2009 Water System Plan

Prepared for

City of Sumner
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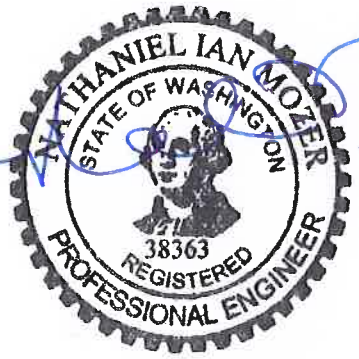
CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Andrew J. Porrini, E.I.T.



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APPENDICES

KEY TERMS

AC	asbestos concrete
ADD	average daily demand
AF	acre-feet
AG	Air Gap
AL	Federal Action Level
AVB	Atmospheric Vacuum Breaker
AWWA	American Water Works Association
BATs	Backflow Assembly Testers
BNSF	Burlington Northern Santa Fe Railway
CCCS	Cross Connection Control Specialist
ccf	100 cubic feet
cfs	cubic feet per second
CIP	Capital Improvement Plan
CTI	City Transfer Incorporated
CWA	Cascade Water Alliance
CWSP	Pierce County Coordinated Water System Plan
D Improvements	Distribution System
D/DBPR	Disinfectants and Disinfection Byproducts Rule
DBPs	disinfection byproducts
DCDA	double-check detector backflow prevention assembly
DCVA	Double Check Valve Assembly
DOH	Department of Health
DS	dead storage
DSHS	Washington State Department of Social and Health Services
DSL	Distribution System Leakage
E. coli	*Escherichia coli*
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERU	Equivalent Residential Unit
ES	equalizing storage
FSS	fire suppression storage
gpcd	gallons per capita day
gpd	gallons per day
gpm	gallons per minute

KEY TERMS (CONTINUED)

GWI	Groundwater Under the Influence of Surface Water
GWR	Groundwater Rule
HAA5	haloacetic acids
IDSE	Initial Distribution System Evaluation
IESWTR	Interim Enhanced Surface Water Treatment Rule
MCL	Maximum Contaminant Limit
MCLGs	Maximum Contaminant Level Goals
MDD	Maximum Daily Demand
mg	million gallons
mgd	million gallons per day
MRDLGs	Maximum Residual Disinfectant Level Goals
MRDLs	Maximum Residual Disinfectant Levels
NFPA	National Fire Protection Association
NPDWR	National Primary Drinking Water Regulations
O&M Improvements	Operations and Maintenance Improvements
OS	operational storage
PCBs	polychlorinated biphenyls
pCi/L	picocuries per liter
PHD	peak-hour demand
ppb	parts per billion
psi	pounds per square inch
PVB	Pressure Vacuum Breaker
PVC	Polyvinyl Chloride
PWSCA	Public Water System Coordination Act of 1977
RPBA	Reduced Pressure Principal Backflow-Prevention Assembly
RPDA	reduced-pressure principal detector backflow prevention assembly
RTU	remote telemetry unit
S Improvements	Source Improvements
SAL	State Advisory Level
SB	standby storage
SDC	system development charges
SDWA	Safe Drinking Water Act
SMC	Sumner Municipal Code

KEY TERMS (CONTINUED)

SOC	Synthetic Organic Chemical
SRL	State Reporting Level
ST Improvements	Storage Improvements
Stage 1 D/DBPR	Stage 1 Disinfectants and Disinfection By-Products Rules
Stage 2 D/DBPR	Stage 2 Disinfectants and Disinfection By-products Rule
SWTR	Surface Water Treatment Rule
TCR	Total Coliform Rule
TNTC	too numerous to count
TPCBH	Tacoma Pierce County Board of Health
TPCHD	Tacoma Pierce County Health Department
TTHM	trihalomethanes
UGA	Urban Growth Area
UPRR	Union Pacific Railroad
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WDMs	Water Distribution Managers
WDS	Water Distribution Specialist
WISHA	Washington Industrial Safety and Health Act
WLCAP	Water Loss Control Action Plan
WPA	Works Project Administration
WRIA	Water Resource Inventory Area
WSP	Water System Plan
WSRP	Water Shortage Response Plan
WTPO	Water Treatment Plant Operator
WUE	Water Use Efficiency

EXECUTIVE SUMMARY

The 2009 Sumner Water System Plan has been developed in compliance with the requirements of the Washington State Department of Health (DOH), including the applicable Washington Administrative Code (WAC) 246-290 sections and the Municipal Water Supply – Efficiency Requirements Act of 2003 Interim Direction Water System Plan/Small Water System Management Program Approvals (Municipal Water Law). This summary is meant to provide a brief description of the key elements discussed in the plan.

Service Area

The Sumner water utility service area is situated in the Puyallup/White River basin, and is adjoined by the water services areas of the City of Bonney Lake, Mountain View-Edgewood, the City of Puyallup, Valley Water District, the City of Auburn, Tacoma Water, and the City of Pacific. The Sumner water system has interties with both the Pacific and Puyallup water infrastructure. These interties are meant to be utilized during emergencies only and do not provide additional water for daily demands. The future Sumner water service area, which is discussed in Section 1.4, is consistent with the Pierce County Coordinated Water System Plan and is located entirely within the Urban Growth Area Boundary established by Pierce County.

System Inventory

The Sumner water infrastructure consists of approximately 85 miles of transmission mains ranging from 2-inch diameter to 18-inch diameter. Sumner currently utilizes seven potable water sources, including four springs (County Springs, Sumner Springs, Weber Springs, and Elhi Springs) and three wells (South Well, Dieringer Well, and West Well). Sumner potable water sources physical capacity are inventoried in Table ES-1.

Table ES-1. Sumner Potable Water Sources

DOH ID Number	Source Name	Source Type	Source Capacity (mgd)
SO 1	Sumner Springs	Free-Flowing Spring	1.15
SO 2	Weber Springs	Free-Flowing Spring	a
SO 3	Elhi Springs	Free-Flowing Spring	0.13
SO 4	County Springs	Free-Flowing Spring	0.71
SO 5	West Well	Artesian Well	0.36
SO 6	South Well	Artesian Well	1.01
SO 7	Dieringer Well	Artesian Well	0.36

[a] Flow from Weber Springs combines with Sumner and County Springs.

The Sumner Water System currently has a physical source capacity of approximately 3.72 million gallons per day (mgd) and storage capacity of 5.07 million gallons (mg).

Demand Projections

Water demand projections in the plan are based on historic water usage per Equivalent Residential Unit (ERU) and the projected population growth within the water service area during the 6-year and 20-year planning period. Population growth within the Sumner water service area is projected to increase based on information provided by the City's Community Development department as described in Section 3.2 of this Plan.

Using historical data from 1997 through 2007, the average consumption per day per ERU was estimated to be 262 gpd/ERU. Water-use projections are outlined in Table ES-2:

Table ES-2. Water Demand Projections

Year	Population [a]	Average Day Demand (mgd) [b]	Maximum Day Demand (mgd) [c]
2008	9,465	1.57	3.14
2009	9,881	1.71	3.42
2010	10,285	1.78	3.56
2011	10,677	1.85	3.70
2012	11,057	1.91	3.82
2013	11,426	1.97	3.94
2014	11,785	2.03	4.06
2019	13,435	2.30	4.60
2024	14,879	2.53	5.06
2029	16,153	2.74	5.48

[a] Based on annual population increase described in Section 3.2.

[b] Based on average demand requirement for 2008 and proposed population growth rate.

[c] Based on 2.00 peaking factor.

The Sumner water system has a current source capacity of approximately 3.72 mgd. Based on water demand projections, the instantaneous capacity of the existing City sources may be insufficient to meet the projected maximum-day demand by the year 2012 if the City does not pursue modifications to water rights and/or sources to increase the instantaneous capacity of the water system. This information is presented in Table ES-3.

Table ES-3. Existing Source Capacity Versus Projected Maximum-Day Demand

	2008	2009	2014	2019	2029
Projected Maximum-Day Demand (mgd)	3.14	3.42	4.06	4.60	5.48
Existing Source Capacity (mgd)	3.72	3.72	3.72	3.72	3.72
Source Deficit/Surplus	+0.58	+0.30	(0.34)	(0.88)	(1.76)

The current sources can, however, meet the projected average daily demands through the 20-year planning period.

Water Resources

The Sumner potable water sources have a combined instantaneous water right of approximately 7.6 mgd, including rights for Weber Springs No. 1 and No. 2 and not including any rights for the West Well. This right is sufficient to meet the projected maximum-day demand throughout the 20-year planning period. However, the water rights at the springs and South Well are currently greater than the production capacity at those sources. Improvements need to be made to these sources to utilize the full water right, or the right may be transferred to other sources capable of producing greater flow than allowed under the individual water-right certificates such as the West Well and Dieringer Well.

The City is planning to redevelop the spring sources. It is estimated that improvements to the existing spring sources could increase instantaneous flow capacity by approximately 500 gpm. In addition, the City is planning to improve/construct interties with City of Pacific and Mountain View-Edgewood (in 2010) and develop a new well (in 2011). Table ES-4 outlines the estimated combined capacity of Sumner sources assuming that the water-right applications are approved by the Washington State Department of Ecology and that the source improvements outlined in the plan are constructed.

Table ES-4 Projected Source Capacity Versus Projected Maximum-Day Demand

	2008	2009	2010[a]	2011[b]	2019	2029
Projected Maximum Day Demand (mgd)	3.14	3.42	3.56	3.70	4.60	5.48
Source Capacity (mgd)	3.72	3.72	3.72	4.87	7.03	7.03
Additional Source Capacity (mgd)	–	–	+1.15	+2.16	–	–
Source Deficit/Surplus	+0.58	+0.30	+1.31	+3.33	+2.43	+1.55

[a] Additional source capacity from intertie with City of Pacific (450 gpm) and intertie with Mountain View-Edgewood (347 gpm).

[b] Additional source capacity from improvements at springs (500 gpm) and a new well (1000 gpm).

Based on the population and water-use projections developed for this plan, the City has sufficient instantaneous water rights to meet the maximum-day demands through the 20-year planning period. The Sumner water system currently has 5.07 mg of storage capacity, which is sufficient to supply the City through the 20-year planning period. Source Physical capacity appears to be insufficient to meet maximum-day demands through the 6-year planning period at this time. Sumner plans on increasing source physical capacity to meet 20-year projected maximum-day demands through a combination of source improvements, intertie construction, new source construction, and water right transfers.

Water Quality

The Sumner sources produce very high quality water and conformance with water quality rules and regulations is generally not an issue. Water quality regulations recently implemented, or currently under development, that will likely be applicable to the City of Sumner are:

- Arsenic Rule: Reduced the Arsenic Maximum Contaminant Limit (MCL) from 50 parts per billion (ppb) to 10 ppb. Water systems were required to demonstrate compliance with this rule beginning January 23, 2006. Based on monitored data, this rule has not affected the Sumner Water System.
- Radon Rule: Establishes a general Radon-222 MCL of 300 picocuries per liter (pCi/L) for all Class A water systems. The Radon Rule was originally scheduled for adoption in 2001. It is unknown when this rule will be finalized.
- Groundwater Rule: The Groundwater Rule is based on the need to protect the public against bacteria, viruses, or contaminants in groundwater sources. Based on the requirements outlined in the draft rule, promulgation of the Groundwater Rule would require the City to increase disinfection dosage to maintain a log-4 inactivation (dose needed to neutralize viruses) and retrofit the existing chlorination facilities to allow continuous chlorine-residual monitoring. The final Groundwater Rule was published in the Federal Register on November 8, 2006, and the deadline for compliance is December 1, 2009. The City of Sumner currently has chlorine-residual monitors on their chlorine disinfection and monitors the system via sampling at 10 locations each month. This rule should not affect the Sumner Water System.

- Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 D/DBPR): This rule was published on January 4, 2006, to expand on the requirements outlined in the Stage 1 Rule, which established a maximum disinfectant residual allowed within the water system and MCLs for disinfection byproducts. Stage 2 D/DBPR strengthens public health protection by tightening compliance monitoring requirements for two groups of disinfection byproducts (DBPs), trihalomethanes (TTHM), and haloacetic acids (HAA5). The City of Sumner received 40/30 Certification from the EPA on September 20, 2007 (as seen in Appendix I) and additional monitoring for Stage 2 D/DBPR begins in October 2013.

Capital Improvement Plan

This plan proposes approximately $25 million in capital improvements and operation and maintenance programs over the 20-year planning period, approximately $22 million of which the City is responsible for, with the balance being funded by development. Improvements outlined in the plan are categorized as follows:

- Distribution System Improvements.
- Source Improvements.
- Storage Improvements.
- Operation and Maintenance.

Distribution, source, and storage improvements are further separated into improvements required for future growth and improvements required to address existing infrastructure deficiencies. Table 8-1 in the plan provides a comprehensive capital improvement list, including estimated project costs and implementation schedule.

Financial Review

The water utility fund revenues expected during the 6-year planning period were estimated based on the City's actual budget for 2009–2010. The biennial revenues and expenses were increased by 3.5 percent to account for City growth and an additional 3.1 percent for inflation. Based on the existing and projected financial data, it appears that the existing monthly fees and system development charges (SDC) will be insufficient to cover both the existing expenditures and the future expenditures proposed in the Capital Improvement Plan. Future fund revenues will continue to be increased through a combination of monthly fee/SDC increases and low interest loans. A detailed rate study will be conducted to determine the extent of monthly fee/SDC increases required to enable the City to continue to meet the water utility's financial obligations.

1. SERVICE AREA

1.1 LOCATION AND BOUNDARIES

The City of Sumner and surrounding valley is situated in the ancient floodplain of the Puyallup and White Rivers in north central Pierce County. Sumner is located 11 miles southeast of Tacoma and 3 miles northeast of Puyallup.

The Sumner water service area covers approximately 4,800 acres inside the city limits and 1,500 acres outside the city limits. The Sumner water utility service area and existing water distribution infrastructure is shown in Figure 1-1.

1.2 ADJACENT WATER PURVEYORS

East of the Sumner water service area, the City of Bonney Lake supplies water to approximately 10,300 (2004) accounts with a total service area of 20 square miles. According to the 2006 Planning Commission Review Edition of the Comprehensive Water System Plan, the City of Bonney Lake is projected to have over 15,000 Equivalent Residential Units (ERUs) in year 2010. There are no interties with Sumner due to the difference in pressure zones and separation by steep hillside. An area near the northern limits of the Sumner water service area is served by Bonney Lake, as allowed per the Lakeland Hills Development Water Service Agreement. An intertie could be made in this area due to close proximity of the systems, but no formal action has been taken.

West of Sumner's service area, the Mountain View-Edgewood Water Company supplies approximately 2,910 (2007) services. Land use in the Mountain View-Edgewood Water Company is primarily residential and agricultural. Mountain View-Edgewood Water Company maintains 2.2 million gallons (mg) of reservoir storage. There are no interties between the City of Sumner system and the Mountain View-Edgewood system. However, a signed service area agreement contains provisions for a possible future emergency intertie. This agreement is provided in Appendix A. Sumner provides water service to several parcels located within the City of Edgewood where it is geographically infeasible for Mountain View-Edgewood to provide service. Recent negotiations with the Mountain View Edgewood Water Company resulted in a change to the existing boundary, shown in Figure 1-4. The 1991 water service area agreement has been amended as a result of these negotiations, as stated above.

Southwest of the City's service area, the City of Puyallup supplies approximately 9,900 (2009) services. There are two interties between the City of Sumner and the City of Puyallup water systems. The first intertie is west of the Great Northern Pacific Railroad on Main Street in Sumner, and the second intertie is at the intersection of North and Railroad Streets. The water main on which the interties are located conveys water from the Puyallup Salmon Springs, which are at a lower elevation than the Sumner sources. Therefore, under normal conditions, water can only flow out of the Sumner system.

South of the Sumner service area, the Valley Water District supplies water to approximately 950 services in an area of approximately 2,500 acres. There are no interties with Sumner. However, interties with Sumner could occur at two locations. The first location is just south of the Puyallup River Bridge on Valley Avenue. The second location is across the Puyallup River Bridge on Annis Bowman Road. Both interties could provide a beneficial emergency supply for either system for which service area agreements will need to be negotiated.

Also to the south, Tacoma Water services an area of approximately 26,000 acres adjacent to the City's service area. Currently, there are no interties with Tacoma Water.

The City of Pacific water service area borders Sumner's service area to the north. Due to the acquisition of the Fowler Mutual Water Company and the Webstone Water District, there are currently two interties between Sumner and Pacific. The first intertie is located 16th Street East and 136th Avenue East, and the second intertie is located on 8th Street East at the boundary between Sumner/Pacific city limits. A capital improvement project recently completed an extension of the water infrastructure under the White River via a directional drill; therefore, eliminating the need to "wheel" water through Pacific's water system to a few isolated services north of 8th Street East / Stewart Road.

The City of Sumner recently took over the spring supply, water rights, and water customers for the Fowler Mutual Water Company, which are located in northwest Sumner. Additionally, in coordination with the City of Pacific, the City of Sumner recently assumed customers and infrastructure of the Webstone Water District, which used to border the Sumner water service boundary on the northwest. The cities have entered into a Memorandum of Agreement, with the City of Sumner acquiring the Webstone service area outside of Pacific city limits. A copy of this agreement is located in Appendix A.

The City of Auburn abuts the Sumner service area on the northeast. Potential interties could occur along East Valley Highway at the Auburn/Sumner city limits.

The Log Cabin System is located between East Valley Highway and the eastern border of the Sumner city limits. This water system is identified as a Group A water system by the Department of Health. Currently there are no interties with Sumner.

1.3 SERVICE AREA CHARACTERISTICS

1.3.1 Climate

The climate in the Sumner area is typical for the eastern side of Puget Sound, with temperature and weather patterns moderated by the Pacific Ocean and Olympic Mountains. Mild winters with highs in the upper 40s and lows in the mid 30s (Fahrenheit) are typical. Temperatures below freezing rarely occur for periods of more than a few days. The valley is usually frost-free from March 11 to November 18.

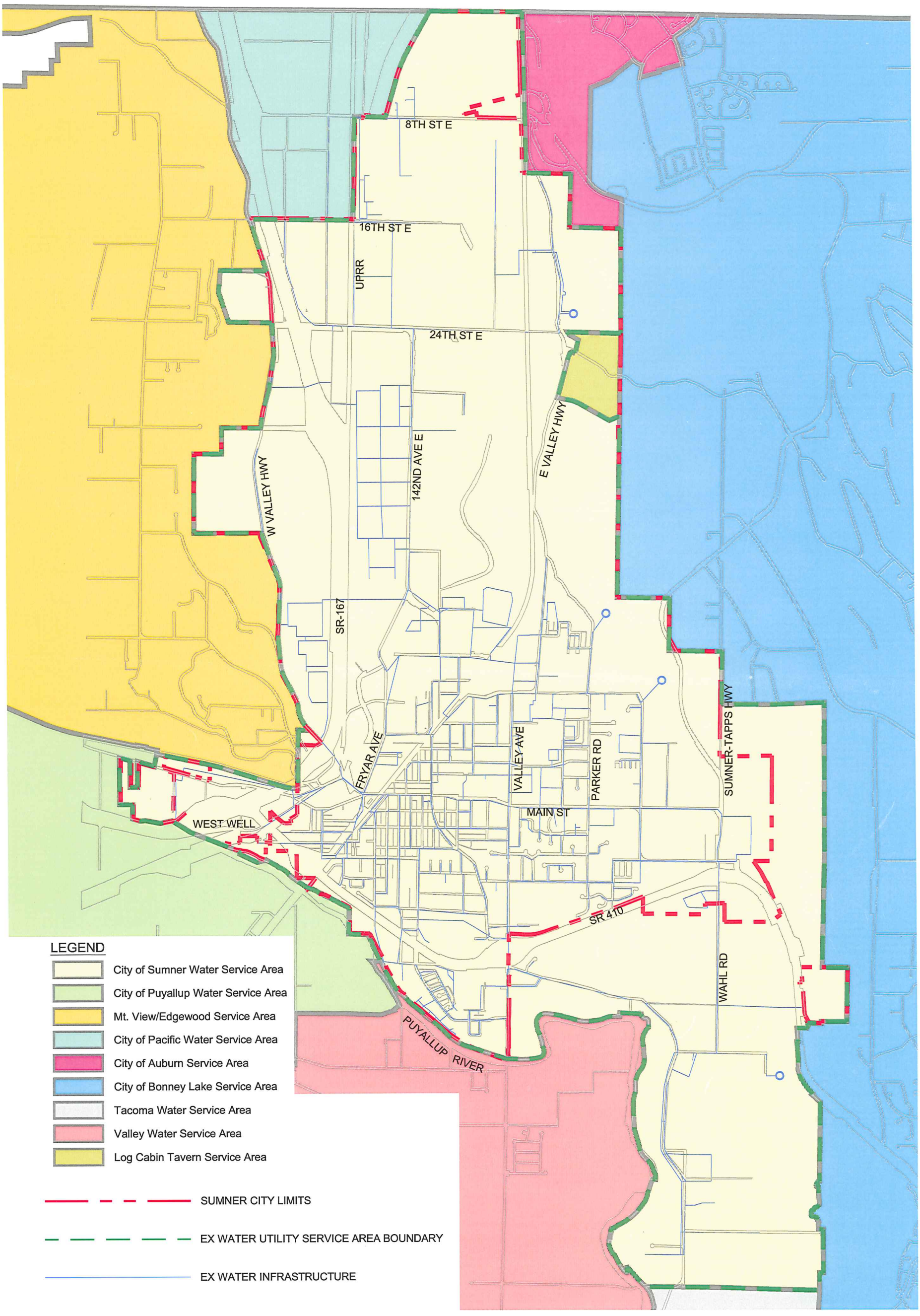
Average annual precipitation in Sumner is approximately 42 inches. Most precipitation falls as steady rain; snow is rare. Storms in the Sumner area last an average of 20 hours, with a rainfall intensity of 0.024 inches per hour creating 0.48 inches of precipitation. The average interval between storms is about 100 hours.

1.3.2 Topography

The city of Sumner lies in a broad valley with slopes ranging from 0 to 5 percent. The shallow slopes break abruptly at the east and west sides of the valley, where hills extend from the valley floor with slopes ranging from 20 to 70 percent. Hillsides are primarily undeveloped and forested, although some of the forest is cleared for gravel mining. The elevation of the valley ranges from 40 to 90 feet above sea level. The highest point in the Comprehensive Planning Area is slightly above 550 feet.

1.3.3 Soil Conditions

Two geologic depositional processes are responsible for soil characteristics in the planning area. Most of the soil in the valley is comprised of alluvial deposits from the White and Puyallup Rivers. Mudflows from past Mount Rainier eruptions account for a smaller portion of the soils. The hillsides are mostly glacial till deposited during the retreat of the last ice age 2 million years ago.



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SCALE IN FEET

Figure 1-1
City of Sumner
Existing Water Utility Service Area Boundary and Infrastructure

Infiltration capacities of the valley soils vary based on the amount of fine silts and clays in the top layers. Overall, the soils in the valley infiltrate poorly, particularly in the northern half of the study area. Hillside soils infiltrate readily and erode very easily due to their sand content and location on steep slopes.

1.3.4 Land Use

The city of Sumner is currently in a transition phase from a largely agricultural-based community to a mixed community of commerce, industry, agriculture, and various types and densities of housing. Recent population estimate for Sumner is 8,504 (United States Census 2000). Sumner's population is estimated to be 9,881 in 2009.

The population density is greatest within the city limits; however, there are large neighborhoods east and south of the city. Just to the north of the city center are some light industrial complexes, such as Costco, Golden State Foods, Shining Ocean, and Western Wood Preserving. Beatrice Cheese, previously the second largest water user, is closed indefinitely.

Outside of the city limits the main land use is agricultural. Homes in these areas are concentrated along main roads. Other uses in the rural areas include storage lots, hobby farms, turf farms, trucking, and other businesses requiring large storage yards. Hillside residences are generally confined to the tops and bases of the hills where the land is more suitable for development.

A portion of the Sumner water service area is located within unincorporated Pierce County. The County's zoning within these areas include Moderate Density Single Family, Community Center, and Employment Center (Urban); Rural 10 (Rural); and Agricultural Resource Lands (Natural Resource). This information is illustrated in Figures 1-2 and 1-3.

The Sumner water service area that is located within the City of Edgewood municipal boundaries is zoned single-family residential.

Industrial-zoned areas represent most of the land use north of the City's central core and downtown area. The approximate relative magnitude of existing land uses based on City and Pierce County zoning (within Sumner's Urban Growth Area [UGA]) is:

- Single-Family Residential: 24 percent
- Commercial: 13 percent
- Industrial: 30 percent
- Multifamily Residential: 8 percent
- Agricultural: 25 percent

Figure 1-2 shows the Comprehensive Plan Map. Many of the existing agricultural uses in the north end of the city were recently converted to light industrial/commercial uses. Figure 1-3 shows the Zoning Map.

1.3.5 Land Use, Zoning, and Service Area

The City of Sumner established the Sumner UGA in 1997 in cooperation with Pierce County and surrounding communities. The Land Use Section (Part IV) of the *City of Sumner Comprehensive Plan* was developed in accordance with the Growth Management Act to address land use within the city. The Land Use Section has also been developed in conformance with countywide planning policies.

A majority of the area in the service area is located within Sumner city limits. Existing and projected land use for the areas located in city limits includes residential, commercial, and industrial development, as shown in zoning and land-use figures (see Figure 1-2 and Figure 1-3). The existing land use for service area located within unincorporated Pierce County consists primarily of Agricultural Resource Land and Rural 10 land use designations, as well as Master Planned Community, Moderate Density Single Family and Neighborhood Center. The existing land use for service area located within the City of Edgewood is zoned Single-Family Residential.

1.4 FUTURE SERVICE AREA

The City of Sumner future service area is generally bounded on the east and west by the steep hillside terrain, on the north by the City of Pacific, and on the south by the Puyallup River and Annis Bowman Road. Recent negotiations with the City of Bonney Lake and Mountain View-Edgewood Water Company have resulted in boundary revisions to the City of Sumner service area (see Figure 1-4).

The City of Sumner future service area is in agreement with the *Pierce County Coordinated Water System Plan*. The City's Growth Management Act Boundaries are defined by the City's Comprehensive Plan. Figure 1-4 shows the location of the proposed future Sumner water utility service area.

Future growth is expected to follow a pattern similar to other river basin communities in Western Washington, with agricultural lands being developed for commercial, residential and industrial purposes.

Figure 1-3 shows maximum build-out land use based on the City's 2007 zoning map, Pierce County zoning designations, and zoning designations for the City of Edgewood. An industrial land-use class has been added in addition to the land-use categories from the previous land-use map. In years before maximum build-out, industrial developments will be mixed with agricultural uses.

1.5 RELATED PLANS

1.5.1 City of Sumner 1993 Water System Plan

This plan established a capital improvement program based on expected growth in the Sumner service area and water system development needs. Recommendations of this plan have been substantially carried out. Where implementation was deferred, recommendations were updated as appropriate and carried forward in this plan.

1.5.2 Pierce County Coordinated Water System Plan (CWSP) and Regional Supplement, 2001

This plan was developed to present a unified approach to water resource development in Pierce County. The Sumner Water System Plan follows the recommendations of the Pierce County Coordinated Water System Plan (CWSP) and is in agreement with CWSP policies. Concurrence with the CWSP will be discussed where appropriate in the text of the Sumner Water System Plan.

1.5.3 City of Tacoma Water System Plan and Intertie

The Tacoma Water System Plan document presents an implementation plan for the City of Tacoma. Of particular importance to Sumner are Tacoma's plans for new transmission piping and the potential for an intertie between the two utilities. Concurrence with the Tacoma Water System Plan will be discussed where appropriate in the text of the Sumner Water System Plan.

1.5.4 City of Puyallup Water System Plan

This plan presents the overall planning effort for the City of Puyallup and should be used to determine the potential for cooperative interties between the two utilities and resolution of service area conflicts.

1.5.5 Washington State Department of Ecology Instream Flow Requirements (WAC 173-510)

This WAC lists the minimum required instream flows for the Puyallup River Basin. Of interest to Sumner are the flows required in Salmon Creek and the resultant impacts on spring-water availability. WAC 173-510 is discussed in Chapter 5 under "Water Rights."

1.5.6 City of Pacific Water System Plan, September 2008

The City of Pacific Water System is located north of Sumner with an estimated 1,622 connections and the City encompasses an area of 1,587 acres. The City of Pacific's potable water infrastructure is connected to Sumner's water system with two separate interties.

1.5.7 Webstone Water System Plan, 1995

The City of Pacific assumed the Webstone Water District in 2002. Following assumption of the district, Sumner entered into a Memorandum of Agreement with the City of Pacific to acquire the Webstone service area outside of Pacific city limits.

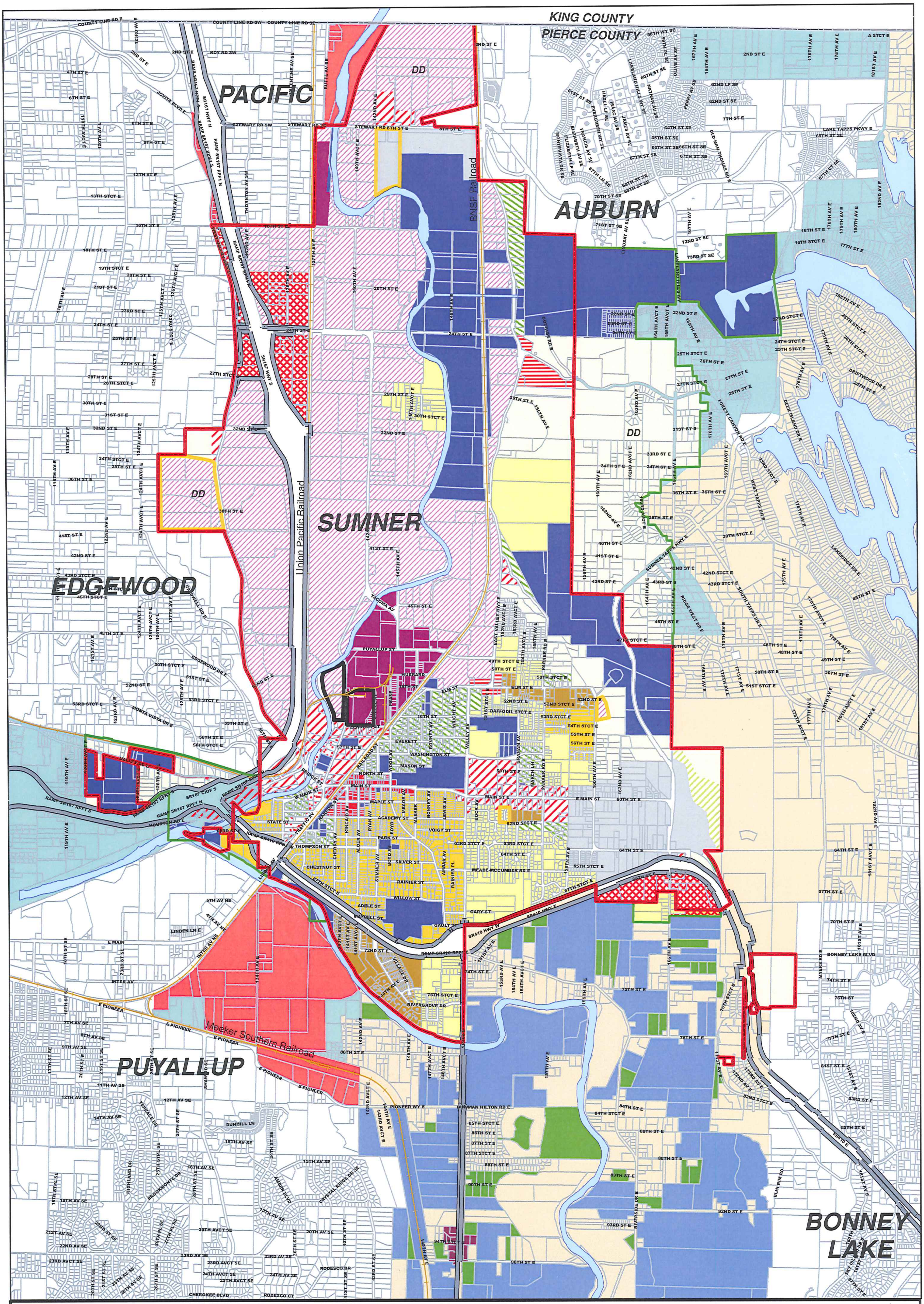
Per the 1995 Webstone Water District Comprehensive Plan, the district maintained approximately 170 connections located within Sumner and Pacific city limits. The district had no sources or storage facilities and depended entirely on Sumner and Pacific for daily and emergency demands.

1.5.8 Pierce County Comprehensive Plan, 2007

This plan was developed in response to the requirements of the Washington State Growth Management Act. The City of Sumner provides water service to unincorporated Pierce County. Compliance with policies outlined in the Pierce County Comprehensive Plan and applicable Pierce County codes is required when providing water service within Unincorporated Pierce County limits.

1.5.9 City of Edgewood Comprehensive Plan, 2006

The City of Edgewood created a Comprehensive Plan to establish clear intent and policy base to develop and interpret City regulations. The City of Sumner supplies water service to portions of incorporated City of Edgewood. Compliance with the City of Edgewood Comprehensive Plan, policies, and applicable City ordinances is required when providing service within Edgewood city limits.



Parametrix
Figure: 1-2
City Of Sumner
Comprehensive Plan Map

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ORDINANCE NO: 2276
PLOTTED ON: 12-03-2008, JAM

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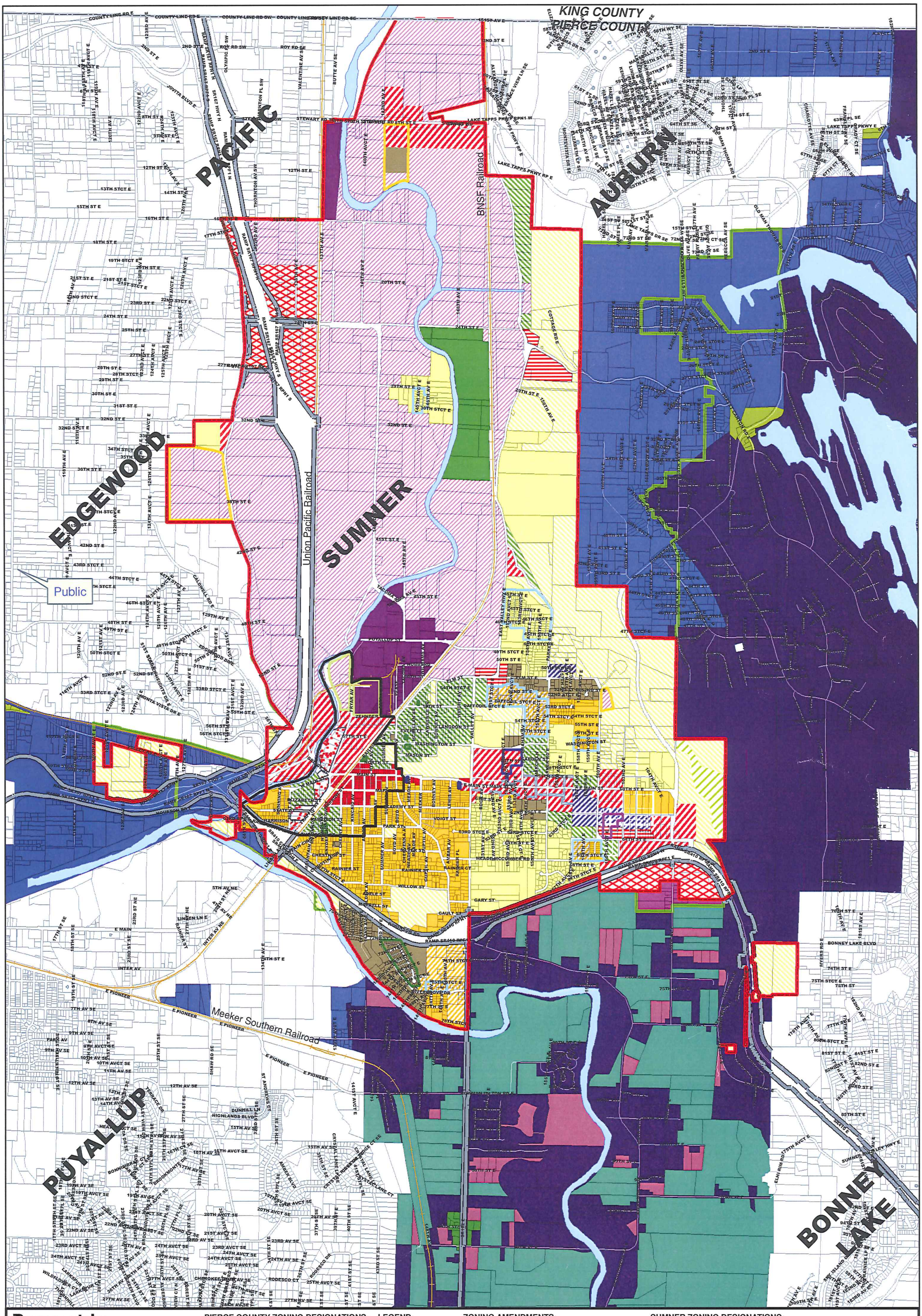
PIERCE COUNTY COMPREHENSIVE PLAN DESIGNATIONS:
- Agricultural Resource Land
- Community Center
- Employment Center
- Moderate Density Single Family
- Mixed Use District
- Rural 10
- Rural Farm
- Rural Neighborhood Center

LEGEND:
- Sumner City Limits
- Urban Growth Boundary
- Highways
- Railroads
- Tax Parcels
- Proposed Mixed Use Development
- Special Restrictions & Agreement

COMPREHENSIVE PLAN DESIGNATIONS:
- Central Business District
- General Commercial
- Interchange Commercial
- Neighborhood Commercial
- Mixed Use Development
- Heavy Industrial
- Light Industrial
- High Density Residential
- Medium Density Residential
- Low Density Residential 2
- Low Density Residential 1
- Residential Protection
- Urban Village
- Public-Private Utilities & Facilities



Parametrix
Figure: 1-3
City Of Sumner
Zoning Map

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SOURCE: City Of Sumner Comminity Develpment Deparment, 2008

ADOPTED: 12/01/2008
ORDINANCE NO: 2276
PLOTTED ON: 12/03/2008, JAM

PIERCE COUNTY ZONING DESIGNATIONS:

- Agricultural Resource Land
- Community Center
- Master Planned Community
- Moderate Density Single Family
- Neighborhood Center
- Rural 10
- Rural Farm
- Rural Neighborhood Center

LEGEND:

- County Limits
- Sumner City Limits
- Town Center Area
- UGA_Sumner
- Railroads
- Tax Parcels

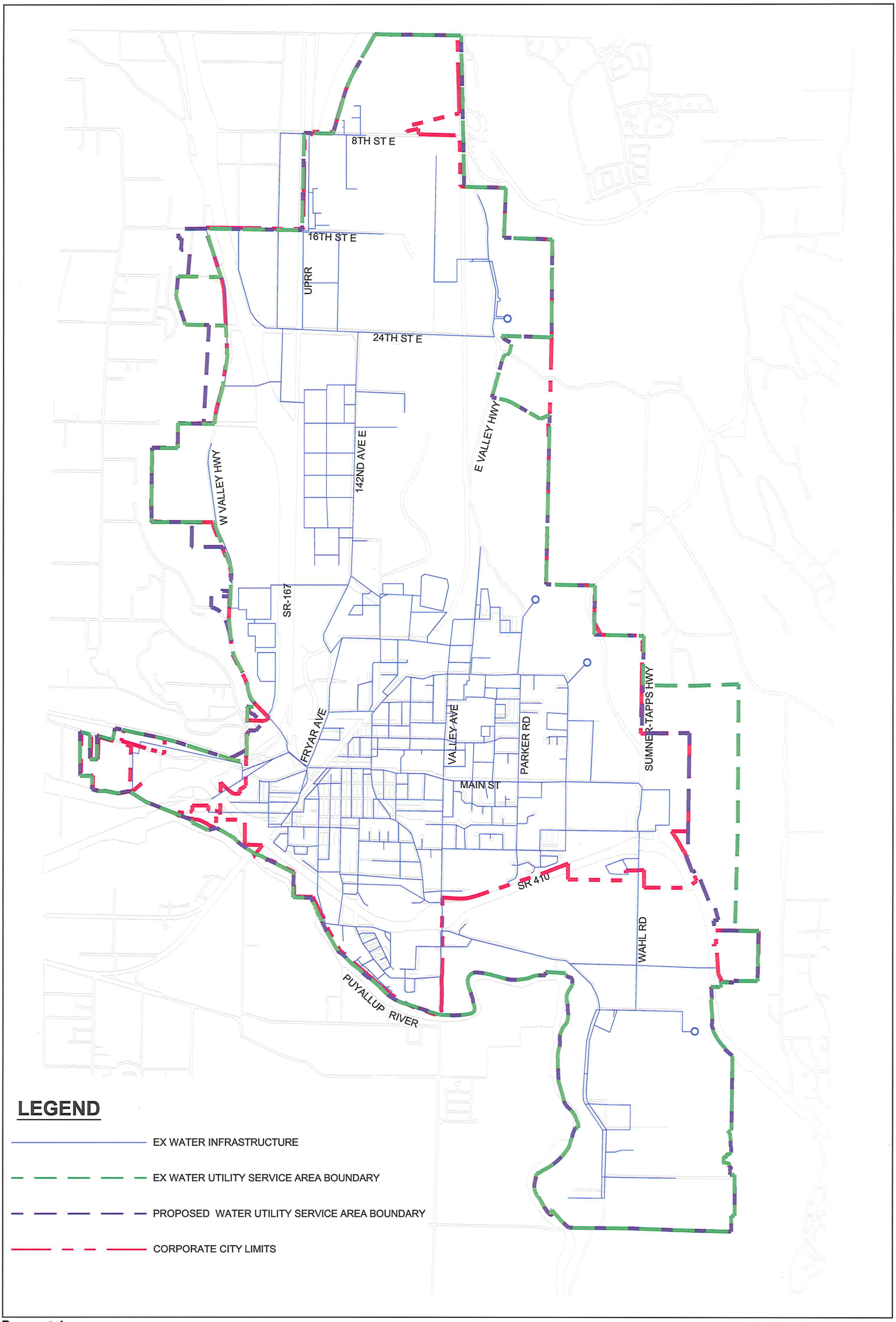
Scale: Not To Scale

ZONING AMENDMENTS:

- Cross-Access Cooridors/Combined Driveways (deeded)
- Cross-Access Cooridors/Combined Driveways (not deeded)
- Detached Single-Family Development
- Mixed Use Commercial
- Mobile Home Parks Allowed
- Special Restrictions & Agreement
- Traditional Neighborhood Design Option
- PMUD
- Highways

SUMNER ZONING DESIGNATIONS:

- Central Business District (CBD)
- General Commercial (GC)
- Interchange Commercial (IC)
- Neighborhood Commercial (NC)
- Mixed Use Development (MUD)
- Heavy Industrial (M-2)
- Light Industrial (M-1)
- High Density Residential (HDR)
- Medium Density Residential (MDR)
- Low Density Residential 12000 (LDR-12)
- Low Density Residential 8500 (LDR-8.5)
- Low Density Residential 7200 (LDR-7.2)
- Low Density Residential 6000 (LDR-6)
- Low Density Residential 4000 (LDR-4)
- Residential Protection (RP)
- Agriculture (AG)



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SCALE IN FEET

Figure 1-4
City of Sumner
Proposed Water Utility
Service Area Boundary

2. SERVICE AREA POLICIES

This chapter establishes procedures and policies that affect growth of the Sumner Water System. Conditions of service are given, and all new facilities shall be in accordance with City of Sumner Municipal Code Chapters 13.24, 13.28, 13.30, and 13.40, City of Sumner Development Specifications and Standard Details, and the *Pierce County Coordinated Water System Plan* (2001). The Sumner Municipal Code and Development Specifications will govern over the CWSP. Sumner Municipal Code Chapter 13.24 is related to general water system regulations, Chapters 13.28 and 13.30 are related to water infrastructure extensions and new water main installation requirements, and Chapter 13.40 is related to reimbursement agreements for infrastructure installation. Applicable Sumner Municipal Code Chapters are provided in Appendix B.

A number of changes in Washington State Department of Health (DOH) requirements have taken place since the City Ordinance and CWSP were amended in 2001. Recommended changes to these documents are identified below:

- All references to Department of Social and Health Services (DSHS) should be changed to reference Department of Health (DOH).
- References to WAC 248-54 should be changed to WAC 246-290.
- Section 13.24.020, "Definitions," of the Sumner Municipal Code (SMC) should be revised to include a definition for "unit."
- Section 13.24.300, "Rates for metered service within the city," of the SMC should be revised to match existing rates for monthly water service.
- SMC Section 13.24.230, "Service connection – No main in street," appears to conflict with SMC Section 13.28.010, "Size and expense of water mains and sewer trunk lines." The City Attorney should review and revise these SMC sections as necessary.
- The first paragraph of SMC Section 13.24.240, "All services to be metered," should be revised to state that the City will provide, install, and retain ownership of all service connection meters.
- SMC Section 13.24.240(C), "All services to be metered," should be revised to read "Water meters for services larger than 20 units shall be sized by a professional engineer licensed in the state of Washington and approved by the City Engineer prior to installation."
- SMC Section 13.28.020. "Installation charges," should be deleted.
- Section 13.30.010 of the SMC, "Pressure Requirement," should be revised to read "Water systems shall be designed to provide a design quantity of water at a positive pressure of at least 30 pounds per square inch (psi) under peak-hour demand (PHD) flow conditions measured at any customer's water meter. If fire flow is to be provided, the distribution system shall be designed to provide the required fire flow at a pressure of at least 20 psi during PHD conditions. A positive pressure shall be maintained throughout the entire system during fire flow conditions." [WAC 246-290-230, 249-290-420]

- The second sentence under SMC Section 13.30.050, "Blow-off valves," should be revised to read "The blow-off assembly shall be installed in the utility right-of-way, except where an access, construction, and utility easement is provided for in writing by the property owner to allow City water utility personnel access."
- Section 13.30.060, "Storage," of the Sumner Ordinance should be revised to read, "Sizing of storage facilities shall be adequate to provide for equalizing storage, standby storage, and fire storage."
- References to Pierce County or "applicable ordinance" in Section 13.30.070, "General facility placement," should be removed and changed to a specific City of Sumner ordinance or standard.
- Section 15.28.060, "Location and spacing," of the SMC should be revised to indicate average and maximum hydrant spacing shall be 330 feet and 660 feet, respectively.

In addition, an evaluation of the following subjects and a determination of whether to incorporate them in the ordinance should be made:

- Satellite System Management: The Sumner service area is completely surrounded by other purveyors. In the future, there may be areas that could be more easily and cost effectively served through a satellite-system procedure rather than connecting the new area to the existing system. These requirements should be established prior to a satellite system approaching the City.

Sections 2.1, 2.2, and 2.3 below list the provisions of City of Sumner Municipal Code Chapters 13.24, 13.28, 13.30, and 13.40 and the *Pierce County Coordinated Water System Plan* to aid prospective customers in identifying requirements and conditions of service.

2.1 GENERAL PROVISIONS

2.1.1 General Design Standards

Except as otherwise superseded in these standards, water system design, installation, modification, and operation are subject to the *Group A Public Water Supplies*, Washington State Department of Health, WAC 246-290.

2.1.2 General Material Specifications and Construction Standards

Except as provided in approved plans and specifications or in these minimum standards, selection of materials and construction of water system facilities in Sumner shall conform to the following, in order of hierarchy:

- Standard Specifications and Details Manual (City of Sumner, latest edition).
- *Standard Specifications for Road, Bridge, and Municipal Construction* (Washington State Department of Transportation/APWA latest edition).
- *Standards of the American Water Works Association* (AWWA).
- *National Fire Protection Association Standards* (NFPA).
- Manufacturer materials and equipment specifications and recommendations.

The City Engineer will make the final determination of all applicable standards. Copies of the City of Sumner ordinances applicable to the water system are contained in Appendix B. Water utility infrastructure construction specifications are contained in the *City of Sumner Development Specifications and Standard Details* document.

2.1.3 Fire Flow Requirements

Utility-based minimum fire flows by land use class with required duration are specified in the following Table 2-1:

Table 2-1. Utility-Based Minimum Fire Flows by Land-Use Class

Land-Use Class	Minimum Rate (gpm)	Minimum Duration (hours)
Medium- and Low-Density Residential	1,000	2
High-Density Residential and Commercial	1,500	2
Industrial	3,500	3
Existing High Fire Flow Buildings	4,500	4

Land-use-based fire flow requirements are based on the governing local ordinance and guidance by the East Pierce Fire and Rescue Fire Marshal. The developer is responsible for making up any deficiency between land-use-based and building-based fire flow requirements. Additional facilities and capacity for flow may be provided by the utility at the developer's expense to meet site requirements. Fire-resistant construction, sprinklers, and other fire protection measures may be used to reduce site-specific fire flow requirements. A new ordinance should be written outlining fire flow requirements.

3. HISTORIC AND PROJECTED WATER-DEMAND

3.1 INTRODUCTION

The objective of this chapter is to develop future population and land use projections for water-demands within the City of Sumner's water service area.

3.2 HISTORICAL POPULATION

Population growth of Sumner has increased from 1,200 residents at the turn of the century, to 8,504 residents in 2000, to an estimated 9,881 residents in 2009. Table 3-1 shows some of the historic populations for Sumner and the average annual growth rates.

Table 3-1. City of Sumner Population

Year	City Population	Population Change per Decade	Annual Population Growth (%)
1950	2,816	–	–
1960	3,155	339	1.1
1970	4,325	1,170	3.2
1980	4,936	611	1.3
1990	6,459	1,523	2.7
2000	8,504	2,045	3.2

The City's Planning Department has estimated that the total population of the City's Water Service Area will be approximately 14,350 in 2022 (based on the City's Comprehensive Plan, December 2005), and ultimate "build out" population of the City will be approximately 21,000. Table 3-2 is the population projection for the City of Sumner through the year 2029 based upon data provided by the City of Sumner Planning Department. An average annual population change decreasing from approximately 4.4 percent in 2009 to approximately 1.5 percent in 2029 has been used to project the population into the future.

