6. OPERATION AND MAINTENANCE PROGRAM

6.1 Introduction

The purpose of the O&M program is to ensure satisfactory management of a water system's operations in accordance with WAC 246-290-100, -300, -310, -320, -440, -480, and -490; and WAC 246-292-020, -050, and -090. An O&M program provides guidance for water system personnel to identify the necessary tasks required to ensure that the system life is extended to its full capacity, and to provide a safe and reliable water supply to the public.

The following areas are included as part of the O&M program:

1. Water system management and personnel
2. Operator certification
3. System operation and control
4. Comprehensive monitoring plan
5. Emergency response program
6. Safety procedures
7. Cross-connection control (CCC) program
8. Customer complaint response program
9. Record-keeping and reporting
10. O&M deficiencies and improvements.

The intent of this chapter is to provide a standalone document that is routinely reviewed and updated.

6.2 Water System Management and Personnel

The City currently has four full-time water system personnel who operate the system on a day-to-day basis. The Public Works Director and Public Works Field Supervisor divide their time between water system operations and other duties of the Public Works Department. The City's Project Manager divides time between miscellaneous water duties and capital improvement projects. Staff members at City Hall divide their time between entering the water use information for billing purposes, preparing the monthly water bills, and collecting the payments and other non-water system administrative duties. The water system organizational chart is shown in Figure 6-1. A general synopsis of the responsibilities of each staff member follows. In total, the City employs 4.15 full-time equivalents (FTEs) in the Public Works Department for the operation of the water system. City Hall administrative staff also work on projects and tasks related to the operation of the water system. When these employees are taken into account, the number of FTEs employed to operate the water system increases to 6.35.

Public Works Director. The Public Works Director works directly with staff to ensure that the system is operated efficiently. The Public Works Director and Field Supervisor work together to develop the annual operating budget. Additional responsibilities include staff oversight, plan review for new projects, and responding to customer complaints.

