City of Memphis

Lift Station and Force Main Operations and Maintenance Program

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August 8, 2013

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.

Bobby D. Allen, P.E.	Date

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Section 1
Introduction

On September 20, 2012, the Consent Decree between the City of Memphis (Memphis or "City"), the United States, the State of Tennessee, and the Tennessee Clean Water Network was entered by the United States District Court for the Western District of Tennessee. Within the Consent Decree, a number of programs were set forth for the continued improvement of the City's wastewater collection and transmission system (WCTS), including the Lift Station and Force Main Operations and Maintenance (O&M) Program described herein. The Lift Station and Force Main O&M Program is intended to facilitate proper O&M activities associated with lift stations and force mains within the WCTS. The requirements for the Lift Station and Force Main O&M Program are described in section V.10.c of the Consent Decree.

This Lift Station and Force Main O&M Program is intended to address operating procedures, procedures for information management, and key performance indicators for lift stations and force mains. The program will be reviewed once every two years unless a more frequent review is determined to be necessary by the City, and the program may be modified based on changes in field operating conditions and industry standards.

1.1 Description of the System

The City of Memphis provides sanitary sewer collection and treatment services to most areas within the city limits. Memphis also receives wastewater generated from municipal satellite systems, including the Horn Lake Creek Basin Interceptor Sewer District (Mississippi), the City of Germantown, portions of the cities of Bartlett, Collierville, Lakeland, and Millington, and from unincorporated areas of Shelby County. The WCTS is a separate sanitary sewer system that serves a total area of 442 square miles, with 314 square miles within the City limits and 128 square miles within suburban areas. The WCTS is divided into six major sewer basins: Loosahatchie River, Wolf River, Front Street, President's Island, Nonconnah Creek, and Horn Lake Creek.

The sewer system in the Memphis service area is predominately gravity based and currently consists of approximately 2,400 miles of sewer lines, including gravity sewers and force mains, 85,000 manholes, and 102 lift stations. This excludes privately owned laterals or private collection systems, such as those lines within gated communities and apartment complexes; these sewers are neither owned nor maintained by Memphis and therefore are not covered by this Lift Station and Force Main O&M Program.

The Maynard C. Stiles WWTP, located near the confluence of the Mississippi and Wolf Rivers, serves the northern portion of the service area, including the Wolf River, Front Street, and Loosahatchie River sewer basins. This WWTP receives flow from two 96-inch diameter interceptors which generally follow the Loosahatchie and Wolf Rivers.

The T. E. Maxson WWTP, located near the confluence of McKellar Lake and the Mississippi River south of President's Island, serves the southern portion of the service area, including the Nonconnah Creek, Horn Lake Creek, and President's Island sewer basins. There are two main interceptors serving the T. E. Maxson WWTP. A 96-inch diameter sewer collects flow from the east, generally following Nonconnah

Creek. A second 90-inch diameter sewer serves the area to the south, including the Horn Lake Creek Basin Interceptor Sewer District in Mississippi.

Figure 1-1 is a schematic of the WCTS showing lift stations, treatment plants, and gravity sewers 15 inches in diameter and larger.

1.2 Consent Decree Requirements

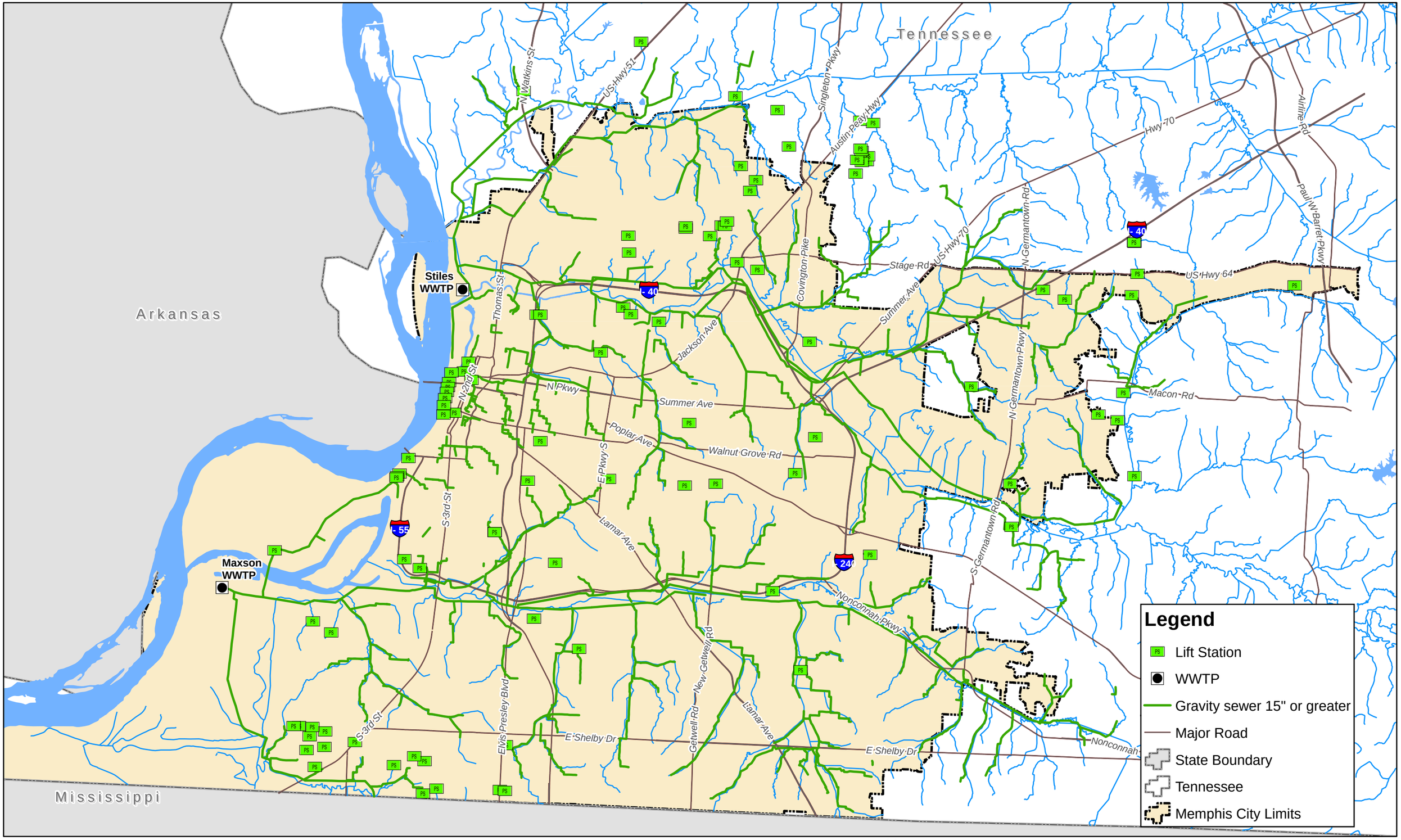
The Lift Station and Force Main O&M Program is intended to set forth protocols and procedures to facilitate proper O&M activities associated with lift stations and force mains. Requirements of the program are described in paragraphs V.10.c.(i) through V.10.c.(ix) in the Consent Decree and are summarized below:

- Identification of the means and modes of communication between lift stations, field crews, and supervising staff
- Technical specifications of each lift station
- A description of each lift station monitoring system
- Written preventive operations and maintenance schedules and procedures related to the inspection and operation of lift stations and force mains
- Written standard lift station and force main emergency/reactive operations and maintenance procedures.
- An inventory management system with information on critical equipment and spare parts
- A common information system that Memphis will use to track implementation of the Lift Station and Force Main O&M Program, track maintenance activities, and track management, operations, and maintenance performance indicators.
- Key Performance Indicators that will be tracked to measure performance of the WCTS through this Lift Station and Force Main O&M Program
- Reports which list equipment problems and the status of work orders generated during the prior month.

1.3 Related Consent Decree Requirements

The Lift Station and Force Main O&M Program is one of several components required under the Consent Decree related to the Management, Operation, and Maintenance (MOM) of the Memphis WCTS. These MOM programs include:

- Sewer Overflow Response Plan (SORP)
- Fats, Oils, and Grease (FOG) Management Program
- Lift Station and Force Main O&M Program
- Gravity Sewer O&M Program



CDM Smith

Figure 1-1
Sewer System Overview
Memphis, Tennessee

- Inter-Jurisdictional Agreement Program
- Continuing Sewer Assessment Program (CSAP)
- Infrastructure Rehabilitation Program (IRP)

The Lift Station and Force Main O&M Program focuses on activities to effectively operate and maintain lift stations and force mains within the system. These activities primarily center on operating and maintaining lift stations and force mains to minimize the occurrence of SSOs associated with those system components. This program is closely related to the other above-listed components, which together provide a framework for Memphis to effectively and efficiently manage, operate, and maintain the WCTS. Activities conducted through the Lift Station and Force Main O&M Program may be utilized to meet the CSAP target for assessment of approximately ten percent of the WCTS on average per year.

1.4 Organization of the Report

This Lift Station and Force Main O&M Program is organized into the following sections:

- **Section 1 – Introduction:** Provides background information, describes the existing system, and summarizes related Consent Decree requirements.
- **Section 2 – Definitions:** Provides definitions of commonly used terminology referenced in the document.
- **Section 3 – Resources:** Describes the resources available to support the Lift Station and Force Main O&M Program, including staffing, contractors, equipment, and critical spare parts.
- **Section 4 – Emergency / Reactive O&M Procedures:** Provides a general description of the activities performed by Memphis to address emergency operations and maintenance issues.
- **Section 5 – Lift Station O&M Procedures:** Describes the on-going, preventive activities utilized by Memphis to properly operate and maintain lift stations.
- **Section 6 – Force Main O&M Procedures:** Describes the on-going, preventive activities utilized by Memphis to properly operate and maintain force mains.
- **Section 7 – Reporting:** Describes the information tracking system and how that system is used to assess performance indicators.

Section 2
Definitions

This section is designed to help familiarize readers with common terms and acronyms used in this document.

Building Backup: A wastewater release or backup into a building or private property that is caused by blockages, flow conditions, or other malfunctions in the WCTS. A wastewater backup or release that is caused by blockages, flow conditions, or other malfunctions of a Private Lateral (as defined in the Consent Decree) is not a Building Backup.

Closed-circuit Television (CCTV): Technology by which Memphis and/or its outside contractors use a video camera to visually inspect the internal condition of pipes and sub-surface structures.

Continuing Sewer Assessment Program (CSAP): The Consent Decree deliverable that sets forth the procedures for assessing and analyzing the infrastructure of the WCTS, including the establishment of procedures for setting priorities and schedules.

Environmental Protection Agency (EPA): United States Environmental Protection Agency and any of its successor departments or agencies.

Fats, Oils, and Grease (FOG) Program: "FOG" refers to fats, oils and grease, which are generated by residents and businesses processing or serving food and other products. A FOG program aims to prevent FOG accumulation in sewer systems.

Force Mains: Any pipe that receives and conveys, under pressure, wastewater from the discharge side of a pump. A force main is intended to convey wastewater under pressure.

Geographic Information System (GIS): A system consisting of hardware, software, and data that is designed to capture, store, and analyze geographically-referenced information.

Gravity Sewer Line or Gravity Sewer: Pipes that receive, contain, and convey wastewater not normally under pressure but are intended to flow unassisted under the influence of gravity.

Gravity Sewer Operations and Maintenance (O&M) Program: The Consent Decree deliverable that sets forth the protocols and procedures associated with the gravity sewer system.

Inflow and Infiltration (I/I): The total quantity of water from inflow, infiltration, and rainfall-induced infiltration without distinguishing the source.

Infrastructure Rehabilitation Program (IRP): The Consent Decree deliverable that describes the basis for evaluating and prioritizing how Memphis will manage and respond to defects found in the WCTS.

Lift Station: A facility in the WCTS (not at the WWTPs) comprised of pumps which lift wastewater to a higher hydraulic elevation, including all related electrical, mechanical, and structural systems necessary to the operation of the lift station.

Lift Station and Force Main Operations and Maintenance (O&M) Program: The Consent Decree deliverable that sets forth the protocols and procedures associated with the operation and maintenance of lift stations and force mains.

Manhole or Junction Box: A structure which provides a connection point for gravity lines, private service laterals, or force mains, as well as an access point for maintenance and repair activities.

Memphis: The City of Memphis, Tennessee, Public Works Division, and any successor thereto.

Sanitary Sewer Overflow (SSO): An overflow, spill, or release of wastewater from the WCTS or WWTPs, including: (a) unpermitted discharges; (b) overflows, spills, or releases of wastewater that may not have reached waters of the United States or the State; and (c) all Building Backups.

Sewer Overflow Response Plan (SORP): The SORP provides structured guidance, including a range of field activities to choose from, for a generalized uniform response to overflows.

Supervisory Control and Data Acquisition (SCADA) System: A system of automated sensory control equipment that monitors the operation of a portion of the lift stations within the collection system. The SCADA system is designed to convey alarms when predetermined conditions occur. Monitoring parameters may include, but are not limited to, power failures, high wet well levels, and pump failures that could potentially cause overflows.

Tennessee Department of Environment and Conservation (TDEC): Tennessee Department of Environment and Conservation and any of its successor departments or agencies.

Unpermitted Discharge: A discharge of pollutants which reaches waters of the United States or the State from (a) the WCTS, (b) WWTPs through a point source not specified in a National Pollutant Discharge Elimination System (NPDES) Permit, or (c) WWTPs which constitutes a prohibited bypass except if the criteria set forth at 40 C.F.R. § 122.41(m)(2) or 40 C.F.R. § 122.41(m)(4)(i)(A) – (C) are met.

Wastewater Collection and Transmission System (WCTS): The municipal wastewater collection, retention, and transmission system including all pipes, force mains, gravity sewer lines, lift stations, pumps, manholes, and appurtenances thereto, which are owned or operated by the City of Memphis and service the City of Memphis and which flow to the Maynard C. Stiles and T. E. Maxson WWTPs.

Wastewater Treatment Plant (WWTP): Devices or systems used in the storage, treatment, recycling, and reclamation of municipal wastewater. For purposes of this document and the Consent Decree, this definition shall refer only to the following treatment facilities: the Maynard C. Stiles WWTP located at 2303 N. 2nd St., Memphis, Tennessee, and the T. E. Maxson WWTP located at 2685 Plant Road, Memphis, Tennessee, and all components of such sewage treatment plants but does not include the WCTS.

Waters of the State: Waters of the State shall have the same meaning as “Waters” defined at TCA § 69-3-103, whereby "Waters" means any and all water, public or private, on or beneath the surface of the ground, that are contained within, flow through, or border upon Tennessee or any portion thereof, except those bodies of water confined to and retained within the limits of private property in single ownership that do not combine or effect a junction with natural surface or underground waters.

Section 3
Resources

In order to effectively and efficiently maintain and operate lift stations and their associated force mains within the system, Memphis utilizes a combination of internal staff and contractual support, which are described in this section. This section also describes the equipment and spare parts inventory utilized as part of the Lift Station and Force Main O&M Program.

The resources described in this section are anticipated to be adequate for the operations and maintenance of lift stations and force mains. Memphis will continue to monitor resources and equipment as part of its biennial assessment as described in Section 1.

3.1 Public Works Organization

The Division of Public Works is a multifaceted organization with an organizational structure in place to provide operations and maintenance of the Wastewater Collection and Transmission System (WTCS), as well as the streets, storm water management and drainage, flood control, and solid waste systems of the City. An organizational chart of the current Wastewater Collection Systems Department is included in **Appendix A**. Also, for information purposes only so that the reader of this document has a better understanding of the organizational structure, job descriptions of key staff members are included in Appendix A. While this document recognizes that the specifics may change, the City expects to maintain an appropriate level of effort in implementing the Lift Station and Force Main O&M Program.

The Wastewater Collection Systems Department, which is responsible for compliance with the regulatory requirements of the City's NPDES permits and in addressing sanitary sewer overflows (SSOs), is directed on a day-to-day basis by the Administrator of Wastewater Collection Systems. The Administrator reports directly to the Administrator of Environmental Engineering, who oversees all services associated with the WCTS. The Administrator of Environmental Engineering reports directly to the Public Works Director, who oversees all activities within the Public Works Division for the City.

The Wastewater Collection Department includes professionals with backgrounds in engineering, wastewater operations and maintenance, administration, and communications. These individuals coordinate and communicate work and programs with other departments and divisions of the City government, including engineering, construction administration, wastewater treatment, and others to achieve the goals of the WCTS.

The Lift Station Bureau operates and maintains the wastewater lift stations located throughout the WCTS, including regular monitoring and maintenance of the pumping facilities. There are currently 102 lift stations within the WCTS, although the number of station may fluctuate as stations are added to the system or removed from service in conjunction with other improvements. The Lift Station Manager, who reports to the Administrator of Wastewater Collection Systems, is responsible for operations and maintenance of the lift stations. The Lift Station Manager is supported by three stationary engineers who are assigned to and responsible for a defined section of the City WCTS system (North, South, and East). Each stationary engineer is supported by a maintenance worker/helper who assists the engineer with tasks associated with lift station operation and maintenance. With the assistance of the maintenance workers/helpers, the stationary engineers are tasked with operations, maintenance, and upkeep of

stations and associated mechanical equipment used within and around the lift stations. They are responsible for conducting routine inspections and performing required maintenance and repairs at lift stations. They utilize the SCADA system and local station monitoring to verify operating conditions and make adjustments as necessary to manual controls or override automatic controls to regulate proper operations. The three crews implement maintenance activities, including preventive maintenance and ensure that records of maintenance and preventive maintenance are maintained and tracked.

The Environmental Maintenance Manager is responsible for overseeing the operations and maintenance of the City's force mains. The Environmental Maintenance Manager, who is the head of the Environmental Maintenance Bureau, reports directly to the Administrator of Wastewater Collection Systems. The Environmental Maintenance Bureau includes both the Stoppage/Inspection and Repair Bureaus. Currently seven shift supervisors, who report to the Environmental Maintenance Manager, are responsible for the day-to-day gravity sewer and force main maintenance program. The shift supervisors oversee personnel providing training, work direction, and assignments of work orders. Currently there are 113 full-time equivalent (FTE) positions in the City's organizational structure for the Stoppage/Inspection and Repair Bureaus of the Wastewater Collection Systems Department that maintain the WCTS and perform other maintenance / construction activities.

3.2 Contractual Support

In addition to in-house staff, Memphis has the ability to contract with specialty firms to assist with activities under the Lift Station and Force Main O&M Program. Contractors are used when City resources become stretched or when the necessary repairs are complex or involve expertise not available through internal staff. Contractor work is inspected by a representative of the City prior to acceptance.

Support contracts can generally be classified into one of three categories – emergency contracts, on-call contracts, and individual project contracts.

3.3 Equipment and Critical Spare Parts

The City maintains a significant inventory of equipment and critical spare parts to operate and maintain the WCTS. This includes equipment and critical spare parts necessary for emergency / reactive O&M activities, as well as preventative O&M activities. If the need for additional equipment or critical spare parts arises, the City has the option of renting the equipment, purchasing critical spare parts from a local vendor, or utilizing one of its existing maintenance contractors. The City stores its equipment and critical spare parts at the following locations: Environmental Maintenance Section facilities at 664 St. Jude Place, 1519 Levee Road, and Gayoso Lift Station at 35 Saffarans Avenue.

3.3.1 Equipment

A list of the equipment utilized for WCTS operation and maintenance is provided in **Appendix B**. The available equipment includes closed-circuit television (CCTV) inspection equipment, sewer cleaning equipment, trucks, backhoes, compressors, pumps, and other supplies. The City also has two large portable generators and two small portable generators that are used to supply temporary power to lift stations, if needed. Eleven portable, diesel-powered pumps of various capacities are also available for temporary use at lift stations, if needed.