Table 3-2. City of Sumner Population Projection

Year	Population	Annual Population Growth (%)
2009	9,881	4.4
2014	11,785	3.1
2019	13,435	2.4
2024	14,879	1.9
2029	16,153	1.5

3.3 HISTORICAL WATER CONSUMPTION

3.3.1 Service Meters

Service meters have been installed on all customer water connections in the Sumner water system. Customers are divided into seven separate classes: residential, commercial, schools, industrial, multifamily, church, and motels. In 1997, the multifamily category was added to separate the previous combined classification of motels, apartments, and multifamily. Multifamily dwellings include both duplexes and apartments. Table 3-3 lists the annual billed water use for each customer class between 1997 and 2008.

Figure 3-1 shows the annual average water use percentage in each customer class. This figure also shows Authorized Consumption and Distribution System Leakage (DSL) as a percentage of total water delivered to the system.

The historical water demand from each source was observed to remain relatively constant over a period between 1991 and 2008. Part of this "flat-line" could be attributed to the closure of Beatrice Cheese and to system conservation measures. Figure 3-2 represents the historical water demands of the system by contributing source.

3.3.2 Master Meters

In addition to service meters at each customer connection, the City of Sumner has a number of "master" flow meters located where source flow enters the distribution system. The master flow meters are connected to the City's SCADA system, and data is constantly being collected from these meters. Annual source production to the water system is shown in Table 3-4.

3.3.3 Station Meters

Station meters are located at metering vaults upstream of the storage tanks at Sumner and County Springs. Station meters utilize weir flow with head measured with transducers to record total spring flow (spring production) and spring bypass (bypass). The difference in these measured parameters is the spring flow to the system (system demand).

Spring Production Minus Bypass = System Demand

Instantaneous readings do not accurately reflect system demands, as the reservoirs fill and empty regularly.

Table 3-3. Water Billing Record Summary 1997–2008

Year	Single Family Residential (ccf) [a]	Commercial (ccf)	Schools (ccf)	Industrial (ccf)	Multi-Dwellings (ccf)	Church (ccf)	Motel (ccf)	Unclassified Consumption (ccf)[b]	Total Annual Use		
									ccf	gallons	gpd
1997 Total	443,473	87,515	36,028	92,300	–	4,318	133,120		796,754	596,011,830	1,632,909
1998 Total	286,346	96,482	23,961	113,686	141,500	5,295	3,053		670,323	501,435,120	1,373,795
1999 Total	284,286	81,572	29,408	39,430	125,765	4,451	3,403		568,315	425,128,036	1,164,734
2000 Total[c]											
2001 Total	264,897	86,346	34,610	17,763	132,915	6,469	3,685		546,685	408,947,714	1,120,405
2002 Total	281,606	95,563	13,803	23,375	114,831	6,587	2,824		538,589	402,891,501	1,103,812
2003 Total	311,641	114,235	18,697	44,860	128,418	6,758	1,807		626,416	468,590,489	1,283,810
2004 Total	296,261	129,225	15,280	48,259	117,797	6,327	1,844		614,993	460,045,514	1,260,399
2005 Total	280,776	136,559	13,350	49,807	122,219	5,242	2,000		609,953	456,275,342	1,250,069
2006 Total	281,732	148,238	15,785	51,383	120,491	5,313	2,347		625,289	467,747,436	1,281,500
2007 Total	271,092	155,928	23,950	42,882	133,881	8,438	2,739	28,220	667,130	499,046,626	1,367,251
2008 Total	267,501	147,934	19,711	46,146	113,418	6,218	2,821	16,376	620,125	463,884,439	1,270,916
Average (1997-2008)[c]	**297,237**	**116,327**	**22,235**	**51,808**	**113,749**	**5,947**	**14,513**	**22,298**	**644,114**	**481,829,459**	**1,320,081**

[a] ccf = 100 cubic feet

[b] The City began tracking Unclassified Consumption in 2007 for the WUE program. Unclassified consumption is an estimate of water used that doesn't fit within another category. It is typically water taken from hydrants for construction and maintenance uses. This water is typically not billed due to special agreements with the City.

[c] Year 2000 billing data disregarded due to reporting error in billing software.

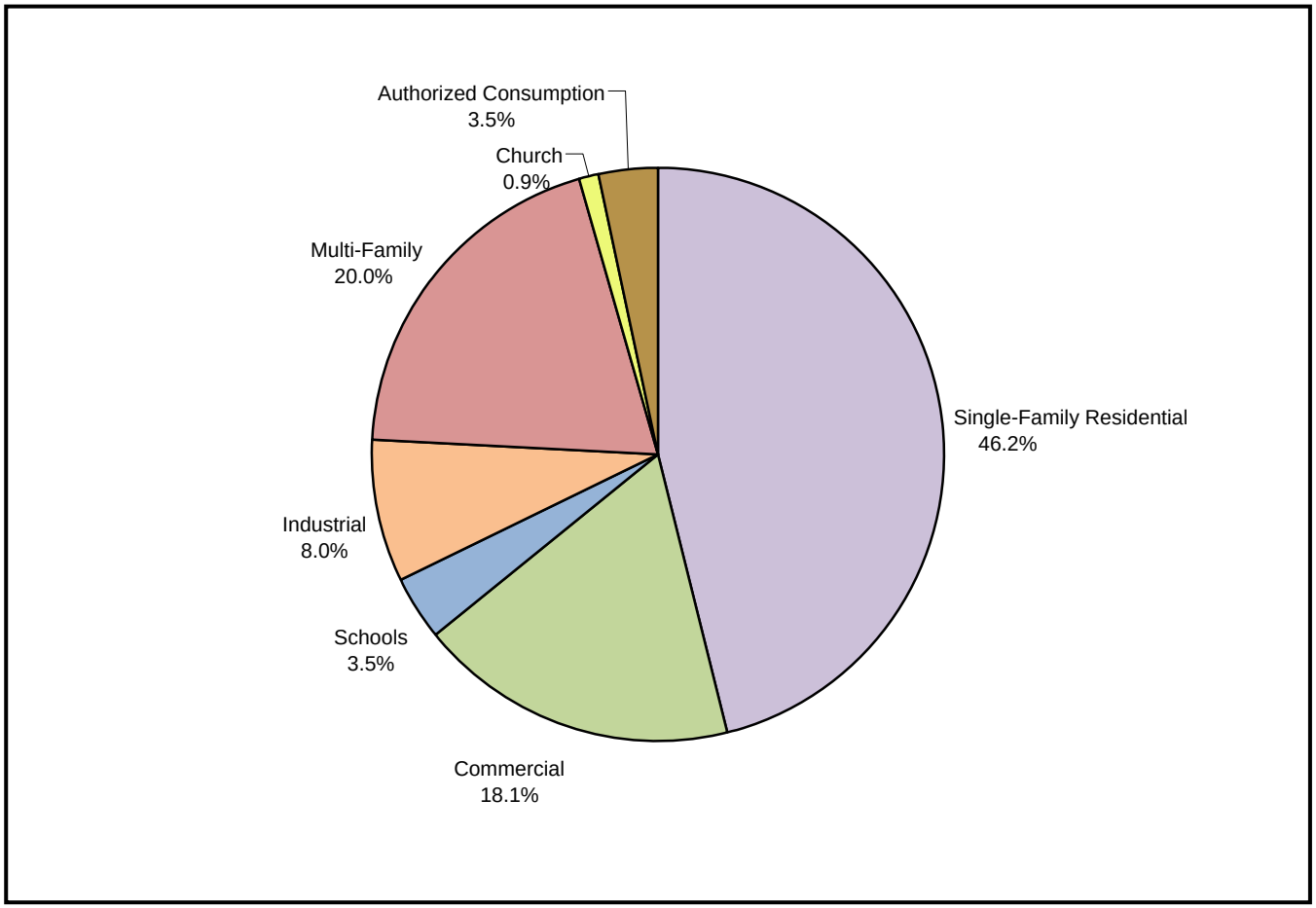
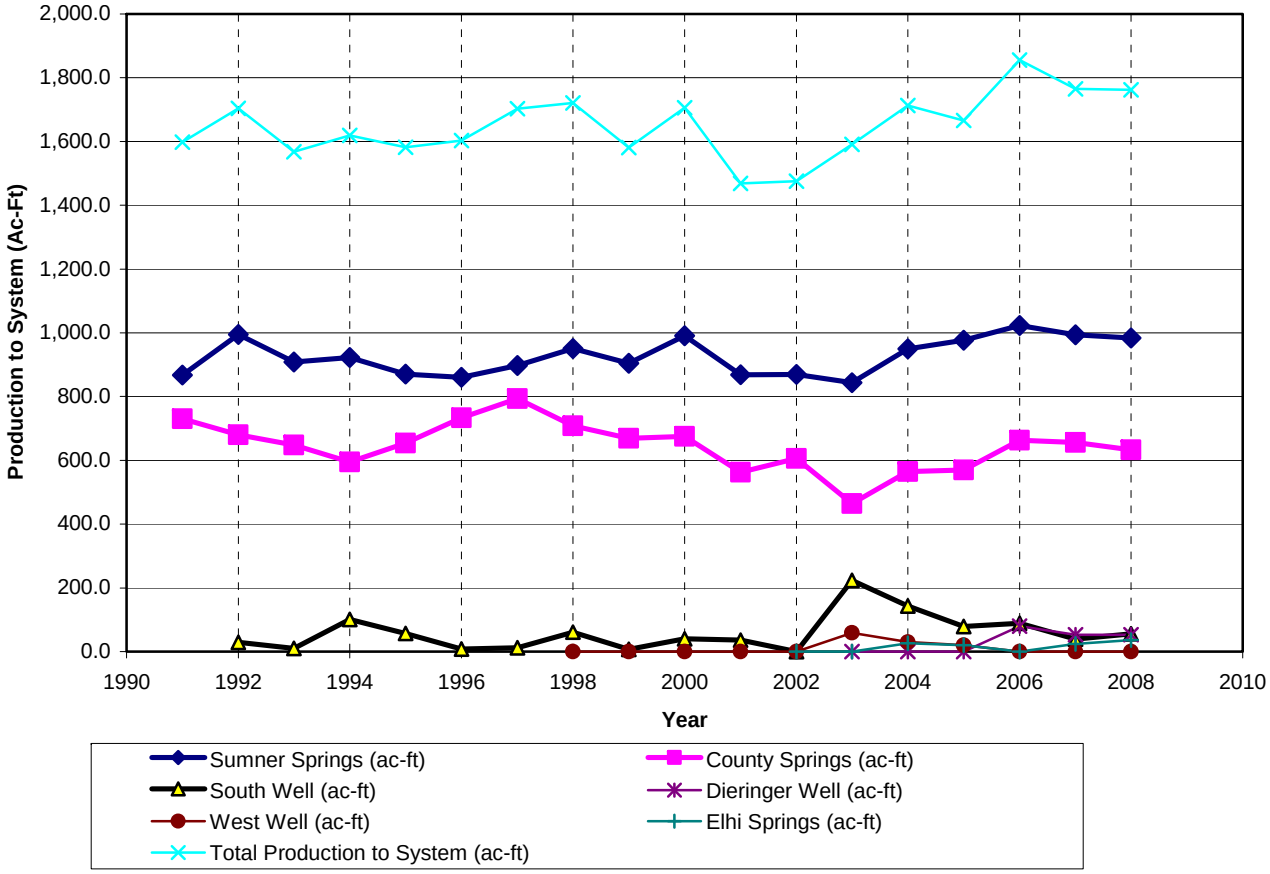


Figure 3-1. 1997 to 2008 Water Use by Category



(a) Sumner Springs production data adjusted as follows: March–May 1991: Use average of 1992–97; Jan,–April, and May 1998: Use average of 1992–97.

Figure 3-2. Annual Source Production to the System (1990 to 2008)[a]

Table 3-4. Annual Source Production to the System [a]

Year	Sumner Springs [b] (ac-ft)	County Springs (ac-ft)	Elhi Springs (ac-ft)	South Well (ac-ft)	Dieringer Well (ac-ft)	West Well (ac-ft)	Total Production to System (ac-ft)	Average Production to System (mgd) [c]
1991	867.6	730.0	–	-	–	–	1,597.6	1.426
1992	994.6	680.3	–	29.2	–	–	1,704.0	1.517
1993	909.2	648.3	–	10.4	–	–	1,568.0	1.400
1994	922.5	594.6	–	101.3	–	–	1,618.4	1.445
1995	870.4	653.8	–	57.1	–	–	1,581.3	1.412
1996	860.7	733.3	–	8.3	–	–	1,602.4	1.427
1997	898.1	793.7	–	11.7	–	–	1,703.5	1.521
1998	951.1	708.1	–	61.5	–	0.0	1,720.7	1.536
1999	904.6	668.7	–	7.5	–	0.0	1,580.8	1.411
2000	990.9	674.5	–	40.5	–	0.0	1,706.0	1.519
2001	869.1	562.9	–	36.5	–	0.0	1,468.4	1.311
2002	869.3	605.7	-	0.2	–	0.0	1,475.3	1.317
2003	843.2	464.5	-	224.0	0.0	59.2	1,590.9	1.420
2004	949.5	564.8	25.6	143.3	0.0	30.2	1,713.4	1.525
2005	976.6	569.8	20.4	79.6	0.0	20.0	1,666.4	1.488
2006	1,022.9	662.7	0.2	89.4	80.6	-	1,855.7	1.657
2007	993.6	655.6	24.4	39.0	52.8	0.0	1,765.3	1.576
2008	983.6	632.6	36.5	56.3	52.9	0.0	1,761.9	1.573
Average ('91-'08)	926.5	644.7	15.3 [d]	58.6	31.0	10.9	1,648.9	1.471
							Average (1997–2008) [e]	**1.485**

[a] Production data for Elhi Springs, South Well, Dieringer Well, and West Well based on available information for years when production went into the system.

[b] Sumner Springs production data adjusted as follows: March–May 1991: use average of 1992–1997; Jan, April, May 1998: use average of 1992–1997.

[c] mgd = million gallons per day.

[d] Elhi Springs' production data prior to 2004 not available.

[e] 1997–2008 Average Production utilized in projection calculations. Year 2000 data disregarded due to error in billing data.

3.3.4 Top Water Users

The top users of Sumner's water are included in Table 3-5. The annual water use for 2008 is included in this analysis. The largest single use of water in the system is Shining Ocean TWC.

Table 3-5. City of Sumner – Year 2008 Top 10 Water Users[a]

Rank	Account Number	Customer	Total Consumption (ccf)
1	005241-000	Shining Ocean	18,683
2	007618-000	Summerville	8,959
3	008167-000	Rainier Manor	6,223
4	007601-000	Crystal Springs	4,293
5	006497-000	Fred Meyer	3,369
6	006777-000	Stafford Suites	3,362
7	005198-000	Western Wood	3,001
8	008171-000	Redmond Mgr	2,959
9	008421-000	Costco	2,633
10	006838-000	Sumner School	2,519

[a] Information based upon City provided billing data.

3.4 AUTHORIZED CONSUMPTION AND DISTRIBUTION SYSTEM LEAKAGE (DSL)

Table 3-6 is a comparison of annual source production to the system data from master meters and demand data from service meters, therefore indicating Authorized Consumption and Distribution System Leakage (DSL). Accurate demand data is only available for years 1998 through 1999 and 2001 through 2008. Year 2000 billing data is suspect due to the fact that a new billing system was implemented that year. DSL can be attributed to leaks, fire flows, hydrant testing, or dead-end main flushing. A portion of DSL may also be a result of miscalibrated master meters at the sources.

Table 3-6. Source Production to the System Versus System Demand

Year [a]	Production (mg) [b]	Billed and Authorized Consumption (mg)	DSL
1998	560.7	501.4	10.6%
1999	515.1	425.1	17.5%
2001	478.5	408.9	14.5%
2002	480.7	402.9	16.2%
2003	518.4	468.6	9.6%
2004	558.3	460.0	17.6%
2005	543.0	456.3	16.0%
2006	604.7	468.0	22.6%
2007	575.2	498.9	13.3%
2008	574.1	463.9	19.2%
Total/Average	**5,408.8**	**4,553.9**	**15.8%**

[a] Year 2000 data not used in determining DSL due to error in billing data.

[b] mg = million gallons

In previous water plans, the average DSL was between 9 and 14 percent. Accuracy in this determination is dependent on the time period of overlapping data for consumption and demand. Long periods of record are desirable to increase the expected accuracy of the DSL. Short periods of overlapping data have error associated due to different schedules of reading the meters. This analysis is highly dependent on the accuracy of both source and service meters.

3.4.1 Water Loss Control Action Plan (WLCAP)

The City's DSL average (from 1998 to 2008) of 15.8 percent is above the DSL threshold of 10 percent designated by DOH's Water Use Efficiency Program, and therefore, requires the City to implement a Water Loss Control Action Plan (WLCAP). The plan is outlined as follows:

- Conduct a regular and systematic program of locating and repairing leaks in system mains and laterals, including on-site testing using computer-assisted leak-detection equipment on water-distribution mains, valves, services, and meters.
- Develop procedures to account for billing errors, both in the financial records and water use records.
- Conduct station and master meter calibration to verify that accurate system production is recorded.
- Conduct a quarterly review of water production and consumption.
- Standardize and organize the record keeping procedures between City departments including Shops, Public Works, and Finance in regards to water consumption
- Establish a policy (through SMC or city council-approved resolution) for water used during the testing, disinfection, and flushing procedures at construction sites that measures the authorized consumption for recording and billing purposes.

These actions will be ongoing and continue until (and likely after) the City reaches an allowable DSL average based on a 3-year period. This plan includes costs for the WLCAP in the Capital Improvement Plan outlined in Chapter 8.

3.5 EQUIVALENT RESIDENTIAL UNITS

Equivalent residential units (ERUs) are defined as the amount of water consumed by a typical single family residence. The DOH requires that water purveyors convert current and projected water usage into ERUs. The water use for each ERU was determined by taking the average daily use per residential connection. A 11-year period from 1997 to 1999 and from 2001 to 2008 was used to calculate the average use per residential unit. As stated above, billing data (demand) was determined to be inaccurate in 2000 due to changes in billing software; therefore, year 2000 data was not used in determination of the ERUs. Average billed water use per residential connection was calculated as follows:

- Average daily demand (ADD) for residential use (1997 to 2008) = 609,174 gallons per day (gpd).
- Average number of residential connections (1997 to 2008) = 2,691 connections.
- Average billed use per residential connection = 226.4 gpd per residential connection.

The average residential use of 226.4 gpd is relatively close to nearby water purveyors. The City has not adjusted residential consumption records when making adjustments to billing inaccuracies.

The total number of ERUs is applied to the entire system by comparing the average daily demand to the use per residential unit. In order to account for DSL of 15.8 percent, the actual water use per ERU includes the average DSL. The total system ERUs are therefore calculated by increasing the average water use per dwelling unit by the demand ratio of the water measured at the source to the water billed from 1997 to 2008 as follows:

- Average Billed per Residential Connection = 226.4 gpd per ERU.
- Average System Billing = 1,282,691 gpd.
- Average Total System ERUs = 5,666.
- Average System Demand at Source = 1,484,623.
- Adjusted use per ERU = 262 gpd per ERU.

By using a value of 262 gpd per ERU, growth projections therefore include DSL.

3.6 PROJECTED WATER DEMAND

3.6.1 Average Daily Demand

A system-demand increase based on the population projections described earlier was used to estimate future water demands. This is consistent an analysis of water-demand projections using land-use classifications. The projected water demands through year 2029 are included in Table 3-7, utilizing a growth rate described in Section 3.2 above for the entire 20-year planning period.

Table 3-7. Water-Demand Projections[a]

Year	Average Daily Demand (mgd)
2008	1.57
2009	1.71
2010	1.78
2011	1.85
2012	1.91
2013	1.97
2014	2.03
2015	2.08
2016	2.14
2017	2.19
2018	2.25
2019	2.30
2024	2.53
2029	2.74

[a] Assuming demand increases proportional to population projections, and without conservation savings.

3.6.2 Maximum Daily Demand

Maximum daily demand utilizes a minimum peaking factor that is required by DOH. Maximum day demands were measured from the station meters from 1999 to 2008 and showed an average maximum-day demand just slightly lower than 2.00. Table 3-8 includes the date of historical use compared with the annual average-day demand for the year. A peaking factor of 2.00 was used for maximum-day-demand estimates.

Table 3-8. Historical Maximum-Day Demands

Date	Maximum Daily Production (mgd)	Day of Week	Average Daily Production (mgd)	Maximum-to-Average Factor
August 21, 1999	3.00	Saturday	1.411	2.13
September 7, 2000	3.44	Thursday	1.519	2.26
July 1, 2001	2.10	Saturday	1.311	1.60
August 19, 2002	3.40	Monday	1.317	2.58
July 28, 2003	2.64	Thursday	1.420	1.86
July 24, 2004	2.68	Thursday	1.525	1.75
August 4, 2005	2.65	Thursday	1.488	1.78
July 25, 2006	3.09	Monday	1.657	1.87
July 11, 2007	2.87	Wednesday	1.576	1.82
August 6, 2008	3.16	Wednesday	1.569	2.02
		Average Maximum-to-Average Factor:		**1.97**

Source: City of Sumner

City staff checks the production records daily. The City has station meters on the spring sources to measure actual production to the system. The older station meters at the springs, which measure total source production and bypass, are maintained and upgraded to allow back check of the station meters.

In calculating the maximum-to-average factor, this document includes the production from 1999 to 2008. The average peaking factor for these years was approximately 1.97. Although this number is reasonable, DOH requires a minimum of 2.0 for the maximum-day demand.

As recommended in the Capital Improvement Program, the City of Sumner will continue to develop methods that accurately record daily water production to better facilitate future planning. According to the City's WLCAP in Section 3.4.1, quarterly review of water production and billing use records will be made to check conformance between the amounts produced and the amounts billed.

3.6.3 Peak Hourly Demand

Due to unavailable meter data that would indicate maximum instantaneous water use, the DOH *Water System Design Manual* suggests using the following equation to calculate the peak hour demand (PHD).

$$PHD = MDD/1{,}440 \times [(C)(N) + 225] + 18$$

Where:
- MDD = *Maximum daily demand (gpd/ERU)*
- C = *Coefficient associated with the number of ERUs (1.6)*
- N = *Number of ERUs*

The peak hour demand is important when estimating the required equalizing storage. Sumner has storage available for the 20-year planning horizon in which peak hourly demand can be accommodated with available storage.

Table 3-9 summarizes the projected system demands from year 2009 through year 2029. The table includes the residential population; the number of ERUs within the system; and the average-day-demand, maximum-daily-demand, and peak-hour-demand calculations.

Table 3-9. Projected System Demands

	2009	2014	2019	2024	2029
Residential Population[a]	9,881	11,785	13,435	14,879	16,153
Estimated Residential Connections	3,359	4,017	4,587	5,087	5,527
System Production ERUs	6,524	7,733	8,766	9,669	10,466
Average-Day Demand (ADD) (mgd)[b]	1,714,753	2,027,015	2,297,642	2,534,441	2,743,381
Maximum Daily Demand (MDD): • DOH Guideline Method (mgd)[c]	3,429,506	4,054,030	4,595,285	5,068,882	5,486,762
Peak-Hour Demand (PHD): • DOH Guideline Method (gpm[d])[e]	3,910	4,604	5,206	5,732	6,196

[a] Population projections based on information provided by City Planning Department and described in Section 3.2.

[b] Average-demand requirement. Started with actual average use from years 1997 to 2008 and population projection increase.

[c] DOH *Water System Design Manual*, August 2001. MDD = 2*ADD.

[d] gpm = gallons per minute.

[e] PHD = (MDD/1,440)[1.6*N+225] + 18. Use peak to average day factor in MDD.

4. WATER SYSTEM INVENTORY

This chapter begins with a brief history of the Sumner water system. Although much is missing from the abbreviated history, it does show the historical perspective to past improvements and provides insight into the logical progression of future improvements. Following the history treatise, all components of the water system will be discussed and relevant physical features summarized, including those for source, storage, and transmission. The relationship among the system components will be detailed, and effectiveness and condition of the facilities will be addressed where lacking.

4.1 HISTORY OF THE WATER SYSTEM

In 1883, George H. Ryan recorded a deed to the timbered hills 1/2 mile northeast of the present city. Ryan built a sawmill and constructed a gravity-water-supply system. The water supply at Ryan's Mill was carried to the town through logs approximately 15 inches in diameter and 15 feet long with a 2-1/2-inch hole bored through the length of each log.

On December 24, 1889, the Sumner Light and Water Company was incorporated and took over the management of Ryan's Sumner Lumber Company water system. Ryan later became the town's first mayor in 1892. In 1893, the water system was sold to A. Brier Wood. The town government wanted to purchase the water system but was unable to finance the purchase as a public utility. It was not until 1905 that the town voted to purchase the water system with a bond issue of $7,000.

The first drinking water ordinance was passed February 1907, which provided for the creation of a water department, appointment of a superintendent, and fixed water rates with a minimum fee of $1 per month.

Soon the town began to industrialize. Lake Tapps was created by enlarging five lakes on the plateau east of Sumner. Puget Power and Light installed a power generation station. Fleischmann's Yeast, Northern Board and Paper Company, and several other large manufacturing companies established facilities in the northern factory district.

By 1920, the wooden-stave, turn-of-the-century water system was inadequate. In May 1921 the town authorized a bond issue of $45,000 to rebuild the system, again using wooden-stave pipe.

In July 1928, newly elected officials took office. This event marked a great change in policy and operations of the water department. The new mayor, Frank B. Weick, was a civil engineer from Tacoma who resided in Sumner. Mayor Weick made a very emphatic address to the new town council urging the discontinuation of using water department funds to keep the tax levy down. He proposed instead to use the revenues to provide a better water distribution system as well as fire protection to the factory district, which was outside the corporate limits at that time. Mayor Weick proposed to gradually replace the wooden water mains with longer-life pipes.

The new town council gave the mayor its support, and 2,760 linear feet of pipe was laid in 1929 in the factory district with fire hydrants spaced to conform to the recommendations of the underwriters. The factory district was incorporated into the town limits, and several months later Sumner qualified to become a city.

The schedule for replacement of wooden water mains began in 1930 and was faithfully maintained throughout the Depression years. By the time of maturity of the last bonds (1941) from the 1920 issue, the last of the wooden mains were replaced by cast iron or asbestos cement pipe. Over the years the system has been expanded further, including recent

expansion north along 142nd Avenue East with a 14-inch-diameter ductile iron main, a system developed to serve the eastern residential portions of the city and the REI complex near 45th Street East, construction of a 2 mg reservoir in north Sumner east of the East Valley Highway, and 12-inch-diameter to 16-inch-diameter ductile iron extensions north on West Valley Highway and East Valley Highway.

The City of Sumner acquired all Fowler Mutual Water Company assets, water service area, and water customers on July 2, 2001, through a Water Service Agreement. A copy of this agreement is provided in Appendix A.

On September 4, 2001, the City of Sumner adopted "A RESOLUTION DECLARING INTENT TO SUPPORT THE CITY OF PACIFIC'S ASSUMPTION OF THE WEBSTONE WATER DISTRICT AND THE SUBSEQUENT TRANSFER OF THE DISTRICT'S SERVICE AREA IN SUMNER AND SUMNER'S URBAN GROWTH AREA TO THE CITY OF SUMNER." The City of Pacific adopted Ordinance No. 1518 on March 4, 2002. Ordinance No. 1518 authorized the City of Pacific to begin dissolution of the Webstone Water District and to assume ownership of said district, including all assets, service area, and responsibilities. The Webstone Water District has been completely absorbed by the City of Pacific and City of Sumner systems (i.e., Webstone system located within Sumner's service area was transferred to City of Sumner).

4.2 PAST SPRING AND WATERSHED IMPROVEMENTS

In 1889, the spring headworks of the Sumner Light and Water Company consisted of 17.8 acres of forested hillside northeast of the city. In 1934, Sumner was able to purchase another 30 acres. At that time, the headworks of the Puyallup Springs were to the north. To the south, four or five private water systems were developed (Weber and Ritter, County, etc.). The headworks were fenced in 1937.

In 1938 and 1939, the federal Works Project Administration (WPA), employing out-of-work miners, drove tunnels into the hillside to intercept a greater portion of the four largest springs of the Sumner system. These tunnels extended from 50 to 120 feet, and interception facilities with large culverts carried the spring water to a head house. From the head house, a 14-inch water main leads to the city. Prior to the WPA work on the springs, the flow was approximately 2 million gallons per day. After completion of the improvements, the flow weir at the head house showed approximately 3 million gallons per day. From the time of the WPA improvements until 1980, the springs required few changes, although County, Weber, and Elhi Springs were purchased in 1968.

Passage of the Safe Drinking Water Act in 1974 precipitated efforts by the City to protect and improve their water supply sources. Water system plans in 1975, 1980, and 1985 identified a need to capture a greater portion of the springs and improve their sanitary condition. The 1985 Water System Plan made the following recommendations (Parametrix 1985):

- Chlorination at Sumner and County Springs.
- Watershed fencing for protection from vandalism and unlawful entry.
- Repair of spring taps and collection boxes in order to collect a greater portion of the spring flow and protect surface runoff from entering the collection works.
- Predesign engineering report detailing needed improvements.

A predesign engineering report addressing the fourth bullet, titled *Water Supply Improvements, Spring Protection and Chlorination*, was completed the following year (Parametrix 1986). This report identified in greater detail needed improvements to Sumner, Weber, and County Springs. No improvements were outlined for Elhi Springs in the predesign engineering report.

All recommendations in the predesign report were completed by 1989, although watershed fencing was limited to access points and those areas adjacent to roads and highways. Source improvements for each system were as follows:

- Sumner Springs:
  - Chlorination facilities added.
  - New flow metering system added.
  - Broken pipes slip lined and repaired.
  - Surface drainage improved.
  - Watertight access doors placed on all collection/tap boxes.
- Weber Springs No. 1:
  - New spring tap with Hypalon liner provided.
  - System tied into Sumner Springs.
- Weber Springs No. 2:
  - Existing holding tank abandoned.
  - Existing pipes abandoned.
  - Spring taps improved.
  - Surface drainage improved.
  - Watertight access doors placed on all collection/tap boxes.
  - New spring tap with Hypalon liner provided.
  - System tied into County Springs.
- County Springs:
  - Chlorination facilities added.
  - 68,000-gallon chlorine contact tank installed.
  - New flow metering system added.
  - Broken pipes slip lined and repaired.
  - Surface drainage improved.
  - Watertight access doors placed on all collection/tap boxes.
  - New spring tap with Hypalon liner provided.
- Entire Sumner/Weber/County Spring System:
  - Fenced along Sumner-Tapps Highway and at access points along the valley.
  - Gates installed at all vehicle access points.

The City of Sumner completed source improvements at Elhi Springs in 2003. Source improvements included:

- Chlorine facilities added, including continuous chlorine residual monitoring equipment and instrumentation/control.
- Chlorine contact tanks added.
- Booster pump added to raise the hydraulic grade line of the Elhi Springs to the rest of the Sumner potable water sources.

4.3 WATER SYSTEM OVERVIEW

A schematic of the Sumner Water System is shown on Figure 4-1. The system currently consists of a pressure zone with a hydraulic grade line of approximately elevation 234 and a second pressure zone supporting the Sumner Viewpoint development at approximately elevation 393. Table 4-1 lists the capacity of all sources in the Sumner water system.

Table 4-1. Sumner Potable Water Source Capacities

DOH ID Number [a]	Source Name	Source Type	Source Capacity (mgd)
SO 1	Sumner Springs	Free-Flowing Spring	1.15[b]
SO 3	Elhi Springs	Free-Flowing Spring	0.13[c]
SO 4	County Springs	Free-Flowing Spring	0.71[b]
SO 5[e]	West Well	Artesian Well	0.36[d]
SO 6	South Well	Artesian Well	1.01[d]
SO 7	Dieringer Well	Artesian Well	0.36[d]

[a] DOH source number SO 2 is Weber Springs. Flow from Weber Springs combines with Sumner and County Springs.

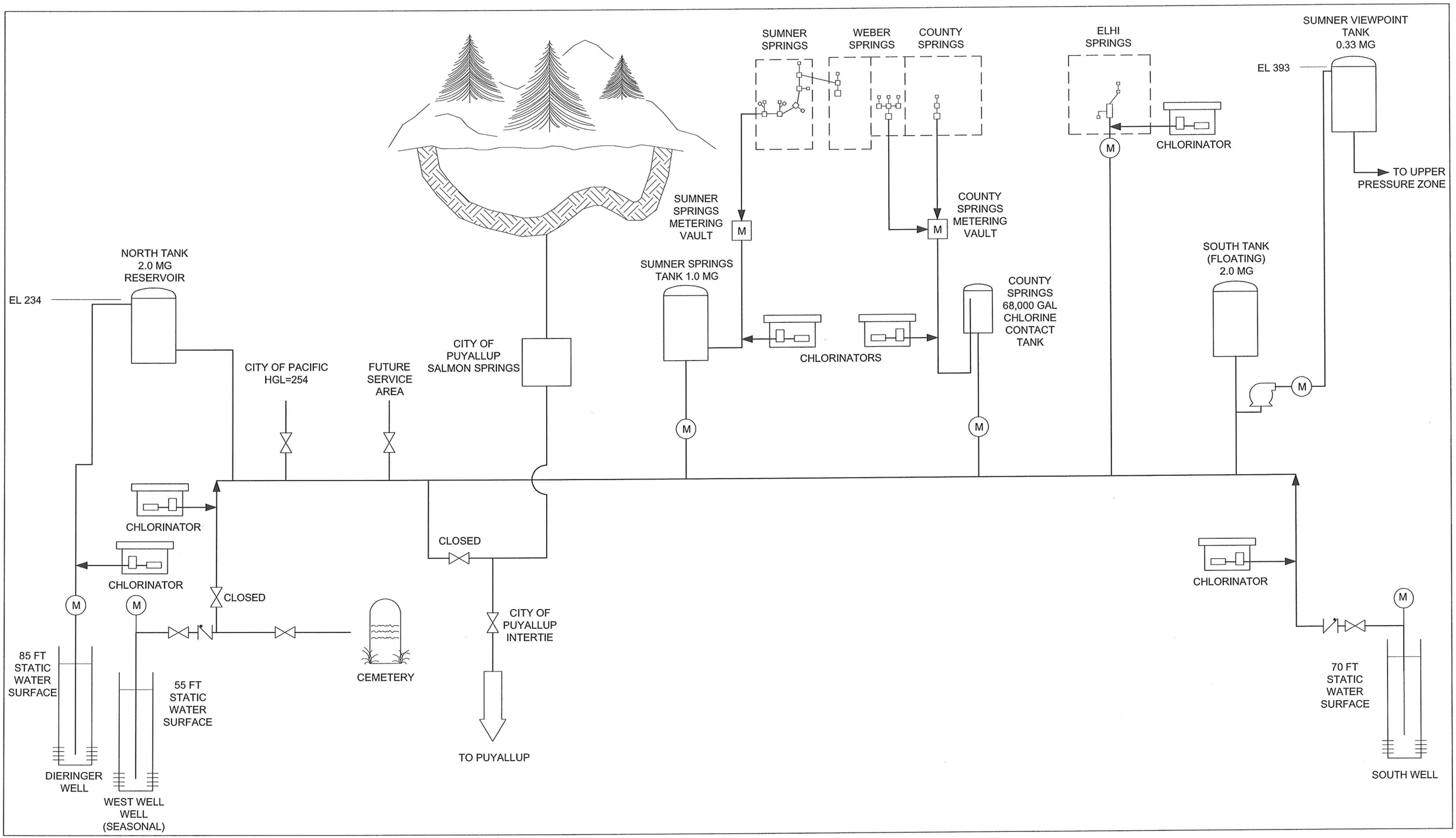
[b] Source capacity based on historic station meter readings.

[c] Source capacity based on City records.

[d] Source capacity based known well pump capacity.

[e] The City is in the process of submitting a change of use application for the West Well to change the water right from irrigation to domestic use. The West Well is currently utilized for domestic use only during times of extremely high use/drought. The change of use application is pending a ruling from the Washington State Supreme Court on the Municipal Water Law.

Construction was recently completed on the Sumner Viewpoint development, which created a separate pressure zone within the Sumner water system at approximately elevation 393. This development is located outside of Sumner city limits, but within the current water service area off SR 410. The development includes a booster station at the South Tank site that pulls potable water from the South Tank inflow line and pumps it to a 330,000-gallon reservoir located at the Sumner Viewpoint site, establishing an approximate hydraulic grade line of 393 feet. The pump station and reservoir were sized to accommodate a maximum build-out of 120 ERUs in the Sumner Viewpoint development.



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LEGEND:

(M) METER

SPRING TAP

Figure 4-1
City of Sumner
Water System Schematic

4.4 DISTRIBUTION NETWORK

The distribution system consists of approximately 934 pipes ranging in size from 2-inch diameter to 18-inch diameter. The approximately 85 miles of pipe also vary in age and material. Detailed maps of the distribution network are maintained and updated by the City. These water system maps show pipe diameters, pipe materials, locations of hydrants, valves, and abandoned pipes, and give the year of installation for most pipes. The approximate length and percentage of each pipe size in the distribution network is listed in Table 4-2.

Table 4-2. Distribution Network Inventory (November 2001)

Pipe Sizes (inches)	Length (feet)	Percentage
2	6,282	1.4
3	1,339	0.3
4	6,177	1.4
6	110,920	24.9
8	144,590	32.4
10	3,701	0.8
12	150,829	33.8
14	11,391	2.6
16	5,217	1.2
18	5,557	1.2
Total:	**446,003**	**100.0**

4.5 SPRING COLLECTION WORKS

4.5.1 Sumner Springs

The current Sumner Springs collection works are shown approximately to scale on Figures 4-2, 4-3, and 4-4. There are five spring taps. The spring taps feed into collection boxes, which pass the flow on to the downstream collection box through a common header pipe. All tap boxes may be manually bypassed in the event a single spring tap becomes contaminated or otherwise undesirable. From the header pipe, the spring flow passes into a metering vault where the flow is split between wastage to Salmon Creek and water for distribution. An access road, which turns into a footpath, parallels the spring taps. Surface water is collected and diverted away from the spring taps via perforated pipes and culverts. In general, the Sumner Springs collection works appear to be in good condition. Section 5.6, "Minimum Sanitary Control Area Survey," will discuss Sumner Springs in further detail. Operational information for Sumner Springs is discussed in Chapter 12, "Operations Program."

4.5.2 Weber Springs

The current Weber Springs collection works are shown approximately to scale on Figures 4-5 and 4-6. Figure 4-5 shows Weber Springs No. 1, which feeds into spring tap ST-7 of the Sumner Springs system. Figure 4-6 shows Weber Springs No. 2, which feeds into the metering vault of the County Springs system. There is one spring tap at Weber Springs No. 1 and three spring taps at Weber Springs No. 2. For the purpose of this document, the Weber Springs is not evaluated as a separate source but is considered to be part of Sumner and County Springs. As with Sumner Springs, the spring taps feed into collection boxes, which

pass the flow downstream to the next collection box through a common header pipe. All tap boxes may be manually bypassed in the event a single spring tap becomes contaminated or otherwise undesirable. Surface water is collected and diverted away from the spring taps via perforated pipes and culverts. The abandoned holding tank from the old Weber system is shown on Figure 4-5. An access road parallels the spring taps. In general, the Weber Springs collection works appear to be in good condition. Section 5.6, "Minimum Sanitary Control Area Survey," will discuss Weber Springs in further detail. Operational information for the springs is discussed in Chapter 12, "Operations Program."

4.5.3 County Springs

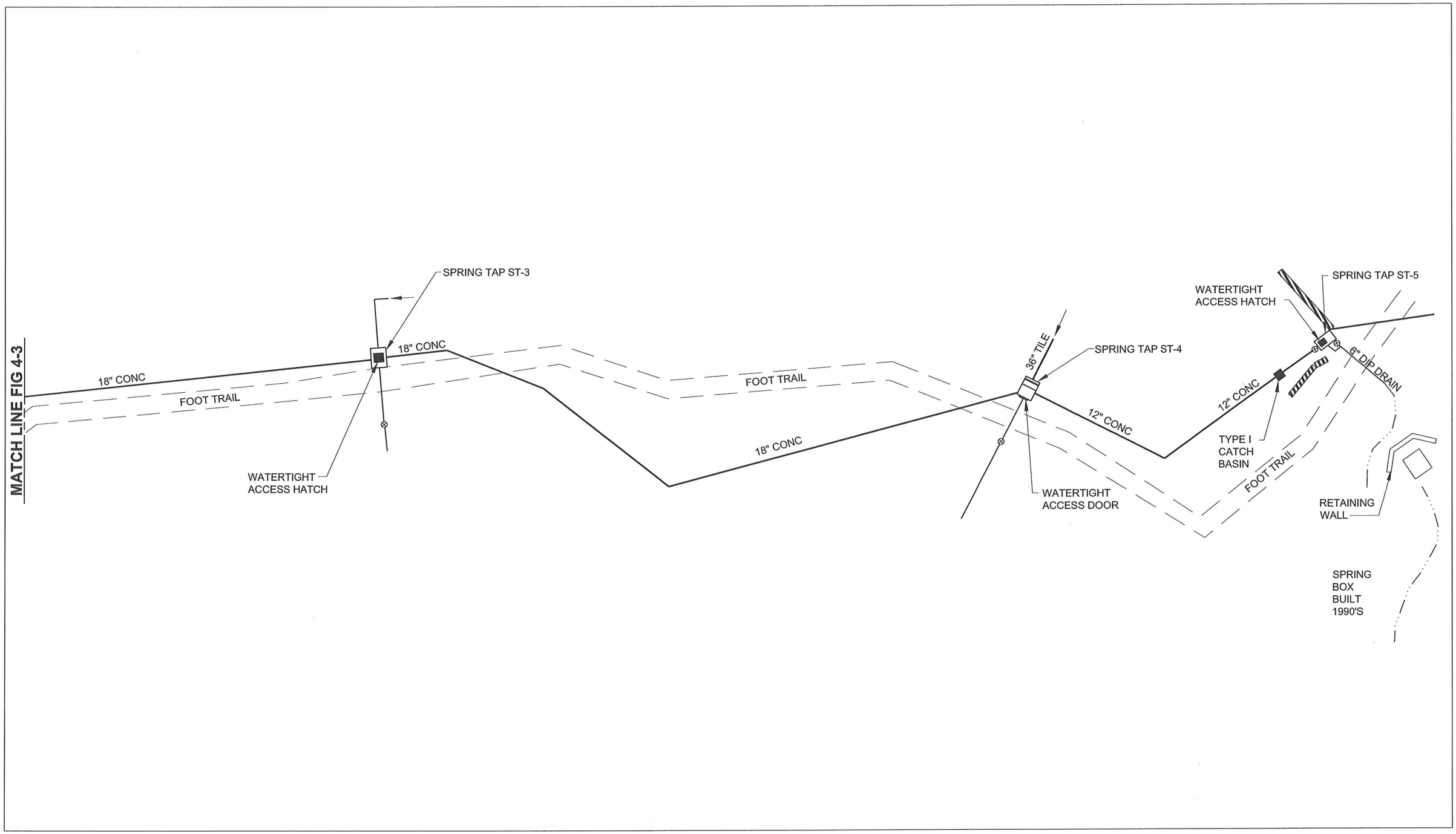
The current County Springs collection works are shown approximately to scale on Figure 4-7. One spring tap flows into the metering vault, where it merges with the flow from Weber Springs No. 2. The metering vault may be manually bypassed in the event of contamination of Weber Springs No. 2 or County Springs. Spring flow from the metering vault is split between wastage to Salmon Creek and water for distribution. An access road leads to the spring tap from the south. Surface water is collected and diverted away from the spring tap via perforated pipes, culverts, and walls. In general, the County Springs collection works appear to be in good condition. Section 5.6, "Minimum Sanitary Control Area Survey," will discuss County Springs in further detail. Operational information for the springs is discussed in Chapter 10, "Operations Program."

4.5.4 Elhi Springs

Elhi Springs collection works are shown on Figure 4-8. Elhi Springs was upgraded in 2000 to 2001, and again in 2003. The following improvements were made:

- Greater spring flow collection with the addition of three spring taps and collection vaults.
- Conversion of settling tank to a spring overflow collection and diversion facility.
- Better channelization of surface water to prevent surface water entering collection works.
- Installation of a metering vault.
- Replacement and addition of piping to transport spring flows to the holding tank.
- Removal of old collection station.
- Installation of a chlorination facility including continuous chlorination residual monitoring and instrumentation/control.
- Installation of chlorine contact tanks.
- Installation of a booster pump to increase the hydraulic grade line of Elhi Springs to match the remainder of the potable water sources.

Elhi Springs is currently online and is considered a permanent source.



