Chapter 9

Operations Program

Chapter 9 – **Operations Program**

9.1 Introduction

The City maintains 23 full-time equivalent (FTE) staff to perform standard operation and maintenance for more than 262 miles of collection system, 14 sewage lift stations, and the City's WWTP. Standard operation and maintenance includes a preventative maintenance program for maintaining the Wastewater Utility. This chapter presents a description of the Wastewater Utility management and the elements of the preventative maintenance program for operating and maintaining the Wastewater Utility.

9.2 Wastewater Utility Management

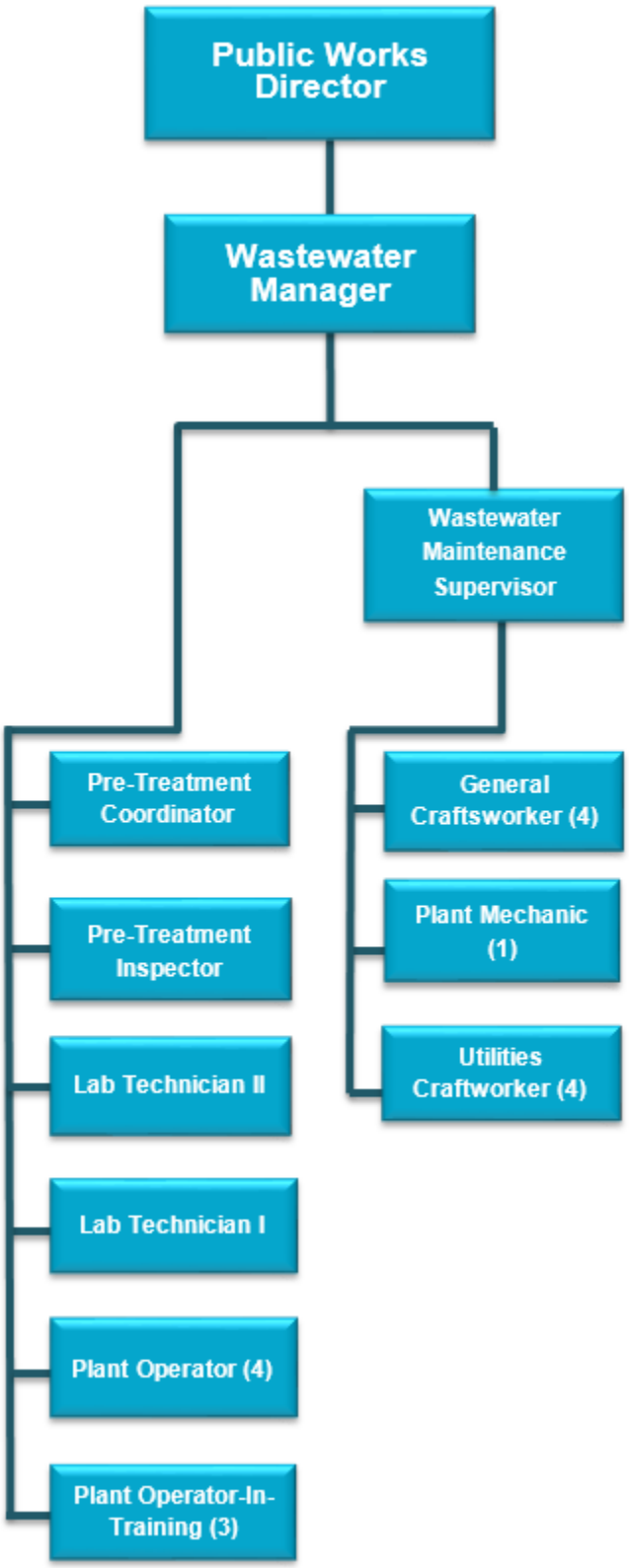
9.2.1 Organizational Structure

The Wastewater Utility operates under the direction of the Public Works Department. The Wastewater Manager, reports to the Public Works Director, and manages the activities of the Wastewater Utility. **Figure 9-1** illustrates the organizational structure of the Wastewater Utility.

