



# THURSTON COUNTY DEPARTMENT OF PUBLIC WORKS

## Part A Water System Plan

### Satellite Management Agency Plan

Boston Harbor Water System (DOH #07850R)

Grand Mound Water System (DOH #07150)

Tamoshan Water System (DOH #87140V)

G&O #17254  
September 2019



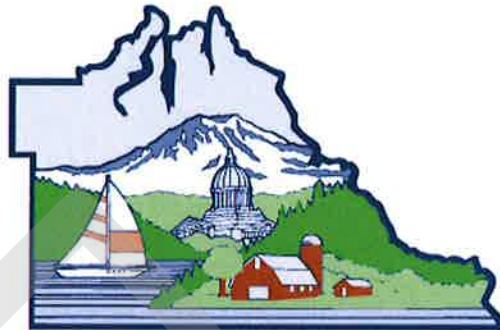
**Gray & Osborne, Inc.**



# **THURSTON COUNTY DEPARTMENT OF PUBLIC WORKS**

THURSTON COUNTY

WASHINGTON



**THURSTON COUNTY**  
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SINCE 1852

## **PART A WATER SYSTEM PLAN SATELLITE MANAGEMENT AGENCY PLAN**



**G&O #17254  
SEPTEMBER 2019**



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS



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# CHAPTER 1

## WATER SYSTEM OWNERSHIP DESCRIPTION

### OBJECTIVE

#### SCOPE OF WORK

This Part A Water System Plan (WSP) and Satellite Water System Management Agency (SMA) Plan is an update of a previous Plan prepared by and for the Thurston County Department of Water and Waste Management<sup>1</sup> in 1997 and adopted in 1998, in accordance with requirements set forth in Chapter 246-290 WAC (Group A Public Water Supplies) and in Chapter 246-295 WAC (Satellite System Management Agencies). This Plan is intended to meet all requirements of Part 246-290-100 WAC (Water System Plan) that are related to water system management and operation, and all requirements of Part 246-295-050 WAC (SMA Plan Content for Ownership) as well as the needs and concerns of the County. Pursuant to Water Regulations, this Plan must receive approval of the Washington State Department of Health (DOH) and be adopted by the County. Gray & Osborne's scope of work on this WSP was authorized by contract dated June 6, 2017. The scope includes updating all applicable sections of Plan chapters.

#### CHAPTER OBJECTIVE

The objective of this chapter is to present background information for the County's WSP. Subjects covered include the following:

- Ownership and Management
- Existing Systems
- Related Planning Documents
- Water System Policies

Later chapters of this Plan assess minimum design and performance requirements, emerging water quality regulatory issues, fire flow standards, water use efficiency program, source protection, system operations, emergency response plans, cross connection control, design standards, and Department of Public Works (DPW) financing.

## OWNERSHIP AND MANAGEMENT

### TYPE OF OWNERSHIP

Thurston County is a political subdivision of the State of Washington with a general purpose government headed by a board of three elected County Commissioners. Thurston County was created out of Lewis County by the government of Oregon

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<sup>1</sup> The Thurston County Department of Water and Waste Management has since been merged into the Thurston County Department of Public Works (DPW).



Territory on January 12, 1852. It is named after Samuel R. Thurston, the Oregon Territory's first delegate to Congress. At that time, Thurston County covered all of the Puget Sound region and the Olympic Peninsula. On December 22 of the same year, Pierce, King, Island, and Jefferson Counties were split off from Thurston County. Since that time Thurston County has been reduced to its current boundaries.

## **MANAGEMENT STRUCTURE**

The County's water systems are managed by the Thurston County DPW Water Resource Division. The County Commissioners and staff involved in water utility management and operations are as follows:

County Commissioner District 1 .....	John Hutchings
County Commissioner District 2 .....	Gary Edwards
County Commissioner District 3 .....	Bud Blake
Public Works Director .....	Jennifer D. Walker, PMP
Water Resources Division Manager .....	Timothy Wilson
Technical Services Group Lead .....	Pat Allen, P.E.
Operations Supervisor .....	Kevin Patching

## **SATELLITE WATER SYSTEM MANAGEMENT SERVICE AREA**

The Satellite Water System Management Service Area for Thurston County DPW is the area within the boundaries of Thurston County, Washington.

## **REQUIREMENTS FOR SATELLITE SYSTEM MANAGEMENT AGENCY**

RCW 70.119A.060 states that no new public water systems may be approved or created unless it is owned or operated by a SMA, if one is available. The RCW further defines a public water system as one having two or more connections, with an exception pertaining to farms.

SMA operational control means that the comprehensive management and operations of the system are conducted in a manner as to ensure that water quality monitoring, routine operations and maintenance, preventative maintenance, troubleshooting and emergency response service, financial reliability and other factors are properly achieved.

New systems do not have a choice of requesting SMA service, however, existing systems may request all or part of the overall SMA umbrella. As an example, an existing system may request assistance with financial planning and/or developing a maintenance program only.

## **LEGAL AUTHORITY TO SERVE PUBLIC WATER SYSTEMS**

Thurston County DPW has authority to serve public water systems under RCW 36.94.



## **INTENT TO OWN PUBLIC WATER SYSTEMS**

It is the intent of the Thurston County DPW to own and/or operate public water systems where this would serve the public interest. General conditions for taking ownership of a water system are delineated in the County's 1997 SMA Plan for Water System Ownership and Operation. These conditions generally include the following:

1. Timely service is not available from another approved municipal or private purveyor;
2. County ownership and/or operation would serve to ensure reliable water service to Thurston County residents, businesses and agencies;
3. County ownership and/or operation would support significant public interest objectives of protecting groundwater resources and associated surface water resources.

Specific details of criteria and procedures for County ownership of public water systems is discussed in greater detail later in this chapter under the heading, SERVICE AREA POLICIES.

## **CONTACTING THURSTON COUNTY PUBLIC WORKS**

The Thurston County Public Works current mailing address and telephone number are:

Thurston County Public Works  
9605 Tilley Road South  
Olympia, Washington 98512  
Phone: (360) 867-2300

## **WATER SYSTEMS OWNED AND OPERATED BY THURSTON COUNTY PUBLIC WORKS**

### **SYSTEM NAMES AND DOH ID NUMBERS**

There are a total of three (3) water systems owned and managed by the Thurston County DPW. These systems are listed in Table 1-1.



**TABLE 1-1****Water Systems Owned and Operated by Thurston County Public Works**

<b>Water System Name</b>	<b>DOH Water System ID Number</b>	<b>Water System Type</b>
Boston Harbor	07850R	Group A Community
Grand Mound	071580	Group A Community
Tamoshan	87140V	Group A Community

The locations of these water systems are shown in Figure 1-1. The Boston Harbor, Grand Mound, and Tamoshan water systems serve residences and businesses within their respective service areas.

**WATER FACILITIES INVENTORY FORMS**

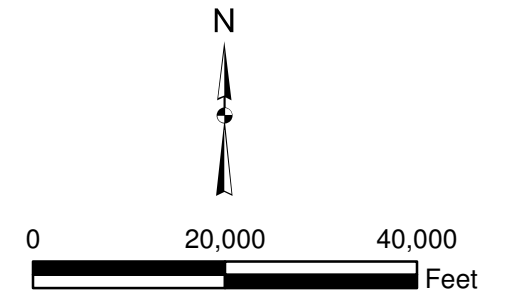
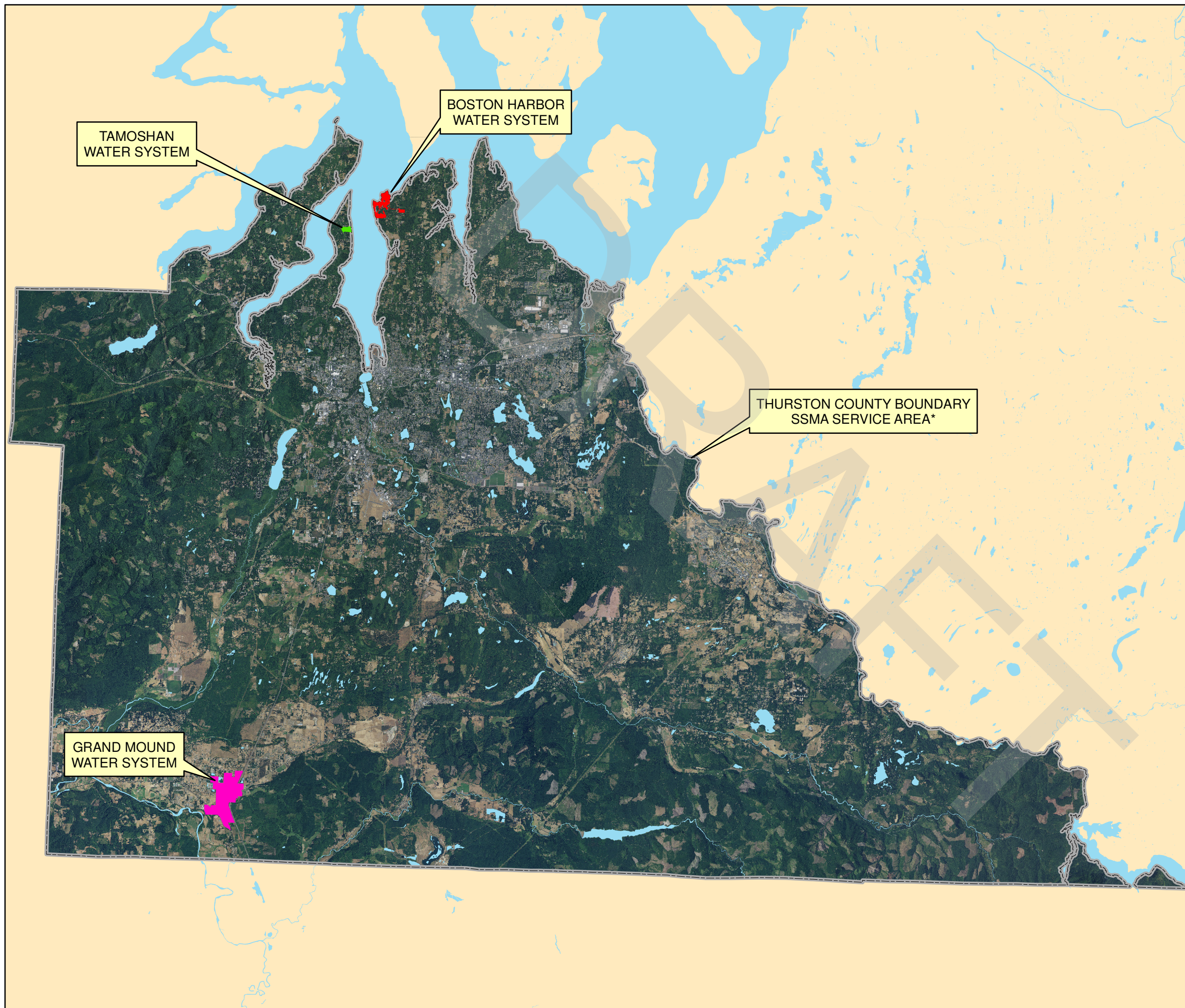
Copies of the Water Facilities Inventory (WFI) forms for the water systems owned by Thurston County are included in Appendix A. Water system connections data from the WFI forms is summarized in Table 1-2, below.

**TABLE 1-2****Summary of WFI Information**

<b>Water System</b>	<b>Boston Harbor</b>	<b>Grand Mound</b>	<b>Tamoshan</b>
Full-Time Single-Family Residential Connections	273	240	92
Apartments Condos, or Duplexes	1	0	0
Full-Time Residential Units in Apartments Condos, or Duplexes	2	0	0
Recreational Services and/or Transient Accommodations	2	0	1
Institutional, Commercial/Business, School, Day Care, or Industrial Services	4	91	2
Total Connections	282	331	95
Estimated Full-Time Residential Population	880	650	260
Estimated Transient Population	520	51,000 <sup>(1)</sup>	0
Estimated Non-Transient, Non-Residential Population	250	60	0

(1) Large transient population for Grand Mound water system is driven largely by Great Wolf Lodge.






### Legend

- GRAND MOUND WATER SYSTEM
- BOSTON HARBOR WATER SYSTEM
- TAMOSHAN WATER SYSTEM
- THURSTON COUNTY/SSMA SERVICE AREA\*

\*SSMA Service Area excludes incorporated areas of Thurston County

THURSTON COUNTY PUBLIC WORKS  
PART A WATER SYSTEM PLAN AND  
SATELLITE WATER SYSTEM MANAGEMENT PLAN  
FIGURE 1-1  
WATER SYSTEM LOCATIONS AND SATELLITE  
SYSTEM MANAGEMENT AGENCY SERVICE AREA



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## **SYSTEM BACKGROUNDS**

### **BOSTON HARBOR WATER SYSTEM**

#### **Location**

The Boston Harbor water system is located about 6.7 miles north of downtown Olympia on the east side of the mouth of Budd Inlet. It is accessed from Olympia via East Bay Drive, which turns into Boston Harbor Road and ends at Boston Harbor. The location of the Boston Harbor water system is shown in Figure 1-1. The Boston Harbor Water System Service Area as shown in a 1996 report by D.R. Strong Consulting Engineers is shown in Figure 1-2. This Service Area Map will be updated to reflect the actual current extents of the Service Area as part of the Boston Harbor Part B Water System Plan.

#### **History**

The Boston Harbor water system was formerly owned and operated by a private company called “Boston Harbor Water Systems Corporation.” The name would seem to imply that maybe there was more than one Boston Harbor Water system at the time, although that is not known for certain. Water Right application G2-00630 was submitted on December 16, 1970 for two existing and one new well, and the subsequent water right certificate was issued on June 11 1973. The report of examination for water right G2-00630 stated that the two wells had a combined capacity of 50 gpm and that the system also had two storage reservoirs with a combined capacity of 40,000 gallons. Since the report of examination mentions two existing wells and two existing storage reservoirs, it is assumed that the Boston Harbor water system existed prior to the water right application. On August 6, 1975 water right application G2-23917 was submitted for a fourth well, and on October 1, 1976 water right certificate G2-23917 was issued.

During the 1980s Boston Harbor Water Systems Corporation was unable to meet current standards for providing a safe, usable and dependable water supply for the Boston Harbor area, and under pressure from the Washington State Department of Health, the water system was taken over by Thurston County. A water system study for the Boston Harbor water system, dated May 1987, was prepared by R. W. Beck & Associates. Thurston County DPW submitted water right application G2-27271 on March 1, 1988 for two new wells to be located on Boston Harbor Elementary School property, approximately 1 mile east of the community of Boston Harbor. Well 5 was completed on July 27, 1988, Well 6 was completed on December 1, 1989. Subsequently the Boston Harbor Water System was redesigned in 1989 and almost completely replaced in 1990. Water right certificate G2-27271 was issued on November 4, 1991.

A 1996 report by D. R. Strong Consulting Engineers evaluated system demand and system capacity, and obtained system approval for service of up to 340 equivalent residential units (ERUs) as of October 21, 1996. The system remains approved for 340 ERUs as of the date of this report. A letter contained in the report dated



October 14, 1996 and signed by Donald E. Germann, Thurston County Assistant Fire Marshal, states that the fire flow requirement for Boston Harbor School (which is served by the Boston Harbor water system) is 1,500 gpm at 20 psi.

More recently, the Boston Harbor water system has been found to exceed the MCL for Disinfection Byproducts (DBPs). In response to this, a recirculation system was installed in the Boston Harbor water system reservoir to reduce DBP formation. This improvement was completed in 2017, and the first round of samples showed a marked reduction in DBPs. Compliance with the DBP standard is based on a rolling 1-year average, so further sampling is required to verify that the recirculation system has conclusively eliminated the DBP compliance issue.

### Water Rights

The Boston Harbor water system has three water rights dating from 1970 to 1988, and totaling 300 gpm and 150 ac-ft/yr. Water rights for the Boston Harbor water system are summarized in Table 1-3.

**TABLE 1-3**

#### **Boston Harbor Water System Water Rights**

<b>Water Right No.</b>	<b>Instantaneous Right, gpm</b>	<b>Annual Right, ac-ft/yr</b>	<b>Priority Date</b>	<b>Points of Withdrawal</b>
G2-00630	50	56 Additive <sup>(1)</sup>	12/16/1970	3 Wells, SW <sup>1</sup> / <sub>4</sub> , NW <sup>1</sup> / <sub>4</sub> , Sec 14, T19N R 2W
G2-23917	100	34 Additive <sup>(1)</sup> 56 Non-Additive <sup>(2)</sup>	8/6/1975	A Well, SW <sup>1</sup> / <sub>4</sub> , NW <sup>1</sup> / <sub>4</sub> , Sec 14, T19N R 2W
G2-27271	150	60 Additive <sup>(1)</sup> 90 Non-Additive <sup>(2)</sup>	3/1/1988	Wells 5 and 6, SW <sup>1</sup> / <sub>4</sub> , NW <sup>1</sup> / <sub>4</sub> , Sec 14, T19N R 2W
<b>Totals</b>	<b>300</b>	<b>150</b>		

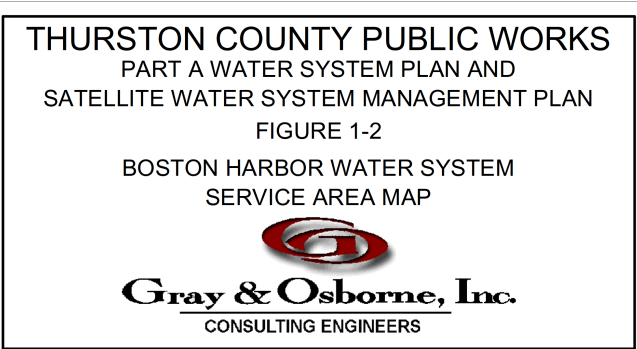
(1) An Additive Water Right is defined as follows: "A water right for either annual or instantaneous quantities of water that are added to an existing water right."

(2) A Non-Additive Water Right is defined as follows: "A water right for either annual or instantaneous quantities of water that does not increase the water available in existing water rights."

### Sources

The Boston Harbor water system has two active wells, Well 5 and Well 6, both located on Boston Harbor Elementary School property, approximately 1 mile west southwest from the center of Boston Harbor. Wells 1 through 4 and a spring are previous sources that have been inactive since 1990. Table 1-4 summarizes information regarding the Boston Harbor water system's currently active wells.







**TABLE 1-4****Boston Harbor Water System Sources**

<b>Source Name</b>	<b>Diameter, inches</b>	<b>Completed Depth, feet</b>	<b>Screened Interval, feet</b>	<b>Capacity, gpm</b>
Well 5	6	537.7	499.6 to 530.3	65
Well 6	8	543.3	508.0 to 538.7	65

**Treatment**

The Boston Harbor water system provides disinfection by injection of sodium hypochlorite. The system also provides iron and manganese treatment using manganese dioxide coated media filtration with two 42-inch diameter filter vessels. Sodium hypochlorite is injected upstream of the filters to help maintain oxidizing conditions across the filters and maintain a chlorine residual. Backwash from the iron and manganese filters is discharged to the Boston Harbor Sewer System.

**Storage**

The Boston Harbor water system has one water storage reservoir, located on Boston Harbor Elementary School property near Wells 5 and 6. The reservoir is a welded steel tank 31 feet in diameter, with a base elevation of 126 feet, an outlet elevation of 127 feet, and an overflow elevation of 216.5 feet, based on system drawings. The reservoir drawing further indicates a high level alarm elevation of 216.0 feet, an all-pumps-off level of 215.5, a lead pump on level of 213.5 feet, and a lag pump on level of 211.5 feet.

At 31 feet diameter, the reservoir contains 5,646 gallons per foot of water. From reservoir floor to overflow (90.5 feet) the reservoir volume is 510,970 gallons. From top of outlet to lag pump on level (84.5 feet), the volume is 477,090 gallons. However, since the water system relies on the water level in this reservoir to maintain a regulatory minimum operating pressure of 30 psi, the minimum operating level in this reservoir is higher than the outlet elevation of 127 feet, and therefore the effective storage volume is less than 477,090 gallons. Determination of actual minimum operating level and effective volume will be addressed separately in the Boston Harbor Part B water system plan.

**GRAND MOUND WATER SYSTEM****Location**

The Grand Mound water system is located approximately 17 miles south southwest from Downtown Olympia, near the border between Thurston and Lewis Counties. It is accessed via Interstate 5 at Exit 88 (US Highway 12 West exit). The location of the Grand Mound water system is shown in Figure 1-1. The Grand Mound Water System



Service Area as shown in the 2012 Grand Mound Water System Plan is shown in Figure 1-3. This Service Area Map will be updated to reflect the actual current extents of the Service Area as part of the Grand Mound Part B Water System Plan.

## History

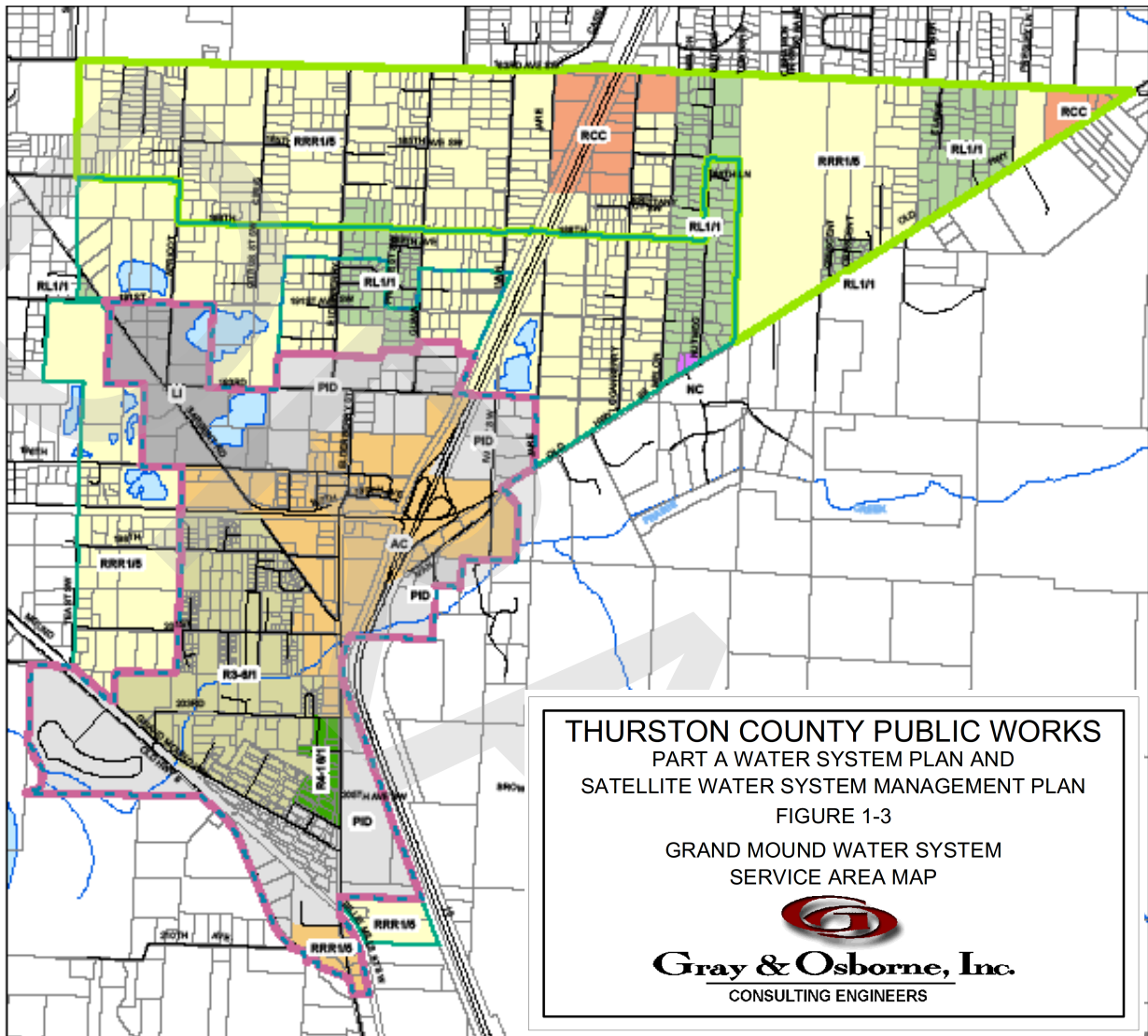
The Grand Mound water system was planned, designed, constructed, and from its inception, has been managed and operated by Thurston County. The following was taken from the 2012 Grand Mound Water System Plan prepared by Thurston County Public Works:

**Formation:** The Grand Mound Public Water System was developed after a locally formed Citizens Advisory Committee approached Thurston County and expressed its interest in developing a water supply and wastewater disposal system. Subsequent actions led to the formation of Utility Local Improvement District (ULID) 96-2 that funded the water and sewer system infrastructure.

**Growth:** The Grand Mound Public Water System began delivering potable water in 1999. The original water system plan forecasted 321 initial Service Connection Equivalent Residential Units (ERUs) for the utility's first year of operation in 1999. Thereafter, the average annual forecasted growth rate was 58 Service Connection ERUs which, if realized, would have resulted in 669 Service Connection ERUs in 2004. The actual growth has been less than forecasted. In 1999, the utility connected 15.2 Service Connection ERUs. The delivery of ERUs increased significantly when the Great Wolf Lodge was constructed and added 500 ERUs to the system. Following 1999, the average connection rate was 26.6 ERUs per year, resulting in a total of 172 ERUs through 2004. The average changed to 104 ERUs per year on average from 2004 to 2010 based on the construction of the Great Wolf Lodge and other developments. The average in this time frame is skewed based on the construction of the Great Wolf Lodge. In 2002 the Board of County Commissioners adopted Thurston County Code (TCC) 15.010.230 which authorized properties outside of the Grand Mound Urban Growth Area (UGA) to connect to the water system, providing the development proponent:

- construct the water system infrastructure to service their development,
- provide water rights with sufficient quantity to service their development,
- pay a fee (Equivalent Service Extension Charge) roughly equivalent to the Grand Mound Utility Local Improvement District (ULID) assessment paid by property owners within the ULID; and





#### Zoning

- Arterial Commercial (AC)
- Rural Commercial (RC)
- Light Industrial (LI)
- Planned Industrial Park (PP)
- Neighborhood Convenience Commercial (NC)
- Residential 3-6 Units per Acre (R3-6)
- Residential 4-16 Units per Acre (R4-16)
- Residential LAMIRD 1/1 (RL1/1)
- Rural Residential Resource 1/5 (RRR1/5)

- Grand Mound UGA
- Retail Service Area
- Six Year Future Service Area
- 20 Year Future Service Area
- Parcel
- Water Body
- Stream



0 0.25 0.5  
Miles

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- pay an additional capacity charge to fund future municipal water system improvements.

In 2005, a development proponent who met the Board's criteria requested service outside the UGA. The utility amended its water system plan as required by the Municipal Water Law and expanded its service area in 2005 to add 102 acres of residential zoned property. The current Retail Service Area boundaries encompass 1,004 acres in and north of the Grand Mound Urban Growth Area.

**Trends:** In 2010, Grand Mound experienced a lower level of growth than the cumulative total of the previous six years, with fewer new subdivisions going to construction. Several other commercial and retail outlets have expressed interest in developing within the Grand Mound service area. The development trend for the Grand Mound area appears to be flat due to local, regional and national economic circumstances.

As shown in Table 1-2, the most recent WFI form indicates that the Grand Mound water system serves 240 residential connections and 91 non-residential connections, for a total of 331 connections. Note that the analysis from the 2012 Grand Mound Water System Plan refers to ERUs, whereas the WFI form counts water system connections. Many of the non-residential connections account for multiple ERUs each.

### Water Rights

The Grand Mound water system has a total of eight different water rights, which total to 2,319 gpm and 1,071.15 ac-ft/yr. Table 1-5 summarizes the Grand Mound water system water rights.

**TABLE 1-5**

**Grand Mound Water System Water Rights**

<b>Water Right No.</b>	<b>Instantaneous Right, gpm</b>	<b>Annual Right, ac-ft/yr</b>	<b>Priority Date</b>	<b>Points of Withdrawal</b>
G2-28527	870	521.00	6/12/1992	Four Wells, S $\frac{1}{2}$ Sect 11 T15N R 3W
G2-22514(B)	100	40.00	3/28/1996	A well, SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sect 11 T15N R 3W
CG1-GWC220	70	10.50	1/18/1947	Four Wells, S $\frac{1}{2}$ Sect 11 T15N R 3W
CS2-SWC8031	314	140.00	6/21/1956	Four Wells, S $\frac{1}{2}$ Sect 11 T15N R 3W



**TABLE 1-5 – (continued)****Grand Mound Water System Water Rights**

<b>Water Right No.</b>	<b>Instantaneous Right, gpm</b>	<b>Annual Right, ac-ft/yr</b>	<b>Priority Date</b>	<b>Points of Withdrawal</b>
CS2-SWC10790	373	83.25	3/21/1968	Four Wells, S½ Sect 11 T15N R 3W
CS2-SWC3210(A)	476	263.00	9/14/1943	Four Wells, S½ Sect 11 T15N R 3W
G2-20904	80	5.40	3/29/1973	A well, NW¼ NW¼ Sect 13 T15N R 3W
G2-22057(B)	36	8.00	3/22/1974	Four Wells, S½ Sect 11 T15N R 3W
Totals	2,319	1,071.15		

**Sources**

The Grand Mound water system has two active wells, Well 1 and Well 2. Table 1-6 summarizes information regarding the Grand Mound Wells.

**TABLE 1-6****Grand Mound Water System Sources**

<b>Source Name</b>	<b>Well Tag Number</b>	<b>Diameter, inches</b>	<b>Completed Depth, feet</b>	<b>Screened Interval, feet</b>	<b>Capacity, gpm</b>
Well 1	ACK 136	6	87.5	62 to 84	500
Well 2	ACT 016	6	81	59.5 to 77	425

**Treatment**

Treatment at the Grand Mound Water system consists of gas chlorination and pH adjustment with sodium hydroxide. Water from both wells is treated at a chlorination facility located at the Wastewater Treatment Plant. A detectable chlorine residual is maintained throughout the distribution system.

**Storage**

The Grand Mound water system has one water storage reservoir, located on a hill east of Interstate 5 and south of Old Highway 99. The reservoir is a welded steel tank 42 feet in diameter, with a base elevation of 270.5 feet, an outlet elevation of 271 feet, and an overflow elevation of 316 feet, based on system drawings. The reservoir drawing further indicates a normal high water level 315.5 feet. The base elevation of the Grand Mound



reservoir is sufficiently higher than the highest water service in the Grand Mound water system such that gravity water pressure is not a factor limiting effective storage capacity.

At 42 feet diameter, the reservoir contains 10,364 gallons per foot of water. From reservoir floor to overflow (45.5 feet) the reservoir volume is 471,550 gallons. From top of outlet to normal high water level (44.5 feet) the volume is 461,190 gallons. However, some amount of water is required above the reservoir outlet to meet system demand, and the actual operating water levels in the reservoir are set by the water system operator. Therefore the actual effective volume of this reservoir may be less than 461,190 gallons. Determination of actual effective volume will be addressed separately in the Grand Mound Part B water system plan.

As of this writing a second reservoir is under construction at the same site as the existing reservoir. This second reservoir is also planned to be 42 feet in diameter, with a design base elevation of 270.5 feet, a design overflow elevation of 316 feet, and a design normal high water elevation of 315.5 feet. It will approximately double the effective storage capacity for the Grand Mound water system. It will also allow for one reservoir to be taken out of service at a time for maintenance while allowing for system operation using the other reservoir. It is anticipated that this second reservoir will be completed in summer of 2019.

## **TAMOSHAN WATER SYSTEM**

### **Location**

The Tamoshan water system is located approximately 5.8 miles north-northwest from downtown Olympia and approximately 1.5 miles south of the north end of Cooper Point. The system serves an area east of Cooper Point Road between 63<sup>rd</sup> Avenue NW and 65<sup>th</sup> Lane NW. The location of the Tamoshan water system is shown in Figure 1-1. The Tamoshan Water System Service Area is shown in Figure 1-4.

### **History**

The Tamoshan water system was originally constructed by a developer and ownership was subsequently transferred to Thurston County. Tamoshan Well 1 was completed on September 12, 1972. Application for Water Right G2-20562 was submitted on October 16, 1972 by, and Permit G2-20562 issued to, Richard D. Swanson for Tamoshan, Inc. However, a note on the permit, issued February 14, 1975, says "Assigned to Thurston County Dept. of Public Works, 4-26-76." On August 27, 1976 a water right certificate for the Tamoshan well was issued to Thurston County DPW.

In May 1989 a Tamoshan O&M Manual was completed by Skillings & Chamberlain, Inc. On August 30, 1990 Thurston County DPW applied for Water Right G2-27838 for a new well for Tamoshan. A temporary permit was issued by Ecology on October 23, 1990, and Tamoshan Well 2 was completed on February 15, 1991. On June 12, 1991, water



system improvement plans for Tamoshan were completed, including a new well, a new reservoir, a new booster pump system, and new water service meters. The report of examination (ROE) for Water Right G2-27838, dated July 23, 1991, stated that water right G2-20562 should be relinquished back to the State after water right G2-27838 is put into full service. Water right permit G2-27838 was issued to Thurston County DPW on October 1, 1991, and water right certificate G2-27838 was issued on October 30, 1992.

On October 27, 1992, Richard D. Swanson, on behalf of Tamoshan HOA, applied for a change to water right G2-20562, from Community Domestic Supply to Irrigation of 2 acres, and on June 28, 1993, the ROE for Change App G2-20562 approved the requested change of use for irrigation of a park. However, on October 28, 1994, Tamoshan Well 1 was reported as decommissioned.

The Tamoshan water system has exceeded the MCL for the Disinfection Byproduct (DBP) Total Trihalomethanes (TTHMS) in 2006, 2007, 2014, 2015, and 2017, and for the DBP total of five Haloacetic Acids (HAA5) in 2007. On August 31, 2016 a project report was submitted to DOH, recommending reservoir circulation and aeration to reduce Disinfection Byproducts. The reservoir improvements were completed on August 14, 2017. The first round of samples showed a marked reduction in DBPs. Compliance with the DBP standard is based on a rolling 1-year average, so further sampling is required to verify that the recirculation and aeration system has conclusively eliminated the DBP compliance issue.

## Water Rights

The Tamoshan Water System has one water right, G2-27838, in the amount of 120 gpm and 49 ac-ft/yr. The Tamoshan water right is summarized in Table 1-7.

**TABLE 1-7**

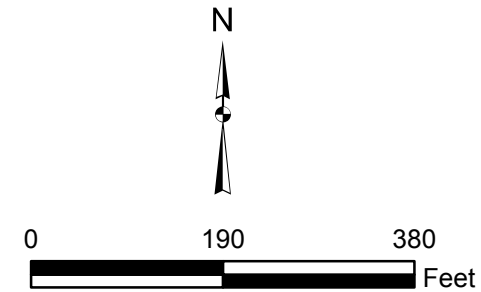
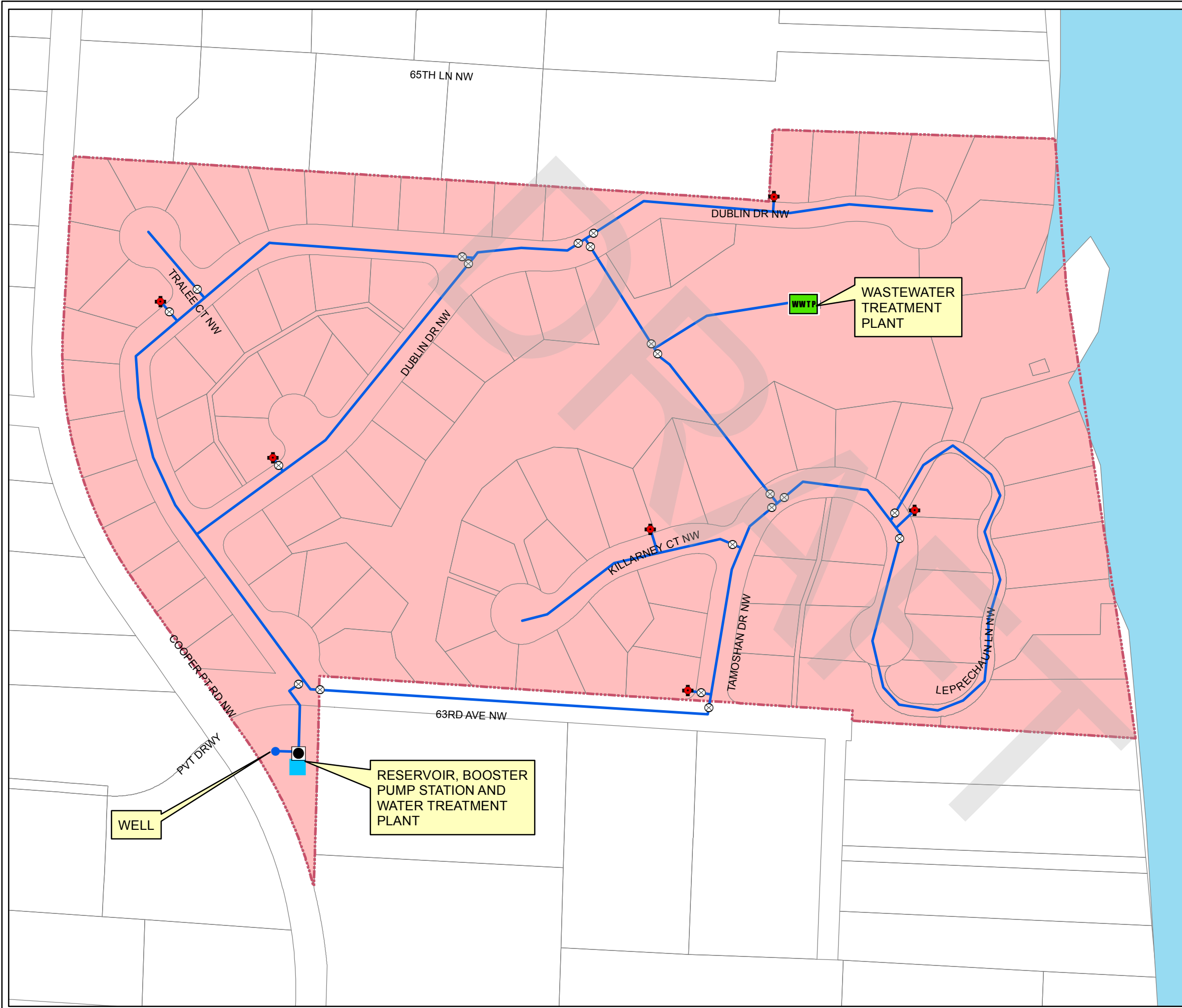
**Tamoshan Water System Water Rights**

<b>Water Right No.</b>	<b>Instantaneous Right, gpm</b>	<b>Annual Right, ac-ft/yr</b>	<b>Priority Date</b>	<b>Points of Withdrawal</b>
G2-27838	120	49	8/23/1990	Well 2, NE <sup>1</sup> / <sub>4</sub> , Sec 21, T19N R 2W

## Sources









Tamoshan water system has one active well, identified as Well 2, located on the south side of 63<sup>rd</sup> Avenue NW between Cooper Point Road NW and Tralee Drive NW. Table 1-8 summarizes information regarding the Tamoshan Well.





### Legend

#### TAMOSHAN WATER SYSTEM:

-  WASTEWATER TREATMENT PLANT
-  BOOSTER
-  RESERVOIR
-  HYDRANT
-  VALVE
-  WELL
-  EXISTING WATER LINES
-  TAMOSHAN WATER SYSTEM SERVICE AREA AND RETAIL SERVICE AREA

THURSTON COUNTY PUBLIC WORKS  
PART A WATER SYSTEM PLAN AND  
SATELLITE WATER SYSTEM MANAGEMENT PLAN  
FIGURE 1-4

TAMOSHAN WATER SYSTEM  
SERVICE AREA MAP

  
**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS



**TABLE 1-8****Tamoshan Water System Source**

<b>Source Name</b>	<b>Well Tag Number</b>	<b>Diameter, inches</b>	<b>Completed Depth, feet</b>	<b>Screened Interval, feet</b>	<b>Capacity, gpm</b>
Well 2	None	6	579.4	565 to 575.2	145

**Storage**

The Tamoshan water system has one water storage reservoir, located on the south side of 63<sup>rd</sup> Avenue NW between Cooper Point Road NW and Tralee Drive NW, near the Tamoshan well. The reservoir is a cast-in-place concrete tank with interior dimensions 33 feet 8 inches square, and 7 feet 6 inches from floor to the top of the reservoir wall.

At 33 feet 8 inches square, the reservoir contains 8,479 gallons per foot of water. From floor to top of the wall the reservoir volume is 63,590 gallons. The reservoir drawings indicate the reservoir hatch extending 1 foot 4 inches above the top of the reservoir roof, and the reservoir overflow located in the side of the reservoir hatch extension. The drawings show a well-pump-on level at 6 inches below the top of the reservoir wall, which is 7 feet above the reservoir floor. The drawings further show the booster pump suction lines drawing from 4 inches above the reservoir floor. From four inches above the reservoir floor to 7 feet above the reservoir floor (6.67 feet) is a volume of 56,525 gallons. Determination of actual effective volume will be addressed separately in the Tamoshan Part B water system plan.

In order to help improve water quality, a recirculation system for the Tamoshan Reservoir was installed in 2018.

**Treatment**

Treatment at the Tamoshan Water system consists of chlorination at the well using liquid sodium hypochlorite fed with a metering pump. A detectable chlorine residual is maintained throughout the distribution system.

**Booster Pump Station**

The Tamoshan reservoir is not of sufficient elevation to provide adequate pressure for the Tamoshan water system, so a booster pump station pumps out of the reservoir to provide system pressure. The booster pump system is located immediately adjacent to the reservoir, with the south wall of the booster pump building being the north wall of the reservoir. The booster pump station includes three pumps, including two 5-hp pumps and one 20-hp pump. The pumps are controlled by pressure switches and a 700-gallon hydropneumatic pressure tank. The plans indicate that the lead 5-hp pump turns on at a pressure of 45 psi and off at a pressure of 60 psi, the lag 5-hp pumps turns on at 40 psi



and off at 50 psi, and the 20-hp pump turns on at 35 psi and off at 45 psi. A natural gas powered standby generator is on site to provide power for the pumping system during power outages.

## **SERVICE AREA POLICIES**

### **CRITERIA FOR TAKING OWNERSHIP OF WATER SYSTEMS**

Criteria for taking ownership of water systems, established in the 1997 Thurston County SMA Plan, vary based on whether the water system is located within an urban growth area or in a rural area. These criteria are as follows:

#### **Rural Area Service Criteria**

Existing or new rural area water systems in any part of Thurston County may be owned and operated by Thurston County only upon approval of the County Commissioners based on the following criteria:

- a. No other approved SMA is available;
- b. Written request for County water system ownership and operation is submitted which describes construction and existing condition of the system, operational history, reason ownership is being offered to the County, and other details as required by the DPW;
- c. The public interest would be served by County ownership and operation of the water system, including interest in ensuring safe and reliable drinking water;
- d. The water system and water source meet all applicable standards. Existing water systems must meet minimum requirements for water source, along with a financial commitment by the customers to a plan for upgrading to meet standards on a schedule approved by Environmental Health and/or DOH and the DPW. Funding sources could include rates, ULID, and loans repaid from rates; and
- e. A feasible financing plan is included whereby water system customers will be responsible for funding operating and maintenance costs, and will fund or repay funding for necessary remedial capital improvements to existing systems.



## **Urban Growth Area Service Criteria**

In a designated municipal Urban Growth Area, the County may be an interim water purveyor until the designated water provider can feasibly operate the system. Such service must be approved by the County Commissioners based on the following criteria:

- a. An agreement is in place with the designated water utility and the affected property owners addressing short-term and long-term provision of water service to the subject property, including system ownership, billing, and funding.
- b. The water system and water source meet all applicable standards. Existing water systems must meet minimum requirements for water source, along with a financial commitment by the customers to a plan for upgrading to meet standards on a schedule approved by Environmental Health and/or DOH, DPW and the designated long-term purveyor. Funding sources could include rates, ULID, and loans repaid from rates.
- c. Water system customers will fund operating and maintenance costs, and pay required municipal water system general facility charges.

## **PROCEDURES FOR TAKING OWNERSHIP OF PUBLIC WATER SYSTEMS**

Procedures for taking ownership of public water systems are delineated in the County's 1997 SMA Plan for Water System Ownership and Operation as follows:

### **Application Procedures for SMA Service**

All proposed acquisitions or interim operation agreements will be considered by the Board of County Commissioners, with DPW staff responsible for technical review and providing a recommendation to the elected officials.

#### Pre-Submittal Meeting

While not required, it may be useful to schedule a meeting with staff prior to submitting a formal request for ownership/operation of a water system. County requirements and review criteria can be discussed with potentially interested parties.

#### Written Request

All requests for ownership and operation must be in writing and should include the following information listed below:

- a. Brief operational history and reason ownership/operation is being offered to Thurston County;



- b. Ownership of the system including the well site;
- c. Number of connections;
- d. “As built plans” will be submitted showing the pump houses, wells, storage reservoirs, pipelines, valve locations, easements, and all facilities for ownership;
- e. Records of the water quality analysis and coliform bacteria reports;
- f. A copy of the well log for each well, including the well drillers report;
- g. A copy of the water rights permit;
- h. Copies of water production reports; and
- i. Copy of the State of Washington Water Facilities Inventory (WFI) sheet.

#### Preliminary Evaluation

Schedule a preliminary water system evaluation with the Thurston County utility operations review team, including a site inspection and review of maintenance and cross connection records.

#### Board of County Commissioners’ Preliminary Determination

Request and preliminary staff recommendation is forwarded to the Board of County Commissioners (BoCC). If the BoCC makes the preliminary determination that County ownership/operation of the system would be in the public interest, staff will perform a full review and report. If the determination is negative, the system owner/proponent will be informed of the decision.

#### Water System Report and Final Action

A full water system review and report, including a financial plan for the system, are prepared by DPW staff with input from health agencies.

#### Board of County Commissioners Action

The water system report and financial plan are provided by DPW to the BoCC. If the BoCC determines that the proposal is in the public interest, the BoCC will authorize the Director of Public Works to negotiate acquisition of the water system and prepare a water system operations and capital improvement budget.



The BoCC also adopts a resolution establishing rates for the water system.

#### Approval from Health Agency

The relevant health agency (DOH or Thurston County Environmental Health, depending on the size of the system) is responsible for review and approval of the water system transfer to Thurston County DPW.

### **ANNEXATION**

Annexation policies are not applicable to the County because all areas eligible to be served are already in the county, and the county cannot annex land from neighboring counties.

### **CROSS-CONNECTION CONTROL**

A Cross-Connection Control Program is required by regulation (WAC 246-290-490) to reduce the potential for system contamination through backflow from potential contaminant sources. The Cross-Connection Control Program is addressed in Chapter 6 of this WSP.

### **DIRECT CONNECTION POLICY**

As a SMA, the County cannot require all new development within the County to connect to an existing County water system. However, where connection to an existing County water system is a reasonable option rather than creation of a new water system, the County would prefer connection to an existing system. The county will consider taking ownership and operations responsibilities for new and existing water systems on a case by case basis based on criteria and procedures outlined herein.

### **DESIGN AND PERFORMANCE STANDARDS**

Recommendations of this plan will follow the DOH Water System Design Manual. Distribution improvements are to be designed in accordance with the policies and standards identified in Chapter 7 of this plan.

### **FORMATION OF LOCAL IMPROVEMENT DISTRICT**

The County will consider participating in formation of a Utility Local Improvement District (ULID) to pay for system extensions and upgrades. The initial costs for a ULID feasibility study is borne by the applicant or rolled into ULID costs, but in no case is the cost the responsibility of the County. The County will provide an initial construction cost estimate for the proposed project and other technical assistance as needed. Once ULID formation is shown to be feasible, the County will take the lead role to ensure proper formation of a ULID.



## **LATECOMER AGREEMENTS**

Whenever any owner of real estate installs any water facilities to connect to existing County water for the purpose of serving the area in which the real estate of such owner is located, the County may require owners of benefited properties who subsequently develop their property to reimburse the party installing the water facilities. This reimbursement shall be the fair pro rata share of the costs of the project to the extent that such share exceeds the benefited property owner's applicable service extension charge or equivalent service extension charge.

Additional details on latecomer agreements may be found in Chapter 15.13 of the Thurston County Code.

## **INDIVIDUAL BOOSTER PUMPS**

Individual booster pumps are allowed for existing properties along existing distribution mains, where the main has a normal operating pressure in excess of 20 psi. In this case, the property owner shall be responsible for all costs of the booster pump system and shall be required to install a backflow prevention device on the private side of the service meter. The backflow device must then be tested on an annual basis in accordance with the County's Cross Connection Control Program. Where operating pressure is below 20-psi, WAC 246-290-230(8) requires the County to own and operate individual booster pumps on an interim basis until such a time that operating pressures can be brought into compliance. Properties within new developments can utilize individual booster pumps if the new distribution main along the frontage of the property is designed to provide 30 psi at Peak Hour Demand. The backflow prevention requirements apply to these cases as well.

## **OVERSIZING**

Larger size mains may be required in specific areas as outlined in the applicable Water System Plan. Nothing shall preclude Thurston County from requiring the installation of a larger sized main in areas not addressed in the applicable Water System Plan if Thurston County determines a larger size is needed to meet fire protection requirements or for future service. Oversizing agreements may be negotiated with Thurston County.

## **UNDERSIZED MAIN REPLACEMENT**

If a County owned water main is identified as deficient (through modeling or flow tests), the County assumes responsibility for upsizing the main to the minimum size of a looped 6-inch or 8-inch dead end main, or larger if hydraulic analysis indicates the need for a larger main. The prioritization of undersized main replacement projects (when applicable) shall be identified in the WSP Capital Improvement Program (CIP) and shall be based upon overall benefit to customers as well as degree of deficiency of the flow



condition. Basic regulatory compliance shall be a higher priority than meeting minimum fire flow goals. Should the County not be able to replace an undersized main in a time frame to meet service conditions for proposed development, the development applicant can upgrade the main, but at no cost to the County.

## **WATER WHEELING**

Water wheeling is the practice of selling or buying water to or from a water system by using the piping network of a third water system. There is currently no potential for water wheeling in service areas of water systems currently owned by Thurston County DPW. If future systems are acquired at a location where wheeling of water is a possibility, the County will consider wheeling of water on a case by case basis.

## **WHOLESALE OF WATER**

The County does not currently wholesale water to any other public water system. The locations of the Boston Harbor and the Tamoshan water systems do not make it likely that wholesaling of water will be a reasonable possibility in the near future. The proximity of the Grand Mound water system to the Rochester water system could make water wholesaling a possibility in the future, however there has been no interest expressed in wholesaling of water by either entity at this time.

## **COMPLAINTS**

Complaints are logged on a complaint form, entered into a database table, and investigated by operations personnel. Customers are usually contacted in person or by phone and informed of the results of the investigation. If complaints are not resolved satisfactorily, customers may discuss the complaint with the supervisory chain to include the Board of County Commissioners.

## **RELATED PLANNING DOCUMENTS**

The following documents were consulted in the preparation of this WSP:

**Water System Operations and Maintenance Manual, Tamoshan,** 1989, Skillings & Chamberlain, Inc.

**North Thurston County Coordinated Water System Plan Area-Wide Supplement,** 1996, Thurston County Department of Water and Waste Management

**Boston Harbor Water System Connection Capacity Study,** 1997, D. R. Strong Consulting Engineers, Inc.



**Thurston County Department of Water and Waste Management Satellite Management Agency Plan for Water System Ownership and Operation,** 1997, revised 1998. Thurston County Department of Water and Waste Management

**South Thurston County Urban Growth Areas Abbreviated Coordinated Water System Plan,** 2000, Thurston County Department of Water and Waste Management

**Grand Mound Water System Plan, Grand Mound Service Area,** 2012. Thurston County Department of Public Works.

**Small Water System Management Program, Tamoshan Water System,** 2016, Thurston County Department of Public Works



## **CHAPTER 2**

### **BASIC PLANNING DATA**

#### **OBJECTIVE**

Chapter 2 of the standard Water System Plan format addresses historic water system demand statistics, historic growth rates, growth projections and projected water system demands. These statistics and projections are system specific and as such are handled in the individual water systems Part B Water System Plans.



## CHAPTER 3

### WATER SYSTEM ANALYSIS

#### OBJECTIVE

The objective of this chapter is to determine if system improvements are necessary to meet water quality standards and to meet projected demands. This chapter includes the following elements:

- System Design Standards
- Water Quality Analysis
- System Facilities Analysis
- Water System Capacity Limits
- Summary of System Needs and Concerns

#### PERFORMANCE AND DESIGN CRITERIA

The standards for planning and design for the Thurston County DPW water systems are based on commonly accepted standards including the following:

**WAC 246-290, Group A Public Water Systems, Washington State Board of Health (March 2012)**

This is the primary drinking water regulation used by DOH. It sets basic standards to assess capacity, water quality, and system reliability.

**Water System Design Manual, Washington State Department of Health (December 2009)**

These standards serve as guidance for the preparation of plans and specifications for Group A public water systems in compliance with WAC 246-290.

**Standard Specifications for Road, Bridge and Municipal Construction, Washington State Department of Transportation, American Public Works Association (Current Edition)**

These standards include detailed specifications for materials and workmanship of a wide variety of public works projects, including installation of public water supply facilities and restoration of facilities impacted by water main construction and repair.

**Thurston County Developer Standards for Water and Sewer Systems, January 2007**

These standards include detailed specifications for materials and workmanship for installation of water main extensions, including piping installation details, thrust blocking, in-line valves, fire hydrants, air release valves, service connections of various



types, backflow preventions devices, and blow offs, as well as sewer system standards. A copy of the water system portions of these standards is contained in Appendix B.

## WATER QUALITY STANDARDS

The Thurston County DPW water systems are public water supply systems regulated by the Water Regulations, WAC 246-290-310, as well as sections of Code of Federal Regulations (CFR) Title 40, Parts 141 and 143, adopted by reference in WAC 246-290. These regulations set water quality standards applicable to all public water supplies in Washington State. The Thurston County DPW water systems all have groundwater supplies, so only ground water supply regulations apply.

## SYSTEM CAPACITY STANDARDS

### General Design Standards

The Thurston County DPW uses the DOH Water System Design Manual as a guide for establishing water system capacity standards. Table 3-1 lists the recommended standards from the DOH Manual and the Thurston County DPW policies regarding each standard for general facility design.

**TABLE 3-1**

### System Performance and Design Criteria

Standard	DOH Water System Design Manual (December 2009)	Thurston County Public Works Standard
Average Day and Maximum Day Demand	Average day demand should be determined from previous metered water production and consumption data. Maximum day demand is estimated at approximately 2.0 times the average day production requirement if metered data is not available.	<u>Boston Harbor</u> <sup>(1)</sup> ADD = 463 gpd/ERU MDD = 668 gpd/ERU <u>Grand Mound</u> <sup>(2)</sup> ADD = 282 gpd/ERU MDD = 479 gpd/ERU <u>Tamoshan</u> <sup>(3)</sup> ADD = 226 gpd/ERU MDD = 452 gpd/ERU
Peak Hour Demand	Peak hour demand is determined using the following equation: $PHD = (MDD/1440)((C)(N) + F) + 18$ C = Coefficient from DOH Water System Design Manual Table 5-1 N = Number of ERUs F = Factor from DOH Water System Design Manual Table 5-1	<u>Boston Harbor</u> N = 275, C = 1.8, F = 125 PHD = $0.84 \times N + 76$ At 275 conn, PHD = 307 gpm <u>Grand Mound</u> <sup>(2)</sup> PHD = 524 gpm <u>Tamoshan</u> N = 92, C = 2.5, F = 25 PHD = $0.57 \times N + 26$ At 92 conn, PHD = 78 gpm



**TABLE 3-1 – (continued)****System Performance and Design Criteria**

<b>Standard</b>	<b>DOH Water System Design Manual (December 2009)</b>	<b>Thurston County Public Works Standard</b>
Minimum System Pressure	The system must be designed to maintain a minimum of 30 psi in the distribution system under peak hour demand and 20 psi under fire flow conditions during MDD.	The System will meet or exceed the DOH required minimums.
Maximum System Pressure	Regulations do not address maximum system pressure. The Water System Design Manual, Chapter 8, part 8.1.7, recommends that pressures should not exceed 100 psi.	The County's goal is to maintain distribution system pressures below 100 psi.
Minimum Pipe Sizes	The diameter of a transmission line shall be determined by hydraulic analysis. The minimum size distribution system line shall not be less than 6-inches in diameter, except for dead end lines not providing fire flow and only as justified by a hydraulic analysis.	Same as DOH Water System Design Manual, Chapter 8, except that dead end lines greater than 50 feet in length that do provide fire flow shall be a minimum of 8-inches in diameter.
Valve Spacing	Sufficient valving should be placed to keep a minimum number of customers out of service when water is turned off for maintenance or repair.	Valves every 1,000 feet, two gate valves at every tee and three at every cross unless otherwise directed. Valves on each end of a water main in an easement.
Source Reliability	18 hours of source pumping to meet maximum day demand. Source capacity to replenish fire storage capacity within 72 hours while meeting maximum day demand. Redundancy in all critical pumping systems. Backup power supply for all critical pumping systems.	Same as DOH Standard.

- (1) Boston Harbor water system ADD and MDD taken from 1996 Boston Harbor Connection Capacity Study.
- (2) Grand Mound water system ADD, MDD, and PHD taken from 2012 Grand Mound Water System Plan Table 2-10C, 2017 data.
- (3) Tamoshan water system ADD based on total connections on 2016 WFI and maximum annual water sales in 2009 – 2016 WUE reports. MDD based on 2 x ADD.

**Fire Suppressions Standards**

The Thurston County Development Standards for Water and Sewer Systems dated January 2007, state in Section 2, Part 2.01 that the fire flow required for water systems within an Urban Growth Area “will in no case be less than 1,000 gpm at 20 psi residual pressure, and 1,500 gpm at 20 psi for multi-family, commercial and industrial areas.” The standard further indicates that no fire flow is required outside urban growth areas,



unless specifically required by the County Fire Marshall based on the nature of the structures served.

The Thurston County Public Works Grand Mound Water Plan, dated March 2012, states that “a fire flow demand of 2,000 gpm for 2 hours has been recommended by the Thurston County Fire Marshal” for the Grand Mound water system, based on fire protection needs for the Great Wolf Lodge.

**TABLE 3-2**

**Fire Flow Standards**

<b>Land Use</b>	<b>Fire Flow Rate, gpm</b>	<b>Fire Flow Duration, minutes</b>
Residential and Duplex Residential in UGA	1,000	60
Multi-family, Commercial and Industrial in UGA	1,500	120
Grand Mound at Great Wolf Lodge	2,000	120
Outside UGA	None <sup>(1)</sup>	None <sup>(1)</sup>

(1) Fire Marshall may impose a minimum fire flow and duration based on building size and type and use.

**Storage Standards**

The nominal volume of a water reservoir is generally the name given to a reservoir based on an approximation of the gross volume of the reservoir, which is the amount of water the reservoir could hold if filled all the way to the top. However, practically speaking, a reservoir cannot be filled to the top and a reservoir also often cannot, under normal operational conditions, be drained completely while meeting system demand. Therefore, there is a need to determine how much of a reservoir volume is *effective* storage and how much effective storage a water system needs.

The DOH Water System Design Manual identifies the following components of reservoir storage volume:

- Operational Storage
- Equalizing Storage
- Standby Storage
- Fire Suppression Storage
- Dead Storage

A reservoir’s effective storage volume is the gross volume less operational storage and dead storage. This volume must be large enough to accommodate the requirements for equalizing storage, standby storage and fire suppression storage.



### Operational Storage

Operational storage is the amount of water that flows in and out of a reservoir during normal system control cycling. Reservoirs typically operate with a maximum water level at which all source pumps are turned off, and a minimum level at which all source pumps are turned on. The amount of water that flows into and out of the reservoir between these two levels depends upon the operational control levels and the dimensions of the system's reservoirs.

### Equalizing Storage

Equalizing storage is the amount of water needed to meet peak system demand for a period of time that the system demand exceeds the system source capacity. The DOH Water System Design Manual recommends that this volume be estimated as PHD minus source capacity for 150 minutes, but not less than zero.

### Standby Storage

Standby Storage is water held in reserve for emergency situations, such as temporary loss of a water source. The DOH Water System Design Manual recommends that this volume be estimated as two days of average day demand for the water system, less the amount of water that can be produced by the water system in 1 day with the largest source of supply out of service, but not less than 200 gallons per ERU.

### Fire Suppression Storage

Fire Suppression Storage is the maximum fire flow rate standard times the maximum fire flow duration standard for the water system. For example, 1,000 gallons per minute sustained for 60 minutes would be a fire suppression storage standard of 60,000 gallons.

### Dead Storage

Dead storage is the volume of the reservoir that either cannot be utilized for storage because it is above the maximum operational water level of the reservoir, or cannot be withdrawn from the reservoir at the required rates while maintaining the minimum required system pressure or other required operating parameter, such as chlorine contact time. The amount of dead storage existing in a system depends on storage system dimensions, elevations, pumping systems, outlet design, and possibly other requirements such as disinfectant contact time.



### Effective Storage

The amount of effective storage a water system needs will be referred to as the Effective Storage Requirement. The Effective Storage Requirement is based on equalizing, standby, and fire suppression storage, and will depend on whether or not “Nested Storage” is allowed. “Nested Storage,” pursuant to WAC 246-290-010, means one component of storage is contained within the component of another. WAC 246-290-235 states, “Standby and fire suppression storage volumes may be nested with the larger of the two volumes being the minimum available, provided the local fire protection authority does not require them to be additive.” Therefore, the Effective Storage Requirement will be either the sum of equalizing, standby and fire suppression, if nesting of standby and fire suppression storage is *not* allowed, or it will be the sum of equalizing storage plus the greater of either standby or fire suppression storage if nesting of standby and fire storage *is* allowed.

The 1996 North Thurston County Coordinated Water System Plan Area Wide Supplement states in Table 1 item 5.3 that the greater of Standby Storage or Fire Storage shall be provided, which means that nesting is allowed.

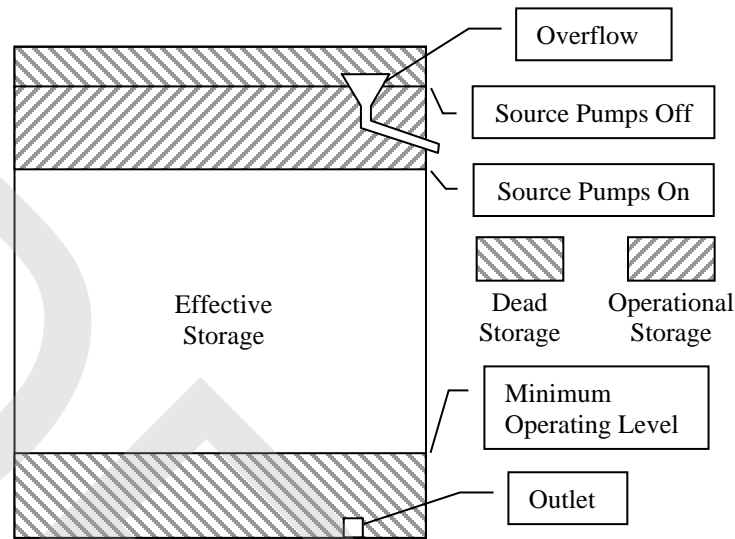
**TABLE 3-3**

#### **Effective Storage Requirement**

<b>If Nesting Is Not Allowed by Local Fire Authority</b>	<b>If Nesting Is Allowed by Local Fire Authority</b>	<b>Standard Applicable to Thurston County</b>
The sum of: Equalizing Storage, plus Standby Storage, plus Fire Suppression Storage	The sum of: Equalizing Storage, plus The Greater of Standby Storage, or Fire Suppression Storage	The Thurston County standard is based on nesting of standby and fire suppression storage.

Figure 3-1 illustrates an elevation view of a typical reservoir indicating dead storage, operational storage and effective storage volumes.



**FIGURE 3-1****Typical Storage Reservoir Effective Capacity****WATER QUALITY****WATER QUALITY MONITORING REQUIREMENTS**

Water quality monitoring requirements are specified in the Water Regulations WAC 246-290-300. Many of the monitoring requirements include options for state waivers or reduced monitoring frequency based on prior sampling results or evidence that specific contaminants are not present in the area. To assist water purveyors determine what sampling is due in each calendar year, DOH issues annual Water Quality Monitoring Schedules. The most recent Water Quality Monitoring Schedule for each of the Thurston County DPW water systems is included in Appendix C. Up-to-date Water Quality Monitoring Schedules can be obtained from the DOH web site at the following web address:

<https://fortress.wa.gov/doh/eh/portal/odw/si/Disclaimer.aspx?Page=FindWaterSystem.aspx>

**WATER QUALITY HISTORY**

An in-depth evaluation of water quality for the individual water systems owned and operated by Thurston County DPW will be presented in the individual water system Part B water system plans. In this section we briefly review the recent water quality status of the County DPW owned water systems.



## **Boston Harbor Water System**

The most recent water quality issue at Boston Harbor water system has been exceedance of total trihalomethanes (TTHMs) in the water distribution system. The distribution system standard for TTHMs was exceeded in December 2015, and June, September and December of 2016, but have not been exceeded since December 2016. A recirculation pump was installed in the Boston Harbor water system reservoir during summer of 2017 to improve reservoir circulation and reduce formation of TTHMs from the water. Since the installation of this system TTHMs have not exceeded the standard, but standards are based on a rolling 1-year average, so additional monitoring is required to determine if the recirculation system has been effective in reducing TTHMs.

In the past, the Boston Harbor water system had problems with excessive manganese in the water, but a treatment system was installed to remove manganese, and manganese has not been an issue since 1999. In 2019, the County upgraded the iron and manganese treatment system for the Boston Harbor water system.

Boston Harbor water system has also had exceedances for Total Coliform bacteria in 1999, but this has not been a recurring problem. It should be noted that under the current Revised Total Coliform Rule these total coliform positive samples would not be MCL exceedances.

## **Grand Mound Water System**

The only exceedances on record for the Grand Mound water system are total coliform MCL exceedances in June and July 1999, August 2007, November 2010, October 2013, and April 2019. These exceedances have been sporadic and do not seem to represent any kind of trend, and as noted above, under the Revised Total Coliform Rule these total coliform positive samples would not have been MCL exceedances.

## **Tamoshan Water System**

The only recent water quality issue with the Tamoshan water system has been disinfection byproducts (DBPs). The MCL for TTHM in the distribution system was exceeded in December 2014, March 2015, September 2016, December 2016 and March 2017. The MCL for HAA5 was exceeded in March 2007, December 2007, March 2015, June 2018, and March 2019. Iron and manganese were problems for Tamoshan prior to 1987 before a new well was drilled in 1991. There is one Total Coliform MCL exceedance on record from October 2007, but as noted above, under the Revised Total Coliform Rule these total coliform positive samples would not have been an MCL exceedance.

During June and July of 2017 a new recirculation and aeration system was installed in the Tamoshan reservoir for the purpose of reducing DBPs in the water. Since the DBP



exceedances were rather sporadic, it may take a year or more of routine monitoring to verify that this treatment process has been effective in controlling DBPs.

## **WATER QUALITY COMPLAINTS**

Thurston County handles water quality complaints pursuant to their policy for dealing with complaints as described in Chapter 1. The most common water quality complaints are regarding water taste. In response to water complaints, the water operator will generally check out the validity of the complaint by an on-site investigation and flush water mains if appropriate.

The County also receives complaints about low water pressure and water leaks. Low pressures have generally been associated with plugged faucet screens and have been corrected by cleaning or replacing the faucet screen. Leaks have generally been service line breaks, usually on the customer's side of the meter, and have been corrected by repair of the service lines.



## **CHAPTER 4**

### **WATER USE EFFICIENCY PROGRAM**

#### **OBJECTIVE**

The objectives of this chapter are to identify the conservation and water use efficiency requirements pertaining to the Thurston County DPW water systems, evaluate past conservation efforts, and describe Thurston County DPW's water use efficiency plan for the next 10 years.

#### **WATER USE EFFICIENCY PLANNING REQUIREMENTS**

In 1989, the Washington Legislature passed the Water Use Efficiency Act (43.20.230 RCW), which directed DOH to develop procedures and guidelines relating to water use efficiency. In response to this mandate, Ecology, the Washington Water Utilities Council, and DOH jointly published a document titled *Conservation Planning Requirements* (1994). In 2003, the Municipal Water Supply – Efficiency Requirements Act (Municipal Water Law) was passed. This legislation amended RCW 90.03 to require additional conservation measures. The Municipal Water Law applies to all Municipal Water Suppliers. Among other things, the Municipal Water law directed DOH to develop the Water Use Efficiency Rule (WUE Rule), which was adopted January 22, 2007. In addition, DOH has developed a WUE Rule guidance document titled “Water Use Efficiency Guidebook” (WUE Guidebook) originally dated July 2007, and revised January 2011 (DOH Publication No. 331-375). The WUE Guidebook supersedes and replaces the 1994 Conservation Planning Requirements. Therefore, the WUE Rule and the WUE Guidebook now provide all the currently effective water use efficiency planning requirements.

#### **WATER USE EFFICIENCY RULE**

The WUE Rule consists of a series of amendments to existing sections and addition of new sections to WAC 246-290, the Group A Public Water System Regulations, and sets additional requirements for public water purveyors. The WUE Rule is comprised of four sections:

- |                          |  |
|--------------------------|--|
| 1. Planning requirements | 3. Distribution leakage standard                       |
| 2. Metering requirements | 4. Goal setting and performance reporting requirements |

The WUE Guidebook is intended to provide guidance and clarification on the requirements of the WUE Rule, and not to establish any additional requirements. The requirements of the WUE Rule are discussed in the following sections.



## PLANNING REQUIREMENTS

The Planning Requirements of the WUE Rule include the following:

- Estimation of the amount of water saved through implementation of the system's WUE program over the past 6 years.
- Description of the water system's WUE goals.
- Select WUE measures.
- For each WUE measure selected, either:
  - Include a plan to implement the measure, or
  - Evaluate selected water use efficiency measures to show that they are not cost effective.

These WUE Rule planning requirements are addressed in the following sections:

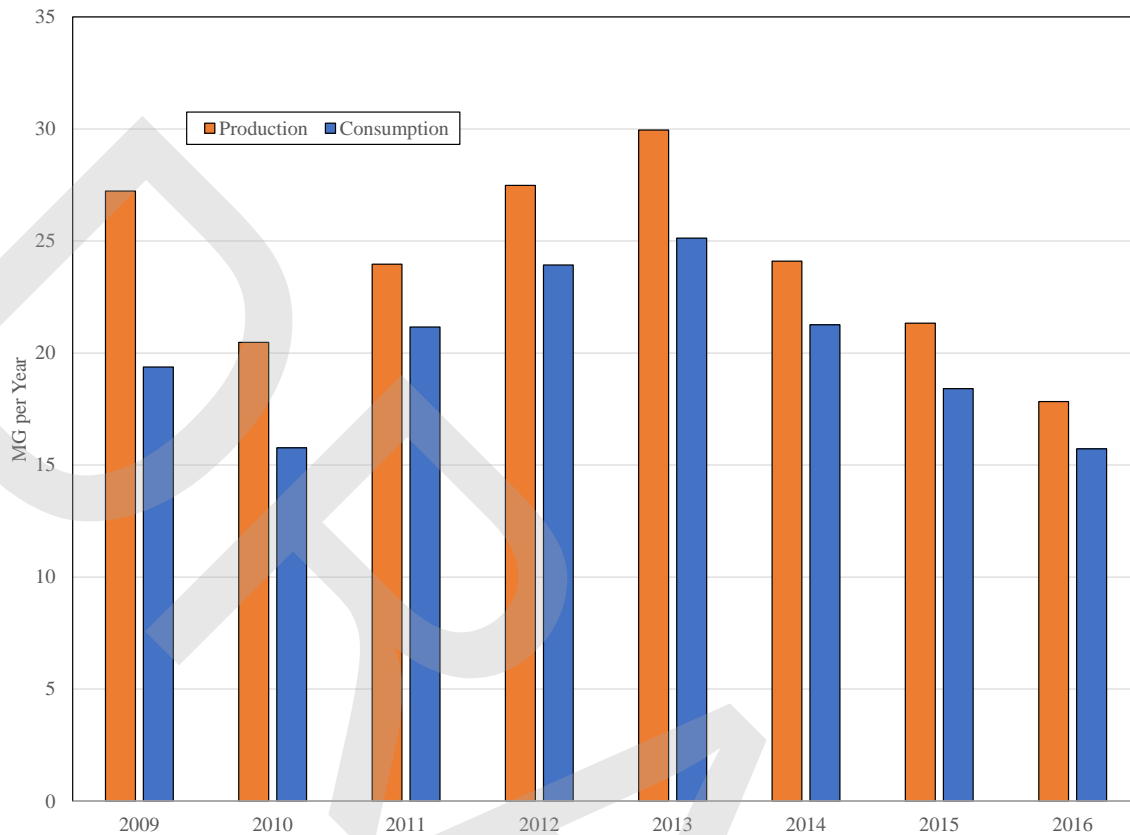
### ESTIMATION OF WATER SAVED

Water may be saved by reduction of system leakage or by reduction of consumers' usage, or both. Also, since the number of users may be changing over the data period, it may also be better estimated based on the water use relative to the number of users. Water usage may be influenced by the number of customers, weather, landscaping needs, and by consumer water use habits. When estimating water saved, the question we are trying to answer is, "How much more water would have been used had we not implemented water use efficiency measures?" This is by its nature a very theoretical estimate, since we can't go back and try it with and without the WUE measures. Following are estimates of water saved for each of the Thurston County DPW water systems.

#### **Boston Harbor**

Annual water production and consumption for the Boston Harbor water system from 2009 through 2016, based on WUE Annual Reports, is shown in Figure 4-1.



**FIGURE 4-1**

### **Boston Harbor Water System Annual Production and Consumption**

It can be seen from Figure 4-1 that both water production and water consumption decreased from 2009 to 2010, then increased from 2010 through 2013, then decreased again from 2013 through 2016.

During this period the number of connections served by the Boston Harbor Water System increased. In the 1997 Thurston County Department of Water and Waste Management Satellite Management Agency Plan, the number of connections cited for the Boston Harbor water system was 226 in 1996, whereas the 2016 WFI for the Boston Harbor water system indicates 275 connections, an increase of 49 connections over 20 years. Assuming a straight line growth in the number of connections between 1996 and 2016, the average rate of increase was 2.45 connections per year. Rounding to the nearest whole number of connections, the estimated connections in 2009 was 258, and the number of connections increased by two to three per year through 2016. If water was used at the 2009 usage rate, the usage would have gone up proportionately to the number of connections. Comparing that estimate to the actual water production for each year yields an estimate of water saved for that year by implementation of WUE measures. Adding the annual savings thus estimated, yields an estimated WUE savings of



32.66 MG over the data period. Table 4-1 shows estimated connections, annual water production, annual water consumption, DSL, percent DSL, 3-year rolling percent DSL, estimated production at 2009 rate, and estimated annual savings compared to 2009 rate.

