

# **GRAVITY SEWER SYSTEM OPERATIONS AND MAINTENANCE PROGRAM**

**FOR**

**CAPACITY, MANAGEMENT, OPERATION AND  
MAINTENANCE (CMOM) PROGRAM**



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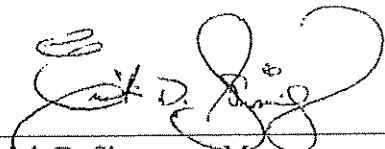
**PROGRAM DATE:**

**February 28, 2018  
September 10, 2018 (Revision No. 1)  
January 11, 2019 (Revision No. 2)**

## **CERTIFICATION**

**Gravity Sewer System Operations and Maintenance Program**  
Partial Consent Decree  
City of Greenville, MS

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

  
\_\_\_\_\_  
Erniek D. Simmons, Mayor

1 / 11 / 19  
\_\_\_\_\_  
Date

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## 1.0 Introduction

### 1.1 Purpose

On April 4, 2016, a Partial Consent Decree (PCD), issued by the United States of America on behalf of the United States Environmental Protection Agency (EPA) to the City of Greenville, Mississippi (CITY), was executed. The PCD cited the CITY for violations to both their National Pollutant Discharge Elimination System (NPDES) Permit and the Clean Water Act (CWA). The CITY was required by the PCD to develop and implement a Capacity, Management, Operation and Maintenance (CMOM) Program with one of the major sub-programs being the Gravity Sewer Operation and Maintenance Program (PROGRAM), among other things.

A well-designed preventive maintenance program is key to keeping a wastewater collection system in good working condition. It helps preserve capital investment while preventing service interruptions and the excessive infiltration/inflow (I/I) and system failures that can result in Sanitary Sewer Overflows (SSOs). The PROGRAM focuses on activities to effectively operate and maintain the gravity sewer system. These activities primarily center on maintaining the existing sewer capacity by addressing the causes of SSOs, particularly those resulting from obstructions in the system.

The CITY has out-sourced the operation and maintenance (O&M) of the Wastewater Collection and Transmission System (WCTS) and the Wastewater Treatment Plant (WWTP) to Clearwater Solutions LLC (CS) of Auburn, AL, a utility O&M company. CS is responsible for the management, operation and maintenance of the approximately 206 miles of gravity sewer and approximately 3,582 manholes.

### 1.2 Program Components

The PROGRAM is divided into nine (9) major components. These components complement each other and are designed to be implemented as a whole. Without this approach, the PROGRAM will not be successful. The PROGRAM's components are described below:

- A. Preventative O&M schedules/procedures designed to identify, document, schedule and carry out maintenance on all gravity sewers;
- B. Corrosion prevention for those materials subject to corrosion used in the gravity sewers;



- C. Evaluation of the gravity sewers based on given factors such as numbers of SSOs, citizen complaints, pipe size, etc. for prioritization purposes;
- D. Inspection procedures for the gravity sewers and manholes;
- E. Scheduling maintenance of sewer utility easements;
- F. Staffing and funding plans for O&M activities related to the gravity sewers;
- G. Mapping program utilization to identify areas of concern such as locations of SSOs;
- H. An inventory management system that includes information about critical equipment and spare parts; and
- I. Reporting on equipment problems and work order status.

## 2.0 Inspections Schedules and O&M Procedures

### 2.1 Inspections

The CITY is following its Sanitary Sewer Rehabilitation Program (SSRP) implemented over a six-year period to evaluate the sanitary collection system and determine the CITY's repair/rehabilitation priorities. As part of the SSRP, the Sewer System Evaluation/Rehabilitation (SSER) consists of smoke testing activities, Closed Circuit Television (CCTV) sewer inspections, manhole inspections, pump station inspections and force main inspections. The findings are vetted to determine the condition of the sewer system and to prioritize their repairs.

Inspection activities will be restricted to a three (3) month window per year due to the area's conflicting shallow aquifer. Given this issue and the CITY's budgetary concerns, the CITY's goal is to annually inspect approximately 5% of the gravity sewer system, including the gravity system previously assessed as part of SSRP. This equates to approximately 180 manholes and 10 miles of gravity sewer lines per year. This also results in a 20-year cycle for the entire system. A typical annual inspection schedule is shown below.

Planning Phase	January-February
Wet Weather Manhole Inspection Phase	March-April
Bid Phase	May
Contract Award/Execution Phase	June
Assessment Phase	July-September
Data Evaluation Phase	October-December

Inspection of the collection system includes one or more of the following: smoke testing, dyed water injection, or closed-circuit television inspections of the sewer



lines, as well as, inspections of all the manholes and pump stations. Pump stations are covered in the Pump Station Operations and Preventative Maintenance Program of the CMOM plan.

The CITY has been divided into three (3) sewer sheds, Theobald, Daniel and Peripheral, as shown in Figure 1, through which inspection activities for the sewer lines and manholes continuously rotate. These sewer sheds are each divided into mini-systems as shown in Figures 2-4. Group 3 mini-systems will be scheduled for inspection in the first 6 years of the PROGRAM (see Group 3 Sewer Inventory in Appendix A). Scheduling will be adjusted if problems in other areas develop. Groups 1 and 2 Sewer Inventories are also shown in Appendix A. The information gathered during the inspections of a given mini-system will be the main driver for scheduling maintenance activities within that mini-system during subsequent years.

The following general schedule will be followed.

- A. Each manhole within the mini-system for the given PROGRAM year is inspected during dry weather and wet weather, and the Manhole Inspection form completed (Appendix B).
- B. Smoke testing and/or dyed water injection is conducted throughout each mini-system at the beginning of each cycle. The procedures for smoke testing can be found in Appendix C.
- C. Based on these findings and a number of other factors (National Association of Sewer Service Companies' (NASSCO) index, Information Management System (IMS) call-in history, reported SSOs, proximity of sewer to water bodies, etc.), sewer lines are identified and scheduled for further CCTV inspections, maintenance and/or rehabilitation. Scheduling priority is based on the following rating system:
  - 0 – Emergency Priority (NASSCO 5 Index);
  - 1 – High Priority (NASSCO 4 Index);
  - 2 – Medium Priority (NASSCO 3 Index); and
  - 3 – Low Priority (NASSCO 1 or 2 Index).

Zero (0) priority rated inspection findings are those that are an imminent threat to fail or are already failing. These are handled under the Emergency Maintenance Section 2.2.D. of the PROGRAM.



- D. Areas with potential SSO or back-up issues or confirmed problems reported through citizen complaints receive the most immediate attention and rated as zero (0) or one (1) priority based on the SSO or back-up threat. If the problem is found as a result of complaints, the Complaint Response Report in the CITY's SORP should also be completed.

Additionally, routine visual inspections are conducted by the CITY during the normal course of the maintenance staff's daily activities. CITY personnel will look for signs of gravity sewer problems such as roadway depressions, missing or incorrect placement of manhole covers, shifted manhole frames and sections, debris build-up and sewer line deflections at stream crossings, and surface water entering a depressed area or hole where a sewer is located (usually found during a rainfall event). Any lines or manholes with problems noted during these visual inspections will be scheduled for closer inspection or scheduled for maintenance. Any SSOs discovered during these inspections will also be handled as directed in the CITY's SORP.

## 2.2 Maintenance Procedures

As stated earlier, CS currently manages the CITY's public works department. In this role, CS is responsible for establishing all maintenance procedures/schedules. This applies to corrective maintenance, rehabilitation, emergency maintenance and preventative maintenance. These are described below:

### A. Corrective Maintenance

The majority of the maintenance activities (e.g., sewer jetting, root cutting, etc.) are scheduled according to the findings of the inspection activities within a mini-system. Scheduling of maintenance activities is done through the CITY's work order process. Corrective maintenance may be scheduled immediately after inspection activities if an imminent problem is discovered that must be corrected to avoid an emergency situation. Other corrective maintenance activities will be scheduled according to the priority rating system previously stated.

### B. Rehabilitation

Data collected during gravity sewer/manhole inspections are used to determine if further action is needed. Structural problems are prioritized based on the priority rating system. Section V, Methods of Rehabilitation in the SSER Workplan will be followed for sewer rehabilitation projects



(Appendix E). Surcharged or slow flow conditions are scheduled for maintenance to remove the blockage and reduce the threat of overflows. All surcharged lines and manholes are submitted for follow-up preventive maintenance consisting of line cleaning. Any surcharges which are an imminent threat of causing an overflow or back-up are handled under Emergency Maintenance.

#### C. Preventive Maintenance

Preventive maintenance activities primarily consist of cleaning and flushing of gravity sewers and manholes. Cleaning is performed more often than inspection because it addresses the accumulation of debris which can occur randomly and cause hydraulic disruptions in a short period of time. This flushing addresses the accumulation of debris or other matter within pipes and manholes, thus limiting the potential for surcharging or flooding. Cleaning the collection system typically includes flushing/jetting with high pressure water. Standard Operating Procedures for sewer cleaning can be found in Appendix F.

Cleaning and flushing of sewer lines will be performed at regular intervals, while troublesome areas that have high rates of debris accumulation will be cleaned or flushed more frequently. A standard cleaning schedule will be developed. The inspections performed under Section 2.1 are used to identify problem areas that need frequent cleaning. The flatter portions of the CITY's sewer collection system should be given more frequent attention because the potential for the accumulation of solids is higher in these sewers. Odor complaints from residents also help identify areas in need of more frequent flushing or other maintenance. If, during the SSES activities, certain sections of the sewer are found to be in need of more frequent cleaning, due to such issues as Fats, Oils and Grease (FOG), roots, protruding laterals or other issues, these sections of sewer will also receive more frequent cleanings.

#### D. Emergency Maintenance

Unlike corrective or preventive maintenance, emergency maintenance activities require the CITY to evaluate the nature of the emergency, take immediate corrective actions as required, and assess whether the situation can be addressed through internal resources or whether external contractors should be engaged to complete the activity.





Depending on the nature of the emergency, the following corrective actions may be required and will be selected based upon the discretion and professional judgment of CITY staff and/or CS management:

- Cleaning/flushing, vacuum debris removal, manual debris removal, or root cutting,
- Inspecting the gravity sewer to assess the extent of repairs required,
- Establishing temporary bypass pumping or initiating pump and haul procedures to divert flows around the problem area,
- Constructing berms to prevent the flow of wastewater into streams or public places,
- Setting up temporary disinfection to protect public health,
- Repairing the sewer through a point repair, open cut replacement, lining, or other means.

All corrective actions will be reported on the Work Order Form (Appendix D). If emergency maintenance is required as a result of an SSO, the record keeping/reporting and response procedures referenced in the CITY's SORP will be followed.

### 3.0 Corrosion

The WCTS, including manholes, are inspected for corrosion as part of the systematic condition assessment work under the Corrosion Control Program (CCP). The purpose of the CCP is to establish provisions for inspecting the sanitary sewer system infrastructure for corrosion caused by hydrogen sulfide or other corrosives, the development and implementation of site specific corrosion control measures, application of corrosion control measures where needed, a monitoring program to evaluate corrosion control programs and performance measures, and a corrosion control program information management system.

Based on the CITY's knowledge of the existing gravity sewer system and various EPA studies on the matter, the greatest potential for corrosion exists at the following components of WCTS/WWTP system:

- Gravity Sewers
- Manholes
- Pump Stations and Force Mains



- Treatment Facilities

Prioritization for corrosion control focuses on these system components. Other areas of the system are addressed on an as-needed basis. When a corrosion problem has been identified, the CITY will take the appropriate action to investigate and determine the best course of corrective action for the problem. Specific corrosion control details are referenced in the CCP.