3.3.2 Critical Spare Parts

In addition to the equipment, the City also maintains a supply of critical spare parts that may be needed to complete repairs on lift stations and their associated force mains. These include sections of pipe of

various sizes, pump spare parts, etc. The current list of critical spare parts is included in Appendix B. The inventory of critical spare parts is inspected quarterly to ensure that these parts are available to allow the City to quickly address required sewer repairs.

Any necessary equipment or critical spare parts that are needed to address lift station and force main O&M activities that are not kept by Memphis can be obtained from outside vendors, such as 48-inch diameter pipe. The Lift Station Bureau has ongoing relationships with vendors for all major manufacturers of lift station pumps in use within the system. The Bureau can initiate a request for parts or service from these vendors through phone requests, followed up by purchase orders or other documentation as needed to expedite the process. Requests of this type will be reviewed quarterly, at a minimum, to assess the need to keep additional spare parts or materials on-hand. A list of vendors currently used is also included in Appendix B.

Section 4

Emergency / Reactive O&M Procedures

In addition to preventive measures for lift stations and force mains which are discussed in Sections 5 and 6, respectively, the Lift Station and Force Main O&M Program includes emergency or reactive procedures. In many instances, emergency O&M activities are triggered by the observation of an SSO, but this may not always be the case. Situations determined by City staff to pose an immediate risk may be addressed as an emergency. For instance, a high level alarm at a lift station due to a pump failure may initiate the need for immediate action prior to the observation of an SSO.

This section describes basic emergency or reactive O&M procedures for lift stations and force mains, but it does not include specific information for mitigating the impacts of an SSO or SSO reporting. Measures taken by the City to respond to SSOs are described in the Sewer Overflow Response Plan (SORP), which has been approved by EPA and TDEC and is included as an appendix to the Consent Decree. When an SSO is observed, the procedures described in the SORP are followed. Emergency or reactive O&M activities that are not related to an SSO are documented through the City's lift station maintenance records or the work order system.

Unlike preventive measures, emergency O&M 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 the City staff:

- Cleaning including hydraulic cleaning / jet washing, vacuum debris removal (vactoring), manual debris removal, or root cutting
- Inspecting the WTCS to assess the extent of repairs required
- Establishing temporary bypass pumping or initiating pump and haul procedures to divert flows around the problem area
- Repairing the sewer through a point repair, open cut replacement, lining, or other means

If the required corrective actions cannot be handled with internal resources, the Wastewater Collection System Administrator or the Environmental Maintenance Manager will notify the appropriate on-call contractor to schedule and complete the corrective actions. If on-call contractors do not have the appropriate capabilities or cannot complete the work in a timely manner, the Wastewater Collection System Administrator or the Environmental Maintenance Manager may proceed with securing an emergency contract to complete the work.

In some cases, the City may not be able to immediately proceed with corrective actions if safety or access is a concern. For instance, if a force main break is observed within a stream, City crews may need to wait for stream flows to recede prior to initiating a repair. In other cases, the emergency work performed may provide a temporary solution during which time the situation can be further assessed to

determine if additional improvements are needed. These improvements may be addressed through increased levels of preventive O&M activities, such as more frequent inspections, or may ultimately result in more extensive work. Additionally, the locations of emergency O&M activities may be considered while selecting future areas to inspect under the CSAP.

4.1 Lift Station Emergency Procedures

Despite the City's efforts to provide continuous preventive maintenance to the City's lift stations, unanticipated system failures will occur. If a lift station failure that results in an SSO occurs, the procedures established for responding to an SSO, as described in the SORP, will be employed. Personnel from the Environmental Maintenance Bureau and the Lift Bureau will work together to assess and remedy conditions causing an SSO.

In the event of lost electrical power service to a lift station, the City will respond and evaluate the station condition. If the condition cannot be immediately rectified (such as resetting a breaker, or similar measure) the City will respond with temporary power or pumps until the condition can be repaired. Currently the City has two large portable generators, two small portable generators, and eleven portable diesel pumps available to provide temporary operation of the lift station. This is in addition to the two stations, 1525 Kimbrough and 2820 Harbor, that have stationary on-site emergency generators. The portable pumps can also be utilized in the event of pump failures. New lift stations and any station that undergoes significant modifications are equipped with a bypass tee to facilitate installation and use of these portable pumps. These resources have historically proven to be adequate to address emergencies associated with lift stations.

Response to lift station alarms, when not associated with an overflow, is described in Section 5.

4.2 Force Main Emergency Procedures

If a force main break occurs, the procedures established for responding to an SSO, as described in the SORP, will be employed. In addition to those procedures, response to a force main failure may include the following activities as deemed appropriate by City personnel:

- Shut down the lift station and store flows in the wet well and upstream collection system while monitoring critical upstream locations for signs of significant surcharging
- Transfer flows to a parallel force main, if available
- Complete emergency repairs using the stored or procured repair clamps and/or pipe sections
- Employ pump truck operations to remove wastewater from the wet well and dispose of the wastewater at an appropriate location
- Pump around the force main break with temporary piping to convey the flow until repairs are complete

Section 5

Lift Station O&M Procedures

In addition to emergency O&M procedures, on-going, preventive activities are utilized by Memphis to properly operate and maintain lift stations. These preventive maintenance activities include maintaining a lift station inventory, utilizing the Supervisory Control and Data Acquisition (SCADA) system to observe lift station operation, and performing routine inspections and preventive maintenance.

5.1 Lift Station Inventory and Technical Specifications

An inventory of the City's lift stations is maintained by the Lift Station Manager in a Microsoft Excel spreadsheet and updated as changes are made to any of the stations. A current copy of the inventory is included in **Appendix C** and sets forth the technical specifications of each lift station. The inventory includes the following information, when available, on each lift station:

- Station Name
- Location Information:
  - System section (N-North, S-South, E-East)
  - Street address
  - Zip code
- Associated Outfall Sheets/Map Book Page
- Inclusion in SCADA System
- Station Type (Flooded Suction, Suction Lift, or Submersible)
- Pump Information:
  - Number of pumps
  - Rated capacities
  - Pump horsepower
  - Pump manufacturer
  - Pump details or reference

5.2 SCADA Monitoring

As noted in the semi-annual report dated April 30, 2013 the City has completed all SCADA installations as required by the Consent Decree.

The SCADA system includes automated sensory control equipment that monitors the operation of lift stations and conveys alarms when predetermined conditions occur. Monitoring parameters include, but are not limited to, power failures, high wet well levels, and pump failures that could potentially cause operational issues or overflows. The City's SCADA equipment is supplied by Mission Communications. This system is a prepackaged, outsourced SCADA and Management Information System that integrates cellular data networks, redundant central database computer server facilities, web-based data viewing tools, and computer telephony to provide the Lift Station Bureau staff with an easy way to receive timely data and to quickly respond to alarm data.

SCADA alarm information is immediately transmitted to the lift station engineers in the event of a power failure, high wet well level, or other predetermined alarm settings. Additionally, the SCADA system has the ability to monitor and log the following, including reading, recording and maintaining records of information from the elapsed time meters and pump start counters:

- Pump run times
- Pump start/stop
- Power/phase failure
- Pump failure
- High wet well level
- Low wet well level
- Communication fault

The information can be reviewed and retrieved from any internet accessible device, such as a computer or smartphone, by all assigned employees when on-duty or during non-duty hours. Additionally, summary reports are generated by the SCADA system and emailed monthly to the Lift Station Manager. These reports summarize response time to alarms and assess run times for each pump relative to its long-term average run time. Example screen shots of the SCADA system and the operational assistance it provides are shown in **Appendix D**.

5.3 Monitoring Stations Not on SCADA

As discussed, the minor lift stations are not currently monitored nor required by the Consent Decree to be monitored through the SCADA system. The majority of these lift stations are very small, often serving only a few residences. Each of these stations is equipped with a visual alarm. These stations are visited on a monthly basis, and nearby residences have been informed to contact the City if they observe the alarm has been activated.

5.4 Lift Station Inspections

In addition to monitoring station performance through the SCADA system and alarm notifications, lift stations undergo three levels of inspections and maintenance, as described in the following subsections.

These include routine inspections, quarterly inspections, and annual inspections. Each level of inspection is intended to confirm that the equipment is operating properly and to address required maintenance activities. These inspections may be completed as separate visits to the lift station or may be combined into a single visit. For instance, the annual inspection may include activities and documentation associated with routine and quarterly inspections.

5.4.1 Routine Inspection and Maintenance

In addition to continuous monitoring by the SCADA system and alarm notifications, each lift station undergoes a routine inspection on a regular basis by one of the three lift station crews. The frequency of these inspection and maintenance activities is based on several factors including the pumping capacity of the facility, age of the facility, operating history, and whether the facility is on SCADA. Under normal operating conditions, stations with pump capacities greater than 1500 gallons per minute are typically inspected every two weeks and all other stations are inspected monthly. However, the frequency of routine inspections may be adjusted up or down by the Lift Station Manager following a review of recent maintenance issues or other field observations.

During each routine inspection and maintenance visit to a lift station, the field crew is responsible for performing basic maintenance activities and completing an inspection report. The inspection report captures observations made during the inspection and identifies potential additional maintenance activities needed. These reports are submitted to the Lift Station Manager who reviews each report, confirms that necessary maintenance is being addressed, and makes necessary adjustments to the inspection frequency. These reports are then scanned and filed electronically. The current lift station inspection report is provided as **Appendix E**; this report, which may be modified based upon the City's needs, can be supplemented with additional field notes or observations as deemed necessary by lift station personnel. In general, routine inspection and maintenance activities, following the example report, include the following:

- Visually inspect the station for vandalism or damage.
- Record pump run time hours for each pump.
- Run each pump by hand (manual control) to ensure pumps/motors are operating properly.
- Assess wet well to determine need for cleaning.
- Test panel lights and change as needed to ensure proper operation.
- Visually inspect emergency generator (if applicable) for fuel and start the generator to confirm its ability to operate properly.
- Place pump controls back in auto position prior to leaving station.
- Lock up station, including exterior power panels if required, prior to leaving.

Inasmuch as lift stations do not have pressure gages, system pressures are not checked. Additional routine inspection and maintenance activities may be identified for individual lift stations based on the observations and experience of the lift station crews. Any additional observations or activities completed are noted on the inspection report, as is the need to complete maintenance activities at the station.

5.4.2 Quarterly Inspection and Maintenance

Quarterly inspection and maintenance activities are completed at each lift station approximately once per quarter. As with routine inspections, during quarterly inspection and maintenance visits, the lift station field crew is responsible for performing maintenance activities, completing a more detailed inspection of the station, and identifying the need for additional maintenance activities at the station. Documentation of observations and activities completed are summarized in an inspection report. As with routine inspection reports, these reports are submitted to the Lift Station Manager who reviews reports and confirms that needed maintenance activities are being addressed. These reports are then scanned and filed electronically; hard copies of the reports are maintained for five years at the Lift Station Bureau. An example lift station inspection report is provided as Appendix E; this report may be supplemented with additional field notes or observations as deemed necessary by lift station personnel.

In most cases, routine inspection and maintenance activities will also be completed in conjunction with quarterly inspections. Additional activities associated with quarterly inspection and maintenance visits include the following:

- Open up wet well and visually inspect the pumping of each pump.
- Pump down the wet well to its lowest point. Hose down the wet well during the pump down process. Visually inspect the condition of the wet well.
- Clean grit and grease from the wet well using a vacuum truck, as needed.
- Check wet well floats for rag or grease build up and clean, as needed.
- Visually check pumps and piping for defects.
- Take amperage and vibration readings on each motor in the lift station. If the readings do not meet the manufacturer's specifications, it is an indication of potential issues with the motor or pumping systems, and the motor shall be evaluated further to determine if additional maintenance is required.
- If a generator is present at the station, confirm automatic generator operation by reviewing runtime meter or operate the generator, under load. . In the latter instance this test is to be conducted by tripping power to the station and observing a successful transfer to generator power. Emergency generators are to be operated per manufacturer’s requirements and in compliance with applicable operating permits.

Additional inspection and maintenance activities may be identified for individual lift stations based on the observations and experience of the lift station crews. Any additional observations or activities completed are noted on the inspection report, as is the need to complete maintenance at the station.

5.4.3 Annual Inspection and Maintenance

Annual inspection and maintenance activities are completed at each lift station approximately once per year. As with the other levels of inspection, during annual inspection and maintenance visits, the lift station field crew is responsible for performing a series of maintenance activities and identifying the need for additional maintenance activities at the station. Documentation of observations and activities completed are summarized in an inspection report. As with routine inspection reports, these reports are submitted to the Lift Station Manager who reviews reports and confirms that needed maintenance

activities are being addressed. These reports are then scanned and filed electronically; hard copies of the reports are maintained for five years at the Lift Station Bureau. An example lift station inspection report is provided as Appendix E; this report may be supplemented with additional field notes or observations as deemed necessary by lift station personnel.

In many cases, routine and quarterly inspection and maintenance activities will also be completed in conjunction with annual inspections. Additional activities associated with annual inspection and maintenance visits include the following:

- Pump out and clean the wet well to remove debris and grease build up.
- Inspect pumps and impellers to assure they are free of debris and in good operating condition.
- Assess operating set points (on/off) for pumps and resetting as necessary to improve system performance.
- Inspect valves and operate each valve fully in both directions to ensure proper working order.
- Inspect electrical motor control equipment to identify any potential issues, such as poor connections and worn parts. This inspection shall include appropriate scheduled panel maintenance.
- Inspect, service, and calibrate instrumentation, such as flow meters and SCADA instrumentation (level sensors, alarms, run time meters), to ensure reliable reporting of station operations.

In addition to these activities, additional activities may be identified based on manufacturer's recommendations or the observations and experience of the lift station crews. Any additional observations or activities completed are noted on the inspection report, as is the need to complete maintenance activities at the station.

Any additional analyses of a station's capacity and performance will be conducted, as described in the CSAP.

5.5 Lift Station Repairs

Internal crews are primarily used to complete minor repairs on lift stations, although contractor support may be utilized for specialty repairs or maintenance activities, such as instrumentation upgrades. Large or complex system repairs are typically handled as capital improvement projects and thus are outside of this program.

Section 6

Force Main O&M Procedures

In addition to O&M procedures associated with lift stations, on-going, preventive activities are utilized by Memphis to properly operate and maintain the system's force mains. The primary goals of this work are to ensure the system's existing hydraulic capacity is maintained, to identify structural defects that may require immediate attention, and to reduce overflows caused by structural failures.

These maintenance activities include cleaning and inspection of force mains, inspection of easements, and corrosion control activities. The majority of these activities follow similar procedures as used to maintain the gravity sewer system.

6.1 Force Main Inventory

Although the WTCS currently includes 102 lift stations, the majority of these lift stations have relatively short force mains associated with them; approximately half of the force mains are less than one quarter of a mile long. The City has only 39 miles of force mains. Information on the City's force mains is maintained by the Lift Station Manager as part of the lift station inventory. This inventory is periodically updated. A copy of the current inventory is included in Appendix C. The inventory includes the following information, where available, on each force main:

- Associated Lift Station
- System section (N-North, S-South, E-East)
- Associated Outfall Sheets/Map Book Page
- Force Main Size
- Length of Force Main

6.2 Force Main Cleaning

Force main cleaning activities are initiated if the performance of the associated lift station indicates potential excessive headloss in the force main. The systematic assessment of the lift stations and associated force mains is primarily conducted as part of the City's Continuing Sewer Assessment Program (CSAP).

6.3 Force Main Inspection Program

Another important component of the Lift Station and Force Main O&M Program is the inspection of force mains. Although condition assessment activities associated with force mains will primarily be conducted as part of the CSAP, routine or preventive maintenance activities include air release valve inspections, easement inspections, and a corrosion control program. These activities, when conducted as part of the Lift Station and Force Main O&M Program, are primarily conducted by internal resources.

6.3.1 Air Release Valve Inspections

Upon implementation, air release valves will be inspected every 2 years, except for lift stations listed below. Under this program, air release valves on the lift stations, as listed below, will initially be inspected and serviced annually. These stations have pump capacities greater than 1500 gallons per minute.

- Gayoso Sewer Pumps
- 1043 Wilson
- 1254 Big Orange
- 1399 Ridgeway
- 1490 Bellevue
- 1550 Kimbrough
- 2820 Harbor
- 386 Jack Carley (Meachem)
- 4239 South Mendenhall
- 5230 Raleigh Millington

The frequency of the inspection of air release valves may be adjusted by the Environmental Maintenance Manager following review of recent field observations.

During each air release valve inspection and servicing , the field crew inspecting the valves will be in contact with an operator at the associated lift station who will cycle the pumps and communicate their status to the inspector. Valves will be inspected to identify whether the valves are properly functioning, that they are free of leaks, that they are in serviceable condition, and that they are adequately protected from damage. Isolation valves that are used to shut off the air release valves will be operated at the time of the inspection to verify proper operation.

The volume of wastewater that may be discharge when an air release valve is flushed is dependent on the size and type of the valve; however, any discharges are captured for proper disposal.

The field crew is also responsible for completing an inspection report that captures observations made during the inspection and identifies additional maintenance needed. Photographs are taken to document any significant or unusual conditions observed. These reports are submitted to the Lift Station Manager who reviews each report, confirms that any needed maintenance is being addressed, and makes necessary adjustments to the air release valve inspection frequency. Records associated with air release valve inspections are maintained by the Environmental Maintenance Bureau.

If air release valves are determined to be inoperable or otherwise require replacement, this information is submitted to the Repair Bureau's Scheduler/Planner, who issues a work order through the Oracle-based work order system.

6.3.2 Easement Inspection and Maintenance

Force main easements will be inspected every two years. Many of the City's force mains are located along or within public street rights-of-way, where the area generally remains clear and accessible; however, some force mains are located in easements. In the ideal world, all easements would remain clear of any fences, buildings, trees, etc. to allow equipment access for maintenance of the collection system. The reality of the situation, however, is that over time permanent structures, fences, trees or vegetation may be built, grow, or otherwise encroach on the sewer easement and adversely impact access to the sewer system. The Consent Decree takes a practical approach and does not require the City to remove these objects, e.g., to assure that a portion of the sewer system is always accessible. If an SSO occurs that requires remediation, the City, however, may need to cut down trees or remove vegetation

to remediate the SSO. Notwithstanding the fact that the City is not liable to repair or replace any such items that are removed in the process of completing repairs or maintenance on the collection system, the crews, as a practical matter, are instructed to work with the property owner whenever possible to try and limit the impact on the property while maintaining the necessary access based upon the situation.

During easement inspections, special attention is paid to aerial or subsurface creek crossings and stream bank encroachment towards the sewer system. Surface conditions along the force main easement are also evaluated for significant tree growth along the sewer alignment that may damage the force main, for structures such as buildings or fences that may impede access to the force main, and observations of the ground surface that may indicate a break in the force main. These and similar observations are documented and reported to the Administrator of Wastewater Collection Systems and the Environmental Maintenance Manager who assesses the need for additional actions to ensure the integrity of the force main. If the observed conditions warrant a repair, a work request is completed for defects observed and submitted to the Repair Bureau, who then oversees the completion of the repair using internal resources or external contracts.

Easement inspection will include the assessment of the potential need to control vegetative growth or encroachment of man-made structures that could threaten the integrity of the affected portions of the WCTS. Information collected as part of that program will assess not only the need for immediate activities to facilitate access but will also set the frequency for future easement inspections in that area.

During easement inspections, the inspector will promptly report any observed SSO to their supervisor in accordance with the SORP.