**TABLE 4-1****Boston Harbor Water Production and Consumption, and Estimated WUE Savings**

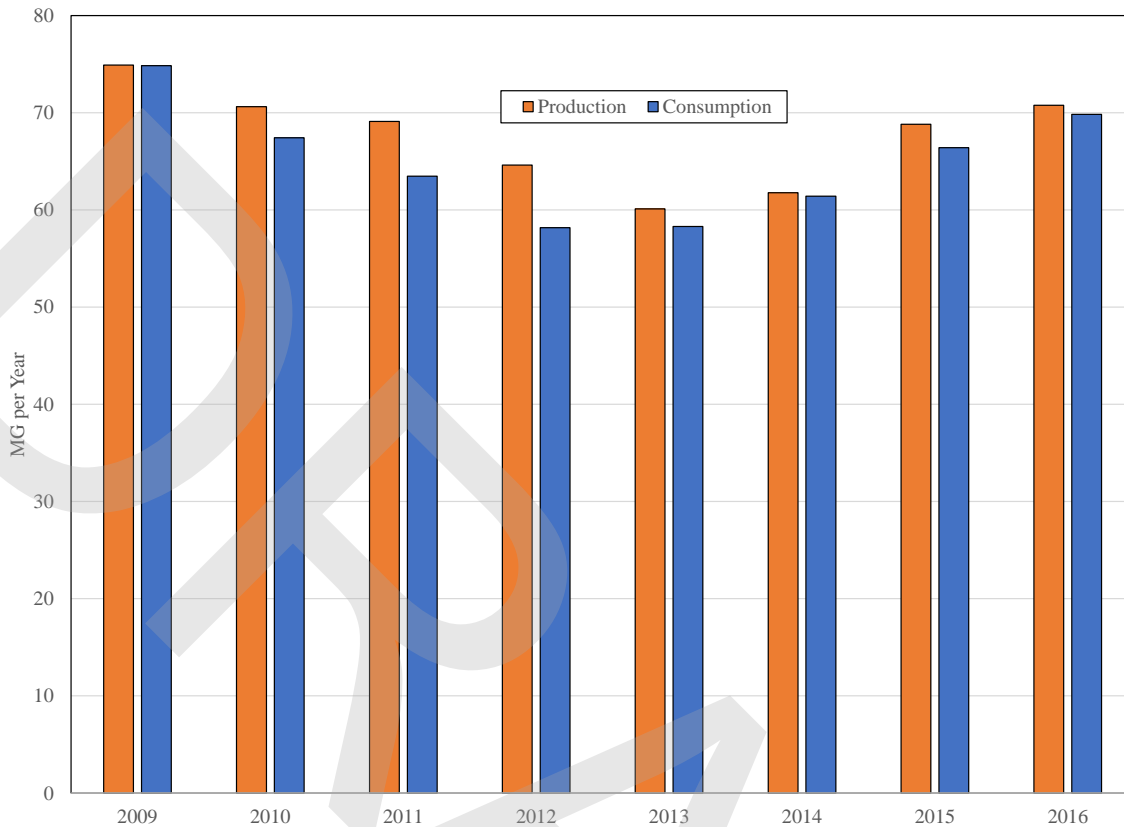
<b>Year</b>	<b>Estimated Connections<sup>(1)</sup></b>	<b>Production, MG</b>	<b>Consumption, MG</b>	<b>DSL, MG</b>	<b>Percent DSL</b>	<b>3-Year Rolling Percent DSL</b>	<b>Estimated Production at 2009 Rate, MG<sup>(2)</sup></b>	<b>Estimated Annual Savings Compared to 2009 Rate, MG<sup>(3)</sup></b>
2009	258	27.23	19.38	7.86	28.85%		27.23	0.00
2010	260	20.47	15.77	4.70	22.96%		27.44	6.97
2011	263	23.97	21.16	2.81	11.72%	21.44%	27.76	3.79
2012	265	27.48	23.93	3.56	12.95%	15.39%	27.97	0.49
2013	268	29.95	25.13	4.82	16.10%	13.75%	28.29	-1.66
2014	270	24.10	21.26	2.84	11.79%	13.77%	28.50	4.40
2015	273	21.33	18.41	2.92	13.68%	14.04%	28.82	7.48
2016	275	17.83	15.72	2.11	11.86%	12.45%	29.03	11.19
<b>Estimated Total Savings</b>								<b>32.66</b>

- (1) Connections are estimated based on a straight line interpolation between 226 connections in 1996 as indicated in the 1997 Thurston County Department of Water and Waste Management Satellite Management Agency Plan, and 275 in 2016 as indicated on the March 3, 2016 WFI, and rounded to the nearest whole number of connections.
- (2) Estimated Production at 2009 Rate is the 2009 annual production increased proportionately to the estimated number of connections for each year.
- (3) Estimated Annual Savings Compared to 2009 Rate is Estimated Production at 2009 Rate minus Production.

**Grand Mound**

Annual water production and consumption for the Grand Mound water system from 2009 through 2016, based on WUE Annual Reports, is shown in Figure 4-2.



**FIGURE 4-2**

### **Grand Mound Water System Annual Production and Consumption**

It can be seen from Figure 4-2 that both water production and water consumption decreased from 2009 to 2013, then increased from 2013 through 2016.

During this period the number of connections served by the Grand Mound Water System increased. In the 2012 Thurston County Department of Public Works Grand Mound Water System Plan, the number of connections cited for the Grand Mound water system was 198 in 2009 and 248 in 2010. The 2016 WFI for the Grand Mound water system indicates 331 connections, an increase of 83 connections over 6 years. Assuming a straight line growth in the number of connections between 2010 and 2016, the average rate of increase was 13.83 connections per year. Rounding to the nearest whole number of connections, the number of connections increased by 13 to 14 per year from 2010 through 2016. If water was used at the 2009 usage rate, the usage would have increased proportionately to the number of connections. Comparing that estimate to the actual water production for each year yields an estimate of water saved by implementation of WUE measures for that year. Adding the annual savings thus estimated yields an estimated WUE savings of 301.16 MG over the data period. Table 4-2 shows estimated connections, annual water production, annual water consumption, DSL, percent DSL,



3-year rolling percent DSL, estimated production at 2009 rate, and estimated annual savings compared to 2009 rate.

**TABLE 4-2****Grand Mound Water Production and Consumption, and Estimated WUE Savings**

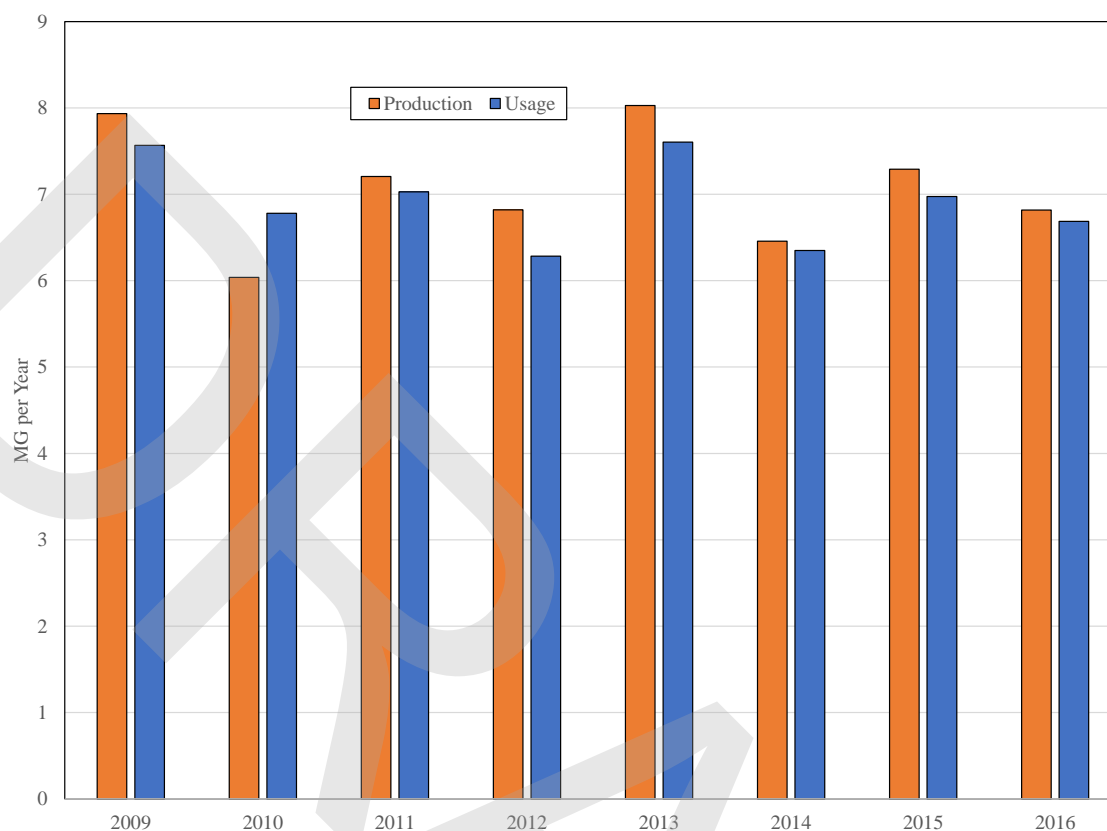
<b>Year</b>	<b>Estimated Connections<sup>(1)</sup></b>	<b>Production, MG</b>	<b>Consumption, MG</b>	<b>DSL, MG</b>	<b>Percent DSL</b>	<b>3-Year Rolling Percent DSL</b>	<b>Estimated Production at 2009 Rate, MG<sup>(2)</sup></b>	<b>Estimated Annual Savings Compared to 2009 Rate, MG<sup>(3)</sup></b>
2009	198	74.92	74.85	0.07	0.09%		74.92	0.00
2010	248	70.62	67.42	3.20	4.54%		93.84	23.21
2011	262	69.11	63.47	5.64	8.16%	4.15%	99.13	30.02
2012	276	64.61	58.17	6.44	9.96%	7.48%	104.43	39.82
2013	290	60.10	58.29	1.80	3.00%	7.16%	109.73	49.63
2014	303	61.76	61.43	0.34	0.55%	4.60%	114.65	52.88
2015	317	68.83	66.41	2.41	3.50%	2.39%	119.94	51.12
2016	331	70.77	69.84	0.92	1.31%	1.83%	125.24	54.47
<b>Estimated Total Savings</b>								<b>301.16</b>

- (1) Connections are based on 198 and 248 for 2009 and 2010 respectively, as reported in the 2012 Thurston County Department of Public Works Grand Mound Water System Plan, 331 for 2016 as reported in the 2016 Grand Mound WFI, and estimated between 2010 and 2016 based on a straight line interpolation rounded to the nearest whole number of connections.
- (2) Estimated Production at 2009 Rate is the 2009 annual production increased proportionately to the estimated number of connections for each year.
- (3) Estimated Annual Savings Compared to 2009 Rate is Estimated Production at 2009 Rate minus Production.

**Tamoshan**

Annual water production and consumption for the Tamoshan water system from 2009 through 2016, based on WUE Annual Reports, is shown in Figure 4-3.



**FIGURE 4-3**

### **Tamoshan Water System Annual Production and Consumption**

It can be seen from Figure 4-1 that both water production and water consumption fluctuated up and down over the data period.

During this period the number of connections served by the Tamoshan Water System increased slightly. In the 1997 Thurston County Department of Water and Waste Management Satellite Management Agency Plan, the number of connections cited for the Tamoshan water system was 89 in 1996, whereas the 2016 WFI for the Tamoshan water system indicates 92 connections, an increase of 3 connections over 20 years. Assuming a straight line growth in the number of connections between 1996 and 2016, the average rate of increase was 0.15 connections per year. Rounding to the nearest whole number of connections, the estimated connections in 2009 was 91, and the number of connections increased to 92 in 2013. If water was used at the 2009 usage rate, the usage would have gone up proportionately to the number of connections. Comparing that estimate to the actual water production for each year yields an estimate of water saved for that year by implementation of water WUE measures. Adding the annual savings thus estimated, yields an estimated WUE savings of 7.24 MG over the data period. Table 4-3 shows estimated connections, annual water production, annual water consumption, DSL, percent



DSL, 3-year rolling percent DSL, estimated production at 2009 rate, and estimated annual savings compared to 2009 rate.

**TABLE 4-3****Tamoshan Water Production and Consumption, and Estimated WUE Savings**

<b>Year</b>	<b>Estimated Connections<sup>(1)</sup></b>	<b>Production, MG</b>	<b>Consumption, MG</b>	<b>DSL, MG</b>	<b>Percent DSL</b>	<b>3-Year Rolling Percent DSL</b>	<b>Estimated Production at 2009 Rate, MG<sup>(2)</sup></b>	<b>Estimated Annual Savings Compared to 2009 Rate, MG<sup>(3)</sup></b>
2009	91	7.94	7.57	0.37	4.63%		7.94	0.00
2010	91	6.04	6.78	-0.74	-12.28%		7.94	1.90
2011	91	7.21	7.03	0.18	2.48%	-0.92%	7.94	0.73
2012	91	6.82	6.28	0.54	7.85%	-0.14%	7.94	1.12
2013	92	8.03	7.60	0.42	5.27%	5.16%	8.02	0.00
2014	92	6.46	6.35	0.11	1.64%	5.00%	8.02	1.57
2015	92	7.29	6.97	0.32	4.34%	3.89%	8.02	0.73
2016	92	6.82	6.69	0.13	1.91%	2.69%	8.02	1.21
<b>Estimated Total Savings</b>								<b>7.24</b>

- (1) Connections are estimated based on a straight line interpolation between 89 connections in 1996 as indicated in the 1997 Thurston County Department of Water and Waste Management Satellite Management Agency Plan, and 92 connections in 2016 as indicated on the March 3, 2016 WFI, and rounded to the nearest whole number of connections.
- (2) Estimated Production at 2009 Rate is the 2009 annual production increased proportionately to the estimated number of connections for each year.
- (3) Estimated Annual Savings Compared to 2009 Rate is Estimated Production at 2009 Rate minus Production.

**WATER USE EFFICIENCY GOALS****Goal Requirements**

The WUE Rule requires that the “governing body of the public water system shall establish water use efficiency goals within 1 year of the effective date of this rule.” The effective date of the rule was January 22, 2007, so the WUE Goals were to be adopted by January 22, 2008. The WUE Rule further requires that WUE Goals must “be set in a public forum that provides opportunity for consumers and the public to participate and comment on the water use efficiency goals,” and further requires that the goals must include a measurable outcome in terms of water production or consumption, address water supply and forecasted demand characteristics, and include an implementation schedule for meeting the goals.



## **Current Thurston DPW WUE Goals**

The water use efficiency goals as stated on annual WUE reports for each of the three Thurston County DPW water systems are as follows:

Boston Harbor: Reduce household usage by 3 percent by 2016.

Grand Mound: Reduce usage at each metered connection by 3 percent by 2016.

Tamoshan: Reduce household usage by 3 percent by 2016.

These goals are essentially the same. The Grand Mound Water System's goal is slightly different because there is a larger percentage of non-residential connections on that water system. All goals were apparently originally set in public forums in October 2009. The Boston Harbor and Tamoshan annual WUE reports indicate more recent dates for forums, but also indicate that the goals were not changed.

Referring to Table 4-1, Boston Harbor water system water production has declined from 27.23 MG in 2009 to 17.83 MG in 2016, a reduction of 34.5 percent, while consumption has declined from 19.38 MG in 2009 to 15.72 MG in 2016, a reduction of 18.9 percent. The decrease in use per connection will be greater than this because the number of connections in the Boston Harbor water system increased over the same time period.

Referring to Table 4-2, Grand Mound water system water production has declined from 74.92 MG in 2009 to 70.77 MG in 2016, a reduction of 5.5 percent, while consumption has declined from 74.85 MG in 2009 to 69.84 MG in 2016, a reduction of 6.7 percent. The decrease in use per connection will be greater than this because the number of connections in the Grand Mound water system increased over the same time period.

Referring to Table 4-3, Tamoshan water system water production has declined from 7.94 MG in 2009 to 6.92 MG in 2016, a reduction of 14.1 percent, while consumption has declined from 7.57 MG in 2009 to 6.69 MG in 2016, a reduction of 11.6 percent. The decrease in use per connection will be greater than this because the number of connections in the Tamoshan water system increased over the same time period.

Based on this analysis, the Thurston County DPW has more than met their WUE Goals on all three of their water systems. The goals for all three water systems were based on three percent reduction by 2016. Since 2016 has now passed and the goals have been met, it is now time for Thurston County to set new WUE goals for their water systems.



## Current WUE Goals

With this Water System Plan update, Thurston County revises its water use efficiency goals as follows:

### Boston Harbor:

Boston Harbor water system average day usage per connection increased from 206 gpd per connection in 2009 to 257 gpd per connection in 2013, then declined to 157 gpd per connection in 2016. Boston Harbor Distribution System Leakage (DSL) declined from 28.9 percent in 2009 to 11.9 percent in 2016. Based on this history, the WUE goals for the Boston Harbor water system for the next 10 years are as follows:

- **Demand Side Goal:** Maintain average day water system usage at or below 200 gpd/conn over the 10-year planning period.
- **Supply Side Goal:** Reduce DSL to below 10 percent of production by the end of the 10-year planning period.

### Grand Mound:

Grand Mound water system average day usage per connection declined from 1,036 gpd per connection in 2009 to 578 gpd per connection in 2016. However, much of this demand is going to the Great Wolf Lodge (GWL). If we assume that water demand for all water uses other than GWL is 200 gpd per connection, roughly similar to water use at Tamoshan and Boston Harbor water systems, then GWL demand would have to be 166,000 gpd in 2009, declining to 102,000 gpd in 2013 and increasing again to 125,000 gpd in 2016. Grand Mound DSL was 0.09 percent in 2009, increased to 9.96 percent in 2012, and declined to 1.31 percent in 2016. Based on this history, the WUE goals for the Grand Mound water system for the next 10 years are as follows:

- **Demand Side Goal 1:** Maintain average day residential water usage at or below 200 gpd/conn over the 10-year planning period.
- **Demand Side Goal 2:** Reduce average day water usage at Great Wolf Lodge to or below 120,000 gallons over the 10-year planning period.
- **Supply Side Goal:** Maintain DSL below 10 percent of production over the 10-year planning period.

### Tamoshan:

Tamoshan water system average day use declined from 228 gpd per connection in 2009 to 189 gpd per connection in 2014, then increased to 199 gpd per connection in 2016. DSL declined from 4.63 percent in 2009 to 1.64 percent in 2014 and increased to



1.91 percent in 2016. Based on this history, the WUE goals for the Tamoshan water system for the next 10 years are as follows:

- **Demand Side Goal:** Maintain average day water system usage at or below 200 gpd/conn over the 10-year planning period.
- **Supply Side Goal:** Maintain DSL below 10 percent of production over the 10-year planning period.

### **SELECTED WATER USE EFFICIENCY MEASURES**

The WUE Rule requires that water systems with less than 500 service connections must implement or evaluate a minimum of one water use efficiency measure. The WUE Guidebook further states that water use efficiency measures that are required in other portions of the WUE Rule cannot be counted as measures to be selected under this requirement. Measures required in other portions of the WUE Rule include the following:

- Installation of source and service meters if meters are not already present;
- Regular calibration of meters;
- Development and implementation of a water loss control program if DSL exceeds 10 percent; and
- Education of consumers about water use efficiency practices once per year.

Measures that the WUE Guidebook suggests can count toward satisfying the required number of water use efficiency measures include the following:

- Implementation of a conservation rate structure.
- Implementation of a water reclamation program.
- Customer assistance in repair of leaks in customer service lines and in homes.
- Additional consumer education, such as student education and consumer education at fairs.
- Bills showing water consumption history.



Note that implementation of measures by customer class count as separate measures for each customer class for which they are implemented.

Thurston County Public Works is adopting the following WUE Measures for the coming 10-year planning period:

### **Measures to Meet Supply-Side Goals**

The measure that the County intends to implement to meet the supply-side goal of “Maintain DSL below 10 percent of production over the 10-year planning period.” (Grand Mound and Tamoshan) is as follows:

- Review water production and water sales records annually to determine if DSL has remained below 10 percent.

The measures that the County intends to implement to meet the supply-side goal of “Reduce DSL below 10 percent of production over the 10-year planning period.” (Boston Harbor) are as follows:

- Review water production and water sales records annually to determine if DSL is above 10 percent.
- If DSL remains above 10 percent after the year 2020, the County will implement a leak detection and repair program to reduce DSL below 10 percent.

### **Measures to Meet Demand-Side Goals**

The measures that the County intends to implement to meet the demand-side goal of “Maintain average day residential water usage at or below 200 gpd/conn over the 10-year planning period,” Boston Harbor, Grand Mound, and Tamoshan water systems include the following:

- Customer assistance in repair of leaks in customer service lines and in homes.
- Bills showing water consumption history.
- Review residential water usage data annually to determine if average day residential water use is below 200 gpd per connection.
- Distribute additional consumer education information if usage rate remain greater than 200 gpd per connection.



The measures that the County intends to implement to meet the demand-side goal of “Maintain average day Great Wolf Lodge water usage at or below 120,000 gpd over the 10-year planning period,” (Grand Mound water system only) include the following:

- Meet with Great Wolf Lodge water facilities operations staff a minimum of annually to review water usage at Great Wolf Lodge and strategize practical methods to reduce water usage.
- Review Great Wolf Lodge water usage data a minimum of annually to determine if average day water usage is in excess of 120,000 gallons per day.

### **Required Number of WUE Measures**

As listed above, Thurston County will implement one supply-side WUE measure for Tamoshan and Grand Mound water systems, and two supply-side WUE measures for the Boston Harbor water system. In addition, Thurston County will implement three demand-side WUE measures for the Boston Harbor and Tamoshan water systems and five demand side measures for the Grand Mound water system.

The demand side measures apply to all of the County’s customer classes. Since each action counts as one measure for each customer class to which it applies, the WUE measures identified above constitute more than the minimum WUE Rule requirement. Therefore, the proposed measures listed above meet this requirement of the WUE Rule.

### **IMPLEMENT OR EVALUATE WATER USE EFFICIENCY MEASURES**

Thurston County Public Works intends to implement more than the minimum required number of WUE Measures. Therefore, no evaluation of the cost effectiveness of conservation measures is required.

### **METERING REQUIREMENTS**

The WUE Rule requires all sources and customer service connections be metered by January 22, 2007. Thurston County Public Works currently meters all service connections and all water sources.

### **DISTRIBUTION SYSTEM LEAKAGE STANDARD**

The WUE Rule set a DSL standard of ten percent or less of finished water production. DSL is defined as the sum of all water metered into the distribution system over a 3-year time period, less the sum of all metered water uses, and known or credibly estimated unmetered uses, out of the distribution system over the same time period. Known or credibly estimated unmetered uses may include uses such as construction, firefighting, and water main flushing.



As shown in Tables 4-1, the 3-year rolling average DSL for Boston Harbor water system has declined from 21.44 percent for 2009 – 2011 to 12.45 percent for 2014 – 2016. The annual DSL values have consistently exceeded ten percent, but have been coming down, and since 2011 have been mostly below 15 percent.

As shown in Tables 4-2 and 4-3, the 3-year rolling average DSL, as well as individual annual averages, for Grand Mound and Tamoshan water systems, respectively, have been consistently below 10 percent.

Since the Grand Mound and the Tamoshan water systems have DSL rates consistently well below the 10 percent DSL standard, pursuant to WAC 246-290-820 (1)(b)(i), no further action is required for these systems other than to continue to monitor and report DSL.

Since the Boston Harbor water system has consistently exceeded the 10 percent DSL standard, but has been consistently below 20 percent DSL, then pursuant to WAC 246-290-820 (4)(e) Thurston County is required to implement a Water Loss Control Action Plan for the Boston Harbor water system consisting of assessment of data accuracy and data collection.

## **WATER LOSS CONTROL ACTION PLAN**

Thurston County Public Works will implement a Water Loss Control Action Plan consisting of assessment of data accuracy and data collection, as required by WAC 246-290-820 (4)(e). The following specific actions will be taken to satisfy this requirement:

- **Improve Water Use Accounting:** The County will continue to improve their system for water use accounting, including tracking non-billed and non-metered water use on a regular basis and regularly comparing water production records with water use records.
- **Water Meter Replacement:** The County will routinely replace water meters 1-inch or smaller in size that have been in service for over 10 years, and will regularly test and replace as necessary all larger meters.

## **GOAL SETTING AND PERFORMANCE REPORTING**

Pursuant to the WUE Rule, Thurston County Public Works must set water use efficiency goals and report progress annually. The County's water use efficiency goals have been addressed in preceding sections of this chapter. The annual report must include the following:

- Total source production



- DSL in percentage and volume
- Goal description, schedule, and progress toward meeting goals

Thurston County Public Works has submitted annual WUE reports, including all of the above data, annually since reporting was required in 2008.

## GOAL SETTING

The WUE Rule requires that water conservation goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. The goal setting process must be held through a public forum and be re-evaluated every 6 to 10 years, concurrent with updates of water system plans, or more frequently if the goals are no longer current. The WUE Rule required that the first water use efficiency goals were to be set by January 22, 2008 for municipal water suppliers with 1,000 or more service connections, and by January 22, 2009 for municipal water suppliers with fewer than 1,000 service connections.

The County has authorized submittal of this Water System Plan, including these WUE Goals, and will adopt these WUE goals in a public forum together with adoption of this Water System Plan after the initial review by DOH.

## WATER USE DATA REPORTING

The WUE Rule requires annual reporting of water use data. The first annual reports were due July 1, 2008, for municipal water suppliers with 1,000 or more service connections, and by July 1, 2009, for municipal water suppliers with fewer than 1,000 service connections, and annually by July 1 each year thereafter. Table 4-4 summarizes the water use data collection requirements.

**TABLE 4-4**

### Summary of Water Use Data Collection

<b>Data Type</b>	<b>Unit of Measure</b>	<b>Collection Frequency</b>	<b>Comments</b>
Water Production	Gallons	Monthly	Total by month and by year.
Interties	Gallons	Monthly	None of the County water system have interties.
Water Sold	Gallons	Billing Period	Total sold by customer class for each billing period.
Estimated Unmetered Water Use	Gallons	Billing Period	Estimate and record unmetered water uses for each billing period.



**TABLE 4-4 – (continued)****Summary of Water Use Data Collection**

<b>Data Type</b>	<b>Unit of Measure</b>	<b>Collection Frequency</b>	<b>Comments</b>
Accounted-for Water	Gallons	Billing Period	The sum of Water Sold and Estimated Unmetered Water Use.
DSL	Gallons	Billing Period	The difference between monthly Water Production and monthly Accounted-for Water.
Percent DSL	Percent	Billing Period	DSL divided by Water Production times 100 percent. Calculate for each billing period, for each year and for a 3-year running average. If 3-year running average exceeds 10 percent, further actions are required to reduce DSL.

Thurston County Public Works has been submitting annual water use efficiency reports to DOH and distributing water use efficiency reports to customers annually in conjunction with annual consumer confidence reports, including all applicable data required in Table 4-4.

## **WATER USE EFFICIENCY PROGRAM DEVELOPMENT AND LEVEL OF IMPLEMENTATION**

The following sections describe the Thurston County Public Works water use efficiency goals, conservation measures, and the resulting water use projections.

### **REGIONAL CONSERVATION PROGRAMS**

The effects of a customer conservation program extend beyond the water service area. For example, Seattle Public Utilities heavily promoted water conservation to its customers in 2001 and communities throughout Puget Sound experienced a decrease in consumption. As the WUE Rule takes effect, neighboring water systems will likely increase their conservation efforts, thus increasing awareness of the need to conserve. Thurston County Public Works water systems may also be affected by regional water use efficiency promotion efforts.

### **TARGET WATER SAVINGS PROJECTIONS**

Projected water savings by implementation of water use efficiency goals is generally estimated by comparing projected demand at projected growth rates while meeting water use efficiency goals to projected demand at projected growth rate without meeting water use efficiency goals. However, since this Part A water system plan does not include



projected demands for the individual water systems, projected water use savings will not be addressed in the Part A water system plan, but will rather be addressed in the Part B water system plans for each individual water system.

## **SOURCE OF SUPPLY ANALYSIS**

### **OPTIMIZING USE OF CURRENT SUPPLIES**

As can be seen in Tables 4-1, 4-2 and 4-3, Water use and DSL at all three of the County's water system have reduced compared to 2009 usage rates. These reductions can be attributed to water conservation promotion, water rates that encourage conservation, and diligence on the part of Thurston County Public Works staff in dealing with system leaks and keeping water meters in good operating condition.

### **ENHANCED CONSERVATION MEASURES**

As technology for water leak detection and repair advances, and as more water efficient building fixtures and appliances become the standard, water conservation will be enhanced by implementation of standard building codes and replacement of aging fixtures and appliances with newer, more water efficient units.

### **WATER RIGHT CHANGES**

This Part A water system plan does not project water needs for the County's water systems, so future water right needs are not evaluated in this plan. However, water rights are summarized in Tables 1-3, 1-5 and 1-7, and historic water usage is included in Tables 4-1, 4-2 and 4-3. Boston Harbor water system has a total of 150 ac-ft/yr annual water rights, and over the past eight years it has used a maximum of 29.95 MG per year, which is 91.9 ac-ft/yr. Grand Mound water system has a total of 1,071.15 ac-ft/yr annual water rights, and over the past eight years it has used a maximum of 74.92 MG per year, which is 229.9 ac-ft/yr. Tamoshan water system has a total of 49 ac-ft/yr annual water rights, and over the past eight years it has used a maximum of 8.03 MG per year, which is 24.6 ac-ft/yr. So all three of the Thurston County Public Works water systems have water rights available for future expansion.

### **ARTIFICIAL RECHARGE**

As stated in the 2012 Grand Mound Water System Plan, Thurston County Public Works plans to develop an Engineering Report that evaluates alternatives for generating Class A Reclaimed Water at the Grand Mound Wastewater Treatment Plant. The end use of this Class A Reclaimed Water has not yet been determined, but one possibility is aquifer recharge for the Grand Mound water system.

At this time there are no plans for any kind of artificial recharge of the aquifers in the areas of the Tamoshan or Boston Harbor water systems. Thurston County Public Works



owns and operates sewer systems within the water service areas of these water systems, but the cost to treat to reuse standards, construct water reuse piping, pumping and storage facilities, and the permitting process involved in implementing a groundwater recharge system are not cost effective for such small systems.

## **WATER RECLAMATION**

The WUE Rule requires that water utilities with more than 1,000 service connections include an evaluation of water reclamation and reuse opportunities in their water system plans. However, since none of the Thurston County Public Works water systems have 1,000 or more service connections, and none are likely to have more than 1,000 service connections within the coming ten-year planning period, it is not required that Thurston County Public Works provide an evaluation of water reclamation and reuse opportunities. Nonetheless, as stated above, Thurston County Public Works is currently planning to prepare an Engineering Report investigating water reclamation at the Grand Mound Wastewater Treatment Plant.

## **WATER SUPPLY CHARACTERISTICS**

The WUE Guidebook indicates that a Water Use Efficiency Program should include a description of the water system source characteristics. The source characteristics for the Thurston County Public Works water system are thoroughly described in Chapters 1 and 3 of this Plan.



## **CHAPTER 5**

### **SOURCE PROTECTION PROGRAM**

#### **OBJECTIVE**

The objective of this chapter is to document and update Thurston County's historic and ongoing efforts at source protection. All of the County's water system sources are ground water sources accessed by wells. Therefore, the source protection program includes only a Wellhead Protection Program (WHPP) element. Surface water sources require Watershed Protection Programs, but Watershed Protection Programs are not applicable to the Thurston County Public Works water systems.

This Part A Water System Plan summarizes the current source protection program for each of the three County water systems (Boston Harbor, Grand Mound, and Tamoshan). Detailed and updated analysis of source protection will be included in each system's respective Part B Water System Plan, as required by the Department of Health.

#### **CURRENT WELLHEAD PROTECTION PROGRAMS**

This section summarizes the current WHPPs in place for the County's water systems.

##### **BOSTON HARBOR WATER SYSTEM**

There is no record of a comprehensive WHPP having ever been completed for the Boston Harbor water system. The Boston Harbor water system Wellhead Protection Area (WHPA) shown in Figure 5-1 was taken from the DOH Source Water Assessment Program (SWAP) mapping application, showing the WHPAs for Boston Harbor Wells 5 and 6. The SWAP mapping application indicates that both Boston Harbor Wells 5 and 6 have susceptibility ratings of "High."

It should be noted that the WHPA as shown on the DOH SWAP mapping application consists of two overlapping WHPAs, one for each well. These areas are most likely based on calculated fixed radius (CFR) areas indicated in the individual well susceptibility assessment forms. However, the Wellhead Protection Guidance Document, DOH Publication No. 331-018, requires that when two or more nearby wells withdraw from the same aquifer, their wellhead protection areas as determined by the CFR methodology should be combined into one area with its center at the centroid of the wells, and utilizing the combined withdrawals of all of the wells to determine the radius of the WHPA. Therefore, it is likely that the WHPA for the Boston Harbor wells will need to be revised when the Boston Harbor Part B water system plan is updated. If the combined withdrawals of both wells are twice the withdrawal of either well individually, then the WHPA radius for the combined wells will be larger than what is shown in Figure 5-1 by the square root of 2, or approximately 40 percent larger.



Neither the DOH “SWAP” mapping application, nor the Department of Ecology “Spills Maps” application, nor the Department of Ecology “What’s in My Neighborhood” map application identify any source of contamination within, or in the vicinity of, the Boston Harbor water system WHPAs.



From DOH Source Water Assessment Program Mapping Application.

**FIGURE 5-1**

### **Boston Harbor Water System WHPA Map**

#### **GRAND MOUND WATER SYSTEM**

The Grand Mound water system has a comprehensive WHPP that was developed as part of the Grand Mound Water System Plan, dated March 2012. Figure 5-2 is taken from the 2012 Grand Mound Water System Plan. Due to the high groundwater flow velocity in the area, the WHPAs are shown in this figure as lines with 6-month, 1-year, 5-year and 10-year time of travel indicated by squares. The SWAP mapping application indicates that Grand Mound Well 1 has a susceptibility rating of “High,” and Grand Mound Well 2 has a susceptibility rating of “Moderate.”







Potential sources of contamination shown in Figure 5-2 are listed below in Table 5-1.

**TABLE 5-1**

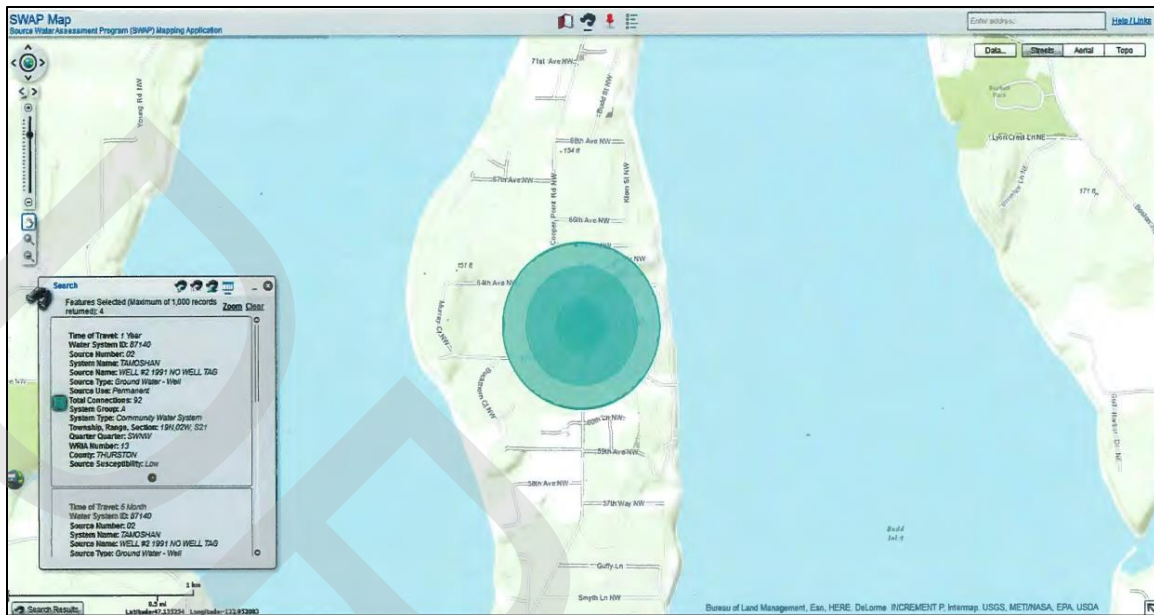
**Potential Sources of Contamination in Grand Mound WHPA**

<b>Map ID</b>	<b>Occupancy</b>	<b>Address</b>	<b>Parcel</b>
1	76 Gas Station	6212 SW 197 <sup>th</sup> Avenue	55702000200
2	AAA Auto Parts and Sales	20223 Old Hwy 99	51304900200
3	Atlas Concrete Products	19221 Sergeant Road	55801700400
4	Aztec Storage Containers	19946 Old Hwy 99	13512320300
5	C & D Propane Storage	20937 Old Hwy 99	42200900100
6	Conoco	6011 SW 193 <sup>rd</sup> Avenue	55700400000
7	Conoco	5845 SW 193 <sup>rd</sup> Avenue	55703000000
8	Doelman Dairy	7231 James Road	55901400000
9	Doelman manure spreading field	6711 – 198 <sup>th</sup> (situs)	51300700000
10	Evergreen Propane	20933 Old Hwy 99	42200900000
11	Ferrel Gas, dba Blue Rhino Propane	20935 Old Hwy 99	42200900000
12	Franks RV Repair	19515 Old Hwy 99	31410900900
13	Grand Mound AM-PM/Arco	Old Hwy 99	55702400101
14	Lakeside Industries	6701 196 <sup>th</sup> Avenue	55802700000
15	Martin Sand and Gravel	6500 196 <sup>th</sup> Avenue SW	55700900000
16	Modern Machinery Inc	19444 Ivan Street	31410900600
17	Northwest Custom Trailers	19530 Ivan Street	55700300000
18	Pacific Pride Gas	19615 Elderberry Street SW	55702000101
19	Quality Rock	6802 SW 196 <sup>th</sup>	55802100000
20	Shell Gas Station	Old Hwy 99	55702400500
21	Top Notch Trailers	19541 Elderberry Street SW	55701200500

**TAMOSHAN WATER SYSTEM**

The Tamoshan water system has a basic WHPP included in the Tamoshan Water System Small Water System Management Program dated August 2016. The Source Water Protection Program section of the Small Water System Management Program workbook includes general instructions regarding how to develop a WHPP, and it includes a WHPA map. A copy of the WHPA from the Tamoshan Water System August 2016 Small Water System Management Program is shown in Figure 5-3. The SWAP mapping application indicates that the Tamoshan Well has a susceptibility rating of “Low.”





From Tamoshan Water System Small Water System Management Program, August 2016.

**FIGURE 5-3**

### **Tamoshan Water System WHPA Map**

The WHPA map does not show any potential sources of contamination within the WHPA for the Tamoshan well. The Department of Ecology cleanup site tracking system “What’s In My Neighborhood” shows one site located approximately 0.8 miles north of the Tamoshan Well at 7111 Cooper Point Road NW, identified as “the Wilder Residence.” The cleanup site summary sheet indicates that the site was contaminated with unspecified petroleum products in the soil, that the site has been remediated, and that no further action is required at the site at this time. Since the soil contamination at this site has been remediated to the satisfaction of the Department of Ecology, and since this site is outside the 10-year time of travel zone to the Tamoshan well, this site poses minimal threat to the Tamoshan community water supply.

Other potential sources of contamination within the Tamoshan Well WHPA include public roads, and the Tamoshan Community Wastewater Treatment Facility. Cooper Point Road, which is the main access in the area, runs within approximately 40 feet to the west of the Tamoshan Well. The potential for accidental spills along a busy public road is a significant concern. Timely cleanup of any spills that may occur in that area can be critical for protection of the community water supply.

The Tamoshan wastewater treatment facility is located approximately 1/4 mile northwest from the Tamoshan well, as shown in Figure 1-4, and within the 5- to 10-year travel zone as shown in Figure 5-3. The facility treats domestic wastewater and discharges to Budd Inlet to the east of the treatment plant. This is an activated sludge batch reactor using UV disinfection prior to discharge to Budd Inlet. Nothing routinely discharges to ground.



Waste activated sludge is aerated, thickened and transported to Grand Mound wastewater treatment plant for digestion. This facility is located in a ravine at an elevation of approximately 25 feet, whereas the well is located at an elevation of approximately 120 feet. The ravine drains to the east toward Budd Inlet. Therefore, any spill or unintended discharge from the wastewater treatment facility would tend to drain to the east, away from the well site, and any pathogenic bacteria that might infiltrate into the ground as result of a spill or unintended discharge would not be likely to survive the 5- to 10-year time frame required to travel 1/4 mile through the ground to the well site. Therefore, the wastewater treatment facility poses minimal threat to the Tamoshan community water supply.

## **WELLHEAD PROTECTION RECOMMENDATIONS**

The Boston Harbor water system Wellhead Protection Plan needs to be revised to show the time of travel zones based on the combined withdrawal of both wells. This revision can be done when the Boston Harbor Part B water system plan update is to be completed.



## **CHAPTER 6**

### **OPERATION AND MAINTENANCE PROGRAM**

#### **INTRODUCTION**

The objective of this chapter is to provide an evaluation of Thurston County's operation and maintenance (O&M) program and its ability to assure satisfactory management of the water system operations in accordance with WAC 246-290. Thurston County's Operation and Maintenance Manual and specific component related documentation are maintained by Thurston County for use by operations personnel. Information presented in the complete O&M manual is considered sensitive information and is not intended for general distribution to the public.

The O&M Program includes the following elements:

- Water System Management and Personnel
- Operator Certification
- System Operation and Control
- Water Quality Monitoring
- Preventive Maintenance
- Emergency Response Program
- Cross-Connection Control Program
- Customer Complaint Response Program
- O&M Improvements

#### **WATER SYSTEM MANAGEMENT AND PERSONNEL**

The Thurston County Department of Public Works is governed by a three member County Commission. The commissioners and Public Works management staff are shown in Chapter 1 under the heading "Management Structure." Water system staff are addressed in the following section.

#### **OPERATOR CERTIFICATION**

##### **Certification Requirements**

Department of Health (DOH) regulations (WAC 246-292-050) require all Group A water systems to have at least one certified Water Distribution Manager (WDM). The WDM must further be certified at a level equal to or higher than the water system's classification rating as described in Table 6-1 and in accordance with WAC 246-292-040.



**TABLE 6-1**

**Water System Group Classification**

<b>Classification</b>	<b>Population Served</b>
Group 1	Less than 1,500
Group 2	1,501 to 15,000
Group 3	15,501 to 50,000
Group 4	Greater than 50,000

Between the three water systems, Thurston County serves an estimated total of 1,790 people on a full time basis, and therefore is required to have a WDM Level 2. Additionally, Thurston County is required to have a Cross Connection Control (CCC) Program and must ensure that a Cross Connection Specialist (CCS) is responsible for overseeing the program and for periodic inspections of premises for cross connections. Finally, Thurston County must ensure that a Backflow Assembly Tester (BAT) is responsible for inspecting, testing, and monitoring backflow prevention assemblies in accordance with WAC 246-290-490. Thurston County can have a CCS on staff or have an outside CCS specialist review their CCC program and do cross connection inspections. Thurston County can also have a BAT on staff to perform the backflow assembly tests or can have an independent BAT on contract, or can allow the customers to have their device tested by an independent certified BAT.

**Thurston County Water Operations Staff Certifications**

Table 6-2 lists the County's maintenance personnel, positions and certifications. Thurston County has four employees with WDM 2 or higher certification, and four with CCS certification. The Thurston County Department of Public Works does not have a certified BAT. Thurston County currently contracts with Backflo Pro's, Inc., based in Tumwater, Washington, for backflow testing. Water customers who are required by the County to maintain backflow prevention assemblies are also required to hire their own independent BAT to provide testing and certification of backflow prevention assemblies.



**TABLE 6-2****Thurston County Water System Personnel Certifications**

<b>Staff</b>	<b>Position</b>	<b>Water Operator Certifications</b>	<b>Water Operator Certification Number</b>	<b>Phone Numbers</b>
Kevin Patching	Utility Supervisor	WDM 2, WTPO 2, CCS	12555	360-239-4486 360-431-8486
Dennis Baker	Utility Operator III	WDM 2, WTPO 2, CCS	6315	360-485-3143 360-520-4138
Reuben Stringer	Utility Operator III	WDM 2, WDM 1, WTPO 1, CCS	14082	360-480-8772 775-997-5996
Vern Prell	Utility Operator III	WDM 1	7967	360-239-4489 360-264-5022
Keith Cournyer	Utility Operator III	WDM 3, WTPO 3, CCS	12802	360-239-4492 509-995-3715
Zainab Nejati, P.E.	Utility Planner	N/A	N/A	360-867-2072 360-490-6082

**PROFESSIONAL GROWTH REQUIREMENTS**

In order to promote and maintain expertise for the various grades of operator certification, Washington State regulations require all certified operators meet professional growth requirements by completing no less than three continuing education units (CEUs) every 3 years. Programs sponsored by both Washington Environmental Training Resource Center (WETRC) and the American Water Works Association (AWWA) Pacific Northwest Subsection are popular sources of CEUs for certified operators in Washington State. Other CEU opportunities are also available through many local community colleges and other educational institutions and professional associations. The professional growth requirement may also be met by advancement, by examination, or by certification in a different classification.

The Thurston County Department of Public Works maintains the status of staff CEUs. Resources to obtain training are provided by the County as necessary to maintain these credits.

**SYSTEM OPERATION AND CONTROL****MAJOR SYSTEM COMPONENTS**

Descriptions of major system components are included in Chapter 1, and further discussed Chapter 3. The locations of the major system components are shown on Figures 1-2, 1-3 and 1-4, the system facilities maps. A description of the normal operation of each facility is given in the following sections.



## **Boston Harbor Water System**

### Source of Supply

The Boston Harbor Water System obtains its water from two wells (Well 5 and Well 6) both located on the grounds of Boston Harbor Elementary School, approximately 0.75 miles east of the center of the Boston Harbor community. These wells are turned on and off by a Programmable Logic Controller (PLC), based on water levels in the Boston Harbor Reservoir, also located at the Boston Harbor Elementary School, as determined by a pressure transducer located in the water treatment building, and connected to the reservoir by a dedicated pressure line. Well on and off levels are adjustable by the operator from the PLC interface screen.

Operations and maintenance include routinely checking the water level as displayed on the PLC to verify it is reading correctly and levels are within normal operating range, recording source meter readings and checking daily production volumes to verify they are within normal range, and checking water production rate from each well to verify they are operating within normal range. It is also recommended that well water levels be measured regularly both with the wells off and with the wells on to determine if aquifer levels are declining or if pumping drawdown is increasing. Comparing well pump run times and power usage to water production can also be useful in detecting well pump problems before a well pump actually fails.

### Treatment

The treatment system at Boston Harbor water system consists of sodium hypochlorite injection and filtration through an oxidative filtration media to remove iron and manganese. The objective is to remove iron and manganese from the source water and provide a detectable chlorine residual throughout the distribution system.

Operations and maintenance consists of keeping the sodium hypochlorite feed tank filled, recording the amount of chemical used, checking the operation of the feed pump system, checking chlorine residual after treatment, checking iron and manganese before and after treatment, recording the volume of water filtered, and recording the amount of water backwashed. Filter media needs to be checked every one to five years and media added to the filter tanks as needed.

In addition, a recirculation pump was installed in the Boston Harbor water system reservoir during summer of 2017 to improve reservoir circulation and reduce formation of TTHMs from the water. The County periodically checks to verify that this system is operating properly.



## Reservoir

The Boston Harbor water reservoir provides water storage to meet maximum water system demands and emergency situations, and provides system pressure based on the elevation of the water in the reservoir. Water level in the reservoir is used to turn wells on and off, and the reservoir provides a place for water to go when source output exceeds system demand.

As described in Chapter 1, the Boston Harbor water system has a welded steel water reservoir that is 31 feet in diameter and 90.5 feet from floor to overflow. Water level in the reservoir is determined by a pressure transducer, as described above under the heading “Source of Supply.” Water level in the reservoir must be maintained at a minimum of 70 feet above the highest water service to provide a minimum pressure of 30 psi in the distribution system.

The reservoir should be inspected regularly for signs of intrusion. The overflow should be inspected regularly to verify if water has been overflowing from the reservoir. If water regularly overflows from the reservoir that is an indication of a problem with the control system. The water level indicator on the reservoir should be checked to make sure it is sliding freely on the gauge board, and the level on the gauge board should be compared to the level shown on the PLC to make sure they agree reasonably well. The vent on the top of the reservoir should be inspected every 6 months to a year to make sure that the vent screen is intact so that insects, birds and bats cannot enter the reservoir, and the vent is unobstructed so that air can move freely into and out of the reservoir. The reservoir should be cleaned and the paint inspected every 5 to 10 years.

## System Control

The main control system is a PLC located at the water treatment building. Water level from the Reservoir is determined by a pressure transducer and transmitted to the PLC. Control levels for starting and stopping wells and pumps are adjustable by the operator at the PLC. The PLC initiates chemical feed when the wells are running and initiates treatment system backwash based on a combination of elapsed time and total water treated since the last backwash. The PLC also initiates alarms based on high and low reservoir levels, pump failure, and intrusion.

## Distribution System

Tasks associated with maintaining the distribution system include water main flushing, hydrant and valve exercising, and distribution system sampling. Also, because, as discussed in Chapter 4, the Boston Harbor water system DSL rate exceeds 10 percent of production, regular efforts at leak detection may be warranted.

Required water main flushing frequency is location dependent. Water mains that have significant regular flow do not require flushing as frequently as dead end water mains and



water mains in areas with little flow. Water main flushing may be triggered by inadequate chlorine residual in routine samples and by water taste, odor and color complaints. When flushing a water main in one area, it is possible that increased flow may stir up sediments in the water mains in another area, leading to dirty water complaints. Therefore, it is important to consider this issue and possibly close some key valves prior to flushing to avoid creating additional problems.

## **Grand Mound Water System**

### Source of Supply

The Grand Mound Water System obtains its water from two wells (Well 1 and Well 2) both located near the southwest corner of the water system. Well 1 is located approximately 320 feet west of the south end of Dakota Court, south of 201<sup>st</sup> Avenue SW, and is accessed via the Grand Mound Wastewater Treatment Plant (WWTP) and Grand Mound Way. Well 2 is located one third of a mile west northwest of Well 1, approximately 150 feet west of the intersection of 201<sup>st</sup> Avenue SW and Tea Street SW.

These wells are turned on and off by a Programmable Logic Controller (PLC) located at the Grand Mound WWTP, based on water levels in the Grand Mound Reservoir, which is located approximately 0.9 mile east of Well 1. The water level in the Grand Mound reservoir is determined by a pressure transducer located on the side of the reservoir, and the level data is transmitted from the reservoir to the Grand Mound WWTP by radio. Well on and off signals are transmitted from the Grand Mound WWTP to Wells 1 and 2 by radio. Well on and off reservoir levels are adjustable by the operator from the PLC interface screen at the Grand Mound WWTP.

Operations and maintenance include routinely checking the water level as displayed on the PLC to verify it is reading correctly and levels are within normal operating range, recording source meter readings and checking daily production volumes to verify they are within normal range, and checking water production rate from each well to verify they are operating within normal range. It is also recommended that well water levels be measured regularly both with the wells off and with the wells on to determine if aquifer levels are declining or if pumping drawdown is increasing. Comparing well pump run times and power usage to water production can also be useful in detecting well pump problems before a well pump actually fails.

### Treatment

Treatment at the Grand Mound Water system consists of gas chlorination and pH adjustment with sodium hydroxide. Water from both wells is treated at a chlorination facility located at the Wastewater Treatment Plant. The objective is to provide a detectable chlorine residual throughout the distribution system.



Operations and maintenance tasks associated with the gas chlorination system consist of swapping gas cylinders, recording the amount of gas chlorine used, maintaining chlorine feed equipment, and checking the chlorine residual in the finished water. Operations and maintenance tasks associated with the pH adjustment system include keeping the sodium hydroxide tanks filled, recording the amount of sodium hydroxide used, checking the operation of the feed pumps, and monitoring the pH of the finished water.

### Reservoir

The Grand Mound water reservoir provides water storage to meet maximum water system demands and emergency situations, and provides system pressure based on the elevation of the water in the reservoir. Water level in the reservoir is used to turn wells on and off, and the reservoir provides a place for water to go when source output exceeds system demand.

As described in Chapter 1, the Grand Mound water system has a welded steel water reservoir that is 42 feet in diameter and 45.5 feet from floor to overflow. The reservoir base elevation is 270.5 feet and the overflow elevation is 316 feet. Water level in the reservoir is controlled by a pressure transducer and PLC that turns the wells on and off, as described above under the heading “Source of Supply.” Pressure in the water distribution system is controlled by the water level in the reservoir, however, elevations within the Grand Mound service area range from approximately 160 feet to approximately 200 feet, so even with the reservoir almost empty, the water pressures at the highest locations in the system will be approximately 30 psi. With the reservoir full the highest system pressure will be approximately 67 psi.

As of this writing, a second Grand Mound Reservoir is under construction, with construction completion anticipated in summer of 2019. The second reservoir will be the same diameter and same base and overflow elevations as the existing reservoir. The new reservoir will also be equipped with a pressure transducer to determine the water level in the reservoir, and a selector switch will be provided at the reservoir site to select which pressure transducer will send the water level signal to the PLC at the Grand Mound WWTP.

The reservoirs should be inspected regularly for signs of intrusion. The overflows should be inspected regularly to verify if water has been overflowing from either reservoir. If water regularly overflows from the reservoirs that is an indication of a problem with the control system. The water level indicators on the reservoirs should be checked to make sure they are sliding freely on the gauge boards, and the level on the gauge boards should be compared to the level shown on the PLC to make sure they agree reasonably well. The vent on the top of the reservoir should be inspected every 6 month to a year to make sure that the vent screen is intact so that insects, birds and bats cannot enter the reservoirs, and the vents are unobstructed so that air can move freely into and out of the reservoirs. The reservoirs should be cleaned and the paint inspected every 5 to 10 years.



### System Control

The main control system is a PLC located at the Grand Mound WWTP. Water level from the reservoir is determined by a pressure transducer and transmitted to the PLC. The PLC feeds into a SCADA system, which displays system operating conditions, records system operating data, and acts as an interface between the operator and the PLC for adjustment of system control parameters.

### Distribution System

Tasks associated with maintaining the distribution system include water main flushing, hydrant and valve exercising, and distribution system sampling. Required water main flushing frequency is location dependent. Water mains that have significant regular flow do not require flushing as frequently as dead end water mains and water mains in areas with little flow. Water main flushing may be triggered by inadequate chlorine residual in routine samples and by water taste, odor and color complaints. When flushing water mains in one area, it is possible that increased flow may stir up sediments in water mains in another area, leading to dirty water complaints. Therefore it is important to consider this issue and possibly close some key valves prior to flushing to avoid creating additional problems.

## **Tamoshan Water System**

### Source of Supply

The Tamoshan Water System obtains its water from one well (Well 2) located near the intersection of Cooper Point Road and 63<sup>rd</sup> Avenue NW. The well is turned on and off by a float switch located in the nearby Tamoshan reservoir. Well on and off levels are adjustable by the operator by moving the float switch up or down.

Operations and maintenance include routinely checking the water level to verify it is within normal operating range, recording source meter readings and checking daily production volumes to verify they are within normal range, and checking water production rate from the well to verify that it is operating within normal range. It is also recommended that well water levels be measured regularly both with the well off and with the well on to determine if aquifer levels are declining or if pumping drawdown is increasing. Comparing well pump run times and power usage to water production can also be useful in detecting well pump problems before a well pump actually fails.

### Treatment

The treatment system at Tamoshan Water system consists of sodium hypochlorite injection. The objective is to provide a detectable chlorine residual throughout the distribution system.



Operations and maintenance consists of keeping the sodium hypochlorite feed tank filled, recording the amount of chemical used, checking the operation of feed pumps, and checking chlorine residual after treatment.

### Reservoir

The Tamoshan water reservoir provides water storage to meet maximum water system demands and emergency situations. Water level in the reservoir is used to turn wells on and off, and the reservoirs provide a place for water to go when source output exceeds system demand.

As described in Chapter 1, the Tamoshan water system has a cast-in-place concrete water reservoir that is 33 feet 8 inches square, and 7 feet 6 inches tall. Water level in the reservoir is controlled by float switches, as described above under the heading “Source of Supply.” Water is pumped from the reservoir to the distribution system, so water level in the reservoir does not control system pressure so long as there is water over the reservoir outlet pipe.

The reservoir should be inspected regularly for signs of intrusion. The overflow should be inspected regularly to verify if water has been overflowing from the reservoir. If water regularly overflows from the reservoir that is an indication of a problem with the control system. The vent on the top of the reservoir should be inspected every 6 months to a year to make sure that the vent screen is intact so that insects, birds and bats cannot enter the reservoir, and the vent is unobstructed so that air can move freely into and out of the reservoir. The reservoir should be cleaned and the paint inspected every 5 to 10 years.

### Booster Pump Station

A booster pump station pumps water from the reservoir to the water distribution system. The booster pumps are housed in a concrete building adjacent to the concrete reservoir. Each of the booster pumps discharges to the distribution system through a header shared with a hydropneumatic tank to dampen pressure spikes and limit pump cycling. There are two 5-hp booster pumps to meet domestic demand in the distribution system. A single 20-hp booster provides fire flow to the distribution system. Each pump is operated via a dedicated pressure switch. The pressure tank is a horizontally mounted ASME non-bladder-type tank with an air makeup system.

Maintenance items for the booster pump system include inspection of motors and pumps, valves, hydromantic tank, pressure switches, compressor, and motor control panels. Listen for any unusual sounds from the pumps and motors, such as whining or rattling sounds. Unusual sounds from the pumps may indicate pump problems that should be investigated. Check the water level in the pressure tank. Non-bladder-type pressure tanks require air makeup because air under pressure dissolves into water and exits the



tank with the water. If water levels in the pressure tank are higher than normal, check the air makeup pump and its controls to make sure they are operating properly. Observe the booster pump cycling on and off. A complete pump cycle from pump on to pump off to pump on again should take no less than 10 minutes. If pumps cycle more frequently than once every ten minutes, that is an indication that there is too little air in the hydropneumatic pressure tank. Check the pressures at which the booster pumps turn on and off and compare those pressures with the desired pressure settings, and adjust pressure switches if needed.

### System Control

The Tamoshan water system is controlled entirely by float switches and pressure switches. Float switches turn the well off and on based on water level in the reservoir, and pressure switches turn the booster pumps on and off based on system pressure. Alarms are generated by low or high reservoir water level, and low or high system pressure. An autodialer is activated by alarm conditions, and calls pre-programmed telephone numbers until a call is answered and the alarm message is delivered and acknowledged by the party answering the phone.

### Distribution System

Tasks associated with maintaining the distribution system include water main flushing, hydrant and valve exercising, and distribution system sampling. Required water main flushing frequency is location dependent. Water mains that have significant regular flow do not require flushing as frequently as dead end water mains and water mains in areas with little flow. Water main flushing may be triggered by inadequate chlorine residual in routine samples and by water taste, odor and color complaints. When flushing water mains in one area, it is possible that increased flow may stir up sediments in water mains in other area, leading to dirty water complaints. Therefore it is important to consider this issue and possibly close some key valves prior to flushing to avoid creating additional problems.

## **WATER QUALITY MONITORING**

Thurston County DPW receives an annual statement from DOH that indicates what water quality tests are required and when they are required. The monitoring requirements for 2018 are provided in Appendix C. An analysis of Thurston County's most current water quality test results can be found in Chapter 3. Thurston County is also required to publish a Consumer Confidence Report (CCR) every year to provide customers with water quality data and to explain to its customers any challenges the water system may have. A copy of the most recent CCR can be found in Appendix D.



## **PREVENTIVE MAINTENANCE**

The most cost-effective method for maintaining a water system is to provide a planned Preventive Maintenance (PM) program. A planned PM program can provide the optimum level of maintenance activities for the least total maintenance cost. Routine maintenance procedures for each system component follow.

### **Reservoirs**

Reservoirs are particularly vulnerable parts of water systems because they are one of the few locations where the water is not under pressure, and therefore contaminants can enter more freely. Improperly maintained reservoirs can cause contamination in public water systems. This is a result of contaminants entering the reservoir through cracks or openings at the vent, overflow or drain screens. Deteriorating hatch covers and vandalism can also compromise reservoir water quality. Poorly designed and maintained reservoirs can hamper the emergency operation of a water system. If reservoir drains are not functioning properly, it may be difficult to purge a contaminant from the system. Written documentation of reservoir maintenance must be completed with each inspection and repair, and a copy of the report retained on file.

#### Periodic Maintenance

The existing Boston Harbor reservoir was constructed in 2005. This reservoir is welded steel and requires a protective coat of paint to prevent rusting. The Boston Harbor Reservoir was last inspected and cleaned in April 2017, and found to be in good condition.

The existing Grand Mound reservoir was constructed in 1998. This reservoir is welded steel and requires a protective coat of paint to prevent rusting. The Grand Mound Reservoir was last inspected and cleaned in April 2017, and found to be in good condition.

The existing Tamoshan reservoir was constructed in 1991. This reservoir is cast-in-place concrete and does not require any kind of protective coating or recoating. The Tamoshan Reservoir was last inspected and cleaned in April 2017, and found to be in good condition.

Periodic maintenance of the reservoir includes the following. Vent screens and the integrity of the access hatch and other openings into the reservoir will be inspected quarterly. Any opening that may allow the entry of insects or small animals will either be sealed or screened accordingly.



## **Distribution System Valve Maintenance**

Good preventative maintenance dictates that all valves be exercised regularly. The County's Water System Operations Manual indicates all distribution system valves are to be exercised annually. Records are kept of valve maintenance. A sample valve maintenance form is included in Appendix E. Valves that do not close tightly are scheduled to be removed, repaired or replaced. An important aspect of distribution system valve maintenance and record keeping is to ensure distribution valves are completely open. A partially closed valve can seriously reduce peak day operation and fire flow supply.

## **Hydrant Maintenance**

Hydrants should be inspected regularly and repaired if necessary. It is important to maintain good records of hydrant maintenance. A sample hydrant maintenance form is included in Appendix E. The following recommended procedure for testing fire hydrants has been adapted from the American Water Works Association M17 Manual, *Fire Hydrants: Installation, Field Testing, and Maintenance, Fifth Edition* (AWWA, 2016)

### Maintenance Procedure

- Check appearance of hydrants for visible damage or leaks. Check for residue stains on the hydrant.
- Remove the outlet-nozzle cap and use a listening device to check for leakage.
- Check for presence of water or ice in the hydrant body with a plumb bob.
- Replace the outlet-nozzle cap. Open the hydrant a few turns and allow air to vent. Tighten the cap.
- Open the hydrant fully.
- Check for leakage at flanges and around outlet nozzles, packing, and seals.
- Partially close the hydrant so the drains open and water flows through under pressure for about 10 seconds, flushing the drain outlets.
- Close the hydrant completely.
- Remove an outlet-nozzle cap and attach a fire hose or some other deflector
- Open the hydrant and flush.
- Close the hydrant and check operation of the drain valve.
- Check the main valve for leakage.
- Remove all outlet-nozzle caps, clean and lubricate the threads.
- Check chains and cables for free action.
- Replace caps and tighten.
- Check lubrication of operating nut threads.
- Locate and exercise auxiliary valve. Leave open.



## Water Main Flushing

Water mains in the system are flushed periodically. The extent of flushing is usually determined by customer complaints of “dirty water” and after any construction in the immediate area. An entire water system may be systematically flushed over a period of time. This may be accomplished by using directional flushing procedures to flush a percent of the total system each month with scouring velocities.

### Flushing Procedures

Before initiating a comprehensive flushing program, staff will need to review distribution maps and preplan each month’s flushing. The following procedures are adapted from guidance published in the AWWA Journal, titled, “Unidirectional Flushing: A Powerful Tool” (JAWWA Vol 91, No. 7, 1999).

Determine the initial clean source of flushing water, sections of mains to be flushed at a given time, the valves to be used in each case, and the order in which the sections will be flushed. Start at or near one of the interties and work outward so as not to disturb sediments in unflushed portions of the system. If possible, schedule work so that each zone can be completed by the end of the day or so that a natural stopping point is reached. If this is not done, fire protection may be severely restricted. Ensure that all flushing water used comes from areas previously cleaned or from mains large enough to resist sediments being stirred up by the flow. Keep the length of main being flushed as short as possible, especially on small pipe. This will minimize pressure losses in the system and the length of time each customer may be delivered dirty water. Assure that an adequate amount of flushing water at sufficiently high pressure is available and that it can be disposed of safely. Use a rate of flow required to produce a velocity of 2.5 fps in pipes as follows:

Pipe Diameter, inches	2	3	4	6	8	10	12
Flow Rate for 2.5 fps, gpm	25	56	98	221	392	612	882

- Hydrant pressure or pitot gauges are useful in determining flushing rates.
- Do not flush a large main supplied by a single smaller main; the volume available is usually inadequate for flushing.

Prior to flushing, notify the following parties:

- Fire department and water utility billing office.
- Other utilities, such as gas, electric, and telephone companies, who may have underground facilities in the area.



- Those customers who may be inconvenienced by reduced pressure or dirty water, including:
  - food service establishments
  - hospitals, nursing homes, and other health facilities
  - customers with special medical needs, such as home dialysis
- Isolate the section to be flushed from the system. Close valves slowly to prevent water hammer.
- Open the fire hydrant or blowoff valve slowly until the desired flow rate is obtained. When flushing from a dry-barrel fire hydrant, use the gate valve upstream of the hydrant for throttling purposes. Open the hydrant valve fully to prevent water from escaping into the ground through the fire hydrant barrel drain.
- Direct flushing water away from traffic, pedestrians, and private land. Ensure that flushing water drains to an appropriate storm sewer or watercourse without causing excessive flooding of streets, underground utility vaults, or private property; the utility may be held responsible for any accidents or damage related to the released water.
- Prevent heavily contaminated water from discharging to sensitive natural watercourses. Check with the local sewer department for conditions of disposal to the sanitary sewer. If sewer disposal is unavailable, flushing into a tanker truck may be necessary.
- If water contains chlorine, dechlorinate waters discharging to sensitive natural streams. Following are the steps of dechlorination:
  - Estimate the rate of flushing. This may be estimated from previous hydrant flow tests or flushing data. If no data is available, open flushing valve just long enough to take a pitot gauge measurement. Calculate the flushing rate using a formula from the AWWA guidance manual.
  - Determine the chlorine residual in the main using a suitable field test kit.
  - Prepare a dechlorinating agent solution to be pumped into the flushing discharge using a positive displacement chemical feed pump.
  - Simultaneously flush main and pump dechlorinating agent into the discharge.



- Check system pressure at a nearby hose bib. If pressure is less than 20 psi, throttle the flow through the hydrant. When possible, check system pressures in higher or remote areas of the pressure zone to ensure that pressures do not drop below 20 psi. This may necessitate a two-man crew with radios.
- Record the date, time, location, pressure zone, size and length of main; and estimate the flushing flow rate and velocity, and time required to clear. Take samples noting the water's odor, color, turbidity, and the presence of any visible objects or organisms.
- When the flushing water is clear, close the hydrant or blowoff valves slowly.
- Keep records of which valves are opened and closed. If, at the end of a day's work, valves normally open are left closed, alert the fire department.
- Proceed to the next section to be flushed and repeat these procedures.

### **Dead-End Waterlines**

The County currently flushes dead-end mains on an as-needed basis. Dead-end waterlines are susceptible to water quality problems and should be flushed regularly to remove stagnant water and debris, which may have been deposited.

### **Pump Stations**

The County owns and operates one water supply pump station, which pumps from the Tamoshan reservoir to the Tamoshan water distribution system. This booster pump station was constructed in the year 1991 along with the Tamoshan Reservoir. As previously described, the pump system consists of two 5-hp pumps and one 20-hp pump. The pumps are all constant speed pumps with pressure controlled by a hydropneumatic pressure tank with air makeup pump. The hydropneumatic tank is reportedly approximately 700 gallons in capacity. One of the 5-hp pumps was replaced in February 2018 and one of the 5-hp pumps was replaced in approximately 2012. Records of when the 20-hp pump was last replaced are not readily available. A detailed operation and maintenance manual is available in the County's operations center. Routine maintenance includes keeping records of water meter totalizer and flow rate readings for each pump, pump output pressure, and periodic running of the 20-hp pump to assure it is working properly, and keeping the facilities clean.



## **Wells**

Routine maintenance for the wells includes keeping records of water meter totalizer and flow rate readings for each well, discharge pressures, periodic sounding of the static and pumping water levels in each well, and keeping the facilities clean. Water quality samples must be taken at each well as required by the Washington State Department of Health. Summaries of the total monthly production of each well should be maintained, as well as maximum day production of all wells. Records should be maintained of the original well construction, any modifications to the well construction, all equipment installed in each well and all service performed on the equipment.

## **Meters**

Accurate water metering is an essential financial and conservation-oriented component of water system infrastructure. A substantial amount of revenue may be lost through inaccurate metering of residential, commercial, and industrial accounts. Without accurate master or source meter readings, the water utility cannot assess productivity of sources or determine distribution system leakage rates.

The Thurston County Department of Public Works has several master water meters, one at each well, and also pump station meters at each pump station. These meters must be checked regularly to ensure accurate source data. It is also recommended that, in addition to flow meter data, the County keep run time data on all pumps. Flow meter reads in gallons should be regularly divided by run time meter reads in minutes to check the actual gallons per minute each pump is producing. These values should be fairly consistent for each pump. If the numbers change significantly for any pump that may signal problems with the pump or with the flow meter.

The current County practice is to replace faulty service meters whenever poor or inaccurate meter readings are observed by the County meter readers and/or administrative staff. An inventory of all service meters, their size, type, and location is currently available. The age of each meter should be included in the inventory so that routine testing, repair and replacement can be prioritized.

## **PREVENTIVE MAINTENANCE SCHEDULE**

Thurston County has developed a routine schedule for water system operation and maintenance. Table 6-3 summarizes the Thurston County Operations and Maintenance Schedule.



TABLE 6-3

**Thurston County Water Systems Operation and Maintenance Schedule**

<b>Item</b>	<b>Description</b>
<b>Daily Tasks</b>	
Record Readings	Well production meters, chemical solution, chemical solution usage, reservoir levels, well and generator hours.
Visual Inspection	Chemical feed pumps, pipe gallery for leaks, space heaters, air circulation, security check of buildings and fencing, locks on well and reservoir gates.
Cl <sub>2</sub> Test and Record	Chlorine residual at point of application, throughout the distribution system (use designated points).
Test and Record	Check instrumentation for proper signal input/output. Visual inspection of testing equipment for Cl <sub>2</sub> (clean as needed).
Customer Service	Respond to customer complaints, reread meters as needed, leak investigation, taste and odor complaints.
<b>Weekly Tasks</b>	
Fire Hydrant Accessibility	Drive by inspection, ensure hydrants are accessible.
Testing Equipment for chlorine residual (Colorimeter)	Clean and calibrate - DPD reagent has valid expiration date.
Chlorination Equipment /Solution Tank	Check tubing, pump, and chlorine solution. Mix solution as needed. Test specific gravity of solution
Reservoir, Generator & Well Head	Check area around tank, well and generator, ensure security fence and locks are in place and in good shape and secure.
Grounds Maintenance	Mow, weed eat, trim, sweep, water landscape. Trim trees, bushes and other perform general yard maintenance around water facilities.
Facility - General Building Maintenance	Clean and sweep working area.
Record pumping rate from well	Record the pumping rate from each well, check for change in pumping rate.
Facilities	Check facilities for damages; lubricate locks, security check of fences and gates.
Water meter accessibility	Check meter box integrity, meter box accessibility, viewing glass, remove excess dirt from box. **Minimum Inspection of four water services each month.



**TABLE 6-3 – (continued)****Thurston County Water Systems Operation and Maintenance Schedule**

<b>Item</b>	<b>Description</b>
<b>Monthly Tasks</b>	
Check well head and reservoir	Check well head, screens, seals and electrical conduit for damage.
Check Static and Pumping water levels	Check and record SWL and PWL.
Monthly Water quality sampling	Check DOH water inventory sheet for required monthly sampling.
Read record PSE meter reading	Track meter reading against PSE billing.
Emergency Generators	Exercise emergency generators and verify proper operation.
<b>Quarterly Tasks</b>	
Valve maintenance. – Well and Treatment system	Operate and make adjustment, check packing of control valves and isolation valves.  January D      April D      July D      October D
Booster Pump Station	Inspect motors and pumps, valves, hydropneumatic tank, pressure switches, compressor, motor control panels.  January D      April D      July D      October D
Safety equipment	All safety equipment needs to be inventoried, repaired, replace and or replenished if necessary.  January D      April D      July D      October D
Chemical feed pumps	Re-calibrate pumps feed rate, dosing rate. Inspect and change out tubing, check valves, any and all moving components if necessary.  January D      April D      July D      October D
TTHM and HAA5's	Special requirement.  March D      June D      September D      December D



## Thurston County Water Systems Operation and Maintenance Schedule

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*Thurston County Department of Public Works* *6-19*  
*Part A Water System Plan* *September 2019*



**TABLE 6-3 – (continued)**

**Thurston County Water Systems Operation and Maintenance Schedule**

<b>Item</b>	<b>Description</b>
Start-up and running amps	Check startup and running amps on well and booster pumps.  September D
Auxiliary Generator Maintenance	Lube, oil, oil filter and air filter change out, according to manufacture specifications. Check all controls, relays, switches, block heater, fuel level, and fuel additives. Test run under load, minimum 1 hour.  September D
Winterize & Review Emergency Ops. SOP's	Winterize exposed pipes, install proper insulation at facility. Also review, discuss emergency SOP's for well ops, disinfection, pump station, prolonged power outage, etc.  September D

**EMERGENCY RESPONSE PROGRAM**

Thurston County Public Works has developed a written emergency response plan. A copy of that plan is included in Appendix F. The sections below are intended to summarize and supplement that emergency response plan.

**WATER SYSTEM PERSONNEL EMERGENCY CALL-UP LIST**

A comprehensive list of emergency contacts is included in the emergency response plan in Appendix F.

**EMERGENCY PROCEDURES**

Although it is not possible to anticipate all potential disasters affecting the County's water systems, formulating procedures to manage and remedy several common emergencies is appropriate. The emergency response plan in Appendix F includes detailed actions to be taken in various emergency situations. Following is a summary of additional standard response procedures to typical emergency situations.

**Contamination of Water Supply**

Bacterial contamination of the water supply can occur from such items as main breaks, reservoir intrusion, flooding or pollution from an isolated source. Table 6-4 provides the



appropriate action that will be taken in the event of the contamination of the water supply.

**TABLE 6-4**

**Water Contamination Response**

<b>Distribution System Contamination</b>
Notify customers of contamination.
Contact the Washington State Dept. of Health Coliform Program Manager or Regional Engineer.
Consider installation of emergency chlorination equipment if appropriate.
Perform coliform, chemical and free chlorine residual analysis at various locations within the system, including the reservoirs and the system extremities.
Flush and Disinfect distribution lines as dictated by the nature of the contamination.
<b>Reservoir Contamination</b>
If possible, isolate reservoir from system.
Re-sample to confirm contamination.
Check distribution system for presence of contamination
Inspect vent screens, hatches, and piping to identify source of contamination
If reservoir water is contaminated and therefore considered unsuitable for consumption, drain and clean reservoir.
Disinfect reservoir if bacteriological standards are exceeded. Follow AWWA Standards. A 50-ppm chlorine solution in a 100,000 gallon reservoir can be obtained by adding 95 gallons of 5.25 percent chlorine bleach.

**Bacteriological Presence Detection Procedure**

Notification procedures for notifying system customers, the local health department, and DOH of water quality emergencies are an important component of an emergency response program. Many public water systems will occasionally detect positive coliform samples, mainly as a result of minor contamination in distribution mains or sample taps, or improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. Coli or Fecal Coliform bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers. Emergencies such as floods, earthquakes, and other disasters can affect water quality as a result of damage to water system facilities, thereby warranting a boil water order in advance of supply. A suggested boil water notification is included in Appendix G. WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system.

**Power Failure**

Various types of weather can cause loss of power, such as wind, lightning, freezing rain, and snowstorms. Additionally, power can be lost through traffic accidents and power



company equipment failure. During a County-wide power outage, standby storage is designed to provide water reserves for two days of average demand. In addition, the County has a backup power supply. *Puget Sound Energy will be contacted at (888) 225-5773 to determine the estimated length of the power outage. Then customers will be notified of the emergency. Water use curtailment will be requested through radio, television, newspaper and/or police loudspeaker, if necessary.*

### Severe Earthquake

A severe earthquake could result in transmission line breaks, distribution system breaks and structural damage to the reservoirs, wells and to vaults which house critical valving and meters. Also severe earthquakes tend to be followed by aftershocks that can exacerbate damage caused by initial earthquake. Table 6-5 addresses the possible emergency events and response actions that will be taken in the event of an earthquake.

**TABLE 6-5**

#### Earthquake Emergency Response Actions

System Component	Action
Transmission and distribution lines  (The nature of the emergency would depend on the area of the water system in which the break occurred.)	<ul style="list-style-type: none"> <li>• Close valves to isolate breaks in water mains.</li> <li>• Check reservoir levels.</li> <li>• Notify water customers of emergency and request customers to conserve water.</li> <li>• Shut down source pumps if appropriate.</li> <li>• Isolate break, check the base water system section maps for valve locations.</li> <li>• Repair break.</li> <li>• Disinfect isolated section.</li> </ul>
Reservoirs: May be leaking or structurally damaged.	<ul style="list-style-type: none"> <li>• Observe structures for visual signs of structural damage, leakage, cracks, etc. Typical damage is to hold down saddles or straps at base of reservoir wall. Also check storm drainage system in the vicinity for significant flows.</li> <li>• If non-observable leakage is suspected, isolate one reservoir at a time and monitor water level for at least 24 hours.</li> <li>• If structural damage is apparent, drain reservoir and inspect the interior.</li> </ul>
Pumping station, critical valving, and meters	<ul style="list-style-type: none"> <li>• All meter and valve vaults will be inspected following a major earthquake to check for joint leakage caused by earth movements.</li> </ul>
Supply facilities	<ul style="list-style-type: none"> <li>• Inspect all supply facilities, for leakage or other structural damage.</li> </ul>



## Severe Snowstorm

Heavy snowfall may bring motor vehicle traffic to a standstill. Employees may not be able to reach the problem area. Water supply will not be interrupted directly by snow, but heavy snow can bring down trees and branches which can fall on power lines and cause power outages. Table 6-6 addresses the possible emergency events and response actions that will be taken in the event of a severe snowstorm.

