



Request for Bid
Front Street & Mud Island Interceptor Rehab Addendum # 2 to
RFP No. 179821.71.0404
January 20, 2016



The following information encompasses Addendum # 2 for the above referenced RFB. Bidders shall fully consider and acknowledge this Addendum in the preparation and submittal of its formal Bid. Failure to do so may result in the rejection of the Bid.

Section 1 – Additional Bidder Questions

Section 2 – Updates to the RFB

All other conditions and requirements remain unchanged

Additional Bidder Questions

Q1: Could a different pricing method be considered for the Front Street manhole linings?

SARP10: Yes. See amended specs.

Q2: Who will be responsible for providing the Jersey barriers for the dive setup (rehab contractor or evaluation contractor)?

SARP10: The rehab contractor will cut the asphalt, remove manhole cone, frame and cover, then place a steel plate over the hole. Evaluation contractor will remove the plate and perform their work (which includes the use of Jersey barriers). When their work has been completed, they will remove all of their traffic control and safety equipment and cover the hole back up with the steel plate at which point the rehab contractor can replace the cone, frame, and cover, and continue work of rehab contract.

Q3: Will SARP10 formally approve the use of fiber-reinforced CIPP? Installation methods would remain the same. However, the fiber-reinforced tube would simply allow an additional option. This would provide the City with a stronger end product due to the fiber reinforcement, and would also maximize the finished internal diameter, which should maximize flow characteristics.

SARP10: At this time, the City does not allow the use of fiber-reinforced CIPP.

Q4: It appears that MH# M1010111 is marked incorrectly on the maps provided. Can the map be revised to reflect the exact location of this manhole as well as the approx. location of the next manhole upstream for bypass pumping purposes?

SARP10: The maps that are provided reflect the latest information that SARP10 has regarding the location and condition of the manholes. In this instance, SARP10 does not have an MACP inspection or GPS coordinates for MH MI010111 so the location is based on the paper “bible maps” which were provided to the program from the City. All bidders have been given the opportunity to obtain MACP information from the SARP10 office. However, additional map pages will be provided to show upstream and downstream manhole approximate locations for bypass pumping purposes.

Q5: Can the upstream manhole(s) on the 60” from MH# M1010101 be located for bypass purposes?

SARP10: Yes, an additional map page will be included to show this manhole location which shows pipe diameters.

Q6: Will it be permitted to install dog house manholes on both the 24” & 60” SS lines? If so, can the engineer provide specifications for these dog house manholes?

SARP10: SARP10 does not intend for any new manholes to be installed as part of this project.

Q7: Will the engineer provide flow data for the 24” & 60” lines for bypass system sizing?

SARP10: SARP10 does not have any flow data for the project area.



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Q8: How much can the 24" line at MH upstream of MH MI010111 (inside apt complex fence) be surcharged?

SARP10: The manhole can be surcharged as long as it does not cause an SSO or backup in the apartment complex.

Q9: If the combination of bypassing the manhole and mechanical ventilation results in the LEL being below 10%, in accordance with the specifications of this project, and could be tested with a multi-gas monitor, could we get approval from the engineer or inspector to use equipment required to grout and line the manhole?

SARP10: There are multiple engineering solutions for working in hazardous atmospheres. Ventilation to below explosive limits as verified with a gas meter or use of spark-proof tools are among the options available to the contractor to determine the best method to perform the work.



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Updates to the RFP

Table 00370.3.1 - Unit Price Bid Form

Bidder should refer to Section 00270, Instructions to Bidders, when completing this Bid Form. Bidder shall complete this form entirely and return it with Bidder's Bid.						
Bid Submitted by (Company Name)						
00370.3 Bid Pricing Information						
00370.3.1 Unit Pricing						
Bidder proposes to complete the RFB Work based on firm, fixed, unit prices (US dollars), which prices multiplied by the final Work quantities would represent the full consideration to Bidder for its complete and satisfactory performance of the Work in compliance with all the terms and conditions of the RFB Documents. The Unit Prices in this Table include the cost of all the work which is required or implied by the RFB documents or which may be inferred therefrom, and which is customarily provided in furnishing a complete and finished work item of its kind. Further, any and all alterations, modifications, and adjustments to the work item, which is reasonably foreseeable or customarily encountered in providing and installing equipment, material, and services of the work item kind, will be performed without additional compensation.						
In the event of a Purchaser-approved change in the scope of Work for which a unit price from this Table is not applicable, as determined by the Purchaser, the Subcontractor shall provide a new unit price for review and acceptance by the Purchaser. Subcontractor shall provide all information requested by the Purchaser to substantiate the value of the new unit price.						
00370.3.1.1 Unit Prices					Bidder Response Columns	
Item Number	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Extension Price	
00004-6.01	Post-Rehab CCTV & Sonar Inspection for Each Diameter	LF	3,905	\$ -	\$ -	
00005-6.01	GPS Coordinates of Manhole Cover	EA	23	\$ -	\$ -	
00005-6.02	MACP Level 2 Manhole Inspections	EA	N/A	\$ -	#VALUE!	
00005-6.03	MACP Level 2 Manhole Inspections	EA	23	\$ -	\$ -	
00010-6.01.01	Standard Manhole Coating: Mud Island Manholes	VF	245	\$ -	\$ -	
00010-6.01.01	Standard Manhole Coating: Front St. Manholes	VF	330	\$ -	\$ -	
00010-6.02.01	Special Structure Manhole Coating - FS030721	EA	1	\$ -	\$ -	
00010-6.02.01a	Each Additional Vertical Foot Beyond 50' - FS030721	VF	20	\$ -	\$ -	
00010-6.02.02	Special Structure Manhole Coating - FS031014	EA	1	\$ -	\$ -	
00010-6.02.02a	Each Additional Vertical Foot Beyond 50' - FS031014	VF	20	\$ -	\$ -	
00010-6.02.03	Special Structure Manhole Coating - FS031000	EA	1	\$ -	\$ -	
00010-6.02.03a	Each Additional Vertical Foot Beyond 50' - FS031000	VF	10	\$ -	\$ -	
00010-6.02.04	Special Structure Manhole Coating - FS020129	EA	1	\$ -	\$ -	
00010-6.02.04a	Each Additional Vertical Foot Beyond 50' - FS020129	VF	13	\$ -	\$ -	
00010-6.02.05	Special Structure Manhole Coating - FS020108	EA	1	\$ -	\$ -	
00010-6.02.05a	Each Additional Vertical Foot Beyond 50' - FS020108	VF	10	\$ -	\$ -	
00010-6.02.06	Special Structure Manhole Coating - FS020107	EA	1	\$ -	\$ -	
00010-6.02.06a	Each Additional Vertical Foot Beyond 50' - FS020107	VF	13	\$ -	\$ -	
00010-6.02.07	Special Structure Manhole Coating - FS020105	EA	1	\$ -	\$ -	
00010-6.02.07a	Each Additional Vertical Foot Beyond 50' - FS020105	VF	13	\$ -	\$ -	
00010-6.02.08	Special Structure Manhole Coating - FS020102	EA	1	\$ -	\$ -	
00010-6.02.09	Special Structure Manhole Coating - FS020101	EA	1	\$ -	\$ -	
00010-6.03	Additional Leak-Stop Grouting	HR	52	\$ -	\$ -	
00010-6.04	Traffic Control per Manhole Repair	EA	15	\$ -	\$ -	
02532-5.01	Manhole Modification for Dive Team	EA	4	\$ -	\$ -	
02532-5.02	Traffic Control per Manhole Modification	EA	4	\$ -	\$ -	
02532-5.03	Pavement Backfill	CY	38	\$ -	\$ -	
02950-01.01	Asphaltic Concrete Pavement Removal and Replacement	SY	40	\$ -	\$ -	
02950-01.02	Concrete Pavement Removal and Replacement	SY	NA	\$ -	#VALUE!	
02950-02	Concrete Sidewalk Removal and Replacement	SF	20	\$ -	\$ -	
02950-03	Concrete Curb and Gutter Removal and Replacement	LF	10	\$ -	\$ -	
09910-7.01.01	24" Diameter CIPP (20-30 feet depth)	LF	762	\$ -	\$ -	
09910-7.01.02	60" Diameter CIPP (20-30 feet depth)	LF	3,143	\$ -	\$ -	
09910-7.02.01	Heavy Cleaning for 24" Pipe	LF	76	\$ -	\$ -	
09910-7.02.02	Heavy Cleaning for 60" Pipe	LF	314	\$ -	\$ -	
	100% Performance and Payment Bonds	Lot	1	\$ -	\$ -	
Total Estimated Unit Price Value					#VALUE!	

00170 - Request for Bid

00170.1 Introduction

Sealed bids will be received at the Office of the City of Memphis Environmental Administration, Room 620, City Hall, 125 N. Main, Memphis, TN 38103, until **3:00 p.m. local time, January 28, 2016** for furnishing the City of Memphis with the following:

FOR THE DIVISION OF: PUBLIC WORKS FOR THE CONSTRUCTION OF:
SARP10 Program **Front Street & Mud Island Interceptor Rehab**

The Sealed Bid envelope must be labeled with the project name, bidder's name, license bidder number, license expiration date, license classification. The Sealed Bid envelope must contain one (1) hardcopy of the bid and one (1) electronic CD copy of the bid.

Sealed Bids that are sent through the mail or other such delivery service shall be sent in such a manner so as to allow the opening of the "Mailing Container" and still have intact the sealed Bid. On the Mailing Container the sender shall state the words that a **"SEALED RESPONSE IS ENCLOSED"** and the Bid number.

Subcontractors intending to bid on this project must have submitted Registration documents electronically to Overland Construction, Inc. (OCI) per the instructions included in Advertisement Legal Notice Request for Bid No. **179821.71.0404** dated **December 8, 2015** and due **January 19, 2016**.

00170.2 Program Overview

The Program consists of the management of the capital program needed to bring the City's wastewater and sewer system into compliance with federal and state regulations per The City of Memphis Wastewater Collection and Transmission System (WCTS) Condition Assessment and Rehabilitation Program Consent Decree signed on September 21, 2012, including the procurement of studies, design and construction services associated with the City of Memphis SARP10 Program.

00170.3 Scope of Work

~~The general scope of work for this RFB is the furnishing of labor, equipment, and materials for the mainline sewer point repair.~~ The scope of Work for this bid generally consists of installing cured in place pipe (CIPP) on approximately 4,000 linear feet of 24" and 60" diameter sewer mains along the northern portion of the Mud Island Interceptor, and rehabilitating 23 manholes on the Mud Island and the Front Street Interceptors. The manholes on the Mud Island Interceptor are typical construction and are to be rehabilitated in their entirety with a corrosion resistance coating. The Front Street Interceptor manholes are always surcharged and include multiple special chambers and are to be rehabilitated with a corrosion resistant coating down to the water line. The work will also consist of temporarily modifying four manhole cones along the Front Street Interceptor to allow a dive evaluation crew to enter the manholes to access the interceptor. Other related work will include bypass pumping, restoring the disturbed area, and providing traffic control where applicable.

00170.4 Bid Guarantee Requirements

Guarantee Requirements:

- (a) Bidder will not withdraw bid for one hundred eighty (180) calendar days after opening of bids without Purchaser's written consent.
- (b) If bid is accepted, bidder will enter into formal Subcontract with Purchaser, within five (5) calendar days after receipt of Subcontract documents for execution.
- (c) If bid is accepted, bidder will execute required 100% Performance/Payment Bond in accordance with Article 00571.4 and will obtain required insurance coverage in



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PART 1 – SCOPE

- 1.01 This Work will consist of assessment, Pipeline Assessment Certification Program (PACP) internal closed circuit television (CCTV), and Sonar surveys to digitally inspect and record conditions of existing sanitary sewer mains and connections in 24-inch and larger diameter sanitary sewer pipe and siphons. Larger diameter sewer pipes to be inspected are located in both improved streets, arterial and primary roads, backyards and unimproved easements. No cleaning of the sanitary sewer is required prior to CCTV and Sonar inspection.
- 1.02 The Work covered by this section includes furnishing all labor, competent PACP certified technicians, equipment, tools, accessories, and materials required to CCTV and Sonar inspect the designated 24-inch diameter and larger sanitary sewer lines.
- 1.03 PACP compliant inspections, logs, data, and photos shall be delivered to the Program Manager (from hereon Program Manager shall be interpreted as “Program Manager or his designee”) on external hard drives which will become property of the Program Manager. Data files shall be formatted to facilitate upload into a PACP compliant exchange database or internet uploads formats to an FTP site approved by the Program Manager.