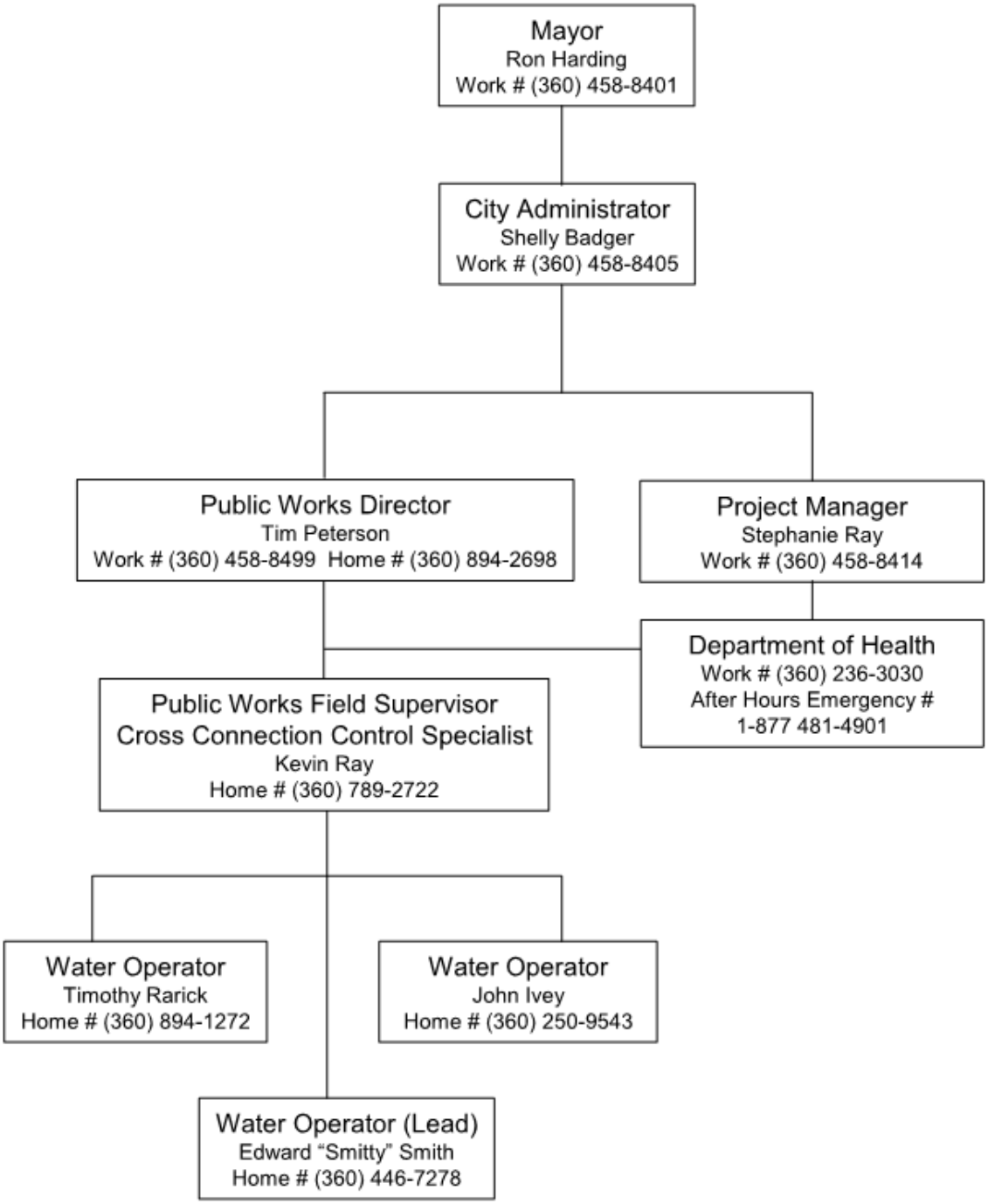

Figure 6-1. Yelm Water System Organizational Chart

Operations staff. Operations staff conduct the day-to-day work necessary to maintain, operate, test, analyze, and repair the system to ensure proper operation and system longevity. The staff performs monthly meter reading for use in preparing the monthly water bills. The staff works with the Lead Water System Operator to coordinate work items and to schedule necessary repair and maintenance tasks. Operations staff are

responsible for issuing water meters for new customers, ensuring that sufficient supplies and tools are available, ordering chemical supplies, and checking that the monthly billing information is correct.

Cross-Connection Control Specialist. The CCCS is responsible for implementing the CCC Plan. This person is responsible for testing, monitoring, repairing, and recording the necessary information pertaining to CCC, as well as preparing the annual Cross-Connection Report due to DOH. The CCCS also works with the building inspector to review plans to ensure that approved CCC devices are installed during construction.

Project Manager. The Project Manager works with the Public Works Director on budget preparation for capital improvement needs, water system planning, and execution of capital improvement projects.

City Administrator. The City Administrator works with the Project Manager and Public Works Director regarding policy development, project issues, annual water system budget preparation, and working with the funding agencies to fund system improvements.

City Council. The City Council sets policy and water system rate schedules; approves ordinances; and serves as a sounding board for public response, feedback, and guidance. The Council also approves the water system budgets, sets citywide priorities, and provides funding and support for water system projects.

6.3 Operator Certification

The water system is classified as a Group 2 (defined in WAC 246-292-040: population served is 1,501–15,000). The City is legally required to designate the certified operator in responsible charge of the daily operational activities of the public water system, treatment facility, and distribution system.

The following staff members have certifications related to the water system's operation. Copies of these certifications are included in Appendix 6A.

Edward B. "Smitty" Smith
Position: Lead Water System Operator
Certification: Water Distribution Manager III and CCCS

Tim Peterson
Position: Public Works Director
Certification: Water Distribution Specialist I

Kevin Ray
Position: Public Works Field Supervisor, CCCS
Certification: Water Distribution Manager II, CCCS, and Backflow Assembly Tester

John Ivey
Position: Water System Operator
Certification: Water Distribution Manager II, CCCS, and Backflow Assembly Tester

Timothy Rarick
Position: Water System Operator
Certification: Water Distribution Manager II, CCCS, and Backflow Assembly Tester

The City supports professional training and development and provides funding and time away from work to attend training.

6.4 Operation and Maintenance Tasks

Staffing requirements were studied as part of the development of this WSP to determine if sufficient staff were available to efficiently operate, maintain, repair, and to collect and report the information necessary to properly operate, the system. Water system staff interviews, review of required work, current workloads, method of organizing work, and the actual amount of time available to conduct the work after vacations, sick leave, and training were used to determine staffing requirements. Table 6-1 shows the estimated time to conduct water system business.

Table 6-1 shows that enough FTEs are associated with the water utility to perform the tasks necessary to operate and maintain the water system. As the system continues to expand, the time required to complete these tasks will increase and additional staff and operators will be required. It is assumed that an additional FTE will be added to the water system staff in 2012. If the MPCs develop on the schedule identified in this Plan, another FTE will be required in 2014. The financial forecast presented in Chapter 9 conservatively assumes no growth in the number of connections to the system over the 6-year planning period and consequently no increase in the number of FTEs required for O&M. If connections grow at the pace projected in this WSP, the additional FTE will be funded through the resulting increase in revenues collected from monthly rates.

6.5 System Operations and Control

This section of the O&M document includes the following:

- Routine system operation
- Preventive maintenance program
- Equipment, supplies, and chemical listing.

A description of the major components of the water system is presented in Chapter 1. The City's water system is gravity-operated; there are no booster pump stations in the system currently, although a small booster pump is currently being planned and constructed by a private developer. Figure 6-2 identifies the location of the major components of the City's water system. Figure 6-3 presents a schematic diagram showing the interconnection of these facilities.

6.5.1 Identification of Major System Components

The facilities that make up the Yelm water system are described in the following sections. The capacity of these facilities are described in Chapter 3 of this WSP, along with the additional facilities that are planned for construction to address current deficiencies and serve anticipated growth.

6.5.1.1 Water Supply Sources

The City currently owns two groundwater sources that are used to supply the City with potable water. Wells 1A and 2 are located on Second Avenue between Washington and McKenzie Streets. The wells are approximately 30 feet apart and have an average depth of 65 feet. Each well has a 12-inch-diameter well casing and each is protected in an individual well house. Each well has a capacity of 1,200 gpm. Hydraulic limitations restrict pumping from the wells so that only one well can operate at any one time when operating at full capacity of 1,200 gpm. The well pumps discharge directly into the Baker Hill tank through a dedicated 8-inch chlorine contact line. The system pressure depends on the water level within the tanks.