6.3.3 Corrosion Control Approach

Based on historical observations of the City staff, force mains within the WCTS have typically not shown evidence of deterioration caused by hydrogen sulfide corrosion. To the extent feasible, force mains will be assessed for evidence of corrosion in conjunction with the inspection and servicing of air release valves. Additional force main inspections will be conducted as part of the CSAP. If significant evidence of corrosion is observed, the City will attempt to identify the potential causes of the corrosion, including the possibility that the observed corrosion is caused by an industrial discharge as opposed to hydrogen sulfide. Once the cause and extent of corrosion throughout the WCTS is evaluated, a summary report of findings of significant corrosion, including a recommendation of the preferred sulfide and corrosion control methods shall be prepared. These corrosion control methods may include lining systems, chemical addition to control hydrogen sulfide development, replacement of corroded system components with non-corrosive materials, adjustments to the operation of pump stations, etc.

The City also utilizes plastic-based, non-corrosive pipes, such as polyvinyl chloride (PVC), fiberglass reinforced polymer pipe (FRP), and high-density polyethylene (HDPE), for new sewer construction wherever possible.

6.4 Force Main Repairs

The City currently utilizes environmental maintenance crews, including contractor crews, to conduct force main repairs in response to reactive and preventive maintenance activities. These crews are outfitted with backhoes and related trenching and shoring equipment. Additional heavy equipment is available from other City departments. Repair crews typically operate five days per week but are available on nights and weekends on an emergency basis. In general, repairs on sewers up to 36 inches

in diameter can be completed by internal resources. However, large or complex system repairs are typically handled as capital improvement projects and thus are outside of this program.

Section 7
Reporting

In order to effectively track implementation of the Lift Station and Force Main O&M Program, the City utilizes two systems. Lift station inspections and maintenance documents are maintained by the Lift Station Bureau in hard copy and/or electronic formats. Inspection and maintenance activities associated with force mains are tracked through the Environmental Maintenance Section's Oracle-based work order system. Through querying these two systems, the City can track the key performance indicators established in the Consent Decree. Additionally, the City may compare information from the work order system against other pertinent information, such as the location of SSOs, for identification of portions of the WCTS that may require increased levels of O&M activities.

7.1 Lift Station Maintenance Tracking System

Lift station maintenance activities are tracked by the Lift Station Bureau. As lift station inspection and maintenance activities are completed by lift station crews, they are tracked through the reports described in Section 5. These reports are submitted to the Lift Station Manager who reviews reports, confirms that any needed maintenance activities are being addressed, and makes necessary adjustments to the inspection frequency. These reports are then scanned and filed electronically.

The Lift Station Manager is responsible for tracking any required maintenance activities until the associated work is successfully completed. Lift station inspection reports that indicate maintenance is required will be left open until the Lift Station Manager confirms that the work required has been completed.

7.2 Force Main Maintenance Tracking System

Maintenance activities associated with force mains are tracked by the Environmental Maintenance Section through the same Oracle-based system used to track gravity sewer maintenance activities.

This work order system allows work requests to be tracked and managed and is an integral part of this program. The maintenance tracking procedure related to an overflow response is discussed in the SORP. Work requests are logged by the Scheduler/Planner, are prioritized, and kept open until the work is completed. Among other items, these work order request can be issued for the following:

- Investigations to assess the causes of surcharging or overflows
- Emergency and preventive sewer cleaning
- Force main inspections
- Air release valve inspection, maintenance, and repair
- Force main point repair and replacement activities
- Asphalt and concrete repairs

Once the work request is entered, a work order is issued to a supervisor in the Stoppage Bureau or the Repair Bureau based on the work location and the type of work. Daily crew assignments are compiled by the supervisors. Upon job completion, the work order is returned to the Scheduler/Planner with pertinent information and the job closed out. Open work orders continue to be tracked by supervisors until the work is successfully completed. A monthly report summarizing work orders, actions taken, and the time to complete the work order is submitted for review to the Administrator of Wastewater Collection Systems and the Environmental Maintenance Manager. This monthly report will also include equipment problems observed.

Currently, work orders are tracked by address and map page. Work orders associated with force mains also include the name of the associated lift station. As the City's geographic information system (GIS) is developed, the feasibility of also tracking work order activities by pipe identification numbers will be evaluated.

Some information gathered through the Lift Station and Force Main O&M Program is maintained in hard-copy format at the Environmental Maintenance Section. This includes air release valve inspection data and easement inspection reports. As the City's GIS is developed and additional condition assessment information is collected through the CSAP, the City will look for opportunities to incorporate this information into a single system for consistent documentation and easier retrieval. The scope of the GIS program as required by the Consent Decree is set forth in Appendix J to the Consent Decree.

7.3 Key Performance Indicators

The following Key Performance Indicators (KPIs) will be used to measure performance of the lift station and force main systems:

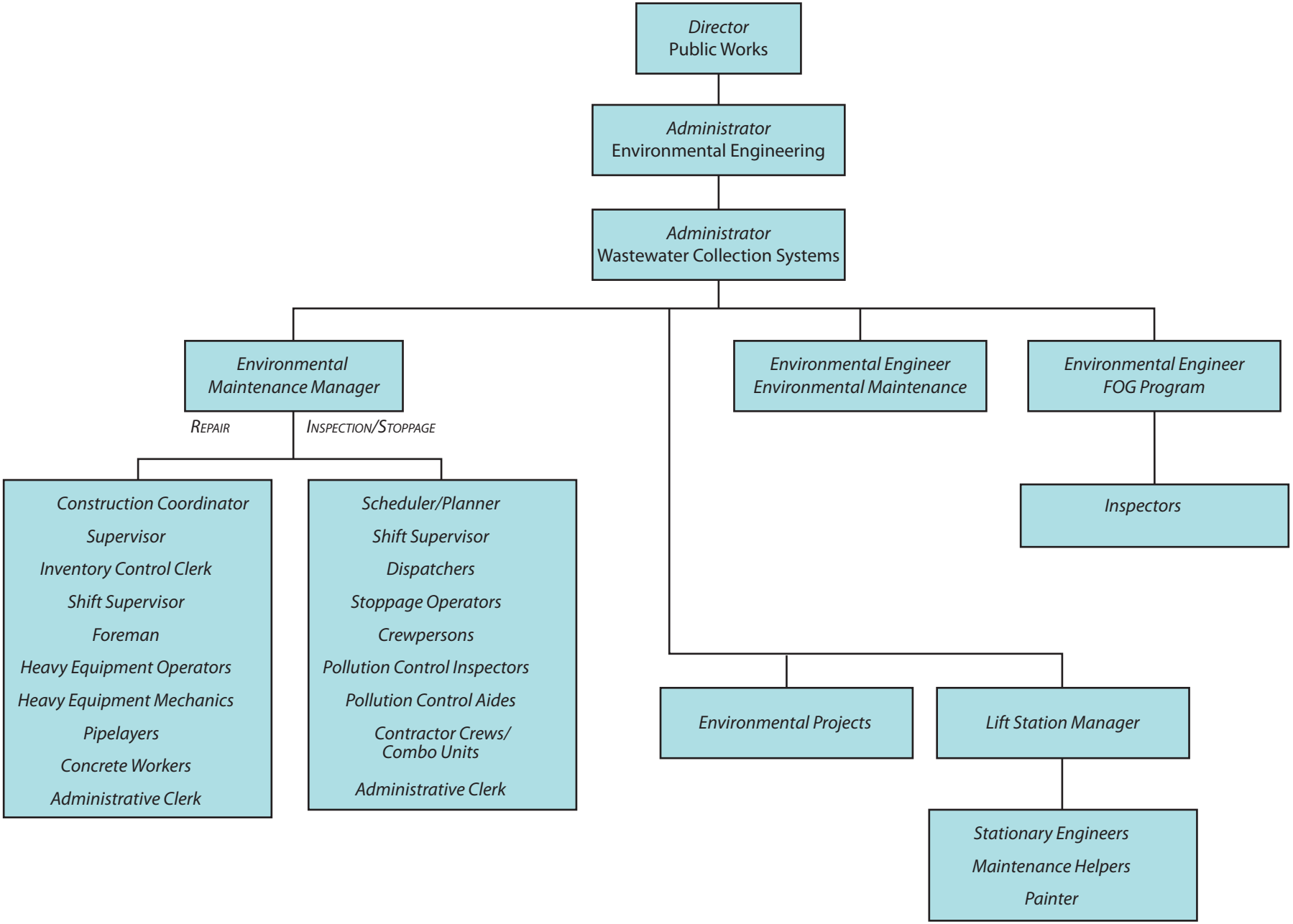
- Number of lift station-related SSOs
- Number of force main-related SSOs per mile of force main
- Number of unscheduled maintenance activities at lift stations

Maintenance activities will be tracked by type (emergency, corrective, and preventive) including work completed under the CSAP or other City programs.

Appendix A

Organization Chart

City of Memphis
Public Works Organizational Chart



JOB TITLE: Environmental Engineer
DIVISION: Public Works
SERVICE CTR: Environmental Mnt.(CMOM program)
FLSA: Exempt

JCC#: F052EV
DATE: 6/5/2002

ESSENTIAL JOB FUNCTIONS: Works under the direction of the Manager of Environmental Maintenance to manage and provide technical support for major programs and projects in Environmental Maintenance such as the Capacity, Management, Operation, and Maintenance (CMOM) program. Supervises and evaluates a staff responsible for inspecting and maintaining the City's sewer lines including ensuring compliance with all OSHA/safety program regulations and guidelines; and directs and reviews the work of outside contractors. Manages programs to maintain compliance with all Federal Environmental Protection Agency and State of Tennessee regulations and requirements. Interprets and analyzes field data and reviews plans; performs detailed engineering calculations; maintains related data and prepares reports required by the EPA and the State of Tennessee. Responds to inquires and communicates on a regular basis with professionals and the general public regarding sewer problems. Researches and employs new developments in engineering techniques, methods, and materials in the operation of the wastewater collection system. Prepares budget estimates, specifications, and monitors daily expenditures.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned.

TYPICAL PHYSICAL DEMANDS: Must be able to communicate clearly verbally and in writing with management, staff, and the public. Requires visual acuity to read pipeline schematics and inspect designated areas related to sanitary sewers, traversing uneven woods, weeded areas, and flood lands, and some lifting and carrying objects such as engineering equipment weighing up to 25 lbs. Requires the ability to operate general office equipment such as a personal computer and telephone and specialized engineering equipment. Requires frequent use of an automobile to make on-site inspections.

TYPICAL WORKING CONDITIONS: Work is performed in an office and at sewer construction/repair sites throughout the City including exposure to sewer fumes and gases and changing weather conditions and temperatures.

MINIMUM QUALIFICATIONS: Bachelor's degree in Civil Engineering and four (4) years experience in environmental engineering and enforcement programs with at least two (2) of the four (4) years in a supervisory/lead capacity; or any combination of experience and training which enables one to perform the essential job functions. Must possess a license to practice engineering in the State of Tennessee or a state that has reciprocity with Tennessee. Before the end of 24 months of employment must take and pass written examination for State of Tennessee Class II Wastewater Collection License as condition of continued employment. Must possess a valid Tennessee driver's license.

****

Eric J. Johnson 6/5/02
WRITTEN BY: DATE:

Clifford L. Smith 6/6/02
EEO REVIEW: DATE:

REVIEWED FOR ADA: RJB
6-6-02

6/12/02
DIVISION APPROVAL: DATE:

NOTICE OF JOB OPENINGS

EMPLOYMENT SERVICE CENTER

CITY OF MEMPHIS

SEPTEMBER 22, 1993

Applications will be accepted from 8:00 A.M. until 5:00 P.M. in the Employment Office, Room 1B-33, City Hall, 125 North Main until OCTOBER 01, 1993

THE CITY CHARTER REQUIRES THAT CITY EMPLOYEES MUST ESTABLISH RESIDENCE WITHIN SHELBY COUNTY, TENNESSEE WITHIN SIX (6) MONTHS FROM DATE OF EMPLOYMENT.

** THIS POSITION IS PROMOTIONAL ONLY **

POSITION: **ADMINSTRATOR - WASTE COLLECTION FACILITIES** - (1 Opening)
Public Works/Environmental/Administration - J.O. #93-151 - GRADE 00

ESSENTIAL JOB FUNCTIONS: Works under the general direction of an assigned supervisor. Plans, coordinates, and directs activities concerned with maintenance and inspection of the physical sewer system, flood control, operation and maintenance of sewer lift stations, and storm water management: Analyzes trends, such as population and industrial growth of area being served to determine adequacy of current facilities and to project demands for future facilities; develops plans to meet expanded demands and requests engineering staff to design and prepare specifications for extended facilities and capacity; directs activities of designated employees who oversee water and sewage facilities; seeks consultants to perform special studies for the department, reviews bids, and makes recommendation for selection; confers with consultants and management personnel to discuss alternatives and to choose most suitable plan on basis of efficiency and cost-effectiveness; communicates with regulatory agencies to resolve any problems and to coordinate projects; inspects field projects to confirm conformance to specifications and government regulations; researches and evaluates new developments in materials, tools, and equipment and recommends or denies purchase; prepares various reports including monthly EPA report; and prepares department budget.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned from time to time.

TYPICAL PHYSICAL DEMANDS: Requires ability to inspect work area which may involve walking, sometimes across ditches, along river banks, or in wooded areas. Requires ability to communicate with staff, management, public government agencies, consultants, private contractors, and other City officials.

TYPICAL WORKING CONDITIONS: Work is performed in an office environment and outdoors to inspect field projects and to demonstrate new products.

MINIMUM QUALIFICATIONS: A Bachelor's Degree in Environmental Engineering, Civil Engineering, or related engineering degree, and five (5) years administrative experience in the field of wastewater treatment and/or collection; or any combination of training and experience which enables one to perform the essential job functions. Must possess a valid Tennessee Driver's License. **PROOF OF EDUCATION REQUIRED. (PHOTOCOPY OF LICENSE MUST BE ATTACHED TO APPLICATION).**

SPECIAL REQUIREMENTS: Must possess a current valid State of Tennessee Class II Wastewater Collection License or be able to obtain before the end of 24 months of employment as an Administrator of Waste Collection Facilities.

EQUAL OPPORTUNITY EMPLOYER

JOB TITLE: Manager - Environmental Mnt.
DIVISION: Public Works
BUREAU: Environmental Mnt.
FLSA: Exempt

JCC#: F101EN
DATE: 04-13-93

ESSENTIAL JOB FUNCTIONS: Works under the direction of the Administrator of Collection System. Directs and coordinates, through subordinate supervisory personnel, activities of workers engaged in repair and maintenance of the City's sanitary sewer system: Reviews and analyzes reports and records and confers with supervisory personnel to obtain data required for planning department activities and to address future needs; gives work direction, resolves problems such as disgruntled property owners, and sets deadlines necessary to meet work objectives; evaluates current procedures and practices and develops and implements alternate methods to improve operations; researches and evaluates new developments in material, tools, and equipment to recommend or deny purchase; reviews new land development projects to evaluate additions and modifications to sewer system; coordinates department activities with inter-related activities of other City departments and representatives of utilities to insure optimum efficiency; prepares various reports for Management, State and EPA; prepares and monitors budget; prepares bid specifications and contracts necessary to requisition tools, equipment, and supplies; inspects work sites to evaluate work requirements; and directs clerical personnel in typing reports and record keeping activities.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned from time to time.

TYPICAL PHYSICAL DEMANDS: Requires ability to inspect work area which may involve walking in wooded and river swamp areas, climbing, and stooping. Requires ability to communicate with staff, public, utility representatives, other City departments managers, etc.

TYPICAL WORKING CONDITIONS: Majority of work is performed in an office environment but outdoor work is required to inspect work site, new development sites, and to meet with the public.

MINIMUM QUALIFICATIONS: High school graduate with eight (8) years experience in the maintenance and repair of sanitary sewer lines with five (5) of the eight years in a supervisory capacity; or any combination of experience and training which enables one to perform essential job functions.

SPECIAL REQUIREMENTS: Must possess a current valid State of Tennessee Wastewater Collection License and a valid Tennessee Driver's License.

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Mary Dennison
WRITTEN BY:

4-26-93
DATE:

Tom Miles
EEO REVIEW:

4-26-93
DATE:

REVIEWED FOR ADA: RHG 4/28/93

CITY OF MEMPHIS

MARCH 01, 2006

EQUAL OPPORTUNITY EMPLOYER

Applications will be accepted from 8:00 A.M. until 5:00 P.M. in the Employment Office, Room 1B-33, City Hall, 125 North Main until MARCH 10, 2006
or visit our **Satellite Office at 4225 Riverdale**
For a complete listing of job openings please visit web site at www.memphistn.gov

THE CITY CHARTER REQUIRES THAT CITY EMPLOYEES MUST ESTABLISH RESIDENCE WITHIN THE MEMPHIS CITY LIMITS WITHIN SIX (6) MONTHS FROM DATE OF EMPLOYMENT

POSITION: SHIFT SUPERVISOR/PUBLIC WORKS - (1 Opening) **MINIMUM SALARY: $4,710.41 Mo**
Public Works/Environmental Maintenance - **J.O. #06-014** GRADE 12 SM1

ESSENTIAL JOB FUNCTIONS: Works under the general supervision of the Supervisor of Environmental Maintenance. Directs and coordinates through subordinate personnel activities of workers engaged in the maintenance, repair, and/or replacement of the City's sanitary sewer lines, connections, and manholes: oversees personnel providing training, work direction, and evaluation of work performance; evaluates work demands and makes daily assignments; adjusts work schedules to meet work demands and shortage of staff; makes field inspections to review work and to evaluate work requirements such as type of equipment needed; inspects equipment daily, substitutes equipment needing repairs and prepares work order for maintenance required; completes daily activity reports; interprets personnel policies and contract memorandums and conveys to workers; takes disciplinary action according to established practices; confers with workers' representatives to attempt to resolve grievances; and investigates and resolves citizen complaints and requests.

OTHER FUNCTIONS:
1. Performs additional functions (essential or otherwise) which may be assigned.

TYPICAL PHYSICAL DEMANDS: Requires ability to inspect work area which may involve walking in wooded and river swamp areas, climbing, and stooping. Requires ability to communicate with staff, management, public, Health Department officials and other City department supervisors.

TYPICAL WORKING CONDITIONS: Majority of work is performed outdoors to inspect work activities, to evaluate work requirements, and to respond to problem situations. Twenty-four hour, seven-day week operation. Must work assigned shift.

MINIMUM QUALIFICATIONS: High school graduate and six (6) years experience in sewer line maintenance with one (1) of the six (6) years in a supervisory/lead capacity; or any combination of training and experience which enables one to perform essential job functions. Must be on call 24 hours a day for emergencies and possess a valid Tennessee Driver's License. **(PROOF OF DRIVER'S LICENSE REQUIRED)**

JOB TITLE:	Stoppage Operator/Sewer	**JCC#:**	F556SO
DIVISION:	Public Works	**DATE:**	12/16/98
SERVICE CTR:	Environmental Inspection		
FLSA:	Non-exempt		

ESSENTIAL JOB FUNCTIONS: Works under the general supervision of a Zone Supervisor to maintain sewer lines through clearing and removing stoppages, obstructions, or restrictions: inspects sewer lines and manholes and performs dye tests/smoke tests, if necessary, to locate the stoppage; drives and operates sewer cleaning equipment such as a flusher, vactor, power rodder, drag machine, etc. to clear the stoppage and applies chemical solvents to aid in clearing the obstruction; enters confined spaces to remove debris from manholes; cleans and disinfects areas such as basements and yards flooded as a result of sewer stoppages; performs routine washing of sewer lines, manholes, and siphons; and directs the tasks of a Semi-skilled Crewperson assigned to assist in these duties. Reports the location of the problem, action taken, and current job status to a dispatcher or supervisor using a mobile radio. Prepares a daily summary report on all activities performed and documents any special job site conditions. Performs light preventative maintenance of vehicles and equipment such as fluid levels, pre-trip inspections, filters, etc.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned.

