INFRASTRUCTURE REHABILITATION PROGRAM (IRP)

FOR

Winchester Municipal Utilities

Winchester, Kentucky

August 2009

TABLE OF CONTENTS

Page No.

FIGURES

APPENDICES

1.0 EXECUTIVE SUMMARY

Winchester Municipal Utilities (WMU) and the city of Winchester (City) finalized the Consent Decree with the Environmental Protection Agency (EPA) in April 2007 for violations of the Clean Water Act that included 27 documented recurring Sanitary Sewer Overflow (SSO) locations. In accordance with Section VI, Remedial Measures, Item B, CcMOMMOM Programs, paragraph 28d, Infrastructure Rehabilitation Program, the Consent Decree requires the City of Winchester and WMU to develop, submit, finalize, and implement plans for the continued improvement of the wastewater collection and transmission system, and of the wastewater tTreatment pPlant (WWTP).

Effective management of the WMU wastewater collection and transmission systems is necessary to ensure optimum performance. The purpose of the Infrastructure Rehabilitation Program (IRP) as required by Section VI, Remedial Measures, Item B, cMOM CMOM Programs, paragraph 28d, Infrastructure Rehabilitation Program is to provide a link between the Continuing Sewer Assessment Program (CSSAP) and the establishment of a comprehensive sewer maintenance and improvement program. The overall goal of the IRP is to prevent component failures resulting from structural deterioration or inadequate system capacity.

The IRP uses information gathered in the CSSAP through flow monitoring, modeling, and routine maintenance and inspections of system components to identify and prioritize system rehabilitation efforts. Use of these assessment tools will allow WMU to make prudent infrastructure management decisions to prevent failures, maintain regulatory compliance, and reduce the overall potential for recurring and nonrecurring SSOs in the WMU sanitary sewer collection system.

The IRP will be reviewed annually by WMU management to ensure all elements of the program are up-to-date and are being implemented. A review and update log is provided in Appendix A.

WMU is committed to efficiently maintaining and operating its sanitary sewer system to reduce the negative impact on the environment in Winchester and Clark County, and to comply with requirements set forth in federal and state regulations, and in the Consent Decree.

2.0 DEFINITION OF TERMS

Business Hours – Hours that WMU has customer service representatives available to handle customer inquiries and/or complaints. (Monday – Friday: 7:00 a.m. – 4:00 p.m.)

Capacity, Management, Operations, and Maintenance (~~cMOM~~CMOM) – Flexible program of accepted industry practices to properly manage, operate and maintain sanitary wastewater collection, transmission and treatment systems, investigate capacity-constrained areas of these systems, and respond to SSO events.

Closed-Circuit Television (CCTV) – The use of video cameras to broadcast images to a specific place and on a limited set of monitors; this is the means by which the internal condition of a pipe or other subsurface structure is visually inspected.
~~The means by which the internal condition of a pipe or other subsurface structure is visually inspected.~~

Collection System – The network of gravity sewer pipes, manholes, and associated appurtenances that conveys wastewater to a pump station or to the wastewater treatment plant.
~~The network of pipes, manholes, and associated appurtenances that conveys wastewater to the wastewater treatment plant.~~

Comprehensive Planning Document – Document prepared to help guide the future growth and development of a community.

Environmental Protection Agency (EPA) – United States Environmental Protection Agency, Region 4. Federal regulatory agency with the mission of protecting the environment.~~regulatory agency with respect to the Clean Water Act and Consent Decree.~~

Force Main Sewer – A pressurized sewer line that conveys wastewater to some point in the collection system or to the wastewater treatment plant.

Full Time Employee (FTE) – Individual employed by WMU and working a 40-hour work week.

Geographic Information System (GIS) – A spatially related, automated mapping database created and maintained by WMU that contains all of WMU's sanitary sewer system and appurtenant structures.

Gravity Sewer – A sewer line that utilizes gradient to transport wastewater to a pump station or the wastewater treatment plant.

Infiltration – The introduction of groundwater into the sewer system by such means as defective pipes, pipe joints, connections between pipes, or manhole covers.

Inflow – The introduction of surface water runoff to the sewer system from sources such as: roof leaders; drains in basements, driveways, and yards; manhole covers; and cross connections from storm sewers.

Kentucky Division of Water (KDOW) – State regulatory agency with the mission of managing, protecting, and enhancing the quality and quantity of the Commonwealth's water resources through voluntary, regulatory and educational programs.

Manhole – Structure within the sanitary sewer system that provides access to the system for visual inspections and for performance of maintenance. Typically located at intersections with other line sections or changes in vertical elevations.

Non-Bbusiness Hours – Hours that WMU customer service representatives are not available to handle customer inquiries and/or complaints. During this time, customer inquiries and complaints are handled by Emergency Contacts. (Mon -Fri 4:00 p.m. – 7:00 a.m., Saturdays, Sundays, holidays)

Point Repair – Repair made at a specific point in a line section as a means of corrective action.

Private Sewer – A sewer not meeting any or a portion of the criteria for ownership and perpetual maintenance as set forth in WMU Policy 408.1. (See Appendix C)

Pump Station – That part of the sanitary sewer system responsible for conveying sewage under pressure from the collection system to another gravity sewer or to the treatment plant.