PART 2 – MATERIALS & EQUIPMENT

2.01 MATERIALS

A. Submittals

1. Unless otherwise specified all sample submittals shall be delivered to the Program Manager within two weeks of the NTP.
2. Traffic Control Plan shall be submitted to the Program Manager, including the following items:
 - a. Outline of permit acquisition procedure for lane closures.
 - b. Methods for proper signing and barricades, which comply with City of Memphis requirements.
 - c. Major streets (e.g. Shelby County Principal Arterial & Minor Arterial) requiring a City approved permit if taking a lane for mobile operations, secured through Traffic Control Plan submittal to the City and signed by a TN P.E. The City requires two-week lead time for permit processing.
 - i. The Contractor will be required to deliver a sample primary/arterial road Traffic Control Plan for review by the City.
 - ii. If the City determines that the nature of the work operation or the type of road in which the Contractor is working requires a

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- permit, the Contractor will be required to modify the sample Traffic Control Plan to obtain a permit from the City.
- d. For everywhere else where a permit is not required, the Contractor shall develop, provide, and implement a traffic control plan for all mobile operations in accordance with standard MUTCD specifications.
 - e. The Contractor is also responsible for acquiring all necessary disposal and/or landfill site permits as required to perform this work.
 - f. Railroad Rights of Way: The Contractor shall notify the Program Manager when work or access to manholes and sanitary sewers lie within the 25 feet of railroad easement as measured by 25 feet outside the nearest rail of the tracks. To access sewer facilities within the 25 feet of the railroad right of way the Contractor shall contact the Program Manager 48 hours in advance who will alert the City's Zone Construction Inspector to coordinate individual railroad direction and guidance.
3. Site Contractor emergency phone numbers.
 4. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following with daily AM email updates of approximate crew locations each day.
 - a. Weekly schedule format shall contain the following elements:
 - i. Map format.
 - ii. Sufficient streets labeled and identified at a scale to provide clarity.
 - iii. Nature and type of crew location by map area.
 5. Permit required confined space entry plans in compliance with the Loss Control Manual.
 6. Copies of National Association of Sewer Service Companies (NASSCO) certification for all field staff conducting PACP inspections.
 7. Sample of PACP compliant television survey log in MS Access format.
 8. Sample of PACP compliant video inspection in MP-4 format.
 9. CCTV and Sonar inspection vehicle and equipment supplies list.
 10. Sample of combined CCTV & Sonar inspection report.

2.02 EQUIPMENT

A. General

1. All equipment used for PACP compliant CCTV sewer segment inspections of existing larger diameter sanitary sewer mains shall be specifically designed and manufactured for the purpose intended under this Contract. The software and hardware for the electronic

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capture of the inspection defects and recorded observations must be Version 6.0.1 NASSCO PACP compliant.

2. All CCTV equipment requirements contained in Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 2.02 are applicable, except 2.02.D. Cleaning Equipment since pre-cleaning of the larger diameter sewers is not required.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 CCTV & Sonar Inspection of Sewer Mains

A. Sewer Flow Levels During Inspection Operations

1. Maintain low sewer flow during inspection by using sandbags or flow-through plugs or by inspecting during low flow times of day, evening or early morning hours while camera is moving and recording observations in the sewer segment. Any items used to restrict flow shall be removed immediately after intended use.
 - a. Flow-through Plugs: If used, secure the plugs so as to remain in place during inspection. Use a fail-safe device at the downstream pipe connection to ensure the plug is not lost in the downstream sewer segment if it becomes dislodged from the upstream pipe connection.
 - b. Conduct all cleaning and CCTV operations to prevent building backups and sewer overflows.
 - c. Contractor shall be responsible for cleanup, repair, fines, property damage costs, and claims for any sewage backup, spillage or sanitary sewer overflow during or as a result of the cleaning and inspection operations.
2. Allowable Depth of Flow For Inspection Operations:
 - a. For effective inspection, all flow shall be minimized in the segment being inspected. However, the depth of flow at the upstream manhole of the interceptor section being worked shall be within the specified limits provided herein.
3. Maximum Allowable Depth of Flow for CCTV Inspection
 - a. 24-inch diameter and Larger Pipe - 30% of pipe diameter. Flow in excess of the 30% depth of flow limitation shall include the provision for Sonar inspection for below the water surface level in addition to a raft mounted CCTV inspection for above the water level.
 - b. Exceptions to these guidelines shall result in rejection, and non-payment, of the CCTV inspection unless approved in advance by the Program Manager.

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B. Camera Operations

1. When flow is in excess of the 30% depth of flow limitation, the Contractor shall include the provision for Sonar inspection for below the water surface level in addition to a raft/float mounted CCTV inspection for above the water level.
2. Raft/float supports shall be collapsible to fit through existing manhole frames associated with 24-inch diameter and larger sewers.
3. Camera Operations requirements shall be as contained in Section 00003 – Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 3.01 are applicable for the execution of the CCTV operations with the camera mounted on a raft or float, except as modified below.
4. Contractor shall be responsible for all judgments and impacts as to whether an obstruction in the sewer main can be passed. Costs involved in extracting a stuck camera in the sewer main will be borne by the Contractor and at no additional cost to the Program Manager.

C. Camera & Sonar Combined Operations

1. The combination CCTV and Sonar equipment shall be capable of inspecting a length of sewer up to at least 1,000 linear feet when entry into the sewer may be obtained at each end and up to 750 feet where a self-propelled unit is used and where entry is possible from one end only.
2. Each inspection unit shall contain a means of transporting the CCTV camera or Sonar equipment in a stable condition through the sewer under inspection. Such equipment shall ensure the maintained location of the CCTV camera and Sonar equipment when used independently on or near to the central axis of a circular shaped sewer. The maximum allowable flow depth that is permissible for the combination Sonar/CCTV is equal to 75% of the pipe diameter.
3. Where the CCTV camera or Sonar head are towed through the sewer, all winches shall be stable with either lockable or ratcheted drums. All connection shall be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera or Sonar equipment through the surcharged sewer. All winches shall be inherently stable under loaded conditions.
4. Each inspection unit shall carry sufficient numbers of guides and rollers such that, when inspecting, all connecting materials are supported away from pipe and manhole structures and all CCTV & Sonar lines used to measure the CCTV camera and the Sonar head location within the sewer are maintained in a taut manner and set a right angles where possible, to run through or over the measuring equipment.

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5. The CCTV Camera and Sonar head shall be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or Sonar head shall be positioned, when possible, centrally within the “dry” area for the CCTV and centrally within the “wet” area for the Sonar head. In non-circular sewers, picture/sonar image orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera/sonar lens shall be positioned looking along the axis of the sewer. A positioning tolerance of + 10% of the vertical sewer dimension shall be allowed.
6. When the scanning Sonar is deployed, either stand alone or combined with CCTV, the speed or travel shall be limited to 4 inches per second or 20 feet per minute.
7. A General Condition 360° CCTV rotational scan must be implemented at every 50 feet interval (min) along sewers, and at all manholes and all salient, specified, defect features. More frequent scans must be made should the condition of the pipe differ from the previous scan. The tilt must not be less than 225°.
8. The color palette shall have a minimum of 16 colors with text. The Sonar image, inside the viewing area shall be in color.
9. The picture update speed shall not result in unsatisfactory picture resolution. The range of resolution shall be 1/10 inch.
10. The maximum beam width of Sonar energy pulse shall be no greater than two degrees from the center of the transducer.
11. The transducer shall be of the continuous scanning type, the speed of which shall be 1 second per 360° scan.
12. The Contractor is responsible for hiring a licensed sub-contractor to retrieve any equipment/foreign objects that get stuck in the sewer system through the execution of the scope of work (fallen cameras, jet nozzles, inflatable plugs, sandbags etc.) at the Contractor’s own cost. Such retrieval by an appropriately licensed sub-contractor shall be made within 72 hours to avoid interfering with the City of Memphis sewer system operations. Any and all impacts and related costs due to the Contractor’s equipment in the line shall be the responsibility of the Contractor. Contractor shall follow SARP10 sewer point repair specifications outlined in “Section 02540 Sanitary Sewer Point Repairs” and “Section 02950 Removal and Replacement of Pavements and Incidentals” during retrieval of equipment. Also per “00585.2.2 Safety, Health, and Accident Prevention Program”, Purchaser must approve sub-tier contractors prior to mobilization to the jobsite.

D. Quality Assurance

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1. QA/QC shall be as contained in Section 00003 - Closed Circuit Television Inspection of Sewer Mains & Connections, Paragraph 3.01.D. Quality Assurance.

E. Deliverable Documentation

1. Mainline Sewer:
 - a. Submit V.6.0.1 PACP compliant records, logs, and electronic inspection data for sewer line inspection to Program Manager by the close of business on the Monday following a week after data acquisition
 - b. Digital videos, data, and photos shall be delivered to the Program Manager on external hard drives which will become property of the Program Manager.
 - c. Data files shall be formatted to facilitate upload into a PACP Database with the approval of the Program Manager.
 - d. Inspections displaying poor digital video/audio quality will be rejected. Quality refers to, but is not limited to, grease or debris on lens, camera under water, image too dark, image washed-out, distorted image, or out of focus images, lines improperly cleaned, and poor/no audio.
 - i. Contractor will re-televiser rejected inspections and resubmit inspections at no additional cost to the Program Manager.
2. Map changes/undocumented manholes:
 - a. For map changes identifying undocumented manholes and network changes which were found as a result of field inspections or observations, a Map Edit Form shall also be prepared and supplied by the Contractor with a drawing or sketch and shall indicate special details, field measurement or distances, or locations about an observed undocumented manhole or a change to the sewer network. The Map Edit Form should also identify buried manholes and siphons that have been encountered.
 - b. Contractor shall indicate all buried manholes identified in the field via Sonar/CCTV using the provided Buried Manhole Form. Any additional manholes that have not been located or verified via Sonar/CCTV but are impeding the completion of required Sonar/CCTV work should be designated as unable to locate (UTL) and be included on the form.
3. Sonar Reports
 - a. The Contractor shall submit two hard copies of all details, i.e. a typed "Full Detail" report for each inspection, showing the position and full text of each defect encountered and their grades. The Contractor shall also supply an overall Summary Report detailing major defects and those inspections that require attention along with

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- a. a statistical report showing lengths of sewers inspected and a breakdown of sizes and lengths inspected.
- b. The Contractor shall supply a MS ACCESS database and free issue software for both the viewing of the media files and the Sonar images from within the database.
- c. The Sonar Inspection shall include complete structural and service assessment to the equivalent PACP standard as that obtained through conventional CCTV imagery.
- d. The Sonar inspection shall include measurement of flow depth and debris/silt depth.
- e. A Color High Resolution Sonar image of cross sections of the sewer must be taken (saved) every 50 feet or more frequently should the internal profile or debris/silt depth of the sewer change from the previously saved image.
- f. These images are to be cross-referenced to the reports and database(s) for ease of retrieval.

PART 4 –DELIVERABLES

4.01 RECORDS

A. Digital Inspection Record

In the digital PACP V.6.0.1 compliant format, the Contractor shall provide the following information:

1. Digital CCTV survey and Sonar inspection which shall be recorded and shall be continuous as the inspection proceeds through the manholes and sewer pipes.
2. Digital Recordings: The digital recording shall document the visual and audio record of the sewer pipe inspection and shall be the basis of measurement and payment. Digital recording playback shall be at the same speed that it was recorded. Original digital recordings for the Project shall be forwarded to the Program Manager on clearly labeled external hard drive(s) in PACP ACCESS format with final report submittals and shall become the property of the Program Manager. Data for a single facility asset will not be split across multiple hard drives. Digital recordings shall be available to the Program Manager by the close of business on the Monday following a week after data acquisition. File naming must be consistent. Additional instructions, naming conventions, file structures, etc. will be provided after contract award.
 - a. Picture Quality: The sewer inspection digital record shall be free of steam, fog, vapor, or other headspace distortion that degrades the quality of the picture from the intended purpose of evaluating the sewer for structural and watertight integrity. If necessary, the

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Contractor shall provide positive ventilation or other means through the sewer pipe to draw out steam, fog, and vapor that will degrade the recorded image of the pipe.

B. Inspection Documentation Logs

1. CCTV Records

- a. Observations made during television inspection shall be documented in an unmodified PACP compliant manner within an electronic inspection log form, supported by accompanying audio, digital photographs and MP-4 (web optimized) format recording written to an external hard drive and submitted to the Program Manager. Hard copies of completed inspection log photographs shall be furnished to the Program Manager with invoicing.

2. Sonar Records

- a. Where combined CCTV and Sonar inspections are performed, the display in the viewing area shall show the combined CCTV and Sonar images of the sewer being inspected. The Sonar image shall be superimposed on the real CCTV image, and continuously recorded, as a combined operation at the time of the inspection resulting in a single combined video file in MP-4 (Web optimized) format for each inspection.
- b. The Sonar Inspection shall include a comprehensive final report on the findings concerning major defects including fractures, displaced joints, deformation, corrosion, lateral intrusions, dominant surface features, encrustation, and debris/silt depths.

C. Electronic & Hard Copy Records

1. Reports: The Contractor shall prepare printed inspection log reports for each associated sewer pipe inspected during the actual field inspection activities. These field logs shall then be reviewed by the Contractor's technical staff, along with reviewing the associated digital video record, as a means of ensuring that no defects or entries are omitted or incorrect. Edited field logs shall then be used in the final project reports and submitted in pdf format.
2. Draft Report and Final Report: The Draft Final Report will contain electronic and hard copies of each of the PACP CCTV log pipe segment inspection logs. Digital recordings of the inspections written to an

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external hard drive and the PACP compliant database of the inspections in ACCESS format shall also be submitted in electronic and pdf format.