#### 4.0 Sewer Utility Easements

Proper operation and maintenance of the sewer system begins with adequate access to the system, therefore, inspection and maintenance of sewer utility easements is an important component of the PROGRAM. The CITY will determine the needed easement maintenance work based on those easement assessment findings identified during the manhole inspection work and referenced on the inspection forms. Not only does vegetation need to be controlled, but such items as fences and buildings which were constructed in easements by homeowners and/or businesses must also be evaluated. Any of these can encroach on the sewer easement and adversely impact access to the sewer system. As general practice, the CITY does not require a homeowner or business to remove these structures or vegetation unless they: A) hinder the operation of the system or B) are in an area that must be accessed due to needed repair. While the CITY will take as much care as possible to only disturb the areas needed for access, the CITY is not liable to repair or replace any such items that are removed from the easement in the process of completing repairs or maintenance on the collection system.

Easements are referenced in the CITY's sewer mapping program (ArcGis) and inspected as part of the inspection process described in Section 2.1 of the PROGRAM. During the easement inspections, manholes and stream crossings are observed. Manholes in easements are inspected and documented using the form in Appendix B. Maintenance of easements is the responsibility of each homeowner. Through CITY ordinances (Sections 4-71, 505 and Chapter 9), a homeowner must keep weeds and grass cut, avoid easements when constructing any buildings, and submit a request to the City for placing any fencing on such easements (see Fence Permit form in Appendix G). If an easement is not being maintained, the CITY's Planning Department will be notified and asked to address the problem. The Planning Department will then notify the property owner by letter (see Information Form and Example Letter in Appendix H) to correct the problem. If the issue is not addressed, the CITY's Property Committee will take the matter before the CITY Council for action (See Enforcement Notice in Appendix H).



## 5.0 Staffing and Funding

As noted earlier, CS is under contract with the CITY to manage the CITY's public works department (PWD) which consists of the water department, sewer department, water utility department solid waste department, waste water treatment plant, street department, buildings/grounds department and fleet maintenance department. CS's total staff consists of 81 employees and 22 CITY public works department personnel.

Of these personnel, twenty-two (22) CS/PWD employees manage the CITY's sewer collection/pump stations. A breakdown of their time, associated with both preventive and routine maintenance, is listed below:

<b>Employee Name</b>	<b>Routine Maintenance</b>	<b>Preventive Maintenance</b>
Donde Baldwin	20%	10%
Brad Jones	50%	50%
Jeff Appleton	60%	10%
Kendrick Davis	80%	10%
Tommie Willis	90%	10%
Thomas Lee	90%	10%
Sedrick Jackson	90%	10%
Tim Smith	90%	10%
Keeton Robinson	40%	10%
Johnny Durkins	40%	10%
Brian Cook	100%	---
Slyvester Winters	100%	---
Eddie Durkins	100%	---
Adrick McMiller	30%	10%
Leon Martin	10%	---
Jermaine Sleet	10%	---
Johnny Sellers, Jr.	10%	---
Eugene Holley	30%	10%
Jessie Ross	10%	---
Christopher Williams	10%	---
Walter Aaron	10%	---
Jefferson Appleton	10%	---

Properly trained personnel are more capable of maintaining the WCTS and effectively preventing the occurrence of emergencies. Employees will attend training sessions which are tailored for their job titles. In general, they will attend NASSCO, OSHA and MDEQ/Collection System Certification training sessions. CS also provides PROGRAM training for the crews and support staff. Continued education is repeated on an annual



basis, for new employees, and whenever new changes are made to the SORP or PROGRAM.

CS's sewer department budget is itemized below:

Repair and Maintenance*	\$1,770,450.00
CS Budget	221,306.25
City Budget	<u>250,000.00</u>
<b>TOTAL</b>	<b>\$2,241,756.25</b>

\* The Repair and Maintenance line item is the total for all Public Works (water, sewer, drainage, street, etc.)

## 6.0 Information Management System

The IMS is used by the CITY to manage information regarding WCTS from all sources. An accurate and up-to-date IMS not only enhances operational performance, but also provides the CITY with guidance and instruction to adequately evaluate operations, maintenance, customer service, and sewer system rehabilitation activities. The CITY currently has a system in place where information is organized in a system of in-field documents, Microsoft Access spreadsheets and a GIS mapping program.

In case of a service call, a work order will be generated and a crew foreman or a supervisor of field operations will be promptly notified and dispatched to the site for assessment of the situation. If a sewer problem is verified, it will be recorded on the work order (Appendix D) and updated on to the IMS system for future references. The CITY uses the IMS information, along with other data (NASSCO Index, SSO locations, proximity of sewer to water bodies, etc.) to identify problem areas. Once identified, the CITY will schedule appropriate actions (root cutting, sewer cleaning, lateral trimming, etc.) to correct and/or manage the problem(s). The information is then updated on the spreadsheet and/or marked on the GIS mapping program, if warranted.

The status of work orders are checked daily and marked "Closed" upon successful completion of the associated maintenance or repair activities. Report forms are filed and maintained for future references.

## 7.0 Inventory Management System

Spare parts, equipment and supplies requiring continuous and immediate availability are stored at the CITY's 1896 Water Plant located at 806 West Union Street. Examples of equipment required to successfully perform emergency repairs include: pumps for bypass



pumping, hoses, generators, portable lights, tools required to install critical parts, etc. Without such an inventory, the collection system may experience long down times or periods of inefficient operation in the event of a breakdown or malfunction. A list of the equipment that is available for sewer maintenance can be found in Appendix I.

CS will review/amend the inventory of in-house stocked critical spare parts at least annually based on utilization. Critical spare parts stocked by outside vendors will be confirmed on a semi-annual basis. CITY-owned equipment availability will be updated weekly. Additions or deletions to critical equipment inventory will be made annually.

CS has agreements in place with the following vendors to secure those critical spare parts and equipment not routinely stocked by CS to ensure repairs can be made in a reasonable amount of time:

- Southern Pipe (Water/Sewer (W/S) Supplies) (24 Hr. Service)  
1225 Raceway Road  
Greenville, MS 38701  
(662) 332-6812
- Hydra Service, Inc. (Bypass Pump Company) (24 Hr. Service)  
4381 Highway 80  
Pelahatchie, MS 39145  
(601) 854-5502
- Meter Service and Supply Co. (W/S Supplies) (24 Hr. Service)  
598 E. Brooks Road  
Memphis, TN 38116  
(901) 332-4942
- H.D. Supply (W/S Supplies)  
947 N. Broadway St.  
Greenville, MS 38701  
(662) 335-2316
- USA Blue Book (W/S Supplies)  
[www.usabluebook.com](http://www.usabluebook.com)
- Industrial Service (General Industrial Contractor)  
1789 MS-1  
Greenville, MS 38703  
(662) 334-9408



- Mixon Concrete/Construction (Municipal Repairs, General Construction)  
840 Beauchamp Ext.  
Greenville, MS 38701  
(662) 332-2957
- Garner Shannon Construction (Municipal Repairs, General Construction)  
103 Pluck Road  
Belzoni, MS 39038  
(662) 247-3724
- Kendall Crane (Crane Services)  
815 S. Raceway Road  
Greenville, MS 38703  
(662) 335-1734
- Avis Construction (Municipal Repairs, General Construction) (24 Hr. Service)  
3870 MS-1  
Wayside, MS 38730  
(662) 335-4752

## 8.0 Work Order Management

Maintenance needs are identified through customer complaints, scheduled inspections or knowledge of problem areas. Work orders are authorized to address the maintenance activities and entered in the Microsoft Access program. The standard data entry form used to electronically document maintenance activities and repairs can be found in Appendix D.

CS monitors the work orders from conception to completion. CS generates monthly reports which list equipment and infrastructure problems identified by the CITY and documents the status of their associated work orders during the reporting period. The reports are reviewed by CS's Project Manager and supporting staff and contain information such as sewer equipment/infrastructure problems, work order numbers, staff assigned to each work order and the status of the work order during the reporting period.

[END OF PROGRAM]



## FIGURES



**Figure 1**

**Schematic of Sewersheds/Mini-Systems**





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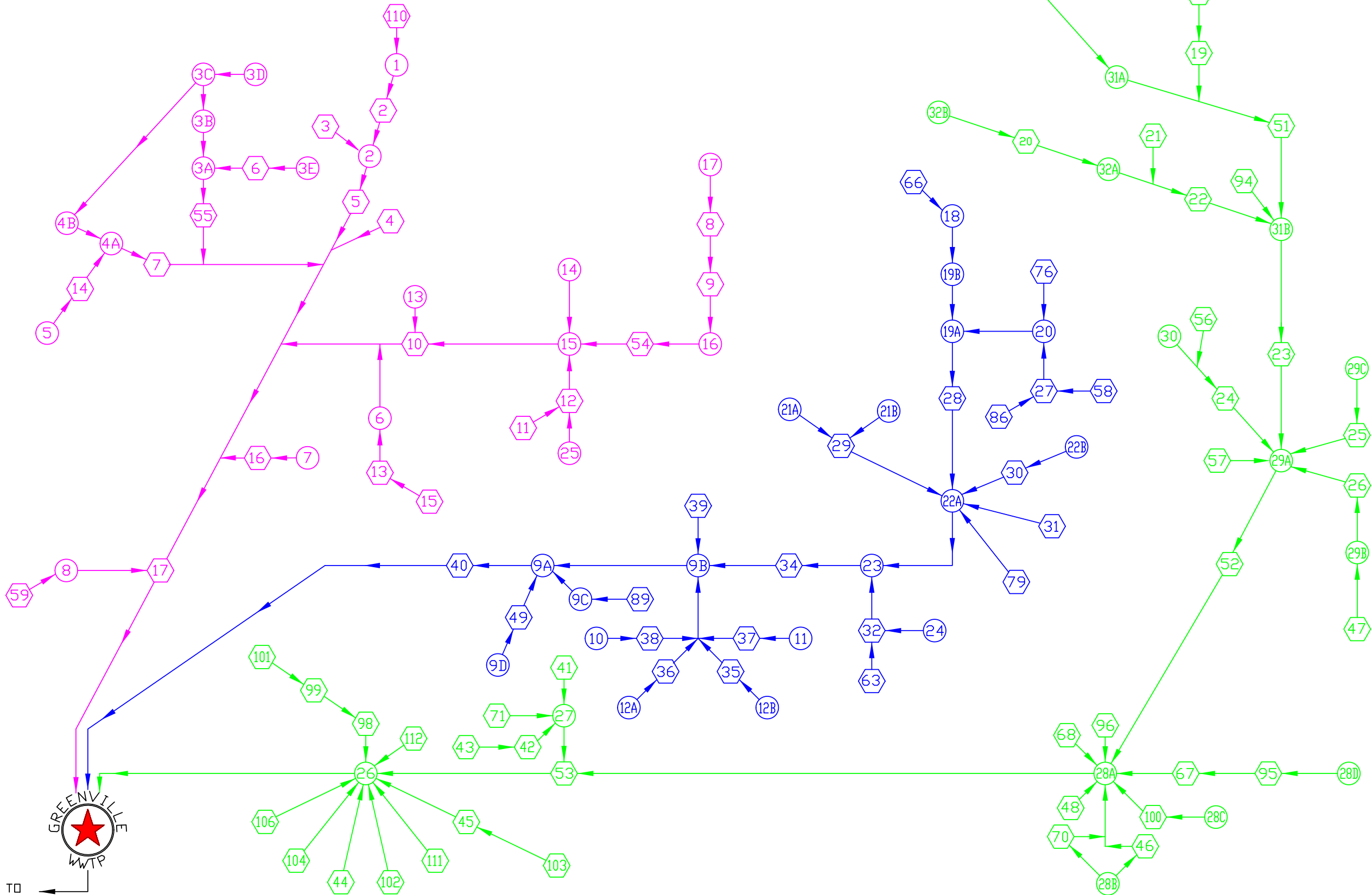
THEOBALD SEWER BASIN  
(REFER TO FIGURE 3)