TYPICAL PHYSICAL DEMANDS: Must be able to communicate clearly both verbally and in writing. Requires the ability to traverse uneven ground, lift and carry objects such as tools and power equipment weighing up to 50 lbs., and maneuver including stooping, bending, reaching (including above head), pushing, pulling, and climbing into and out of manholes. Requires the ability to drive and operate specialized sewer equipment such as a wash truck and power rodder.

TYPICAL WORKING CONDITIONS: Majority of work is performed in an outdoor environment. Performing job requires exposure to sewage fumes and odors, insects, weeds and poisonous plants, emulsifiers, bacteria, insecticides, sewer solvents, traffic, noise, heat and all types of weather conditions. Must be able to enter confined spaces such as a manhole/sewer line. Requires some contact with the general public.

MINIMUM QUALIFICATIONS: High School graduate and two (2) years experience in sewer line maintenance; or any combination of experience and training which enables one to perform the essential job functions. Must have a valid class "B"Tennessee driver's license with endorsement (C or N) for tanks 1,000 gallons or greater. Must comply with Federal Department of Transportation (DOT) Alcohol and Drug testing rules.

****

Eric N. Sabatino 12/16/98
WRITTEN BY: DATE:

Tom Miles 12/17/98
EEO REVIEW: DATE:

REVIEWED FOR ADA: RCB 12-16-98

12/21/98
DIVISION APPROVAL: DATE:

JOB TITLE: Scheduler-Planner
DIVISION: Public Works
SERV. CENTER: Environmental
FLSA: Exempt

JCC#: [illegible]
REVISED DATE: 5/6/1993

ESSENTIAL JOB FUNCTIONS: Works under the supervision of the Manager of Environmental: Responsible for scheduling work crews to handle sewer repairs and/or sewer stoppages; and directs the work activities of designated staff; receives calls or complaints regarding sewer repairs, and obtains information from dispatchers on sewer stoppages; transfers information to complaint cards and enters detailed data into the computer; runs reports daily to analyze data by using specialized software to determine which repairs should be made priority; reassigns crews to handle emergency repairs; monitors status of repairs to ensure problems are corrected. Provides information or requests MLGW, telephone or cable companies to locate cable/lines; informs private contractors and plumbers of the location of sewer lines, pulls sewer maps or documents, and determines appropriate location by accurately calculating dimensions of sewer location. May occasionally go to job sites to locate sewer lines. Prepares special reports, regarding sewer repairs and maintenance, for administrative personnel in City and County departments, the State, and the EPA agency; maintains maps on sewer line locations. Interacts with the Mayor's Citizen Service Center regarding complaints received, and the City Attorney's office regarding claims filed due to sewer damages. Maintains files and utilizes data to schedule preventive maintenance for sewer systems.

OTHER FUNCTIONS:

1. Acts as supervisor in his/her absence to supervise daily work operations of other areas.
2. Performs additional functions (essential or otherwise) which may be assigned from time to time.

YPICAL PHYSICAL DEMANDS: Requires the use of equipment, such as computer terminal, specialized software programs, radio transmitters, and telephones. Requires the ability to exercise independent judgment in assigning work crews to handle repairs. Involves constant contact with crews and staff to provide information or to reassign crews. Requires the ability to communicate with the public on sewer repair requests or complaints, plus utilities, private contractors, and plumbers regarding sewer repairs where tactfulness and persuasiveness is required. May occasionally operate sewer locator tools when locating sewer lines.

TYPICAL WORKING CONDITIONS: Work is performed in an office environment, and may occasionally be required to visit work sites to locate sewer lines.

MINIMUM QUALIFICATIONS: High School education and six years experience in planning and scheduling job projects, recordkeeping, and dealing with the public with two of the six years experience in working with computers preferred, or any combination of experience and training which enables one to perform the essential job functions.

Rhonda H. Gillespie / RZB
Written By:

5-7-93
Date:

[illegible]
O Review:

5-7-93
Date:

REVIEWED FOR ADA RZB

JOB TITLE: Dispatcher
DIVISION: Public Works
SERVICE CENTER: Environmental Inspection
FLSA: Non-exempt

JCC#: F264DP
DATE: 12-8-93

ESSENTIAL JOB FUNCTIONS: Works under the general supervision of an assigned supervisor in the Environmental Inspection area of the Public Works Division. Receives and processes citizen complaints and requests regarding sewer maintenance needs: Answers telephone and obtains necessary information; relays information to crew assigned to area in which problem occurs, using two-way radio; inputs and retrieves complaint/request information such as time, location, nature of call and action taken, maintains follow up status, and generates reports based on data; and refers non-sewer maintenance calls to appropriate department or agency.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned from time to time.

TYPICAL PHYSICAL DEMANDS: Requires the ability to operate personal computer, telephone and two-way radio. Must be able to communicate with the public and staff.

TYPICAL WORKING CONDITIONS: Work is performed in an office environment and involves contact with citizens and staff.

MINIMUM QUALIFICATIONS: High school graduation and four (4) years clerical experience; or any combination of experience and training which enables one to perform the essential job functions. One (1) year experience and/or education in operating personal computers with some experience in operating two-way radio preferred.

****

Mary Dennison
WRITTEN BY: 12-9-93
DATE:

EEO REVIEW: 12-9-93
DATE:

REVIEWED FOR ADA: RZB 12/9/93

JOB TITLE:	Sewer Lift Stations Maintenance Manager	JCC#:	F102LS
DIVISION:	Public Works	DATE:	04-22-98
SERVICE CTR:	Lift Stations		
FLSA:	Exempt		

ESSENTIAL JOB FUNCTIONS: Works under the direction of the Administrator of Wastewater Collection Systems. Plans and directs the maintenance of Flood Control Pumping Stations and Sewer Lift Stations. Trains, directs, and evaluates the performance of maintenance personnel in adherence to following proper operation and maintenance procedures; develops and implements maintenance procedures, including a preventive maintenance program; inspects pump stations and equipment for malfunctions and needed repairs; oversees the installation and testing of new or rebuilt equipment and the inspection of contracted maintenance work; ensures that proper records of maintenance, preventative maintenance and equipment manuals, etc. are maintained; prepares contracts, evaluates bids, and prepares the budget for flood control and sewer lift maintenance; and coordinates maintenance work with the operating personnel. Utilizes various PC programs to generate reports, inventory lists, and correspondence..

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned from time to time.

TYPICAL PHYSICAL DEMANDS: Requires the ability to operate a personal computer. Requires the ability to perform routine inspections of the facilities which involves climbing/descending on ladders. May have to assist with manual labor during emergency situations. Requires the ability to operate an automobile to drive to various City facilities for inspections and offices for meetings.

TYPICAL WORKING CONDITIONS: Majority of work is performed in an office environment, but must make inspections of facility which requires being outdoors. May be exposed to various weather conditions, fumes, odors, dust, and noise. May be required to be on-call, twenty-four (24) hours a day, seven (7) days a week for emergencies.

MINIMUM QUALIFICATIONS: High school diploma and seven (7) years experience in the field of mechanical engineering with three (3) of the seven (7) years in a supervisory capacity; or any combination of experience or training which enables one to perform the essential job functions. Must have a valid Tennessee driver's license.

SPECIAL REQUIREMENTS: Must successfully pass written examination and obtain State of Tennessee Wastewater Collection License (grade II) within twenty-four (24) months of employment as a condition of continued employment.

****

Denise Nelson 4-23-98
WRITTEN BY: DATE:

Tom [illegible] 5/7/98
EEO REVIEW: DATE:

REVIEWED FOR ADA: RRB 4-23-98

[illegible] 5/6/98
DIVISION APPROVAL: DATE:

JCC#: F551SE
DATE: 1-29-93

JOB TITLE: Stationary Engineer
DIVISION: Public Works
BUREAU:
FLSA: Non-exempt

JOB SUMMARY: Works under the direction of an assigned supervisor at the pumping stations in the Public Works Division. Performs more complex task in operating, maintaining, and repairing stationary and mechanical equipment used in and around a flood control pumping station and sewer lift station: Reads and monitors meters and gages to verify operating conditions; adjusts manual controls or overrides automatic controls to regulate equipment according to water levels and prescribed operating ranges; directs crew in the technical maintenance and repair of equipment such as air compressors, pumps, motors, valves, fork lifts, etc.; fabricates equipment and parts using a variety of welding equipment; inspects equipment to detect malfunctions and to perform preventative maintenance; examines and repairs flood walls and levees by repairing and rebuilding broken and weakened sections; and interprets blueprints and operation manuals to determine location, size and type of parts. Operates with appreciable latitude for unreviewed action or decision.

OTHER FUNCTIONS:

1. Performs additional functions (essential or otherwise) which may be assigned from time to time.

TYPICAL PHYSICAL DEMANDS: Must be able to read blueprints and manufacturer's manuals. Requires visual and physical inspections of mechanical systems, and have ability to detect unusual characteristics. Requires walking and the ability to climb ladders and stairs. Requires heavy lifting (approx. 100 lbs.), stooping, balancing, crouching and reaching.

TYPICAL WORKING CONDITIONS: Majority of work is performed in a machine shop environment. Some work is performed outdoors. May be exposed to dust, noise, high voltages, confined spaces, and hot and cold temperatures.

MINIMUM QUALIFICATIONS: High school graduate or equivalent and five (5) years experience in industrial plant maintenance or similar work; or any combination of experience and training which enables one to perform job functions. Some supervisory experience preferred.

****

Mary Dennison
WRITTEN BY:

1-29-93
DATE:

EEO REVIEW

1-29-93
DATE:

REVIEWED FOR ADA 1/29/93

Appendix B

List of Available Equipment, Critical Spare Parts, and Vendors

Lift Station
List of Critical Spare Parts

ITEM GROUP	ITEMS IN INVENTORY
SEALS	1-7/8"; 3"; 2-1/8" - Seal parts - Springs; Locks; Bellows - Rotating face; StationaryFace; 1-1/4"; oil
CAPACITORS	Start & Run
RELAYS	8 pin; 11 pin; 12 volt; 24 volt; 115 volt; 120 volt; 240 volt; Time delays; control; Devar; Pneumatic timer
FUSES	Blade; Mini; Fuse_inks
VALUES	Check; Ball; Gate; Float_switch
CLAMPS	Cable; Hose; Electrical
FITTINGS	Pipe; Air; Hose; PVC; Dresser; Brass; Barb
BEARINGS	Ball; Sealed; Seals
BREAKERS	Circuit
TRANSFORMERS	Control; Electrical
MOTORS	Electric; Fan; Cooling
PUMPS	Sump; Vacuum_pumps; Vacuum pump repair kits; Pump controls

Lift Station
List of Major Equipment

Item	Purpose
6" Pump	Lift for Sewage Bypass
6" Pump	Lift for Sewage Bypass
8" Pump	Trash (H&E)
8" Pump	Trash (H&E)
6" Pump	Dry Prime Hartland
6" Pump	Dry Prime Hartland
6" Pump	Hydraulic
8" Pump	Dry PrimeThompson
Riding Mowers	Zero Turn (4 Each)
12" Pump	Dry Prime (4 Each)
6" Pumps	Hydraulic
1.5 MW Trailer Mounted Generator	Portable Generator
1.5 MW Trailer Mounted Generator	Portable Generator
125 KW Trailer Mounted Generator	Portable Generator
125 KW Trailer Mounted Generator	Portable Generator

Lift Station
List of Vendors

Superior Industrial Supply
2675 Whitman Ave.
901-327-0450
Lay flat pipe, seals, pipe fittings, floats, valves, hand tools, power tools, industrial supplies

Dabney-Hoover Supply Co.
1950 Latham St.
901-523-8061
Sump pumps, valves, hose fittings, hand tools, power tools, industrial supplies

Meter Service & Supply
598 E. Brooks Rd.
901-332-4942
Valves, flanges, pipe

Central Pipe Supply Inc.
3998 Runway Rd.
901-365-1260
PVC pipe, flanges, PVC fittings

Grainger Industrial Supply
1901 Nonconnah Blvd.
901-396-9740
Compressors, contacts, relays, electric motors, dehumidifiers, vacuum pumps, pressure controls, industrial supplies, capacitors, heaters

Van Brocklin & Associates Inc.
5978 Knight Arnold
901-795-6611
Electro bowls, valves, check valves, pump controls, Smith & Loveless Pumps & parts

Lucky Electric
325 E. GE Patterson
901-525-6990
Wire, starters, breakers, electrical parts, fuses, capacitors

Memphis Bearing & Supply Co.
69 W. EH Crump Blvd.
901-948-2969
Seals, bearings

Memphis Chain & Cable
581 Pear Ave.
901-524-1100
Chain, cable, straps, clamps, clevis

Trench Safety and Supply, Inc.
3000 Ferrell Park Cove
901-346-5800
Large plug rental

Johnstone Supply
3078 Broad Ave.
901-324-1111
Capacitors, HVAC parts

Gravity Sewer and Force Main
List of Major Equipment

ITEM	Purpose
6 WRAP AROUND MH SHIELD"/EM-20	Trench Safety
6 WRAP AROUND MH SHIELD"/EM-21	Trench Safety
6 WRAP AROUND MH SHIELD"/EM-22	Trench Safety
6 WRAP AROUND MH SHIELD"/EM-23	Trench Safety
AIR COMPRESSOR/SM- 156	Air For Tools
AIR COMPRESSOR/SM- 157	Air For Tools
AIR COMPRESSOR:AT COP/SM- 158	Air For Tools
ATVEHICLE/	Moving in Woods
BABCAT CAT/PW__259B	Excavation
BACKHOE CAT/ PW_(420E)	Excavation
BACKHOE JOHN DEERE/ PW_410J	Excavation
BACKHOE JOHN DEERE/ PW_410J	Excavation
BACKHOE/590SM/ N6C420596	Excavation
BACKHOE: CASE/PW-804	Excavation
BACKHOE: CASE/PW-806	Excavation
BACKHOE: CASE/PW-807	Excavation
BACKHOE: FORD/PW-654	Excavation
BACKHOE: FORD/PW-690	Excavation
BACKHOE: FORD/PW-691	Excavation
BACKHOE: FORD/PW-693	Excavation
BACKHOE: FORD/PW-695	Excavation
BACKHOE: FORD/PW-802	Excavation
BACKHOE: FORD/PW-803	Excavation
BREAKOUT HAMMER	Sewer Maintenance
BUCKET MACHINE/PW-1700	Dragging
CCTV INSPECTION VANS (3 TOTAL)	Sewer Maintenance
COMPACTOR: ALLIED/PW-1310	Excavation
COMPRESSOR	Air For Tools
COMPRESSOR PTO/	Air For Tools
DIAGONISTIC SCANNER/TESTER/P-X	Auto Diagonsis
DRAG MACHINE / PW_____	Sewer Cleaning
EASEMENT MACHINE	Sewer Maintenance
EASEMENT MACHINE	Sewer Maintenance
ELECTRIC EEL/PW-629	Sewer Cleaning
FORKLIFT/PW-704	Material Handling
FRONT END LOADER: CAT/PW-801	Excavation/Earth Moving
FUSION MACHINE	Weld HDPE Pipe
GEORGIA BUGGY	MAINTENANCE
GEORGIA BUGGY/PW-1330	Earth Moving
HYDRAULIC HAMMER/PW-1372	Cutting Asphalt Roads
JACK FOUR POST FOR SHOP	Truck Maintenance
LOADER: HYUNDAI/PW812	Earth Moving
MINI EXCAVATOR (HYUND)/PW-805	Earth Moving
PIPE CUTTER: REED/PW-1380	Pipe Fabrication
PIPELINE WELDER/PW-632	Welding Pipes
PNEUMATIC PIPE CUTTER/PW-1320	Pipe Fabrication
PORTABLE COMPRESSOR/	Air For Tools
PORTABLE COMPRESSOR/	Air For Tools
PORTABLE COMPRESSOR/	Air For Tools
PORTABLE COMPRESSOR/	Air For Tools
ROOT CUTTER (HYD.)/PW-1503	Pipe Fabrication
ROOT CUTTER (HYD.)/PW-1504	Pipe Fabrication
SEWER CLEAN M/C ELEC EEL/P-X	Sewer Cleaning
TRACKHOE-CAT 329D/PW811	Earth Moving

ITEM	Purpose
TRAILER LOW BOY	Transport CAT Trackhoe
TRAILER/PW_____	Transport Backhoe
TRAILER/PW_____	Transport Backhoe
TRAILER/PW_____	Transport Backhoe
TRAILER/PW_____	Transport Backhoe
TRAILER/PW-671	Transport Backhoe
TRAILER/PW-672	Transport Backhoe
TRAILER/PW-687	Transport Backhoe
TRAILER/P-X	Transport Backhoe
TRAILER: 22' HD W/GO_NK/PW-709	Transport Backhoe
TRAILER: BOAT, MOTOR, /PW-1400	Transport Backhoe
TRAILER: GOOSENECK /PW-703	Transport Backhoe
TRAILER: GOOSENECK /PW-704	Transport Backhoe
TRENCH BOX XLAP 8'x10'(12dP)/EM-26	Trench Safety
TRENCH BOX XLAP 8'x10'(16dP)/EM-25	Trench Safety
TRENCH BOX XLAP 8'x10'(16dP)/EM-25	Trench Safety
TRENCH BOX XLAP 8'x10'(16dP)/EM-27	Trench Safety
TRENCH BOX XLAP 8'x10'(16dP)/EM-29	Trench Safety
VACTOR COMBO TRUCK	Sewer Maintenance
VACUUM TRUCK	Sewer Maintenance
WASH TRUCK (10 TOTAL)	Sewer Maintenance
WASH TRUCK WITH CCTV CAMERA	Sewer Maintenance