Draft Report shall be delivered to the Program Manager within fifteen working days of oldest inspection. The Program Manager will have two workweeks to review and comment. The Contractor shall address all comments provided and submit a Final Report within one workweek upon receipt of comments. At the Program Manager's discretion a meeting will be held so the Contractor can explain the processes used to address the comments.

D. Meetings

The Program Team will arrange bi-weekly meetings (every other week) with the contractor to discuss data management and field issues.

E. Quality

Rejection of deliverables will be submitted to the Contractor via the Program Team in a written communication discussing issues that must be addressed. The Contractor will be required to follow up with a response within three business days upon receipt of the written communication. Contractors will have seven (7) calendar days from the rejection notice date to make the necessary corrections and resubmit the data deliverable in its entirety.

PART 5 – MEASUREMENT

5.01 CCTV & SONAR INSPECTION

CCTV & Sonar inspection shall be measured by linear foot by each diameter of mainline sewer inspected and documented in accordance with the specification.

PART 6 – PAYMENT

6.01 CCTV & SONAR INSPECTION

CCTV & Sonar inspection shall be paid for at the unit price for each linear foot of each diameter inspected and documented in accordance with the specification.

The unit price for CCTV & Sonar inspection shall cover the entire cost of the required CCTV & Sonar inspection and reporting in accordance with

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SECTION 00004 - CLOSED CIRCUIT TELEVISION & SONAR INSPECTION
OF LARGER DIAMETER SEWER MAINS**

PACP V 6.0.1 format, including but not limited to labor, mobilization and access, CCTV equipment, recording media, traffic control, light cleaning of mainline sewer, documenting results in PACP records and logs, digital format recordings, photo equipment, power supply for equipment, interim and final reports, and all other appurtenant work.

No additional payment will be made for:

1. Re-inspection due to rejected inspection and/or records for any reason
2. Incomplete electronic logs for either CCTV or Sonar digital records

6.02 PAYMENT WILL BE MADE UNDER:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00004-6.01	CCTV & SONAR INSPECTION FOR EACH DIAMETER	LF

END OF SECTION 00004

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS
SECTION 00005 – INTERCEPTOR MANHOLE GPS & MACP INSPECTION**

PART 1 – SCOPE

1.01 This Work will consist of locating sanitary sewer system facilities, gathering sub-meter grade GPS coordinates of manhole (including lamphole) covers, Manhole Assessment Certification Program (MACP) protocol Level 1 and Level 2 manhole inspections using the National Association of Sewer Service Companies (NASSCO) MACP Version 6.0.1 protocols, associated photographs, camera inspection of manholes and the associated pipe connections, and documentation of manholes not found, not on grade and/or not showing. The work will also consist of completing a 3D manhole scan. Manholes to be located, documented and inspected are in both improved streets, arterial and primary roads, backyards and unimproved easements. Once new manhole coordinates are obtained, the updated source GIS map data shall be delivered to Program Manager (from hereon Program Manager shall be interpreted as “Program Manager or his designee”) in order to reflect the actual sewer system network.

The Work covered by this section includes furnishing all labor, competent MACP certified technicians/crew leads, equipment, tools, accessories, and materials required to GPS, perform MACP Level 1 and Level 2 inspections, conduct 3D camera inspections and document the specified manholes.

1.02 Sub-meter GPS coordinates, updated GIS map data, Levels 1 and 2 MACP data and records, and camera inspection photos and 3D scan of the manholes shall be delivered to the Program Manager on clearly labeled external hard drive(s) which will become property of the Program Manager. Inspection data for any one asset shall not be split between multiple drives. MACP data files shall be formatted to facilitate upload into a MACP Exchange Database or internet upload to an FTP site as approved by the Program Manager.

1.03 Selected Contractor(s) will be provided two Geo-databases; one will have supporting records (aerial photo overlays, outfall and block maps and as-builts, as available), and a maiden database which will include the asset ID for each manhole.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Submittals

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS
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1. Unless otherwise specified, all sample submittals shall be delivered to the Program Manager within two weeks of the NTP.
2. A Traffic Control Plan shall be submitted to the Program Manager, including the following items:
 - a. Outline of permit acquisition procedure for lane closures.
 - b. Methods for proper signing and barricades, which comply with local requirements and the City.
 - c. Major streets (e.g. Shelby County Principal Arterial & Minor Arterial) requiring a City approved permit if taking a lane for mobile operations, secured through Traffic Control Plan submittal to the City and signed by a TN P.E. The City requires a two-week lead time for permit processing.
 - i. The Contractor will be required to deliver a sample primary/arterial road Traffic Control Plan for review by the City.
 - ii. If the City determines that the nature of the work operation or the type of road in which the Contractor is working requires a permit, the Contractor will be required to modify the sample Traffic Control Plan to obtain a permit from the City.
 - d. For everywhere else where a permit is not required, the Contractor shall develop, provide, and implement a Traffic Control Plan for all mobile operations in accordance with standard MUTCD specifications.
 - e. The Contractor is also responsible for acquiring all necessary disposal and/or landfill site permits required to perform this work.
 - f. Railroad Rights of Way: The Contractor shall notify the Program Manager when work or access to manholes and sanitary sewers lie within the 25 feet railroad easement, as measured by 25 feet outside the nearest rail of the tracks. To access sewer facilities within the 25 feet of the railroad right of way, the Contractor shall contact 48 hours in advance the Program Manager, who will alert the City's Zone Construction Inspector to coordinate individual railroad direction and guidance.
3. Site Contractors emergency phone numbers.
4. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following, and daily AM email updates of approximate crew locations each day.
 - a. Weekly schedule format shall contain the following elements:
 - i. Map format.
 - ii. Sufficient streets labeled and identified at a scale to provide clarity.
 - iii. Nature and type of crew location by map area.
5. Permit required confined space entry plans in compliance with the Loss Control Manual.

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6. GPS calibration standards, including frequency, are to be followed in the field; specify which available base stations will be used for the work.
7. Sample of sub-meter GPS coordinates delivered in electronic and pdf format.
8. Copies of NASSCO certifications for all field staff conducting MACP Levels 1 and 2 inspections.
9. Sample of MACP Level 1 and Level 2 documentation logs (with photo documentation comments and photos properly referenced) in MACP formats, in both electronic and pdf format.
10. Equipment list, including GPS and 3D camera manufacturer and model equipment to be used.
11. Sample of the GPS coordinate delivery in an ESRI ArcPAD .axf file format.
12. Sample of the digital inspection data delivery in MS ACCESS database format.

2.02 EQUIPMENT

All equipment used for the gathering of GPS coordinates, collection of condition assessment information, and digital 3D camera inspection of manholes shall be specifically designed and manufactured for the purpose intended under this Contract. The software and hardware for the electronic capture of the inspection defect observations must be consistent with NASSCO's MACP Level 1 and Level 2 requirements for the collection of data. ESRI ArcPad 10.1 is required for GPS data collection and GIS map updates for manhole / lamphole facility locations. Export of the electronic inspection data to an MACP format Microsoft ACCESS database for analysis is required.

The Contractor shall submit an equipment list to the Program Manager for approval before the commencement of the Work and shall certify that back-up equipment is available and can be delivered to the worksite in 72 hours.

A. GPS Equipment

1. Equipment shall be sub-meter grade, Trimble Pro Series Receivers with Floodlight technology capability, Top Con GRS-1 Series equipment or equal (to be approved by Program Manager prior to mobilization). GPS coordinates to be real-time or post-processed to achieve sub-meter accuracy. Equipment must have ESRI ArcPad 10.1 installed for use in data acquisition.

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B. Camera

1. All camera systems used shall be digital format. The camera must have two independently or simultaneously controlled digital cameras, one facing in the downward direction and one facing in the upward direction. Each camera must have a minimum of 185 degree field of view. The inspection camera system must illuminate the interior of the manhole using a xenon strobe light. The light shall be positioned 360 degrees around the camera lens to distribute the light evenly onto the structure walls. The lighting must be able to illuminate manholes up to 120” in diameter without the need of any auxiliary lighting.

A camera must also be able to obtain still images of the following specified pictures: Photo 1- surface view photos taken of the manhole should include a whiteboard (or similar) with the manhole ID number identified on it. The photographer should be standing with the outlet pipe facing their 6 o'clock position. Photo 2 - the downhole photo of the manhole channel should be taken with the outlet pipe facing their 6 o'clock position. Additional photos as specified by MACP guidance. The camera used for these images must be minimum 5 megapixel .jpg format for sufficient clarity and detail in the photos, and photos of at least 2 MB shall be submitted. If the 3D scan camera system cannot obtain photos of sufficient quality, a pole-mounted digital camera with lighting shall be used for the specified pictures in this paragraph.

The 3D camera system shall produce individual images or frames with no more than 0.001 inches of movement during image or frame exposure to produce crisp, clear images. The inspection camera must provide a minimum of 3,000 lines of vertical resolution in the side view and a minimum of 500 lines in the perspective view.

Inadequate lighting, image distortions, blurry or murky images, low resolution, dirty lens and/or other quality issues will be a cause for rejection. If unsatisfactory, Contractor shall perform work until deliverable is of acceptable quality. No payment will be made for unsatisfactory inspections or until product is accepted.

C. Data Logger and Software

1. MACP and camera inspections and logs created and captured electronically during the MACP inspection of the manhole through the use of commercially available electronic data loggers are required. Paper records for data collection in the field shall not be

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used. NASSCO MACP protocols shall be used for capturing and recording the observations.

The data logger equipment and software shall allow Program Manager direct access to the captured electronic data, and provide for export of the data in accordance with MACP formats and standards.

D. Retrieval of Stuck Equipment

1. The Contractor is responsible for hiring a licensed sub-contractor to retrieve any equipment that becomes lodged in the sewer system through the execution of the scope of work (fallen cameras, jet nozzles, inflatable plugs, sandbags etc.) at the Contractor's own cost. Such retrieval by an appropriately licensed sub-contractor shall be made within 72 hours to avoid interfering with the City of Memphis sewer system operations. Any and all impacts and related costs due to the Contractor's equipment in the line shall be the responsibility of the Contractor.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 INSPECTION

A. GPS Coordinates of Manhole Cover

Program Manager will provide Contractor with a digital copy of the original GIS source map indicating the sewer system network compiled from existing City records.

The Contractor shall capture and record sub-meter grade x, y and z coordinates of each manhole cover identified in the original GIS maiden data map provided with a unique asset identification (ID) number. Additional sanitary sewer lamphole and manholes found in the field in the course of the inspection work that are not provided in current mapping nor identified with a current unique asset ID shall be documented and GPS coordinates shall be recorded. A provisional manhole asset ID number shall be used by the Contractor by adding a dash and a two-character number to the closest upstream manhole ID.

Record sub-meter GPS coordinates in NAD83 TN State Plane Coordinates horizontal, NAVD88 vertical in US Survey feet using properly-calibrated GPS equipment. If GPS coordinates cannot be obtained due to buildings, trees or cloud cover, Contractor shall note this on the inspection form and return at least one additional time at a different time of day or under different sky cover. If both attempts fail at securing the sub-meter coordinates, this

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is to be documented and reported in the submittal. Land surveying shall not be required where GPS is not available.

The Contractor shall be expected to use all reasonable means to locate the lampholes and manholes in the field. This includes walking the pipeline alignment, using measuring tapes or wheels from the last found manhole, using metal detectors, or other means. If manholes are not able to be found and documented or unknown manholes are found, record the reasons for not locating or not opening the manhole or the specifics of the new manhole found, and submit with supporting MACP documentation to the Program Manager daily.

Once GPS coordinates are obtained for known and newly discovered facilities, the original GIS map data shall be delivered to the Program Manager to reflect the actual sewer system network for the assigned inspection area.

The Contractor shall revisit predefined GPS control locations near project area at least one time per day per each GPS unit used as a quality control check on GPS accuracy. Contractor is to document these checks on a single log, which shall be kept on file for the duration of the project, and shall be released to Program Manager on a weekly basis.

B. MACP MH Inspection

The Contractor shall document and record each sanitary sewer manhole inspection in MACP Level 1 format for lampholes and Level 2 format for manholes with supporting completed MACP format database. The complete NASSCO MACP Levels 1 and Level 2 protocols must be utilized for the lamphole and manhole inspections respectively, and must be associated in the electronic database and pdf documentation with the unique asset ID provided.

The Contractor shall mark the direction of wastewater flow (one arrow per pipe) in and out of the manhole around the perimeter of the manhole cover on the street with discrete green arrows spray painted onto the road surface using a guide or template for the arrows. The arrows shall be a minimum of 12 inches and a maximum of 18 inches in length.

The Contractor shall follow the prescribed MACP Level 1 and Level 2 procedures and use the required nomenclature and formats to document the manhole interior and exterior conditions and defects.

