	\$560.00	\$25.00	20	\$500.00
28	516.1	General Sanitary Sewer Bid Items		BERMUDA SODDING (COSA SPEC)	SY	\$20.00	60	\$1,200.00	\$22.50	60	\$1,350.00	\$8.00	60	\$480.00
29	516.2	General Sanitary Sewer Bid Items		ST. AUGUSTINE SODDING (COSA SPEC)	SY	\$20.00	60	\$1,200.00	\$17.00	60	\$1,020.00	\$8.00	60	\$480.00
30	520.1	General Sanitary Sewer Bid Items		HYDROMULCHING (RESIDENTIAL OR COMMERCIAL) (COSA SPEC)	SY	\$10.00	60	\$600.00	\$11.00	60	\$660.00	\$20.00	60	\$1,200.00
31	530.1	General Sanitary Sewer Bid Items		BARRICADES, SIGNS AND TRAFFIC HANDLING, PER WORK ORDER	EA	\$1,800.00	20	\$36,000.00	\$13,260.00	20	\$265,200.00	\$3,000.00	20	\$60,000.00
32	535.1	General Sanitary Sewer Bid Items		4 INCH WIDE YELLOW LINE (COSA SPEC)	LF	\$10.00	35	\$350.00	\$9.00	35	\$315.00	\$25.00	35	\$875.00
33	535.2	General Sanitary Sewer Bid Items		4 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$10.00	35	\$350.00	\$9.00	35	\$315.00	\$25.00	35	\$875.00
34	535.7	General Sanitary Sewer Bid Items		24 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$40.00	35	\$1,400.00	\$31.00	35	\$1,085.00	\$30.00	35	\$1,050.00
35	537.6	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE 1-C) (COSA SPEC)	EA	\$300.00	15	\$4,500.00	\$6.00	15	\$90.00	\$42.00	15	\$630.00
36	537.8	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE 1-A-A) (COSA SPEC)	EA	\$15.00	15	\$225.00	\$6.00	15	\$90.00	\$48.00	15	\$720.00
37	550.1	General Sanitary Sewer Bid Items		TRENCH EXCAVATION SAFETY PROTECTION	LF	\$1.00	2,500	\$2,500.00	\$1.00	2,500	\$2,500.00	\$2.00	2,500	\$5,000.00
38	799	General Sanitary Sewer Bid Items		REMOVAL AND REPLACEMENT OF SPEED HUMP (TYPE II) (PER EACH HUMP)	EA	\$1,200.00	2	\$2,400.00	\$1,934.00	2	\$2,868.00	\$3,500.00	2	\$7,000.00
39	851	General Sanitary Sewer Bid Items		ADJUSTING EXISTING MANHOLES	EA	\$1,800.00	35	\$63,000.00	\$2,184.00	35	\$76,440.00	\$2,985.00	35	\$104,475.00
40	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 4 FT. DIAMETER (0'-4)	EA	\$5,400.00	5	\$27,000.00	\$7,176.00	5	\$35,880.00	\$6,000.00	5	\$30,000.00
41	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 5 FT. DIAMETER (0'-4)	EA	\$7,200.00	2	\$14,400.00	\$9,611.00	2	\$19,222.00	\$7,950.00	2	\$15,900.00
42	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 4 FT. DIAMETER (0'-6)	EA	\$6,400.00	1	\$6,400.00	\$7,480.00	1	\$7,480.00	\$6,725.00	1	\$6,725.00
43	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 5 FT. DIAMETER (0'-6)	EA	\$8,200.00	1	\$8,200.00	\$9,680.00	1	\$9,680.00	\$9,200.00	1	\$9,200.00
44	852.3	General Sanitary Sewer Bid Items		EXTRA DEPTH MANHOLES, 4 FT. DIAMETER (>4)	VF	\$600.00	5	\$3,000.00	\$467.00	5	\$2,335.00	\$395.00	5	\$1,975.00
45	854.1	General Sanitary Sewer Bid Items		SANITARY SEWER LATERALS	LF	\$40.00	30	\$1,200.00	\$663.00	30	\$19,890.00	\$65.00	30	\$1,950.00
46	854.2	General Sanitary Sewer Bid Items		TWO-WAY SANITARY SEWER CLEAN-OUT	EA	\$650.00	3	\$1,950.00	\$1,629.00	3	\$4,887.00	\$860.00	3	\$2,580.00