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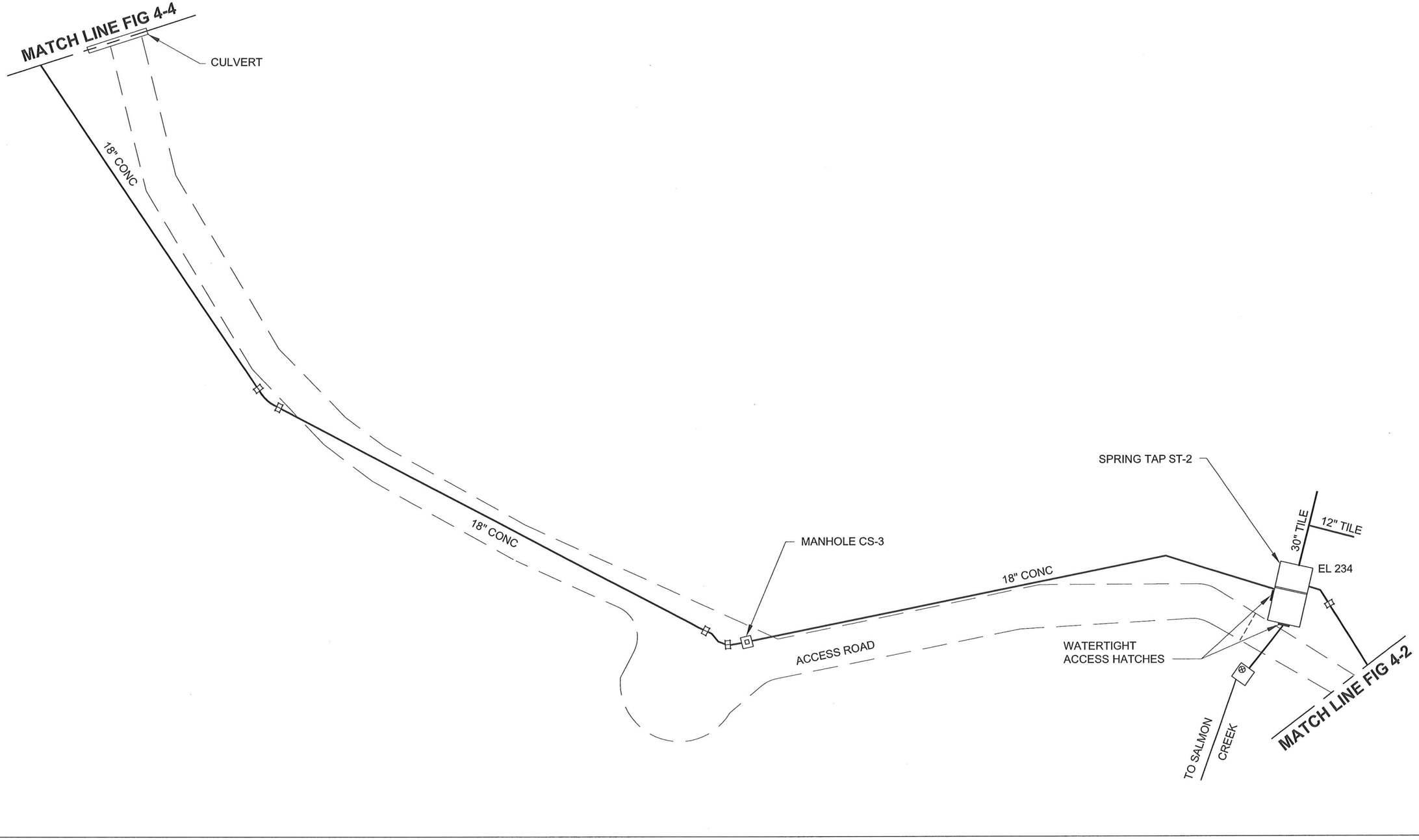
N

0 30'

SCALE IN FEET

Figure 4-2
Sumner Water System
Sumner Springs



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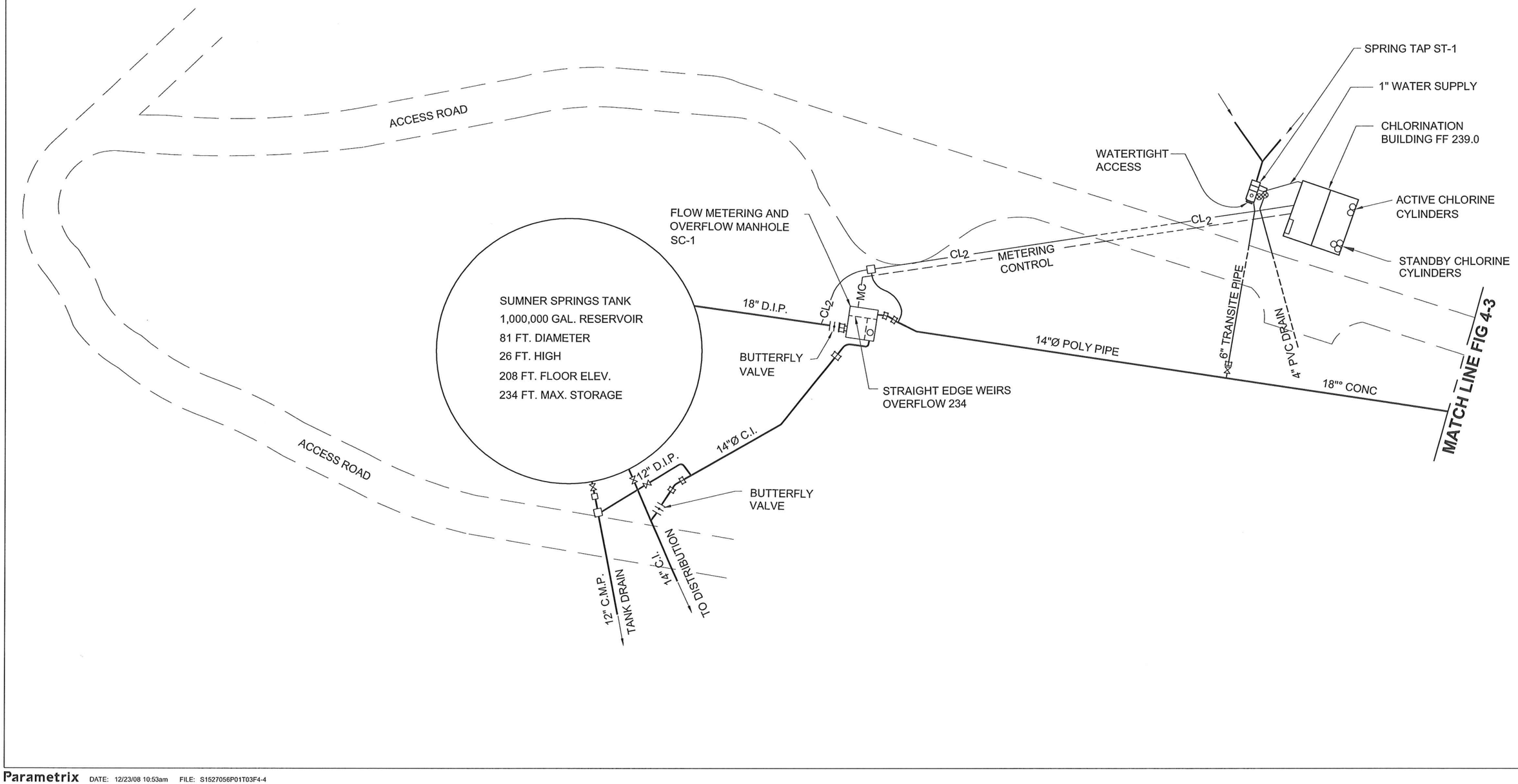
0 30'
SCALE IN FEET

Figure 4-3
Sumner Water System
Sumner Springs



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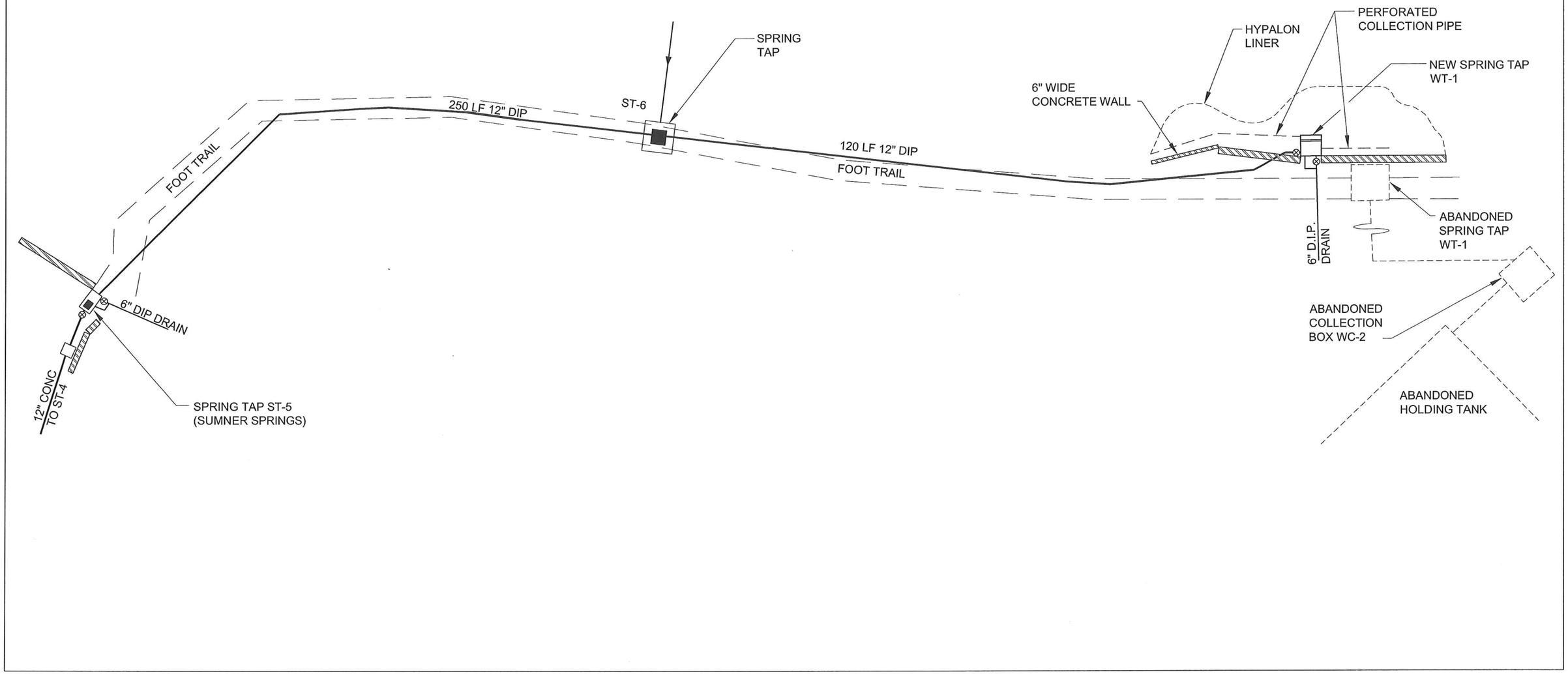
N

0 30'

SCALE IN FEET

Figure 4-4
Sumner Water System
Sumner Springs



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N

0 30'

SCALE IN FEET

Figure 4-5
Sumner Water System
Weber Springs No. 1

SPRING TAP
VAULT W2-4

6" DI WATER MAIN

6" DI
DRAIN

4" PERFORATED ADS
SURFACE WATER
COLLECTION

8" PVC PERFORATED

8" PVC PERFORATED

SPRING TAP VAULT W2-3

SPRING TAP VAULT
W2-1B

VAULT W2-1A

8" D.I.P.

8" D.I.P.

8" D.I.P.

8" DI
DRAIN

8" D.I.P.

8" ADS
CROSS DRAIN

COUNTY
SPRINGS TANK

COUNTY SPRINGS
METERING VAULT

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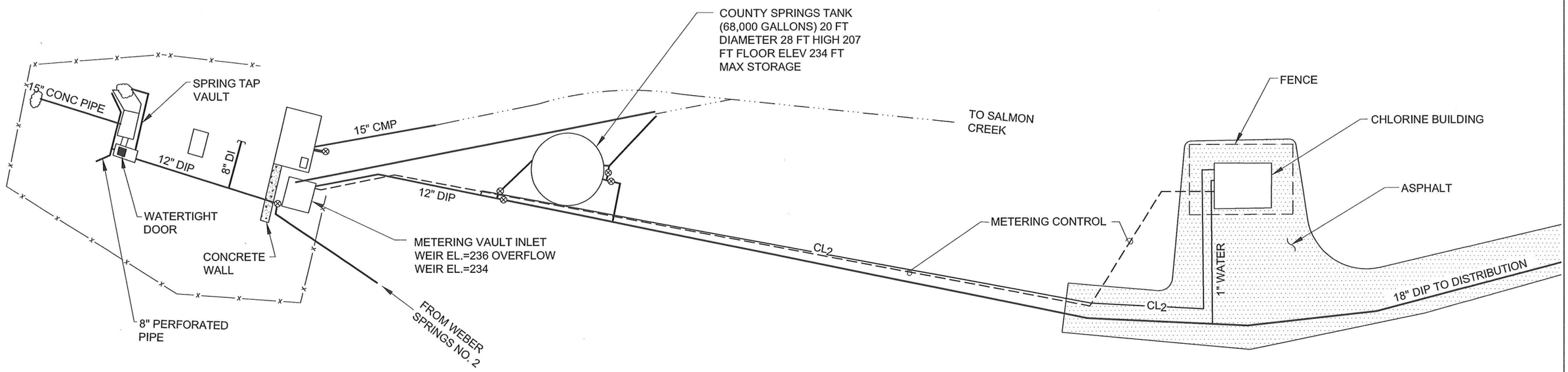
N

0 30'
SCALE IN FEET

Figure 4-6
Sumner Water System
Weber Springs No. 2



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0 30'
SCALE IN FEET

Figure 4-7
Sumner Water System
County Springs

MATCH LINE

CENTERLINE OF SWALE

EDGE OF ROAD

6" DIP

6" DIP

EDGE OF ROAD

6" DIP

COLLECTION VAULT
TOP= 275.43

ECOLOGY BLOCKS

COLLECTION VAULT

ECOLOGY BLOCKS

8" DIP

12" DIP

8" DIP

12" DIP

COLLECTION VAULT
TOP= 231.74
BOTTOM= 224.94

4" PVC

8" DIP

6" DIP

BOOSTER PUMP

ACCESS HATCH

8" DIP

6" DI TO DISTRIBUTION

4" PVC

4" PVC OVERFLOW

METERING VAULT
TOP= 230.16
BOTTOM= 222.23

CHLORINE INJECTION FACILITY

ECOLOGY BLOCKS

CHLORINE CONTACT TANKS

MATCH LINE

COLLECTION VAULT

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N

0 30'

SCALE IN FEET

Figure 4-8
Sumner Water System
Elhi Springs

4.6 WELLS

4.6.1 South Well

The South Well was constructed in 1975 to a depth of 304 feet. The well has a 16-inch-diameter casing with stainless steel screen installed from 304 feet to 280 feet. The South Well is currently utilized as a permanent domestic source and is equipped with a three-stage vertical-turbine well pump with an approximate 700-gpm capacity. Prior to 2002, the well was manually operated, being turned on when the level in the South Tank was drawn down by a third. Currently, South Well is automatically controlled to turn on when the water level in the South Tank drops below a preset elevation.

4.6.2 West Well

The West Well was constructed in 1975 to a depth of 285 feet. The well has a 10-inch-diameter casing with a 10-foot screen length. This well is equipped with a four-stage vertical-turbine pump with an approximately capacity of 250 gpm. The West Well is currently used primarily for irrigating the Sumner Cemetery landscaping and to meet peak demands during drier months. The West Well is considered a seasonal source. The water rights for this well are in question due to a ruling on the Municipal Water Law which is currently before the Washington State Supreme Court. The City plans to wait for this issue to be resolved before improving this well and associated infrastructure.

4.6.3 Dieringer Well

The Dieringer Well was constructed in 1954 to a depth of 408 feet. The well was constructed with 12-inch-diameter casing from 0 feet to 240 feet and 10-inch casing from 240 feet to 408 feet. Per the well log, the 12-inch casing was perforated from 215 feet to 238 feet, and the 10-inch casing was perforated from 245 feet to 386 feet. The Dieringer Well was initially constructed to service the Dieringer School, and was later utilized by Peterson Brothers. The City of Sumner acquired the well and associated water rights and began using the source in 1998. Final acquisition of the Dieringer Well was completed in December 2003. In 2004, well improvements were completed to allow the City of Sumner to fully utilize the Dieringer Well as a permanent potable water source. Video investigation conducted during the well rehabilitation revealed that the actual casing perforations were not as extensive as indicated on the initial well log. Subsequently, the existing well casing was re-perforated between 258 feet and 305 feet, gravel backfill material was installed from 315 feet to 400 feet, and a 6-inch stainless steel screen was installed from 210 feet and 310 feet. Filter pack material was installed from 200 feet to 315 feet. This well is equipped with a seven-stage vertical-turbine pump with a capacity of approximately 250 gpm. The Dieringer Well control is automated such that the well turns on when the level in the North Tank drops below a preset elevation.

4.6.4 Well Information

Table 4-3 (on the following page) gives system well information. Operation of wells is discussed further in Chapter 10, “Operations Program.”

Table 4-3. Well Information

Name (type)	Capacity (gpm)	Pump Head[a] (feet)	Speed (rpm)	Horsepower (hp)	Casing Depth (feet)	Casing Diameter (inches)	Bowl Depth (feet)	Screen Length (feet)	Static Water Surface
South Well	700	155	1,760	50	304	16	100	26	Minus 5 feet
West Well	250	170	1,760	30	285	10	50	10	Minus 7 feet
Dieringer Well	250	264	3,450	30	408	12/10	165	90	Plus 9 feet

[a] At capacity.

4.7 CHLORINATION FACILITIES

4.7.1 Sumner Springs, County Springs, and South Well

Structural and mechanical relationships between the Sumner and County Springs chlorination facilities and spring collection works are shown on Figures 4-4 and 4-7, respectively.

Each of these chlorination buildings, for the Sumner and County Spring sources, contain five chlorine cylinders (two online, three standby or empty), two chlorinators, two injectors, two injector pumps, residual analyzers, metering control equipment and charts, leak detection equipment, alarm, and ventilation. In general, both chlorination facilities are in very good condition and contain adequate safety equipment and controls.

South Well contains one chlorine cylinder, chlorinator, injector, injector pump, residual analyzer, metering control equipment and charts, leak detection equipment, alarm, and ventilation. In general, the chlorination facility is in fair condition and contains adequate safety equipment and controls.

Chlorine dose is based on flow-rate telemetry information from the metering vaults. The chlorine gas is metered in proportion to flow into distribution, injected into solution, and fed to the transmission lines feeding Sumner and County Springs Tanks, respectively. The South Well is connected to the distribution system. Operation of the chlorination facilities is discussed in Chapter 10, "Operations Program."

Chapter 8 describes some planned improvements to the South Well, which will increase the chlorine contact time and improve the building and facilities on-site.

4.7.2 Dieringer Well, West Well, and Elhi Springs

The chlorine injection assemblies at the Dieringer and West Wells and Elhi Springs each consist of a single drum of 12.5 percent sodium hypochlorite with a solenoid diaphragm dosing pump. The discharge side of the pump is equipped with an atmospheric vacuum breaker to prevent siphoning, a back-pressure check valve to keep positive pressure against the dosing pump, and an injection assembly with an integral ball check to prevent siphon and backwash. The suction side of the pump is equipped with a foot valve to keep the suction line primed and a graduated cylinder to allow pump calibration. The Dieringer Well and Elhi Springs chlorination systems are installed with continual chlorine residual analyzers.

4.7.3 Chlorine Contact Time Product

WAC Section 246-290-451 states that groundwater sources required to disinfect shall provide a minimum CT Product of 6.0 at or prior to the first customer. CT (C x T) Product is defined as the combination of free chlorine residual (C) in mg/l and the contact time (T) in minutes. A summary of CT Product for each source at flows equaling physical source capacity and instantaneous water right is depicted in Table 4-4. CT Product Calculations are contained in Appendix P.

Table 4-4. Source CT Product

Source Name (type)	CT @ Source Capacity	CT @ Source Instant. Water Right
Sumner Springs [a]	56.3 (mg/l)(min) @ 0.45 mg/l Cl Residual	16.1 (mg/l)(min) @ 0.45 mg/l Cl Residual
Elhi Springs [b]	6.0 (mg/l)(min) @ 0.92 mg/l Cl Residual	(Spring collection facilities at the Elhi Springs cannot acquire instantaneous water right.)
Elhi Springs – Proposed [c]	6.0 (mg/l)(min) @ 0.69 mg/l Cl Residual [c]	
County Springs [d]	6.6 (mg/l)(min) @ 0.45 mg/l Cl Residual	6.0 (mg/l)(Min) @ 0.63 mg/l Cl Residual
West Well [e]	13.2 (mg/l)(min) @ 0.45 mg/l Cl Residual	13.2 (mg/l)(min) @ 0.45 mg/l Cl Residual
South Well [f]	0.5 (mg/l)(min) @ 0.45 mg/l Cl Residual	0.4 (mg/l)(min) @ 0.45 mg/l CL Residual
South Well – Proposed - CIP S2	6.0 (mg/l)(min) @ 0.49 mg/l Cl Residual	6.0 (mg/l)(min) @ 0.49 mg/l Cl Residual
Dieringer Well [g]	9.5 (mg/l)(min) @ 0.3 mg/l Cl Residual	24.9 (mg/l)(min) @ 0.3 mg/l Cl Residual

[a] Source Capacity = 800 gpm; Instantaneous Water Right = 2,805 gpm.

[b] Source Capacity = 92 gpm; Instantaneous Water Right = 360 gpm

[c] Calculation includes two proposed contact tanks at the spring site (see Appendix P).

[d] Source Capacity = 516 gpm; Instantaneous Water Right = 799 gpm.

[e] Source Capacity = 250 gpm; Instantaneous Water Right = 250 gpm.

[f] Source Capacity = 700 gpm; Instantaneous Water Right = 1,000 gpm.

[g] Source Capacity = 250 gpm; Instantaneous Water Right = 95 gpm.

The City of Sumner target chlorine residual within the conveyance and distribution system is 0.45 mg/l free chlorine. As shown above, a majority of the sources currently being operated are able to provide a minimum CT of 6 while dosing as needed to maintain a free chlorine residual of 0.45 mg/l. The exceptions are Elhi Spring and the South Well, both of which are sources typically used during the dry summer months.

Additional "source" capacity may be constructed as part of Capital Improvement Project S2. Improvements may allow the South Well to operate at 1,000 gpm while maintaining a minimum 0.49 mg/l free chlorine residual. However, if well improvements cannot be made, the City will attempt to transfer 300 gpm of water right to another source. See Chapter 8 for further information on this project.

4.8 FLUORIDATION FACILITIES

On October 22, 2002, the Tacoma Pierce County Board of Health (TPCBH) adopted Resolution 2002-3366A-2, which required all Pierce County water systems serving a population of 5,000 or greater to initiate a fluoridation program. A Pierce County Superior Court confirmed TPCBH's authority to order fluoridation of public and private water systems on February 19, 2003. The City of Sumner entered into a Fluoridation Program Grant Agreement with the Tacoma Pierce County Health Department (TPCHD) on April 10, 2003. In essence, this agreement stated that the City of Sumner would implement a fluoridation program with construction completed no later than November 30, 2003, and start up completed no later than December 31, 2003. In return, the TPCBH would partially reimburse the City of Sumner for engineering, construction, and start-up costs associated with developing and implementing the fluoridation program.

The City of Sumner developed the construction documents and Project Report for the fluoridation program and received TPCHD approval on December 29, 2003. Construction of the fluoridation facilities at each of the Sumner potable water sources began soon after TPCHD approved the project report and construction documents.

On May 13, 2004, the Washington State Supreme Court reversed the earlier Superior Court ruling, deciding that the TPCHB cannot mandate implementation of fluoride programs for public and private water purveyors. The basis of the reverse ruling was that the resolution conflicts with RCW 57.08.012, which gives water districts the power to control the content of their water systems and, with that power, the authority to fluoridate their water.

In light of the Supreme Court ruling, and to satisfy complaints and concerns associated with fluoridation expressed by citizens of Sumner, the City of Sumner scheduled a Public Hearing on July 19, 2004, to measure public opinion. Citizens attending the meeting were overwhelmingly against implementing a fluoridation program in the City of Sumner. As a result, on August 2, 2004, the Sumner City Council ruled that fluoridation would not be implemented in the City of Sumner.

4.9 STORAGE

The City of Sumner currently operates five storage tanks in the water system. Table 4-6 (on page 4-28) gives system storage facility information.

Sumner and County Springs Tanks are gravity fed by Sumner and County Springs, respectively. All storage tanks in the main pressure zone are at the same hydraulic grade. The South Tank and North Tank water surface elevations float up and down with the system hydraulic grade. Figures 4-4 and 4-7 show the orientation of Sumner and County Springs Tanks with the spring collection and chlorination facilities.

The fifth tank is located in the Sumner Viewpoint development. It is fed by a pump house located at the South Tank and operates at a higher hydraulic grade than the rest of the system. Because this tank functions on a higher grade line and serves only the Sumner Viewpoint development, its volume is not included in the total storage capacity calculations of the system.

Figure 4-1 shows the elevation of the tanks with respect to the rest of the system. All tanks are in good condition. Operation of the tanks is discussed in Chapter 10, "Operations Program."

4.10 METERS

Service meters were installed at all customer connections starting in 1975, and installation continued through the early 1980s. System meters include two station meters and six master meters. Master meters are located at the connections of Sumner Springs, County Springs, and Elhi Springs with the distribution system and at all three wells. Station meters, nicknamed "system meters," are located in the metering vaults upstream of Sumner and County Springs storage tanks. Table 4-5 lists system meter information. Meters are further discussed in Chapter 10, "Operations Program."

Table 4-5. System Meter Information

Meter	Type	Size	Flow Measurement
Sumner Springs Station	Ultrasonic	Weir	System Flow, Bypass Flow, Total Flow
Sumner Springs Master	Magnetic	8 Inch	Flow from Sumner Springs Tank into Distribution
County Springs Station	Ultrasonic	Weir	System Flow, Bypass Flow, Total Flow
County Springs Master	Magnetic	8 Inch	Flow from County Springs Tank into Distribution
Elhi Springs Master	In-Line Turbine	2 Inch	Flow from Elhi Springs into Distribution
South Well Master	In-Line Turbine	10 Inch	Flow from South Well into Distribution
West Well Master	In-Line Turbine	10 Inch	Flow from West Well into Distribution
Dieringer Well Master	In-Line Turbine	4 Inch	Flow from Dieringer Well to North Tank

4.11 VALVES

The system contains hundreds of isolation valves that have been assigned a number on the City's water system maps. There are two air-release valves, several pressure-reducing valves (within the Sumner Viewpoint development on individual services and one 8-inch pressure reducing valve at the Sumner Viewpoint booster pump that connects the Sumner Viewpoint tank to the South Tank hydraulically for emergency use only), and no pressure-sustaining valves in the system. Valves are exercised on a regular basis. Valves are further discussed in Chapter 10, "Operations Program."

4.12 HYDRANTS

The system contains approximately 920 hydrants. All hydrants have been assigned a number on the City's water system maps. The fire department conducts flow tests periodically to assure proper hydrant operation. Hydrants are further discussed in Chapter 10, "Operations Program."

4.13 TELEMETRY AND CONTROLS

The City's tanks and sources all utilize remote telemetry that is connected to the City Shops.

The telemetry system is expandable to over 500 remote telemetry units (RTUs). Over 6,000 calculation blocks can be programmed, as well as 500 screens. Any telemetry upgrades involve adding RTUs, installing telephone service, and programming the computer.

Power hookups are available at Sumner Springs, County Springs, Elhi Springs, South Well, Dieringer Well, and West Well facilities. The South, Dieringer, and West Wells do not have permanent auxiliary power sources.

4.14 INTERTIES

The Sumner water system interties with the Puyallup water system. The valves remain closed except in emergencies. Figure 4-1 shows the location (schematically) of the Puyallup intertie. The portion of the Sumner water system previously owned by Webstone connects the Sumner and Pacific water systems with two interties normally left open. Existing and potential interties are discussed in further detail in Section 1.2, "Adjacent Water Purveyors."

Potential projects on the existing and proposed interties are also described in the Section 8.3.3. Interties in Section 8.3.3 are proposed to be either improved so as to be used as emergency sources or constructed in order to supplement redundancy for the system and potentially turn into another source for the Sumner water system.

Table 4-6. Storage Information

Name	Function(s)	Total Volume	Working Volume [a]	Dimensions (diameter)	Height (feet)	Overflow Elevation (feet)	Floor Elevation (feet)	Condition
Sumner Springs Tank	Storage, Chlorine Contact	1.0 mg	1.0 mg	81 feet	26.00	234.00	208.0	Good
County Springs Tank	Primarily Chlorine Contact	68,000 gallons	66,000 gallons	20 feet	28.00	234.00	207.0	Good
South Tank	Storage	2.0 mg	2.0 mg	104 feet	32.00	234.00	202.0	Good
North Tank	Storage	2.0 mg	2.0 mg	120 feet	24.23	234.23	210.0	Good
Sumner Viewpoint	Storage, higher pressure zone	330,000 gallons	193,900 gallons	26 feet	85.00	392.00	310.0	Good

[a] To overflow elevation.

5. WATER RESOURCES

This chapter discusses water resource issues, including an evaluation of the adequacy of current source and storage and projected requirements for new source and storage based on future water demands. Additionally, water rights laws, regulations, policies, and the City's water rights status will be discussed, as well as a Water Conservation Plan to meet the City's goals. Observation of the minimum sanitary control areas of the wells and springs and the City of Sumner watersheds will be detailed. Recommendations for protection of these areas will also be presented.

5.1 SOURCE EVALUATION

Present source requirements are presented in Table 5-1. Required source is equal to maximum-day demand, which is calculated in Chapter 3, "Population and Demand Projections." Total instantaneous source capacity is equal to the total instantaneous production from Sumner Springs (1.15 mgd), County Springs (0.71 mgd), Elhi Springs (0.13 mgd), South Well (1.01 mgd), Dieringer Well (0.36 mgd), and West Well (0.36 mgd) for a total of 3.72 mgd.

Table 5-1. Source Requirements[a]

	2008	2009	2014	2029	2024	2029
Maximum-Day Demand (mgd)[b]	3.14	3.42	4.06	4.60	5.07	5.48
Source Capacity (mgd):						
• Existing[c]	3.72	3.72	3.72	3.72	3.72	3.72
Cumulative Source Surplus (Deficiency) (mgd):						
• Existing Source[c]	+0.58	+0.30	(0.34)	(0.88)	(1.35)	(1.76)

[a] Source Capacity Assuming No Source Capacity Improvements.

[b] Calculated in Chapter 3.

[c] Capacity of Sumner Springs = 1.15 mgd, County Springs = 0.71 mgd, Elhi Springs = 0.13 mgd, South Well = 1.01 mgd, Dieringer Well = 0.36 mgd, and West Well = 0.36 mgd.

Subtracting source capacity from maximum-day demand yields source surplus/deficiency. The current source had an approximate 0.58-mgd surplus in flow during maximum-day-demand conditions in the summer of 2008. Continuation of this analysis indicates, however, that the existing source physical capacity, including contribution from the West Well, will become insufficient to accommodate maximum-day-demand conditions by the end of year 2012 if source improvements and water right transfers are not completed. Figure 5-1 shows the 20-year planning window for source capacity and maximum-day demands with the surplus and deficiency total of the existing sources.

The current sources combined annual water rights are not sufficient to meet projected average daily demands through the 20-year planning period as indicated in Figure 5-2. Existing source combined instantaneous water rights are sufficient to meet the projected maximum-day demand through the 20-year planning period.

Total monthly source production is shown in Figure 5-3. The total source production includes system demands and bypass.

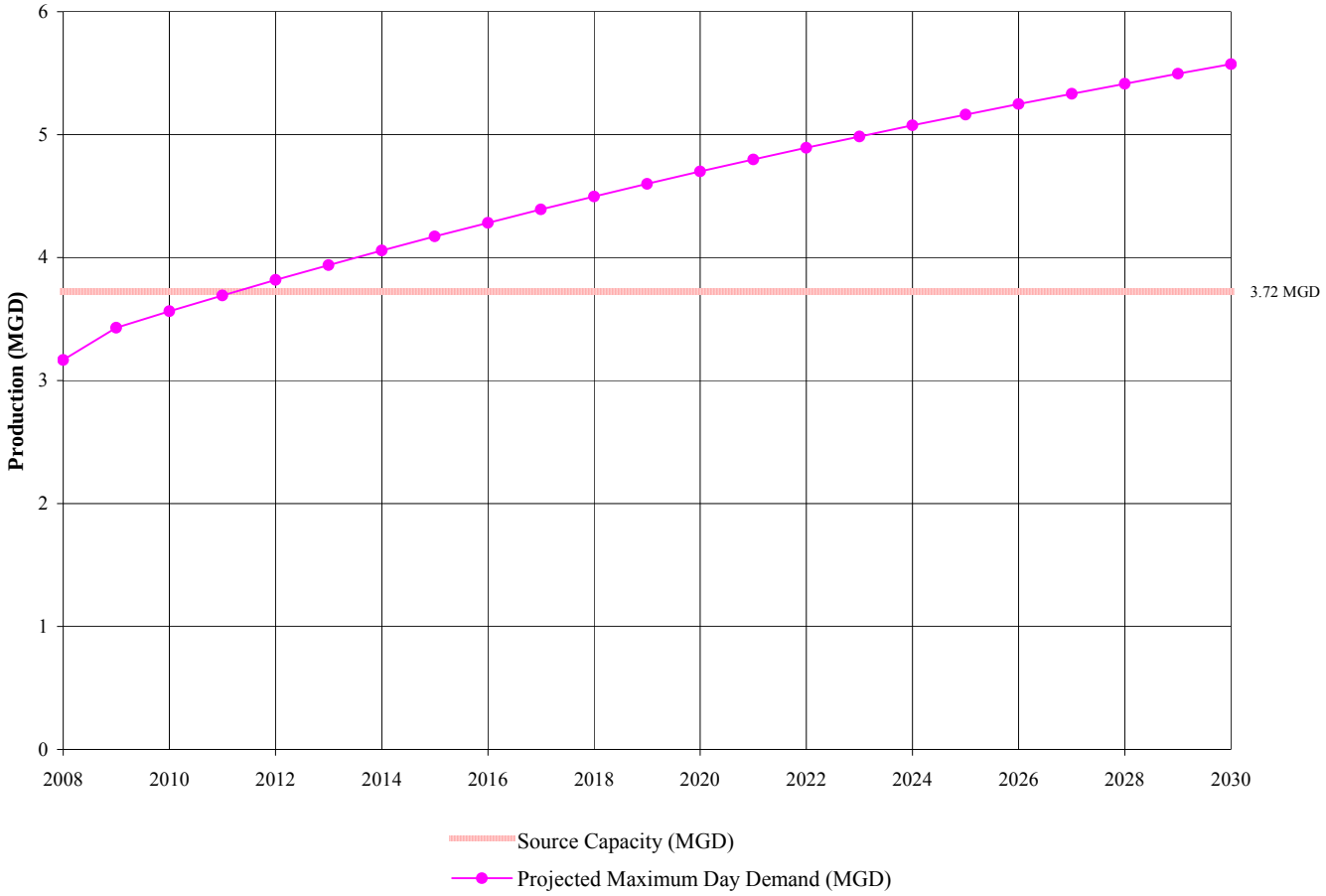


Figure 5-1. Maximum Day Demand Versus Source Capacity (Assuming No Source Capacity Improvements)

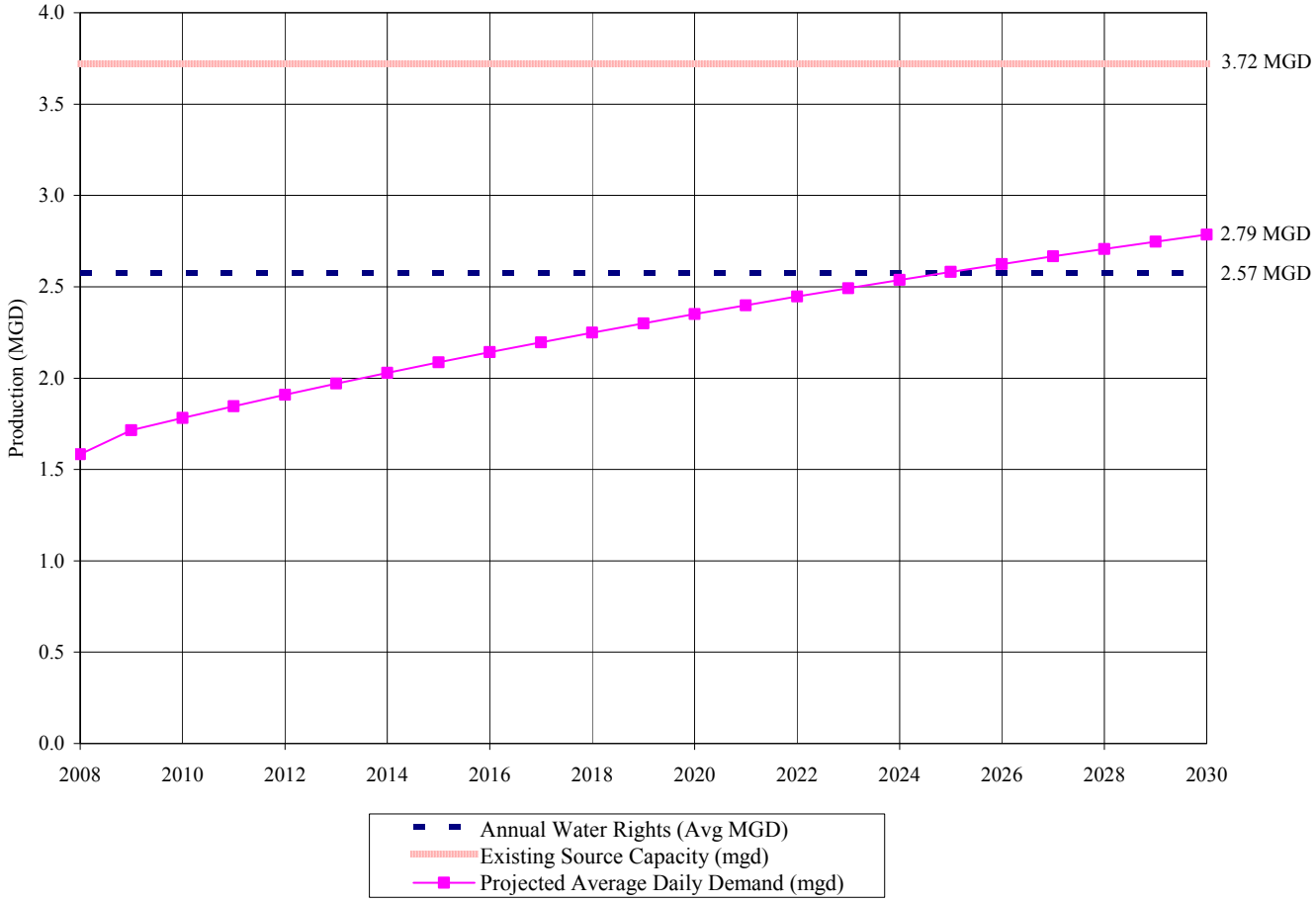


Figure 5-2. Average Day Demand Versus Source Capacity and Water Rights (Assuming No Source Capacity Improvements)

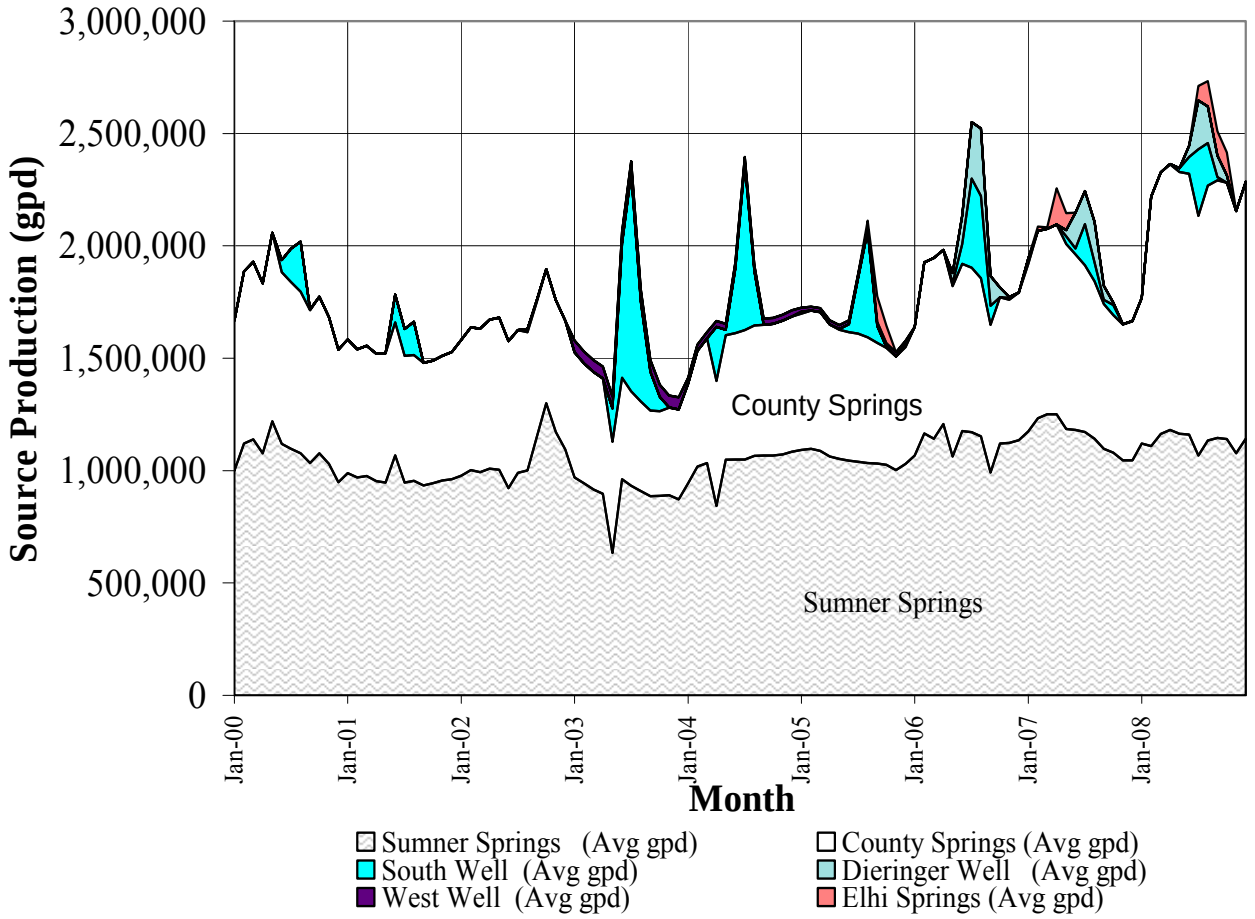


Figure 5-3. Monthly Source Production Including Spring Bypass (2000 to 2008)
(Note: Bypass for years 2000–2003 not available)

Based on demand projections, the combined physical capacity of the City's current source(s) appears to be insufficient to meet the maximum-day demands projected through the 6-year planning period. The City's demand has not significantly increased over recent years, partially due to the shutdown of a large industrial user, Beatrice Cheese, and ongoing conservation measures. The City is currently working to expand existing sources, develop new interties with local purveyors, and pursue additional water rights. The City is in ongoing negotiations with the Cascade Water Alliance (CWA) and others concerning water rights and additional sources of water.

Table 5-2 is a summary of the existing sources, planned improvements to sources, and future sources of supply that the City intends to pursue. Figure 5-4 shows how these improvements will increase projected source capacity for the City's growth.

Table 5-2. Future Source of Supply

Existing Sources	Existing Physical Capacity (mgd)	
Sumner Springs (includes Weber)	1.15	
County Springs (includes Weber and Crystal)	0.71	
Elhi Springs	0.13	
South Well	1.01	
Dieringer Well	0.36	
West Well	0.36	
Total:	**3.72**	
Improvements to Existing Sources or New Sources to Provide Additional Capacity	**Additional Physical Capacity Provided by Improvement (mgd)**	**Estimated Year Online**
Intertie with Pacific (450 gpm)	0.65	2010
Intertie with Mountain View-Edgewood (347 gpm)	0.50	2010
Spring Source Improvements (500 gpm)	0.72	2011
Construct new well (1,000 gpm)	1.44	2011
Total:	**3.31**	
Future New Water Rights		
Continue Negotiations with CWA (TBD)	~1.41	2012
Develop new deep well application and transfer spring sources to well (TBD).	N/A	2016
Total:	**~1.41 +**	

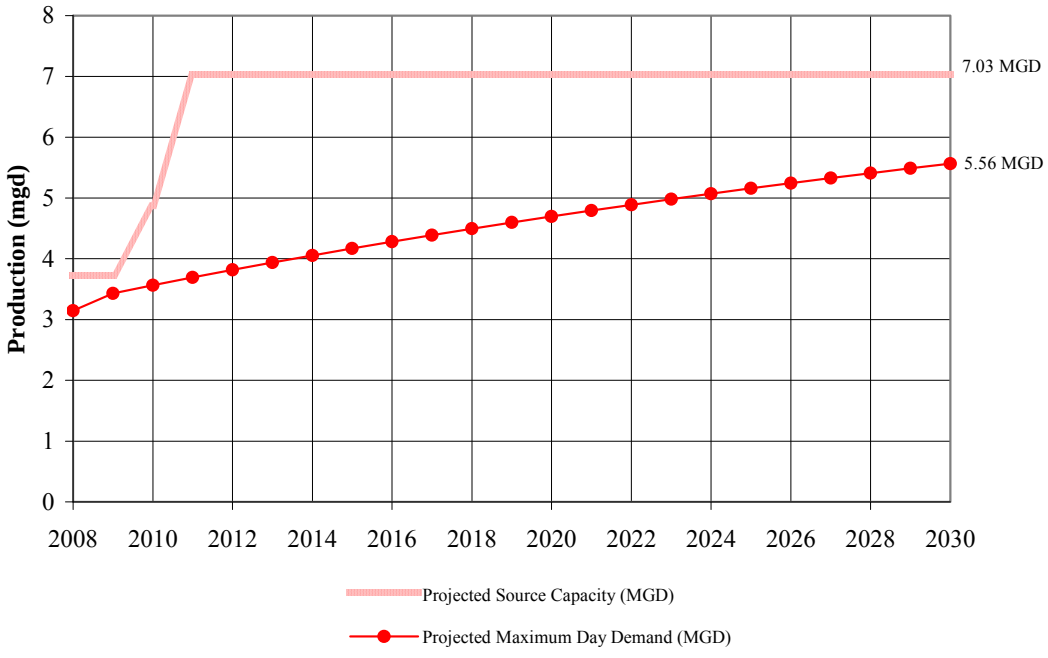


Figure 5-4. Projected System Maximum Daily Demand Versus System Capacity (Assuming Construction of Source Capacity Improvements)

Improvements to the existing system include spring rehabilitation and improvements at Sumner and County Springs in an attempt to more fully utilize the existing water rights. The South Well is reportedly at a current capacity of 700 gpm, but has an instantaneous right of 1,000 gpm. The City is in the process of applying for additional points of withdrawal for this water right so that the remaining 300 gpm water right can be utilized at a new well or at the Dieringer Well (to utilize the full physical capacity at the Dieringer Well). The West Well has been used as both an irrigation and municipal water source. This water right meets the definition of "municipal water supply purposes" in RCW 90.03.015(4), and would otherwise be eligible for use as a municipal supply throughout the Sumner water service area, but a constitutional challenge to this section is pending before the Washington Supreme Court.

Completion of the source improvements to provide additional capacity shown in Table 5-2 above will increase the instantaneous physical capacity of the system as a whole to approximately 7.03 mgd by the end of 2011, which exceeds the peak-hour demand requirements throughout the 6-year planning horizon. The future water rights additions will increase the instantaneous water rights of the system as a whole to accommodate the ultimate buildout of Sumner's water service area, including peak-hour demand requirements throughout the 50-year planning horizon.

Potential future sources of supply include the use of agricultural water rights from parcels adjacent to the White River, capturing additional spring flow that is currently bypassed around the City's collection system, connecting to local water purveyors (Mountain View-Edgewood and Pacific) through interties, and developing an agreement with the CWA for additional water rights from Lake Tapps. The City's goal is to remain "independent" with their water sources and supply but to develop interties as a form of redundancy in the system and to meet peak demands in emergency situations.

Other potential sources of water include an irrigation well to serve the City sports complex, high school, St. Andrew Catholic Church, and nearby commercial users, and transfer of existing surface water irrigation rights from the Sumner golf course to a groundwater source for municipal use. These sources are contingent upon several factors, including construction of a water reuse system from the wastewater treatment plant to the Sumner golf course. Water reuse is further discussed in Section 5.5, Water Reclamation.

5.2 STORAGE

According to the 2001 *Water System Design Manual*, the following five components shall be considered in sizing required storage volume for a public water system:

- Operational storage (OS);
- Equalizing storage (ES);
- Standby storage (SB);
- Fire suppression storage (FSS); and
- Dead storage (DS), if any.

The tank located in the Sumner Viewpoint development is fed by a pump house located at the South Tank and operates at a higher hydraulic grade than the rest of the system. Because this tank functions on a higher grade line and serves the Sumner Viewpoint development (which includes a very small number of residential connections), its volume is not included in the total storage capacity calculations of the system.

5.2.1 Operational Storage (OS)

Per the *Water System Design Manual*:

> "Operational storage is the volume of the reservoir devoted to supplying the water system while, under normal operating conditions, the source(s) of supply are in 'off' status…The definition specifies that OS is an additive quantity to the other components of storage. This provides an additional factor of safety to the ES, SB, and FSS components if the reservoir is full when that component of storage would be needed."

The City of Sumner Water System utilizes spring sources that in normal operation have constant bypass. This means that the reservoirs are constantly being filled to overflow. When the reservoir is full, the excess flow is diverted to the spring bypass; therefore, the City of Sumner does not have measurable operational storage (OS) requirements.

5.2.2 Equalizing Storage (ES)

Equalizing storage (ES) is used to help meet demand requirements during peak hours of the day. Peak hours often demand water at a rate faster than the source can provide, so equalizing storage is called upon to make up the difference during those hours. Later, the source can catch up and replenish this storage when demand is low. The total water produced by the source during a day should equal total demand for that day. ES acts as a buffer and helps balance the demand on the source.

When figuring the necessary ES for a water system, several factors must be considered: peak system demand, diurnal variations in the system demand, the production rate of the source facility, and how the production facility operates (i.e., continuous production or production during daily shifts). ES must provide adequate volume to meet the periodic hourly peak demands and allow the supply facility a reasonable amount of time to supply total daily demand.

A recommended equation for determining equalizing storage, as provided by DOH, is as follows:

ES = ***(PHD – Qs)(150 min.)****, but in no case less than zero.*

Where: ***ES*** = *Equalizing storage component, in gallons.*

PHD = *Peak hourly demand, in gpm.*

Qs = *Sum of all installed and active source of supply capacities, except emergency sources of supply, in gpm.*

5.2.3 Standby Storage (SB)

Standby storage (SB) refers to an emergency or reserve storage supply. The DOH Sizing Guidelines for SB are based upon the maximum-day demand, the duration of a possible emergency, the supply capacity to the system, and the number of connections in the water system. This supply of water shall be available to all connections with a minimum pressure of 20 psi.

The recommended equation for determining standby storage is as follows:

$$SB_{TMS} = (2\ Days)(ADD)(N)-t_m\ (Q_S-Q_L)$$

Where:

- SB_{TMS} = *Total standby storage component for a multiple source system; in gallons.*
- ADD = *Average day demand for the system, in gpd/ERU.*
- N *Number of ERUs.*
- Qs = *Sum of all installed continuously available source of supply capacities, except emergency sources, in gpm.*
- Q_L = *The largest capacity source available to the system, in gpm.*
- t_m *Time that remaining sources are pumped on the day when the largest source is not available, in minutes (generally assumed to be 1,440 minutes).*

SB is used to provide water service during an emergency occurring somewhere within the water system. Such an emergency could be a pump going out, an interruption in the water supply, fire flow, a critical valve or pipeline going out of service somewhere in the distribution system, etc.

5.2.4 Fire Suppression Storage (FSS)

Per the *Water System Design Manual*:

> "Public water systems are **required** to construct and maintain facilities, including storage reservoirs, capable of delivering fire flows in accordance with the *determination of fire flow requirement* made by the local fire protection authority or County Fire Marshal while maintaining 20 psi pressure throughout the distribution system [WAC 246-290-221(5)]. The magnitude of FSS is the product of the maximum flow *rate* and *duration* established by the local fire protection authority or County Fire Marshal. For water systems located in areas governed under the Public Water System Coordination Act of 1977 (PWSCA), Chapter 70.116 RCW, minimum flow rates and durations that **must** apply for residential, commercial, and industrial developments are specified in the Water System Coordination Act regulations, WAC 246-293-640. Greater FSS requirements may be specified by the local fire protection authority, County Fire Marshal, and/or locally adopted Coordinated Water System Plan."

Minimum FSS Volume

The minimum FSS volume for systems served by a single source of supply or multiple sources of supply is the product of the required flow rate (expressed in gpm) multiplied by the flow duration (expressed in minutes).

Equation:

$$FSS = (FF)(t_m)$$

Where:

- FF = *Required fire flow rate, expressed in gpm, as specified by fire protection authority or the Coordination Act, whichever is greater; and*
- t_m = *Duration of FF rate, expressed in minutes, as specified by fire protection authority or the Coordination Act, whichever is greater.*

Sumner:

- FSS = *(4,000 gpm)(4 hours) 60 min/hr*
- FSS = *0.96 Million Gallons*

5.2.5 Dead Storage (DS)

Per the *Water System Design Manual*,

> "Dead storage (effective only to provide adequate pressure) is the volume of stored water not available to all consumers at the minimum design pressure in accordance with WAC 246-290-230(5) and (6). DS volume is excluded from the volumes provided to meet OS, ES, and/or FSS requirements. Local community standards apply as to whether or not some DS volume may be used to provide SB volume to meet minimal community expectations during unusual operating conditions."

The City of Sumner service area is served at a hydraulic grade line of 234 feet. The minimum system pressures within the system are normally at 50 psi. The height of the reservoirs varies, but is approximately 25 feet. A pressure drop of 11 psi (25 feet) results in minimum system pressure of 38 psi, which is above the minimum allowed pressure. Therefore, a majority of the system does not include dead storage. The second pressure zone, served exclusively by the Sumner Viewpoint tank, has approximately 136,100 gallons of dead storage.