Contractor shall be responsible for cleanup, repair, fines, property damage costs, and claims for any sewage backup, spillage or sanitary sewer overflow during or as a result of the field operations.

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C. Camera Inspection of Manholes and Associated Pipe Connections

A 3D manhole scan shall be completed in conjunction with Level 2 manhole inspections of defects and include each sewer pipe connection in the manhole. The photo record of the inspection shall document defects and leaks and shall include a photo record of the connecting pipes in each manhole. Abbreviations, naming conventions, and numbering conventions shall be documented in MACP formats.

File naming must be consistent. Additional instructions, naming conventions, file structures, etc. will be provided after contract award.

D. Meetings

The Program Team will arrange bi-weekly (every other week) meetings with the contractor to discuss data management and quality, and field issues.

PART 4 – DELIVERABLES

4.01 RECORDS

A. GPS Manhole Cover Coordinates

Contractor's Level 1 Manhole and Level 2 Manhole GPS coordinate delivery to the Program Manager shall be in an ESRI ArcPAD .axf file format. The updated GIS source map data reflecting the actual sewer system network shall also be delivered. Inspection data is to be delivered to the Program Manager by the close of business on the Monday following a week after data acquisition. Subsequent data will not be accepted if GPS data is not obtained and delivered at the same time as inspection is conducted. The requested GPS control check file (MS EXCEL) shall also be delivered at this time.

B. Level 1 and Level 2 Inspection Documentation

Deliver complete MACP Level 1 for manholes and Level 2 inspections for manholes in MACP electronic database and pdf electronic formats on an external hard drive. Delivery will be in MS ACCESS database format unless otherwise preapproved by the Program Manager. Inspection data is to be delivered to the Program Manager by the close of business on the Monday following a week after data acquisition.

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C. 3D Camera Inspection

The Contractor shall provide the Program Team with the software required to view the digital film file in the way the Contractor can view it, including full control of the virtual pan and tilt. The digital files must include the following:

1. An unfolded view of the manhole with a minimum of 3,000 lines of vertical resolution.
2. The capability to produce three-dimensional representation of the manhole structure.
3. A distortion-free virtual pan and tilt allowing the review of the manhole structure from any angle at any depth. The virtual pan and tilt must consist of view from the bottom and top camera, any virtual pan and tilt that artificially creates this view from a single camera will be deemed unacceptable due to distorted images on the direct side view.

D. Camera Inspection Documentation

Include specified camera photo documentation of defects, leaks and pipe connections in the MACP Image reference field as appropriate, for the Level 2 documentation. Inspection data is to be delivered to the Program Manager by the close of business on the Monday following a week after data acquisition.

E. Manhole Reports

Deliver a summary report in PDF format of each manhole inspected. The report will include all MACP Level 1 & Level 2 data collected for the manhole. The report shall include the surface view photo of the manhole with the outlet pipe facing 6 o'clock as well as a downhole photo of the channel with the outlet pipe at 6 o'clock. Any defects noted in the manhole shall also have an accompanying photo in the report.

F. Draft Report and Final Report

In addition to the electronic database and pdf format reports, three copies of the Draft Report will contain hard copies of each of the MACP inspections with camera manhole defect and pipe connection photographs. The MACP compliant database of the inspections in ACCESS format shall also be submitted to the Program Manager electronically on an external hard drive.

Draft Report shall be delivered to Program Manager within fifteen working days of the last or final inspection. The Program Manager will have a two

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workweek period to review and provide comments to the Contractor. The Contractor shall address all comments and submit the Final Report within one workweek from receipt of comments. At the Program Manager's discretion, a meeting will be held upon submittal of the Final Report to have the Contractor go over the processes used to address comments.

F. Quality

Rejection of deliverables will be submitted to the Contractor via the Program Team in a written communication discussing issues that must be addressed. The Contractor will be required to follow up with a response within three business days upon receipt of the written communication. Contractors will have seven (7) calendar days from the rejection notice date to make the necessary corrections and resubmit the data deliverable in its entirety.

PART 5 – MEASUREMENT

5.01 GPS COORDINATES OF MANHOLE COVER

The capture and associated documentation of sub-meter GPS x, y and z coordinates for each lamphole and manhole cover will be measured for payment per each lamphole and manhole located by GPS and its coordinates recorded in accordance with the specification, provided that documentation meets QA/QC standards.

5.02 MACP LEVEL 1 FOR LAMPHOLE INSPECTIONS

The inspection and recording of all lamphole observations in a MACP compliant fashion will be measured for payment per each lamphole inspected in accordance with the specification.

5.03 MACP LEVEL 2 FOR MANHOLE INSPECTIONS

The inspection and recording of all manhole observations in a MACP compliant fashion will be measured for payment per each manhole inspected in accordance with the specification.

PART 6 – PAYMENT

6.01 GPS COORDINATES OF MANHOLE COVER

The capture and associated documentation of sub-meter GPS x, y and z coordinates for each manhole cover shall be paid for at the unit price bid for each lamphole and manhole cover coordinates documented and

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recorded in accordance with the specification provided that QA/QC standards are met.

The unit price for each manhole cover GPS set of coordinates shall cover the entire cost of the GPS equipment and time necessary to gather the coordinates, including but not limited to calibrating the equipment; setup and access; traffic control; documenting results in prescribed MACP electronic formats, records and logs; power supply for equipment; interim and final reports; and all other appurtenant work.

No additional payment will be made for:

Location or re-inspection due to cars parked over manholes or other impediments to on grade and showing manhole covers.

Additional visit(s) to secure the proper GPS coordinates due to lack of adequate satellite coverage or reception.

6.02 MACP LEVEL 1 FOR LAMPHOLE INSPECTIONS

The inspection and recording of all lamphole observations in a MACP format shall be paid for at the unit price bid per each MACP Level 1 inspection performed in accordance with the specification, provided that QA/QC standards are met.

The unit price for each MACP lamphole inspection shall cover the entire cost of the inspection and reporting, including but not limited to setup and access, documenting results in records and logs, power supply for equipment, interim and final reports and all other appurtenant work.

6.03 MACP LEVEL 2 FOR MANHOLE INSPECTIONS

The inspection and recording of all manhole observations in a MACP format shall be paid for at the unit price bid per each MACP Level 2 inspection performed in accordance with the specification, provided that QA/QC standards are met.

The unit price for each MACP manhole inspection shall cover the entire cost of the inspection and reporting, including but not limited to setup and access, documenting results in records and logs, digital photos, power supply for equipment, interim and final reports, and all other appurtenant work. This also includes the materials and labor to complete 3D scan of the manhole with all associated deliverables.

6.04 PAYMENT WILL BE MADE UNDER:

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<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00005-6.01	GPS COORDINATES OF MANHOLE COVER	EACH
00005-6.02	MACP LEVEL 1 LAMPHOLE INSPECTIONS	EACH
00005-6.03	MACP LEVEL 2 MANHOLE INSPECTIONS	EACH

END OF SECTION 00005

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Modified By SARP10 Program
SECTION 00010 – REHABILITATION OF INTERCEPTOR MANHOLES

PART 1 – SCOPE

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

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

1.03 Each manhole to be rehabilitated shall be thoroughly cleaned and then inspected for loose or missing bricks, loose mortar, holes, etc. All leaks shall be plugged prior to manhole rehabilitation.

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

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

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

1.07 Definitions/Standards:

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

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

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

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

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

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

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

1.08 Quality Assurance. Furnish materials of quality required by the American Society for Testing and Materials (ASTM) standards and industry approved standards and specifications. Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications.

1.09 Sequencing: All required interruptions of flow through manholes or any other portion of the sanitary sewer system shall be coordinated with the Owner, and approval must be received from the

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Owner prior to the interruption.

1.10 When rehabilitating manholes, the material for stopping active leaks and repairing nonleaking holes, cracks, etc. in concrete and masonry manholes shall be compatible with the coating system used for rehabilitation.

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

1.12 The Subcontractor shall apply the manhole coating system material on a sample area not less than four square feet (4 ft²) in size. When approved, the sample area shall serve as a standard of acceptance for all further work.

1.13 All manholes shall be coated either in their entirety or to the water level as indicated on the maps and plans. The average water level in the continuously surcharged manholes is 78' in relation to the attached plan sheets as calculated by the City.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Submittals

1. Unless otherwise specified all sample submittals shall be delivered to the Purchaser within two weeks of the NTP.
2. Site Subcontractor emergency phone numbers.
3. Schedules of work on a weekly basis that will be delivered no later than 2:00 PM on Thursday for the week following with daily AM email updates of approximate crew locations each day. Weekly schedule format shall contain a map, with sufficient streets labeled and identified at a scale to provide clarity, along with the nature and type of crew located by map area.
4. Product Data on the following:
 - Crack and hole repair products.
 - Cementitious plug material.
 - Frame and cover seals.
 - Corrosion resistant coating system including application requirements and chemical resistance data.
 - Gasket Polymer Properties
5. Manufacturer's Certificate of Compliance for each type of product that product furnished meets requirements of this Section.
6. Manufacturer's written recommendations for product handling and installation.
7. Confined space entry plans.
8. Plan for diversion of flow during installation of manhole over existing piping.

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

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

B. Manhole Coating System. ~~Spray applied or centrifugally cast lightweight structural reinforced cement manhole coating system:~~

1. The material applied onto the surface of brick or precast manholes shall be a coating system consisting of a base coat and top coat to provide strength and corrosion resistance within a sanitary sewer environment. The thickness of the base coat and top coat shall meet the manufacturer's recommendation. Where applicable, the coating shall be applied to the roof, fillets, hatch frames, and underside of hatch surfaces. Subcontractor can request to not use a base coat but must provide to the Owner and Purchaser evidence of successful installations of the product without using a base coat and its capability to properly adhere to the manhole wall and form a smooth finish on the wall, bench, and invert. In cases where the base coat is not used, the thickness of the top coating will be increased by the base coat thickness listed above.

2. The top coat applied shall be an approved polymer based polyurethane, a geopolymer, or a high-build solvent free epoxy product in conjunction with a high-strength cementitious repair/patch/base coat. The following products are acceptable and approved: Spectrashield Liner Systems, Quadex QM-1s and Structure Guard, GeoKrete Geopolymer by Quadex, or EcoCast by IPR.

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

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

5. Where specified on the drawings, all invert channels shall be coated with the protective top coat only to prevent infiltration and to build up the invert channel to the new sewer main invert elevations; to fill all voids, cracks, holes, etc.; and to form a

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smooth flow channel. The entire channel shall be coated. The coating thickness shall be in accordance with manufacturer's recommendations.

C. Mortar

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

2.02 EQUIPMENT

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

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 PRELIMINARY AND GENERAL ITEMS

A. Notify all property owners who discharge sewage directly to the manhole being surface that their service will be discontinued while the lining is being placed, cured, and active pipe and service connections reopened. The Subcontractor shall notify individual property owners at least 72 hours in advance, giving the date, start time, and estimated completion time for the work being conducted. This notification shall be coordinated with the door hanger distribution.

B. Traffic Control

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

C. Fall Protection

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

D. Cleaning

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

E. Flow Control:

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

F. Bypass of Flow:

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

2. Bypass pumping is defined as providing pumps, standby pumps, piping, manpower to operate, routine maintenance and repair capability, pipe plugs, fuel, route and pump site clearing and whatever else is necessary to provide a complete bypass pumping operation. The bypass shall typically be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole. The Subcontractor will be required to attenuate noise associated with bypass pumping so that the general public is not disturbed by the sound level. Any structures proposed by the Subcontractor for construction over or penetration into the interceptor piping for the purpose of performing the bypass operations must be approved by the Purchaser prior to implementation. This approval will be based upon the submittal by Subcontractor of Tennessee professional engineer prepared design drawings and details. All bypass pump schemes must be submitted to and approved by the Purchaser in advance.

G. Wastewater Spills

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

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

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

H. Safety

1. The Subcontractor shall carry out his operations in strict accordance with all applicable OSHA and SARP10 standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space.

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3.02 MANHOLE REHABILITATION – PROTECTIVE COATING SYSTEM

- A. The surface prior to spraying shall be damp without noticeable water droplets or running water. Materials shall be spray applied to a minimum uniform thickness to ensure that all cracks, crevices, and voids are filled and a smooth surface remains after light troweling. Perform light troweling to compact the material into voids and to set the bond. All manhole steps shall be removed prior to the coating being applied.
- B. Application procedures shall conform to the recommendations of the protective coating manufacturer, including handling, thickness, mixing, environmental controls during application, safety, and spray equipment.
- C. The equipment shall be specifically designed to accurately ratio and apply the base coat and top coat materials and shall be well maintained and in proper working order for the duration of the Work.
- D. The coating must be applied by a “Certified Applicator” of the protective coating manufacturer.
- E. Specified surfaces shall be coated by moisture tolerant, solvent-free, protective coating exhibiting properties described in these specifications.
- F. Equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating.
- G. If necessary, subsequent top-coating or additional coats of the protective coating shall occur as soon as the base coat becomes tack-free, ideally within twelve (12) hours but not later than the recoat window for the specified products. Additional surface preparation procedures shall be required if the recoat window is exceeded.
- H. The bench covers used to catch debris shall be removed and the bench and invert sprayed such that a gradual slope is produced from the walls to the invert. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.
- I. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24 hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F, using ice if necessary.
- J. The final application shall have a minimum of four (4) hours cure time before subjected to actual flow.