**TABLE 6-6**

### Severe Snowstorm Emergency Response Actions

System Component	Action
Distribution System: Transportation to monitor system and make repairs will be limited.	Contact Thurston County Department of Public Works, Road Operations Division, to expedite plowing to any problem area. Have chains and snow gear ready for maintenance equipment and vehicles. Valve locations will be made available for maintenance personnel and kept current.
Reservoirs: No immediate effect. Snow may prevent access.	Clear snow from roads and walkways.
Power Outage	See previous section on power outage.

## High Water and Flooding

Heavy snow melt and/or rains cause the water level to rise and reach a flood level. If a well is flooded, contaminated water can enter through the top of the well. Table 6-7 addresses the possible emergency events and response actions that will be taken in the event of high water or flooding.

**TABLE 6-7**

### High Water/Flooding Emergency Response Actions

System Component	Action
Distribution system	Test for coliform bacteria
Reservoirs: No effect. Reservoirs are above flood level	No action is necessary



## **CROSS-CONNECTION CONTROL PROGRAM**

A Cross-Connection Control (CCC) Program is a required element of an operations program under WAC 246-290-490. The purpose of a CCC program is to protect public health from the potential for water contamination through back-flow, back-pressure or back-siphonage through a cross-connection with a non-potable liquid. The County has a written CCC program, which is included in Appendix H.

### **PROGRAM ELEMENTS**

WAC 246-290-490 (3) establishes the minimum requirements for a CCC program. The regulation identifies ten elements that must be addressed. The following sections compare the CCC program elements required in WAC 246-290-490 to contents of the County's CCC program.

#### **Element 1: Instrument of Legal Authority to Implement Program**

The County's CCC Ordinance is codified in Section 15.11 of the Thurston County Code. A copy of this section of code is included in Appendix H.

#### **Element 2: Procedures and Schedules for Evaluating Service Connections**

Procedures and Schedules for Evaluating Service Connections are included in Sections 6 and 7 of the Thurston County CCC Program.

#### **Element 3: Procedures and Schedules for Eliminating and Controlling Cross Connections**

Procedures and Schedules for Eliminating and Controlling Cross Connections are included in sections 6 and 7 of the Thurston County CCC Program.

#### **Element 4: Qualified Personnel to Implement Program**

Kevin Patching, Dennis Baker, Reuben Stringer, and Keith Cournyer, as shown in Table 6-2, are certified Cross-Connection Control Specialists (CCSs). Thurston County does not have a certified Backflow Assembly Tester (BAT). Thurston County has backflow assemblies tested by a private third party testing company, Backflow Pro's Inc. (855 Trosper Road., SW #108-230, Tumwater, WA 98512, Phone: 360-951-6130.)

#### **Element 5: Ensure that Approved Backflow Operating Correctly**

Section 7 of the Thurston County CCC program requires that backflow assemblies be tested annually or sooner if the County's CCS determines the testing is needed. The property owner may request that the County perform the test or may have such test



performed by any state-certified BAT. If the property owner opts to have the County do the testing, then the County has Backflow Pro's Inc. do testing on their behalf.

**Element 6: Ensure that Backflow Preventers Are Tested Properly**

Thurston County requires that all BATs doing business with the County maintain current certifications in their areas of specialty. Thurston County requires copies of current certificates and requires updates of these certificates when they expire.

**Element 7: Procedures for Responding to Backflow Incidents**

It is not always immediately evident when a backflow incident has occurred. If routine testing, or customer complaints lead to detection of a contaminant in the water distribution system, it may not be determined immediately that the contaminant entered the distribution system by way of a cross connection or backflow event. If a contaminant is detected in the distribution system, Thurston County water customers will be immediately notified that the water may not be fit to drink and advised not to drink the water until the nature and degree of threat of the contaminant can be determined.

Section 14 of the Thurston County CCC Program addresses Thurston County response to identified backflow events.

**Element 8: Consumer Education**

Public education regarding cross connections and backflow prevention is addressed in Section 15 of the Thurston County CCC Program.

**Element 9: Cross-Connection Control Record Keeping**

CCC record keeping and reporting are addressed in Sections 5 and 13 of the Thurston County CCC Program.

**Element 10: Additional Requirements if Reclaimed Water is Used**

Reclaimed water is not currently used in any of the areas served by Thurston-owned water systems. Therefore, Element 10 is not applicable to Thurston County.



## **PRIORITY SERVICE LIST**

There are three categories of business establishments that may pose a hazard to the water system. Category one services pose the highest degree of hazard and include the following facilities:

Printers  
Medical laboratories  
Chemical companies  
Radiator shops

Battery, fertilizer, and paint manufacturers  
Pest control businesses  
Janitorial companies

Category two services are considered less hazardous and include the following:

Doctor, dentist, and veterinarians' offices  
Blood banks  
Drug rehabilitation centers  
Car washes

Photo labs  
Commercial laundries  
Nursing homes and hospitals

The least hazardous service category includes the following types of businesses:

Food processing facilities  
Dairy establishments  
Beverage and candy manufacturers

Massage and health spas  
Motels and schools with pool, spa, or sauna facilities

## **NEW AND EXISTING CROSS-CONNECTION DEVICES**

Sections 5, 10, and 16 of the Thurston County CCC Program address new and existing CCC devices. It is the responsibility of the customer to ensure proper testing of the devices on an annual basis thereafter. Backflow prevention devices are required on all new cross-connections. A condition for new service is an evaluation by the County's certified cross-connection control specialist to determine what type of backflow device is needed. This review is coordinated with the County building inspector.

## **CUSTOMER COMPLAINT RESPONSE**

Complaints are logged in at Thurston County Public Works office and a water system operator is sent to investigate the complaint. Depending on the findings of the complaint investigator, appropriate actions are taken to resolve the complaint. If a customer feels that their complaint is not being addressed properly, all customers of the water system have access to the Board of County Commissioners at regularly scheduled meetings to be heard regarding their complaints.



## **O&M IMPROVEMENTS**

This section reviews operations and maintenance activities, schedules and needs as identified in the first part of this chapter and identifies possible operations or system changes that could improve or streamline operations.

### **WATER SYSTEM MANAGEMENT AND PERSONNEL**

The scope of this plan does not include a comprehensive evaluation of the staffing needs and adequacy of staffing. The current staff are adequately certified for all aspects water system operation, maintenance and management. A written O&M Plan has been developed, and manuals for the various pieces of equipment are maintained and available.

#### **OPERATOR CERTIFICATION**

Thurston County currently has adequate operator certification. From Table 6-2 it can be seen that Thurston County currently has one staff member with a WDM 3 certification, three staff members with WDM 2 certifications, and one staff member with a WDM 1 certification. As discussed under the section *Water System Management and Personnel* the minimum certified operator requirement is a single WDM 2 certified operator. In the event that any of the operators should leave the County, or if something should happen to any of the operators such that they would be incapable of providing operations leadership, there are at least three other operators with adequate certification to manage the water system. Therefore, Thurston County has adequate certified staff to assure continued reliable system operation.

#### **SYSTEM OPERATION AND CONTROL**

The operation and control systems for the three water systems are all different. The Grand Mound system, with two wells and a reservoir all at different locations, uses radio telemetry and programmable controllers tied to a SCADA system for operations control. The Boston Harbor system also uses a programmable controller, but all operations facilities are located nearby at one site, and all monitoring equipment is hard wired together at the site. All of the Tamoshan facilities are also located at one site, and are controlled with float switches and pressure switches, and no PLC is involved in system control. Alarms generated at any of the systems trigger autodials to inform operations staff of problems. There is no identified need for improvement in the operations and control system at this time.

#### **WATER QUALITY MONITORING**

The County has been staying up to date on all water quality monitoring. There is no identified need for improvement in the Water Quality Monitoring system at this time.



## **PREVENTIVE MAINTENANCE**

Thurston County facilities are generally well maintained. No operations deficiencies have been identified.

## **EMERGENCY RESPONSE PROGRAM**

No deficiencies in Emergency Response Program have been identified.

## **CROSS-CONNECTION CONTROL PROGRAM**

The Thurston County cross connection control program appears to be well supported by county code and by a written cross connection control program. Adequately certified staff are employed to implement the program. Records of cross connection control devices appear to be thorough.

## **CUSTOMER COMPLAINT RESPONSE PROGRAM**

No deficiencies in the Customer Complaint Response Program have been identified.



## **CHAPTER 7**

### **DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS**

#### **OBJECTIVE**

The objective of this chapter is to document Thurston County's design and construction standards to allow Thurston County to retain DOH approval to utilize the alternative review process for construction of new and replacement of existing water distribution facilities. Through this process, a purveyor needs no further approval from DOH for distribution project reports, construction documents, or installation of distribution mains.

#### **THURSTON COUNTY DEVELOPMENT STANDARDS**

The Thurston County Department of Public Works has developed a comprehensive document titled *Development Standards for Water and Sewer Systems Thurston County, Washington*. The document is divided into eight sections as follows:

- Section 1: General
- Section 2: Water
- Section 3: Gravity Sewer
- Section 4: Lift Stations
- Section 5: Pressure Sewer (Force Main)
- Section 6: Sanitary Treatment Effluent Pump (STEP) Standards
- Section 7: Grinder Pump System
- Section 8: Vacuum Sewer System

Copies of Sections 1 and 2 of the Development Standards are included in Appendix B of this Plan, together with Appendices A and C of the Development Standards, titled "Standard Details – Water." and "General Notes – Water," respectively.

#### **GENERAL**

General requirements include an allowance for non-engineered plans for very small projects, but that larger projects and smaller projects when required by the County, must provide plans prepared and stamped by a licensed engineer, and that all projects shall be constructed by a licensed contractor. All construction must be in public rights of way or in easements dedicated to the County for installation and maintenance of the utilities installed. All design must conform to these design standards. A plan checklist is included detailing materials to be included in water and sewer main extensions plans. Survey staking requirements, trench excavation requirements, trench backfilling



requirements, street patching and restoration requirements, and record drawing requirements are included under the General requirements.

## **WATER**

Water requirements include water main sizing requirements both inside and outside of a UGA. Fire flow requirement is stated as 1,000 gpm at 20 psi for single family residential services in an Urban Growth Area, and 1,500 gpm at 20 psi for multi-family and commercial areas inside a UGA. No fire flow requirements are stated outside a UGA. No dead-end mains longer than 1,200 feet are allowed. Water mains shall be looped when feasible. Water quality sampling stations may be required. An operating pressure of 45 to 60 psi at peak demand is required. If system pressure exceeds 80 psi, a pressure reducing valve is required at the customer's service. Water mains are required to be Class 52 ductile iron or Class 200 C900 PVC pipe. All fittings are required to be ductile iron. 12-gauge copper wire is required to be taped to the top of all water mains and brought up into valve boxes for pipe locating. Detectable marking tape is also required 12 inches above all water mains. Minimum cover for all water mains is 42 inches unless approved otherwise.

Standards and procedures are specified for connections to existing water mains, and notification requirements are outlined for temporary shutdown of water service for construction work. Standards are specified for fire hydrant makes and models, location, spacing, hydrant runout lines, hydrant shutoff valves and other miscellaneous fire hydrant installation details. Standards for valve location and spacing and valve boxes are addressed.

## **APPENDIX A STANDARD DETAILS – WATER**

Appendix A includes standard detail drawings for water and sewer line separation, connection to existing system, fire hydrants, valves, valve boxes and marker posts, air release valves, blowoff assemblies, backflow prevention devices, service meters, thrust blocks, and water quality sampling stations.

## **APPENDIX C GENERAL NOTES – WATER**

Appendix C includes general notes about water main installation such as standards of workmanship, preconstruction meeting, further clarifications of water main, valve, and hydrant standards, disinfection requirements, traffic control plan requirements, underground utility locate requirements, and other miscellaneous requirements. The section also includes a *Construction Completion Report for Distribution Main Projects* form.



## CHAPTER 8

### IMPROVEMENT PROGRAM

#### OBJECTIVE

The objective of the Water System Plan Chapter 8 is to summarize deficiencies and needs of water systems identified in previous chapters of the Water System Plan, to identify reasonable alternatives available to address those deficiencies and needs, estimate the costs of those alternatives, and to develop and prioritize a capital improvements schedule for the water systems. However, as a “Part A Water System Plan” this plan does not provide an analysis of system needs, but only summarizes the status of the individual water systems and the capital improvements that are currently planned for the individual systems. Further analysis of individual systems and their deficiencies and needs will be provided separately in Part B water system plans for each individual water system, to be developed separately at a later date. Capital improvements currently scheduled for each water system are summarized in the following sections.

#### BOSTON HARBOR WATER SYSTEM

Currently planned capital improvements for the Boston Harbor Water System are summarized in Table 8-1.

**TABLE 8-1**

**Boston Harbor Water System Capital Improvements**

<b>Description</b>	<b>Year</b>	<b>Estimated Cost</b>
Disinfection Byproduct Pump	2017	\$25,000
Green Sand Filter upgrade	2017 – 2018	\$86,000
Generator Auto Switch	2017 – 2018	\$20,000
Management Plans (System Update, Assets, Satellite Agency)	2018 – 2019	\$15,556
Water Main Replacement	2020 – 2023	\$400,000
Reservoir Clean & Inspect	2022	\$10,000
Well Pump Motor	2022	\$60,000
<b>Total</b>		<b>\$616,556</b>



## GRAND MOUND WATER SYSTEM

Currently planned capital improvements for the Grand Mound Water System are summarized in Table 8-2.

**TABLE 8-2**

### Grand Mound Water System Capital Improvements

Description	Year	Estimated Cost
Grand Mound System SCADA Radio Control Upgrade	2018	\$5,000
Second Grand Mound Reservoir	2018 – 2019	\$1,650,000
Grand Mound Land Acquisition for Wells	2019 – 2020	\$270,000
Grand Mound Way Watermain Loop	2020 – 2021	\$1,000,000
Grand Mound Well and Pumps Program	2023	\$700,000
<b>Total</b>		<b>\$3,625,000</b>

## TAMOSHAN WATER SYSTEM

Currently planned capital improvements for the Tamoshan Water System are summarized in Table 8-3.

**TABLE 8-3**

### Tamoshan Water System Capital Improvements

Description	Year	Estimated Cost
Management Plans (System Update, Assets, Satellite Agency)	2017 – 2018	\$8,659
63rd Avenue Watermain Replacement	2019 – 2022	\$200,000
Water Treatment System	2018 – 2020	\$315,000
Water Reservoir Outlet Filter Screen	2018	\$5,000
Fire Hydrant Replacement	2019	\$15,000
Water Emergency Backup Generator	2021	\$80,000
Secondary Watermain Replacement	2022	\$250,000
Water Redundancy	2024	\$30,000
Well new Pump and Motor	2024	\$40,000
<b>Total</b>		<b>\$943,659</b>



## CHAPTER 9

### FINANCIAL PROGRAM

#### OBJECTIVE

The objective of this chapter is to analyze the County's total costs of providing water service, review the current rate structure to ensure that the current or proposed adjusted rates are adequate to cover the costs of operation and maintenance, and ascertain the County's financial capability to implement the ten-year Capital Improvement Plans outlined in individual Part B Water System Plans.

#### CAPITAL IMPROVEMENTS FUNDING

This section reviews potential sources of funding for water system capital improvements applicable to the Boston Harbor, Grand Mound, and Tamoshan water systems. These funding sources include rates, new water service fees, Thurston County Real Estate Excise Tax (REET) revenues, grants, loans, General Obligation (G.O.) bonds, and revenue bonds.

#### WATER RATES

Thurston County's current water rate schedule is shown in Table 9-1. The monthly water base rate varies from \$34.14 to \$76.17 per month, and the usage rate varies from \$2.44 to \$2.42 per 100 cubic feet based on the water system.

**TABLE 9-1**

**Thurston County Water Rates for 2018**

<b>Service Location</b>	<b>Water Base Rate per Month<sup>(1)</sup></b>	<b>Usage Rate, per 100 CF</b>
Boston Harbor	\$34.14	\$2.56
Grand Mound	\$42.59	\$2.44
Tamoshan	\$76.17	\$2.54

(1) Water base rate is per ERU. Number of ERUs represented by a service connection is estimated based on water use of the service.

The County water rates also include a hydrant meter connection fee of \$160 and a hydrant use fee of \$52 per month plus payment for water at the system rate per 100 CF after the first 40,000 CF.



## **NEW WATER SERVICE FEES**

Rates and allowable charges for water service are detailed in Chapter 15.12 of the Thurston County Code. These rates and charges vary by water system and will be discussed in more detail in the Part B water system plans prepared for the respective systems.

## **REAL ESTATE EXCISE TAX (REET) FUNDING**

RCW 82.46.010 authorizes all cities and counties to levy a 0.25 percent real estate excise tax (REET), known as the “first quarter percent” or “REET 1,” on all sales of real estate. In addition, RCW 82.46.035 authorizes all cities and counties that are planning under the Growth Management Act (GMA) to levy a second 0.25 percent real estate excise tax, known as the “second quarter percent” or “REET 2.”

Thurston County plans under the GMA. As described in the Thurston County Code Chapter 5.17, Thurston County collects both REET 1 and REET 2. In general, funds collected under both REET 1 and REET 2 may be used for capital improvements, including the water system improvements described in this Plan, but not for operations and maintenance expenses (although there are some exceptions to this stricture). A description of REET funding in Washington State prepared by the nonprofit Municipal Research and Services Center (MRSC) is included in Appendix I. Details on the allowable collection and use of REET funds are described in RCW 82.45 and RCW 82.46.

## **OUTSIDE RESOURCES**

In addition to rates and fees as set by Section 15.12 of the Thurston County Code or REET funding, the County could consider applying for grants and/or loans to fund identified Capital Improvements. Financing improvements by issuing bonds is also an option.

### **Grants and Low Cost Loans**

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. A document describing grants and low-cost loans that the County may be eligible for is included in Appendix I.



## **Bond Financing**

### General Obligation Bonds

General Obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation – applicable details are described in RCW 39.36.020. While bonding capacity can limit availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing.

### Revenue Bonds

Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The County agrees to satisfy these requirements by resolution as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

## **HISTORIC AND PROJECTED REVENUES AND EXPENDITURES**

Water utility historic and projected revenues and expenses have been prepared by Thurston County and are included in Appendix J. Separate accounts are maintained for Boston Harbor, Grand Mound and Tamoshan. The Boston Harbor account is a combined water and sewer utility, whereas the Grand Mound and Tamoshan accounts are water utility only. Each system has an operations and maintenance account and a reserve account for non-routine capital facilities improvements.

### **BOSTON HARBOR**

The Boston Harbor Water & Sewer Utility 10-Year Financial Plan shows historic water rates increasing from \$21.74 per month plus \$1.63 per 100 CF in 2011 to \$23.51 per month plus \$1.76 per 100 CF in 2016. Projected rates increase by ten percent in 2017 and 2018, and by five percent each year thereafter to \$38.13 per month and \$2.86 per 100 CF in 2024.



Historic operating fund ending annual balances vary from \$144,854 in 2011 to \$291,344 in 2014, then decline to \$263,163 in 2016. Projected operating fund balances vary from a low of \$119,378 in 2020 to a high of \$210,653 in 2024. Historic annual transfers from the operating fund to the reserve fund have varied from \$5,000 per year in 2012 and 2013, to \$20,000 per year in 2014 through 2016. Projected annual transfers from the operating fund to the reserve fund are \$80,000 per year for 2017 through 2021 and \$100,000 per year for 2022 through 2024.

Historic reserve fund account balances vary from a low of \$305,836 in 2014 to a high of \$411,614 in 2016. Projected reserve fund account balances vary from a low of \$905 in 2022 to a high of \$285,828 in 2019, and a projected ending fund balance of \$104,158 in 2024.

Projected capital expenditures for 2017 through 2024 total \$1,016,556, of which \$616,556 is projected for water system improvements and \$400,000 is projected for sewer system improvements. Water system improvement projects identified in the 6-year capital improvement budget, and budgeted costs include the following:

Disinfection Byproduct Pump	\$25,000
Green Sand Filter upgrade	\$86,000
Generator Auto Switch	\$20,000
Management Plans (System Update, Assets, Satellite Agency)	\$15,556
Water Main Replacement	\$400,000
Reservoir Clean and Inspect	\$10,000
Well Pump Motor	\$60,000
Total	\$616,556

## GRAND MOUND

The Grand Mound Water Utility 10-Year Financial Plan shows historic water rates increasing from \$31.77 per month plus \$1.90 per 100 CF in 2012 to \$36.78 per month plus \$2.21 per 100 CF in 2016. Projected rates increase by five percent each year thereafter to \$54.36 per month and \$3.11 per 100 CF in 2024.

Historic operating fund ending annual balances vary from \$853,632 in 2012 to \$1,020,992 in 2014, then decline to \$988,944 in 2016. Projected operating fund balances vary from a low of \$88,514 in 2023 to a high of \$752,151 in 2017. Expenditures from the fund include, in part, Operating Transfers, Capital Projects and Debt Payments. Historic Operating Transfers range from \$0 from 2012 through 2015 to \$200,000 in 2016. Projected transfers range from \$0 in 2017 and 2018, \$150,000 in 2019 and 2022, \$400,000 in 2020 and 2023, and \$800,000 in 2021. Capital project expenditures paid from this fund range from \$0 in 2012 – 2015, to \$66,342 in 2017 and 2018. The specific capital projects are not itemized on the report. Debt payments vary from \$5,475 in 2023 to \$559,153 in 2019.



Grand Mound Water Reserve 10-Year Financial Plan shows a balance of \$143,501 in 2012 rising to a balance of \$320,602 in 2016, then declining to \$21,613 in 2017 and \$11,454 in 2018, then increasing to \$203,778 in 2022. Capital projects included in the Grand Mound Water System 6-year capital improvement budget total to \$3.625 Million, and include the following.

Grand Mound System SCADA Radio Control Upgrade	\$5,000
Second Grand Mound Reservoir	\$1,650,000
Grand Mound Land Acquisition for Wells	\$270,000
Grand Mound Way Watermain Loop	\$1,000,000
Grand Mound Well and Pumps Program	\$700,000
<b>Total</b>	<b>\$3,625,000</b>

## **TAMOSHAN**

The Tamoshan Water Utility 10-Year Financial Plan shows historic water rates increasing from \$59.70 per month plus \$1.98 per 100 CF in 2011 to \$65.80 per month plus \$2.19 per 100 CF in 2016. Projected rates increase by five percent each year from 2017 through 2024 to \$97.22 per month and \$3.24 per 100 CF in 2024.

Historic operating fund ending annual balances vary from \$88,816 in 2011 to \$193,615 in 2016. Projected operating fund balances vary from a low of \$32,859 in 2022 to a high of \$131,929 in 2017. Historic annual transfers from operating fund to capital facilities fund has varied from \$0 in 2012 and 2013, to \$28,104 in 2016. Projected annual transfers from operating fund to capital reserve fund vary from \$15,000 in 2017 to \$85,000 in 2019.

Historic reserve fund account balances vary from a low of \$11,336 in 2013 to a high of \$62,534 in 2016. Projected reserve fund account balances are shown to become negative after 2018 and to decline to -\$661,141 by 2022. The projected negative values for capital reserves balance for 2019 through 2024 indicate that the current rates for the Tamoshan water system are not adequate to cover the identified water system improvements. Either rates will need to be increased to maintain a positive fund balance, or outside sources of funding will be required, or some capital improvements will need to be postponed. Total revenues for 2018 through 2024 are projected at \$874,942. A revenue increase of approximately 76 percent would be required to fund all of the identified capital improvements.

Projected capital expenditures for 2017 through 2024 total \$1,248,659, of which \$943,659 is projected for water system improvements and \$305,000 is projected for sewer system improvements. Water system improvement projects identified and budgeted costs include the following:



Management Plans (System Update, Assets, Satellite Agency)	\$8,659
63 <sup>rd</sup> Avenue Water Main Replacement	\$200,000
Water Treatment System	\$315,000
Water Reservoir Outlet Filter Screen	\$5,000
Fire Hydrant Replacement	\$15,000
Water Emergency Backup Generator	\$80,000
Secondary Water Main Replacement	\$250,000
Water Redundancy	\$30,000
Well new Pump and Motor	\$40,000
Total	\$943,659

## **RATE STRUCTURE ANALYSIS**

The County's current rate structure includes both a Base Rate that is based equivalent ERUs of the connection, and a Unit Rate that is based on usage. Unit rates ranging from \$2.13 to \$2.42 per 100 CF provide an incentive to use water efficiently. Water rates appear adequate to support water system operations, maintenance, and capital improvements for Boston Harbor and Grand Mound water systems, but additional revenue will be required to fund the Tamoshan water system capital improvements.

## **CONCLUSIONS AND RECOMMENDATIONS**

Based on our review of the County's water utility finances and planned capital improvements, the rate structure shown in Table 9-1 appears to be sufficient to cover operations and maintenance costs and capital improvements for Boston Harbor and Grand Mound water systems, but additional revenues will be required to fund the capital improvements for the Tamoshan water system.





## **APPENDICES**

Appendix A	Water Facilities Inventory Forms
Appendix B	Thurston County Developer Standards
Appendix C	Water Quality Monitoring Schedules
Appendix D	Consumer Confidence Reports
Appendix E	Sample Maintenance Forms
Appendix F	Emergency Response Plan
Appendix G	Sample Public Notification Forms
Appendix H	Cross-Connection Control Program
Appendix I	Potential Funding Sources for Capital Projects
Appendix J	Thurston County Financial Tables



## **APPENDIX A**

### **WATER FACILITIES INVENTORY FORMS**



# WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1

Updated: 03/03/2016

Printed: 3/27/2017

WFI Printed For: On-Demand

Submission Reason: Pop/Connect Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822

<b>1. SYSTEM ID NO.</b> 07850 R	<b>2. SYSTEM NAME</b> BOSTON HARBOR	<b>3. COUNTY</b> THURSTON	<b>4. GROUP</b> A	<b>5. TYPE</b> Comm
<b>6. PRIMARY CONTACT NAME &amp; MAILING ADDRESS</b>  KEVIN P. PATCHING [SUPERVISOR] 9605 TILLEY RD. SOUTH OLYMPIA, WA 98512		<b>7. OWNER NAME &amp; MAILING ADDRESS</b>  THURSTON COUNTY PUBLIC WORKS THERESA PARSON 9605 TILLEY RD. SOUTH OLYMPIA, WA 98512  INTERIM MANAGER		<b>8. OWNER NUMBER: 000592</b>
<b>STREET ADDRESS IF DIFFERENT FROM ABOVE</b>  ATTN ADDRESS CITY STATE ZIP		<b>STREET ADDRESS IF DIFFERENT FROM ABOVE</b>  ATTN ADDRESS CITY STATE ZIP		
<b>9. 24 HOUR PRIMARY CONTACT INFORMATION</b>		<b>10. OWNER CONTACT INFORMATION</b>		
Primary Contact Daytime Phone: (360) 867-2288		Owner Daytime Phone: (360) 867-2330		
Primary Contact Mobile/Cell Phone: (360) 239-4486		Owner Mobile/Cell Phone: (360) 239-6303		
Primary Contact Evening Phone: (xxx)-xxx-xxxx		Owner Evening Phone: (xxx)-xxx-xxxx		
Fax:	E-mail: xxxxxxxxxxxxxxxxxxxx	Fax:	E-mail: xxxxxxxxxxxxxxxxxxxx	
<b>WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.</b>				
<b>11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)</b>				
<input type="checkbox"/> Not applicable (Skip to #12) <input checked="" type="checkbox"/> Owned and Managed <input type="checkbox"/> Managed Only <input type="checkbox"/> Owned Only				
SMA NAME: THURSTON COUNTY PUBLIC WORKS		SMA Number: 134		
<b>12. WATER SYSTEM CHARACTERISTICS (mark all that apply)</b>				
<input type="checkbox"/> Agricultural <input type="checkbox"/> Commercial / Business <input type="checkbox"/> Day Care <input type="checkbox"/> Food Service/Food Permit <input type="checkbox"/> 1,000 or more person event for 2 or more days per year				
<input type="checkbox"/> Hospital/Clinic <input type="checkbox"/> Industrial <input type="checkbox"/> Licensed Residential Facility <input type="checkbox"/> Lodging <input type="checkbox"/> Recreational / RV Park				
<input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> School <input type="checkbox"/> Temporary Farm Worker <input checked="" type="checkbox"/> Other (church, fire station, etc.):				
<b>13. WATER SYSTEM OWNERSHIP (mark only one)</b>				<b>14. STORAGE CAPACITY (gallons)</b>
<input type="checkbox"/> Association <input checked="" type="checkbox"/> County <input type="checkbox"/> City / Town <input type="checkbox"/> Federal <input type="checkbox"/> Investor <input type="checkbox"/> Private <input type="checkbox"/> Special District <input type="checkbox"/> State				500,000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -



# WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO. 07850 R		2. SYSTEM NAME BOSTON HARBOR										3. COUNTY THURSTON					4. GROUP A		5. TYPE Comm	
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15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY												19 USE		20 TREATMENT					22 DEPTH	23	24 SOURCE LOCATION				
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER.  Example: WELL #1 XYZ456  IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
			S01	InAct 07/01/1990 WELL #1		X												X	X							29	60	SW NE
S02	InAct 07/01/1990 WELL #2		X												X	X							32	35	SW NE	14	19N	02W
S03	InAct 07/01/1990 WELL #3		X												X	X							75	22	SW NE	14	19N	02W
S04	InAct 07/01/1990 WELL #4		X										X					X					40	150	SW NE	14	19N	02W
S05	InAct 07/01/1990 SPRING					X									X			X						46	SW NE	14	19N	02W
S06	WELL #5 WW ABS238				X								X		N	X							537	65	SW NW	13	19N	02W
S07	WELL #6 WW ABS223				X								X		Y	X							543	65	SW NW	13	19N	02W
S08	WF (S06 & S07)			X									X		Y		X	X			X		537	130	SW NW	13	19N	02W



# WATER FACILITIES INVENTORY (WFI) FORM - Continued

<b>1. SYSTEM ID NO.</b> 07850 R	<b>2. SYSTEM NAME</b> BOSTON HARBOR	<b>3. COUNTY</b> THURSTON	<b>4. GROUP</b> A	<b>5. TYPE</b> Comm
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	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
<b>25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)</b>		273	338
A. Full Time Single Family Residences (Occupied 180 days or more per year)	273		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
<b>26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)</b>			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
<b>27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)</b>			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	1	1	1
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	1	1	1
<b>28. TOTAL SERVICE CONNECTIONS</b>		275	340

<b>29. FULL-TIME RESIDENTIAL POPULATION</b>												
A. How many residents are served by this system 180 or more days per year? <span style="float: right;">880</span>												

<b>30. PART-TIME RESIDENTIAL POPULATION</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

<b>31. TEMPORARY &amp; TRANSIENT USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	320	320	320	320	420	520	520	520	420	320	320	320
B. How many days per month is water accessible to the public?	30	28	30	30	30	30	30	30	30	30	30	30

<b>32. REGULAR NON-RESIDENTIAL USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	250	250	250	250	250	250	5	5	5	250	250	250
B. How many days per month are they present?	20	20	20	20	20	15	1	1	15	20	20	15

<b>33. ROUTINE COLIFORM SCHEDULE</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	2	2	2	2	2	2	1	1	1	2	2	2

<b>34. NITRATE SCHEDULE</b>	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

**35. Reason for Submitting WFI:**

☐ Update - Change   
 ☐ Update - No Change   
 ☐ Inactivate   
 ☐ Re-Activate   
 ☐ Name Change   
 ☐ New System   
 ☐ Other \_\_\_\_\_

**36. I certify that the information stated on this WFI form is correct to the best of my knowledge.**

**SIGNATURE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**PRINT NAME:** \_\_\_\_\_ **TITLE:** \_\_\_\_\_



<u>WS ID</u>	<u>WS Name</u>
07850	BOSTON HARBOR

Total WFI Printed: 1







# WATER FACILITIES INVENTORY (WFI) FORM - Continued

<b>1. SYSTEM ID NO.</b> 07158 0	<b>2. SYSTEM NAME</b> GRAND MOUND	<b>3. COUNTY</b> THURSTON	<b>4. GROUP</b> A	<b>5. TYPE</b> Comm
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	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
<b>25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)</b>		240	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	240		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
<b>26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)</b>			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
<b>27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)</b>			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	91	91	
<b>28. TOTAL SERVICE CONNECTIONS</b>		331	

<b>29. FULL-TIME RESIDENTIAL POPULATION</b>
A. How many residents are served by this system 180 or more days per year? <span style="float: right;">650</span>

<b>30. PART-TIME RESIDENTIAL POPULATION</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

<b>31. TEMPORARY &amp; TRANSIENT USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	39000	39000	40000	40000	44000	51000	51000	51000	44000	44000	40000	40000
B. How many days per month is water accessible to the public?	30	30	30	30	30	30	30	30	30	30	30	30

<b>32. REGULAR NON-RESIDENTIAL USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	50	50	50	50	50	60	60	60	60	50	50	50
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	30	31

<b>33. ROUTINE COLIFORM SCHEDULE</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	2	2	2	2	2	2	2	2	2	2	2	2

<b>34. NITRATE SCHEDULE</b>	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

**35. Reason for Submitting WFI:**

☐ Update - Change   
 ☐ Update - No Change   
 ☐ Inactivate   
 ☐ Re-Activate   
 ☐ Name Change   
 ☐ New System   
 ☐ Other \_\_\_\_\_

**36. I certify that the information stated on this WFI form is correct to the best of my knowledge.**  
  

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____



Total WFI Printed: 1

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# WATER FACILITIES INVENTORY (WFI) FORM - Continued

<b>1. SYSTEM ID NO.</b> 87140 V	<b>2. SYSTEM NAME</b> TAMOSHAN	<b>3. COUNTY</b> THURSTON	<b>4. GROUP</b> A	<b>5. TYPE</b> Comm
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	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
<b>25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)</b>		90	94
A. Full Time Single Family Residences (Occupied 180 days or more per year)	90		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
<b>26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)</b>			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
<b>27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)</b>			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	1	1	0
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	1	1	0
<b>28. TOTAL SERVICE CONNECTIONS</b>		92	94

**29. FULL-TIME RESIDENTIAL POPULATION**  
 A. How many residents are served by this system 180 or more days per year? 260

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
* Requirement is exception from WAC 246-290	1	1	1	1	1	1	1	1	1	1	1	1

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
(One Sample per source by time period)			

**35. Reason for Submitting WFI:**

☐ Update - Change   
 ☐ Update - No Change   
 ☐ Inactivate   
 ☐ Re-Activate   
 ☐ Name Change   
 ☐ New System   
 ☐ Other \_\_\_\_\_

**36. I certify that the information stated on this WFI form is correct to the best of my knowledge.**  
  

SIGNATURE: _____	DATE: _____
PRINT NAME: _____	TITLE: _____



Total WFI Printed: 1

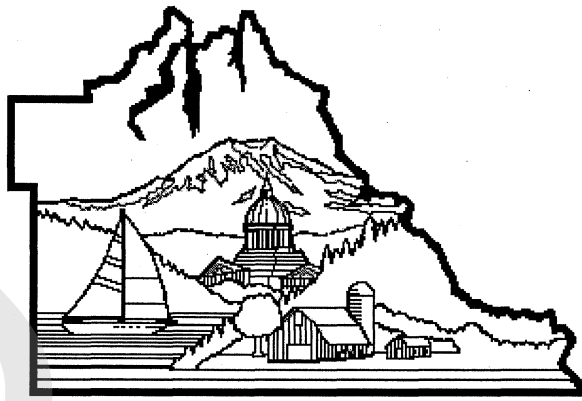
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## **APPENDIX B**

### **THURSTON COUNTY DEVELOPER STANDARDS**





**THURSTON COUNTY**

**W A S H I N G T O N**

SINCE 1852

**Development Standards for  
Water and Sewer Systems  
Thurston County, Washington**

Prepared by: Thurston County  
Department of Water and Waste Management  
January 2007



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**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

## **1.00 GENERAL**

### **1.01 Abbreviated Plans**

Abbreviated plans for water and sewer systems may be submitted for single family homes, duplexes, and some commercial buildings. Thurston County reserves the right to require a proposed water and sewer be designed by a professional engineer. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

### **1.02 Water Standards**

Any extension of the Water System must be approved by the Director of Thurston County Department of Water and Waste Management or his/her designee and, all extensions must conform to these standards. In designing and planning for any development, it is the developers' responsibility to see that adequate water for both domestic use and fire protection is attainable. The developer must show, in the proposed plans, how water will be supplied and whether adequate water pressure and flow will be attained in case of fire. An analysis of the system may be required if it appears that the system might be inadequate. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

Prior to the release of any water meters, all Public Works improvements must be completed and approved including granting of right-of-way or easements, and all applicable fees must be paid. In development where water or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the street construction area are complete.

### **1.03 Sanitary Sewer Standards**

Sanitary sewerage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment shall follow all the requirements as set forth by Thurston County Code 15.09.060 – Discharge Limitations.

Any extension of Thurston County's sanitary sewer system must be approved by Thurston County and must conform to the, Thurston County Health Department, State of Washington Department of Ecology (DOE), and State of Washington Department of Health (DOH) requirements. Additionally, all sewer system extensions of the Grand Mound Sewer System must conform to the Wastewater Engineering Report and Facility Plan for the Grand Mound Sewer System (December 1999).



## **DEVELOPMENT STANDARDS FOR WATER AND SEWER SYSTEMS THURSTON COUNTY, WASHINGTON**

A public sewer system must be used within the Grand Mound Service area where a public sewer is available. Where public sewer is not available within the Grand Mound Sewer Service Area, connection is required provided that the sewage from the structure originates within 200 feet of the public sewer, except in the case of private residential or commercial developments where the developed property abuts a right-of-way in which a public sewer is located or where a service connection is otherwise provided. In this case, connection of all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer.

In new development where sanitary sewer improvements or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the right-of-way are complete. Anyone who wishes to extend or connect to the sewer system should contact Thurston County Development Services. Developers and engineers are encouraged to use existing sanitary sewer manholes, where possible, to connect to the new systems to the existing sanitary sewer system. One new manhole will be allowed to be installed in the existing sanitary sewer main per development. No additional manholes and/or taps into the existing sanitary system will be allowed without the written authorization of the Director or his/her designee. All contractors shall be licensed, insured, and bonded in the State of Washington consistent with all applicable rules and regulations by the Washington State Department of Labor and Industries.

Grease traps, oil-water separators, and other mechanical systems may be required at the discretion of Thurston County.

Prior to the acceptance of the sanitary sewer system, all Public Works improvements must be completed and accepted including granting of right-of-way or easements, and all applicable fees must be paid. In development where sanitary sewer or any private utility work and public street improvements are required, no paving of the public right-of-way shall occur until all utility improvements in the street construction area are complete.

### **1.04 Design Standards**

The design of all water and sanitary sewer system extensions and connections shall conform to Thurston County Standards. The layout of water system extensions shall provide for the future continuation and/or looping," of the existing system as determined by Thurston County. The General Notes included in Appendices C and D shall be included on all plans dealing with water and sanitary sewer system designs.

#### **1.04.1 Plan Checklist**

##### **Abbreviated Plans**

Where abbreviated plans are allowed, Plans shall contain, at minimum, the following information and shall be neatly presented on an 8 ½" x 11" or larger sheet:



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**ABBREVIATED PLANS STANDARD ITEMS**

- ☐ North Arrow
- ☐ Existing and Proposed Site Improvements
  - ☐ All structures shall be accurately located
  - ☐ Access shall be clearly delineated
- ☐ Property Lines and Easements
- ☐ Existing Water and Sewer System
  - ☐ Main Size
  - ☐ Invert elevations of sewer main in nearest manhole, upstream and downstream, of proposed tap to water and sewer
- ☐ Proposed Service Location, size, and slope
- ☐ Plat Number, Parcel Number, Street Address
- ☐ Existing Septic System (if applicable)
- ☐ Existing Well (if applicable)

Plans other than abbreviated plans shall follow the following requirements. Standard items to be included with development plan submittals are identified below. These items are considered a minimum for review of water utility and sanitary sewer system plans. Plans shall be submitted in ANSI B (11"x17") format with a minimum text height of 0.08 inches. All contents of the plans shall be reproducible (up to three times) without loss of readability or clarity.

A survey must be completed by a professional land surveyor licensed in the State of Washington whose professional stamp shall be affixed to each applicable plan sheet. In addition, the design engineer shall affix his/her professional engineering stamp to each plan sheet.

**Standard Items - Plan**

- ☐ Centerline and Stations
- ☐ Edge of Pavement and Width
- ☐ Right-of-Way and Width
- ☐ Existing Utilities
- ☐ Property Lines, Parcel Numbers, and Street Address
- ☐ Identify Street Names, Right of Way, Lots
- ☐ Easements, Width and Type
- ☐ Stations for Structures
- ☐ Type of Pipe
- ☐ Flow Direction of Arrows

**Standard Items - Profile**

- ☐ Profile Grades (decimal Ft./Ft.)
- ☐ Existing and Horizontal Ground
- ☐ Scale (horizontal and Vertical)



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

- ☐ Stationing
- ☐ Type of Pipe
- ☐ Vertical Elevation Increments
- ☐ Existing Utilities
- ☐ Utility Crossings

**Water Plan**

- ☐ No smaller than 40 scale unless approved by Thurston County
- ☐ System Map (1"=300') showing existing and proposed mains with line size, at least 2 valves-one on both sides of the project, and hydrants
- ☐ Existing Utility Conflicts
- ☐ Fixtures (need horizontal and vertical control)
  - ☐ Fire Hydrants
  - ☐ Blow-off (at end of line if no hydrant)
  - ☐ Vacuum and Air Release Valves when Required
- ☐ Station, Offset and Size of Tees, Crosses, Elbows, Adaptors and Valves Need Coupling Type
- ☐ Valves (2 each tee, 3 each cross)
- ☐ Fire Department Connection
- ☐ Backflow Prevention Devices
- ☐ Thrust Blocking if Required at all Fittings Including In-Line Valves
- ☐ Distance from Sewer
- ☐ Bearing and Distance of Each Pipe Run
- ☐ Service to Each Lot (include open tracts)
- ☐ Sample Station
- ☐ Domestic Meter with station, size, and offset
- ☐ Irrigation Meter with station, size, and offset
- ☐ Power Source and Type of Service for Irrigation

**Water Profile**

- ☐ Existing and Proposed Utility Crossings
- ☐ Show Fixtures (tees, crosses, hydrants)
- ☐ Type of Pipe
- ☐ Show Valves and Couplers
- ☐ Size of Watermain
- ☐ Length of Watermain in L.F.
- ☐ Cover Over Pipe
- ☐ Grades (Engineered Design Grade to F.L.)

**Water - Miscellaneous**

- ☐ Detail Sheet
- ☐ Water General Notes



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**Sanitary Sewer Plan**

- ☐ No smaller than 40 scale unless approved by Thurston County
- ☐ System Map (1"=300') showing Tie-In to Existing System, Including Line Size and Valves
- ☐ Manhole
  - ☐ Station and Offset Shown at Each Manhole/Cleanout
  - ☐ Manholes Numbered
  - ☐ Manhole Type Designation
  - ☐ Flow Direction (with arrow on pipe)
  - ☐ Distance from Water Lines
- ☐ Depth at Property Line and Distance from Downhill Manhole for Side Sewer
- ☐ Service to Each Lot
- ☐ Bearing and Distance (or station, offset and angle) of Each Pipe Run When Not Parallel to Centerline
- ☐ Existing Septic Tanks/Drainfields (with note to abandon if necessary)
- ☐ Station, Offset, and Size of Tees, Crosses, Elbows, Adaptors, and Valves

**Sanitary Sewer - Profile**

- ☐ Manholes Numbered
- ☐ Invert Elevation Showing Direction, In and Out
- ☐ Rim Elevation
- ☐ Grades Shown (decimal FT/FT) (minimum slopes)
- ☐ Type of Pipe
- ☐ Size of Pipe
- ☐ Length of Pipe (in L.F.)
- ☐ Existing Utilities and Crossings Shown
- ☐ Proposed Utility Crossings
- ☐ Show Fixtures (tees, crosses, valves, and couplers)
- ☐ Cover Over Pipe

**Sanitary Sewer - Miscellaneous**

- ☐ Detail Sheet
- ☐ Sewer General Notes see Appendix D

**1.05 Abbreviated Plans**

Abbreviated plans, where accepted, shall conform to applicable areas of these standards and are subject to approval by Thurston County. The abbreviated plans shall generally describe the proposed project, proposed water and sewer service, and how the proposed service will connect to the existing water and sewer system.



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**1.05.1 Water Service**

Specific elements of water service shall conform to the following:

1. Backflow prevention assembly, per Section 2.09;
2. Service connections, per Section 2.10;
3. Irrigation, per Section 2.11;
4. Hydrostatic Tests, per Section 2.13;
5. Sterilization and Flushing, per Section 2.14;
6. Termination of Services, per Section 2.15.

**1.05.2 Sanitary Sewer Service**

Specific elements of sewer service shall conform to the following:

1. Building/Side Sewer, per Section 3.11;
2. Service connections per Section 3.04;
3. Sanitary Treatment Effluent Pump (STEP) Standards per Section 6.00;
4. Grinder Pump Systems per Section 7.00;
5. Gravity Sewer from Building for Vacuum System per Section 8.04;

**1.06 Water Main/Sanitary Sewer Crossings**

In case of conflict between the Thurston County Water and Sewer Development Standards and the Department of Ecology Sewage Works Design for requirements regarding sewer and water separation, the most restrictive shall be used, at the discretion of Thurston County.

The Contractor shall maintain a minimum of 18 inches of vertical separation between sanitary sewers and water mains and services. The minimum cover for water main of 42 inches may be reduced to 30 inches upon approval by Thurston County to provide for as much vertical separation as possible. See standard detail WA-01.

The longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or sewer service in pipe or concrete. No concrete shall be installed unless specifically directed by Thurston County.

**1.07 Conflicts**

At crossings of other utilities where the water pipe is within six inches of the other utilities, a polyethylene foam block shall be placed between the pipes. The block shall act as a compression cushion between the pipes.

Conflicts with other utilities may require the pipe alignment be modified in the field. Such realignment shall be subject to approval by Thurston County.



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**1.08 Staking**

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

A preconstruction meeting shall be held with the Thurston County prior to commencing construction. The minimum staking of sewer lines shall be as follows:

**1.08.1 Water Systems:**

1. Stake centerline alignment every 50 feet (25 feet through curve sections) with cuts and/or fills to bottom of trench maintaining 42 inches of cover over pipe. Centerline cuts are not required when road grade is to finished sub grade elevation.
2. Stake location of all fire hydrants, hydrant flange elevations, tees, water meters, setters and other fixtures with cut or fill to finished grade.

**1.08.2 Sanitary Sewer Systems:**

1. Centerline alignment must be staked with cuts and/or fills to flowline every 50 feet.
2. Manholes must be staked with hubs to include invert elevations of all pipes and top of rim elevations to finished grade.
3. Location of valves, fixtures, valve pits, wet wells, septic tanks, and other appurtenances shall be staked for force mains, gravity and vacuum lines.

**1.09 Trench Excavation**

Clearing and grubbing when required shall be performed within the easement or public right-of-way as permitted by Thurston County and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

The Contractor shall perform excavation of every description and in whatever materials encountered to the depth indicated on the Plans or specified in the Special Provisions. Excavations shall be made by open cut unless otherwise provided for. Trenches shall be excavated to true and smooth bottom grades and in accordance with the lines given by the Engineer or shown on the Plans. The trench bottom shall provide uniform bearing and support for each length of pipe.

Bell holes shall be excavated to the extent necessary to permit accurate work in making and inspecting the joints. The banks of the trenches shall be kept as nearly vertical as soil conditions



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will permit, and where required to control trench width or to protect adjacent structures, the trench shall be sheeted and braced. Trench widths to 1 foot above the top of the pipe shall not exceed 30 inches maximum or  $1\frac{1}{2}$  times the outside diameter of the pipe plus 18 inches whichever is greater. Standard excavating equipment shall be adjusted so as to excavate the narrowest trench possible.

The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

The length of trench excavation in advance of pipe laying shall be kept to a minimum. Excavations shall be either closed up at the end of the day or protected per Section 1-07.23(1) of the WSDOT Standard Specifications.

Conformance with Washington Industrial Safety and Health Administration (WISHA) and Labor and Industries (L&I) Safety Standard for worksite related issues is the Contractor's responsibility.

If workers have to enter any trench or other excavation four (4) feet or more in depth that does not meet the open pit requirements of Section 2-09.3(3)B of the WSDOT Standard Specifications, it shall be shored. The Contractor alone shall be responsible for worker safety, and the Contracting Agency assumes no responsibility. See the WSDOT/APWA specification for more thorough requirements regarding trench excavation.

The Contractor shall supply all safety equipment, including all shoring necessary shoring equipment, to complete the work consistent with WISHA and L&I standards for worker safety. Upon completing the work, the Contractor shall remove all shoring unless the Plans or the Engineer direct otherwise.

The Contractor shall exercise sound engineering and construction practices in excavating the trench and maintaining the trench so that no damage will occur to any foundation, structure, pole line, pipe line, or other facility because of slough or slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground, which may endanger other property, the Contractor shall immediately take remedial action at no additional expense to the Contracting Agency. No act, representation, or instruction of the Engineer shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth specified. Excavation below that depth shall be backfilled with foundation material and compacted as specified herein.

See the WSDOT/APWA specification for complete requirements regarding trench excavation.



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### **1.10 Backfilling**

Prior to backfilling, form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling.

Backfill up to 12 inches over the top of the pipe shall be evenly and carefully placed. Materials capable of damaging the pipe or its coating shall be removed from the backfill material. The remainder of the material shall be placed by dumping into the trench by any method at the option of the Contractor, and shall be compacted as specified hereinafter.

A minimum of a 3-inch sand cushion shall be placed between the water or sewer main and existing pipelines or other conduits when encountered during construction and as directed by the Engineer or Thurston County.

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of Thurston County. Selected backfill material shall be placed and compacted around and under the water and sewer mains by hand tools to a height of six inches above the top of the main. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas, 90 percent outside traveled area. Where governmental agencies other than Thurston County have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. If suitable backfill material, as determined by Thurston County, is not available from trenching operations, Thurston County may order the placing of bedding conforming to APWA Standard Specification 9-03 around the main and gravel base conforming with Section 9-03 of the Standard Specifications for backfilling the trench.

Control density fill may be required for backfill material, at the discretion of Thurston County.

See the WSDOT/APWA specification for complete requirements regarding backfilling.

### **1.11 Street Patching and Restoration**

This section pertains to existing public roads and those roads proposed to be dedicated to the County as public roads. All work shall be performed consistent with these standards and Thurston County Road Standards. Inconsistencies and conflicts shall be governed by the Thurston County Road Standards.

All roadway crossings shall be done by means of boring or pushing (untrenched installation). Opening of the roadway surface shall not be permitted unless it has been determined by the Engineer, or his designated representative, that boring or pushing can not be done.

When a trenched crossing is approved, restoration shall be in accordance with one of the following guidelines:

1. Controlled density backfill, CDF shall be required as a backfill material; or



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2. Select backfill, meeting the requirements of the Standard Specifications may be used. Backfill shall be compacted to at least 95 percent density and placed in a maximum of 12-inch lifts, as specified in the Standard Specifications. Written verification of compaction, based upon acceptable testing methods, and placement of the backfill shall be required.

Native material may be used as backfill material when standard acceptable tests show the material meets the requirements for backfill material as specified in the Standard Specifications. The requirements for compaction and placement in item B above also apply when native material is used.

All utilities placed parallel to and within the pavement structure shall be required to rebuild a minimum of half the road, from centerline for utilities in one driving lane, to include grinding and the replacement of a minimum 0.20' of asphalt.

When conditions are warranted, the Engineer may require all or a portion of the trench be backfilled with a combination of select backfill or CDF. Conditions that may warrant a combination use may be, but not limited to, the depth of trench required, the type of material that is being excavated and crossings on arterial and collector roadways.

When conditions are warranted, the Engineer may require financial security for a minimum of 10-years in the form of a bond, irrevocable letter of credit or irrevocable assignment of interest in a bank account for all or a portion of restoration. Conditions that may warrant this may be, but not limited to, the placement of utilities in or near sensitive areas and areas of continuous settlement.

See Chapter 6.00 of the Thurston County Road Standards for complete trench backfill and restoration requirements.

## **1.12 Record Drawings**

The Engineer of Record shall submit one full size and three 11x17 sets of record drawings, bearing the engineer's stamp of record, to Thurston County before receiving Final Approval. An electronic copy of the record drawings shall be submitted concurrently in a media format approved by Thurston County.



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## **2.00 WATER**

### **2.01 Main Line - Water**

- A. Within the urban growth area (UGA):
  - i. Water mains shall be sized to provide adequate domestic, plus fire flow at the required residual pressure. Fire flow requirements will be determined by the Building Safety Official/Fire Marshall; however, the quantity of water required will in no case be less than 1,000 GPM at 20 psi residual pressure and 1,500 GPM at 20 psi for multi-family, commercial and industrial areas.
  - ii. The minimum water main size shall meet minimum fire flow requirements and be equal to or larger than six inches for looped lines and eight inches for dead end lines as long as fire flow requirements can be met.
- B. Outside the UGA:
  - i. Water mains shall be sized to provide adequate domestic flow at the required residual pressure.
  - ii. The minimum water main size shall meet provide adequate domestic flow requirements and be equal to or larger than six inches for looped lines and eight inches for dead end lines. No dead end mains shall be longer than 1,200 lineal feet.

Larger size mains may be required in specific areas as outlined in the *Grand Mound Water System Plan*. Nothing shall preclude Thurston County from requiring the installation of a larger sized main in areas not addressed in the *Grand Mound Water System Plan* if Thurston County determines a larger size is needed to meet fire protection requirements or for future service. Oversizing agreements may be negotiated with Thurston County.

- C. Water mains shall be looped where feasible to ensure improved water quality and provide redundancy. The water main will be designed to meet desired velocities of seven feet per second (fps) during any flow condition to reduce the chance of water hammer.
- D. A water quality sampling station may be required at the discretion of Thurston County. (See Standard Detail WA-20)
- E. All water mains that may be extended or looped will end with an approved gate valve and blind flange.
- F. Pressure of 45 to 60 psi shall be maintained at the main during peak day demands. A pressure of 45 PSI provides adequate pressure at all the fixtures, and pressure above 65 PSE results in excess water usage and is above the target level set in the Thurston



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County Water Conservation plan.

- G. When pressures reach 80psi or above, during static conditions, a pressure reducing valve is required on the customer's side of the meter.
- H. All material for water distribution and transmission shall be new and unblemished. All pipe for water mains shall have flexible gasketed joints and shall comply with one of the following types:

Ductile iron pipe shall conform to AWWA C 151 Class 52 and have a cement mortar lining conforming to AWWA C 104. All pipes shall be joined using non-restrained joints which shall be rubber gasket, Tyton type, or mechanical joint, conforming to AWWA C 111.

PVC Pipe: All PVC pipe shall conform to the latest revision of the following specifications: Four inch through 12 inch pipe shall meet AWWA C900 ASTM 2241 Class 200 standards. Fourteen inch through 20-inch pipe shall meet AWWA C905 Class 235 standards.

- I. All fittings for ductile iron pipe or PVC pipe shall be ductile iron compact fittings conforming to AWWA C 153. All shall be cement mortar lined conforming to AWWA C 104. Plain end fittings shall be ductile iron if mechanical joint retainer glands are installed on the plain ends. All fittings shall be connected by flanges or mechanical joints. Where required, Mega-Lug retainer glands will be used.
- J. Transition couplings shall be Style 501 Manufactured by Romac Industries, or equal. Flanged coupling adaptors shall be Style 912 Manufactured by Rockwell, or equal.
- K. Sleeve couplings shall be ductile iron, mechanical joint type in accordance with AWWA C110, except the minimum sleeve length shall be 6 inches.
- L. Joint restraint follower glands installed with mechanical-joint fittings shall be equal to the Mega-Lug Series 1100 Retainer Glands Assembly manufactured by EBAA Iron, Inc., or equal.
- M. All pipe and services shall be installed with 12 gauge coated copper toning wire taped to the top of pipe, brought up and tied off at the top of the valve box. Two (2) feet of slack shall be exposed and tied off at the top of the valve box and meter box. A one pound magnesium anode shall be buried with the force main every 1,000 lineal feet maximum for cathodic protection. Toning wire splices and connections to anodes shall join wires both mechanically and electrically, shall employ epoxy resin or heat shrink tape insulation and shall be encapsulated in splice pots. Toning wire shall be tested prior to acceptance.
- N. Detectable marking tape shall be installed over all water lines. The tape shall be



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placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.

- N. The minimum cover for all water mains from top of pipe to finish grade shall be 42 inches unless otherwise approved. Deviations from water main locations may be allowed by approval of Thurston County where existing utilities will interfere. Shallower or increased depths of burial because of interference will require extraordinary protective measures.

## **2.02 Connection to Existing Water Main**

The developer's engineer shall be responsible for determining the scope of work for connection to existing water mains. See standard Detail WA-02. All cut-ins and all taps to water mains shall be witnessed by a Thurston County inspector.

At any connection to an existing line where a new valve is not anticipated, the existing valve must be pressure tested to County Standards prior to connection. If an existing valve fails to pass the test, the Contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve and replace the existing valve, at the discretion of Thurston County.

Where connections require "field verification" connection points will be exposed by the Contractor and fittings verified two working days prior to distributing shut down notices. Shut down notices will be distributed by the Contractor.

All material required for the connection will be at the site prior to the shutdown and start of work. Connection to a new section shall only be made after the new section has been tested and disinfected. Connecting pipe will be swabbed with strong chlorine solution such as liquid household bleach with 5 or 6% chlorine before making the connection. After work is started, work will proceed continuously, as rapidly as possible, until necessary connection and restoration of services is accomplished. Care shall be taken throughout construction to avoid contamination of materials.

## **2.03 Service Interruption**

The contractor shall provide Thurston County a minimum of 48 hours notice, or two full working days, whichever is longer, of any planned connection to an existing pipeline. This includes all cut-ins and live taps. Notice is required so any disruptions to existing services can be scheduled. The contractor shall notify customers involved or affected by the water service interruption. The contractor shall make every effort to schedule water main construction with a minimum interruption of water service. All taps shall be made between the hours of 8:00 a.m. and 2:00 p.m. No tap shall be made to an existing main on a Friday without approval by the County.



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Water will not be shut off overnight or over weekends or holidays. Water disruptions shall not be longer than four (4) hours, unless contractor provides water to all affected users. In certain situations, Thurston County may dictate scheduling of water main shutdowns so as not to impose unnecessary shutdowns during specific periods to existing customers.

**2.04 Hydrants**

- A. The lead from the service main to the fire hydrant shall be ductile iron cement mortar lined Class 52 no less than six inches in diameter. The gate valve shall be located a minimum of eight (8) feet from the hydrant, unless otherwise approved by Thurston County.
- B. Fire Hydrants shall have two (2), 2-1/2 inch NST outlet/port, and one 4-1/2 inch NST threaded outlet/port and equipped with one 5 inch Storz fitting or approved equal pumper outlet/port connection. The hydrant shall be the dry barrel type and shall be of the "safety" or break-away style. The end connections shall be mechanical joint or flanged conforming to AWWA C110, 110a, and C111. See standard detail [WA-03].
- C. Hydrants shall be Mueller Centurion or Clow F2500.
- D. Hydrants shall be painted with Sun Yellow High Grade Enamel #13312.
- E. All hydrants shall be bagged until system is approved.
- F. All chains between caps and hydrants shall be cut and removed.
- G. Unless otherwise required, following guidelines shall apply for hydrant number and location:
  - 1. At least one hydrant shall be installed at all roadway intersections.
  - 2. Hydrants shall be placed at a maximum interval of one hydrant per 330 lineal feet of watermain in all areas except single-family and duplex residential areas.
  - 3. Hydrant spacing of 600 feet will be required for single-family and duplex residential areas.
  - 4. When any portion of a proposed building is in excess of 150 feet from a water supply on a public street on-site hydrants shall be required.
  - 5. For dead ends mains within the UGA, hydrants shall be placed off dead ends of mains, with a valve, blind flange, and appropriate thrust blocking.
- H. Fire hydrants shall be set as shown in standard detail WA-03.
- I. For requirements regarding use, size and location of a fire department connection (FDC) and/or post indicator valve contact the Building Official/Fire Marshall. Location of FDC shall be shown on water plans.



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- J. Where needed, Thurston County or Building Official/Fire Marshall may require hydrants to be protected by two or more posts (bollards), each four inches in diameter by five feet in height made of either reinforced concrete or steel. Adequate clear zone is three foot radius as shown in standard detail [WA-05].
- K. Fire hydrants must be installed, tested, and accepted prior to the issuance of a full building permit.

## **2.05 Valves**

All valves and fittings shall be ductile iron with ANSI flanges or mechanical joint ends with restraints. All existing valves shall be operated only by Thurston County employees, or its agents or assignees.

Valves shall be installed in the distribution system at sufficient intervals to facilitate system repair and maintenance, provided:

- 1. In no case shall there be less than one valve every 1,000 lineal feet;
- 2. There shall be two valves on each tee;
- 3. There shall be three valves on each cross.

Specific requirements for number of valves configuration and spacing will be made at the plan review stage by Thurston County.

- A. Gate valves shall be used on all lines. The design, materials and workmanship of all gate valves shall conform to AWWA C509-80 latest revision. Gate valves shall be resilient wedge non-rising stem (NRS) with two internal O-ring stem seals and shall open when the stem is rotated counterclockwise. Gate valves shall be Mueller, M & H, American Flow Control Series 500, or as otherwise determined by Thurston County. Valve ends shall be mechanical joint or ANSI flanges. The valves shall be placed at a maximum depth of 42", measured from finished grade.

Extension systems shall be constructed of steel and attached to the valve operating nut with set screws drilled into the nut.

- B. Valve Box; all valves shall have a standard water valve box set to grade with a cast iron riser from valve to within four to six inches of valve box top and shall be a Buffalo Style Valve box. The valve box shall be installed such that the lugs line up with the direction of the pipe. Valve box lids will be ductile iron and shall be anti kick-out, and marked "water." A three foot by three foot by four inch concrete pad shall be set around each valve box at finished grade. In areas where valve box falls in road shoulder, the ditch and shoulder shall be graded before placing concrete pad. See standard detail WA-04.



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- C Valve marker posts shall be four inch by four-inch reinforced concrete or schedule 40 steel posts five feet long stamped with "W" and distance to valve. Post shall be painted with one base coat and two coats white oil base enamel. See standard detail WA-05.

## **2.06 Casing**

Steel casing pipe shall be schedule 20 steel or equal. Pipe spacers shall be Cascade style CC5 with eight-inch runners as available from Cascade Waterworks, or approved equal. Casing pipe and spacer shall be sized for pipe being installed. Install minimum of three spacers per section of pipe. Casing should be sand packed and sealed in accordance with manufacturers' recommendations.

## **2.07 Air and Vacuum Release**

Valve air and vacuum release valves shall be Val-Matic 201-C or as otherwise determined by Thurston County. Galvanized piping shall be Schedule 40. Valve chamber shall be standard precast concrete manhole section with cast iron manhole ring and 2-foot diameter cover, traffic pattern, imprinted with "WATER." See standard Detail WA-06.

The installation shall be set at the high point of the line when required. Where possible, pipes are to be graded to prevent the need for an air release valve. Air release valves may not be required, at the County's discretion.

## **2.08 Blowoff Assembly**

- A. Within the UGA, if a fire hydrant is not located at the end of a dead end main, a blowoff assembly shall be required.
- B. Outside the UGA boundary, a blowoff assembly shall be required at the end of a dead end main.
- C. On water mains which will be extended in the future, the valve which operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block. The pressure rating for blowoff assemblies shall be 200 psi. Installation shall be as set forth in see standard detail WA-07.

## **2.09 Backflow Prevention**

All water system connections to serve buildings or properties with domestic potable water, fire sprinkler systems, or irrigation systems will comply with the minimum backflow prevention requirements as established by the DOH and Thurston County in its Cross Connection Program. The installation of required backflow devices is necessary to protect the existing water system and users from possible contamination. All backflow prevention assemblies will be of a type and



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model pre-approved by the DOH or Thurston County (see standard detail WA-08). No cross connections will be created, installed, used, or maintained within the water service area. Approved backflow prevention assemblies will be installed at the expense of the user, either at the service connection or within the premises, as determined by Thurston County Cross Connection Specialist in each of the following circumstances:

- A. If the nature and extent of any activity on the premises, or the materials used in connection with any activity on the premises, or materials stored on the premises could contaminate or pollute the potable water supply.
- B. On premises having one or more cross connections.
- C. Internal cross connections that are not correctable or intricate plumbing arrangements that make it impracticable to ascertain whether or not cross connections exist.
- D. A repeated history of cross connections being established or reestablished.
- E. Unduly restricted entry so that inspections for cross connections cannot be made with sufficient frequency or with sufficient notice to assure that cross connections do not exist.
- F. Materials of a toxic, objectionable, or hazardous nature, either liquids, solids, or gases being used such that if back siphonage should occur, a health hazard could result.
- G. Any mobile apparatus that uses water from any water system managed by Thurston County.
- H. All uniform plumbing codes (UPC) must be maintained.
- I. Assemblies installed at the point of delivery or on the internal plumbing system of any building shall not have galvanized piping attached to the inlet side of the assembly. Rigid piping, such as brass or copper, is allowed on the inlet side.
- J. On any premise where installation of an approved backflow prevention device is deemed to be necessary to accomplish the purpose of these regulations in the judgment of the Thurston County certified cross connection specialist.
- K. Any use of radiant heat will require the installation of a reduced pressure (RP) backflow assembly at the meter.
- L. A reduced pressure (RP) backflow assembly is required at all new commercial buildings and will be required to be installed when a change of use occurs at a commercial building. The RP device shall be installed at the meter. See Standard Detail WA-10.



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- M. On any premise where an appropriate cross-connection report form has not been filed with the office of the Thurston County Department of Water and Waste Management.
- N. On any premise where a bypass arrangement is installed around a backflow assembly, a second backflow assembly of equal protection shall be installed on the bypass piping.
- Thurston County will have the authority to perform regular inspections on all backflow assemblies, both inside and outside any building connected to the County's water system and will be provided access to the premises to inspect.
- O. The Contractor shall provide Thurston County the certificate for testing of any backflow prevention assembly before releasing the Certificate of Occupancy on any building.
- a. A list of state-certified approved testers may be obtained from Thurston County.
  - b. Backflow Prevention Assembly testers shall hold a current Washington State Department of Health Backflow Assembly Tester Certification.
- P. The Fire District #1 will test the fire line and obtain the certificate for underground piping. In any situation, the Fire District #1 will not test the fire line until the main line up to the fire line has been tested and approved.
- a. Backflow assemblies for fire protection shall have integrated shutoff valves approved as part of the assembly and shall be separate from any post indicator valve installed on the fire service line.
  - b. Double-check detector assemblies shall be required on all fire lines. See standard Detail WA-09.

## **2.10 Service Connection**

- A. **Connection to New Mains:** All service connections relating to new development will be of the appropriate size as determined by industry standard and approved by the Thurston County and installed by the developer at the time of mainline construction. After the lines have been constructed, tested and approved, the owner may apply for a water meter. The Contractor shall supply and Thurston County will install a Sensus SRII Touch Read style water meter (read in cubic feet) after the application has been made and all applicable fees have been paid. Water meters will be set only after system is inspected and approved. See standard details [WA-12 to WA-16].
- B. **Connection to Existing Mains:** When water is desired to a parcel fronting an existing main but not served by an existing setter, an application must be made to Thurston County. Upon approval of the application and payment of all applicable fees, Thurston County will tap the main, and install the service line, the meter, box, and setter.



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- C. Tapping valves shall be intended for use in tapping applications. Tapping valves shall be resilient seated gate valves with a thrust collar with stainless-steel bearing, vulcanized SBR rubber coating of the wedge (gate), lugs, and stem bore; fully coated inside and outside to AWWA C-550; two o-rings above thrust collar and one o-ring below thrust collar; and cast tongue and groove between gate and valve body. Tapping sleeves shall be stainless steel with a flanged SBR gasket; ¾" NPT stainless steel test plug with standard square head for pressure testing; SBR gaskets for use in water service; stainless steel, type 304, nuts, bolts, and shell; and predrilled stainless steel, type 304 flange.
- D. Service lines shall be a minimum of one inch high density polyethylene pipe (HDPE), minimum pressure class 200 psi, grade PE 3408. Glued joints will not be accepted. Service lines will be installed a minimum of 45 degrees off the main. Pipe joints shall be made with mechanical couplers, pack joint type in accordance with manufacturer's recommendations.
- E. Detectable marking tape shall be installed over all water lines. The tape shall be placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.
- F. Twelve (12) gauge copper toning wire shall be wrapped around the pipe on all service lines. Service saddle shall be all bronze with stainless steel straps. PVC service saddles may be required at the discretion of Thurston County or his/her designee. All clamps shall have rubber gasket and iron pipe threaded outlets.
- G. Corporation stop shall be all bronze and shall be Ford type F1101 or approved equal with iron pipe threads conforming to AWWA C 800. Stainless steel inserts shall be used with pack joints and polyethylene pipe.
- H. Customer shut off valve shall be provided and shall be PVC ball valves with PVC valve boxes on all ¾" and 1" water service lines. The ball valves shall be PVC construction rated at 200 psi with non-rising stems and polypropylene handwheel as manufactured by Spears Manufacturing Company or equal. The work shall include providing PVC/PE adaptors. The PVC valve box shall be 6-inch (minimum) PVC pipe with glued cap.
- I. Gate valves 3" and smaller shall be supported on a 4"x8"x16" precast block with no anchor strap required.
- J. Master meters will not be allowed for service to more than one building. An approved backflow prevention system must be installed in conjunction with any master meter. Deviations from this may be granted by Thurston County.
- K. Meter boxes shall be Carson BCF and BC Series rectangular meter boxes. Meter boxes shall be pre-drilled to accommodate the Sensus touch-read pad supplied by the contractor.



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**APPENDIX A**

**Standard Details – Water**

DRAFT



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

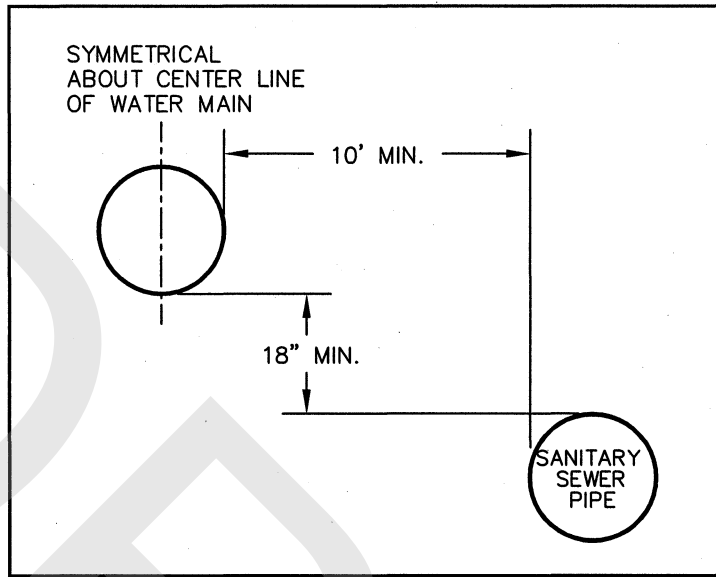
Water Standards

List of Standard Details

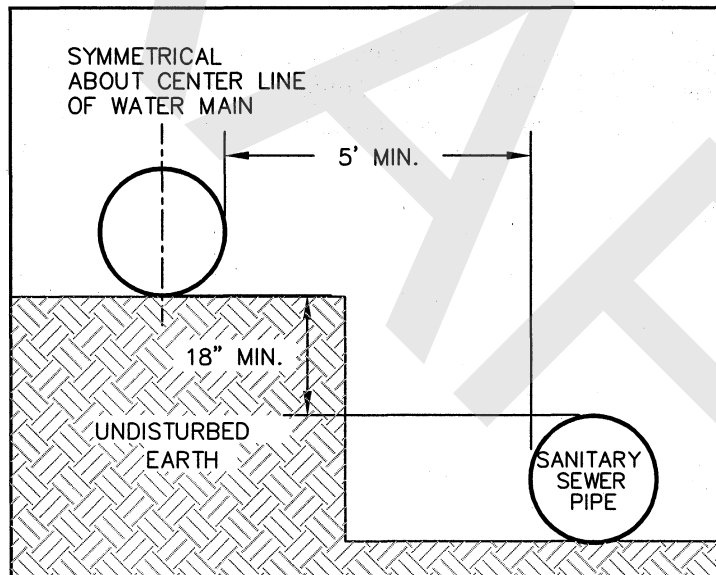
<b>TITLE</b>	<b>DRAWING</b>
Water Sewer Separation.....	WA-01
Connection to Existing Main .....	WA-02
Fire Hydrants .....	WA-03
Standard Valve Box .....	WA-04
Valve Marker Post & Hydrant Bollard Detail. ....	WA-05
Combination Air Vacuum/Air Release Valve .....	WA-06
2" Blowoff Assembly. ....	WA-07
Typical Installations with Minimum Clearances & Backflow Prevention Assemblies.....	WA-08
1 1/2" – 2" PVBA/SVBA Backflow Preventer.....	WA-09
Standard Reduced Pressure Backflow Assembly 3" or Larger .....	WA-10
Single Service Double Check Valve Assembly. W/FDC .....	WA-11
Typical 3/4" & 1" Water Service and Meter Setter Placement. ....	WA-12
1" Dual Water Service .....	WA-13
Typical 1 1/2" – 2" Water Service and Meter Setter Placement .....	WA-14
Standard Plumbing Configuration for 3" & 4" Meters.....	WA-15
Large Meter Vault .....	WA-16
Standard Thrust Blocking Detail. ....	WA-17
Standard Thrust Block Areas. ....	WA-18
Thrust Loads. ....	WA-19
Water Quality Sampling Station. ....	WA-20
Water Testing – Charging & Flushing.....	WA-21



# THURSTON COUNTY WATER STANDARD DETAIL



REQUIRED SEPERATION BETWEEN WATER LINES  
AND SANITARY SEWERS, PARALLEL CONSTRUCTION.



REQUIRED SEPERATION BETWEEN WATER LINES  
AND SANITARY SEWERS, UNUSUAL CONDITIONS  
PARALLEL CONSTRUCTION.

NOTE:

SOURCE; CRITERIA FOR SEWAGE WORKS DESIGN  
STATE OF WASHINGTON DEPARTMENT OF ECOLOGY  
DECEMBER 1998 EDITION.

SITUATIONS NOT ADDRESSED ABOVE SHALL FOLLOW THE CRITERIA AS OUTLINED  
IN THE ABOVE MENTIONED DOCUMENT, MOST CURRENT EDITION.