Pump Station Technician(s) – WMU personnel who perform routine maintenance checks on the pump stations appurtenant to the sewer system.

Sanitary Sewer Overflow (SSO) – Any discharge to waters of the United States from the Sewer System owned and operated by the City and WMU through point sources not specified in any KPDES permit (otherwise known as "Unpermitted Discharges"), as well as any release of wastewater from the Sewer System to public or private property that does not reach waters of the United States, such as a release to a land surface or structure that does not reach waters of the United States; provided, however, that releases or wastewater backups into buildings that are caused by blockages, flow conditions, or malfunctions in a building lateral, or other piping or conveyance system that is not owned or operationally controlled by the City and WMU, are not SSOs for the purposes of WMU's Consent Decree.

Sanitary Sewer Overflow Response Plan (SORP) – Guidance document that delineates WMU's options for responding to sanitary sewer system overflows.

Service Lateral – Pipes that receive sewage from homes and businesses and transport that sewage to the publicly-owned sewer system.

Sewer System – The wastewater collection, retention, and transmission system owned or operated by the City and WMU designed to collect and convey municipal sewage (domestic, commercial and industrial) to the WWTP. The sewer system does not include any sewer systems that are not owned by the City or WMU.

Transmission System – The network of force main sewers, pump stations, and associated appurtenances that conveys wastewater to some point in the collection system or to the wastewater treatment plant.

Unpermitted Bypass – Any discharge to the waters of the United States from the Wastewater Treatment Plant which constitutes a prohibited bypass as defined in 40 C.F.R. § 122.41(m).

Waters of the Commonwealth – Any and all rivers, streams, creeks, lakes, ponds, impounding reservoirs, springs, wells, marshes, and all other bodies of surface or underground water, natural or artificial, situated wholly or partly within or bordering upon the Commonwealth or its jurisdiction as defined by KRS 224.01-010.

WMU Cleanout – A vertical pipe with a removable cap extending from a service lateral to the surface of the ground. It is used for access to the service lateral from the limits of the easement or the right-of-way to the publicly-owned, gravity sewer for inspection and maintenance. Typically, the WMU cleanout is located at the limit of the easement or right-of-way line.

3.0 SYSTEM AND ORGANIZATIONAL STRUCTURE

3.1 WMU Wastewater System

Currently, WMU provides wastewater service to 11,533 residential, commercial, institutional, and industrial customers. The WMU sewer system is comprised of the following:

- 137.7 miles of gravity sewer
- 9.8 miles of force main sewer
- 0.8 miles of private sewer (including private pump stations)
- 3,585 manholes
- 17 pump stations
- 1 wastewater treatment plant

Treatment is provided at a wastewater treatment plant (WWTP) with a capacity of 7.2 MGD, with a peak hydraulic capacity of 29.6 MGD. The facility incorporates influent pumping, screening, a biological nutrient removal system (BNR), oxidation ditches, clarification, ultraviolet disinfection, and post aeration. Discharge is to Strodes Creek, a tributary to the Licking River watershed. Solids generated by the WWTP are dewatered using belt filter presses and stabilized through a lime/alkaline stabilization process to produce Class A biosolids. The biosolids are distributed for local use in Winchester and Clark County. WMU charges users a hauling fee for delivery of the biosolids based on distance.

WMU maintains a GIS system database of sanitary sewer line sections within the WMU sewer system. The sanitary sewer line sections are located in five (5) watersheds that are divided into a total of fourteen (14) subwatersheds. WMU owns and maintains sewer system lines in eight (8) of the subwatersheds. A map of the overall sewer system is provided in Appendix B.

WMU owns and maintains the sewer system and appurtenances that transport the wastewater to the treatment plant. WMU Policies 203.1, 402.2, and 408.1, (Appendix C), establishes points of ownership and maintenance for the utility and the customer. In general, WMU owns and maintains the sanitary sewer system to the right-of-way or easement limit. Typically, a cleanout is located at the right-of-way or easement limit to establish the point of responsibility. A private sanitary sewer line is defined in WMU Policy 408.1 and maintained per WMU Policy 203.1. In the event a problem occurs on a private sanitary sewer and repair or maintenance is required to protect the public health, safety, and welfare of the general public, work **may** be initiated by WMU to alleviate, eliminate, or mitigate the problem.

3.2 WMU Organizational Structure

A copy of WMU's organizational structure is shown in Figure 3-1. (See Page 3-3). An Emergency Contact List and list of Contract Service Providers is provided in Appendix D. Procedures for notification of personnel in the event of an emergency are outlined in WMU's Sewer Overflow Response Plan, October 2007.

3.3 Employee Responsibilities

- General Manager – Responsible for overall CSSAP compliance. Oversight includes regulatory compliance and ensuring the financial capacity of the utility to comply with CSSAP requirements.