47	855	General Sanitary Sewer Bid Items		RECONSTRUCTION OF EXISTING MANHOLE	EA	\$3,000.00	8	\$24,000.00	\$3,479.00	8	\$27,832.00	\$5,000.00	8	\$40,000.00
48	858	General Sanitary Sewer Bid Items		CONCRETE ENCASUREMENT, CRADLES, SADDLES AND COLLARS	CY	\$300.00	10	\$3,000.00	\$193.50	10	\$1,935.00	\$250.00	10	\$2,500.00
49	860	General Sanitary Sewer Bid Items		VERTICAL STACKS	VF	\$80.00	20	\$1,600.00	\$33.50	20	\$670.00	\$135.00	20	\$2,700.00
50	864-S1	General Sanitary Sewer Bid Items		BYPASS PUMPING SMALL DIAMETER SANITARY SEWER, PER WORK ORDER	EA	\$4,000.00	20	\$80,000.00	\$15,000.00	20	\$300,000.00	\$2,500.00	20	\$50,000.00
51	866	General Sanitary Sewer Bid Items		SEWER MAIN TELEVISION INSPECTION (8" THROUGH 15" DIA)	LF	\$4.00	12,600	\$50,400.00	\$2.50	12,600	\$31,500.00	\$4.00	12,600	\$50,400.00
52	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 0'-10' DEEP	LF	\$56.00	5,600	\$313,600.00	\$80.00	5,600	\$448,000.00	\$65.00	5,600	\$364,000.00
53	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 10'-15' DEEP	LF	\$65.00	3,000	\$195,000.00	\$95.00	3,000	\$285,000.00	\$70.00	3,000	\$210,000.00
54	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, >15' DEEP	LF	\$80.00	100	\$8,000.00	\$150.00	100	\$15,000.00	\$75.00	100	\$7,500.00
55	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 0'-10' DEEP	LF	\$70.00	600	\$42,000.00	\$100.00	600	\$60,000.00	\$68.00	600	\$40,800.00
56	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 10'-15' DEEP	LF	\$70.00	600	\$42,000.00	\$120.00	600	\$72,000.00	\$76.00	600	\$45,600.00
57	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, >15' DEEP	LF	\$80.00	100	\$8,000.00	\$150.00	100	\$15,000.00	\$80.00	100	\$8,000.00
58	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 0'-10' DEEP	LF	\$73.00	600	\$43,800.00	\$120.00	600	\$72,000.00	\$84.00	600	\$50,400.00
59	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 10'-15' DEEP	LF	\$75.00	600	\$45,000.00	\$130.00	600	\$78,000.00	\$92.00	600	\$55,200.00
60	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, >15' DEEP	LF	\$85.00	100	\$8,500.00	\$165.00	100	\$16,500.00	\$98.00	100	\$9,800.00
61	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 0'-10' DEEP	LF	\$105.00	600	\$63,000.00	\$150.00	600	\$90,000.00	\$125.00	600	\$75,000.00
62	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 10'-15' DEEP	LF	\$110.00	600	\$66,000.00	\$165.00	600	\$99,000.00	\$135.00	600	\$81,000.00
63	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, >15' DEEP	LF	\$140.00	100	\$14,000.00	\$200.00	100	\$20,000.00	\$145.00	100	\$14,500.00
64	900	General Sanitary Sewer Bid Items		SUPPORTING EXISTING UTILITIES	EA	\$100.00	20	\$2,000.00	\$500.00	20	\$10,000.00	\$1,500.00	20	\$30,000.00
65	910	General Sanitary Sewer Bid Items		MANHOLE REHABILITATION	VF	\$400.00	285	\$114,000.00	\$500.00	285	\$142,500.00	\$365.00	285	\$104,025.00
66	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (0'-10"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$700.00	50	\$35,000.00	\$3,897.00	50				