## WATER SEWER SEPARATION

APPR. DATE:

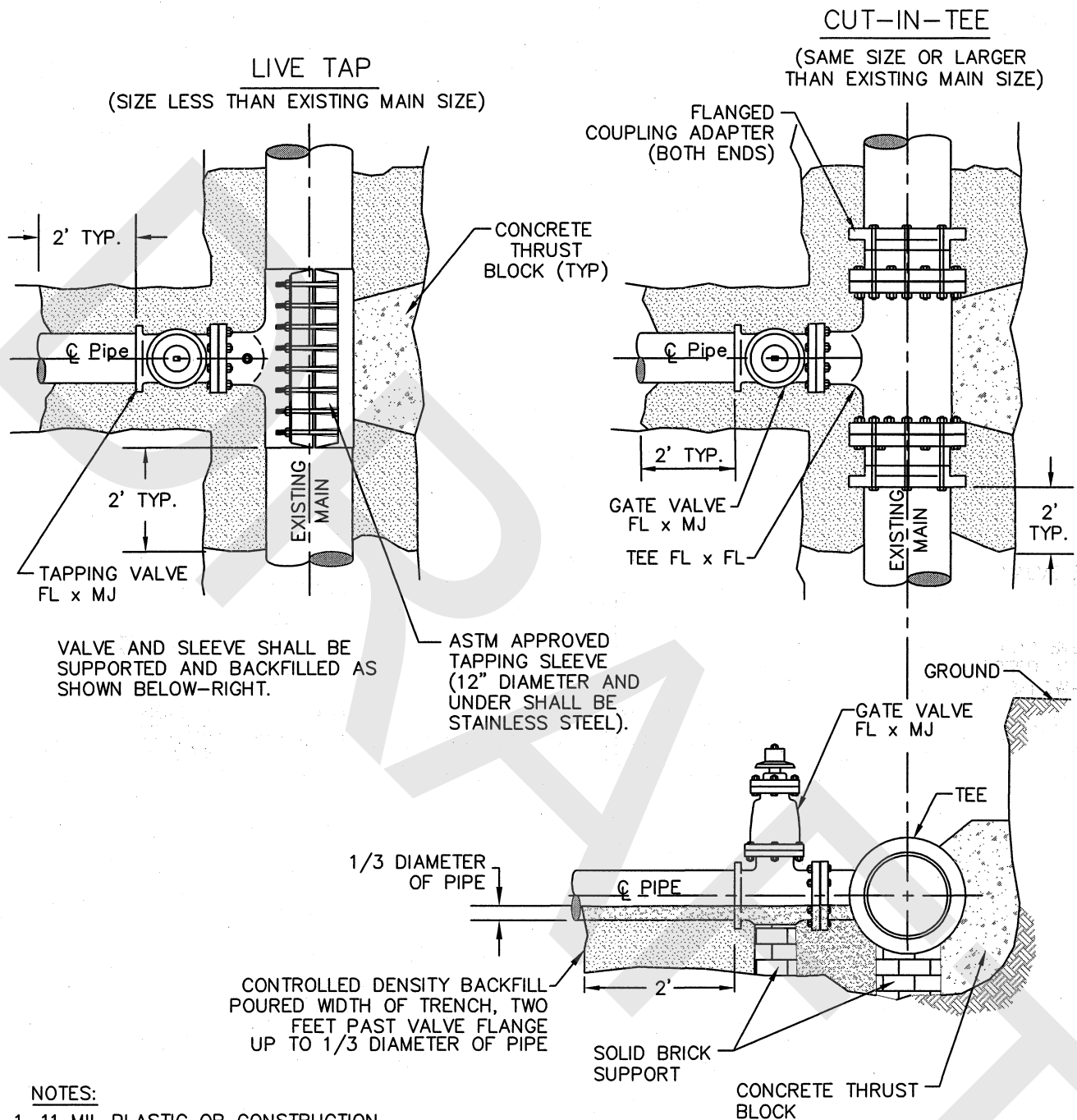
REFER:

FIG NO:

WA-01



# THURSTON COUNTY WATER STANDARD DETAIL



## NOTES:

1. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND BACKFILL ARE POURED.
2. CONTROLLED DENSITY BACKFILL IS A PLANT MIX CONSISTING OF : 3100# SAND, 450# WATER, AND ONE SACK (94#) OF CEMENT.
3. MJ CUT IN TEES SHALL NOT BE PERMITTED.
4. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.

N.T.S.

## CONNECTION TO EXISTING MAIN

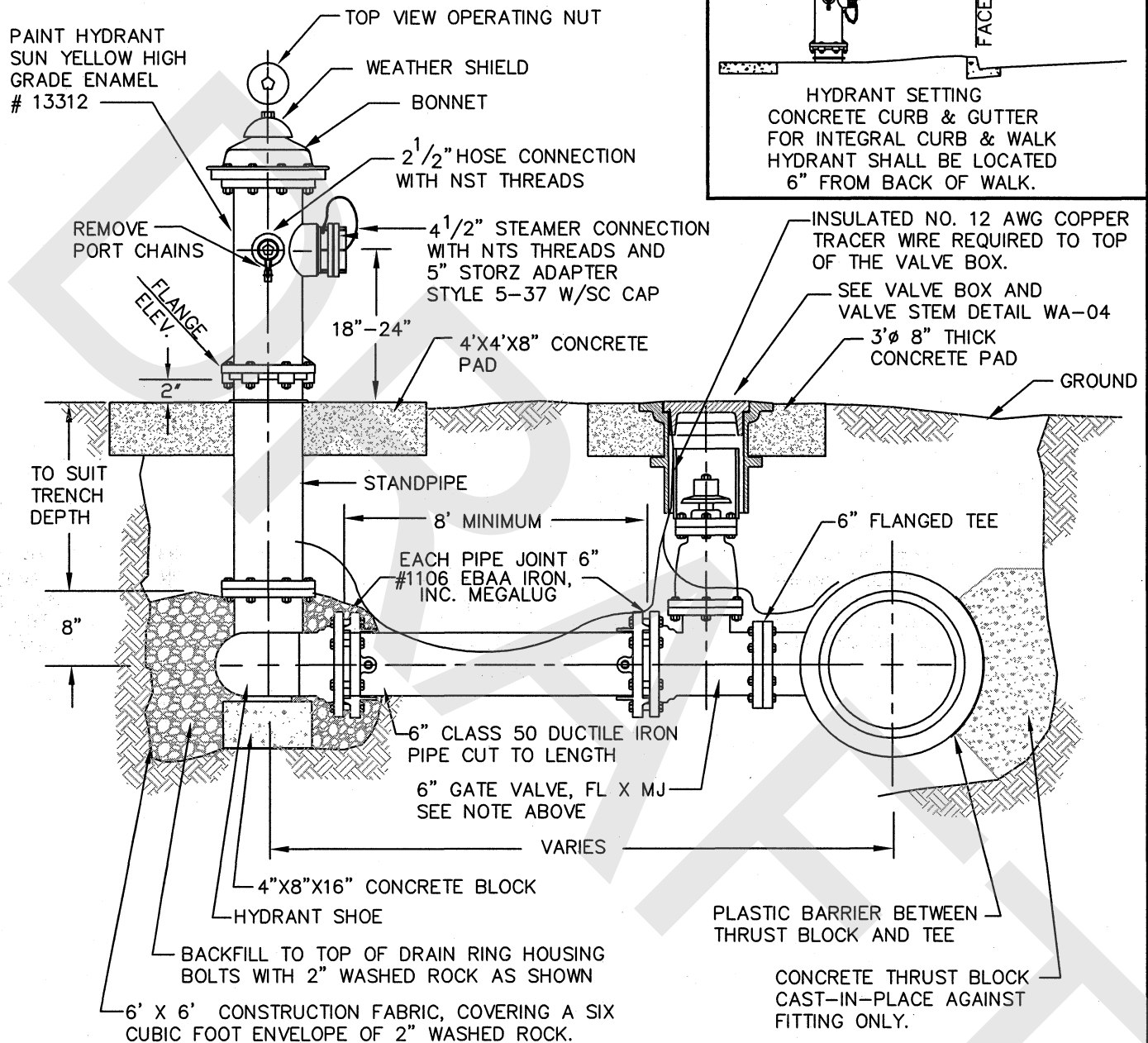
APPR. DATE:

FIG NO:

WA-02



# THURSTON COUNTY WATER STANDARD DETAIL



1. HYDRANTS SHALL BE LOCATED WITH A MINIMUM THREE FOOT RADIUS UNOBSTRUCTED WORKING AREA PROVIDED AROUND ALL HYDRANTS. FOUR GUARDPOSTS TO BE INSTALLED IN UNPROTECTED AREAS
2. HYDRANT SHALL BE MUELLER CENTURION OR CLOW F-2500.

3. GATE VALVES SHALL BE RESILIENT WEDGE NRS WITH O-RING SEALS. VALVE ENDS SHALL BE MECHANICAL JOINT BY ANSI FLANGES. VALVES SHALL CONFORM TO AWWA 509-80 VALVES SHALL BE MUELLER, M & H OR AMERICAN FLOW CONTROL SERIES 500.
4. THURSTON COUNTY MAY REQUIRE HYDRANTS TO BE PROTECTED BY BOLLARDS. (REF. WA-05)

N.T.S.

## FIRE HYDRANT

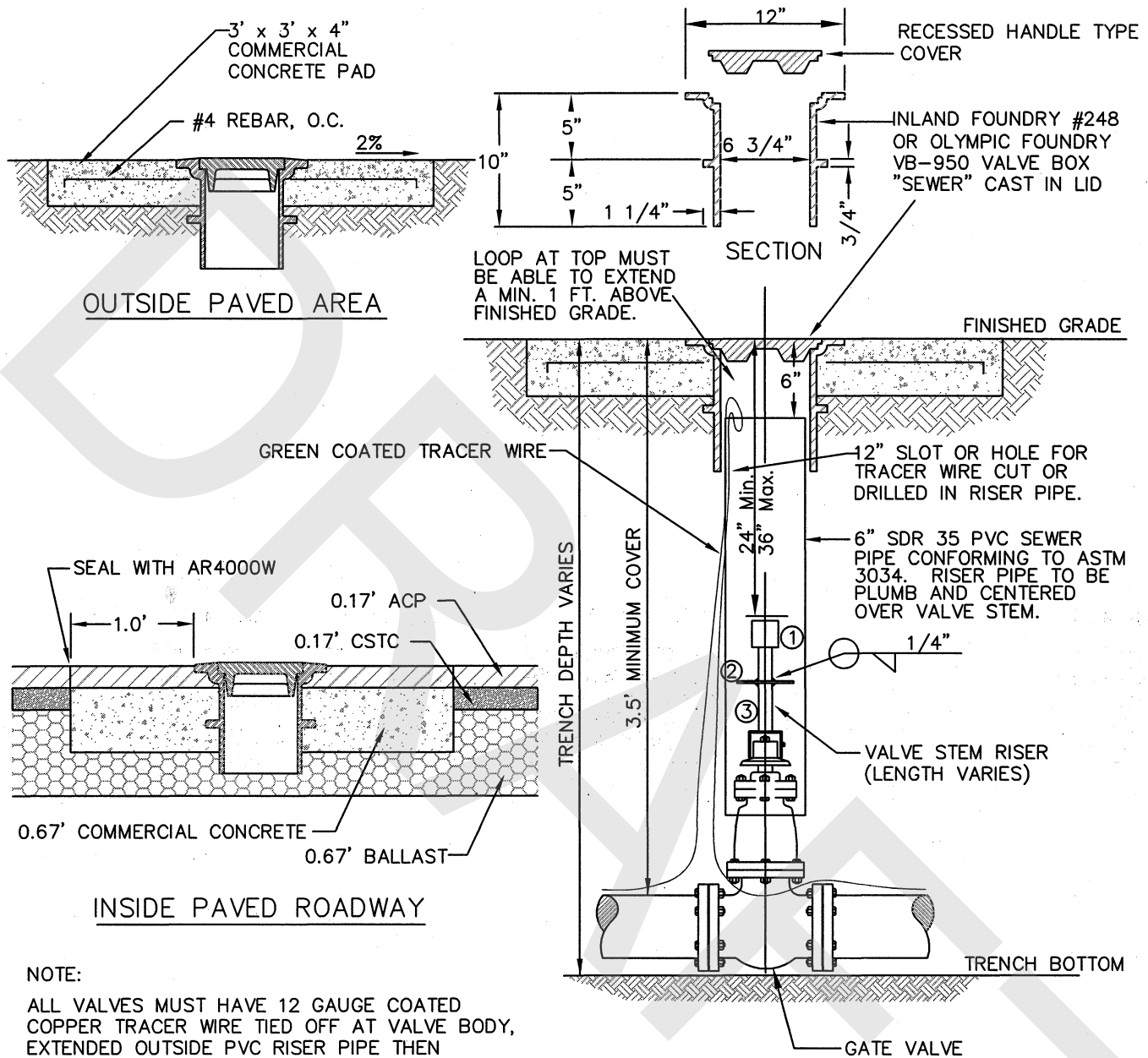
APPR. DATE:

FIG NO:

WA-03



# THURSTON COUNTY WATER STANDARD DETAIL



## VALVE STEM EXTENSION LEGEND

- ① VALVE OPERATING NUT OR 1 7/8" X 1 7/8" X 2" HIGH GRADE STEEL WELDED TO GUIDE PLATE.
- ② 3/16" THICK X 5 1/5" DIA STEEL GUIDE PLATE WELDED TO RISER SHAFT.
- ③ 2"X2"X 3/16" SQUARE STRUCTURAL STEEL TUBING TO FIT OPERATING NUT. LENGTH AS REQUIRED.

### NOTE:

ALL WELDS TO SHAFT SHALL BE FILLET WELD ALL AROUND, AS SPECIFIED ABOVE

## STANDARD VALVE BOX

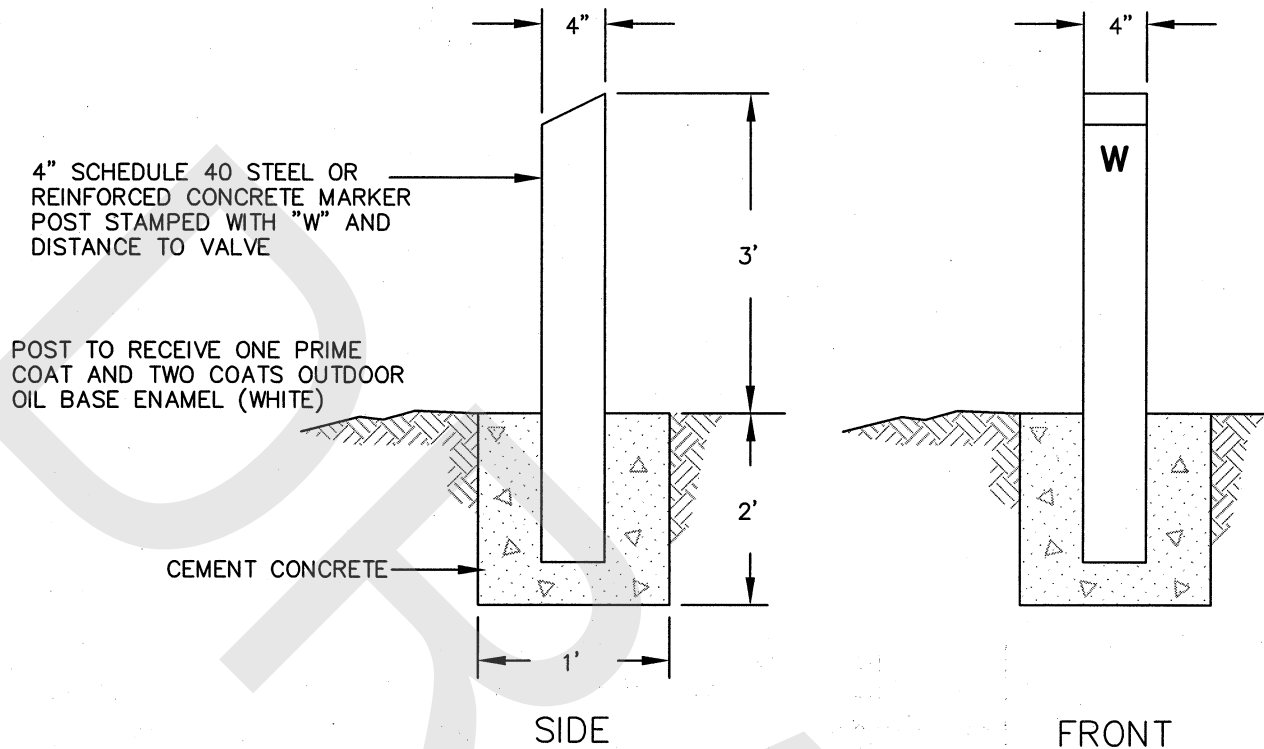
APPR. DATE:

FIG NO:

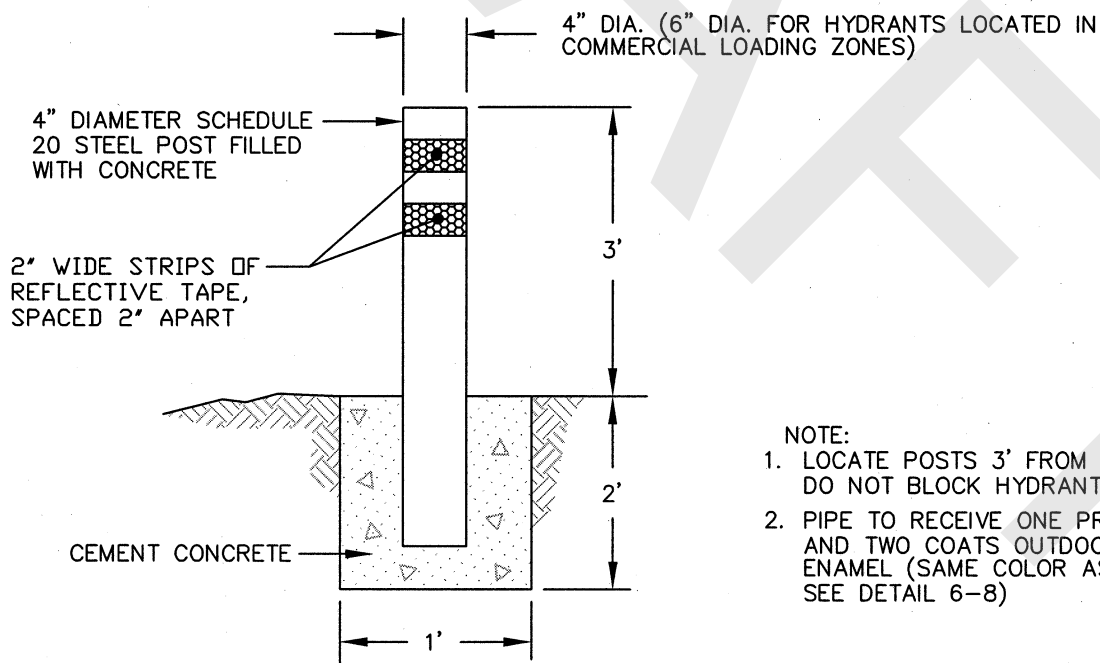
WA-04



# THURSTON COUNTY WATER STANDARD DETAIL



VALVE MARKER POST



HYDRANT BOLLARD

NOTE:

1. LOCATE POSTS 3' FROM HYDRANT DO NOT BLOCK HYDRANT PORTS
2. PIPE TO RECEIVE ONE PRIME COAT AND TWO COATS OUTDOOR OIL BASE ENAMEL (SAME COLOR AS HYDRANT-SEE DETAIL 6-8)

N.T.S.

## VALVE MARKER POST & HYDRANT BOLLARD DETAIL

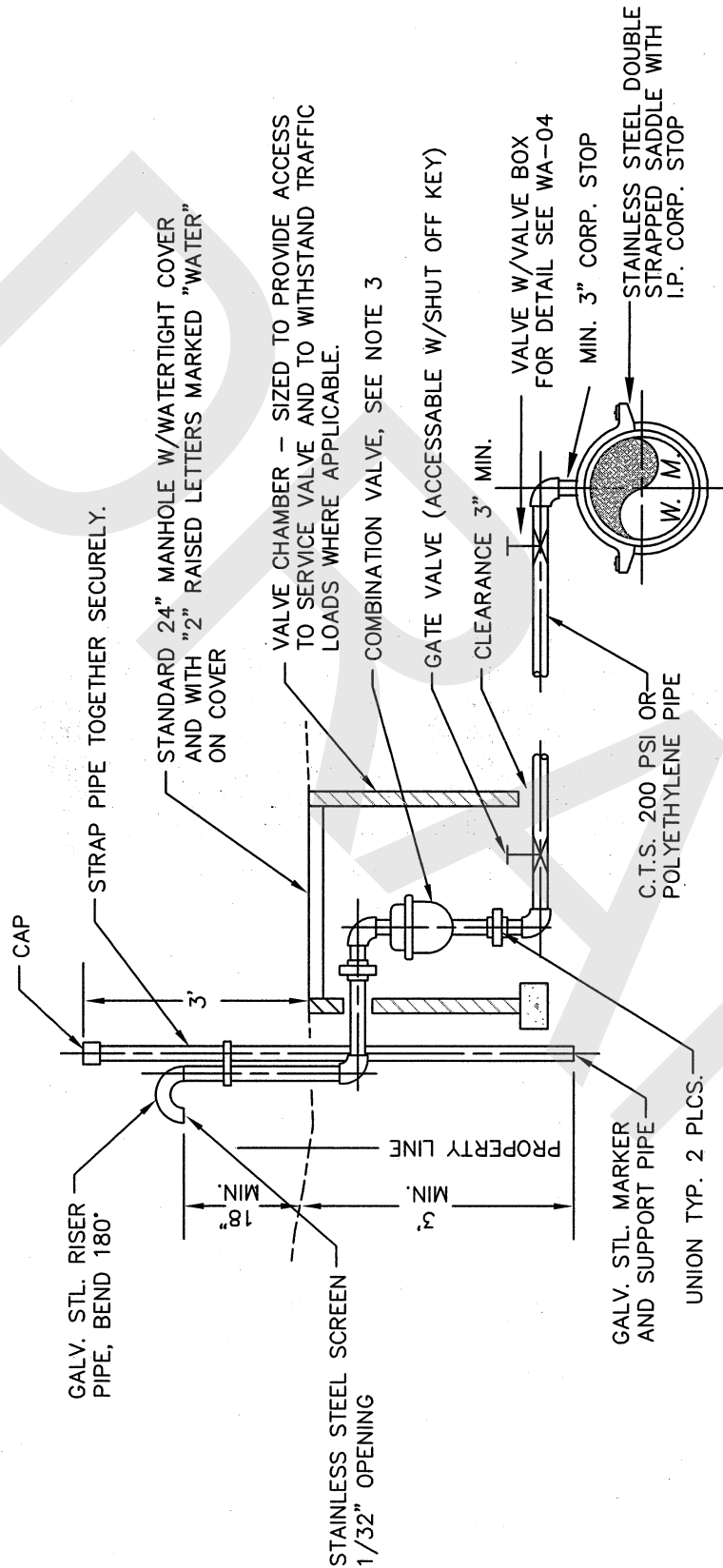
APPR. DATE:

FIG NO:

WA-05



# THURSTON COUNTY WATER STANDARD DETAIL



## NOTES:

1. IF NOT SPECIFIED, SIZE OF PIPE TO BE SUBMITTED TO THURSTON COUNTY FOR APPROVAL
2. SUBMIT SHOP DRAWINGS OF VALVE CHAMBER FOR APPROVAL
3. COMBINATION A.V./A.R. VALVE SHALL BE VALMATIC 201-C OR EQUAL

## COMBINATION AIR VACUUM/AIR RELEASE VALVE

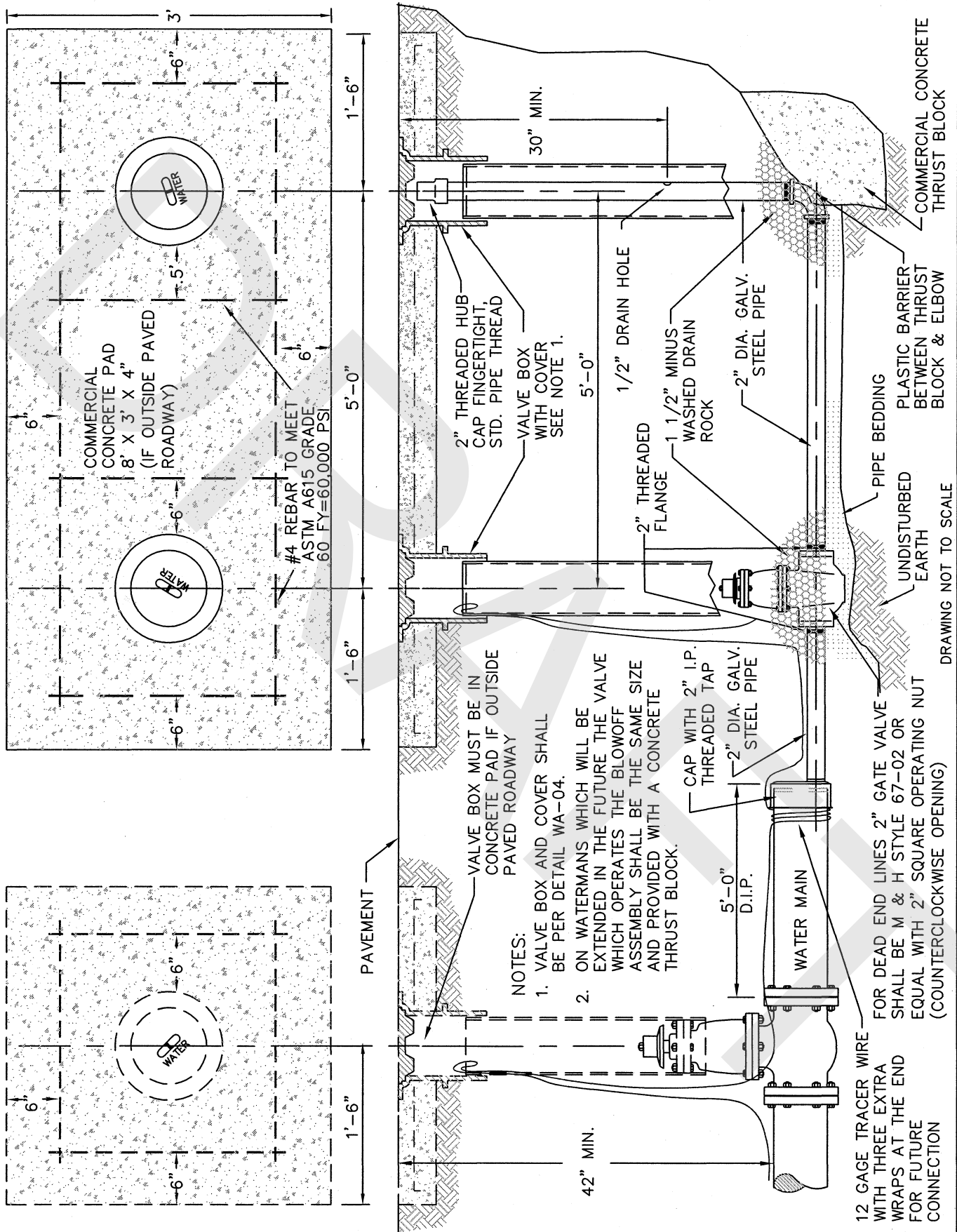
APPR. DATE:

FIG NO:

WA-06



# THURSTON COUNTY WATER STANDARD DETAIL



## 2"-BLOWOFF-ASSEMBLY

APPR. DATE:

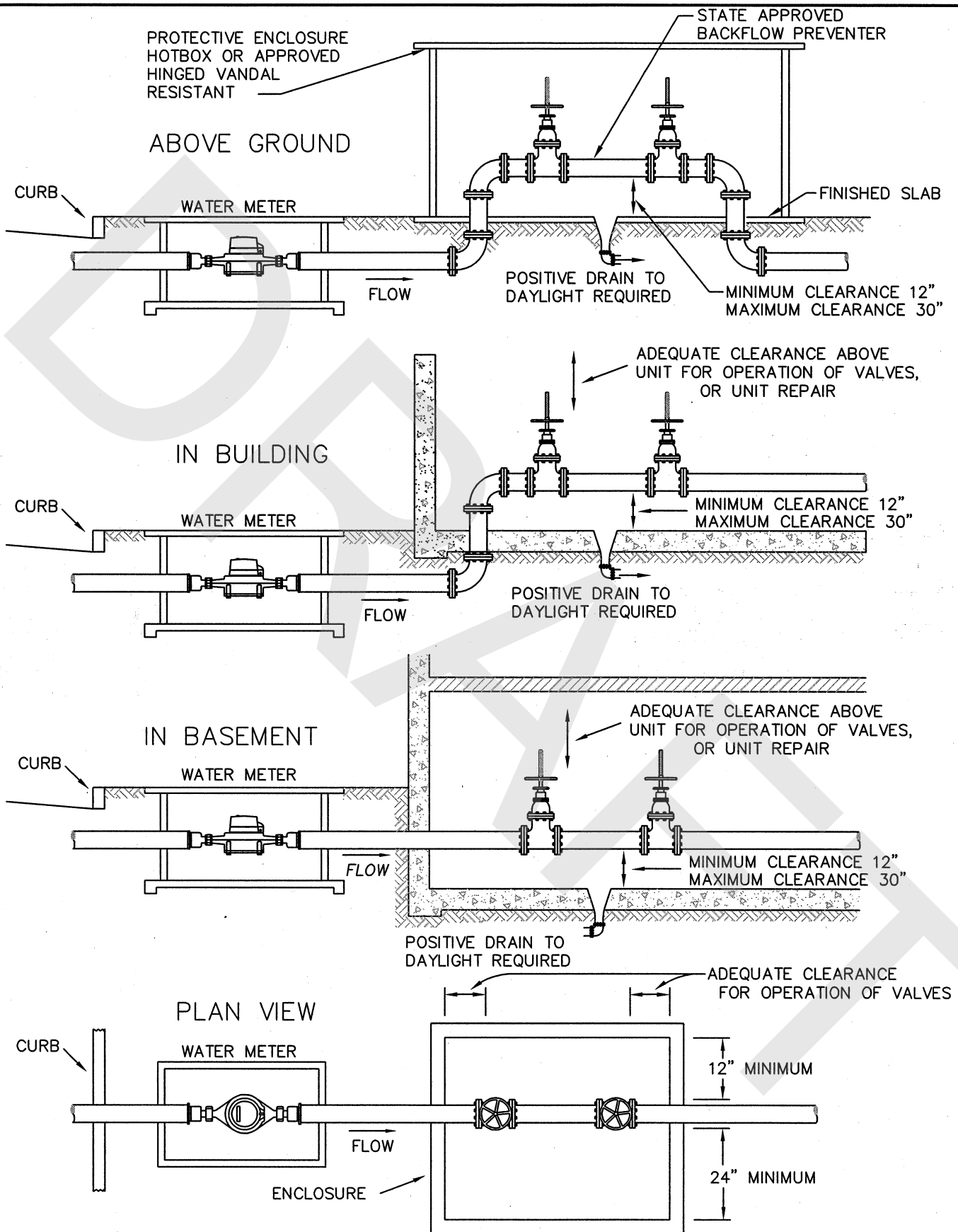
REF: CITY OF LACEY

FIG NO:

WA-07



# THURSTON COUNTY WATER STANDARD DETAIL



**TYPICAL INSTALLATION WITH MINIMUM CLEARANCE  
& BACKFLOW PREVENTION DEVICE ASSEMBLY**

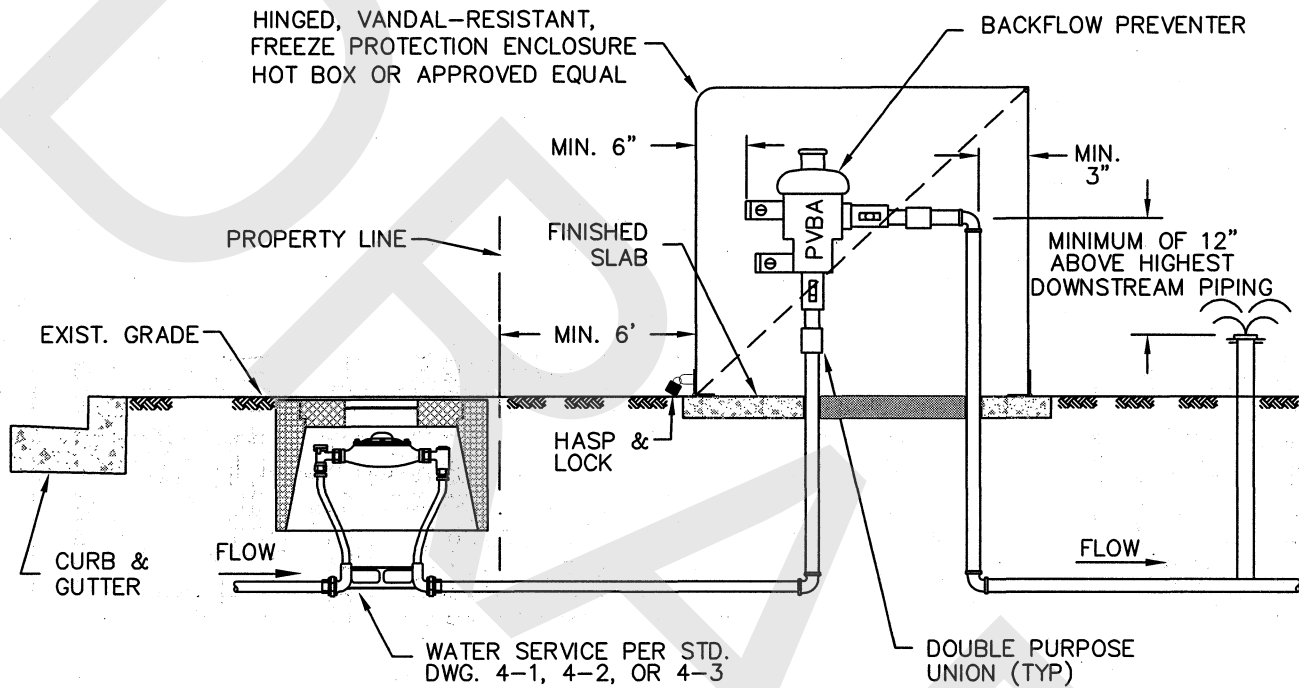
APPR. DATE:

FIG NO:

WA-08



# THURSTON COUNTY WATER STANDARD DETAIL



## NOTES:

1. BACKFLOW ASSEMBLY SHALL BE WASHINGTON STATE DEPT. OF HEALTH APPROVED MODEL.
2. THE BACKFLOW ASSEMBLY SHALL BE TESTED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE BY A CERTIFIED BACKFLOW ASSEMBLY TESTER. ANNUAL TESTING IS REQUIRED THEREAFTER. TEST RESULTS SHALL BE SENT TO THURSTON COUNTY DEPT. OF WATER AND WASTE MANAGEMENT.
3. ALL MATERIALS TO BE BRASS OR COPPER AS APPROVED BY THURSTON COUNTY.
4. THE BACKFLOW ASSEMBLY SHALL BE PROTECTED FROM FREEZING AND FLOODING.
5. FINISHED SLAB SHALL BE SLOPED TO DRAIN.
6. ALL VAULTS SHALL BE PRE-APPROVED PRIOR TO INSTALLATION.

N.T.S.

1/2"-2" PVBA/SVBA BACKFLOW PREVENTER

APPR. DATE:

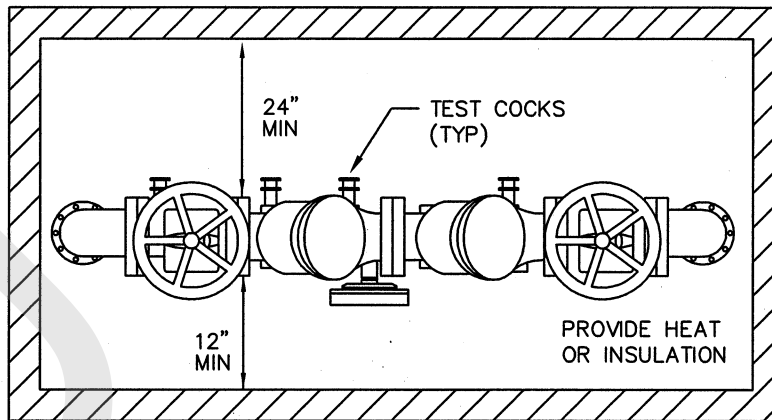
FIG NO:

WA-09

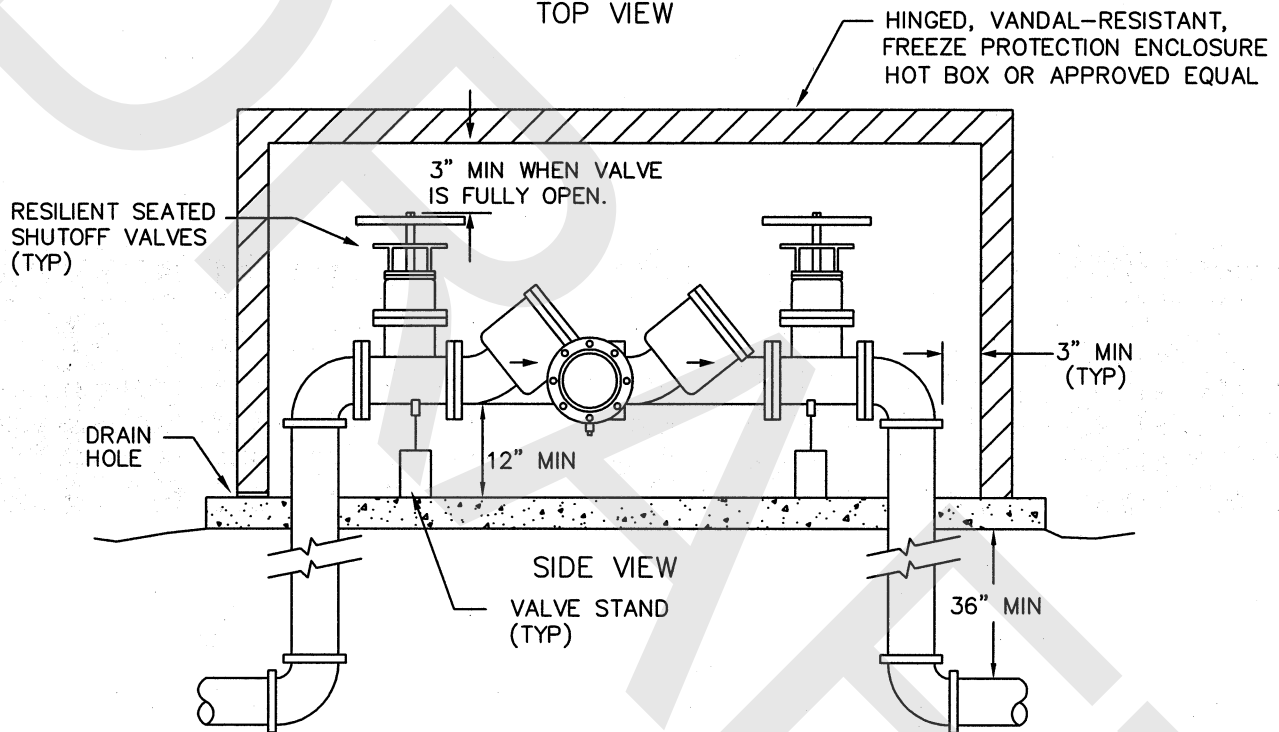


# THURSTON COUNTY WATER STANDARD DETAIL

A THURSTON COUNTY APPROVED VALVE IS REQUIRED BETWEEN THE SUPPLY MAIN AND THE ENCLOSURE.



TOP VIEW



SIDE VIEW  
VALVE STAND  
(TYP)

ABOVE GROUND INSTALLATION

## NOTES:

1. BACKFLOW ASSEMBLY SHALL BE A WASHINGTON STATE DEPT. OF HEALTH APPROVED MODEL.
2. APPROVED BACKFLOW ASSEMBLY TO LAY HORIZONTAL ONLY.
3. THE BACKFLOW ASSEMBLY SHALL BE TESTED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE BY A CERTIFIED BACKFLOW ASSEMBLY TESTER. ANNUAL TESTING IS REQUIRED THEREAFTER. TEST RESULTS SHALL BE SENT TO THURSTON COUNTY DEPT. OF WATER AND WASTE MANAGEMENT.
4. ALL PIPE, VALVE, AND FITTING JOINTS FROM THE SUPPLY MAIN, SHALL BE FLANGED AND RESTRAINED.
5. THE WATER LINE SHALL BE DISINFECTED, FLUSHED, AND PRESSURE TESTED PRIOR TO INSTALLING THE BACKFLOW ASSEMBLY.
6. THE BACKFLOW ASSEMBLY SHALL BE PROTECTED FROM FREEZING AND FLOODING.
7. SEAL PIPE ENTRANCE AND EXIT, THROUGH ENCLOSURE, SO AS TO BE WATER TIGHT.
8. ALL ENCLOSURES SHALL BE PRE-APPROVED BY THE COUNTY, PRIOR TO INSTALLATION.
9. ENCLOSURES SHALL BE INSTALLED AT PROPERTY LINE ON OWNERS SIDE.
10. ENCLOSURES SHALL HAVE A MINIMUM OF 3' CLEARANCE FROM ALL STRUCTURES.
11. VALVE STANDS SHALL BE INSTALLED ACCORDING TO MANUFACTURERS RECOMMENDATIONS.
12. TEST COCKS SHALL BE LOCATED SO AS TO FACILITATE ACCESS.

N.T.S.

## STANDARD REDUCED PRESSURE BACKFLOW ASSEMBLY 3" OR LARGER

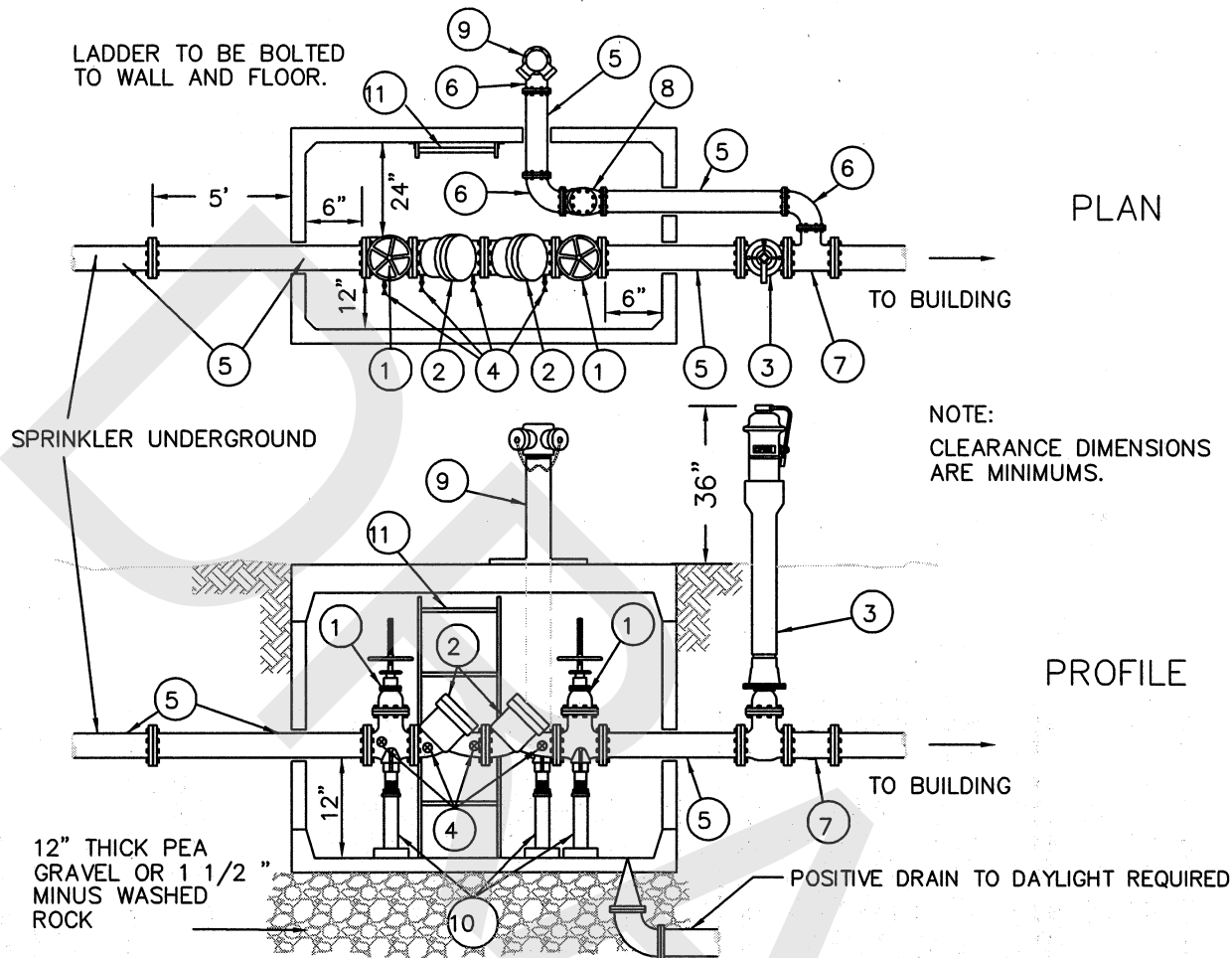
APPR. DATE:

FIG NO:

WA-10



# THURSTON COUNTY WATER STANDARD DETAIL



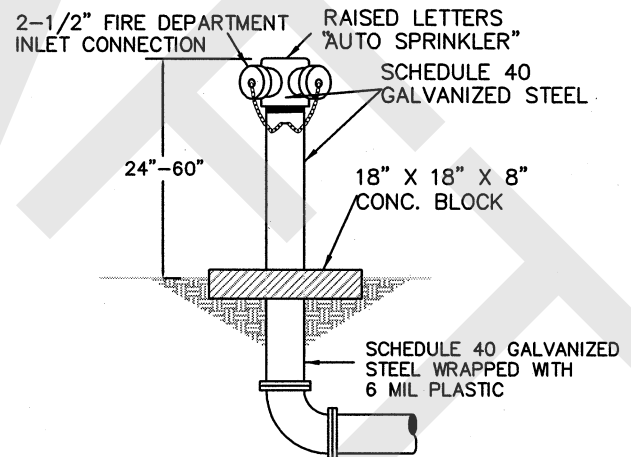
## MATERIAL LIST:

1. OS&Y GATE VALVE W/HANDWHEEL FL X FL
2. DSHS APPROVED CHECK VALVE FL X FL
3. POST INDICATOR VALVE
4. TEST COCK - 4 REQUIRED
5. CLASS 52 DI WALL PIPE FL X FL
6. CLASS 52 DI 90° BEND FL X FL
7. CLASS 52 DI TEE FL X FL
8. SWING CHECK VALVE W/BALL DRIP ASSEMBLY
9. FIRE DEPARTMENT CONNECTION
10. VALVE STANDS
11. LADDER

## GENERAL NOTES:

1. THOROUGHLY FLUSH LINES PRIOR TO INSTALLING BACK FLOW ASSEMBLY.
2. PIPE FROM VAULT TO BUILDING SHALL BE CLASS 52 DI.
3. TAMPER SWITCHES SHALL BE INSTALLED ON 1 AND 3 CONNECTED TO BUILDING FIRE ALARM SYSTEM.
4. WHERE PIPING PASSES THROUGH CONCRETE WALL PROVIDE 2" CLEARANCE W/ WATERPROOF MASTIC OR FLEXIBLE SEALANT
5. DIAMETER OF PIPE AND FITTINGS TO BE DETERMINED BY CERTIFIED SPRINKLER DESIGNER.

## FIRE DEPARTMENT CONNECTION



6. ALL PIPING SHALL BE A MINIMUM OF 4" DIA. AS PER NFPA13.
7. ALL VAULTS SHALL BE EQUIPPED WITH A DRAIN TO DAYLIGHT OR BE INSTALLED ABOVE GROUND.
8. ALL FIRE SPRINKLER LINES UP TO THE FIRST VALVE ON THE DCVA SHALL BE DISINFECTED, PRESSURE TESTED, FLUSHED AND TESTED FOR PURITY PER

## SINGLE SERVICE DOUBLE CHECK VALVE ASSEMBLY W/FDC

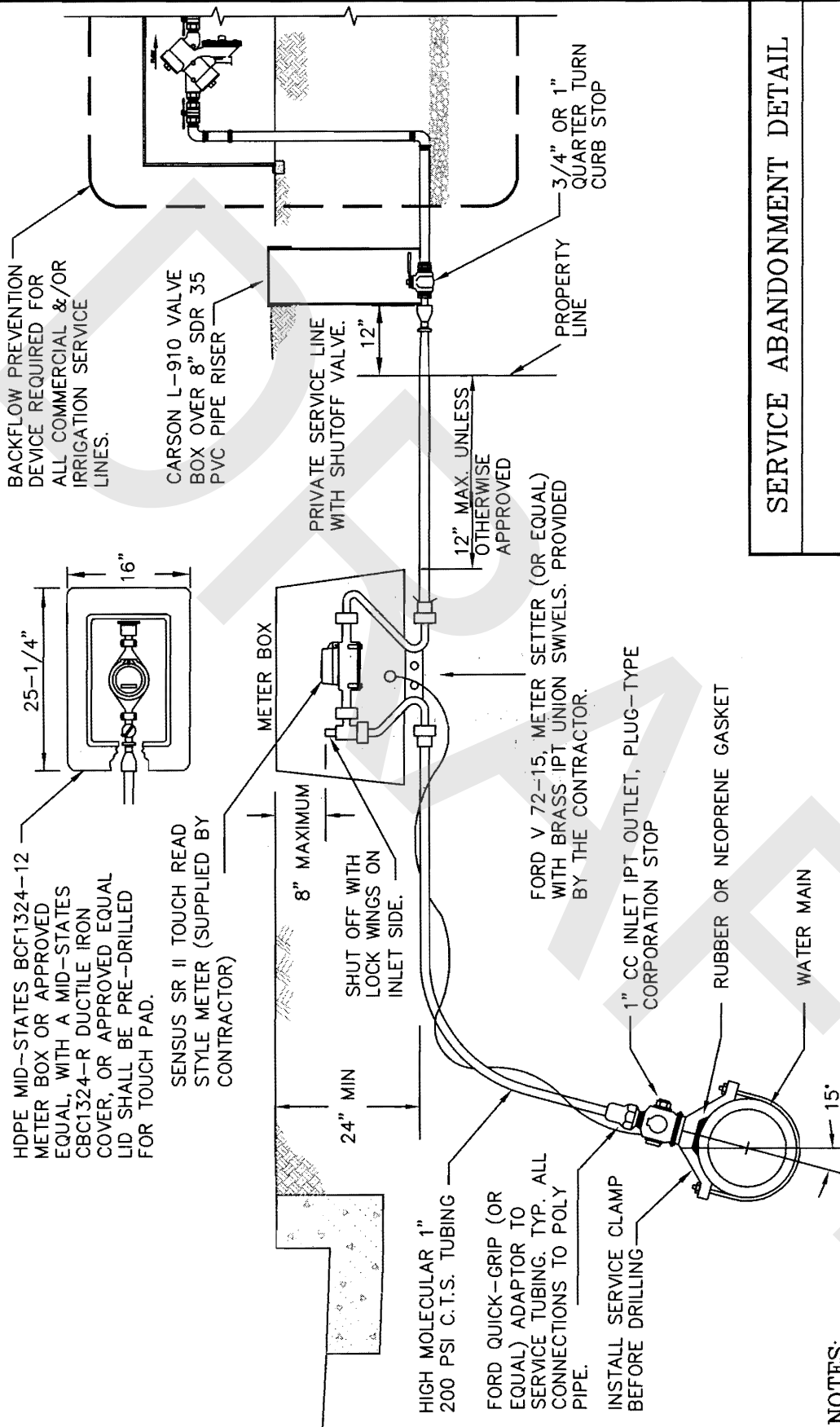
APPR. DATE:

FIG NO:

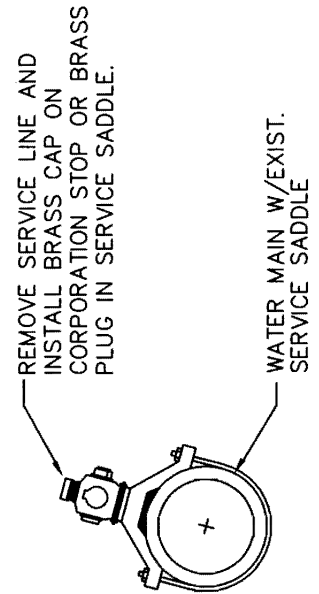
WA-11



# THURSTON COUNTY WATER STANDARD DETAIL



## SERVICE ABANDONMENT DETAIL



### NOTES:

- 1) SERVICE CLAMPS SHALL BE DOUBLE STRAP. DIRECT TAPS ARE NOT ALLOWED.
- 2) DOUBLE-INSULATED No. 12 AWG COPPER TRACER WIRE SPLICED TO MAINLINE TRACER WIRE W/DIRECT BURY SPLICING KIT REQ'D ON ALL SERVICE LINES.
- 3) ALL SERVICE LINE FITTINGS SHALL BE BRASS.
- 4) METER BOX LID MUST ACCOMMODATE TOUCH PAD. SPECIAL LIDS MAY BE REQUIRED.
- 5) ANGLE CHECK VALVE REQUIRED ON ALL WATER METER OUTLETS

## TYPICAL 3/4" & 1" WATER SERVICE AND METER SETTER PLACEMENT

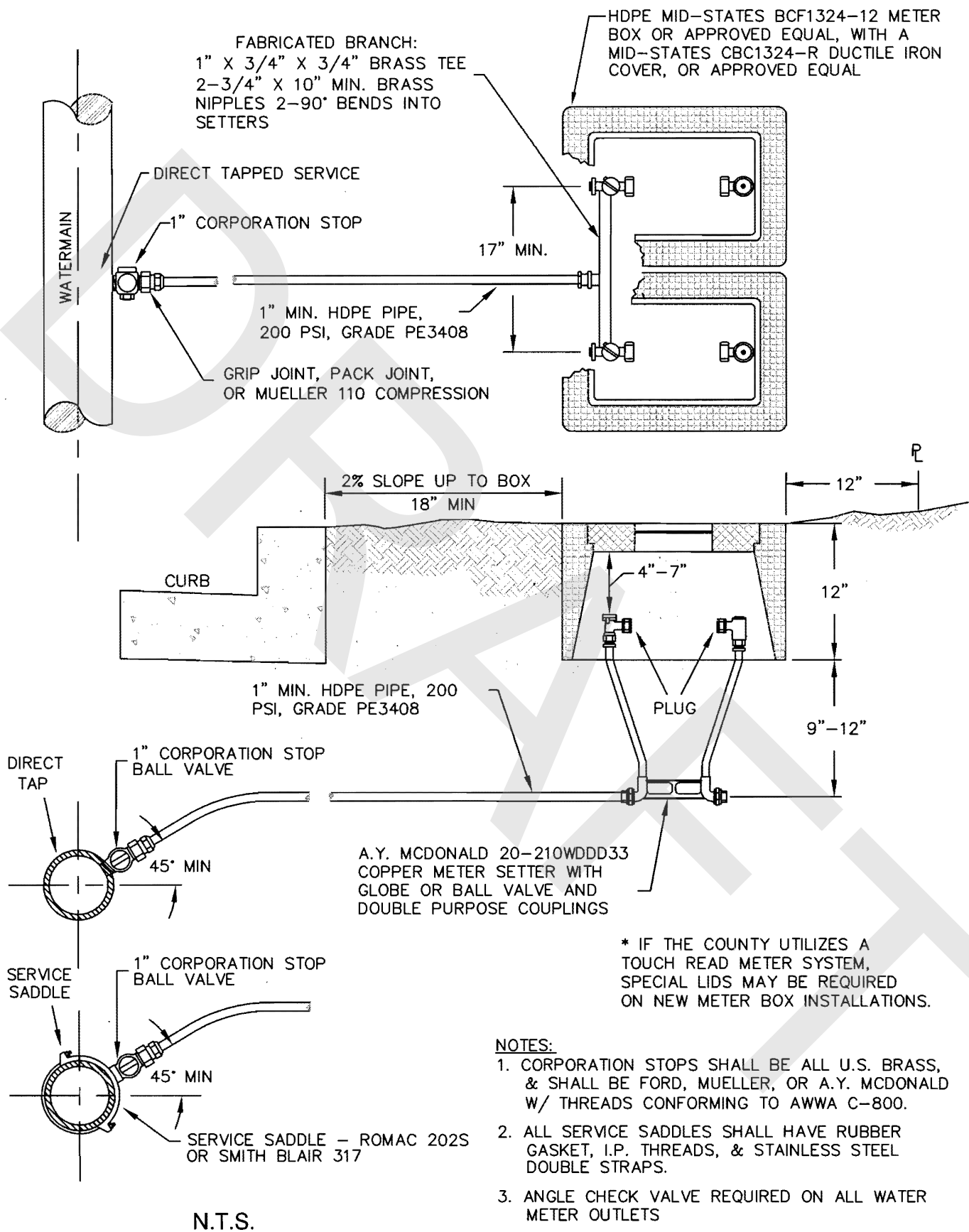
APPR. DATE:

FIG NO:

WA-12



# THURSTON COUNTY WATER STANDARD DETAIL



## 1" DUAL WATER SERVICE

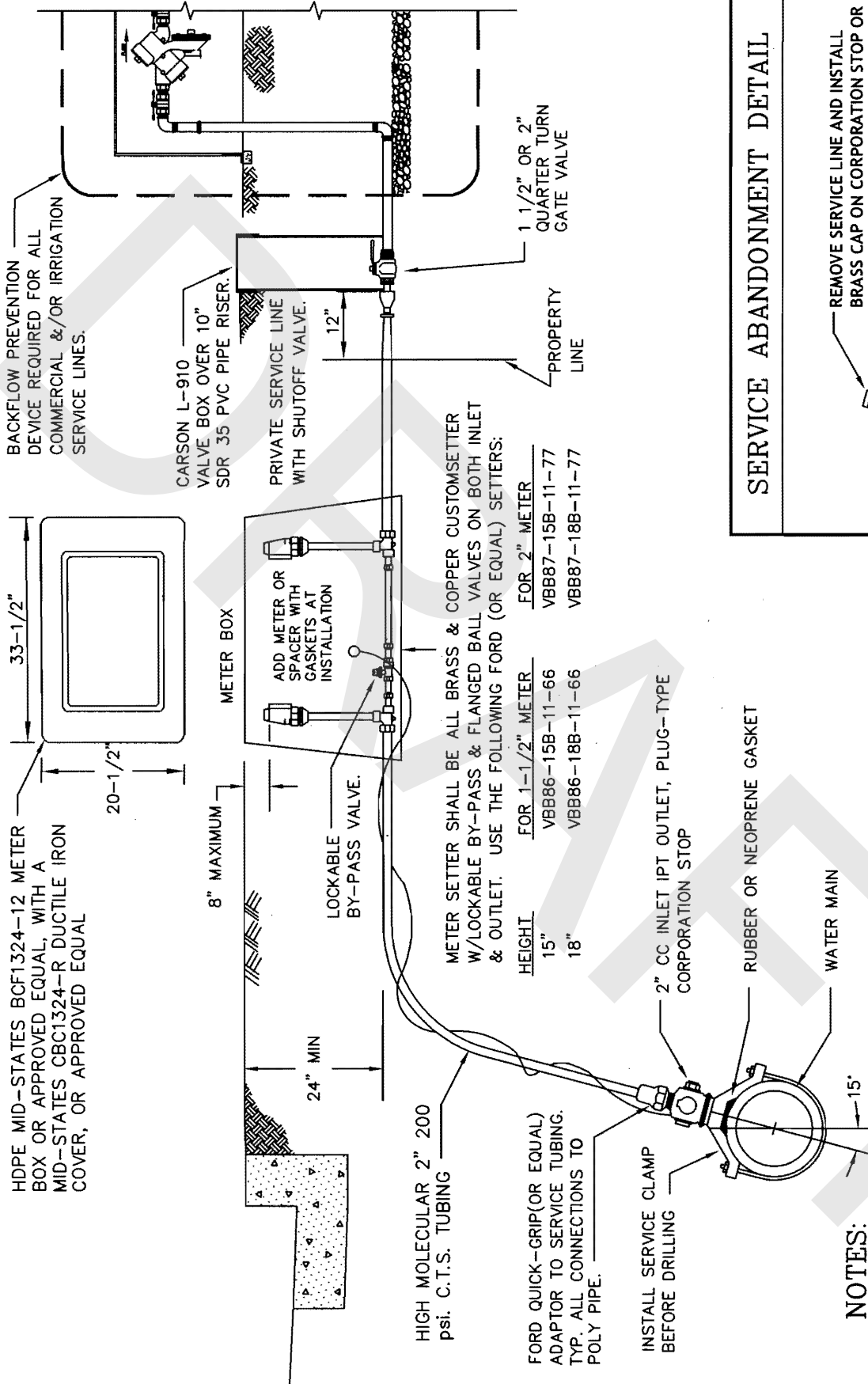
APPR. DATE:

FIG NO:

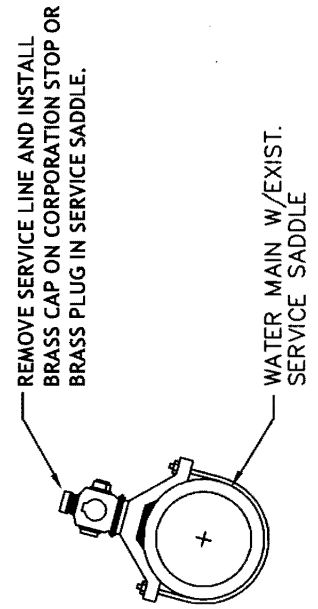
WA-13



# THURSTON COUNTY WATER STANDARD DETAIL



## SERVICE ABANDONMENT DETAIL



## TYPICAL 1-1/2" & 2" WATER SERVICE & METER SETTER PLACEMENT

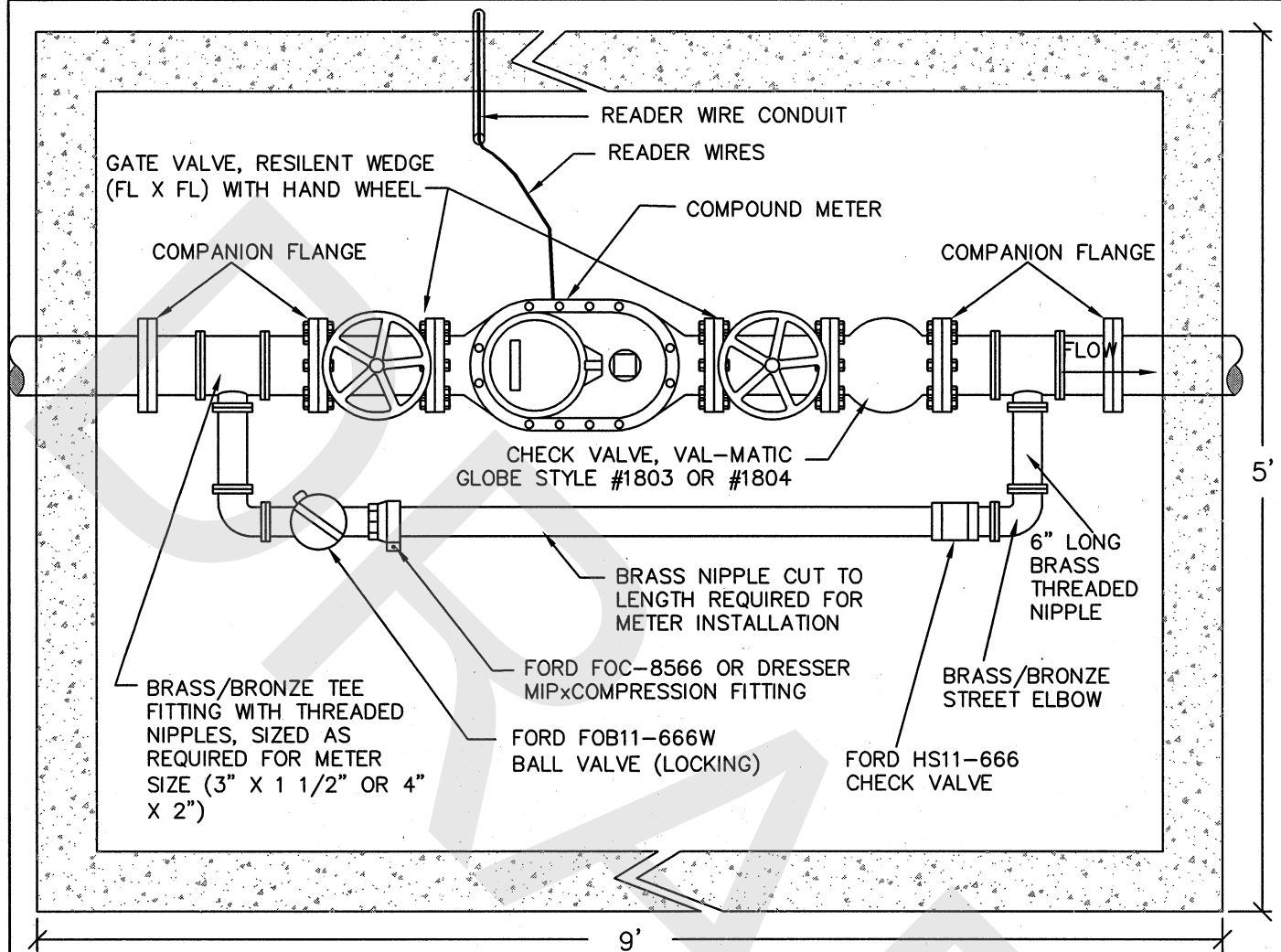
APPR. DATE:

FIG NO:

WA-14



# THURSTON COUNTY WATER STANDARD DETAIL



PLAN VIEW

## GENERAL NOTES:

1. 3" METERS SHALL HAVE 3" PLUMBING AND 1 1/2" BYPASS PLUMBING.
2. 4" METERS SHALL HAVE 4" PLUMBING AND 2" BYPASS PLUMBING.
3. A MINIMUM OF 10 PIPE DIAMETERS OF STRAIGHT UNOBSTRUCTED PIPE SHALL BE REQUIRED UPSTREAM OF THE INSTALLED METER.
4. THE METER BOX PIT SHALL BE BEDDED WITH 6" DEPTH OF CRUSHED ROCK.
5. USE CONCRETE UTILITY VAULT SIZED ACCORDINGLY WITH TRAFFIC RATED HINGED ACCESS HATCH(S) AND READER LID. VAULT SHALL HAVE CONCRETE BOTTOM WITH DRAIN HOLE. INSIDE DEPTH SHALL NOT EXCEED 4'.
6. BYPASS AND GLOBE STYLE CHECK VALVE NOT REQUIRED FOR IRRIGATION ONLY INSTALLATION.
7. ALL PLUMBING SHALL BE SUPPORTED BY ADJUSTABLE JACK STANDS. THESE STANDS SHALL BE PLACED IN FOUR LOCATIONS TO PROVIDE THE INSTALLATION WITH A FIRM SUPPORT.
8. REMOTE READER ABOVE GROUND BOX SHALL BE INSTALLED. ALLIED MOLDED PRODUCTS # 1056 W/ READER WINDOW.
9. REMOTE METER READER BOX SHALL BE MOUNTED A MIN. 3' ABOVE GROUND ON A 1-1/2" GALVANIZED UNISTRUT POST SET IN CONCRETE.
10. INSTALL 3/4" PVC ELECTRICAL CONDUIT FROM METER VAULT TO REMOTE READER BOX.

## STANDARD PLUMBING CONFIGURATION FOR 3" & 4" METERS

APPR. DATE:

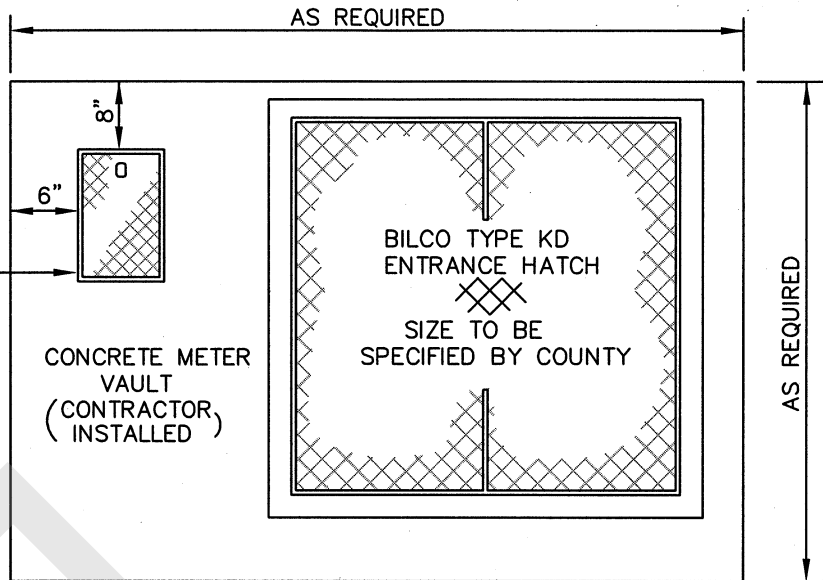
FIG NO:

WA-15



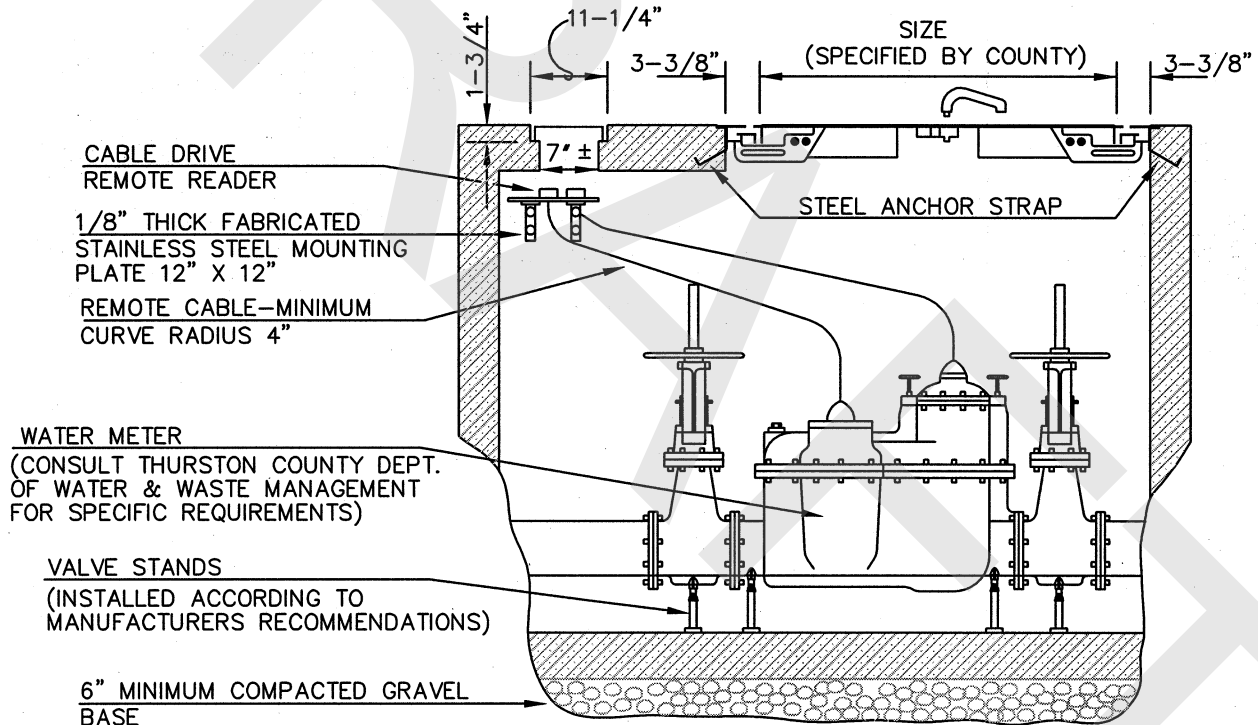
# THURSTON COUNTY WATER STANDARD DETAIL

TRAFFIC COVER  
BROOKS #37-T  
(OR APPROVED EQUAL)



PLAN VIEW

N.T.S.



ELEVATION VIEW

N.T.S.

NOTES:

- 1—VAULT SHALL BE DESIGNED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF WASHINGTON
- 2—MOUNTING PLATE TO BE INSTALLED BY CONTRACTOR SO THAT ALL READING REGISTERS ARE VISIBLE THROUGH TRAFFIC COVER, AND CABLE(S) DO NOT INTERFERE WITH ACCESS TO METER.

N.T.S.

## LARGE METER VAULT

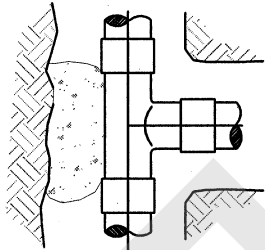
APPR. DATE:

FIG NO:

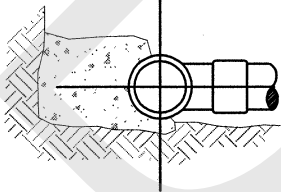
WA-16



# THURSTON COUNTY WATER STANDARD DETAIL

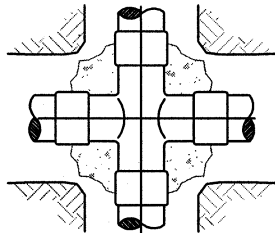


TOP VIEW

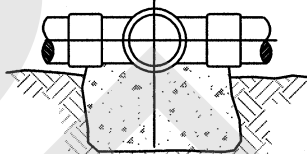


SIDE VIEW

TEE

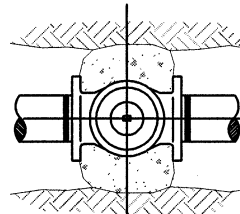


TOP VIEW

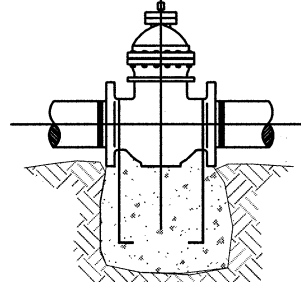


SIDE VIEW

CROSS

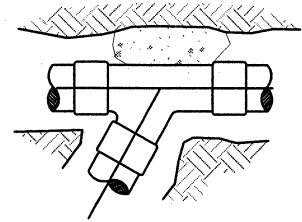


TOP VIEW

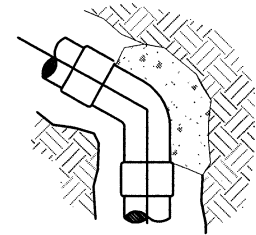


SIDE VIEW

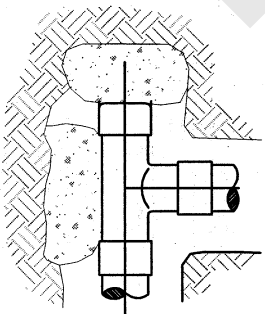
GATE VALVE



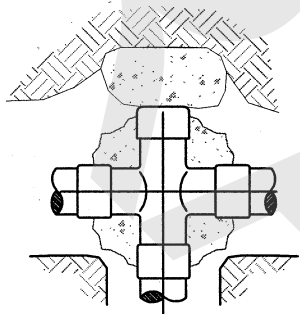
WYE



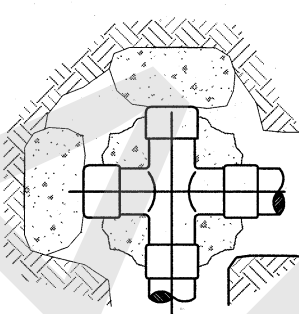
HORIZ. BEND



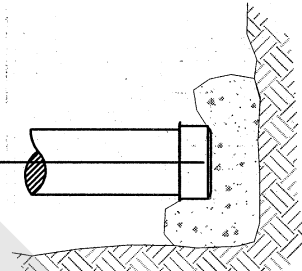
TEE WITH  
PLUG



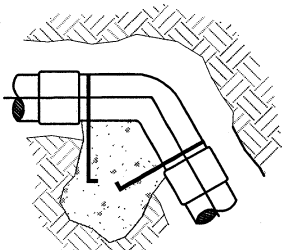
CROSS WITH  
PLUG



CROSS WITH  
PLUGS



PLUG OR CAP



45° - 90°  
VERTICAL BEND

## NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. 11 MIL PLASTIC BARRIER SHALL BE PLACED BETWEEN ALL CONC THRUST BLOCKS & FITTINGS.
3. ANCHOR REBAR SHALL BE #5 ON 12" DIA AND LESS IMBEDDED 30", #5 ON 16"-24" DIAMETER IMBEDDED 36".
4. PLUGS TO BE MINIMUM OF 5' FROM TEE, WYE, CROSS ON VALVE.

## STANDARD BLOCKING DETAIL

APPR. DATE:

FIG NO:

WA-17



# THURSTON COUNTY WATER STANDARD DETAIL

## NOTES:

1. BLOCKING SHALL BE CEMENT CONCRETE CLASS "B" POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 11 MIL PLASTIC OR SIMILAR MATERIAL.
2. KEEP CONCRETE CLEAR OF JOINTS AND ACCESSORIES.
3. THE REQUIRED THRUST BEARING AREAS FOR SPECIAL CONNECTIONS ARE SHOWN ENCIRCLED ON THE PLANS; e.g. (15) INDICATES 15 SQUARE FEET BEARING AREA REQUIRED.
4. IF NOT SHOWN ON PLANS REQUIRED BEARING AREAS AT FITTINGS SHALL BE PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIAL SPECIFICATIONS.
5. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAIL.