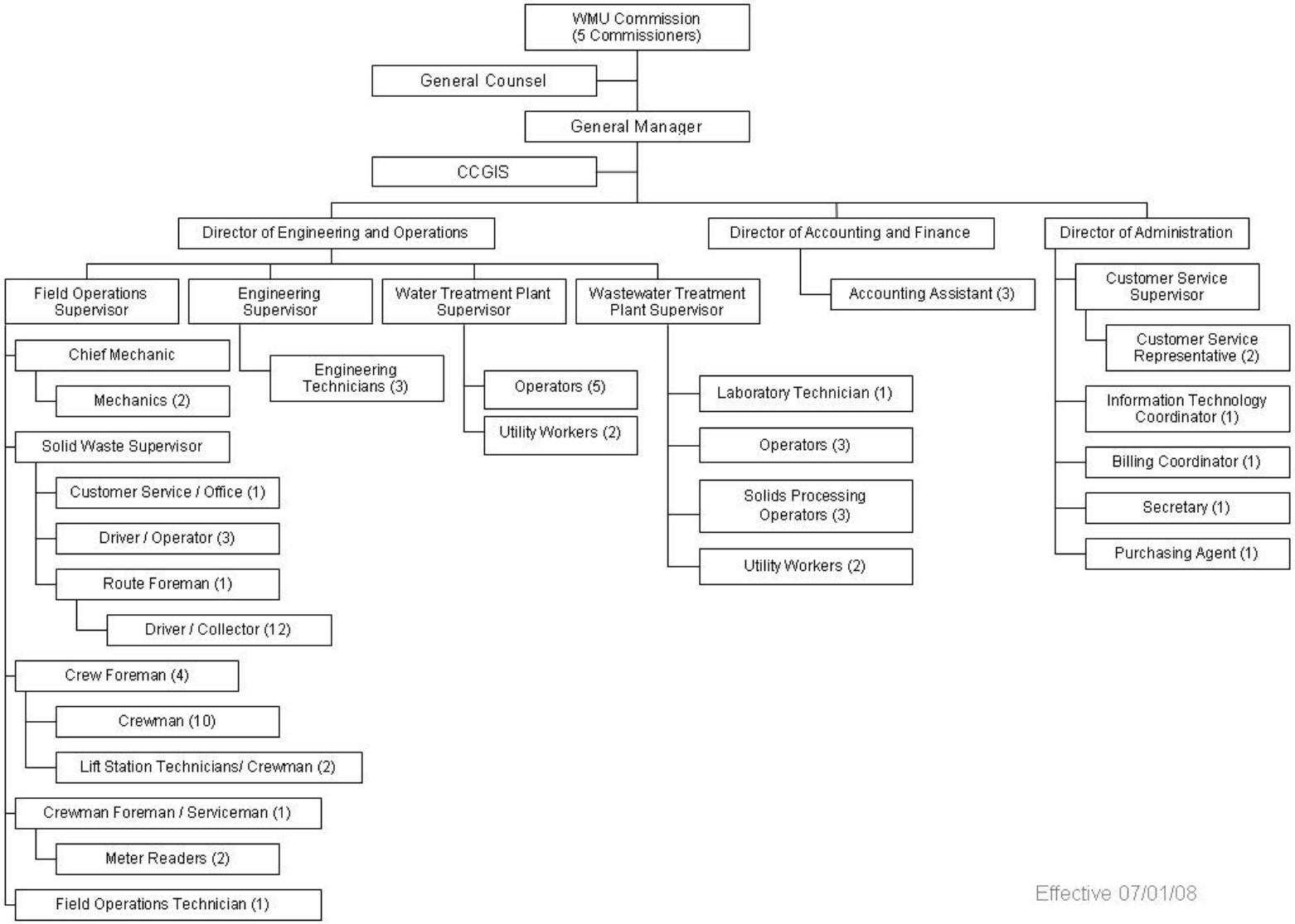
- Director of Operations/Engineering – Serves as the Program Manager. Ensures implementation of the CSSAP with respect to manpower, coordination, and engineering functions.

- Field Operations Supervisor – Responsible for allocating weekly manpower and equipment to comply with the CSSAP.

- Engineering Supervisor – Responsible for providing engineering support needed to comply with the CSSAP.

- Crew Foreman – Responsible for overseeing the daily tasks performed to comply with the CSSAP.