The wastewater maintenance unit is responsible for the operation and maintenance of the collection system including the lift stations. The wastewater maintenance supervisor and nine craft workers are assigned to this service unit.

The WWTP is staffed with those responsible for the daily operations and maintenance of equipment and facilities at the WWTP, including conveyance facilities associated with the plant, and the City's pretreatment program. The pretreatment staff, two lab technicians, and plant operators are assigned to this service unit.

Figure 9-1 – Wastewater Utility Organizational Chart



9.2.2 Staffing

As previously indicated, the Wastewater Utility has a total of 23 FTE staff. In 2005, the EPA published a guide, which includes a table with suggested manpower guidelines for public wastewater collection systems based on city population. As per **Section 2.11**, the City's 2015 population estimate is 53,054 and therefore a manpower estimate for a population of 50,000 was used. The recommendations are based on EPA documents with a publication date of 1973 and 1974 (over 40 years old); however they provide a point of comparison. As a disclaimer, EPA notes that the manpower values may not take into account technological advances that have occurred since the publication date that might reduce staffing requirements. The suggestions are listed in **Table 9-1**.

Table 9-1 – Staffing Comparison [(a)]

Occupational Title	Est. number of personnel	Est. total man-hours per week
Superintendent	1	40
Assistant Superintendent		
Maintenance Supervisor	1	40
Foreman	1	40
Maintenance II	1	40
Maintenance I	3	120
Mason II [(b)]	1	40
Mason I		
Maintenance Equipment Operator	2	80
Construction Equipment Operator	1	40
Auto Equipment Operator		
Photo Inspection Technician		
Laborer	2	80
Dispatcher	1	40
Clerk Typist	1	40
Stock Clerk	1	40
STAFF TOTAL	**16**	**640**

[(a)] *Presented in Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems by EPA.*

[(b)] *Originally included for systems constructed of brick, the position can be replaced with a system-specific position.*

The total staffing requirements, based on the EPA guidelines, is 16 FTE's. The City currently has 23 FTEs and appears to be well staffed according to these guidelines.

9.2.3 Training

Well-trained staff are an essential part of an effective operation and maintenance program. In addition to the workforce possessing the education and skills necessary to operate and maintain a utility system that is becoming

increasingly complex with automation and computerization, staff training and education is seen as an important aspect of workforce retention and recruitment.

Maintenance personnel should be familiar with current equipment and procedures, as well as having access to review all applicable regulations. Training criteria should be established for each job description with periodic reviews conducted accordingly. The Wastewater Utility currently budgets $9,000 per year for technical training of the staff – this includes travel expenses, tuition and conference costs, safety pamphlets, and in-house safety training. The staff also attend non-cost PNCWA regional section meetings several times per year. The Wastewater Utility staff is allocated 30-40 full training days per year.

In addition to staff training, a succession plan to document and record system knowledge from aging staff, nearing retirement, is also of value. Updating maintenance procedures and collection system records by experienced senior staff and implementing skill-based training and knowledge transfer should be incorporated.

9.2.4 Customer Service

An effective customer service and public relations program ensures that the City and the Wastewater Utility address all incoming inquiries, requests, and complaints in a timely fashion. From this customer information, the City and the Wastewater Utility may further develop or revise programs to better address areas of concern. Currently, when a problem or customer complaint is received the responder updates the Wastewater Supervisor. The Supervisor then contacts a crew in the field to respond. Typically crews respond within 30 minutes of receiving the contact call. Complete details of the problem or complaint are entered to the City's Sewer Incident Reports. The program then returns a job ticket with an assigned work order number. This information is stored in a computer database. Awareness of past issues will help the Wastewater Supervisor to determine how the amount and types of inquiries, requests, or complaints are trending.

During daily routine and complaint-related activities, the collection system field crews and their activities are the most visible segment of any Wastewater Utility. Workers project a public image and therefore staff should be aware of how to respond to the public and familiar with any existing easements that might require access onto private property to service facilities. Vehicles should also be equipped with adequate emergency lighting, flashers, and signs for visible notification and traffic control. As appropriate, operators should notify homeowners prior to maintenance or construction work.

