PRELIMINARY - CITY REVIEW ONLY

AGENCY REVIEW DRAFT: AUGUST 2021

City of Snoqualmie

WATER SYSTEM PLAN



PREPARED BY RH2 ENGINEERING AND FCS GROUP

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PRELIMINARY - CITY REVIEW ONLY

City of Snoqualmie Water System Plan

AGENCY REVIEW DRAFT
AUGUST 2021

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CERTIFICATION

This Water System Plan for the City of Snoqualmie was prepared under the direction of the following registered professional engineers.



XX/XX/2021

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E | EXECUTIVE SUMMARY

PURPOSE OF THE WATER SYSTEM PLAN

The City of Snoqualmie's (City) water system is a major infrastructure, much of which is invisible to the customers that receive its water. The water system requires qualified staff to operate and maintain an ongoing capital improvement program to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the City of Snoqualmie Water System Plan (WSP) is to identify and schedule water system improvements that correct existing system deficiencies and ensure a safe and reliable supply of water to current and future customers. This WSP complies with Washington State Department of Health (DOH) regulations under Chapter 246-290 Washington Administrative Code (WAC), which requires water purveyors to update their water system plans every 10 years.

The City's previous WSP was prepared in February 2013. This updated 2021 WSP reflects King County's (County) population allocation to the City and the City's current Urban Growth Area (UGA), which are consistent with the 2014 City and 2018 County *Comprehensive Plan* updates. The WSP also reflects improvements and changes to the water system since the completion of the 2013 WSP.

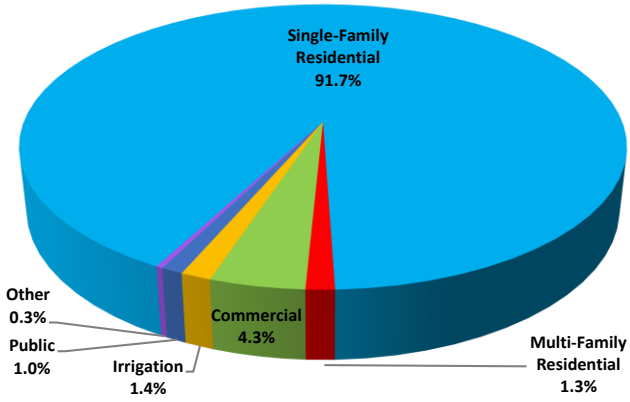
SUMMARY OF KEY ELEMENTS

This WSP presents a description of the existing water system and service area, a forecast of future water demands, policies and design criteria for water system operation and improvements, the operations and maintenance program, staffing requirements, a schedule of improvements, and a financial plan to accomplish the improvements. The WSP also includes several ancillary elements that include a water use efficiency plan, a water quality monitoring plan, a wellhead protection plan, a watershed control plan, and a cross-connection control program. A summary of the key issues related to these elements is provided in the following sections.

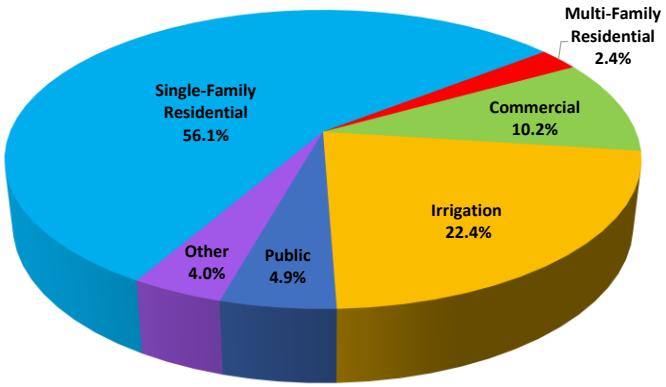
Water Service Area

The City provides water service to approximately 14,322 people throughout its water service area boundary, which extends beyond the City's corporate limits. The City is responsible for providing public water service, utility management, and water system development within this area. The City will provide new water service within the City limits and where there are existing water mains (i.e., the retail water service area). Requests for new water service outside of the City limits but within the UGA, where there are no existing water mains fronting the property, will only be granted after completion of an annexation agreement.