FIGURE 3-1: WMU ORGANIZATIONAL CHART



4.0 PRIORITIZATION AND SCHEDULING

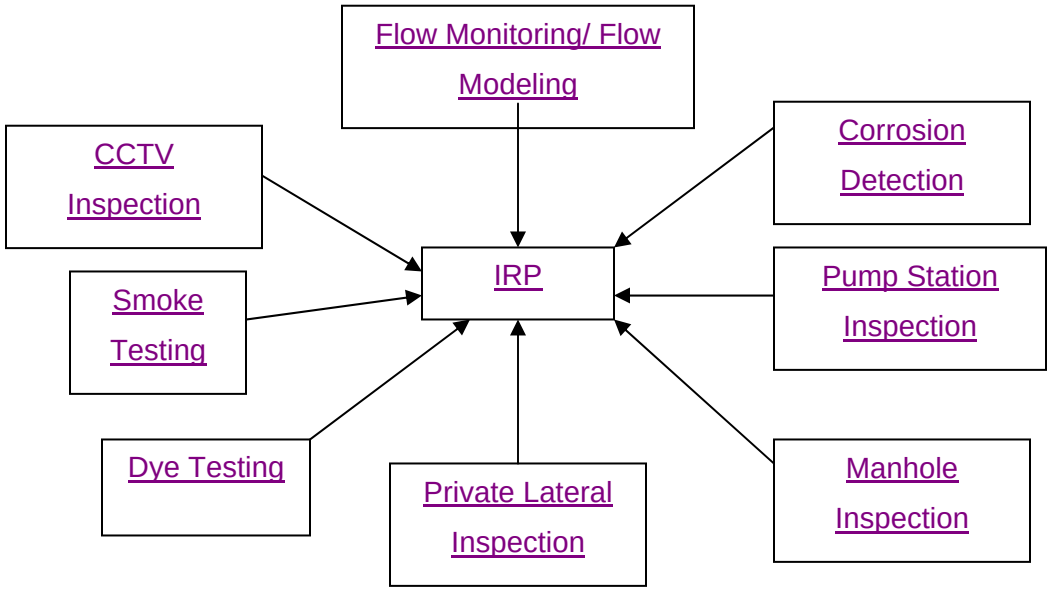
4.1 System Performance Criteria

The primary objective of the WMU Infrastructure Rehabilitation Program (IRP) is to maintain overall performance of the sewer system. Rehabilitation projects can be categorized based on the following performance criteria:

- Capacity Restoration – Keep components functioning at full, original capacity, through measures such as reduction in I/I, and repairing system defects. In some cases, an increase in capacity is necessary due to increased flows from development upstream.
- Structural Integrity Restoration – Repair structural damage to components caused by corrosion, wear, age, or other factors, to extend the useful life, and reduce risk of system failures that could impact service to customers or increase costs, and/or cause SSOs in the sewer system.
- Maintenance Optimization – Repair components of the system subjected to known and repeated maintenance issues. Examples include root intrusion, improper connections, pipe sag, and joint offsets.

WMU's CSSAP will provide the information needed to implement the IRP and Capital projects. Figure 4.1 illustrates the information obtained in CSSAP and used in the IRP. As WMU moves forward, components of the CSSAP will play an increasingly important role in supporting asset management decision-making under the IRP. As the CSSAP matures, additional emphasis will be placed on a variety of information sources and decision support tools to make prudent infrastructure management decisions before components fail.

FIGURE 4-1: CSSAP COMPONENTS USED IN IRP



The IRP will address both the gravity portion of the WMU sewer system (gravity lines and related appurtenances including manholes) and the transmission components of the WMU sewer system (pump stations and force mains).

4.2 Prioritization and Scheduling of System Components

4.2.1. Gravity Lines

The overall goal of the IRP with respect to the gravity components of the system is to restore or increase system capacity to reduce the incidence of SSOs. Pipe rehabilitation and upgrades will be designed to contain predicted Rainfall Dependent Infiltration and Inflow (RD I/I) for a pre-determined peak flow obtained from the hydraulic model. When planning rehabilitation projects, WMU will take projected growth into consideration, using the Comprehensive Development Plan for Winchester, to ensure the capacity of the system will meet future needs.

Data collected from inspection activities outlined in Section 4.1.1 of the CSSAP will be used in the development and prioritization of rehabilitation efforts to restore structural integrity and optimize maintenance activities. WMU employs a numerical rating system to prioritize pipe segments for rehabilitation or replacement, using thea Gravity Line ~~Project~~ Prioritization Wworksheet (See Appendix E). Pipe attributes, including age, type, material, maintenance history, cost and constructability factors are assigned a point value and multiplied by an "importance factor." ~~Pipe segments are then prioritized for replacement or rehabilitation based on their numerical rating.~~The final point values are then used to prioritize rehabilitation or replacement of each pipe segment. Pipe segments with higher values are to receive higher priorities.

In accordance with the Consent Decree, WMU will ensure all pipe segments identified as deficient from a structural or capacity standpoint are prioritized for rehabilitation or replacement. An annual allocation is provided in the WMU Five Year Capital budget for replacement and rehabilitation of sewer mains in accordance with the prioritized list. Projects are ~~scheduled~~ ranked based on the highest total points used in the Gravity Line~~Project~~ Prioritization Wworksheet and ~~an~~ estimated cost. The schedule is based on these two factors plus the amount of funds allocated to sewer main rehabilitation/replacement in a given year. A current prioritized list of sanitary sewer mains is provided in Appendix F.

4.2.2. Force Mains

Rehabilitation efforts for force mains are intended to ensure adequate capacity for present and projected future peak flows, and reduce the incidence of overflows. Rehabilitation to address structural integrity issues is primarily intended to correct structural defects resulting from corrosion.

WMU uses corrosion identification procedures such as CCTV inspection, as well as historical data and knowledge of the existing system to identify areas with the highest potential for corrosion as outlined in the CSSAP and Corrosion Control Plan.