San Antonio Water System
Solicitation Vendor Price List

Run Date 03/29/2019

Prepared By : Jessica Goforth

Solicitation No : CO-00211

Job # : 18-4527

Contract No : CO-00211-01

SAN ANTONIO WATER SYSTEM

PO Box : 2994
San Antonio, Texas, 78208-2449
TABULATION OF BIDS

Proposal : 2019 Pipe Bursting Sanitary Sewer Package (Unspecified)

Time And Date : March 29, 2019 at 10:00 AM

Price List

Line No	Item No	Quote Category	SOV Item	Item Description	Unit	CO-00211 - 4. PRONTO SANDBLASTING & COATING			CO-00211 - 5. CRUZ TEC INC		
						Unit Price	Quantity	Total Amount	Unit Price	Quantity	Total Amount
1	100	General Sanitary Sewer Bid Items		MOBILIZATION	ALW	\$100,000.00	1	\$100,000.00	\$100,000.00	1	\$100,000.00
2	103.1	General Sanitary Sewer Bid Items		REMOVE CONCRETE CURB (COSA SPEC)	LF	\$10.00	20	\$200.00	\$10.00	20	\$200.00
3	103.3	General Sanitary Sewer Bid Items		REMOVE CONCRETE SIDEWALKS AND DRIVEWAYS (COSA SPEC)	SF	\$3.00	1,638	\$4,914.00	\$5.00	1,638	\$8,190.00
4	103.4	General Sanitary Sewer Bid Items		REMOVE MISCELLANEOUS CONCRETE (COSA SPEC)	SF	\$3.00	30	\$90.00	\$12.00	30	\$360.00
5	200.1	General Sanitary Sewer Bid Items		FLEXIBLE BASE (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$10.00	500	\$5,000.00	\$65.00	500	\$32,500.00
6	203.1	General Sanitary Sewer Bid Items		TACK COAT (COSA SPEC)	GAL	\$10.00	100	\$1,000.00	\$32.00	100	\$3,200.00
7	205.3	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE C (3" COMP. DEPTH) (COSA SPEC)	SY	\$30.00	500	\$15,000.00	\$85.00	500	\$42,500.00
8	205.4	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE D (2" COMP. DEPTH) (COSA SPEC)	SY	\$25.00	500	\$12,500.00	\$78.00	500	\$39,000.00
9	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$90.00	500	\$45,000.00	\$85.00	500	\$42,500.00
10	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$120.00	500	\$60,000.00	\$90.00	500	\$45,000.00
11	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (2" DEPTH)	SY	\$10.00	500	\$5,000.00	\$28.00	500	\$14,000.00
12	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (3" DEPTH)	SY	\$10.00	500	\$5,000.00	\$28.00	500	\$14,000.00
13	413.1	General Sanitary Sewer Bid Items		FLOWABLE FILL (LOW STRENGTH)	CY	\$20.00	60	\$1,200.00	\$180.00	60	\$10,800.00
14	413.2	General Sanitary Sewer Bid Items		FLOWABLE FILL (HIGH STRENGTH)	CY	\$180.00	30	\$5,400.00	\$195.00	30	\$5,850.00
15	500.1	General Sanitary Sewer Bid Items		CONCRETE CURB (COSA SPEC)	LF	\$20.00	20	\$400.00	\$46.00	20	\$920.00
16	500.4	General Sanitary Sewer Bid Items		CONCRETE CURB AND GUTTER (COSA SPEC)	LF	\$30.00	20	\$600.00	\$52.00	20	\$1,040.00
17	502.1	General Sanitary Sewer Bid Items		CONCRETE SIDEWALKS (COSA SPEC)	SY	\$80.00	25	\$2,000.00	\$65.00	25	\$1,625.00
18	503.1	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY (COSA SPEC)	SY	\$90.00	90	\$8,100.00	\$95.00	90	\$8,550.00
19	503.2	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL (COSA SPEC)	SY	\$90.00	67	\$6,030.00	\$125.00	67	\$8,375.00
20	503.4	General Sanitary Sewer Bid Items		ASPHALTIC CONCRETE DRIVEWAY (COSA SPEC)	SY	\$20.00	25	\$500.00	\$82.00	25	\$2,050.00
21	505.1	General Sanitary Sewer Bid Items		CONCRETE RIPRAP (5" THICK) (COSA SPEC)	SY	\$50.00	20	\$1,000.00	\$105.00	20	\$2,100.00
22	506.1	General Sanitary Sewer Bid Items		CONCRETE RETAINING WALLS - COMBINATION TYPE (COSA SPEC)	CY	\$900.00	8	\$7,200.00	\$335.00	8	\$2,680.00
23	507.1	General Sanitary Sewer Bid Items		CHAIN LINK WIRE FENCE (4 FT. HIGH) (COSA SPEC)	LF	\$40.00	35	\$1,400.00	\$48.00	35	\$1,680.00
24	507.4	General Sanitary Sewer Bid Items		GATES - PEDESTRIAN (COSA SPEC)	EA	\$100.00	2	\$200.00	\$950.00	2	\$1,900.00
25	507.6	General Sanitary Sewer Bid Items		NEW RESIDENTIAL WOODEN PRIVACY FENCE (6 FT. HIGH) (COSA SPEC)	LF	\$40.00	100	\$4,000.00	\$22.00	100	\$2,200.00