## BEARING AREA OF THRUST BLOCKS IN SQ. FT.

FITTING SIZE	TEE, WYE PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN A <sub>1</sub>   A <sub>2</sub>		45° BEND	22-1/2° BEND	11-1/4° BEND
4"	1.0	1.4	1.9	1.4	1.0		
6"	2.1	3.0	4.3	3.0	1.6	1.0	
8"	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10"	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12"	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14"	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16"	15.0	21.3	30.0	21.3	11.6	6.0	3.0
12"	19.0	27.0	38.0	27.0	14.6	7.6	3.8
14"	23.5	33.0	47.0	33.0	18.1	9.4	4.7
16"	34.0	48.0	68.0	48.0	26.2	13.6	6.8

## NOTE:

ABOVE BEARING BASED ON TEST PRESSURE OF 150 psi AND AN ALLOWABLE SOIL BEARING STRESS OF 2,00 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURE AND SOIL BEARING STRESSES. USE STANDARD PLAN WA-16

## THRUST BLOCK AREAS

APPR. DATE:

FIG NO:

WA-18



# THURSTON COUNTY WATER STANDARD DETAIL

## THRUST LOADS

THRUST AT FITTINGS IN POUNDS AT 200 POUNDS PER SQUARE INCH OF WATER PRESSURE

PIPE DIAMETER	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
4"	3,600	2,000	1,000	500	2,600
6"	8,000	4,400	2,300	1,200	5,700
8"	14,300	7,700	4,000	2,000	10,100
10"	22,300	12,100	6,200	3,100	15,800
12"	32,000	17,400	8,900	4,500	22,700
14"	43,600	23,600	12,100	6,100	30,800
16"	57,000	30,800	15,700	7,900	40,300

### NOTES:

- BLOCKING SHALL BE CEMENT CONCRETE CLASS "B" POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 11 MIL PLASTIC OR SIMILAR MATERIAL.
- TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (S.F.):  
EXAMPLE : 12" - 90° BEND IN SAND AND GRAVEL 32,000 LBS 3000 LB/S.F. = 10.7 S.F. OF AREA
- AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZE, PRESSURES AND SOIL CONDITIONS.
- BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

## SAFE SOIL BEARING LOADS

FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

SOIL	POUNDS PER SQUARE FOOT
MUCK, PEAT	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

## THRUST LOADS

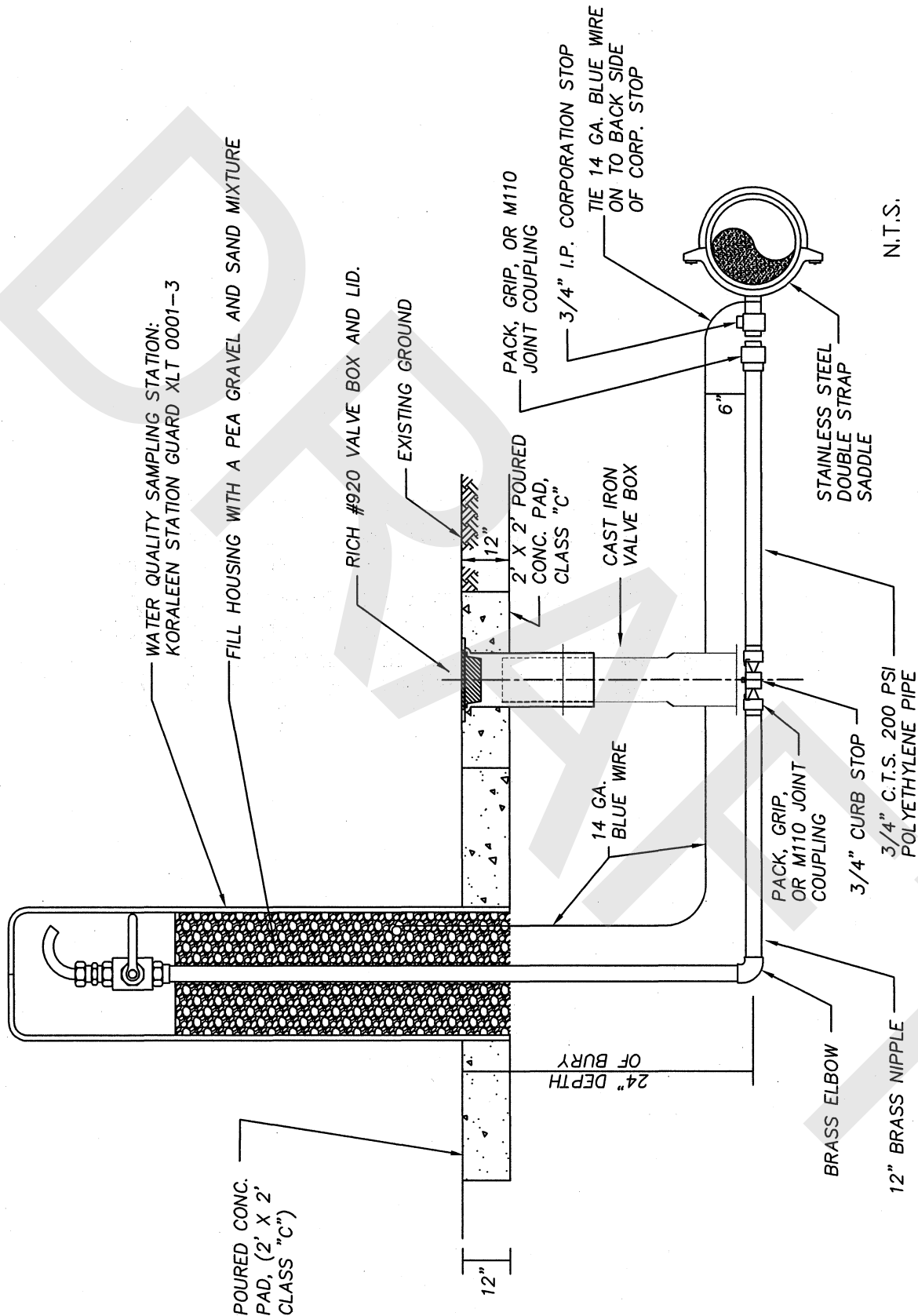
APPR. DATE:

FIG NO:

WA-19



# THURSTON COUNTY WATER STANDARD DETAIL



## WATER QUALITY SAMPLING STATION

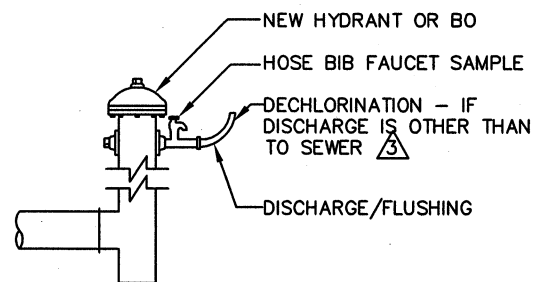
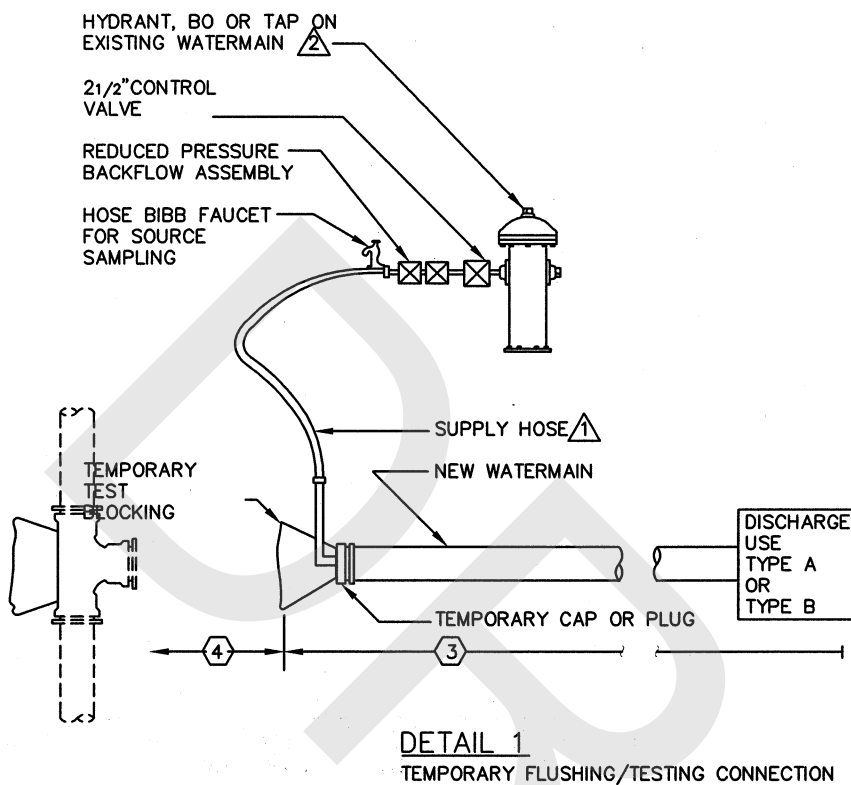
APPR. DATE:

REFER:

FIG NO:

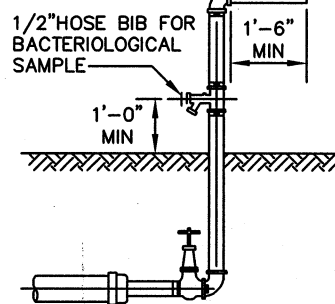
WA-20





**TYPE A**

TEMP SAMPLE TAP AND FLUSHING ASSEMBLY (RESTRAINT OR BLOCKING REQ'D)



**TYPE B**

## NOTES

1. ALL FITTINGS SHALL BE DUCTILE IRON
2. ALL EXCAVATION SHALL PROVIDE A MINIMUM OF 1'-0" CLEAR AROUND PIPE AND FITTINGS.
3. THESE PLANS ARE FOR DIP AND CIP WATERMAINS 12" OR SMALLER DIA OTHER SIZES AND TYPES SEE PROJECT DRAWINGS
4. REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) SHALL BE INSTALLED AS A UNIT (TWO SHUT-OFF VALVES, RELIEF PORT, TWO CHECK VALVES AND FOUR TEST COCKS). WHEN RPBA IS CONNECTED TO HYDRANT AND THE HOSE BIB FAUCET SAMPLE THEY SHALL BE CAPPED WHEN NOT IN USE. ASSEMBLY SHALL BE TESTED WHEN INSTALLED BY A WASHINGTON STATE CERTIFIED BACKFLOW ASSEMBLY TESTER (BAT) AND A CURRENT TEST REPORT SHALL BE ON SITE. FOR INSTALLATION PROCEDURES CALL THE THURSTON COUNTY DEPARTMENT OF WATER & WASTE MANAGEMENT, UTILITY SECTION.

## LEGEND

- ① CLEAN & DISINFECTED POTABLE WATER HOSE ONLY. SIZE FLUSHING RISER PER STD SPEC SEC 7-091.3(23)
- ② HYDRANT PERMIT REQUIRED
- ③ CHECK WITH SEWER UTILITY BEFORE DISCHARGE TO SEWERS
- ③ INSTALLED BY CONTRACTOR
- ④ CONNECTION PIPE: CONTRACTOR FURNISHED AND INSTALLED

# WATER TESTING - CHARGING & FLUSHING

APPR. DATE:

FIG NO:

WA-21



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**APPENDIX C**

**General Notes - Water**

DRAFT



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**APPENDIX C**

**General Notes (Water Main Installation)**

1. All workmanship and material shall be in accordance with the latest edition of the American Water Works Association (AWWA) standards, American Public Works Association (APWA), State of Washington Standard Specifications for Road, Bridge and Municipal construction, latest edition and the Thurston County Road Standards.
2. A preconstruction meeting shall be held with Thurston County prior to the start of construction.
3. Water mains equal to or less than twelve inches in diameter shall be AWWA C900 Class 200, C905 Class 235, or as otherwise required or approved by Thurston County. All water mains larger than 12 inches in diameter shall be AWWA C905, Class 235 or ductile iron cement mortar-lined thickness Class 52.
4. Gate valves shall be resilient wedge, NRS (Non Rising Stem) with O-rings seals. Valve ends shall be mechanical joint or ANSI flanges. Valves shall conform to AWWA 509-80. Gate valves shall be Mueller A2370, M & H Style 3067, American Flow Control Series 500, or as approved by Thurston County. Existing valves shall be operated by Thurston County employees only.
5. Hydrants shall be the dry barrel type and one of the following: Mueller Centurion or Clow F2500. Hydrants shall be bagged until system is approved. All hydrants shall be equipped with Storz adapters.
6. All lines shall be chlorinated and tested in conformance with the above referenced specification (See Note 1 above).
7. All pipe and services shall be installed with 12 gauge coated copper toning wire secured with duct tape to top of pipe to prevent movement during backfilling, brought up and tied off at top of valve box. There shall be two (2) feet of slack exposed in the valve box for connection by locator. The toning wire shall be tested prior to acceptance.
8. Detectable marking tape shall be installed over all water lines. The tape shall be placed twelve (12) inches above the top of the pipe and shall extend its entire length. Detectable marking tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.
9. Provide traffic control plan(s) as required in accordance with MUTCD.
10. All water mains shall be staked for grades and alignment by an engineering or surveying firm capable of performing such work.
11. Call Underground Locate at 1-800-424-5555 a minimum of 48 hours prior to any excavations.
12. Where connections require "field verification, connection points will be exposed by contractor and fittings verified two working days prior to distributing shut-down notices.



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

13. Taps and other disruptions to the existing water system shall only occur Monday through Thursday between the hours of 8:00 a.m. and 2:00 p.m. each day, and shall not occur on Saturday, Sunday, or any holiday recognized by Thurston County, without the approval of Thurston County.
14. At any connection to an existing line where a new valve is not installed, the existing valve must be pressure tested to Thurston County standards prior to connection. If an existing valve fails to pass the test, the contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.
15. All community water systems shall comply with the cross-connection control requirements specified in WAC 246-290-490 and the Thurston County Cross Connection Control Program.
16. No lot line watermain are allowed.
17. All watermain shall be placed in a public right-of-way or within an easement dedicated to Thurston County. The minimum width of the easement shall be 12 feet centered along the watermain.



**DEVELOPMENT STANDARDS FOR  
WATER AND SEWER SYSTEMS  
THURSTON COUNTY, WASHINGTON**

**CONSTRUCTION COMPLETION REPORT FOR DISTRIBUTION MAIN PROJECTS**

In accordance with WAC 246-290-120(5), a **Construction Completion Report** is required for all construction projects. Under the submittal exception process for distribution main projects, designed by a professional engineer but not submitted to DOH for approval, the report does not need to be submitted. **However, the purveyor must keep the Construction Completion Report on file and make it available for review upon request by DOH in accordance with WAC 246-290-125 (2)(b).** Furthermore:

- (1) The report form **must** bear the seal, date and signature of a professional engineer (PE) licensed in the state of Washington; and
- (2) Per WAC 246-290-120(5)(c), the amount of change in the physical capacity of a system must be documented, if the project results in a change in physical capacity.

***Please type or print legibly in ink:***

\_\_\_\_\_  
Name of Water System

DOH System ID No.: \_\_\_\_\_

\_\_\_\_\_  
Name of Purveyor (Owner or System Contact)

Date Water System Plan that includes  
Standard Construction Specifications  
Approved by DOH:

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip

**PROJECT NAME AND DESCRIPTIVE TITLE:**

(Include the name of any development project and number of services.)

\_\_\_\_\_  
Date Project or Portions Thereof Completed

**Professional Engineer's Acknowledgment**

The undersigned professional engineer (PE), or his/her authorized agent, has inspected the above-described project that, as to layout, size and type of pipe, valves and materials, and other designed physical facilities, has been constructed and is substantially completed in accordance with construction documents reviewed by the purveyor's engineer. In the opinion of the undersigned engineer, the installation, physical testing procedures, water quality tests, and disinfection practices were carried out in accordance with state regulations and principles of standard engineering practice.

I have reviewed the disinfection procedures, pressure test results, and results of the bacteriological test(s) for this project and certify that they comply with the requirements of the construction standards/specifications approved by DOH.

**Engineer's Seal**

\_\_\_\_\_  
Engineer's Signature

\_\_\_\_\_  
Date



## **APPENDIX C**

### **WATER QUALITY MONITORING SCHEDULES**



## Water Quality Monitoring Schedule

**System: BOSTON HARBOR**  
**Contact: Kevin P Patching**  
**SMA ID: 134**

**PWS ID: 07850 R**  
**Group: A - Comm**

**Region: SOUTHWEST**  
**County: THURSTON**

**SMA Name: THURSTON COUNTY PUBLIC WORKS**

**NOTE:** To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

### *Coliform Monitoring Requirements*

	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019
<b>Coliform Monitoring Population</b>	1141	1141	1144	1147	902	902	899	1141	1141	1141	1141	1141
<b>Number of Routine Samples Required</b>	2	2	2	2	1	1	1	2	2	2	2	2

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

### *Chemical Monitoring Requirements*

#### *Distribution Monitoring*



## Water Quality Monitoring Schedule

<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Lead and Copper	10	Jan 2018 - Dec 2020	standard - 3 year	11/30/2017	Aug 2020	
Asbestos	0	Jan 2011 - Dec 2019	waiver - 9 year			
Total Trihalomethane (THM)	2	Jan 2018 - Mar 2018	increased - quarterly	11/15/2017	<b>Mar 2018</b>	
Total Trihalomethane (THM)	2	Apr 2018 - Jun 2018	increased - quarterly	11/15/2017	<b>Jun 2018</b>	
Total Trihalomethane (THM)	2	Jul 2018 - Sep 2018	increased - quarterly	11/15/2017	<b>Sep 2018</b>	
Total Trihalomethane (THM)	2	Oct 2018 - Dec 2018	increased - quarterly	11/15/2017	<b>Dec 2018</b>	
Halo-Acetic Acids (HAA5)	2	Jan 2018 - Mar 2018	increased - quarterly	11/15/2017	<b>Mar 2018</b>	
Halo-Acetic Acids (HAA5)	2	Apr 2018 - Jun 2018	increased - quarterly	11/15/2017	<b>Jun 2018</b>	
Halo-Acetic Acids (HAA5)	2	Jul 2018 - Sep 2018	increased - quarterly	11/15/2017	<b>Sep 2018</b>	
Halo-Acetic Acids (HAA5)	2	Oct 2018 - Dec 2018	increased - quarterly	11/15/2017	<b>Dec 2018</b>	

### Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:

- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
- Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
- If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
- If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos*: Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

For *Disinfection Byproducts (HAA5 and THM)*: Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.



## Water Quality Monitoring Schedule

### Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S08	WF (S06 & S07)	Well Field	Use - Permanent	Susceptibility - High		
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	03/22/2017	<b>Mar 2018</b>	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	09/10/2012		
Arsenic	1	Jan 2017 - Dec 2019	standard - 3 year	09/10/2012	Jul 2019	
Iron	1	Jan 2017 - Dec 2019	standard - 3 year	09/10/2012	Aug 2019	
Manganese	1	Jan 2017 - Dec 2019	standard - 3 year	09/10/2012	Jun 2019	
Volatile Organics (VOC)	1	Jan 2018 - Dec 2018	R&C - 1 year	03/22/2017	<b>May 2018</b>	
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	11/09/2009	<b>Nov 2018</b>	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	06/05/2008		
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year	03/10/1992		
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	03/08/2016		
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	03/08/2016		



## Water Quality Monitoring Schedule

### Other Information

<b>Other Reporting Schedules</b>	<b>Due Date</b>
Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2018
Submit CCR certification form to ODW (Community systems only):	10/01/2018
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2018
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

### Special Notes

None

### Southwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding DBPs:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Southwest Office: (360) 236-3030 or SWRO.Coli@doh.wa.gov

### Additional Notes

The information on this monitoring schedule is valid as of the date in the upper left corner on the first page. However, the information may change with subsequent updates in our water quality monitoring database as we receive new data or revise monitoring schedules. There is often a lag time between when you collect your sample and when we credit your system with meeting the monitoring requirement.

We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.



## Water Quality Monitoring Schedule

**System: GRAND MOUND**  
**Contact: Kevin P Patching**  
**SMA ID: 134**

**PWS ID: 07158 0**  
**Group: A - Comm**

**Region: SOUTHWEST**  
**County: THURSTON**

**SMA Name: THURSTON COUNTY PUBLIC WORKS**

**NOTE:** To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

### Coliform Monitoring Requirements

	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019
<b>Coliform Monitoring Population</b>	2033	2033	2167	2410	2410	2410	2177	2167	2033	2033	2000	2000
<b>Number of Routine Samples Required</b>	2	2	2	2	2	2	2	2	2	2	2	2

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

### Chemical Monitoring Requirements

#### Distribution Monitoring

<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Lead and Copper	10	Jan 2016 - Dec 2018	standard - 3 year	09/10/2015	Sep 2018	
Asbestos	0	Jan 2011 - Dec 2019	waiver - 9 year			
Total Trihalomethane (THM)	1	Jan 2018 - Dec 2018	reduced - 1 year	08/16/2017	Aug 2018	
Halo-Acetic Acids (HAA5)	1	Jan 2018 - Dec 2018	reduced - 1 year	08/16/2017	Aug 2018	



## Water Quality Monitoring Schedule

### Notes on Distribution System Chemical Monitoring

- For *Lead and Copper*:
- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
  - Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
  - If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
  - If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos*: Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

For *Disinfection Byproducts (HAA5 and THM)*: Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.



## Water Quality Monitoring Schedule

### Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S01	Well #1 ACK136	Well	Use - Permanent	Susceptibility - High		
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Nitrate	1	Jan 2018 - Dec 2018	R&C - 1 year	04/11/2017	<b>Jul 2018</b>	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	04/26/2012		
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	07/24/2014		
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	03/17/2017		
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	07/14/2008		
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year			
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	11/24/2015		
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	11/24/2015		

Source S02	Well #2 ACT016 TCGM	Well	Use - Permanent	Susceptibility - Moderate		
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	03/28/2017	<b>Mar 2018</b>	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	10/30/2012		
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	07/24/2014		
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	03/17/2017		
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	09/10/2007		
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year			
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	11/24/2015		
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	11/24/2015		



## Water Quality Monitoring Schedule

### Other Information

<b>Other Reporting Schedules</b>	<b>Due Date</b>
Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2018
Submit CCR certification form to ODW (Community systems only):	10/01/2018
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2018
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

### Special Notes

None

### Southwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding DBPs:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Southwest Office: (360) 236-3030 or SWRO.Coli@doh.wa.gov

### Additional Notes

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We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.



## Water Quality Monitoring Schedule

**System:** TAMOSHAN  
**Contact:** Kevin P Patching  
**SMA ID:** 134

**PWS ID:** 87140 V  
**Group:** A - Comm

**Region:** SOUTHWEST  
**County:** THURSTON

**SMA Name:** THURSTON COUNTY PUBLIC WORKS

**NOTE:** To receive credit for compliance samples, you must fill out laboratory and sample paperwork completely, send your samples to a laboratory accredited by Washington State to conduct the analyses, AND ensure the results are submitted to DOH Office of Drinking Water. There is often a lag time between when you collect your sample, when we credit your system with meeting the monitoring requirement, and when we generate the new monitoring requirement.

### *Coliform Monitoring Requirements*

	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019
<b>Coliform Monitoring Population</b>	260	260	260	260	260	260	260	260	260	260	260	260
<b>Number of Routine Samples Required</b>	1	1	1	1	1	1	1	1	1	1	1	1

- Collect samples from representative points throughout the distribution system.
- Collect required repeat samples following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source.
- For systems that chlorinate, record chlorine residual (measured when the coliform sample is collected) on the coliform lab slip.

### *Chemical Monitoring Requirements*

#### *Distribution Monitoring*



## Water Quality Monitoring Schedule

<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Lead and Copper	5	Jan 2017 - Dec 2019	standard - 3 year	06/22/2016	Aug 2019	
Asbestos	0	Jan 2011 - Dec 2019	waiver - 9 year			
Total Trihalomethane (THM)	1	Jan 2018 - Mar 2018	increased - quarterly	11/15/2017	<b>Mar 2018</b>	
Total Trihalomethane (THM)	1	Apr 2018 - Jun 2018	increased - quarterly	11/15/2017	<b>Jun 2018</b>	
Total Trihalomethane (THM)	1	Jul 2018 - Sep 2018	increased - quarterly	11/15/2017	<b>Sep 2018</b>	
Total Trihalomethane (THM)	1	Oct 2018 - Dec 2018	increased - quarterly	11/15/2017	<b>Dec 2018</b>	
Halo-Acetic Acids (HAA5)	1	Jan 2018 - Mar 2018	increased - quarterly	11/15/2017	<b>Mar 2018</b>	
Halo-Acetic Acids (HAA5)	1	Apr 2018 - Jun 2018	increased - quarterly	11/15/2017	<b>Jun 2018</b>	
Halo-Acetic Acids (HAA5)	1	Jul 2018 - Sep 2018	increased - quarterly	11/15/2017	<b>Sep 2018</b>	
Halo-Acetic Acids (HAA5)	1	Oct 2018 - Dec 2018	increased - quarterly	11/15/2017	<b>Dec 2018</b>	

### Notes on Distribution System Chemical Monitoring

For *Lead and Copper*:

- Collect samples from the COLD WATER side of a KITCHEN or BATHROOM faucet that is used daily.
- Before sampling, make sure the water has sat unused in the pipes for at least 6 hours, but no more than 12 hours (e.g. overnight).
- If you are sampling from a faucet that has hot water, make sure cold water is the last water to run through the faucet before it sits overnight.
- If your sampling frequency is annual or every 3 years, collect samples between June 1 and September 30.

For *Asbestos*: Collect the sample from one of your routine coliform sampling sites in an area of your distribution system that has asbestos concrete pipe.

For *Disinfection Byproducts (HAA5 and THM)*: Collect the samples at the locations identified in your Disinfection Byproducts (DBP) monitoring plan.



## Water Quality Monitoring Schedule

### Source Monitoring

- Collect 'source' chemical monitoring samples from a tap after all treatment (if any), but before entering the distribution system.
- Washington State grants monitoring waivers for various test panels /analytes. Please note that we may require some monitoring as a condition of some waivers. We have granted complete waivers for dioxin, endothal, glyphosate, diquat, and insecticides.
- Nitrate, arsenic, iron, and other individual inorganics are included as part of a Complete Inorganic (IOC) analysis when it is collected.

Source S02	WELL #2 1991 AHF169	Well	Use - Permanent	Susceptibility - Low		
<u>Test Panel/Analyte</u>	<u># Samples Required</u>	<u>Compliance Period</u>	<u>Frequency</u>	<u>Last Sample Date</u>	<u>Next Sample Due</u>	
Nitrate	1	Jan 2018 - Dec 2018	standard - 1 year	03/28/2017	<b>Mar 2018</b>	
Complete Inorganic (IOC)	1	Jan 2011 - Dec 2019	waiver - 9 year	07/30/2014		
Iron	1	Jan 2017 - Dec 2019	standard - 3 year	07/30/2014	Oct 2019	
Volatile Organics (VOC)	1	Jan 2014 - Dec 2019	waiver - 6 year	09/04/2014		
Herbicides	1	Jan 2014 - Dec 2022	waiver - 9 year	11/09/2009	<b>Nov 2018</b>	
Pesticides	0	Jan 2017 - Dec 2019	waiver - 3 year	06/11/2008		
Soil Fumigants	0	Jan 2017 - Dec 2019	waiver - 3 year			
Gross Alpha	1	Jan 2014 - Dec 2019	standard - 6 year	11/03/2015		
Radium 228	1	Jan 2014 - Dec 2019	standard - 6 year	11/03/2015		



## Water Quality Monitoring Schedule

### Other Information

<b>Other Reporting Schedules</b>	<b>Due Date</b>
Measure chlorine residuals and submit monthly reports if your system uses continuous chlorination:	monthly
Submit Consumer Confidence Report (CCR) to customers and ODW (Community systems only):	07/01/2018
Submit CCR certification form to ODW (Community systems only):	10/01/2018
Submit Water Use Efficiency report online to ODW and to customers (Community and other municipal water systems only):	07/01/2018
Send notices of lead and copper sample results to the customers sampled:	30 days after you receive the laboratory results
Submit Certification of customer notification of lead and copper results to ODW:	90 days after you notify customers

### Special Notes

None

### Southwest Regional Water Quality Monitoring Contacts

For questions regarding chemical monitoring:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding DBPs:	Sophia Petro: (360) 236-3046 or sophia.petro@doh.wa.gov
For questions regarding coliform bacteria and microbial issues:	Southwest Office: (360) 236-3030 or SWRO.Coli@doh.wa.gov

### Additional Notes

The information on this monitoring schedule is valid as of the date in the upper left corner on the first page. However, the information may change with subsequent updates in our water quality monitoring database as we receive new data or revise monitoring schedules. There is often a lag time between when you collect your sample and when we credit your system with meeting the monitoring requirement.

We have not designed this monitoring schedule to display all compliance requirements. The purpose of this schedule is to assist water systems with planning for most water quality monitoring, and to allow systems to compare their records with DOH ODW records. Please be aware that this monitoring schedule does not include constituents that require a special monitoring frequency, such as monitoring affiliated with treatment.

Any inaccuracies on this schedule will not relieve the water system owner and operator of the requirement to comply with applicable regulations.

If you have any questions about your monitoring requirements, please contact the regional office staff listed above.



**APPENDIX D**  
**CONSUMER CONFIDENCE REPORTS**



THURSTON COUNTY  
PUBLIC WORKS

# 2017 WATER QUALITY REPORT

for the  
Boston Harbor  
community

**This report contains important  
information about your  
drinking water.**



THURSTON COUNTY  
WASHINGTON  
SINCE 1852





## Overlooking Boston Harbor.

Thurston County Public Works is pleased to present the Boston Harbor annual water quality report, in accordance with the federal Safe Drinking Water Act and Washington Department of Health regulations.

This report provides detailed results from drinking water tests taken in 2016, and compares the results to federal and state standards. Results from 2017 tests will be published in 2018.

We are proud to provide you with high quality drinking water. If you have any questions about this report, or your water system, please contact me at 360-867-2330 or [parsonst@co.thurston.wa.us](mailto:parsonst@co.thurston.wa.us).

*Theresa L. Parsons*  
Utility Operations Manager

### **PARA NUESTROS CLIENTES HISPANOHABLANTE:**

Este informe proporciona los resultados de los análisis efectuados en el agua potable durante el año 2016. Dichos resultados demostraron que su agua potable cumplió con los normas de seguridad estatales y federales. De acuerdo a los requisitos en el procesamiento de los informes, los resultados del año 2017 serán enviados por el website [co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks) en el año 2018.



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# WATER SOURCE AND TREATMENT

Boston Harbor's drinking water comes from groundwater within the Upper Salmon Springs Drift - part of the Puget Sound aquifer system. The water is pumped from the aquifer through two 540-foot deep wells next to the water reservoir off Zangle Road.

To protect public health, your water is disinfected with chlorine. Disinfection is vital to eliminating bacterial and viral contaminants that can cause illness to you, your family, and your pets. Chlorine is particularly effective in killing the microbial organisms that cause cryptosporidiosis, cholera, giardia, salmonella, and other illnesses. By acting as a protective barrier, chlorine prevents recontamination of water while it is in your pipes.

Thurston County Public Works regularly conducts water quality testing to ensure the safety of your drinking water. We test for the following contaminants:

**Inorganic contaminants**, such as nitrates, salts, and metals, which can occur naturally or result from urban stormwater runoff, industrial or domestic wastewater discharges, and farming.

**Copper and lead**, which can leach from your household plumbing system.

**Microbial contaminants**, such as bacteria, parasites, and viruses, that may come from sewage treatment plants, septic systems, agriculture, or wildlife.

**Pesticides and fertilizers**, which may come from agriculture, stormwater runoff, and residential uses.

**Organic chemical contaminants**, such as petroleum products and byproducts from industrial manufacturing.

**Radioactive contaminants**, which can occur naturally or are the result of oil and gas production.

**Disinfection byproducts**, which are compounds that form in the presence of chlorine or other disinfectants.





# WATER QUALITY AND HEALTH

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, in some cases radioactive material, and substances resulting from the presence of animals or from human activity. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency (EPA) Safe Drinking Water Hotline at 1-800-426-4791.

To ensure that tap water is safe to drink, the Washington Department of Health and the EPA prescribe regulations that limit the

amount of certain contaminants in water provided by public water systems. The Food and Drug Administration and the Washington Department of Agriculture establish limits for bottled water contaminants that provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population.

Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants, may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control

guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

**EPA SAFE  
DRINKING  
WATER  
HOTLINE  
800-426-4791**





# BOSTON HARBOR WATER QUALITY IN 2016

Boston Harbor's drinking water is monitored and tested extensively throughout the year. After testing nearly 200 chemical compounds, only a few were detected - they are presented in the following tables. Some of the information is older because not all contaminants are tested each year. If you would like a complete list of the chemical compounds tested but not detected, please call Thurston County Public Works at 360-867-2300.

## READING THE REPORT TABLES

### CONTAMINANT TESTED

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
-------------	--------------------	------------------------------	-------------------------	-------------------------	-----------------------------------

**Contaminant**  
tells you the  
chemical sampled.

**Highest Level Detected**  
shows you the highest  
amount of the contaminant  
detected during sampling.

**Ideal Goal**  
shows you the  
contamination level the  
county strives to stay below.

**Violation**  
tells you whether or not the  
amount of contaminant present  
in the sample exceeded state  
and federal standards.

**Maximum Level Allowed or  
Action Level**  
shows you the greatest amount of a  
contaminant allowed before treatment  
is required or regulations are exceeded.

**Likely Source of  
Contamination**  
tells you the likely  
origin of the  
contaminant.



## DEFINITIONS AND UNITS OF MEASURE

### Action Level (AL)

The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

### Maximum Contaminant Level (MCL)

The highest level of a contaminant that is allowed in drinking water. MCLs are set at very stringent levels. To understand possible health effects described for many regulated constituents, a person would have to drink two liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

### Maximum Contaminant Level Goal (MCLG)

The “goal” is the level of a contaminant in drinking water below which there is no known or expected risk to health. These goals allow for a margin of safety.

### Maximum Residual Disinfectant Level (MRDL)

The highest level of a disinfectant allowed in

drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbiological contaminants (e.g. chlorine).

### Maximum Residual Disinfectant Level Goal (MRDLG)

The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

### Micrograms Per Liter (ugl)

A unit of measurement equivalent to parts per billion. One part per billion is roughly one second in 32 years.

### Milligrams Per Liter (mgl)

A unit of measurement equivalent to parts per million. One part per million is roughly one second in two years.

### Treatment Technique (TT)

A required process intended to reduce the level of a contaminant in drinking water.

## WATER QUALITY REPORT TABLES

### COPPER & LEAD (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Copper	N	0.29 mgl	1.3 mgl	0 mgl	Corrosion of household plumbing systems.
Lead	N	<0.001 mgl	0.015 mgl	0 mgl	Corrosion of household plumbing systems.

In Washington State, lead in drinking water comes primarily from materials and components used in household plumbing. The more time water has been sitting in pipes, the more dissolved metals, such as lead, it may contain. Elevated levels of lead can cause serious health problems, especially in pregnant women and young children.

To help reduce potential exposure to lead: for any drinking water tap that has not been used for 6 hours or more, flush water through the tap until the water is noticeably colder before using for drinking or cooking. You can use the flushed water for watering plants, washing dishes, or general cleaning. Only use water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead. If you are concerned about lead in your water, have your water tested. Information on lead in drinking water is available from EPA's Safe Drinking Water Hotline 1-800-426-4791 or online at [epa.gov/safewater/lead](https://www.epa.gov/safewater/lead).



## INORGANIC CHEMICAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM LEVEL ALLOWED (MCL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Nitrates (results from both wells)	N	<0.2 mg/l (average level detected over one sample period)	10 mg/l	0 mg/l	Runoff from fertilizer use; leaching from septic tanks; sewage; and erosion of natural sources.

## MICROBIAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	TREATMENT TECHNIQUE	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Fecal indicators ( <i>E. coli</i> )	N	No detect (21 samples taken)	Chlorination	n/a	Human and animal fecal waste.

## CHEMICAL BYPRODUCTS OF DISINFECTION (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM RESIDUAL DISINFECTANT LEVEL (MRDL)	IDEAL GOAL (MRDLG)	LIKELY SOURCE OF CONTAMINATION
Trihalomethanes	Y	121 ug/l	80 ug/l	n/a	Byproduct of drinking water disinfection.
Haloacetic acids	N	16.6 ug/l	60 ug/l	n/a	Byproduct of drinking water disinfection.

Some people who drink water containing trihalomethanes in excess of the MRDL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer. Thurston County Public Works is addressing the elevated levels of trihalomethanes in your drinking water through the following actions:

- Circulating and aerating water throughout the reservoir to reduce the formation of trihalomethanes.
- Circulating water throughout the distribution piping system more frequently. This will reduce the amount of time water sits unused in a pipe.
- Reducing the level of residual chlorine in reservoir water. Drinking water needs to have a certain level of residual disinfectant while traveling through the piping system to keep your water clear of microbiological contaminants.
- Cleaning and inspecting your water's reservoir to remove sediments and minerals.





# 2017-2018 PROJECTS



## RESERVOIR INSPECTION & CLEANING

Boston Harbor's potable water reservoir holds 500,000 gallons of water. Over time, the reservoir's bottom can accumulate sediments and minerals. In 2017, Boston Harbor's potable water reservoir is scheduled to be inspected for structural integrity and cleaned of sediment and mineral build up.



## UPGRADING SAND FILTERS

Due to greater water demand in Boston Harbor, Thurston County Public Works will be upgrading the type of sand filters used to remove iron and manganese from your water. Currently the system uses green sand, but testing is underway to determine the best product capable of filtering Boston Harbor's potable water needs.



## INSTALL RESERVOIR CIRCULATION

To further improve water quality, Thurston County Public Works will install a water circulation and aeration system in Boston Harbor's water reservoir. This means the water will be forced to move around, minimizing stagnation. The system will enhance oxygenation of the water and reduce the formation of disinfection byproducts.





## PREVENT BACKFLOW

Did you know that water from your drain could end up flowing into Boston Harbor's drinking water system? When your water system loses pressure, used water from your plumbing fixtures - such as sprinklers, hot tubs, and swimming pools - can get drawn back into the drinking water pipes and contaminate the whole neighborhood's water supply.

Make sure to install and maintain a backflow preventer where connections exist between your drinking water and wastewater pipes. For more information, contact Kevin Patching at 360-867-2288 or [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us).

## PICK UP PET POOP

Did you know that Thurston County dogs generate around six tons of pet waste every single day? Make sure your pooch's waste doesn't lay around wrecking havoc on the environment or the bottom of people's shoes. Pet poop contains bacteria, viruses, and parasites that can make their way into your drinking water supply. Make sure to scoop it, bag it, and trash it - every dog, every poo, every time.



## KEEP STORMWATER CLEAN

Storm drains prevent flooding in our streets and neighborhoods by draining rain water into the nearest body of water. Along the way, rain water can pick up pollutants on streets and in storm drains - polluting our drinking water sources with paint, oil, toxic chemicals, fertilizers, pesticides, soaps, yard waste, and litter. Keep storm drains and ditches clear of yard waste and litter. Use common sense lawn care practices described at [co.thurston.wa.us/health/ehcsg/index.html](http://co.thurston.wa.us/health/ehcsg/index.html). And, never hose or dump anything into the storm drain.





# TIPS TO SAVE WATER & MONEY

## KITCHEN.

- Use a dishwasher in lieu of hand washing dishes.
- Install an instant water heater so you don't waste water waiting for it to heat up.

## BATHROOM.

- Upgrade older toilets with WaterSense® models and install aerators on all your faucets.
- Shorten your shower by a minute or two and you'll save up to 150 gal/month.

## LAUNDRY.

- Consider purchasing a high efficiency washing machine to save water and energy.
- When doing laundry, make sure to match water level to the size of the load.

## OTHER INDOOR.

- Run your washer and dishwasher only when full - could save you up to 1000 gal/month.
- Monitor your water bill for unusually high use. It can help you discover leaks.

## LANDSCAPING.

- Use native plants in your yard to significantly reduce irrigation needs.
- Aerate your lawn periodically to allow greater water percolation.

## OTHER OUTDOOR.

- Use a commercial car wash to save water and prevent soaps from entering storm drain.
- Use a broom instead of a hose to clean patios, sidewalks, and driveways.

## WATER SAVING RESOURCES.

- Check out [wateruseitwisely.com](http://wateruseitwisely.com) for 100+ water and energy saving tips.
- Visit [gracelinks.org/1297/how-to-save-water](http://gracelinks.org/1297/how-to-save-water) for even more water-saving tips.



# CONTACT US



**360-867-2300**



**[co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks)**



**Thurston County Public Works  
9605 Tilley Rd. S  
Olympia, WA 98512**



**[@Thurston\\_PW](https://twitter.com/Thurston_PW)**



**Water service: Kevin Patching - [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us)  
Customer service & billing: Sandy Griffin - [griffis@co.thurston.wa.us](mailto:griffis@co.thurston.wa.us)**

If you are a Boston Harbor property manager, please pass this information on to your tenant or guest. Thank you!



**THURSTON COUNTY**  
WASHINGTON  
SINCE 1852



THURSTON COUNTY  
PUBLIC WORKS

# 2017 WATER QUALITY REPORT

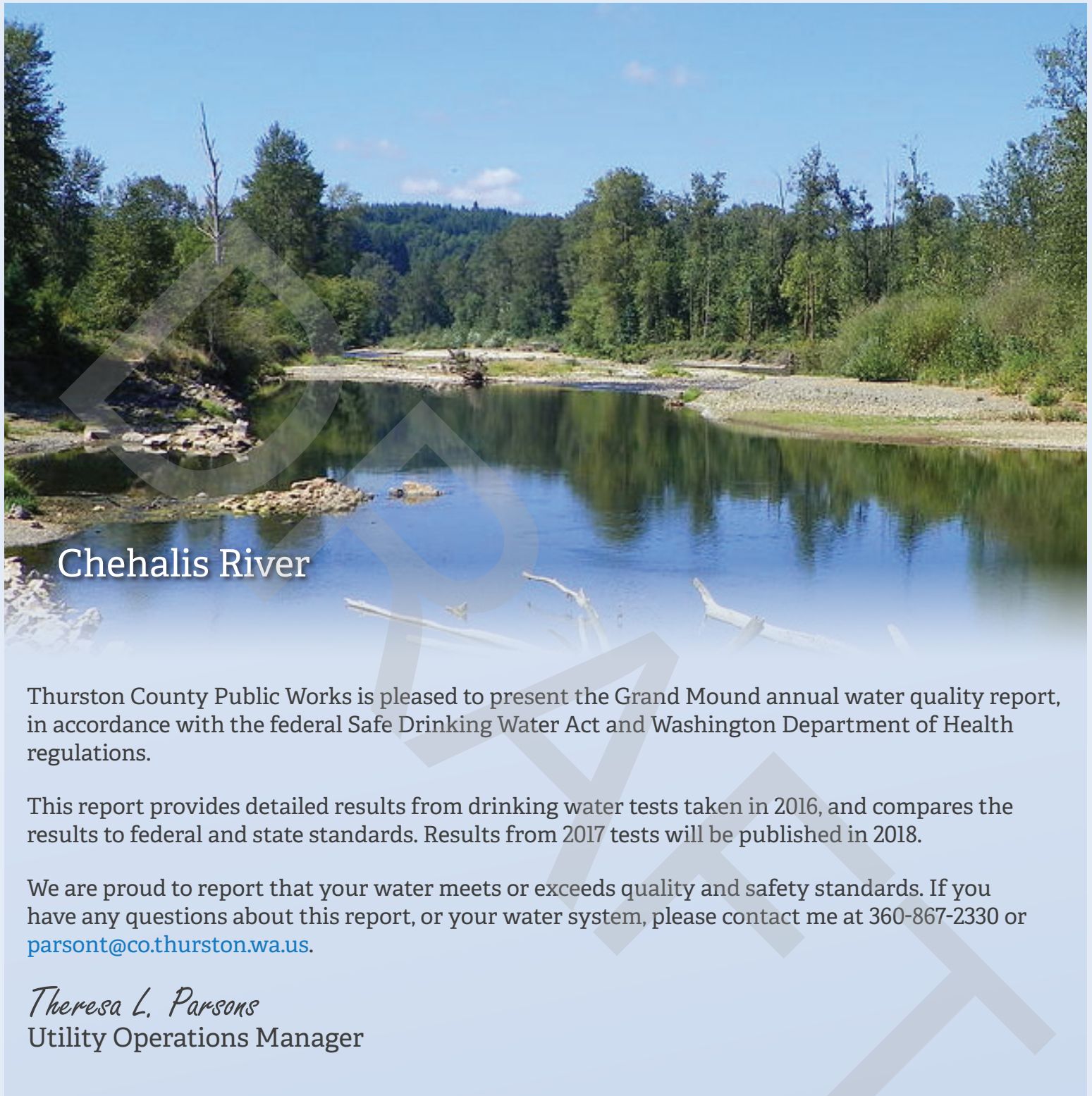
for the  
Grand Mound  
community

**This report contains important  
information about your  
drinking water.**



THURSTON COUNTY  
WASHINGTON  
SINCE 1852





## Chehalis River

Thurston County Public Works is pleased to present the Grand Mound annual water quality report, in accordance with the federal Safe Drinking Water Act and Washington Department of Health regulations.

This report provides detailed results from drinking water tests taken in 2016, and compares the results to federal and state standards. Results from 2017 tests will be published in 2018.

We are proud to report that your water meets or exceeds quality and safety standards. If you have any questions about this report, or your water system, please contact me at 360-867-2330 or [parsonst@co.thurston.wa.us](mailto:parsonst@co.thurston.wa.us).

*Theresa L. Parsons*  
Utility Operations Manager

### **PARA NUESTROS CLIENTES HISPANOHABLANTE:**

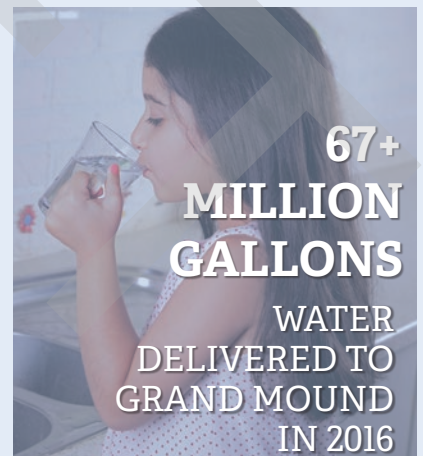
Este informe proporciona los resultados de los análisis efectuados en el agua potable durante el año 2016. Dichos resultados demostraron que su agua potable cumplió con los normas de seguridad estatales y federales. De acuerdo a los requisitos en el procesamiento de los informes, los resultados del año 2017 serán enviados por el website [co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks) en el año 2018.



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# WATER SOURCE AND TREATMENT

Grand Mound's drinking water comes from groundwater within the Scatter Creek aquifer - part of the Chehalis River watershed. The water is pumped from the aquifer through two wells: one located off 201st Avenue SW, and another located off Tea Steet.

To protect public health, your water is disinfected with chlorine. Disinfection is vital to eliminating bacterial and viral contaminants that can cause illness to you, your family, and your pets. Chlorine is particularly effective in killing the microbial organisms that cause cryptosporidiosis, cholera, giardia, salmonella, and other illnesses. By acting as a protective barrier, chlorine prevents recontamination of water while it is in your pipes.

Thurston County Public Works regularly conducts water quality testing to ensure the safety of your drinking water. We test for the following contaminants:

**Inorganic contaminants**, such as nitrates, salts, and metals, which can occur naturally or result from urban stormwater runoff, industrial or domestic wastewater discharges, and farming.

**Copper and lead**, which can leach from your household plumbing system.

**Microbial contaminants**, such as bacteria, parasites, and viruses, that may come from sewage treatment plants, septic systems, agriculture, or wildlife.

**Pesticides and fertilizers**, which may come from agriculture, stormwater runoff, and residential uses.

**Organic chemical contaminants**, such as petroleum products and byproducts from industrial manufacturing.

**Radioactive contaminants**, which can occur naturally or are the result of oil and gas production.

**Disinfection byproducts**, which are compounds that form in the presence of chlorine or other disinfectants.





Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, in some cases radioactive material, and substances resulting from the presence of animals or from human activity. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency (EPA) Safe Drinking Water Hotline at 1-800-426-4791.

To ensure that tap water is safe to drink, the Washington Department of Health and the EPA prescribe regulations that limit the

amount of certain contaminants in water provided by public water systems. The Food and Drug Administration and the Washington Department of Agriculture establish limits for bottled water contaminants that provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants, may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control

guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

**EPA SAFE  
DRINKING  
WATER  
HOTLINE  
800-426-4791**





# GRAND MOUND WATER QUALITY IN 2016

Grand Mound's drinking water is monitored and tested extensively throughout the year. After testing nearly 200 chemical compounds, only a few were detected - they are presented in the following tables. Some of the information is older because not all contaminants are tested each year. If you would like a complete list of the chemical compounds tested but not detected, please call Thurston County Public Works at 360-867-2300.

## READING THE REPORT TABLES

### CONTAMINANT TESTED

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
-------------	--------------------	------------------------------	-------------------------	-------------------------	-----------------------------------

**Contaminant**  
tells you the  
chemical sampled.

**Highest Level Detected**  
shows you the highest  
amount of the contaminant  
detected during sampling.

**Ideal Goal**  
shows you the  
contamination level the  
county strives to stay below.

**Violation**  
tells you whether or not the  
amount of contaminant present  
in the sample exceeded state  
and federal standards.

**Maximum Level Allowed or  
Action Level**  
shows you the greatest amount of a  
contaminant allowed before treatment  
is required or regulations are exceeded.

**Likely Source of  
Contamination**  
tells you the likely  
origin of the  
contaminant.



## DEFINITIONS AND UNITS OF MEASURE

### Action Level (AL)

The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

### Maximum Contaminant Level (MCL)

The highest level of a contaminant that is allowed in drinking water. MCLs are set at very stringent levels. To understand possible health effects described for many regulated constituents, a person would have to drink two liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

### Maximum Contaminant Level Goal (MCLG)

The “goal” is the level of a contaminant in drinking water below which there is no known or expected risk to health. These goals allow for a margin of safety.

### Maximum Residual Disinfectant Level (MRDL)

The highest level of a disinfectant allowed in

drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbiological contaminants (e.g. chlorine).

### Maximum Residual Disinfectant Level Goal (MRDLG)

The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

### Micrograms Per Liter (ugl)

A unit of measurement equivalent to parts per billion. One part per billion is roughly one second in 32 years.

### Milligrams Per Liter (mgl)

A unit of measurement equivalent to parts per million. One part per million is roughly one second in two years.

### Treatment Technique (TT)

A required process intended to reduce the level of a contaminant in drinking water.

## WATER QUALITY REPORT TABLES

### COPPER & LEAD (2015 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Copper	N	0.14 mgl	1.3 mgl	0 mgl	Corrosion of household plumbing systems.
Lead	N	0.0019 mgl	0.015 mgl	0 mgl	Corrosion of household plumbing systems.

In Washington State, lead in drinking water comes primarily from materials and components used in household plumbing. The more time water has been sitting in pipes, the more dissolved metals, such as lead, it may contain. Elevated levels of lead can cause serious health problems, especially in pregnant women and young children.

To help reduce potential exposure to lead: for any drinking water tap that has not been used for 6 hours or more, flush water through the tap until the water is noticeably colder before using for drinking or cooking. You can use the flushed water for watering plants, washing dishes, or general cleaning. Only use water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead. If you are concerned about lead in your water, have your water tested. Information on lead in drinking water is available from EPA's Safe Drinking Water Hotline 1-800-426-4791 or online at [epa.gov/safewater/lead](http://epa.gov/safewater/lead).



## INORGANIC CHEMICAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM LEVEL ALLOWED (MCL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Nitrates	N	2.7 mg/l (average level detected over one sample period)	10 mg/l	0 mg/l	Runoff from fertilizer use; leaching from septic tanks; sewage; and erosion of natural sources.

## MICROBIAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	TREATMENT TECHNIQUE	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Fecal indicators ( <i>E. coli</i> )	N	No detect (24 samples taken)	Chlorination	n/a	Human and animal fecal waste.

## CHEMICAL BYPRODUCTS OF DISINFECTION (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM RESIDUAL DISINFECTANT LEVEL (MRDL)	IDEAL GOAL (MRDLG)	LIKELY SOURCE OF CONTAMINATION
Trihalomethanes	N	not detected	80 ug/l	n/a	Byproduct of drinking water disinfection.
Haloacetic acids	N	<6 ug/l	60 ug/l	n/a	Byproduct of drinking water disinfection.





# 2017-2018 PROJECTS



## NEW WATER RESERVOIR

Thurston County Public Works will installing a second 50,000 gallon reservoir to enhance service, improve fire flow, and accommodate future area growth. The new reservoir will be located adjacent to the existing reservoir off Ivan Way.



## UPDATING WATER METERS

Water meters in Grand Mound will be replaced with models that transmit water usage readings electronically. This will enhance leak detection, saving you time and money should a leak occur. The new meters will also help reduce the amount of time spent reading meters so staff can focus on maintenance and operation tasks.



## WELL PUMP UPGRADE

The pump for Grand Mound's Well 1, off of Grand Mound Way, has reached the end of its intended lifespan. Thurston County Public Works is replacing the pump and upgrading to a model that will increase capacity and efficiency.





## PREVENT BACKFLOW

Did you know that water from your drain could end up flowing into Grand Mound's drinking water system? When your water system loses pressure, used water from your plumbing fixtures - such as sprinklers, hot tubs, and swimming pools - can get drawn back into the drinking water pipes and contaminate the whole neighborhood's water supply.

Make sure to install and maintain a backflow preventer where connections exist between your drinking water and wastewater pipes. For more information, contact Kevin Patching at 360-867-2288 or [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us).

## PICK UP PET POOP

Did you know that Thurston County dogs generate around six tons of pet waste every single day? Make sure your pooch's waste doesn't lay around wrecking havoc on the environment or the bottom of people's shoes. Pet poop contains bacteria, viruses, and parasites that can make their way into your drinking water supply. Make sure to scoop it, bag it, and trash it - every dog, every poo, every time.



## KEEP STORMWATER CLEAN

Storm drains prevent flooding in our streets and neighborhoods by draining rain water into the nearest body of water. Along the way, rain water can pick up pollutants on streets and in storm drains - polluting our drinking water sources with paint, oil, toxic chemicals, fertilizers, pesticides, soaps, yard waste, and litter. Keep storm drains and ditches clear of yard waste and litter. Use common sense lawn care practices described at [co.thurston.wa.us/health/ehcsg/index.html](http://co.thurston.wa.us/health/ehcsg/index.html). And, never hose or dump anything into the storm drain.





# TIPS TO SAVE WATER & MONEY

## KITCHEN.

- Use a dishwasher in lieu of hand washing dishes.
- Install an instant water heater so you don't waste water waiting for it to heat up.

## BATHROOM.

- Upgrade older toilets with WaterSense® models and install aerators on all your faucets.
- Shorten your shower by a minute or two and you'll save up to 150 gal/month.

## LAUNDRY.

- Consider purchasing a high efficiency washing machine to save water and energy.
- When doing laundry, make sure to match water level to the size of the load.

## OTHER INDOOR.

- Run your washer and dishwasher only when full - could save you up to 1000 gal/month.
- Monitor your water bill for unusually high use. It can help you discover leaks.

## LANDSCAPING.

- Use native plants in your yard to significantly reduce irrigation needs.
- Aerate your lawn periodically to allow greater water percolation.

## OTHER OUTDOOR.

- Use a commercial car wash to save water and prevent soaps from entering storm drain.
- Use a broom instead of a hose to clean patios, sidewalks, and driveways.

## WATER SAVING RESOURCES.

- Check out [wateruseitwisely.com](http://wateruseitwisely.com) for 100+ water and energy saving tips.
- Visit [gracelinks.org/1297/how-to-save-water](http://gracelinks.org/1297/how-to-save-water) for even more water-saving tips.





# CONTACT US



**360-867-2300**



**[co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks)**



**Thurston County Public Works**

**9605 Tilley Rd. S**

**Olympia, WA 98512**



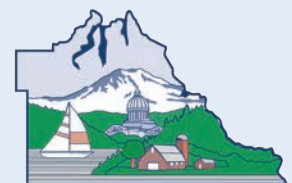
**[@Thurston\\_PW](https://twitter.com/Thurston_PW)**



**Water service: Kevin Patching - [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us)**

**Customer service & billing: Sandy Griffin - [griffis@co.thurston.wa.us](mailto:griffis@co.thurston.wa.us)**

If you are a Grand Mound property manager, please pass this information on to your tenant or guest. Thank you!



**THURSTON COUNTY**

**WASHINGTON**

SINCE 1852



THURSTON COUNTY  
PUBLIC WORKS

# 2017 WATER QUALITY REPORT

for the  
Tamoshan  
community

**This report contains important  
information about your  
drinking water.**



THURSTON COUNTY  
WASHINGTON  
SINCE 1852





## Overlooking Puget Sound from Beverly Beach.

Thurston County Public Works is pleased to present the Tamoshan annual water quality report, in accordance with the federal Safe Drinking Water Act and Washington Department of Health regulations.

This report provides detailed results from drinking water tests taken in 2016, and compares the results to federal and state standards. Results from 2017 tests will be published in 2018.

We are proud to provide you with high quality drinking water. If you have any questions about this report, or your water system, please contact me at 360-867-2330 or [parsonst@co.thurston.wa.us](mailto:parsonst@co.thurston.wa.us).

*Theresa L. Parsons*  
Utility Operations Manager

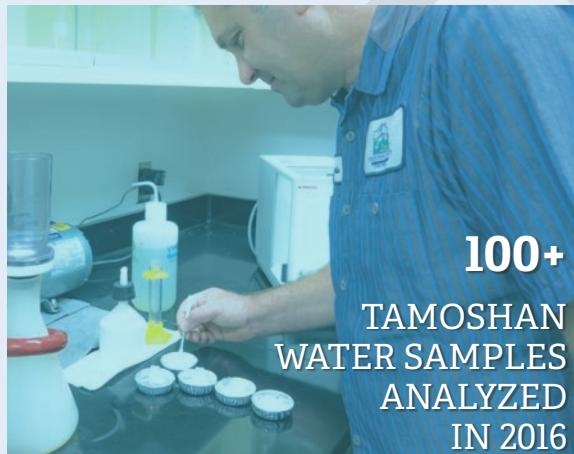
### **PARA NUESTROS CLIENTES HISPANOHABLANTE:**

Este informe proporciona los resultados de los análisis efectuados en el agua potable durante el año 2016. Dichos resultados demostraron que su agua potable cumplió con los normas de seguridad estatales y federales. De acuerdo a los requisitos en el procesamiento de los informes, los resultados del año 2017 serán enviados por el website [co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks) en el año 2018.



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# WATER SOURCE AND TREATMENT

Tamoshan's drinking water comes from groundwater within the Upper Salmon Springs Drift - part of the Puget Sound aquifer system. The water is pumped from the aquifer through a 580-foot deep well, adjacent to the water reservoir off 63rd Avenue.

To protect public health, your water is disinfected with chlorine. Disinfection is vital to eliminating bacterial and viral contaminants that can cause illness to you, your family, and your pets. Chlorine is particularly effective in killing the microbial organisms that cause cryptosporidiosis, cholera, giardia, salmonella, and other illnesses. By acting as a protective barrier, chlorine prevents recontamination of water while it is in your pipes.

Thurston County Public Works regularly conducts water quality testing to ensure the safety of your drinking water. We test for the following contaminants:

**Inorganic contaminants**, such as nitrates, salts, and metals, which can occur naturally or result from urban stormwater runoff, industrial or domestic wastewater discharges, and farming.

**Copper and lead**, which can leach from your household plumbing system.

**Microbial contaminants**, such as bacteria, parasites, and viruses, that may come from sewage treatment plants, septic systems, agriculture, or wildlife.

**Pesticides and fertilizers**, which may come from agriculture, stormwater runoff, and residential uses.

**Organic chemical contaminants**, such as petroleum products and byproducts from industrial manufacturing.

**Radioactive contaminants**, which can occur naturally or are the result of oil and gas production.

**Disinfection byproducts**, which are compounds that form in the presence of chlorine or other disinfectants.





# WATER QUALITY AND HEALTH

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, in some cases radioactive material, and substances resulting from the presence of animals or from human activity. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency (EPA) Safe Drinking Water Hotline at 1-800-426-4791.

To ensure that tap water is safe to drink, the Washington Department of Health and the EPA prescribe regulations that limit the

amount of certain contaminants in water provided by public water systems. The Food and Drug Administration and the Washington Department of Agriculture establish limits for bottled water contaminants that provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population.

Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants, may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control

guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

**EPA SAFE  
DRINKING  
WATER  
HOTLINE  
800-426-4791**





# TAMOSHAN WATER QUALITY IN 2016

Tamoshan's drinking water is monitored and tested extensively throughout the year. After testing nearly 200 chemical compounds, only a few were detected - they are presented in the following tables. Some of the information is older because not all contaminants are tested each year. If you would like a complete list of the chemical compounds tested but not detected, please call Thurston County Public Works at 360-867-2300.

## READING THE REPORT TABLES

CONTAMINANT TESTED					
CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
<b>Contaminant</b> tells you the chemical sampled.	<b>Violation</b> tells you whether or not the amount of contaminant present in the sample exceeded state and federal standards.	<b>Highest Level Detected</b> shows you the highest amount of the contaminant detected during sampling.	<b>Maximum Level Allowed or Action Level</b> shows you the greatest amount of a contaminant allowed before treatment is required or regulations are exceeded.	<b>Ideal Goal</b> shows you the contamination level the county strives to stay below.	<b>Likely Source of Contamination</b> tells you the likely origin of the contaminant.



## DEFINITIONS AND UNITS OF MEASURE

### Action Level (AL)

The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

### Maximum Contaminant Level (MCL)

The highest level of a contaminant that is allowed in drinking water. MCLs are set at very stringent levels. To understand possible health effects described for many regulated constituents, a person would have to drink two liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

### Maximum Contaminant Level Goal (MCLG)

The “goal” is the level of a contaminant in drinking water below which there is no known or expected risk to health. These goals allow for a margin of safety.

### Maximum Residual Disinfectant Level (MRDL)

The highest level of a disinfectant allowed in

drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbiological contaminants (e.g. chlorine).

### Maximum Residual Disinfectant Level Goal (MRDLG)

The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

### Micrograms Per Liter (ugl)

A unit of measurement equivalent to parts per billion. One part per billion is roughly one second in 32 years.

### Milligrams Per Liter (mgl)

A unit of measurement equivalent to parts per million. One part per million is roughly one second in two years.

### Treatment Technique (TT)

A required process intended to reduce the level of a contaminant in drinking water.

## WATER QUALITY REPORT TABLES

### COPPER & LEAD (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	ACTION LEVEL (AL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Copper	N	0.2 mgl	1.3 mgl	0 mgl	Corrosion of household plumbing systems.
Lead	N	0.0011 mgl	0.015 mgl	0 mgl	Corrosion of household plumbing systems.

In Washington State, lead in drinking water comes primarily from materials and components used in household plumbing. The more time water has been sitting in pipes, the more dissolved metals, such as lead, it may contain. Elevated levels of lead can cause serious health problems, especially in pregnant women and young children.

To help reduce potential exposure to lead: for any drinking water tap that has not been used for 6 hours or more, flush water through the tap until the water is noticeably colder before using for drinking or cooking. You can use the flushed water for watering plants, washing dishes, or general cleaning. Only use water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead. If you are concerned about lead in your water, have your water tested. Information on lead in drinking water is available from EPA's Safe Drinking Water Hotline 1-800-426-4791 or online at [epa.gov/safewater/lead](https://www.epa.gov/safewater/lead).



## INORGANIC CHEMICAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM LEVEL ALLOWED (MCL)	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Nitrates	N	<0.5 mg/l (average level detected over one sample period)	10 mg/l	0 mg/l	Runoff from fertilizer use; leaching from septic tanks; sewage; and erosion of natural sources.

## MICROBIAL CONTAMINANTS (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	TREATMENT TECHNIQUE	IDEAL GOAL (MCLG)	LIKELY SOURCE OF CONTAMINATION
Fecal indicators ( <i>E. coli</i> )	N	No detect (12 samples taken)	Chlorination	n/a	Human and animal fecal waste.

## CHEMICAL BYPRODUCTS OF DISINFECTION (2016 DATA)

CONTAMINANT	VIOLATION (Y/N)	HIGHEST LEVEL DETECTED	MAXIMUM RESIDUAL DISINFECTANT LEVEL (MRDL)	IDEAL GOAL (MRDLG)	LIKELY SOURCE OF CONTAMINATION
Trihalomethanes	Y	132 ug/l	80 ug/l	n/a	Byproduct of drinking water disinfection.
Haloacetic acids	N	23.6 ug/l	60 ug/l	n/a	Byproduct of drinking water disinfection.

Some people who drink water containing trihalomethanes in excess of the MRDL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer. Thurston County Public Works is addressing the elevated levels of trihalomethanes in your drinking water through the following actions:

- Circulating and aerating water throughout the reservoir to reduce the formation of trihalomethanes.
- Circulating water throughout the distribution piping system more frequently. This will reduce the amount of time water sits unused in a pipe.
- Reducing the level of residual chlorine in reservoir water. Drinking water needs to have a certain level of residual disinfectant while traveling through the piping system to keep your water clear of microbiological contaminants.
- Cleaning and inspecting your water's reservoir to remove sediments and minerals.





# 2017-2018 PROJECTS



## RESERVOIR INSPECTION & CLEANING

Tamoshan's potable water reservoir holds 60,000 gallons of water. Over time, the reservoir's bottom can accumulate sediments and minerals. In 2017, Tamoshan's potable water reservoir is scheduled to be inspected for structural integrity and cleaned of sediment and mineral build up.



## UPDATING WATER METERS

Water meters in Tamoshan will be replaced with models that transmit water usage readings electronically. This will enhance leak detection, saving you time and money should a leak occur. The new meters will also help reduce the amount of time spent reading meters so staff can focus on maintenance and operation tasks.



## INSTALL RESERVOIR CIRCULATION

To further improve water quality, Thurston County Public Works will install a water circulation and aeration system in Tamoshan's water reservoir. This means the water will be forced to move around, minimizing stagnation. The system will enhance oxygenation of the water and reduce the formation of disinfection byproducts.





# HELP PROTECT WATER QUALITY



## PREVENT BACKFLOW

Did you know that water from your drain could end up flowing into Tamoshan's drinking water system? When your water system loses pressure, used water from your plumbing fixtures - such as sprinklers, hot tubs, and swimming pools - can get drawn back into the drinking water pipes and contaminate the whole neighborhood's water supply.

Make sure to install and maintain a backflow preventer where connections exist between your drinking water and wastewater pipes. For more information, contact Kevin Patching at 360-867-2288 or [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us).

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## KEEP STORMWATER CLEAN

Storm drains prevent flooding in our streets and neighborhoods by draining rain water into the nearest body of water. Along the way, rain water can pick up pollutants on streets and in storm drains - polluting our drinking water sources with paint, oil, toxic chemicals, fertilizers, pesticides, soaps, yard waste, and litter. Keep storm drains and ditches clear of yard waste and litter. Use common sense lawn care practices described at [co.thurston.wa.us/health/ehcsg/index.html](http://co.thurston.wa.us/health/ehcsg/index.html). And, never hose or dump anything into the storm drain.





# TIPS TO SAVE WATER & MONEY

## KITCHEN.

- Use a dishwasher in lieu of hand washing dishes.
- Install an instant water heater so you don't waste water waiting for it to heat up.

## BATHROOM.

- Upgrade older toilets with WaterSense® models and install aerators on all your faucets.
- Shorten your shower by a minute or two and you'll save up to 150 gal/month.

## LAUNDRY.

- Consider purchasing a high efficiency washing machine to save water and energy.
- When doing laundry, make sure to match water level to the size of the load.

## OTHER INDOOR.

- Run your washer and dishwasher only when full - could save you up to 1000 gal/month.
- Monitor your water bill for unusually high use. It can help you discover leaks.

## LANDSCAPING.

- Use native plants in your yard to significantly reduce irrigation needs.
- Aerate your lawn periodically to allow greater water percolation.

## OTHER OUTDOOR.

- Use a commercial car wash to save water and prevent soaps from entering storm drain.
- Use a broom instead of a hose to clean patios, sidewalks, and driveways.

## WATER SAVING RESOURCES.

- Check out [wateruseitwisely.com](http://wateruseitwisely.com) for 100+ water and energy saving tips.
- Visit [gracelinks.org/1297/how-to-save-water](http://gracelinks.org/1297/how-to-save-water) for even more water-saving tips.



# CONTACT US



**360-867-2300**



**[co.thurston.wa.us/publicworks](http://co.thurston.wa.us/publicworks)**



**Thurston County Public Works  
9605 Tilley Rd. S  
Olympia, WA 98512**



**[@Thurston\\_PW](https://twitter.com/Thurston_PW)**



**Water service: Kevin Patching - [patchik@co.thurston.wa.us](mailto:patchik@co.thurston.wa.us)  
Customer service & billing: Sandy Griffin - [griffis@co.thurston.wa.us](mailto:griffis@co.thurston.wa.us)**

If you are a Tamoshan property manager, please pass this information on to your tenant or guest. Thank you!



**THURSTON COUNTY**  
WASHINGTON  
SINCE 1852



**APPENDIX E**  
**SAMPLE MAINTENANCE FORMS**



## DISTRIBUTION SYSTEM VALVE RECORD

[illegible]

Valve Position Indications: C = Closed, O = Open, P = Partially Opened or Partially Closed



## DISTRIBUTION SYSTEM VALVE RECORD

[illegible]

Valve Position Indications: C = Closed, O = Open, P = Partially Opened or Partially Closed



## FIRE HYDRANT FLOW RECORD

[illegible]



## FIRE HYDRANT MAINTENANCE RECORD

[illegible]

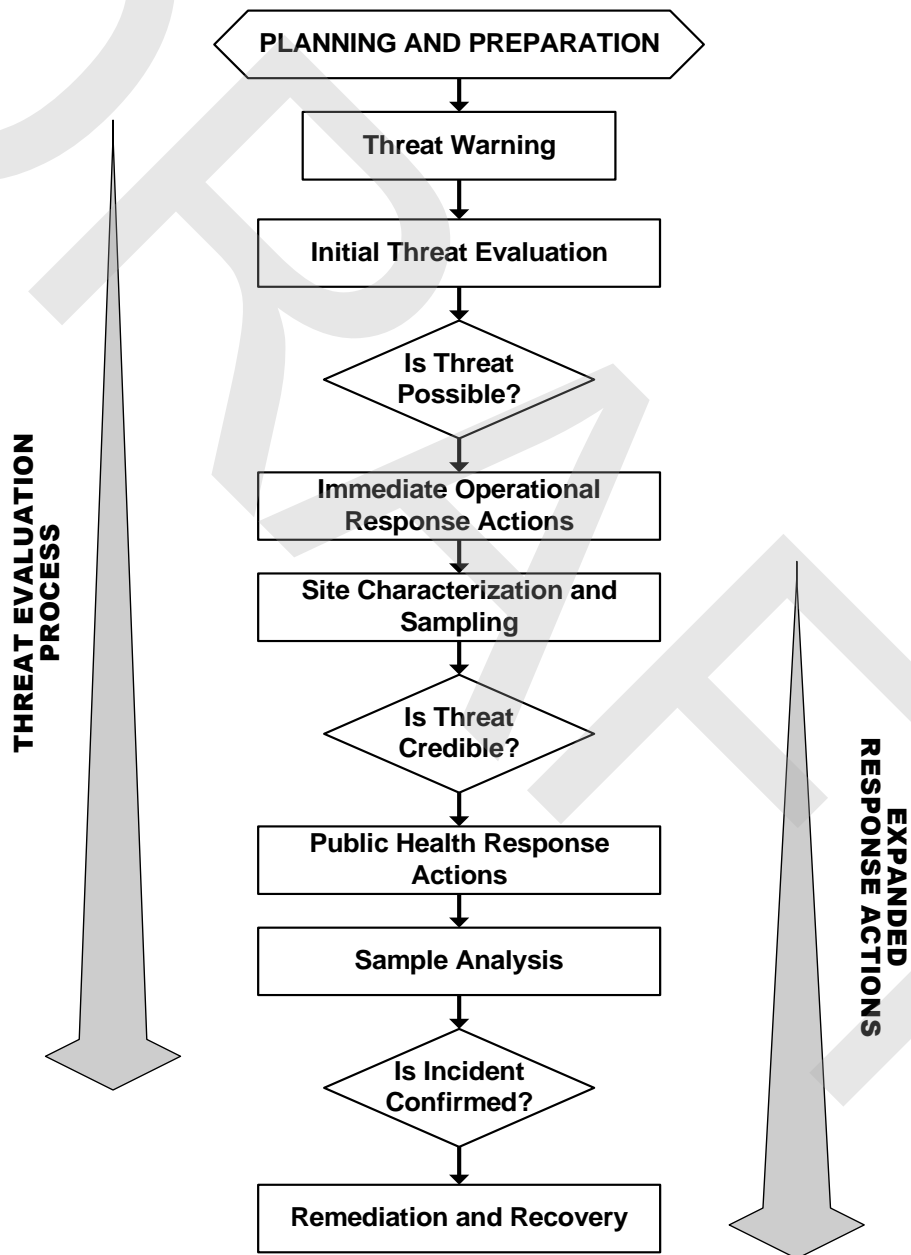


**APPENDIX F**  
**EMERGENCY RESPONSE PLAN**



# Response Protocol Toolbox: Planning for and Responding to Drinking Water & Wastewater Contamination Threats and Incidents

## Response Guidelines





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## Introduction

The EPA released the interim final *Response Protocol Toolbox: Planning for and Responding to Drinking Water Contamination Threats and Incidents* (the *Response Protocol Toolbox*) in winter of 2003 and spring of 2004 to help the water sector effectively and appropriately plan for and respond to contamination threats and incidents. Since its release, EPA has received feedback and suggestions from several sources concerning improvements in the *Response Protocol Toolbox*. These *Response Guidelines* have been developed to provide an easy to use document for field and crisis conditions. While the *Response Protocol Toolbox* provides detailed information, the *Response Guidelines* are to be viewed as the application of the same principles during an actual incident. Thurston County Public Works Utility Division has utilized this for Wastewater emergency response planning as well.

As stated in the definition of Response Guidelines in Module 1, Section 4.3 of the *Response Protocol Toolbox*, Response Guidelines are different from an Emergency Response Plan in that they are essentially a “field guide” for responding to contamination threats and can be developed in many different formats.

This document is intended to be an action oriented document to assist drinking water utilities, laboratories, emergency responders, state drinking water programs, technical assistance providers, and public health and law enforcement officials during the management of an ongoing contamination threat or incident. The *Response Guidelines* are derived from the content of the six full modules of the *Response Protocol Toolbox*.

The *Response Guidelines* are not intended to replace the *Response Protocol Toolbox* and they do not contain the detailed information contained within the six complete modules. Finally, users are encouraged to adapt the *Response Guidelines* as necessary to meet their own needs and objectives.



# 1 Communications and Notifications

The tables below provide contact information which may be helpful in the event of an emergency related to Thurston County Public Works facilities.