Gravity Sewer and Force Main
List of Critical Spare Parts and Vendors

ITEM	Vendor
PIPE SEAL W/TPFE	HUGHES; METER; PATTON
MH_CASTING_#6_COVER ONLY	HUGHES; METER; UNIVERSAL
MH_CASTING_#7_1 1/2" RISER	HUGHES; METER; UNIVERSAL
MH_CASTING_#7_2' RISER	HUGHES; METER; UNIVERSAL
MH_CASTING_#7_COVER & RIM ASSY	HUGHES; METER; UNIVERSAL
MH_CASTING_#7_COVER ONLY	HUGHES; METER; UNIVERSAL
MH_CASTING_#7_FRAME ONLY	HUGHES; METER; UNIVERSAL
M/HOLE BARREL CONC. VARIOUS SIZES	CHOCTAW
M/HOLE CONE 48" x 36"	CHOCTAW
M/HOLE FLAT TOPS	CHOCTAW
M/HOLE PLUGS	CRETEX
QUADEX QUAD PLUG	HUGHES; METER; PATTON;Trench Safety
DUCTILE IRON FTGS VARIOUS SIZES	CONSOLIDATED
MECH JOINTS DUCTILE LONG SLEEVE	HUGHES; METER; PATTON
MECH JOINTS 4" x 7 1/2" DI SLEEVE W/ACC	PATTON
MECH JOINTS 6" LONG SLEEVE W/ACC	HUGHES; METER; PATTON
MECH JOINTS TRANS GASKETS	PATTON
D/I FTG BLK SQ HD PLUG 2 1/2"	CONSOLIDATED
VALVES BRONZE_____	CONSOLIDATED
FERNCO CPLG CLAY x CI/PVC 12"	HUGHES; METER; PATTON
PIPE JOINT LUBRICANT 1 QT	HUGHES; METER; PATTON
PIPE JOINT LUBRICANT 2 LB	HUGHES; METER; PATTON
PIPE JOINT LUBRICANT 27-A	WINNELSON
PVC ELL 221/2 SW 10"	HUGHES; METER; PATTON
PVC ELL 221/2 SW 4"	HUGHES; METER; PATTON
PVC ELL 221/2 SW 6"	HUGHES; METER; PATTON
PVC ELL 221/2 SW 8"	HUGHES; METER; PATTON
PVC CEMENT GAL	WINNELSON
PVC CPLG SEWER 12"	HUGHES; METER; PATTON
PVC CPLG SEWER 3"	HUGHES; METER; PATTON
PVC CPLG SEWER 4"	HUGHES; METER; PATTON
PVC CPLG SEWER 6"	HUGHES; METER; PATTON
PVC CPLG SEWER 8"	HUGHES; METER; PATTON
PVC CPLG SEWER 10"	HUGHES; METER; PATTON
PVC CPLG/REDUCER SEWER 8"x6"	HUGHES; METER; PATTON
PVC CPLG/REDUCING SEWER 6 x 4	HUGHES; METER; PATTON
PVC CPLG/REDUCING SEWER 8 x 6	HUGHES; METER; PATTON
PVC DWV CTSK HD C/OUT PLUG	WINNELSON
PVC DWV HXFIPT FEM ADAPTOR 4"	HUGHES; METER; PATTON
PVC DWV SQ HD C/OUT PLUG	WINNELSON
PVC ELL 221/2 SEWER 12"	
PVC ELL 221/2 SEWER 4"	HUGHES; METER; PATTON
PVC ELL 221/2 SEWER 6"	HUGHES; METER; PATTON
PVC ELL 221/2 SEWER 8"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 10"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 12"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 4"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 6"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 6"	HUGHES; METER; PATTON
PVC ELL 45 SEWER 8"	HUGHES; METER; PATTON
PVC F/ADAPT C/O PLUG W/CAP DWV 4"	HUGHES; METER; PATTON
PVC PIPE F-679 13 Ft LENGTHS 36"	HUGHES; METER; PATTON
PVC PIPE F-679 21" LAR. DIA. SEWER PIPE	HUGHES; METER; PATTON
PVC PIPE SCH40 __ Ft LENGTHS __	HUGHES; METER; PATTON
PVC PIPE SCH40 __ Ft LENGTHS 12"	HUGHES; METER; PATTON
PVC PIPE SCH40 __ Ft LENGTHS 18"	HUGHES; METER; PATTON
PVC PIPE SCH40 __ Ft LENGTHS 21"	HUGHES; METER; PATTON
PVC PIPE SCH40 20' Ft LENGTHS 4"	HUGHES; METER; PATTON
PVC PIPE SCH40 20 Ft LENGTHS 6"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 10"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 12"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 12"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 15"	HUGHES; METER; PATTON

ITEM	Vendor
PVC PIPE SEWER 13 Ft Lg 18"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 21"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 4"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 6"	HUGHES; METER; PATTON
PVC PIPE SEWER 13 Ft Lg 8"	HUGHES; METER; PATTON
PVC PIPE 12 DR-18 C900	HUGHES; METER; PATTON
PVC SEWER PLUG RAISED HD 4"	HUGHES; METER; PATTON
PVC VALVE BACKWATER 4"	HUGHES; METER; PATTON
PVC VALVE BACKWATER 6"	HUGHES; METER; PATTON
PVC WYE SEWER 4" x 4" x 4"	HUGHES; METER; PATTON
PVC WYE SEWER 6" x 6" x 6"	HUGHES; METER; PATTON
PVC WYE SEWER 8" x 8" x 8"	HUGHES; METER; PATTON
PVC WYE SEWER 10"x10"x6"	HUGHES; METER; PATTON
PVC WYE SEWER 10"x10"x8"	HUGHES; METER; PATTON
PVC WYE SEWER 12"x12"x10"	HUGHES; METER; PATTON
PVC WYE SEWER 6" MULTI HUB	HUGHES; METER; PATTON
PVC WYE SEWER 6" x 6" x 4"	HUGHES; METER; PATTON
PVC WYE SEWER 6" x 6" x 6"	HUGHES; METER; PATTON
PVC WYE SEWER 6"x4" 45 DEG	HUGHES; METER; PATTON
PVC WYE SEWER 8" x 8" x 6"	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 - 514 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 - 696 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 - 894 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 - 939 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 - 939 x 15	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1 -1104 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1-1302 x 12	HUGHES; METER; PATTON
CLAMP FULL CIRCLE F1-473 x 12	HUGHES; METER; PATTON
FERNCO CI/PL-CI/PL 3"	WINNELSON
FERNCO CPLG CI/PL-CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CI/PL-CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CI/PVC x CI/PVC 10"	HUGHES; METER; PATTON
FERNCO CPLG CI-PVC 6"	HUGHES; METER; PATTON
FERNCO CPLG CI-PVC 4"	HUGHES; METER; PATTON
FERNCO CPLG CI-PVC 6"	HUGHES; METER; PATTON
FERNCO CPLG CI-PVC 6"x4"	HUGHES; METER; PATTON
FERNCO CPLG CI-PVC 8"	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PLST	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PLST	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PLST	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PVC 6	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PVC 10"	HUGHES;METER
FERNCO CPLG CLAY x CI/PVC 10"	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI/PVC 8	HUGHES; METER; PATTON
FERNCO CPLG CLAY x CI-PVC 4"	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PVC 10"	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PVC 12"	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PVC 4"	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PVC 6	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PVC 8	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PL	HUGHES; METER; PATTON
FERNCO CPLG CONC x CI/PLST	HUGHES; METER; PATTON
FERNCO CPLG CONC x CIPVC	HUGHES; METER; PATTON
FERNCO CPLG PVC x PVC 12"	HUGHES; METER; PATTON
FERNCO CPLG PVC x PVC 6"	HUGHES; METER; PATTON
FERNCO CPLG PVC x PVC 6"x4"	HUGHES; METER; PATTON
FERNCO CPLG PVC x PVC 8"	HUGHES; METER; PATTON
FERNCO SADDLE TEE 6"	HUGHES; METER; PATTON
FERNCO SS CLAMPS_____	HUGHES; METER; PATTON
FERNCO SS CLAMPS_____	
FERNCO SS CLAMPS_____	
FERNCO SS CLAMPS_____	

Appendix C

Lift Station and Force Main Inventory l·yŘ ¢ŜŎKyƛŎl·f {LJŜŎƛŦƛŎl·ŭƛƶyã

Station Number	Station Name	Alternate Station Name	Street, Street Number	Is station in SCADA?	SCADA Type	System Section (N, S, E)	Street Address	Zip Code	Map Book Page	Associated Outfall	Number of Pumps	Pump Capacity	Pump Manufacturer	Pump Details or Reference	Multiple Force Mains?	Force Main Size	Force Main Length	Station Type (Flooded Suction, Suction Lift, or Submersible)
1320	3461 Airways	Airways	Airways, 3461	Y	M-110	S	3461 Airways	38116	073-C	911	2	200	ABS	NS-5A-#12		4	390	SUB
1113	4360 Ann Arbor	Ann Arbor	Ann Arbor, 4360	Y	M-110	N	4360 Ann Arbor	38128	004-R	431	2	220	SMITH & LOVELESS	LS-4-#17		6	1,780	FS
1127	1490 Bellevue	Bellevue	Bellevue North, 1490	Y	M-110	N	1490 Bellevue	38107	021-E	565	2	5,600	SMITH & LOVELESS	WS-1A-#8 thru 12		24	3,000	FS
1202	1254 Big Orange	Big Orange	Big Orange, 1254	Y	M-110	E	1254 Big Orange	38108	024-M	638, 664, 694, 727	4	4200	FLYGT	WN-8 -#43	YES	10 & 14	17,420	SUB
1108	2366 Blue Road	Blue Road	Blue, 2366	Y	M-110	N	2366 Blue Road	38108	022-B	539	2	220	SMITH & LOVELESS	WS-3		4	500	FS
1134	4791 Bolen Huse	Bolen Huse	Bolen House, 4791	Y	M-800	N	4791 Bolen Huse	38128	122-K		2	950	FLYGT	LS		10		SUB
1218	5251 Brenton	Brenton	Brenton, 5251	Y	M-110	E	5251 Brenton	38117	039-H	685	2	300	ABS	WS-6-#68		4	25	SUB
1110	2951 Calvert	Calvert	Calvert, 2951	Y	M-110	N	2951 Calvert	38108	022-G	569	2	200	SMITH & LOVELESS	WS-4-#88, 89		4	970	FS
1232	4313 Cedar Hills	Cedar Hills (4313)	Cedar Hills, 4313	Y	M-110	E	4313 Cedar Hill	38135	006-F	407	2	100	SMITH & LOVELESS	LS-6-#18(B)		6	990	
1231	4411 Cedar Hills	Cedar Hills (4411)	Cedar Hills, 4411	Y	M-110	E	4411 Cedar Hills	38135	006-F	407	2	80	SMITH & LOVELESS	LS-6-#18(A)		6	1,040	
1130	837 Claybrook	Claybrook	Claybrook, 837	Y	M-110	N	837 Claybrook	38107	029-A	595	2	80	BARNES					FS
1103	2844 Coach	Coach	Coach, 2844	Y	M-110	N	2844 Coach	38128	016-H	513	2	100	SMITH & LOVELESS	4" Private		4	1,190	SUC LIFT
1314	4784 Cora Road	Cora Road	Coro Road, 4784	Y	M-110	S	4784 Cora Road	38109	079-N	1021	2	150	SMITH & LOVELESS	HL-1			610	FS
1213	2646 Countrywood	Country Wood	Countrywood Pkwy, 2646	Y	M-110	E	2646 Countrywood	38018	135-J	521	2	140	SMITH & LOVELESS	WN-10-#4		8	500	FS
1312	1868 Memphis Depot	Depot	Memphis Depot	Y	M-110	S	1868 Memphis Depot	38114	053-K	810	2	100						
1222	950 Early Maxwell	Early Maxwell	Early Maxwell , 950	Y	M-110	E	950 Early Maxwell	38104	044-A	713, 746	2	1350		WS-3-#104 & 105		10	2,750	FS
1307	4730 East Shore	East Shore #1	East Shore, 4730 (#1)	Y	M-110	S	4730 East Shore	38109	079-K	1021	2	400	CAN-TEX	HL-1-#81			410	FS
1308	4950 East Shore	East Shore #2	East Shore, 4950 (#2)	Y	M-110	S	4950 East Shore	38109	088-A	1062	2	500	CAN-TEX	HL-1-#44			680	FS
1209	9561 El Hill	El Hill	El Hill, 9561	Y	M-110	E	9561 El Hill	38133	157-N	496	2	350	SMITH & LOVELESS	WN-10B-#90		4	750	FS
1210	9624 El Hill Cove	El Hill Cove	El Hill Cove, 9624	Y	M-110	E	9624 El Hill Cove	38133	157-N		2	150		WN-10B-# 101,102		4	1,390	SUC LIFT
1319	5455 Elvis Presley	Elvis Presley	Elvis Presley, 5455	Y	M-110	S	5455 Elvis Presley	38116	090-L	1108	2	400	SMITH & LOVELESS	NS-5A-#31, 30		8	1,750	FS
1133	119 Gayoso	Gayoso Lift Station	Gayoso, 119	Y	M-110	N	119 Gayoso	38103	034-D	645	2	300	SMITH & LOVELESS			6		SUB
1136	Gayoso Sewer Pumps	Gayoso Sewer Pumps	35 W. Saffarans	Y	M-800	N	35 W. Saffarans	38103	158-A	524	3	30,000	ALLIS CHAMBERS	WN-10B-#		34	1,930	SUC LIFT
1114	4292 Genyth	Genyth	Genyth, 4290	Y	M-110	N	4292 Genyth	38128	010-D	431	2	100	ABS	WN-5		6	1,300	SUB
1331	3909 Grandview	Grandview	Grandview, 3909	N	-	S	3909 Grandview	38111	045-F	715	2	300	FLYGT			6	6	SUB
1227	682 Greystone	Greystone	Greystone Dr, 682	Y	M-110	E	682 Greystone	38017	163-G	792, 793	2	270	BARNES			12	920	SUB
1221	9612 Grove	Grove Road	Grove Road, 9612	Y	M-110	E	9612 Grove	38018	158-K	524	2	130		WN-8		4	1,550	SUC LIFT
1109	2497 Hanwood	Hanwood	Hanwood, 2497	N	-	N	2497 Hanwood	38108	022-F	568	1	100	ABS	WS-1		4	35	SUB
1329	2820 Harbor	Harbor	Harbor, 2820	Y	M-800	S	2820 Harbor	38113	050-K	802, 835, 868	4	4900	SMITH & LOVELESS	PI-2-#19-23 & 38-41		30	6,780	FS
1211	9680 Highway 64	Highway 64	Highway 64, 9680	Y	M-110	E	9680 Highway 64	38002	158-A	524	2	415		WN-10B-#		4	1,200	SUC LIFT
1324	5081 Hillbrook	Hillbrook	Hillbrook, 5081	Y	M-110	S	5081 Hillbrook	38109	089-C	1065	2	180	SMITH & LOVELESS	HL-1			340	SUC LIFT
1304	1324 Holmes Road	Holmes Road	Holmes W, 1324	Y	M-110	S	1324 Holmes Road	38109	090-D	1061, 1062	2	1200	SMITH & LOVELESS	Hl-1-#181		12	3,650	FS
1305	5595 Horn Lake	Horn Lake	Horn Lake, 5595	Y	M-110	S	5595 Horn Lake	38109	089-L	1106	2	175	SMITH & LOVELESS	HL-1A-#3			1,290	SUC LIFT
1107	2109 Howell	Howell	Howell, 2109	N	-	N	2109 Howell	38108	021-R	596	2	100	SMITH & LOVELESS	WS-1		4	10	SUC LIFT
1303	4884 Highway 61 South	Hwy 61 South	Highway 61 South, 4884	Y	M-110	S	4884 Highway 61 South	38109	079-L	1022, 1063	2	75	SMITH & LOVELESS	HL-1			1,200	SUC LIFT
1330	400 West Illinois	Illinois	Illinois W, 400	Y	M-110	S	400 West Illinois	38106	034-O	707	2	300	SMITH & LOVELESS	PI-1-#27			800	FS
1317	120 Industrial	Industrial Drive	Industrial W, 120	Y	M-110	S	120 Industrial	38109	051-L	839, 840	2	300	ABS	NN-1		4	400	SUC LIFT
1327	450 Jack Carley (Exxon)	Jack Carley Causeway (Exxon)	Jack Carley Causeway, 450 (Exxon)	N	-	S	450 Jack Carley	38106	041-A	707	2	80	SMITH & LOVELESS	PI-2-#17 thru 24		4	650	FS
1326	386 Jack Carley	Jack Carley Causeway (Meacham)	Jack Carley Causeway, 386 (Meacham)	Y	M-110	S	386 Jack Carley	38106	041-A	707	3	1750	SMITH & LOVELESS	PI-2-#18		16	2,410	FS
1328	482 Jack Carley	Jack Carley Causeway (Waxler)	Jack Carley Causeway, 482	Y	M-110	S	482 Jack Carley	38106	041-A	707	2	80	SMITH & LOVELESS	PI-2-#14		4	620	SUC LIFT
1301	5175 Jonetta	Jonetta	Jonetta, 5175	Y	M-110	S	5175 Jonetta	38109	080-N	1064	2	450	FAIRBANKS & MORSE	NS-2A-#34,35		8	2,150	FS
1325	3022 Josibett	Josibpet	Josibpet, 3022	Y	M-110	S	3022 Josibett	38116	064-F	876	2	300		NS-5A-#75 & 76		6	1,200	SUC LIFT
1215	1550 Kimbrough	Kimbrough	Kimbrough, 1550	Y	M-110	E	1550 Kimbrough	38138	049-L	757, 756, 722	3	3500	SMITH & LOVELESS	WO-6-#4		16	10,370	FS
1216	1525 Kimbrough	Kimbrough #2	Kimbrough, 1525	Y	M-110	E	1525 Kimbrough	38138			2							FS
1115	3734 Lakewood	Lakewood #1	Lakewood Dr North, 3734	N	-	N	3734 Lakewood	38128	010-O	484	2	75	ABS	WN-8-#44		4	470	SUB
1116	3919 Lakewood	Lakewood #2	Lakewood Dr North, 3919	Y	M-110	N	3919 Lakewood	38128	010-L	458	2	75	SMITH & LOVELESS	LS-4-#54			950	SUC LIFT
1117	3995 Lakewood	Lakewood #3	Lakewood Dr North, 3995	N	-	N	3995 Lakewood	38128	010-L	457, 458	2	75	SMITH & LOVELESS			4	300	SUC LIFT
1135	1513 Levee Rd	Levee Road	Levee Road, 1513	Y	M-110	N	1513 Levee Rd				3		SMITH & LOVELESS					FS
1313	5035 Mallard Point	Mallard Point	Mallard Point, 5035	Y	M-110	S	5035 Mallard Point	38109	079-N	1061, 1062	2	400	SMITH & LOVELESS	HL-1		8	1,540	FS
1118	3997 Martindale	Martindale	Martindale, 3997	Y	M-110	N	3997 Martindale	38128	010-L	458	2	500	SMITH & LOVELESS	WN-3-#10,11		4	1,060	SUC LIFT
1321	1217 Meadowlark	Meadowlark	Meadowlark, 1217	Y	M-110	S	1217 Meadowlark	38116	081-L	1026	1	100	ABS	NS-5-#27		8	570	SUB
1226	4239 South Mendenhall	Mendenhall	Mendenhall South, 4239	Y	M-800	E	4239 South Mendenhall	38141	085-D	993, 954, 917	3	2085		NS-9B-#54,55,56,&57		20	25,170	
1316	1250 West Mitchell	Mitchell #1	Mitchell West, 1250	N	-	S	1250 West Mitchell	38109	061-N	904	2	180		NS-2		4	400	SUC LIFT
1315	1585 West Mitchell	Mitchell #2	Mitchell West, 1585	Y	M-110	S	1585 West Mitchell	38109	060-M	869	2	600	SMITH & LOVELESS	NS-1-#1		6	2,500	FS
1112	2619 Monette	Monette Avenue	Monette, 2619	Y	M-110	N	2619 Monette	38127	009-R	482	2	400		LS-2-#51		8	800	Building
1119	Mud Island #1	Mud Island #1	Island Dr South	N	-	N	Island Dr South	38103	027-H	592, 619, 645	2	50	ABS	MI-1		4	500	SUB
1120	Mud Island #2	Mud Island #2	280 Island Dr South	Y	M-110	N	280 Island Dr South	38103	027-	592, 619, 645	2	500	CUSTOM	MI-1		8	8000	SUB
1121	Mud Island #3	Mud Island #3	Island Dr South	N	-	N	Island Dr South	38103	027-	592, 619, 645	2	100	PEERLESS	MI-1		4	40	SUB
1122	Mud Island #4	Mud Island #4	Island Dr South	N	-	N	Island Dr South	38103	027-	592, 619, 645	2	50		MI-1		4	100	SUB
1123	Mud Island #5	Mud Island #5	Island Dr South	N	-	N	Island Dr South	38103	027-	592, 619, 645	2	100	TORAN	MI-1		2	300	SUB
1332	506 Mynders	Mynders	Mynders, 506	Y	M-110	S	506 Mynders	38111	045-A	715	2	250	FLYGT			10	8,910	SUB
1223	360 North Highland	North Highland	Highland North, 360	Y	M-110	E	360 North Highland	38122	038-N	715, 682	2	300	CAN-TEX	WS-4		8	560	FS
1106	408 Island Drive	North Island (River Town)	North Island L/S	Y	M-110	N	408 Island Drive	38103	027-H	619	2							
1111	5065 North Watkins	North Watkins	Watkins North, 5065	Y	M-110	N	5065 North Watkins	38127	118-H	353	2	180	SMITH & LOVELESS	LN-1-#11		6	1,390	SUC LIFT
1105	4479 Northwood Hills	Northwood Hills	Northwood Hills, 4479	Y	M-110	N	4479 Northwood Hills	38128	005-B	405	2	240	SMITH & LOVELESS	LS-5-#37		4	1,320	SUC LIFT
1131	3262 Old Allen #1	Old Allen #1	Old Allen, 3262	N	-	N	3262 Old Allen				2							SUB
1132	3322 Old Allen #2	Old Allen #2	Old Allen, 3322	N	-	N	3322 Old Allen				2							
1228	4280 Old Brownsville	Old Brownsville	Old Brownsville, 4282	Y	M-110	E	4280 Old Brownsville	38135	006-K	407, 434, 461	2	80		LS-6-#18		6	11,520	
1224	5945 E. Old Brownsville Rd	Old Brownsville #2	Old Brownsville Rd, 5945	N	-	E	5945 E. Old Brownsville Rd	38135			2		SMITH & LOVELESS					SUB
1203	5184 Pleasant View	Pleasant View	Pleasant View, 5184	Y	M-110	E	5184 Pleasant View	38134	024-M	573, 574	2	200	SMITH & LOVELESS	WN-10A-#5		6	3,100	SUC LIFT
1101	1 Auction	Pyramid Lift Station	Auction, 1 (Pyramid Lift Station)	Y	M-110	N	1 Auction	38103	27-H		2	400		FS-2 - #62,63,64,65		8	650	
1104	4417 Raleigh Lagrange	Raleigh Lagrange	Raleigh Lagrange, 4417	Y	M-110	N	4417 Raleigh Lagrange	38128	017-E	514	2	100	CAN-TEX	WN-4-#12		4	650	FS
1125	5230 Raleigh Millington	Raleigh Millington (dry well)	Raleigh Millington, 5230	Y	M-110	N	5230 Raleigh Millington	38053	121-G	359	3	2250	SMITH & LOVELESS	LN-3-#97,98		14	2,930	FS
1124	4177 Raleigh Millington	Raleigh Millington (wet well)	Raleigh Millington, 4177	Y	M-110	N	4177 Raleigh Millington	38128	004-G	404	2	100	SMITH & LOVELESS	Ls-4-#96		4	780	SUC LIFT
1129	2918 Rangeline	Range Line	Rangeline, 2918	Y	M-110	N	2918 Rangeline	38127	015-B	510	2	125		WN-2-#4		6	1,200	Building
1217	1399 Ridgeway	Ridgeway	Ridgeway, 1399	Y	M-110	E	1399 Ridgeway	38119	057-C	786, 819	2	1600	SMITH & LOVELESS	Nn-7-# 22 thru 24		14	4,140	FS
1318	2309 Riverport (#2)	Riverport #2 (Big Mapco) / Valero	Riverport, 2309	Y	M-110	S	2309 Riverport	38109	051-J	806	2	1200	SMITH & LOVELESS	NN-1		10	3,000	
1126	251 Riverside Drive	Riverside Drive	Riverside Drive, 251	N	-	N	251 Riverside Drive	38105			2							SUB
1212	8709 Rockcreek Parkway	Rockcreek Parkway	Rockcreek Parkway, 8709	Y	M-110	E	8709 Rockcreek Parkway	38018	135-O	551	2	550	SMITH & LOVELESS	WN-10B-#80		8	2,530	FS
1234	9503 Rocky Hills	Rocky Hills	Rocky Hills, 9503	Y	M-110	E	9503 Rocky Hills	38018	326-N	638, 664	2	100		WN-8-#59 & 60		4	4,210	
1220	948 Rocky Oaks Trail	Rocky Oaks Trail	Rocky Oaks Trail, 948	Y	M-110	E	948 Rocky Oaks Trail	38018	140-R	663	2	100		WN-8		4	520	SUC LIFT
1205	5730 Saranac	Saranac	Saranac, 5730	Y	M-110	E	5730 Saranac	38135	006-K	434	2	100	SMITH & LOVELESS	LS-6		4	820	SUC LIFT
1208	2837 Schaeffer	Schaeffer Rd.	Schaeffer Rd, 2837	Y	M-110	E	2837 Schaeffer	38028	325-K		2	160	FLYGT	WN-8		6	12,700	SUB
1309	1474 West Shelby Drive	Shelby Drive #1	Shelby Drive West, 1474	Y	M-110	S	1474 West Shelby Drive	38109	079-J	1021, 1020	3	400	CAN-TEX	HL-1-#44		8	3,950	FS
1310	1660 West Shelby Drive	Shelby Drive #2	Shelby Drive West, 1660	N	-	S	1660 West Shelby Drive	38109	078-M	1020	2	10		HL-1-#104			570	SUB