5.2.6 Storage Summary

The City's excess reservoir capacity serves as storage for peak-hour demands. Based upon the required storage calculations, the City had an excess storage capacity of 3.4 million gallons in 2008 and will have an estimated excess of 0.6 million gallons in year 2030, assuming that no improvements are made to existing sources and no additional sources are acquired to improve instantaneous system capacity. The City's existing source capacity, combined with available storage capacity, is therefore capable of supplying more water to the system than estimated using the source capacity only.

The City currently has excess storage capacity to provide an additional approximate 1.1 mgd for the 3-day maximum-day demand. The following conservative assumptions were used to arrive at this conclusion:

- Assume a projected maximum-day demand to last for 3 days.
- Excess capacity for year 2008 was estimated to be 3.4 million gallons.
- 3.4 million gallons/3 days ~ 1.1 mgd excess source capacity for 3 days.

The City is still rigorously pursuing additional sources and continuing to improve the record keeping of source meters. Additional analysis will continue to be made as more records become available.

The storage analysis was made assuming that source physical capacity was not increased to meet projected maximum-day demands. Figure 5-5 shows the storage capacity available within the Sumner water system.

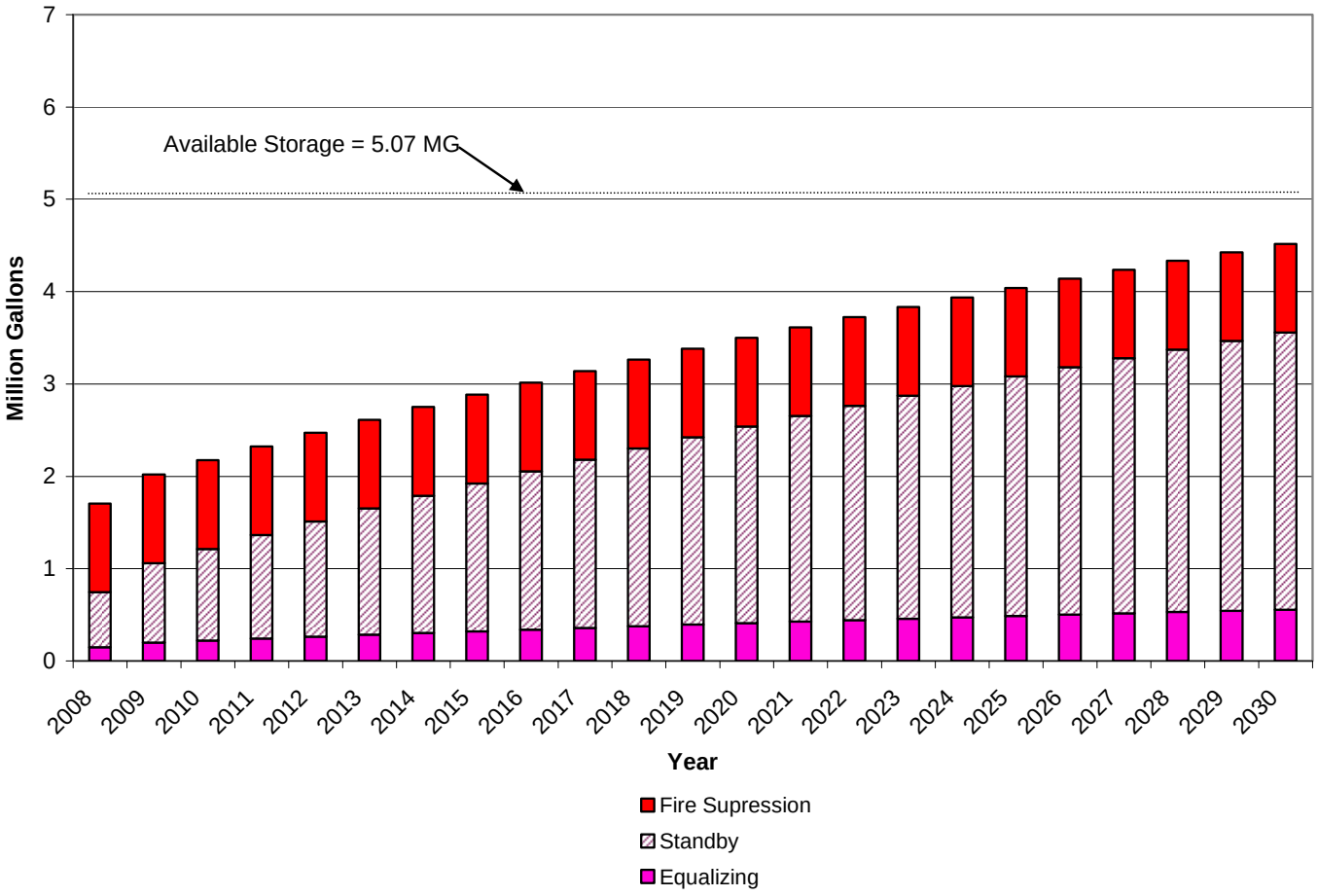


Figure 5-5. Storage Requirements (Assuming No Additional Source Capacity)

5.3 WATER RIGHTS EVALUATION

This section provides an overview of water resources laws and regulations that relate to the City's present and future water supplies.

5.3.1 Water Rights Laws

Rights to use water in Washington State are established under water rights laws and regulations administered by the Washington State Department of Ecology (Ecology). Water rights in the state of Washington are only allowed through the following legal sources:

- Surface water code (Chapter 90.03 RCW).
- Groundwater code (Chapter 90.44 RCW).
- Pre-Code Claims based on one of the following common law or statutory doctrines:
  - Prior Appropriation; Riparian Rights.
  - Federal Trust (Winters Doctrine) Water Rights.
  - Federal Treaty Rights.

The City's water rights derive from the surface and groundwater codes and pre-code prior appropriation claims, which are discussed briefly below.

5.3.1.1 Prior Appropriation

Washington statutes and case law recognize the common law prior appropriation doctrine as a means of creating a water right based on the principal of "first in time; first in right." Initially, anyone desiring to appropriate public water for beneficial use had to post a notice at the proposed point of diversion and record a copy of that notice with the local county auditor. Construction of the diversion facilities and putting the water to beneficial use, with due diligence, perfected the right in the amount of the beneficial use. Until such rights are confirmed by a court's general adjudication of water rights, these rights are generally referred to as "claims to vested right." In order to preserve the validity of a pre-code water right claim, the claim had to be filed and registered with Ecology or its predecessor water rights agency, the Department of Water Resources, during the period from July 1, 1969, through June 30, 1974, pursuant to the water right claim registration requirements of Chapter 90.14 RCW. An additional claims filing period was authorized by the legislature for September 1, 1997, to June 30, 1998, pursuant to RCW 90.14.068. Two of the City's water sources, County Springs and Elhi Springs, have associated pre-1917 "vested rights." The City filed claims for these rights in 1998 to protect the rights from relinquishment.

5.3.1.2 Surface Water Code (Chapter 90.03 RCW)

Laws were enacted in 1917 that recognized and protected pre-existing rights, provided a process for establishing rights to surface waters after that date, and set up a three-step procedure for acquiring water rights. The procedure includes:

- Application: A filing must be submitted to the state (now Ecology) requesting permission to appropriate water for beneficial use. Following a process of publication of legal notice, evaluation of protest (if any), field examination, and consulting other agencies, Ecology either approves, approves with modification, or rejects the application. To approve an application, Ecology must find:
  - The proposal is a "Beneficial Use" as defined in the Code.
  - Water is available for appropriation in the amount requested.
  - The proposed use will not impair existing rights.
  - The proposed use will not be detrimental to the public interest, having due regard to the highest feasible development of the use of the waters belonging to the public.
- Permit: Assuming approval of the application, a permit is issued. The permit is authorization to proceed with construction of facilities and use of water consistent with the time schedule and other provisions of the permit.
- Certificate: Once a project is completed and water fully utilized, the Certificate of Water Right is issued. This document is recorded with the local county auditor and in Ecology records. The right embodied in a certificate is perpetual and not subject to renewal.

Once a right is established in either of the above three categories, it is fixed in:

- Source.
- Priority.
- Quantity.

- Purpose of use.
- Period of use.
- Point of diversion.
- Place of use.

There is provision in the laws to change the purpose of use, place of use, and point of diversion/withdrawal. However, to make such changes, an application must be filed with Ecology and a Certificate of Change granted.

5.3.1.3 Groundwater Code (Chapter 90.44 RCW)

Laws were enacted in 1945, which extended the provisions of the 1917 Surface Water Code to the appropriation and use of groundwater. There were, however, two key differences: First, withdrawals of less than 5,000 gpd were exempt from the permit requirement. Second, a 5-year period was allowed for "declaring" rights to groundwater existing prior to 1945. An application/certificate process was provided during this period. The application essentially constituted a claim of right, which, if verified by the state, was confirmed by issuing a "declaration" certificate.

The application/permit/certificate process discussed above for surface water is essentially the same for groundwater. There is, however, an additional criterion Ecology must consider in acting on new applications for groundwater permit. RCW 90.44.070 provides in part that "No permit shall be granted for the development or withdrawal of public groundwaters beyond the capacity of the underground bed or formation in the given basin, district, or locality to yield such water within reasonable or feasible pumping lift in case of pumping developments, or within a reasonable or feasible reduction of pressure in the case of artesian developments…"

5.3.2 Primary and Supplemental Water Rights

Some terminology used in water rights documents, such as "supplemental," has created confusion and led to conflicting interpretations of water right quantities. Ecology issued program policy POL-1040 in 2006 in order to clarify terms used in water right documents and the relationship between certain water rights. As a result of POL-1040, Ecology no longer uses the term "supplemental" and clarifies that most water rights using that term are "non-additive" according to the definition and example set forth below. The City currently has one water right that is identified as being partially "supplemental." Future rights may be designated as "non-additive." Therefore, for general background understanding, an explanation and example of "non-additive" rights from POL-1040 is provided here:

"Scenario 2
Staff is reviewing the Town of Turnip's first Comprehensive Water System Plan. The Town has two water rights. Water Right G3-11111 issued in 1960 for 300 gpm and 448 ac-ft from the Town Well No. 1. In 1980, the Town received a second water right, G3-22222 for Well No. 2 for 500 gpm and 627 ac-ft from the Town Well No. 2. Certificate G3-22222C describes these quantities as supplemental to existing rights. Staff reviews the complete water right record to determine the correct terms to use. The ROE for G3-11111 describes the intent of the project as serving a population 500 people by 1980 at 800 gallons per capita day (gpcd). The ROE for G3-22222 was written in 1979 and describes 350 people living in the Town in 1979 using approximately 314 ac-ft, and the Town is planning for 700 people by the year 2000. The ROE for G3-22222 indicates that a total of 500 gpm and 627 ac-ft are needed to serve the 2000-year projection. Based on the review of the record in this case, staff concludes that the Town's water rights should be interpreted as follows."

Water Right	Source	GPM (Qi)		Ac-Ft/Year (Qa)		Comment
		Additive	Non-Additive	Additive	Non-Additive	
G3-11111	Well 1	300		448		
GS-22222	Well 2	200	300	179	448	Alternate to G3-22222
	Total:	**500**		**627**		

Using this example, the City of Sumner's South Well water right, Certificate G2-23281C, would be interpreted as "additive" for 542 acre-feet and "non-additive" for 258 acre-feet because of language in the documents that states, "In no instance shall the total annual quantity withdrawn/diverted under all existing and/or claimed rights exceed 2,450 acre-feet for municipal supply." The 2,450 acre-foot limitation was based on the South Well application's population projection of 12,500 and a per capita demand of 175 gallons daily. The City then had rights totaling 1,908 acre-feet, so the first 542 acre-feet of Certificate G2-23281C is additive, and the balance of the 800 acre-foot allocation is non-additive. This is reflected in Table 5-3 (page 5-14). Non-additive quantities are listed separately as "NA" and not included in the total annual quantity.

5.3.3 Instream Flow Laws and Stream Closures

The maintenance of protection of certain specified flows in rivers and streams has been provided, for the most part, by three statutes:

- RCW 75.20.050, which established the policy "that a flow of water sufficient to support game fish and food fish populations be maintained at all times in the streams of the state…" The policy was carried out by conditioning permits or rejecting applications for new water rights based on recommendations from the Directors of Fisheries or Game (now Wildlife).
- Minimum Water Flows and Levels Act (Chapter 90.22 RCW).
- Water Resources Act (Chapter 90.54).

The last two statutes establish a state policy that sufficient flows are to be retained in perennial rivers and streams to protect fish, game, wildlife, and other resources and values. Chapter 90.22 RCW refers to "minimum flows" and Chapter 90.54 RCW to "base flows." Ecology has overcome the definition problem by establishing "instream flows" through the process of adoption of state regulations. Once instream flows are established, all new permits using or impacting the same source are issued subject to these flows, and are generally referred to as "interruptible." As a matter of law, a new appropriation cannot be exercised when instream flows are not being met, in the absence of an approved mitigation plan. Water rights established prior to establishment of instream flows are not affected.

When Ecology determines that a stream has no available capacity for additional consumptive appropriations of water, it can "close" the stream, or segment thereof, to further appropriation. Stream closures in the Puyallup-White watershed were listed in the regulation described below. An application for a new groundwater appropriation in continuity with a closed stream must be denied if it would have any effect on the flow of the stream, unless that flow is mitigated.

Table 5-3. City of Sumner Water Rights Tabulation

Certificate Name	Current Name	Point of Diversion[a]	Water Right Certificate No.	Instantaneous Maximum			Annual AF[c,d]	Comments
				gpm	cfs[b]	mgd		
Well	Dieringer Well	20N05E-07	2151-A	95	0.21	0.14	6.25	This water right was changed to municipal supply purposes pursuant to an application that was approved in the April 12, 2006, Report of Examination. (See Appendix D).
Salmon Springs	Sumner Springs	20N05E-18P and Q	7838	2,244	5.0	3.23	1,008	These two water rights relate to the combined spring area development referred to as "Sumner Springs."
Salmon Springs	Sumner Springs		S2-21979C	561	1.25	0.81	900	
Well	South Well	20N05E-30R	G2-23281C	1,000	2.23	1.44	542 258 (NA)	Report of Examination identified projected need for "Area served by City of Sumner" to be 2,450 acre-feet per year for municipal supply by the year 1995. Therefore, 258 acre-feet of the authorized 800 acre-feet per year is non-additive to existing rights and is not included in totals.
Well	West Well	20N04E-23P	G2-21980C	250			100	This right is for irrigation of 50 acres (Sumner Cemetery) and has a period of use from May 1 to October 1 of each year. It is currently unknown whether this right is eligible for use as a municipal source throughout the Sumner water service area.[e]
Crystal Springs	Weber Springs No. 1	20N05E-19B	2266	112	0.25	0.16	181	These two certificates were issued to Weber and Ritter, Inc., and the place of use is described as the Van Tassell Garden Tracts; E 1/2 of NW 1/4; E 1/2 of SW 1/4 of Section 19, T20N, R.5E.W.M. An annual quantity was not identified on either right and is assumed to be based on continuous usage at the maximum instantaneous quantity. The annual quantity is considered "additive" and is included in the total because the service area and connections in the Weber and Ritter system were not considered in Ecology's review of future water right demand in the ROE for G2-23281C.

Table Continues

Table 5-3. City of Sumner Water Rights Tabulation (Continued)

Certificate Name	Current Name	Point of Diversion[a]	Water Right Certificate No.	Instantaneous Maximum			Annual AF[c,d]	Comments
				gpm	cfs[b]	mgd		
Unnamed Springs	Weber Springs No. 2	20N05E-19B	2267	90	0.20	0.13	145	These two certificates were issued to Weber and Ritter, Inc., and the place of use is described as the Van Tassell Garden Tracts; E 1/2 of NW 1/4; E 1/2 of SW 1/4 of Section 19, T20N, R.5E.W.M. An annual quantity was not identified on either right. The annual quantity is considered "additive" and is included in the total because the service area and connections in the Weber and Ritter system were not considered in Ecology's review of future water right demand in the ROE for G2-23281C.
Elhi Springs	Elhi Springs	20N05E-29L	300571	360	0.80	0.518	100(NA)	Water Right Claim. The annual quantity of these claims is not included in the total because of language in Ecology's ROE for the South Well water right, which limited the City's total annual quantity to 2,450 acre-feet "including claims to vested rights."
County Springs	County Springs	20N05E-19B	300572	799	1.78	1.15	675(NA)	Water Right Claim. The annual quantity of these claims is not included in the total because of language in Ecology's ROE for the South Well water right, which limited the City's total annual quantity to 2,450 acre-feet "including claims to vested rights."

[a] The location of the point of diversion is given by township, range, section, and 40-acre tract (e.g., NW 1/4 SW 1/4) within the section. For example, in the location, 20N05E-30R, the part preceding the hyphen indicates Township 20 North, Range 5 East Willamette Meridian. The number following the hyphen indicates the section (30) and the letter (R) gives the 40-acre tract within the section as shown in the schematic on the right

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

(e.g., R is the SE 1/4 of the SE 1/4 of section.)

[b] cfs = cubic feet per second.

[c] AF = acre-feet.

[d] An (NA) following acre-feet/year means the right is non-additive to prior existing right to that extent; therefore, the quantity is not included in the annual AF total.

[e] This water right meets the definition of "municipal water supply purposes" in RCW 90.03.015(4), and would otherwise be eligible for use as a municipal supply throughout the Sumner water service area. A constitutional challenge to this section is pending before the Washington Supreme Court.

5.3.4 Puyallup Watershed Regulations

Chapter 173-510 WAC is the comprehensive regulation establishing instream flows and stream closures for the Puyallup River Basin, Water Resource Inventory Area (WRIA) 10. A copy of the regulation is included as Appendix C of this plan.

The purpose of this regulation is to retain perennial rivers, streams, and lakes in the Puyallup River Basin with instream flows and levels necessary to provide protection for wildlife, fish, scenic-aesthetic, environmental values, recreation, navigation, and to preserve high water quality standards (WAC 173 510-020). This rule established instream flow levels for the Puyallup River and the Carbon River, and listed stream closures for several streams including all tributaries of the Unnamed Stream (Strawberry Creek) and Salmon Creek, and the tributary to White River near NE 1/4 SE 1/4, Section 13, T20N, R4E. All Sumner's source springs are tributary to these streams.

The regulation affects new groundwater development, as well as changes to existing water rights in the vicinity of regulated or closed streams. WAC 173-510-050 reads in part, "In future permitting actions relating to groundwater withdrawals, particularly from shallow aquifers, a determination shall be made as to whether the proposed withdrawal will have a direct and measurable impact on stream flows in streams for which closures and instream flows have been adopted…" The phrase "direct and measurable impact" does not permit withdrawals that are under the detection limit according to technology available when the regulation was adopted in 1988. The courts have held that Ecology can use new technology, including computer models, when evaluating the effect of a new or changed water right on stream flow. If Ecology finds that a new appropriation would affect the flow of a closed stream or impair a regulated instream flow, the application must be rejected unless there are adequate mitigation conditions to protect the instream flows or prevent effects to closed streams.

5.3.5 City of Sumner Water Rights

The water rights of the City of Sumner have been reviewed by water rights attorney Thomas M. Pors based on the February 1985 *Comprehensive Plan Update for the City of Sumner*. Water rights certificates and claims are provided in Appendix D. A summary of this review is shown in Table 5-3 (page 5-14).

Water Right Claims were submitted to Ecology in 1998 for County and Elhi Springs. These claims are included in Table 3 – Existing Water Right(s) Status and Table 4 – Forecasted Water Right(s) Status of the DOH *Water System Planning Handbook* (see Appendix E).

The City's water usage appears to be within total annual authorization under existing rights of 5,511 gpm and 2,882.25 acre-feet per year for public water supply purposes.

The City of Sumner submitted five applications for change of its existing water rights to the Department of Ecology in late May 2004. The intent of these change applications is to add new and existing City wells to several of the other existing water rights in order to allow more security and operational flexibility, especially in the event of a catastrophic loss of one or more water sources. Three of the applications for the City's existing surface water rights were withdrawn after Ecology adopted a new procedural policy requiring "direct and substantial continuity" between a surface water source and aquifer as a prerequisite for any surface to groundwater change application (POL-2010, adopted February 15, 2007). The remaining applications, for the South Well and West Well water rights, are still under review by Ecology.

In September 2005, the City of Sumner filed an application to change its Dieringer School District water right from domestic supply to municipal, and to change the place of use to include the City's entire water service area. Ecology investigated the history of beneficial use of this water right, and concluded that only 95 gallons per minute and 6.25 acre-feet of the right had been put to beneficial use and was eligible to be changed. The application was approved on April 12, 2006, and a copy of the ROE is included in Appendix D. The reduced water right quantities are reflected in Table 5-3 (page 5-14).

Historical and forecasted water-use data indicates that the existing City sources are able to meet average day and annual demand through the 6-year planning window, but have difficulty meeting the maximum-day and peak-hour demands during the summer months due to a combination of source capacity and instantaneous quantity limitations. Adding existing wells and new well sites as alternative points of withdrawal to each of the City of Sumner's existing groundwater rights will allow the City flexibility to use sources with available physical capacity to access water rights currently associated with other sources. The public health and safety will benefit by providing additional sources to meet maximum-day demands when one or more other sources may be lost due a catastrophic event.

5.4 WATER USE EFFICIENCY (WUE) PROGRAM

5.4.1 Background

The Sumner Water Utility goal is to provide adequate, high quality, potable water for economic growth and use by its customers at a reasonable price. In general, in an area where there is adequate rainfall, recharge, and water resource, this is attainable. The utility follows the old adage, "Waste not, want not." The utility does not wish to put undue pressure on its citizens to not use water, but neither do we believe in wasting water. The programs discussed in this chapter constitute the utility's efforts in meeting the objectives of a sound water conservation plan.

The population of Sumner has increased from 7,200 residents in 1991 to approximately 9,881 residents in 2009. The annual water use has increased only slightly over this period of time, partially due to the closure of Beatrice Cheese. When in operation, Beatrice Cheese consumed more water than the remaining top 14 water users combined. Other reasons for the slight increase in water use can be attributed to water conservation measures that the City has utilized. The average billed water use per residential connection (prior to increase to account for DSL) was 226 gpd from 1997 to 2008. This is a significant drop considering the average from 1997 to 2003 was 283 gpd. Average daily residential use for nearby purveyors is listed in Table 5-4. It is apparent that residential consumption is comparable in Sumner with that of adjacent purveyors but there is still room to conserve more water.

Table 5-4. Water Use per Residential Connection in Nearby Purveyors

Purveyor	Average Daily Demand (gpd per connection)
City of Sumner	226
City of Puyallup	240
City of Orting	223
City of Pacific	259
Fruitland Mutual Water Company	252
City of Bonney Lake	248
City of Auburn	260

5.4.2 Water Use Efficiency Program

The Municipal Water Law was passed in the 2003 legislative session. It requires municipal water suppliers to more efficiently use their water supplies. The water use efficiency rules required by the municipal water law are being implemented by the DOH and Ecology. The water use efficiency rules establish:

- Requirements for water use efficiency programs for municipal water suppliers.
- A distribution system leakage (DSL) standard.
- Requirements and processes for water use efficiency goal setting.
- Requirements for water use efficiency performance reporting.

The DOH guidebook, *Getting Started: Water Use Efficiency Guidebook*, was published in July 2007 (the second edition was published in January 2009) as an aid to municipal water suppliers to meet the requirements of the Water Use Efficiency (WUE) program and is the basis for this section.

5.4.2.1 Required Measures

The WUE program requires implementation of the following elements:

- Water Meters and Data Collection:
  - Production meter installation was required on or before January 22, 2007.
  - Begin collecting production and consumption data was required on or before January 1, 2007.
  - Service meter installation is required for all water services to track consumption within the system and DSL. The installation schedule was required by July 1, 2008, and the complete installation will be required by January 22, 2017.
- Demand Forecasting and WUE Program:
  - A WUE Program is required to be included in planning documents submitted after January 22, 2008. Requirements of the WUE program are explained in the WUE Guidebook from DOH (Publication No. 331-375).
- Distribution System Leakage (DSL):
  - Meet distribution leakage standard (based on 3-year rolling average) by July 1, 2010, or 3 years after installing all service meters.
  - Develop and implement a Water Loss Control Action Plan (WLCAP) to control leakage. This includes a regular and systematic program of locating and repairing leaks in system mains and laterals, including on-site testing using computer-assisted leak-detection equipment on water-distribution mains, valves, services, and meters.
- Goal Setting and Public Forum:
  - The City was required to set its own WUE goals on or before January 22, 2008. This documentation is available in Appendix R.
- Annual Performance Report:
  - The first annual performance report was required to be submitted on July 1, 2008. This documentation is available in Appendix R.

5.4.2.2 Water Conservation Program

Water conservation programs are composed of demand-side strategies and supply-side strategies. Demand-side strategies are those that lessen demand (e.g., a showerhead and toilet retrofit program). Supply-side strategies are those that supply demand from an alternative source or improve system efficiency, but in which demand is not actually reduced (e.g., water reuse and use of nonpotable water sources—including exempt wells—satisfies existing demand with an alternative source). Both strategies allow water systems the ability to supply more users with a fixed amount of supply.

Water-demand management includes the implementation of comprehensive long-term conservation programs, short-term emergency response plans, and peak-use management. In considering measures in a demand-side strategy for water conservation, it is necessary to distinguish a permanent reduction in average-per-capita demand from a temporary reduction in demand resulting from short-term or mandatory measures. Short-term regulatory or mandatory measures more associated with drought or other emergency conditions of water shortage are not considered elements of conservation. Instead, these conditions are elements of an emergency response plan that result in reduced use and a corresponding reduction in service by the public water system.

Peak-flow management, such as use of impoundments to capture excess flows for supply use, or operational programs, such as every-other-day lawn watering, can be an integral measure of an emergency-response plan, a conservation plan, or a supply strategy.

The City set forth goals in a public forum before the City Council that are listed in Section 5.4.2.3. Other measures the City is considering implementing in the coming years are as follows:

1. The City will consider providing cash rebates for residential, commercial, and/or industrial customers purchasing new high-efficiency toilets/urinals and clothes washers.

   Research states ultra-low-flow (ULF) and high-efficiency toilets reduce water consumption by approximately 2.5 gallons per flush (gpf), saving an estimated 9 gallons per capita per day. Using an estimate of 50 percent implementation among Sumner's population during the 20-year planning period, this equates to an average demand reduction of over 30 gpm, or 16.4 million gallons per year. This represents a reduction of about 2.62 percent of Sumner's 2009 ADD (2009 ADD is ~1.71 mgd).

   Other Municipalities, such as Pullman, Seattle, and Kent, have rebate programs for low-flow and high-efficiency toilets with incentives ranging from $50 to $150. Cascade Water Alliance (CWA) also offers $100 rebates for new residential customer purchases of low-flow toilets labeled as, "WaterSense." WaterSense is the water efficiency equivalent to EnergyStar for energy savings among household appliances.

   WashWise

   Many local municipalities and water distributing authorities are offering rebates for high-efficiency clothes washers and toilets through the WashWise Rebate Program. These organizations include: PSE, CWA, City of Bonney Lake, Tacoma Water, City of Renton, etc. Basically, WashWise processes the rebates and distributes the funds for the program, and municipalities or other organizations in the program pay WashWise a process fee on a per unit basis.

There are three tiers of rebates that range from $50 to $100 based on the annual water savings for the new appliance. The three tiers are as follows: $50 rebate for an appliance that saves an average of 5,962 gallons/year; $75 for an appliance that saves an average of 7,693 gallons/year; and $100 for an appliance that saves and average of 9,433 gallons per year.

The City of Sumner will further explore their potential participation in the WashWise program in 2010.

2. The City will consider implementing a program that would grant participants free fixtures or discounts on purchases of faucet aerators, low-flow showerheads, and toilet displacement devices.

   Faucet aerators reduce flow and the cost is relatively cheap ($0.33 to $1.39 each). The effectiveness in reducing overall consumption has not been researched enough to make any assumptions on the total or even per capita water demand reduction.

   Research states low-flow showerheads can reduce average consumption from over 5 gpm to 2.5 gpm, and eventually saving approximately 5.5 gpd per installation. If Sumner has 3,100 residential connections, and half participate with 1.5 showerheads per participant, that equals 2,325 showerheads. If each showerhead saves 5.5 gpd, there is potentially almost 13,000 gpd savings. This represents a reduction of about 0.74 percent of Sumner's 2009 ADD. Low-flow showerhead kits cost approximately $2 each.

   Toilet displacement devices can save 4.2 gpd per installation. However, any savings is contingent on proper installation and no increase in the average number of flushes per day. Once again, research has not determined how effective these devices are because there is a relatively high rate of removal, and toilet design often is not compatible with less flow, leading to double-flushing, which negates any savings.

3. Sumner will internally discuss landscaping and irrigation practices with the Parks department, including the cemetery staff. The City will consider additional equipment purchases and installation of moisture sensors, timers, weather stations, etc. to reduce consumption during peak periods.

   Improving efficiency of irrigation for landscaping can decrease water demand during the peak consumption periods and directly aid the City during the toughest times for the water system. Research states that moisture sensors, that can be set up to automatically adjust irrigation controllers, can save an average of 5 to 10 percent in overall outdoor use when used in conjunction with a conventional watering timer. It is unknown how much of Sumner's water use is for outdoor landscaping, so estimates for total reduction cannot be made. The cost for moisture sensors and tensiometers is between $35 and $125, and the total lifecycle costs, including replacement and repair, is approximately $270 per each installation.

   Large landscaping areas can see significant reduction in water consumption after equipment upgrades, timer adjustment, leak repair, and operator training. Research states reduction can be as much as 50 percent after these changes are made. When extra devices, such as rain shut-off switches and wireless connections to weather/irrigation information systems are added, costs can be significantly higher than other WUE measures. Research recommends that landscaping areas over 2 acres get evaluated for potential upgrades, as it can cost several hundred to several thousand dollars to implement effective changes to large landscaping/irrigation areas, depending on the options available.

4. The City will adopt language in their code that gives the City authority to fine people for illegal hydrant use or even metered hydrant use that is not reported on a monthly basis to the City. This will likely be similar to the policy of the City of Puyallup, but details for the code revision will be completed in early 2010.

   City of Tacoma charges a $1,000 fine for using a fire hydrant without a permit. The permit cost is $100, and the meter deposit is an additional $1,000. Deposits are returned after meter readings and payment for water is made.

   City of Puyallup charges a permit fee of $25 for hydrant use. A deposit for the meter is an additional $1,000 for a 3-inch meter or $300 for a 3/4-inch meter. There is a flat fee of $200 for water usage if hydrant meters are not brought to the City for a "check-up" to read the meter bimonthly and meters are then revoked.

5. In addition to the fines, Sumner will consider implementing a program to install hydrant locks which would prevent illegal connections at problem locations.

   Hydrant locks can cost in the area of $100 to $175. This is a significant investment considering Sumner has approximately 900 hydrants, but would likely only install locks on 50 to 100 of the highest theft risk hydrants. Potentially, this program could be somewhat self-sustaining if the money collected from fines described in item #4 were directly funneled into investing in hydrant locks. Also, the City will have to coordinate any changes to the hydrants with East Pierce Fire and Rescue.

6. An inherent goal of the WUE program is reducing the 3-year running average DSL to 10 percent or less. The City would like to take the first step in doing this by reducing a single-year DSL to 10 percent or less within 3 years.

   The City already has a leak detection program, but expanding the program may be an investment to consider. Other ways of reducing DSL, such as reducing the system pressure, loss from evaporation, and accounting errors are not feasible or have already been addressed. The City needs to continue to research and implement the most effective measures based on their existing customers and sources or DSL.

   Table 5-5 is a summary of the additional measures described above with an anticipated savings and cost.

Table 5-5. Projected Demand Reduction and Costs of Additional WUE Measures

Measure	ADD Demand Reduction[a] (%)	Approximate Cost/Each ($)	Approximate Total Cost ($)
1) Toilets and Clothes Washers – WashWise[b]	~3.00%	$34	$51,000
2) Faucet Aerators, Showerheads, and Toilet Displacement[c]	~0.75%	$5	$35,000
3) Landscaping[c]	~1.50%	$270	$27,000
4) Fees and Fines[d]	~0.75%	-$500	-$50,000
5) Hydrant Locks[e]	~1.00%	$125	$37,500
Total	**~7.00%**		**~$100,500**

[a] Based on estimated 2009 ADD of 1.71 mgd.

[b] Assumes 50 percent of Sumner's residential population will implement this measure.

[c] Based on 100 landscaping areas.

[d] Based on 100 fees and fines averaging $100/each.

[e] Based on the installation of 300 hydrant locks.

With the City's continuing educational efforts and other existing measures, this projected demand reduction presents a conservative estimate of the total demand reduction from the City's WUE program. These measures will also need time to be implemented and utilized by Sumner's residential, commercial, and industrial customers, so the reduction will not be realized for quite some time.

5.4.2.3 Goals

City of Sumner Resolution number 1232, in Appendix R, established initial goals for the City's WUE program on January 7th, 2008. These goals included:

1. Reduce single-family annual average daily water consumption from 283 gallons per day (2005 Comprehensive Plan) to 260 gallons per day within five years.

2. Reduce the peak monthly average daily flow to no more than twice the base winter average daily flow or 1500 cubic feet per month within 5 years.

3. Reduce unaccounted hydrant use by 50 percent within five years.

This plan represents the City's adoption of the following goals, replacing the goals listed above:

1. Reduce the 3-year running average DSL to 10 percent or less by 2016.

2. Reduce single-family annual average daily water consumption from 262 gallons per day to 250 gallons per day by 2014.

3. Decrease demand by 7 percent per ERU within the 20-year planning period.

5.4.2.4 Cost-Effectiveness Evaluation

The WUE Program requires evaluation or implementation of WUE measures. Each measure evaluated must consider the following three perspectives:

1. Water System Perspective: This evaluation looks to see if the measure is cost-effective for the water system.

2. Cost-Sharing Perspective: This evaluation looks to see if the measure is cost-effective if the implementation costs are shared with other nearby entities.

3. Societal Perspective: This evaluation looks to see if the measure is cost-effective if all the costs and benefits are included.

The City of Sumner had over 3,600 connections in 2008. This number of connections requires the City to evaluate or implement six (6) WUE measures. Any measure that is implemented, the WUE Guidebook states, does not have to be evaluated for cost-effectiveness.

Sumner is required to implement or evaluate six measures, and the following section describes two measures that cover four customer classes each; meaning the City has implemented eight measures. Therefore, no other measures will be evaluated for cost-effectiveness.

5.4.2.5 Implementation

The following WUE measures are mandatory:

1. Install production (source) meters (WAC 246-290-496[1]).
2. Install consumption (service) meters (WAC 246-290-496[2]).
3. Perform meter calibration (WAC 246-290-496[3]).
4. Implement a water loss control action plan (WLCAP) to control leakage (WAC 246-290-820[4]).
5. Educate customers about water use efficiency practices (WAC 246-290-810[4][f]).

Because these measures are mandatory, they cannot be counted as one of the six minimum evaluated or implemented measures under WAC 246-290-810(4)(d)(i). All of the above measures have been implemented, including the WLCAP (as discussed in Section 3.4.1) and education efforts (described in the following section).

Below are the measures that have been implemented for all customer classes. There are four customer classes that the City distinguishes, meaning the following measures each count for four measures towards the City's WUE Program goals. The customer classes are residential, commercial, industrial, and other. The "other" class includes schools, churches, motels/hotels, and multifamily connections.

1. Conservation rates – Conservation rate structures are set up for all customer classes in Sumner Municipal Code 13.24.300. The rates are changed on a yearly basis based on the CPI-U Index for the Seattle-Puget Sound area. The thresholds for the graduated rates remain the same, lowest rate for consumption up to 1,000 cubic feet per month, increased rate for water used between 1,000 and 2,000 cubic feet per month, and the highest rate for water used in excess of 2,000 cubic feet per month.
2. Water bill showing consumption history – The City's current water bills show customer consumption history over the past year on a month-to-month basis.

As stated in Section 5.4.2.2, there are several other goals/measures that the City will evaluate and consider implementing in the future. Below are educational efforts the City will promote in the coming years.

5.4.2.6 Education

The following sections describe the City's educational programs separated by target customer class.

All Customer Classes
Publicize the need for water conservation through television and radio public-service announcements, news articles, public-water-systems bill inserts, or other means. This includes promoting efficient indoor and outdoor water usage; distribution of Ecology/Health conservation brochures or other printed material informing customers, builders, and contractors of new plumbing code regulations requiring efficient plumbing fixtures; and other efforts.

Industrial and Commercial Customer Classes
Provide assistance to wholesale suppliers that will aid wholesale customers to develop and implement conservation programs tailored to their needs, and provide assistance to wholesale suppliers that will help them carry out their own conservation programs.

Nurseries/Agriculture Customers
Encourage the application of current water-conservation techniques for large agriculture/irrigation operations. Examples include nurseries and commercial agriculture. Moisture sensors, flow timers, low-volume sprinklers, drip irrigation, weather monitoring, and other practices to increase irrigation efficiency could be installed.

Landscape Management/Playfields – Xeriscaping
Promote low-water-demand landscaping in all retail customer classes (private, public, commercial, industrial, etc.). Work with local nurseries to ensure the availability of plants that achieve this objective.

Table 5-5 (page 5-21) shows the City's required and WUE program measures.

5.4.2.7 Estimated Water Savings

The projected water savings from the City's WUE program can be attributed to goal setting and implementation of the education and other efforts described above. The City has decreased the single-family annual average daily water consumption from 283 gallons per day (2005) to approximately 262 gallons per day through 2008. This represents an approximate 3 percent decrease in total consumption for the Sumner water system (this is a per capita comparison, which does not take the City's population growth into account).

The demand forecasts shown previously in this chapter assume no projected water savings from WUE program measures. Over the coming years, the goals and measures the City will continue to implement are the basis for projected water savings described in Section 5.4.3.

5.4.2.8 Measure Effectiveness

The goal of the WUE program is to measure water production and consumption and to use this information to track reduction in the demands in the system. Reduction of water demand will be aided by the WUE program measures.

The water use production and consumption demands have and will continue to be tracked over the coming years. These demands will be looked at on a quarterly basis to help evaluate the effectiveness of the WUE program and help with future projections of the water system.

The Annual Water Use Efficiency Performance Reports, due to DOH each calendar year, summarize water produced, billed, and the resulting DSL. This information will be analyzed to track progress toward the WUE program goals within the planning period. The 2009 Annual Water Use Efficiency Performance Report is shown in Appendix R.

5.4.3 Water Use Savings Projections

Water usage for a single-family residence in Sumner averages 226 gpd, not accounting for DSL within the system between the source and the service connection. To be conservative, it is assumed that Water Use Efficiency efforts by the City of Sumner will result in a 7 percent decrease in total gallons per ERU during the 20-year planning period. These savings are shown in Table 5-6 (page 5-25).

Table 5-6. Evaluation of WUE Measures

	Benefits			Costs			Level of Implementation			Year of Implementation[a,b]
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	
Required Measures										
Production Meter Installation		X			X				X	–
Service Meter Installation (and schedule)		X			X				X	–
Collect Production/Consumption Data and Forecast Demands		X			X				X	–
WUE Program in Planning Document		X			X			X		2009
Meet DSL Standard /Implement WLCAP		X			X			X		2009
Set WUE Goals		X		X				X		–
Submit Annual Performance Report		X			X			X		–
WUE Program Measures (Implemented)										
Education		X			X			X		2009
Bill Showing Consumption History		X			X			X		–
Conservation Pricing			X	X			X			–
Reclaimed Water			X			X		X		#

[a] "–" indicates conservation measures already in effect.

[b] "#" indicates conservation measures not being implemented by the City of Sumner.

Table 5-7. Projected Demands with WUE Program Savings[a]

Year	Average Daily Demand (ADD) (mgd)	Maximum Day Demand (MDD) (mgd)	WUE Program Savings (%)
2008[b]	1.57	3.14	–
2009	1.68	3.36	2.00
2010	1.74	3.48	2.25
2011	1.80	3.60	2.50
2012	1.86	3.72	2.75
2013	1.91	3.82	3.00
2014	1.96	3.92	3.25
2019	2.20	4.40	4.50
2024	2.39	4.78	5.75
2029	2.56	5.12	7.00

[a] The ADD and MDD values shown here are presented to demonstrate how implementation of small conservation measures can affect total system consumption. These conservation savings are theoretical and should not be used for planning purposes.

[b] The actual ADD and MDD for 2008 are shown here as a baseline for the projected WUE savings.

5.5 WATER RECLAMATION

The Municipal Water Supply – Efficiency Requirements Act, Chapter 5, Laws of 2003 (Municipal Water Law), amended Chapter 90.46 of the RCW to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their Water System Plan (WSP). Municipal Water Law Attachment 9: Water Reclamation Checklist for Systems with 1,000 or More Connections for the City of Sumner outlines potential reclaimed water annual use, including estimated annual savings to the City. Attachment 9 is included in Appendix N of this Plan.

Expansion and water quality improvements to the Sumner wastewater treatment facility were recently completed. The plant provides enhanced secondary treatment with nitrification/denitrification capabilities and was designed to allow construction of a future effluent filtration process as funding allows. The effluent filter process will be designed and built to meet water reuse criteria as established by the Washington State Department of Ecology. The water reuse facility is sized to treat 3.0 mgd. Rotary cloth and/or membrane filters will be used. Initially, there will be only enough rotary discs to treat an average daily flow of 1.5 mgd. In time, as needed, additional filter units will be installed to increase the capacity to 3.0 mgd. The filter unit frames, flocculation tank, piping, and chemical feed will be sized initially to treat 3.0 mgd. Construction of the effluent filtration plant alone will not enable the City to produce Class A reuse water from the WWTP until a new UV disinfection system is constructed.

The effluent filter plant serves two general purposes.

- To enhance the quality of the effluent.
- Provide summer irrigation water, in the form of reclaimed water, in lieu of using potable water and surface water rights.

The 50-acre cemetery site has a water right for 100 acre-feet of annual consumption for irrigation of the cemetery property. The West Well presently primarily serves the cemetery. This water right could be better used for general municipal use. With the construction of approximately 9,300 feet of 4-inch force main from the WWTP to the cemetery, the cemetery may be irrigated with reuse water. The development of directional boring has made this a feasible scenario. A 4-inch high-density polyethylene line may be bored under the rivers and SR 167 in a fairly direct line to the cemetery.

The City golf course on the east side of the White (Stuck) River south of Stewart Road has 284 acre-feet of surface water rights. This water is pumped from the river each summer to irrigate the course. The reuse plant will have sufficient capacity to supply irrigation for the golf course. To accomplish this, approximately 19,300 feet of 10-inch main line would have to be installed to get the water from the wastewater plant to the south end of the golf course. The pipeline would be located in the Sumner Trail System right-of-way along the east side of the river. The 11 interconnected ponds at the golf course would provide adequate equalization storage. A preliminary cost estimate for this pipeline is $1.6 million. The 284 acre-feet of surface rights could be transferred for use as potable, municipal water distributed within Sumner's water service area or utilized as mitigation for new groundwater rights.

The City will consider installing and maintaining irrigation in the planter areas at the SR 410/Traffic Avenue interchange. This will require an intergovernmental agreement with the WSDOT. The purpose is to enhance the aesthetic appearance of one of the principal entrances to the City of Sumner. The wastewater treatment plant is adjacent to this interchange. Supplying irrigation water to this area would not be expensive. The real cost is in the continued maintenance of the area by the City's Parks Department.

The construction of the effluent filter plant as a part of the future expansion was anticipated during the 2004 expansion project. The three reuse projects described above have not been studied in any further detail than described above. These projects are not included in the capital facility budget at this time. When existing water transfer applications and acquisition of additional water rights is solidified, engineering feasibility studies will be prepared for all three projects. If these projects are found to be viable and wanted, the projects will be incorporated into future updates of this Plan. Construction of the WWTP upgrade is anticipated to be completed in 2011/2012. The construction date of the new UV disinfection system and effluent filter plant is unknown at this time. Therefore, it is not likely that reclaimed water will be available to the City before the end of the 6-year planning period.

5.6 MINIMUM SANITARY CONTROL AREA SURVEY

Sanitary conditions at the City's springs and wells were assessed during site visits. The area of focus for the visits was the minimum sanitary control area, defined as 200 feet and 100 feet for springs and wells, respectively (WAC 246-290-135). To a lesser extent, areas surrounding the minimum sanitary control areas were also investigated. The DOH Water System Sanitary Survey Report is included in Appendix G.

5.6.1 Sumner, Weber, and County Springs

Collection, transmission, treatment, and storage works at the Sumner, Weber, and County Springs are in good condition and protect the spring sources from normal routes of exposure to contamination. Recent spring corrective measures within the minimum sanitary radii, as discussed in Section 4.2, were scrutinized, including:

- Collection of maximum spring flow.
- Waterproofing of lids on all tap boxes.
- Routing surface drainage around collection works.
- Filter fabric installation near spring taps.
- Slip lining leaking pipes.

Several of the tap box lids were opened to observe the raw water supply. No surface films or sheens were observed, and water was not turbid. No silt or other deposits were observed at the bottom of the tap/collection boxes. Some insects were seen in the tap boxes but in small numbers. Surface water appeared to pool near some of the spring taps and tap boxes.

In general, items on the above list were adequate, although some improvements could be made to ensure an even greater degree of protection, such as:

- Each tap box could be examined for defects and sealed with grout or epoxy to prevent insect infiltration. A vent with fine screen could be placed on airtight boxes.
- Impermeable geomembrane materials could be placed around the spring collection areas within the minimum sanitary radius as needed to prevent surface water from entering the spring(s) collection area.
- Surface water could be further channelized around the minimum sanitary radii of the spring taps where problems exist. Methods may include trenching, intercepting shallow surface flows with perforated pipe, and installing diversionary culverts in swales upstream of the spring taps. A study of surface drainage both upstream and downstream of the spring taps will be needed to facilitate the siting of surface water collection and diversion works.

Poor drainage and development uphill of the springs poses a potential problem of increased volumes of runoff, which could potentially aggravate the occurrences of mass wasting and slope failures above the spring taps. Surface water diversion will help reduce this potential, but some bank stabilization may also be needed. It is recommended that a geologic investigation be conducted to determine slope stability near the Sumner, Weber, and County Springs and that appropriate measures be taken to reduce the likelihood of bank failure.

5.6.2 Elhi Springs

Elhi Springs was last upgraded in 2003, during which the existing holding tank was converted into a treatment building with an entryway and stairs installed on the east side of the tank to allow access. A chlorine-injection system, including chlorine contact chambers and a chlorine-residual monitor, was installed in the retrofitted holding tank. The existing collection facilities are in good condition.

Overall, this source is in very good condition, and no additional improvements are recommended at this time.

5.6.3 South Well

The pump and pump house are in good condition. The pump base is encased in concrete within the pump house. The pump house is surrounded by a chain-link fence. The wellhead is above the 100-year floodplain of the Puyallup River. In general, the immediate vicinity of the well is protected.

However, just outside of the pump building, the wellhead may not be protected from contamination. The following potential sources of pollution were observed within the minimum sanitary control radius of 100 feet:

- A large creek (Van Ogles Creek) flows south of the well. The estimated 25-year, 24-hour precipitation flood flow for this creek is 140 cfs (Parametrix 1992). Van Ogles Creek is believed to be subject to high suspended-solids loadings from surrounding farms. A variety of agricultural pollutants may be present.
- Riverside Road to the north is subject to truck traffic carrying a variety of cargoes.
- The field to the east may contain fertilizers and insecticides.

Outside of the sanitary control area within 100 yards of the well, the following potential sources of pollution were observed:

- Goats less than 30 feet from Van Ogles Creek.
- Turkey/chicken coop.
- Knutson farm packaging facility.

These potential polluting activities could affect the risk classification of the well under the Groundwater Disinfection Rule and Wellhead Protection Program (see Chapter 6).

5.6.4 Dieringer Well

Dieringer Well improvements were recently completed to allow the City to fully utilize the previously existing 250-gpm instantaneous water right. However, the water right has recently been reduced to 95 gpm because the City could not show historical evidence of beneficial use of the entire 250 gpm. The pump and pump house are in very good condition. This well is located on the Peterson Brothers property (a local contractor), the perimeter of which is fenced and gated to prevent illegal entry.

The DOH approved a Sanitary Control Area variance for the Dieringer Well in 1998, allowing the control-area radius to be reduced from 100 feet to 42 feet. Potentially contaminating activities observed within the required sanitary control radius include:

- Parking lot.
- Equipment and vehicle operation.

The Dieringer Well is a deep well that, based on aquifer testing and available hydrogeological information, draws from a deep confined aquifer. Therefore, it seems unlikely that activities resulting in surface water or shallow aquifer contamination within the 42-foot sanitary-control-radius area would adversely affect water quality within the well.

Based on historical well records, the Dieringer Well is an artesian well with hydraulic head approximately 7 to 9 feet above the top of the well casing. Currently, an overflow structure is in place to convey artesian flow from the well casing. Flow from the overflow is routed to the existing stormwater conveyance system located to the north of the well house. Cross-connection control is provided by an air gap located inside the well house. It is recommended that the City provide further cross-connection control by installing a discharge and catchment structure with a second air gap outside of the well house.

5.6.5 West Well

The City recently successfully transferred the West Well rights and place of distribution to allow seasonal domestic use. The pump and pump house are in good condition. No fencing is provided around the pump house. A variety of potentially contaminating activities were observed within the minimum sanitary-control radius of the West Well. These include:

- Hobby farms with horses.
- Vehicle maintenance shop.
- Parking lot.
- Storage of chemicals.

5.7 WATERSHED SURVEY

5.7.1 Protected City of Sumner Watersheds

The City of Sumner owns and exercises control over two protected watersheds. The northern watershed encompasses the Sumner, Weber, and County Springs. The southern watershed encompasses Elhi Springs. Both watersheds are steeply sloped; heavily forested with fir, cedar, and deciduous trees; and are relatively undisturbed.