26	513.1	General Sanitary Sewer Bid Items		REMOVING AND RELOCATING MAIL BOXES (COSA SPEC)	EA	\$100.00	5	\$500.00	\$1,100.00	5	\$5,500.00
27	515.1	General Sanitary Sewer Bid Items		TOPSOIL (COSA SPEC)	CY	\$30.00	20	\$600.00	\$45.00	20	\$900.00
28	516.1	General Sanitary Sewer Bid Items		BERMUDA SODDING (COSA SPEC)	SY	\$10.00	60	\$600.00	\$12.00	60	\$720.00
29	516.2	General Sanitary Sewer Bid Items		ST. AUGUSTINE SODDING (COSA SPEC)	SY	\$10.00	60	\$600.00	\$9.00	60	\$540.00
30	520.1	General Sanitary Sewer Bid Items		HYDROMULCHING (RESIDENTIAL OR COMMERCIAL) (COSA SPEC)	SY	\$5.00	60	\$300.00	\$3.00	60	\$2,100.00
31	530.1	General Sanitary Sewer Bid Items		BARRICADES, SIGNS AND TRAFFIC HANDLING, PER WORK ORDER	EA	\$12,000.00	20	\$240,000.00	\$5,500.00	20	\$110,000.00
32	535.1	General Sanitary Sewer Bid Items		4 INCH WIDE YELLOW LINE (COSA SPEC)	LF	\$10.00	35	\$350.00	\$15.00	35	\$525.00
33	535.2	General Sanitary Sewer Bid Items		4 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$10.00	35	\$350.00	\$15.00	35	\$525.00
34	535.7	General Sanitary Sewer Bid Items		24 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$30.00	35	\$1,050.00	\$35.00	35	\$1,225.00
35	537.6	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE I-C) (COSA SPEC)	EA	\$20.00	15	\$300.00	\$35.00	15	\$525.00
36	537.8	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE II-A) (COSA SPEC)	EA	\$20.00	15	\$300.00	\$35.00	15	\$525.00
37	550.1	General Sanitary Sewer Bid Items		TRENCH EXCAVATION SAFETY PROTECTION	LF	\$3.00	2,500	\$7,500.00	\$5.00	2,500	\$12,500.00
38	799	General Sanitary Sewer Bid Items		REMOVAL AND REPLACEMENT OF SPEED HUMP (TYPE II) (PER EACH HUMP)	EA	\$2,500.00	2	\$5,000.00	\$1,500.00	2	\$3,000.00
39	851	General Sanitary Sewer Bid Items		ADJUSTING EXISTING MANHOLES	EA	\$500.00	35	\$175,000.00	\$2,500.00	35	\$87,500.00
40	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 4 FT. DIAMETER (0'-6")	EA	\$8,000.00	5	\$40,000.00	\$6,500.00	5	\$32,500.00
41	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 5 FT. DIAMETER (0'-6")	EA	\$9,000.00	2	\$18,000.00	\$8,500.00	2	\$17,000.00
42	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 4 FT. DIAMETER (0'-6")	EA	\$9,000.00	1	\$9,000.00	\$6,500.00	1	\$6,500.00
43	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 5 FT. DIAMETER (0'-6")	EA	\$10,000.00	1	\$10,000.00	\$8,500.00	1	\$8,500.00
44	852.3	General Sanitary Sewer Bid Items		EXTRA DEPTH MANHOLES, 4 FT. DIAMETER (0'-6")	VF	\$700.00	5	\$3,500.00	\$350.00	5	\$1,750.00
45	854.1	General Sanitary Sewer Bid Items		SANITARY SEWER LATERALS	LF	\$90.00	30	\$2,700.00	\$65.00	30	\$1,950.00
46	854.2	General Sanitary Sewer Bid Items		TWO-WAY SANITARY SEWER CLEAN-OUT	EA	\$850.00	3	\$2,550.00	\$1,250.00	3	\$3,750.00
47	855	General Sanitary Sewer Bid Items		RECONSTRUCTION OF EXISTING MANHOLE	EA	\$3,500.00	8	\$28,000.00	\$4,200.00	8	\$33,600.00
48	858	General Sanitary Sewer Bid Items		CONCRETE ENCASUREMENT, CRADLES, SADDLES AND COLLARS	CY	\$200.00	10	\$2,000.00	\$85.00	10	\$850.00
49	860	General Sanitary Sewer Bid Items		VERTICAL STACKS	VF	\$40.00	20	\$800.00	\$85.00	20	\$1,700.00
50	864-S1	General Sanitary Sewer Bid Items		BYPASS PUMPING SMALL DIAMETER SANITARY SEWER, PER WORK ORDER	EA	\$10,000.00	20	\$200,000.00	\$9,500.00	20	\$190,000.00
51	866	General Sanitary Sewer Bid Items		SEWER MAIN TELEVISION INSPECTION (8" THROUGH 15" DIA)	LF	\$22.00	12,600	\$277,200.00	\$7.50	12,600	\$94,500.00
52	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$80.00	5,600	\$448,000.00	\$53.00	5,600	\$296,800.00
53	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$61.50	3,000	\$184,500.00	\$62.00	3,000	\$186,000.00
54	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, >15" DEEP	LF	\$60.00	100	\$6,000.00	\$75.00	100	\$7,500.00