Table 6-1. Staff Work Activities		
Work Activity	Days Required Annually	Assumptions
Vacation	83	20 days per year for 4.15 FTEs
Sick leave	50	12 days per year for 4.15 FTEs
Data collection/record-keeping	12	Record-keeping and reporting includes daily pumping records, water use data, and chemical use; maintaining training logs; and reviewing budget status and reporting.
Line flushing	48	Current flushing schedule of 2 days per month using two people.
Inspection	36	Current time spent to inspect construction projects involving water service (3 days per month).
Plan review	24	Current time spent to review and comment on project plans (2 days per month).
Meter installation	24	Current time spent to install new meters (2 days per month)
Locates	48	Current time spent to located existing water service (2 days per month)
Valve and hydrant exercising	62	Based on ability for two people to exercise 48 valves and hydrants per day. There are approximately 1,000 valves and 485 hydrants in the system.
CCCP	130	Based on one person half-time dedicated to CCC.
Hydrant testing	48	Current exercising schedule (two people, 2 days per month).
Training	8	Current schedule (2 days for three water operators and Public Works Director)
Line testing	24	Current schedule (1 day per month using two people).
Meter reading	96	Current schedule (4 days per month for two people).
Repair line breaks	120	Current time spent to repair breaks (5 days per month for two people).
Leak detection	10	Recommended time required to detect and aggressively stop system water loss.
Part orders	12	Time spent ordering parts and equipment for system repair and maintenance.
Service disconnects and re-connects for non-payment	36	Time spent turning service on and off.
Preventive maintenance	60	Recommended maintenance to ensure that the system is efficient and reliable (2.5 days per month for 2 months).
Management/meetings	48	Current schedule (2 days for two people).
Inventory	12	Time recommended to annually prepare or update the equipment and parts inventory (1 day per month).
Travel times	24	Estimated time spent traveling for shop to site or City Hall (1 day per month for two people).
Consumer confidence report	5	Prepare the federal water system consumer confidence report (one person for 5 days).
Total days required to complete the necessary work	1,020	
Total number of working days available	249	11 holidays per year
Number of Public Works Dept. FTEs required	4.1	
Current water system FTEs	4.15	

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Figure 6-2
City of Yelm
Water System

Legend

- City of Yelm
- Urban Growth Area
- Existing Active Tanks
- Existing Active Wells

Existing Water System

Pipe Diameter

- 2"
- 3"
- 4"
- 6"
- 8"
- 10"
- 12"
- 16"

0 Feet 2,000

N

Public Works Tank

Baker Hill Tank

ANDERSON LN SE
MUD RUN RD SE
86TH LN SE
UNNAMED PVT DRWY
YELM HWY SE/SR 510
RATHBUN RD SE
89TH AVE SE
WALTON LN SE
88TH AVE SE
83RD WAY SE
84RD CT SE
THUJA AVE SE
BRIAR ST SE
HEATHER LN SE
PORT ORFORD BLVD SE
JOYCE CT SE
CRYSTAL SPRINGS RD SE
WILKENSEN RD SE
92ND AVE SE
EL CAMINO LN SE
MOUNTAIN VIEW RD SE
KILLION RD SE
GULLENS RD SE
94TH AVE SE
BRIDGE ST SE
94TH LN SE
RAILWAY RD SE
NORTHERN PACIFIC RD NW
BERRY VALLEY RD SE
VAN TRUMP ST SW
SW WASHINGTON AVE
SW MCSWAIN AVE
LONGMIRE ST SE
FLUME RD SE
CANAL RD SE
GROVE RD SE
WEST RD SE
FRONTIER PARK LN NE
103RD AVE SE
104TH AVE SE
VAN NORHOP ST SE
HILL RD SE
109TH AVE SE
109TH LN SE
110TH AVE SE
GEORGE RD SE
SHAW RD SE
FOX HILL RD SE
CHARBONNEAU LN SE
WEISENBERGER RD SE
HOBBY ST SE
CLARK RD SE
LAUKERS LN SE
MORRIS RD SE
HARRIS RD SE
BALD HILL RD SE
115TH LN SE