Access to the watersheds is controlled by locked gates. The Parker Road entrance to the northern watershed allows vehicular access to the Sumner Springs tank and chlorination facility. The Van Tassel Road entrance to the northern watershed allows access to the County Springs tank and chlorination facility. A forest trail of varying width connects the Sumner Springs tank and County Springs tank allowing foot traffic to pass by all spring taps in the Sumner, Weber, and County Springs systems. The other access to the northern watershed off Sumner-Tapps Highway is rarely used. There is only one entrance from Highway 410 to the southern watershed and Elhi Springs.

The northern and southern watersheds are protected with fences that run along the western side of Sumner-Tapps Highway and the northern side of SR 410, respectively. However, the entire perimeter of the watersheds is not fenced. Hikers, horses, and animals may enter the watersheds and pass close to the spring taps. Sumner-Tapps Highway runs through the eastern side of the northern watershed allowing easy access to the eastern portion, which is unfenced.

5.7.2 Unprotected Tributary Drainage Areas

Surface runoff from upstream drainage areas can migrate to the protected portions of the watershed via overland flow. The northern tributary drainage area is more than twice as large as the protected area of the watershed. The southern tributary drainage area is less than half the size of the protected area of the watershed. The tributary drainage areas are experiencing rapid residential development. The abundance of new houses and subdivisions in the northern tributary drainage area indicates most development is recent. The southern drainage area has seen similar types of residential development, although it has been on a smaller scale.

5.7.3 Groundwater

A 1965 geologic report speculates that the sources of groundwater for the Sumner Springs system are precipitation on the upland east of the springs and possibly from Lake Tapps (see Appendix F). The springs flow out from a geologic contact where a permeable gravel layer overlies a less permeable layer of older glacial drift. The permeable gravel layer is itself overlain by another layer of younger glacial drift. The younger glacial drift is thin in some places, and surface drainage could penetrate to the water-bearing gravel layer from which the springs flow. The absence of visible surface channels in the younger glacial drift is evidence that much of the runoff may be subsurface flow. Appendix F further describes geology and groundwater flow.

5.7.4 Potential Sources of Groundwater Contamination

Based on the geology of the area around the springs, it can be speculated that surface-water infiltration from the area between Lake Tapps, Bonney Lake, and the springs could contribute to replenishment and recharge of the spring aquifer. Outside of the tributary drainage areas, runoff would first have to penetrate the upper layer of glacial drift and travel as groundwater to enter the spring aquifer. Filtering through the soil and traveling the distance to the springs would likely remove *Giardia*, viruses, particulates, and colloidal particles from the groundwater. Therefore, these contaminants are not of primary concern outside the tributary drainage areas. However, dissolved substances such as oils, solvents, fertilizers, pesticides,

and other contaminants can travel with the groundwater to the springs. Since most development above the springs is residential, large quantities of hazardous chemicals are unlikely to enter the aquifer that feeds the springs. Nevertheless, the City will carefully monitor development and activities above the spring sources outside the watershed.

5.7.5 Potential Sources of Surface Water Contamination

Runoff from the tributary drainage areas may not have the benefit of filtration. Surface water is a potential avenue of contamination if it reaches the spring collection areas.

The City of Sumner can reduce the potential for water supply contamination from surface runoff by maintaining the Sumner, County, Weber, and Elhi Springs, and exercising control of the tributary drainage areas above the protected watersheds. Exercising control could involve annexing these portions of the watershed into the city, interlocal agreements with Pierce County on types and magnitude of development, or funding projects in these areas to divert and contain runoff. On-site sewage systems should be monitored to ensure adequate function. Development in these areas should be restricted to single- or double-family rural housing. Unwarranted activities include livestock tending, farming, medium-to-large hobby farms, industry, gravel-mining operations, large parking lots, and nonfunctional on-site sewage disposal.

5.8 SOURCE WATER PROTECTION

The Safe Drinking Water Act requires that public water system wells be protected from potential sources of contamination. DOH has complied with this requirement by establishing a Wellhead Protection Program. A Wellhead Protection Program has been completed for all current sources. See Appendix G for the Wellhead Protection Program and information. Appendix G also includes data for the susceptibility assessment, the protection area information, an inventory of containment sources, and samples of letters distributed to businesses that may impact water quality. A contingency plan for replacement of water sources has not been formally developed. The City of Sumner will be forced to locate additional sources of water in the event that the existing sources are contaminated. Documentation for spill response planning is included in Chapter 10, "Operations Program."

6. WATER QUALITY

The City of Sumner must comply with water quality regulations on both the federal and state level. State regulations enforced by the Washington State DOH may be the same as or more stringent than the federal regulations. DOH regulates water quality of public water systems under the State Drinking Water Regulations, WAC 246-290-300 through 320. The DOH also has enforcement responsibility for federal regulations included in primacy agreements with the United States Environmental Protection Agency (EPA). Water quality regulations are currently evolving, and will continue to evolve, becoming more stringent due to implementation of the Safe Drinking Water Act and other state and federal legislation.

This chapter outlines the current water quality requirements within the City of Sumner and upcoming water quality regulations that may be applicable to the City's water system.

6.1 CURRENT REGULATIONS

Table 6-1 shows the current state-regulated chemical contaminants and physical properties applicable to the City of Sumner water system. As the table shows, the state has defined each contaminant as either a primary or secondary standard. Primary standards refer to those contaminants or physical properties associated with chronic, nonacute, or acute human health effects. Secondary standards refer to those contaminants or physical properties associated with problems other then health effects, such as the general aesthetic quality of the water.

Table 6-1. Primary and Secondary Maximum Contaminant Limits (MCL)

Parameter	Units	MCL	Detection Limit	Comments
Inorganics/Primary				
Antimony (Sb)	mg/ℓ	0.006	0.002	
Arsenic (As)	mg/ℓ	0.01	0.01	[a]
Asbestos	1 E^6 fibers/L	7 (> 10 um)		
Barium (Ba)	mg/ℓ	2.0	0.1	
Beryllium (Be)	mg/ℓ	0.004	0.002	
Cadmium (Cd)	mg/ℓ	0.005	0.002	
Chromium (Cr)	mg/ℓ	0.1	0.01	
Copper (Cu)	mg/ℓ	[b]	0.2	[a]
Cyanide (HCN)	mgℓ	0.2	0.05	
Fluoride (F)	mg/ℓ	4.0	0.2	
Lead (Pb)	mg/ℓ	[b]	0.002	[a]
Mercury (Hg)	mg/ℓ	0.002	0.0005	
Nickel (Ni)	mg/ℓ	0.1	0.04	
Nitrate (as N)	mg/ℓ	10.0	0.2	
Nitrite (as N)	mg/ℓ	1.0	0.2	
Selenium (Se)	mg/ℓ	0.05	0.005	
Sodium (Na)	mg/ℓ	[b]	5	[a]
Thallium (Tl)	mg/ℓ	0.002	0.001	

(Table Continues)

Table 6-1. Primary and Secondary Maximum Contaminant Limits (MCL) (Continued)

Parameter	Units	MCL	Detection Limit	Comments
Inorganics/Secondary				
Chloride (Cl)	mg/ℓ	250.0	–	
Fluoride	mg/ℓ	2.0	0.2	
Iron (Fe)	mg/ℓ	0.3	0.03	
Manganese (Mn)	mg/ℓ	0.05	0.01	
Silver (Ag)	mg/ℓ	0.1	0.01	
Sulfate (SO_4)	mg/ℓ	250.0	–	
Zinc (Zn)	mg/ℓ	5.0	0.05	
Physical Characteristics/Secondary				
Color	Color Units	15	5.0[b]	At 25°C
Hardness	mg/ℓ $CaCO_3$	None	N/A	
Specific Conductivity	µmhos/cm	700	–	
TDS	mg/ℓ	500	–	[b]
Disinfection By-Products/Primary				
Total Trihalomethanes (TTHM)	mg/ℓ	0.080	–	
Haloacetic Acids	mg/ℓ	0.060	–	
Bromate	mg/ℓ	0.010	-	
Chlorite	mg/ℓ	1.0	-	
Pesticides				
Endrin	mg/ℓ	0.0002	0.00001	
Lindane	mg/ℓ	0.004	–	
Methozychlor	mg/ℓ	0.1	0.0001	
Toxaphene	mg/ℓ	0.005	0.001	
2, 4-D	mg/ℓ	0.1	–	
2, 4, 5-TP Silvex	mg/ℓ	0.01	–	
Radionuclides/Primary				
Radium-226	PCi/L	3.0		
Combined Radium–226 and Radium-228	PCi/L	5.0		
Gross Alpha Particle Activity	PCi/L	15.0		
Volatile Organic Chemicals/Primary				
Vinyl Chloride	mg/ℓ	0.002	0.0005	
Benzene	mg/ℓ	0.005	0.0005	
Carbon Tetrachloride	mg/ℓ	0.005	0.0005	
1, 2-Dichloroethane	mg/ℓ	0.005	0.0005	
Trichloroethylene	mg/ℓ	0.005	0.0005	
Para-Dichlorobenzene	mg/ℓ	0.075	0.0005	
1, 1-Dichloroethylene	mg/ℓ	0.007	0.0005	

(Table Continues)

Table 6-1. Primary and Secondary Maximum Contaminant Limits (MCL) (Continued)

Parameter	Units	MCL	Detection Limit	Comments
Volatile Organic Chemicals/Primary (continued)				
1, 1, 1-Trichloroethane	mg/ℓ	0.2	0.0005	
Cis-1, 2-Dichloroethylene	mg/ℓ	0.07	0.0005	
1, 2-Dichloropropane	mg/ℓ	0.005	0.0005	
Ethylbenzene	mg/ℓ	0.7	0.0005	
Monochlorobenzene	mg/ℓ	0.1	0.0005	
o-Dichlorobenzene	mg/ℓ	0.6	0.0005	
Styrene	mg/ℓ	0.1	0.0005	
Tetrachloroethylene	mg/ℓ	0.005	0.0005	
Toluene	mg/ℓ	1	0.0005	
Trans-1, 2-Dichloroethylene	mg/ℓ	0.1	0.0005	
Xylenes (total)	mg/ℓ	10	0.0005	
Dichloromethane	mg/ℓ	0.005	0.0005	
1, 2, 4-Trichlorobenzene	mg/ℓ	0.07	0.0005	
1, 1, 2-Trichloroethane	mg/ℓ	0.005	0.0005	
Synthetic Organic Compounds/Primary				
Alachlor	mg/ℓ	0.002	0.0004	
Aldicarb	mg/ℓ	0.003	0.001	
Aldicarb sulfoxide	mg/ℓ	0.004	0.0018	
Aldicarb sulfone	mg/ℓ	0.002	0.0007	
Atrazine	mg/ℓ	0.003	0.0002	
Carbofuran	mg/ℓ	0.04	0.002	
Chlordane	mg/ℓ	0.002	0.0004	
Dibromochloropropane	mg/ℓ	0.0002	–	
2, 4-D	mg/ℓ	0.07	0.0002	
Ethylene dibromide	mg/ℓ	0.00005	–	
Heptachlor	mg/ℓ	0.0004	0.00008	
Heptachlor epoxide	mg/ℓ	0.0002	0.00004	
Lindane	mg/ℓ	0.0002	0.00004	
Methoxychlor	mg/ℓ	0.04	0.0002	
Polychlorinated biphenyls	mg/ℓ	0.0005	–	
Pentachlorophenol	mg/ℓ	0.001	0.00008	
Toxaphene	mg/ℓ	0.003	0.002	
2, 4, 5-TP	mg/ℓ	0.05	0.0004	
Benzo[a]pyrene	mg/ℓ	0.0002	0.00004	
Dalapon	mg/ℓ	0.2	0.002	
Di (2-ethylhexyl) adipate	mg/ℓ	0.4	0.0013	
Di (2-ethylhexyl) phthalate	mg/ℓ	0.006	0.0013	

(Table Continues)

Table 6-1. Primary and Secondary Maximum Contaminant Limits (MCL) (Continued)

Parameter	Units	MCL	Detection Limit	Comments
Synthetic Organic Compounds/Primary (continued)				
Dinoseb	mg/ℓ	0.007	0.0004	
Diquat	mg/ℓ	0.02	–	
Endothall	mg/ℓ	0.1	–	
Endrin	mg/ℓ	0.002	0.00004	
Glyphosate	mg/ℓ	0.7	–	
Hexachlorobenzene	mg/ℓ	0.001	0.0002	
Hexachlorocyclopentadiene	mg/ℓ	0.05	0.0002	
Oxamyl (Vydate)	mg/ℓ	0.2	0.004	
Picloram	mg/ℓ	0.5	0.0002	
Simazine	mg/ℓ	0.004	0.00015	
2, 3, 7, 8-TCDD (Dioxin)	mg/ℓ	3E-8	–	

[a] Although the state board of health has not established MCLs for copper, lead, and sodium, there is sufficient public health significance connected with these elements to require inclusion in inorganic chemical and physical source monitoring. For lead and copper, EPA has established distribution system related levels at which a system is required to consider corrosion control. The levels, called "action levels," are 0.015 mg/L for lead and 1.3 mg/L for copper and are applied to the highest concentration in 10 percent of all samples collected from the distribution system. EPA has also established a recommended level of 20 mg/L for sodium as a level of concern for those consumers with restricted diets of daily sodium intake.

[b] Required only when specific conductivity exceeds 700 µmhos/cm.

Table 6-2 indicates the approximate locations and frequency for each type of water quality monitoring.

Table 6-2. Water Quality Monitoring Parameters

Sample Type	Sample Location	Frequency
Bacteriological	At representative points throughout the distribution system.	Monthly
Inorganic Chemical and Physical	At the source, after treatment, before entry to disinfection system.	Every 36 months [a]
Radionuclides	At the source.	Every 36 months
Volatile Organic Chemical (VOC)	At the source, after treatment, before entry to disinfection system.	Every 36 months
Synthetic Organic Chemical (SOC)	At the source, after treatment, before entry to disinfection system.	Every 36 months
Lead and Copper	At selected homes throughout the distribution system, at the source.	Every 36 months
Disinfection By-Products	At location within the distribution that represents the maximum residence time before mixing for source treatment plant.	Every 36 months
Disinfection Residual	At bacteriological routine and repeat monitoring locations.	Monthly
Water Quality Parameters (Treated Source)	At the source.	Monthly

[a] This sampling frequency was required prior to the City's waiver from DOH allowing reduced monitoring. Reduced monitoring allows for one sample every 9 years. The next deadline for the City's reduced monitoring samples is December 2010.

6.1.1 Lead and Copper Rule

Lead is a highly toxic metal now banned for use in new public water system pipes, flux, and solder. Infants and pregnant women are especially susceptible to lead poisoning. Lead causes central and peripheral nervous system damage, hindering development in small children. The presence of lead in older facilities is a nationwide concern. All new pipes, fittings, solder, or flux used in the installation or repair of public water systems must now be lead-free (WAC 246-290-230). Lead-free is defined in the state regulations as no more than 8 percent lead in pipes and pipe fittings and no more than 0.2 percent lead in solder and flux.

Copper is both a primary and secondary drinking water standard. Copper is associated with stomach distress, Wilson's disease, and staining of porcelain.

The EPA lead and copper action levels are 0.015 mg/ℓ and 1.3 mg/ℓ, respectively. Lead and copper are being regulated through the Lead and Copper Rule, which is currently being implemented at the state level.

6.1.1.1 Monitoring

The City of Sumner has records dating back to 1992 for monitoring of lead and copper. Lead and copper monitoring is performed at the consumer's tap. In 1992, the City of Sumner was required to collect lead and copper samples from 40 locations within the distribution system every 6 months. The DOH allowed Sumner to initiate a reduced monitoring program, requiring 20 samples once every year, in 1994 after all samples were below the Action Level for both lead and copper for four consecutive sampling periods. The City of Sumner is currently required to collect lead and copper samples from 20 locations within the water system every 3 years.

Lead and copper monitoring was done in 1993, 1994, 1995, 1998, 2001, 2004, and 2007 with results summarized in Table 6-3. The results indicate that no samples of lead or copper exceeded the EPA action level. The state reporting level was exceeded for both copper and lead.

Table 6-3. Summary of Lead and Copper Data

		Copper		Lead	
Month/Year	Number of Samples	Number Exceeding SRL (0.2 mg/ℓ)	Number Exceeding AL (1.3 mg/ℓ)	Number Exceeding SRL (0.002 mg/ℓ)	Number Exceeding AL (0.015 mg/ℓ)
May 1993	40	38	0	16	0
Sept–Oct 1994	20	20	0	7	0
July 1995	29	28	0	12	0
July–Aug 1998	25	23	0	6	0
Oct–Nov 2001	20	20	0	0	0
October 2004	28	28	0	16	0
September 2007	22	21	0	17	0

Notes: SRL = State Reporting Level
AL = Federal Action Level

6.1.1.2 Sample Sites

Each public water system must identify an available supply of targeted sampling sites that represent high-risk locations, such as homes with lead solder installed after 1982, homes with lead pipes, and homes with lead service lines. Sampling is voluntary, and the homeowners may later decide to discontinue participation.

6.1.1.3 Sample Collection

All samples for lead and copper are collected as first-drawn samples, consisting of one liter of water that has stood motionless within the plumbing system for at least 6 hours. Sampling is conducted at a cold-water interior tap that is typically drawn for consumption.

The system's staff may collect first-drawn samples, or the system may allow residents to collect samples after proper procedure instruction. However, if residents are allowed to collect samples, the system may not challenge the accuracy of sampling results based on alleged errors in sampling collection.

6.1.1.4 Action Level Exceedance

No samples have included lead and copper levels that exceed the action level. Both lead and copper levels exceed the state reporting level. A summary of lead and copper data is included in Table 6-3.

6.1.2 Total Coliform Rule

Coliform bacteria, though not necessarily disease-causing themselves, can be indicators of organisms that can cause gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. Coliform bacteria reside in the intestinal tracts of warm-blooded mammals and are excreted in large numbers with feces. Fecal coliforms are a subset of total coliforms and are generally a better indicator of direct fecal contamination. *Escherichia coli* (*E. coli*) is a subset of fecal coliforms and is an even better indicator of fecal contamination. Coliforms can be found in sewage, soils, surface waters, and vegetation.

The numerical water quality standard criterion for coliform bacteria is based on the following arguments: The number of coliforms in domestic water supplies far outnumbers the number of pathogenic microorganisms, since fecal coliforms are contributed by the entire population, while pathogens are contributed only from persons with enteric illnesses. The die-off rate of pathogenic bacteria is greater than the death rate of coliforms outside the intestinal tract of animals; thus, exposure to treatment and residence in water reduce the number of pathogens relative to coliforms. Based on these premises, water that meets the state standards is, statistically speaking, safe for human consumption because of the improbability of ingesting pathogens. Unfortunately, comparable protection against viruses is unclear. Available information indicates that viruses can survive considerably longer than coliform bacteria outside the human host and that the infectious dose may be a very small number (Viessman and Hammer, 1985).

The coliform rule, WAC 246-290-310, is based on a presence/absence of total coliforms in routine samples. If coliforms are detected in a routine sample, the sample must be analyzed for fecal coliforms or E. coli and three repeat samples collected. The first repeat sample is collected at the site of the sample with coliform presence. The second repeat sample is collected within five active service connections upstream of the sample with coliform presence. The third repeat sample is collected within five active service connections downstream of the site with coliform presence. Other follow-up actions are stipulated in WAC 246-290-320, including department notification, public notification, and correction procedures.

Acute MCL violation of the coliform rule occurs when:

- Fecal coliform presence is detected in a repeat sample.
- E. coli presence is detected in a repeat sample.
- Coliform presence is detected in a set of repeat samples collected as a follow-up to a sample with fecal coliform or E. coli presence.

Nonacute MCL violation of the coliform rule occurs when:

- Systems taking less than 40 samples during the month have more than one sample with coliform presence.
- Systems taking 40 or more routine samples per month have more than 5 percent with coliform presence.

Table 6-4 includes a summary of bacteriological data between 1996 and 2003. All samples from the public system have been negative for coliform counts.

Table 6-4. Summary of Bacteriological Data

Year	Number of Distribution Samples Required per Month	Number of Samples Collected	Results
1996	8	96	Coliforms absent
1997	8	96	Coliforms absent
1998	8	96	Coliforms absent
1999	8	96	Coliforms absent
2000	8	96	Coliforms absent
2001	8	98	Coliforms absent
2002	8	100	Coliforms absent
2003	8	96	Coliforms absent
2004	10	197	2 Samples had Coliforms present
2005	10	120	Coliforms absent
2006	10	121	Coliforms absent
2007	10	120	Coliforms absent
2008	10	121	Coliforms absent

Samples included for determining acute and nonacute compliance include routine samples and repeat samples. Samples not included in determining acute and nonacute compliance include special purpose samples and invalid samples. Circumstances invalidating a sample occur when:

- Presence/absence technique cultures are turbid in the absence of an acid reaction.
- Multiple tube technique cultures are turbid without appropriate gas production.
- There are confluent growth patterns or growth of too numerous to count (TNTC) colonies without a surface sheen using a membrane filter analytic technique.
- There is excess debris in the sample.
- The analyzing laboratory establishes that improper sample analysis occurred.

- DOH determines a domestic or nondistribution system problem is indicated by repeat samples collected at the same location that also have coliform presence, and all other samples in the set of repeat samples are free of coliform.
- The department determines a coliform presence is due to a circumstance or condition that does not reflect water quality in the distribution system.

6.1.3 Coliform Monitoring Plan

All public water systems are required to collect samples for coliform bacteria analysis by the State Board of Health Drinking Water Regulations (Chapter 246-290 WAC). For Group A systems, coliform bacteria sample collections are based upon a written monitoring plan. The sampling sites and monitoring frequency indicated in the plan represent the water throughout the distribution system. Coliform monitoring plans are subject to review and to revision as directed by the DOH. The plan is kept on file with the water system and made available to the DOH at the time of any routine Comprehensive System Evaluation or special site visit. A copy of the current Coliform Monitoring Plan is provided in Appendix H.

6.1.4 Groundwater Disinfection Rule

The purpose of disinfection is to destroy organisms that cause disease. Without appropriate disinfection, a water supply can be susceptible to contamination. Two types of disinfection (primary and secondary) are normally practiced. Primary disinfection is applied at the source. This is usually accomplished by maintaining a disinfectant residual in a tank for a period of time necessary to kill pathogenic organisms. Secondary disinfection is maintained in the distribution system. This is accomplished by assuring disinfectant residual remains after primary disinfection to kill pathogenic organisms that may be introduced after the source through cross connections, subsequent growth, etc. A secondary disinfection residual could also be used to trace contamination in the system, since any oxidizable substances would reduce or eliminate the disinfectant residual and could be easily measured.

Primary disinfection for the Sumner water system sources is provided by chlorine injection.

Per WAC 246-290-250, all non-GWI (groundwater under the influence of surface water) groundwater sources shall have continuous disinfection consistent with the following requirements:

- The combination of free chlorine residual concentration (Cmg/l) and chlorine contact time (Tminutes) CT product (C x T) shall be greater than or equal to 6 prior to the first water customer.
- A free chlorine residual, measured as total chlorine, combined chlorine, or chlorine dioxide, shall be detectable throughout all active portions of the distribution system (Note: A system with a heterotrophic plate count of 500 organisms/ml or less is considered to have a detectable chlorine residual.)

The DOH may require increased chlorine residual concentrations, increased contact times, or additional treatment as necessary to protect public health.

6.1.5 Stage 1 Disinfectants and Disinfection By-Products Rule

Amendments to the SDWA in 1996 required the EPA to develop rules to balance the risks between microbial pathogens and disinfection by-products. In December 1998, EPA promulgated the Stage 1 Disinfectants and Disinfection By-Products Rules (Stage 1 D/DBPR) as one of the first set of rules under the 1996 SDWA amendments.

While effective in controlling many microorganisms, disinfecting chemicals commonly react with natural and organic matter in water to form disinfection by-products. Recent epidemiology studies have suggested a weak association between certain cancers and reproductive/development effects and exposure to chlorinated water. Further, disinfection by-products such as bromodichloromethane, bromoform, dichloroacetic acid, and bromate are shown to be carcinogenic in lab animals.

The Stage 1 D/DBPR updated and superseded the 1979 total trihalomethanes regulations, and is aimed at reducing public exposure to three disinfectants and many disinfection by-products. Specifically, the rule introduced Maximum Residual Disinfectant Level Goals (MRDLGs) and Maximum Residual Disinfectant Levels (MRDLs) for three chemical disinfectants, while establishing Maximum Contaminant Level Goals (MCLGs) and MCLs for total trihalomethanes, haloacetic acids, chlorite, and bromate.

Washington Administrative Code (WAC) required that water systems using only groundwater, and that add a chemical disinfectant, comply with the requirements of the Stage 1 D/DBPR as outlined in the applicable sections of WAC Chapter 246 290 300(7) by January 1, 2004.

The City of Sumner is a community water system utilizing chlorine to disinfect their groundwater sources, and therefore was required to begin sampling for disinfection by-products and disinfectant residuals in the year 2004.

6.1.5.1 Disinfection By-Products

Water systems using only groundwater not under the direct influence of surface water, utilizing chemical disinfectant, and serving a population greater than 10,000, are required to collect one sample per "treatment plant" per quarter (40 CFR 141.132). Samples for each "treatment plant" need to be collected at the point in the system representing the maximum residence time for that particular plant. Per discussions with DOH personnel, systems are required to sample for disinfection by-products for each "treatment plant" if the source associated with that "treatment plant" is in operation at least 15 days during the calendar quarter.

The disinfection by-products to be sampled and their associated MCLs allowable and MCLGs are shown in Table 6-5.

Table 6-5. Disinfection By-Products

Disinfection By-Product	MCL (mg/l)	MCLG (mg/l)
Total Trihalomethanes (TTHMs)[a]	0.080	
• *Chloroform*	–	–
• *Bromodichloromethane*	–	Zero
• *Dibromochloromethane*	–	0.060
• *Bromoform*	–	Zero
Haloacetic Acids (five) (HAA5)[b]	0.060	–
• *Monochloroacetic Acid*	–	–
• *Dichloroacetic Acid*	–	Zero
• *Trichloroacetic Acid*	–	0.3
• *Bromoacetic Acid*	–	–
• *Dibromoacetic Acid*	–	–

[a] Total trihalomethane is the sum of the concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

[b] Haloacetic acids (five) are the sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids.

Multiple sources that draw water from a single aquifer can be considered a single "treatment plant" in determining the minimum number of TTHM and HAA5 samples required to be collected.

TTMH/HAA5 MCL Compliance

Compliance with Stage 1 D/DBPR requirements for TTHMs and HAA5s is demonstrated by calculating an annual average of the sampling results for TTHMs and HAA5s. A system is in compliance if the annual average does not exceed the MCLs listed in Table 6-5. If the annual average exceeds the MCL for either constituent, the system will be required to notify the public per 40 CFR 141.201 and WAC 246-290-320, Part 7, Subpart A, report the exceedance to DOH in conformance with WAC 246-290-480, and complete follow-up action as outlined in WAC 246-290-320. The system is in violation of the MCL if the running annual arithmetic average of quarterly samples covering any consecutive four-quarter period exceeds the MCL.

DOH may allow reduced disinfection by-product monitoring if the annual average for TTHM and HAA5 is equal to or less than 0.040 mg/l and 0.030 mg/l, respectively, for 2 consecutive years, OR if the annual average for TTHM and HAA5 is equal to or less than 0.020 mg/l and 0.015 mg/l, respectively, for 1 year. If allowed by DOH, reduced TTHM and HAA5 monitoring will consist of one sample per treatment plant per 3-year monitoring cycle (40 CFR 141.132). "40/30 Certification" was granted to the City of Sumner via a letter from EPA dated September 20, 2007. This letter is attached in Appendix I. The City is required to prepare a Stage 2 DBPR monitoring plan prior to Stage 2 DBPR compliance monitoring in October 2013.

As of October 2007, the City has been under a reduced monitoring schedule. The City's reduced monitoring schedule is reflected in Table 6-2. The monitoring schedule will need to be updated once the Stage 2 D/DBPR monitoring begins in October 2013 as described in Section 6.2.3.

6.1.5.2 Disinfectant Residual

The City of Sumner uses both sodium hypochlorite and chlorine gas for disinfection. Therefore, in addition to the daily chlorine residual monitoring currently conducted by the City, compliance with Stage 1 D/DBPR requires that additional chlorine residual samples be collected at the same time and location as routine and repeat coliform sampling collection. The allowable MRDL and MRDLG for free chlorine residual are shown in Table 6-6.

Table 6-6. Disinfection Residuals

Disinfectant Residual	MRDL (mg/l)	MRDLG (mg/l)
Chlorine	4.0 as Cl_2	4

The Stage 1 D/DBPR became effective on January 2004. A copy of the current Disinfectants and Disinfection By-Products Monitoring Plan is presented in Appendix I.

6.1.6 Revised Radionuclides Rule

Radionuclides are compounds that emit radioactive particles, which essentially "destabilize" nearby cells. Resulting cell "destabilization" in humans and animals is thought to result in increased likelihood of cancer and/or birth defects.

The 1986 Safe Drinking Water Act (SDWA) Amendments required the EPA to promulgate a revised radionuclide rule by June 1989. EPA did not meet the Congress mandated deadline

and consequently a lawsuit was filed against them, the result of which was that the EPA entered into a series of consent agreements that required them to issue non-radon radionuclides regulations by November 21, 2000. In 1991, the EPA proposed new regulations for uranium and revisions to the existing radionuclides regulations.

The revised Radionuclides Rule establishes an MCL for uranium while retaining the existing MCLs for combined radium-226/228, gross alpha particle, and beta particle/photon radioactivity listed under the EPA National Primary Drinking Water Regulations, establishing MCLG of zero for all ionizing radiation, and establishing new radionuclide monitoring requirements. The MCLs/MCLGs proposed in the revised rule are shown in Table 6-7.

Table 6-7. Revised Radionuclide Rule MCLs

Regulated Radionuclide	MCL	MCLG
Beta/Photon Emitters	4 mrem/yr	Zero
Gross Alpha Particle	15 pCi/L	Zero
Combined Radium-226–228	5 pCi/L	Zero
Uranium	30 ug/L	Zero

Systems determine initial compliance with the revised rule by collecting four consecutive quarterly samples at each entry point to the water distribution system. Compliance is determined based on the annual average of the quarterly samples. Systems exhibiting annual average radionuclide concentrations below the MCL will be eligible for reduced monitoring as follows:

- If an entry point's annual average concentration for gross alpha, uranium, and combined radium-226/228 is below the detection limit, the system will be allowed to reduce monitoring to one sample every 9 years at that entry point (40 CFR 141.26[a][3][i]).
- If an entry point's annual average concentration for gross alpha, uranium, and combined radium-226/228 is at or above the detection limit, but at or below one-half the MCL, the system will be allowed to reduce monitoring to one sample every 6 years at that entry point (40 CFR 141.26[a][3][ii]).
- If an entry point's annual average concentration for gross alpha, uranium, and combined radium-226/228 above one-half the MCL, but at or below the MCL, the system will be allowed to reduce monitoring to one sample every 3 years at that entry point (40 CFR 141.26[a][3][iii]).

Systems that exhibit an average radionuclide concentration exceeding the MCL will be required to continue sampling and coordinate with DOH to develop treatment strategies.

The timetable for the Revised Radionuclides Rule is shown in Table 6-8.

Table 6-8. Revised Radionuclide Rule Development

December 2000	EPA Release Final Radionuclide Rule
September 2002	Application deadline for states wishing to establish primacy
December 8, 2003	Radionuclide Rule Effective date/Systems must begin initial sampling
December 31, 2007	Systems must complete initial monitoring

Samples were taken at the South Well, West Well, Crystal/County Springs, and Sumner Springs in 2005. No Radium 228 was detected in any of these samples meaning the levels were much less than the MCL regulated by DOH. Samples were taken at Elhi Springs in 2006 and 2007 and the results were similar; no Radium 228 or Gross Alpha particles were detected. The Radionuclide Analyses Reports are available in Appendix S.

6.1.7 Groundwater Rule

The SDWA 1996 amendments require the EPA to develop regulations requiring groundwater source disinfection as needed to protect public health. The Final Groundwater Rule (GWR) was published in the Federal Register on November 8, 2006, and GWR compliance is required on December 1, 2009.

The GWR is based on the need to protect against disease-causing microorganisms found in systems that serve groundwater as drinking water. The GWR establishes protective measures and target systems to identify water systems at high risk for contamination. The proposed GWR is based on the ideas of the following regulations:

- Total Coliform Rule (TCR).
- Surface Water Treatment Rule (SWTR).
- Interim Enhanced Surface Water Treatment Rule (IESWTR).
- Stage 1 Disinfectants and Disinfection Byproducts Rule (D/DBPR).
- Underground Injection Control Program.
- Source Water Assessment and Protection/Wellhead Protection Program.

The requirements of the GWR are outlined below. Each aspect of the rule is covered in greater detail in the following sections of this Plan:

- Regular sanitary surveys of the public water systems to look for significant deficiencies in key operational areas.
- Triggered source water monitoring when a system that does not sufficiently disinfect drinking water identifies a positive sample during its Total Coliform Rule monitoring and assessment monitoring (at the option of the state) targeted at high-risk systems.
- Implementation of corrective actions by groundwater systems with a significant deficiency or evidence of source water fecal contamination to reduce the risk of contamination.
- Compliance monitoring for systems that are sufficiently disinfecting drinking water to ensure that the treatment is effective at removing pathogens.

6.1.7.1 Sanitary Surveys

The state shall conduct sanitary surveys on all community water systems every 3 to 5 years. During the survey, the state will compile a list of observed system deficiencies to be provided to the system prior to 30 days following the survey completion. The codification of the groundwater rule will provide the state with the authority to enforce all corrective action required to remedy all system deficiencies defined during sanitary surveys.

A sanitary survey is a review conducted by the state that looks at critical components of a public water system. The sanitary survey provisions build on existing state programs established under the 1989 Total Coliform Rule and the Interim Enhanced Surface Water Treatment Rule and states the authority to define both outstanding performance and

significant deficiencies. The groundwater rule defines eight specific components that must be reviewed during a survey (to the extent applicable to the individual water system being surveyed):

1. Source.
2. Treatment.
3. Distribution system.
4. Finished water storage.
5. Pumps, pump facilities, and controls.
6. Monitoring, reporting, and data verification.
7. System management and operation.
8. Operator compliance with state requirements.

The latest DOH Water System Sanitary Survey Report was completed in 2006 and is included in Appendix G. Another survey should be completed within the next 2 years.

6.1.7.2 Hydrological Sensitivity Assessment

The state shall perform a one-time assessment of sensitivity for all systems that are unable to maintain a minimum 4-log removal (virus inactivation through disinfection). A system that is determined to be hydrologically sensitive must be monitored monthly as outlined under "Source Water Monitoring."

6.1.7.3 Source Water Monitoring

Groundwater systems that are determined to be located within sensitive aquifers shall conduct monthly sampling for fecal indicators. The sampling frequency may be reduced after a consecutive 12 months of negative results. Table 6-4 showed the results of the City's history of coliform monitoring, which is a key indicator for fecal coliforms.

Additionally, if routine coliform sampling within the distribution system yields coliform-positive results, then the system shall, as a supplement to the additional sampling required in the TCR, collect a source water sample and monitor for fecal indicator.

A groundwater system is subject to **triggered source water monitoring** if it does not already provide treatment to reliably achieve at least 99.99 percent (4-log) inactivation or removal of viruses. If a system receives notice of a total coliform-positive distribution system sample collected under the Total Coliform Rule (TCR), it must take a source water sample within 24 hours. The system does not have to take a source water sample if the state can determine that the positive sample was due to an issue in the distribution system and not the source. If any initial triggered source water sample is fecal indicator-positive, the system must collect an additional five repeat source water samples over the next 24 hours for each of the sites that was initially fecal indicator-positive. States can also require immediate corrective action to address contamination at those sites.

The GWR also allows states to require systems that do not provide sufficient disinfection treatment to remove 99.99 percent of viruses to conduct **optional assessment source water monitorin**g at any time and require systems to take corrective action. States may evaluate the need for assessment monitoring on a case-by-case basis. EPA recommends that the following risk factors be considered by states in targeting high-risk systems:

1. High population density combined with on-site wastewater treatment systems.
2. Aquifers with restricted geographic extent, such as barrier island sand aquifers.

3. Sensitive aquifers (e.g., karst, fractured bedrock and gravel).
4. Shallow unconfined aquifers.
5. Aquifers with thin or absent soil cover.
6. Wells previously identified as having been fecally contaminated.

For those systems that already treat drinking water to reliably achieve at least 99.99 percent (4-log) inactivation or removal of viruses, the rule requires **regular compliance monitoring** to ensure that the treatment technology installed is reliably removing contaminants.

Table 6-4 showed the results of the City's history of coliform monitoring, which is a key indicator for fecal coliforms.

6.1.7.4 Corrective Actions

If a system is notified by the state that a significant deficiency is present within the distribution system or that fecal indicator is present within the system, then corrective action must be taken within 90 days of notification. If corrective action includes treatment implementation or expansion, then the system must monitor to ensure that a 4-log inactivation is maintained.

When a system has a significant deficiency or a fecal indicator-positive groundwater source sample (either by the initial triggered sample, or positive repeat sample, as determined by the state), the groundwater system must implement one or more of the following corrective action options:

1. Correct all significant deficiencies (e.g., repairs to well pads and sanitary seals, repairs to piping tanks and treatment equipment, control of cross-connections);
2. Provide an alternate source of water (e.g., new well, connection to another PWS);
3. Eliminate the source of contamination (e.g., remove point sources, relocate pipelines and waste disposal, redirect drainage or run-off, provide or fix existing fencing or housing of the wellhead); or
4. Provide treatment that reliably achieves at least 4-log treatment of viruses (using inactivation, removal, or a state-approved combination of 4-log virus inactivation and removal).

These actions are presented formally in Section 10.4, Emergency Response Program.

6.1.7.5 Compliance Monitoring

Compliance monitoring applies to all water systems that disinfect as a corrective action or to avoid source water monitoring. As written, disinfection system monitoring must be conducted as outlined in Table 6-9 below.

Table 6-9. GWR Compliance Monitoring Requirements

System Size	Monitoring Frequency
<3,300	Daily disinfection treatment monitoring.
>3,300	Continuous disinfection treatment monitoring.

If said monitoring shows the disinfection concentrations within the distribution system to be below the required level, then the system must notify the state or restore the required disinfection level within 4 hours.

6.2 UPCOMING REGULATIONS

The SDWA of 1974 directs the EPA to establish minimum national drinking water standards, setting limitations on the amounts of various substances allowed in drinking water. In 1996, Congress passed a set of amendments expanding the protection provided by the SDWA. The authorization of the 1996 SDWA amendments requires the EPA to develop and implement several new health-related drinking water regulations.

Congress prefers that individual states take on the responsibility for implementation of the new programs. Washington State has the primary responsibility for implementing and enforcing the SDWA. The state DOH is the lead agency with authority to permit, regulate, and enforce the state water quality regulations. The proposed upcoming regulations that will likely be applicable to the City of Sumner are discussed in the following sections.

6.2.1 Radon Rule

Radon is a colorless, odorless, naturally forming gas produced by uranium decay. Radon intake from both drinking water and indoor air is thought to increase the risk of cancer.

On July 18, 1991, a National Primary Drinking Water Regulations (NPDWR) of 300 picocuries per liter (pCi/L) was proposed by the EPA. Enactment of this proposal met resistance, primarily due to the projected cost of treatment implementation. On August 6, 1996, the SDWA was amended; and as a result of this amendment, the EPA is required to develop an MCLG and NPDWR for Radon-222. The steps required of the EPA during completion of this directive are as follows:

- Withdraw the radon-222 NPDWR proposed in 1991 (completed August 6, 1997).
- Consult with the National Academy of Sciences to conduct a radon-in-drinking-water risk assessment, including consideration of feasible mitigation measures.
- Publish the radon health risk reduction proposal, including cost analysis, for public comment.
- Propose a radon MCLG and NPDWR by August 1999; promulgate by August 2000.

The November 1999 EPA radon MCLG and NPDWR proposal asks for a general Radon-222 MCL of 300 pCi/L for all Group A water systems, unless the system develops and implements a radon "multimedia mitigation" program. Communities with a multimedia mitigation program in place will be subject to a less stringent MCL of 4,000 pCi/L for radon in drinking water.

6.2.1.1 Multimedia Mitigation Program

Multimedia mitigation programs are to be developed to help minimize the public's exposure to radon from sources other than drinking water (i.e., indoor air). Recent data released by the National Academy of Sciences reports that as much as 10 percent of all lung cancer deaths in the United States may be attributable to breathing radon in indoor air, while an estimated 0.1 percent of U.S. lung cancer deaths are a result of radon in drinking water.

The proposed Radon Rule does not specify all aspects to be included in a multimedia mitigation program, simply stating that only plans incorporating the following issues shall be approved:

- Public involvement in program development.
- Quantitative goals for reducing radon in new and existing homes.
- Strategies to achieve said quantitative goals.
- Plans for tracking and reporting project results.

Additional measures suggested by Congress that may be implemented during program development are as follows:

- Public education.
- Testing.
- Training.
- Technical assistance.
- Remediation grants.
- Loan or incentive programs.

6.2.1.2 Applicability

The Radon Rule was originally scheduled for promulgation in 2001. It is unclear at this time when this rule will be finalized and become effective for water systems in Washington State. Given the known geological conditions within and surrounding the City of Sumner, it seems unlikely that the promulgation of the Radon-222 Rule will apply to the Sumner water system. Upon final ruling, however, the City will be required to collect quarterly water samples at each of the water distribution system entry points to be analyzed for Radon-222 concentration.

As the draft Radon Rule is written, if sample analyses indicate radon concentrations greater than the proposed 300 pCi/L MCL, then a choice must be made whether to implement treatment at the source to maintain a radon concentration less than 300 pCi/L, or to develop a multimedia mitigation program. Per the initial EPA benefit/cost analysis, the implementation of radon treatment at the source to achieve 300 pCi/L will be costly, a projected five times greater than the development and implementation of a multimedia mitigation program.

Conversely, if after 1 year, the radon concentration at the sources is found to be below the proposed MCL, the City would be allowed to request a reduced sampling frequency.

6.2.2 Stage 2 Disinfectants and Disinfection By-Products Rule

As part of the 1996 SDWA amendments, the Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 D/DBPR) is meant to further refine the premise of the Stage 1 D/DBPR by assessing whether to establish additional microbial and disinfection by-products regulations or revise the regulations found in the Stage 1 rule. EPA promulgated the Stage 2 rule in May 2002, and DOH published their version in January 2006. The EPA will enforce Stage 2 D/DBPR requirements until DOH adopts them into their drinking water rules. There is a graduated schedule for this adoption of EPA's rules which will begin in October 2013 for the City of Sumner.

Under the Stage 2 D/DBPR, systems conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations with high disinfection byproduct concentrations. These locations will then be used by the systems as the sampling sites for Stage 2 D/DBPR compliance monitoring. A system can fulfill the IDSE requirements by certifying that all individual TTHM and HAA5 monitoring results for compliance with the Stage 1 D/DBPR are less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 during a prescribed 2-year time period. This is commonly known as "40/30 Certification." In addition, the system must not have had any Stage 1 D/DBPR monitoring violations for TTHM and HAA5 during the same period. Sumner will likely be able to certify such compliance. The City's 40/30 certification was submitted in 2007 and 40/30 certification was approved in a letter from EPA on September 20, 2007 (the letter is in Appendix I). Monitoring under Stage 1 compliance must continue until additional sampling under Stage 2

begins routine monitoring in October 2013. A Stage 2 compliance-monitoring plan, similar to the Stage 1 plan, must be developed prior to any monitoring and must be kept on file for state and public review. Additional information regarding the details of this new rule has been published on the EPA's website, http://www.epa.gov/safewater/disinfection/stage2/index.html.

6.2.3 Waterworks Operator Certification Rule

This rule is currently being crafted, and a draft of the rule is scheduled to be completed in February 2010. The rule is being revised for a list of reasons including the following:

- Strengthening the department's authority to take immediate enforcement actions in cases of gross negligence.
- Clarifying the department's authority to certify backflow assembly testers and cross-connection control specialists.
- Amending the definition of a "Group A public water system" to be consistent with other related statutes.
- Adding a reference to the specialty plumbers licensing requirements that cover some activities performed by backflow assembly testers licensed under Chapter 18.106 RCW.
- Addressing large public water system recruitment issues to allow broader substitution options for minimal education requirements.
- Adding a new definition and requirements for "responding in a timely manner" to identify a reasonable response time for contract operators during an emergency.
- Revising temporary certification requirements for surface water treatment plant operators.
- Evaluating existing program guidelines for possible adoption into the rule.

It is anticipated that the rule revisions may be adopted in the first or second quarter of 2011. The City currently does not have a Water Treatment Plant Operator (WTPO) on staff due to the state of their current sources (being spring and well chlorination only), but the City will stay updated on the rule revisions as they become available.

6.2.4 Lead and Copper Rule Revisions

On July 8, 2009, DOH filed a notice with the state to begin revising the Lead and Copper Rule. The topics for the revision will include:

- Clarifying monitoring requirements.
- Improving consumer awareness.
- Modifying lead service line replacement.

Federal requirements for lead and copper must be adopted no later than October 2011, but the state's schedule for short-term revisions is currently unknown.

7. HYDRAULIC ANALYSIS

A computerized water system model was developed as part of the Water System Plan. Computer simulations were performed to locate deficiencies in the existing pipe network and to size future transmission mains. All of the methodology, assumptions, scenarios modeled, and simulation results are presented in this chapter.

7.1 COMPUTER MODEL

The computer model is an extremely useful tool in analyzing water systems, allowing many different demand conditions and system configurations to be simulated in a short timeframe. The computer program used for analysis of the Sumner Water System is WaterCAD, Version 8-V8i. The program uses the Hazen-Williams formula to calculate pipe head loss, flows, and pipe velocities. The following is a list of some WaterCAD model capabilities:

- Able to change demands globally, in a group, or node by node for each customer class.
- Calculates available fire flows given a specified minimum pressure or system operating pressure given a fire flow.
- Easily adds, removes, or replaces pipes, nodes, and sources.
- Simulates changing operational conditions, such as:
  - Shutting down sources.
  - Changing storage tank levels.
  - Valve closures.
  - Increased industrial demands.

7.2 PERFORMANCE AND DESIGN CRITERIA

The following criteria were used to determine deficiencies in the system:

- System pressures shall not be less than 30 psi at all nodes during PHD.
- Head losses should not be more than 3 feet per 1,000 feet in main transmission lines (AWWA Standard).
- Head losses should not be more than 10 feet per 1,000 feet in small service lines (AWWA Standard).
- Velocities should not be more than 5 feet per second (AWWA Standard).
- Commercial, industrial, and apartment use districts have a maximum fire hydrant spacing of 400 feet (SMC 15.28.060)
- Minimum system pressures should not be less than 20 psi during fire flows as given below:

	Minimum Flow Rate
Medium- and low-density residential	1,000 gpm
High-density residential and commercial	1,500 gpm
Industrial	3,500 gpm
Several existing buildings	4,500 gpm

- Fire flow durations for storage analysis shall be no less than the following:

1,000 – 2,750 gpm	2 hours
3,000 – 3,750 gpm	3 hours
4,000 – 8,000 gpm	4 hours

Fire flow requirements were based on the governing local ordinance and guidance by the East Pierce Fire and Rescue Fire Marshal. The 1998 *Pierce County Coordinated Water System Plan* requires 1,500 gpm for high-density residential and commercial areas. Industrial areas require 3,500 gpm based on the Fire Marshal's recommendations for fire-resistant construction. The REI complex, which utilized fire-resistive construction, such as automatic fire suppression sprinklers, early warning detection, Type III-n noncombustible construction, and major setbacks from adjacent property lines, requires 3,750 gpm. (However, several existing buildings were not constructed using fire-resistive construction and require a larger fire flow.) The Fire Marshal recommends 4,500 gpm for the Wattles Building, the Methodist Church, Pasquire Panel, and the McConkey Company.

7.3 MODEL APPROACH

The current model was updated in September of 2009. The City has made a concerted effort to improve pipe network data since 2004; the current model reflects the most up-to-date information available.

7.3.1 History

The water model was first created in 1993. The data for the 1993 Model was derived from existing City of Sumner water system maps showing pipe materials, diameters, and locations. The maps were digitized into AutoCAD to set up the 1993 model and to determine the lengths of each pipe section.

The model was then updated in 2004. Data used to update the water model was taken from as-built drawings for developments constructed between 1993 and 2004. The as-builts included road alignments, water line size and length, and spot elevations using the City datum. Ground elevations were assigned to each node using Pierce County Public Works Comprehensive Drainage Program maps, which show contours and spot elevations throughout the service area.

7.3.2 Setup

The current model is based on the previous 2004 model with updates based on GIS data, flow tests, and general pipe updates provided by the City. Data was also taken from as-built drawings for developments constructed between 2004 and 2008. Ground elevations were assigned to each new node using existing model elevations and planimetric data from Sumner aerial photographs.

The overall demand for the system was determined by using the metered information available. With this overall demand, nodes within the system were assigned a demand by estimating the number and type of connections in the area. For industrial or multifamily connections, more of the overall demand was assigned to the corresponding node. The following roughness coefficients were entered for use in the Hazen-Williams equation.

Pipe Material	Hazen-Williams Coefficient
Asbestos Cement	C = 140
Cast Iron	C = 100
Ductile Iron Pipe	C = 130
Polyvinyl Chloride (PVC)	C = 150

The Average Daily Demand (ADD), Maximum Daily Demand (MDD), and Peak Hour Demand (PHD) were determined by using the estimated values for 2009 of this Water System Plan found in Chapter 3, Tables 3-7 and 3-9. Demands were distributed based on land use classifications of the City's Zoning Map adopted July 16, 2007, and assumed to reflect historical consumption data found in Table 3-8.

7.3.3 Calibration

The current model was calibrated by comparing field-measured pressures to those calculated by the computer model. The field tests included measuring the static pressures and residual pressures from opened fire hydrants at five locations throughout the water system. The demands in the computer model were set so that the total demand equaled the actual source demand during the field tests. The model was determined to be calibrated when all of the computer model pressures were within 5 percent of the measured pressures. If the difference was greater than 5 percent, the pipe roughness was changed, and input data was rechecked against the City's water system maps to verify accuracy.