In 2017, the City provided water service to an average of 4,911 connections, which were mainly comprised of single-family connections. Single-family connections represent approximately 91.7 percent of all accounts, but the single-family class only consumed 56.1 percent of all water supplied to the system in 2017.



2017 Water Connections



2017 Water Consumption

Existing Water System

The City's water system was initially established from springs and surface streams. In 1950, the City began to utilize the Canyon Springs source. Well No. 1 was the City's next source, which was constructed in 1973 on the Mount Si High School property. This well was eventually decommissioned and replaced with Well No. 1-R in 2006. Well No. 2 was drilled by a developer in 1995 and fully developed in 2009 as a second well. Both Well Nos. 1-R and 2 currently comprise the South Wellfield. Well Nos. 6 and 7 were drilled in 1995 and equipped in 1996 to become the North Wellfield. Well No. 8 was drilled in 2001 and equipped in 2002 to become a part of the North Wellfield. A summary of the City's sources is shown in **Table ES-1**.

Table ES-1
Supply Facilities Summary

Facility	Pressure Zone	Year Installed	Use	Existing Capacity (gpm)	Well Depth (feet)	Water Treatment
Canyon Springs	599 Zone	1950s	Active	898	N/A	Chlorination
North Wellfield[1]						
Well No. 6	705 Zone	1996	Active	550	589	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 7	705 Zone	1996	Active	550	541	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 8	705 Zone	2002	Active	1,250	694	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
South Wellfield[2]						
Well No. 1-R	599 Zone	2006	Active	600	557	Chlorination, Filtration (Iron and Manganese Removal)
Well No. 2	599 Zone	2009	Active	600	564	Chlorination, Filtration (Iron and Manganese Removal)

1 = Well No. 6 cannot be run simultaneously with Well No. 8, so the maximum combined capacity of the North Wellfield is approximately 1,800 gpm.
2 = The capacity of the South Wellfield is currently limited to 563 gpm by the South Wellfield WTP.

The City's water system currently has six storage facilities that provide storage directly to the 599 Zone, 705 Zone, 1040 Zone, and 1172 Zone. A summary of the City's storage facilities are shown in **Table ES-2**.

Table ES-2

Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Overflow Elevation (feet)	Diameter (feet)	Height (feet)
599 Zone								
599 Reservoir	South of Cortland Avenue SE	599 Zone	1961	Steel	0.51	599	52	32
Snoqualmie Ridge Pressure Zones								
705 Reservoir No. 1	Fisher Creek Park	705 Zone	1996	Steel	0.03	705	15	24
705 Reservoir No. 2			2018	Steel	0.13		30	24
1040 Reservoir No. 1	South of SE Jacobia St, between Hancock Ave SE and SE Keller St	1040 Zone	1997	Concrete	2.10	1,040	122	24
1040 Reservoir No. 2			2004	Concrete	1.72		110.5	24
South Pressure Zones								
1172 Reservoir	South of Snoqualmie Point Park	1172 Zone	1989	Steel	0.40	1,172	47	31

The City's water system currently has five booster pump station (BPS) facilities. The 705 BPS, 1040 BPS, and 1180-1260 BPS provide water to pressure zones in the Snoqualmie Ridge area. The 384th Avenue SE BPS and Snoqualmie Point BPS provide water to pressure zones in the southern areas of the system. A summary of the pumping facilities is shown in **Table ES-3**.