55	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$54.00	600	\$32,400.00	\$61.50	600	\$36,900.00
56	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$58.00	600	\$34,800.00	\$68.00	600	\$40,800.00
57	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, >15" DEEP	LF	\$64.00	100	\$6,400.00	\$85.00	100	\$8,500.00
58	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$56.00	600	\$33,600.00	\$71.35	600	\$42,810.00
59	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$60.00	600	\$36,000.00	\$77.65	600	\$46,590.00
60	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, >15" DEEP	LF	\$65.00	100	\$6,500.00	\$92.00	100	\$9,200.00
61	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$60.00	600	\$36,000.00	\$105.00	600	\$63,000.00
62	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$64.00	600	\$38,400.00	\$111.00	600	\$66,600.00
63	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, >15" DEEP	LF	\$70.00	100	\$7,000.00	\$115.00	100	\$11,500.00
64	900	General Sanitary Sewer Bid Items		SUPPORTING EXISTING UTILITIES	EA	\$25.00	20	\$500.00	\$1,200.00	20	\$24,000.00
65	910	General Sanitary Sewer Bid Items		MANHOLE REHABILITATION	VF	\$700.00	285	\$199,500.00	\$405.00	285	\$115,425.00
66	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (0'-10"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$500.00	50	\$25,000.00	\$3,500.00	50	\$175,000.00
67	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (10'-15"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$1,300.00	12	\$15,600.00	\$3,900.00	12	\$46,800.00
68	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (>15"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$4,000.00	1	\$4,000.00	\$6,500.00	1	\$6,500.00
69	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (0'-10"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$1,000.00	1	\$1,000.00	\$6,150.00	1	\$6,150.00
70	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (10'-15"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$1,000.00	2	\$2,000.00	\$6,700.00	2	\$13,400.00
71	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (>15"DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$1,000.00	1	\$1,000.00	\$8,600.00	1	\$8,600.00
72	1103.2	General Sanitary Sewer Bid Items		EXTRA LENGTH POINT REPAIR, 8" OR 10" DIAMETER, ALL DEPTHS	LF	\$60.00	200	\$12,000.00	\$150.00	200	\$30,000.00
73	1103.2	General Sanitary Sewer Bid Items		EXTRA LENGTH POINT REPAIR, 12" OR 15" DIAMETER, ALL DEPTHS	LF	\$75.00	50	\$3,750.00	\$250.00	50	\$12,500.00
74	1103.3	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY EXCAVATION 8" OR 10" DIAMETER, ALL DEPTHS	EA	\$700.00	5	\$3,500.00	\$1,750.00	5	\$8,750.00
75	1103.3	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY EXCAVATION 12" OR 15" DIAMETER, ALL DEPTHS	EA	\$1,500.00	2	\$3,000.00	\$2,575.00	2	\$5,150.00
76	1103.4	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY REMOTE CONTROL, 8" OR 10" DIAMETER, ALL DEPTHS	EA	\$300.00	33	\$9,900.00	\$450.00	33	\$14,850.00
77	1103.4	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY REMOTE CONTROL, 12" OR 15" DIAMETER, ALL DEPTHS	EA	\$500.00	2	\$1,000.00	\$750.00	2	\$1,500.00
78	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, 0'-10" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$900.00	90	\$81,000.00	\$1,450.00	90	\$130,500.00
79	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, 10'-15" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$1,200.00	80	\$96,000.00	\$1,650.00	80	\$132,000.00
80	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, >15" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$1,500.00	5	\$7,500.00	\$3,500.00	5	\$17,500.00
81	2000	General Sanitary									