The calibration results show that all of the nodes calculated and measured pressures were within 5 percent tolerance. Table 7-1 shows the calibration results.

Table 7-1. Computer Model Calibration Results

Node	Hydraulic Grade Line in feet (Field)	Hydraulic Grade Line in feet (Model)	Difference in feet	Difference
J-105	150.15	154.54	4.39	2.8%
J-366	138.60	144.38	5.78	4.0%
J-408	170.94	176.48	5.54	3.1%
J-650	170.94	174.41	3.47	2.0%
J-3113	164.01	166.32	2.30	1.4%
		Average:	**4.30**	**2.6%**

The results of the calibration shown above are after several iterations of the pipes in the system. All of the Hazen-Williams coefficients shown above were adjusted to 81 percent of their original values to account for aging pipes and higher roughness.

7.4 EXISTING SYSTEM MODELING

7.4.1 Assumptions

The following assumptions were made for the simulations of the existing system:

- South Tank, North End Tank, Sumner Springs Tank, County Springs Tank, Sumner Viewpoint Tank, Elhi Well, Dieringer Well, and South Well were the only sources operating full time.
- The West Well (Cemetery Well) was shown in the model, but turned off.
- The fire flow analysis was conducted with the fire suppression volume depleted for the 4-hour, 4,500 gpm fire flow scenario.

7.4.2 Scenarios Modeled

Two types of scenarios were modeled to test the performance of the existing system. PHD was modeled to locate undersized pipes as determined by the maximum head loss and velocity criteria and to locate areas that fall below the 30-psi minimum pressure. Nodes were tested at MDD in representative areas of similar building classes to find areas that do not meet the specified fire flow requirements.

7.4.3 Results

The existing system model runs show some deficiencies that are explained below. However, the minimum pressure at PHD is 42 psi at the far south end of the Sumner Viewpoint development. This is above the 30-psi requirement. PHD system pressures are shown in Figure 7-1, page 7-7, and can be found in Appendix J.

The results show that there are fire flow deficiencies at dead-end/non-looped lines, at small diameter pipes less than 6 inches in diameter, and four other miscellaneous locations. Proposed capital improvement projects to correct all the system deficiencies found in the model are further explained in Chapter 8. Tables of fire flow results are presented in Appendix J. Figure 7-2, page 7-9, summarizes these results. Nodes on lines smaller than 4 inches were modeled for fire flows. In general, 4-inch lines should be replaced with a larger pipe in areas where there is not a hydrant within 350 feet of a building.

7.5 FUTURE SYSTEM MODELING

7.5.1 Future System Setup

Several changes were made to the water system to best represent the system in the year 2029. First, the demands at all of the nodes were increased to those projected in Chapter 3. Due to the increased demand, new sources must be online. The proposed pipe additions are sized in this section and follow established rights-of-way. The following assumptions were made in modeling the future system:

- The calculated PHD in the year 2029 is accurate.
- The required sources are available, including the new/proposed sources and improvements discussed in Chapter 8.
- Future commercial and industrial establishments meet fire codes with noncombustible construction, sprinklers, etc.
- Sumner Springs, County Springs, South Well, Elhi Springs, and a new well were the only sources operating full time.
- West Well, Dieringer Well, and the interties with Pacific and Mountain View-Edgewood are seasonal sources, which operate during times of extremely high use/drought.
- Low tank levels were used.

No deficiencies were found for pressure in the 2029 water system. Fire flows of approximately 900 gpm were found at the south end of the City. Tables of the 2029 fire flows and pressures can be found in Appendix J. Figures 7-3 and 7-4 (pages 7-11 and 7-15) summarize these results.

7.5.2 Scenarios Modeled

Two types of scenarios were modeled for the future to size the additional pipes and to test the existing pipe network:

- PHD was simulated to assure that the system pressures were above 30 psi. Head loss and velocity criteria were supplied to the proposed pipes to check for the proper size of the pipes.
- Fire flows at nodes were added to the MDD demands to test that future fire flows could be met with the proposed pipes.

7.5.3 Results

The results show that, with the addition of all of the proposed system improvements, there are fire flow deficiencies in the south end of town on dead-end runs. System pressures under PHDs and available fire flows under MDDs are shown in Figure 7-3 and Figure 7-4, respectively. Tables of fire flow results are found in Appendix J.

Although the system mostly meets or exceeds all of the criteria in the year 2029, it may not meet the criteria as the system continues to expands. If new pipe is added without forming a loop, or if the proposed sources and tanks are not added, the system may not meet the criteria. As the proposed system expands and future water users are served, the available fire flows should be evaluated by the City to determine if the proposed improvements will create a deficiency in the system.

7.6 SUMMARY

Overall, the water system performs very well in both the existing system and the proposed 2029 system. There are a few locations in the existing system that cannot meet the fire flow requirements. These deficiencies will be corrected by upsizing or looping existing infrastructure as identified in Chapter 8.

Figure 7.1
City of Sumner Existing Water System Pressures at Peak Hourly Demand

Pressure in PSI

FILE: PHD LAYOUT: Layout1
DATE: Oct 23, 2009 - 2:30pm PLOTTED BY: Parriand

IMAGES: Exi16B |
XREFS: BASEMAP without utilities

N

SCALE IN FEET
0 1000 2000

Figure 7.2
City of Sumner Existing Water System Fireflow at Maximum Daily Demand

Flow in GPM

N

SCALE IN FEET

0 1000 2000

FILE: MDD LAYOUT: Layout1
DATE: Oct 23, 2009 - 2:35pm PLOTTED BY: Parriand

IMAGES: Ex116B |
XREF'S: BASEMAP without utilities

Figure 7.3
City of Sumner
2029 Water System Pressures
at Peak Hourly Demand

Pressure in PSI

N

SCALE IN FEET
0 1000 2000

FILE: PHD DEMAND 2029 LAYOUT: Layout1
DATE: Oct 23, 2009 – 2:37pm PLOTTED BY: Parriand

IMAGES: Ex116B |
XREFS: BASEMAP without utilities

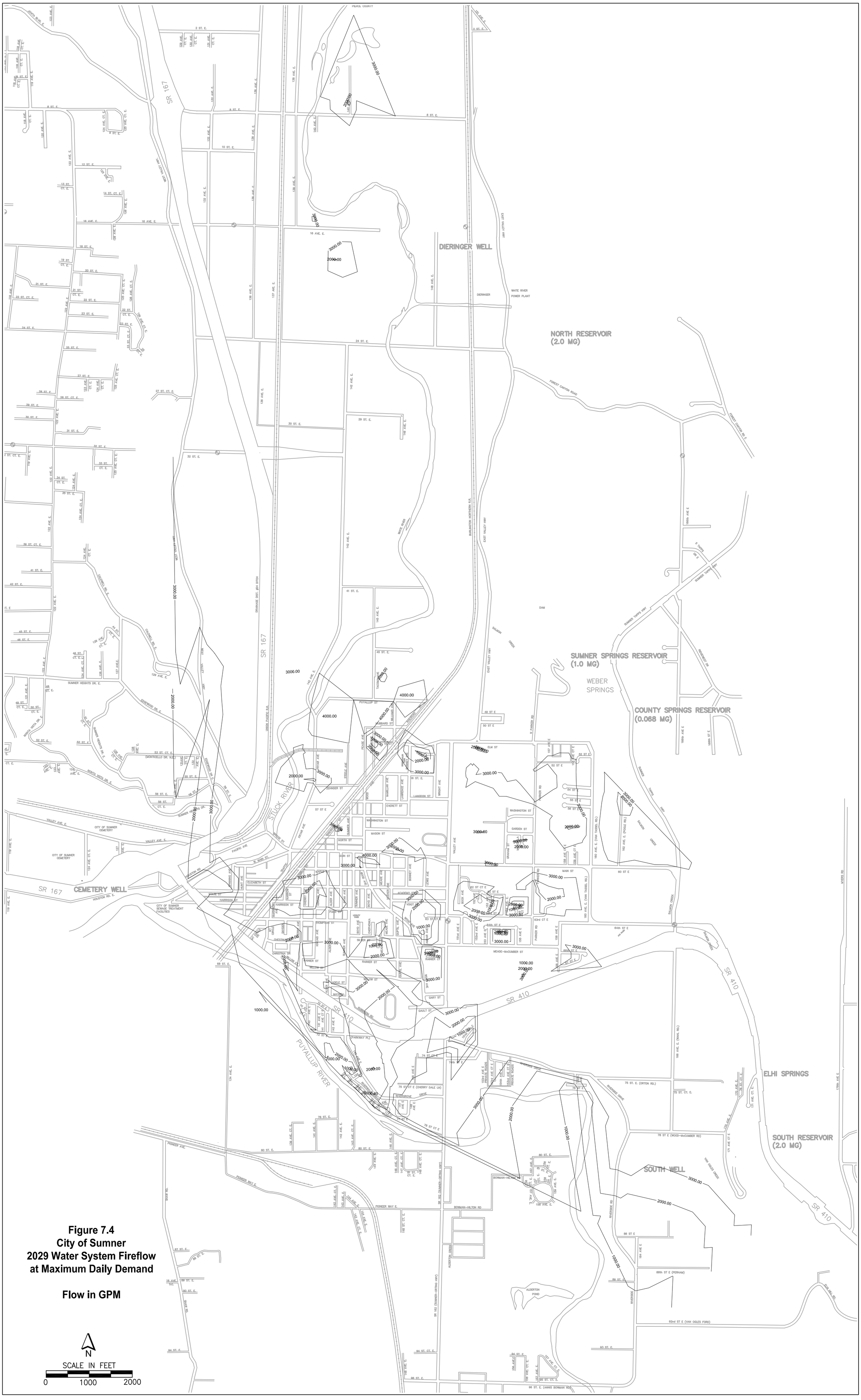


Figure 7.4
City of Sumner
2029 Water System Fireflow
at Maximum Daily Demand

Flow in GPM

FILE: MDD PYSICAL 2029 DEMAND 2029 LAYOUT: Layout1 IMAGES: Exi16BB |
DATE: Oct 23, 2009 – 2:43pm PLOTTED BY: Porriand XREFS: BASEMAP without utilities

8. CAPITAL IMPROVEMENT PLAN

8.1 INTRODUCTION

The Capital Improvement Plan (CIP) has been developed to plan for system-wide improvements. These projects have been selected to not only meet the anticipated needs of a growing system, but also to improve the infrastructure of the existing system. Table 8-1 (located at the end of this chapter) summarizes the recommended CIP projects based upon the type of project, the project cost, and the proposed implementation/construction schedule. The detailed project cost estimates for each project are included in Appendix K. The improvements are classified in the following manner:

- Distribution System (D Improvements).
- Source Improvements (S Improvements).
- Storage Improvements (ST Improvements).
- Operations and Maintenance Improvements (O&M Improvements).

8.2 DISTRIBUTION SYSTEM IMPROVEMENTS

8.2.1 Deficiencies

The City plans to continue to expand the water system as development occurs. The City also has existing pipes that are in need of replacement due to age, disrepair, or lack of capacity.

8.2.2 Needs

Growth in the northern portions of the City requires installation of additional water lines. Most of these lines will be installed at the developer's expense. Although most new water lines will be installed at the expense of either development or surrounding properties, existing lines within the city will be replaced as needed. Many of the City's existing lines are made of asbestos concrete (AC), and have reached the end of their design life. These water lines are proposed to be replaced as significant repairs are made or leaks are found on a segment, in coordination with street improvements, or as needed due to inadequate sizing.

8.2.3 Proposed Distribution System Improvements

The following sections provide discussion of the recommended capital improvements projects. Figure 8-1 is an overall site map showing the locations of the recommended projects. Appendix K contains detailed cost estimates for each recommended capital improvement project. Table 8-1 (located at the end of this chapter) summarizes each project, listing scheduled completion date and estimated construction costs in 2009 and at the expected time of completion.

8.2.3.1 Project D1 – Gary Street and Parker Road Loop

Project D1 will loop the existing 8-inch-diameter water mains, located at the south end of Parker Road and the eastern end of Gary Street. The project includes installing approximately 1,220 linear feet of 8-inch-diameter ductile iron piping. This project is located in a relatively undeveloped part of the City and is expected to be funded and constructed by development.

8.2.3.2 Project D2 – Rainier Street Replacement

Project D2 consists of replacing approximately 370 linear feet of existing 2-inch-galvanized pipe on Rainer Street with 6-inch-diameter ductile iron pipe. The new 6-inch-diameter ductile iron pipe will connect to existing 6-inch-diameter cast iron piping on Rainier Street and at the intersection of Rainier Street and Sumner Avenue. This project will be completed with City capital funds.

8.2.3.3 Project D3 – Main Street and Kincaid Avenue Loop

Project D3 consists of installing approximately 170 linear feet of 8-inch-diameter ductile iron piping to connect the existing 6-inch-diameter dead-end main on Kincaid Avenue to the existing 8-inch-diameter water piping on Main Street. This project will be completed with City funds.

8.2.3.4 Project D4 – Thompson Street and Silver Street Loop

Project D4 consists of replacing the existing 2-inch-diameter galvanized water piping on Meade Avenue, Chervenka Avenue, and Boyd Avenue with 6-inch ductile iron from the intersections with Silver Street to the cul-de-sacs. Additionally, 6-inch ductile iron will be installed from the termination of the of the 6-inch ductile iron on Meade Avenue, Chervenka Avenue, and Boyd Avenue to the existing 6-inch water main at the intersection of Sumner Avenue and Thompson Street. This project proposes installing approximately 1,650 linear feet of 6-inch-diameter ductile iron and will be completed with City capital funds.

8.2.3.5 Project D5 – West Valley Highway

Project D5 consists of installing approximately 510 linear feet of 12-inch-diameter ductile iron pipe to loop the existing dead-end water line at the West Valley Highway/32nd Street East intersection and the dead-end water main located at Rainier Park of Industry's northern property line. The City anticipates that this project will be funded and constructed by development along West Valley Highway.

8.2.3.6 Project D6 – 30th Street East, South of 24th Street East Loop

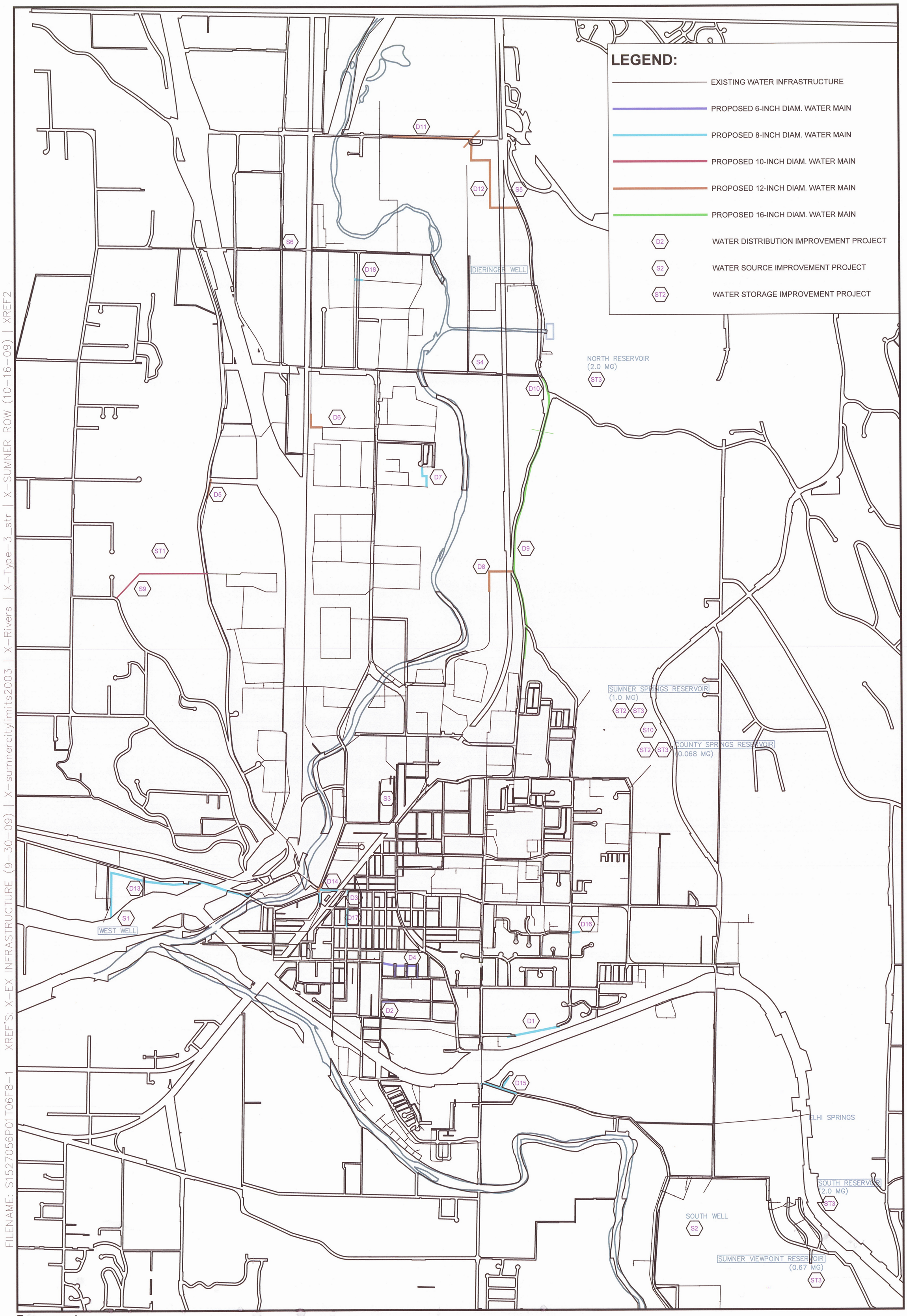
Project D6 consists of installing approximately 460 linear feet of 12-inch-diameter ductile iron water main from the existing 12-inch water mains on 30th Street East, south of 24th Street East, between 142nd Avenue East and Union Pacific Railroad (UPRR). This project is located in an undeveloped portion of the City and is expected to be designed and constructed through future development.

8.2.3.7 Project D7 – 29th Street East and 32nd Street East Loop

Project D7 consists of installing approximately 600 linear feet of 8-inch-diameter ductile iron to complete a loop between an existing 8-inch water main on 29th Street East and an existing 12-inch water main on 32nd Street East. This project will be completed by future development.

8.2.3.8 Project D8 – Extend from 149th Avenue to East Valley Highway

Project D8 consists of installing approximately 1,000 linear feet of 12-inch-diameter ductile iron from the 12-inch-diameter water main currently under construction in 149th Avenue East to the proposed 16-inch-diameter water main on East Valley Highway. The 12-inch water main currently under construction is part of the Mastro Development Park and completion of this project by the City will loop the system and provide water service to a large undeveloped area between Burlington Northern Santa Fe Railway (BNSF) and the White River.



IMAGES:
XREF'S: X-EX INFRASTRUCTURE (9-30-09) | X-sumnercitylimits2003 | X-Rivers | X-Type-3_str | X-SUMNER ROW (10-16-09) | XREF2
FILENAME: S1527056P01T06F8-1
DATE: 4/20/10

Parametrix DATE: Apr 20, 2010 FILE: S1527056P01T06F8-1

N

0 2000

SCALE IN FEET

Figure 8-1
City of Sumner
Proposed Water System
Improvement Projects

8.2.3.9 Project D9 – East Valley Highway from Salmon Creek to CTI

Project D9 consists of installing approximately 5,280 linear feet of 16-inch ductile iron from the existing 16-inch water main on East Valley at the Salmon Creek Bridge to the southern limit of City Transfer Incorporated (CTI) property. Completion of this project will enable the City to provide service to parcels east of the BNSF and will improve flow to the northern portions of the City. This project will likely be designed and constructed using City capital funds.

8.2.3.10 Project D10 – East Valley Highway from 24th Street East to CTI

Project D10 consists of installing approximately 1,300 linear feet of 16-inch ductile iron water main on East Valley Highway from 24th Street East to the southern limit of CTI property. This water line will be installed by CTI as part of East Valley Highway frontage improvement.

8.2.3.11 Project D11 – 8th Street East

Project D11 consists of installing approximately 1,950 linear feet of 12-inch-diameter ductile iron from the existing 16-inch main at the 8th Street East/142nd Avenue East intersection east towards East Valley Highway. This project is the first phase of potable water infrastructure to provide a water main loop north of the White River, when coupled with Project D12. This water main will be constructed concurrently with the 8th Street Improvements designed by Pierce County. Construction is underway at the time of the making of this document. Project D11 will be designed and constructed using City capital funds.

8.2.3.12 Project D12 – 8th Street East and East Valley Highway Loop

This project consists of installing approximately 500 linear feet of 12-inch-diameter water main from the 12-inch main installed under Project D11 to the existing 8-inch-diameter water main located east of the golf course pro shop and approximately 2,300 linear feet of 12-inch-diameter ductile iron pipe from the termination of the existing 8-inch main south paralleling BNSF right-of-way and then east to connect to the existing 12-inch main on East Valley Highway. Completion of this project will complete a potable water infrastructure loop to the northeast of the White River.

8.2.3.13 Project D13 – Valley Avenue East from the West Well to Houston Road

Project D13 consists of replacing approximately 4,200 linear feet of 6-inch main with 8-inch ductile iron on Valley Avenue East from Houston Road to the West Well. The water main will be connected to the 8-inch-diameter ductile iron water main near the end of Huston Road. Project D13 is expected to be designed and constructed using City capital funds. This project will remain in the planning stages until the MWL ruling determines the fate of the West Well water rights.

8.2.3.14 Project D14 – Fryar Avenue / Main Street Intersection

Project D14 includes replacement of some aging mains at the intersection of Fryar Avenue and Main Street. This project will include installation of approximately 280 linear feet of 12-inch-diameter water main, approximately 660 linear feet of 8-inch-diameter water main, and other associated improvements. These improvements have been designed in conjunction with the road improvements and will be constructed in 2010 using City funds.

8.2.3.15 Project D15 – Riverside Drive at 151st Avenue East

Project D15 includes replacement of water mains along Riverside Drive and 151st Avenue East to facilitate better fire suppression flow in the area. This project will include installation of approximately 1,100 linear feet of 8-inch-diameter water main and other associated improvements including two connections to nearby 12-inch-diameter water main.

8.2.3.16 Project D16 – Parker Road and 62nd Street Court East

Project D16 includes a new water main connection from Parker Road to 62nd Street Court East to facilitate better fire suppression flow in the area. This project will include installation of approximately 200 linear feet of 8-inch-diameter water main and other associated improvements.

8.2.3.17 Project D17 – Kincaid Avenue, Maple Street to Academy Street

Project D17 includes replacement of a water main on Kincaid Avenue between Maple Street and Academy Street. This project will include installation of approximately 475 linear feet of 8-inch-diameter water main and other associated improvements.

8.2.3.18 Project D18 – 140th Avenue East and 20th Street East

Project D18 includes a new water main connection from 140th Avenue East to 20th Street East to facilitate better fire suppression flow in the area. This project will include installation of approximately 100 linear feet of 8-inch-diameter water main and other associated improvements.

8.2.3.19 Project D19 – Replacement of Old Water Mains with Street Projects

Project D19 does not consist of any one specific water main replacement or upgrade, but instead anticipates that existing water mains not identified in this CIP will be replaced in the future as part of street improvement projects, or as needed due to failure or other emergency condition.

The proposed distribution main projects have been prioritized by anticipated growth and needs and are included in Table 8-1 located at the end of this chapter.

8.3 SOURCE IMPROVEMENTS

8.3.1 Deficiencies

Maximum day demand is projected to meet present usable source capacity in the year 2012. Projections are based upon a peaking factor of 2.00.

8.3.2 Needs

Although the current source capacity is able to meet average day demands through the 20-year planning period, new sources are required to satisfy projected maximum day demands. An estimated 1.76 mgd of additional source capacity is required within the 20-year planning period to accommodate the maximum day demand projection.

8.3.3 Proposed Source Improvements

It is likely that a combination of several alternative new sources and improvements to existing sources will be required to meet future water demands for the City. Each of the sources will be evaluated for applicable health standards, quantity of available water, reliability, costs, benefits, environmental effects, flexibility for changes, implementation, life expectancy, and risks.

8.3.3.1 Project S1 – West Well Improvements

West Well has been a reliable irrigation source for the Cemetery that could be improved for use as a domestic peaking well. The water rights for West Well limit the peak use to 250 gpm with an average annual yield of 100 acre-feet. The well currently pumps approximately 250 gpm and is utilized as a seasonal domestic source. The 1993 WSP stated that the West Well has high manganese concentrations and would likely require treatment prior to domestic consumption. Although rarely used, the benefits of using the West Well for peak demands include the ability to provide a higher maximum day capacity. Improvements to the West Well will include manganese filtration facilities, well rehabilitation, site upgrades, new pumps, and other upgrades to the existing facilities. These improvements are contingent upon the City being allowed to transfer the existing water rights to domestic purposes, which is currently pending a ruling from the Washington State Supreme Court on the Municipal Water Law.

8.3.3.2 Project S2 – South Well Improvements

The South Well has an instantaneous water right of 1,000 gpm and an annual withdrawal of 800 acre-feet (542 acre-feet primary and 258 acre-feet supplementary or "non-additive"). The City estimates that the current well capacity is 700 gpm. The South Well should be evaluated for the ability to increase capacity to the full water right. The City plans to pull and modify the existing pumps as necessary to utilize the full instantaneous water right or transfer the excess water rights to another source. If the well capacity is increased, in order to increase chlorine contact time (and thus CT Product), approximately 230 linear feet of 36-inch-diameter pipe will be installed out of the south well to increase detention time as needed to produce a minimum CT of 6 while maintaining a maximum free chlorine residual of 0.45 mg/L. A new well house will also be constructed with these improvements.

8.3.3.3 Project S3 – Central Well

The City is currently in the process of a water right application that will allow Sumner to change the point of withdrawal of the existing municipal water rights from the South Well. The City will also explore the possibility of exchanging surface water rights at the springs or the White River for groundwater rights for a new well. The City needs enough rights to continue to pursue a new 750-gpm to 1,250-gpm well. A test well was drilled near the City Shops in late 2008, but did not turn into a feasible water source. Drilling for a new well is currently being reevaluated at other locations. Once a new well is in place, testing for flow and water quality will take place and additional infrastructure improvements to pump the water and connect the well to the City's water system will be constructed.

8.3.3.4 Project S4 – New Well at 148th Avenue East and 24th Street East Intersection

The City plans to construct an additional deep well capable of producing 750 gpm to 1,250 gpm in north Sumner at the intersection of 148th Avenue East and 24th Street East. Construction of this well is contingent on approval of water right revisions and/or additional groundwater rights. Completion of Project S4 will provide further source redundancy, making the City less vulnerable to water shortages in the event that another source needs to be taken off-line for repair or maintenance during high-use periods and will provide increased capacity and system pressure to north Sumner.

8.3.3.5 Project S5 – Intertie with Auburn

The City has historically had sufficient water supplies to meet demands, but water demand in the City is fast approaching the capacity of the existing sources, especially when the system is strained by weather or sources being taken off-line. The City could connect to other systems through existing interties or by wheeling water through other purveyors. These options are evaluated as the options are made available.

Project S5 would create an intertie with the City of Auburn. The location could potentially occur at 8th Street East and East Valley Highway as both systems have infrastructure in the nearby area.

8.3.3.6 Project S6 – Intertie with Pacific

Project S6 is the improvement to an existing intertie with the City of Pacific. The existing intertie is located at 16th Street East and 136th Avenue East. The existing intertie at this location includes a check valve that only allows flow from Sumner's system to Pacific's system. S6 would remove the check valve and install a flow meter. The City is currently exploring this option as a near-term option for water shortages.

8.3.3.7 Project S7 – Water Right Modifications

The City of Sumner submitted five applications to the Department of Ecology in late May 2004 for change of the City's existing water rights granted under Surface Water Certificates S2-21979C, 7838, 2266, and Groundwater Certificates G2-21980C and G2-23281C. The intent of these change applications is to add new and existing City wells to several of the existing water rights in order to allow more security and operational flexibility, especially in the event of a catastrophic loss of one or more water sources. Three of the applications for the City's existing surface water rights were withdrawn after Ecology adopted a new procedural policy requiring "direct and substantial continuity" between a surface water source and aquifer as a prerequisite for any surface to groundwater change application (POL-2010, adopted February 15, 2007). The remaining applications, for the South Well and West Well water rights, are still under review by Ecology. The City is in the process of locating a site to develop a new well, which was prompted by Ecology's issuance of a preliminary permit requiring well testing in order to complete investigation for the applications.

The City currently maintains three separate surface water rights in addition to those listed above that allow them to withdraw 272 acre-feet per year from the White River. Currently, these rights are primarily used to irrigate the golf course. The City plans on pursuing applications to change the point of withdrawal for these rights from surface water to groundwater. Completion of the applications to change point of withdrawal will be contingent on finding an alternative irrigation source for the golf course. The City investigated using reclaimed water from the WWTP to provide irrigation water to the golf course as discussed in Section 5.5.

8.3.3.8 Project S8 – Additional Water Rights Acquisition

The City is currently negotiating with the Cascade Water Alliance (CWA) and others about water rights, as well as other nearby municipalities. Approximately 200 acre-feet of annual water right will be needed within the 20-year planning window based on the average day demand projections discussed in Chapter 5.

8.3.3.9 Project S9 – Intertie with Mountain View-Edgewood Intertie

Project S9 will develop an intertie with Mountain View-Edgewood, and it is currently being explored in the area west of West Valley Highway. This connection would install approximately 2,100 feet of 10-inch water main, a pressure reducing valve (due to the pressure difference between the two systems), a flexible pipe assembly unit, and chlorination facilities for the additional water. The proposed intertie project area is near the proposed site of the new reservoir project, ST1, described below.

8.3.3.10 Project S10 – Springs Source Improvements

This project will explore the possibility of drilling new horizontal "wells" into the hillside for collecting additional spring flow. Additional options will be evaluated if the horizontal drills are found to not be effective for this application.

Project S10 will proceed with development after successful tests for flow and water quality. Preliminary investigations indicate that improvements at the springs could capture approximately 500 gpm. The potential additional springs locations investigated are near the current springs in the Sumner watershed, but at a slightly lower elevation. New spring collection boxes would likely need supplementary pumping facilities due to elevation differential from the existing collection, chlorination, and storage facilities. A small collection system from the new boxes, booster pump(s), and a transmission main would collect the new additional spring flow and route it to the existing infrastructure for disinfection and storage prior to distribution to the City's water system.

8.3.3.11 Project S11 – Intertie with Puyallup

Project S11 would develop an intertie with the City of Puyallup water system into a usable source for peaking demands. The improvements would require the installation of a booster pump station due to the operating pressure difference between the two systems and require installation of a flowmeter to quantify the flow to (and from) the Sumner water system. The location of the improvements will be determined during design, but it could be made at the existing intertie near the west end of North Street. The existing intertie site contains a double valve connection between the Sumner and Puyallup water system, and is constricted by railroad tracks and a commercial building. In an emergency, the intertie should be able to flow water from Sumner's water system into Puyallup's water system. This gives both system added redundancy during a water emergency.

8.4 STORAGE IMPROVEMENTS

8.4.1 Deficiencies and Needs

The City of Sumner has adequate storage capacity projected through 2025. If additional storage is desired for increased fire flows or if storage is used to meet maximum day demands, an additional reservoir can be sited along the west side of the valley.

8.4.2 Proposed Storage Improvements

8.4.2.1 Project ST1 – Construct 2 MG Reservoir on West Hill

The City of Sumner currently has more than sufficient storage for existing and projected demands through the 20-year planning window. A reservoir can be sited in northwest Sumner, west of West Valley Highway, if system pressures and/or fire flow for future development deem it necessary. This reservoir could also help provide additional storage to meet the MDD at the times of highest water use.

8.4.2.2 Project ST2 – Earthquake Control Valves and Foundation Improvements

The existing reservoirs may be subject to draining in the event of a large earthquake in the valley floor. This project is for the installation of a control valve at each of the South Tank, the Sumner Springs Tank, and the County Springs Tank and is scheduled to be completed over several years. Improvements to the foundation of the Sumner Springs Tank are also proposed. This will include strapping the existing steel tank to a new, reinforced concrete foundation.

8.4.2.3 Project ST3 – Reservoir Mixing

The City plans to retrofit their existing storage tanks with reservoir mixers. The City will explore several options to mix the reservoirs to eliminate stratification and short circuiting in the existing storage tanks and help promote better quality water within the system.

8.5 OPERATIONS AND MAINTENANCE IMPROVEMENTS

The following operations and maintenance program activities are required to modernize the operations and maintenance program and to address state requirements regarding deficiencies in the system. A majority of the costs necessary to complete these projects are in addition to the existing budget levels.

8.5.1 Deficiencies

Although the City continues to operate and maintain the system, additional projects have been identified to increase the operational effectiveness of the system. The Water Use Efficiency Program also implements requirements for additional operations and maintenance projects.

8.5.2 Needs

In addition to anticipated expansion, the City's water system will continue to age and need continued maintenance and upkeep. The O&M improvements are intended to provide additional system reliability and provide a more efficient method to either reduce system costs or increase revenues through accurate meters.

8.5.3 Proposed Operation and Maintenance Projects

8.5.3.1 Project O&M1 – Meter Replacement Program – 10 Years

As required by the Water Use Efficiency Program, Project O&M1 is budgeted to continue to replace service meters throughout the system. The City has about 5 or 6 years of replacing meters remaining. As meters age, they become less accurate and read lower than actual usage. Touch-tone meters are proposed for this project, which will increase the accuracy and efficiency of reading meters.

8.5.3.2 Project O&M2 – Hydrant and Isolation Valve Upgrades – 20 Years

Many of the City's existing fire hydrants are near the end of their useful life. The City plans to replace approximately five hydrants per year. Valves identified as inoperable or damaged during exercising will be scheduled for replacement.

8.5.3.3 Project O&M3 – Source Meter Calibration

Part of the City's WLCAP states that the City's source meters should be checked for accuracy and calibrated on a frequent basis. A source meter calibration program has been implemented, and the City plans on conducting ongoing meter calibration.

8.5.3.4 Project O&M4 – Increased Telemetry Maintenance

Over the past few years, the City has upgraded their system telemetry. However, their water system will be expanding, and the number of sources will be increasing. Therefore, the system telemetry will continue to require maintenance and expansion. The goal of this program is to continue to provide the level of service they are accustomed to with increased telemetry maintenance as the system expands.

8.5.3.5 Project O&M5 – Water Use Efficiency Program/WLCAP

The City will maintain and continue to develop their Water Use Efficiency Program as discussed in Section 5.4 and implement strategies to reduce the DSL as discussed in the WLCAP in Section 3.4. WUE reports are due to DOH on a yearly basis by July 1st of the year following the reporting year. While compiling the reports, the City has the opportunity to review all production and consumption numbers, calibrate source meters, discuss additional WUE measures that could be implemented, and discuss demand projections and upcoming CIP projects.

Another aspect of this project, due to a substandard DSL average in the City's water system, is expanding the leak detection program. The leak detection program is part of the WLCAP and has been implemented. Sumner plans on increasing their leak detection schedule to a semiannual basis throughout the system to locate and fix leaks within the distribution system.

Table 8-1. City of Sumner DRAFT Capital Improvement Plan Schedule

Project No. – Description	Funding Source	Total Cost Year 2009	Year of Completion										
			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019-2029
Seattle Construction Cost Index (increases at an average of 3.06%/year)		8652	8652	8917	9190	9471	9761	10059	10367	10684	11011	11348	11695
DISTRIBUTION SYSTEM IMPROVEMENTS													
D1 – Gary Street and Parker Road Loop	D	$291,000										$382,000	
D2 – Rainier Street Replacement	CM	$125,000					$142,000						
D3 – Main Street and Kincaid Avenue Loop	CM	$150,000					$170,000						
D4 – Thompson Street and Silver Street Loop	CM	$520,000			$553,000								
D5 – West Valley Highway	D	$204,000		$211,000									
D6 – 30th Street East, South of 24th Street East Loop	D	$167,000				$183,000							
D7 – 29th Street East and 32nd Street East Loop	D	$164,000			$175,000								
D8 – Extend from 149th Avenue to East Valley Highway	CM	$413,000						$96,000	$396,000				
D9 – East Valley Highway from Salmon Creek to CTI	CG	$2,500,000						$2,907,000					
D10 – East Valley Highway from 24th Street East to CTI	D	$650,000				$712,000							
D11 – 8th Street East	CG	$496,000	$23,000	$489,000									
D12 – 8th Street East and East Valley Highway Loop	CG	$880,000			$935,000								
D13 – Valley Avenue East from the West Well to Houston Road	CG	$1,400,000						$1,628,000					
D14 – Fryar Avenue / Main Street Intersection	CM	$208,000		$215,000									
D15 – Riverside Drive and 151st Avenue	CG	$222,000							$267,000				
D16 – Parker Road and 62nd Street Court East	CG	$69,000									$88,000		
D17 – Kincaid Avenue, Maple Street to Academy Street	CG	$277,000											$376,000
D18 – 140th Avenue East and 20th Street East	CG	$42,000										$56,000	
D19 – Replacement of Old Water Mains with Street Projects	CM	$4,005,000				$200,000	$200,000	$200,000	$200,000	$220,000	$235,000	$250,000	$2,500,000
Subtotal:		**$12,783,000**	**$23,000**	**$915,000**	**$1,663,000**	**$1,095,000**	**$512,000**	**$4,831,000**	**$863,000**	**$220,000**	**$323,000**	**$688,000**	**$2,876,000**
Subtotal City Funded (Capital Imp Related to Growth) (CG):		**$5,886,000**	**$23,000**	**$489,000**	**$935,000**	**$0**	**$0**	**$4,535,000**	**$267,000**	**$0**	**$88,000**	**$56,000**	**$376,000**
Subtotal City Funded (Capital Imp Related to Maintenance) (CM):		**$5,421,000**	**$0**	**$215,000**	**$553,000**	**$200,000**	**$512,000**	**$296,000**	**$596,000**	**$220,000**	**$235,000**	**$250,000**	**$2,500,000**
Developer Funded (D):		**$1,476,000**	**$0**	**$211,000**	**$175,000**	**$895,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$382,000**	**$0**

(Table Continues)

Table 8-1. City of Sumner DRAFT Capital Improvement Plan Schedule (continued)

Project No. – Description	Funding Source	Total Cost Year 2009	Year of Completion										
			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019-2029
Seattle Construction Cost Index (increases at an average of 3.06%/year)		8652	8652	8917	9190	9471	9761	10059	10367	10684	11011	11348	11695
SOURCE IMPROVEMENTS													
S1 – West Well Improvements	CM	$950,000						$1,106,000					
S2 – South Well Improvements	CM	$665,000			$706,000								
S3 – Central Well	CG	$2,264,000		$250,000	$2,140,000								
S4 – New Well at 148th Avenue East and 24th Street East Intersection	CG	$1,139,000								$1,407,000			
S5 – Intertie with Auburn	CG	$238,000											$322,000
S6 – Intertie with Pacific	CG	$187,000				$205,000							
S7 – Water Right Modifications	CG	$105,000		$55,000	$56,000								
S8 – Additional Water Rights Acquisition	CG	$810,000		$209,000	$646,000								
S9 – Intertie with Mountain View-Edgewood	CG	$750,000			$797,000								
S10 –Springs Source Improvements	CG	$566,000		$117,000	$481,000								
S11 – Intertie with Puyallup	CG	$325,000		$335,000									
Subtotal:		**$7,999,000**	**$0**	**$966,000**	**$4,826,000**	**$205,000**	**$0**	**$1,106,000**	**$0**	**$1,407,000**	**$0**	**$0**	**$322,000**
Subtotal City Funded (Capital Imp Related to Growth) (CG):		**$6,384,000**	**$0**	**$966,000**	**$4,120,000**	**$205,000**	**$0**	**$0**	**$0**	**$1,407,000**	**$0**	**$0**	**$322,000**
Subtotal City Funded (Capital Imp Related to Maintenance) (CM):		**$1,615,000**	**$0**	**$0**	**$706,000**	**$0**	**$0**	**$1,106,000**	**$0**	**$0**	**$0**	**$0**	**$0**
STORAGE IMPROVEMENTS													
ST1 – Construct 2 MG Reservoir on West Hill	CG	$2,550,000							$3,056,000				
ST2 – Earthquake Control Valves and Foundation Improvements	CM & D/LID/Other	$3,502,000			$300,000						$4,076,000		
ST3 – Reservoir Mixing	CM	$107,000				$40,000	$41,000	$42,000					
Subtotal:		**$6,159,000**	**$0**	**$0**	**$300,000**	**$40,000**	**$41,000**	**$42,000**	**$3,056,000**	**$0**	**$4,076,000**	**$0**	**$0**
Subtotal City Funded (Capital Imp Related to Growth) (CG):		**$2,250,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$3,056,000**	**$0**	**$0**	**$0**	**$0**
Subtotal City Funded (Capital Imp Related to Maintenance) (CM):		**$1,682,900**	**$0**	**$0**	**$135,000**	**$40,000**	**$41,000**	**$42,000**	**$0**	**$0**	**$1,834,200**	**$0**	**$0**
Developer / LID / Other Funded (D/LID/Other):		**$1,926,000**	**$0**	**$0**	**$165,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$2,241,800**	**$0**	**$0**
OPERATIONS AND MAINTENANCE PROGRAMS													
O&M1 – Meter Replacement Program – 10 Years	O	$393,000	$98,000	$101,000	$104,000	$108,000							
O&M2 – Hydrant and Isolation Valve Upgrades – 20 Years	O	$576,000	$29,000	$30,000	$31,000	$32,000	$32,000	$33,000	$35,000	$36,000	$37,000	$38,000	$389,000
O&M3 – Source Meter Calibration (All Sources)	O	$194,000	$8,200	$8,400	$8,600	$8,800	$9,000	$9,200	$9,400	$9,600	$9,800	$10,000	$103,000
O&M4 – Increased Telemetry Maintenance	O	$26,000	$26,000	$27,000	$28,000	$28,000	$29,000	$30,000	$31,000	$32,000	$33,000	$34,000	$176,000
O&M5 – Water Use Efficiency Program / WLCAP	O	$153,000	$15,300	$16,000	$13,000	$13,000	$12,000	$12,000	$9,000	$9,000	$10,000	$10,000	$62,000
Operating Funds (O):		**$1,342,000**	**$176,500**	**$182,400**	**$192,900**	**$198,500**	**$91,200**	**$93,800**	**$94,500**	**$97,200**	**$100,900**	**$103,600**	**$872,000**
TOTAL WATER FUND (ALL CITY-FUNDED PROJECTS):		**$24,880,900**	**$199,500**	**$1,852,400**	**$6,641,900**	**$643,500**	**$644,200**	**$6,072,800**	**$4,013,500**	**$1,724,200**	**$2,258,100**	**$409,600**	**$4,070,400**

Notes: CG Capital Improvement Projects Related to Growth (Infrastructure Expansion) D Developer Funded
CR Capital Improvement Projects Related to Maintaining Existing Infrastructure O Operating Funds

9. FINANCIAL PLAN

Effective implementation of the Sumner Water System Plan depends upon developing improvements that can be financially supported by the utility, meets state and local regulatory requirements, and provides the flexibility to accommodate growth and unforeseen changes. The subsequent sections present a review of the City's current funding sources, required revenues, and any deficiencies.

9.1 CURRENT FINANCIAL POSITIONS OF THE CITY

9.1.1 Balance Statement

The City of Sumner maintains a water utility fund, which accounts for the maintenance and operations of the system, debt service, and capital asset acquisition. Tables 9-2 and 9-3 list revenues and expenditures for the water utility from 2004 through 2008, as well as the biennial budget for 2009-2010.

9.1.2 Debt and Debt Service Obligations

The City has one outstanding water and sewer bond issue that was originally issued in 1998. This bond was refinanced in June 2008 to lower the interest rate for repayment. The average annual debt service for this bond is in the range of $569,400 to $582,000 for the years 2009 through 2018. The debt service for the 2008 refunded revenue bonds will be paid from both the water utility and the sewer utility in the ratio of water to sewer utility income, with the water utility paying approximately 24 percent and the sewer utility paying approximately 76 percent.

9.1.3 Population

In general, water utility revenues will increase in proportion to the population served. Population projection methodology and results are discussed in Section 3.2, "Historic Population."

9.2 WATER UTILITY MONTHLY RATE REVIEW

This section presents a review of the current water utility monthly rate structure, recent water utility budgets (expenditures and revenue), capital projects proposed to address deficiencies in the existing water infrastructure, and additional operation and maintenance programs that are anticipated in the future.

9.2.1 Current Water Utility Monthly Rate Structure

The largest source of revenues for the water system is from water rates, which are collected on a monthly basis. Residential, multifamily, commercial, and industrial accounts are billed under the same rate structure, which is a fixed fee (base rate) based on the size of the water service meter and an additional usage rate charged per 100 cubic feet (ccf) of water consumption. The usage rate is implemented under a three-tiered structure where the customer pays successively higher usage rates for water consumed above the preset usage thresholds.

Table 9-1 lists the billing rate schedule, which is described in detail under City Ordinance Chapter 12.24. Connections outside the city limits are billed under the same rate structure as those within city limits, but are assessed an additional 15 percent over the base rate.

Table 9-1. 2009 Water Rates for Metered Connections

Within City Limits:		
	Base Rates	**Monthly Usage Rates**
Meter Size (in inches)	Monthly Charge [a] ($)	<10 ccf = $0.93/ccf
0.75	10.64	10–20 ccf = $1.22/ccf
1.0	25.78	>20 ccf = $1.46/ccf
1.5	51.54	
2.0	82.44	
3.0	154.61	
4.0	257.65	
6.0	515.31	
8.0	824.51	
Outside the City Limits:		
Base and Usage Rates are the same as above plus an additional 15 percent applied to the base rate.		
NON-REFUNDABLE PERMIT AND INSPECTION FEES ($)		
Residential	$195	
Commercial/Industrial	$225	
Fire Hydrant	$195	
Sprinkler System	$250	
Residential Irrigation System	$125	
All Other Systems	$175	

[a] Includes water utility tax.

9.2.2 Historical Water Utility Operating Budgets

Table 9-2 presents a summary of the water operations for 2004 through 2010. Values shown for 2009–2010 are amounts budgeted; values for years 2004 through 2008 are actual revenues and expenditures.

Table 9-2. Statement of Revenues and Expenses and Changes in Net Assets, 401 – Water Fund

Item	2004	2005	2006	2007	2008	2009–2010[a]
REVENUE						
Charges for Service	$1,127,209	$1,241,432	$1,371,032	$1,409,025	$1,470,175	$3,116,370
Fees and Permits	–	$55,759	$54,923	$84,105	$26,330	$70,000
Intergovernmental Revenue	–	–	–	–	–	$285,000
Other Operating Revenue	$27,790	$19,897	$3,418	$11,521	$18,819	$41,000
Total Operating Revenue:	**$1,154,999**	**$1,317,088**	**$1,429,373**	**$1,504,651**	**$1,515,324**	**$3,512,370**
EXPENSES						
Administration/Overhead	$342,618	$355,677	$378,662	$533,917	$691,678	$1,389,090
Maintenance and Operations	$478,905	$496,819	$528,050	$642,471	$604,758	$1,336,300
Tax/B&O (State)	$102,729	$68,571	$137,309	$147,159	$147,393	$302,550
Depreciation	$541,112	$773,637	$673,763	$708,157	$853,430	–
Total Operating Expenses:	**$1,465,364**	**$1,694,704**	**$1,717,784**	**$2,031,704**	**$2,297,259**	**$3,027,940**
Operating Income (Loss):	**$(310,365)**	**$(377,616)**	**$(288,411)**	**$(527,053)**	**$(781,935)**	**$484,430**

(Table Continues)

Table 9-2. Statement of Revenues and Expenses and Changes in Net Assets, 401 – Water Fund (Continued)

Item	2004	2005	2006	2007	2008	2009–2010[a]
Special Assessment Revenues	–	–	$259,654	$163,130	$123,053	–
Gain (Loss) on Disposal of Capital Assets	$(17,195)	$(8,303)	–	–	–	–
Unrealized Gain (Loss) on Investments	$(5,677)	$(11,329)	$2,883	$11,944	$2,364	$2,250
Bond Issuance Costs	–	–	–	–	$1,559	–
Other Non-Operating Revenues	$7,771	–	–	–	–	$93,780
Interest and Fiscal Charges	$(128,155)	$(106,439)	$(157,340)	$(132,318)	$(144,872)	$(397,180)
Non-Operating Revenues Net of Expenses:	**$(121,447)**	**$(78,412)**	**$342,968**	**$257,605**	**$156,774**	**$(118,150)**
Income (Loss) Before Contributions and Transfers:	**$(431,812)**	**$(456,028)**	**$54,557**	**$(269,448)**	**$(625,161)**	**$366,280**
Contributions	$1,057,696	$984,899	$2,069,019	$786,760	$511,516	$650,000
Transfers In	$95,802	$12,071	–	–	–	–
Transfers Out	$(168,132)	$(384,266)	$(153,265)	$(134,337)	$(86,270)	$(66,160)
Change in Net Assets:	$553,554	$156,676	$1,970,311	$382,975	$(199,915)	$950,120
Net Assets at Beginning of Year:	**$7,447,414**	**$8,256,641**	**$12,278,280**	**$12,680,140**	**$13,063,115**	**$13,194,320**
Prior Period Adjustments	$255,673	$3,864,963	$(1,568,451)	–	$331,120	–
Net Assets at End of Year:	**$8,256,641**	**$12,278,280**	**$12,680,140**	**$13,063,115**	**$13,194,320**	**$14,144,440**

[a] Budgeted

9.2.3 Projected Water Utility Operating Budget

Because the City of Sumner monthly fees are based both on a base rate and a usage rate that escalates depending on the actual volume of water consumed in the billing period, it is difficult to project the revenue that can be expected as a result of future growth. Therefore, the future operational revenues estimated for this review are based on actual 2007 and 2008 revenue and expenses and the biennial budget for 2009–2010.