LEGEND

PT PRESSURE TRANSMITTER
PLC PROGRAMMABLE LOGIC CONTROL
ZI POSITION INDICATOR
PVC POLYVINYL CHLORIDE
HS HAND SWITCH

VALVE KEY

ALTITUDE VALVE
GATE VALVE
CHECK VALVE

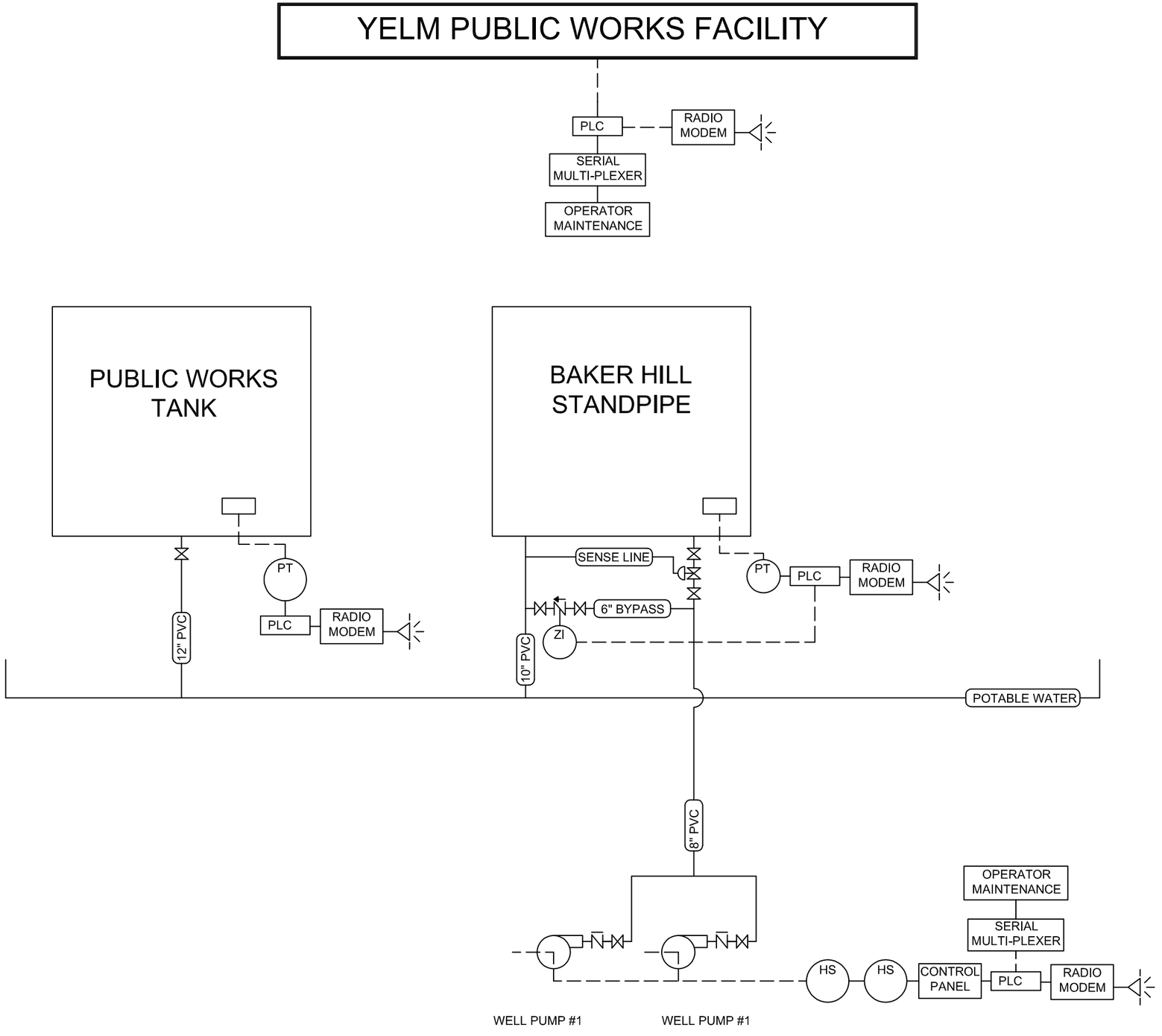

Figure 6-3
City of Yelm
Facility Interconnection Diagram

Drawing based on Skillings Connolly Process & Instrumentation Diagram, 2003.

Well 2 was drilled to a depth of 61 feet in 1958. The well is constructed with a 12-inch casing and 9 feet of 80-slot Armco iron well screen. In 2002, Well 2 was upgraded and a new pump was installed. The new pump is a Goulds deep well turbine pump and has a capacity of 1,200 gpm.

Well 1A was drilled in 2005. The well is constructed with a 12-inch casing and has 10 feet of 50-slot Johnson screening. The pump is a Goulds model 10DHHC turbine pump with a 4-stage pump motor that can provide 1,200 gpm. The well is 68.7 feet deep.

Wells 1A and 2 operate on an "on-call" basis using a pressure transducer located at the Public Works reservoir. The telemetry system allows the wells to operate in either auto or manual mode. In auto mode, alternating operation is provided along with simultaneous operation of the wells if the reservoir levels drop to a predetermined level. The well pump operational procedures specify alternate operation of Wells 1A and 2 when the tank level of the Public Works reservoir falls to a set point.

The Public Works reservoir and the Baker Hill tank are connected by a bypass valve system and piping to the distribution system. A pressure transducer in the Baker Hill tank controls the bypass valve between the two reservoirs. When the water level in the Baker Hill tank is low, the transducer trips the bypass valve, which directs the flow to the Baker Hill tank. Once the Baker Hill tank is full, the bypass valve directs the flow to the Public Works tank though the distribution system piping. The Public Works tank transducer then shuts off the pumps when the tank is full. The wells are set to run so that the wells have a resting period between uses on an average day. A control valve installed near the wells allows water to be pumped directly from the wells into the distribution system if pressure at the valve drops below 30 psi if a fire or other event causes low pressure in the system. The valve allows water to be discharged directly into the system, bypassing the storage tank, until the pressure increases to 45 psi.

The existing wells are in good condition: Well 2 was reconstructed in 2002 and Well 1A was constructed and placed into service in 2005. No significant work on either of these sources beyond routine maintenance is expected to be necessary over the next 10 years.