In accordance with the Consent Decree, a similar method will be implemented to prioritize rehabilitation and replacement of force mains which are identified as deficient from a structural, corrosion, or capacity standpoint. Based on information obtained from the inspection methods (See Section 4.1.1 of the CSSAP), all force mains with be assigned point values based on categories outlined in the Force Main Prioritization Worksheet (See Appendix G). These initial point values are then multiplied by an importance factor to obtain the final point values. Force mains with higher point totals will have priority over those of lower point totals.

~~In accordance with the Consent Decree, WMU will ensure that all force main segments identified as deficient from a structural, corrosion, or capacity standpoint are prioritized for rehabilitation or replacement.~~ WMU's long-range goal is to reduce the force main inventory in the ~~system,~~system; therefore, emphasis will be placed on ~~projects to eliminate~~eliminating rather than rehabilitating existing force mains. ~~or replace vs. rehabilitate existing force mains where feasible.~~

4.2.3. Manholes

Condition assessment of manholes is performed in conjunction with inspection and cleaning of associated pipe segments as outlined in Section 4.1.3 of the CSSAP. Prioritization and scheduling for rehabilitation or replacement of manholes is based on the priority rating of its associated pipe segments (see Section 4.2.1). An annual allocation is provided in the WMU Capital budget for manhole adjustments. Out-of-cycle rehabilitation or replacement of a manhole may be programmed if WMU determines that structural deterioration or I/I through the manhole cover presents a significant SSO hazard.

In accordance with the Consent Decree, WMU will ensure that all manholes identified as deficient from a structural or capacity standpoint are prioritized for rehabilitation or replacement. Manholes are prioritized for rehabilitation or replacement depending on data collected during manhole inspections. Appendix H provides guidelines applicable in determining the structural integrity of the manhole while identifying traces of I/I. This data is then used to complete the Manhole Prioritization Worksheet which is provided in Appendix I. Manholes are then prioritized for rehabilitation or replacement based on the final point totals similar to that of the sewer lines.

4.2.4. Pump Stations

Pump stations are prioritized and scheduled for rehabilitation or upgrades as needed to ensure each location's ability to convey pre-determined peak flows, to include Rainfall Derived I/I. As with other components of the system, hydraulic capacity upgrades will take into account projected future growth as outlined in the Comprehensive Planning Document.

Data collected through thrice-weekly maintenance checks, and monthly facility inspections will be used to prioritize and schedule rehabilitation or replacement of pump station components as needed to restore structural integrity, and electrical and mechanical reliability. Based on monthly performance measures, WMU will review pump run times to track changes over time, and identify significant changes in pump station performance outlined in Section 4.1.4 of the CSSAP.

In accordance with the Consent Decree, WMU will ensure that pump stations identified as deficient from a structural, corrosion, mechanical, or capacity standpoint are prioritized for rehabilitation or replacement. WMU's long-range goal is the reduction of the inventory of pump stations. Per the Consent Decree, the following pump stations and associated force main sewers will be eliminated:

Pump Station/ Force Main	Proposed Date for Removal From Service
Maryland Avenue	~~August, 2010~~July 31, 2012
Wabash	~~August, 2010~~July 31, 2012
Smith Manor	~~August, 2010~~July 31, 2012
Snowfall	January 31, 2013
Stoneybrook	January 31, 2013
Bel-Air	January 31, 2021
Westside	January 31, 2021

Emphasis for rehabilitation of pump stations and force main sewers will be placed on those intended for long-term service.

5.0 INFORMATION MANAGEMENT

WMU will continue to develop its methods for managing, tracking, and measuring progress towards the goals set forth in the IRP. WMU currently employs a number of data management/analysis systems to evaluate and prioritize work within the sewer system, including, but not limited to:

- Routine Inspection/Maintenance Data Collection
- Hydraulic Model
- CCTV program software
- Geographic Information System (GIS)

5.1 Routine Inspection/Maintenance Data Collection

WMU regularly collects data on the condition of system components during both routine (scheduled) and emergency (unscheduled) maintenance. Individual inventory, ~~and~~ inspection forms, and checklists are used to record the condition of pipes including gravity lines and force mains, manholes, and pump stations identified in the CSSAP. WMU collects and tracks data related to SSOs, blockages, pipe failures, and customer complaints, as well as changes in the condition of individual components (e.g. pump runtimes, manhole condition, etc.) and uses this information as part of its decision-making process for prioritizing components for rehabilitation or replacement.

5.2 Hydraulic Model

WMU will maintain a hydraulic model of the sewer system in each basin. The model is being developed using the physical attributes of the current sewer system (sewer line sizes, slopes, pipe characteristics, manhole elevations, pump station capacities, etc), and dry/wet weather flow conditions obtained through analysis of flow monitoring data and historical rainfall data. The objectives of the hydraulic model are:

- Provide a calibrated hydraulic model of the entire sewer system
- Identify and diagnose dry/wet weather capacity issues
- Assist in developing improvement alternatives and priorities for each basin
- Ensure additional flow does not create downstream SSOs

WMU will continue to maintain and update the hydraulic model by:

- Updating the database as rehabilitation/replacement projects are completed, new developments or line extensions are added to the system, or new information is obtained
- Recalibrating the model as needed based upon data from flow monitoring studies
- Updating of projected wet weather I/I flows based on effectiveness of rehabilitation efforts
- Updating of projected future dry weather flows based on population data, and as development occurs

5.3 CCTV Inspection/PACP

WMU employs Closed-Circuit Television (CCTV) inspection equipment as part of its routine hydraulic cleaning and assessment programs. CCTV is used to evaluate the structural integrity of individual line segments and manholes by verifying cleaning and identifying blockages that could result in potential overflows. This information is used in the numerical rating of pipe segments for the Sanitary Sewer Main Replacement Program priority list.