Table ES-3
Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Number of Pumps	Pump Type	Pump Motor Size (HP)	Pump Capacity	Has VFDs?	Sum of Pump Capacities (gpm)[1]	Generator
Snoqualmie Ridge Pressure Zones Booster Pump Stations										
705 BPS	599 Zone	705 Zone	1997	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	No	2,400	Kimball Creek LS Diesel Generator
			2008	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	Yes		Portable Diesel Generator
1040 BPS	705 Zone	1040 Zone	1996	4	Vertical turbine	(2) 100	(2) 625 gpm @ 385' TDH	No	2,500	Diesel Generator
						(2) 125	(2) 625 gpm @ 385' TDH	No		
1180-1260 BPS	1040 Zone	1180 Zone	2008	6	Vertical turbine	(1) 10	(1) 155 gpm @ 164' TDH	Yes	4,748	Diesel Generator
						(3) 40	(3) 531 gpm @ 215' TDH	Yes		
						(2) 125	(2) 1,500 gpm @ 210' TDH	No		
		1260 Zone		6	Vertical turbine	(1) 15	(1) 137 gpm @ 245' TDH	Yes	4,445	
						(3) 50	(3) 436 gpm @ 290' TDH	Yes		
						(2) 150	(2) 1,500 gpm @ 290' TDH	No		
South Pressure Zones Booster Pump Stations										
384th Avenue SE BPS	599 Zone	799 Zone	1982	3	Vertical turbine	(2) 20	(2) 200 gpm @ 216' TDH	No	1,600	Natural Gas Generator
					Horizontal end-suction	(1) 125	(1) 1,200 gpm @ 272' TDH	No		
Snoqualmie Point BPS	799 Zone	1172 Zone	1989	2	Submersible	(2) 25	(2) 150 gpm @ 414' TDH	No	300	None

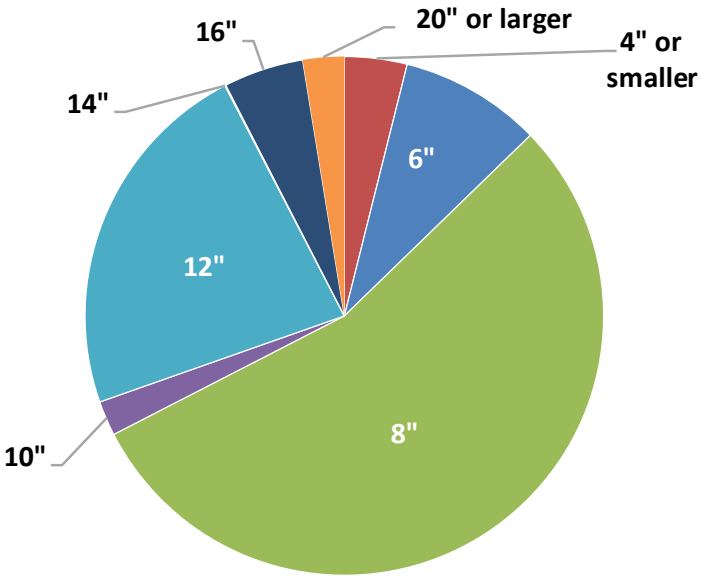
1 = The actual total station capacity is typically less than the sum of pump capacities, due to increased head losses at higher flow rates. Total capacity may also be limited if the BPS electrical system is not designed to run all pumps concurrently.

The City's water system contains approximately 69 miles of water main ranging in size from 2 inches to 24 inches. As shown in **Table ES-4**, most of the water main (approximately 92 percent) within the system is 12 inches in diameter or less. The remaining 8 percent of the water main is 14 inches in diameter or larger.

Table ES-4

Water Main Diameter Inventory

Diameter (Inches)	Length (Feet)	% of Total
4 or smaller	14,151	3.9%
6	32,069	8.8%
8	198,496	54.7%
10	7,872	2.2%
12	82,597	22.8%
14	227	0.1%
16	18,077	5.0%
20 or larger	9,338	2.6%
Total	**362,827**	**100%**



Past Water Usage

Table ES-5 presents the total annual supply and average day demand for 2011 through 2017. Water demands have generally been increasing since 2011. This is most likely the result of new development, which primarily consists of single-family residences in the Snoqualmie Ridge area.