3.03 MANHOLE REHABILITATION ACCEPTANCE

- A. After the manhole rehabilitation work has been completed, the manhole shall be visually inspected by the Subcontractor in the presence of the Purchaser’s Representative and the work shall be accepted if found satisfactory to the Purchaser’s Representative. The finished surface shall be free of blisters, “runs” or “sags” or other indications of uneven coating thickness. No evidence of visible leaks shall be allowed.
- B. After the protective coating has set hard to the touch, it shall be inspected with high-voltage holiday detection equipment. The surface shall first be dried, an induced holiday shall then be made onto the coated concrete surface and shall serve to determine the

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minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All tough-up/repair procedures shall follow the protective coating manufacturer's recommendations.

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

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

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

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

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

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

3.04 WARRANTY AND GUARANTEE FOR REHABILITATED MANHOLES

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

PART 4 – DELIVERABLES

4.01 Provide post-rehabilitation MACP inspection for each manhole. Refer to Section ~~00004~~
Manhole GPS & MACP Inspection.

00005

PART 5 – MEASUREMENTS

5.01 STANDARD MANHOLE COATING

A. A protective coating system consisting of a base coat and top coat with thicknesses in accordance with manufacturer's recommendations shall be measured per vertical foot of manhole from the downstream invert or water level up to the bottom of the frame casting where specified on the maps and plans.

5.02 SPECIAL STRUCTURE MANHOLE COATING

A. **Special structure manhole coating will be measured per each special structure for the first fifty (50) vertical feet and then will be measured per additional vertical foot beyond fifty feet to the water level. If the manhole is not fifty feet in depth, the measurement will only be per each.**

5.03 ADDITIONAL LEAK-STOP GROUTING

A. Additional continuous leak-stop grouting beyond four hours per manhole structure shall be measured per hour.

5.03 TRAFFIC CONTROL

A. Traffic control will be paid per each manhole rehabilitated.

5.04 DEWATERING

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

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5.05 BYPASS PUMPING

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

PART 6 – PAYMENT

6.01 STANDARD MANHOLE COATING

A. A standard manhole coating shall be paid for per vertical foot and shall include consist of surface preparation, up to four hours of continuous leak-stop grouting, sprayed on lining, removal and disposal of manhole steps, and holiday testing.

6.02 SPECIAL STRUCTURE MANHOLE COATING

A. ~~Special structure manhole coating will be paid per each special structure for the first fifty (50) vertical feet and then per vertical foot beyond fifty feet to the water level. This shall consist of surface preparation, up to four hours of continuous leak-stop grouting, sprayed on lining, removal and disposal of manhole steps, and holiday testing. If the manhole is not fifty feet in depth, the payment will be per each. The Subcontractor will not be paid additionally if the water level in the structure differs from the estimate provided in this specification.~~

6.03 ADDITIONAL LEAK-STOP GROUTING

A. Additional continuous leak-stop grouting beyond four hours per manhole structure shall be paid for per hour. This item includes all materials and labor necessary to complete the grouting.

6.04 TRAFFIC CONTROL

A. Traffic control will be paid per each manhole rehabilitated including all appurtenances required to comply with MUTCD standards.

6.05 PAYMENT WILL BE MADE UNDER:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
00010-6.01.01	STANDARD MANHOLE COATING: MUD ISLAND MANHOLES	VF
00010-6.01.02	STANDARD MANHOLE COATING: FRONT ST MANHOLES	VF
00010-6.02.01	COATING: FS030721 (50' depth)	Each
00010-6.02.01a	Each additional vertical foot beyond 50' – FS030721	VF
00010-6.02.02	COATING: FS031014 (50' depth)	Each
00010-6.02.02a	Each additional vertical foot beyond 50' – FS031014	VF
00010-6.02.03	COATING: FS031000 (50' depth)	Each
00010-6.02.03a	Each additional vertical foot beyond 50' – FS031000	VF
00010-6.02.04	COATING: FS020129 (50' depth)	Each
00010-6.02.04a	Each additional vertical foot beyond 50' – FS020129	VF
00010-6.02.05	COATING: FS020108 (50' depth)	Each
00010-6.02.05a	Each additional vertical foot beyond 50' – FS020108	VF
00010-6.02.06	COATING: FS020107 (50' depth)	Each
00010-6.02.06a	Each additional vertical foot beyond 50' – FS020107	VF
00010-6.02.07	COATING: FS020105 (50' depth)	Each
00010-6.02.07a	Each additional vertical foot beyond 50' – FS020105	VF
00010-6.02.08	COATING: FS020102 (50' depth)	Each
00010-6.02.09	COATING: FS020101 (50' depth)	Each
00010-6.03	ADDITIONAL LEAK-STOP GROUTING	HOUR

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00010-6.04

TRAFFIC CONTROL

Each

END OF SECTION 00010

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PART 1 – SCOPE

This Work shall consist of adjusting existing sanitary sewer manhole frames, covers, and cones necessary to allow a dive team and Sonar/CCTV equipment to enter the manhole or as directed by the Purchaser and in accordance with these Specifications.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

A. Mortar

1. Mortar shall be composed of the following mixtures by volume: one part Portland cement, twoparts sand, hydrated lime not to exceed 10 percent of the cement used, and four parts water. All ingredients shall be proportioned by measurement and not by estimation. All hydrated lime shall be aspecified by ASTM C 6.

2. The mortar shall be hand mixed or machine mixed. In the preparation of hand mixed mortar, the sand, cement and hydrated lime shall be thoroughly mixed together in a clean, tight mortar boxuntil the mixture is of uniform color, after which water shall be added. Machine mixed mortar shallbe prepared in an approved mixer and shall be mixed not less than 1 ½ minutes. Mortar shall beused within 30 minutes after mixing.

B. Brick

1. All brick shall conform to the Specifications for Concrete Building Brick, ASTM C55 for GradeA. Bricks shall conform to the following dimensions, unless otherwise approved by the Purchaser.

	Depth	Width	Length
	Inches	Inches	Inches
Standard Size	2 ¼	3 ¾	8
Allowable Variation	+ ¼	+ ¼	+ ½

2. All brick shall be new and whole, of uniform standard size and with substantially straight andparallel edges and square corners. Bricks shall be tough and strong and free from injuriouscracks and flaws. Bricks shall be culled after delivery, if required, and all culls shall be removed from the work site.

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3. The Subcontractor may be required to furnish the Purchaser with at least five bricks of the character and make he proposes to use, at least one week before any bricks are delivered for use. All bricks shall be of the same quality as the accepted samples.

C. Portland Cement Concrete

Portland cement concrete for adjustment of precast or poured-in-place concrete manholes shall be in accordance with Section 03050 Portland Cement Concrete.

D. Steel Reinforcement

Deformed steel reinforcing bar and welded wire fabric shall be of the grades, sizes and dimensions and at the designated spacing's and locations as shown on the plans or as directed by the Purchaser.

E. Manhole Steps

Manhole steps shall be removed as part of the Evaluation contract and will not be the responsibility of the Rehab Contractor.

F. Grade Adapter Ring

Grade adapter rings shall be of the standard Memphis type as manufactured by Memphis MachineWorks, or equal. The City shall supply the Grade Adapter Ring. The Subcontractor shall make arrangements to secure the Grade Adapter Ring from the City.

G. Manhole Frame & Cover

Manhole Frame & Covers shall be of the standard Memphis type as manufactured by Memphis MachineWorks, or equal. The City shall supply the Manhole Frame & Cover. The Subcontractor shall make arrangements to secure the Manhole Frame & Cover from the City.

H. Paving Materials

Flexible pavement (asphaltic concrete) and rigid pavement (Portland cement) shall be restored in kind using materials in accordance with Section 02950 Removal and Replacement of Pavements and Incidentals.

I. Backfill Under Pavement

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Backfill beneath all paved areas shall be either crushed limestone or recycled crushed concrete.

Crushed limestone will be size No. 67 Coarse Aggregate meeting the requirements of the Tennessee DOT Standard Specifications for Road and Bridge Construction and the following gradation:

Total Percent by Dry Weight, Passing Each Sieve (U.S. Standard)					
Size No.	1"	3/4"	3/8"	No. 4	No. 8
67	100	90-100	20-55	0-10	0-5

2.02 EQUIPMENT

All equipment necessary for the satisfactory performance of this work shall be on hand and available before Work will be permitted to begin.

PART 3 - CONSTRUCTION REQUIREMENTS

3.01 MANHOLE MODIFICATION FOR DIVE TEAM

Contractor shall be responsible for modifying the cone section of the manhole to allow a dive team and Sonar/CCTV equipment to enter and descend the manhole for inspection of the associated interceptor gravity mains. These modifications could include street cuts, removal of brick cones to a diameter approved by the Program Manager and Dive Team Manager allowing for the safe entry and emergency extraction of the diver if required. Steel trench plates shall be installed over the hole to secure the area during non-working hours. Final paving shall be performed once the manholes are reconstructed and the project is complete. The paving shall be completed no later than 7 days after completion of the dive team completing their evaluation.

3.02 TRAFFIC CONTROL

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

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3.03 FALL PROTECTION

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

3.04 REMOVAL & REPLACEMENT OF PAVEMENTS & INCIDENTALS

The Subcontractor shall remove and replace pavement and incidentals in accordance with requirements of Standard Construction Specifications Section 02950, Removal and Replacement of Pavement and Incidentals.

3.05 SHEETING AND SHORING

- A. The subcontractor will furnish, place, and maintain sheeting and shoring as required to support the sides of any excavation to prevent earth movement that could endanger the workers or public and to prevent damage to the excavation, adjacent utilities or property. The Subcontractor will place this sheeting and shoring without the Purchaser's instructions.
- B. Sheeting will extend to a sufficient depth to assure adequate support. Walers and struts will be designed and installed to present no obstructions to proper manhole modification and reinstallation.
- C. Sheeting, bracing, and shoring will be withdrawn and removed as the back-filling is being done, except when the Purchaser permits the material to be left in place.
- D. All sheeting, bracing, and shoring which are not left in place under this provision will be removed in a way that will not endanger the completed work or other structures, utilities, storm drains, sewers, or property. The Subcontractor will be careful to prevent the opening of voids during the extraction process.
- E. If sheeting and shoring are not specifically required on the Plans or in the Specifications, steel drag shields or trench boxes may be used subject to the authorization of the Purchaser. Voids left by the advancement of the shield will be carefully backfilled and compacted following trench backfill requirements.

3.06 BACKFILLING

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A. General

1. After the manhole cone, frame, and cover have been replaced according to these Specifications and upon permission of the Purchaser, the backfill may be placed. Backfilling operations will continue following as closely behind pipe installation as practical. All backfill will be placed in uniform horizontal layers. Pushing backfill material down a ramp into excavated areas will not be permitted. No trash will be allowed to accumulate in the space to be backfilled. Particular care will be taken to avoid allowing wood to be included in the backfill, other than sheeting and shoring that has been approved to be left in place.
2. The Subcontractor will be responsible for the condition of the trenches and filled areas during the contract and warranty period. The Subcontractor will maintain frequent inspection of the same. Anytime during the 12-month warranty period the trenches or filled areas settle and sunken places appear, the Subcontractor will be required to refill these sunken places when they are discovered with suitable material and will replace all damaged curb, gutter, and sidewalk. All soft or dangerous trenches will be marked, barricaded and caution lighted for the protection of the public.

B. Street Right of Way and Improved Property

1. Backfill Material: Backfill for pipe trench excavations through pavements in street or highway right of way or where the Purchaser orders, will be made with pit run gravel or other acceptable material as approved by the Purchaser. The backfill will be from the top of the pipe embedment material or manhole foundation to the subgrade elevation of the pavement. Pea gravel or similar granular material approximately uniform in size and without bonding properties will not be used.
2. Backfill for pipe trench excavations beyond pavements in street or highway right of way or outside public right of way will be made with select earth from the top level of the pipe embedment material or foundation to the subgrade elevation in paved area, or within 1 inch of the surface in areas to be sodded, or to the surface in all other areas.
3. Select material will be free from debris, organic matter, perishable compressible material and will contain no stones or lumps larger than 6 inches. Rocks and lumps smaller than 6 inches will not exceed an amount that will interfere with the consolidating properties of the fill material. Care will be taken that stones and lumps are kept separated and well distributed, and that all voids are completely filled

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with fine material. No rocks or lumps will come in direct contact with the pipe. The upper 3 feet of backfill in sodded or planted areas will be free of rocks or lumps larger than 1 inch in diameter.

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

C. Open Areas and Unimproved Property

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

3.08 RESTORATION OF ROAD SURFACES

Flexible pavement (asphaltic concrete) and rigid pavement (Portland cement) shall be restored in kind using materials in accordance with Section 02950 Removal and Replacement of Pavements and Incidentals.