DANIEL SEWER BASIN  
(REFER TO FIGURE 4)

PERIPHERAL SEWER BASIN  
(REFER TO FIGURE 5)

MINI SYSTEM

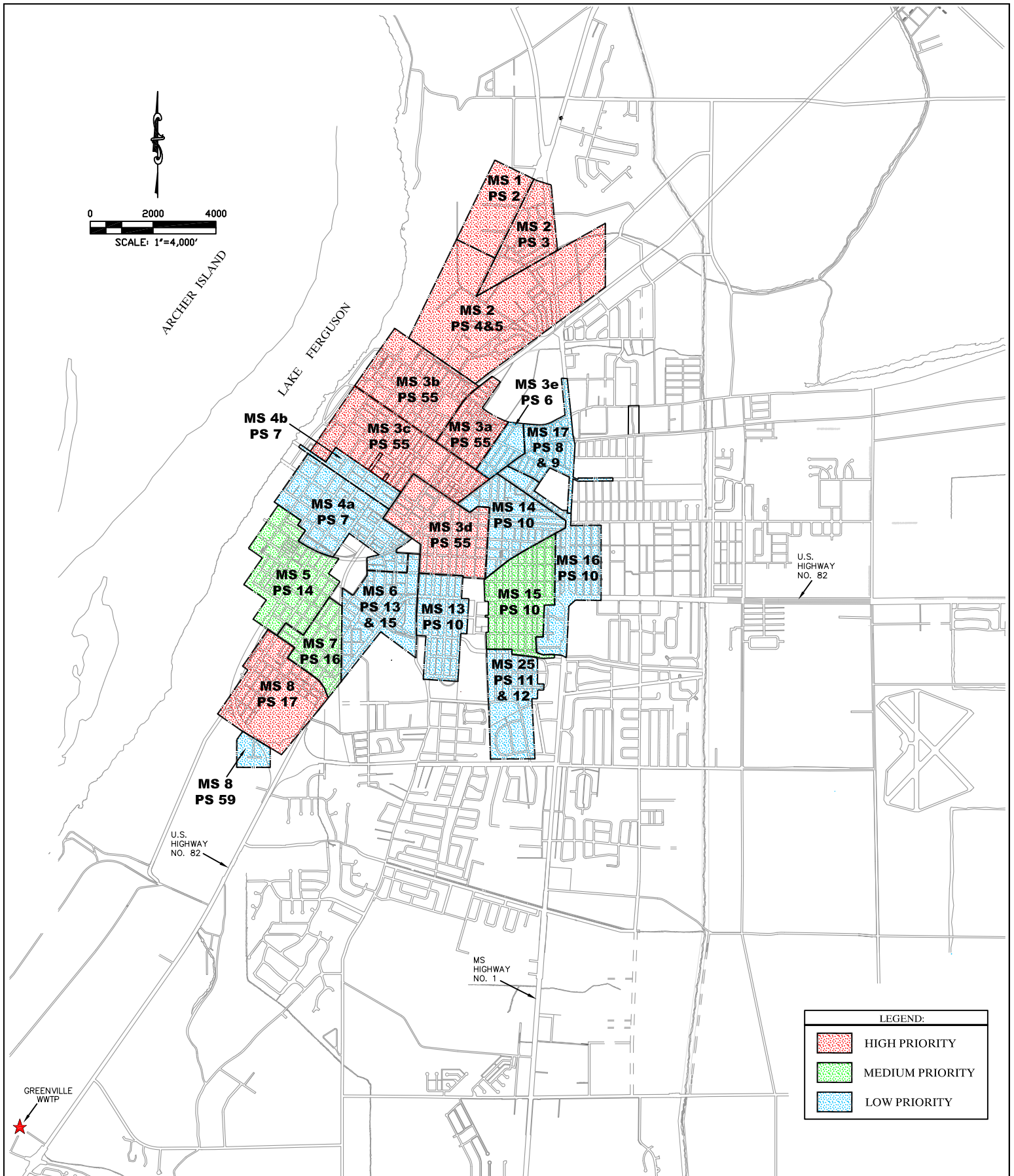
PUMP STATION



**Figure 2**

**Theobald Sewershed Map**





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GRAVITY SEWER O&M PROGRAM  
THEOBALD SEWERSHED MAP  
GREENVILLE, MISSISSIPPI

FIGURE  
2

Proj. No.  
02500-2-0214

CAD File No.  
Sewer Basin Maps.dwg

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Chkd. By: PND

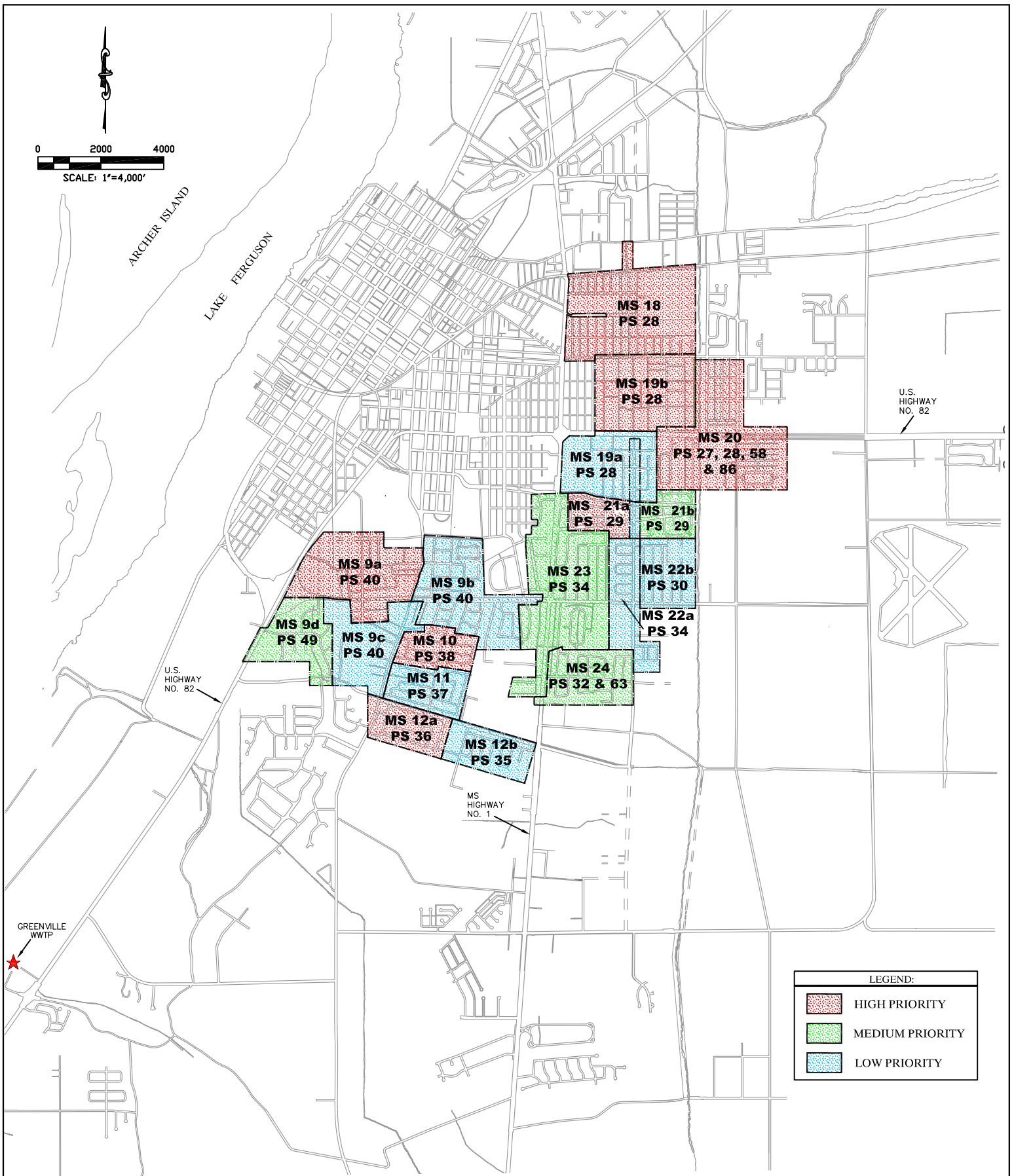
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Scale: 1" = 4,000'

**Figure 3**

**Daniel Street Sewershed Map**





LEGEND:	
	HIGH PRIORITY
	MEDIUM PRIORITY
	LOW PRIORITY



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GRAVITY SEWER O&M PROGRAM  
DANIEL SEWERSHED MAP  
GREENVILLE, MISSISSIPPI

FIGURE  
3

Proj. No.  
02500-2-0214

CAD File No.  
Sewer Basin Maps.dwg

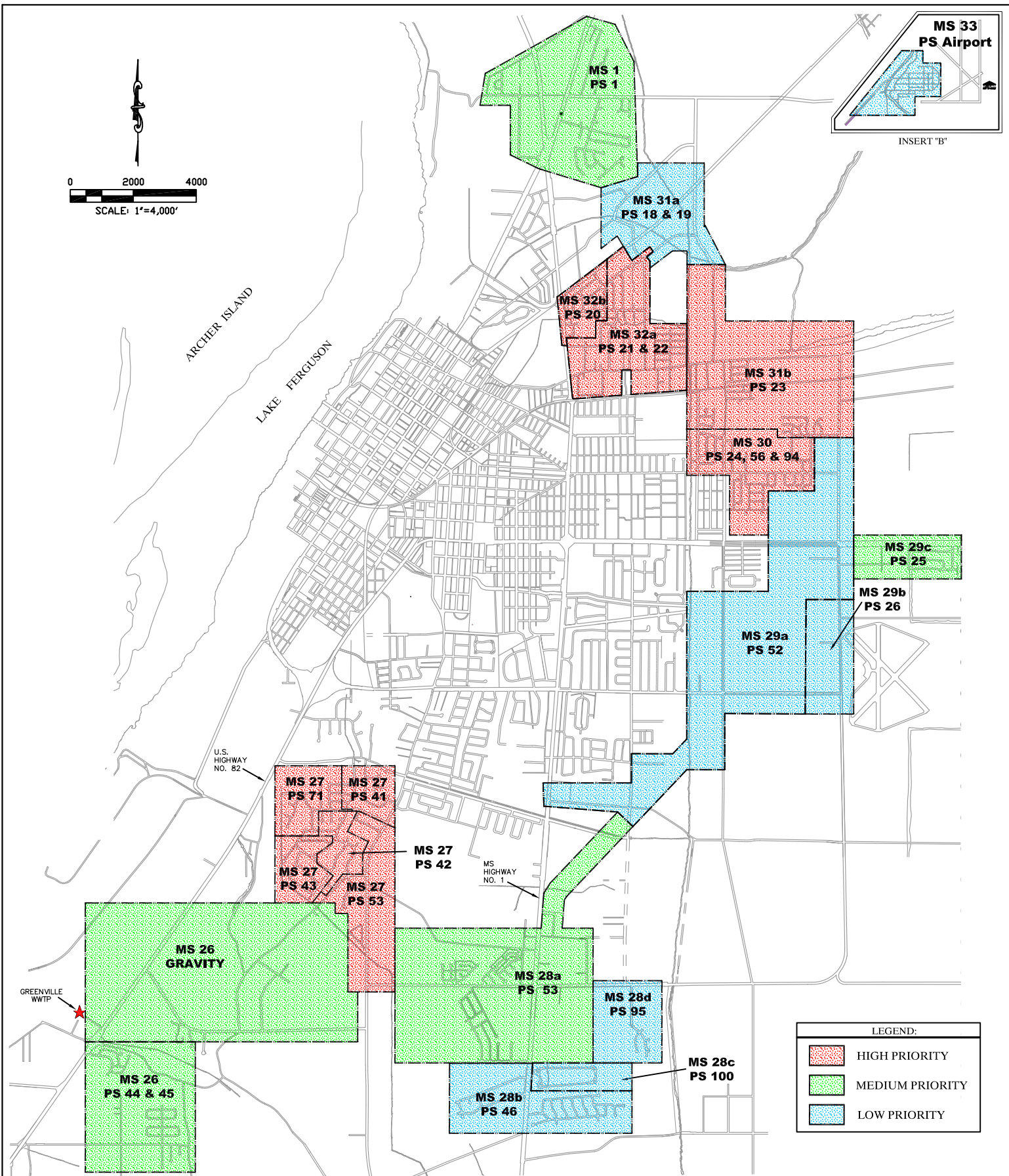
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Chkd. By: PND	3
Date: 12/21/2015	
Scale: 1"= 4,000'	