Table ES-5

Historical Water Supply and System Demand

Year	Canyon Springs Supply (MG)	North Wellfield Supply (MG)	South Wellfield Supply (MG)	Total Supply (MG)	Average Day Demand (gpm)
2011	127.5	248.7	65.9	442.1	841
2012	128.8	239.1	104.2	472.2	896
2013	143.0	297.2	66.1	506.3	963
2014	156.1	300.7	79.3	536.0	1,020
2015	350.2	139.2	29.8	519.2	988
2016	398.7	90.7	0.0	489.4	929
2017	360.5	148.2	52.9	561.6	1,068

Per Capita Demands

Table ES-6 show the computation of the existing residential population per capita demand based on 2017 data. The existing per capita demand of 86 gallons per day (gpd) was calculated by adding the estimated distribution system leakage with the residential consumption.

Table ES-6

Existing Residential Population Per Capita Demand

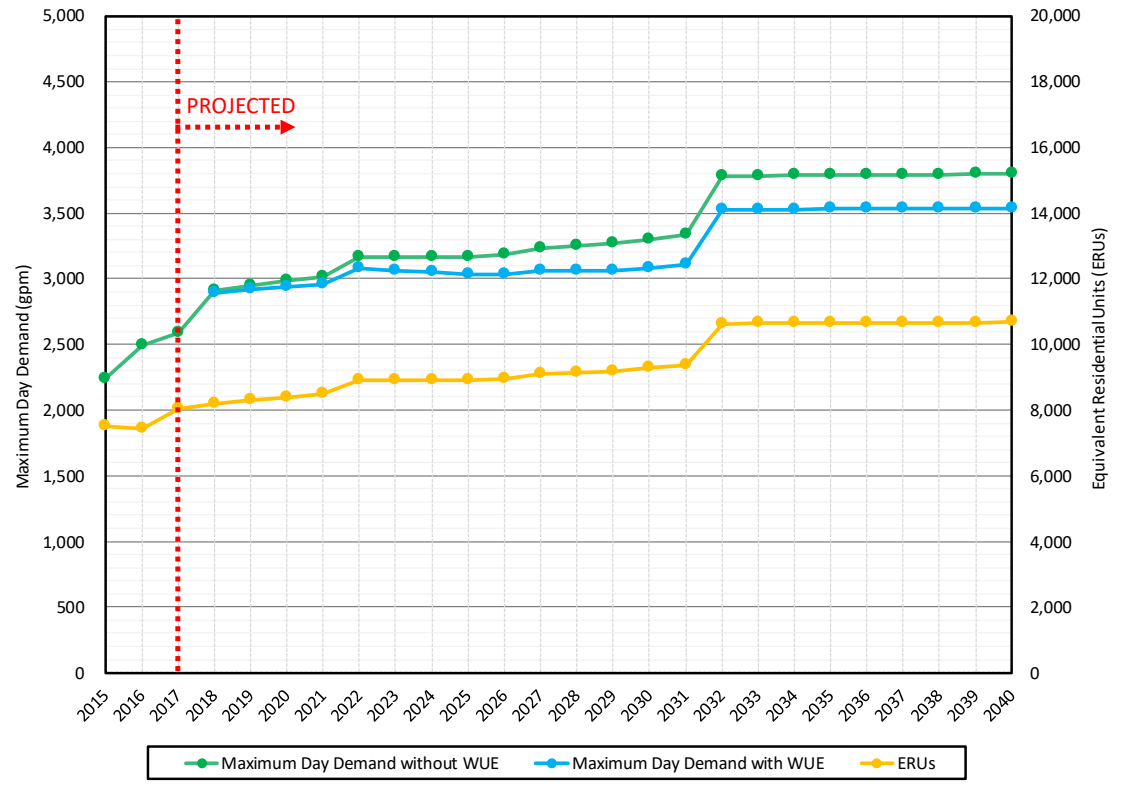
Calculated 2017 Residential Population Served	14,322
2017 Total Annual Residential Population Consumption (gallons)	441,469,877
Existing Residential Population Per Capita Consumption (gpd/capita)	84
2017 Estimated Residential Population DSL (gallons)	8,260,265
2017 Total Annual Residential Population Demand (gallons)	449,730,142
Existing Residential Per Capita Demand (gpd/capita)	**86**