6.5.1.2 Treatment Facilities

The City system uses chlorine gas to disinfect the raw water from Wells 1A and 2. The dedicated transmission main from Wells 1A and 2 to the Baker Hill reservoir has no service connections to it and provides chlorine contact for the full distance between the wells and the reservoir. The City does not allow connections to this line. Additional contact time is provided in the reservoir prior to introduction into the distribution system.

The pH adjustment system installed in 2000 consists of a 2,000-gallon polyethylene caustic soda tank. Caustic soda is injected directly into the dedicated chlorine line that goes to the Baker Hill reservoir. The injection pump is a Wallace & Tiernan Encore 700 mechanical diaphragm pump that is speed-controlled using a variable frequency drive paced by a 6-inch magnetic flow meter on the contact line. The facility's life expectancy is 50 years. The injection pump can handle flows up to 1,400 gpm, although the maximum continuous design flow is 1,200 gpm.

6.5.1.3 Storage Reservoirs

Yelm has two storage tanks in operation: the Baker Hill tank and the Public Works tank. These tanks each provide 500,000 gallons of system storage and operate at a maximum elevation of 477 feet.

In 1976, Reliable Steel Fabricators, Inc., constructed the Baker Hill tank, a 500,000-gallon steel standpipe. The tank has a diameter of 36.3 feet and is 64.7 feet high. It is located south of Baker Road between Mill Road and Clark Road. In 2006 the interior and exterior of this tank were repainted.

Construction of the Public Works tank was completed in 2005. The tank has a diameter of 50 feet and is 34 feet high; the top of the tank is at 477 feet. It is located next to the Public Works building on Rhoton Road SE. The level in the Public Works tank floats on the Baker Hill tank and controls the start and stop of the wells.

6.5.1.4 Standby Power Supply

The City installed a new generator in 2003 at the Well 1 well house to provide standby power for Wells 1A and 2. The equipment is exercised weekly, with fluid levels checked routinely as recommended by the manufacturer. The generator is run under a load to ensure that the equipment is working properly.

6.5.1.5 Alternative Operation Modes

The only alternative operation mode that is designed into the system is a pressure-controlled valve at Wells 1A and 2. The valve is on a line that is connected directly between the well discharge manifold and the distribution system and bypasses the treatment system. The valve is designed to open when the distribution system pressure drops below 20 psig, and then close when the system pressure rises to 40 psig. The operation of this valve provides large flows of water directly into the distribution system during emergencies and avoids sending the water up to the reservoir and back down to the discharge point during a large fire event.

6.5.1.6 Supervisory Control and Data Acquisition (SCADA) System

The existing local control and SCADA monitoring equipment for the water system uses Allen-Bradley MicroLogix 1100 and 1500 programmable logic controllers. These devices should serve well into the foreseeable future. The existing SCADA system relies on Allen-Bradley PanelView control panel-type human-machine interface (HMI) units that are located at the individual facilities rather than a computer-based HMI system. An O&M manual for this system is maintained in the Public Works facility. Maintenance is usually contracted out to the system vendor, Taurus Power & Controls, Inc. (Tualatin, Oregon). Chapter 8 of this WSP includes a description of improvements to the SCADA system that will upgrade the system to a computer-based system that will provide better remote access and flexibility.

6.5.2 Routine System Operation

Each piece of equipment should have specific written directions regarding the startup and shutdown procedures. The following information is general in nature. As new facilities are constructed and put into service, more detailed O&M directions will be prepared and used to supplement the directions provided below.

6.5.2.1 Startup and Shutdown Procedures

Well pumps. Prior to starting well pumps, all line valves should be open. Tools, rags, and other objects that may foul the motor should be removed prior to energizing the motor. If work is to be done on the pump, the electric power disconnection switch should be locked out and tagged out in accordance with the City's lockout procedures and Labor and Industries code requirements.

Standby generator. Startup and shutdown procedures for the standby generator should be done in accordance with the manufacturer's recommendations. During maintenance activities, the generator should be prevented from starting.

6.5.2.2 Safety Procedures

Worker safety is the responsibility of all water system employees and the best way to prevent injuries is to provide the necessary training for workers to identify dangerous situations and stop operations until safer methods can be used. Areas of concern for water system employees include:

- Chlorine gas hazards
- Trench excavation
- Electrical hazards
- AC pipe
- Pressure line dangers
- Confined space entry
- Chemical danger
- Traffic control procedures
- Animal control methods and procedures.

Specific requirements regarding these areas will be prepared by the Public Works Department and inserted into this document as facilities are upgraded and added to the existing system.

6.5.2.3 Meter Reading

The City reads the meters on a monthly basis. Water Department personnel follow a regular route to read the meters, which is done electronically or manually. Currently, electronic readings are taken by touching a receiver wand to individual meters. When conducting a manual reading, the operator manually enters the meter information into the receiver. The receiver stores the meter information, which is then downloaded at City Hall to generate monthly water bills. The City plans to begin using remote radio readings by the end of 2009 for portions of the system. Touch and radio reads will be used elsewhere until the system can be completely replaced. A copy of the monthly water use information is reviewed by city hall administrative staff as well as by water system staff to identify potential leaks and trends in water use. Meters with readings that are suspiciously low or high should be tested for accuracy and replaced if necessary.

