

## **CHAPTER 7**

### **OPERATION AND MAINTENANCE PROGRAM**

#### **INTRODUCTION**

This Chapter summarizes the District's operation and maintenance programs designed to ensure performance and reliability of the wastewater collection system. The District operates and maintains eleven lift stations, four grinder pumps, approximately 8,500 lineal feet of force main, and approximately 240 miles of gravity lines. The District does not own wastewater treatment facilities. All wastewater collected within the District is conveyed to KCDNR wastewater treatment facilities via KCDNR sewer interceptors.

#### **WASTEWATER SYSTEM ORGANIZATION**

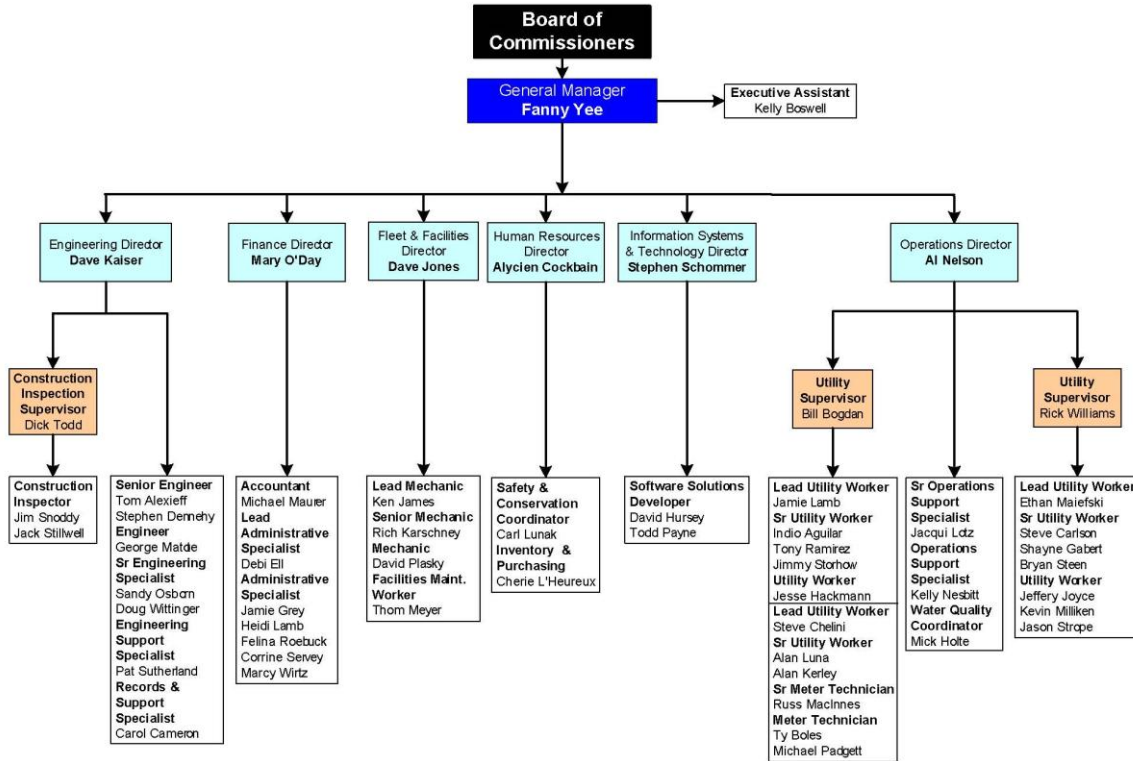
The District is a special purpose district that has the authority to operate under Title 57 of the Revised Code of Washington (RCW). District staff is organized into six departments: Engineering, Operations, Finance, Information Systems, Human Resources, and Fleet/Facilities. Figure 7-1 presents an organizational chart for the District. The Operations Department is responsible for the operation and maintenance of the water and wastewater systems. The Operations Department is also responsible for emergency response planning and drills.

Routine wastewater utility work and assignments include, at a minimum, the following tasks:

- Side sewer replacement and repair
- Sewer gravity main inspections, flushing, and repair
- Wet well maintenance, inspection, and repair
- Lift station maintenance and repair
- Grinder pump station maintenance and repair
- Gravity manhole inspection and repair

**FIGURE 7-1**

**Organization Chart**



**Northshore Utility District - Organizational Chart August 2006**

**OPERATOR CERTIFICATION**

There are currently no Washington State certification requirements for wastewater collection system operators. However, the Department of Ecology encourages participation for utilities who do not operate a wastewater treatment plant. The District currently has 16 employees that have been certified under this program; 9 Wastewater Collection Specialist – I, 6 Wastewater Collection Specialist – II, and 1 Wastewater Collection Specialist – III.