As stated in SMC 13.24.300, the City base rates and usage fees are increased according to the CPI-U Index (June to June) for the Seattle-Puget Sound area effective January 1 of each year. Once again, the combination of the index and population growth makes it difficult to project revenue over the long term. Therefore, the water utility operating budget was only projected through 2012.

Table 9-3 on the following page presents the projected operating budget for the water utility based on actual revenue and expenses in 2007 and 2008 and budgeted amounts for 2009-2010. A 3.5 percent growth rate was added to the 2009–2010 biennium budget to estimate the next biennial budget projections. These projections for the water utility show a surplus through 2012, but operation and maintenance upgrade projects may come up that are not necessarily included in the table.

Table 9-3. Projected Revenues and Expenses, 401 – Water Fund

Item	2009–2010	2011–2012[a]	2013–2014[a]	2015–2016[a]
		REVENUE		
Charges for Service	$3,116,370	$3,325,432	$3,548,518	$3,786,571
Fees and Permits	$70,000	$74,696	$79,707	$85,054
Intergovernmental Revenue	$285,000	$304,119	$324,521	$346,292
Other Operating Revenue	$41,000	$43,750	$46,685	$49,817
Non-Operating Revenues	$279,030	$297,749	$317,723	$339,038
Total Operating Revenue:	**$3,791,400**	**$4,045,746**	**$4,317,155**	**$4,606,771**
		EXPENSES[b]		
Administration/Overhead	$1,400,980	$1,494,965	$1,595,254	$1,702,272
Maintenance and Operations	$1,199,650	$1,280,129	$1,366,006	$1,457,644
Operating Transfers Out	$212,350	$226,595	$241,797	$258,018
Interest and Fiscal Charges[c]	$397,180	$423,825	$452,257	$482,597
O and M Upgrade Projects[d]	$358,900	$391,400	$185,000	$191,700
Tax/B&O (State)	$302,550	$322,847	$344,505	$367,616
Depreciation	–	–	–	–
Total Operating Expenses:	**$3,871,610**	**$4,139,760**	**$4,184,819**	**$4,459,847**

a 2011-2012 values increased by 3.5 percent for City growth and 3.1% for inflation (based on average annual CCI increase).

b Excludes depreciation expense.

c Based on the additional O&M Programs outlined in the Capital Improvement Program. Several of these programs have already been initiated and are already funded under Operating Transfers Out. Therefore, the dollar amounts shown on the Capital Improvement Plan implementation schedule do not match those shown above.

d Upgrade to existing infrastructure to address deficiencies. See the Capital Improvement Program for additional detail.

9.3 WATER UTILITY SYSTEM DEVELOPMENT CHARGE REVIEW

A system development charge (SDC) for new connections, based on meter size, is also billed. An SDC is a one-time fee, paid at the time of development, which is intended to enable the City to recover from new development a proportional share of both 1) the cost of the existing system, and 2) the projected cost of capital facilities that will serve growth. In essence, an SDC is an attempt to establish equity between the City's existing and future customers by placing the infrastructure investment of new customers on par with existing utility ratepayers. Additional permit and inspection fees are charged by the City to new connections as those costs are incurred.

9.3.1 Current Water Utility System Development Charge Structure

Table 9-4 lists the system development charge schedule, which is described in detail under City Code Chapter 12.24. Connections outside the city limits are assessed an additional 25 percent over that paid for customers within Sumner city limits.

Table 9-4. Current System Development Charges

WITHIN THE CITY LIMITS:	
Type of Structure	**Rate ($)**
Single-Family Dwellings	2,460
Multiple-Unit Dwellings	1,845 (per unit)
Accessory Dwellings	1,230
Each Commercial or Industrial Establishment per Building	
Meter Size (in inches)	
0.75	2,460
1.0	6,160
1.5	12,316
2.0	19,710
3.0	36,950
4.0	61,590
6.0	123,180
Industrial or Interchange Commercial	8,610 (per acre) + actual water use (if necessary)
OUTSIDE THE CITY LIMITS:	
Service charges are 25 percent higher than tabulated above.	
SERVICE CONNECTION FEE:	
The property owner is to pay for the cost of installation plus 25 percent for overhead.	

9.3.2 Historical Water Utility Capital Asset Activity

Table 9-5 presents a summary of the water capital asset activity for 2004 through 2010. Values shown for 2009-2010 are amounts budgeted for the current biennium; values for years 2004 through 2008 are actual revenues and expenditures.

As shown in Table 9-5, the City water capital asset activity has been operating with a substantial surplus over the past 4 years. This is in part due to the fact that substantial commercial and industrial development has been occurring and, therefore, a majority of the water infrastructure expansion that has occurred over the past 4 years has been installed by and funded by developers.

Table 9-5. Capital Asset Activity 401 – Water Fund[a]

Item	2004	2005	2006	2007	2008	2009–2010[b]
BEGINNING BALANCE:	**$179,700**	**$834,696**	**$1,519,925**	**$2,282,091**	**$2,575,557**	**$2,624,536**
System Development Charges	$1,057,696	$887,271	$993,915	$485,915	$271,777	$650,000
Interest Earnings	$7,119	$22,613	$48,911	$104,860	$76,099	$165,000
Total Revenue for Capital:	**$1,064,815**	**$909,884**	**$1,042,826**	**$590,775**	**$347,876**	**$815,000**
CAPITAL EXPENSES						
Capital Improvements	$203,824	$38,082	$98,746	$113,587	$38,103	$1,693,000
Bond Debt Service	$168,682	$150,270	$146,622	$149,440	$227,301	$270,594
Other Debt Service	$37,313	$36,303	$35,292	$34,282	$33,493	$63,520
Total Capital Expenses:	**$409,819**	**$224,655**	**$280,660**	**$297,309**	**$298,897**	**$2,027,114**
ENDING BALANCE:	**$834,696**	**$1,519,925**	**$2,282,091**	**$2,575,557**	**$2,624,536**	**$1,412,422**

[a] Actual amounts were taken from audited financial statements for the Water Utility 2004 through 2008.

[b] 2009–2010 amounts are based on the 2009–2010 Biennial Budget.

9.3.3 Projected Water Capital Asset Budget

To be consistent with the methodology used to project future revenue from monthly fees, the future SDC revenue was estimated assuming a percent increase from the revenue projected in 2009 (Table 9-6).

Table 9-6. Projected Capital Asset Activity from System Development Charges – Water Fund

Item	2009/2010[a]	2011/2012[b]	2013/2014[b]	2015/2016[b]
BEGINNING BALANCE:	**$2,624,536**	**$1,336,737**	**$(5,135,945)**	**$(11,193,704)**
System Development Charges	$ 739,315	$ 788,912	$ 841,836	$ 898,310
Total Revenue for Capital:	**$ 739,315**	**$ 788,912**	**$ 841,836**	**$ 898,310**
CAPITAL EXPENSES				
Bond Debt Service	$270,594	$272,864	$272,864	$272,864
Other Debt Service	$63,520	$94,730	$94,730	$94,730
Capital Improvements[c]	$ 1,693,000	$ 6,894,000	$ 6,532,000	$ 5,546,000
Total Capital Expenses:	$ 2,027,114	$ 7,261,594	$ 6,899,594	$ 5,913,594
ENDING BALANCE:	**$ 1,336,737**	**$ (5,135,945)**	**$ (11,193,704)**	**$ (16,208,987)**

[a] 2009/2010 amounts are based on the 2009-2010 Biennial Budget and CIP schedule in Chapter 8.

[b] Amounts are based on the previous Biennial Budget with 3.1% increase on SDCs, 3.5% increase on population and projections for Debt Services.

[c] Infrastructure improvements or extensions necessary to service future demand. See the Capital Improvement Program for additional detail.

Based on the information presented in the table above, the City of Sumner will be operating under a deficit during the 6-year planning period if all scheduled capital improvement projects are constructed unless the SDC and rates are increased and substantial funding in the way of grants, loans, or LIDs are arranged, or additional projects are funded by developers. Table 9-7 shows the projected revenues of the Capital Asset Fund assuming that the system development charge is increased by 25 percent in the year 2010 and that the City receives low interest loans and grants in 2010 and 2011 to offset capital improvement construction costs.

Table 9-7. Projected Capital Asset Activity from System Development Charges - Water Fund (Assuming SDC Increase and Additional "Revenue" Gained Through Loans and Grants)

Item	2009/2010[a]	2011/2012[b]	2013/2014[b]	2015/2016[b]
BEGINNING BALANCE:	**$2,624,536**	**$ 2,595,497**	**$ 4,398,934**	**$ 6,622,952**
System Development Charges	$ 739,315	$ 788,912	$ 841,836	$ 898,310
SDC and Rate Increase[c]	$ 258,760	$ 276,119	$ 294,643	$ 314,409
Low Interest Loan/Grant	$ 1,000,000	$ 8,000,000	$ 8,000,000	
Total Revenue for Capital:	**$ 1,998,075**	**$ 9,065,031**	**$ 9,136,478**	**$ 1,212,719**
CAPITAL EXPENSES				
Bond Debt Service	$270,594	$272,864	$282,414	$292,299
Other Debt Service	$63,520	$94,730	$98,046	$101,477
Capital Improvements[d]	$ 1,693,000	$ 6,894,000	$ 6,532,000	$ 5,546,000
Total Capital Expenses:	**$ 2,027,114**	**$ 7,261,594**	**$ 6,912,460**	**$ 5,939,776**
ENDING BALANCE:	**$ 2,595,497**	**$ 4,398,934**	**$ 6,622,952**	**$ 1,895,896**

[a] 2009/2010 amounts are based on the 2009-2010 Biennial Budget.

[b] Amounts are based on the previous Biennial Budget with 3.1% increase on SDCs, 3.5% increase on population and projections for Debt Services.

[c] SDC increase is 25% and only for SDCs projected for 2010 and beyond.

[d] Infrastructure improvements or extensions necessary to service future demand. See the Capital Improvement Program for additional detail.

9.4 SUMMARY

The information presented in Tables 9-6 and 9-7 indicate that the Sumner water fund will likely be operating under a deficit if all the operation and maintenance programs and capital improvement projects proposed in the Capital Improvement Plan are implemented, unless the City increases the monthly fees and the system development charges while acquiring a significant low-interest loan and/or grant. A formal rate study will be conducted to determine the extent of the increases, and additional rate review will be conducted after the increased rates are enacted to verify that the City will continue to meet their financial commitments during and beyond the 6-year planning period.

The City is underway in conducting a rate study on their utilities. This will alter some of the rates used in this section and some of the projected revenues. The City will be using the CIP list provided in Chapter 8 as a means of establishing expenses for the water utility.

10. OPERATIONS PROGRAM

This chapter satisfies the requirements for an operations program outlined in the DOH Planning Handbook for Water System Plans and current Washington State Drinking Water Regulations (WAC 246-290). The City of Sumner has an established operations program, with staff and equipment to adequately manage and control the program, protect water quality, and provide a safe and reliable supply of drinking water to all customers.

This operations program is divided into five sections:

- Organization Structure/Responsibilities.
- System Operation and Control.
- Water Quality Monitoring.
- Emergency Response Program.
- Cross Connection Control Program.

For each component of the operations program, current practices are discussed and recommended changes or improvements are included.

10.1 ORGANIZATION STRUCTURE/RESPONSIBILITIES

The City of Sumner Water Utility is overseen by the Public Works Department, which is operated and maintained by the Public Works Director. Figure 10-1 on the following page shows the City of Sumner organization chart. The Public Works staff includes many personnel that are flexible and can work on water system projects when the need arises due to emergencies, new construction, or increased monitoring. Table 10-1 shows key responsibilities of water system staff.

Table 10-1. Key Responsibilities of Water System Staff

Responsibility	Staff Member
Normal Day-to-Day Operations	Water Superintendent
Preventive Maintenance	Water Superintendent, Water Specialists, Utility Operators
Field Engineering	Public Works Director, City Engineer
Water Quality Monitoring	Water Superintendent, Water Specialists
Troubleshooting	Water Superintendent, Water Specialists
Emergency Response	Public Works Director, Water Superintendent, Water Specialists
Cross Connection Control	City Engineer, Engineering Technicians
Capital Improvement Development	Public Works Director, City Engineer
New Construction	City Engineer
System Upgrade and Expansion	City Engineer, Engineering Technicians
Budget Formulation	Public Works Director,, approved by Mayor and City Council
Response to Complaints	Water Superintendent, Water Specialist
Public/Press Contact	Public Works Director

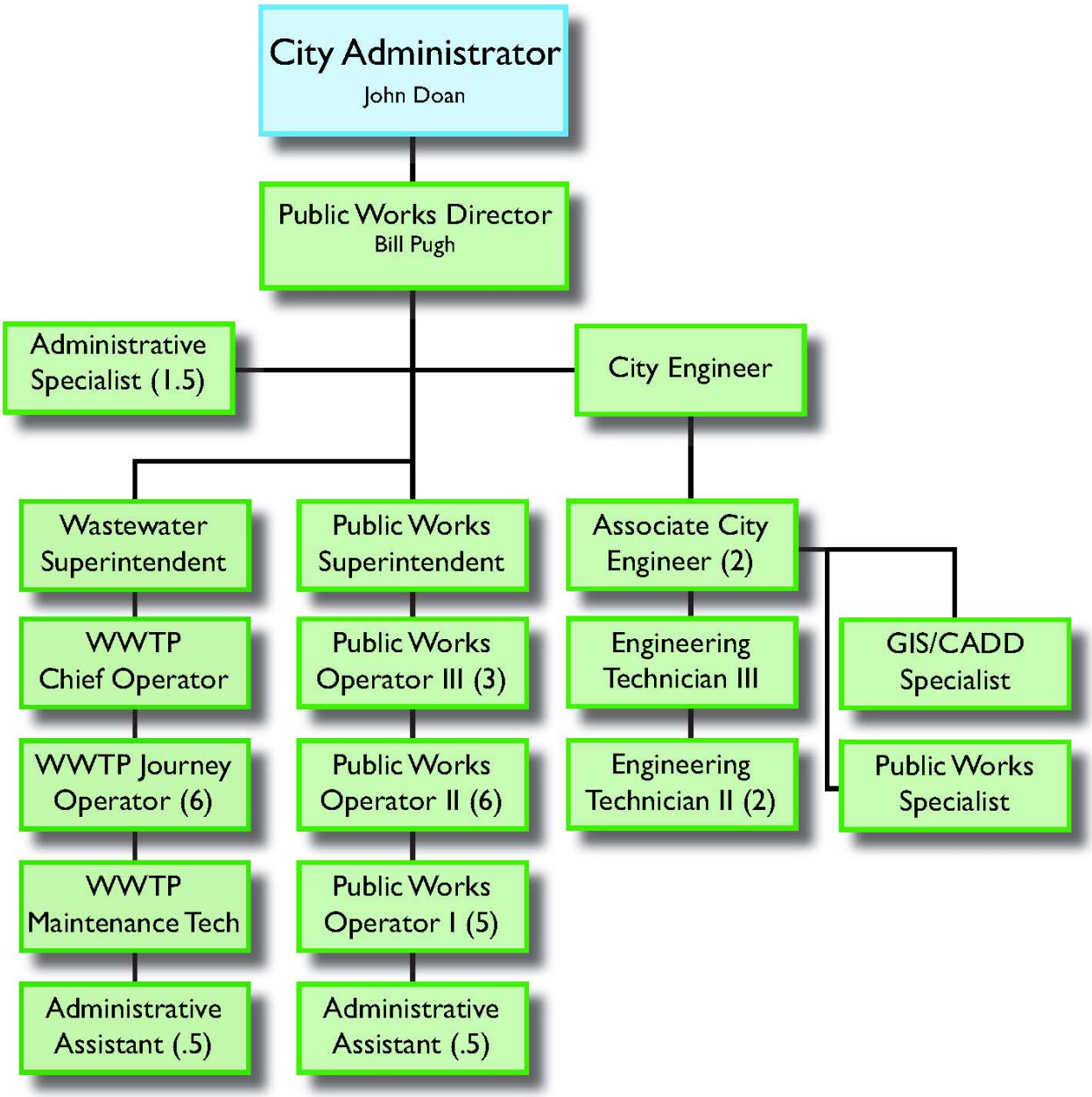


Figure 10-1. City of Sumner Organizational Chart

10.1.1 Certification

Chapters 70.119 RCW and 246-292 WAC require all community water systems to have a certified operator. In addition, specialty certification is required for treatment plant operation, backflow device testing, and asbestos cement pipe handling. Table 10-2 shows current certifications of the Public Works staff, including specialty licenses.

Table 10-2. Staff Certification List – Street/Utilities Division (2008)

Employee	WDM I	WDM II	WDM III	WDM IV	CCCS I	AC Pipe Handling	WWC I	WWC II	WWC III	ICS 100/700
Patrick Clerget				X	X	X			X	X
Tony Utanis			X		X	X			X	X
Gary Lucas		X				X		X		X
Steve Canonica		X				X		X		X
Daron Uphaus		X			X	X			X	X
Darren Young		X				X		X		X
Shaun Piper		X			X	X		X		X
Kevin Babic	X				X	X		X		X
Dave Ellingson	X					X	X			X
Lester Reedy		X				X	X			X
Casey Stumpt	X					X	X			X
Scott Pries	X					X	X			X
Joe Langford	X					X	X			X
Beau LaCrosse	X					X	X			
Monty Brant	X					X	X			
Ryan O'Flaherty	X					X	X			
Totals Per Certification:	**8**	**6**	**1**	**1**	**5**	**16**	**8**	**5**	**3**	**13**

(Table Continues)

Table 10-2. Staff Certification List – Street/Utilities Division (2008) (Continued)

Employee	CDL "A"	CONFINED SPACE	Signs and Markings Level	Traffic Signal Tech Level	Pest/Herb License	Flagging/Work Zone Safety	First Aid CPR	B.A.T.
Patrick Clerget	X	X				X	X	
Tony Utanis	X	X				X	X	X
Gary Lucas	X	X	I	II		X	X	
Steve Canonica	X	X				X	X	
Daron Uphaus	X	X				X	X	
Darren Young	X	X				X	X	
Shaun Piper	X	X				X	X	X
Kevin Babic	X	X	II			X	X	X
Dave Ellingson	X	X	I	I		X	X	
Lester Reedy	X	X	II			X	X	
Casey Stumpt	X	X				X	X	
Scott Pries	X	X			X	X	X	
Joe Langford	X	X				X	X	
Beau LaCrosse	X	X				X	X	
Monty Brant	X	X			X	X	X	
Ryan O'Flaherty	X	X			X	X	X	
Totals Per Certification:	**16**	**16**	**4**	**2**	**3**	**16**	**16**	**3**

Source: City of Sumner

WDM I	Water Distribution Manager I	WWC II	Wastewater Collection II
WDM II	Water Distribution Manager II	WWC III	Wastewater Collection III
WDM III	Water Distribution Manager III	CCCS I	Cross Connection Control Specialist I
WDM IV	Water Distribution Manager IV	BAT	Backflow Assembly Tester
WWC I	Wastewater Collection I	CDL "A"	Commercial Driver's License- Endorsement Class A
		ICS	Incident Command System

All operator certifications must be renewed annually. Evidence must be presented to the board that the operator has demonstrated continued professional growth in the field. Accumulation of three college credits or continuing education units every 3 years is considered satisfactory evidence of professional growth (WAC 246-292-090). The City of Sumner fosters professional growth and certification level advances. Staff members are hired in accordance with the City of Sumner Personnel Policies and Procedures Manual kept on file at the Public Works Department.

10.1.1.1 Water Distribution Manager Certification

Water Distribution Managers (WDMs) are responsible for the administration and operation of the water system. Table 10-3 shows the required certification level for population ranges from WAC 246-292.

Table 10-3. Water Distribution System Certification Requirements

Certification Level	Population	City Status
Group S	Less than 251	–
Group I	251 to 1,500	–
Group II	1,501–15,000	Current
Group III	15,001–50,000	2025
Group IV	Greater than 50,000	N/A

The City of Sumner currently serves a population of approximately 12,000 (including transient employment populations), which requires a Group II certification level of the lead operator. There is one Group IV WDM, one Group III WDM, and six Group II WDMs in the City Public Works Department, satisfying current certification requirements.

10.1.1.2 Water Treatment Plant Operator Certification

Water Treatment Plant Operator (WTPO) certification is based on a total point scale as follows:

Classification	Total Points Assigned	Certification Requirement
Group I	Less than 31	BTO
Group II	31 to 55	WTPO II
Group III	56 to 75	WTPO III
Group IV	Greater than 75	WTPO IV

Points are accumulated based on level of complexity in the treatment process and source water quality. Table 10-4 shows the breakdown of points for Sumner's current water system along with a hypothetical future source water quality and treatment worst-case scenario.

Table 10-4. Purification Plant Certification Level

Item	Current Level	Points Assigned	Future Level	Points Assigned
System Size				
Maximum Population Served		2		3
Peak Month Production (average day)		2		3
Water Supply Sources				
Groundwater	Groundwater	0	Groundwater	3
Average Raw Water Quality	Good	0	Fair	2
High Manganese Levels	West Well	5	West Well	5
Chemical Treatment/Addition Process				
Chlorine Disinfection	Gas/NaClO	5	Gas/NaClO	5
Filtration Process				
Pressure or Greensand Filtration	None	0	West Well	20
Residuals Disposal				
Discharge to Sanitary Sewer	None	0	West Well	3
Facility Characteristics				
SCADA to provide data and moderate process control		4		4
	TOTAL:	**18**		**48**
	CERTIFICATION LEVEL:	**Group I**		**Group II**

This analysis shows the currently required WTPO certification level is Group I. However, DOH indicates that for spring and well chlorination only, a WTPO is not needed (Cheryl Bergener, December 1992). The highest anticipated future WTPO certification level is Group II. The City does not currently have a WTPO on staff, but will likely need one if a manganese filtration plant is constructed at the West Well in the future.

10.1.1.3 Distribution System Specialists

Certification is also available on a voluntary basis to individuals interested in Water Distribution Specialist (WDS) and Cross Connection Control Specialist (CCCS). The WDS classification is recommended for any person engaged in a specialized phase of water works operation such as main repair, meter repair, pump maintenance, service installation, chlorination process operation, and watershed control. The City currently does not have a WDS, but may consider encouraging a staff member to seek certification for chlorination process operation.

The CCCS classification is required for those involved in the Cross-Connection Control Program. The City currently has five CCCSs (I's) and three Certified Backflow Assembly Testers (BATs) in the water department.

10.1.1.4 Asbestos Cement Pipe Handing

The Washington Industrial Safety and Health Act (WISHA) requires staff members exposed to asbestos cement (AC) pipe to have certification. A moderate portion of the Sumner transmission system contains AC pipe that must be handled and disposed of in an appropriate manner. Old AC pipe may be left in the trench when future improvements are made if properly backfilled. All personnel in the Public Works Maintenance Department are Certified AC Pipe Handlers.

10.1.2 Operating Permits and Fees

In 1991, the legislature passed a law that requires all Group A water systems to have an operating permit. The purpose of the law is to generate revenue to carry out state and local drinking water programs and to serve as a compliance tool. The operating permit must be renewed annually.

Operating permits are issued in four colors:

- *Green* designates substantial compliance with no conditions.
- *Blue* designates substantial compliance with conditions.
- *Red* designates nonsubstantial compliance with conditions.
- *Yellow* designates an undetermined system.

A permit may be withheld, or lower compliance ranking permit issued, for one or more of the following reasons:

- Failure to have approved construction documents.
- Work stoppage on system improvements.
- Failure to meet pressure requirements.
- Failure to meet water treatment requirements.
- Failure to have a certified operator.
- Failure to meet water quality MCLs.
- Violation of departmental order.
- Noncompliance with Water System Plan provisions.
- Failure to notify public of coliform and turbidity MCL exceedance.
- Noncompliance with coliform and inorganic chemical monitoring.
- Noncompliance with inorganic chemical and volatile organic chemical MCLs.
- Other DOH criteria described in draft WAC 246-294.

Permit fees for the City of Sumner will be $4,999.50, plus 10 cents for each service connection over 3,333.

10.2 SYSTEM OPERATION AND CONTROL

Non-emergency system operation and control is described in this section. Deficiencies in the current system and recommendations for improvements are given.

10.2.1 Reference Materials

The following reference materials supplement this operations program and are highly recommended for inclusion in the Public Works Department library.

- American Water Works Association. Denver, Colorado. 1980–2009. *Manuals of Water Supply Practices*, which include:
  - AWWA M20 1998. *Water Chlorination Principles and Practices*.
  - AWWA M14 2004. *Recommended Practice for Backflow Prevention and Cross Connection Control*.
  - AWWA M19 2001. *Emergency Planning for Water Utility Management*.

- Pacific Northwest Section, American Water Works Association. Sixth Edition December 1995. *Accepted Procedure and Practice in Cross Connection Control Manual*.
- Washington State Department of Health. WAC 246-292. *WaterWorks Operator Certification Requirements.*
- APHA - AWWA - WPCF 18th Edition. Washington, D.C., 1992. Standard Methods: For the Examination of Water and Wastewater.
- City of Sumner Public Works Department, Sumner, Washington 1991. *Standard Specifications and Details Manual*.
- Washington State Department of Health 1992. Health Effects Language for Drinking Water Public Notification.
- Washington State Department of Health 2009. Getting Started: Water Use Efficiency Guidebook.
- City of Sumner Public Works Department. Updated continuously. *Water System Maps*.
- American Public Works Association, Washington State Chapter 2008. Standard Specifications for Road, Bridge, and Municipal Construction.
- Washington State Board of Health. WAC 246-290 May 2008. *Drinking Water Regulations*.

Operations and maintenance manuals for individual system components are kept at the chlorination buildings in the telemetry cabinet. As-builts and another set of operation and maintenance manuals are kept at the City Shops.

10.2.2 System Overview

Chapter 4 of this Water System Plan discusses and shows all existing water system components, including spring collection works, wells, storage tanks, chlorination facilities, transmission facilities, hydrants, watersheds, and interties. The distribution system is shown in greater detail on the Water System Maps created by the Public Works Department. These maps are updated continuously by the City's GIS/CAD Analyst to illustrate the as-built water system including hydrants, pipe sizes, pipe material, and isolation valves.

The City of Sumner water system is supplied by four springs and three wells. The primary sources of water are Sumner and County Springs. Spring flow is chlorinated prior to entering storage/detention.

South Well, Dieringer Well, and West Well are typically used only when maintenance and repairs interfere with normal supply from the springs and when demands peak. Currently, there are five storage tanks maintained in the Sumner water system. Four of the five tanks are at the same hydraulic grade. Sumner Springs and County Springs Tanks are gravity fed by their respective springs. County Springs Tank is used primarily for chlorine contact (0.068 mg). Sumner Springs' tank is used for chlorine contact and storage (1 mg). The North and South Tanks are floating reservoirs used for storage (2 mg each). The North Tank provides fire flow for the north end of the city. The fifth tank, at the Sumner Viewpoint development, is supplied by a booster pump station at the South Tank and has a capacity of 330,000 gallons. This tank operates at a higher hydraulic grade line than the other tanks and serves only the Sumner Viewpoint development.

10.2.3 Spring Collection Works

10.2.3.1 Routine Operations

Spring taps, collection boxes, plumbing, metering vaults, surface water diversion structures, and other spring collection works are shown in Chapter 4. Sumner and County Springs are gravity fed into metering vaults. From the metering vaults, the water is either diverted to a storage/detention tank or allowed to overflow to Salmon Creek.

10.2.3.2 Alternate Operating Modes

Peak Use – During peak water use, all water is transferred from the metering vaults to the tanks with no diversion to Salmon Creek.

Source Bypass – Individual spring taps, or the entire Sumner and County Springs collection works as a whole, can be bypassed from the system by closing isolation valves and directly spilling to Salmon Creek. Elhi Springs may also be bypassed. Isolation valves are shown on Figures 4-1 through 4-9.

10.2.3.3 Preventive Maintenance

Item	Frequency
Check Spring Flow	Daily
Check Meter Readings	Daily
Change Strip Charts, Pens	Daily as needed
Inspect Metering Vaults	Weekly
Inspect Spring Taps, Collection Boxes, and Plumbing; Check for Siltation, Surface Water Drainage, Evidence of Vandalism, Leaks, and Surface Films (requires walking along access road)	Biweekly
Exercise Spring Tap Isolation Valves	Biannually
Calibrate Flow Meters	Biannually
Clean Spring Tap Boxes and Repair as Needed	Annually

10.2.3.4 Evaluation

Any deficiencies in the system should be corrected immediately. Reduced maintenance can cause water quality impairment. Problems should be noted on damage report forms. Valve exercising and maintenance should be recorded on valve report forms or a maintenance schedule database.

10.2.4 Chlorinators

10.2.4.1 Routine Operations

There are six chlorination facilities in the system, one each at Sumner Springs, County Springs, Elhi Springs, South Well, Dieringer Well, and West Well. A majority of the source chlorination facilities are equipped with dual dosing pumps for redundancy. Where chlorine gas is used for disinfection (Sumner Springs, County Springs, and South Well), chlorination buildings are separated into two rooms. Chlorine cylinders are housed separately from chlorinators and pumps.

Structural and mechanical relationships between the Sumner and County Springs chlorination facilities and spring collection works are shown on Figures 4-1 to 4-9.

Chlorine dose at County and Sumner Springs is based on flow rate telemetry information from the metering vaults. The chlorine gas is metered in proportion to water flow, injected into solution, and fed to the transmission lines feeding the tanks. Liquid sodium hypochlorite at West Well, and Dieringer Well is injected directly into the well discharge lines in proportion to flow.

Chlorine residuals are tested daily and used as a basis for any chlorine dosage adjustment. For all sources excluding Elhi Springs and South well, chlorine residual is typically kept in a range of 0.3 mg/ℓ to 0.45 mg/ℓ. The on-line chlorinator is rotated annually at each facility. Free chlorine residual concentration required at or before the first customer for each source is listed in Chapter 4, Table 4-4.

Equipment Failure

Since each facility contains a second chlorination system, standby equipment is ready to use in case of on-line system equipment failure.

10.2.4.2 Preventive Maintenance

Item	Frequency
Check Cylinder/Drum Depletion, Rotate as Needed	Daily
Inspect Chlorine Leak Detector	Daily
Check Injector Pump Pressure	Daily
Check mg/ℓ Dosage versus mg/ℓ Residual	Daily
Calibrate Chlorine Scales	Quarterly
Calibrate Residual Analyzers	Quarterly
Check Ultrasonic Flow Meters and Calibrate	Quarterly
Check Telemetry Instrumentation and Lubricate	Quarterly
Check or Test Fire Extinguisher, Shower, Leak Detector and Ventilation Fan	Quarterly
Change Electrolyte	As Needed
Rotate Chlorinators/Drums	Annually
Rebuild Chlorinators, Injectors, Injector Pumps, Alarm Panel, and Other Equipment	Annually or as needed

10.2.4.3 Evaluation

System performance is checked by comparing residual settings to the residuals maintained as determined by field monitoring.

Any safety deficiencies should be corrected immediately. Inside each chlorination building's control room doors are respirators, eye protection, and other personnel protection equipment to be used in case of a chlorine leak. If the alarm goes off, the chlorination building should not be entered until the room is well ventilated. Operators should be trained to handle a chlorine leak emergency. Contingency plans are discussed in the Emergency Response Plan.

10.2.5 Storage Tanks

10.2.5.1 Routine Operations

There are currently five storage tanks in the Sumner water system with a total storage capacity of 5.40 mg. Sumner and County Springs Tank dimensions and elevations are shown on Figures 4-1 and 4-9.

Sumner Springs Tank (1 mg) is gravity fed by the Sumner Springs metering vault. County Springs Tank is gravity fed by the County Springs metering vault. The primary purpose of the County Springs Tank (68,000 gallons) is to provide chlorine contact. Disinfection performance for both Sumner and County Springs Tanks is discussed in Chapter 6, "Water Quality." During average day demands, Sumner and County Springs tanks are full to their overflow elevations (234 feet).

Normal operations of the South Tank (2 mg) and the North Tank (2 mg) are similar. Both are floating tanks with water levels riding up and down depending on system supply and demand.

The Sumner Viewpoint Tank (0.33 mg) is supplied by a booster pump station at the South Well. It operates at a higher hydraulic grade line than the rest of Sumner's water system. Disinfection at this tank can be accomplished via a chlorination facility built into the pump house.

10.2.5.2 Alternate Operating Modes

Peak Use

During peak water use, one-third of the storage at South Tank is allowed to deplete before the South Well pump is automatically turned on. During recent drought conditions, the County Springs Tank was observed to lower more quickly than the Sumner Springs Tank. This may be in part due to the larger, shorter transmission pipe (18-inch-diameter) from the County Springs tank versus the smaller, longer transmission pipe from Sumner Springs Tank (14-inch-diameter). This condition should be recognized in calculating chlorine contact times.

Tank Cleaning

During periods of low demands, tanks may be drained and cleaned, provided chlorinated water is dechlorinated prior to entering Salmon Creek.

10.2.5.3 Preventive Maintenance

Item	Frequency
Check Water Level	Hourly
Check Overflow Pipe	Weekly
Check for Leaks	Weekly
Check for Surface Films	Weekly
Check Locks and Fence (South Tank)	Weekly
Check for Vandalism	Weekly
Check Accuracy of Level Gauges	Quarterly
Check Ladders	Quarterly
Check Access Hatches	Quarterly
Check Condition of Exterior and Interior Paint (look for deposits on walls and bottom)	Annually
Check Foundation and Structural Conditions	Annually
Operate all Valves	Annually
Clean Tank	Annually

10.2.5.4 Evaluation

Changes in water quality found to be attributed to the tank should be addressed immediately. Wall and floor deposits, structural corrosion, and painting should be addressed during the annual tank cleaning and inspection.

10.2.6 Wells

10.2.6.1 Routine Operations

The City of Sumner operates South Well, Dieringer Well, and West Well. Typically, these wells are turned on only when system demand exceeds the production of the springs and storage tanks are drawn down by one-third. The South Well is turned on by telemetry when tank level drops below predefined elevation. The Dieringer Well is operated based on the level of the North Tank. When the tanks are full or demand has decreased below spring production, the wells are shut off. The West Well is a seasonal source and is operated manually during times of extremely high demand.

Well production is recorded by totalizers. The totalizer reading is relayed via telemetry to the City Shops.

The City is currently trying to increase the system source capacity. They are seeking new and/or better groundwater sources from within the city limits. If any new source(s) are approved, the sources will likely operate similarly to the three existing wells.

10.2.6.2 Alternate Operating Modes

Spring Repairs/Shutdown

The South Well and Dieringer Well are automatically controlled to maintain water level(s) in the South Tank and North Tank, respectively. The West Well is not normally turned on unless the emergency is extreme.

10.2.6.3 Preventive Maintenance

Item	Frequency
Check Pump Equipment and Operation	Daily (when in use)
Check for Unusual Vibration, Noise, Temperature	Daily (when in use)
Record Meter Reading	Daily, Start–Up, and Shut-Down (when in use)
Record Hours of Pump Operation	From Start-Up to Shut-Down
Record Suction and Discharge Pressure	Weekly
Inspect Gate, Locks, Doors	Weekly
Monitor Activities in Minimum Sanitary Radius (fill out Inspection Report)	Weekly
Check Activities in Wellhead Protection Zone (fill out Inspection Report)	Monthly
Record Well Water Level	Monthly
Grease Motor Bearings	Monthly
Check Oil Level in Motors	Monthly
Calibrate Flow Meter	Quarterly
Check Amperage Draw and Brake Horsepower	Annually
Conduct Pump Drawdown Test (Pump until drawdown stabilizes, then record time to static water level recovery. Record water level at intervals during test.)	Annually

10.2.6.4 Evaluation

All manufacturer-recommended performance criteria should be met, including discharge head, amperage draw, temperature, and motor rpm. Well static and residual water levels should be tracked to determine any changes in aquifer replenishment. Unwarranted activities in the wellhead protection zone should be prohibited.

Any vandalism or equipment malfunction should be repaired as soon as possible, since it is unknown when the well may need to be put in operation. Well evaluation forms should be completed for each inspection, or inspection findings should be catalogued in a well maintenance database.

In case of power failure, all wells should have the ability to run off a portable generator. When well sources are used more often due to increasing demands, a telemetry link should be installed with necessary equipment to read chlorine residual, flow rate, and hours of operation.

10.2.7 Distribution Network

10.2.7.1 Routine Operations

The distribution network consists of approximately 934 pipe runs ranging in size from 2 to 18 inches. Pipes vary in age and material. The system network is shown on Figure 4-2. The City Shops are prepared to fix leaks as they occur and remove and repair short lengths of pipe. Dead-end mains are flushed regularly.

10.2.7.2 Alternate Operating Modes

System Repairs

Isolation valves are shut to repair portions of the system.

10.2.7.3 Preventive Maintenance

Item	Frequency
Flush Dead-End Mains	Rotating Annual Schedule
Check Corrosion of Representative Pipes in the System (based on age and material)	Rotating Annual Schedule
Optimize Corrosion Control	As Needed
Conduct Leak Detection Tests	Annually

10.2.7.4 Evaluation

Results of leak detection tests should be used to assess the integrity of the system and any needed repairs. An accelerated rate of corrosion in pipes can be indicative of corrosive water. Dead-end mains should be flushed on a rotating schedule throughout the year. More isolation valves and looping are needed so disruption of service will be minimized when repairs are made.

10.2.8 Valves

10.2.8.1 Routine Operations

The system contains hundreds of isolation valves and three air release valves. All valves are assigned a number on the City's water system maps, which are kept on file at the City Shops and Public Works Department. Valve exercising is done on an annual basis and missing, buried, inoperable, or leaking valves are located and repaired or replaced by the City Shops. No maintenance on air-release valves takes place unless there is a problem.

10.2.8.2 Alternate Operating Modes

System Repairs

Isolation valves are shut when repairs are required on portions of the system.

10.2.8.3 Preventive Maintenance

Item	Frequency
Visually Inspect Each Valve Box	Rotating Annual Schedule
Clean Valve Box	Rotating Annual Schedule
Raise Valve Box to Grade as Needed	Rotating Annual Schedule
Replace Valve Box Lid as Needed	Rotating Annual Schedule
Operate Valve to Fully Closed and Back to Fully Open	Rotating Annual Schedule
Record Number of Turns to Fully Operate Valve	Rotating Annual Schedule
Record Depth to Valve Nut	Rotating Annual Schedule

10.2.8.4 Evaluation

The purpose of the inspection is to assure all valves can be operated in an emergency. This includes knowing the location of each valve, depth to nut, and number of turns necessary to fully engage the valve. Valve locations should be identified on the City GIS base maps. The GIS database should include information such as installation date, maintenance schedule, etc.

10.2.9 Meters

10.2.9.1 Routine Operations

There are two system meters located at the following locations:

- Upgradient of the Sumner Springs Tank.
- Upgradient of the County Springs Tank.

There are six master meters at the following locations:

- Bottom of hill beneath Sumner Springs Tank.
- Bottom of hill beneath County Springs Tank.
- Within Elhi Springs Control Building after the chlorine contact tanks.
- South Well.
- Dieringer Well.
- West Well.

Routine operations consist of daily system and master meter readings. Individual service meters are read every 2 months.

10.2.9.2 Alternate Operating Modes

Meters may fall out of calibration. Care should be taken to calibrate and read all meters correctly.

10.2.9.3 Preventive Maintenance

Item	Frequency
Calibrate System and Master Meters	Semiannually
Audit a Representative Sample of Service Meters	Rotating Annual Schedule

10.2.9.4 Evaluation

Meter function and accuracy is important for tracking system supply and demand. Installation and repair cards should be kept on file for all meters, or a database pertaining to meter repair should be maintained at the City Shops.

10.2.10 Hydrants

10.2.10.1 Routine Operations

Hydrants are checked for proper operation by the Fire Department, and problems are reported to the Public Works Department. Flow tests are conducted periodically by the Fire Department and kept on file at the Public Works Department. All hydrants are assigned a number on the City's water system maps, which are kept on file at the City Shops and Public Works Department.

10.2.10.2 Alternate Operating Modes

Fire

A separate hydrant should be opened for each 2,000 gpm required. In several locations, the hydrant spacing is too great for this allowance.

10.2.10.3 Routine Maintenance

Item	Frequency
Complete Hydrant Flow Test	Rotating Biannual Schedule
Lubricate Hydrant Ports	Biannually
Operate Hydrant Valve and Tee Valve	Biannually
Clear Vegetation Around Hydrants	As Needed
Paint Hydrants (color coding based on available flow)	Rotating 2-Year Schedule
Hydrant Replacement Program	Annually

10.2.10.4 Evaluation

Hydrants should be accessed easily and opened quickly to respond to fires. Hydrant maintenance records and flow test results should be compiled on a maintenance database maintained at the City Shops.

10.2.11 Watershed

10.2.11.1 Routine Operations

Northern and southern watersheds encompassing Sumner, County, and Elhi Springs are described in Chapter 5, "Water Resources." Routine operations involve inspecting gates and fences for signs of illegal entry or vandalism. However, not all activities in the watershed can be monitored since fencing is only complete along Sumner-Tapps Highway (Sumner and County Springs) and SR 410 (Elhi Springs) and fenced access points. Staff members routinely walk along the vehicle and foot trails paralleling the springs in the northern watershed. Vegetation is cleared periodically around spring collection works.

10.2.11.2 Alternate Operation Modes

Increased Surveillance

When evidence of vandalism or other unlawful entry to the watershed is observed, it may be necessary for the Police Department to patrol the area more frequently. Signs can be posted notifying trespassers of consequences.

10.2.11.3 Preventive Maintenance

Item	Frequency
Check All Fences, Gates, and Locks	Weekly
Examine Slope Stability Above Collection Works	Biweekly (more often during heavy rains)
Check Surface Water Drainage	During and After Large Storms
Channelize Surface Water Away from Spring Taps	As Needed
Look for Frequently Used Paths of Entry (human and animal); Post Warning Notices	Annually
Top Trees in Danger of Falling on Collection Works	Annually
Monitor Activities in Tributary Drainage Areas	Continuous

10.2.11.4 Evaluation

Potential sources of surface and groundwater contamination should be eliminated from the watershed and tributary drainage areas. Long-term slope movement should be recorded to aid in predicting slope failures. Watershed inspection report forms should be completed for the items identified above. Any changes to the watershed and other observations should be kept in a database on file at the Public Works Department.

10.2.12 Equipment, Supplies, and Chemical Inventory

The City Public Works Department stocks and maintains (in the City Shops) all equipment, supplies, and replacement parts necessary for continued operation of the water system. Most commonly used parts are kept on stock at the City Shops. Basic maintenance supplies including recording paper, pens, gaskets, pressure/vacuum regulator kits, and tubing for the chlorinators are kept in the chlorination buildings. Vehicles available for water system use include a backhoe, utility truck, and pickup trucks. Personnel protection equipment (including respirators and clothing) is kept at the City Shops and in the chlorination buildings.

The City uses 150-pound chlorine gas cylinders at the rate of 9 to 12 per year depending on system demand. There are five chlorine cylinders each at Sumner and County Springs, one cylinder at South Well, and two drums of 12.5 percent liquid sodium hypochlorite each at the Dieringer Well and West Well. Two chlorine cylinders are on-line at any time at the springs, and three are held in reserve (chained to the wall). Chlorinator kits are not kept in stock, because the standby chlorinator at each station is operational and ready to use should the on-line chlorinator fail.

Table 10-5 lists the names and addresses of all regular suppliers and manufacturers of equipment supplies and chemicals used for water system operation and maintenance. Specific suppliers for individual components can be found in the equipment operations and maintenance manuals on file at the City Shops and chlorination facilities.

Table 10-5. Frequently Contacted Manufacturers and Suppliers

Item	Manufacturer and/or Supplier	
Chlorine Gas	Jones Chemicals, Inc. 1919 Marine View Drive Tacoma, WA 98422 (253) 274-0104	
Water Distribution Parts	H. D. Fowler, Inc. 1417 Thornton Ave SW Pacific, WA 98047 (253) 863-8600	U.S. Filter 602 Valley Avenue NE Puyallup, WA 98372 (253) 840-8558
Chlorination Repair Kits and Supplies	TMG Services 3216 E. Portland Avenue Tacoma, WA 98404 (800) 562-2310	
Recorder Charts, Pens, and Parts	Johnson Yokogawa 4 Dart Road Shenandoah Industrial Park Newnan, GA Local Representative: Brett-Ross, Inc. (425) 576-9123	
Miscellaneous Parts and Supplies	Grainger 2808 Pacific Hwy. E Fife, WA 98242 (253) 922-2268	McLendon Hardware, Inc. 1111 Fryar Avenue Sumner, WA 98390 (253) 863-2264
Calibration of Sparling Meters and Miscellaneous Telemetry Equipment	S & B, Inc. 13200 A SE 30th Street Bellevue, WA 98005 (425) 644-1700	

10.2.13 Record Keeping

Table 10-6 lists records compiled and maintained by the City Public Works Department. These records should be supplemented with new information suggested in this operations program.

Table 10-6. Routine Operations and Maintenance Records on File

Item	Frequency of Data Collection
Sources	
Total Flow – County Springs	Continuous (Telemetry)
System Flow – County Springs	Continuous (Telemetry)
Bypass Flow – County Springs	Continuous (Telemetry)
Total Flow – Sumner Springs	Continuous (Telemetry)
System Flow – Sumner Springs	Continuous (Telemetry)
Bypass Flow – Sumner Springs	Continuous (Telemetry)
Master Meter – County Springs	Continuous (Telemetry)
Master Meter – Sumner Springs	Continuous (Telemetry)
Master Meter – South Well	Continuous (Telemetry)
Master Meter – Dieringer Well	Continuous (Telemetry)
Master Meter – West Well	Daily (when is use) (Manually)
Master Meter – Elhi Springs	Continuous (Telemetry)
Chlorine Usage (All Sources When In Operation)	
Chlorine Dosage (lb/day)	Daily
Chlorine Dosage (mg/ℓ)	Daily
Chlorine Residual (mg/ℓ)	Continuous (Telemetry)
Cylinder/Drum Weight	Daily
Injector Pump Pressure	Daily
Water Quality	
Coliform Monitoring Reports	10 Samples/Month
Lead and Copper	Every 36 Months
Primary and Secondary Inorganic Chemicals included with: • Groundwater Turbidity • Physical Characteristics (color, TDS, etc.)	Every 36 Months [a]
Pesticides	Every 36 Months or waiver
Volatile Organic Chemicals	Every 36 Months
Chlorine Residual	8 Samples/Month (with Coliform Sampling)
Disinfection By-Products	Every 36 Months
Hydrants	
Hydrant Flow Pressure Tests (on file with Fire Department)	Approximately Biannually or As Needed

In addition to the above records, inspection and repair reports for all system components are on file. It is recommended that the City standardize inspection and maintenance frequencies and all forms to create a uniform, low-maintenance database for the utility.

10.3 WATER QUALITY

Federal and state regulations specify minimum water quality monitoring requirements for community water systems. The Washington State Department of Health has the responsibility for enforcing these regulations. The City of Sumner is responsible for collecting water samples, submitting samples to laboratories, and notifying the public of any water quality violations.

Water quality samples are collected by the utility foreman per DOH instructions and submitted to one of the following laboratories:

Tacoma-Pierce County Health Department 3629 South D Street Tacoma, WA 98418 (253) 798-6470	Water Management Laboratory 1515 80th East Tacoma, WA 98404 (253) 531-3121

Water Management Laboratory currently performs all lab work for the City. Water quality reports are kept on file at both the City Hall and City Shops.

Monitoring requirements, maximum allowable contaminant levels, and required actions for MCL exceedance are presented in this chapter. Interpretation of water quality analysis results, recommendations for improvement, and existing and upcoming regulations are discussed in Chapter 6, "Water Quality."

10.3.1 Primary and Secondary Contaminants, Toxicants

Drinking water contaminants have been divided into several classifications. Primary contaminants are those that directly affect public health. Secondary contaminants affect aesthetic features of the water such as taste, color, and odor. Pesticides, polychlorinated biphenyls (PCBs), disinfection by-products, and volatile organic and other synthetic compounds are classified as primary contaminants.

10.3.2 Bacteria

The process of determining an acute versus a nonacute Bacteriological MCL violation is as follows:

- If coliforms are detected in a routine sample, the sample must first be analyzed for fecal coliforms or *E. coli* and three repeat samples collected. The first repeat sample is collected at the site of the sample with coliform presence. The second repeat sample is collected within five active service connections upstream of the sample with coliform presence. The third repeat sample is collected within five active service connections downstream of the site with coliform presence.
- Acute MCL violation of the coliform rule occurs when:
  - Fecal coliform presence is detected in a repeat sample.
  - *E. coli* presence is detected in a repeat sample.
  - Coliform presence is detected in a set of repeat samples collected as a follow-up to a sample with fecal coliform or E. coli presence.
- Nonacute MCL violation of the coliform rule occurs when:
  - Systems taking less than 40 samples during the month have more than one sample with coliform presence. (Sumner currently takes eight samples per month.)
  - Systems taking 40 or more routine samples per month have more than 5 percent with coliform presence.
- Samples included for determining acute and nonacute compliance include routine samples and repeat samples. Samples not included in determining acute and nonacute compliance include special purpose samples and invalid samples. Circumstances invalidating a sample include the following:

- Using a membrane filter analytic technique, there are confluent growth patterns or growth TNTC of colonies without a surface sheen.
- There is excess debris in the sample.
- The analyzing laboratory establishes that improper sample analysis occurred.
- The department determines a domestic or nondistribution system problem is indicated by repeat samples collected at the same location that also have coliform presence, and all other samples in the set of repeat samples are free of coliform.
- The department determines a coliform presence is due to a circumstance or condition that does not reflect water quality in the distribution system.

10.3.3 Routine Procedures and Follow-Up Actions

Water quality sample collection points, monitoring frequencies, follow-up actions, reporting, and record keeping are summarized in Table 10-7. Source samples should be taken before chlorination or other treatment. Well samples should be taken after the pump discharge has reached a steady state.