9.2.5 Maintenance Management and Record Keeping

The Wastewater Utility uses the Hansen Information Technologies (now Infor Hansen) software for maintenance management recording and record keeping. To maintain access to the most current collection system information all maintenance work performed on the collection system, including new construction, labelling of manholes and clean-outs, closed circuit television (CCTV) inspections, preventative maintenance including cleanings and repairs, sanitary sewer backups, and sanitary sewer overflows (SSO) is recorded on a log sheet that is kept on file at the WWTP.

9.3 Operation and Maintenance Activities and Programs

This section presents elements of the preventative maintenance program for operating and maintaining the Wastewater Utility. It includes operations and maintenance routines with preventative and corrective routines, wastewater-related programs and an inventory of equipment.

9.3.1 Collection System Maintenance

9.3.1.1 Gravity Sewer Pipe

The gravity sewer pipe collection system maintenance program consists of cleaning and flushing pipes, root removal and treatment, CCTV inspection, and construction repairs (both minor and major). To address these maintenance requirements the Wastewater Utility maintains a staff of six utility workers and one maintenance supervisor. The utility workers are divided into three two-man crews, each assigned to a specific maintenance task: 1) hydraulic jet flushing crew for scheduled preventative maintenance of City pipes; 2) a second hydraulic jet crew that also completes hydraulic sawing and rodding; 3) a CCTV crew for inspection of all sewer pipes 6-inches and larger. Each crew is also available to make repairs to sewer pipes, manholes and clean-outs and respond to emergency sewer back-up calls as necessary. Each maintenance program is described below.

Cleaning and Flushing

A principal goal of maintaining public support and system reliability of the wastewater collection system is to ensure that sewers remain clear of stoppages and free of odor. The City has a goal to clean all sewer pipes (262 miles) at least once every three years. Problem areas are identified and placed on a routine cleaning schedule until system repairs are made to eliminate the restrictions or problem areas.

Roots, grease and deposited solids are the most common cleaning problems. Effective control of these problems necessitates understanding how they develop. Grease builds up in a pipe over time as waste oils from foods float on the surface of the wastewater and coat the inside of the pipe. Repeated coatings can restrict a pipe to a fraction of its original size and inhibit flow. The grease coating hardens over time and becomes difficult to remove. This problem is usually found near restaurants and commercial food processors. Household garbage disposal units also affect the character of residential wastewater and can lead to grease problems. Rodding and hydraulic cleaning are used to treat root and grease problems.

The City uses a Trailer Mounted Hand Rodder and Power Rodder with motor to turn the rod. The rod, which is stored on a reel, is fed into the sewer pipe to the point of obstruction and turned automatically. It can be set so that the machine functions with little operator effort. Rodders are used to clear obstructions such as root intrusions and grease accumulations and retrieve rags and other materials. With proper tools, roots and obstructions in six inch and up to fifteen inch pipes can be removed. Set up time for rodders is longer than is required for hydraulic cleaners and greater operator skill is needed. All equipment is limited to use on driveable surfaces – although equipment must sometimes be pushed by hand behind homes or at access points off of the street. Because the skill level required for this equipment is higher than for hydraulic cleaners, safe and effective operation of the rodder requires thorough training. Experience is necessary to operate rods without damaging them.

Hydraulic cleaning uses high velocity water to clean the pipe. A water pump delivers water through a nozzle at high pressure and velocity, moving most materials through the pipe.

Currently two, two-man crews are performing the cleaning and flushing maintenance in the City. To provide the recommended level of maintenance (once every three years) a total of 461,120 lineal feet (LF) (1/3 of 262 miles) of sewer pipe is required to be cleaned and flushed per year. A total of 2,500 man-hours is required to provide this recommended level of maintenance with the current collection system.

Root Control and Treatment

Chemical treatment with RootX is used by maintenance staff in many locations throughout the City.