Future Water Demands and Water Supply

Overall water demand within the City's system is expected to increase by approximately 32 percent of 2017 demand by the end of the 20-year planning period. Future demand projections were calculated with and without water savings expected from implementing the City's water use efficiency measures. **Chart ES-1** shows the Maximum Day Demand and ERU projections for the system through the end of the 20-year planning period.

Chart ES-1

Maximum Day Demand and ERU Projections (Demand Basis)



Water Source and Quality

Water is supplied to the City from Canyon Springs, the North Wellfield, and the South Wellfield. Canyon Springs is located in a deep canyon on the north hillside bank of the North Fork of the Snoqualmie River and has a capacity of 898 gallons per minute (gpm).

The North Wellfield consists of Wells No. 6, No. 7, and No. 8 located in the northernmost area of the City's water service area. Due to interference, Wells No. 6 and No. 8 are not operated simultaneously, so the wellfield has a combined capacity of approximately 1,800 gpm.

The South Wellfield consists of Wells No. 1R and No. 2 on property currently occupied by Mount Si High School. The wellfield has a capacity of 563 gpm.

All City water sources are chlorinated. The North Wellfield Water Treatment Plant (WTP) and South Wellfield WTP remove iron and manganese from the water produced by their respective wells. The North Wellfield WTP also treats the water to remove arsenic. At the North Wellfield WTP, a sodium hypochlorite solution is added to the raw water for oxidation, while ferric chloride is added to the raw water to coprecipitate with arsenic. Three filter trains are used to remove iron, manganese, and arsenic that binds with the ferric chloride.

At the South Wellfield WTP, sodium hypochlorite is used for oxidation and then filtered with pyrolusite media to remove iron and manganese compounds. Canyon Springs water currently is treated with sodium hypochlorite generated onsite. The sodium hypochlorite is injected into the 12-inch PVC transmission main from the springs 1,320 feet upstream of the disinfection building.

Operations and Maintenance

The City's operations and maintenance organization is staffed by well qualified, technically trained personnel. City staff regularly participate in safety and training programs to keep abreast of the latest changes in the water industry and ensure a smooth and safe operation of the water system. The current staff have effectively operated and maintained the water system in the past. However, to optimize the preventive maintenance program and operations of the water system, additional personnel are recommended. As the water system expands in the future and continues to age, additional staff will be required. The City plans to add staff to meet the increased requirements from system expansion as the budget allows.

The City has taken several steps to prepare for emergency situations. Vulnerability Assessment and Emergency Response Plans (ERP) have been prepared that conform to the requirements of the Bioterrorism Act of 2002. Per America's Water Infrastructure Act (AWIA) of 2018, the City is required to complete an all-hazards risk and resilience assessment (RRA) and ERP. The City's RRA was completed in June 2021. The ERP is currently being updated and will be completed in December 2021.

Water System Evaluation

The existing water system was evaluated to determine its ability to meet the policies and design criteria of the City and those mandated by DOH. The results of the evaluation are summarized as follows.

- The City will have a source capacity deficiency of approximately 41 gpm by 2030, increasing to 537 gpm at the end of the 20-year planning period. As part of a long-rang water supply plan, the City is considering implementation of an Aquifer Storage and Recovery program and other improvements to resolve the deficiency.