## Emergency Services

Fire/Police/Medical Emergency	911
Thurston County Sheriff Dispatch	360-786-5500

## Regulatory Agencies

DOH Regional Office	360-236-3030
County Health Department	360-867-2630
DOE Regional Office	360-407-6300

## Thurston County Utilities Crew

Utilities Crew Emergency Pager	800-926-7761
Kevin Patching-Operations Supervisor	360-239-4486
Vern Prell	360-239-4489
Keith Cournyer	360-239-4492
Dennis Baker	360-485-3143
Reuben Stringer	360-480-8772
Theresa Parsons-Manager	360-701-8995
Scott Lindblom-County Engineer	360-239-2716

## Thurston County Roads Crew

Roads Crew Emergency Pager	360-239-3106
Lucy Mills	360-239-1322
Lane McAllister	360-239-3319
Frank Zoller	360-239-0394
Brian Nurmi	360-628-2389
Donna Eaton	360-628-0790
Terry Roberts	360-239-2110



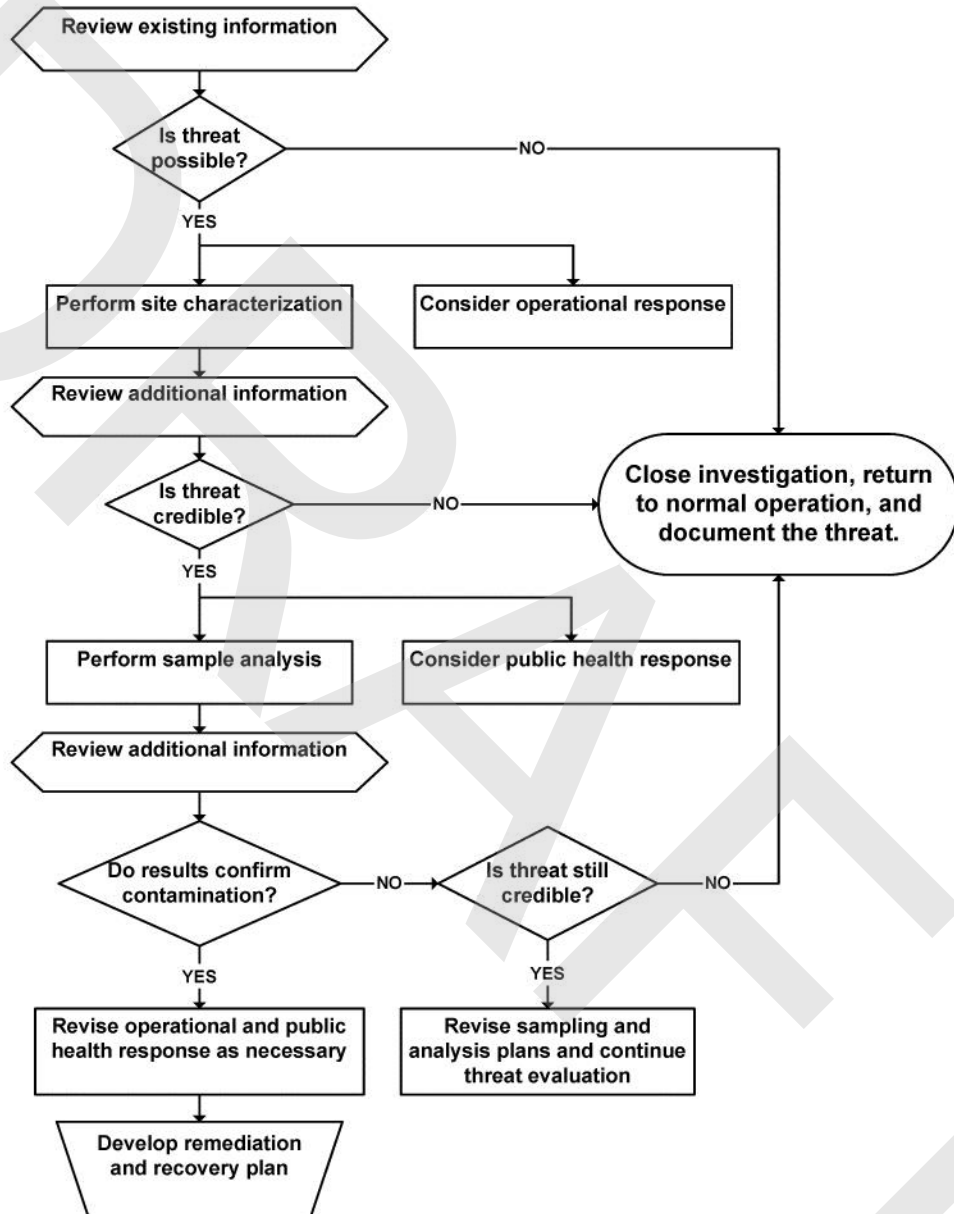
**Contractors and Service Providers**

Black Hills Excavating Inc. (Evan Hufana)	Cell: 360-507-6057
Helton Construction (Josh Helton)	360-791-7536
Flo Hawks (Gary Clarke)	253-475-2213 Cell: 253-606-2269
A Advanced Septic (Robert Leach)	253-435-9999 Cell: 253-888-3438
Kugel Construction (Dan Hatfield)	360-740-4305 Cell: 360-957-2040
Whitney Equipment (Randy McDowell)	425-486-9499 Cell: 206-437-4351
HD Fowler (Ted Huber)	360-459-7300 Cell: 360-239-2634
KBH Construction Co. (Dan Kirkpatrick)	360-413-7888 Cell: 360-381-0054
NW Generator Service (Chris Elfrank)	253-318-5705
Lassen Electric (Todd or Tim or Dan)	360-584-4885; 360-352-8512; 360-789-6518
Reliable Electric (Ray Crisp)	360-790-3900
Systems Interface	425-481-1225
Control Systems International	360-459-5580; 360-280-6005



## 2 Threat Evaluation

### 2.1 Threat Evaluation Process





## 2.2 Evaluating Threat Warnings

The first critical step in evaluating a contamination threat is recognition of a *threat warning* (i.e., an unusual situation that may have presented the opportunity for contamination of the drinking water). The utility will likely be in the best position to observe a threat warning and evaluate whether or not the activity is suspicious (i.e., first decision point in the *Threat Evaluation* process). This section briefly describes factors to consider when evaluating various types of threat warnings.

The common types of threat warnings include:

- **Security breaches**: A security breach is an unauthorized intrusion into a secured facility that may be discovered through direct observation, an alarm trigger, or signs of intrusion (e.g., cut locks, open doors, cut fences). Security breaches may be the most common threat warnings, but in **most** cases are related to day-to-day operation and maintenance within the water system. Other security breaches may be due to criminal activity such as trespassing, vandalism, and theft rather than attempts to contaminate the water.
  - Security Incident Report Form → Section 2.4
- **Witness account**: A threat warning may come from an individual who directly witnesses suspicious activity, such as trespassing, breaking and entering, or some other form of tampering. The witness could be a utility employee, law enforcement officer, citizen, etc.
  - Witness Account Report Form → Section 2.5
- **Direct notification by perpetrator**: A threat may be made directly, verbally or in writing, to the water utility, the news media, law enforcement, or a government agency. Verbal threats made over the phone are historically the most common type of direct threats from perpetrators; however, there have also been written threats to contaminate the drinking water supply.
  - Phone Threat Report Form → Section 2.6
  - Written Threat Report Form → Section 2.7
- **Unusual water quality or consumer complaints**: Unusual water quality results or an unexplained or unusually high incidence of consumer complaints may serve as a warning of potential contamination. In order to evaluate this type of warning, it will be necessary to carefully track routinely monitored water quality data and/or consumer complaints such that significant deviations from an established baseline might be observed.
  - Water Quality and Consumer Complaints Report Form → Section 2.8
- **Notification by public health agency**: Notification from a public health agency regarding increased incidence of disease or death is another possible threat warning. A threat triggered by a public health notification is unique in that at least a segment of the population has presumably been exposed to a harmful substance. In this case, public health officials may launch an epidemiological investigation in an attempt to identify the source of the outbreak, during which the utility may be expected to play a support role.
  - Public Health Information Report Form → Section 2.9



## 2.3 Threat Evaluation Worksheet

### INSTRUCTIONS

The purpose of this worksheet is to help organize information about a contamination threat warning that would be used during the Threat Evaluation Process. The individual responsible for conducting the Threat Evaluation (e.g., the WUERM) should complete this worksheet. The worksheet is generic to accommodate information from different types of threat warnings; thus, there will likely be information that is unavailable or not immediately available. Other forms in the Appendices are provided to augment the information in this worksheet.

### THREAT WARNING INFORMATION

Date/Time threat warning discovered: \_\_\_\_\_

Utility Name and Address: \_\_\_\_\_

Name/Number of person who discovered threat warning: \_\_\_\_\_

#### Type of threat warning:

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Security breach            | <input type="checkbox"/> Witness account       | <input type="checkbox"/> Phone threat        |
| <input type="checkbox"/> Written threat             | <input type="checkbox"/> Unusual water quality | <input type="checkbox"/> Consumer complaints |
| <input type="checkbox"/> Public health notification | <input type="checkbox"/> Other _____           |  |

Identity of the contaminant: ☐ Known ☐ Suspected ☐ Unknown

*If known or suspected, provide additional detail below*

☐ Chemical ☐ Biological ☐ Radiological

Describe \_\_\_\_\_  
\_\_\_\_\_

Time of contamination: ☐ Known ☐ Estimated ☐ Unknown

*If known or estimated, provide additional detail below*

Date and time of contamination: \_\_\_\_\_

Additional Information: \_\_\_\_\_  
\_\_\_\_\_

Mode of contamination: ☐ Known ☐ Suspected ☐ Unknown

*If known or suspected, provide additional detail below*

Method of addition: ☐ Single dose ☐ Over time ☐ Other \_\_\_\_\_

Amount of material: \_\_\_\_\_

Additional Information: \_\_\_\_\_  
\_\_\_\_\_



## RESPONSE GUIDELINES

**Site of contamination:** ☐ Known ☐ Suspected ☐ Unknown

*If known or suspected, provide additional detail below*

Number of sites: \_\_\_\_\_

*Provide the following information for each site.*

### **Site #1**

Site Name: \_\_\_\_\_

Type of facility

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Source water        | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station             |
| <input type="checkbox"/> Ground storage tank | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water reservoir |
| <input type="checkbox"/> Distribution main   | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection       |
| <input type="checkbox"/> Other _____         |  |   |

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_

### **Site #2**

Site Name: \_\_\_\_\_

Type of facility

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Source water        | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station             |
| <input type="checkbox"/> Ground storage tank | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water reservoir |
| <input type="checkbox"/> Distribution main   | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection       |
| <input type="checkbox"/> Other _____         |  |   |

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_

### **Site #3**

Site Name: \_\_\_\_\_

Type of facility

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Source water        | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station             |
| <input type="checkbox"/> Ground storage tank | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water reservoir |
| <input type="checkbox"/> Distribution main   | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection       |
| <input type="checkbox"/> Other _____         |  |   |

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_



## ADDITIONAL INFORMATION

**Has there been a breach of security at the suspected site?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Security Incident Report' (Section 2.4)*

**Are there any witness accounts of the suspected incident?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Witness Account Report' (Section 2.5)*

**Was the threat made verbally over the phone?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Phone Threat Report' (Section 2.6)*

**Was a written threat received?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Written Threat Report' (Section 2.7)*

**Are there unusual water quality data or consumer complaints?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Water Quality/Consumer Complaint Report' (Section 2.8)*

**Are there unusual symptoms or disease in the population?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Public Health Report' (Section 2.9)*

**Is a 'Site Characterization Report' available?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Site Characterization Report' (Section 3.4)*

**Are results of sample analysis available?** ☐ Yes ☐ No  
*If "Yes", review the analytical results report, including appropriate QA/QC data*

**Is a 'Contaminant Identification Report' available?** ☐ Yes ☐ No  
*If "Yes", review the completed 'Sample Analysis Report' (Section 4.3)*

**Is there relevant information available from external sources?** ☐ Yes ☐ No  
*Check all that apply*

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Local law enforcement | <input type="checkbox"/> FBI                          | <input type="checkbox"/> DW primacy agency     |
| <input type="checkbox"/> Public health agency  | <input type="checkbox"/> Hospitals / 911 call centers | <input type="checkbox"/> US EPA / Water ISAC   |
| <input type="checkbox"/> Media reports         | <input type="checkbox"/> Homeland security alerts     | <input type="checkbox"/> Neighboring utilities |
| <input type="checkbox"/> Other                 |   |  |

Point of Contact: \_\_\_\_\_  
 \_\_\_\_\_

Summary of key information from external sources (provide detail in attachments as necessary):

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



# THREAT EVALUATION

**Has normal activity been investigated as the cause of the threat warning?** ☐ Yes ☐ No

Normal activities to consider

- |  |   |
|--|---|
| <input type="checkbox"/> Utility staff inspections   | <input type="checkbox"/> Routine water quality sampling           |
| <input type="checkbox"/> Construction or maintenance | <input type="checkbox"/> Contractor activity                      |
| <input type="checkbox"/> Operational changes         | <input type="checkbox"/> Water quality changes with a known cause |
| <input type="checkbox"/> Other _____                 |   |

**Is the threat 'possible'?** ☐ Yes ☐ No

Summarize the basis for this determination: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Response to a 'possible' threat:

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> None                          | <input type="checkbox"/> Site characterization | <input type="checkbox"/> Isolation/containment |
| <input type="checkbox"/> Increased monitoring/security | <input type="checkbox"/> Other _____           |  |

**Is the threat 'credible'?** ☐ Yes ☐ No

Summarize the basis for this determination: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Response to a 'credible' threat:

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Sample analysis        | <input type="checkbox"/> Site characterization | <input type="checkbox"/> Isolation/containment          |
| <input type="checkbox"/> Partial EOC activation | <input type="checkbox"/> Public notification   | <input type="checkbox"/> Provide alternate water supply |
| <input type="checkbox"/> Other _____            |  |   |

**Has a contamination incident been confirmed?** ☐ Yes ☐ No

Summarize the basis for this determination: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Response to a confirmed incident:

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Sample analysis                   | <input type="checkbox"/> Site characterization | <input type="checkbox"/> Isolation/containment          |
| <input type="checkbox"/> Full EOC activation               | <input type="checkbox"/> Public notification   | <input type="checkbox"/> Provide alternate water supply |
| <input type="checkbox"/> Initiate remediation and recovery |  |   |
| <input type="checkbox"/> Other _____                       |  |   |



**How do other organizations characterize the threat?**

Organization	Evaluation	Comment
<input type="checkbox"/> Local Law Enforcement	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	
<input type="checkbox"/> FBI	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	
<input type="checkbox"/> Public Health Agency	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	
<input type="checkbox"/> Drinking Water Primacy Agency	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	
<input type="checkbox"/> Other	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	
<input type="checkbox"/> Other	<input type="checkbox"/> Possible <input type="checkbox"/> Credible <input type="checkbox"/> Confirmed	

**SIGNOFF**

Name of person completing this form:

Print name \_\_\_\_\_ Phone Number \_\_\_\_\_

Signature \_\_\_\_\_ Date/Time: \_\_\_\_\_



## 2.4 Security Incident Report Form

### INSTRUCTIONS

The purpose of this form is to help organize information about a security incident, typically a security breach, which may be related to a water contamination threat. The individual who discovered the security incident, such as a security supervisor, the WUERM, or another designated individual may complete this form. This form is intended to summarize information about a security breach that may be relevant to the threat evaluation process. This form should be completed for each location where a security incident was discovered.

### DISCOVERY OF SECURITY INCIDENT

Date/Time security incident discovered: \_\_\_\_\_

Name of person who discovered security incident: \_\_\_\_\_

#### Mode of discovery:

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Alarm (building)   | <input type="checkbox"/> Alarm (gate/fence)        | <input type="checkbox"/> Alarm (access hatch) |
| <input type="checkbox"/> Video surveillance | <input type="checkbox"/> Utility staff discovery   | <input type="checkbox"/> Citizen discovery    |
| <input type="checkbox"/> Suspect confession | <input type="checkbox"/> Law enforcement discovery |   |
| <input type="checkbox"/> Other _____        |  |   |

Did anyone observe the security incident as it occurred? ☐ Yes ☐ No

If "Yes", complete the 'Witness Account Report' (Appendix 8.4)

### SITE DESCRIPTION

Site Name: \_\_\_\_\_

#### Type of facility

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Source water        | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station             |
| <input type="checkbox"/> Ground storage tank | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water reservoir |
| <input type="checkbox"/> Distribution main   | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection       |
| <input type="checkbox"/> Other _____         |  |   |

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_

### BACKGROUND INFORMATION

Have the following "normal activities" been investigated as potential causes of the security incident?

- |  |  |
|--|--|
| <input type="checkbox"/> Alarms with known and harmless causes | <input type="checkbox"/> Utility staff inspections   |
| <input type="checkbox"/> Routine water quality sampling        | <input type="checkbox"/> Construction or maintenance |
| <input type="checkbox"/> Contractor activity                   | <input type="checkbox"/> Other _____                 |



## RESPONSE GUIDELINES

**Was this site recently visited *prior* to the security incident?**

☐ Yes

☐ No

*If "Yes," provide additional detail below*

Date and time of previous visit: \_\_\_\_\_

Name of individual who visited the site: \_\_\_\_\_

Additional Information: \_\_\_\_\_

**Has *this location* been the site of previous security incidents?**

☐ Yes

☐ No

*If "Yes," provide additional detail below*

Date and time of most recent security incident: \_\_\_\_\_

Description of incident: \_\_\_\_\_

\_\_\_\_\_

What were the results of the threat evaluation for this incident?

☐ 'Possible'

☐ 'Credible'

☐ 'Confirmed'

**Have security incidents occurred at *other locations* recently?**

☐ Yes

☐ No

*If "Yes", complete additional 'Security Incident Reports' (Appendix 8.3) for each site*

Name of 1<sup>st</sup> additional site: \_\_\_\_\_

Name of 2<sup>nd</sup> additional site: \_\_\_\_\_

Name of 3<sup>rd</sup> additional site: \_\_\_\_\_

## SECURITY INCIDENT DETAILS

**Was there an alarm(s) associated with the security incident?**

☐ Yes

☐ No

*If "Yes," provide additional detail below*

Are there sequential alarms (e.g., alarm on a gate and a hatch)? ☐ Yes ☐ No

Date and time of alarm(s): \_\_\_\_\_

Describe alarm(s): \_\_\_\_\_

\_\_\_\_\_

**Is video surveillance available from the site of the security incident?**

☐ Yes

☐ No

*If "Yes," provide additional detail below*

Date and time of video surveillance: \_\_\_\_\_

Describe surveillance: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**Unusual equipment found at the site and time of discovery of the security incident:**

- |  |  |
|--|--|
| <input type="checkbox"/> Discarded PPE (e.g., gloves, masks)   | <input type="checkbox"/> Empty containers (e.g., bottles, drums) |
| <input type="checkbox"/> Tools (e.g., wrenches, bolt cutters)  | <input type="checkbox"/> Hardware (e.g., valves, pipe)           |
| <input type="checkbox"/> Lab equipment (e.g., beakers, tubing) | <input type="checkbox"/> Pumps or hoses                          |
| <input type="checkbox"/> None                                  | <input type="checkbox"/> Other _____                             |

Describe equipment: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Unusual vehicles found at the site and time of discovery of the security incident:**

- |  |   |                                       |
|--|---|---------------------------------------|
| <input type="checkbox"/> Car/sedan     | <input type="checkbox"/> SUV                  | <input type="checkbox"/> Pickup truck |
| <input type="checkbox"/> Flatbed truck | <input type="checkbox"/> Construction vehicle | <input type="checkbox"/> None         |
| <input type="checkbox"/> Other _____   |   |                                       |

Describe vehicles (including make/model/year/color, license plate #, and logos or markings): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Signs of tampering at the site and time of discovery of the security incident:**

- |  |  |
|--|--|
| <input type="checkbox"/> Cut locks/fences            | <input type="checkbox"/> Open/damaged gates, doors, or windows |
| <input type="checkbox"/> Open/damaged access hatches | <input type="checkbox"/> Missing/damaged equipment             |
| <input type="checkbox"/> Facility in disarray        | <input type="checkbox"/> None                                  |
| <input type="checkbox"/> Other _____                 |  |

Are there signs of sequential intrusion (e.g., locks removed from a gate and hatch)? ☐ Yes  
☐ No

Describe signs of tampering: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Signs of hazard at the site and time of discovery of the security incident:**

- |  |   |
|--|---|
| <input type="checkbox"/> Unexplained or unusual odors            | <input type="checkbox"/> Unexplained dead animals |
| <input type="checkbox"/> Unexplained dead or stressed vegetation | <input type="checkbox"/> Unexplained liquids      |
| <input type="checkbox"/> Unexplained clouds or vapors            | <input type="checkbox"/> None                     |
| <input type="checkbox"/> Other _____                             |   |

Describe signs of hazard: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**SIGNOFF**

Name of person responsible for documenting the security incident:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 2.5 Witness Account Report Form

### INSTRUCTIONS

*The purpose of this form is to document the observations of a witness to activities that might be considered an incident warning. The individual interviewing the witness, or potentially the witness, should complete this form. This may be the WUERM or an individual designated by incident command to perform the interview. If law enforcement is conducting the interview (which may often be the case), then this form may serve as a prompt for "utility relevant information" that should be pursued during the interview. This form is intended to consolidate the details of the witness account that may be relevant to the threat evaluation process. This form should be completed for each witness that is interviewed.*

### BASIC INFORMATION

Date/Time of interview: \_\_\_\_\_

Name of person interviewing the witness: \_\_\_\_\_

#### Witness contact information

Full Name: \_\_\_\_\_

Address: \_\_\_\_\_

Day-time phone: \_\_\_\_\_

Evening phone: \_\_\_\_\_

E-mail address: \_\_\_\_\_

Reason the witness was in the vicinity of the suspicious activity: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### WITNESS ACCOUNT

Date/Time of activity: \_\_\_\_\_

#### Location of activity:

Site Name: \_\_\_\_\_

#### Type of facility

☐ Source water

☐ Treatment plant

☐ Pump station

☐ Ground storage tank

☐ Elevated storage tank

☐ Finished water reservoir

☐ Distribution main

☐ Hydrant

☐ Service connection

☐ Other \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Additional Site Information: \_\_\_\_\_

\_\_\_\_\_



**Type of activity**

- ☐ Trespassing                      ☐ Vandalism                      ☐ Breaking and entering  
☐ Theft                                      ☐ Tampering                      ☐ Surveillance  
☐ Other \_\_\_\_\_

Additional description of the activity \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Description of suspects**

Were suspects present at the site?                      ☐ Yes                      ☐ No

How many suspects were present? \_\_\_\_\_

Describe each suspect's appearance:

Suspect #	Sex	Race	Hair color	Clothing	Voice
1					
2					
3					
4					
5					
6					

Where any of the suspects wearing uniforms?                      ☐ Yes                      ☐ No

If "Yes," describe the uniform(s): \_\_\_\_\_  
 \_\_\_\_\_

Describe any other unusual characteristics of the suspects: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Did any of the suspects notice the witness?                      ☐ Yes                      ☐ No

If "Yes," how did they respond: \_\_\_\_\_  
 \_\_\_\_\_

**Vehicles at the site**

Were vehicles present at the site?                      ☐ Yes                      ☐ No

Did the vehicles appear to belong to the suspects?                      ☐ Yes                      ☐ No

How many vehicles were present? \_\_\_\_\_



# RESPONSE GUIDELINES

Describe each vehicle:

Vehicle #	Type	Color	Make	Model	License plate
1					
2					
3					
4					
5					
6					

Where there any logos or distinguishing markings on the vehicles? ☐ Yes ☐ No  
 If "Yes," describe: \_\_\_\_\_

Provide any additional detail about the vehicles and how they were used (if at all): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Equipment at the site

Was any unusual equipment present at the site? ☐ Yes ☐ No

- |  |   |
|--|---|
| <input type="checkbox"/> Explosive or incendiary devices       | <input type="checkbox"/> Firearms                             |
| <input type="checkbox"/> PPE (e.g., gloves, masks)             | <input type="checkbox"/> Containers (e.g., bottles, drums)    |
| <input type="checkbox"/> Tools (e.g., wrenches, bolt cutters)  | <input type="checkbox"/> Hardware (e.g., valves, pipe, hoses) |
| <input type="checkbox"/> Lab equipment (e.g., beakers, tubing) | <input type="checkbox"/> Pumps and related equipment          |
| <input type="checkbox"/> Other _____                           |   |

Describe the equipment and how it was being used by the suspects (if at all): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Unusual conditions at the site

Were there any unusual conditions at the site? ☐ Yes ☐ No

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Explosions or fires      | <input type="checkbox"/> Fogs or vapors | <input type="checkbox"/> Unusual odors  |
| <input type="checkbox"/> Dead/stressed vegetation | <input type="checkbox"/> Dead animals   | <input type="checkbox"/> Unusual noises |
| <input type="checkbox"/> Other _____              |   |   |

Describe the site conditions: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**Additional observations**

Describe any additional details from the witness account: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SIGNOFF**

Name of interviewer:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_

Name of witness:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 2.6 Phone Threat Report Form

### INSTRUCTIONS

*This form is intended to be used by utility staff that regularly answer phone calls from the public (e.g., call center operators). The purpose of this form is to help these staff capture as much information from a threatening phone call while the caller is on the line. It is important that the operator keep the caller on the line as long as possible in order to collect additional information. Since this form will be used during the call, it is important that operators become familiar with the content of the form. The sections of the form are organized with the information that should be collected during the call at the front of the form (i.e., Basic Call Information and Details of Threat) and information that can be completed immediately following the call at the end of the form (i.e., the description of the caller). The information collected on this form will be critical to the threat evaluation process.*

**Remember, tampering with a drinking water system is a crime under the SDWA Amendments!**

### THREAT NOTIFICATION

Name of person receiving the call: \_\_\_\_\_

Date phone call received: \_\_\_\_\_

Time phone call received: \_\_\_\_\_

Time phone call ended: \_\_\_\_\_

Duration of phone call: \_\_\_\_\_

Originating number: \_\_\_\_\_

Originating name: \_\_\_\_\_

*If the number/name is not displayed on the caller ID, press \*57 (or call trace) at the end of the call and inform law enforcement that the phone company may have trace information.*

Is the connection clear? ☐ Yes ☐ No

Could call be from a wireless phone? ☐ Yes ☐ No

### DETAILS OF THREAT

Has the water already been contaminated? ☐ Yes ☐ No

Date and time of contaminant introduction known? ☐ Yes ☐ No

Date and time if known: \_\_\_\_\_

Location of contaminant introduction known? ☐ Yes ☐ No

Site Name: \_\_\_\_\_

Type of facility

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Source water        | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station             |
| <input type="checkbox"/> Ground storage tank | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water reservoir |
| <input type="checkbox"/> Distribution main   | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection       |
| <input type="checkbox"/> Other _____         |  |   |

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_



## RESPONSE GUIDELINES

### Name or type of contaminant known?

☐ Yes

☐ No

Type of contaminant

☐ Chemical

☐ Biological

☐ Radiological

Specific contaminant name/description: \_\_\_\_\_

### Mode of contaminant introduction known?

☐ Yes

☐ No

Method of addition:

☐ Single dose

☐ Over time

☐ Other

Amount of material: \_\_\_\_\_

Additional Information: \_\_\_\_\_

### Motive for contamination known?

☐ Yes

☐ No

☐ Retaliation/revenge

☐ Political cause

☐ Religious doctrine

☐ Other

Describe motivation: \_\_\_\_\_

## CALLER INFORMATION

### Basic Information:

Stated name: \_\_\_\_\_

Affiliation: \_\_\_\_\_

Phone number: \_\_\_\_\_

Location/address: \_\_\_\_\_

### Caller's Voice:

Did the voice sound disguised or altered?

☐ Yes

☐ No

Did the call sound like a recording?

☐ Yes

☐ No

Did the voice sound?

☐ Male / ☐ Female

☐ Young / ☐ Old

Did the voice sound familiar?

☐ Yes

☐ No

If 'Yes,' who did it sound like? \_\_\_\_\_

Did the caller have an accent?

☐ Yes

☐ No

If 'Yes,' what nationality? \_\_\_\_\_

How did the caller sound or speak?

☐ Educated

☐ Well spoken

☐ Illiterate

☐ Irrational

☐ Obscene

☐ Incoherent

☐ Reading a script

☐ Other



## RESPONSE GUIDELINES

What was the caller's tone of voice?

- |                                      |                                  |                                  |  |
|--------------------------------------|----------------------------------|----------------------------------|--|
| <input type="checkbox"/> Calm        | <input type="checkbox"/> Angry   | <input type="checkbox"/> Lipping | <input type="checkbox"/> Stuttering/broken |
| <input type="checkbox"/> Excited     | <input type="checkbox"/> Nervous | <input type="checkbox"/> Sincere | <input type="checkbox"/> Insincere         |
| <input type="checkbox"/> Slow        | <input type="checkbox"/> Rapid   | <input type="checkbox"/> Normal  | <input type="checkbox"/> Slurred           |
| <input type="checkbox"/> Soft        | <input type="checkbox"/> Loud    | <input type="checkbox"/> Nasal   | <input type="checkbox"/> Clearing throat   |
| <input type="checkbox"/> Laughing    | <input type="checkbox"/> Crying  | <input type="checkbox"/> Clear   | <input type="checkbox"/> Deep breathing    |
| <input type="checkbox"/> Deep        | <input type="checkbox"/> High    | <input type="checkbox"/> Raspy   | <input type="checkbox"/> Cracking          |
| <input type="checkbox"/> Other _____ |                                  |                                  |  |

Were there background noises coming from the caller's end?

- |  |          |       |
|--|----------|-------|
| <input type="checkbox"/> Silence               |          |       |
| <input type="checkbox"/> Voices                | describe | _____ |
| <input type="checkbox"/> Children              | describe | _____ |
| <input type="checkbox"/> Animals               | describe | _____ |
| <input type="checkbox"/> Factory sounds        | describe | _____ |
| <input type="checkbox"/> Office sounds         | describe | _____ |
| <input type="checkbox"/> Music                 | describe | _____ |
| <input type="checkbox"/> Traffic/street sounds | describe | _____ |
| <input type="checkbox"/> Airplanes             | describe | _____ |
| <input type="checkbox"/> Trains                | describe | _____ |
| <input type="checkbox"/> Ships or large boats  | describe | _____ |
| <input type="checkbox"/> Other: _____          |          |       |

### SIGNOFF

Name of call recipient:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_

Name of person completing form (if different from call recipient):

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 2.7 Written Threat Report Form

### INSTRUCTIONS

The purpose of this form is to summarize significant information from a written threat received by a drinking water utility. This form should be completed by the WUERM or an individual designated by incident command to evaluate the written threat. The summary information provided in this form is intended to support the threat evaluation process; however, the completed form is not a substitute for the complete written threat, which may contain additional, significant details.

The written threat itself (e.g., the note, letter, e-mail message, etc.) may be considered evidence and thus should be minimally handled (or not handled at all) and placed into a clean plastic bag to preserve any forensic evidence.

**Remember, tampering with a drinking water system is a crime under the SDWA Amendments!**

### SAFETY

A suspicious letter or package could pose a threat in and of itself, so caution should be exercised if such packages are received. The US Postal Service has issued guidance when dealing with suspicious packages ([http://www.usps.com/news/2001/press/pr01\\_1022gsa.htm](http://www.usps.com/news/2001/press/pr01_1022gsa.htm)).

### THREAT NOTIFICATION

Name of person receiving the written threat: \_\_\_\_\_

Person(s) to whom threat was addressed: \_\_\_\_\_

Date threat received: \_\_\_\_\_ Time threat received: \_\_\_\_\_

#### How was the written threat received?

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> US Postal service | <input type="checkbox"/> Delivery service | <input type="checkbox"/> Courier        |
| <input type="checkbox"/> Fax               | <input type="checkbox"/> E-mail           | <input type="checkbox"/> Hand delivered |
| <input type="checkbox"/> Other _____       |   |   |

If mailed, is the return address listed? ☐ Yes ☐ No  
 \_\_\_\_\_  
 \_\_\_\_\_

If mailed, what is the date and location of the postmark? \_\_\_\_\_  
 \_\_\_\_\_

If delivered, what was the service used (list any tracking numbers)? \_\_\_\_\_  
 \_\_\_\_\_

If Faxed, what is the number of the sending fax? \_\_\_\_\_

If E-mailed, what is the e-mail address of sender? \_\_\_\_\_  
 \_\_\_\_\_

If hand-delivered, who delivered the message? \_\_\_\_\_  
 \_\_\_\_\_



**DETAILS OF THREAT**

**Has the water already been contaminated?**

☐ Yes

☐ No

**Date and time of contaminant introduction known?**

☐ Yes

☐ No

Date and time if known: \_\_\_\_\_

**Location of contaminant introduction known?**

☐ Yes

☐ No

Site Name: \_\_\_\_\_

Type of facility

☐ Source water

☐ Treatment plant

☐ Pump station

☐ Ground storage tank

☐ Elevated storage tank

☐ Finished water reservoir

☐ Distribution main

☐ Hydrant

☐ Service connection

☐ Other \_\_\_\_\_

Address: \_\_\_\_\_

Additional Site Information: \_\_\_\_\_

**Name or type of contaminant known?**

☐ Yes

☐ No

Type of contaminant

☐ Chemical

☐ Biological

☐ Radiological

Specific contaminant name/description: \_\_\_\_\_

**Mode of contaminant introduction known?**

☐ Yes

☐ No

Method of addition:

☐ Single dose

☐ Over time

☐ Other \_\_\_\_\_

Amount of material: \_\_\_\_\_

Additional Information: \_\_\_\_\_

**Motive for contamination known?**

☐ Yes

☐ No

☐ Retaliation/revenge

☐ Political cause

☐ Religious doctrine

☐ Other \_\_\_\_\_

Describe motivation: \_\_\_\_\_

**NOTE CHARACTERISTICS**

**Perpetrator Information:**

Stated name: \_\_\_\_\_

Affiliation: \_\_\_\_\_

Phone number: \_\_\_\_\_

Location/address: \_\_\_\_\_



**Condition of paper/envelop:**

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Marked personal         | <input type="checkbox"/> Marked confidential | <input type="checkbox"/> Properly addressed     |
| <input type="checkbox"/> Neatly typed or written | <input type="checkbox"/> Clean               | <input type="checkbox"/> Corrected or marked-up |
| <input type="checkbox"/> Crumpled or wadded up   | <input type="checkbox"/> Soiled/stained      | <input type="checkbox"/> Torn/tattered          |
| <input type="checkbox"/> Other: _____            |  |   |

**How was the note prepared?**

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Handwritten in print | <input type="checkbox"/> Handwritten in script                     | <input type="checkbox"/> Computer typed |
| <input type="checkbox"/> Machine typed        | <input type="checkbox"/> Spliced (e.g., from other typed material) |   |
| <input type="checkbox"/> Other: _____         |  |   |

If handwritten, does writing look familiar? ☐ Yes ☐ No

\_\_\_\_\_

**Language:**

- |  |                                       |
|--|---------------------------------------|
| <input type="checkbox"/> Clear English           | <input type="checkbox"/> Poor English |
| <input type="checkbox"/> Another language: _____ |                                       |
| <input type="checkbox"/> Mixed languages: _____  |                                       |

**Writing Style**

- |                                       |  |                                     |
|---------------------------------------|--|-------------------------------------|
| <input type="checkbox"/> Educated     | <input type="checkbox"/> Proper grammar        | <input type="checkbox"/> Logical    |
| <input type="checkbox"/> Uneducated   | <input type="checkbox"/> Poor grammar/spelling | <input type="checkbox"/> Incoherent |
| <input type="checkbox"/> Use of slang | <input type="checkbox"/> Obscene               |                                     |
| <input type="checkbox"/> Other: _____ |  |                                     |

**Writing Tone**

- |  |                                     |                                     |
|--|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> Clear         | <input type="checkbox"/> Direct     | <input type="checkbox"/> Sincere    |
| <input type="checkbox"/> Condescending | <input type="checkbox"/> Accusatory | <input type="checkbox"/> Angry      |
| <input type="checkbox"/> Agitated      | <input type="checkbox"/> Nervous    | <input type="checkbox"/> Irrational |
| <input type="checkbox"/> Other: _____  |                                     |                                     |

**SIGNOFF**

Name of individual who received the threat:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_

Name of person completing form (if different from written threat recipient):

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 2.8 Water Quality/Consumer Complaint Report Form

### INSTRUCTIONS

*This form is provided to guide the individual responsible for evaluating unusual water quality data or consumer complaints. It is designed to prompt the analyst to consider various factors or information when evaluating the unusual data. The actual data used in this analysis should be compiled separately and appended to this form. The form can be used to support the threat evaluation due to a threat warning from unusual water quality or consumer complaints, or another type of threat warning in which water quality data or consumer complaints are used to support the evaluation.*

*Note that in this form, water quality refers to both specific water quality parameters and the general aesthetic characteristics of the water that might result in consumer complaints.*

**Threat warning is based on:**      ☐ Water quality      ☐ Consumer complaints      ☐ Other

**What is the water quality parameter or complaint under consideration?**

**Are unusual consumer complaints corroborated by unusual water quality data?**

**Is the unusual water quality indicative of a particular contaminant of concern? For example, is the color, order, or taste associated with a particular contaminant?**

**Are consumers in the affected area experiencing any unusual health symptoms?**

**What is 'typical' for consumer complaints for the current season and water quality?**

Number of complaints.  
Nature of complaints.  
Clustering of complaints

**What is considered to be 'normal' water quality (i.e., what is the baseline water quality data or level of consumer complaints)?**

**What is reliability of the method or instrumentation used for the water quality analysis?**

Are standards and reagents OK?  
Is the method/instrument functioning properly?

**Based on recent data, does the unusual water quality appear to be part of a gradual trend (i.e., occurring over several days or longer)?**

**Are the unusual water quality observations sporadic over a wide area, or are they clustered in a particular area?**

What is the extent of the area? A pressure zone. A neighborhood. A city block. A street. A building.



**If the unusual condition isolated to a specific area:**

Is this area being supplied by a particular plant or source water?

Have there been any operational changes at the plant or in the affected area of the system?

Has there been any flushing or distribution system maintenance in the affected area?

Has there been any repair or construction in the area that could impact water quality?

---

**SIGNOFF**

Name of person completing form:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 2.9 Public Health Information Report Form

### INSTRUCTIONS

*The purpose of this form is to summarize significant information about a public health episode that could be linked to contaminated water. This form should be completed by the WUERM or an individual designated by incident command. The information compiled in this form is intended to support the threat evaluation process.*

*In the case of a threat warning due to a report from public health, it is likely that the public health agency will assume incident command during the investigation. The drinking water utility will likely play a support role during the investigation, specifically to help determine whether or not water might be the cause.*

### PUBLIC HEALTH NOTIFICATION

**Date and Time of notification:** \_\_\_\_\_

**Name of person who received the notification:** \_\_\_\_\_

#### Contact information for individual providing the notification

Full Name: \_\_\_\_\_

Title: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Day-time phone: \_\_\_\_\_

Evening phone: \_\_\_\_\_

Fax Number: \_\_\_\_\_

E-mail address: \_\_\_\_\_

**Why is this person contacting the drinking water utility?** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Has the state or local public health agency been notified?** ☐ Yes ☐ No

If "No," the appropriate public health official should be immediately notified.

### DESCRIPTION OF PUBLIC HEALTH EPISODE

#### Nature of public health episode:

- ☐ Unusual disease (mild) ☐ Unusual disease (severe) ☐ Death  
☐ Other: \_\_\_\_\_

#### Symptoms:

- ☐ Diarrhea ☐ Vomiting/nausea ☐ Flu-like symptoms  
☐ Fever ☐ Headache ☐ Breathing difficulty  
☐ Other: \_\_\_\_\_

Describe symptoms: \_\_\_\_\_

\_\_\_\_\_

**Causative Agent:** ☐ Known ☐ Suspected ☐ Unknown

If known or suspected, provide additional detail below

- ☐ Chemical ☐ Biological ☐ Radiological

Describe \_\_\_\_\_

\_\_\_\_\_

Estimate of time between exposure and onset of symptoms: \_\_\_\_\_



**Exposed Individuals:**

Location where exposure is thought to have occurred

- |                                       |  |   |
|---------------------------------------|--|---|
| <input type="checkbox"/> Residence    | <input type="checkbox"/> Work          | <input type="checkbox"/> School           |
| <input type="checkbox"/> Restaurant   | <input type="checkbox"/> Shopping mall | <input type="checkbox"/> Social gathering |
| <input type="checkbox"/> Other: _____ |  |   |

Additional notes on location of exposure: \_\_\_\_\_

Collect addresses for specific locations where exposure is thought to have occurred.

Is the pattern of exposure clustered in a specific area? ☐ Yes ☐ No

Extent of area

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Single building | <input type="checkbox"/> Complex (several buildings) | <input type="checkbox"/> City block            |
| <input type="checkbox"/> Neighborhood    | <input type="checkbox"/> Cluster of neighborhoods    | <input type="checkbox"/> Large section of city |
| <input type="checkbox"/> Other: _____    |  |  |

Additional notes on extent of area: \_\_\_\_\_

Do the exposed individuals represent a disproportionate number of:

- |  |   |                                   |
|--|---|-----------------------------------|
| <input type="checkbox"/> Immune compromised  | <input type="checkbox"/> Elderly        | <input type="checkbox"/> Children |
| <input type="checkbox"/> Infants   | <input type="checkbox"/> Pregnant women | <input type="checkbox"/> Women    |
| <input type="checkbox"/> Other: _____  |   |                                   |
| <input type="checkbox"/> None, no specific groups dominate the makeup of exposed individuals |   |                                   |

**EVALUATION OF LINK TO WATER**

**Are the symptoms consistent with typical waterborne diseases, such as gastrointestinal disease, vomiting, or diarrhea?** ☐ Yes ☐ No

**Does the area of exposure coincide with a specific area of the system, such as a pressure zone or area feed by a specific plant?** ☐ Yes ☐ No

**Were there any consumer complaints within the affected area?** ☐ Yes ☐ No

**Were there any unusual water quality data within the affected area?** ☐ Yes ☐ No

**Were there any process upsets or operational changes?** ☐ Yes ☐ No

**Was there any construction/maintenance within the affected area?** ☐ Yes ☐ No

**Were there any security incidents within the affected area?** ☐ Yes ☐ No

**SIGNOFF**

Name of person completing form:

Print name \_\_\_\_\_

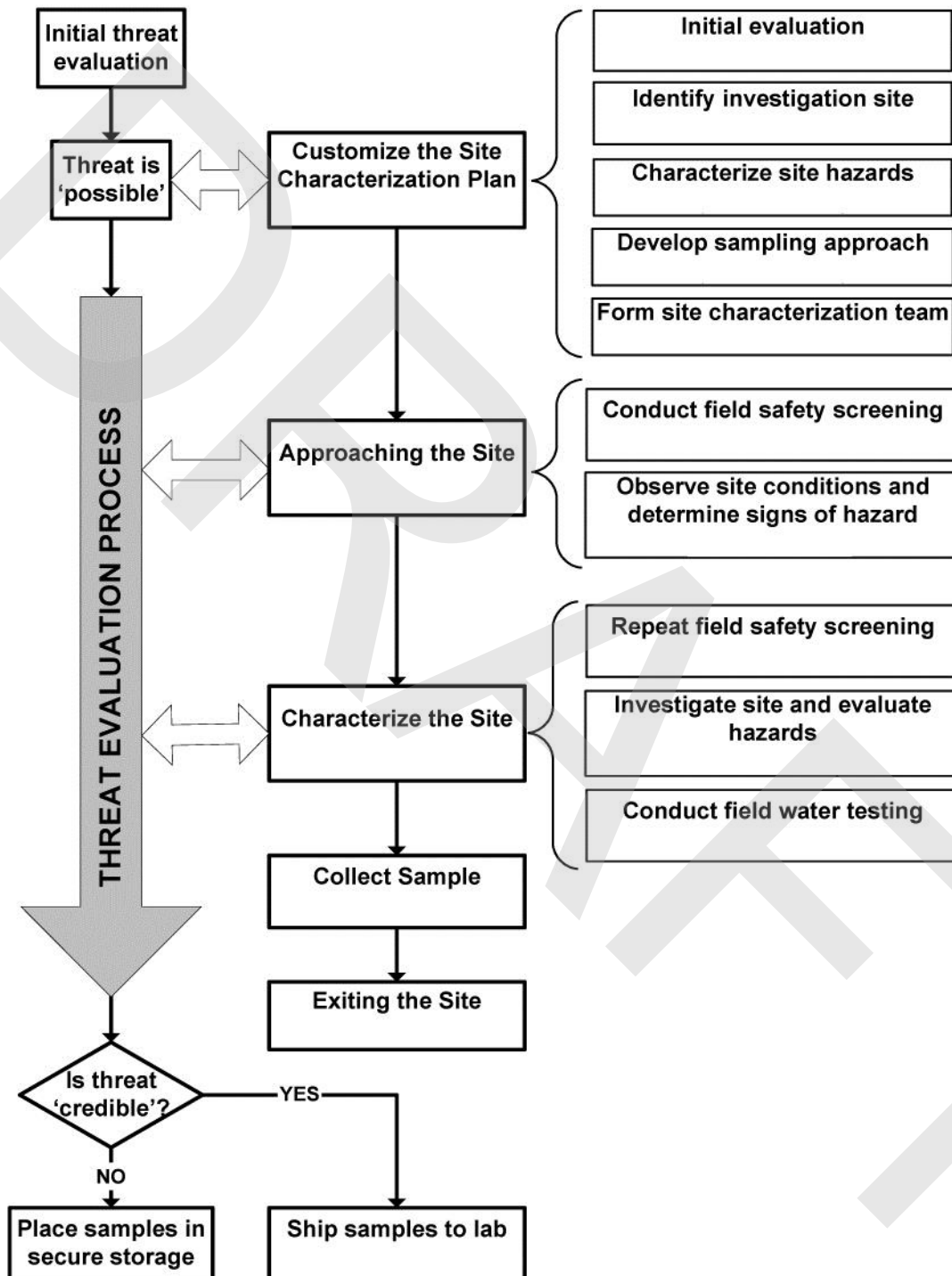
Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



### 3 Site Characterization and Sampling

#### 3.1 Site Characterization Process





### 3.2 Emergency Water Sample Collection Kit

Item	Quantity	Notes
<b>Field Resources and Documentation</b>		
Field guide	2	Resource for field personnel
Health and safety plan	2	If required for the site
Sample labels	48	Waterproof (filled out in advance, if possible)
Sample documentation forms	24	For recording sample information
Custody tape (or seals)	2 rolls	Used on sample or shipping containers
Chain of custody forms	24	For documenting sample custody
Lab marker	2	Waterproof, 1 red, 1 black
<b>General Sampling Supplies</b>		
Sample containers	Table 3-2	For collecting samples
Device for grab sampling	1	For sampling large water bodies
10 liter HDPE container	4	For collection of large volume water samples
Lab grade tape	3 rolls	For temporary labeling in the field
Miscellaneous glassware	N/A	Beakers, graduated cylinders, spatula, etc.
Collapsible cooler	1	For sample storage
Rigid shipping container	1	For shipping by overnight service if needed.
1 qt. zippered freezer bags	1 pack/100	For double bagging ice and sample containers
Thermometer	2	For checking water temperature
Paper towels	2 rolls	Wiping wet containers and containing spills
<b>Pathogen Sampling Supplies</b>		
Tubing and clamp	1	For sample tap flushing, etc.
Stopwatch & graduated cylinder	1	For measuring flow rate
Ultrafiltration apparatus	1	For concentrating pathogen samples
<b>Reagents (may need to be kept separate from the rest of the kit)</b>		
Laboratory grade water	5 liters	For sample dilution in the field
Sodium thiosulfate crystals	100 grams	For water sample dechlorination
Ascorbic acid	100 grams	For water sample dechlorination
Sodium sulfite crystals	100 grams	For water sample dechlorination
Potassium dihydrogen citrate	100 grams	For carbamate preservation
6 Molar ACS grade hydrochloric acid (HCl)	25 mL	In dropper bottle for preservation of samples for organic analyses
6 Molar trace metal-grade nitric acid (HNO <sub>3</sub> )	25 mL	In dropper bottle for preservation of samples for trace metals analysis
10 Normal Sodium hydroxide (NaOH)	25 mL	In dropper bottle for preservation of samples for cyanide analyses
pH paper in ranges from 0 - 4 and 10 - 14	50 strips	For checking the pH of samples preserved with acid or base (sensitive to 0.5 pH units)
<b>Safety Supplies</b>		
Splash resistant goggles	2	One per individual (minimum)
Disposable gloves	6 pairs	Nitrile or polyethylene, powder-free
Disposable shoe covers	2 pairs	One pair per individual (minimum)
Disposable laboratory coats	2	One per individual (minimum)
Clear, heavy duty plastic trash bags	4	For disposal of lab coat, gloves, etc.
Rinse water	20 liters	For general use and first aid
Antiseptic wipes	1 container	For cleaning hands, sample containers, etc.
Bleach solution (at least 5%)	1 gallon	For decontamination if necessary
Squirt bottle	2	For use with rinse water or lab grade water
First aid kit	1	For general first aid
Flashlight/headlamp	3	For working at night or in dark locations



### 3.3 Sample Containers

Sample Type	Container Size	Container Type	No.	Dechlorinating Agent	Preservative	Analytical Technique	Reference Methods
<b>CHEMISTRY - BASIC SCREEN (Established Techniques)</b>							
<b>Organic Analytes</b>							
Volatiles	40 mL	Glass w / Teflon faced septa	5	Ascorbic acid	1:1 HCl to pH < 2 See method.	P&T – GC/MS	EPA 524.2, 8260B
						P&T – GC/PID/ELCD	EPA 502.2, 8021B
Semi-volatiles	1 L	Amber w / Teflon-lined screw caps	4	Sodium sulfite	6M HCl. See method.	SPE GC/MS	525.2, 8270D/3535
Quarternary nitrogen compounds	1 L	Amber PVC or silanized glass	4	Sodium thiosulfate	Sulfuric acid to pH 2	SPE HPLC - UV	549.2
Carbamate Pesticides	40 mL	Glass w / Teflon faced septa	4	Sodium thiosulfate	Potassium dihydrogen citrate sample pH to ~3.8	HPLC-fluorescence	531.2
<b>Inorganic Analytes</b>							
Metals/Elements	125 mL	Plastic (i.e. HPDE)	2	None	Trace metal grade nitric acid. See method.	ICP-MS	200.8
						ICP-AES	200.7
						AA	200.9
Organometallic compounds	125 mL	Plastic (i.e. HPDE)	2	None	Nitric acid to pH ≤2. See method.	AA – cold vapor manual	245.1
						AA – cold vapor automater	245.2
Cyanide	1 L	Plastic	2	Ascorbic acid	Sodium hydroxide to pH 12. See method.	Titrimetric Spectrophotometric	335.2
						Colorimetric UV	335.3
Radiological	2 L	Plastic	2	None	None - mark samples not preserved	Gross alpha, gross beta, gamma isotopes, specific radionuclides	900 Series



Sample Type	Container Size	Container Type	No.	Dechlorinating Agent	Preservative	Analytical Technique	Reference Methods
<b>CHEMISTRY - EXPANDED SCREEN (Exploratory Techniques)</b>							
Unknown organics (volatile)	40 mL	Glass w / Teflon faced septa	5	None	None - mark samples not preserved	P&T-GC/MS	See Module 4
Unknown organics (general)	1 L	Amber Glass	4	None	None - mark samples not preserved	<b>Prep:</b> SPE, SPME, micro LLE, direct aqueous injection, headspace	See Module 4
						<b>Analysis:</b> GC/MS, GC, HPLC, LC-MS	
Unknown inorganics	1 L	Plastic	2	None	None - mark samples not preserved	ICP-MS	See Module 4
Immunoassays	1 L	Amber Glass	2	Consult manufacturers instructions	Consult manufacturers instructions	Consult manufacturers instructions	None
<b>PATHOGENS - EXPANDED SCREEN (Established and Exploratory Techniques)</b>							
Pathogens - culture	100 mL	HDPE (plastic)	2	Thiosulfate	TBD	Per target pathogens	See Module 4
Pathogens - PCR	100 mL	HDPE (plastic)	2	Thiosulfate	TBD	Per target pathogens	See Module 4
<b>BASELINE WATER QUALITY PARAMETERS (See Section 3.4)</b>							
Water quality: bacteria	250 mL	Plastic	1	Thiosulfate	None	Fecal coliforms, E-coli,	Standard methods
Water quality: chemistry	1 L	Plastic	1	None	None - mark samples not preserved	Conductivity, pH, alkalinity, hardness, turbidity	Standard methods
Surrogates	1 L	Amber glass	2	None	None - mark samples not preserved	Total organic carbon, ultraviolet absorbance, color, chlorine demand	Standard methods
Toxicity	125 mL	Glass	2	Consult manufacturers instructions	Consult manufacturers instructions.	Rapid toxicity assay (several vendors)	None



### 3.4 Sample Collection Guidelines

#### 3.4.1 Safety Guidelines

1. **Do not** enter the site to perform sampling until cleared. Hazardous materials response units may perform safety screening before allowing other responders to enter the site. *Note that field safety screening does **not** generally include testing for pathogens.*
2. **Do not** eat, drink, or smoke at the site.
3. **Do not** taste or smell the water samples.
4. **Do** use general personal protective equipment (PPE) such as splash-proof goggles, disposable gloves, proper footwear (i.e., no open toe or open heel shoes), a chemical resistant, disposable lab coat, and long pants. *(Note that this level of PPE is only intended to minimize incidental contact with the water or chemical reagents used during sample collection or field testing.)*
5. **Avoid** all skin contact with the water, and if incidental contact does occur, immediately flush the affected area with clean water brought to the site for that purpose.
6. Fill sampling containers **slowly** to avoid volatilization or aerosolization of contaminants.
7. **Minimize** the time that personnel are on the site and collecting samples.

#### 3.4.2 Sampling Procedures

1. Pre-label sample containers with a waterproof marker. Information should include: analyte class (pathogen, chemical, or radionuclide), specific analyte (if sample is being collected for a specific target), sample identification number, utility name, location of sample collection, sample collection date and time, and sampler's initials.
2. Check for the presence of any in-line filters (e.g., home treatment devices) that might interfere with sampling. Remove such devices if present.
3. If the sample tap is the suspected point of contaminant introduction, collect swab samples from the tap **before** flushing the tap and collecting water samples.
4. Flush sample taps for a time sufficient to displace the water in connecting lines in order to obtain a sample that is representative of the water of interest. Keep the flow rate from the sample tap sufficiently low in order to avoid splashing and aerosolizing water droplets. Divert water to a drain if possible.
5. Carefully collect samples in the specified containers (see Section 3.3). If a reagent needs to be added to the sample, allow enough headspace in the container to add the proper amount of preservative. Cap then gently mix the contents to ensure that the reagent is properly mixed with the sample. Test the sample with a strip of pH paper to ensure preservation to the proper pH. Do not insert the pH paper into the sample container. Pour a small portion of the mixed sample into the container cap then pour from the cap onto the pH paper to verify
6. For chlorinated samples, VOCs should be collected into a secondary 8-oz. glass container (prepared with ascorbic acid - see footnote 1, Table 3.3). Gently mix the sample and transfer to 3, 40-ml VOA containers (triplicate). Fill the 40-ml container above the top to form a meniscus. Close the container with the Teflon side of the septa facing the water sample, gently invert the sample container several times, and verify that there are no air bubbles in the container. Once each container is tagged, the three 40-ml containers



should be inserted into a plastic whirlpack bag (provided) and sealed prior to sample storage.

7. Wipe the outside of the sealed containers with paper towel.
8. Attach custody seal to the sample container.
9. Place the sealed container into a rigid cooler and pack with frozen ice packs (preferred) or sealable freezer bags filled with ice.
10. Tag each sample and record all necessary information on “Sample Documentation” and “Chain of Custody” forms.
11. After all samples have been collected, preservative blanks and temperature blanks should be prepared and tagged. A preservative blank should be prepared for each preservative used during the sampling event. The preservative blank can be prepared by adding the appropriate amount of preservative to the preservative blank containers, and tagging the sample for the appropriate analysis (i.e., HNO<sub>3</sub> preservative blank should be analyzed for metals). Additionally, a temperature blank container should be placed in each cooler containing samples.

#### 3.4.3 Sample Holding

1. When samples are not in the possession of designated personnel, they should be secured (e.g., locked in a *secure area*) and only accessible by designated personnel. In the field, samples may need to be locked in a vehicle.
2. Samples should be chilled, but protected from freezing.
3. Samples should be held at the drinking water utility lab until shipped to a lab for analysis or until it is determined that they are not needed.
4. Samples that are held longer than the approved holding times for contaminant analysis may no longer be useful.

#### 3.4.4 Sample Transport

1. Sample integrity and chain of custody must be maintained. All factors that might compromise sample integrity (e.g., storage containers, excessive transit time, temperature, pressure, physical disturbance, etc.) should be considered and appropriate measures taken to avoid compromising samples.
2. Sample packaging must be in compliance with shipping regulations.
3. Samples may be screened by law enforcement and/or ICs prior to sample transport to the laboratory.
4. Samples will be transported to the appropriate laboratory in coordination with law enforcement using appropriate air and ground assets.



### 3.5 Site Characterization Plan Template

#### INSTRUCTIONS

*This form is intended to support the development of a customized site characterization plan developed in response to a specific water contamination threat. The incident commander and site characterization team leader should develop this plan jointly if possible. The completed form will be used to guide site characterization activities in the field; however, it may be necessary to revise the initial plan based on initial observations at the site. A form should be completed for each investigation site that will be characterized.*

#### THREAT WARNING INFORMATION

**Consult Module 2, Appendix 8.2 “Threat Evaluation Worksheet” for details about the threat.**

#### INVESTIGATION SITE

**Site Name:** \_\_\_\_\_

**Type of facility:**

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Source water                     | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station       |
| <input type="checkbox"/> Ground storage tank<br>reservoir | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Finished water     |
| <input type="checkbox"/> Distribution main                | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection |
| <input type="checkbox"/> Other _____                      |  |   |

**Address:** \_\_\_\_\_

**Additional Site Information:** \_\_\_\_\_

#### INITIAL HAZARD ASSESSMENT

**Are there any indicators of an explosive hazard?** ☐ Yes ☐ No

*If “Yes,” notify law enforcement and do not send a team to the site.*

**Initial hazard categorization**

- |  |  |
|--|--|
| <input type="checkbox"/> Low hazard          | <input type="checkbox"/> Chemical hazard   |
| <input type="checkbox"/> Radiological hazard | <input type="checkbox"/> Biological hazard |

*If the initial hazard assessment indicates a chemical, radiological, or biological hazard (as described in Module 3, Section 4.1.3), then only teams trained to deal with such hazards should be sent to the site.*



## SITE CHARACTERIZATION TEAM

Name & Affiliation of Site Characterization Team Leader:

---

### Drinking water utility staff:

- |   |             |
|---|-------------|
| <input type="checkbox"/> Water quality specialist | Name: _____ |
| <input type="checkbox"/> Security specialist      | Name: _____ |
| <input type="checkbox"/> Operations specialist    | Name: _____ |
| <input type="checkbox"/> Other _____              | Name: _____ |

### Representatives from other agencies:

- |  |  |                                 |
|--|--|---------------------------------|
| <input type="checkbox"/> Local law enforcement | <input type="checkbox"/> Fire department | <input type="checkbox"/> HazMat |
| <input type="checkbox"/> US EPA                | <input type="checkbox"/> FBI             | <input type="checkbox"/> Other  |

## COMMUNICATION PROCEDURES

### Mode of communication:

- |                                    |                                      |                                  |
|------------------------------------|--------------------------------------|----------------------------------|
| <input type="checkbox"/> Phone     | <input type="checkbox"/> 2-way radio | <input type="checkbox"/> Digital |
| <input type="checkbox"/> Facsimile | <input type="checkbox"/> Other _____ |                                  |

### Reporting events:

- |  |  |                                     |
|--|--|-------------------------------------|
| <input type="checkbox"/> Upon arrival at site  | <input type="checkbox"/> During approach     | <input type="checkbox"/> Site entry |
| <input type="checkbox"/> After site evaluation | <input type="checkbox"/> After field testing | <input type="checkbox"/> Site exit  |
| <input type="checkbox"/> Other _____           |  |                                     |

## FIELD SCREENING CHECKLIST

Y	Parameter <sup>1</sup>	Screen <sup>2</sup>	Meter/Kit ID <sup>3</sup>	Check Date <sup>4</sup>	Reference Value <sup>5</sup>
	Radiation	Both			
	Chlorine residual	Water			
	pH / conductivity	Water			
	Cyanide	Water			
	Volatile chemicals	Safety			
	Chemical weapons	Both			
	Biotoxins	Water			
	Pathogens	Water			

1. List the parameters that will be evaluated as part of field screening (examples are listed).
2. Screening may be conducted for safety, rapid water testing, or both.
3. Report the unique identifier for the meter or kit used during screening.
4. Report date of last calibration, last equipment check, or expiration date as appropriate.
5. List any reference value that would trigger a particular action, such as exiting the site.



**SAMPLING CHECKLIST**

Y	Analyte <sup>1</sup>	No. Samples	Sample Preservation <sup>2</sup>
	Standard VOCs		
	Semi-volatiles		
	Quaternary nitrogen compounds		
	Cyanide		
	Carbamate pesticides		
	Metals/elements		
	Organometallic compounds		
	Cyanide		
	Radionuclides		
	Non-target VOCs		
	Non-target organic compounds		
	Non-target inorganic compounds		
	Immunoassays		
	Pathogens – culture		
	Pathogens – PCR		
	Water quality – bacteria		
	Water quality – chemistry		

1. List the parameters that will be sampled during site characterization (examples are listed).
2. List preservatives and dechlorinating agents and indicate if they are to be added in the field.

**EQUIPMENT CHECKLIST**

- |   |  |
|---|--|
| <input type="checkbox"/> Completed Site Characterization Plan     | <input type="checkbox"/> Additional documentation      |
| <input type="checkbox"/> Emergency Water Sampling Kit (Table 3-1) | <input type="checkbox"/> Field Testing Kit (Table 3-3) |
| <input type="checkbox"/> Reagents (if stored separately)          | <input type="checkbox"/> Bags of ice or freezer packs  |
| <input type="checkbox"/> Laboratory grade water (5 gal)           | <input type="checkbox"/> Rinse water (20 liters)       |
| <input type="checkbox"/> Special equipment for the specific site  | <input type="checkbox"/> Disposable camera             |
| <input type="checkbox"/> Other _____                              |  |



# **SAMPLE HANDLING INSTRUCTIONS**

## **Sample delivery:**

- ☐ Return samples to water utility
- ☐ Ship samples to specified location
- ☐ Deliver samples to specified recipient (e.g., laboratory, law enforcement, shipping co., etc.)

Name of recipient: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Fax No.: \_\_\_\_\_

Delivery address: \_\_\_\_\_

\_\_\_\_\_

## **Sample storage and security:**

Describe any special precautions or instructions related to sample storage and security:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **SIGNOFF**

Incident Commander (or designee responsible for developing Site Characterization Plan):

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_

Site Characterization Team Leader:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



### 3.6 Site Characterization Report Form

#### INSTRUCTIONS

*Members of the site characterization team can use this form to record their observations at the investigation site. It also serves as a checklist for notifying incident command at key points during the characterization. Additional checklists are included in this form for sample collection and exiting the site. The completed form can also be used as a component of the site characterization report. A form should be completed for each investigation site that is characterized*

#### GENERAL INFORMATION

**Date:** \_\_\_\_\_ **Time arrived investigation at site:** \_\_\_\_\_

**Name of Site Characterization Team Leader:** \_\_\_\_\_

**Phone No.:** \_\_\_\_\_ **Fax No.:** \_\_\_\_\_

#### LOCATION OF INVESTIGATION SITE

**Site Name:** \_\_\_\_\_

**Type of facility:**

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Source water             | <input type="checkbox"/> Treatment plant       | <input type="checkbox"/> Pump station        |
| <input type="checkbox"/> Finished water reservoir | <input type="checkbox"/> Elevated storage tank | <input type="checkbox"/> Ground storage tank |
| <input type="checkbox"/> Distribution main        | <input type="checkbox"/> Hydrant               | <input type="checkbox"/> Service connection  |
| <input type="checkbox"/> Other _____              |  |  |

**Address:** \_\_\_\_\_  
\_\_\_\_\_

**Weather Conditions at Site:** \_\_\_\_\_  
\_\_\_\_\_

**Additional Site Information:** \_\_\_\_\_  
\_\_\_\_\_



## APPROACH TO SITE

Time of Approach to Site: \_\_\_\_\_

### Initial Field Safety Screening (as listed in the “Site Characterization Plan”):

- |                                      |   |   |
|--------------------------------------|---|---|
| <input type="checkbox"/> None        | <input type="checkbox"/> Radiation        | <input type="checkbox"/> Volatile chemicals |
| <input type="checkbox"/> HAZCAT      | <input type="checkbox"/> Chemical weapons | <input type="checkbox"/> Biological agents  |
| <input type="checkbox"/> Other _____ |   |   |

**Report results of field safety screening in Section 3.7 “Field Testing Results Form.”**  
*If any field safety screening result is above the corresponding reference value, immediately notify incident command and do not proceed further into the site.*

### Initial Observation and Assessment of Immediate Hazards

- ☐ Unauthorized individuals present at the site
- ☐ Fire or other obvious hazard
- ☐ Signs of a potential explosive hazard (e.g., devices with exposed wires)
- ☐ Signs of a potential chemical hazard (e.g., dead animals, unusual fogs, unusual odors)
- ☐ Unusual and unexplained equipment at the site
- ☐ Other signs of immediate hazard \_\_\_\_\_

*If there are any indicators of immediate hazard, immediately notify incident command and do not proceed further into the site.*

**Report initial observations and results to incident commander.**

Approval granted to proceed further into the site? ☐ Yes ☐ No

## SITE INVESTIGATION

Time of Entry to Site: \_\_\_\_\_

### Repeat Field Safety Screening

- |                                      |   |   |
|--------------------------------------|---|---|
| <input type="checkbox"/> None        | <input type="checkbox"/> Radiation        | <input type="checkbox"/> Volatile chemicals |
| <input type="checkbox"/> HAZCAT      | <input type="checkbox"/> Chemical weapons | <input type="checkbox"/> Biological agents  |
| <input type="checkbox"/> Other _____ |   |   |

**Report results of field safety screening in Section 3.7 “Field Testing Results Form.”**  
*If any field safety screening result is above the corresponding reference value, immediately notify incident command and do not proceed further into the site.*

### Signs of Hazard:

- |  |   |
|--|---|
| <input type="checkbox"/> None                                    | <input type="checkbox"/> Unexplained dead animals     |
| <input type="checkbox"/> Unexplained dead or stressed vegetation | <input type="checkbox"/> Unexplained clouds or vapors |
| <input type="checkbox"/> Unexplained liquids                     | <input type="checkbox"/> Other _____                  |

Describe signs of hazard: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**Unexplained or Unusual Odors:**

- |                                       |                                       |  |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> None         | <input type="checkbox"/> Pungent      | <input type="checkbox"/> Irritating    |
| <input type="checkbox"/> Sulfur       | <input type="checkbox"/> Skunky       | <input type="checkbox"/> Bitter almond |
| <input type="checkbox"/> Sweet/Fruity | <input type="checkbox"/> New mown hay | <input type="checkbox"/> Other _____   |

Describe unusual odor: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Unusual Vehicles Found at the Site:**

- |  |   |                                       |
|--|---|---------------------------------------|
| <input type="checkbox"/> Car/sedan     | <input type="checkbox"/> SUV                  | <input type="checkbox"/> Pickup truck |
| <input type="checkbox"/> Flatbed truck | <input type="checkbox"/> Construction vehicle | <input type="checkbox"/> None         |
| <input type="checkbox"/> Other _____   |   |                                       |

Describe vehicles (including make/model/year/color, license plate #, and logos or markings): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Signs of Tampering:**

- |  |  |
|--|--|
| <input type="checkbox"/> None                                  | <input type="checkbox"/> Cut locks/fences            |
| <input type="checkbox"/> Open/damaged gates, doors, or windows | <input type="checkbox"/> Open/damaged access hatches |
| <input type="checkbox"/> Missing/damaged equipment             | <input type="checkbox"/> Facility in disarray        |
| <input type="checkbox"/> Other _____                           |  |

Signs of sequential intrusion (e.g., locks removed from a gate and hatch)?

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

Describe signs of tampering: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Unusual Equipment:**

- |  |  |
|--|--|
| <input type="checkbox"/> None                                  | <input type="checkbox"/> Discarded PPE (e.g., gloves, masks) |
| <input type="checkbox"/> Tools (e.g., wrenches, bolt cutters)  | <input type="checkbox"/> Hardware (e.g., valves, pipe)       |
| <input type="checkbox"/> Lab equipment (e.g., beakers, tubing) | <input type="checkbox"/> Pumping equipment                   |
| <input type="checkbox"/> Other _____                           |  |

Describe equipment: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**Unusual Containers:**

**Type of container:**

- |                                      |   |   |
|--------------------------------------|---|---|
| <input type="checkbox"/> None        | <input type="checkbox"/> Drum/Barrel    | <input type="checkbox"/> Bottle/Jar           |
| <input type="checkbox"/> Plastic bag | <input type="checkbox"/> Box/Bin        | <input type="checkbox"/> Pressurized cylinder |
| <input type="checkbox"/> Test Tube   | <input type="checkbox"/> Bulk container | <input type="checkbox"/> Other _____          |

**Condition of container:**

- |                                   |                              |  |
|-----------------------------------|------------------------------|--|
| <input type="checkbox"/> Opened   | <input type="checkbox"/> New | <input type="checkbox"/> Damaged/leaking |
| <input type="checkbox"/> Unopened | <input type="checkbox"/> Old | <input type="checkbox"/> Intact/dry      |

**Size of container:** \_\_\_\_\_

**Describe labeling on container:** \_\_\_\_\_

**Describe visible contents of container:** \_\_\_\_\_

**Rapid Field Testing of the Water**

- |                                     |  |  |
|-------------------------------------|--|--|
| <input type="checkbox"/> None       | <input type="checkbox"/> Residual disinfectant | <input type="checkbox"/> pH / conductivity |
| <input type="checkbox"/> Cyanide    | <input type="checkbox"/> Radiation             | <input type="checkbox"/> VOCs and SVOCs    |
| <input type="checkbox"/> Pesticides | <input type="checkbox"/> Biotoxins             | <input type="checkbox"/> General toxicity  |
| <input type="checkbox"/> Other      | _____  |  |

**Report results of rapid field testing of the water in Section 3.7 “Field Testing Results Form.”**

*If any field test result is above the corresponding reference value, immediately notify incident command and wait for instruction regarding how to proceed.*

**Report findings of site investigation to incident commander.**

**Approval granted to proceed with sample collection?** ☐ Yes ☐ No

**SAMPLING**

**Time Sampling was Initiated / Completed:** \_\_\_\_\_ / \_\_\_\_\_

**Implement Sampling Procedures Appropriate for the Hazard Conditions at the Site:**

- |  |  |
|--|--|
| <input type="checkbox"/> Low hazard          | <input type="checkbox"/> Chemical hazard   |
| <input type="checkbox"/> Radiological hazard | <input type="checkbox"/> Biological hazard |

*If the site is characterized as a chemical, radiological, or biological hazard, then special sampling and safety procedures should be followed.*



**Safety Checklist:**

- ☐ **Do not** eat, drink, or smoke at the site.
- ☐ **Do not** taste or smell the water samples.
- ☐ **Do** use the general PPE included in the emergency water sampling kit.
- ☐ **Avoid** all contact with the water, and flush immediately with clean water in the case of contact.
- ☐ **Slowly fill** sample bottles to avoid volatilization and aerosolization.
- ☐ **Minimize** the time that personnel are on site and collecting samples.

**General Sampling Guidelines:**

- ☐ Properly label each sample bottle.
- ☐ Carefully flush sample taps prior to sample collection, if applicable.
- ☐ Collect samples according to method requirements (e.g., w/o headspace for VOCs).
- ☐ Add preservatives or dechlorinating agents as specified.
- ☐ Carefully close sample containers and verify that they don't leak.
- ☐ Wipe the outside of sample containers with a mild bleach solution if needed.
- ☐ Place sample containers into a sealable plastic bag.
- ☐ Place samples into an appropriate, rigid shipping container.
- ☐ Pack container with frozen ice packs.
- ☐ Complete "Sample Documentation Form" (Section 3.8).
- ☐ Complete "Chain of Custody Form" (Section 3.9).
- ☐ Secure shipping container with custody tape.
- ☐ Comply with any other sample security provisions required by participating agencies.

**EXITING THE SITE**

**Time of Site Exit:** \_\_\_\_\_

**Site Exit Checklist**

- ☐ Verify that hatches, locks, etc. are properly secured.
- ☐ Remove all samples, equipment, and materials from the site.
- ☐ Verify that all samples are in the cooler and properly seal the cooler.
- ☐ Remove all PPE at site perimeter.
- ☐ Place disposable PPE and other trash into a heavy-duty plastic trash bag.
- ☐ Verify that the perimeter has been properly secured before leaving the site.
- ☐ Ensure that all documentation has been completed before leaving the site perimeter.
- ☐ Comply with any site control measures required by participating agencies.
- ☐ Contact incident commander and inform them that the team is leaving the site.

---

**SIGNOFF**

Site Characterization Team Leader:

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



### 3.7 Field Testing Results Form

[illegible]

- 1: Screening may be conducted for safety, rapid water testing, or both.
- 2: Report the unique identifier for the meter or kit used during screening.
- 3: Report the specific location where the field testing was conducted.
- 4: Report the specific time at which the test was performed.
- 5: Results of field testing should include replicate analysis where appropriate.
- 6: Results should be compared with a reference value, if available, to determine whether or not the levels detected pose a hazard.



### 3.8 Sample Documentation Form

[illegible]

1: Report preservatives, dechlorinating agents, acid/base for pH adjustment, and any other sample additives.



### 3.9 Chain of Custody Form

[illegible]



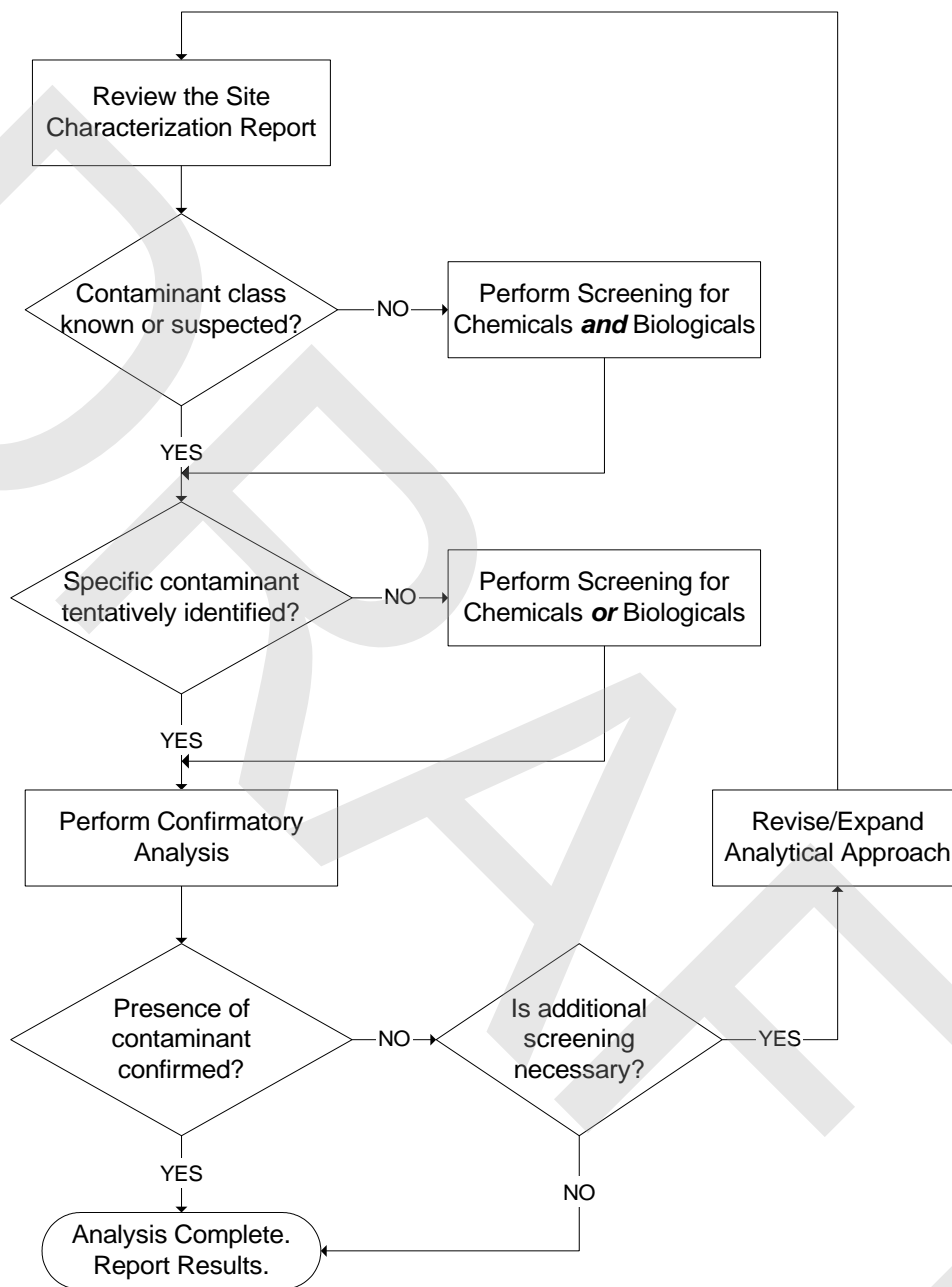
## 4 Sample Analysis

### 4.1 Laboratory Contact List

Analysis	Laboratory	Physical Address	Contact Person	Phone
Pathogens	Water Mgmnt	1515 80 <sup>th</sup> St E. Tacoma, WA		253-531-3121
Chemical	Water Mgmnt	1515 80 <sup>th</sup> St E. Tacoma, WA		253-531-3121
Chemical	Water Mgmnt	1515 80 <sup>th</sup> St E. Tacoma, WA		253-531-3121
Radiological	Water Mgmnt	1515 80 <sup>th</sup> St E. Tacoma, WA		253-531-3121
CW Agents	Water Mgmnt	1515 80 <sup>th</sup> St E. Tacoma, WA		253-531-3121



## 4.2 General Approach for Analysis of Unknowns in Water





### 4.3 General Classes of Chemicals, Analyte Groups, and Example Contaminants

Chemical types	Analytical Group	Example Contaminants*
Organic	Volatiles	Acetone, acrylonitrile, chloroform, methyl <i>t</i> -butyl ether, tetrachloroethene, toluene,
	Semivolatiles	Organophosphates (e.g., malathion, mevinphos, dichlorvos, etc.), cyanazine, chlorinated insecticides, chlordane, pentachlorophenol
	Non-volatiles	Sodium trifluoroacetates, surfactants
	Carbamate compounds	Aldicarb, carbofuran, oxamyl
	Quaternary nitrogen compounds	Diquat, paraquat
	Pharmaceuticals	Nicotine, illicit drugs
Inorganic	Trace metals	Mercury, lead, cobalt
	Nonmetals	Arsenic salts
	Organometallics	Organomercury compounds
Cyanides	Cyanides	Cyanide salts, cyanogen chloride
Radionuclides	Radiologicals	Cesium-137, Cobalt-60, Strontium-92
CW Agents	Schedule 1 only	(e.g., VX, sarin, nitrogen and sulfur mustards, Lewsites)

\* Not every contaminant in a particular analytical group is listed in this column.