CCTV Inspection

Inspection by CCTV is an effective method of determining the nature and extent of internal problems in the City's collection system. The City's CCTV inspection crew consists of a two-man crew using a portable TV camera mounted on rubber wheels. The City has a goal to inspect all sewer pipes (262 miles) at least once every ten years. Required inspection is performed on both existing and new sewer pipes and where problems have been reported. All inspections are captured on video and all information recorded during inspection is uploaded into the Infor Hansen maintenance database. Not only can reports be generated with the inspection, but a permanent visual record can be made for subsequent review. In addition, television inspection of the entire system would provide an inventory of all system conditions that could be used to prioritize rehabilitation options for the City system.

Currently a two-man crew performs all the CCTV inspections in the City. To provide the recommended level of maintenance (once every ten years) a total of 138,336 LF (1/10 of 262 miles) of sewer pipe is required to be inspected per year.

System Repairs

Collection system repairs include both major and minor repairs. Only minor system repairs such as manhole repair, manhole cover replacement and adjustments, and repairs involving only limited excavations (spot repair on shallow lines) is typically performed by City staff. Major system repairs are contracted through the Public Works Department to trenching and piping contractors with the equipment and personnel to perform this work.

9.3.1.2 Manholes

The majority of the existing City manholes are concrete and overtime can deteriorate due to age or chemical attack. Manhole rehabilitation options include concrete-based linings, chemical lining systems, and chemical grouting. As the City's collection system ages, manhole rehabilitation may be considered compared to structure replacement, especially in areas that are difficult to access or in high use. Rehabilitation options are listed below:

1. Concrete-Based Linings:
    a. Goal: To maintain existing concrete, no chemical attack resistance
    b. Surface Prep: High pressure wash to remove debris
    c. Result: Similar to a non-shrink grout that can include additives to reduce shrinkage cracking

2. Chemical Lining System:
    a. Goal: To halt the chemical attack on the concrete surface
    b. Surface Prep: Range of options including pressure wash to sand blasting
    c. Result: Final coating thickness is product specific and can vary but will line the walls and channel

3. Chemical Grouting:
    a. Goal: To halt groundwater intrusion cause by infiltration of groundwater
    b. Surface Prep: None
    c. Result: Chemical is injected in the intrusion area to fill voids, multiple injections may be required

9.3.1.3 Lift Stations

The City currently maintains 14 lift stations spaced throughout the collection system. Six are located south of the Yakima River with the remaining eight located to the north. To maintain each lift station, the Wastewater Utility conducts site visits approximately once per week. During these visits, preventative maintenance tasks are performed and recorded in each lift station logbook/recordbook. Any maintenance issues are recorded at that time. These issues are typically addressed and resolved once the correct tools and parts are obtained.

Eight of the lift stations are submersible pump style lift stations. Preventative maintenance at these lift stations includes, routinely inspecting the concrete wet wells for surface striping or spalling caused by hydrogen sulfide and a submersible pump drawdown test. The wet wells are cleaned out as needed based on visual inspection. Five of the City's lift stations are the wet pit/dry pit style lift stations. Preventative maintenance at these lift stations includes, checking logs and runtime hours for each pump, test pump operation, check valve operation, test alarm functions, and visual inspection of condition and need for maintenance

Currently backup power provisions for one the lift stations is provided (Montana LS).The collection system renewal and replacement list identifies that standby generators will be installed at the Columbia Park Trail lift station in 2016.

9.3.2 WWTP Maintenance

The wastewater treatment plant maintenance unit is responsible for the maintenance at the WWTP. Routine tasks at the WWTP include valve, pump, and telemetry maintenance and any preventative maintenance routines on all equipment.

A detailed list of maintenance requirements and schedule is provided in the WWTP Operations and Maintenance Manual (updated 2015).

9.3.2.1 New Facilities

Recent facility upgrades include the following:

1. Conversion of chlorine gas to on-site generated sodium hypochlorite for final wastewater disinfection.
2. Replacement of the variable frequency drives on the influent lift station pumps.
3. Position gauges for the floating digester gas covers.