Station Number	Station Name	Alternate Station Name	Street, Street Number	Is station in SCADA?	SCADA Type	System Section (N, S, E)	Street Address	Zip Code	Map Book Page	Associated Outfall	Number of Pumps	Pump Capacity	Pump Manufacturer	Pump Details or Reference	Multiple Force Mains?	Force Main Size	Force Main Length	Station Type (Flooded Suction, Suction Lift, or Submersible)
1311	1723 West Shelby Drive	Shelby Drive #3	Shelby Drive West, 1723	N	-	S	1723 West Shelby Drive	38109	078-M	1020	2	10		HL-1-#104			450	SUB
1102	380 North Third	St. Joe	North Third, 380	Y	M-110	N	380 North Third	38105	028-E	620	2	900	SMITH & LOVELESS	FS-2		10	250	FS
1233	4286 Sunset Point East	Sunsent Point East	Sunsent Point East, 4286	Y	M-110	E	4286 Sunset Point East	38135	006-F	407	2	150		LS-6-#18(C)		6	750	
1225	2556 Thousand Oaks	Thousand Oaks Cove	Thousand Oaks, 2256	Y	M-110	E	2556 Thousand Oaks	38118			2	100						
1302	47 West Vanhusen	Van Huesen	Van Huesen, 47	Y	M-110	S	47 West Vanhusen	38109	080-P	1065	2	100	SMITH & LOVELESS	HL-1-#1(Aux)		4	1,050	FS
1322	5471 Vandergreen	Vandergreen	Vandergreen, 5471	Y	M-110	S	5471 Vandergreen	38116	090-H	1108	2	200	ABS	NS-5		4	670	SUB
1214	251 Walnut Bend	Walnut Bend	Walnut Bend, 251	Y	M-110	E	251 Walnut Bend	38018	142-P	724	2	100	SMITH & LOVELESS	WN-7A-#21		4	450	SUC LIFT
1207	9748 Walnut Grove Rd	Walnut Grove	Walnut Grove Rd, 9748	N	-	E	9748 Walnut Grove Rd				2		SMITH & LOVELESS			4		SUC LIFT
1229	4329 Wildwood	Wildwood (4329)	Wildwood, 4329	Y	M-110	E	4329 Wildwood	38135	006-F	407	2			LS-6-#18(D)		6	1,350	
1230	4478 Wildwood	Wildwood (4478)	Wildwood, 4478	Y	M-110	E	4478 Wildwood	38135	006-F	407	2	150		LS-6-#18(E)		6	1,620	
1323	1043 Wilson	Wilson	Wilson, 1043	Y	M-110	S	1043 Wilson	38106	042-H	710, 743	2	2000	SMITH & LOVELESS	NN-2B-#81		14	1,300	FS
1204	4486 Window	Window	Window, 4486	Y	M-110	E	4486 Window	38135	006-F	407, 434, 461	2	250	SMITH & LOVELESS	Ls-6-#16		6	7,180	SUC LIFT
1306	277 Windsor	Windsor	Windsor, 277	Y	M-110	S	277 Windsor	38109	089-L	1106	2	100	SMITH & LOVELESS	HL-1A-#2 & 6			1,830	SUC LIFT
1201	3628 Winplace	Winplace	Winplace, 3628	N	-	E	3628 WINPLACE	38118	076-H	917, 954, 993	2	300	SMITH & LOVELESS	NS-8-#40 thru 48, NS-9B-#54		20	10,100	SUC LIFT
1206	9651 Woodland Run	Woodland Run	Woodland Run, 9651	Y	M-110	E	9651 Woodland Run	38016			2							
1219	9666 Woodland View	Woodland View	Woodland View, 9666	Y	M-110	E	9666 Woodland View	38018	326-O	664	2	200		WN-8-#44		4	1,950	SUC LIFT
1128	5985 Woodstock Hills	Woodstock Hills	Woodstock Hills, 5985	Y	M-110	N	5985 Woodstock Hills	38053	315-K	312	2	300				6	3,400	SUC LIFT

Appendix D

Example SCADA Information

SCADA System

City of Memphis, Tennessee

Current Status – Interactive Map

MISSION

OPC
MISSION Web Acts as Backup

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

Help Weather

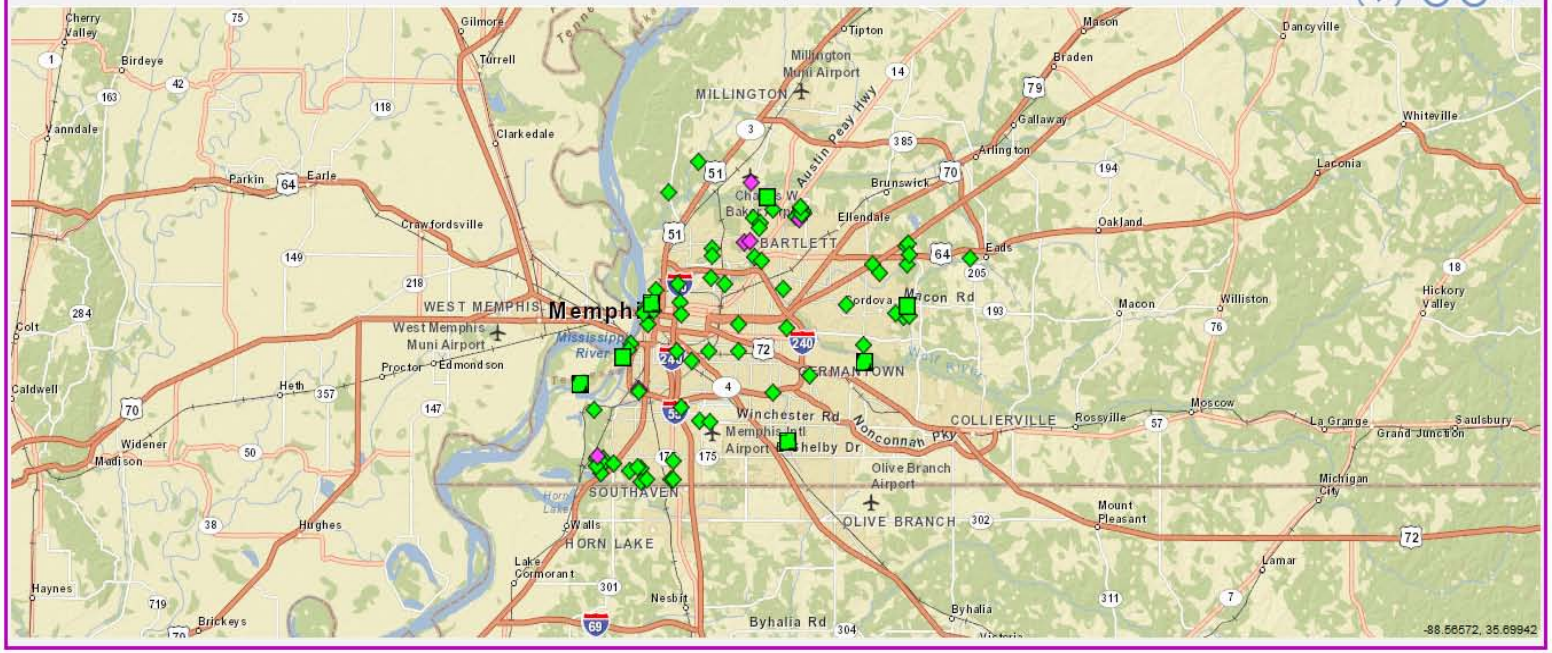
- Reports
- Current Status
- Data
- Quick Message
- Setup
- Download
- Logout

KEY
OK
M100 Alarm
M110 Offline
M800 Service
M80 Disabled

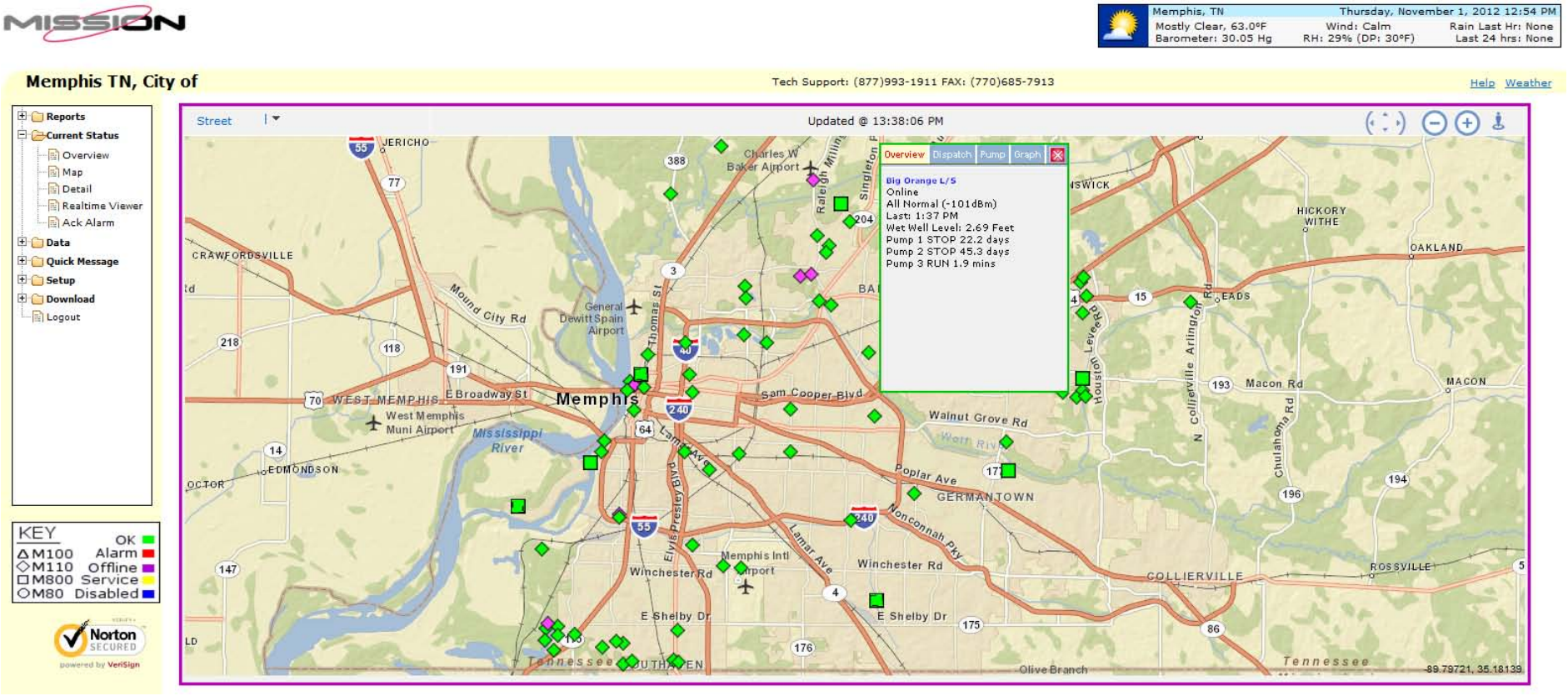
Norton SECURED powered by VeriSign

Street

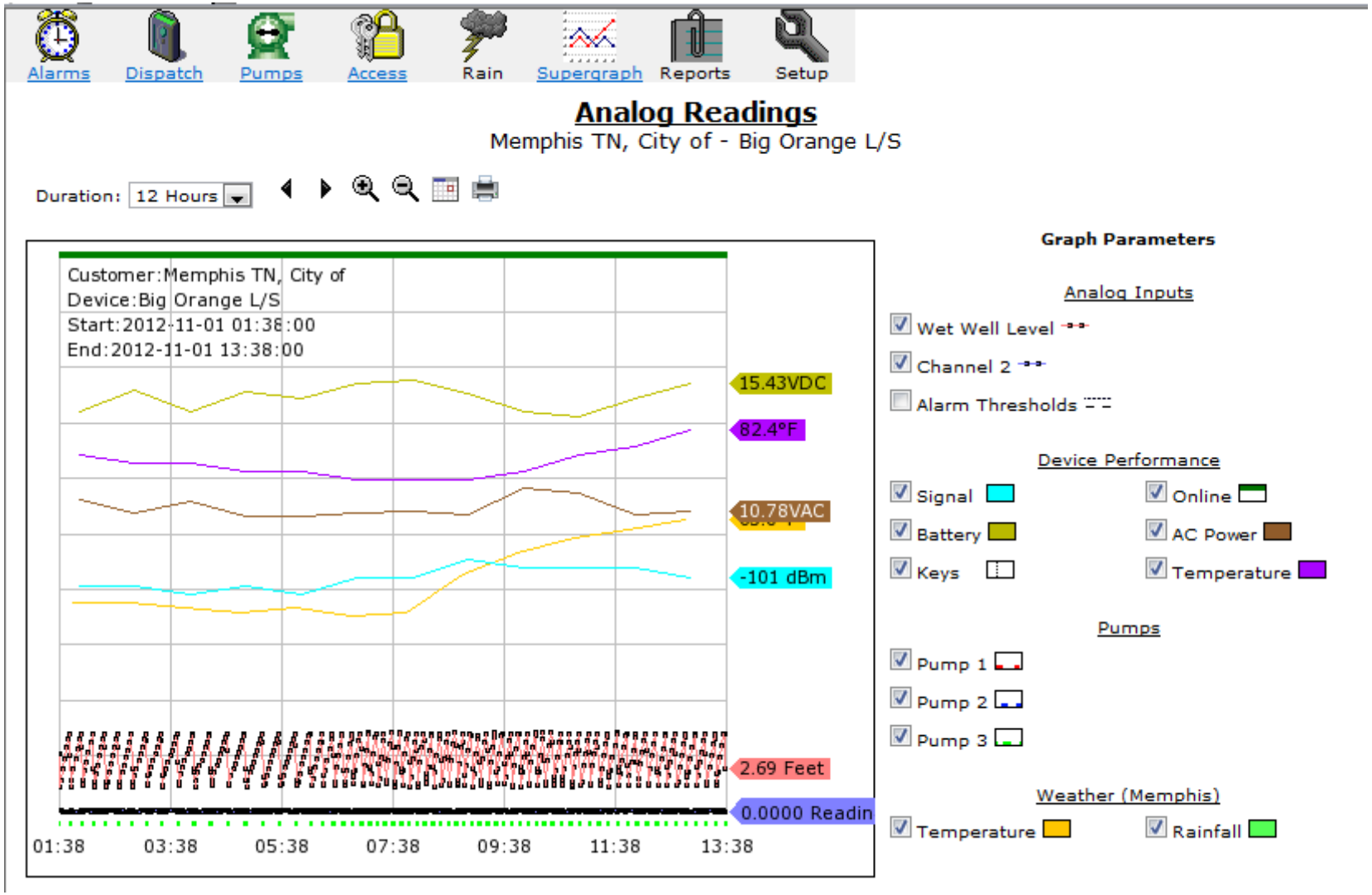
Updated @ 13:15:33 PM



Current Status – Interactive Map



Current Status – Pump Station Readings



Current Status - Overview

MISSION

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
- Current Status
  - Overview
  - Map
  - Detail
  - Realtime Viewer
  - Ack Alarm
- Data
- Quick Message
- Setup
- Download
- Logout