Flow meter readings are read at the wells every work day (excluding weekends and holidays) and manually recorded in a system log book. Monthly reports are prepared to track total water production and compare production from one year to the next.

6.5.2.4 System Performance Evaluation

A set of performance standards to evaluate the system performance needs to be developed by the Public Works Department. The maintenance system to be implemented will be developed so that statistics and criteria such as the following can be tracked and reported:

- Percent of lost or unaccounted-for water
- Number of broken line repairs performed
- Number of customer complaints
- Number of water quality violations
- Number of job-related injuries
- Number of unplanned shutdowns or equipment downtime
- Ability to complete scheduled maintenance items on time.

6.5.3 Preventive Maintenance Program

A preventive maintenance program is important to maximize the life span of the water system. The initial cost of a preventive maintenance program is high, but that investment is eventually realized because additional time is required to determine what items need inclusion on the preventive maintenance list. However, in the ensuing years the cost to conduct preventive maintenance is a fraction of the cost to replace system equipment and components. Preventive maintenance is a proactive method that reduces the need for reactive operation of the system. Preventive maintenance tasks for the water system include the following:

Well pumps

- Inspect and test well pumps to ensure proper operation
- Lubricate as recommended by the manufacturer
- Test pump controls to ensure proper operation.

Generator

- Inspect and operate under a load on a weekly basis
- Maintain in accordance with the manufacturer's recommendation.

Source meters

- Test and calibrate on an annual basis.

Water treatment system

- Caustic soda system:
  - Inspect system daily to ensure proper operation
  - Calibrate metering pump in accordance with the manufacturer's recommendations
  - Test magnetic flow meter and calibrate in accordance with the manufacturer's recommendations
  - Inspect caustic tank for leaks and cracks monthly
  - Inspect level gage monthly for proper operation
  - Test heater each fall to ensure proper operation
  - Test STEP pump monthly to ensure proper operation
  - Safety equipment should be accounted for and inspected for proper operation.
- Chlorine injection system:
  - Inspect chlorinators and injection pumps monthly to ensure proper operation
  - Follow manufacturer's recommended maintenance requirements
  - Inspect injection line (above ground) for cracks or leaks
  - Safety equipment should be accounted for and inspected for proper operation.
- Reservoirs:
  - Inspect annually for damage to the foundation
  - Inspect and operate roof entry for proper operation
  - Inspect overflow to ensure that overflow pipe is not blocked or restricted
  - Inspect water level indicator and well pump control system

  - Inspect interior coating at least every 10 years and re-coat as necessary
  - Inspect the structural integrity of elevated towers
  - Inspect the exterior of reservoirs and clean or paint as necessary.
- Water meters:
  - Inspect monthly during readings for leaks, condensation, or improper operation. Replace as necessary.
- Distribution system:
  - Flush distribution lines
  - Conduct leak detection annually and repair water lines where leaks are detected
  - Flush lines on a planned basis to remove collected debris.
- Hydrants:
  - Inspect hydrants annually for leaks or damage and operate hydrants to ensure smooth, easy operation
  - Paint hydrants as necessary to protect them from the elements
  - Conduct hydrant flow testing during line flushing operations. Collect the data and forward to the Public Works Director for recording. This information can be used to calibrate the water system model.
- Valves:
  - Inspect valve boxes for excess debris. Remove as necessary to ensure easy valve operation
  - Exercise valves annually to ensure proper operation. Defective valves should be replaced as soon as possible.
- Well houses:
  - Keep well houses neat and clean
  - Paint as necessary
  - Inspect venting and equipment annually.

6.5.4 Equipment, Supplies, and Chemical Listing

The material safety data sheets (MSDS) for the chemicals stored at the water system facilities are included in Appendix 6B. Individual equipment manuals and operations documents are kept near the equipment. The City will develop a computerized inventory tracking and maintenance system over the next 2–3 years to better manage spare parts and track regularly scheduled maintenance tasks. The cost for this program is included in the O&M costs that are incorporated into the evaluation of monthly rates presented in Chapter 9.

6.6 Comprehensive Monitoring Plan

The City is required to test its well sources and distribution system for water quality and to sample its system's water quality at representative locations within its distribution system. These sampling tests help the City determine the adequacy of public health protection provided to customers. Sampling requirements are primarily established by federal rule, adopted by the state, and enforced by DOH.

This comprehensive monitoring plan describes the following items:

- The monitoring locations for each analytical parameter

- Schedules showing the monthly, annual, and long-term sampling needs
- Existing and anticipated waivers for the sampling requirements.

As the new sources in the southwest Yelm wellfield are developed and placed into service, the monitoring plans described below will be updated.

6.6.1 Source

The required tests and testing schedules are provided in Table 6-2. These requirements are taken from Yelm's Water Quality Monitoring Report (WQMR) issued by DOH in March 2008 (provided in Appendix 6C). The tests are taken at the sampling taps for Wells 1, 1A, and 2. In addition to the required tests, pH is measured at the well house chemical feed room every morning as part of the operation of the corrosion control system.