9.3.3 Wastewater Programs

9.3.3.1 Pretreatment Program

The City's pretreatment program regulates the quality of wastewater discharged to the WWTP through the Richland Municipal Code (RMC) section 17.30, which lists general provisions, discharge requirements, industrial permit requirements, sampling requirements, and enforcement actions. The pretreatment program includes the industrial

permitting program and the fats, oils, and grease (FOG) program.The pretreatment program is currently staffed with one Pretreatment Coordinator and one Pretreatment Inspector. Pretreatment is discussed more in **Chapter 10**.

9.3.4 Wastewater Equipment

The City has several types of equipment for operations and maintenance procedures. An inventory list of the equipment in included in **Table 9-2**.

Table 9-2 – Existing Wastewater Utility Equipment

Quantity	Equipment
1	CCTV Inspection Truck
2	Vactor Truck
1	Pretreatment Truck
2	Service Truck (4WD)
3	Service Vehicle (2WD)
1	Jet Truck
3	Flow Monitoring Devices

9.3.5 Preventative Maintenance

Operating equipment includes all plant and pumping stations, and wastewater collection maintenance equipment. Each lift station should be visited once per week with a complete cleaning (wash-down) and lubrication of the facility mechanical systems as necessary. Electrical equipment should be tested once per week to establish operational conditions.

9.4 Performance Indicators

Performance ratings use measures of system performance to provide a quantitative basis for characterizing utility performance. Below are performance measures that can be used to help evaluate sewer collection system infrastructure performance:

- Pipe failures (in failures per mile per year)
- Flushing efforts (in feet of pipe flushed annually) and number of problem sections
- Customer complaints on collection system performance
- Lift Station failures
- Dollar amount in claims payout (annual basis)
- Root treatment efforts (in feet cleaned annually)

Additionally, the parameters described below can also be used to help evaluate collection system performance.

9.4.1 Collection System

By implementing and adhering to a preventative maintenance program, the need for reactive maintenance routines should decrease.

9.4.2 NPDES Permitting Requirements

The City's NPDES permit covers the WWTP and the collection system. The current permit (WA0020419) was issued June 17th, 2009 and on July 2nd, 2014 it was given an administrative extension, until further notice, due to limited DOE staffing. The City was sent a draft permit and fact sheet in October, 2015 for review and comment prior to finalizing. A copy of the permit, fact sheet, and letter of administrative extension are included in **Appendix O**.

The City's NPDES permit requires the City to perform sampling and submit annual reports. On a monthly basis, the parameters set forth in the permit monitoring schedule, which includes both WWTP influent and effluent flows, are tracked and reported to DOE by the Discharge Monitoring Report (DMR).

9.5 Current Operation and Maintenance Issues

9.5.1 Collection System

There are many locations in the collection system (approximately 91,000 LF) where 8-inch and 6-inch local collector or service pipes are cleaned on a routine basis (semi-annual to annual) due to FOG buildup, roots or other obstruction, aging and brittle pipe material (clay or concrete), or low or inconsistent slopes. Sewer service pipes with FOG buildup or low slopes do not produce adequate flushing velocities to transport wastewater solids. In some areas the aging and brittle pipe is rehabilitated, instead of being replaced, with a cast-in-place (CIP) liner.

There are also several locations in the collection system where homes with basements have a deeper service lateral. These service pipes are then directly connected, downstream, to the bottom invert of an interceptor pipe, instead of the top of the pipe. As the flow depth in the main rises, it causes surcharging in the local collector pipes and backups in the service lateral pipes and has the potential to lead to spills in homes with basements.

Issues with larger diameter interceptor pipes include dropped joints, groundwater infiltration at the pipe joints, and low slopes (<0.10%) which results in low flow velocities (notably the 42-inch Horn Rapids sewer trunk often has dark organic material floating on the wastewater surface giving it a "salad bar" appearance – flushing the trunk only temporarily relieves this issue).

Groundwater seepage into the collection system at manhole and pipe joints is also an ongoing issue. The City has developed an annual Manhole Rehabilitation Program that it funds through its annual renewals and replacements project list.