San Antonio Water System
Solicitation Vendor Price List

Run Date 03/29/2019

Prepared By : Jessica Goforth

Solicitation No : CO-00211

Job # : 18-4527

Contract No : CO-00211-01

SAN ANTONIO WATER SYSTEM
PO Box : 2994
San Antonio, Texas, 78208-2449
TABULATION OF BIDS

Proposal : 2019 Pipe Bursting Sanitary Sewer Package (Unspecified)

Time And Date : March 29, 2019 at 10:00 AM

Price List

Line No	Item No	Quote Category	SOV Item	Item Description	Unit	CO-00211 - 6, DORAZIO ENTERPRISES, INC.			CO-00211 - 7, VORTEX TURNKEY SOLUTIONS, LLC		
						Unit Price	Quantity	Total Amount	Unit Price	Quantity	Total Amount
1	100	General Sanitary Sewer Bid Items		MOBILIZATION	ALW	\$100,000.00	1	\$100,000.00	\$100,000.00	1	\$100,000.00
2	103.1	General Sanitary Sewer Bid Items		REMOVE CONCRETE CURB (COSA SPEC)	LF	\$6.03	20	\$120.60	\$10.00	20	\$200.00
3	103.3	General Sanitary Sewer Bid Items		REMOVE CONCRETE SIDEWALKS AND DRIVEWAYS (COSA SPEC)	SF	\$4.80	1,638	\$7,862.40	\$10.00	1,638	\$16,380.00
4	103.4	General Sanitary Sewer Bid Items		REMOVE MISCELLANEOUS CONCRETE (COSA SPEC)	SF	\$16.98	30	\$509.40	\$10.00	30	\$300.00
5	200.1	General Sanitary Sewer Bid Items		FLEXIBLE BASE (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$28.95	500	\$14,475.00	\$125.00	500	\$62,500.00
6	203.1	General Sanitary Sewer Bid Items		TACK COAT (COSA SPEC)	GAL	\$31.83	100	\$3,183.00	\$15.00	100	\$1,500.00
7	205.3	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE C (3" COMP. DEPTH) (COSA SPEC)	SY	\$62.86	500	\$31,430.00	\$65.00	500	\$32,500.00
8	205.4	General Sanitary Sewer Bid Items		HOT MIX ASPHALTIC PAVEMENT, TYPE D (2" COMP. DEPTH) (COSA SPEC)	SY	\$53.98	500	\$26,990.00	\$60.00	500	\$30,000.00
9	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$71.48	500	\$35,740.00	\$70.00	500	\$35,000.00
10	206.1	General Sanitary Sewer Bid Items		ASPHALT TREATED BASE (ATB) (1" COMPACTED DEPTH) (COSA SPEC)	SY	\$66.31	500	\$33,155.00	\$85.00	500	\$42,500.00
11	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (2" DEPTH)	SY	\$13.53	500	\$6,765.00	\$30.00	500	\$15,000.00
12	208.1	General Sanitary Sewer Bid Items		SALVAGING, HAULING AND STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT (3" DEPTH)	SY	\$21.49	500	\$10,745.00	\$35.00	500	\$17,500.00
13	413.1	General Sanitary Sewer Bid Items		FLOWABLE FILL (LOW STRENGTH)	CY	\$131.30	60	\$7,878.00	\$170.00	60	\$10,200.00
14	413.2	General Sanitary Sewer Bid Items		FLOWABLE FILL (HIGH STRENGTH)	CY	\$155.68	30	\$4,670.40	\$225.00	30	\$6,750.00
15	500.1	General Sanitary Sewer Bid Items		CONCRETE CURB (COSA SPEC)	LF	\$42.78	20	\$855.60	\$30.00	20	\$600.00
16	500.4	General Sanitary Sewer Bid Items		CONCRETE CURB AND GUTTER (COSA SPEC)	LF	\$25.27	20	\$505.40	\$45.00	20	\$900.00
17	502.1	General Sanitary Sewer Bid Items		CONCRETE SIDEWALKS (COSA SPEC)	SY	\$83.49	25	\$2,087.25	\$90.00	25	\$2,250.00
18	503.1	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY (COSA SPEC)	SY	\$114.45	90	\$10,300.50	\$115.00	90	\$10,350.00
19	503.2	General Sanitary Sewer Bid Items		PORTLAND CEMENT CONCRETE DRIVEWAY - COMMERCIAL (COSA SPEC)	SY	\$126.60	67	\$8,482.20	\$135.00	67	\$9,045.00
20	503.4	General Sanitary Sewer Bid Items		ASPHALTIC CONCRETE DRIVEWAY (COSA SPEC)	SY	\$87.46	25	\$2,186.50	\$90.00	25	\$2,250.00
21	505.1	General Sanitary Sewer Bid Items		CONCRETE RIPRAP (5" THICK) (COSA SPEC)	SY	\$203.01	20	\$4,060.20	\$135.00	20	\$2,700.00
22	506.1	General Sanitary Sewer Bid Items		CONCRETE RETAINING WALLS - COMBINATION TYPE (COSA SPEC)	CY	\$1,442.34	8	\$11,538.72	\$1,100.00	8	\$8,800.00
23	507.1	General Sanitary Sewer Bid Items		CHAIN LINK WIRE FENCE (4 FT. HIGH) (COSA SPEC)	LF	\$27.80	35	\$973.00	\$30.00	35	\$1,050.00
24	507.4	General Sanitary Sewer Bid Items		GATES - PEDESTRIAN (COSA SPEC)	EA	\$522.10	2	\$1,044.20	\$800.00	2	\$1,600.00