Table 6-2. Source Testing Sampling Frequency

Contaminant	Frequency
Volatile organic contaminants	One sample between 2008 and 2010 for Wells 1, 1A, and 2
Herbicides	One to two samples every 3 years, see WQMR
General pesticides	One to two samples every 3 years, see WQMR
Insecticides	One to two samples every 3 years, see WQMR
EDB and other soil fumigants	Two samples every 3 years for Well 1A, waived through 2010 for Wells 1 and 2
Dioxin, endothall, diquat, and glyphosphate	State waived through 2010
Inorganic contaminants	One complete sample between 2002 and 2010 for Wells 1 and 2 One complete sample between 2008 and 2010 for Well 1A
Nitrate	One sample every year. This can be collected as part of inorganic chemical sampling
Radionuclides	One sample every 3 years

6.6.2 Distribution

The required tests and testing schedules for the distribution system, as specified in the WQMR are provided in Table 6-3.

Table 6-3. Water Distribution System Sampling Frequency

Contaminant	Frequency
Asbestos	Sample to be collected in 2009
Bacteriological	Six samples monthly (2008)
Chlorine residual sampling	One sample every working day
Lead and copper	One set of 40 samples between January and June 2008

The City conducts its coliform testing program based on a plan first approved in the City's 1995 Comprehensive Water Plan and updated annually. The number of samples required to represent a distribution system depends on the number of service connections the system supports. In 2008, the City submitted six samples per month for microbiological/bacteriological contaminant analysis. These samples

were taken from seven site group locations throughout the distribution system. Sampling locations were routinely alternated throughout the year.

In the event that a sample indicates the presence of coliform bacteria, five follow-up samples must be submitted. These samples will be collected from the following locations:

1. The site of the positive sample
2. One site downstream from the positive sample location
3. One site upstream from the positive sample location
4. Two routine samples from the sample site group
5. One sample from the sources.

The City updated the Coliform Monitoring Plan in 2010. A complete description of the updated Coliform Monitoring Plan is provided in Appendix 6D, along with recent water quality results.

6.6.3 Disinfection By-Products

Water systems using disinfectants must monitor for total trihalomethanes (TTHM) and five haloacetic acids (HAA5). These disinfection by-products (DBPs) are formed during the disinfection process when the disinfectant (chlorine in the case of the water system) reacts with naturally occurring organic substances in the water.

Some disinfectants and DBPs cause cancer and reproductive defects in laboratory animals and may have bladder cancer and reproductive defects in humans. While there is no conclusive evidence that disinfectants or DBPs are associated with cancer or other health effects, the EPA issued the Stage 1 Disinfectants and Disinfection By-products Rule (Stage 1 DBPR) in 1998. The purpose of the Stage 1 DBPR is to improve public health protection by reducing exposure to DBPs. The DOH incorporated the Stage 1 DBPR requirements into the state's drinking water regulations on April 27, 2003.

Water systems that provide disinfection were required to develop a system-specific monitoring plan to be available for inspection by DOH and the public by January 31, 2004. The monitoring plan prepared by Yelm in 2004 and updated in 2008 is provided in Appendix 6E.

EPA published the Stage 2 DBPR in January 2006. This rule set new monitoring requirements for TTHM and HAA5. Under the Stage 2 rule, affected systems are required to monitor at locations with the highest averages of TTHM and HAA5. Stage 1 monitoring showed that Yelm did not have any DBPR TTHM or HAA5 monitoring violations and that every sample taken during a prescribed eight-consecutive-quarter period had no more than 40 micrograms per liter (µg/L) for TTHM and 30 µg/L for HAA5. Consequently, the City qualified for a "40/30 Certification Waiver." This waiver requires Yelm to prepare a Stage 2 DPBR compliance monitoring plan and perform Stage 2 monitoring by October 2013. Without this waiver this monitoring would have had to begin in 2009. Documentation of this waiver is included in Appendix 6E.

6.7 Emergency Response Program

Yelm has completed an Emergency Disaster Plan and a copy is on file with the Thurston County 911 system. Depending on the emergency type and severity, water system personnel are typically the first to respond to a water system emergency. When a water system emergency is declared, the Public Works Director is the emergency contact for the Public Works Department.

A water system emergency includes any event that may degrade the quality or quantity of potable water supplies available to serve customers. Minor emergencies consist of broken pipe, sticking valves, broken hydrants, or short-term power outages. Major emergencies affect the entire or large portions of the water

system, lower the quality and quantity of the water, and may put the health and safety of the community at risk. The City has rarely experienced a major emergency.

Annex AA of the Yelm Emergency Disaster Plan identifies water tower damage areas that would be impacted if one of the existing reservoirs was to fail catastrophically. These pages from the Disaster Plan are included in Appendix 6F.

The City has also prepared an Emergency Response Plan that outlines procedures to take in the event of an emergency related to the water system. This plan is included in Appendix 6F with the Emergency Disaster Plan.

6.7.1 Water System Personnel, Emergency Call-up List, and Notification Procedures

In the event of a water system emergency, the extent of public notification required is determined by the Public Works Director. Depending on the extent of the emergency, several options are available, which include the following:

- Door-to-door notification (using door hangers if no one is home)
- Reader boards on the east and west ends of Yelm Avenue and the north city limit; boundary on First Street; and the south City limit boundary on SR 507
- Local (Olympia area) radio announcements (e.g., KGY)
- Press releases to the *Nisqually Valley News* and *Olympian* newspapers.