**Figure 4**

**Peripheral Sewershed Map**







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GRAVITY SEWER O&M PROGRAM  
PERIPHERAL SEWERSHED MAP  
GREENVILLE, MISSISSIPPI

FIGURE  
4

Proj. No. 02500-2-0214	
CAD File No. Sewer Basin Maps.dwg	
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Chkd. By: PND	4
Date: 12/21/2015	
Scale: 1"= 4,000'	

## APPENDICES





**Appendix A**

**Sewer Inventories**



The CITY has mapped and inventoried the Groups 1, 2 and 3 mini-systems. The breakdown of the systems is given below:

#### Group 1 Sewer Inventory

Group No.	Mini-System No.	No. of Pump Stations	Length of Sewer (LF)	No. of Manholes
1	1	2	7,780	26
1	2	4	33,510	134
1	3a	1	17,120	46
1	3b	0	23,505	77
1	3c	0	42,795	142
1	3d	0	20,580	63
1	8	1	15,990	44
1	9a	3	23,840	100
1	10	1	10,840	37
1	12a	1	9,530	30
1	18	1	32,965	91
1	19b	0	25,315	64
1	20	4	32,735	111
1	21a	1	7,430	23
1	27	5	50,330	198
1	30	2	26,025	84
1	31b	2	29,745	105
1	32a	2	25,860	89
1	32b	1	9,330	42
<b>Group 1</b>	<b>TOTALS</b>	<b>31</b>	<b>445,425</b>	<b>1,506</b>

#### Group 2 Sewer Inventory

Group No.	Mini-System No.	No. of Pump Stations	Length of Sewer (LF)	No. of Manholes
2	1	4	37,860	123
2	5	1	22,100	71
2	7	1	17,910	33
2	9d	2	8,465	34
2	15	0	23,815	58
2	21b	0	11,145	41
2	23	1	38,925	128
2	24	3	16,285	58
2	26	11	62,895	227
2	28a	5	41,510	137
2	29c	1	9,715	25
<b>Group 2</b>	<b>TOTALS</b>	<b>29</b>	<b>290,625</b>	<b>935</b>

### Group 3 Sewer Inventory

Group No.	Mini-System No.	No. of Pump Stations	Length of Sewer (LF)	No. of Manholes
3	3e	1	5,775	17
3	4a	1	34,100	116
3	4b	0	9,630	41
3	6	2	24,890	71
3	7	1	1,930	8
3	9b	1	27,340	90
3	9c	1	7,325	21
3	11	1	14,810	49
3	12b	1	7,345	32
3	13	1	17,445	39
3	14	0	21,795	64
3	16	1	27,280	71
3	17	2	20,350	68
3	19a	1	17,145	68
3	22a	2	10,450	41
3	22b	1	8,360	24
3	25	2	12,385	33
3	28b	2	19,170	62
3	28c	1	4,835	16
3	28d	1	3,950	14
3	29a	2	29,430	92
3	29b	2	6,885	23
3	31a	4	7,950	28
3	33	7	10,620	53
<b>Group 3</b>	<b>TOTALS</b>	<b>38</b>	<b>350,835</b>	<b>1141</b>

## **Appendix B**

### **Gravity Sewer Manhole Inspection Form**





340 Main Street  
Greenville, MS 38701  
www.greenvillems.org

Project: \_\_\_\_\_  
Client: \_\_\_\_\_  
Mini System: \_\_\_\_\_

# Manhole Inspection Form

Pump Station Area: \_\_\_\_\_  
Manhole Number: \_\_\_\_\_  
Manhole Address: \_\_\_\_\_

1. Inspection Method (A-condition evaluation, B-surface flood dye test, C-observed ground water inflow)
2. Manhole Location (A-road, B-gutter, C-sidewalk, D-driveway, E-paved servitude, F-grass servitude, G-ditch, H-backyard, I-easement)
3. Surface Type (A-asphalt, C-concrete, D-dirt, G-gravel, S-sod)
4. Precipitation at time of Inspection (N-none, L-light, H-heavy)
5. Traffic at time of Inspection (N-none, L-light, H-heavy)
6. Is manhole subject to ponding (Y=yes, N=no)
7. Access (A-good, B-poor)
8. Easement Obstruction (Y=Yes, N-No) Describe: \_\_\_\_\_
9. Easement Undergrowth (i.e. overgrown vegetation) (Y=Yes, N-No) Describe: \_\_\_\_\_
10. MH Cover Diameter (measured to the nearest inch)
11. MH Cover Type (A-solid, B-bolted, C-grated, D-vented by \_\_\_\_\_ holes @ \_\_\_\_\_" Diameter, E-other \_\_\_\_\_)
12. MH Cover Material (A-cast, B-concrete, C-glass-reinforced plastic, D-composite material, E-other \_\_\_\_\_)
13. MH Cover Condition (A-satisfactory, B-broken, C-corroded, D-missing)
14. MH Cover to Rim Fit (A-satisfactory, B-poor)
15. MH Cover Distance Above/Below Grade (A-above or B-below measured to the nearest 1/2 inch)
16. Frame Condition (A-good, B-broken, C-corroded, M-misaligned)
17. Frame to Manhole Seal (A-satisfactory, B-poor)
18. Insert Condition (A-satisfactory, B-broken, M-missing plug, N-none)
19. Riser Type (BR-brick, CO-concrete, PC-precast, S-steel, O-other \_\_\_\_\_)
20. Riser Condition (A-satisfactory, B-broken, C-cracked, M-misaligned, F-corroded/missing material)
21. Evidence of Infiltration/Inflow from Riser (Y=yes, N=no) if yes, clock position and depth from rim \_\_\_\_\_

## Details of Influent and Effluent Piping (Clock Positions, North=12 o'clock)

	Manhole #	Diameter (in)	Clock Position	Type <sup>1</sup>	Material <sup>2</sup>	Seal Condition <sup>3</sup>	Rim to Invert (ft)	Drop (ft)	Comments
Downstream									
Upstream									
Upstream									
Upstream									
Upstream									
Downstream									

Type<sup>1</sup> (G-gravity line, FM-force main, S-service, P-siphon)

Material<sup>2</sup> (BR-brick, CO-concrete, IR-iron, PL-plastic, VC-vitrified clay, LI-lined pipe, FR-fiberglass reinforced, XX-Other)

Seal Condition<sup>3</sup> (S-satisfactory, U-unsatisfactory)

22. MH Depth (to the nearest 0.1 ft)
23. MH Diameter (to the nearest 0.1 ft) Any variance, list here: \_\_\_\_\_
24. Flow Depth (to the nearest inch)
25. MH Wall and Cone Type (BR-brick, PC-precast, C-poured concrete, F-other \_\_\_\_\_)
26. Cone Condition (A-satisfactory, B-broken, C-cracked, M-misaligned, F-medium corrosion, H-heavy corrosion)
27. Evidence of Infiltration/Inflow from Cone (Y=yes, N=no), if yes, clock position & depth from rim \_\_\_\_\_
28. Wall Condition (A-satisfactory, B-broken, C-cracked, F-medium corrosion, H-heavy corrosion)
29. Evidence of Infiltration/Inflow from Wall (Y=yes, N=no) if yes, clock position & depth from rim \_\_\_\_\_
30. Number of Steps
31. Step Condition (A-satisfactory, B-poor, F-medium corrosion, H-heavy corrosion)
32. Bench and Invert Type (BR-brick, PC-precast, C-poured concrete, F-other \_\_\_\_\_)
33. Bench and Invert Condition (A-satisfactory, B-broken, C-cracked, F-corroded, NA-missing)
34. Evidence of Infiltration/Inflow at Bench and Invert (Y=yes, N=no) if yes, clock position \_\_\_\_\_
35. Bench Deposits (A-none, D-debris, G-grease, F-other \_\_\_\_\_)

Digital Photo Files (Refer to Part 3 of SECTION 15030 for naming details)

These Photos are Stored on Manhole Inspection CD-ROM No.:

Area Photograph File Name(s)	Defect Photograph File Name(s)		
Internal Photograph File Name(s)			

Miscellaneous Field Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Inspected By)

(Date & Time)

## **Appendix C**

### **Smoke Testing Procedures**



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- 1.4 SUBMITTALS
- 1.5 NOTIFICATION

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## DIVISION 15- MECHANICAL

### SECTION 15040

#### SMOKE TESTING WASTEWATER COLLECTION SYSTEMS

##### PART 1 GENERAL

###### 1.1 SCOPE OF WORK

The CONTRACTOR shall furnish all plant, labor, materials and equipment, and perform any associated quality control, tests and reports, and all work required to perform smoke testing as required by these Specifications and as illustrated on the Project Drawings. It is the intent of these Specifications to provide for the smoke testing materials and procedures to be used in the investigation of the sanitary sewer facilities as shown on the Project Drawings. All materials and procedures shall be consistent with these Specifications, current industry standards, and as approved by the ENGINEER.

The nature of the smoke testing inspections shall be to confirm system connectivity, identify gravity sewer system defects and to provide a permanent record of the defects including type, location, and severity. Inspections will be performed by introducing non-toxic smoke into the sanitary sewer pipes using a high capacity blower, observing smoke exiting vent stacks and at defect locations, documenting the defects, and photographing the defects.

###### 1.2 REQUIREMENTS

The CONTRACTOR shall inspect the gravity sanitary sewer system using high capacity blower(s). The smoke blower(s) shall be suitable for the anticipated testing and capable of generating non-toxic smoke. The CONTRACTOR personnel shall visually identify, photograph, and document each defect location. Documentation of each sewer defect discovered shall be flagged, photographed, and sketched on map in accordance with Paragraph 3.3(B) of this Section. CONTRACTOR shall provide all safety equipment suitable for the field and traffic conditions.