25	507.6	General Sanitary Sewer Bid Items		NEW RESIDENTIAL WOODEN PRIVACY FENCE (6 FT. HIGH) (COSA SPEC)	LF	\$63.66	100	\$6,366.00	\$38.00	100	\$3,800.00
26	513.1	General Sanitary Sewer Bid Items		REMOVING AND RELOCATING MAIL BOXES (COSA SPEC)	EA	\$266.06	5	\$1,330.30	\$750.00	5	\$3,750.00
27	515.1	General Sanitary Sewer Bid Items		TOPSOIL (COSA SPEC)	CY	\$30.39	20	\$607.80	\$45.00	20	\$900.00
28	516.1	General Sanitary Sewer Bid Items		BERMUDA SODDING (COSA SPEC)	SY	\$10.34	60	\$620.40	\$25.00	60	\$1,500.00
29	516.2	General Sanitary Sewer Bid Items		ST. AUGUSTINE SODDING (COSA SPEC)	SY	\$8.81	60	\$528.60	\$25.00	60	\$1,500.00
30	520.1	General Sanitary Sewer Bid Items		HYDROMULCHING (RESIDENTIAL OR COMMERCIAL) (COSA SPEC)	SY	\$1.73	60	\$103.80	\$15.00	60	\$900.00
31	530.1	General Sanitary Sewer Bid Items		BARRICADES, SIGNS AND TRAFFIC HANDLING, PER WORK ORDER	EA	\$13,383.07	20	\$267,661.40	\$2,500.00	20	\$50,000.00
32	535.1	General Sanitary Sewer Bid Items		4 INCH WIDE YELLOW LINE (COSA SPEC)	LF	\$9.61	35	\$336.35	\$10.00	35	\$350.00
33	535.2	General Sanitary Sewer Bid Items		4 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$5.85	35	\$204.75	\$10.00	35	\$350.00
34	535.7	General Sanitary Sewer Bid Items		24 INCH WIDE WHITE LINE (COSA SPEC)	LF	\$24.77	35	\$866.95	\$30.00	35	\$1,050.00
35	537.6	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE I-C) (COSA SPEC)	EA	\$7.59	15	\$113.85	\$25.00	15	\$375.00
36	537.8	General Sanitary Sewer Bid Items		PAVEMENT MARKER (TYPE II-A) (COSA SPEC)	EA	\$6.79	15	\$101.85	\$30.00	15	\$450.00
37	550.1	General Sanitary Sewer Bid Items		TRENCH EXCAVATION SAFETY PROTECTION	LF	\$5.84	2,500	\$14,600.00	\$2.00	2,500	\$5,000.00
38	799	General Sanitary Sewer Bid Items		REMOVAL AND REPLACEMENT OF SPEED HUMP (TYPE II) (PER EACH HUMP)	EA	\$1,591.50	2	\$3,183.00	\$800.00	2	\$1,600.00
39	851	General Sanitary Sewer Bid Items		ADJUSTING EXISTING MANHOLES	EA	\$3,076.90	35	\$107,691.50	\$1,000.00	35	\$35,000.00
40	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 4 FT. DIAMETER (0'-6")	EA	\$9,283.75	5	\$46,418.75	\$4,200.00	5	\$21,000.00
41	852.1	General Sanitary Sewer Bid Items		SANITARY SEWER MANHOLE, 5 FT. DIAMETER (0'-6")	EA	\$9,761.20	2	\$19,522.40	\$6,800.00	2	\$13,600.00
42	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 4 FT. DIAMETER (0'-6")	EA	\$9,283.75	1	\$9,283.75	\$4,500.00	1	\$4,500.00
43	852.2	General Sanitary Sewer Bid Items		SANITARY SEWER DROP MANHOLE, 5 FT. DIAMETER (0'-6")	EA	\$9,761.20	1	\$9,761.20	\$7,000.00	1	\$7,000.00
44	852.3	General Sanitary Sewer Bid Items		EXTRA DEPTH MANHOLES, 4 FT. DIAMETER (0'-6")	VF	\$543.76	5	\$2,718.80	\$450.00	5	\$2,250.00
45	854.1	General Sanitary Sewer Bid Items		SANITARY SEWER LATERALS	LF	\$29.71	30	\$891.30	\$25.00	30	\$750.00
46	854.2	General Sanitary Sewer Bid Items		TWO-WAY SANITARY SEWER CLEAN-OUT	EA	\$318.30	3	\$954.90	\$350.00	3	\$1,050.00
47	855	General Sanitary Sewer Bid Items		RECONSTRUCTION OF EXISTING MANHOLE	EA	\$4,259.92	8	\$34,079.36	\$2,400.00	8	\$19,200.00
48	858	General Sanitary Sewer Bid Items		CONCRETE ENCASUREMENT, CRADLES, SADDLES AND COLLARS	CY	\$318.30	10	\$3,183.00	\$200.00	10	\$2,000.00
49	860	General Sanitary Sewer Bid Items		VERTICAL STACKS	VF	\$84.88	20	\$1,697.60	\$150.00	20	\$3,000.00
50	864-S1	General Sanitary Sewer Bid Items		BYPASS PUMPING SMALL DIAMETER SANITARY SEWER, PER WORK ORDER	EA	\$10,610.00	20	\$212,200.00	\$1,500.00	20	\$30,000.00
51	866	General Sanitary Sewer Bid Items		SEWER MAIN TELEVISION INSPECTION (8" THROUGH 15" DIA)	LF	\$7.06	12,600	\$88,956.00	\$4.00	12,600	\$50,400.00
52	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$76.92	5,600	\$430,752.00	\$52.00	5,600	\$291,200.00
53	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$90.19	3,000	\$270,570.00	\$55.00	3,000	\$165,000.00
54	900	General Sanitary Sewer Bid Items		PIPE BURSTING 8" SANITARY SEWER PIPE, >15" DEEP	LF	\$98.31	100	\$9,831.00	\$90.00	100	\$9,000.00