The CCTV software used by WMU is compatible with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) standards. PACP provides a standardized assessment and reporting system for evaluating the condition of pipelines, allowing WMU to benchmark with other communities. WMU currently has two operators trained in PACP standards.

5.4 Geographic Information System (GIS)

The Geographic Information System (GIS) uses a system of graphic layers to provide a visual representation of data collected in the field. It allows almost unlimited flexibility for viewing desired features of the WMU sewer system. WMU's GIS database currently includes:

- All photo-identifiable data (location of manholes, pump stations, etc.)
- Property and jurisdictional boundaries
- Road/Address locations
- Locations and physical attributes of utilities (pipe sizes, lineal lengths, etc.)

In the future, WMU intends to incorporate condition/inventory data in its GIS database to provide real-time information on the status of rehabilitation efforts, including rehabilitation techniques used, if applicable.

6.0 DECISION MODEL

Effective management of WMU's sewer system will maximize the performance of the system, reduce SSOs, and provide the best service to customers. WMU's total asset management plan involves long-range planning, proactive operations and maintenance, and capital improvement projects. This comprehensive approach ensures:

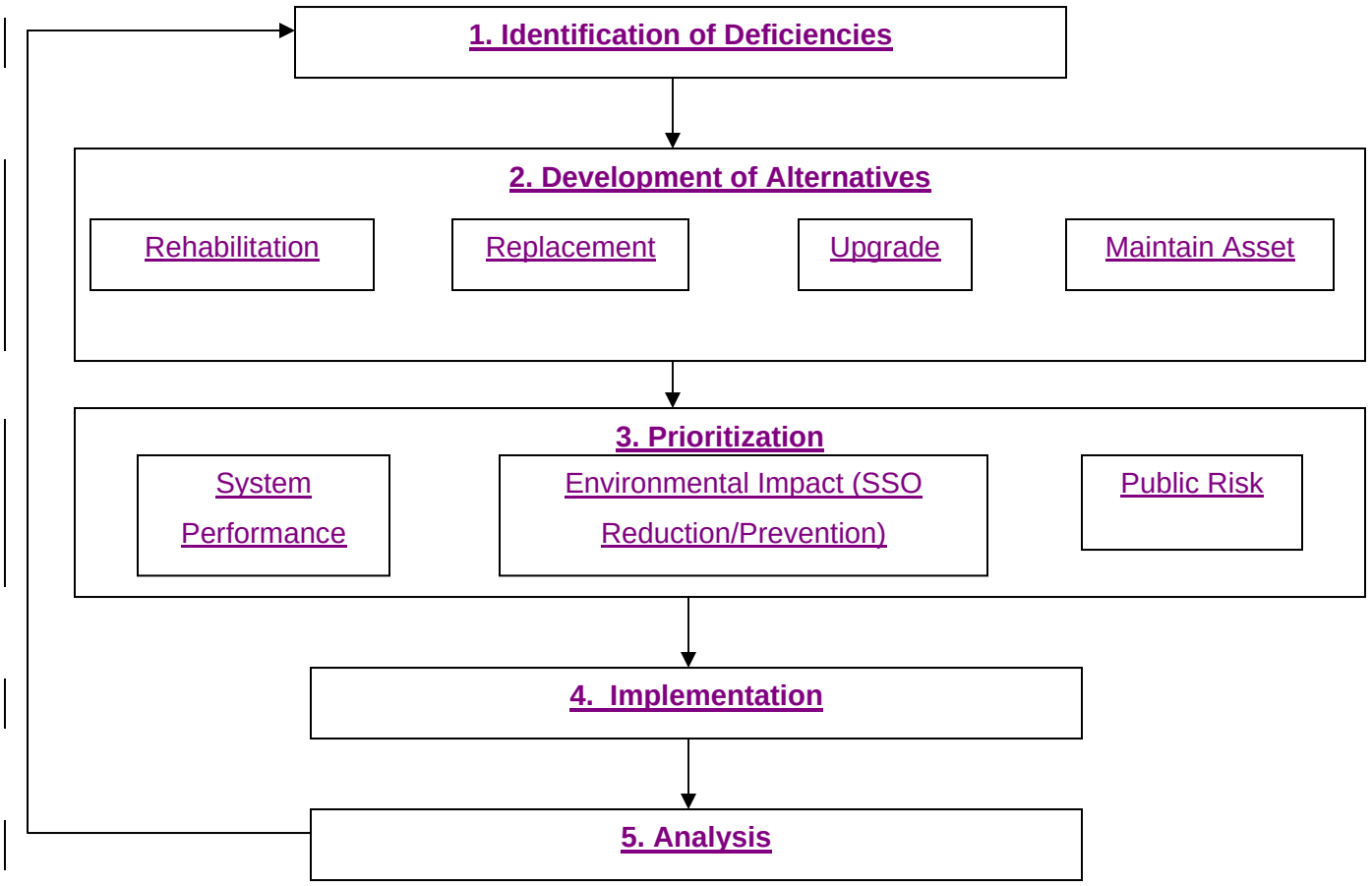
- Proper maintenance protects components from premature failure
- Forward-thinking capital improvement planning and implementation to reduce overall operating costs
- Reduction of I/I
- Reduction in cost of improvements through economic evaluation of alternatives
- Focus on the primary goals of reducing wet-weather flows and SSOs