###### 1.3 QUALITY ASSURANCE

- A. Each smoke testing field supervisor shall be certified under the Pipeline Assessment & Certification Program (PACP) offered by the National Association of Sewer Service Companies (NASSCO). Use of PACP certified technicians to review/document defects in the office (post process) is not acceptable.
- B. The smoke testing CONTRACTOR shall have an internal quality assurance/quality control program in place and all inspection data shall be



subjected to the procedures prior to submittal to the ENGINEER. The quality of deliverables shall be satisfactory to the ENGINEER.

- C. The field crew shall be of sufficient size to properly operate the smoke generation machine and provide full coverage of the area to visually locate smoke discharge from defects (minimum of three (3) employees).
- D. All CONTRACTOR's employees performing the smoke testing under the provisions of these Specifications shall be properly trained and thoroughly experienced in the use of the equipment and procedures. The field supervisor shall have at least two (2) years of previous testing experience obtained in the last four (4) years prior to the Project bid date.
- E. A list of employees to be used shall be provided to the ENGINEER. The information provided shall include, but is not limited to, the name and a copy of the driver's license of each individual. Each employee shall wear a photo ID identifying him by name, and the name and contact information for the CONTRACTOR. All job supervisors shall have business cards to provide to residents upon request. The business cards shall contain the job, supervisor's name, as well as, the CONTRACTOR's name and contact information.
- F. The CONTRACTOR shall take appropriate action to ensure that his employees are polite to the public in all aspects of the work and that immediate assistance is provided to property owners if needed.

#### 1.4 SUBMITTALS

The CONTRACTOR shall provide the ENGINEER the following submittals prior to commencement of work:

- A. Smoke production product information and Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS);
- B. Method of smoke production;
- C. Common defect codes and their description. The approved defect code shall be utilized to identify defects during the smoke testing work;
- D. Draft pre-notification door hanger that the CONTRACTOR will hang on residents doors 7-14 days prior to investigation work;
- E. Draft door hanger that the CONTRACTOR will hang on residents doors 24 hours prior to investigation work;
- F. Sample electronic portable document format (.pdf) of a smoke test field report containing all items required by Paragraph 3.3(B) of this Section;
- G. Sample digital photographs discovered during smoke testing in .jpeg format saved on CD-ROM's, DVD or portable hard drives. The photographs shall be in accordance with this Specification;

- H. Sample maps in accordance with this Specification depicting smoke testing results;
- I. Identification for all CONTRACTOR employees that will work on the project;
- J. If required, work permits from applicable local, state, or federal agencies;
- K. Traffic Control Plan, as needed; and
- L. Sample table of defects, including descriptions, physical property address, owner's name, and owner's mailing address.

The submitted samples shall be the work of the field supervisor or foreman to be used on this project. All required deliverables shall be in accordance with this Specification and similar to the submittals that were approved by the ENGINEER prior to commencement of work. Any variation thereof shall be preapproved by the ENGINEER. CONTRACTOR shall be responsible for modifications to equipment and/or inspection procedures to achieve report material of acceptable quality.

## 1.5 NOTIFICATION

The CONTRACTOR shall notify, by hand delivery, an ENGINEER approved door hanger to all residences and businesses in the area to be tested. ENGINEER approved notifications shall be printed and distributed by the CONTRACTOR at no additional cost to the OWNER.

It shall be the CONTRACTOR's responsibility to keep adequate records of all notifications for which they are responsible and to produce them upon request by the OWNER or ENGINEER. Failure to comply with this requirement may be cause to suspend the CONTRACTOR's operations until compliance is achieved.

CONTRACTOR shall provide the OWNER and ENGINEER the location for the next day's work at the end of each day. No payment will be made for work performed without proper notification. Each of the following notifications shall be the responsibility of the CONTRACTOR at no additional Cost to the OWNER:

### A. Pre-Notifications

The CONTRACTOR shall notify all affected residents/tenants and businesses in the work area that smoke testing will occur no more than two weeks prior and not less than one week prior to the date of the testing. Printed door hangers shall be used for this pre-notification. The CONTRACTOR shall supply and place door hangers on all affected residences and businesses 7-14 days prior to smoke testing. The ENGINEER approved door hanger shall include:

1. Contact numbers for the CONTRACTOR's home office and Project Superintendent. This information shall be provided so that any residents who wish to obtain additional information regarding the smoke testing can do so. All CONTRACTOR personnel who will be in contact with the public shall be well

versed in the smoke testing procedures, work schedule and content of the notifications.

2. Warnings to the homeowner that individuals with respiratory, heart problems, or others who should never be exposed to smoke, should be removed from the premises prior to the tests. Others such as house confined invalids, sleeping shift workers and locked in animals should be identified and evacuated before the test. The pre-notification shall also request that homes with these individuals be requested to be registered as "Homes of Special Concern".

#### B. Regulatory Notifications

Prior to commencing work each day the CONTRACTOR shall notify the local Police and Fire Departments daily of any smoke testing activities that will be performed.

#### C. Daily Notifications

The CONTRACTOR shall provide and place ENGINEER approved printed door hangers on all residences and businesses 24 hours prior to smoke testing. Daily notification door hangers shall not be placed for areas which will not be tested within 24 hours. At minimum the notifications shall include the information prescribed in Paragraph 1.5(A) above. If smoke testing is delayed due to rain, etc., the area shall be re-notified (24 hour minimum) by door hangers.

Logs shall be maintained to document notification of special needs facilities such as hospitals, nursing homes, schools, high rise buildings, etc. The logs shall include the facility name, date, time and individual notified.

On the day of testing, the CONTRACTOR shall check with all residents who, during the pre-notification period, registered as "Homes of Special Concern" to ensure that persons sensitive to smoke will be out of the home prior to testing.

### PART 2 EQUIPMENT

#### 2.1 BLOWERS

The CONTRACTOR shall provide a portable blower(s) designed and built specifically for the use of smoke testing. The base of the blower shall have appropriate adapters and seals to make a good connection to the manhole without excessive loss of air and smoke. The blower shall be self-contained and capable of producing a minimum of 4,500 cubic feet of air per minute (cfm). Blowers with less cfm may be approved by the ENGINEER provided it demonstrated that sufficient pressure is generated for the testing. If inadequate pressure is being generated, then additional blowers (dual blowers) or larger blowers shall be required. Adequate pressure is being provided when smoke is exiting the vent stacks as a plume or, where no vent stacks are present, smoke is exiting the upstream/downstream manhole casting/vent hole/pick hole, etc. The CONTRACTOR shall be responsible for isolating the line segments being tested by plugging,

sandbagging, etc. at no additional cost to the OWNER. The isolation is required immediately upstream and downstream of ALL pipe segments being smoke tested. Means of isolating the line segments being tested shall be to the satisfaction of the ENGINEER. The CONTRACTOR shall be responsible for sewer flow control, and any required clean-ups resulting from CONTRACTOR's actions, during isolation of segments being tested. In general the larger the pipe diameter being tested, the higher the smoke blower capacity (cfm) required.

## 2.2 SMOKE PRODUCTION

Smoke bombs shall not be allowed for this project. Smoke Fluid, or approved equal, shall produce continuous smoke that can be controlled by the testing crew. The smoke generated shall be white to gray smoke, leaving no residue, and shall be non-toxic and non-explosive.

## 2.3 OTHER EQUIPMENT

In addition to the blower(s), the CONTRACTOR shall also provide all plant, labor, materials, tools, equipment, and incidentals required to perform smoke testing operations as required by these Specifications including, but not limited to, temporary plugs, sandbags, flow barriers, sewer flow control equipment (refer to Paragraph 3.1 of Section 15020 for addition details) digital photography equipment (refer to Paragraph 2.1 of Section 15030 for requirements), global positioning system (refer to Paragraph 2.2 of Section 15030 for requirements), confined space entry equipment (as needed), and traffic control equipment (refer to Paragraph 3.2 of Section 15010 for details).

# PART 3 EXECUTION

## 3.1 WORK PROGRESS

The work shall generally progress as follows:

- A. The CONTRACTOR shall apply for and obtain work permits for all work to be performed in State/Federal Highways. All required insurances, traffic control measures, and other terms of the permit shall be provided to the satisfaction of the ENGINEER and the governing entity of the Highway. Permitting and work required by the permit shall be the sole responsibility of the CONTRACTOR at no additional cost to the OWNER.
- B. The CONTRACTOR shall have all required submittals reviewed, including, but not limited to, the sample field inspection forms and database deliverables, by the ENGINEER. Work shall not proceed until acceptance of all submittals by the ENGINEER.
- C. A Work Schedule shall be submitted for review and approval by the ENGINEER. No testing or notification may proceed until the schedule has been approved by the ENGINEER. After approval of the Work Schedule by the

ENGINEER, the CONTRACTOR shall not make revisions or modifications without approval of the ENGINEER.

- D. Pre-notification, regulatory notifications, and daily notifications in accordance with Paragraph 1.5 of this Section.
- E. Perform the smoke testing services on the areas indicated on the Project Drawings and in accordance with these Specifications.
- F. Prepare and provide the smoke testing data documents.

### 3.2 WORK SCHEDULE

- A. Upon award of the Contract and prior to commencing any work, the CONTRACTOR shall provide a complete Work Schedule to the OWNER and ENGINEER for review and approval. The schedule shall be submitted at least two (2) weeks prior to the start of smoke testing. The Work Schedule shall be typed and shall indicate the planned progress for the proposed work. The CONTRACTOR shall also provide a one week look-ahead schedule and coordinate with the OWNER and ENGINEER the exact locations of smoke testing for the upcoming week.
- B. The submitted schedule shall be accompanied by a map or detailed schedule of streets to be smoke tested each work day.
- C. The Work Schedule shall indicate the following:
  - 1. Street name (when in easements-the names of the abutting streets).
  - 2. Street limits (cross streets or property addresses).
  - 3. Upstream and downstream manhole numbers (from Project Drawings).
  - 4. Date of testing.
  - 5. Starting time.
  - 6. Ending time.
- D. Acceptable Periods of Work:
  - 1. The CONTRACTOR shall not commence testing before 8:00 a.m. and shall terminate no later than 5:00 p.m. each day.
  - 2. No testing shall be performed on weekends or holidays unless otherwise approved by the OWNER and ENGINEER.
  - 3. If the CONTRACTOR wishes to test before 8:00 a.m. or after 5:00 p.m. in commercial areas or high traffic areas, such testing shall be shown on the submitted Work Schedule and is subject to the approval of the OWNER and ENGINEER.
  - 4. Smoke testing shall not be performed:
    - a. During rainfall events,

- b. Within 24 hours following a significant rainfall event,
- c. During high water events on the Mississippi River,
- d. During time when groundwater levels are above the invert of the pipe being tested, or
- e. On days that, in the opinion of the ENGINEER, will hinder the results of the test (for example, when high winds, heavy rains, or excessively high groundwater levels would interfere with the effectiveness of the testing).