PART 4 – MEASUREMENT

4.01 MANHOLE MODIFICATION FOR DIVE TEAM

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- A. Manhole modifications will be measured per each.
- 4.02 TRAFFIC CONTROL
- A. Traffic control will be paid for per each construction area.
- 4.03 PAVEMENT BACKFILL
- A. Pit run gravel or other acceptable material used for backfill under pavements or other areas directed by the Purchaser will be measured by the cubic yard. The excavation site for each manhole to be modified shall be defined as a six-foot wide by six-foot long by four-foot deep area.

PART 5 – PAYMENT

- 5.01 MANHOLE MODIFICATION FOR DIVE TEAM
- Manhole modification will be paid for at the contract unit price per each. The unit price shall include furnishing all labor and materials necessary to complete the modification including all sheeting and shoring.
- 5.02 TRAFFIC CONTROL
- Traffic control will be paid for per each construction area including all appurtenances required to comply with MUTCD standards.
- 5.03 PAVEMENT BACKFILL
- A. Accepted quantities of pit run gravel or other acceptable material used for backfill under pavements or other areas designated by the Purchaser will be paid for at the contract unit price per cubic yard furnished and placed, which will be full compensation for furnishing, placing and compacting the selected material.

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5.05 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02532-5.01	Manhole Modification for Dive Team	Each
02532-5.02	Traffic Control per Manhole Repair	Each
02532-5.03	Pavement Backfill	Cubic Yard

END OF SECTION 02532

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SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND
INCIDENTALS**

PART 1 – SCOPE

This Work shall consist of the removal and replacement of pavements, sidewalks, driveway aprons, curbs and gutters, driveways, paved areas, and curbs made necessary by the improvement of sanitary sewer infrastructure, and other items of construction that require temporary cuts. Such replacement shall be to a condition at least equal to the condition existing prior to removal and of in-kind material and shall be compliance with the Drawings, these Specifications, or as directed by the Purchaser. The Work which will be included in the Subcontract and for which the Subcontractor shall be compensated therefore is limited to that area within the rights-of-way and construction easements for the Project. The Subcontractor will not be compensated for the removal and replacement of facilities outside the rights-of-way, easements, and limits of construction of the Project.

PART 2 – MATERIALS AND EQUIPMENT

2.01 MATERIALS

- A. Concrete: Portland cement concrete shall be in accordance with Section 03050 Portland Cement Concrete.
- B. Asphaltic Concrete Pavement: Asphaltic concrete surface courses shall meet the requirements of Mix No. 1 and bases courses shall meet the requirements of Mix No. 2 as described below.

- 1. The composition of the mixes shall be as follows:

Total Percent Passing by Weight

<u>Sieve Size</u>	<u>Mix No. 1</u>	<u>Mix No. 2</u>
2"	100	100
1-1/2"	100	100
3/4"	100	100
3/8"	76 - 96	65 - 95
No. 4	51 - 76	45 - 70
No. 8	36 - 60	25 - 50
No. 30	16 - 40	12 - 30
No. 100	3 - 12	2 - 12
No. 200	2 - 8	1 - 6

- 2. The proportions of the total mixture, in percent by weight, shall be as follows:

<u>Courses</u>	<u>Combined Mineral Aggregate</u>	<u>Asphalt Cement</u>
Mix No. 1, Surface	92.0 – 96.0	4.0 – 8.0
Mix No. 2, Binder	93.0 – 97.5	2.5 – 7.0

- 3. It is the intent of this Section of the Specifications that the above described mixes shall conform to the following mixtures specified in the Tennessee Department of Transportation Standard Specifications for Road and Bridge construction.

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Mix No. 1 – Section 411, Asphaltic Concrete Surface (Hot Mix), Grading E.
 Mix No. 2 – Section 307, Bituminous Plant Mix Base (Hot Mix), Aggregate Grading C.

4. For multiple layer construction, succeeding layers shall not be laid until the previous layer has cooled sufficiently to support the construction equipment
 5. When Mix No. 1 is to be used as a surface for traffic lanes, the mineral aggregate shall be composed of not less than 50 percent nor more than 55 percent crushed limestone and not more than 50 percent nor less than 45 percent natural sand. When Mix No. 1 is used for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely of limestone, including screening and manufactured sand, but in no case shall the mineral aggregate for this construction consist of less than 50 percent limestone. The natural sand shall be so graded that not more than 5 percent will be retained on the No. 4 sieve.
- C. Expansion Joint Filler: Preformed expansion joint filler shall be of the bituminous type, shall conform to the requirements of AASHTO M 213 and shall not be more than 1 inch or less than 1/2 inch in thickness. The filler shall be cut to the full depth of pavement, curb and gutter, sidewalk, or driveway being replaced.
- D. Gravel Pavement or Base: Crushed limestone with such material as manufactured sand or other fine materials naturally contained or added thereto as needed to match existing conditions and conform to the gradations shown below:

Grading Table for Graded Aggregate Base Course
 Total Percent, by Dry Weight, Passing Each Sieve (U.S. Standard)

<u>Size No.</u>	<u>2 1/2"</u>	<u>2"</u>	<u>1 1/2"</u>	<u>1"</u>	<u>3/8"</u>	<u>No. 40</u>
1	100	95-100			35-65	10-30

2.02 EQUIPMENT

- A. Equipment and tools necessary for cutting, removal, and hauling of existing items; handling and placement of new material; and all equipment necessary to perform all parts of the Work shall be at the job site sufficiently ahead of the start of construction operations to be examined and approved by the Purchaser.
- B. When saws are used to cut pavement, the Subcontractor shall provide sawing equipment adequate in power to complete the sawing to a minimum of 1-1/2 inches below the pavement surface in one pass. An ample supply of saw blades shall be maintained at the site of the Work at all times during sawing operations.
- C. Other types of pavement cutting equipment shall be capable of cutting the pavement to a neat straight line of 1-1/2 inch minimum depth below the pavement surface in one pass.
- D. The Subcontractor shall provide equipment capable of removal of pavements, sidewalks, driveway aprons, curbs and gutters, driveways, paved areas, and curbs without disturbance of adjacent items to remain in place.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 REMOVAL OF ASPHALT PAVEMENT

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS modified by
SARP10 Program
SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND
INCIDENTALS**

Asphalt pavement shall be removed to a clean straight line as shown on the drawing details. Pavement shall be cut by saw or other equipment approved by the Purchaser in advance. Edges of existing asphalt pavement adjacent to trenches, where damaged, shall be recut in a clean straight line within the limits of damaged pavement only. Such recuts shall be parallel to the original cuts and perpendicular to the pavement surface.

3.02 REMOVAL OF CONCRETE PAVEMENT

Concrete pavement shall be removed to a neat straight line as shown on the drawing details. Care shall be used to avoid damage to pavements and to the pavement base remaining in place.

3.03 REMOVAL OF CONCRETE SIDEWALK, CURB AND GUTTER, AND DRIVEWAY

Concrete sidewalks, curbs and gutters, and driveways shall be removed to the nearest contraction or expansion joint. Care shall be used to avoid damage to sidewalks, curbs and gutters, and driveways remaining in place.

3.04 REMOVAL OF GRAVEL PAVEMENT

Gravel surfaces encountered in construction shall be removed as needed to allow for the adjustment of the manhole frame and cover.

3.05 REPLACEMENT OF PAVEMENT

A. Asphalt Pavements

1. Replace asphalt paving courses to match existing thickness. The minimum surface course thickness shall be 2 inches. Asphalt pavement and base replacement shall be constructed for the entire cross-section of pavement removal area including all areas where pavement was re-cut subsequent to the initial pavement removal.

B. Concrete Pavements

1. Concrete pavement shall be replaced with Class A concrete pavement equal in thickness to the pavement removed but not less than 4 inches thick. Concrete pavement and base replacement shall be constructed for the entire cross-section of pavement removal area including all areas where pavement was re-cut subsequent to the initial pavement removal.

2. Reasonable efforts shall be made to avoid contrast in the color and texture of existing and restored surfaces.

C. Placing, Curing, and Protection of Concrete

1. After the backfill in the trench has been brought to the appropriate subgrade elevation shown on the Plans, compacted to the specified density, and permission has been given by the Purchaser, a concrete slab of the appropriate thickness shall be placed within the entire disturbed area.

2. Any loose or disturbed pavement or base shall be removed prior to placement of the concrete. Concrete shall be placed only on a moist subgrade and shall not be placed unless the ambient temperature is 35° F and rising. In no case shall concrete be placed on a frozen or frosty subgrade. After the concrete is placed, it shall be struck off in an approved manner to the appropriate grade as shown on the Plans and shall be finished with floats and straight edges until the required surface texture has been obtained.

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS modified by
SARP10 Program
SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND
INCIDENTALS**

3. No vehicles or loads shall be permitted on any concrete until the Purchaser has determined that the concrete has obtained sufficient strength for such loads. The Subcontractor shall construct and place such barricades and protection devices as are necessary to protect the concrete.

**3.06 REPLACEMENT OF SIDEWALKS, DRIVEWAY APRONS, CURBS AND GUTTERS,
DRIVEWAYS AND OTHER PAVED AREAS, AND CURBS**

A. Concrete sidewalks and driveway aprons shall be replaced in accordance with the City of Memphis Standard Construction Specifications.

B. Unless otherwise directed, curb and gutter shall be replaced with new concrete curb and gutter of the same cross-section and at the same top of curb elevation and flow line as that removed. Where curb and gutter of a different type than existing is to be used for replacement, the replacement flow line shall match existing and a transitions section provided between the existing and replacement cross-sections. Curb heights shall be transitioned at a rate of 1 inch in 5 feet. Granite curb shall be replaced with new concrete curb whose height matches existing adjacent curb top elevations. Any expansion joint material removed shall be replaced at the original locations. Existing concrete edges shall be cleaned prior to placement of concrete. The finished curb and gutter cross-section, elevations, texture, and color shall conform to the adjacent concrete surfaces.

C. Replacement of paved areas other than street pavement; concrete, asphalt, or gravel driveways; and asphalt or concrete curb within the right-of-way or construction easement limits shall be in kind for those cross-sections removed, unless directed otherwise by the Purchaser.

3.07 DAMAGE DUE TO SETTLEMENT

A. The Subcontractor shall be responsible for any damage caused by settlement of backfill placed beneath pavements, sidewalks, driveway aprons, curbs, curbs and gutters, driveways, paved areas other than street pavement, and asphalt or concrete curb within the right-of-way or construction easement limits. This includes any damage which may occur at any time prior to, and during a period of one year from the date of Final Completion of the Work covered by the Subcontract.

B. During such period, the Subcontractor shall at his own cost and expense refill all excavations where settlement damage has occurred and replace damaged pavements, sidewalks, driveway aprons, curbs, curbs and gutters, paved areas, driveways, and all other damaged items to the satisfaction of the Purchaser. Should the Subcontractor fail to repair settlement damage which may occur as described above within 5 days after being given notice thereof, the Purchaser shall have the right to repair such settlement and charge the cost of such repairs to the Subcontractor.

3.08 DAMAGE OUTSIDE CONSTRUCTION EASEMENT LIMITS

The Subcontractor will be held responsible for all damage to roads, highways, shoulders, curbs and gutters, ditches, embankments, bridges, culverts, and other property, caused by him or any of this Sub-subcontractors in hauling or otherwise transporting materials to and from the several sites of Work, regardless of the location of such damage. The Subcontractor shall make arrangements relative to the payment for, or repair or replacement of, such damage or damaged surfaces or structures which are satisfactory and acceptable to the Purchaser, at the Subcontractor's cost and expense.

PART 4 – MEASUREMENT

**CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS modified by
SARP10 Program
SECTION 02950 REMOVAL AND REPLACEMENT OF PAVEMENTS AND
INCIDENTALS**

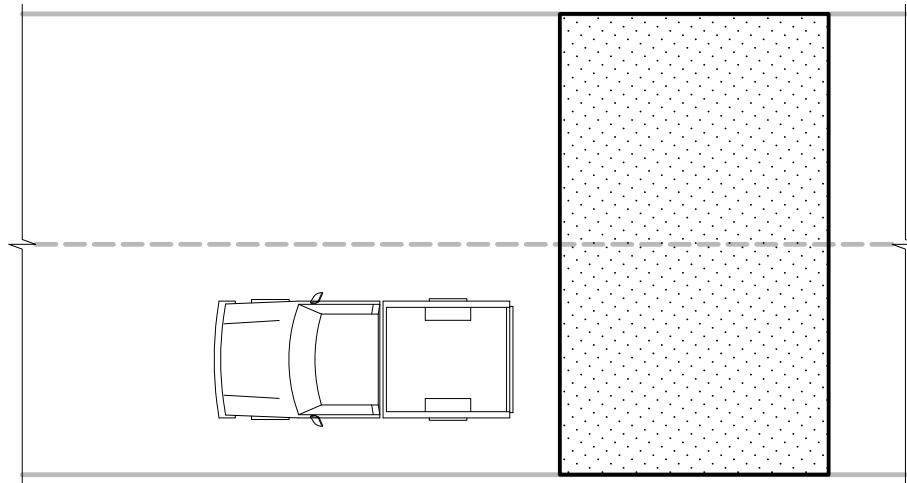
- 4.01 PAVEMENT REMOVAL AND REPLACEMENT
Pavement removal and replacement shall be measured for payment by the square yard, complete in place.
- 4.02 CONCRETE SIDEWALK REMOVAL AND REPLACEMENT
Sidewalk removal and replacement shall be measured for payment by the square foot, complete in place.
- 4.03 CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT
Curb and gutter removal and replacement shall be measured for payment by the linear foot, complete in place.