The IRP plays an integral role in the management of the WMU sewer system by providing a link between the CSSAP and accomplishing necessary sewer improvements. The CSSAP outlines the processes for collecting and analyzing information on individual components. The IRP decision model outlines the progression from condition assessment data obtained through the CSSAP to the development of sanitary sewer improvement projects.

Initially, in accordance with WMU's current Five-Year Capital Plan (2008-09), projects focusing on renewal and replacement will drive most of the WMU Capital Improvement Program. Additional projects may be implemented to address capacity improvements (relief sewers, replacement of segments with larger sewers, pump station and storage facility capacity expansion). Primary tools to support decision-making for this phase are flow monitoring data, data obtained from the completed system hydraulic model, and historical records of existing deficiencies.

As WMU continues to refine its programs, the CSSAP will play an increasingly important role in the decision-making process under the IRP. As capital improvements are completed, WMU anticipates a decrease in the number of projects to address system deficiencies such as overflows and capacity issues, and an increase in projects developed through the assessment and prioritization procedures outlined in the CSSAP. This process is illustrated in Figure 6.0.

FIGURE 6-1: IRP PROCESS FLOW DIAGRAM



The IRP decision process consists of five steps:

1. Identification of Deficiencies
2. Development of Alternatives
3. Prioritization
4. Implementation
5. Analysis

6.1 Identification of Deficiencies

WMU will identify components of the sewer system needing rehabilitation or replacement through assessment procedures outlined in the CSSAP including:

- Hydraulic model
- Historical data (e.g. complaints, blockages, SSOs)
- Flow monitoring
- CCTV Inspections
- Physical inspections

6.2 Development of Alternatives

To address sewer system deficiencies, WMU will develop and evaluate alternative actions to correct the deficiency. In deciding on the appropriate alternative, WMU may consider factors including, but not limited to:

- Effectiveness of alternative in correcting the deficiency
- Life-cycle cost, including initial investment and follow-on maintenance cost
- Environmental impact

Alternative corrective actions may include, but are not limited to:

- ~~Rehabilitiation~~Rehabilitation – Improves the condition of an existing pipe, manhole, or pump station equipment through the use of an applied technology such as liners or spray coatings. Rehabilitation lowers the impact on the surrounding area by leaving the existing asset in place. Once a line segment has been rehabilitated, it will remain in the Routine Hydraulic Cleaning program. Various rehabilitation techniques are discussed in Section 7 of this plan.

- Replacement/Elimination – Information on the current system is used to determine the need to replace an asset, or remove it from the inventory. Replacement is considered when rehabilitation is not feasible or cost-effective. As the current sewer system ages and implementation of the CSSAP progresses, the influence of replacements on the IRP is expected to increase. WMU may also consider elimination of an asset based on obsolescence or system redundancy.
- Upgrade – Results in an enhancement of the existing system. The decision to upgrade a component is closely associated with condition assessments from the CSSAP as well as capacity assurance. Justification factors for upgrade vs. rehabilitation/replacement include data from flow monitoring studies, the hydraulic model, and projected growth within the system as related to the Comprehensive Planning Document.
- Maintenance – Continue regular scheduled maintenance of an asset. If a component's condition assessment does not indicate a need for rehabilitation, replacement, or upgrade, it will be prioritized within the routine maintenance program. All components of the WMU sewer system are re-evaluated on a regular basis for changes that may warrant further corrective actions.

6.3 Prioritization

After determining the appropriate ~~alternative~~alternatives (rehabilitate/eliminate, replace, upgrade, maintain) for an asset, WMU will assess the priority for the necessary improvements using the Prioritization Worksheets found in the appropriate appendices. Whenever feasible, WMU will select the alternative that provides the highest system performance, while minimizing impacts to the environment and public health and safety.

System Performance – When evaluating the need for an asset to be rehabilitated, replaced/eliminated, upgraded, or maintained, WMU will consider the effect of the proposed improvement on the performance of the overall system, including the impact on downstream flows. WMU will ensure rehabilitation of a particular asset will not have a negative impact on other areas of the system.

Environmental Impact – Assessment of a project's environmental impact addresses the impact of a deficiency on the surrounding areas. WMU will take a proactive approach, considering the environmental impact of events that have already occurred, such as an overflow, as well as events that may likely occur if corrective action is not taken. Projects are prioritized based on the positive environmental impact on the location. Rehabilitation techniques are also evaluated based on their potential impact on the surrounding environment, both during and after construction.