- Canyon Springs needs collector box upgrades and new access trail/road to replace the aging existing infrastructure. The City also is considering installation of a BPS to maximize source output.
- The City plans to install permanent backup power with an automatic transfer switch for Well Nos. 6 and 7.
- The South Wellfield's on-site hypochlorite generation system is aging. The City plans to upgrade the system to standardize with the Canyon Springs and North Wellfield WTP manufacturer.
- The 705 BPS is equipped with four pumps: two fixed speed and two variable frequency drives (VFDs). The City plans to retrofit the fixed speed pumps with VFDs to allow for more efficient operation.
- The City plans to install a fifth pump at the 1040 BPS to increase the capacity by approximately 625 gpm.
- The City plans to construct a new 1.6 million gallon (MG) 599 Reservoir No. 2 to resolve the storage deficiency for the 20-year planning period.
- The City plans to construct a new 1040 Reservoir No. 3 by 2030 to remedy storage deficiencies in the 1040 Zone operating area. The 1.8 MG capacity will remedy storage deficiencies in both the 1040 and 705 Zones.
- The City's Reinig Road PRV/PSV has been installed but is currently inactive. The City plans to activate this PRV/PSV and install a supervisory control system. An additional PRV also is recommended to supply water from the 705 Zone to the 599 Zone.
- Several pressure zone improvements, consisting of new water main, PRVs, and valve configuration changes, need to be implemented to address high and low pressures.
- Several areas of the system require water main replacements to resolve deficiencies related to low fire flows, aging water main, and undesirable materials.

Proposed Water System Improvements and Financing Plan

Improvements to the water system are necessary, primarily to resolve existing system deficiencies, but also to accommodate the increase in water demands from future growth. Improvements identified for the first 11 years (2020 through 2030) are estimated to cost approximately $48.2M. The 21-year period through 2040 includes $72.9M in total project costs.

The financial analysis is intended to illustrate the feasibility of funding the operation and maintenance and capital improvements recommended for the water system in the next 10 years. The results of the financial analysis indicate that rates must increase to provide sufficient revenue to cover all utility financial obligations. The City completed a rate study in 2020 that was based on the CIP presented in **Table ES-7**. The results of the rate study indicated that beginning in 2022, annual rate increases of 4.80 percent through 2030 should provide for continued financial viability while maintaining affordable rates.