The City also has two sewer siphons (Leslie Rd Interceptor Inverted Siphon and Richland West Sewer Inverted Siphon) that convey flows from South Richland under the Yakima River and to the WWTP. Additional inspection and maintenance should be provided to these two structures since they provide the only method for draining South Richland, they cross the Lower Yakima River and any type of leak or spill would be a significant event, and they are uncased ductile iron (DI) pipe installed over 20 years ago. Record drawings show inlet and outlet structures on either

side of the river crossing. These are weir structures that house isolation valves for each siphon barrel, although the current valve status (open or closed) for each pipe is not known. Design standards for sewer siphons note that these inlet and outlet structures are prime environments for hydrogen sulfide release, which results in an aggressive corrosion attack on concrete and iron materials. Therefore frequent inspection and any necessary corrosion control is important to maintain these facilities. A brief description of each siphon crossing is listed below.

9.5.1.1 Leslie Rd Interceptor Inverted Siphon

According to record drawings, the Leslie Rd Interceptor Inverted Siphon was constructed in 1979. It consists of three separate, uncased, ductile iron siphon barrels measuring 10-inch, 12-inch and 16-inch in diameter, with an equivalent diameter of 22.4". Based on record drawings, the bury depth is approximately 5-feet below the river bottom and the siphon crossing has a length of 426-ft from inlet structure to outlet structure. This siphon conveys flows from the 30-inch trunk pipe along Columbia Park Trail which drains the central and eastern portions of South Richland (generally all of Richland south of Columbia Park Trail and east of Shockley Blvd). The siphon barrels have not been flushed or CCTV inspected and therefore the current condition of each barrel is not known and if there is any accumulation of heavy solids that might be affecting the overall siphon capacity. Although conducting routine maintenance on this existing siphon is difficult due to limited site access, large existing average flow (1.40 mgd) and submerged pipe conditions, developing a maintenance schedule is critical given the large drainage basin and because it is a river crossing. Any scheduled maintenance should take place between the hours of 2 am to 5 am when existing flows are at the lowest (0.60 mgd), according to the calibrated hydraulic model, and flow depths are roughly 6-inches.

9.5.1.2 Richland West Sewer Inverted Siphon

According to record drawings, the Richland West Sewer Inverted Siphon was constructed in 1994. It consists of three separate, uncased, ductile iron siphon barrels measuring 8-inch, 14-inch and 16-inch in diameter, with an equivalent diameter of 22.7". Based on record drawings, the bury depth is approximately 5.5-feet below the river bottom and has a crossing length of 876-ft from inlet structure to outlet structure. The siphon conveys flows from the 24-inch trunk pipe along I-182 which drains the west portion of South Richland (generally west of Shockley Blvd). The siphon barrels are jetted twice per year but have not been CCTV inspected and therefore the current condition of each barrel is not known and if there is any accumulation of heavy solids that might be affecting the overall capacity. Although conducting routine maintenance on this existing siphon is difficult due to limited site access and submerged pipe conditions, the existing average flow (0.24 mgd) is not large and maintenance is critical given the large drainage basin and because it is a river crossing. Any scheduled maintenance should take place between the hours of 4 am to 6 am when existing flows are at the lowest (0.07 mgd) according to the calibrated hydraulic model, and flow depths are roughly 2-inches.

9.5.2 Lift Stations

Montana Lift Station. City crews previously noted the accumulation of sand and rock in the wet well and consistent ragging and clogging of both the pumps and check valves. Also noted was that the lift station pumps cycle frequently, up to 10 times per hour per pump, instead of a more typical value of 6. The lift station forcemain pipe also consists of both 8-inch AC pipe and 10-inch PVC pipe. The exact location and alignment of the 10-inch section is not known and was considered to be buried during the 2007 construction of the roundabout at Columbia Park Trail and Steptoe Street.

Wellhouse Loop Lift Station. City crews previously noted wet well turbulence while pumping leading to pump plugging and also ragging issues with this lift station.

9.5.3 WWTP

Current plant upgrades are discussed in **Section 5.1.2**.