### 4.4 General Classes of Pathogens, Specific Organisms, and Select Agent Status

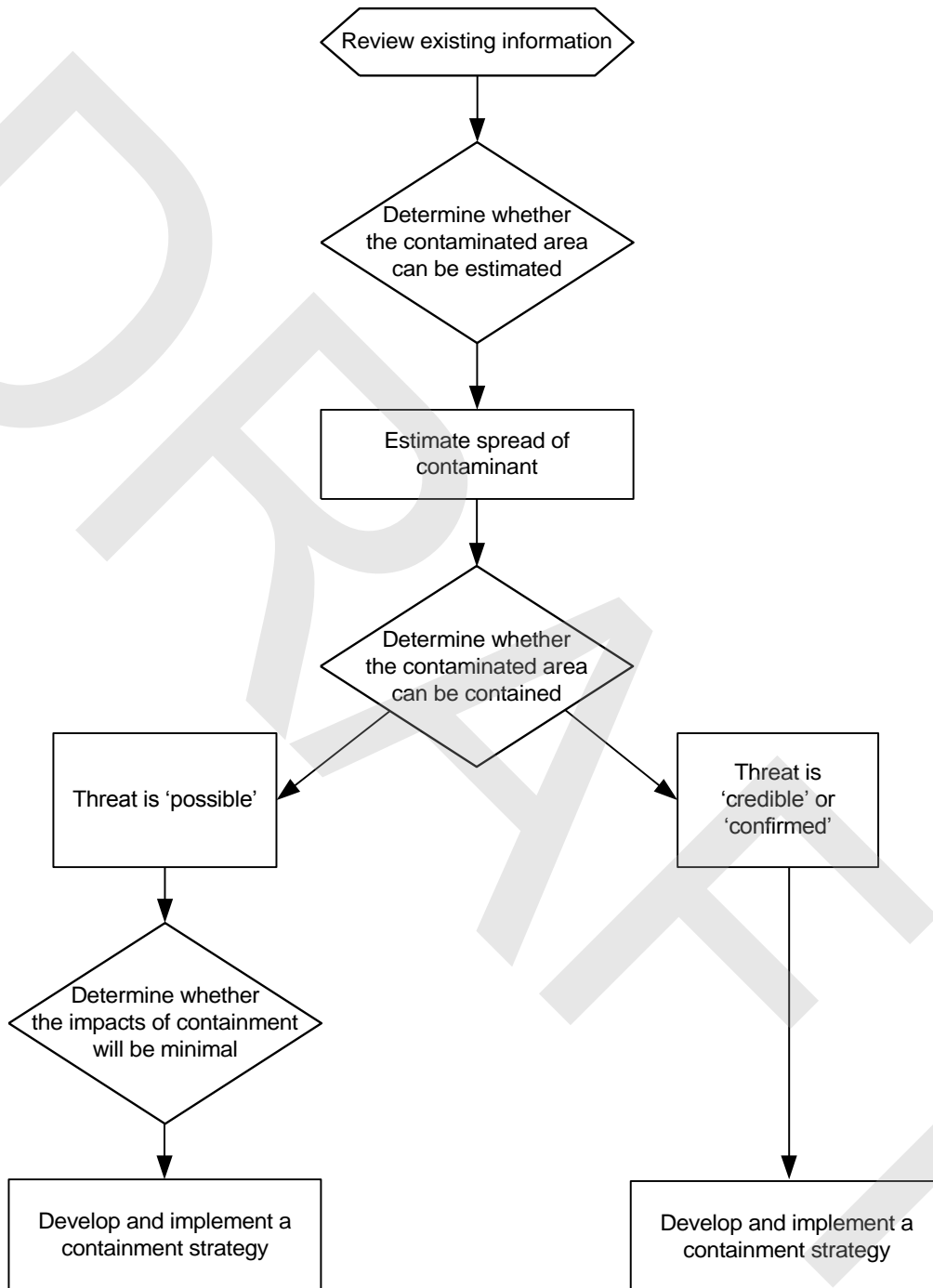
Pathogen general class	Organism	Select Agent*
Bacteria (non-spore forming)	<i>Brucella</i> spp.	Yes
	<i>Burkholderia pseudomallerei</i>	Yes
	<i>Campylobacter</i> spp.	
	E. coli 0157:H7	
	<i>Francisella tularensis</i>	Yes
	<i>Salmonella</i> spp.	
	<i>Shigella</i> spp.	
	<i>Vibrio cholerae</i>	
	<i>Yersinia pestis</i>	Yes
Bacteria (spore forming)	<i>Bacillus anthracis</i>	Yes
	<i>Clostridium botulinum</i> A	Yes
Bacteria (Rickettsia)	<i>Coxiella burnetti</i>	Yes
Protozoa	<i>Cryptosporidium parvum</i>	
	<i>Entamoeba histolytica</i>	
	<i>Giardia intestinalis</i>	
	<i>Toxoplasma gondii</i>	
Viruses	Enteroviruses	
	Hepatitis A	
	Hepatitis E	
	Noroviruses	
	Rotavirus	
	Variola	Yes
	VEE	Yes
	VHF	Yes

\* See <http://www.cdc.gov/od/sap/docs/salist.pdf>



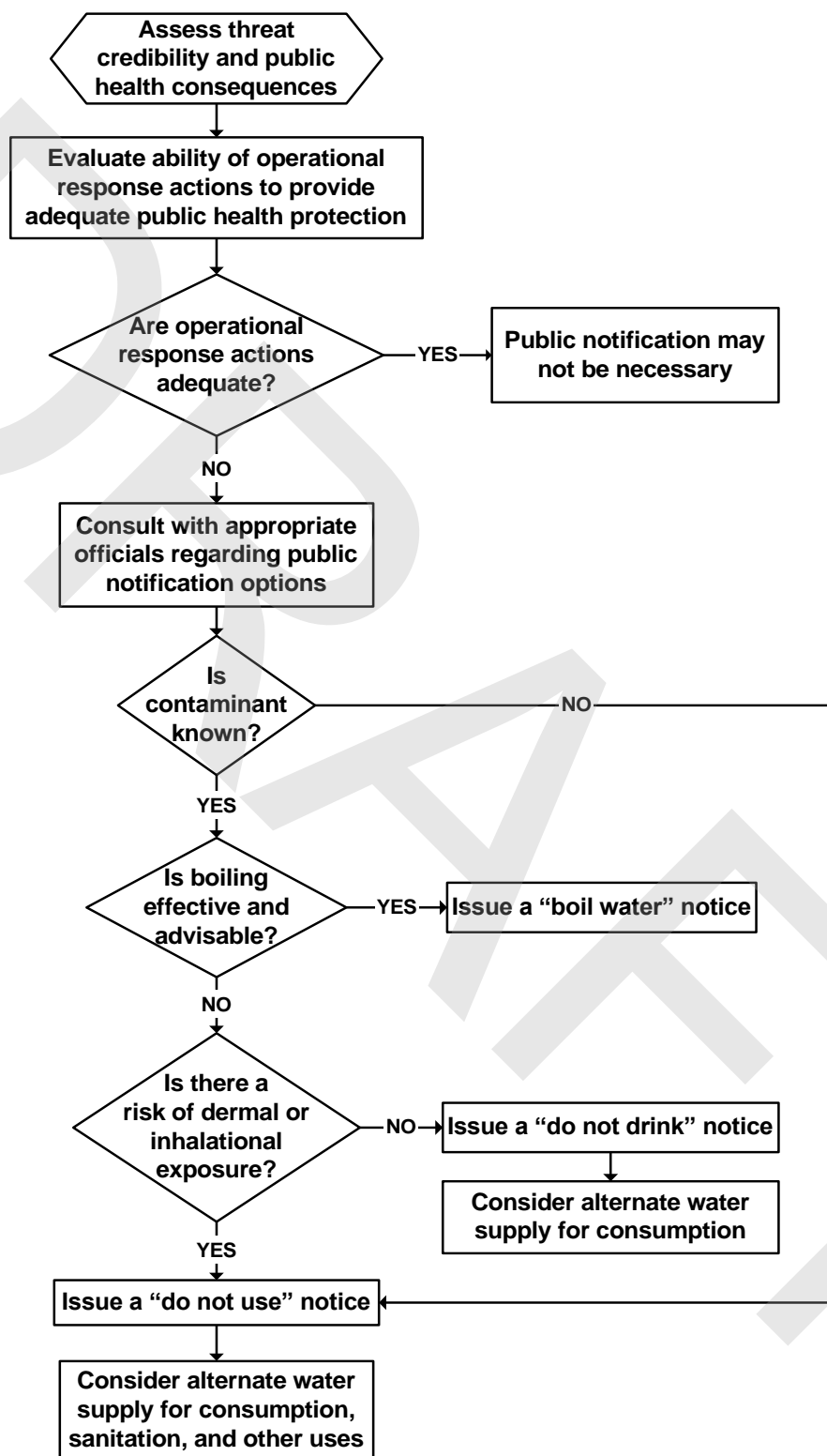
## 5 Response Actions

### 5.1 Decision Tree for Containment Options





## 5.2 Decision Tree for Public Notification





### 5.3 Contaminant Characterization and Transport Worksheet

#### INSTRUCTIONS

The purpose of this worksheet is to help organize information that will lead to the identification of the contaminant to facilitate decisions on appropriate operational responses and provide more accurate information for public communication/notification. Contaminant identification will most likely first be a presumptive identification followed by more lengthy procedures to verify the identity of the contaminant. While validated analytical results are typically the most reliable means of contaminant identification, other information collected during the **threat evaluation** and **site characterization** may provide valuable insight regarding the identity of the contaminant.

#### SITE CHARACTERIZATION/THREAT EVALUATION SUMMARY

Describe the contaminant's odor, if applicable. \_\_\_\_\_

Describe the *reported* taste of the contaminant, if applicable. \_\_\_\_\_

**Caution: Do NOT taste the water.**

What was the physical form of the contaminant?

- |                                      |                                 |                                   |
|--------------------------------------|---------------------------------|-----------------------------------|
| <input type="checkbox"/> Solid       | <input type="checkbox"/> Liquid | <input type="checkbox"/> Gas      |
| <input type="checkbox"/> Slurry      | <input type="checkbox"/> Powder | <input type="checkbox"/> Granules |
| <input type="checkbox"/> Other _____ |                                 |                                   |

What color was the contaminant? \_\_\_\_\_

Summarize additional information obtained during site characterization/threat warning that is relevant to contaminant identification. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Summarize the on-line monitoring data, consumer complaints, or witness accounts that are relevant to contaminant identification. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#### Field Analysis Summary

Summarize the results of the field analysis for the following parameters:

Radiation \_\_\_\_\_  
Chlorine residual \_\_\_\_\_  
pH, conductivity \_\_\_\_\_  
Cyanide \_\_\_\_\_  
Volatile chemicals \_\_\_\_\_  
Chemical weapons \_\_\_\_\_  
Biotoxins \_\_\_\_\_  
Pathogens \_\_\_\_\_  
Other \_\_\_\_\_



## Public Health Information

Have death or disease in the population been reported? ☐ Yes ☐ No ☐ Unknown

Type/symptoms \_\_\_\_\_

Is there information on unusual sales of pharmaceutical supplies (e.g., diarrhea medication)? \_\_\_\_\_

Number of people affected \_\_\_\_\_

Number of fatalities \_\_\_\_\_

Location/area affected \_\_\_\_\_

Was an epidemiological investigation conducted? ☐ Yes ☐ No ☐ Unknown

Results \_\_\_\_\_

Was a clinical investigation conducted? ☐ Yes ☐ No ☐ Unknown

Results \_\_\_\_\_

Is the contaminant acutely toxic and what are the acute effects? ☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

## LABORATORY ANALYSIS SUMMARY

Results of analysis \_\_\_\_\_

Reporting units \_\_\_\_\_

Analytical method \_\_\_\_\_

Minimum reporting level \_\_\_\_\_

Precision (relative standard deviation) \_\_\_\_\_

QA/QC (e.g., recovery of matrix spikes, standard checks, etc.) \_\_\_\_\_

Summarize additional information obtained during laboratory analysis that is relevant to contaminant identification.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## CONTAMINANT CHARACTERISTICS

What is the class of the contaminant?

☐ Biological

☐ Chemical

☐ Radiological

☐ Unknown \_\_\_\_\_

Can any conclusions regarding the contaminant properties be made? (Place an 'X' in the appropriate column)

	Yes	No	Unk	Comment/Additional Information
Is the contaminant susceptible to disinfection or chemical oxidation?				
Does the contaminant hydrolyze into less toxic products?				
Does the contaminant hydrolyze into more toxic products?				
What are pKa values for chemicals?				
Is the contaminant water soluble?				
Does the contaminant have a discernable taste, odor, or color?				
Is the contaminant volatile or semi-volatile?				
Does the contaminant impact the pH?				
Does the contaminant impact conductivity?				
Does the contaminant impact other water quality parameters?				
Does the contaminant react with certain disinfectants (i.e., chlorine, chloramines, etc.)?				
What is the contaminant's half life?				

## Contaminant Public Health Effect Information

What are the primary routes of exposure?

☐ Ingestion

☐ Inhalation

☐ Dermal Contact

☐ Unknown \_\_\_\_\_

What are the acute health effects for the exposure routes identified? \_\_\_\_\_

\_\_\_\_\_

What is the contaminant's LD<sub>50</sub>/ID<sub>50</sub>? \_\_\_\_\_

\_\_\_\_\_

What is the length of time to first onset of symptoms after exposure? \_\_\_\_\_

\_\_\_\_\_

What are the chronic health effects associated with exposure to the contaminant? \_\_\_\_\_

\_\_\_\_\_



Does the contaminant have a method of secondary transmission?

☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

Is an approach available to prevent undesirable health effects from the contaminant?

☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

Are there treatments available for individuals exposed to the contaminant?

☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

Are health standards for the contaminant available?

☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

By which exposure route(s)?

☐ Ingestion ☐ Inhalation  
☐ Dermal ☐ Ocular

List the levels for each exposure route.

\_\_\_\_\_

#### Contaminant Treatment Information

Treatment Types	Could be used to treat the contaminant?		Degradation products formed as a consequence of treatment	Rating of effectiveness (poor, fair, good) of percent effectiveness
Lime softening	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Reverse osmosis	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard chlorination	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced chlorination	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard filtration	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced filtration	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Membrane filtration	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Nanofiltration	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Electrodialysis	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Cation exchange resin	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Anion exchange resin	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Activated alumina	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Chloramine	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Chlorine dioxide	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard UV	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced UV	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard ozone	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced ozone	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard GAC	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced GAC	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Standard air stripping	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Enhanced air stripping	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Other Methods	<input type="checkbox"/> Yes	<input type="checkbox"/> No		



## Access to contaminant information (effects and properties)

### *In-house information*

Contact/phone no. \_\_\_\_\_

Internal database \_\_\_\_\_

### *Public Health officials*

Contact/phone no. \_\_\_\_\_

Web site/database \_\_\_\_\_

### *US EPA Water Contaminant Information Tool*

Web site/access code \_\_\_\_\_

- US EPA water contaminant information tool (WCIT).
- US EPA's List of Drinking Water Contaminants & MCLs: <http://www.epa.gov/safewater/mcl.html#mcls>.
- Agency for Toxic Substances and Disease Registry (ATSDR): [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov).
- CDC Emergency Preparedness and Response: [www.bt.cdc.gov](http://www.bt.cdc.gov).
- Recognizing Waterborne Disease and the Health Effects of Water Pollution: A Physician On-line Reference Guide: [www.WaterHealthConnection.org](http://www.WaterHealthConnection.org).
- Physician Preparedness for Acts of Water Terrorism: [www.waterhealthconnection.org/bt/index.asp](http://www.waterhealthconnection.org/bt/index.asp).
- Registry of Toxic Effects of Chemical Substances (RTECS): [www.cdc.gov/niosh/rtecs.html](http://www.cdc.gov/niosh/rtecs.html).
- Risk Assessment Information System (RAIS), which contains information taken from US EPA's Integrated Risk Information System (IRIS), the *Health Effects Assessment Summary Tables* (HEAST-rad HEAST-nonrad), US EPA Peer Reviewed Toxicity Values (PRTVs) Database, and other information sources: <http://risk.lsd.ornl.gov/index.shtml>.
- United States Army Medical Research Institute of Infectious Diseases (USAMRIID) Medical Management of Biological Casualties Handbook: <http://www.usamriid.army.mil/education/bluebook.html>.
- WHO: [www.who.int/search/en/](http://www.who.int/search/en/).
- WHO's "Public health response to biological and chemical weapons:" [www.who.int/csr/deliberidemics/biochemguide/en/index.html](http://www.who.int/csr/deliberidemics/biochemguide/en/index.html).

## CONTAMINANT TRANSPORT

Summarize what is known regarding the location of contaminant introduction.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

How much material was used \_\_\_\_\_ (lbs., tons, gal, etc.)

How was it added? ☐ Single dose ☐ Over time ☐ Unknown

Time period of suspected contaminant introduction. \_\_\_\_\_

Elapsed time. \_\_\_\_\_

Method of estimating the spread.

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Manual calculations                          | <input type="checkbox"/> Hydraulic model | <input type="checkbox"/> Water flow analysis          |
| <input type="checkbox"/> GIS  | <input type="checkbox"/> Field analysis  | <input type="checkbox"/> Areas of customer complaints |
| <input type="checkbox"/> Areas of people with health-related symptoms |  |   |
| <input type="checkbox"/> Other _____                                  |  |   |

Estimate the contaminated area. \_\_\_\_\_

Estimate the population affected. \_\_\_\_\_



Identify any customers with special needs that are within the affected area.

☐ Critical Care Facilities



- ☐ Hospitals  
☐ Nursing Homes  
☐ Other \_\_\_\_\_

- ☐ Clinics  
☐ Dialysis Centers

☐ Schools

☐ Day Care Facilities

☐ Businesses

- ☐         
-             
- ☐ Restaurants ☐ Agricultural Operations  
☐ Power Generation Facilities  
☐ Other \_\_\_\_\_

**SIGNOFF**

Name of person completing form

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 5.4 Public Health Response Action Worksheet

### INSTRUCTIONS

The purpose of this form is to help organize information to aid in the evaluation of containment options and public notification options. The objectives of public health response actions (operational and public notification) are to prevent or limit public exposure to potentially contaminated water by either restricting further propagation of the contaminant through the distribution system or restricting use of the water through public notification. This worksheet assumes that the "Contaminant Characterization and Transport Worksheet" in Section 5.3 has been completed to the extent possible.

### ASSESSMENT OF PUBLIC HEALTH IMPACT

#### Identity of the contaminant

☐ Suspected ☐ Known ☐ Unknown

Describe \_\_\_\_\_

Contaminant properties (if known):

Toxic or infectious dose (LD<sub>50</sub>/ID<sub>50</sub>): \_\_\_\_\_

Route of exposure:

☐ Ingestion

☐ Inhalation

☐ Dermal Contact

☐ Other \_\_\_\_\_

Symptoms of exposure to high dose: \_\_\_\_\_

Symptoms of exposure to low dose: \_\_\_\_\_

Other: \_\_\_\_\_

### EVALUATION OF CONTAINMENT OPTIONS

Describe the location and extent of the contaminated area. \_\_\_\_\_

#### Containment options

☐ Valve closures

☐ Reverse flow conditions

☐ By-pass

☐ Isolate zone(s)

☐ Other \_\_\_\_\_

#### Critical equipment within contaminated area

☐ System equipment

☐ Zones

☐ Pump stations

☐ Hydrants

☐ Other \_\_\_\_\_

#### Customers with special needs within contaminated area

☐ Critical Care Facilities

☐ Hospitals

☐ Clinics









☐ Nursing Homes

☐ Dialysis Centers

☐ Other \_\_\_\_\_

☐ Schools

☐ Businesses

☐        

☐ Restaurants

☐ Agricultural Operations

☐ Power Generation Facilities

☐ Other \_\_\_\_\_



### Effectiveness of containment options

- |   |   |
|---|---|
| <input type="checkbox"/> Complete contaminant isolation | <input type="checkbox"/> Reduction in spread of contaminant |
| <input type="checkbox"/> Unknown                        | <input type="checkbox"/> Other _____                        |

Is containment expected to provide adequate public health protection?

- ☐ Yes   ☐ No   ☐ Unknown

### Timeline for implementation of containment options

Containment procedures to begin: \_\_\_\_\_

Containment procedures to end: \_\_\_\_\_

### EVALUATION OF PUBLIC NOTIFICATION OPTIONS

Is public notification necessary?

- ☐ Yes   ☐ No

### Collaboration Agencies (identified in Public Health Response Plan and Utility's ERP)

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Public health agencies         | <input type="checkbox"/> Police departments | <input type="checkbox"/> Fire departments              |
| <input type="checkbox"/> Hospitals/clinics              | <input type="checkbox"/> Laboratories       | <input type="checkbox"/> Drinking water primacy agency |
| <input type="checkbox"/> Regional Poison Control Center |   |  |
| <input type="checkbox"/> Other _____                    |   |  |

### Type of notification (Follow steps shown)

Is the contaminant known?

- ☐ Yes   ☐ No

***If no, issue a "Do Not Use" notice.***

- If yes, is boiling effective and advisable?

- ☐ Yes   ☐ No   ☐ Unknown

***If yes, issue a "Boil Water" notice.***

- - If no or unknown, is there a risk of dermal or inhalation exposure?

- ☐ Yes   ☐ No   ☐ Unknown

***If no, issue a "Do Not Drink" notice.***

***If yes or unknown, issue a "Do Not Use" notice.***

### Content of public notification

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Has the contamination incident been confirmed? | <input type="checkbox"/> Yes                 | <input type="checkbox"/> No              |
| <input type="checkbox"/> Is the contaminant known?                      | <input type="checkbox"/> Yes                 | <input type="checkbox"/> No              |
| <input type="checkbox"/> If yes, identity of the contaminant _____      |  |  |
| <input type="checkbox"/> Characteristics of the contaminant _____       |  |  |
| <input type="checkbox"/> Restrictions on use _____                      |  |  |
| <input type="checkbox"/> Ingestion exposure                             | <input type="checkbox"/> Inhalation exposure | <input type="checkbox"/> Dermal exposure |
| <input type="checkbox"/> Exposure symptoms _____                        |  |  |
| <input type="checkbox"/> Medical treatments _____                       |  |  |
| <input type="checkbox"/> Transmission mode (if biological) _____        |  |  |
| <input type="checkbox"/> Duration of restriction _____                  |  |  |
| <input type="checkbox"/> Alternate water supply _____                   |  |  |
| <input type="checkbox"/> Additional instructions to consumers _____     |  |  |
| <input type="checkbox"/> Other information about the incident _____     |  |  |
| <input type="checkbox"/> Other _____                                    |  |  |



**Notification to customers with special needs**☐ **Critical Care Facilities**

- ☐ Hospitals  
☐ Nursing Homes  
☐ Other \_\_\_\_\_

- ☐ Clinics  
☐ Dialysis Centers

☐ **Schools**☐ **Businesses**

- ☐ \_\_\_\_\_  
☐ \_\_\_\_\_  
☐ \_\_\_\_\_

- ☐ Restaurants  
☐ Power Generation Facilities  
☐ Other \_\_\_\_\_

- ☐
- Agricultural Operations**

Are there subpopulations that will be affected at a greater rate than general population?

- ☐ Yes ☐ No ☐ Unknown

Describe \_\_\_\_\_

Notification to consecutive system.

- ☐ Yes ☐ No ☐ Not Applicable

**Method of dissemination**

- |   |   |
|---|---|
| <input type="checkbox"/> Broadcast media (radio and television)               | <input type="checkbox"/> Government access channels         |
| <input type="checkbox"/> Web site   | <input type="checkbox"/> Listserv email                     |
| <input type="checkbox"/> Newspaper  | <input type="checkbox"/> Letters by mail                    |
| <input type="checkbox"/> Newsletters (water utility or partner organizations) | <input type="checkbox"/> Phone banks                        |
| <input type="checkbox"/> Broadcast phone messages                             | <input type="checkbox"/> Broadcast faxes                    |
| <input type="checkbox"/> Posting in conspicuous locations                     | <input type="checkbox"/> Mass distribution through partners |
| <input type="checkbox"/> Hand delivery  | <input type="checkbox"/> Door-to-door canvassing            |
| <input type="checkbox"/> Town hall meetings                                   | <input type="checkbox"/> Conference calls                   |
| <input type="checkbox"/> Other _____  |   |

**Notification/restriction timeline**

Notification/restriction to begin: \_\_\_\_\_

Notification/restriction to end: \_\_\_\_\_

**ALTERNATE WATER SUPPLY NEEDS**

Is an alternate water supply needed?

- ☐ Drinking water ☐ Fire fighting  
☐ Other \_\_\_\_\_

Where can customers obtain the alternate water supply?

- ☐ Bottled water provided by local government agencies  
☐ Bottled water provided by local retailers  
☐ Bulk water provided by certified water haulers  
☐ Bulk water transported or provided by military assets  
☐ Bulk water providing by neighboring water utilities  
☐ Water treated at plant and hauled to distribution centers (i.e., in the case of distribution system contamination)  
☐ Other \_\_\_\_\_



What customers with special needs should be notified of the alternate water supply availability?

☐ Critical Care Facilities

- ☐ Hospitals  
☐ Nursing Homes  
☐ Other \_\_\_\_\_

- ☐ Clinics  
☐ Dialysis Centers

☐ Schools

☐ Businesses

- ☐

- ☐ Restaurants

- ☐ Power Generation Facilities  
☐ Other \_\_\_\_\_

- ☐ Agricultural Operations

**SIGNOFF**

Name of person completing form

Print name \_\_\_\_\_

Signature \_\_\_\_\_

Date/Time: \_\_\_\_\_



## 6 Appendices

### 6.1 *Critical System Information Checklist*

- ☐ Population Served and Service Connections
- ☐ Distribution Network Map (including pressure zones)
- ☐ Pressure Zone Map
- ☐ Treatment Process Flow Diagram
- ☐ Chlorination Stations (location and quantity of chlorine on site)
- ☐ Chemical Handling and/or Storage Facilities and Release Impact Analysis
- ☐ Booster Pump Stations (location, capacity, and power requirements)
- ☐ Supervisory Control and Data Acquisition systems
- ☐ Site Staffing Rosters and Employee's Duties and Responsibilities
- ☐ Vulnerability Assessments
- ☐ Backup Equipment and Power Generation



## 6.2 Information Resources

- Agency for Toxic Substances and Disease Registry (ATSDR): [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov).
- AOAC. 2003b. "Rapid Test Kits Test Kit Database"  
<http://www.aoac.org/testkits/TKDATA2.HTM>.
- CDC Emergency Preparedness and Response: [www.bt.cdc.gov](http://www.bt.cdc.gov).
- CDC. 2003f. "List of Select Biological Agents" <http://www.cdc.gov/od/sap/docs/salist.pdf>.
- CWC. 2003b. "The Chemical Weapons Convention – A Quick Guide, CWC-002"  
[http://www.cwc.gov/Industry\\_Outreach/Publications/002/cwc-b0001.html](http://www.cwc.gov/Industry_Outreach/Publications/002/cwc-b0001.html).
- FEMA, Hazardous Materials Guide for First Responders. <http://www.usfa.fema.gov/fire-service/hmgfr3.cfm>
- Physician Preparedness for Acts of Water Terrorism:  
[www.waterhealthconnection.org/bt/index.asp](http://www.waterhealthconnection.org/bt/index.asp).
- Recognizing Waterborne Disease and the Health Effects of Water Pollution: A Physician On-line Reference Guide: [www.waterhealthconnection.org](http://www.waterhealthconnection.org).
- Registry of Toxic Effects of Chemical Substances (RTECS): [www.cdc.gov/niosh/rtecs.html](http://www.cdc.gov/niosh/rtecs.html).
- Risk Assessment Information System (RAIS), which contains information taken from the US EPA Integrated Risk Information System (IRIS), the *Health Effects Assessment Summary Tables* (HEAST-rad HEAST-nonrad), US EPA Peer Reviewed Toxicity Values (PRTVs) Database, and other information sources: <http://risk.lsd.ornl.gov/index.shtml>.
- US Army Medical Research Institute of Infectious Diseases (USAMRIID) Medical Management of Biological Casualties Handbook: <http://www.usamriid.army.mil/education/bluebook.html>.
- US Army. 2002. "Toxic Chemical Agent Safety Standards"  
[http://www.usapa.army.mil/pdffiles/p385\\_61.pdf](http://www.usapa.army.mil/pdffiles/p385_61.pdf).
- US Coast Guard. 2001. "Chemical Hazards Response Information System"  
<http://www.chrismanual.com>.
- US EPA's List of Drinking Water Contaminants & Maximum Contaminant Levels (MCLs):  
<http://www.epa.gov/safewater/mcl.html#mcls>.
- US EPA. 2000. "EPA Radiological Emergency Response Plan"  
<http://www.epa.gov/radiation/rert/docs/rerp-1-00.pdf>.
- US EPA. 2003c. "EPA Environmental Technology Verification Home" <http://www.epa.gov/etv/>.
- US EPA. Undated c. Compendium of Environmental Testing Laboratories.  
<http://www.epa.gov/compendium>
- US National Library of Medicine. 2001. Toxicology Tutor I - Basic Principles. May 14.  
<http://www.sis.nlm.nih.gov/ToxTutor/Tox1/a12.htm>
- WaterISAC, which contains information on contaminants including various contaminant fact sheets as well as the United Kingdom Water Industry Research (UKWIR) database:  
[www.waterisac.org](http://www.waterisac.org).
- WHO's "Public health response to biological and chemical weapons"  
[www.who.int/csr/delibepidemics/biochemguide/en/index.html](http://www.who.int/csr/delibepidemics/biochemguide/en/index.html).
- WHO. 2001. "Health Aspects of Biological and Chemical Weapons"  
[http://www.who.int/emc/pdfs/BIOWEAPONS\\_FULL\\_TEXT2.pdf](http://www.who.int/emc/pdfs/BIOWEAPONS_FULL_TEXT2.pdf)



### 6.3 Threat Management Matrices

This section presents a “contamination threat management matrix” for each of the threat warnings described in Section 2.2. Each matrix is a tabular summary that lists the following at the ‘possible,’ ‘credible,’ and ‘confirmatory’ stages of the threat evaluation:

- Information considered during the threat evaluation.
- Factors considered during the threat evaluation.
- Potential response actions.

#### 6.3.1 Security Breach

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
Information	<ul style="list-style-type: none"> <li>• Location of security breach.</li> <li>• Time of security breach.</li> <li>• Information from alarms.</li> <li>• Observations when security breach was discovered.</li> <li>• Additional details from the threat warning.</li> </ul>	<ul style="list-style-type: none"> <li>• Results of site characterization at location of security breach.</li> <li>• Previous security incidents.</li> <li>• Real time water quality data from the location of security breach.</li> <li>• Input from local law enforcement.</li> </ul>	<ul style="list-style-type: none"> <li>• Results of sample analysis.</li> <li>• Contaminant information.</li> <li>• Results of site characterization at other investigation sites.</li> <li>• Input from primacy agency and public health agency.</li> </ul>
Evaluation	<ul style="list-style-type: none"> <li>• Was there an opportunity for contamination?</li> <li>• Has normal operational activity been ruled out?</li> <li>• Have other “harmless” causes been ruled out?</li> </ul>	<ul style="list-style-type: none"> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Is this security breach similar to previous security incidents?</li> <li>• Does other information (e.g., water quality) corroborate threat?</li> <li>• Does law enforcement consider this a credible threat?</li> </ul>	<ul style="list-style-type: none"> <li>• Were unusual contaminants detected during analysis? Do they pose a risk to the public?</li> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Is contamination indicated by a “preponderance of evidence?”</li> </ul>
Notifications	<ul style="list-style-type: none"> <li>• Notifications within utility.</li> <li>• Local law enforcement agencies.</li> </ul>	<ul style="list-style-type: none"> <li>• Drinking water primacy agency.</li> <li>• State/local public health agency.</li> <li>• FBI.</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency response agencies.</li> <li>• National Response Center.</li> <li>• Other state and federal assistance providers.</li> </ul>
Response	<ul style="list-style-type: none"> <li>• Isolate affected area.</li> <li>• Initiate site characterization.</li> <li>• Estimate spread of suspected contaminant.</li> <li>• Consult external information sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement appropriate public health protection measures.</li> <li>• Plan for alternate water supply.</li> <li>• Analyze samples.</li> <li>• Perform site characterization at additional investigation sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Characterize affected area.</li> <li>• Revise public health protection measures as necessary.</li> <li>• Provide alternate water supply.</li> <li>• Plan remediation activities.</li> </ul>

Security breaches may be the most common type of threat warning encountered by a utility since they may result from trespassing, vandalism, theft, or failure to re-secure facilities following legitimate activities. The purpose of the threat evaluation under this scenario is to distinguish between these more frequent, yet relatively harmless security breaches, and those few that might be considered ‘credible’ contamination threats.

At the ‘possible’ stage of the threat evaluation, information about the security breach will be available. Specifically, the location of the security breach will be known, which will likely be established as the initial investigation site. Other information may be available from alarms



(including surveillance footage), which may help to establish the time of the security breach. The evaluation at this stage should consider whether or not there was an opportunity for contamination at the site of the security breach. Furthermore, “normal” activity should be considered and investigated at this stage as a potential cause of the security breach (e.g., was a utility crew recently at the site and potentially forgot to re-secure the area?). Potential response actions to a ‘possible’ threat may include isolating areas of the system that could be affected, initiating site characterization activities to collect more information in support of the threat evaluation, and initiating the process to estimate the spread of the suspect water through the system.

Information that may be available at the ‘credible’ stage includes the results of site characterization, an assessment of previous security incidents, real-time water quality data in the area of the security breach, and an assessment of the threat by law enforcement. The evaluation at this stage will consider whether or not signs of contamination were discovered during site characterization, including unusual results from field testing or unusual observations during the site investigation. Consideration should also be given to whether or not the new information available at this stage corroborates the information about the threat. If the threat is determined to be ‘credible,’ response actions may include measures to limit or prevent exposure of the public to the suspect water, such as public notification. Actions taken to continue the investigation at this point may include analysis of samples collected from the site, continued site characterization activities, and an analysis to estimate the spread of the contaminant.

The new information available at the confirmatory stage may include the results from laboratory analysis, including QA/QC data to support the interpretation of the results. If a specific contaminant is identified, then additional information about that contaminant can be used to further evaluate the nature of the threat as well as implications to public health. The findings of continued site characterization activities may also help to confirm the incident. The basis for confirming a contamination incident can be analytical results that identify a specific contaminant or other definitive evidence that a contaminant is present in the water. If a contaminant has been identified, consideration should be given to the health effects associated with exposure to that contaminant. It may be necessary to revise the sampling and analysis plans if a contaminant was not positively identified through laboratory analysis but the threat is still deemed ‘credible.’ Response actions potentially initiated once a contamination incident has been confirmed include characterization of the contaminated area, revision to public health protection measures, provision of alternate water supplies, and planning for remediation and recovery activities.



### 6.3.2 Witness Account

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
Information	<ul style="list-style-type: none"> <li>Location of the suspicious activity.</li> <li>Witness account of the suspicious activity.</li> <li>Additional details from the threat warning.</li> </ul>	<ul style="list-style-type: none"> <li>Additional information from the witness.</li> <li>Results of site characterization at location of suspicious activity.</li> <li>Previous security incidents.</li> <li>Real time water quality data from the location of suspicious activity.</li> <li>Input from local law enforcement.</li> </ul>	<ul style="list-style-type: none"> <li>Results of sample analysis.</li> <li>Contaminant information.</li> <li>Results of site characterization at other investigation sites.</li> <li>Input from primacy agency and public health agency.</li> </ul>
Evaluation	<ul style="list-style-type: none"> <li>Was there an opportunity for contamination?</li> <li>Is the witness reliable?</li> <li>Has normal operational activity been ruled out?</li> <li>Have other “harmless” causes been ruled out?</li> </ul>	<ul style="list-style-type: none"> <li>Do site characterization results reveal signs of contamination?</li> <li>Is the suspicious activity similar to previous security incidents?</li> <li>Does other information (e.g., water quality) corroborate threat?</li> <li>Does law enforcement consider this a credible threat?</li> </ul>	<ul style="list-style-type: none"> <li>Were unusual contaminants detected during analysis? Do they pose a risk to the public?</li> <li>Do site characterization results reveal signs of contamination?</li> <li>Is contamination indicated by a “preponderance of evidence?”</li> </ul>
Notifications	<ul style="list-style-type: none"> <li>Notifications within utility.</li> <li>Local law enforcement.</li> </ul>	<ul style="list-style-type: none"> <li>Drinking water primacy agency.</li> <li>State/local public health agency.</li> <li>FBI.</li> </ul>	<ul style="list-style-type: none"> <li>Emergency response agencies.</li> <li>National Response Center.</li> <li>Other state and federal assistance providers.</li> </ul>
Response	<ul style="list-style-type: none"> <li>Isolate affected area.</li> <li>Initiate site characterization.</li> <li>Estimate spread of suspected contaminant.</li> <li>Consult external information sources.</li> <li>Interview witness for additional information.</li> </ul>	<ul style="list-style-type: none"> <li>Implement appropriate public health protection measures.</li> <li>Plan for alternate water supply.</li> <li>Analyze samples.</li> <li>Perform site characterization at additional investigation sites.</li> </ul>	<ul style="list-style-type: none"> <li>Characterize affected area.</li> <li>Revise public health protection measures as necessary.</li> <li>Provide alternate water supply.</li> <li>Plan remediation activities.</li> </ul>

From the perspective of the threat management process, a threat triggered by a witness account is similar to one triggered by a security breach. One of the few significant differences is the use of information collected directly from the witness throughout the evaluation, particularly during the ‘possible’ and ‘credible’ stages of the threat evaluation. The reliability of the witness must be considered when making these determinations, and additional evidence collected during the investigation should be evaluated to determine whether or not it corroborates the witness account.



### 6.3.3 Direct Notification by Perpetrator

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
Information	<ul style="list-style-type: none"> <li>• Transcript of phone (or written) threat.</li> <li>• The who, what, where, when, and why of the threat.</li> <li>• Additional details from the threat warning.</li> <li>• Vulnerability assessment.</li> </ul>	<ul style="list-style-type: none"> <li>• Law enforcement assessment.</li> <li>• Primacy agency assessment.</li> <li>• Previous threats at this utility or other utilities.</li> <li>• Results of site characterization at selected investigation sites.</li> <li>• Real time water quality data.</li> <li>• Reports from ISAC, EPA, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• FBI assessment.</li> <li>• Results of sample analysis.</li> <li>• Contaminant information.</li> <li>• Results of site characterization at other investigation sites.</li> <li>• Input from primacy agency and public health agency.</li> </ul>
Evaluation	<ul style="list-style-type: none"> <li>• Is the threat feasible?</li> <li>• Has the water already been contaminated?</li> <li>• Is the location known or suspected?</li> <li>• Is the identity of the perpetrator known or suspected?</li> <li>• Have there been personnel problems at the utility?</li> </ul>	<ul style="list-style-type: none"> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Does other information (e.g., water quality) corroborate threat?</li> <li>• Does law enforcement consider this a credible threat?</li> <li>• Does the primacy agency consider this a credible threat?</li> </ul>	<ul style="list-style-type: none"> <li>• Were unusual contaminants detected during analysis? Do they pose a risk to the public?</li> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Is contamination indicated by a “preponderance of evidence?”</li> </ul>
Notifications	<ul style="list-style-type: none"> <li>• Notifications within utility.</li> <li>• Local law enforcement.</li> <li>• Drinking water primacy agency.</li> </ul>	<ul style="list-style-type: none"> <li>• FBI.</li> <li>• State/local public health agency.</li> <li>• EPA Criminal Investigation Division.</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency response agencies.</li> <li>• National Response Center.</li> <li>• Other state and federal assistance providers.</li> </ul>
Response	<ul style="list-style-type: none"> <li>• Isolate affected area if identified in the threat.</li> <li>• Identify sites and initiate site characterization.</li> <li>• Consult external information sources.</li> <li>• Gather information from law enforcement assessment.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement appropriate public health protection measures.</li> <li>• Plan for alternate water supply.</li> <li>• Analyze samples.</li> <li>• Perform site characterization at additional investigation sites.</li> <li>• Estimate spread of suspected contaminant.</li> </ul>	<ul style="list-style-type: none"> <li>• Characterize affected area.</li> <li>• Revise public health protection measures as necessary.</li> <li>• Provide alternate water supply.</li> <li>• Plan remediation activities.</li> </ul>

Threats to contaminate the water made via direct notification by a perpetrator need to be taken seriously. However, the majority of such direct threats are hoaxes that may be intended to cause panic or disruption, gain attention, or fulfill a personal vendetta. Thus, the focus of the threat evaluation for this type of threat warning is to identify any credible threats amongst the larger number of hoax notifications. In any case, direct threats against the water supply should be reported to local law enforcement.

A key source of information that may support the threat evaluation under this scenario is provided directly by the perpetrator making the threat. In the case of a phone threat, it is important to collect information about the threat from the caller to support the threat evaluation. Similarly, a written notification should be carefully reviewed for details about the threat. Additional information collected throughout the investigation should be evaluated against the details of the threat notification, and it corroborates the details of the notification, then the threat is more likely to be deemed ‘credible.’



One of the potential challenges in managing a threat triggered by direct notification from a perpetrator is identification of an investigation site that will be the focus of site characterization activities. Unless a location is named in the threat, it will be necessary to use other information, such as that derived from vulnerability assessments or unusual water quality data/consumer complaints, to identify investigation sites.

DRAFT



### 6.3.4 Unusual Water Quality or Consumer Complaints

#### Unusual Water Quality

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
<b>Information</b>	<ul style="list-style-type: none"> <li>Unusual water quality data.</li> <li>Baseline water quality data.</li> <li>Real time water quality data.</li> <li>Operational information corresponding to the time of the unusual water quality.</li> </ul>	<ul style="list-style-type: none"> <li>Results of site characterization at selected investigation sites.</li> <li>Previous threat warnings triggered by water quality.</li> <li>Contaminant information.</li> <li>Reports of consumer complaints.</li> </ul>	<ul style="list-style-type: none"> <li>Results of sample analysis.</li> <li>Contaminant information.</li> <li>Results of site characterization at other investigation sites.</li> <li>Input from primacy agency and public health agency.</li> </ul>
<b>Evaluation</b>	<ul style="list-style-type: none"> <li>Is the unusual water quality significantly different from an established baseline?</li> <li>Could operational changes be the cause?</li> <li>Could changes in source water quality be the cause?</li> <li>Are there similar results at other monitoring locations?</li> </ul>	<ul style="list-style-type: none"> <li>Do site characterization results reveal signs of contamination?</li> <li>Is this unusual data substantial different from other water quality episodes?</li> <li>Is the unusual data indicative of a specific contaminant?</li> <li>Are the unusual water quality clustered in a specific area?</li> <li>Are there any unusual consumer complaints in the area?</li> </ul>	<ul style="list-style-type: none"> <li>Were unusual contaminants detected during analysis? Do they pose a risk to the public?</li> <li>Do site characterization results reveal signs of contamination?</li> <li>Is contamination indicated by a “preponderance of evidence?”</li> </ul>
<b>Notifications</b>	<ul style="list-style-type: none"> <li>Notifications within utility.</li> </ul>	<ul style="list-style-type: none"> <li>Drinking water primacy agency.</li> <li>State/local public health agency.</li> <li>Local law enforcement.</li> <li>FBI.</li> </ul>	<ul style="list-style-type: none"> <li>Emergency response agencies.</li> <li>National Response Center.</li> <li>Other state and federal assistance providers.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>Identify sites and initiate site characterization.</li> <li>Begin analysis of available water quality data.</li> <li>Investigate unusual consumer complaints.</li> <li>Consult external information sources.</li> </ul>	<ul style="list-style-type: none"> <li>Estimate affected area and isolate if possible.</li> <li>Implement appropriate public health protection measures.</li> <li>Plan for alternate water supply.</li> <li>Analyze samples.</li> <li>Perform site characterization at additional investigation sites.</li> </ul>	<ul style="list-style-type: none"> <li>Characterize affected area.</li> <li>Revise public health protection measures as necessary.</li> <li>Provide alternate water supply.</li> <li>Plan remediation activities.</li> </ul>

#### Consumer Complaint

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
<b>Information</b>	<ul style="list-style-type: none"> <li>Compilation of consumer complaints, including geographic distribution.</li> <li>Recent water quality data that may be associated with complaints.</li> <li>Operational information corresponding to the time of the unusual complaints.</li> </ul>	<ul style="list-style-type: none"> <li>Results of site characterization at selected investigation sites.</li> <li>Summary of historic consumer complaints.</li> <li>Results of consumer interviews.</li> <li>Contaminant information.</li> </ul>	<ul style="list-style-type: none"> <li>Results of sample analysis.</li> <li>Contaminant information.</li> <li>Results of site characterization at other investigation sites.</li> <li>Input from primacy agency and public health agency.</li> </ul>



<b>Evaluation</b>	<ul style="list-style-type: none"> <li>• Are the complaints unusual?</li> <li>• Could operational changes be the cause?</li> <li>• Could changes in source water quality be the cause?</li> <li>• Are the complaints clustered in a specific area?</li> <li>• Are complaints from habitual complainers?</li> </ul>	<ul style="list-style-type: none"> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Are other consumers in the area experiencing similar water quality?</li> <li>• Are the unusual complaints significantly different from typical complaints?</li> <li>• Are the complaints indicative of a specific contaminant?</li> <li>• Is there anything unusual about the water quality in the area?</li> </ul>	<ul style="list-style-type: none"> <li>• Were unusual contaminants detected during analysis? Do they pose a risk to the public?</li> <li>• Do site characterization results reveal signs of contamination?</li> <li>• Is contamination indicated by a “preponderance of evidence?”</li> </ul>
<b>Notifications</b>	<ul style="list-style-type: none"> <li>• Notifications within utility.</li> </ul>	<ul style="list-style-type: none"> <li>• Drinking water primacy agency.</li> <li>• State/local public health agency.</li> <li>• Local law enforcement agency.</li> <li>• FBI.</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency response agencies.</li> <li>• National Response Center.</li> <li>• Other state and federal assistance providers.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>• Identify sites and initiate site characterization.</li> <li>• Begin analysis of available water quality data.</li> <li>• Interview consumers in area with high numbers of complaints.</li> <li>• Consult external information sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Estimate affected area and isolate if possible.</li> <li>• Implement appropriate public health protection measures.</li> <li>• Plan for alternate water supply.</li> <li>• Analyze samples.</li> <li>• Perform site characterization at additional investigation sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Characterize affected area.</li> <li>• Revise public health protection measures as necessary.</li> <li>• Provide alternate water supply.</li> <li>• Plan remediation activities.</li> </ul>

A threat warning arising from unusual water quality data is **significantly different** from the other threat warnings previously discussed and thus should be handled differently during the threat evaluation. In determining whether or not the threat is ‘possible,’ it is necessary to evaluate the anomalous data relative to an established baseline. Furthermore, it is important to consider operational conditions, or potential impacts from changing source water quality or distribution system blending as possible explanations for the unusual water quality or complaint. If the unusual water quality data is determined to be significantly different from the baseline, and cannot be explained by other factors, then t contamination may be considered a possibility.

Presumably, the unusual water quality data will be associated with a particular location in the system, which will help in the identification of investigation sites that will be the focus of site characterization activities. At this stage, it is important to verify the anomalous water quality data through additional testing using independent equipment. For example, if an incident was triggered by a rapid decrease in the free chlorine residual, as detected by online electrochemical monitors, additional testing could be performed with colormetric field kits to confirm the results. Additional rapid field testing might also help to determine the bounds of the affected area. Furthermore, specific information about particular contaminants should be considered at the ‘credible’ stage as it might be used to identify potential contaminants that would impact the water quality parameter with anomalous readings. For example, contaminants with acidic functional groups might result in reduced pH.



### 6.3.5 Notification by Public Health

	THREAT EVALUATION STAGE		
	Possible	Credible	Confirmatory
<b>Information</b>	<ul style="list-style-type: none"> <li>Details of notification from public health sector.</li> <li>Symptoms of disease and causative agent, if known.</li> <li>Contaminant information.</li> </ul>	<ul style="list-style-type: none"> <li>Geographic distribution of disease or death.</li> <li>Recent water quality and operational data.</li> <li>Reports of consumer complaints.</li> <li>Contaminant information.</li> </ul>	<ul style="list-style-type: none"> <li>Results of site characterization at selected investigation sites.</li> <li>Results of sample analysis.</li> <li>Contaminant information.</li> <li>FBI assessment.</li> </ul>
<b>Evaluation</b>	<ul style="list-style-type: none"> <li>Why is water under investigation as a possible source?</li> <li>Are the reported symptoms consistent with exposure to the contaminant via water?</li> <li>If causative agent is known, is it stable in water?</li> </ul>	<ul style="list-style-type: none"> <li>Is the geographic pattern of exposure consistent with exposure to contaminated water?</li> <li>Is there a recent occurrence of unusual water quality data or consumer complaints?</li> <li>Does additional information about the potential contaminant indicate water as a potential source?</li> </ul>	<ul style="list-style-type: none"> <li>Has the public health agency concluded that water is the cause of the disease or deaths?</li> <li>Did sample analysis detect the causative agent?</li> <li>Was another contaminant detected during sample analysis that could be the cause of the disease or deaths?</li> </ul>
<b>Notifications</b>	<ul style="list-style-type: none"> <li>Notifications within utility.</li> <li>State/local public health agency.</li> <li>Drinking water primacy agency.</li> </ul>	<ul style="list-style-type: none"> <li>FBI.</li> <li>Local and State law enforcement agencies.</li> </ul>	<ul style="list-style-type: none"> <li>Emergency response agencies.</li> <li>National Response Center.</li> <li>Other state and federal assistance providers.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>Consult with public health agency and primacy agency.</li> <li>Consult external information sources.</li> </ul>	<ul style="list-style-type: none"> <li>Estimate affected area and isolate if possible.</li> <li>Implement appropriate public health protection measures.</li> <li>Plan for alternate water supply.</li> <li>Identify sites and initiate site characterization.</li> <li>Analyze samples.</li> </ul>	<ul style="list-style-type: none"> <li>Characterize affected area.</li> <li>Revise public health protection measures as necessary.</li> <li>Provide alternate water supply.</li> <li>Plan remediation activities.</li> </ul>

Notification from public health officials regarding a potential water contamination incident is unique in that individuals have been exposed to a harmful substance resulting in illness, disease or death in the population. The threat evaluation in this case may be part of a larger epidemiological investigation to determine the cause of disease. It is critical that the utility work with the appropriate public health officials from the outset, since these officials will likely have information critical for the evaluation. For example, they may know or suspect the causative agent based on clinical information. This knowledge, in conjunction with information about the properties of the contaminant, may indicate whether or not contaminated water is even a possibility. For example, if the causative agent is known to immediately break down into harmless byproducts upon exposure to water, then the possibility of contaminated water might be dismissed.

If water is considered a possible carrier for the contaminant, then further investigation should be conducted to determine if water is the most likely carrier of the contaminant (i.e., analogous to the ‘credible’ stage of the threat evaluation). Information that may help to make this determination will include additional findings from the larger epidemiological investigation, geographic distribution of exposure, recent water quality and operational data, and reports of



consumer complaints. If this additional information indicates that water contamination is likely, response actions would likely include public notification and sampling for the contaminant. The sampling plan developed at this point may start with information about the geographic distribution of exposure; however, consideration must be given to the latency period of the disease, which could be from minutes to weeks, as well as the travel time within the system. The objectives of sampling and analysis at this point would include: 1) confirming the presence of the contaminant in the water; 2) determining if the contaminant is still present; and 3) determining the area affected. If water contamination is confirmed, and the contaminant is still present in the system, it will be necessary to begin planning for remediation and recovery efforts. If the contaminant is not found, extensive sampling would likely be necessary to demonstrate that the contaminant is indeed absent from the system.



## **APPENDIX G**

### **SAMPLE PUBLIC NOTIFICATION FORMS**





# Coliform

## Public Health Advisory Packet

We developed this packet to provide the tools you will use to manage fecal contamination in your water supply. We will work closely with you to help you identify the source of contamination, eliminate it, and determine if you need to issue a public health advisory.

You can get an electronic version of this packet—including all the templates and forms listed below—at <http://www.doh.wa.gov/ehp/dw/Coliform/coliform.htm>

Publications	Pub #
<i>Public Health Advisory: Coliform Questions &amp; Answers</i>	331-179 *
<i>Coliform Bacteria and Drinking Water Fact Sheet</i>	331-181
<i>Troubleshooting Checklist for Coliform Contamination Fact Sheet</i>	331-180
<i>Emergency Disinfection of Small Systems</i>	331-242

Publications	Pub #
<i>Emergency Water Supply Guidelines for Food Services Establishments Fact Sheet</i>	331-182 *
<i>Drinking Water After-Hours Emergency Hotline Brochure</i>	331-133
<i>Treatment of Drinking Water For Emergency Use Brochure</i>	331-115
<i>Office of Drinking Water authority over operators and water systems Fact Sheet</i>	331-449

\* Publication also available in Spanish.

Templates and Forms	Pub #
Boil Water Door Hanger (English and Spanish)	None
<i>Coliform Public Notice Certification Form</i>	331-264
<i>Drinking Water Warning for community water systems</i>	None

Templates and Forms	Pub #
News Release Template: Boil Water Advisory	331-260-2
News Release Template: Rescinding Boil Water Advisory	331-260-3
<i>Drinking Water Warning for noncommunity water systems</i>	None

### Public Notification Templates and Forms

Page 2 has information and instructions on using the coliform public notification templates and forms.



HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER



## Public notification templates and forms

You can choose from the *Drinking Water Warning* template or the *Door Hanger* template to provide public notice to your customers in an emergency. You must distribute one or both of these templates to all of your customers within 24 hours in the event of an acute maximum contaminant level (MCL) violation or other emergency that requires a health advisory.

1. **Drinking Water Warning:** This public notice template provides detailed information about health effects and instructions for your customers. You can download templates for community and noncommunity water systems in Microsoft Word or PDF from our website.\*  
You can use the Drinking Water Warning template to notify your customers in response to an *E. coli* or fecal coliform positive sample result. You may reformat this template, but the content must remain the same. Type or write all the information required to complete the template. Next, copy it on brightly colored paper and distribute it to all of your customers.
2. **Door hanger:** Use this template to inform your customers of contamination in the system and precautions they can take. Door hangers include information in English and Spanish. You can get door hangers from our regional offices, your local health office, or our website.\*

### Ways to use door hangers to inform customers quickly during a public health advisory:

- Write information on each door hanger.
- Fill in the top portion of the door hangers. Then print labels with the water system name, ID#, county, contact person's name and phone number, and the date you distribute the notice. Attach a label to the bottom of each notice.
- Complete the Drinking Water Warning template, make photocopies, and then staple a copy to the door hanger. This will draw attention to the notice.

**Coliform Public Notice Certification Form (331-264):** You must complete this form and mail it to our regional office, along with a copy of the public notice you gave to your customers, within 10 days after notifying your customers about an acute MCL violation.

**News Releases:** We sometimes advise systems serving more than 100 connections to use a news release to communicate with customers through the news media. These templates will help you present information in a format suitable for the media. Visit our website for electronic copies of these news releases.\* If you need help contacting the media, call our nearest regional office.

- **Boil Water Advisory (331-260-2):** Send at the start of a boil water advisory. Gives advice to customers and explains what you're doing to resolve the problem.
- **Rescinding Boil Water Advisory (331-260-3):** Send at the end of a boil water advisory.

\*Template available online at <http://www.doh.wa.gov/ehp/dw/Coliform/coliform.htm>

## For more information

Most of our publications are online at <http://www.doh.wa.gov/ehp/dw/default.htm>

If you have questions, call our regional office at:

Spokane Valley (509) 329-2100

Kent (253) 395-6750

Tumwater (360) 236-3030

After-hours Emergency (877) 481-4901





April 2016

DOH 331-181

Revised

## Questions & Answers

# Coliform Bacteria and Drinking Water

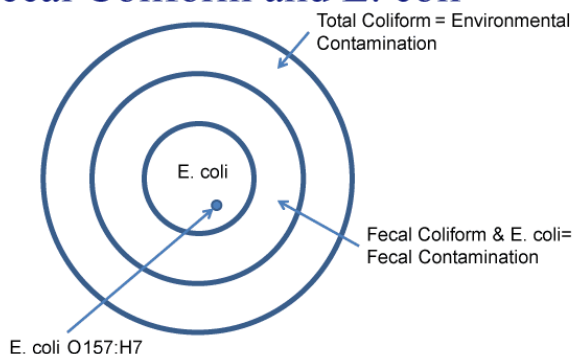
Public water systems must deliver safe and reliable drinking water to their customers 24 hours a day, 365 days a year. If the water supply becomes contaminated, consumers can get seriously ill. Fortunately, public water systems take many steps to make sure drinking water is safe. One of the most important steps is regular testing for coliform bacteria.

### What are coliform bacteria?

Coliform bacteria are present in the environment and feces of all warm-blooded animals and humans. Coliform bacteria are unlikely to cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Most pathogens that can contaminate water supplies come from the feces of humans or animals. Testing drinking water for all possible pathogens is complex, time-consuming, and expensive. It is easy and inexpensive to test for coliform bacteria. If testing detects coliform bacteria in a water sample, water systems search for the source of contamination and restore safe drinking water.

**There are three groups of coliform bacteria. Each is an indicator of drinking water quality and each has a different level of risk.** Total coliform is a large collection of different kinds of bacteria. Fecal coliform are types of total coliform that exist in feces. *E. coli* is a subgroup of fecal coliform. Labs test drinking water samples for total coliform. If total coliform is present, the lab also tests the sample for *E. coli*.

### Total Coliform, Fecal Coliform and *E. coli*



**Total coliform bacteria** are common in the environment (soil or vegetation) and are generally harmless. If a lab detects only total coliform bacteria in drinking water, the source is probably environmental and fecal contamination is unlikely. However, if environmental contamination can enter the system, pathogens could get in too. It is important to find and resolve the source of the contamination.

**Fecal coliform bacteria** are a subgroup of total coliform bacteria. They exist in the intestines and feces of people and animals.



Division of Environmental Health  
Office of Drinking Water

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*E. coli* is a subgroup of the fecal coliform group. Most *E. coli* bacteria are harmless and exist in the intestines of people and warm-blooded animals. However, some strains can cause illness. The presence of *E. coli* in a drinking water sample usually indicates recent fecal contamination. That means there is a greater risk that pathogens are present.

**Note:** *E. coli* outbreaks receive a lot of media coverage. A specific strain of *E. coli* bacteria known as *E. coli O157:H7* causes most of those outbreaks. When a drinking water sample is reported as “*E. coli* present,” it does not mean that *O157:H7* is present. However, it does indicate recent fecal contamination. Boiling or disinfecting contaminated drinking water destroys all forms of *E. coli*, including *O157:H7*.

### **What if coliform bacteria are found in my water?**

When coliform bacteria are found, water systems investigate to find out how the contamination got into the water. They collect additional water samples and often inspect the entire system. Collecting additional samples helps determine whether an actual problem exists. If the lab detects bacteria in any of the additional samples, the initial findings are “confirmed.”

### **What if total coliform bacteria are confirmed in my water?**

If a lab confirms total coliform bacteria in your drinking water, your water system must conduct an assessment to find out how the contamination got into the water. If the assessment identifies the cause of the contamination, the water system can usually correct the problem with repairs, treatment, or improved operation and maintenance practices. We help water systems resolve problems. When a lab confirms total coliform bacteria in drinking water, we recommend that the water system notify its customers as soon as possible. The notice will explain what the system is doing to correct the problem, when the problem will likely be resolved, and what customers may need to do until then.

### **What if *E. coli* are confirmed in my water?**

Confirmation of *E. coli* in a water system indicates recent fecal contamination, which may pose an immediate health risk to anyone who consumes the water. The water system will issue a “health advisory” within 24 hours to alert all water users of a health risk associated with the water supply. The advisory usually recommends using boiled or bottled water for drinking, preparing food, and brushing teeth. It also outlines the steps underway to correct the problem and explains when the system expects to resolve the problem.

Responding to health emergencies is our highest priority. We will inspect the system as soon as possible to help the water system resolve the problem. More water samples will be collected to find and eliminate potential contamination sources, and a system not normally disinfected will most likely be chlorinated and flushed. The health advisory will remain in effect until the situation is resolved and the water is safe to drink.

### **For more information**

Our publications are online at <https://fortress.wa.gov/doh/odwpubs/>

### **Call our nearest regional office**

Northwest Region: Kent  
253-395-6750

Southwest Region: Tumwater  
360-236-3030

Eastern Region: Spokane Valley  
509-329-2100



Your logo or  
company name  
here.

# News Release

---

**For Immediate Release:** <DATE>

**Contact:** Water purveyor/system contact name and telephone number

**<Water System> announces boil water advisory for all customers in <area>**

**CITY NAME** – The <SYSTEM NAME> is advising all water customers to boil their drinking water after recent samples showed the presence of *E. coli*. The Washington State Department of Health (DOH) has been notified and <SYSTEM NAME> is working closely with the Office of Drinking Water to find the source of contamination and fix the problem, which may include disinfecting the system. The boil water advisory will remain in effect until further notice.

(Sample quote) “We are doing all we can to eliminate the bacteria from the water system. Safe and reliable drinking water is critical to good health and responding to this kind of emergency is our highest priority,” said <System spokesperson>.

<NUMBER or NO> illnesses related to the community’s drinking water have been reported. To correct the problem <WHAT IS BEING DONE> (e.g. Chlorine was applied to the entire system on DATE.)

The boil water advisory includes several precautionary steps for customers. These include using purchased bottled water or boiled water for drinking, brushing teeth, dishwashing, preparing food, and making ice. Water should come to a roiling boil for one minute, then cool to an appropriate temperature before using.

The advisory will remain in effect until <SYSTEM NAME> and DOH are confident the water is safe. When satisfactory results are reported, customers will be notified that the advisory has been lifted.

If you have questions, please call us at <TELEPHONE NUMBER>.

###





August 2017

DOH 331-179

Revised

## Questions & Answers

# Public Health Advisory

# *E. coli*

### Why must I boil my water?

Recent tests show that your water system is contaminated with organisms that can cause illness.

### Who can be affected? Can I become ill?

Anyone who drinks contaminated water may become ill. Infants, young children, the elderly, and people with severely compromised immune systems are more at risk of illness.

### Who are people with compromised immune systems?

People who are on chemotherapy, organ or bone marrow recipients, those with HIV or AIDS, malnourished children, infants, and some of the elderly have compromised or weakened immune systems. An infection from a disease-causing organism may lead to very serious health problems for these people.

### Can these diseases be spread in ways other than drinking the water?

Yes. Many of these disease-causing organisms are shed in the feces of infected people. In fact, some infected people do not have any symptoms but still shed these organisms. Childcare workers, young children who attend childcare, and caregivers for people who are sick and shedding these organisms are at the greatest risk of becoming ill. Washing hands with soap and water after using the toilet and before preparing food prevents the spread of diseases to others.

### What are the symptoms to watch for?

### What should I do if I think I have a waterborne illness?

Disease-causing organisms in water can cause diarrhea, stomach cramps, bloating, gas, fatigue, weight loss, nausea, vomiting, and/or fever. Symptoms may appear as early as a few hours to several days after infection and may last more than two weeks. If you are ill with these symptoms, contact your health care provider.

### How can I make the water safe?

Boiling is the best way to ensure water is free of illness-causing organisms. Bring the water to a rolling boil for one minute. When it cools, refrigerate the water in clean covered containers.

If you don't want to boil your water, you can disinfect the water using household bleach. Do not use bleach that contains perfume, dyes, or other additives. Use 1/4-teaspoon bleach per gallon of water, mix thoroughly, and then let stand for 60 minutes before using.



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## Can I use bottled water?

You can use purchased bottled water. If you choose to use bottled water, Department of Health recommends water that is:

- Reverse-osmosis treated.
- Distilled.
- Filtered through an “absolute” one-micron or smaller filter.

Carbonated water in cans or bottles is usually filtered or heated to remove illness-causing organisms.

## During a health advisory, can I use tap water for...?

Drinking	No	Coffee or tea	No
Ice cubes	No	Showers/Baths	Yes
Brushing teeth	No	Washing clothes	Yes
Baby’s formula	No	Baby’s bath	See below
Washing vegetables/fruits	No	Washing dishes	See below
Preparing food	No	Pet’s water bowl	Contact Veterinarian

## Can I bathe my baby or child using tap water?

Yes, as long as they do not drink any of the water. Don’t let babies suck on a washcloth, as they will be ingesting some of the water.

## Can I wash dishes?

You can use your dishwasher if you use the sanitizing/heat cycle and commercial dishwashing detergent. You can hand wash dishes, rinse them in a diluted bleach solution—one teaspoon household bleach to one gallon of water—and then let dishes air dry.

## What must be done to fix the problem?

Fixing the problem could be different in each situation depending on whether the problem is at the water source or in the water lines. Usually, in every case the water lines will need to be flushed and the whole system will need to be disinfected using chlorine. The water will then be tested to make sure it is free of coliform bacteria.

## How long will this health advisory be in effect?

This health advisory will remain in effect until the water is tested and results show that it meets public health drinking water standards. Your water system will notify you when that occurs.

## For more information:

**Personal medical questions:** Contact your health care provider (physician, nurse consultant, etc.)

**Call your local health jurisdiction** with general questions about infectious disease, communicable disease transmission, symptoms, causes and prevention of waterborne disease.





## DRINKING WATER WARNING

### *E. coli* MCL Violation

The \_\_\_\_\_ Water System, ID \_\_\_\_\_, located in \_\_\_\_\_ County is contaminated with *E. coli* bacteria.

*E. coli* bacteria were detected in the water supply on \_\_\_\_\_. These bacteria can make you sick and are a particular concern for people with compromised immune systems. Boiled or purchased bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice. Boiling kills bacteria and other organisms in the water.

What should you do? **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST.** Bring all water to a rolling boil, for 1 minute, and let it cool before using. Boiling kills bacteria and other organisms in the water.

*E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the elderly, and people with severely compromised immune systems.

The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care provider.

What happened? What is the suspected or known source of contamination?

The following is being done to correct the problem:

We will consult with the State Department of Health about this incident. We will provide you notification when you no longer need to boil the water. We anticipate resolving the problem by \_\_\_\_\_.

For more information please contact: \_\_\_\_\_  
(owner/operator) (phone #) (address) (email)

*Please share this notice with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is sent to you by \_\_\_\_\_ Water System on \_\_\_\_/\_\_\_\_/\_\_\_\_



# WARNING:

## Do not drink tap water without boiling it first!

- ☐ Fecal coliform  
☐ E. coli bacteria  
☐ Other: \_\_\_\_\_

were detected in the water supply on:  
(date) \_\_\_\_\_.

**Boiling kills bacteria and other organisms in the water:**

- Bring water to a rolling boil for one minute
- Let water cool before using

**To avoid possible illness:** use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

**Contact your doctor, if you experience one or more of these symptoms:** nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

**Water System:** \_\_\_\_\_  
**I.D.:** \_\_\_\_\_  
**County:** \_\_\_\_\_  
**Contact:** \_\_\_\_\_  
**Telephone:** \_\_\_\_\_  
**Date notice distributed:** \_\_\_\_\_

### What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

### How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

***Vea al reverso para la versión en Español.***

# WARNING:

## Do not drink tap water without boiling it first!

- ☐ Fecal coliform  
☐ E. coli bacteria  
☐ Other: \_\_\_\_\_

were detected in the water supply on:  
(date) \_\_\_\_\_.

**Boiling kills bacteria and other organisms in the water:**

- Bring water to a rolling boil for one minute
- Let water cool before using

**To avoid possible illness:** use boiled or purchased bottled water for drinking, making ice, brushing teeth, washing dishes, and food preparation until further notice.

**Contact your doctor, if you experience one or more of these symptoms:** nausea, cramps, diarrhea, jaundice, headache and/or fatigue. People with chronic illnesses, infants and the elderly may be at higher risk and should seek medical advice.

**Water System:** \_\_\_\_\_  
**I.D.:** \_\_\_\_\_  
**County:** \_\_\_\_\_  
**Contact:** \_\_\_\_\_  
**Telephone:** \_\_\_\_\_  
**Date notice distributed:** \_\_\_\_\_

### What is fecal coliform and E. coli?

Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these waters can cause short-term effects, such as diarrhea, cramps, nausea, headaches or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

### How long will this warning be in effect?

We will consult with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water.

***Vea al reverso para la versión en Español.***



# ADVERTENCIA:

¡No tome el agua de la llave sin antes hervirla!

- ☐ Bacteria coliforme fecal
- ☐ Bacteria E. coli
- ☐ Otra: \_\_\_\_\_

fueron encontradas en su sistema de agua: (el día)\_\_\_\_\_.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- Ponga el agua en la estufa hasta que hierva y deje hervir el agua por un minuto
- Deje enfriar el agua antes de usarla

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: \_\_\_\_\_  
I.D.: \_\_\_\_\_  
Condado: \_\_\_\_\_  
Contacto: \_\_\_\_\_  
Teléfono: \_\_\_\_\_  
Fecha de notificación: \_\_\_\_\_

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua esta contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English version.

# ADVERTENCIA:

¡No tome el agua de la llave sin antes hervirla!

- ☐ Bacteria coliforme fecal
- ☐ Bacteria E. coli
- ☐ Otra: \_\_\_\_\_

fueron encontradas en su sistema de agua: (el día)\_\_\_\_\_.

Hervir el agua mata a las bacterias y otros organismos en el agua:

- Ponga el agua en la estufa hasta que hierva y deje hervir el agua por un minuto
- Deje enfriar el agua antes de usarla

Para evitar posibles enfermedades y hasta nuevo aviso: use agua hervida o agua potable embotellada para tomar, hacer hielo, limpiarse los dientes, lavar los platos y para preparar comidas.

Hable con su doctor si usted tiene uno o más de los siguientes síntomas: náusea, dolor estomacal, diarrea, ictericia, dolores de cabeza y/o cansancio. La gente con enfermedades crónicas, bebés y personas mayores de edad, pueden estar en situación de alto riesgo y deben consultar con su médico o proveedores de servicios médicos.

Sistema de agua: \_\_\_\_\_  
I.D.: \_\_\_\_\_  
Condado: \_\_\_\_\_  
Contacto: \_\_\_\_\_  
Teléfono: \_\_\_\_\_  
Fecha de notificación: \_\_\_\_\_

¿Qué son las bacterias coliforme fecal y E. coli?

Coliformes fecales o E. coli son bacterias cuya presencia indica que el agua esta contaminada con desechos humanos o de animales. Microbios de esos desechos pueden causar diarrea, dolor estomacal, náusea, dolores de cabeza u otros síntomas. Pueden representar un peligro para la salud de bebés, niños y niñas de corta edad y personas con sistemas inmunológicos en alto riesgo.

¿Por cuánto tiempo va a estar en efecto esta advertencia?

Vamos a consultar con el Departamento de Salud del estado de Washington acerca de este incidente. Le vamos a notificar cuando ya no sea necesario hervir el agua.

See reverse side for English version.





## PUBLIC NOTICE CERTIFICATION *E. coli*-MCL Violation

Within 10 days after notifying your customers about an *E. coli*-MCL violation, you must complete this form and send it to our regional office along with a copy of each type of notice you distributed to your customers (hand-delivered notices, news releases, newspaper articles, and so on).

By completing this form, you certify that:

- You met all of the public notification requirements.
- You will meet future requirements for notifying new billing units of the violation or situation.

If the boil water advisory remains in effect more than three months, you must re-notify your water users and send another completed copy of this *Public Notice Certification* to us.

**Complete the following items, sign the form and mail it to the nearest regional office, addresses below:**

Water System: _____ ID # _____ County: _____		
Violation Date: ____ / ____ / ____ Violation Type _____		
This public water system certifies that it gave this public notice to water users, following state and federal requirements for delivery, content, and deadlines.		<input type="checkbox"/> Yes <input type="checkbox"/> No
Distribution was completed Yes <input type="checkbox"/> No <input type="checkbox"/> on ____ / ____ / ____.		
Check all that apply:		
<input type="checkbox"/> Hand delivery,		
<input type="checkbox"/> News release (TV, radio, newspaper)		
<input type="checkbox"/> Posting at _____ (by DOH approval only),		
<input type="checkbox"/> Other _____ (by DOH approval only).		
Were the water users notified within 24 hours? Yes <input type="checkbox"/> No <input type="checkbox"/>		
_____ Signature of owner or operator	_____ Position	_____ Date

If you need this publication in an alternative format, call 800.525.0127 (TDD/TTY call 711). This and other publications are available at [www.doh.wa.gov/drinkingwater](http://www.doh.wa.gov/drinkingwater).

**Northwest Regional Office:**  
20425 72nd Ave S Suite 310  
Kent WA 98032  
(253) 395-6775  
Fax: (253) 395-6760  
Email: [dwnwro@doh.wa.gov](mailto:dwnwro@doh.wa.gov)

**Southwest Regional Office:**  
PO Box 47823  
Olympia WA 98504-7823  
(360) 236-3030  
Fax (360) 664-8058  
Email: [swro.coli@doh.wa.gov](mailto:swro.coli@doh.wa.gov)

**Eastern Regional Office:**  
16201 E Indiana Ave Suite 1500  
Spokane Valley WA 99216  
(509) 329-2100  
Fax: (509) 329-2104  
Email: [mark.steward@doh.wa.gov](mailto:mark.steward@doh.wa.gov)



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Office of Drinking Water

# Treating Drinking Water for Emergency Use

For more information call  
our regional office.

**Eastern Region:** 509-329-2100  
**Northwest Region:** 253-395-6750  
**Southwest Region:** 360-236-3030

If you need this publication in an alternative  
format, call 800.525.0127 (TDD/TTY call 711).  
This and other publications are available  
at [www.doh.wa.gov/drinkingwater](http://www.doh.wa.gov/drinkingwater).

September 2017

DOH 331-115 (Revised)



## When do You Need to Treat Drinking Water?

Normally, your water is safe to drink, but you may need to treat it if your usual water supply is interrupted or becomes unsafe for drinking. Conditions that may require treatment of drinking water include:

- ◆ Disasters that interrupt your water supply, such as floods, earthquakes, and power outages.
- ◆ Water supply system disruption or loss of pressure due to line breaks or repairs.
- ◆ Special conditions when your water system, local health department, or the state Department of Health advise you to boil or treat the water before drinking.

## Preparing for Emergencies

The best way to ensure a safe supply of drinking water is to store enough water to last through an emergency. Although most emergencies are unexpected, you may be able to anticipate situations by watching or listening to weather reports. You should also pay attention to notices from your water system about planned water disruptions or other conditions that could signal a problem with your water supply.

Even if you don't store a supply of water, keep the following items on hand to treat water during an emergency:

- ◆ Fresh supply of liquid bleach and kitchen measuring spoons or a medicine dropper. You can get a dropper with teaspoon and milliliter markings at a drug store.
- ◆ Equipment to boil water, such as propane or gas stoves or an outside barbecue grill. Remember, your usual source of energy may not be available during an emergency.

## Storing Drinking Water for Emergencies

To prepare for a drinking water emergency, the American Red Cross recommends storing **one gallon of water per person per day—enough for at least three days** (two quarts for drinking and two quarts for food preparation and sanitation).

Very warm temperatures and intense physical activity can double that amount; children, nursing mothers, and ill people will need more.

- ◆ **Collect water from a safe supply.** If your water comes from a private well or a water system serving fewer than 15 homes or businesses, ask your local health department how to have it tested.

- ◆ **Use proper storage containers.** Store the water in containers made for water storage, or glass and plastic jugs previously used for soft drinks or bottled water. Clean the containers thoroughly before using and make sure the caps fit tightly. Never reuse a container that held toxic substances such as pesticides, chemicals, or oil.