Public Risk – WMU considers the following public risk factors in determining improvement priorities:

- Location of an asset in relation to:
  - Hospitals
  - Schools
  - Residential/Rural Areas
  - Parks/Recreation Areas
  - High pedestrian traffic
- Cultural Impacts (tourism, business, etc.)
- Other variables determined by site

6.4 Implementation

For each deficiency identified, a project package will be prepared for funding and implementation. Various corrective actions can be combined into one project (e.g. rehabilitation of existing gravity mains and replacement of failed lines within an individual basin) depending on their geographic proximity, downstream impacts, and types of corrections~~)~~. Once a project's scope and budget is established, it is incorporated into the Five-Year Capital Plan to compete for funding.

6.5 Analysis

Once complete, WMU will analyze and evaluate the effectiveness of a rehabilitation/replacement project based on comparison of data collected before and after completion of the project.

For gravity line, force main, and manhole rehabilitation to correct structural deficiencies, WMU will use trends in the number of SSOs, customer complaints, and emergency work orders in a rehabilitated section vs. data collected prior to rehabilitation, or if unavailable, to a similar un-rehabilitated section. To measure effectiveness in the reduction of I/I, WMU will use flow monitoring data for a rehabilitated section with data collected prior to rehabilitation, or a similar, unrehabilitated section. To evaluate the effectiveness of pump station rehabilitation projects, WMU will use data on pump run times, frequency of pump starts, and number of mechanical or structural maintenance issues.

The IRP itself will be also be reviewed regularly to ensure it reflects the most up-to-date and cost-effective methods for prioritizing and implementing corrective actions. As a management tool, the IRP must also be updated on a regular basis to reflect the systems current requirements. An IRP review and update log is provided in Appendix A.

7.0 IMPROVEMENT TECHNIQUES

In developing appropriate corrective measures for deficiencies in the system, WMU will elect whether a deficient asset should be rehabilitated, replaced, or eliminated from the inventory. If WMU elects to rehabilitate or replace the asset, various sewer improvement techniques will be evaluated for their appropriateness to the site conditions and the problem being addressed. Options considered by WMU include, but are not limited to:

- Pipe/Force Main Rehabilitation
- Pipe/Force Main Replacement
- Manhole Rehabilitation
- Manhole Replacement
- Pump Station Rehabilitation
- Pump Station Replacement

7.1 Pipe/Force Main Rehabilitation

WMU uses Cured-in-Place Pipe (CIPP) as its primary pipe rehabilitation method. CIPP provides a cost effective technique for rehabilitating pipe segments without digging, avoiding disturbing features such as sidewalks, pavement, landscaping, or other utilities. The process involves inserting a resin-coated flexible tube into the existing pipe. The tube is then pressure-inverted against the inner pipe wall and heated in place to cure the resin, creating a structurally-sound lining.

7.2 Pipe/Force Main Replacement

Traditional pipe replacement methods require trenching along the existing pipe. Replacement may involve installation of a parallel pipe segment or re-routing of the existing alignment. Surface disturbances may be minimized through the use of new ~~technologies,~~technologies; however, some excavation is likely in many cases. Dig-and-replace methods of corrective action are usually required in (but not limited to) instances involving structural damage or collapses, severe swags, obstructions that cannot be removed by hydraulic cleaning, or severely displaced joints (>1 inch).

7.3 Manhole Rehabilitation

Several trenchless technologies are available to rehabilitate deteriorated manholes. The techniques are designed to restore structural integrity to the manhole with a minimum of surface disruption. In some cases, spot repairs may be performed. For severely degraded manholes, structural form repairs may be required, involving the construction or insertion of a new manhole within the existing manhole.

7.4 Manhole Replacement

In some instances, corrective actions cannot be accomplished with trenchless technologies. In these cases, excavation and replacement of the manhole structure may be necessary. The dig-and-replace method may be required for manholes involved in pipe rehabilitation projects, or severe structural damage.

7.5 Pump Station Rehabilitation

The majority of problems in pump stations fall within three categories:

- Electrical – tripped breakers, blown fuses, bad starter contacts.
- Mechanical – faulty valves, worn impeller or bearings
- Structural – degradation of housing structure, facilities

In many cases, regular inspections can identify faulty equipment or structural defects within a pump station. Capital projects may be developed when the scope of a problem cannot be addressed through routine pump station maintenance.

APPENDIX A – REVIEW/UPDATE LOG

APPENDIX B – MAPS

APPENDIX C – RELATED WMU POLICIES

APPENDIX D – EMERGENCY CONTACT LIST & CONTRACT SERVICE PROVIDERS

APPENDIX E – GRAVITY LINE PRIORITIZATION WORKSHEET

APPENDIX F – GRAVITY LINE PRIORITIZATION SCHEDULE

APPENDIX G – FORCE MAIN PRIORITIZATION WORKSHEET

APPENDIX H – MANHOLE INSPECTION REPORT

APPENDIX I – MANHOLE PRIORITIZATION WORKSHEET

APPENDIX J – PUMP STATION PRIORITIZATION WORKSHEET