KEY

	OK
△M100	Alarm
◇M110	Offline
□M800	Service
○M80	Disabled

Norton SECURED powered by VeriSign

Memphis TN, City of

Site Name	Status	Site Name	Status	Site Name	Status
North Highland		Genyth		Pyramid Pump Station	AC Fail
4177 Raleigh Millington		Greystone		Raleigh Lagrange	
42599SPARE		Grove Road		Raleigh Millington	Alarm
4313 Cedar Hills		Harbor		Range Line	
4329 Wildwood		Highway 64		Ridgeway	
4411 Cedar Hills		Hillbrook		River Port	
4478 Wildwood		Holmes Road		Rockcreek Parkway	
689MIS4527		Horn Lake		Rocky Hills L/S	
Airways		Hwy 61 South		Rocky Oaks	
Ann Arbor		Illinois		Saranac	
Bellevue		Industrial Drive	Comm Error.	Schaeffer Rd.	
Big Orange L/S		Jack Carly		South Island	
Blue Road		Jonetta		South Mendenhall	
Bolen Huse		Josibpet		St. Joe	
Brenton		Kimbrough		Sunset Point East	
Calvert		Lakewood	Comm Error.	Thousand Oaks Cove	
Claybrook		Mallard Point		Van Huesen	
Coach		Marble		Vandergreen	
Coro Road		Martindale		Walnut Bend	
Country Wood		Meadowlark		Waxler	
Depot		Monette Avenue		West Mitchell	
Early Maxwell		Mynders		West Shelby Drive	Comm Error.
East Shore #1		North Island L/S		Wilson	
East Shore #2		North Watkins		Winchester Tunnel	

Current Status – Active Alarms

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
- Current Status
  - Overview
  - Map
  - Detail
  - Realtime Viewer
  - Ack Alarm
- Data
- Quick Message
- Setup
- Download
- Logout

KEY

	OK
△M100	Alarm
◇M110	Offline
□M800	Service
○M80	Disabled

Current Status Detail

Alarm Notifications In Progress

- None -

Active Alarms (Off-Normal Inputs)

- None -

Alarm Dispatch History

Date	Site Name / Event	Result (minutes)
01 Nov 12:15	East Shore #1 / Wet Well Level Normal	Shannon Griffin (1.7)
01 Nov 11:59	East Shore #1 / High Wet Well Alarm	Shannon Griffin (0.3)
01 Nov 11:58	East Shore #1 / Wet Well Level Normal	Shannon Griffin (0.7)
01 Nov 11:57	East Shore #1 / High Wet Well Alarm	Shannon Griffin (0.5)
01 Nov 11:51	East Shore #1 / Wet Well Level Normal	Shannon Griffin (0.4)
01 Nov 10:47	East Shore #1 / High Wet Well Alarm	Shannon Griffin (0.3)
01 Nov 09:41	East Shore #1 / Wet Well Level Normal	Shannon Griffin (0.5)
01 Nov 09:32	Highway 64 / Wet Well Level Normal	Jimmy Miller (0.4)
01 Nov 09:28	Highway 64 / High Wet Well Alarm	Jimmy Miller (0.5)
01 Nov 09:24	Highway 64 / Wet Well Level Normal	Jimmy Miller (0.4)

Access Report

Date	Site Name	Key User
06 Aug 13:09	West Mitchell	Key 3
12 Jul 07:46	Industrial Drive	Key 1
12 Jul 07:43	Industrial Drive	Key 1
30 Apr 11:06	Industrial Drive	Key 3
11 Apr 11:20	Industrial Drive	Key 1
11 Apr 11:20	Industrial Drive	Key 1
11 Apr 11:19	Industrial Drive	Key 1
24 Feb 10:55	North Highland	Key 1
30 Dec 2011 10:31	El Hill	Key 1
30 Dec 2011 10:11	El Hill	Key 1

Prepared Thursday, November 1, 2012 2:18:18 PM.

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Reports – Alert History

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
  - Alert History
  - Management
  - Runtime Daily
  - Runtime Monthly
  - Runtime Variance
  - Checkin
  - Logins
  - Disabled Inputs
  - SSO CSO Events
  - SDWA CL Report
- Current Status
- Data
- Quick Message
- Setup
- Download
- Logout

KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

Alert History

Date	Report Name	Devices	Destinations
1 Nov 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse East Shore #1 Meadowlark Range Line Rockcreek Parkway Vandergreen Windsor	william.north@memphistn.gov
31 Oct 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse Gayoso Lift Station Ridgeway Windsor	william.north@memphistn.gov
30 Oct 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse Marble Monette Avenue Range Line Saranac Thousand Oaks Cove Walnut Bend	william.north@memphistn.gov
29 Oct 06:31	Runtime Variance	Bolen Huse Gayoso Lift Station Gayoso Pump Station Mynders River Port South Mendenhall Thousand Oaks Cove Walnut Bend Wilson	william.north@memphistn.gov
29 Oct 06:18	Management Report		william.north@memphistn.gov
28 Oct 06:31	Runtime Variance	Bolen Huse Gayoso Lift Station	william.north@memphistn.gov

Reports – Management

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- **Reports**
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  - Management
  - Runtime Daily
  - Runtime Monthly
  - Runtime Variance
  - Checkin
  - Logins
  - Disabled Inputs
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- **Current Status**
- **Data**
- **Quick Message**
- **Setup**
- **Download**
- Logout

KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

Mission Communications Weekly Report
Memphis TN, City of
21 Oct 2012 - 27 Oct 2012

Total Units Assigned to Customer : 87

Cingular 800 Units: 8
Cingular 110 Units: 79

Active Units: 85
Disabled Units: 2
Units in Communications Fault: 8

There are devices with inputs disabled indefinitely. Mission does not recommend this practice.
The complete list of sites and inputs is available on the website under **Reports.**

Alarm Callouts	This Week	Last Week	Prior Week
Total Event	**25**	**454**	**123**
Input or Unit Disabled	11	35	32
Input Swinger Mode	0	274	13
Total Notification Attempts	**14**	**145**	**78**
Total Acknowledged	**14 (100%)**	**132 (91%)**	**77 (99%)**
User Ack Events	13	114	62
Web Ack Events	1	18	15
Never Acked Events	**0**	**13**	**1**
Digital Events	14	143	78
AC Power Events	0	2	0

Response Times	This Week	Last Week	Prior Week
Average Time (minutes)	3	1	5
Exceeding 1 Hour	0	0	0
Unacknowledged	0	13	1

Reports – Management, cont.

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
  - Alert History
  - Management
  - Runtime Daily
  - Runtime Monthly
  - Runtime Variance
  - Checkin
  - Logins
  - Disabled Inputs
  - SSO CSO Events
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- Setup
- Download
- Logout

KEY
OK
M100 Alarm
M110 Offline
M800 Service
M80 Disabled

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RTU Transmissions	This Week	Last Week	Prior Week
Total Successful	115610	115812	117196
First Attempt	115610 (100.0%)	115812 (100.0%)	117196 (100.0%)
Three or Fewer Attempts	0 (0.0%)	0 (0.0%)	0 (0.0%)
Failed Attempts	-	-	-

Realtime Connection	This Week	Last Week	Prior Week
North Highland	100.0%	87.8%	100.0%
4177 Raleigh Millington	100.0%	100.0%	100.0%
4313 Cedar Hills	100.0%	100.0%	100.0%
4329 Wildwood	100.0%	100.0%	100.0%
4411 Cedar Hills	100.0%	100.0%	100.0%
4478 Wildwood	100.0%	100.0%	100.0%
Airways	100.0%	100.0%	100.0%
Ann Arbor	100.0%	99.9%	99.7%
Bellevue	100.0%	100.0%	100.0%
Big Orange L/S	100.0%	100.0%	100.0%
Blue Road	100.0%	100.0%	100.0%
Bolen Huse	100.0%	100.0%	100.0%
Brenton	100.0%	100.0%	100.0%
Calvert	100.0%	100.0%	100.0%
Claybrook	100.0%	100.0%	100.0%
Coach	100.0%	100.0%	100.0%
Coro Road	100.0%	100.0%	99.8%
Country Wood	100.0%	100.0%	100.0%
Depot	100.0%	100.0%	100.0%
Early Maxwell	100.0%	100.0%	100.0%
East Shore #1	100.0%	100.0%	100.0%
East Shore #2	100.0%	100.0%	100.0%
El Hill	100.0%	100.0%	100.0%
El Hill Cove	100.0%	100.0%	100.0%
Elvis Presley	100.0%	100.0%	100.0%
Gayoso Lift Station	100.0%	100.0%	
Gayoso Pump Station	99.9%	100.0%	

MISSION

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
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  - Management
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  - Runtime Variance
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KEY
OK
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Norton SECURED powered by VeriSign

Rocky Hills L/S	100.0%	100.0%	100.0%
Rocky Oaks	100.0%	100.0%	100.0%
Saranac	88.1%	100.0%	100.0%
Schaeffer Rd.	100.0%	100.0%	100.0%
South Island	100.0%	100.0%	100.0%
South Mendenhall	100.0%	100.0%	100.0%
St. Joe	100.0%	100.0%	100.0%
Sunset Point East	100.0%	100.0%	100.0%
Thousand Oaks Cove	100.0%	100.0%	100.0%
Van Huesen	100.0%	100.0%	100.0%
Vandergreen	100.0%	100.0%	100.0%
Walnut Bend	100.0%	100.0%	100.0%
Waxler	100.0%	100.0%	86.9%
West Mitchell	100.0%	100.0%	100.0%
West Shelby Drive	0.0%	9.6%	8.0%
Wilson	100.0%	100.0%	100.0%
Winchester Tunnel	100.0%	100.0%	100.0%
Window Drive	100.0%	100.0%	100.0%
Windsor	100.0%	100.0%	100.0%
Woodland Run	100.0%	100.0%	100.0%
Woodland View	100.0%	100.0%	100.0%
Woodstock Hills	100.0%	100.0%	100.0%

Summary RTU Status (Failed or Missed Tests)

Location	Daily	RSSI	Battery	Wiring	Temp
	- None -				

Site Accesses	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Name	21 Oct	22 Oct	23 Oct	24 Oct	25 Oct	26 Oct	27 Oct
		- None -					

Prepared Thursday, November 1, 2012 2:23:52 PM.

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Reports – Daily Runtime Summary

Memphis TN, City of

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KEY

	OK
△M100	Alarm
◇M110	Offline
□M800	Service
○M80	Disabled

Norton SECURED powered by VeriSign

Daily Runtime Summary

Memphis TN, City of

< 30 Oct | 31 October 2012 | 1 Nov >

Site Name	- Runtime - Minutes	Gallons	Starts	Average (minutes/start)
North Highland				
Pump 1	36.0	-	27	1.3
Pump 2	0.0	-	0	-
4177 Raleigh Millington				
Pump 1	4.0	-	4	1.0
Pump 2	3.0	-	2	1.5
4313 Cedar Hills				
Pump 1	42.0	-	25	1.7
Pump 2	32.0	-	10	3.2
4329 Wildwood				
Pump 1	27.0	-	10	2.7
Pump 2	28.0	-	12	2.3
4411 Cedar Hills				
Pump 1	14.0	-	3	4.7
Pump 2	12.0	-	2	6.0
4478 Wildwood				
	8.0	-	4	2.0
	6.0	-	3	2.0
Airways				
Pump 1	2.0	-	1	2.0
Pump 2	2.0	-	1	2.0
Ann Arbor				
Pump 1	82.0	-	38	2.2
Pump 2	80.0	-	38	2.1

Reports – Monthly Runtime Summary

Memphis TN, City of

Tech Support: (877)993-1911 FAX: (770)685-7913

- Reports
  - Alert History
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KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

Monthly Runtime Summary

Memphis TN, City of

October 2012

< Sep 2012 | Nov 2012 >

Site Name	- Runtime - Minutes	Gallons	Starts	Average Minutes/Start	Duty Cycle(%)
North Highland					
Pump 1	790.0	-	822	0.96	1.8 %
Pump 2	446.0	-	675	0.66	1.0 %
4177 Raleigh Millington					
Pump 1	157.0	-	108	1.45	0.4 %
Pump 2	190.0	-	124	1.53	0.4 %
4313 Cedar Hills					
Pump 1	1,844.0	-	956	1.93	4.1 %
Pump 2	82.0	-	34	2.41	0.2 %
4329 Wildwood					
Pump 1	894.0	-	333	2.68	2.0 %
Pump 2	738.0	-	290	2.54	1.7 %
4411 Cedar Hills					
Pump 1	397.0	-	83	4.78	0.9 %
Pump 2	503.0	-	82	6.13	1.1 %
4478 Wildwood					
	230.0	-	110	2.09	0.5 %
	228.0	-	108	2.11	0.5 %
Airways					
Pump 1	94.0	-	47	2.00	0.2 %
Pump 2	92.0	-	47	1.96	0.2 %
Ann Arbor					
Pump 1	2,824.0	-	1,470	1.92	6.3 %
Pump 2	3,491.0	-	1,473	2.37	7.8 %

Reports – Runtime Variance

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KEY

	OK
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○M80	Disabled

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Runtime Variance

Last 30 Days

Site Name	Mean/Dev Pump 1	Mean/Dev Pump 2	Mean/Dev Pump 3	Last Report	Current Pump 1	Current Pump 2	Current Pump 3
North Highland	25/7.1	14/8.2	-	1 Nov	36.0	0.0	-
4177 Raleigh Millington	5/3.2	6/3.9	-	1 Nov	4.0	3.0	-
4313 Cedar Hills	59/10.1	3/7.8	-	1 Nov	42.0	32.0	-
4329 Wildwood	29/9.4	24/9.2	-	1 Nov	27.0	28.0	-
4411 Cedar Hills	13/2.2	16/3.7	-	1 Nov	14.0	12.0	-
4478 Wildwood	7/1.7	7/1.8	-	1 Nov	8.0	6.0	-
Airways	3/2.5	3/2.5	-	1 Nov	2.0	2.0	-
Ann Arbor	94/13.2	112/23.0	-	1 Nov	82.0	80.0	-
Bellevue	0/0.0	0/0.0	-	1 Nov	0.0	0.0	-
Big Orange L/S	113/272.0	0/0.0	360/27.6	1 Nov	0.0	0.0	326.4
Blue Road	71/10.3	70/11.1	-	1 Nov	79.0	75.0	-
Bolen Huse	53/13.1	38/17.9	-	1 Nov	74.1	0.0	-
Brenton	1/0.9	1/0.8	-	1 Nov	1.0	1.0	-
Calvert	67/7.3	0/0.0	-	1 Nov	58.0	0.0	-
Claybrook	2/5.4	34/9.5	-	1 Nov	0.0	34.0	-
Coach	2/4.7	44/7.2	-	1 Nov	0.0	58.0	-
Coro Road	10/2.2	16/3.6	-	1 Nov	9.0	11.0	-
Country Wood	40/9.6	38/9.3	-	1 Nov	29.0	30.0	-
Depot	8/4.5	8/4.1	-	1 Nov	2.0	6.0	-
Early Maxwell	0/0.0	0/0.0	-	1 Nov	0.0	0.0	-
East Shore #1	160/121.6	158/37.3	0/0.0	1 Nov	720.0	60.0	0.0
East Shore #2	203/258.5	18/9.9	-	1 Nov	11.0	10.0	-
El Hill	33/4.4	32/4.6	-	1 Nov	25.0	30.0	-
El Hill Cove	59/7.3	65/7.7	-	1 Nov	61.0	58.0	-
Elvis Presley	4/3.1	4/3.2	-	1 Nov	2.0	2.0	-

Reports – Unit Check In

Memphis TN, City of

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KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

Unit Check In Report

Model	Site Name	Last Heard
C110	North Highland	01 Nov 13:30
C110	4177 Raleigh Millington	01 Nov 13:30
C110	42599SPARE **(Disabled)**	No record of communications!
C110	4313 Cedar Hills	01 Nov 13:30
C110	4329 Wildwood	01 Nov 13:30
C110	4411 Cedar Hills	01 Nov 13:30
C110	4478 Wildwood	01 Nov 13:30
C110	Airways	01 Nov 13:30
C110	Ann Arbor	01 Nov 13:30
C110	Bellevue	01 Nov 13:30
C110	Blue Road	01 Nov 13:30
C110	Brenton	01 Nov 13:30
C110	Calvert	01 Nov 13:30
C110	Claybrook	01 Nov 13:30
C110	Coach	01 Nov 13:30
C110	Coro Road	01 Nov 13:30
C110	Country Wood	01 Nov 13:31
C110	Depot	01 Nov 13:30
C110	Early Maxwell	01 Nov 13:30
C110	East Shore #1	01 Nov 13:30
C110	East Shore #2	01 Nov 13:30
C110	El Hill	01 Nov 13:30
C110	El Hill Cove	01 Nov 13:30
C110	Elvis Presley	01 Nov 13:30
C110	Gayoso Lift Station	01 Nov 13:30
C110	Genyth	01 Nov 13:31
C110	Greystone	01 Nov 13:30

Data – Rainfall

Runtime vs. Rainfall Report

Memphis TN, City of

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    - Graphs
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  - Delayed Alarms
  - Dispatch History
  - Volumetric Calc
- Quick Message

KEY

OK
M100 Alarm
M110 Offline
M800 Service
M80 Disabled

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Runtime vs. Rainfall Report

Sep 2012 | October 2012 | Nov 2012

North Highland — Chart

Date	Rainfall KMEM: Memphis	Total Runtime
1 Oct	0.80	68.0
2 Oct	0.00	42.0
3 Oct	0.00	40.0
4 Oct	0.00	41.0
5 Oct	0.11	42.0
6 Oct	0.39	53.0
7 Oct	0.00	42.0
8 Oct	0.02	43.0
9 Oct	0.00	43.0
10 Oct	0.00	37.0
11 Oct	0.19	45.0
12 Oct	0.00	47.0
13 Oct	0.00	45.0
14 Oct	0.26	53.0
15 Oct	0.00	40.0
16 Oct	0.00	30.0
17 Oct	1.48	28.0
18 Oct	0.00	28.0
19 Oct	0.00	39.0
20 Oct	0.00	30.0
21 Oct	0.00	39.0
22 Oct	0.00	36.0
23 Oct	0.00	39.0
24 Oct	0.00	39.0
25 Oct	0.00	35.0
26 Oct	0.40	38.0
27 Oct	0.00	32.0
28 Oct	0.00	37.0
29 Oct	0.00	27.0
30 Oct	0.00	42.0
31 Oct	0.00	36.0

Data – Pump Information

Daily Runtime Summary: Minutes

Memphis TN, City of

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  - Dispatch History
  - Volumetric Calc

KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

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Daily Runtime Summary
Minutes