Table ES-7

Proposed Improvements Implementation Schedule

No.	Description	Estimated Cost (2020 $)	Schedule of Improvements Planned Year of Project and Estimated Cost in 2020 $										
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030-2040
	Water Main Improvements												
WM1	Annual Water Main Replacement Program[1]	$21,036,000				$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$10,536K
WM2	SR 202 Bridge Water Main Replacement Feasibility Analysis	$75,000	$50K	$25K									
WM3	SR 202 Bridge Water Main Replacement	$1,424,000					$475K	$949K					
WM4	Infrastructure Improvement Program/Street Preservation Program	$8,500,000	$2,500K	$1,870K	$3,570K	$560K							
WM5	Investigation and Potential Replacement of Fisher Ave Water Main	$200,000					$200K						
WM6	Investigation and Potential Replacement of Denny Peak Water Main	$80,000						$80K					
WM7	SE 76th St in Ernie's Grove	$780,000											$780K
WM8	Williams Addition Water System	$580,000	$145K	$218K	$218K								
WM9	Spruce St SE Water Main Replacement	$550,000	$138K	$206K	$206K								
WM10	SE King St Water Main Replacement	$30,000					$30K						
WM11	Maple Ave SE Water Main Replacement	$240,000					$240K						
WM12	Mill Site WM Loop (Developer Funded)	$5,770,000			$1,443K	$2,885K						$1,443K	
	Pressure Zone Improvements												
PZ1	599 Zone Evaluation and Reinig Road PRV/PSV Station Activation	$10,000	$10K										
PZ2	SCADA for Reinig Rd PRV/PSV Station	$110,000	$110K										
PZ3	705 Zone to 599 Zone Conversion	$100,000				$100K							
PZ4	599 Zone to 705 Zone Conversion[2]	$90,000				$90K							
	PRV Improvements												
PRV1	670 Zone PRV Adjustment[2]	$19,000	$19K										
PRV2	1180/1040 Zone PRV at Raines Ave SE and Water Main	$830,000											$830K
PRV3	PRV Recirculation Study and Improvements	$140,000				$140K							
	Facility Improvements												
F1	1040 BPS Additional Pump	$390,000	$390K										
F2	South Wellfield VFDs	$50,000	$50K										
F3	Canyon Springs Improvements	$5,520,000								$920K	$2,300K	$2,300K	
F4	South Wellfield Chlorine Contact Time Improvements	$800,000				$267K	$533K						
F5	South Wellfield On-Site Sodium Hypochlorite Generation Improvements	$470,000				$157K	$313K						
F6	Permanent Backup Generator for South Wellfield/South Wellfield Treatment Plant	$1,020,000				$1,020K							
F7	Permanent Backup Generator for Well No. 6 and Well No. 7 (North Wellfield)	$1,020,000										$1,020K	
F8	Retrofit 705 BPS with VFDs	$70,000					$70K						
F9	705 BPS Additional Pump	$390,000					$390K						
F10	Install Drain System for 1040 Reservoir Valve Vaults	$30,000				$30K							
F11	Reservoir Siting Study	$40,000				$40K							
F12	1.6 MG 599 Reservoir No. 2 (Partially Developer Funded)	$3,970,000					$662K	$1,654K	$1,654K				
F13	1.8 MG 1040 Reservoir No. 3	$4,470,000						$745K	$1,863K	$1,863K			
F14	0.2 MG 1172 Reservoir No. 2/799 Reservoir	$1,180,000									$393K	$787K	
	Miscellaneous Improvements												
M1	Source of Supply Improvements - Study	$200,000	$200K										
M2	Source of Supply Improvements - Implementation	$2,000,000		$1,000K	$1,000K								
M3	Risk & Resiliency Assessment and Emergency Response Plan[3]	$60,000	$30K	$30K									
M4	Water Use Efficiency Audit and Programming	$299,000	$46K	$46K	$12K	$12K	$12K	$12K	$12K	$12K	$12K	$12K	$115K
M5	Water System Plan Update	$805,000										$403K	$403K
M6	Pump Condition Evaluation	$60,000				$60K							
Total Estimated Costs of City Funded Improvements		**$55,653,000**	**$3,688K**	**$3,395K**	**$5,005K**	**$3,975K**	**$4,094K**	**$4,113K**	**$4,201K**	**$4,294K**	**$4,205K**	**$6,021K**	**$12,664K**
Total Estimated Costs of Developer Funded Improvements		**$7,755,000**			**$1,443K**	**$2,885K**	**$331K**	**$827K**	**$827K**			**$1,443K**	

1 = Annual project cost can be adjusted to meet City budget goals. Remainder of project costs can be shifted to the 2040+ horizon.

2 = Project should be completed in the short-term due to pressures below 30 psi and/or significant impact on available fire flow.

3 = America's Water Infrastructure Act of 2018 requires development or update of the Risk and Resilience Assessment by June 30, 2021, and the Emergency Response Plan by December 30, 2021.

1 | INTRODUCTION

WATER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Snoqualmie (City) is a municipal corporation that owns and operates a public water system that covers its corporate boundaries and some areas outside the City's corporate boundaries. Water system data on file at the Washington State Department of Health (DOH) for the City's system is shown in **Table 1-1**.

Table 1-1

Water System Ownership Information

Information Type	Description
System Type	Group A - Community - Public Water System
System Name	Snoqualmie Water
County	King
DOH System ID Number	81080C
Address	PO Box 987 Snoqualmie, WA 98065
Contact	Jeff Hamlin, PE Project Manager/Operations Manager - Utilities
Contact Phone Number	(425) 831-4919

OVERVIEW OF EXISTING SYSTEM

In 2017, the City provided water service to an average of approximately 4,911 customer connections, or 8,027 equivalent residential units (ERUs), within the City's water service area. The City limits comprise an area of approximately 7.4 square miles, and the existing retail water service area is approximately 14.6 square miles. The 2017 residential population served by the water system was approximately 14,322 people, whereas the residential population residing in the City limits was approximately 13,210 people. The 2017 water system employment was 3,718 jobs.