55	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$100.80	600	\$60,480.00	\$60.00	600	\$36,000.00
56	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$90.19	600	\$54,114.00	\$64.00	600	\$38,400.00
57	900	General Sanitary Sewer Bid Items		PIPE BURSTING 10" SANITARY SEWER PIPE, >15" DEEP	LF	\$105.44	100	\$10,544.00	\$110.00	100	\$11,000.00
58	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$86.68	600	\$52,008.00	\$74.00	600	\$44,400.00
59	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$96.25	600	\$57,750.00	\$78.00	600	\$46,800.00
60	900	General Sanitary Sewer Bid Items		PIPE BURSTING 12" SANITARY SEWER PIPE, >15" DEEP	LF	\$130.77	100	\$13,077.00	\$135.00	100	\$13,500.00
61	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 0'-10" DEEP	LF	\$138.46	600	\$83,076.00	\$102.00	600	\$61,200.00
62	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, 10'-15" DEEP	LF	\$172.09	600	\$103,314.00	\$110.00	600	\$66,000.00
63	900	General Sanitary Sewer Bid Items		PIPE BURSTING 15" SANITARY SEWER PIPE, >15" DEEP	LF	\$200.00	100	\$20,000.00	\$155.00	100	\$15,500.00
64	900	General Sanitary Sewer Bid Items		SUPPORTING EXISTING UTILITIES	EA	\$371.35	20	\$7,427.00	\$500.00	20	\$10,000.00
65	910	General Sanitary Sewer Bid Items		MANHOLE REHABILITATION	VF	\$503.98	285	\$143,634.30	\$325.00	285	\$92,625.00
66	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (0'-10" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$4,010.58	50	\$200,529.00	\$800.00	50	\$40,000.00
67	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (10'-15" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$5,319.41	12	\$63,832.92	\$1,000.00	12	\$12,000.00
68	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 8" OR 10" DIAMETER, (>15" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$7,361.09	1	\$7,361.09	\$3,000.00	1	\$3,000.00
69	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (0'-10" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$5,748.87	1	\$5,748.87	\$1,250.00	1	\$1,250.00
70	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (10'-15" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$7,364.09	2	\$14,728.18	\$2,000.00	2	\$4,000.00
71	1103.1	General Sanitary Sewer Bid Items		POINT REPAIRS FOR 12" OR 15" DIAMETER, (>15" DEPTH) INCLUDING UP TO 20 LF OF PIPING	EA	\$8,217.76	1	\$8,217.76	\$3,500.00	1	\$3,500.00
72	1103.2	General Sanitary Sewer Bid Items		EXTRA LENGTH POINT REPAIR, 8" OR 10" DIAMETER, ALL DEPTHS	LF	\$62.33	200	\$12,466.00	\$200.00	200	\$40,000.00
73	1103.2	General Sanitary Sewer Bid Items		EXTRA LENGTH POINT REPAIR, 12" OR 15" DIAMETER, ALL DEPTHS	LF	\$154.60	50	\$7,730.00	\$200.00	50	\$10,000.00
74	1103.3	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY EXCAVATION 8" OR 10" DIAMETER, ALL DEPTHS	EA	\$1,312.99	5	\$6,564.95	\$400.00	5	\$2,000.00
75	1103.3	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY EXCAVATION 12" OR 15" DIAMETER, ALL DEPTHS	EA	\$1,510.34	2	\$3,020.68	\$600.00	2	\$1,200.00
76	1103.4	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY REMOTE CONTROL, 8" OR 10" DIAMETER, ALL DEPTHS	EA	\$795.75	33	\$26,258.75	\$225.00	33	\$7,425.00
77	1103.4	General Sanitary Sewer Bid Items		OBSTRUCTION REMOVAL BY REMOTE CONTROL, 12" OR 15" DIAMETER, ALL DEPTHS	EA	\$591.00	2	\$1,182.00	\$400.00	2	\$800.00
78	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, 0'-10" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$990.63	90	\$89,156.70	\$1,000.00	90	\$90,000.00
79	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, 10'-15" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$1,332.85	80	\$106,628.00	\$1,000.00	80	\$80,000.00
80	1109	General Sanitary Sewer Bid Items		SERVICE RECONNECTION (W/ OPEN CUT EXCAVATION, >15" DEPTH, INCLUDING UP TO 5 LF OF LATERAL	EA	\$2,926.87	5	\$14,634.35	\$2,000.00	5	\$10,000.00
81	2000	General Sanitary Sewer Bid Items									