Appendix 6F includes sample notices to be used in the event of bacteriological contamination of the water system. Samples are provided for both acute and non-acute maximum contaminant levels.

Contact information for water system personnel are provided on the organizational chart in Section 6.2, above.

6.7.2 Vulnerability Analysis

A vulnerability analysis worksheet for each major facility or component is provided in Appendix 6G. These worksheets examine the facilities' vulnerability to failure and/or damage and the consequences thereof. The existing water system facilities are not highly vulnerable to failure or damage. As new facilities are constructed in the southwest Yelm wellfield these analyses will need to be updated. The southwest Yelm wellfield facilities will be located in more remote areas and additional security considerations may need to be taken into account during the design phase of these facilities. Yelm has also prepared a Security Vulnerability Self-Assessment, as required by the Public Health and Security and Bioterrorism Preparedness and Response Act of 2002. This assessment is considered confidential information, and is kept on file at the Public Works Facility.

6.7.3 Contingency Operational Plan

The City has identified options for alternative water sources in the wellhead contingency plans. If Wells 1A or 2 were to fail, Well 1, which is still operational, could be brought back online in an emergency. Since all three of the existing wells draw from the same aquifer, contamination of the aquifer would likely impact all three wells. Until the southwest Yelm wellfield is developed and new wells are placed into service, the water system will continue to be almost entirely reliant on two wells in very close proximity to each other. The City has completed a Water Shortage Response Plan which evaluates alternative water sources and presents curtailment measures in the event of a water shortage. The Water Shortage Response Plan is included in Appendix 4H.

6.8 Safety Procedures

The City follows the Washington State safety regulations set forth in WAC 296.155. The City has first aid kits located in the Public Works building and each City Water Department vehicle. An eyewash station and shower facility is provided near the caustic soda treatment system located in the rear of the Well 1 well house.

The City owns two self-breathing apparatus (SBA) that are stored at the wastewater treatment plant. The SBAs could be transported to the wells for use with the chlorine system. It is recommended that two SBAs be purchased and installed near the chlorine rooms of the well houses for Well 1.

The following water department staff members have current certifications for first aid and CPR:

- Tim Peterson
- Stephanie Ray
- Edward Smith
- Kevin Ray
- John Ivey
- Tim Rarick

6.9 Cross-Connection Control Program

The City has implemented a CCC program. The program manual is a standalone document that was developed in 2001. The City's CCC manual is provided in Appendix 6H. The manual provides the following information:

- Adoption of an ordinance that establishes legal authority to implement the CCC program
- Priorities for conducting the system inventory
- Consequences for failing to comply with the ordinance
- Qualified testers of the backflow prevention assemblies (BPAs) and CCCSs
- Guidelines for assessing the degree of hazard associated with identified cross-connections
- Guidelines for appropriate application of BPAs
- Standards for installation and testing of approved BPAs
- Detailed procedures for conducting hazard surveys of new and existing connections
- Requirements that only approved BPAs shall be installed when required
- Procedures to ensure that all installed BPAs are tested as required
- Methods to provide an adequate system of records
- General information available to the water system customer describing the methods and purpose of the City's CCC program.

6.10 Customer Complaint Response Program

The City maintains a list of complaints and identifies what was done to respond to any complaints where public health was at risk. Complaints may be filed at City Hall and/or at the Public Works facility. The City has not received any written water quality complaints in the last 6 years.

6.11 Record-Keeping and Reporting

The following procedures are for keeping and compiling records and reports. The following records are maintained in the Public Works building for the time period recommended. The City will establish a procedure to collect and store this data electronically as part of the computerized maintenance system to be implemented.

Table 6-4. Record-Keeping and Reporting

Record	Recommended Time Period
Water quality test results	6 years
Annual and monthly consumption records	6 years
Annual and monthly billed volume records	6 years
Complaint log	6 years
Maintenance records	6 years
Injury records	As required by insurance and the state of Washington
Line replacement and upgrades	6 years
Valve exercising records	6 years
Hydrant testing and records	6 years
Pressure testing results	6 years

6.12 Operations and Maintenance Deficiencies and Improvements

The water system operations analysis helped to generate the following recommendations regarding the water system O&M program:

1. If the system expands as projected in this plan, an additional O&M FTE will be required in 2012.
2. An upgraded SCADA system will be implemented to provide better control and remote access in 2009–2010.
3. Detailed O&M directions and safety procedures will be prepared for new facilities as they are constructed and put into service.
4. The City will switch part of the system to remote radio meter reading by the end of 2009.
5. The City will develop a computerized inventory tracking and maintenance system over the next 2–3 years to better manage spare parts, track regularly scheduled maintenance tasks and test results, and generate reports on system performance criteria. The cost for this program is included in the O&M costs that are incorporated into the evaluation of monthly rates presented in Chapter 9.
6. The City will prepare a Stage 2 DPBR compliance monitoring plan and perform Stage 2 monitoring by October 2013.
7. As the new sources in the southwest Yelm wellfield are developed and placed into service, the monitoring plans described in Section 6.6 will be updated.
8. As part of the development of the southwest Yelm wellfield, the City will prepare a new emergency response plan based on the DOH guidelines that addresses potential emergencies in the existing system and at the new facilities.