- ◆ **Add one or two drops of liquid bleach per gallon** to maintain water quality while in storage. Seal the container tightly and label with the date.

- ◆ **Store in a cool place**, safe from flooding, freezing, and earthquake damage. We recommend that every six months you use or discard stored water and replace it with a fresh supply.

**One gallon  
per person  
per day.**



## Treating Water During an Emergency

If you are informed, or have reason to believe your tap water is unsafe, you should treat the water before using it for drinking, preparing food, or brushing teeth.

There are two ways to treat water: boil it or add bleach. If the supply is unsafe because of untreated surface water (from floods, streams, or lakes), boiling is the better treatment.

If the water is cloudy, you should filter it before boiling or adding bleach. Filter cloudy water with filters designed for use when camping, coffee filters, paper towels, cheesecloth, or a cotton plug in a funnel.

### Boiling

Boiling is the best way to purify water that is unsafe because of viruses, parasites, or bacterial contamination.

Don't boil the water if the contaminants are toxic metals, nitrates, pesticides, solvents, or other chemicals. Boiling won't remove chemicals or toxins.

- ◆ Bring the water to a roiling boil for one full minute. Boiling is the best way to treat water from—or affected by—surface water.
- ◆ Keep boiled water covered while it cools and then store as described in *Storing Drinking Water for Emergencies* (see prior page).

### Purify by Adding Liquid Chlorine Bleach

If boiling is not possible, add household liquid bleach to water contaminated with viruses, parasites, or bacterial contamination. Bleach won't remove chemicals or toxins.

Household bleach, like Clorox or Purex, is usually 5.25 to 8.25 percent chlorine. **Don't use bleaches that contain perfumes, dyes, or other additives.** Be sure to read the label.

- ◆ Filter cloudy water before adding bleach.
- ◆ Place the water in a clean container. Use the table below to add the right amount of bleach. Mix thoroughly and let stand for 60 minutes before drinking.
- ◆ Purifying tablets or chemicals designed for camping or backpacking can also treat water effectively. Always follow the directions on the package.

Treating Water with Household Bleach	
5.25 to 8.25 percent chlorine	
Water to be treated	Bleach to add
1 quart, 1 liter	5 drops
½ gallon, 2 quarts, 2 liters	10 drops
1 gallon	1/4 teaspoons
5 fallons	1 teaspoon
10 gallons	2 teaspoons

### A Few Words of Caution

Bleach will not remove chemical pollutants or kill some disease-causing organisms commonly found in surface water supplies, such as *Cryptosporidium*. This protozoan parasite can cause gastrointestinal illness. For a person with a weakened or compromised immune system, it can cause prolonged illness, even death.

**AVOID WATER that contains solid materials, has an odor, or a dark color.**

## When Water is Hard to Find

When tap water and bottled water are unavailable, you can find water in some unexpected places.

### Hidden Water Sources in Your Home

Safe water sources in your home include:

- ◆ Water from the drain spout of a water heater. Be sure the electricity and gas are off before opening the spout. Drain the water into a clean storage container.
- ◆ Water drained from the pipes inside your home. Open a faucet on the top floor of your home. Next, go to the faucet at the lowest point in your home. Open the faucet and drain the water you need into a clean storage container.
- ◆ Water placed in ice cube trays in the freezer.

**DO NOT USE water from toilet flush tanks or bowls, radiators, waterbeds, swimming pools, or spas.**

### Sources of Water Outside Your Home

Before you drink water from these surface water sources, boil it for one full minute and allow to cool before using.

- ◆ Rainwater.
- ◆ Lakes.
- ◆ Rivers and streams.
- ◆ Natural springs.
- ◆ Ponds.

**The treatments described here only kill bacteria or viruses.**

**If you suspect the water is unsafe because of chemicals, oils, poisonous substances, sewage, or other contaminants, DO NOT drink the water.**





## **APPENDIX H**

### **CROSS CONNECTION CONTROL PROGRAM**



## Chapter 15.11 - CROSS-CONNECTIONS

### Sections:

#### 15.11.010 - State provisions adopted.

The provisions of WAC 246-290-490 as amended as of or after the effective date of the ordinance codified in this chapter, relating to cross-connection control and elimination and the use of backflow prevention devices, when such are considered to be advisable, are adopted and made a part hereof, and all provisions of the Washington Administrative Code may be executed and applied by the department of public works in determining when cross-connections are prohibited and when backflow prevention devices shall be required.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

#### 15.11.020 - Cross-connections and backflow prevention.

- A. The installation and maintenance of a cross-connection that will, or has the potential to, endanger the quality of the potable water supply of the county's water systems is prohibited. Any such cross-connection existing at the effective date of the ordinance codified in this chapter or hereafter installed, is declared to be unlawful. Cross-connections that cannot be controlled and/or eliminated shall require the installation of a approved backflow prevention device or approved air gap and regular inspection and testing in accordance with WAC 246-290-490 and the county's cross-connection control program.
- B. Service to any property, landowner or water user receiving its water supply from a county water system shall be contingent upon compliance with all requirements of the rules and regulations of the Washington State Department of Health, the county's cross connection control program and this chapter. Service shall be discontinued to any premises, water use or property owner for failure to comply, and any discontinued service will not be reestablished until the county's cross-connection control specialist has approved compliance with such requirements.
- C. Any customers using water from any of the county's water systems are responsible for compliance with this chapter and shall be strictly liable for all damages incurred as a result of failure to comply with the express terms and provisions contained herein.

(Ord. 13604 § 3 (part), 2006)



(Ord. No. 14318, § 3, 12-15-2009)

15.11.030 - Department of public works and development services to administer.

The departments of public works and development services shall be responsible for administering this chapter consistent with WAC 246-290-490 and the county's cross-connection control program as adopted by the board of county commissioners.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.040 - Inspection—Right of entry.

The county's cross-connection control specialist and other duly authorized employee(s) bearing proper credentials and identification shall be permitted to enter upon all properties receiving water service from the county for the purposes of inspection, observation and testing in accordance with the provisions of this chapter.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

15.11.050 - Backflow prevention device inspection, testing and repair charges.

- A. Backflow prevention assembly inspection, as required under Section 15.11.030 shall be seventy-five dollars.
- B. Backflow prevention assembly testing, when performed by the county, shall be sixty-five dollars.
- C. Repairs made to backflow prevention assemblies outside premises shall be performed only by a certified backflow assembly tester. Assemblies in-premises shall be done by a licensed plumber. County staff will only perform repairs to assemblies outside of premises and the actual cost for labor and materials shall be charged to the owner. If the work is performed by a backflow assembly tester or a licensed plumber, he or she shall provide written notification to the county of completion of repairs and request an inspection upon completion of his or her work.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)



#### 15.11.060 - Backflow prevention device charges.

When, pursuant to Section 15.11.030, backflow prevention assemblies are required to be installed, the property owner may request that the county install the assembly. If installed by the county, the county shall charge the owner the actual costs incurred for all materials and labor for the installation.

(Ord. 13604 § 3 (part), 2006)

(Ord. No. 14318, § 3, 12-15-2009)

#### 15.11.070 - Violation—Penalty.

- A. Any person who violates or fails to comply with any of the provisions of this chapter shall be deemed guilty of a misdemeanor and, upon conviction hereof, shall be subject to punishment as provided by law.
- B. The prosecuting attorney may bring such actions as are deemed necessary to prevent the violation of and compel compliance with the provisions of the chapter including enforcement under Title 26 TCC.

(Ord. 13604 § 3 (part), 2006; Ord. No. 14318, § 3, 12-15-2009; Ord. No. 15274, § 2(Att. B)T, 2-23-2016)



# Cross-Connection Control Program

## 1. Definitions

“Backflow” means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer’s potable water system.

“Cross-Connection” means any actual or potential connection between a potable water line and any pipe, vessel, or machine containing a non-potable fluid, such that it is possible for the non-potable fluid to enter the potable water system by backflow.

“CCS” or “Cross-Connection Control Specialist” means the county official certified as a cross-connection control specialist by the Washington State Department of Health.

“Department” means the Department of Public Works Water and Waste Water.

“Director” means the director of the Public Works.

“Potable water” means water suitable for drinking by the public.

“Premises isolation” means a method of protecting the public water system by installation of backflow prevention assemblies or air gaps approved by the Washington State Department of Health at or near the service connection or alternative location acceptable to the County to isolate the consumer’s water system from the County’s distribution system.

## 2. Adoption of State Regulations

The rules and regulations of the Washington State Department of Health regarding cross-connection control, WAC 246-290-490, and the definitions appearing at WAC 246-290-010, as they presently exist and may, from time to time, be amended, are hereby adopted and incorporated herein by this reference as if set forth in full.

## 3. Cross-Connections Prohibited

The installation or maintenance of a cross-connection to the potable water supply managed by the County is prohibited. All water service connections, commercial/industrial, residential, including multi-family, fire sprinkler systems, and irrigations systems must have cross-connection protection commensurate with the degree of hazard.

## 4. Backflow Prevention Assemblies Required

Where the CCS determines that a cross connection exists, backflow prevention assemblies are required in order to achieve premises isolation. The type of backflow prevention assembly required by the CCS will depend on the degree of risk. The assembly must be installed down stream from the County’s water metering device, but within six feet of the meter box or before any other use connection, and in accordance



with this program, WAC 246-290-490 Section 4 (a-g), the Uniform Plumbing Code, and the Cross-Connection Control Manual of the Pacific Northwest Section of the American Water Works Association.

The property owner may make his or her own arrangements to have the backflow prevention assembly installed or may request that the County install the assembly and bill the owner for the actual costs incurred for materials and labor.

In-premises backflow assemblies may be installed only with written permission of the County's CCS or when mandated by the CCS, along with premises isolation, based on the CCS's determination of high health hazards. Any backflow assembly installed inside of a building shall be readily accessible to all county personnel with proper identification during the hours of 8:00 a.m. to 4:30 p.m., Monday through Friday, in accordance with TCC Section 15.10.120. If property containing an in-premises backflow assembly is transferred or if access is not provided, Thurston County reserves the right to require premises isolation.

If the CCS determines that these requirements are not met, the County will follow the procedures as set forth in section 10 (a-f).

## 5. Program Responsibility

The utility division of the Department of Water and Waste Management has primary responsibility for carrying out the County's cross connection control program, including survey, enforcement and record-keeping. The division will work directly with the Department of Development Services in reviewing and approving engineering drawings and building permits for new construction and re-models of commercial/industrial and residential properties. Development Services will alert the utility division of proposed new construction or redevelopment. The utility division will review the site plan for compliance with the cross connection control program. If there are any violations in cross connection control, the utility division will alert Development Services and hold final development approval until the cross connection is managed or eliminated. Development Services will not release a Certificate of Occupancy until the facility's backflow assembly or assemblies have been tested by a state certified BAT.

## 6. Evaluation Procedure

The utility division will compile a list of all existing facilities within the county water systems and determine the health risk associated with each connection. The CCS will then develop a schedule to inspect each facility and evaluate whether the backflow prevention assembly is the proper assembly to control the cross connection at the premises. The inspection will start with the highest risk categories as listed in Table 9 of WAC 246-290-490.

To initiate an inspection, the CCS will set an appointment with the property owner in writing and/or verbally and explain the importance of backflow prevention to protect the potable water system. The CCS will recommend that the property owner have his/her facility manager or a licensed plumber attend the survey to help answer questions about



the complexity of the facility's plumbing system.

The inspection will consist of identifying any cross connections and documenting them with digital photos. The CCS will follow up the inspection with a written report to the property owner indicating what type of backflow assembly is required to establish premises isolation and protect the potable water system from a cross connection. Along with this information the County will supply the development standards for installation and a list of approved assemblies. The inspection will also notify the property owner that he or she must comply with the requirements set by the CCS within thirty days.

#### 7. Backflow Prevention Assemblies to be Inspected and Tested

Once installed, backflow prevention assemblies shall be inspected and tested at the following times:

- a. At the time of initial installation;
- b. Annually after initial installation;
- c. After the assembly is repaired or relocated; and
- d. More often if tests indicate repeated failure or a backflow incident.

The property owner must notify the CCS within 48 hours after installation of a backflow prevention assembly. The CCS will inspect the installation. Following inspection, the County's Back-Flow Assembly Tester (BAT) will test the assembly to ensure it is operating in accordance with Washington state operating standards such as those in the USC Manual.

As an alternative to county testing, the property owner may have the assembly tested by any BAT certified by the Washington Department of Health, using procedures described in Section 8 below, and send in the test report indicating the backflow assembly(s) has passed the test to the CCS.

The department shall notify the property owner that an annual test of the backflow prevention assembly is required not less than 30 days before such annual test is required unless the CCS determines that an emergency test is necessary. The property owner may request that the County perform the test or may have such test performed by any state-certified BAT according to the procedures described below and the results delivered to the County within the time specified in the notice.

#### 8. Backflow Prevention Assemblies Test Procedures

Backflow prevention assemblies within the County's service areas must be tested in accordance with WAC 246-290-490, the Manual of Cross-Connection Control, Ninth Edition, published by the Foundation for Cross-Connection Control and Hydraulic Research University of Southern California, and PNWS/AWWA Cross Connection Control Manual, Sixth Edition, as they presently exist and may, from time to time, be amended.



9. Air-Gap Substitution Permitted

The CCS may permit the substitution of a properly installed air-gap in lieu of an approved backflow prevention assembly. All such air-gaps shall be inspected annually by a Washington State certified BAT to ensure compliance with the approved air-gap definition under WAC 246-290-010.

10. Procedures for Abatement of Unlawful Cross-Connections and Installation of Backflow Prevention Assemblies

Cross-connections, whether presently existing or hereinafter installed, are subject to abatement in accordance with the following procedures. The County will notify the Department of Development Services prior to refusing or discontinuing water service, except in the case of an emergency.

- a. In the event that the CCS, or any of his or her designated representatives, determines that a cross-connection exists, the department shall mail written notice to the property owner or, alternatively, post a copy of such notice on the premises served.
- b. The notice shall provide that the property owner shall correct the cross-connection described herein within thirty (30) days of the date such notice is mailed or posted on the premises or water service will be interrupted.
- c. In the event such cross-connection is not abated within the prescribed time, water service to said premises will be shut off immediately and the property owner directed to install a backflow prevention assembly. Reconnection of service will be allowed only after the backflow prevention assembly is installed and tested in accordance with Section 8 and the reconnection fee provided for in TCC 15.12.010 paid.
- d. As an alternative to shutting off water service, the department may hire a contractor to abate the cross-connection and install a backflow prevention assembly or assemblies. The department will bill the property owner for all costs incurred. Reconnection of service will be allowed only after such costs and the reconnection fee are paid in full.
- e. In the event that a cross-connection, in the opinion of the County's CCS, poses a high health or system hazard to the public water supply, service from the County's water supply system to the premises may be terminated without prior notice, provided, however, that notice will be posted on the premises.
- f. Any new service customer found to have cross-connections as described herein, shall be refused water service or a certificate of occupancy, if applicable, by the County, until such time, as the property owner has installed a backflow prevention assembly and had it tested by a certified BAT.



## 11. Backflow Assembly Testers Quality Control

In order to have their back flow assembly test reports accepted by the County, independent Backflow Assembly Testers (BATs) must submit documentation indicating that their testing equipment has a current certificate of accuracy and that their Department of Health BAT Certification Card is current. These documents may be submitted to the County's CCS annually on or before March 30<sup>th</sup> of each year, or along with any test results sent in for county approval. BATs on staff with the County shall submit the above documentation to the CCS annually.

Before testing any backflow assembly within the service areas of Thurston County, BATs must provide the County's CCS or designee 72 hours (three working days) notice. BATs must comply with the testing procedures as listed above in Section 8. Test reports must be signed by the BAT, with first and last name printed below the signature and the BAT's certificate number. Reports must be submitted to the County's CCS within 30 days of testing. If test reports are delivered without the above requirements, they will be returned to sender.

## 12. Costs

All costs associated with the purchase, installation, inspection, testing, repairs, replacement, and maintenance of the backflow prevention assembly are the responsibility of the property owner.

## 13. Record Keeping and Reporting

As required by WAC 246-290-490 (8), program staff will develop and maintain cross connection control records that contain the following:

- a. A master list of service connections and/or consumer's premises where the County relies on approved backflow preventers to protect the public water system from contamination, the assessed hazard level of each, and the required backflow preventer.
- b. Inventory information on:
  - i. Approved air gaps installed in lieu of approved assemblies including exact air gap location, assessed degree of hazard, installation date, history of inspections, inspection results and person conducting inspections;

Approved backflow assemblies including exact assembly location, assembly description (type, manufacture, model, size, and serial number), assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing the inspections(s);

- c. Cross-connection program summary reports and backflow incident reports



In accordance with WAC 246-290-490(8), program staff will retain records pertaining to the master list of service connections and/or consumer's premises for as long as the premises pose a cross connection hazard. Inventory records shall be kept for five years or the life of the backflow prevention assembly, whichever is shorter.

The County will document backflow incidents known to have contaminated the public water system or occurred within the premises of a water utility customer and will report the incident to the Department of Health, and the County Development Services and Public Health and Social Services Departments as soon as possible, but not later than the end of the next business day. Program staff also will complete the cross-connection control program summary report annually.

#### 14. Response to Backflow Incidents

Once a backflow incident is identified, the property owner will be required to isolate the premises from the County's water system and have a certified BAT test the backflow assembly. If the premises do not have a certified backflow assembly, one or more assemblies must be installed in accordance with Section 5 above. To ensure the premises are free of physical, communicable or chemical hazards, the property owner must demonstrate that the premises' plumbing system has been flushed clean of contaminants and disinfected with a 200ppm chlorine solution before water service will be restored.

#### 15. Public Information

Program staff shall develop programs to educate consumers about cross-connection control requirements and the potential hazards that exist when other substances or systems are connected to the drinking water supply. Opportunities for education include bill inserts, booths at community events, newsletters, public service announcements, fact sheets, local notice boards and speeches to local civic groups. When possible, staff will use cut-away devices or schematics of devices to illustrate how backflow-prevention devices protect the drinking water supply, as well as graphics of proper and improper installations.

#### 16. Reservation of Right to Dictate Terms of Service

Thurston County reserves the right, as a condition of providing water service, to require any party seeking a new water service connection or seeking an upgrade (retrofitting or redesigning in any way) of an existing connection to install a backflow prevention assembly or similar approved assembly at the location where the CCS determines a need to protect the County's water system and/or facilities.

#### 17. Thurston County Not Liable for Damages

Thurston County shall not be liable for damages, nor will allowances be made for loss of production, sales, or service, or other consequential damages arising out of the implementation of any of this program.



**APPENDIX I**

**POTENTIAL FUNDING SOURCES FOR CAPITAL  
PROJECTS**



## Chapter 5.17 - REAL ESTATE EXCISE TAX—UNINCORPORATED AREAS

### Sections:

#### 5.17.010 - Tax levied.

There is levied and there shall be collected by Thurston County a tax equal to one quarter of one percent of the selling price on each sale of real property situated in unincorporated Thurston County. This tax shall be collected from persons who are taxable by the state under RCW Chapter 82.45 on the occurrence of any taxable event within the unincorporated area of Thurston County. This tax shall also comply with all applicable rules, regulations, laws, and court decisions regarding real estate excise taxes as imposed by the state under RCW Chapter 82.45.

(Ord. 7408 § 1, 1983)

#### 5.17.020 - Fund established.

There is established a fund to be known as the Real Estate Excise Tax Fund and the county auditor and county treasurer are directed to establish said fund in their respective offices.

(Ord. 9996 § 1, 1992; Ord. 7408 § 2, 1983)

#### 5.17.030 - Distribution of proceeds of tax.

One percent of the proceeds of the tax imposed under Section 5.17.010 shall be credited to the current expense fund to defray the administrative costs of collection. The remaining proceeds of the tax shall be credited to the Real Estate Excise Tax Fund. All proceeds placed in the Real Estate Excise Tax Fund shall be used for those purposes authorized in RCW 82.46.010.

(Ord. 10060 § 1, 1992; Ord. 9996 § 2, 1992)

#### 5.17.040 - Additional tax levied.

There is levied and there shall be collected by Thurston County a tax equal to one quarter of one percent of the selling price on each sale of real property situated in unincorporated Thurston County pursuant to RCW 82.46.035 and which is in addition to the tax levied in Section 5.17.010 of the Thurston County Code. This tax shall be collected from persons who are taxable by the state under Chapter 82.45 RCW on the occurrence of any taxable event within the unincorporated area of Thurston County. This tax shall also comply with all applicable rules, regulations, laws, and court decisions regarding real estate



excise taxes as imposed by the state under Chapter 82.45 RCW.

(Ord. 9996 § 3, 1992)

5.17.050 - Distribution of proceeds of additional tax.

One percent of the proceeds of the tax imposed under Section 5.17.040 shall be credited to the Current Expense Fund to defray the administrative costs of collection. The remaining proceeds of the tax shall be deposited in a separate account and shall be used solely for financing capital projects specified in the capital facilities plan element of the County's Comprehensive Plan.

(Ord. 10060 § 2, 1992; Ord. 9996 § 4, 1992)





# Real Estate Excise Tax

This page provides a general overview of local real estate excise taxes (REET) in Washington State, including spending requirements and sample ordinances.

**New legislation:** [EHB 1219](#) extends the timeline for using REET revenues for affordable housing and homelessness purposes to January 1, 2026. We will be updating this page soon with additional analysis.

## Overview

[RCW 82.46.010](#) authorizes all cities and counties to levy a 0.25% real estate excise tax (REET), known as the "first quarter percent" or "REET 1," on all sales of real estate.

In addition, [RCW 82.46.035](#) authorizes all cities and counties that are planning under the Growth Management Act (GMA) to levy a second 0.25% real estate excise tax, known as the "second quarter percent" or "REET 2."

## REET 1: Spending the First Quarter Percent

### Cities and Counties Not Planning Under GMA, or Are Planning and Have a Population of 5,000 or Less

According to [RCW 82.46.010\(2\)](#), these jurisdictions must use REET 1 funds "for any capital purpose identified in a capital improvements plan and local capital improvements, including those listed in [RCW 35.43.040](#)." [RCW 35.43.040](#) additionally lists local improvements that can be funded through a [local improvement district \(LID\)](#), which includes projects such as streets, parks, sewers, water mains, swimming pools, and gymnasiums. Local capital improvements include the acquisition of real and personal property associated with such improvements, thus, land acquisition for parks is a permitted expenditure.

Capital projects not listed in the local improvement statute (for example, a fire station, city hall, courthouse, or library) are also permitted uses as long as they are included in the city's or county's capital improvement plan. Expenditures that are not allowed are such things as the purchase of police cars. Accountants may consider these to be "capital" for accounting purposes, but they are not "capital purposes" or "local capital improvements." See [correspondence between Allen R. Hancock, Deputy Prosecuting Attorney of Island County and Philip H. Austin, Senior Deputy Attorney General](#).

### Cities and Counties Planning Under GMA With a Population of More than 5,000

These jurisdictions must spend the first quarter percent of their real estate excise tax receipts solely on capital projects that are listed in the capital facilities plan element of their comprehensive plan. [RCW 82.46.010\(6\)](#) defines



"capital projects" as:

those public works projects of a local government for planning, acquisition, construction, reconstruction, repair, replacement, rehabilitation, or improvement of streets; roads; highways; sidewalks; street and road lighting systems; traffic signals; bridges; domestic water systems; storm and sanitary sewer systems; parks; recreational facilities; law enforcement facilities; fire protection facilities; trails; libraries; administrative facilities, judicial facilities, river flood control projects... and technology infrastructure that is integral to the capital project.

## REET 2: Spending the Second Quarter Percent

This part of the real estate excise tax may only be levied by cities and counties that are required to or choose to plan under GMA. All cities and counties that levy this tax face the same provisions, whether their population is greater or less than 5,000.

Note that for those entities that voluntarily choose to plan under GMA and have not yet imposed this option, it requires a vote of the people ([RCW 82.46.035\(2\)](#)).

For this 0.25% of the real estate excise tax, "capital project" is defined in [RCW 82.46.035\(5\)](#).as:

public works projects of a local government for planning, acquisition, construction, reconstruction, repair, replacement, rehabilitation, or improvement of streets, roads, highways, sidewalks, street and road lighting systems, traffic signals, bridges, domestic water systems, storm and sanitary sewer systems, and planning, construction, reconstruction, repair, rehabilitation, or improvement of parks.

Note that acquisition of land for parks is not an outright permitted use of REET 2 receipts, although it is a permitted use for street, water, and sewer projects.

Under **limited circumstances**, REET 2 funds may be used for those capital projects that qualify as REET 1 projects, including acquisition of land for parks, recreational facilities; law enforcement facilities; fire protection facilities; trails; libraries; administrative facilities, judicial facilities, and river flood control projects. The dollar limit on the use of REET 2 funds for such purposes is the greater of \$100,000 or 25% of available funds, not to exceed \$1 million per year. The use of REET 2 funds for these purposes also requires additional reporting requirements ([RCW 82.46.037](#), see the next section for further explanation).

## Limited Uses of REET 1 and 2 Funds

### Maintenance (REET 1 and 2)

The 2015 legislative session produced two new statutes that provide limited use of REET 1 and 2 funds for maintenance:

- [RCW 82.46.015\(1\)](#) (REET 1), which provides in part: may use the greater of \$100,000 or 25% of available funds, but not to exceed \$1 million per year, from revenues collected for the maintenance of capital projects, as defined in [RCW 82.46.010\(6\)\(b\)](#).
- [RCW 82.46.037\(1\)](#) (REET 2), which provides in part: may use the greater of \$100,000 or 25% of available funds,



but not to exceed \$1 million per year, from revenues collected under RCW [82.46.035](#) for the maintenance of capital projects, as defined in RCW [82.46.035\(5\)](#); or for REET 1 capital projects (see discussion above).

The definition of maintenance is the same for both REET 1 and 2 and is found in sub-section (5) of each statute. It reads:

Maintenance means the use of funds for labor and materials that will preserve, prevent the decline of, or extend the useful life of a capital project. "Maintenance" *does not* include labor or material costs for routine operations of a capital project *[emphasis added]*.

The use of either REET 1 or REET 2 under the provisions of RCW [82.46.015](#) or [.037](#) requires additional reporting requirements, which are explained in more detail below under Reporting Requirements.

## Housing the Homeless (REET 2)

The 2017 legislative session expanded the use of REET 2 funds in RCW [82.46.037](#) for a limited period of time. From July 1, 2017 until June 30, 2019, funds may be used for the acquisition, construction, improvement, or rehabilitation of facilities to provide housing for the homeless.

This expanded use of REET 2 funds is subject to the same limitations as those provided for maintenance and/or REET 1 capital projects, which is the greater of \$100,000 or 25% of available funds, but not to exceed \$1 million per year.

The use of REET 2 funds during this limited window is subject to reporting requirements provided in detail below.

## Reporting Requirements

The use of either REET 1 or REET 2 for maintenance requires additional reporting requirements. These same reporting requirements are applicable to the use of REET 2 funds for homeless housing or REET 1 defined capital projects that are not included in the REET 2 definition.

The local government must prepare a written report demonstrating that it has, or will have, adequate funding from all sources of public funding to pay for all capital projects identified in its capital facilities plan for a two-year period. This report must be adopted as part of the city's or county's regular budget process and must include:

- Information necessary to demonstrate that the local government has, or will have, adequate funding from all sources to pay for all capital projects identified in its capital facilities plan.
- How revenues collected under REET 1 and REET 2 have been used during the prior two-year period.
- How revenues collected under REET 1 and REET 2 will be used for the succeeding two-year period.
- What percentage of funds for capital projects is attributed to REET 1 and REET 2 revenues compared to all other source of capital project funding.

## Posting of Disclosure Requirements

If the local government has imposed any requirements on landlords or sellers of real property to provide information to a buyer or tenant "pertaining to the subject property or to the surrounding area," the requirements must be posted on the MRSC website in accordance with RCW [43.110.030\(2\)\(e\)](#).



## Additional REET Options

### 0.5% REET 1 for Operating Expenditures - RCW 82.46.010(3)

Cities and counties that are not levying the optional second half-cent sales tax under [RCW 82.14.030\(2\)](#) have the option of levying an additional half-cent real estate excise tax ([RCW 82.46.010\(3\)](#)). These receipts are not designated for capital projects. They are a general fund revenue for operating expenditures. Only two cities, Asotin and Clarkston, have chosen to do this. From a financial standpoint, the optional 0.5% sales tax will probably bring in more revenue than this additional 0.5% real estate excise tax.

The imposition of this tax, a change in rate, or a repeal of the tax is subject to the referendum procedures given in [RCW 82.46.021](#).

### 1% REET for Conservation Areas - RCW 82.46.070

A county legislative authority may submit a ballot proposition to the voters for an additional real estate excise tax on each sale of real property in the county at a rate not to exceed 1% of the selling price. The revenue from this tax is restricted to the acquisition and maintenance of conservation areas. Conservation areas are defined in [RCW 36.32.570](#) as:

land and water that has environmental, agricultural, aesthetic, cultural, scientific, historic, scenic, or low-intensity recreational value for existing and future generations, and includes, but is not limited to, open spaces, wetlands, marshes, aquifer recharge areas, shoreline areas, natural areas, and other lands and waters that are important to preserve flora and fauna.

The property buyer, rather than the seller, pays this tax as outlined in [RCW 82.46.070](#). Only San Juan County has levied this tax to date.

### 0.5% REET for Affordable Housing - RCW 82.46.075

[RCW 82.46.075](#) gives a county that has levied a one percent real estate excise tax for conservation areas under [RCW 82.46.070](#) by January 1, 2003 the authority to levy a one-half percent tax for the acquisition, construction, and operation of affordable housing for people with very low, low, and moderate incomes, and those with special needs. Only San Juan County qualifies to levy this tax, and the county's voters first approved this option in 2018.

## Accounting for REET Funds

Because this revenue source has a dedicated purpose, it must be accounted for separately in a capital projects fund. Those cities and counties that are planning under GMA and levying both REET 1 and REET 2 need to keep track of each of these revenues separately because the uses to which they may be put are different ([RCW 82.46.010\(5\)\(b\)](#) and [82.46.035\(5\)](#)).

The optional REET funds received under [RCW 82.46.010\(3\)](#) are general fund revenues and do not require separate accounting.

Although no special direction is given in the statutes as to how to account for funds collected under [RCW 82.46.070](#) for conservation areas or [RCW 82.46.075](#) for affordable housing, both of these statutes explicitly state that "the proceeds of the tax shall be used exclusively" for those respective purposes, so we recommend keeping



these revenues in separate special revenue funds.

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## Examples of REET Ordinances/Documents

MRSC has prepared several sample ordinances for imposing REET 1 and REET 2:

### MRSC REET 1 Sample Ordinances

- [Cities and towns planning under GMA and population over 5,000 \(2012\)](#)
- [Cities and towns not planning under GMA or with a population of 5,000 or less \(2012\)](#)
- [Counties planning under GMA and population over 5,000 \(2012\)](#)
- [Counties not planning under GMA or with a population of 5,000 or less \(2012\)](#)

### MRSC REET 2 Sample Ordinances

- [Cities and towns planning under GMA \(2012\)](#)
- [Counties planning under GMA \(2012\)](#)

### Other REET Documents

- [Pacific County Resolution No. 2017-029 \(2017\)](#) - Submitting REET 2 to voters, as required by RCW 82.46.035(2) for jurisdictions voluntarily planning under GMA. Also includes two-page FAQ.
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## Recommended Resources

- [WA Department of Revenue Real Estate Excise Tax Rates](#) - Shows REET rates for all cities and counties
- [WA Department of Revenue 2016 Tax Reference Guide: Real Estate Excise Taxes](#)
- [Ask MRSC Archives: Real Estate Excise Tax](#) - Selected inquiries we have answered regarding REET

Last Modified: July 09, 2019



# Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects

Updated 4-15-19

Type of Program	Pages
Planning	2 - 3
Pre-Construction Only	4 - 5
Construction and Design/Construction	6 - 9
Emergency	10 - 11

Please contact Cathi Read at [cathi.read@commerce.wa.gov](mailto:cathi.read@commerce.wa.gov) if you would like to update your program information or if you would like an electronic version of this document.



PLANNING Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>CDBG</b> Community Development Block Grant – General Purpose Grant Fund – Planning-Only Activities	<ul style="list-style-type: none"> <li>• Comprehensive plans</li> <li>• Non-routine infrastructure plans</li> <li>• Feasibility studies</li> <li>• Community action plans</li> <li>• Low-income housing assessments</li> </ul>	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. <ul style="list-style-type: none"> <li>• Cities or towns with fewer than 50,000 people</li> <li>• Counties with fewer than 200,000 people</li> </ul>	Grant <ul style="list-style-type: none"> <li>• Up to \$24,000 for a single jurisdiction.</li> </ul>	Pending HUD CDBG funding, applications will be due June 5, 2019.  <b>Contact:</b> Jeff Hinckle 360-725-3060 <a href="mailto:jeff.hinckle@commerce.wa.gov">jeff.hinckle@commerce.wa.gov</a>  Visit <a href="http://www.commerce.wa.gov/cdbg">www.commerce.wa.gov/cdbg</a> for information and forms.
<b>SOURCE WATER PROTECTION GRANT PROGRAM</b>	Source water protection studies (watershed, hydrogeologic, feasibility studies).  Projects need to identify solutions to source water protection problems, assist in implementation of protection plans, or increase or update data that directly benefits source water protection.	Non-profit Group A water systems.  Local governments proposing a regional project.  Project must be considered a priority for drinking water source protection by Department of Health Regional Offices.	Grants <ul style="list-style-type: none"> <li>• Funding is dependent upon project needs, but typically does not exceed \$30,000.</li> </ul>	Applications accepted anytime; grants awarded on a funds available basis.  <b>Contact:</b> Corina Hayes Source Water Protection Program Manager 360-236-3114 <a href="mailto:corina.hayes@doh.wa.gov">corina.hayes@doh.wa.gov</a>  <a href="http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/SourceWater/SourceWaterProtection.aspx">http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/SourceWater/SourceWaterProtection.aspx</a>
<b>ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM</b> State Water Pollution Control Revolving Fund (SRF)  Centennial Clean Water Fund	Planning projects associated with publicly-owned wastewater and stormwater facilities.  The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes	Loan interest rates (SFY 2020) <ul style="list-style-type: none"> <li>• 6-20 year loans: 2.0%</li> <li>• 1-5 year loans: 1.0%</li> </ul> Pre-Construction Set-aside (Distressed Communities) 50% forgivable principal loan and 50% loan	This year's applications due October 14, 2019.  <b>Contact:</b> David Dunn 360-407-6503 <a href="mailto:david.dunn@ecy.wa.gov">david.dunn@ecy.wa.gov</a>  <a href="https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans">https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans</a>



PLANNING Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>RD PRE-DEVELOPMENT GRANTS (PPD)</b> U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 10,000 population.	Planning grant to assist in paying costs associated with developing a complete application for RD funding for a proposed project.  Maximum \$30,000 grant. Requires minimum 25% match.	Applications accepted year-round, on a fund-available basis.  <b>Contact:</b> Janice Roderick 360-704-7739 <a href="mailto:janice.roderick@wa.usda.gov">janice.roderick@wa.usda.gov</a>  <a href="http://www.rurdev.usda.gov/wa">http://www.rurdev.usda.gov/wa</a>
<b>RD ‘SEARCH’ GRANTS: SPECIAL EVALUATION ASSISTANCE FOR RURAL COMMUNITIES</b> U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 2,500 population.	Maximum \$30,000 grant. No match required.	Applications accepted year-round, on a fund-available basis.  <b>Contact:</b> Janice Roderick 360-704-7739 <a href="mailto:janice.roderick@wa.usda.gov">janice.roderick@wa.usda.gov</a>  <a href="http://www.rurdev.usda.gov/wa">http://www.rurdev.usda.gov/wa</a>
<b>CERB PLANNING AND FEASIBILITY GRANTS</b> Community Economic Revitalization Board – Project-Specific Planning Program	Project-specific feasibility and pre-development studies that advance community economic development goals for industrial sector business development.	Eligible statewide <ul style="list-style-type: none"> <li>Counties, cities, towns, port districts, special districts.</li> <li>Federally recognized tribes</li> <li>Municipal corporations, quasi-municipal corporations w/ economic development purposes.</li> </ul>	Grant <ul style="list-style-type: none"> <li>Up to \$50,000 per application.</li> <li>Requires 25% (of total project cost) matching funds.</li> </ul>	Applications accepted year-round. The Board meets six times a year.  <b>Contact:</b> Janea Delk 360-725-3151 <a href="mailto:janea.delk@commerce.wa.gov">janea.delk@commerce.wa.gov</a>
<b>RCAC RURAL COMMUNITY ASSISTANCE CORPORATION</b> Feasibility and Pre-Development Loans	Water, wastewater, stormwater, and solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	<ul style="list-style-type: none"> <li>Typically up to \$50,000 for feasibility loan.</li> <li>Typically up to \$350,000 for pre-development loan.</li> <li>Typically up to a 1-year term.</li> <li>5% interest rate.</li> </ul>	Applications accepted anytime.  <b>Contact:</b> Matt Williams 971-772-4063 <a href="mailto:mwilliams@rcac.org">mwilliams@rcac.org</a>  Applications available online at <a href="http://www.rcac.org/lending/environmental-loans/">http://www.rcac.org/lending/environmental-loans/</a>



PRECONSTRUCTION ONLY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM</b> State Water Pollution Control Revolving Fund (SRF)  Centennial Clean Water Fund  Stormwater Financial Assistance Program (SFAP)	Design projects associated with publicly-owned wastewater and stormwater facilities.  The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes.	Loan interest rates (SFY 2020) <ul style="list-style-type: none"> <li>• 6-20 year loans: 2.0%</li> <li>• 1-5 year loans: 1.0%</li> </ul> <u>Pre-Construction Set-aside (Distressed Communities)</u> 50% forgivable principal loan and 50% loan	This year's applications due October 14, 2019.  A cost effectiveness analysis must be complete at the time of application.  <b>Contact:</b> David Dunn 360-407-6503 <a href="mailto:david.dunn@ecy.wa.gov">david.dunn@ecy.wa.gov</a>  <a href="https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans">https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans</a>
<b>PWB PRE-CON</b> Public Works Board – Pre-Construction Program	Low-interest loans to fund pre-construction activities that prepare a specific project for construction.	Counties, cities, special purpose districts, and quasi-municipal organizations that meet certain requirements.  School districts and port districts are not eligible.	<ul style="list-style-type: none"> <li>• Funding is subject to Governor and Legislative appropriation; targeting to open application cycle in July 2019.</li> <li>• Maximum loan amount \$1 million per jurisdiction per biennium.</li> <li>• 5-year loan term.</li> <li>• Interest rates vary.</li> <li>• Application cycle opens once every two months until appropriated funds are exhausted.</li> <li>• Pre-construction work must be completed within 2 years.</li> </ul>	Check the Public Works Board website periodically at <a href="http://www.pwb.wa.gov">http://www.pwb.wa.gov</a> to obtain the latest information on program details or to contact Public Works Board staff.  <b>Contact:</b> Connie Rivera 360-725-3088 <a href="mailto:connie.rivera@commerce.wa.gov">connie.rivera@commerce.wa.gov</a>



PRECONSTRUCTION ONLY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>RCAC RURAL COMMUNITY ASSISTANCE CORPORATION</b> Feasibility and Pre-Development Loans	Water, wastewater, stormwater, or solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	<ul style="list-style-type: none"> <li>Typically up to \$50,000 for feasibility loan.</li> <li>Typically up to \$350,000 for pre-development loan.</li> <li>Typically a 1-year term.</li> <li>5% interest rate.</li> </ul>	<p>Applications accepted anytime.</p> <p><b>Contact:</b> Matt Williams  971-772-4063  <a href="mailto:mwilliams@rcac.org">mwilliams@rcac.org</a></p> <p>Applications available online at  <a href="http://www.rcac.org/lending/environmental-loans/">http://www.rcac.org/lending/environmental-loans/</a></p>



CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>CDBG-GP</b> Community Development Block Grant – General Purpose Grants	<ul style="list-style-type: none"> <li>Final design and construction of wastewater, drinking water, side connections, stormwater, streets, and community facility projects.</li> <li>Infrastructure in support of economic development or affordable housing.</li> <li>Planning activities including comprehensive plans, non-routine infrastructure plans, feasibility studies, community action plans, and low-income housing assessments.</li> </ul>	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. <ul style="list-style-type: none"> <li>Cities or towns with fewer than 50,000 people</li> <li>Counties with fewer than 200,000 people</li> </ul>	Maximum grant amounts: <ul style="list-style-type: none"> <li>\$750,000 for construction projects and acquisition projects.</li> <li>\$500,000 for local housing rehabilitation programs.</li> <li>\$250,000 for local microenterprise assistance programs.</li> <li>\$24,000 for planning-only activities.</li> </ul>	Applications will be due June 5, 2019.  <b>Contact:</b> Jacquie Andresen 360-725-3017 <a href="mailto:Jacquie.andresen@commerce.wa.gov">Jacquie.andresen@commerce.wa.gov</a>  Visit <a href="http://www.commerce.wa.gov/cdbg">www.commerce.wa.gov/cdbg</a> and click on the General Purpose Grants menu for information and forms.
<b>RD</b> U.S. Dept. of Agriculture Rural Development - Rural Utilities Service - Water and Waste Disposal Direct Loans and Grants	Pre-construction and construction associated with building, repairing, or improving drinking water, solid waste facilities and wastewater facilities.	<ul style="list-style-type: none"> <li>Cities or towns with fewer than 10,000 population.</li> <li>Counties, special purpose districts, non-profit corporations or tribes unable to get funds from other sources at reasonable rates and terms.</li> </ul>	Loans; Grants in some cases <ul style="list-style-type: none"> <li>Interest rates change quarterly; contact staff for latest interest rates.</li> <li>Up to 40-year loan term.</li> <li>No pre-payment penalty.</li> </ul>	Applications accepted year-round on a fund-available basis.  <b>Contact:</b> Janice Roderick 360-704-7739 <a href="mailto:janice.roderick@wa.usda.gov">janice.roderick@wa.usda.gov</a>  <a href="http://www.rurdev.usda.gov/wa">http://www.rurdev.usda.gov/wa</a>



CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<p><b>DWSRF</b> Drinking Water State Revolving Fund</p> <p>Construction Loan Program</p>	<p>Drinking water system infrastructure projects aimed at increasing public health protection.</p> <p>There is a limited amount of principal forgiveness for communities with high affordability index numbers and water system restructuring/ consolidation projects.</p>	<p>Group A (private and publicly-owned) community and not-for-profit non-community water systems, but not federal or state-owned systems.</p> <p>Tribal systems are eligible provided the project is not receiving other national set-aside funding for the project.</p>	<p>Loan</p> <ul style="list-style-type: none"> <li>• 1% loan fee (water systems receiving subsidy are not subject to loan fees).</li> <li>• \$3 million per jurisdiction per year.</li> <li>• \$6 million for jointly-owned projects.</li> <li>• 1.75 – 2.25% interest rate.</li> <li>• Loan repayment period: 20 years or life of the project, whichever is less.</li> <li>• No local match required.</li> <li>• \$25 million expected to be available this cycle.</li> </ul>	<p>Applications will be available and accepted October 1 through November 30, 2018.</p> <p><b>Contact:</b> Janet Cherry 360-236-3153 <a href="mailto:janet.cherry@doh.wa.gov">janet.cherry@doh.wa.gov</a></p> <p>For information and forms visit: <a href="http://www.doh.wa.gov/DWSRF">http://www.doh.wa.gov/DWSRF</a></p>
<p><b>ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM</b></p> <p>State Water Pollution Control Revolving Fund (SRF)</p> <p>Centennial Clean Water Fund</p> <p>Stormwater Financial Assistance Program (SFAP)</p>	<p>Construction projects associated with publicly-owned wastewater and stormwater facilities.</p> <p>The integrated program also funds planning and implementation of nonpoint source pollution control activities.</p>	<p>Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes.</p> <p><u>Hardship Assistance</u> Jurisdictions listed above with a population of 25,000 or less.</p>	<p>Loan interest rates (SFY 2020)</p> <ul style="list-style-type: none"> <li>• 21-30 year loans: 2.7%</li> <li>• 6-20 year loans: 2.0%</li> <li>• 1-5 year loans: 1.0%</li> </ul> <p><u>Hardship assistance</u> for the construction of wastewater treatment facilities may be available in the form of a reduced interest rate, grant subsidy, or loan forgiveness. Hardship assistance is based on impact to residential ratepayers and the community MHI. Hardship funding is only available for the portion of a facility serving existing residential need.</p> <p><u>Stormwater grant</u> maximum award per jurisdiction: \$5 million, with a required 25% match.</p>	<p>This year's applications due October 14, 2019.</p> <p>A cost effectiveness analysis must be complete at the time of application.</p> <p><b>Contact:</b> David Dunn 360-407-6503 <a href="mailto:david.dunn@ecy.wa.gov">david.dunn@ecy.wa.gov</a></p> <p><a href="https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans">https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans</a></p>



CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>RCAC RURAL COMMUNITY ASSISTANCE CORPORATION</b> Construction Loans	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities. Can include pre-development costs.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 populations or less if using USDA Rural Development financing as the takeout.	<ul style="list-style-type: none"> <li>Typically up to \$3 million with commitment letter for permanent financing</li> <li>Security in permanent loan letter of conditions</li> <li>Term matches construction period.</li> <li>5% interest rate</li> <li>1% loan fee</li> </ul>	<p>Applications accepted anytime.</p> <p><b>Contact:</b> Matt Williams 971-772-4063 <a href="mailto:mwilliams@rcac.org">mwilliams@rcac.org</a></p> <p>Applications available online at <a href="http://www.rcac.org/lending/environmental-loans/">http://www.rcac.org/lending/environmental-loans/</a></p>
<b>RCAC RURAL COMMUNITY ASSISTANCE CORPORATION</b> Intermediate Term Loan	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less.	<ul style="list-style-type: none"> <li>For smaller capital needs, normally not to exceed \$100,000.</li> <li>Typically up to a 20-year term</li> <li>5% interest rate</li> <li>1% loan fee</li> </ul>	<p>Applications accepted anytime.</p> <p><b>Contact:</b> Matt Williams 971-772-4063 <a href="mailto:mwilliams@rcac.org">mwilliams@rcac.org</a></p> <p>Applications available online at <a href="http://www.rcac.org/lending/environmental-loans/">http://www.rcac.org/lending/environmental-loans/</a></p>
<b>RURAL WATER REVOLVING LOAN FUND</b>	Short-term costs incurred for replacement equipment, small scale extension of services, or other small capital projects that are not a part of regular operations and maintenance for drinking water and wastewater projects.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	<ul style="list-style-type: none"> <li>Loan amounts may not exceed \$100,000 or 75% of the total project cost, whichever is less. Applicants will be given credit for documented project costs prior to receiving the RLF loan.</li> <li>Interest rates at the lower of the poverty or market interest rate as published by USDA RD RUS, with a minimum of 3% at the time of closing.</li> <li>Maximum repayment period is 10 years. Additional ranking points for a shorter repayment period. The repayment period cannot exceed the useful life of the facilities or financed item.</li> </ul>	<p>Applications accepted anytime.</p> <p><b>Contact:</b> Tracey Hunter Evergreen Rural Water of WA 360-462-9287 <a href="mailto:thunter@erwow.org">thunter@erwow.org</a></p> <p>Download application online: <a href="http://nrwa.org/initiatives/revolving-loan-fund/">http://nrwa.org/initiatives/revolving-loan-fund/</a></p>



CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>CERB</b> Community Economic Revitalization Board - Construction Program	<p>Public facility projects required by private sector expansion and job creation.</p> <p>Projects must support significant job creation or significant private investment in the state.</p> <ul style="list-style-type: none"> <li>• Bridges, roads and railroad spurs, domestic and industrial water, sanitary and storm sewers.</li> <li>• Electricity, natural gas and telecommunications</li> <li>• General purpose industrial buildings, port facilities.</li> <li>• Acquisition, construction, repair, reconstruction, replacement, rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>• Counties, cities, towns, port districts, special districts</li> <li>• Federally-recognized tribes</li> <li>• Municipal and quasi-municipal corporations with economic development purposes.</li> </ul>	<p>Loans; grants in unique cases</p> <ul style="list-style-type: none"> <li>• Projects without a committed private partner allowed for in rural areas.</li> <li>• \$2 million maximum per project, per policy.</li> <li>• Interest rates: 1-3% Based on Debt Service Coverage Ratio (DSCR), Distressed County, and length of loan term.</li> <li>• 20-year maximum loan term</li> <li>• Match for committed private partners: 20% (of total project cost).</li> <li>• Match for prospective partners: 50% (of total project cost).</li> <li>• Applicants must demonstrate gap in public project funding and need for CERB assistance.</li> <li>• CERB is authority for funding approvals.</li> </ul>	<p>Applications accepted year-round. The Board meets six times a year.</p> <p><b>Contact:</b> Janea Delk  360-725-3151  <a href="mailto:janea.delk@commerce.wa.gov">janea.delk@commerce.wa.gov</a></p>
<b>PWB</b> Public Works Board - Construction Program	<p>New construction, replacement, and repair of existing infrastructure for stormwater, solid waste, recycling, road or bridge projects.</p>	<ul style="list-style-type: none"> <li>• Counties, cities, special purpose districts, and quasi-municipal organizations.</li> <li>• No school districts, port districts, or tribes per statute.</li> </ul>	<ul style="list-style-type: none"> <li>• Funding is subject to Governor and Legislative appropriation; targeting to open application cycle in July 2019.</li> </ul>	<p>Please visit:  <a href="http://www.pwb.wa.gov">http://www.pwb.wa.gov</a></p> <p><b>Contact:</b> Connie Rivera  360-725-3088  <a href="mailto:connie.rivera@commerce.wa.gov">connie.rivera@commerce.wa.gov</a></p>



EMERGENCY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>RD – ECWAG</b> U.S. Dept. of Agriculture Rural Development  Emergency Community Water Assistance Grants	Domestic water projects needing emergency repairs due to an incident such as: a drought; earthquake; flood; chemical spill; fire; etc. A significant decline in quantity or quality of potable water supply that was caused by an emergency.	Public bodies, tribes and private non-profit corporations serving rural areas with populations under 10,000.	Grant; pending availability of funds <ul style="list-style-type: none"> <li>• \$150,000 limit for incident related emergency repairs to an existing water system.</li> <li>• \$500,000 limit to alleviate a significant decline in potable water supply caused by an emergency.</li> </ul>	Applications accepted year-round on a fund-available basis.  <b>Contact:</b> Janice Roderick 360-704-7739 <a href="mailto:janice.roderick@wa.usda.gov">janice.roderick@wa.usda.gov</a>  <a href="http://www.rurdev.usda.gov/wa">http://www.rurdev.usda.gov/wa</a>
<b>DWSRF</b> Department of Health – Drinking Water State Revolving Fund  Emergency Loan Program	Will financially assist eligible communities experiencing the loss of critical drinking water services or facilities due to an emergency.	<ul style="list-style-type: none"> <li>• Publicly or privately owned (not-for-profit) Group A community water systems with a population of fewer than 10,000.</li> <li>• Transient or non-transient non-community public water systems owned by a non-profit organization. Non-profit non-community water systems must submit tax-exempt documentation.</li> <li>• Tribal systems are eligible provided the project is not receiving other national set-aside funding for the project.</li> </ul>	6-year loans with the following terms: <ul style="list-style-type: none"> <li>• Interest rate: 1.75 – 2.25%</li> <li>• Forgiveness: up to 75%</li> <li>• Loan term: 6 years</li> <li>• \$200,000 maximum award per jurisdiction.</li> <li>• Time of performance: 2 years from contract execution to project completion date.</li> <li>• Repayment commencing first October after contract execution.</li> </ul>	To be considered for an emergency loan, an applicant must submit a completed emergency application package to the department.  <b>Contacts:</b> Department of Health Regional Engineers or Janet Cherry 360-236-3153 <a href="mailto:Janet.cherry@doh.wa.gov">Janet.cherry@doh.wa.gov</a>  For information and forms visit: <a href="http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/DrinkingWaterStateRevolvingFundDWSRF">http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemAssistance/DrinkingWaterStateRevolvingFundDWSRF</a>



EMERGENCY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
<b>PWB</b> Public Works Board – Emergency Loan Program: Repair, replace, rehabilitate, or reconstruct eligible systems to current standards for existing users.	A public works project made necessary by a natural disaster, or an immediate and emergent threat to the public health and safety due to unforeseen or unavoidable circumstances.  Demonstrate financial need through inadequate local budget resources.	Counties, cities, special purpose districts, and quasi-municipal organizations.  No school districts, port districts, or tribes per statute.  Water, sanitary sewer, storm water, roads, streets, bridges, solid waste, and recycling facilities.	<ul style="list-style-type: none"> <li>• Approximately \$4.8 million for emergency loan funding.</li> <li>• Maximum loan amount \$1 million per jurisdiction per biennium.</li> <li>• 20-year loan term or life of the improvement, whichever is less.</li> <li>• Interest rates vary.</li> <li>• Application cycle is open until appropriated funds are exhausted.</li> </ul>	Check the Public Works Board website periodically at: <a href="http://www.pwb.wa.gov">http://www.pwb.wa.gov</a> to obtain the latest information on program details or to contact Public Works Board staff.  <b>Contact:</b> Connie Rivera 360-725-3088 <a href="mailto:connie.rivera@commerce.wa.gov">connie.rivera@commerce.wa.gov</a>
<b>RURAL WATER REVOLVING LOAN FUND</b> Disaster area emergency loans	Contact staff for more information on emergency loans.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	90-day, no interest, disaster area emergency loans with immediate turn-around.	Applications accepted anytime.  <b>Contact:</b> Tracey Hunter Evergreen Rural Water of WA 360-462-9287 <a href="mailto:thunter@erwow.org">thunter@erwow.org</a>  Download application online: <a href="http://nrwa.org/initiatives/revolving-loan-fund/">http://nrwa.org/initiatives/revolving-loan-fund/</a>



## **APPENDIX J**

### **THURSTON COUNTY FINANCIAL TABLES**



BOSTON HARBOR WATER & SEWER UTILITY 10-YEAR FINANCIAL PLAN  
2011 - 2024  
FUND 4200

	Actual 2011	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budget 2017	Budget 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Customer Count	245	245	245	245			259	259	259	259	259	259	259	259
Sewer Rates per month	\$ 77.47	\$ 81.34	\$ 79.75	\$ 82.14	\$ 82.14	\$ 82.14	\$ 90.35	\$ 99.39	\$ 104.36	\$ 109.58	\$ 115.06	\$ 120.81	\$ 126.85	\$ 133.19
Customer Count							265	265	265	265	265	265	265	265
Water Rates per month	\$ 21.74	\$ 22.83	\$ 22.83	\$ 23.51	\$ 23.51	\$ 23.51	\$ 25.86	\$ 28.45	\$ 29.87	\$ 31.36	\$ 32.93	\$ 34.58	\$ 36.31	\$ 38.13
Usage							2,271,079	2,384,633	2,275,000	2,275,000	2,275,000	2,275,000	2,275,000	2,275,000
Consumption rate	\$ 1.63	\$ 1.71	\$ 1.71	\$ 1.76	\$ 1.76	\$ 1.76	\$ 1.94	\$ 2.13	\$ 2.24	\$ 2.35	\$ 2.47	\$ 2.59	\$ 2.72	\$ 2.86
Beginning Fund Balance	\$ 129,830	\$ 144,854	\$ 206,279	\$ 241,161	\$ 291,344	\$ 242,968	\$ 263,163	\$ 188,058	\$ 149,504	\$ 125,854	\$ 119,378	\$ 131,117	\$ 136,954	\$ 163,059
Utility Revenue	\$ 352,093	\$ 351,031	\$ 356,880	\$ 365,153	\$ 372,448	\$ 387,945	\$ 419,235	\$ 461,090	\$ 481,322	\$ 505,338	\$ 530,671	\$ 557,127	\$ 584,997	\$ 614,344
Interest / Penalties	\$ 16,097	\$ 9,096	\$ 4,438	\$ 7,604	\$ 6,951	\$ 9,556	\$ 3,500	\$ 7,500	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Total Revenue	\$ 368,190	\$ 360,127	\$ 361,318	\$ 372,757	\$ 379,399	\$ 397,500	\$ 422,735	\$ 468,590	\$ 486,322	\$ 510,338	\$ 535,671	\$ 562,127	\$ 589,997	\$ 619,344
Salaries, Wages & Benefits	\$ 178,002	\$ 145,027	\$ 168,971	\$ 162,885	\$ 187,345	\$ 203,638	\$ 230,822	\$ 248,228	\$ 248,056	\$ 251,862	\$ 255,817	\$ 259,929	\$ 264,204	\$ 268,648
Operating Costs	\$ 94,393	\$ 72,540	\$ 84,512	\$ 77,626	\$ 160,782	\$ 97,766	\$ 120,316	\$ 120,376	\$ 122,206	\$ 124,047	\$ 125,993	\$ 132,995	\$ 135,055	\$ 137,177
Intergovernmental Services	\$ 71,864	\$ 74,897	\$ 67,953	\$ 62,064	\$ 59,647	\$ 57,458	\$ 66,702	\$ 58,540	\$ 59,711	\$ 60,905	\$ 62,123	\$ 63,366	\$ 64,633	\$ 65,926
Capital Projects/Transfers to Reserve	\$ 8,906	\$ 5,000	\$ 5,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 100,000	\$ 100,000	\$ 100,000
Debt Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Expenditures	\$ 353,166	\$ 297,464	\$ 326,436	\$ 322,575	\$ 427,774	\$ 378,862	\$ 497,840	\$ 507,144	\$ 509,973	\$ 516,814	\$ 523,933	\$ 556,290	\$ 563,892	\$ 571,750
Ending Fund Balance	\$ 144,854	\$ 207,517	\$ 241,161	\$ 291,344	\$ 242,968	\$ 263,163	\$ 188,058	\$ 149,504	\$ 125,854	\$ 119,378	\$ 131,117	\$ 136,954	\$ 163,059	\$ 210,653

Notes & Assumptions:

10% annual rate increase 2017 & 2018; 5% rate increase 2019 forward

3% salary; 5% medical benefit increase

2% professional services, supplies and repairs & maintenance increase

2% internal service rate increase

Increase annual operating transfers to reserve for capital projects 2017 & 2022



BOSTON HARBOR RESERVE 10-YEAR FINANCIAL PLAN  
2011 - 2024  
FUND 4210

	Actual 2011	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budget 2017	Budget 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Beginning Fund Balance	\$ 402,307	\$ 350,650	\$ 346,496	\$ 332,054	\$ 305,836	\$ 377,612	\$ 411,614	\$ 303,917	\$ 249,085	\$ 285,828	\$ 147,546	\$ 129,239	\$ 905	\$ 2,545
Operating Transfers	\$ 8,906	\$ 5,000	\$ 5,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 80,000	\$ 100,000	\$ 100,000	\$ 100,000
Interest / Penalties	\$ 4,034	\$ 2,855	\$ 2,071	\$ 1,869	\$ 2,391	\$ 3,290	\$ 2,400	\$ 2,400	\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 3,000
Capital Contributions / Connection Fees	\$ -	\$ -	\$ -	\$ -	\$ 51,674	\$ 13,426	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 12,940	\$ 7,855	\$ 7,071	\$ 21,869	\$ 74,065	\$ 36,717	\$ 82,400	\$ 82,400	\$ 83,000	\$ 83,000	\$ 83,000	\$ 103,000	\$ 103,000	\$ 103,000
Salaries, Wages & Benefits	\$ 813	\$ -	\$ 5,155	\$ 8,468	\$ -	\$ 1,336	\$ 3,645	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Operating Costs	\$ 61,928	\$ 10,345	\$ 13,897	\$ 38,376	\$ 1,171	\$ -	\$ 10,556	\$ -	\$ 5,000	\$ -	\$ -	\$ -	\$ -	\$ -
Capital Projects (see box below)	\$ -	\$ -	\$ 1,026	\$ -	\$ -	\$ -	\$ 175,000	\$ 136,000	\$ 40,000	\$ 220,000	\$ 100,000	\$ 230,000	\$ 100,000	\$ -
Interfund Expenses (Gov't O/H Allocation)	\$ 1,856	\$ 1,664	\$ 1,435	\$ 1,243	\$ 1,118	\$ 1,379	\$ 896	\$ 1,232	\$ 1,257	\$ 1,282	\$ 1,307	\$ 1,334	\$ 1,360	\$ 1,387
Total Expenditures	\$ 64,597	\$ 12,009	\$ 21,513	\$ 48,087	\$ 2,289	\$ 2,715	\$ 190,097	\$ 137,232	\$ 46,257	\$ 221,282	\$ 101,307	\$ 231,334	\$ 101,360	\$ 1,387

Ending Fund Balance	\$ 350,650	\$ 346,496	\$ 332,054	\$ 305,836	\$ 377,612	\$ 411,614	\$ 303,917	\$ 249,085	\$ 285,828	\$ 147,546	\$ 129,239	\$ 905	\$ 2,545	\$ 104,158
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Reserve Fund Projects:														
TTHM's Disinfection Byproduct Pump							25,000							
Water Treatment System Improvements (Green Sand Filter upgrade)							85,000	1,000						
Generator Auto Switch							15,000	5,000						
Management Plans (System Update, Assets, Satellite Agency)							10,556		5,000					
WWTP Repairs & Major Maintenance							10,000							
Step Tank Repair & Replace							40,000	40,000	40,000	40,000				
Sewer Electrical Upgrade								90,000						
Watermain Replacement										100,000	100,000	100,000	100,000	
Sewer Treatment Plant Generator Replacement									80,000					
Reservoir Clean & Inspect												10,000		
Sewer Inspection & Locate Discharge End												10,000		
Well Pump Motor												60,000		
Sewer I & I Upgrade												50,000		
Capital Projects Estimate Total							\$ 185,556	\$ 136,000	\$ 45,000	\$ 220,000	\$ 100,000	\$ 230,000	\$ 100,000	\$ -



GRAND MOUND WATER UTILITY 10-YEAR FINANCIAL PLAN  
2012 - 2024  
FUND 4350

	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budget 2017	Budget 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Customer Count	333	343	353	363	373	383	411	421	431	441	451	461	471
Water Rates per month	\$ 31.77	\$ 33.36	\$ 35.03	\$ 35.03	\$ 36.78	\$ 38.63	\$ 40.56	\$ 42.59	\$ 44.72	\$ 46.96	\$ 49.30	\$ 51.77	\$ 54.36
Water Consumption rates	\$ 1.90	\$ 2.00	\$ 2.09	\$ 2.10	\$ 2.21	\$ 2.21	\$ 2.32	\$ 2.44	\$ 2.56	\$ 2.69	\$ 2.82	\$ 2.96	\$ 3.11
Beginning Fund Balance	\$ 732,200	\$ 853,632	\$ 962,225	\$ 1,017,688	\$ 911,787	\$ 988,944	\$ 752,151	\$ 637,912	\$ 524,372	\$ 320,703	\$ 92,012	\$ 144,771	\$ 88,514
Utility Revenue	\$ 524,966	\$ 517,563	\$ 578,185	\$ 538,145	\$ 675,944	\$ 563,358	\$ 591,526	\$ 626,213	\$ 662,890	\$ 701,669	\$ 742,669	\$ 786,014	\$ 831,838
Interest / Penalties	\$ 11,272	\$ 10,539	\$ 9,304	\$ 23,545	\$ 29,795	\$ 9,000	\$ 9,000	\$ 12,000	\$ 12,000	\$ 12,000	\$ 12,000	\$ 12,000	\$ 12,000
New Connections	\$ 21,778	\$ 51,890	\$ 49,370	\$ 5,394	\$ 237,052	\$ 35,982	\$ 188,906	\$ 407,682	\$ 94,423	\$ 435,776	\$ 33,000	\$ 36,300	\$ 39,930
Operating Transfers	\$ -	\$ -	\$ -	\$ 327	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 558,016	\$ 579,992	\$ 636,859	\$ 567,411	\$ 942,791	\$ 608,340	\$ 789,432	\$ 1,045,895	\$ 769,313	\$ 1,149,445	\$ 787,669	\$ 834,314	\$ 883,768
Salaries, Wages & Benefits	\$ 77,168	\$ 76,306	\$ 101,387	\$ 114,195	\$ 138,376	\$ 179,332	\$ 193,610	\$ 198,988	\$ 204,551	\$ 210,307	\$ 216,263	\$ 222,425	\$ 228,802
Operating Costs	\$ 95,477	\$ 83,120	\$ 99,312	\$ 101,862	\$ 91,622	\$ 131,946	\$ 131,946	\$ 132,624	\$ 133,316	\$ 134,022	\$ 134,742	\$ 135,476	\$ 136,225
Intergovernmental Services	\$ 51,910	\$ 51,808	\$ 58,230	\$ 80,687	\$ 77,882	\$ 85,584	\$ 85,125	\$ 86,828	\$ 88,564	\$ 90,335	\$ 92,142	\$ 93,985	\$ 95,865
Operating Transfers	\$ -	\$ -	\$ -	\$ -	\$ 200,000	\$ -	\$ -	\$ 150,000	\$ 400,000	\$ 800,000	\$ 150,000	\$ 400,000	\$ -
Capital Projects	\$ -	\$ -	\$ -	\$ -	\$ 6,843	\$ 66,342	\$ 66,342	\$ 31,842	\$ 31,842	\$ 31,842	\$ 33,210	\$ 33,210	\$ 33,210
Debt Payments	\$ 212,029	\$ 260,165	\$ 319,165	\$ 364,065	\$ 350,456	\$ 381,929	\$ 426,648	\$ 559,153	\$ 114,708	\$ 111,630	\$ 108,553	\$ 5,475	\$ 262,975
Total Expenditures	\$ 436,584	\$ 471,399	\$ 578,094	\$ 660,809	\$ 865,179	\$ 845,133	\$ 903,671	\$ 1,159,435	\$ 972,982	\$ 1,378,137	\$ 734,910	\$ 890,571	\$ 757,077
Ending Fund Balance	\$ 853,632	\$ 962,225	\$ 1,020,990	\$ 924,290	\$ 988,944	\$ 752,151	\$ 637,912	\$ 524,372	\$ 320,703	\$ 92,012	\$ 144,771	\$ 88,514	\$ 215,205

Notes & Assumptions:

10 customer base increase/year  
5% rate increase 2017 and beyond  
3% salary; 5% medical benefit increase  
2% professional services, repairs and maintenance increase  
2% internal service rate increase  
REET allocations for debt are based on a 2015 meeting. Asst. County Manager and Public Works will meet on an annual basis to review needs.



GRAND MOUND WATER RESERVE 10-YEAR FINANCIAL PLAN  
2012 - 2024  
FUND 4450

	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budget 2017	Budget 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Beginning Fund Balance	\$ 152,904	\$ 143,568	\$ 164,665	\$ 164,056	\$ 162,132	\$ 320,602	\$ 21,613	\$ 11,454	\$ 25,834	\$ 45,182	\$ 64,497	\$ 203,778	\$ 153,025
Operating Transfers	\$ -	\$ -	\$ -	\$ -	\$ 200,000	\$ -	\$ -	\$ 150,000	\$ 400,000	\$ 800,000	\$ 150,000	\$ 400,000	\$ -
Interfund Loan		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 300,000	\$ -	\$ -	\$ -	\$ 250,000	\$ -
REET Transfers	\$ -	\$ -	\$ -	\$ 15,076	\$ -	\$ 300,000	\$ 1,350,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Interest / Penalties	\$ 1,189	\$ 23,520	\$ 1,181	\$ (1,649)	\$ 1,971	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000	\$ 1,000
Total Revenue	\$ 1,189	\$ 23,520	\$ 1,181	\$ 13,427	\$ 201,971	\$ 301,000	\$ 1,351,000	\$ 451,000	\$ 401,000	\$ 801,000	\$ 151,000	\$ 651,000	\$ 1,000
Operating Costs		\$ -	\$ -	\$ 1,688	\$ -	\$ 33,723	\$ 7,305	\$ -	\$ 25,000	\$ -	\$ 10,000	\$ -	\$ 75,000
Capital Projects	\$ 3,822	\$ 2,423	\$ 89	\$ 13,389	\$ 43,134	\$ 565,455	\$ 1,352,266	\$ 435,000	\$ 355,000	\$ 780,000	\$ -	\$ 700,000	\$ -
Intergovernmental Services	\$ 6,770	\$ -	\$ 1,701	\$ 275	\$ 242	\$ 811	\$ 1,588	\$ 1,620	\$ 1,652	\$ 1,685	\$ 1,719	\$ 1,753	\$ 1,788
Total Expenditures	\$ 10,592	\$ 2,423	\$ 1,790	\$ 15,351	\$ 43,376	\$ 599,989	\$ 1,361,159	\$ 436,620	\$ 381,652	\$ 781,685	\$ 11,719	\$ 701,753	\$ 76,788
Ending Fund Balance	\$ 143,501	\$ 164,665	\$ 164,056	\$ 162,132	\$ 320,602	\$ 21,613	\$ 11,454	\$ 25,834	\$ 45,182	\$ 64,497	\$ 203,778	\$ 153,025	\$ 77,236

Notes & Assumptions

Long range planning required for grants and other funding options for Capital Projects  
Possible interfund loans to fund remainder of 2nd reservoir & pumps #3 & #4 \$ 300,000 Above plan assumes this loan will happen in 2019



TAMOSHAN WATER UTILITY 10-YEAR FINANCIAL PLAN  
2011 - 2024  
FUND 4400

	Actual 2011	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budget 2017	Budget 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Customer Count	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Water Rates per month	\$ 59.70	\$ 63.88	\$ 63.88	\$ 65.80	\$ 65.80	\$ 65.80	\$ 69.09	\$ 72.54	\$ 76.17	\$ 79.98	\$ 83.98	\$ 88.18	\$ 92.59	\$ 97.22
Water Consumption rates	1.98	2.08	2.08	2.14	2.14	2.19	2.30	2.42	2.54	2.67	2.80	2.94	3.09	3.24
Beginning Fund Balance	\$ 75,987	\$ 88,816	\$ 122,899	\$ 152,587	\$ 171,118	\$ 190,899	\$ 193,615	\$ 131,929	\$ 109,984	\$ 47,742	\$ 33,997	\$ 33,961	\$ 32,859	\$ 35,930
Utility Revenue	\$ 91,386	\$ 92,497	\$ 94,926	\$ 95,676	\$ 94,883	\$ 96,107	\$ 100,481	\$ 105,582	\$ 111,389	\$ 116,959	\$ 122,807	\$ 128,947	\$ 135,394	\$ 142,164
Interest / Penalties	\$ 1,190	\$ 1,182	\$ 1,314	\$ 1,350	\$ 2,817	\$ 5,652	\$ 1,500	\$ 1,500	\$ 1,700	\$ 1,700	\$ 1,700	\$ 1,700	\$ 1,700	\$ 1,700
Loans/Grants/Other	\$ -	\$ -	\$ -	\$ -	\$ 10,922	\$ 11,578	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 92,576	\$ 93,679	\$ 96,241	\$ 97,026	\$ 108,623	\$ 113,337	\$ 101,981	\$ 107,082	\$ 113,089	\$ 118,659	\$ 124,507	\$ 130,647	\$ 137,094	\$ 143,864
Salaries, Wages & Benefits	\$ 39,482	\$ 23,807	\$ 27,323	\$ 32,070	\$ 35,321	\$ 46,099	\$ 40,859	\$ 41,504	\$ 42,634	\$ 43,802	\$ 45,009	\$ 46,258	\$ 47,548	\$ 48,883
Operating Costs	\$ 19,561	\$ 14,333	\$ 18,138	\$ 15,572	\$ 25,962	\$ 19,332	\$ 89,192	\$ 33,725	\$ 28,523	\$ 29,045	\$ 29,585	\$ 35,143	\$ 30,721	\$ 31,320
Intergovernmental Services	\$ 20,093	\$ 21,341	\$ 21,092	\$ 20,852	\$ 17,559	\$ 17,116	\$ 18,616	\$ 18,798	\$ 19,174	\$ 19,557	\$ 19,949	\$ 20,348	\$ 20,755	\$ 21,170
Capital Projects/Transfers to Reserve	\$ 611	\$ -	\$ -	\$ 10,000	\$ 10,000	\$ 28,104	\$ 15,000	\$ 35,000	\$ 85,000	\$ 40,000	\$ 30,000	\$ 30,000	\$ 35,000	\$ 40,000
Debt Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Expenditures	\$ 79,747	\$ 59,481	\$ 66,553	\$ 78,494	\$ 88,842	\$ 110,651	\$ 163,667	\$ 129,027	\$ 175,331	\$ 132,404	\$ 124,543	\$ 131,749	\$ 134,024	\$ 141,372
Ending Fund Balance	\$ 88,816	\$ 123,014	\$ 152,587	\$ 171,118	\$ 190,899	\$ 193,615	\$ 131,929	\$ 109,984	\$ 47,742	\$ 33,997	\$ 33,961	\$ 32,859	\$ 35,930	\$ 38,422

Notes & Assumptions:  
5% annual rate increase 2017 forward  
3% salary; 5% medical benefit increase  
2% professional services, repairs & maintenance increase



TAMOSHAN RESERVE  
2011 - 2024  
FUND 4420

	Actual 2011	Actual 2012	Actual 2013	Actual 2014	Actual 2015	Actual 2016	Budgeted 2017	Estimated 2018	Estimated 2019	Estimated 2020	Estimated 2021	Estimated 2022	Estimated 2023	Estimated 2024
Beginning Fund Balance	\$ 19,672	\$ 19,453	\$ 17,863	\$ 11,336	\$ 23,027	\$ 42,522	\$ 62,534	\$ 89,824	\$ 109,121	\$ (20,939)	\$ (216,002)	\$ (336,069)	\$ (661,141)	\$ (576,218)
Operating Transfers	\$ 78,642	\$ 686,565	\$ 1,600	\$ 18,000	\$ 20,000	\$ 20,000	\$ 30,000	\$ 80,000	\$ 135,000	\$ 55,000	\$ 60,000	\$ 100,000	\$ 85,000	\$ 85,000
REET Transfers	\$ -	\$ -	\$ 49,885	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Interest/Penalties	\$ 126	\$ 142	\$ 65	\$ 469	\$ 241	\$ 429	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150	\$ 150
Loans/Grants/Other	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Revenue	\$ 78,768	\$ 686,707	\$ 51,550	\$ 18,469	\$ 20,241	\$ 20,429	\$ 30,150	\$ 80,150	\$ 135,150	\$ 55,150	\$ 60,150	\$ 100,150	\$ 85,150	\$ 85,150
Salaries, Wages & Benefits	\$ 13,614	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,648	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Operating Costs	\$ 16,506	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,659	\$ 6,000	\$ 15,000	\$ -	\$ -	\$ -	\$ -	\$ 40,000
Intergovernmental Services	\$ 1,630	\$ 3,355	\$ 5,391	\$ 6,779	\$ 745	\$ 417	\$ 201	\$ 205	\$ 209	\$ 213	\$ 218	\$ 222	\$ 226	\$ 231
Capital Projects (incl. unfunded)	\$ 47,237	\$ 684,965	\$ 52,686	\$ -	\$ -	\$ -	\$ -	\$ 50,000	\$ 250,000	\$ 250,000	\$ 180,000	\$ 425,000	\$ -	\$ 30,000
Total Expenditures	\$ 78,987	\$ 688,320	\$ 58,077	\$ 6,779	\$ 745	\$ 417	\$ 2,860	\$ 60,853	\$ 265,209	\$ 250,213	\$ 180,218	\$ 425,222	\$ 226	\$ 70,231
Ending Fund Balance	\$ 19,453	\$ 17,840	\$ 11,336	\$ 23,027	\$ 42,523	\$ 62,534	\$ 89,824	\$ 109,121	\$ (20,939)	\$ (216,002)	\$ (336,069)	\$ (661,141)	\$ (576,218)	\$ (561,298)

Reserve Fund Projects:														
Management Plans (System Update, Assets, Satellite Agency)						\$ 2,659	\$ 6,000							
63rd Avenue Watermain Replacement									50,000	50,000	50,000	50,000		
Water Treatment System								15,000	150,000	150,000				
WWTP Plant & Pump Upgrades								30,000						
Water Reservoir Outlet Filter Screen								5,000						
Fire Hydrant Replacement								15,000						
Water Emergency Backup Generator											80,000			
Secondary Watermain Replacement												250,000		
Sewer I & I study/repair/upgrade								50,000	50,000	50,000	50,000	50,000		
Beverly Beach Generator												75,000		
Water Redundancy														30,000
Well new Pump & Motor														40,000
Reserve Fund Projects Total						\$ 2,659	\$ 56,000	\$ 265,000	\$ 250,000	\$ 180,000	\$ 425,000	\$ -	\$ 70,000	