Device	Time	Pump 1 Minutes	Pump 2 Minutes	Both Minutes	Total Minutes
North Highland		Pump 1 Minutes	Pump 2 Minutes	Both Minutes	Total Minutes
	01 Nov	20.0	0.0	0.0	20.0
	31 Oct	36.0	0.0	0.0	36.0
	30 Oct	30.0	12.0	1.0	42.0
	29 Oct	27.0	0.0	0.0	27.0
	28 Oct	37.0	0.0	0.0	37.0
	27 Oct	21.0	11.0	0.0	32.0
	26 Oct	22.0	16.0	0.0	38.0
	25 Oct	17.0	16.0	0.0	33.0
4177 Raleigh Millington		Pump 1 Minutes	Pump 2 Minutes	Both Minutes	Total Minutes
	01 Nov	1.0	3.0	0.0	4.0
	31 Oct	4.0	3.0	0.0	7.0
	30 Oct	6.0	5.0	0.0	11.0
	29 Oct	4.0	4.0	0.0	8.0
	28 Oct	11.0	9.0	2.0	20.0
	27 Oct	11.0	11.0	3.0	22.0
	26 Oct	4.0	11.0	0.0	15.0
	25 Oct	1.0	10.0	0.0	11.0
4313 Cedar Hills		Pump 1 Minutes	Pump 2 Minutes	Both Minutes	Total Minutes
	01 Nov	18.0	15.0	0.0	33.0
	31 Oct	42.0	32.0	0.0	74.0
	30 Oct	24.0	24.0	0.0	48.0
	29 Oct	54.0	18.0	0.0	72.0
	28 Oct	62.0	0.0	0.0	62.0
	27 Oct	55.0	0.0	0.0	55.0
	26 Oct	59.0	0.0	0.0	59.0
	25 Oct	57.0	0.0	0.0	57.0
4329 Wildwood		Pump 1 Minutes	Pump 2 Minutes	Pump 3 Minutes	Total Minutes

Data – Pump Information

Pump Starts Alarms and Alerts

Memphis TN, City of

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    - Runtime Graph
    - Starts
    - Pump Alarm
    - Capacity Estim
    - Download
  - Site Access
  - Analog Data
  - Digital Data
  - Cellular Test
  - Solar Info
  - Voltage Reports
  - Alarms
  - Alerts
  - Delayed Alarms
  - Dispatch History
  - Volumetric Calc

KEY

	OK
△M100	Alarm
◇M110	Offline
□M800	Service
○M80	Disabled

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Pump Start Alarms and Alerts

Device	Time	Pump 1	Pump 2	Pump3
North Highland				
-Alerts-				
	18 Oct 14:00	9	11	0
	18 Oct 10:00	16	19	0
	17 Oct 11:00	10	13	0
	17 Oct 00:00	15	13	0
	22 Sep 12:00	15	18	0
	08 Sep 12:00	13	16	0
	06 Sep 12:00	11	9	0
	14 Jun 13:00	5	11	0
	31 May 19:00	16	16	0
	28 May 16:00	6	10	0
	09 May 09:00	12	12	0
	04 May 15:00	18	18	0
	29 Apr 12:01	7	10	0
	14 Apr 14:01	6	10	0
	01 Apr 13:00	10	9	0
	13 Mar 13:00	10	8	0
	08 Jan 10:00	15	5	0
	05 Dec 2011 13:00	10	9	0
	05 Dec 2011 12:00	10	12	0
	05 Dec 2011 11:00	11	10	0
	04 Dec 2011 22:00	0	11	0
	22 Nov 2011 06:00	11	0	0
	21 Nov 2011 09:00	11	0	0
	21 Nov 2011 09:00	11	0	0
	21 Nov 2011 06:00	10	0	0
-Alarms-				
None				
4177 Raleigh Millington				
-Alerts-				
None				
-Alarms-				
None				
42599SPARE				
-Alerts-				
None				
-Alarms-				
None				

Data – Analog Readings

MISSION

Memphis TN, City of

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KEY
OK
M100 Alarm
M110 Offline
M800 Service
M80 Disabled

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Analog Readings

North Highland All Channels	Channel 1	|	Channel 2
01 Nov 13:45:37	1	|	0
01 Nov 13:30:43	1	|	1
01 Nov 13:15:43	1	|	1
01 Nov 13:00:43	1	|	1
01 Nov 12:45:40	2	|	1
4177 Raleigh Millington All Channels	Channel 1	|	Channel 2
01 Nov 13:45:19	1	|	0
01 Nov 13:30:19	1	|	0
01 Nov 13:15:19	1	|	1
01 Nov 13:00:26	1	|	1
01 Nov 12:45:16	1	|	0
42599SPARE All Channels	Count	|	Count
	-No Data-		
4313 Cedar Hills All Channels	Channel 1	|	Channel 2
01 Nov 13:45:28	1	|	1
01 Nov 13:30:28	1	|	0
01 Nov 13:15:28	1	|	1
01 Nov 13:00:27	1	|	1
01 Nov 12:45:25	1	|	0
4329 Wildwood All Channels	Channel 1	|	Channel 2
01 Nov 13:45:30	1	|	1
01 Nov 13:30:23	1	|	1
01 Nov 13:15:23	1	|	1
01 Nov 13:00:31	1	|	1

Data – Digital Readings

MISSION

Memphis TN, City of

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- Reports
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  - Pump Info
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KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

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Digital Reports

North Highland

Time	Inputs 1	2	3	4	5	6	7	8	Relays 1	2	3	AC
29 Oct 23:25:33	C	C	C	O	O	O	O	O	O	O	O	
29 Oct 23:04:05	O	O	C	C	O	O	O	O	O	O	O	
23 Oct 11:42:07	C	C	C	O	O	O	O	O	O	O	O	
23 Oct 10:03:29	O	O	C	C	O	O	O	O	O	O	O	
18 Oct 13:40:10	O	O	C	O	O	O	O	O	O	O	O	
18 Oct 13:37:41	O	O	C	O	O	O	O	O	O	O	O	
18 Oct 13:20:00	O	O	C	O	O	O	O	O	O	O	O	

4177 Raleigh Millington

Time	Inputs 1	2	3	4	5	6	7	8	Relays 1	2	3	AC
31 Oct 15:54:33	O	O	C	O	O	O	O	O	O	O	O	
31 Oct 15:24:41	O	O	C	C	O	O	O	O	O	O	O	
04 Oct 02:02:27	O	O	C	O	O	O	O	O	O	O	O	
18 Sep 02:02:14	O	O	C	O	O	O	O	O	O	O	O	
01 Sep 11:59:57	O	O	C	O	O	O	O	O	O	O	O	
01 Sep 11:24:22	O	O	C	O	O	O	O	O	O	O	O	
31 Aug 21:40:15	O	O	C	O	O	O	O	O	O	O	O	

42599SPARE

Time	Inputs 1	2	3	4	5	6	7	8	Relays 1	2	3	AC
28 Aug 15:35:38	C	C	C	C	C	C	C	C	O	O	O	

4313 Cedar Hills

Time	Inputs 1	2	3	4	5	6	7	8	Relays 1	2	3	AC
09 Oct 10:17:14	O	O	O	C	O	O	O	O	O	O	O	
09 Oct 10:11:28	O	O	O	C	O	O	O	O	O	O	O	
28 Sep 02:04:21	O	O	O	C	O	O	O	O	O	O	O	
18 Sep 16:14:41	O	O	O	C	O	O	O	O	O	O	O	
18 Sep 16:02:52	O	O	O	O	O	O	O	O	O	O	O	
18 Sep 16:02:51	O	O	O	O	O	O	O	O	O	O	O	

Data – Voltage Reports

MISSION

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- Reports
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KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

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Voltage Reports

Device	Time	Battery Voltage	AC Voltage
North Highland			
	01 Nov 14:00	15.06	10.92
	01 Nov 13:00	15.27	11.13
	01 Nov 12:00	15.78	10.95
	01 Nov 12:00	14.41	11.57
	01 Nov 11:00	15.61	10.75
	01 Nov 10:00	15.92	10.82
4177 Raleigh Millington			
	01 Nov 14:00	14.67	10.82
	01 Nov 13:00	14.96	10.80
	01 Nov 12:00	14.71	10.89
	01 Nov 11:00	14.71	11.24
	01 Nov 10:00	15.27	10.92
	01 Nov 09:00	15.33	10.97
4313 Cedar Hills			
	01 Nov 14:00	14.98	10.89
	01 Nov 13:00	15.62	10.88
	01 Nov 12:00	14.57	11.31
	01 Nov 11:00	14.59	11.57
	01 Nov 10:00	14.61	11.43
	01 Nov 09:00	15.06	10.85
4329 Wildwood			
	01 Nov 14:00	14.71	11.42
	01 Nov 13:00	15.84	10.95
	01 Nov 12:00	15.86	10.97
	01 Nov 11:00	15.84	10.95
	01 Nov 10:00	14.80	11.27
	01 Nov 09:00	15.37	10.98
4411 Cedar Hills			

Data – Alarm History

MISSION

Memphis, TN
Mostly Clear, 63.0°F
Barometer: 30.05 Hg

Memphis TN, City of

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KEY
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Alarm History

Full List
Top 30

Date	Site Name	Event	Result (Minutes)
01 Nov 14:01	Jack Carly	Wet Well Level Normal	Shannon Griffin (0.6)
01 Nov 13:59	Jack Carly	High Wet Well Alarm	Shannon Griffin (0.4)
01 Nov 12:15	East Shore #1	Wet Well Level Normal	Shannon Griffin (1.7)
01 Nov 11:59	East Shore #1	High Wet Well Alarm	Shannon Griffin (0.3)
01 Nov 11:58	East Shore #1	Wet Well Level Normal	Shannon Griffin (0.7)
01 Nov 11:57	East Shore #1	High Wet Well Alarm	Shannon Griffin (0.5)
01 Nov 11:51	East Shore #1	Wet Well Level Normal	Shannon Griffin (0.4)
01 Nov 10:47	East Shore #1	High Wet Well Alarm	Shannon Griffin (0.3)
01 Nov 09:41	East Shore #1	Wet Well Level Normal	Shannon Griffin (0.5)
01 Nov 09:32	Highway 64	Wet Well Level Normal	Jimmy Miller (0.4)
01 Nov 09:28	Highway 64	High Wet Well Alarm	Jimmy Miller (0.5)
01 Nov 09:24	Highway 64	Wet Well Level Normal	Jimmy Miller (0.4)
01 Nov 08:50	Highway 64	High Wet Well Alarm	Shannon Griffin (6.6)
01 Nov 08:19	Jack Carly	Wet Well Level Normal	Shannon Griffin (1.1)
01 Nov 08:19	Jack Carly	High Wet Well Alarm	Shannon Griffin (0.9)
01 Nov 08:19	Jack Carly	Wet Well Level Normal	Shannon Griffin (0.9)
01 Nov 08:16	Jack Carly	Input 4 Wiring Fault	Never Acknowledged
01 Nov 07:35	East Shore #1	High Wet Well Alarm	Shannon Griffin (0.4)
01 Nov 02:02	East Shore #1	Wet Well Level Normal	Web: Engineers(240.2)
31 Oct 23:52	East Shore #1	High Wet Well Alarm	Web: Engineers(370.0)
31 Oct 19:02	Jack Carly	High Wet Well Alarm	Web: Engineers(659.9)
31 Oct 16:35	Jack Carly	Wet Well Level Normal	Shannon Griffin (0.4)
31 Oct 15:54	4177 Raleigh Millington	Wet Well Level Normal	Wayne Dotson (0.5)
31 Oct 15:44	Jack Carly	High Wet Well Alarm	Shannon Griffin (1.3)
31 Oct 15:24	4177 Raleigh Millington	High Wet Well Alarm	Wayne Dotson (0.5)
31 Oct 12:56	Jack Carly	Wet Well Level Normal	Shannon Griffin (0.4)
31 Oct 11:59	Jack Carly	Unit AC Power Restore	Input Disabled
31 Oct 11:58	Jack Carly	Unit AC Power Fault	Input Disabled
31 Oct 10:23	Jack Carly	High Wet Well Alarm	Shannon Griffin (0.5)

Data – Alert History

MISSION

Memphis TN, City of

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KEY

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□ M800	Service
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Alert History

Date	Report Name	Devices	Destinations
1 Nov 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse East Shore #1 Meadowlark Range Line Rockcreek Parkway Vandergreen Windsor	william.north@memphistn.gov
31 Oct 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse Gayoso Lift Station Ridgeway Windsor	william.north@memphistn.gov
30 Oct 06:31	Runtime Variance	4313 Cedar Hills Bolen Huse Marble Monette Avenue Range Line Saranac Thousand Oaks Cove Walnut Bend	william.north@memphistn.gov
29 Oct 06:31	Runtime Variance	Bolen Huse Gayoso Lift Station Gayoso Pump Station Mynders River Port South Mendenhall Thousand Oaks Cove Walnut Bend Wilson	william.north@memphistn.gov
29 Oct 06:18	Management Report		william.north@memphistn.gov
28 Oct 06:31	Runtime Variance	Bolen Huse Gayoso Lift Station	william.north@memphistn.gov

Data – Delayed Alarm Log

Memphis TN, City of

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KEY

	OK
△M100	Alarm
◇M110	Offline
□M800	Service
○M80	Disabled

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Delayed Alarm Log

Arrival Time	Device Name	Input	State	Delay Until	Result
01 Nov 13:33:23	**Illinois**	Comms	Alarm	01 Nov 15:38:23	Cancelled
01 Nov 13:05:21	**Industrial Drive**	Comms	Alarm	01 Nov 15:10:21	Active
01 Nov 12:52:37	**Illinois**	Comms	Alarm	01 Nov 14:57:37	Cancelled
01 Nov 11:49:14	**Illinois**	Comms	Alarm	01 Nov 13:54:14	Cancelled
01 Nov 11:15:28	**Illinois**	Comms	Alarm	01 Nov 13:20:28	Cancelled
01 Nov 11:05:16	**Industrial Drive**	Comms	Alarm	01 Nov 13:10:16	Cancelled
01 Nov 09:18:44	**Industrial Drive**	Comms	Alarm	01 Nov 11:23:44	Cancelled
01 Nov 08:05:17	**Industrial Drive**	Comms	Alarm	01 Nov 10:10:17	Cancelled
01 Nov 06:05:12	**Industrial Drive**	Comms	Alarm	01 Nov 08:10:12	Cancelled
01 Nov 04:11:01	**Industrial Drive**	Comms	Alarm	01 Nov 06:16:01	Cancelled
01 Nov 03:05:14	**Industrial Drive**	Comms	Alarm	01 Nov 05:10:14	Cancelled
01 Nov 01:05:13	**Industrial Drive**	Comms	Alarm	01 Nov 03:10:13	Cancelled
31 Oct 23:05:26	**Industrial Drive**	Comms	Alarm	01 Nov 01:10:26	Cancelled
31 Oct 21:15:07	**Industrial Drive**	Comms	Alarm	31 Oct 23:20:07	Cancelled
31 Oct 20:09:58	**Industrial Drive**	Comms	Alarm	31 Oct 22:14:58	Cancelled
31 Oct 19:17:43	**Industrial Drive**	Comms	Alarm	31 Oct 21:22:43	Cancelled
31 Oct 18:18:26	**Industrial Drive**	Comms	Alarm	31 Oct 20:23:26	Cancelled
31 Oct 17:05:17	**Industrial Drive**	Comms	Alarm	31 Oct 19:10:17	Cancelled
31 Oct 15:26:27	**Industrial Drive**	Comms	Alarm	31 Oct 17:31:27	Cancelled
31 Oct 14:32:04	**West Mitchell**	Comms	Alarm	31 Oct 16:37:04	Cancelled

Next

Prepared Thursday, November 1, 2012 3:08:37 PM.

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Data – Dispatch History

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KEY

	OK
△ M100	Alarm
◇ M110	Offline
□ M800	Service
○ M80	Disabled

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Dispatch History Select Unit

Site	Location
North Highland	360 N Highland, Memphis TN
4177 Raleigh Millington	4177 Raleigh Millington
42599SPARE	
4313 Cedar Hills	
4329 Wildwood	4329 Wildwood
4411 Cedar Hills	
4478 Wildwood	4478 Wildwood
689MIS4527	
Airways	3461 Airways
Ann Arbor	4360 Ann Arbor
Bellevue	1490 Bellevue
Big Orange L/S	1254 Big Orange St
Blue Road	2366 Blue Road
Bolen Huse	4791 Bolen Huse
Brenton	5251 Brenton
Calvert	2951 Calvert
Claybrook	837 Claybrook
Coach	2844 Coach Drive
Coro Road	4784 Coro Road
Country Wood	2646 Country Wood
Depot	1868 Memphis Depot Parkway
Early Maxwell	950 Early Maxwell
East Shore #1	4730 E. Shore
East Shore #2	4950 East Shore
El Hill	9561 El Hill
El Hill Cove	9624 El Hill Cove

Appendix E

Lift Station Inspection Report

Pump/Lift Station Inspection Report

Memphis, Tennessee

Type of report: ☐ Routine ☐ Quarterly ☐ Annual Date: _____

Station Description:

Station name or location: _____ Inspection crew: _____

Observations of grounds: _____ Observations of power source: _____

Breaker box on: ☐ Yes ☐ No | Station secure: ☐ Yes ☐ No | Trim/mow as required: ☐ Yes ☐ No | Remove trash/debris: ☐ Yes ☐ No

Station Entry:

Safe to enter pump station: ☐ Yes ☐ No Explanation: _____

When hatch opened: | Blower on: ☐ Yes ☐ No ☐ N/A | Lights on: ☐ Yes ☐ No ☐ N/A

Comments/observations: _____

Water in dry well: ☐ Yes ☐ No _____

Pump and Pump Station Information

Tripped breakers: ☐ Yes ☐ No If yes, explain repair/fix: _____

Wet well condition: _____ Comments: _____

Operational test of sump pump successful: ☐ Yes ☐ No
If no, explain repair/fix: _____

Check alarms, if applicable: ☐ Yes ☐ No Comments: _____

Hand-check of motors completed: ☐ Yes ☐ No Comments: _____

Pumps alternating correctly: ☐ Yes ☐ No

Pump #	Date	RTM-Now
1		
2		
3		
4		

Is additional maintenance required? ☐ Yes ☐ No

If yes, what? _____

Continue to next section for quarterly inspection report

Quarterly inspection and maintenance tasks

Pumping of each pump visually inspected: ☐ Yes ☐ No Comments: _____

Visually inspected pumped down wet well: ☐ Yes ☐ No Comments: _____

Grit and grease cleaned from wet well: ☐ Yes ☐ No Comments: _____

Wet well floats cleaned of rags, grease: ☐ Yes ☐ No Comments: _____

Pumps/piping visually checked for defects: ☐ Yes ☐ No Comments: _____

Generator operated under load for 15 min.: ☐ Yes ☐ No ☐ NA Comments: _____

Motor #	Amperage Reading	Vibration Reading
1		
2		
3		
4		

Quarterly inspection comments: _____

_____

_____

_____

Is additional maintenance required? ☐ Yes ☐ No

If yes, what? _____

Continue to next section for annual inspection report

Annual inspection and maintenance tasks

Wet well pumped out and cleaned of grease and debris build-up:
☐ Yes ☐ No Comments: _____

Pumps and impellers inspected to assure they are free of debris and in good operating condition:
☐ Yes ☐ No Comments: _____

Operating set points (on/off) assessed and adjusted as needed:
☐ Yes ☐ No Comments: _____

Valves inspected to assure working order:
☐ Yes ☐ No Comments: _____

Electrical motor control equipment inspected (including appropriate scheduled panel maintenance) to identify any potential issues:
☐ Yes ☐ No Comments: _____

All instrumentation inspected, serviced and calibrated (including flow meters and SCADA instrumentation):
☐ Yes ☐ No Comments: _____

Is additional maintenance required? ☐ Yes ☐ No

If yes, what? _____

For all inspection reports

Lift Station Manager Review

Signature _____

Date _____