### 3.3 PERFORMING THE SMOKE TEST

#### A. Procedures

##### 1. Safety

- a. The CONTRACTOR and his personnel shall be aware of and shall follow all applicable Federal, State and local safety laws and regulations.
- b. No entry into any part of the collection system shall be permitted until the CONTRACTOR has demonstrated that on-site personnel have been trained in applicable confined space safety procedures and has the equipment on-site to allow those procedures to be implemented.
- c. The CONTRACTOR shall minimize the physical entry of personnel into the sanitary sewer facilities. Where required, manhole entry shall be in accordance with all applicable Federal, State, and local regulations for confined space entry and other regulations that may be applicable. The CONTRACTOR shall provide all safety equipment required for safe manhole entry operations including, but not limited to, harness, ventilation equipment, etc. In the event manhole entry is required, safety for the entry work shall not have a separate pay item and shall be absorbed in the price of other items.
- d. The CONTRACTOR shall be responsible for the maintenance of traffic. The area of work shall at all times be protected by means of an adequate number of cones, barricades, flags, or by other means necessary to properly and safely protect both vehicular and pedestrian traffic. Flag person(s) shall be provided, as needed. The Traffic Control Plan is the sole responsibility of the CONTRACTOR and shall be prepared in accordance with the latest edition of the manual of Uniform Traffic Control Devices (MUTCD), where applicable. Further requirements for traffic control may be imposed by the OWNER, ENGINEER, or the Mississippi Department of Transportation (MDOT). Traffic

Control work will not have a separate pay item and shall be absorbed in the price of other items.

- e. Safety is the sole responsibility of the CONTRACTOR exclusively. Any condition deemed to be an unsafe condition shall be immediately corrected by the CONTRACTOR. The failure of the OWNER, ENGINEER or their representative(s) to bring a potentially dangerous situation to the CONTRACTOR's attention shall not relieve the CONTRACTOR from his responsibility for providing a safe work area and shall in no way place fault on the OWNER, ENGINEER or their representative(s) in the event of an accident.
- 2. Unless otherwise approved by the ENGINEER, the sections of sewer subject to testing shall:
    - a. Consist of a central manhole, where the blower will be positioned, and an upstream and downstream manhole and the sewer pipe between them. With three (3) manholes and two (2) pipe sections, lengths should not exceed 1,000 feet.
    - b. Consist of two (2) manholes and one pipe section. Distances greater than 500 feet radius may only be tested when the length is in excess of 500 feet due to inaccessible manholes. Where smoke is not adequate, regardless of the length, dual blowers shall be placed in adjacent manholes in an attempt to increase pressure to smoke test the sewer. Where sags or blockages prevent adequate smoke tests, the CONTRACTOR will note on the inspection form the area where no smoke was observed.
  - 3. Bypassing pumping is not anticipated for this Project. The CONTRACTOR shall provide, install, and maintain temporary plugs, sandbags, or flow barriers as required to contain an adequate volume of smoke within the section of sewer being tested, or to limit the extent of sewer subjected to pressurized smoke. The CONTRACTOR shall monitor the resulting surcharged sewer at the manhole upstream of the section of sewer being tested, and prevent overflow conditions from occurring by removing the flow barriers or removing sewage by vacuum trucks. In the event bypass pumping is required for adequate sewer flow control, the CONTRACTOR shall be responsible for providing the pumps, equipment, tools, plant and labor to bypass the section being tested at no additional cost to the OWNER.
  - 4. Prior to placing smoke into a manhole, the CONTRACTOR shall first evacuate the system with a blower to ensure that any collection of explosive gas and odor that may be introduced into the homes and businesses have been dispersed prior to pressuring the sewer with smoke.

Evacuation may be accomplished by removing the manhole covers of all manholes in the run, then placing a vacuum or blower on a manhole.

5. The walk through for locating defects shall not begin until smoke is highly visible with a smoke plume emanating from the plumbing vents of houses at the end of setup location (maximum 500 ft radius) from the smoke testing machine. A colored locate flag will be placed at the location of each defect. Walkers shall traverse not only the sidewalk but between all homes and in backyards looking for illegal connections including patio, pool and roof drain connections, leakage at house laterals, broken or missing clean-out caps and storm drain cross connections. Defect flags shall be provided by the CONTRACTOR. The defect flags shall be left at the location of defect and will not be returned to the CONTRACTOR.
6. All smoke testing information shall be accurately and neatly recorded on field worksheets and on 200 scale maps (1 in.= 200 ft.) or other maps of suitable scale as approved by the ENGINEER. The CONTRACTOR's final report and information shall be transferred to a computer generated log sheet together with related digital photographs taken during the project execution. CONTRACTOR's field worksheet maps shall be provided in Autodesk format.

B. Test Documentation

1. For each sewer main tested, the CONTRACTOR shall prepare a field log identifying each point of smoke exfiltration from:
  - a. Roof gutters,
  - b. Sewer cleanouts,
  - c. Leakage in house laterals,
  - d. Patio or area drains,
  - e. Storm drain cross connections,
  - f. Any other source not stated above, and
  - g. Indicate if roof vents showed evidence of smoke.
2. Defects should be logged as "private," or "public."
3. Each smoke defect, as identified above, shall be referenced by sketch and dimensioned to permanent landmarks and include the house or lot numbers. A separate sketch shall be prepared for each defect and attached to the field form.
4. CONTRACTOR shall obtain GPS coordinates of each defect. The coordinates shall be included in the Final Excel Summary Report and on



the defect sketch page. The GPS deliverables shall include State Plane Coordinates, as well as, latitude and longitude.

5. In addition to GPS coordinates, the CONTRACTOR shall also obtain measurements to the nearest 0.1 feet for each observed defect from a minimum of two nearby structures or permanent landmarks. These measurements shall be shown on the defect sketch page.
6. The CONTRACTOR shall provide a flag and a self-standing sign (sandwich board) at each defect. The sign shall consist of minimum 4" tall neatly written numbers physically located at each defect. There shall be a unique number for each defect, clearly visible in the photographs and noted in the report, record drawings, and summary spreadsheet. In the event that multiple crews are working, each crew shall be assigned a series of unique numbers.
7. Once a defect has been flagged, the CONTRACTOR shall take a digital photograph (delivered with time and date stamp on the digital photograph) showing the smoke rising from the defect, flag, unique number, and physical features at or near the defect. The photographs shall be included in the field log. Photographs of smoke evidence shall have a location indicated in the photograph using a defect flag, provided by the CONTRACTOR. All photographs shall be clearly cross-referenced to the typed and/or computer generated log indicating the location of the leak.
8. Flags shall be left in place at the locations of broken laterals, connected yard drains, area drains, pool/hot tub drains, roof drains, and broken caps.
9. Photographs without smoke plume from the located defect or missing visible unique number are unacceptable.
10. For defects where capturing a photograph of the smoke does not capture the defect (e.g. connected downspout), a second photo of the actual defect shall be obtained.
11. The smoke testing report shall reference the manhole numbers shown on the Project Drawings.

C. Defective or Missing Clean Out Caps

Defective or missing clean out caps discovered during testing shall be replaced by the OWNERs personnel during testing. The CONTRACTOR shall inform the OWNER of such missing clean out caps. The inspection report will document the original defect location (with measurements and GPS coordinates) and notation that the repair has been made. The CONTRACTOR shall take a before

and after photograph at each repair location. Clean out caps shall be provided by the OWNER.

### 3.4 SMOKE TESTING DELIVERABLES

- A. The CONTRACTOR shall prepare a Smoke Testing Report and submit it on two (2) CD-ROMS along with two (2) hardcopy reports. The report shall contain a minimum of:
1. Prior to submission to ENGINEER, the CONTRACTOR shall review all deliverables for quality, missing data, etc. The quality of deliverables shall be satisfactory to the ENGINEER.
  2. CONTRACTOR's name, date, address of defect, description of defect, manhole to manhole (using numbering from Project Drawings), digital photograph number, inflow potential rating of defect, footage smoked, pipe diameter, pipe material, pipe depth, additional comments as needed, and sketch/map with measurements for exact location of defect.
  3. Scanned field forms and sketches in .pdf format.
  4. A Microsoft Excel table of all defects listing the CONTRACTOR's name, date, address of defect, location (obtained with GPS unit specified herein), description of defect, defect number, manhole to manhole (using numbering from Project Drawings), digital photograph number, inflow potential rating of defect, footage smoked, pipe diameter, pipe material, pipe depth, additional comments as needed.
  5. CONTRACTOR shall submit a minimum of two (2) complete copies of the report and the electronic report to the ENGINEER for review. Upon receiving the ENGINEER's review and comments, the CONTRACTOR shall edit or revise the report and/or electronic report as necessary and resubmit two (2) copies of the final report (two hard copies and two electronic copies) to the ENGINEER.
  6. The CONTRACTOR shall submit one hardcopy set of maps, one Autodesk format set of maps, and one .pdf set of maps showing all the defects for the Project to the ENGINEER.
  7. Digital photographs, renamed and re-sized to a 640 x 480 resolution shall be submitted on a CD-ROM, DVD or a portable hard drive.

### 3.5 COMPENSATION

Smoke testing shall be measured as the horizontal distance from the center of the upstream manhole to the center of the downstream manhole for each sewer main

segment tested. Measurements shall be made to the nearest foot. Smoke testing shall be paid for as the unit price bid item for "Smoke Testing of Gravity Sewer Lines (8"-12" Diameter Mainline and Attached Service Lines)" including all products, materials, equipment, tools, labor, deliverables, and incidentals thereto, completed and accepted by the OWNER and ENGINEER. Progress payments for items whose field work has been completed, but no deliverables have been submitted to or approved by the ENGINEER, shall not exceed fifty percent (50%) of the Contract unit price. Final payment shall not be made until all deliverables are submitted and approved acceptable.

- End of Section -

## **Appendix D**

### **Work Order Form & Data Entry Form**



# City of Greenville

## Wastewater System Work Order

*To be completed by person receiving call:*

Received by:	Date:        /        /	Time:
Caller's Name:	Phone No.	Address:
Location of the complaint (address/nearby cross-street):		
Description of the complaint:		
Time crew dispatched:		

*To be completed by field response crew leader:*

Crew Leader Name:	Time of arrival:
Crew Member Name:	Time of arrival:
Crew Member Name:	Time of arrival:
Crew Member Name:	Time of arrival:
Upstream MH number:	Downstream MH number:
Diameter of line:	Length of line:
Was there a blockage in the public main?	
Was the blockage in the street or easement:	
Location of obstruction:	
Observations at site:	
Remedial measures taken:	
Time cleared:	Did an overflow occur?
Property damage?	
Time overflow started:	Time overflow stopped:
Duration of overflow:	Overflow rate:
Source of overflow (manhole, cleanout, etc):	
Cause:	
Steps taken to clean up:	
Did spill reach surface water?	
Person completing report	Date

*Attach photos and return completed report to Public Works Director.*



# Data Log

☐ Print  
☐ Preview

Pri

Date Entered

10/9/2017

Index 43142

First Name

Last Name

Address

Home Phone

Email Address

Event Name

Location

Select Description

Customer Description

Department

Assigned To

Select Description

Work Description

Date Delivered

Received By

John Goodwin

Closed

☐

## **Appendix E**

### **Methods of Rehabilitation**



## SECTION V

### METHODS OF REHABILITATION

Sewer rehabilitation techniques have changed over the years. Besides the traditional excavation-and-pipe replacement, new trenchless methods and procedures are put into practice every day, giving municipalities much to consider. Because complete system replacement is rarely financially viable, many communities are taking the trenchless rehabilitation path.

During the Mini-System Groups 1 and 2 Rehabilitation Projects, Greenville will be considering each of the techniques listed below:

#### A. SEWERS AND FORCE MAINS

##### 1. Excavation and Replace

A determination has been made that the traditional sewer replacement method of excavation and replacing is the preferred methods to replace old and defective collection line. It is one of the only ways to correct sags and humps in the pipeline due to differential soil settlement, and is sometimes the only method that can be used because of the severity of the structural deterioration of the pipe. In some cases the severe misalignment of the pipe will not allow other techniques to be used. Excavation and replacement has its negatives; it can be very disruptive at the surface because utilities in the vicinity of the lines need to be protected, traffic needs to be controlled around the construction and costs of excavation and replacement are equal to new sewer construction.