**SYSTEM OPERATION AND CONTROL**

The location of the major system components are shown on Figure 4-2. A description of the normal operation of each facility is provided in Chapter 4.

## **GRAPHICAL INFORMATION SYSTEM (GIS)**

The Geographical Information System (GIS) database and related maps functions as an essential tool for the Operations Department. The GIS is a depository for all relevant information sewer system, including the District's lift stations, sewers, and manholes is maintained and updated on a regular basis. The GIS for the sewer system is linked to scheduling tools to assist in the routine maintenance of the District's sewer system. The GIS currently maintains the schedule for flushing sewer lines and inspecting manholes, and tracks lines that require frequent maintenance. The District's video inspections are also linked to the GIS, which has facilitated the ease of viewing, therefore, enhancing the usefulness of the video inspections. The GIS is also presently being used to schedule I/I investigations, such as video inspections, smoke testing, and all results are included in the GIS database.

## **SCADA SYSTEM**

The wastewater utility has a Supervisory Control and Data Acquisition (SCADA) system with master control station located at the District office. The system uses Wonderware software to provide a graphical user interface allowing the operator to monitor pump status, run time, and alarm conditions at the eleven sewer lift stations. Figure 4-3 displays a color copy of the graphical user interface screen.

The SCADA system can automatically monitor the District's eleven major lift stations listed in Table 4-1 and four grinder pump stations along Lake Washington south of Saint Edwards State Park. The data management system records the SCADA monitoring data, which is stored on the District's computer system. This data can then be accessed by the operations and engineering staff to evaluate facility performance. Lift Station Nos. 1, 2, and 20 have pressure transducer level sensors, which provide continuous wet well level data. The remaining lift stations listed in Table 4-1 and the four grinder stations have a float switch to monitor and control the wet well level.

The SCADA system is also equipped with alarms to allow staff to respond to conditions such as pump, motor, or power failures before a sewer spill occurs. Examples of the SCADA system's monitoring capabilities and alarms include:

### **Monitoring Capabilities**

- Pump run times
- Generator run times
- Pump start/stop

## **Alarms**

- Operator in trouble
- Station flood
- Air compressor trouble (all except No. 17 and No. 18)
- Power/phase fail
- Communication fail
- Intrusion
- Fire/smoke alarm
- Water seal fail (No. 17 and No. 18 only)
- High wet well level
- Low wet well level
- Pump fail
- Generator running (No. 10 and No. 20 only)
- Fuel low (No. 10 and No. 20 only, not connected)

## **FACILITY PERFORMANCE EVALUATION**

Review of facility performance provides a means for the District's wastewater utility staff to evaluate the operation and optimizes control of the wastewater collection system facilities. The District routinely collects operating information. The information allows the District to evaluate the operation of the collection system and to determine the effectiveness of their preventive maintenance program. Table 7-1 lists the routine operating information collected by the operation staff.

**TABLE 7-1**

**Facility Performance Evaluation and Maintenance**

<b>Facility</b>	<b>Means of Evaluation</b>	<b>Parameter Evaluated</b>	<b>Evaluation Schedule</b>
Lift Stations	SCADA Manual	Pump Start/Stop Run Time Alarms	Continuously Twice Weekly
Grinder Pump Stations	Manual	Pump Start/Stop Run Time Alarms	Twice Weekly
Gravity Sewers	TV Inspection Flushing	Roots, Debris Buildup Infiltration	Every 5 years Every 2 Years
Lateral Inspections	Field Inspection	Conformance to code, Leaks, Overall Condition	2 days per week
Manholes	Visual	Fats, Oils, and Grease Corrosion, Inflow, Surge	2 days per week
Force Mains	Pigging	Scum Buildup	N/A <sup>(1)</sup>
Generators	Manual	Engine Operation	Bi-Monthly

(1) District force mains are sized to achieve a minimum velocity of 3 feet per second to achieve scouring.

**PREVENTIVE MAINTENANCE**

Planning for present and future maintenance of the wastewater utility is an important task. The maintenance effort must be continuous in order for the District to continue to fulfill its role as a wastewater provider in the future.

The role of maintenance is to preserve the value of the physical infrastructure and ensure that the District can continue to provide a safe and reliable wastewater collection system. The most cost-effective method for maintaining a wastewater collection system is to provide a planned Preventive maintenance (PM) program. Through a planned PM program, the optimum level of maintenance activities can be provided for the least total maintenance cost.