Follow-up actions, including department notification, public notification, and correction procedures, are outlined in further detail in WAC 246-290. Public notification requirements are discussed below.

10.3.4 Public Notification

Public notification is mandated by the SDWA and WAC 246-290 whenever human health is at risk due to an MCL exceedance or failure to follow monitoring and testing procedures established by the state DOH. Public notification procedure is begun if one of the following six conditions occur:

- Failure to comply with a primary MCL.
- Failure to comply with a prescribed treatment technique.
- Failure to perform water quality monitoring as required by WAC 246-290.
- Failure to comply with testing procedures.
- Issuance of a variance or exemption from WAC 246-290.
- Failure to meet a variance or exemption schedule.

Because some violations are more serious than others, three tiers of public notification should be established. The EPA Revised Public Notification Handbook (EPA Publication 816-R-07-003, March 2007) should be used for reference when creating public notices. The Revised Public Notification Handbook is included in Appendix Q of this document for reference.

Table 10-7. Water Quality Monitoring Routine Procedure and Follow-Up Actions

Contaminant	Collection Point	Monitoring Frequency	MCL Exceedance Follow-Up Actions	Report to DOH [a]	Record Keeping [b]
Bacteriological (coliform, fecal coliform, enterococci coliform)	From representative points throughout collection system	10 sampling points once a month.	• See Section 10.3.2.	• Coliform in Sample: 10 days. • Fecal Coliform or E. coli in Sample: End of business day. • Acute MCL: 24 hours. • Nonacute MCL: End of next business day • Monitoring Violation: 10 days	5 years
Primary Inorganic Chemicals and Groundwater Turbidity	At sources after chlorination and before entry into distribution system (springs-metering vault)	One complete scan every 36 months .[a]	• Collect three additional samples from the same source within 30 days. If the average of the four samples exceeds MCL, violation is confirmed. • From nitrate, immediately take one additional sample from the same source, if the average of the two samples exceeds MCL, violation is confirmed.	• Violation of MCL: 48 hours • Failure to Comply with Primary Standards: 48 hours • Monitoring Failure: 48 hours	As long as system is in operation.
Secondary Inorganic Chemicals and Physical Characteristics	At source after chlorination and before entry into distribution system (springs-metering vault)	One complete scan every 36 months. [a] Sulfate and TDS monitoring required only if specific conductivity exceeds: $\frac{700\ \mu mhos}{cm}$	• Collect three additional samples from the same source within 30 days. If the average of the four samples exceeds MCL, violation is confirmed.	• Violation of MCL: 48 hours • Monitoring Failure: 48 hours	As long as system is in operation.

(Table Continues)

Table 10-7. Water Quality Monitoring Routine Procedure and Follow-Up Actions (Continued)

Contaminant	Collection Point	Monitoring Frequency	MCL Exceedance Follow-Up Actions	Report to DOH [a]	Record Keeping [b]
Disinfection By-Products	Point in system representing maximum residence time for source	Every 36 months.	• Notify public and DOH. • Coordinate with DOH to develop compliance plan.	• Violation of MCL: 48 hours	As long as system is in operation.
Chlorine Residual	Same time and location as coliform monitoring	Monthly.	• Notify public and DOH. • Coordinate with DOH to develop compliance plan if required.	• Violation of MCL: 48 hours	As long as system is in operation.
Chlorine Residual	Source	Continuous.	• None	• None	As long as system is in operation.
Pesticides	At source before treatment (spring-metering vault)	Every 36 months (collect when pesticide contamination is most likely to occur), or waiver.	• Although monitoring is not a requirement for groundwater sources, it is suggested to help determine groundwater under the influence of surface water (GWI). • Take action as specified by DOH.	• Violation of MCL: 48 hours	As long as system is in operation.
Radionuclides	At source (spring-metering vault)	Once every 36 months.	• If results are <1/2 MCL, take a single sample once every 48 months. • Take action as specified by DOH.	• Violation of MCL: 48 hours	As long as system is in operation.

(Table Continues)

Table 10-7. Water Quality Monitoring Routine Procedure and Follow-Up Actions (Continued)

Contaminant	Collection Point	Monitoring Frequency	MCL Exceedance Follow-Up Actions	Report to DOH [a]	Record Keeping [b]
Lead and Copper	Initially, at 40 high-risk sites with lead and copper solder or pipes. 20 Sites	Discontinued if optimum corrosion control is met. Action Levels met 3 consecutive years Monitoring reduced to once every 3-year period.	• Monitor for corrosion control parameters (pH, alkalinity, calcium, conductivity, and temperature). • Water treatment for optimum corrosion control if violation continues.	• Action Level Exceedance: 7 days	As long as system is in operation.
Volatile Organic Chemicals	At source, after treatment and before entry points to distribution system (master meters).	Once every 36 months	• No VOCs have been detected in initial screening of springs. South well should have a comprehensive scan for List 1 and List 2 VOCs. • Can composite up to five sources to reduce laboratory costs, restrictions apply – see WAC 246-290–300(d). • Provide one-time notification to water users of availability of initial screening results (within 3 months). • List 1 VOC > Detection Limit: Sample source once every 3 months for at least 3 years, and make lab results available to consumers within 3 months.	• Initial Screening VOC. Samples: 90 days after DOH contact. • List 1 VOC > MCL: 7 days. • Running Total List 1 VOCs > MCL; 7 days. • List 2 or 3 VOC > Detection Limit: 7 days. • List 2 or 3 VOC > SAL: 7 days.	As long as system is in operation.

(Table Continues)

Table 10-7. Water Quality Monitoring Routine Procedure and Follow-Up Actions (Continued)

Contaminant	Collection Point	Monitoring Frequency	MCL Exceedance Follow-Up Actions	Report to DOH [a]	Record Keeping [b]
Volatile Organic Chemicals (Continued)			• List 1 VOC > MCL: Submit strategy for gathering additional data and informing public. Sample as above. • Running Total List 1 VOC > MCL: Submit action plan according to WAC 246-290-320. Sample as above. Implement action plan. • List 2 or List 3 VOC > Detection Limit: Sample as above. • List 2 or List VOC > State Advisory Level (SAL): Sample as above. Submit strategy for gathering additional data and informing public (within 6 months).		

[a] All test measurements and analytic reports are to be given to DOH within the 10th day of the following month unless specified otherwise.

[b] Other measurements should be kept at least 5 years, including $C\ell_2$ residual, quantity of chemicals used, and flow records. Records of action taken by system to correct violation of primary regulations and public notifications should be kept 3 years.

10.3.4.1 Content of Notices

Public Notices should be written in a clear, concise manner, emphasizing the following basic information:

- Who? (City of Sumner Water Utility: 253-863-8300)
- What? (Simple explanation of violation including discussion of potential adverse health effects and any segment of the population that may be at higher risk.)
- When? (The time of the violation or date when a variance and/or exemption was granted.)
- Consumer Actions. (List of steps the consumer should take, including advice on seeking an alternative water supply if necessary.)
- Purveyor Actions. (List of steps the purveyor has taken or is planning to take to remedy the situation.)
- Authority Involved. (EPA, DOH or Ecology, and Applicable Administrative Code)

Mandatory health effects information and language will also be required when a violation involves:

- A primary VOC MCL.
- An acute coliform MCL.
- A nonacute MCL.
- Granting or continuation of exemption or variance.
- Failure to comply with a variance or exemption schedule.

Specific language is contained in the DOH guideline titled "Health Effects Language for Drinking Water Public Notification." The District Engineer should be contacted prior to issuing notices. A copy of the completed notices should be sent to DOH.

10.3.4.2 Volatile Organic Compounds Notification

All those served by the water system, including wholesale buyers, should be notified of the availability of new VOC results. This notification is only required once. Notification should be provided in the first set of water bills or by direct mail after the receipt of results.

If a List 1 VOC (see WAC 246-290) is confirmed at a concentration greater than the MCL, or the department confirms that a List 2 or List 3 VOC is at a level greater than a State Advisory Level (SAL), then the consumer should be notified of the following:

- Name and level of VOC detected.
- Location where VOC was detected.
- Any health effects that the VOC could cause at its present concentration.
- Plans for follow-up activities.
- Phone number to call for further information.

10.4 EMERGENCY RESPONSE PROGRAM

All water systems experience emergencies. Pipes break, hydrants rupture, and short-term power outages occur. These emergencies are anticipated by the utility and are handled by the Public Works staff without significant difficulty.

Less frequently, water utilities must deal with natural and man-made disasters of greater proportions. These include earthquakes, watershed fires, hazardous materials spills, vandalism, extended sub-zero weather, extended droughts, flooding, major power outages, and windstorms. Less extensive emergencies include chlorine leaks, injury of water system staff, and large mechanical failures. The City of Sumner Water Utility should be prepared for these types of disasters and be able to circumvent serious public health consequences and wide-scale disruption in water service and fire fighting capabilities.

This chapter presents an emergency response plan to direct action for a variety of potential disasters. A contingency plan for each emergency situation is presented following a discussion of general emergency preparedness. Common to many contingency plans is the Water Shortage Response Plan, which is a step-by-step approach for rationing water during emergency periods. Finally, at the end of the chapter, a Comprehensive Emergency Call-Up List is presented. This list should be readily available to all water system operations personnel, local police, and fire departments.

10.4.1 General Emergency Preparedness

To establish an effective emergency response program, all Public Works, Police, and Fire Department staff must be trained and assigned specific duties. Assignments of duties in each type of emergency situation should be specific, but not so rigid that another member on the staff could not also perform the function. All staff should be made aware of each other's assignments in case:

- An operator is absent or injured and unable to attend to his/her duties.
- A disaster does not fall into the prepared-for category.
- More than one staff member is needed for a response for which only one was anticipated.

General emergency preparedness should be common to all personnel. General emergency preparedness is the greatest single emergency response action that can be taken, even though it occurs well before the emergency situation presents itself.

The following subsections list activities and measures that should be undertaken as part of emergency preparedness. These include staff training and preparation, assuring repair material availability, routine inspections, and hardening of facilities.

10.4.1.1 Personnel Training and Preparation

- Provide all personnel involved in the emergency response program with a copy of the Water System Staff and Emergency Call-Up Lists.
- Train all personnel for hazardous spill response and fundamentals in emergency water treatment. Water quality is the foremost concern in any emergency situation. Emergency water treatment includes substance detection, manual chlorine addition, and filtration.
- Conduct annual mock emergencies to find flaws in the current Emergency Response Plan.

- Provide pagers and/or radios to all foremen at all times.
- Assign general emergency response duties to all personnel. All personnel should know who is responsible for each of the following:
  - Alerting personnel and assigning specific duties.
  - Assessing overall water system damage.
  - Coordinating and or directing Police and Fire Departments.
  - Testing the communication system.
  - Informing public of health dangers or water shortages.
  - Placing and starting auxiliary power supplies.
  - Recruiting volunteers.
  - Acquiring additional emergency repair equipment.
  - Isolating damaged facilities from the system.
  - Coordinating logistics and obtaining supplies from City Shops and local suppliers/merchants.
  - Monitoring water quality.
  - Applying treatment chemicals to water supply.
  - Turning on pumps.
  - Opening interties.
  - Monitoring water tank levels.

10.4.1.2 Material Availability

- Keep extra fuel at City Shops for chainsaws, electric generators, and vehicles.
- Keep keys, bolt cutters, saws, axes, crowbars, water main shutoff wrenches, and other water system access parts in all maintenance vehicles.
- Assure repair materials are available from local suppliers and merchants on short notice (see Emergency Call-Up List).
- Arrange with local suppliers for access to stored chemicals, tools, repair parts, etc., which may be required immediately after the emergency.
- Determine the need to relocate materials to outlying sites. As a suggestion:
  - Keep personnel protection equipment and operations and maintenance manuals at facilities where they will most likely be needed.
  - Keep all electrical parts needed to quickly set up an electric generator at all electric-powered facilities.
  - Keep granular activated carbon, lime, and extra chlorine at all treatment facilities for emergency treatment.
  - Keep spare flashlights and radios at key locations for easy access.
  - Keep fire extinguishers in all buildings.

10.4.1.3 Routine Inspection

- Check automobiles, auxiliary electric power, and pumping units in periods of nonuse.
- Periodically check emergency communications equipment.
- Maintain emergency rations of food, water, and bedding at Fire Station and City Shops.

10.4.1.4 Facilities Hardening

- Keep alternate routes open to all water system facilities. Sumner and County Springs should have clear access roads from both the valley and the top of the hill.
- Keep all gates locked. Install fences around all facilities subject to human interference.
- Reinforce and stabilize slopes in the watersheds that may be prone to slide.
- Harden damage-prone facilities with seismic retrofits, storm windows, and other appropriate measures. Buried facilities are able to better withstand most disasters.

10.4.2 Public Notification

In the event of an emergency, the public should be quickly notified to prevent adverse health effects. This is currently accomplished by the utility crew knocking on doors to inform residents. If the residents are not home, door hangers describing the nature and extent of the emergency are placed on the doorknobs.

Immediate notification can also be made through local radio and television stations. The Emergency Call-Up List gives the numbers of several local radio, television stations, and newspapers to contact for quick public notification.

Public notifications should contain the following types of information, depending on the seriousness and nature of the emergency:

- Water system components affected.
- Nature of threat to public health.
- Water utility and local agency efforts to restore water supply.
- Any curtailment measures or rationing imposed.
- Location of temporary water supply if needed:
  - Will bottled water be distributed?
  - Will wells be directly tapped?
  - Will a tanker truck be parked at City Hall?
  - Will water be provided by Puyallup, etc.?
- Treatment measures to make water suitable for human consumption (e.g., boiling, adsorption on activated carbon, adding bleach, etc.).

10.4.3 Contingency Plans

Each disaster or emergency will have particular effects on different parts of the system depending on location, magnitude, and extent of disaster as well as many unforeseen factors. Damage to one part of the system may affect other parts of the system; the combination of effects is impossible to predict. The greatest single action the utility can take is preparedness. However, there are contingency operation plans that can be implemented to continue providing safe reliable water in the event of disaster. These contingency operation plans are contained in Appendix L.

10.4.4 Water Shortage Response Plan

The Water Shortage Response Plan (WSRP) is a tool to manage a major water use reduction during extreme water-short periods. The WSRP is based on demand management techniques and conservation including voluntary restrictions, mandatory restrictions, water curtailment, and development of long-term water supply, storage, and distribution systems.

This WSRP considers water shortages for two different scenarios. Trigger criteria and specific City actions are identified for both short-term emergency (line break, loss of well) and long-term (drought) conditions. Table 10-8 provides a summary of the *Sumner Water Shortage Response Plan*.

Table 10-8. Water Shortage Response Plan – Triggering Criteria [a]

Stage	Trigger Condition	Minimum Tank Level [b]	Maximum Rebound [c]	Water Use Reduction Desired
Existing Storage				
1	Loss of any one source Loss of any one storage tank	10 below overflow	2 feet below overflow 3 consecutive days	5–10%
2	Loss of any one source Loss of any one storage tank	16 below overflow	5 feet below overflow 3 consecutive days	10–20%
3	Loss of any one source Loss of any one storage tank Loss of any two sources Loss of any two storage tanks	23 below overflow	5 feet below overflow 3 consecutive days	20–30%

[a] If single large fire causes tanks to drop below fire storage level, take no action until observing overnight filling.

[b] Feet below overflow elevation of 234 feet.

[c] Level history only applicable to non-emergency situation.

10.4.4.1 Water Supply and Demand

A detailed analysis of the supply of water and the demand for water in the Sumner Service Area is presented in Chapter 3, "Water Demand Projections," and Chapter 5, "Water Resources." Sumner recognizes that deficiencies in long-term water supply exist and is undertaking an improvement program in an effort to rectify the projected water right, source, and storage deficiencies. Sumner is also negotiating with neighboring water districts for intertie agreements for emergency water supply.

10.4.4.2 City Policies

The City of Sumner has developed several policies that directly relate to this WSRP. These policies are described in the following paragraphs:

- Development of long-term supply adequate for projected demands. Sumner is dedicated to maintaining supply capability in excess of demand. To meet the increased demands, Sumner is preparing a CIP to develop new sources, negotiating intertie agreements with neighboring utilities, and increasing conservation efforts.
- Sumner recognizes the need to maintain and upgrade their supply, storage, and distribution systems and is undertaking a CIP, which will include new source, a new storage tank, and various distribution system improvements. This commitment to system improvements is an ongoing activity.
- An ongoing leak detection and curtailment program will be an operational priority during all conditions of water availability.
- Conservation and water use education will be a continual process with general information mailed to the customer quarterly and available at the Sumner City Hall at all times. Specific information will be mailed to all customers during the early stages of a water shortage (see Example Public Announcements found later in this chapter).
- The rate structure will promote conservation by charging for the amount of water used. Increased unit charges during times of water shortage may be considered by the City Council. The decision to utilize a rate change and size of rate change will be determined by the Council based on the estimated severity, potential longevity of the shortage, and the best interests of the customers.
- Residential and commercial customers will be treated alike, with restrictions placed on all customers without regard to classification.

10.4.4.3 Conservation Actions

Determination of Water Shortage Stage and specific actions to be taken depends on the anticipated longevity of the shortage. The City of Sumner will utilize the meeting of trigger criteria to begin specific actions outlined below as well as performing an analysis of the impacts of the deficit in water supply and how long it will be in place. The ability to place the city in a higher response level if additional water savings are required is an integral part of this WSRP.

This determination will take on less importance following construction of new wells and storage scheduled in the near future. The loss of any one source or storage tank will impact a smaller percentage of the system and will require less demand reduction to compensate. The triggering criteria are summarized below.

Water Shortage Stage 1

- Water Shortage Condition: Minor.
- Consumption Reduction Goal: 5 to 10 percent.

Triggering Criteria

- Loss of any one source for greater than 24 hours.
- Loss of any one storage tank for greater than 24 hours.
- Water level in storage tanks (i.e., tank used to control pumps) falls to a level 10 feet below overflow and returns overnight to a level no greater than 2 feet below overflow for 3 consecutive days.

Public Information Actions

- Prepare and distribute a letter mailed to all customers describing the water shortage condition.
- Make published technical conservation material available from DOH readily available to all customers. Locate copies in the City Hall.
- Prepare a press statement concerning the shortage. Example announcement is included in this WSRP.

City of Sumner Actions

- Public Works Director makes determination if cause for water shortage is long-term and will require savings in excess of 10 percent. If determination justifies greater savings, move to Water Shortage Stage 2.
- Fire hydrants limited to use only during fire fighting operations.
- Promote intensive leak detection and repair program.
- Perform no system maintenance that requires the use of extensive amounts of water such as tank maintenance requiring drainage and flushing of distribution lines.

User Restrictions

- Implement voluntary user restrictions.

Enforcement

- None.

Pricing

- None.

Water Shortage Stage 2

- Water Shortage Condition: Moderate.
- Consumption Reduction Goal: 10 to 20 percent.

Triggering Criteria

- Stage 1 storage tank criteria plus loss of any one source for greater than 24 hours.
- State 1 storage tank criteria plus loss of any one storage tank for greater than 24 hours.
- Water level in storage tank reaches a level 16 feet below overflow and returns overnight to a level no greater than 5 feet below overflow for 3 consecutive days.

Public Information Actions

- Continue public information program defined in Stage 1, with an additional letter mailed to all customers describing the nature of the water shortage and describing the restrictions to be imposed.

City of Sumner Actions

- Continue actions from Stage 1, including determination by Public Works Director of status of shortage.
- Evaluate the consumption of water on a customer-by-customer basis using the latest meter readings to identify high use customers.
- Begin consideration of buying water from other utilities through existing interties.

User Restrictions

- Institute mandatory water conservation activities such as odd/even day watering.
- Institute ban on excessive exterior uses of water (car washing, driveway cleaning, etc.).

Enforcement

- Notify all customers who show use in excess of appropriate amounts that water use is to be decreased.
- Representative of Sumner to visit house if found in violation of restriction.

Pricing

- None.

Water Shortage Stage 3

- Water Shortage Condition: Severe.
- Consumption Reduction Goal: 20 to 40 percent.

Triggering Criteria

- Stage 2 storage tank criteria plus loss of any one source for greater than 24 hours.
- Stage 2 storage tank criteria plus loss of any one storage tank for greater than 24 hours.
- Water level in storage tank falls to a level 23 feet below overflow and returns overnight to a level no greater than 5 feet below overflow for 3 consecutive days.
- Loss of any two sources for greater than 24 hours.
- Loss of any two storage tanks for greater than 24 hours.

Public Information Actions

- Continue public information program defined in Stage 1, with an additional letter mailed to all customers describing the nature of the water shortage and describing the restrictions to be imposed.

City of Sumner Actions

- Continue actions from Stage 2, including determination by Public Works Director of status of shortage.
- Notify DOH and Pierce County Health Department.

- Assign a "Water Cop" to tour the service area to look for violations of restrictions.
- Commission interties for everyday supply, if available.
- Inspect operation and settings on all pumps and instruments to verify efficient use.
- Institute personal customer contact and inspect houses for leaks.

User Restrictions

- Mandatory curtailment of all water usage except for domestic potable use.

Enforcement

- One warning for unnecessary water usage.
- Termination of service following repeat warning.
- Fine for excessive use.

Pricing

- Institute modified rate structure with higher unit prices. New prices and timing of increase to be determined by City Council.

10.4.4.4 Example Public Announcements

Every potential water shortage is unique; therefore, specific announcements prepared in advance are not a part of this WSRP. However, it is wise to have several example announcements available that can be modified to fit the circumstances. The following paragraphs list several example public announcements Sumner can use in the case of a water shortage.

Sample I – Stage 1 Water Shortage

The City of Sumner is experiencing unusually high water demand and is having difficulty maintaining adequate reservoir reserves. Drawdown of reservoirs during the day is not being offset by the overnight refilling capabilities. Residents of the city are requested to reduce water consumption and to avoid wasting water wherever possible. The problem is expected to be temporary in nature, and a public announcement will be made when normal water consumption can be resumed.

Sample II – Stage 1 Water Shortage

The City of Sumner is experiencing a major loss of its water production capacity. The City's customers are requested to reduce their water usage and to avoid wasting water. It would be particularly helpful if homeowners will make every effort to reduce lawn irrigation. The problem is expected to be temporary in nature, and a public announcement will be made when normal water consumption can be resumed.

Sample III – Stage 2 Water Shortage

The City of Sumner has experienced a major loss in water production and storage capacity, and, therefore, is unable to maintain normal water deliveries. It is mandatory that certain water usage activities be curtailed. This includes the imposition of alternate day lawn watering restrictions on all customers and a complete ban on other nonrequired outside uses of water such as car washing and driveway cleaning. Your cooperation is urgently requested. The City is doing everything possible to restore the water system to normal operations. You will be notified of any change in the situation.

Sample IV – Stage 3 Water Shortage

The City of Sumner has experienced a major loss of its water production capacity. Immediate mandatory curtailment of all water usage except for in-house domestic use is hereby imposed. Your cooperation is urgently requested. Failure to comply with the restrictions may result in termination of service with possible fines being imposed. The City is doing everything possible to restore the water system to normal operations. You will be notified of any change in the situation.

10.4.4.5 Supply Augmentation

A number of options are available to Sumner for the short-term augmentation of water supply. Sumner currently has interties with the City of Puyallup. Sumner is also undertaking an improvement program to add new sources and is performing a program to identify new source locations. A conservation and water use education program is in place and is being reviewed and improved during the course of development of the Water System Plan.

Sumner is also involved in a long-term program to improve the efficiency of the existing facilities. The City participates in a continual program of leak detection and maintenance of pipes, wells, and storage facilities and is upgrading and adding new pipelines to enable more efficient distribution of the existing supplies.

10.4.4.6 Schedule and Funding

Sumner's public awareness program is under way. The City has prepared generic water shortage notices that can be used as a basis for public announcements if water shortages occur. Sumner is currently negotiating with neighboring water districts for intertie agreements.

Sumner is also preparing a CIP, part of which includes improvements to existing sources to maximize source capacity. The City is also planning on developing additional sources that will enable them to more completely utilize their existing instantaneous and annual water right allocations. Funding for this construction program will be through the use of general revenue funds, developer participation, ULIDs, and grants and loans available from the federal, state, and local governments. A financial plan for improvements is included in the Water System Plan and will be implemented through annual budget revisions. Sumner performs an annual review of water rates that considers the changing maintenance and operation costs as well as proposed improvement projects.

10.4.4.7 Monitoring Program

Sumner has several mechanisms already in place that can be used to monitor the effectiveness of this WSRP. The City maintains continuous readings on the flow from the springs and wells and the water level in the storage tanks. An expandable telemetry system is being installed. By utilizing this information, Sumner will be immediately informed of the available supply of water. Sumner meters all flow at two locations – the source and as it is discharged to a user. Use of this information will enable Sumner to identify and locate major leaks in a timely manner. Sumner is committed to the development of new source, storage reservoirs, and interties and will watch the construction effort and keep it on schedule.

Sumner will periodically review this WSRP and upgrade it as needs arise. This WSRP reflects what Sumner feels to be a sound implementation WSRP based on fact, professional opinion, comparison with other programs, public expression, and future supply and demand.

10.4.5 Emergency Call-Up List

The following pages provide emergency telephone numbers for easy access during an emergency. The Water System Personnel Priority Call-Up List is on file at the City Public Works Department and Fire Department.

CITY OF SUMNER EMERGENCY CALL UP LIST

CITY OF SUMNER	
Water System Personnel Priority Call-Up List (Business Hours)	
City Hall	253-299-5700
Maintenance Facility	253-299-5740
Water System Personnel Priority Call Up List (After Hours – Police Department)	253-863-6384 **or 911**
Police Department	253-863-6384 **or 911**
East Pierce County Fire and Rescue	253-863-1800 **or 911**
ADJACENT WATER PURVEYORS	
Pierce County Public Works	253-798-7250
Pierce County Emergency/After Hours	253-798-7470
City of Puyallup Public Works	253-864-4165
City of Puyallup Water Superintendent	253-841-5508
City of Puyallup Emergency/After Hours	253-770-3336
City of Bonney Lake Public Works	253-862-8602
Mt. View – Edgewood Water District	253-863-7348
Mt. View – Edgewood Emergency/After Hours	253-591-0613
Alderton-McMillin Water District	253-840-2120
City of Pacific	253-929-1110
UTILITIES	
Puget Sound Energy	
New Construction, Repairs, Power Outage	888-321-7779
Underground Utilities Location Service	800-424-5555
Washington Natural Gas Co.	206-622-6767
Qwest Communications	253-451-5350
DEPARTMENT OF HEALTH	
State Office General Information	800-525-0127
(Drinking Water Information)	360-236-3100
Pierce County Emergency Management	253-798-7470
Northwest Regional Office	253-395-6750
Community Health Systems	800-458-5281
Hazardous Waste Information and Response	800-287-6429
Emergency Operations Center (24-Hour Regional Coordination); and Chemical Spills (State Duty Officer)	800-258-5990
DOH – Water Testing Lab	206-418-5400

CITY OF SUMNER EMERGENCY CALL UP LIST

STATE/FEDERAL ASSISTANCE AGENCIES

Washington State Department of Ecology	360-407-6300
(24-Hour Emergency, Including Spill Response) (**OIL ONLY**)	800-258-5900
Washington Department of Fish and Wildlife (Olympia Office)	360-902-2200
Department of Natural Resources – Forest Fire Reports	800-562-6010
National Weather Service	206-526-6087
U.S. Army Corps of Engineers (Seattle)	206-764-3690

POLICE AGENCIES/CIVIL DISORDER

Washington State Patrol	253-536-6210 **or 911**
Washington National Guard (Puyallup)	253-840-4686
Washington National Guard (Tacoma)	253-597-4150

EQUIPMENT RENTAL/SUPPLIES

Emergency Chemical Supplies	
Jones Chemicals	253-274-0104
Bulk Water Suppliers	
Pure Water Corporation	253-796-2600
Water Purification and Filtration Consultants	
Parametrix, Inc. (Sumner)	253-863-5128
Water Treatment Equipment, Service and Supplies	
Clean Water Systems Northwest (Sumner)	253-863-0397
M S Pure Water Technology (Tacoma)	253-383-8357
Filtration/Treatment Systems, Ltd. (Kent)	253-872-9007
Water Works Equipment and Supplies	
H. D. Fowler, Inc. (Sumner)	253-863-8600
Western Utilities Supply Co. (Tacoma)	253-531-1144
US Filter (Puyallup)	253-840-8558
Safety Equipment and Clothing	
Safety and Supply Co. (Federal Way)	253-922-8000
Firesafe Fire and Safety Equipment Co., Inc. (Tacoma)	253-922-6897
Water Main Contractor	
Don Olson Construction, Inc. (Sumner)	253-922-9331
Chain Saws, Dewatering, Tools, Vehicles	
Bunce Equipment Rentals (Puyallup)	253-845-7527

Equipment Rental/Supplies (Continues)

CITY OF SUMNER EMERGENCY CALL UP LIST

EQUIPMENT RENTAL/SUPPLIES (Continued)

Generators	
United Rentals (Puyallup)	253-845-9441
Prime Equipment (Tacoma)	253-383-1515
Contractors' Equipment	
Aggreko, Inc. (Auburn)	253-939-3443
United Rentals (Puyallup)	253-845-9441
US Filter (Puyallup)	253-840-8558

FEDERAL EMERGENCY MANAGEMENT AGENCY

Regional Office	425-487-4600
Disaster Assistance Programs	800-621-3362
Flood Insurance Programs	425-482-3016
Natural and Technical Hazards	425-487-4448
Mobile Communications Detachment	425-487-4448
Holidays, Weekends, and Evenings	425-487-4448

RADIO STATIONS, TELEVISION STATIONS, NEWSPAPERS

KOMO AM 1000	206-404-4145
KIRO AM 710 Newsradio	206-726-7000
KONP AM 1450	360-457-1450
KISS FM 106	206-805-1061
KISW FM 100	206-285-7625
KBRD FM 104	360-943-5539
KCPQ Channel 13	206-674-1313
KIRO Channel 7	206-728-7777
KOMO Channel 4	206-404-4000
KING Channel 5	206-448-5555
KSTW Channel 11	206-441-1111
Tacoma News Tribune	253-597-8742
Pierce County Herald	253-841-2481

10.5 CROSS CONNECTION CONTROL PROGRAM

The City of Sumner has a responsibility to protect its water system from contamination due to cross connections. Cooperation among all agencies involved in cross connection control is required, including the state Department of Health, the City's Public Works Department, City Attorney, the local health officer, the local plumbing and building code authority, and the Fire Department.

This chapter outlines a comprehensive cross connection control program for the City of Sumner. First, a generalized description of a cross connection is given, followed by a discussion of health hazard assessment and a description of cross connection control methods. Finally, an implementation program for the City of Sumner outlining present and recommended practices is given.

10.5.1 Regulatory Framework

Regulatory framework for cross connection control is through the Safe Drinking Water Act, whose intent is to assure safe, potable water for all U.S. citizens. State regulations pertaining to cross connection control are found in Washington State statutes and "State of Washington Drinking Water Regulations," Chapter 246-290-490 WAC.

The City may be held legally liable for adverse health effects caused by unprotected or inadequately protected cross connections including cost associated with disinfection and/or replacement of piping to remove toxic substances from the water supply system.

The most recently published edition of the *Manual of Cross Connection Control* (9th Edition 1993) must be used as a resource to establish:

- Minimum cross connection control operating policies.
- Backflow prevention assembly installation practices.
- Backflow prevention assembly testing procedures.
- Enforcement authority.

Several other manuals in addition to *Accepted Procedure and Practice in Cross Connection Control* and WAC 246-290-490 should be kept with the cross connection control program document library for ready reference. These include:

- AWWA 2004, Recommended Practice for Backflow Prevention and Cross Connection Control.
- DOH 2008 Backflow Prevention Assemblies Approved for Installation in Washington State.
- City of Sumner Ordinance 13.24.270, "Backflow Prevention Devices."
- The Operation Program Section of the Water System Plan.

These six documents and all records of inspection and testing are an integral part of the City of Sumner Cross Connection Control Program.

10.5.2 What is a Cross Connection?

A cross connection is any unprotected actual or potential connection or structural arrangement between a public or a consumer's potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied. Cross connections usually take the form of either back pressure or back siphonage.

10.5.2.1 Back Pressure

Back pressure can occur whenever a potable system is connected to a nonpotable supply operating under a higher pressure by means of a pump, boiler, elevation difference, air or steam pressure. There is a high risk that nonpotable water may be forced into the potable system whenever these interconnections are not properly protected.

10.5.2.2 Back Siphonage

Back siphonage can occur when there is a negative or reduced pressure in the supply piping. Under normal conditions, the pressure in the distribution system is sufficiently high to create a positive flow to all taps. However, if system pressures are reduced due to fire demands, pipe breakage, or other cause, water may flow from higher elevations into lower parts of the system or vacuum pressure may draw water from service connections. A cross connection occurs when nonpotable water is drawn back through the supply line. Elevated piping at a reduced pressure relative to the system at street level is especially susceptible. The suction side of booster pumps may also cause reduced pressures and create a higher backflow potential.

10.5.3 Classification of Risk

Cross connections are classified into health and nonhealth hazards. A health hazard is posed by any cross connection or potential cross connection involving any substance that could, if introduced to the water system, cause death, illness, spread of disease, or have a high probability of causing such effects. A nonhealth hazard is posed by any cross connection involving any substance that generally would not be a health hazard, but would constitute a nuisance, or be aesthetically objectionable, if introduced into the potable supply.

Classification of risk must consider the potential that piping may be changed, equipment may be used incorrectly, or negligence on the part of the consumer may result in a backflow condition. In general, risk increases both as a function of the hydraulic probability of backflow and the toxicity of the substance that may introduced into the potable supply. When choosing a backflow prevention method, the toxicity of the substance that may be introduced into the potable supply is the governing factor.

General health and nonhealth classifications of risk for various types of cross connection and facilities are presented in Tables 10-9 and 10-10, reproduced here from *Recommended Practice for Backflow Prevention and Cross Connection Control* (AWWA 2004). Objectionable material and routes of contamination from a variety of commercial and industrial establishments are presented in *Recommended Practice for Backflow Prevention for Backflow Prevention and Cross Connection Control* (AWWA 2004).

Table 10-9. Assemblies for Internal Protection

Description of Cross Connection		Assessment of Hazard	Recommended Assembly at Fixture [a]
Aspirator (medical)		Health	AVB or PVB
Bedpan Washers		Health	AVB or PVB
Autoclaves		Health	RPBA
Specimen Tanks		Health	AVB or PVB
Sterilizers		Health	RPBA
Cuspidors		Health	AVB or PVB
Lab Bench Equipment		Health	AVB or PVB
Autopsy and Mortuary Equipment		Health	AVB or PVB
Sewage Pump		Health	AG
Sewage Ejectors		Health	AG
Fire-Fighting System (toxic liquid foam concentrates)		Health	RPBA
Connection to Sewer Pipe		Health	AG
Connection to Plating Tanks		Health	RPBA
Irrigation Systems with Chemical Additives or Agents		Health	RPBA
Connection to Saltwater Cooling System		Health	RPBA
Tank Vats or Other Vessels Containing Toxic Substances		Health	RPBA
Connection to Industrial Fluid Systems		Health	RPBA
Dye Vats or Machines		Health	RPBA
Cooling Towers with Chemical Additives		Health	RPBA
Trap Primer		Health	AG
Steam Generators		Nonhealth [b]	RPBA
Heating Equipment:	Commercial	Nonhealth [b]	RPBA
	Domestic	Nonhealth [b]	DCVA
Irrigation Systems		Nonhealth [b]	DCVA, AVB, or PVB
Swimming Pools:	Public	Nonhealth [b]	RPBA or AG
	Private	Nonhealth [b]	PVB or AG
Vending Machines		Nonhealth [b]	RPBA or PVB
Ornamental Fountains		Nonhealth [b]	DCVA or AVB or PVB
Degreasing Equipment		Nonhealth [b]	DCVA
Lab Bench Equipment		Nonhealth [b]	AVB or PVB
Hose Bibs		Nonhealth [b]	AVB
Trap Primers		Nonhealth [b]	AG
Flexible Shower Heads		Nonhealth [b]	AVB or PVB
Steam Tables		Nonhealth [b]	AVB
Washing Equipment		Nonhealth [b]	AVB
Shampoo Basins		Nonhealth [b]	AVB
Kitchen Equipment		Nonhealth [b]	AVB
Aspirators		Nonhealth [b]	AVB
Domestic Space-Heating Boiler		Nonhealth [b]	RPBA

Notes: AG = Air Gap; AVB = Atmospheric Vacuum Breaker; DCVA = Double Check Valve Backflow-Prevention Assembly; PVB = Pressure Vacuum Breaker; RPBA = Reduced-Pressure Principle Backflow-Prevention Assembly.

[a] AVBs and PVBs may be used to isolate health hazards under certain conditions, that is, back siphonage situations. Additional area or premises isolation may be required.

[b] Where a greater hazard exists (due to toxicity or other potential health impact), additional area protection with RPBAs is required.

Table 10-10. Assemblies for Premises Isolation

Description of Premises	Assessment of Hazard	Recommended Assembly on Water Service Pipe
Hospitals, mortuaries, clinics, laboratories	Health	RPBA
Plants using radioactive material	Health	RPBA
Petroleum processing or storage facilities	Health	RPBA
Premises where inspection is restricted	Health	RPBA
Sewage treatment plant	Health	RPBA
Sewage lift stations	Health	RPBA
Commercial laundry	Health	RPBA
Plating or chemical plants	Health	RPBA
Docks and dockside facilities	Health	RPBA
Food and beverage processing plants	Health	RPBA
Pleasure boat marina	Health	RPBA
Tall buildings (protection against excessive head of water)	Nonhealth	DCVA
Steam plants	Nonhealth	RPBA
Reclaimed water systems	Health	RPBA

Notes: DCVA = Double check valve backflow-prevention assembly.
RPBA = Reduced-pressure principle backflow-prevention assembly.

10.5.4 Cross Connection Control Methods

When cross connections cannot in good faith be eliminated, several methods of cross connection control through approved backflow prevention devices are available. In general, the more serious the health hazard, the greater the complexity and cost of the required backflow prevention device. Discussed in this section are the five most commonly used devices for cross connection control. In general order of increasing cost and complexity, these include:

- Approved Air Gap (AG).
- Pressure Vacuum Breaker (PVB).
- Atmospheric Vacuum Breaker (AVB).
- Double Check Valve Assembly (DCVA).
- Reduced Pressure Principal Backflow-Prevention Assembly (RPBA).

Each backflow device is briefly described below.

10.5.4.1 Approved Air Gap (AG)

An approved air gap is the unobstructed vertical distance through free atmosphere between the lowest point of a water supply outlet and the flood rim of the fixture or assembly into which the outlet discharges. These vertical separations must be at least twice the diameter of the water supply outlet, but never less than 1 inch.

In theory, an approved air gap is the best means of protection against backflow; however, it is not always practical and is vulnerable to bypass arrangements, such as connecting a hose between a water tap and its basin.

10.5.4.2 Pressure Vacuum Breaker (PVB)

A pressure vacuum breaker assembly consists of an independently operating, internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve.

Under normal flow conditions, the internally loaded check valve remains open, and the air inlet valve is closed. When back siphonage conditions develop, the internally loaded check valve closes. And, if this check valve is not fouled, it precludes the back siphonage of water from the PVB body and downstream piping.

However, if the check valve is fouled, the air inlet valve opens with the cessation of normal flow and allows air to enter the supply pipe through the fouled check valve, thus breaking the vacuum and not permitting back siphonage from the downstream piping.

The PVB is effective against backflow caused by back siphonage only and should not be used if back pressures could develop. The PVB should be installed in a vertical position at least 12 inches above all downstream piping and the highest fixture flood level rim, outlet, or highest point of water use.

Atmospheric Vacuum Breaker (AVB)

The atmospheric vacuum breaker is an assembly that performs similarly to the PVB. The AVB consists of a float check, a check seat, and an air inlet port.

During normal flow conditions, the float within the AVB seals against the air inlet. When a back siphonage condition develops, the cessation of normal flow permits the float to drop, thus opening the air inlet valve. If the float seals against the check seat, there is no back siphonage from the AVB body or downstream piping.

However, if the float check is fouled, then the air entering through the air inlet valve dissipates the vacuum through the fouled check valve, thus preventing back siphonage into the supply piping.

The AVB is effective against backflow caused by back siphonage only, and should not be used if back pressure could develop. The AVB should be used for protection against nonhealth hazards. Like the PVB, if used to isolate a health hazard, additional area or premises isolation may be required. The AVB should be installed in a vertical position at least 6 inches above all downstream piping and the highest fixture flood level rim, outlet, or highest point of water use.

Double Check Valve Assembly (DCVA)

The DCVA consists of two internally loaded check valves, either spring-loaded or internally weighted. During normal operation, the check valves open. If backflow conditions occur, the check valves will close tightly.

The DCVA is effective against backflow caused by back pressure and back siphonage and is used to protect the water system from pollutants that would not constitute an actual health hazard but that might be objectionable to the water supply.

Reduced-Pressure Principle Backflow Prevention Assembly (RPBA)

The approved reduced-pressure principle backflow prevention assembly consists of two independent action, approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and below the first check valve.

During normal operation, the first internally loaded check valve creates a reduced-pressure zone between the two check valves; and under normal flow conditions, both check valves are open. The relief valve is held tightly closed by the supply pressure acting on a diaphragm within the relief valve.

In a no-flow or static-pressure condition, both check valves will close, and the supply pressure will hold the relief valve shut.

If the supply pressure drops, the relief valve will maintain a minimum pressure in the zone between Check Valve 1 and Check Valve 2 of 2 psi lower than the supply pressure by releasing sufficient water to maintain the required difference in pressure.

If the supply pressure becomes less than 2 psi, the relief valve opens, discharging the material in the reduced pressure zone to the atmosphere.

In the event that pressure increases downstream of the assembly, tending to reverse the direction of flow, both check valves in the assembly should close tightly to prevent backflow.

However, if the second check valve does not close tightly, leakage into the reduced pressure zone will increase the pressure, which will cause the relief valve to open. If the supply pressure drops to atmospheric pressure, or within 2 psi of the reduced pressure zone, the relief valve will open, creating an internal air gap. Any leakage past the second check valve would then be discharged through the open relief valve.

The RPBA is effective against backflow caused by back pressure and back siphonage. The RPBA is used to isolate health hazards and is used in locations where an approved air gap is impractical.

10.5.5 Selection of Backflow Prevention Device

Tables 10-9 and 10-10 can be used as guides in selecting the appropriate backflow devices for individual cross connections and those needed for premises isolation. Premises isolation is needed in addition to individual equipment isolation when high-risk substances could backflow. WAC 246-290-490 places the following limitations on backflow prevention devices:

- If a cross connection cannot be eliminated, then:
  - An AG, RPBA, or reduced-pressure principal detector backflow prevention assembly (RPDA) shall be installed if the cross connection creates an actual or potential health threat or system hazard.
  - An AG, RPBA, RPDA, DCVA, or double-check detector backflow prevention assembly (DCDA) shall be installed if the cross connection is objectionable, but does not pose an unreasonable risk to health.
  - A PVB or an AVB may be installed where the substance that could backflow is objectionable, but does not pose an unreasonable risk to health and where there is no possibility of back pressure in the downstream piping.
  - Backflow prevention assemblies appropriate for the degree of hazard, or air gaps, and in some cases both, shall be installed at the service connection or within the following facilities, unless in the judgment of the water purveyor and the department, no hazard exists: Hospitals, mortuaries, clinics, laboratories, piers and docks, sewage treatment plants, food and beverage processing plants, chemical plants using water process, metal plating industries, petroleum processing or storage plants, radioactive material processing plants or nuclear reactors, car washes, facilities having a nonpotable auxiliary water supply, and others specified by the department.

Any uncertainty in type of backflow prevention device required should be verified in the *Accepted Procedure and Practice in Cross Connection Control Manual* or through DOH.

All installed RPBAs, RPDAs, DCVAs, DCDAs, PVBs, and AVBs must be approved models included on the current list of backflow assemblies, approved for installation in Washington State, and maintained and published by DOH. Directions on how to acquire the most recent list are provided in Appendix M.

Backflow prevention assemblies in service, but not listed, can remain in service provided they were on the current cross connection control list at the time of installation, are properly maintained, are appropriate for the degree of hazard, and are tested and successfully pass the test annually. The unlisted assemblies cannot be moved or require more than the minimum maintenance or be subject to replacement with a currently approved model.

10.5.6 Implementation Program

The cross connection control implementation program at the City of Sumner should consist of the following elements:

- Cross connection control staff.
- Inventory of cross connections.
- Installation inspections.
- Backflow prevention device testing.
- Cross connection control ordinance.
- Public education and notification.

The current program and recommended improvements to each of these elements are discussed in the following paragraphs.

10.5.6.1 Cross Connection Control Staff

The City of Sumner Cross Connection Control Program is administered by the Public Works Department and supervised by the Public Works Director. The City's engineering staff reviews building permits and plans for cross connection control applicability. The City Engineer assesses risks and hazards associated with cross connections and recommends backflow prevention devices to be installed as a prerequisite for building construction approval.

Currently, the City has three licensed CCCSs who implement the program (see Table 10-2). It is recommended that all applications for building permits be reviewed by a CCCS in addition to the City Engineer.

10.5.6.2 Inventory of Cross Connections

In 1988, the City began keeping detailed installation records of backflow prevention devices. All new industries and commercial establishments are required to install backflow prevention devices suitable for the health hazard. As each device is installed, it is entered into a backflow prevention database.

Columns in the database are provided for the establishment name, address, type of backflow device installed (RPBA, RPBD, etc.), model, size, serial number, manufacturer, location on premises, date installed, and date last tested.

10.5.6.3 Installation Inspection

Under the City's current program, the property owner is required to hire a Certified Backflow Prevention Device Tester to test all units after installation. One of the City's cross connection control specialists witnesses and inspects the arrangement for compliance with all applicable codes and standards. Installation records are kept in the City's Cross Connection Control Database.

10.5.6.4 Backflow Prevention Device Testing

All backflow prevention devices in the City database are tested annually to assure proper operation. Devices should be inspected more frequently if test indicate repeated failures or the assembly was recently repaired. Procedure is as follows:

- The owner is notified in their water bill of the need for testing the backflow prevention device.
- The owner must hire a certified Washington State Backflow Prevention Device Tester to perform the test in accordance to manufacturers' standards and state codes. A list of certified testers is kept on file at DOH.
- Test results are sent to the City Public Works Department. The performance of the backflow prevention assembly is clearly noted as well as the certification status of the Tester.
- The reports are checked for adequacy, the database is updated, and the test reports are filed.

10.5.6.5 Cross Connection Control Ordinance

The City of Sumner has enforcement authority for cross connection control through City of Sumner Ordinance 13.24.270, which states:

> "Backflow prevention devices shall be installed by the owner of the property being served when in the judgment of the city engineer the nature and extent of activities on the premises, or the materials used in connection with the activities, or materials stored on the premises would present an immediate and dangerous hazard to health should a cross connection occur, even though such cross connection does not exist at the time the backflow prevention device is required to be installed. The type of protection device, its installation and periodic testing, shall conform to the provisions of the rules and regulations of the state Board of Health regarding public water supplies as set forth in WAC 248-54-500." (currently WAC 246-290-490).

A revised ordinance may be necessary to define in more detail the responsibilities of the City and the responsibilities of the customer. A new ordinance should have at minimum the following sections:

- 1.01 Definitions
- 1.02 Purpose
- 1.03 Regulated Cross Connections
- 1.04 Backflow Prevention Assembly Requirements
- 1.05 Installation Requirements
- 1.06 Access to Premises
- 1.07 Annual Testing and Repairs
- 1.08 Responsibility for Cost
- 1.09 Termination of Service
- 1.10 Effective Date

At a minimum, the following provisions should be added to Ordinance 13.24.270 or to any new cross connection control ordinance:

- All tests, repairs, overhauls, and/or replacements of backflow prevention devices shall be at the expense of the building and premises owners. Reports on all testing and maintenance of backflow prevention assemblies shall be filed with the City of Sumner Public Works Department. If malfunctioning assemblies are not promptly repaired or replaced, the City of Sumner may deny or discontinue water service to the premises.
- Authorized employees of the City of Sumner with proper identification shall have free access at reasonable hours of the day to all parts of a premises or within buildings to which water is supplied, for the purposes of determining hazards due to cross connections, inspection, testing, or maintenance of backflow prevention devices. Water service may be refused or terminated to any premises for failure to allow employee access.
- All installed RPBAs, RPDAs, DCVAs, DCDAs, PVBs, and AVBs shall be approved models included on the current list of backflow assemblies approved for installation in Washington State and maintained and published by the Department of Health.
- Backflow prevention assemblies in service, but not listed, can remain in service provided the backflow prevention assemblies are listed on the cross connection control list current at the time of installation, are properly maintained, are appropriate for the degree of hazard, and are tested and successfully pass the test annually. When unlisted assemblies are moved or require more than the minimum maintenance, the unlisted assemblies shall be replaced by an assembly listed on the current approved model list.

10.5.6.6 Public Education and Notification

As an aid in the inventory program, forms can be prepared for each customer class encouraging identification and elimination of cross connections. Results of the inventory can be used to assess program effectiveness and identify possible cross connections and health hazards without entering the premises. Inventory forms are especially useful for single and multifamily residences. Owners for this customer class should be requested to identify potential cross connections, which include:

- Hot tubs.
- Underground sprinkler systems.
- Auxiliary water supplies such as:
  - Wells.
  - Swimming pools.
  - Solar systems.
  - Swamp coolers.
  - Threaded faucets over utility sinks.
  - Boilers.
- Any place where a potentially harmful chemical or other substance is used in conjunction with the drinking water plumbing such as:
  - End of garden hose antifreeze flush kits.
  - Substances such as weed killers or fertilizers.

The customer should be informed of the purpose of cross connection control and the City's requirement and authority to prevent cross connections. Methods of notification include newspapers, bill stuffers, direct mailing, information distribution in schools and libraries, and on bulletin boards.