Pipeline replacement results in:

- The correction of misalignment of pipe;
- Increase in the hydraulic capacity;
- Repair of improper service connections; and
- Elimination of direct sources of stormwater and groundwater entry

Pipeline replacement will be performed by contractors and CITY forces.

##### 2. Pipe Bursting

Trenchless pipe replacement, allowing pipe replacement without having to remove existing pipes, involves inserting a cone-shaped bursting tool into the



existing pipe, pulling it through the host pipe using a static pull cable or actuated tool, and breaking the pipe as the tool moves forward. In the static cable version, a pull cable is strung through the pipe and connected at the other end to a wench or backhoe, which pulls the cable (and bursting tool) through the pipe. In the actual tool version, a pneumatically driven hammer mechanism pounds the tool through the pipe while a cable wench maintains tension on the cable to keep it stable. Afterward, a length of replacement pipe is assembled by butt-welds above ground to the appropriate length, attached to the bursting tool, and then pulled into the newly fractured host pipe, thereby replacing it. Laterals are reconnected in a separate operation so the new pipe can “relax”, or contract to a stable length after being stretched. Generally, pipe bursting works best with clay, cast-iron, or unreinforced concrete sewers and in clay and silt soils.

Pipe bursting has been the choice in areas that would have severe problems with:

- Traffic disruption and control;
- Disruption to properties (access to and easement use);
- Pavement damage;
- Shoring requirements;
- Excavation dewatering;
- Noise; and/or
- Restoration of surface improvements (pavement, driveways, sidewalks, fences, landscaping).

### 3. Slip Lining

Slip lining involves inserting a new pipe into an old pipe through an insertion pit. This process may or may not require flow-by passing. The process leaves an annular space between the host pipe and liner, which can be sealed at the ends or filled with grout along the length. Slip lining is not as flexible as other pipe lining options and cannot negotiate curves or offsets. However, the method is a viable option for many replacement situations. Pipe liners can eliminate the need for excavation and as a result, the installation costs can be 50% to 80% of excavation and replacement.

Slip lining has been the choice in the following situations:

- No increase in hydraulic capacity;
- Traffic disruption and control;
- Disruption to properties (access to easement use);

- Pavement damage;
- Shoring requirements;
- Excavation dewatering;
- Noise; and/or
- Restoration of surface improvements (pavement, driveways, sidewalks, fences, landscaping).

#### 4. Pipe Lining

Pipe lining is another method in which the existing pipe does not have to be removed. This procedure involves inserting a liner into the existing pipe, which renews the interior surface and can increase the structural capacity of the old pipeline. With pipe lining, the pipe will be repaired with no damage to the streets. There are two (2) basic types of lining options: thermoset (cure-in-place) liners or thermoplastic (fold-and-form) liners.

- Thermoset (cure-in-place) liners:

Thermoset liners are cloth-like fiber shells filled with thermosetting resin, usually polyester. Liner installation is a three-step process, beginning with “wetting out,” in which resin is applied to the inside of the fiber shell liner tube and forced to go deep within the cloth fibers. Then the liner is placed into the pipe via a manhole (after flow has been by-passed elsewhere). Next, the material is filled with water to invert the tube into the pipeline and curing begins. Curing the pipe involves heating the water used in the second step and circulating it in the pipe for a certain period of time (depending on the size of the repair).

When this step is complete, the liner is mechanically bonded to the interior of the existing pipe. The cured liner is very rigid and corrosion-resistant.

- Thermoplastic (fold-and-form) Liners

Thermoplastic polyvinyl chloride (PVC) or HDPE liners have been deformed to fit easily within an existing pipe. The liner is heated with hot water or steam to soften it and then is inserted into the sewer through a manhole. Once the liner is in place, heat and pressure are applied to mold the material to the pipe’s round shape. Once in place, the liner is then cooled to retain its shape, fitting snugly inside the pipe without adhering to the surface so they can be easily replaced if necessary.

Some of the advantages for pipe lining are:

- Trenchless;
- Strong;
- Cures fast;
- Reliable;
- Earth friendly;
- Long lasting;
- Easy to install;
- Cost competitive;
- Non-disruptive;
- Speed of installation; and
- Restores pipe integrity.

## 5. Point Repairs

Often, a sewer problem is limited to one or two areas, so point repairs are more economical than a total pipe replacement. Many point repairs do not require excavation, and the method (excavation and replacement of short segments, internal repair fittings, or chemical grouting) depends on the nature of the defect.

- Excavation and Replace

This requires excavating at the location for the point repair, removing the failed segment of pipe, then replacing the segment and reconnect using a flexible coupling or hard connection coupling. The repaired area is then stabilized with stone or concrete and the excavation is then backfilled.

- Mechanical Method

This method involves a sheet-metal sleeve that is placed over the repair area and expanded into place. The sleeve has locking tabs to prevent collapse once installed with the portion of the sleeve in contact with the pipe is often coated with a hydrophilic chemical to seal leaks.

- Cure-in-place Method

The cure-in-place method involves an ambient temperature-cured resin, much like the cure-in-place liners. A clamp is placed over the repair and expanded

into place with an air-filled bladder, which is left in place for a certain amount of time to allow the resin to cure.

- Chemical Grout

Chemical grout is usually made up of hydrophilic polymers that are injected into cracks and leaking joints. Specifically designed remote-control devices, called packers, force the grout into the crack or joint.

## B. MANHOLES

Manholes are a necessary part of the CITY's sewer collection system which allows for access so proper preventative and emergency maintenance can be provided. Manhole repairs are performed by entering the manhole and making the repairs or digging the manhole out to make the repairs.

Issues that require a dig out of the manhole:

- Total replacement;
- Manhole boot to pipe repair or replacement;
- Raise or lower manhole; and/or
- Repairs to frame and cover.

Issues that can be performed/repared by entering the manhole:

- Grouting;
- Invert repairs;
- Step repairs; and/or
- Leak repairs.

- End of Section -

## **Appendix F**

### **Standard Operating Procedures for Sewer Cleaning**



## **STANDARD OPERATING PROCEDURES FOR SEWER CLEANING**

### **Purpose**

The purpose of this Standard Operating Procedure is to ensure that sewer cleaning is performed in a manner that will produce a high quality work product. Quality is important because it ensures that the sanitary sewers will not experience problems prior to their next scheduled cleaning.

### **Goal**

The goal of cleaning a gravity sewer is to restore the flow area to 95% of the original flow area of the pipe.

#### ***Required Equipment and Tools***

1. Personal Protective Equipment (PPE) (hardhat, steel toe boots, gloves, eye/face protection, hearing protection)
2. Proper safety cones/barricades/flagging/signs or other traffic control devices
3. Sanitary sewer system map book
4. Combo (jet rodder/vacuum) truck
5. Sewer cleaning nozzles
6. Debris traps
7. Manhole hook or pick-axe
8. Measuring wheel
9. Disinfectant

#### ***Required Forms***

1. Work order
2. Hydraulic cleaning report form

### **Procedures for Sewer Cleaning Crew**

#### ***Prior to leaving the yard***

1. Plan the work so that it starts in the upstream portion of the area and moves downstream.
2. Whenever possible, plan to clean sewers from the downstream manhole.
3. Inspect the sewer cleaning equipment for wear. Replace nozzles that are excessively worn.

#### ***At the Jobsite***

1. Wear proper PPE.
2. Fill the water tank at or near the first jobsite.
3. Determine and confirm location of upstream and downstream manholes (use street addresses, if possible).
4. Look for any overhead utilities that may come into contact with the vacuum boom during the cleaning operation.

5. Set up proper traffic control and work zone by placing traffic signs, flags, cones, and other traffic control devices.
6. Move the cleaning unit into the traffic control/work zone so that the hose reel is positioned over the manhole.
7. Open the manhole and determine if it is safe to proceed with the cleaning operation.
8. Install the sewer cleaning nozzle or the hose.

### ***Cleaning Operation***

1. Initiate proper procedure to place hydro/vac truck in “work mode.”
2. Lower the hose, with a guide or roller to protect the hose, into the manhole and direct it into the sewer to be cleaned.
3. Start the high pressure pump and set the engine speed to provide adequate pressure for the sewer cleaning operation.
4. Open the water valve and allow the hose to proceed up the sewer. The hose speed should not exceed the manufacturers recommended speed.
5. If applicable, allow the hose to proceed 25% of the length of the sewer (or 50 feet minimum) and pull the hose back.
6. Observe the nature and the quantity of debris pulled back to the manhole.
7. If there is little or no debris, allow the hose to proceed to the upstream manhole.
8. If there is moderate to heavy debris, clean the remaining portion of the sewer in steps not to exceed 25% of the length of the sewer (or 50 feet minimum).
9. Open the upstream manhole and verify that the nozzle is at or past the manhole.
10. The sewer has been adequately cleaned when:
  - a. Successive passes with a cleaning nozzle do not produce any additional debris, and;
  - b. The sewer is able to pass for its entire length
11. Determine the nature and quantity of the debris removed during the cleaning operation.
12. Remove the debris from the manhole using the vacuum unit.
13. Rewind the hose on the reel.
14. Clean the mating surface and close the manhole. Ensure that the manhole is properly seated.
15. Enter the results in the Hydraulic Cleaning Report Form.
16. Move the cleaning unit, break down and stow the traffic controls.
17. Proceed to the next cleaning jobsite.

### ***At the end of the day***

1. Inspect the equipment and tools for problems.
2. Report any problems with equipment, tools, or sewers that were cleaned during the day to the supervisor.
3. Submit daily work reports, if any to the supervisor at the end of the shift.

## **STANDARD OPERATING PROCEDURE FOR CCTV OF SEWERS**

### **Purpose**

The purpose of this standard operating procedure is to ensure the proper and adequate inspection of Sanitary Sewer lines.

### **Goal**

The goal of CCTV inspection is to provide live camera footage of a Sanitary Sewer line.

#### ***Required equipment***

1. Television inspection equipment shall have an accurate footage counter that will display on the monitor and record the camera distance from the centerline of the starting manhole.
2. The camera shall be of the remotely operated pan / tilt type. The rotating camera and light head configuration shall have the capability of panning 360 degrees with pan and tilt capability of providing a full view of the pipe to ensure complete inspection of the mainline pipe and service laterals.
3. The camera, television monitor, and other components shall be color. To insure peak picture quality throughout all conditions encountered, the color camera shall be equipped with the necessary circuitry to allow for the remote adjustment of the optical focus iris from the power control unit at the viewing station. A variable intensity of the camera lights shall also be located at the viewing station.
4. Lighting and camera quality shall be suitable to allow a clear, in-focus picture for the entire periphery of pipelines extending at least ten (10) feet in front of the camera. In High Density Polyethylene (HDPE) or ductile iron poly-lined pipe, lighting should be sufficient enough to provide a clear view at least two (2) feet in front of the camera. The replay of the recorded video information shall be free of electrical interference and shall provide a clear stable image.
5. Camera quality shall be suitable to provide a full 360 degree view of the pipe during inspection.
6. The travel speed of the camera shall be variable but uniform and shall not exceed 30 feet per minute. Any means of propelling the camera through the sewer line which would produce non-uniform or jerky movement of the camera, will not be acceptable.
7. The television system shall be capable of performing line segment inspection in increments of at least 400 feet with one setup.
8. Service laterals shall be inspected utilizing a CCTV inspection push rod camera system, capable of inspecting up to one hundred (100) feet of pipe.