The District's PM program involves defining the tasks to be performed, scheduling the frequency of each task, and then providing necessary staff to perform the task. For large and complex wastewater collection systems, the administration, scheduling, and record keeping generated by the PM program may be the greatest challenge.

**SCADA SYSTEM**

The SCADA system is monitored daily to ensure that it is operating correctly. Alarms notify the District if something is not operating correctly.

**LIFT STATIONS**

The District visits and inspects each lift station twice a week. The complete maintenance schedule for the lift stations is provided in Table 7-2, which includes all maintenance items are performed weekly, monthly, quarterly, and annually. The complete maintenance schedule for the generator is provided in Table 7-3.

**TABLE 7-2**

**Lift Station Maintenance Schedule**

<b>Weekly</b>	<b>Monthly</b>	<b>Twice a Year</b>	<b>Annually</b>
<ul style="list-style-type: none"> <li>• Write down hours</li> <li>• Check pump filters</li> <li>• Check pump cycle counter</li> <li>• Inspect check valves for rags</li> <li>• Check ventilation operational</li> <li>• Check for leaks in dry well</li> <li>• Drain sump</li> <li>• Exercise/lube gate valves</li> <li>• Blowdown bubbler</li> </ul>	<ul style="list-style-type: none"> <li>• Replace pump filters</li> <li>• Clean check valves</li> <li>• Clean and sanitize dry well</li> <li>• Drain air compressors</li> <li>• Clean out drain sumps</li> <li>• Check telemetry</li> </ul>	<ul style="list-style-type: none"> <li>• Clean wet well</li> </ul>	<ul style="list-style-type: none"> <li>• Paint interior and piping</li> <li>• Check all force mains that discharge to manholes</li> <li>• Grease all pumps</li> <li>• Check all electric panels</li> <li>• Inspect pump impellers</li> <li>• Clean house thoroughly</li> </ul>

**TABLE 7-3**

**Generator Maintenance Schedule**

Weekly	Monthly
<ul style="list-style-type: none"> <li>• Visual inspection of permanent generators</li> </ul>	<ul style="list-style-type: none"> <li>• Perform test run</li> <li>• Check oil</li> <li>• Check oil filter</li> <li>• Check air filter</li> <li>• Check battery fluid level</li> <li>• Check battery terminals for corrosion</li> <li>• Check alternator output volts</li> <li>• Check coolant level</li> <li>• Check fan belts</li> <li>• Check fuel level</li> <li>• Check rpm</li> </ul>

**GRINDER PUMP STATIONS**

The District maintains four grinder pump stations located along Lake Washington, north of Lift Station No. 15. Each station serves three to four homes. The District visits and inspects each of the grinder pump stations twice a week.

**FORCE MAINS**

The District provides maintenance for their force mains by cleaning the lift station wet wells on a quarterly basis, removing fats, oil, grease, and other debris that could adversely affect their capacity. Table 4-3 presents an inventory of the District’s force mains. Force mains are sized for 3 feet per second to achieve scouring velocity and to remove solids.

**GRAVITY SEWER AND MANHOLES**

The District performs periodic inspections and flushing of the gravity sewers and manholes. The District’s current prioritized task list designates 3 days a week for conducting sewer mainline TV inspections and 2 days a week for sewer lateral and manhole inspections. The District aims to TV inspect the gravity sewer lines at a rate of about once every 5 years. The District flushes the gravity sewer lines in the collection system to clear them of debris, settled solids, and grease buildup. The District’s current prioritized task list designates 3 days per week to flushing the gravity sewer lines.

## **FATS, OILS, AND GREASE PROGRAM**

The District supports the fats, oils, and grease (FOG) guidelines established by KCDNR and is in the process of implementing a FOG program. The District plans to implement a more comprehensive FOG program, which includes establishing a maintenance schedule, public education, automatic letters and responses, and an updated database. The staffing requirements of implementation have not yet been established. The approach the District has taken is to primarily educate and inform commercial sewer customers. The District inspects grease traps two times a year. If an inspection is unsatisfactory the District sends a follow-up letter requiring the trap be cleaned within a specified number of days, after which the District will reinspect. Historically, the District has not had a significant problem with FOG.

## **I/I PROGRAM AND METER MAINTENANCE**

The District actively monitors I/I with flow meters installed throughout the District and by monitoring wet well levels. Twice a month the flow monitoring meters are pulled and checked for accuracy. Wet well monitoring is also conducted twice a month.