PART 5 – PAYMENT

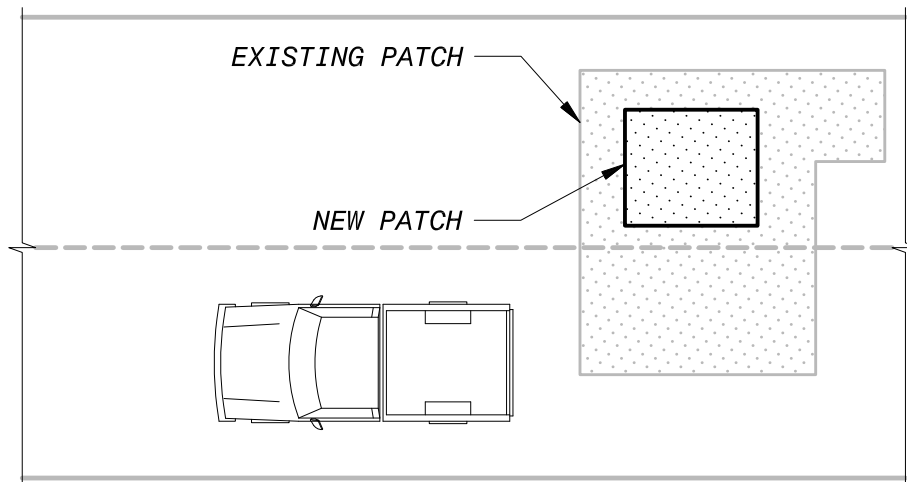
- 5.01 PAVEMENT REMOVAL AND REPLACEMENT
The accepted quantities of pavement removal and replacement shall be paid for at the Subcontract unit price per square yard for the type specified, which price will be full compensation for cutting and recutting pavement; removal and disposal of pavement and base; preparing the subgrade; placing, finishing, curing, and protection of concrete; and placing and compacting asphaltic concrete wearing surfaces, complete in place.
- 5.02 CONCRETE SIDEWALK REMOVAL AND REPLACEMENT
The accepted quantities of sidewalk removal and replacement shall be paid for at the contract unit price per square foot, which price will be full compensation for removal and disposal of sidewalk; preparing the subgrade; and placing, finishing, curing and protection of concrete, complete in place.
- 5.03 CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT.
The accepted quantities of curb and gutter removal and replacement shall be paid for at the Subcontract unit price per linear foot for the type specified, which price will be full compensation for removal and disposal of curb and gutter; preparing the subgrade; and placing, finishing, curing and protection of concrete, complete in place.
- 5.04 PAYMENT WILL BE MADE UNDER:

Item No.	Pay Item	Pay Unit
02950-01.01	Asphaltic Concrete Pavement Removal and Replacement	Square Yard
02950-01.02	Concrete Pavement Removal and Replacement	Square Yard
02950-02	Concrete Sidewalk Removal and Replacement	Square Foot
02950-03	Concrete Curb And Gutter Removal and Replacement	Linear Foot

END OF SECTION 02950



ACCEPTABLE



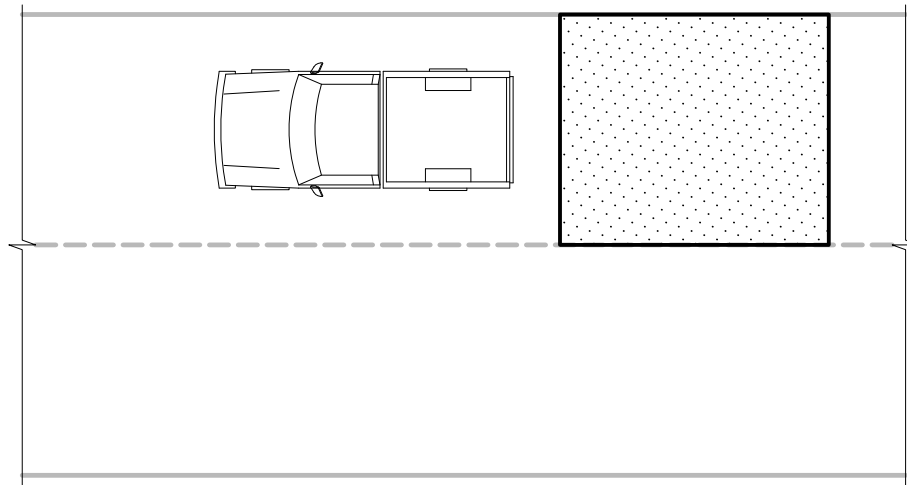
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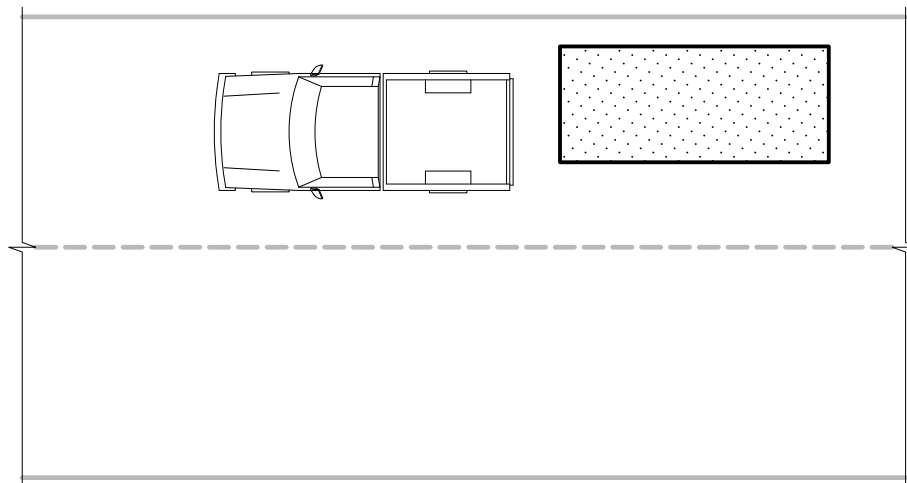
1. EXISTING PAVEMENTS SHALL BE REMOVED TO CLEAN, STRAIGHT LINES PARALLEL AND PERPENDICULAR TO THE FLOW OF TRAFFIC.
2. DO NOT CONSTRUCT PATCHES WITH ANGLED SIDES AND/OR IRREGULAR SHAPES.
3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. AVOID PATCHES WITHIN PATCHES. IF THIS CANNOT BE AVOIDED, MAKE THE BOUNDARIES OF THE PATCHES COINCIDE.



SARP10
 PAVEMENT REPAIR
 PATCH INSIDE A PATCH
 DETAILS



ACCEPTABLE



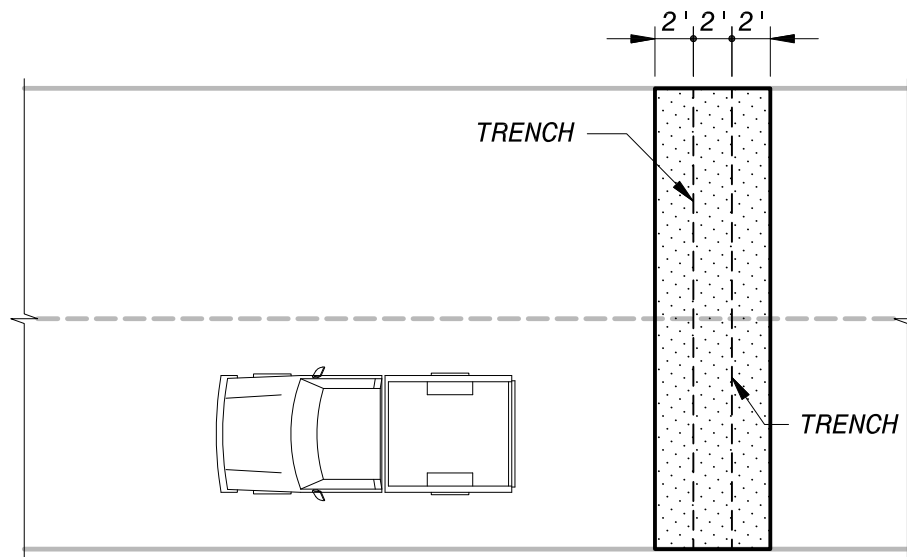
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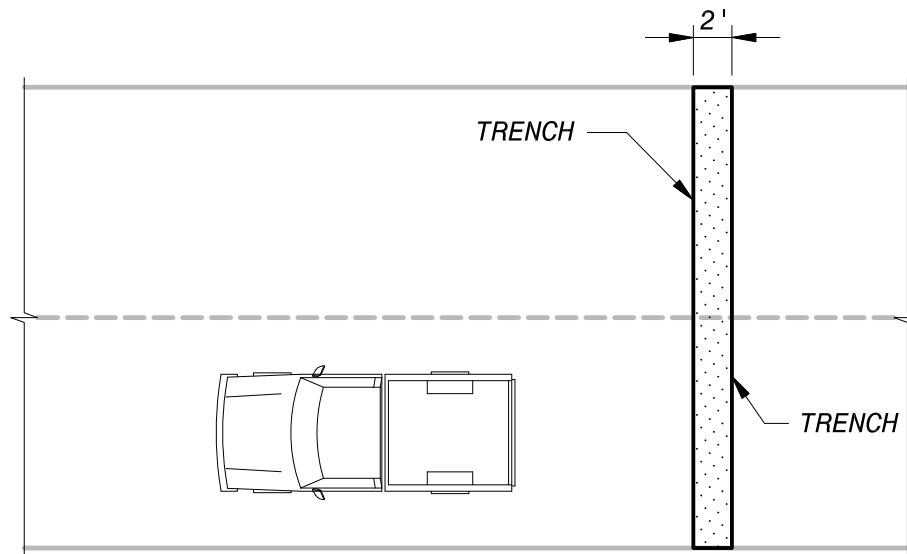
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2. DO NOT CONSTRUCT PATCHES WITH ANGLED SIDES AND/OR IRREGULAR SHAPES.
3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.



SARP10
 PAVEMENT REPAIR
 SINGLE LANE
 DETAILS



ACCEPTABLE



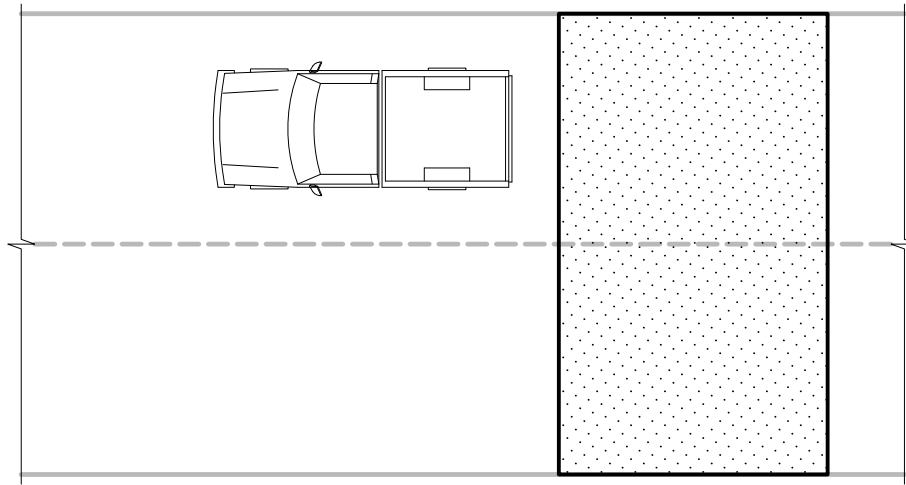
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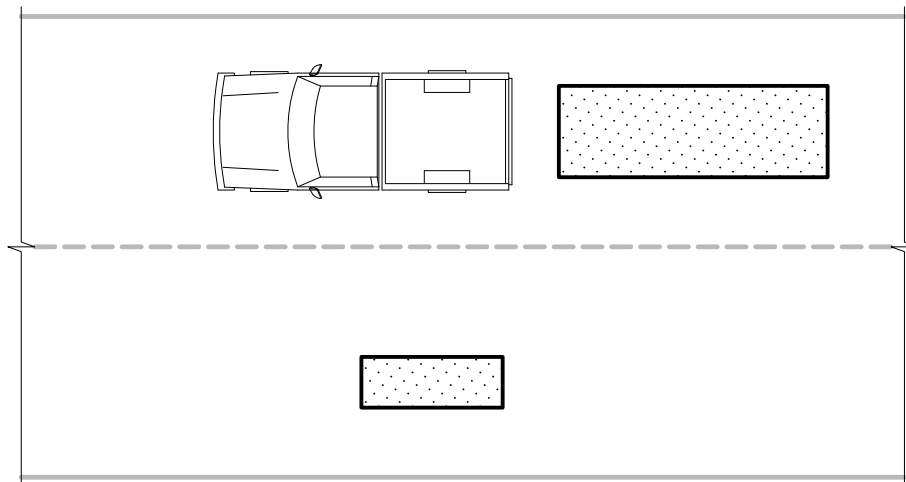
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3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. TRAVERSE PATCHES SHALL BE OVERLAID ACROSS THE ENTIRE STREET WIDTH FOR A DISTANCE OF TWO (2) FEET MINIMUM ON ALL SIDES OF THE TRENCH.