#### ***Required Forms***

1. CCTV inspection report form



## **Procedure for CCTV**

1. Prior to performing CCTV inspection activities, clean the sewer line(s) and service laterals designated to be televised thoroughly.
2. Just prior to performing the video inspection procedure, introduce water into the nearest upstream manhole until observed at the nearest downstream manhole. This will insure that any pipe segments with sags are easily identified during CCTV inspection.
3. Evacuate all debris from the pipeline and keep the pipeline clear of any debris during the CCTV inspection process
4. Main Line Inspection
  - a. Perform the inspection on all mainline sections from manhole to manhole
  - b. Should access to a particular sewer segment be difficult, and where adjacent segments require television inspection, the CCTV operator is allowed to complete the inspection of multiple sewer line segments with one setup. When multiple sewer line segments are inspected utilizing one setup, the CCTV operator shall zero the footage counter at each subsequent sewer manhole to establish a uniform starting point for each line segment televised.
  - c. Carefully inspect the interior of the pipe to determine the location and extent of all deficiencies.
  - d. At all service connections, the camera shall be stopped and the pan and tilt features shall be used to obtain a clear picture. At each service lateral, the camera shall be panned to view up each lateral or point of connection. Make note of any deficiencies through the use of Data Collection Software.
  - e. Prior to the beginning of each CCTV inspection, manhole identification numbers as indicated on the record drawings, shall become a part of the video record.
  - f. Stop the camera to view and analyze conditions that appear unusual or uncommon. The CCTV inspection technician shall, at all times, be able to move the camera through the lines in either direction without the loss of quality in the video presentation.
5. Service Lateral Inspection
  - a. Perform the inspection of all service laterals from property line cleanout to the mainline connection.
  - b. Prior to beginning each CCTV inspection, service addresses, as indicated on the record drawings, shall be added to the video record.

**Appendix G**

**Fence Permit Form**





# CITY OF GREENVILLE

Planning & Zoning Department

## FENCE PERMIT

Note: All Inspections must be called into the Planning Department: (662) 378-1548 or (662) 378-1557.

<b>FENCE ADDRESS:</b> _____	
<b>Project NAME:</b> _____ _____	<b>Property OWNER:</b> _____ <b>Mailing Address:</b> _____ _____
<b>Fence Co:</b> _____ <b>Telephone No.:</b> _____	<b>Contact Person:</b> _____ <b>Mailing Address:</b> _____ _____

### Nature of Work

New Sign/Replace \_\_\_\_\_ Addition \_\_\_\_\_ Alteration \_\_\_\_\_ Repair \_\_\_\_\_ Portable \_\_\_\_\_  
MS One Call # \_\_\_\_\_

### Fence Construction

Wood \_\_\_\_\_ Metal \_\_\_\_\_ Brick \_\_\_\_\_ Chain Link \_\_\_\_\_ Other \_\_\_\_\_

**Zone:** \_\_\_\_\_ **Size of Fence:** Length \_\_\_\_\_ (feet) Width \_\_\_\_\_ (feet) Height \_\_\_\_\_ (feet)

**PERMIT FEE:** \_\_\_\_\_ **ESTIMATED VALUE OF SIGN:** \_\_\_\_\_

**CERTIFICATION:** I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of laws and ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other State, City of Greenville, Washington County, or U. S. law regulating construction or the performance of construction nor does it nullify any private covenants, deed restrictions, or other restrictions running with the title to the property upon which construction is allowed. The undersigned understands that fences will not be permitted on City of Greenville property, including but not limited to all easements and rights of way; and the undersigned further agrees that any such fence will be removed at undersigned's expense.

Sketch in fence on lot

X \_\_\_\_\_  
Signature of Sign Contractor/Owner \_\_\_\_\_ Date \_\_\_\_\_

INSPECTION RECORD				
	DATE	INSP	REMARKS	

### FOR OFFICE USE

**PERMIT FEE:** \_\_\_\_\_

Approved By: \_\_\_\_\_

Date Permit Issued \_\_\_\_\_

Receipt # \_\_\_\_\_

Permit # \_\_\_\_\_

## **Appendix H**

### **Easement Information Form, Example Letter & Enforcement Notice**



## Easement Information Form

### Planning Department Greenville, Mississippi Legal Description

**CIRCLE ONE**    **House**       **Vacant House**       **Grass**       **Debris**       **Care of Premises**

**Address:** \_\_\_\_\_

**Legal Description:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Parcel Number:** \_\_\_\_\_

**Owner:** \_\_\_\_\_

**Owner's Address:** \_\_\_\_\_

\_\_\_\_\_

**Map Number:** \_\_\_\_\_

**Lot Size:** \_\_\_\_\_

**Zone:** \_\_\_\_\_ **Hometead: Yes or DBP:** \_\_\_\_\_

**Property Value:**    **L** \_\_\_\_\_ **I** \_\_\_\_\_ **T** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Contact Person Other Than Owner:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Phone Number:** \_\_\_\_\_

**\*\*\*\*Comments:** \_\_\_\_\_

\_\_\_\_\_



# Greenville

## Heart & Soul of the Delta

### Planning Department

340 Main Street Greenville, MS 38701  
Phone: (662) 378.1557 Fax: (662) 378.1536

July 25, 2018

John Q. Smith  
1234 Any Street  
Greenville, MS 38701

Tenant  
123 South Street  
Greenville, MS 38701

**RE: Care of Premises  
123 South Street  
Greenville, MS 38701**

Dear Mr. Smith and/or Tenant:

You are hereby notified and has been advised and believes that a parcel of land believe to be owned by you and located at the following: **123 South Street – Lot in SE ¼ of Section 12, Township 02, Range 1, Parcel #123400000** constitutes a menace to the community; said condition being caused by the following violations: **Care of Premises, Junk, Camper, Boat, Scrap Iron, Excessive Rubbish, Trash, Debris, etc.**

You are further notified pursuant of **Section 307.4 of the Greenville Housing Code** that you have **one (1) week** to remove all the above violations from said parcel of land. If you do not elect to do so yourself, this will cause a violation of the code, therefore legal proceedings will begin and/or citation(s) issued.

Improving the image of your property means greater pride in our community, enhancing the City's opportunity for economic development and providing a more attractive and healthier society in which to raise our precious children. We are asking for your cooperation in making Greenville a better place to live.

If you have any questions or comments, you may contact Mr. Daryl Richards, Code Enforcement Officer 662.378.1553. Thank you for your assistance in this matter.

Sincerely,

Mr. Daryl Richards  
Code Enforcement Officer

\_\_\_\_\_  
Owner Date

\_\_\_\_\_  
Tenant Date

cc: **Mrs. Carlon Williams  
Planning and Zoning Director**

## NOTICE

To: John Q. Smith  
1234 Any Street  
Greenville, MS 38703

You are hereby notified that the Properties Committee of the City of Greenville, Mississippi has been advised and believes that a parcel owned by you and located at 012 South Street – Lot 9, Block 1, Parcel #1234500000 is in such a state of uncleanness as to constitute a menace to the public health and safety of the community; said condition being caused by the following: Overgrown Grass, Weeds, Trash, Debris, etc.

You are further notified pursuant to Section 21-19-11, MCA, that on the 2nd day of May, 2018 at 1:30 p.m. a hearing will be conducted in the City Council Chambers located at City Hall, 340 Main Street, Greenville, Mississippi to make a determination as to whether or not said property remains in such a state of uncleanness as to be a menace to the public health and safety of the community. *An adjudication at the hearing with authorize the municipality to reenter the property for a period of one (1) year after final adjudication without any further hearing.* A recommendation will also be made to the Greenville City Council as to whether or not to proceed to have the property cleaned of all violations and/or lot cut and cleaned of all overgrown grass, weeds, trash and debris at your cost, if you do not elect to do so yourself.

The recommendation of the Properties Committee will be heard at a Special Greenville City Council meeting, as scheduled OR at the very next regular Greenville City Council meeting on May 15, 2018 at 4:00 p.m.

If desired, you may appear at the hearing to be conducted on May 2, 2018 at 1:30 p.m. If you have any questions, you may contact D'Andre Williams, Housing Inspector at (662) 378-1557.

This, the 16<sup>th</sup> day of April, 2018.

The Properties Committee of the  
City of Greenville

---

Carlton Williams, Planning Director

**Appendix I**

**Equipment List**





# Equipment Inventory

## Vehicles/ Heavy Equipment

1995 Case 580L Back-hoe  
2011 Vactor 2100 Combination Sewer Truck  
2 – 1 ton utility trucks with hydraulic crane  
2001 Caterpillar 322 Track-hoe  
2017 Bobcat Mini-excavator

## Communications Equipment

Portable radios  
Cell phones  
Loud speakers

## General Equipment

Traffic Control Equipment (Barrels, Channelizers, Type 3 Barricades, Signs, tripods)  
3 – 2" gas powered trash pumps with hoses  
2 – 4" gas powered trash pumps with hoses  
1 – root cutter attachment  
1 – digital sewer lateral camera system  
3 – 5,000 watt portable diesel generator, 110/210 volt  
1 – 10,000 watt multi-voltage diesel powered generator  
Portable lift station aeration system  
Gasoline powered cutoff saws  
2 – 4" diesel powered, vacuum assisted trailer mounted bypass pumps  
2 – 6" diesel powered, vacuum assisted trailer mounted bypass pumps  
1 – 12" diesel powered, vacuum assisted trailer mounted bypass pump  
600 linear feet of 4" Bauer pipe  
600 linear feet of 6" Bauer pipe  
600 linear feet of 12" Bauer pipe  
60 linear feet of 4" Bauer Rubber Suction Pipe  
60 linear feet of 6" Bauer Rubber Suction Pipe  
60 linear feet of 12" Bauer Rubber Suction Pipe  
60 linear feet of 4" Bauer Rubber Suction Pipe  
4" C-900 pvc pipe  
6" C-900 pvc pipe  
8" C-900 pvc pipe  
Size 1 starter  
Size 2 starter  
Size 5 starter

### Personal Protective Equipment

SCBA

Tripod

Winch

Respirators

Hardhats

Goggles and facemasks

First aid kits

Fire extinguishers

Multi-gas Meters for confined space

Tripod & harness for manhole entry

Electric manhole and lift station ventilation equipment

### Bulk Supplies

Gloves

Sand and sand bags

Absorbent pads and booms

Absorbent chemicals

Batteries

Fuel

HTH Chlorine

Hydrated Lime

### WWTP Supplies

UV Lamps and Fittings

### Miscellaneous Supplies

Fernco Fittings (4" to 15")

PVC Pipe (4" to 16") (40' of each)

Repair Fittings (3/4" to 16")

Relays

Fuses

Floats

### Southern Pipe Company

4" flanged gate valve

6" flanged gate valve

8" flanged gate valve

10" flanged gate valve

12" flanged gate valve

4" MJ gate valve

6" MJ gate valve

8" MJ gate valve

4" C-900 pvc pipe

6" C-900 pvc pipe

8" C-900 pvc pipe

12" C-900 pvc pipe

14" C-900 pvc pipe

16" C-900 pvc pipe

4" MJ couplings

6" MJ couplings

8" MJ couplings

12" MJ couplings

14" MJ couplings

16" MJ couplings

### Taylor Rental

Emergency diesel powered light towers