## **EMERGENCY RESPONSE PROGRAM**

Wastewater utilities have the responsibility to provide collection of wastewater in a reliable manner at all times. Therefore, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts. The Comprehensive Emergency Response Plan is summarized in Appendix O.

Though it is not possible to anticipate all potential disasters affecting the District's wastewater system, formulating procedures to manage and remedy several common emergencies is appropriate. The District provides guidelines for the general assessment of an emergency situation in the Emergency Response Manual. The Manual recommends establishing an Emergency Operations Center (EOC). Once a general assessment of the situation has been completed, the Manual provides "decision trees," outlining step-by-step procedures for emergency situations such as severe weather events, earthquakes, power failure, and communication failure.

The District maintains two emergency phone number lists for use by District personnel. One list is District staff phone numbers, addresses, and cell phone numbers. The second list includes the numbers for emergency services, generator rentals, adjacent utilities, fuel suppliers, parts suppliers, safety equipment, pumper trucks, contractors, and consultants. The District is also developing specific O&M Manuals for each of its major facilities to facilitate operation during an emergency.



## **SAFETY PROCEDURES**

Work place hazards for this system are primarily limited to confined space entry, electrical equipment, health hazards associated with sewage, and traffic hazards associated with doing work in the right of way. Confined space issues are also a major concern for sewer collection system facilities due to the potential for falls and the potential for lethal gasses in underground facilities such as manholes and wet wells.

Operator training is an important component in maintaining a safe and reliable wastewater collection system. At a minimum, all personnel performing wastewater system related duties receive training in the following areas:

- Confined Space
- Trenching and Shoring
- Traffic Flagging
- First Aid

## **CAPACITY, MANAGEMENT, OPERATION, AND MAINTENANCE**

The EPA has proposed a new round of regulations regarding sewer system Capacity Management Operation and Maintenance (CMOM). The CMOM regulations institute a program for long-term finance and repair of sewer systems. Although the EPA has not formally adopted the regulations, the District has reviewed the CMOM checklist. The District has a system to maintain its sewer system and has informally completed the CMOM checklist through development of this Plan. A blank copy of the checklist is provided in Appendix K for future use.

## **MAINTENANCE RECORD SYSTEM**

The District maintains a system database that serves, along with various other functions, to track customer complaints and maintenance work orders. When a complaint or a work order is filed, the work in question is assigned a specific number. The database will call up this number until the work in question is completed. This is the District's method of tracking work orders and ensuring completion.

The District maintains a system for tracking sewer system projects and the invert elevations and pipe sizes of the sewer system through record drawings, a GIS database, and quarter section Auto CAD maps of the entire sewer system. The GIS system contains the database of invert elevations and pipe sizes of the sewer system.

## **STAFFING LEVELS**

The District has outlined the tasks of the various roles within the water and sewer utility district.

### **WATER QUALITY COORDINATOR**

The Water Quality Coordinator receives all inspection requests, attends preconstruction and plan review meetings, and coordinates with Supervisors when staffing assistance is needed. The Coordinator manages tank levels and administers the fats, oil, and grease program.

### **DISPATCH**

The Dispatch acts as communications hub for operations, processes work orders, develops reports, drafts letters, prepares notifications, and responds to customer service calls.

### **SEWER SUPERVISOR**

The Sewer Supervisor receives all customer calls regarding sewer-related issues. The Supervisor develops work task and oversees performance measures and ensures performance plans are adhered to and resources are allocated appropriately. This position creates weekly, monthly, and annual work schedules. This position regularly trains, guides, and assists employees with their development.

### **UTILITY LEAD SEWER SERVICE**

The Utility Lead Sewer Service works closely and communicates with the Supervisor and reinforces the Supervisor's expectations. The Lead develops daily work schedules and regularly meets with crew regarding upcoming workload assignments. This position consistently plans, guides, coaches, and directs crews to perform work duties as assigned and in a safe, efficient manner.

### **SEWER SERVICE GROUP CREW**

The Sewer Service Group Crew performs a wide variety of work tasks including maintenance of sewer service laterals, paving, roadway cuts and patches, lift station and wet wells, manholes and cleanouts, vehicles and equipment. The Crew is also responsible for sewer main flushing, wastewater metering, sewer line cleaning, inspections, emergency repairs, and electrical and telemetry control monitoring.

## **UTILITY LOCATOR**

The Utility Locator responds, manages, and performs utility locates and line marker installations. This position also performs leak checks, follow-up on easement issues, and responds to customer service calls. The Locator reports to the Water and Sewer Supervisors and is backed up by various assigned individuals within the workgroups.