SARP10
 PAVEMENT REPAIR
 TRAVERSE PATCHES
 DETAILS



ACCEPTABLE



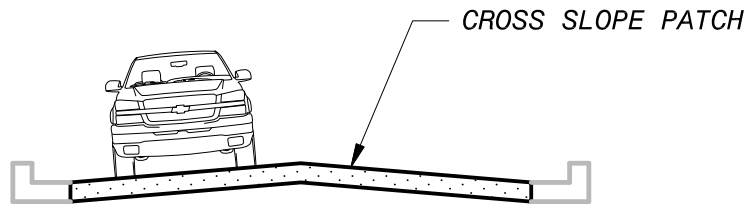
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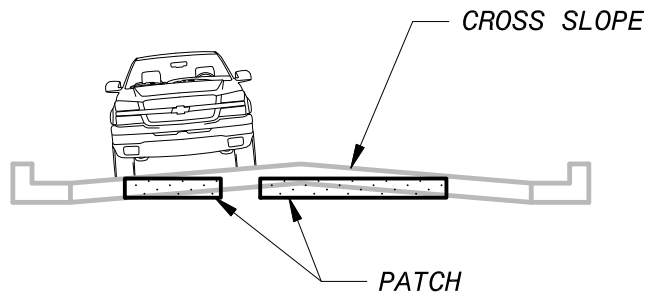
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3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. TRAVERSE PATCHES SHALL BE OVERLAID ACROSS THE ENTIRE STREET WIDTH FOR A DISTANCE OF TWO (2) FEET MINIMUM ON ALL SIDES OF THE TRENCH.
7. DO NOT ALLOW THE EDGES OF PATCHES TO FALL IN EXISTING WHEEL PATHS.
8. THE EDGES OF PATCHES PARALLEL TO THE DIRECTION OF TRAFFIC SHALL BE LIMITED TO THE BOUNDARIES OF LANES OR TO THE CENTERLINE OF TRAVEL LANES.



SARP10
 PAVEMENT REPAIR
 WHEEL PATH
 DETAILS



ACCEPTABLE



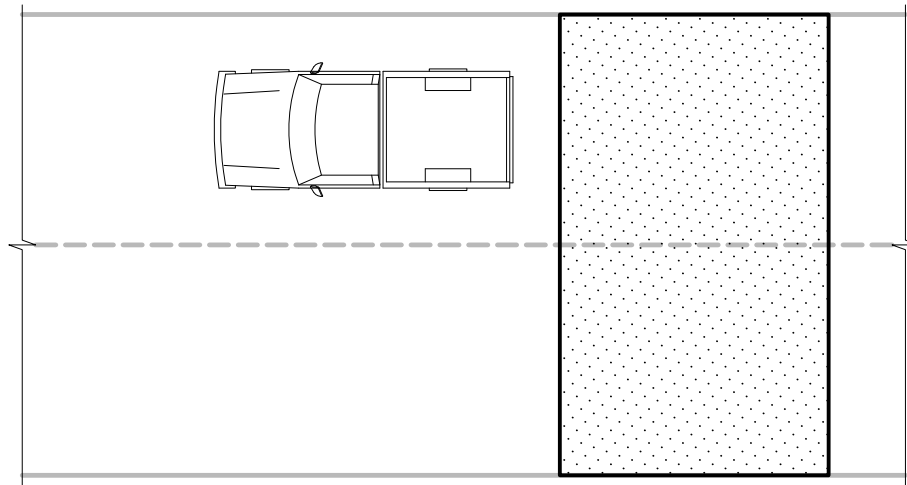
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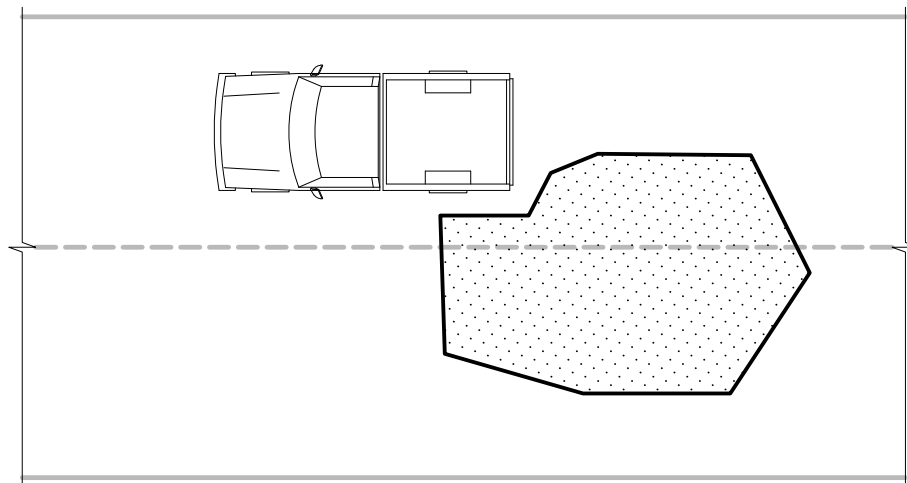
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3. ALL REPAIRS SHALL BE FULL LANE WIDTH.
4. FOR PATCHES IN ASPHALT, A TACK COAT SHALL BE APPLIED TO ALL EDGES OF THE EXISTING ASPHALT BEFORE PLACING THE NEW PAVEMENT.
5. AFTER PLACING THE NEW ASPHALT, ALL SEAMS (JOINTS) BETWEEN THE NEW AND EXISTING PAVEMENTS SHALL BE SEALED WITH AN ASPHALT TACK COAT OR RUBBERIZED CRACK SEAL MATERIAL.
6. PATCHES SHALL HAVE A SMOOTH LONGITUDINAL GRADE CONSISTENT WITH THE EXISTING ROADWAY.
7. PATCHES SHALL ALSO HAVE A CROSS SLOPE OR CROSS SECTION CONSISTENT WITH THE DESIGN OF THE EXISTING ROADWAY.



SARP10
 PAVEMENT REPAIR
 CROSS SLOPE
 DETAILS



ACCEPTABLE



NOT ACCEPTABLE

NOTES

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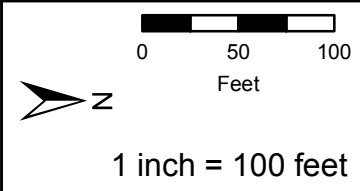


SARP10
 PAVEMENT REPAIR
 MULTI-LANE
 DETAILS



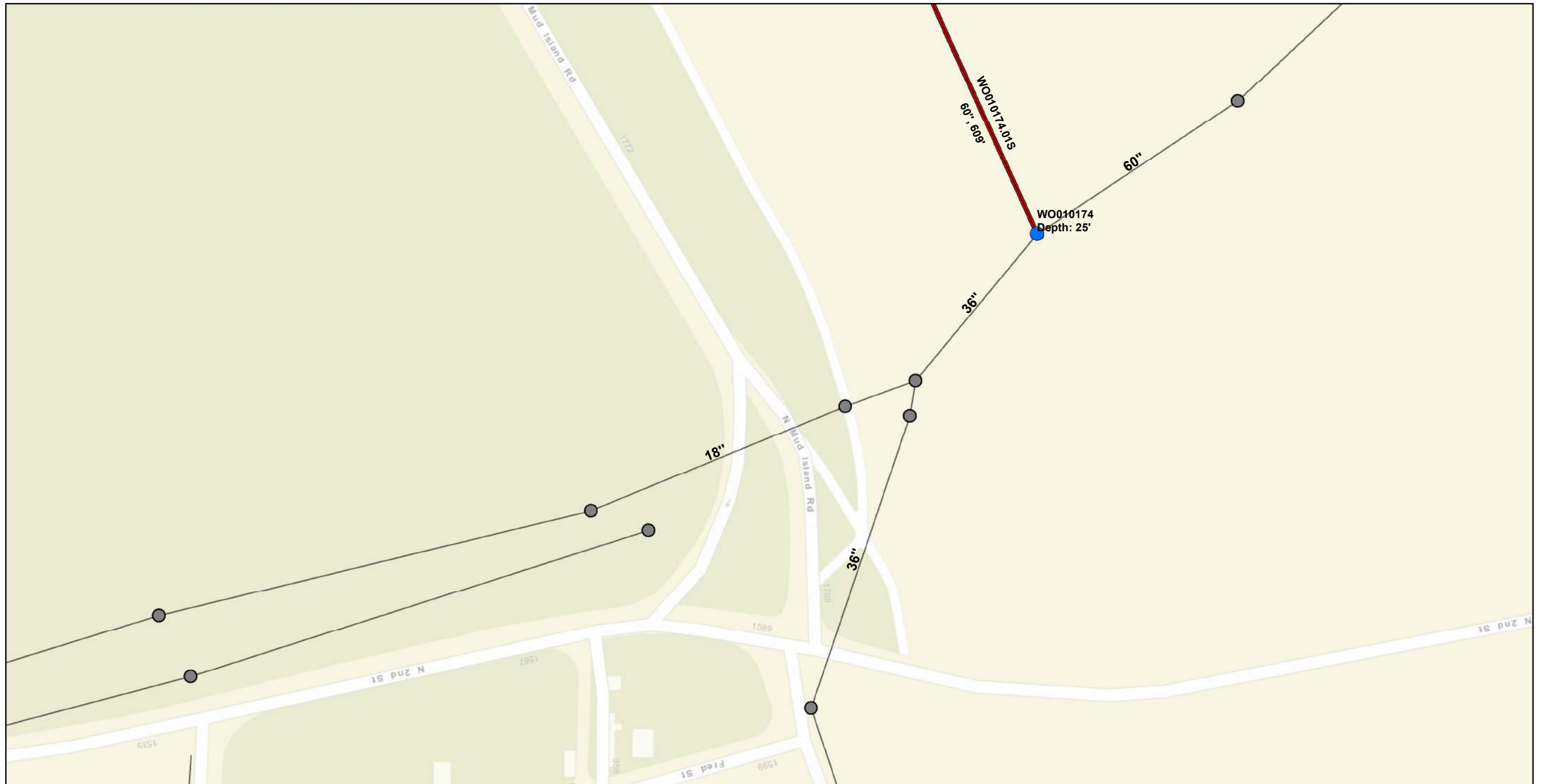
Legend

- Standard Structure, Coat Entire Manhole
- Standard Structure, Coat to Water Level
- ▲ Standard Structure, Coat to Water Level, Cut for Dive
- Special Structure*, Coat to Water Level
- ▲ Special Structure*, Coat to Water Level, Cut for Dive
- Mud Island Interceptor (CIPP)
- Manhole (No Rehab)
- Front St Interceptor (No Rehab)
- Gravity Main (No Rehab)



*Plan Drawings for all Special Structures are included in bid package for reference

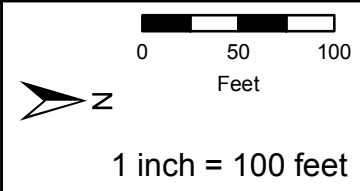
FRONT STREET & MUD ISLAND Bypass Manholes



Legend

- | | |
|---|-----------------------------------|
| ● Standard Structure, Coat Entire Manhole | — Mud Island Interceptor (CIPP) |
| ■ Standard Structure, Coat to Water Level | ● Manhole (No Rehab) |
| ▲ Standard Structure, Coat to Water Level, Cut for Dive | — Front St Interceptor (No Rehab) |
| ■ Special Structure*, Coat to Water Level | — Gravity Main (No Rehab) |
| ▲ Special Structure*, Coat to Water Level, Cut for Dive | |

*Plan Drawings for all Special Structures are included in bid package for reference



**FRONT STREET
& MUD ISLAND
Bypass Manholes**

Coordination of Front Street and Mud Island Evaluation and Rehab Contractors

The rehab contractor will cut the asphalt, remove manhole cone, frame and cover, then place a steel plate over the hole. Evaluation contractor will remove the plate and perform their work (which includes the use of Jersey barriers). When their work has been completed, they will remove all of their traffic control and safety equipment and cover the hole back up with the steel plate at which point the rehab contractor can replace the cone, frame, and cover, and continue work of rehab contract.