The City's water supply currently is provided by two wellfields (with a total of five wells) and the Canyon Springs source. Water from Canyon Springs is treated with hypochlorite that is injected into the 12-inch ductile iron (DI) transmission main from the springs. The wells in the North Wellfield (Wells No. 6, No. 7, and No. 8) are chlorinated and have a filtration process for the removal of iron, manganese, and arsenic. The wells in the South Wellfield (Wells No. 1-R and No. 2) also are chlorinated and have a filtration process for the removal of iron and manganese. Water storage is provided by 6 reservoirs that have a total capacity of approximately 4.9 million gallons (MG). The City's distribution system has 10 pressure zones, with 19 pressure reducing stations. The system has 5 booster pump stations and approximately 69 miles of water main. A summary of the 2017 water system data is shown in **Table 1-2**.

Table 1-2

2017 Water System Data

Description	Data
Water System Residential Population	14,322
Water System Employment Population	3,718
Water Service Area	14.6 square miles
Total Connections	4,911
Total ERUs	8,027
Demand per ERU	192 gallons per day
Annual Consumption	551,272,537 gallons
Average Day Demand	1,068 gpm
Distribution System Leakage	1.8%
Maximum Day/Average Day Demand Factor	2.42
Peak Hour/Maximum Day Demand Factor	1.66
Number of Pressure Zones	10
Number of Well Sources	5
Number of Spring Sources	1
Total Capacity of City Sources	3,898 gpm
Number of Pump Stations and Total Capacity	5 (15,993 gpm)
Number of Reservoirs and Total Capacity	6 (4.9 MG)
Number of Pressure Reducing Stations	19
Total Length of Water Main	69 miles

AUTHORIZATION AND PURPOSE

The City authorized RH2 Engineering, Inc., (RH2) to prepare this Water System Plan (WSP) as required by state law under Washington Administrative Code (WAC) 246-290-100. In accordance with WAC 246-290-100, the WSP shall be updated and submitted to DOH every 10 years. This WSP has been written to meet 10-year planning requirements. The previous WSP was prepared for the City in 2013. The purpose of this updated WSP is as follows:

- To evaluate existing water demand data and project future water demands.
- To analyze the existing water system to determine if it meets minimum requirements mandated by DOH and the City's own policies and design criteria.
- To identify water system improvements that resolve existing system deficiencies and accommodate the system's future needs for at least 20 years into the future.
- To prepare a schedule of improvements that meets the goals of the City's financial program.

- To document the City's existing water rights, their current status, and future requirements.
- To evaluate past water quality and identify water quality improvements, as necessary.
- To document the City's operations and maintenance program.
- To prepare water use efficiency, cross-connection control, wellhead protection, and water quality monitoring plans.
- To comply with all other WSP requirements of DOH.

SUMMARY OF WSP CONTENTS

A brief summary of the content of the chapters in the WSP is as follows.

- The **Executive Summary** provides a brief summary of the key elements of this WSP.
- **Chapter 1** introduces the reader to the City's water system, the objectives of the WSP, and its organization.
- **Chapter 2** presents the water service area, describes the existing water system, and identifies adjacent water purveyors.
- **Chapter 3** presents related plans, land use, and population characteristics.
- **Chapter 4** identifies existing water demands and projected future demands.
- **Chapter 5** presents the City's operational policies and design criteria.
- **Chapter 6** discusses the City's water sources, water rights, and water quality monitoring.
- **Chapter 7** discusses the water system analyses and existing system deficiencies.
- **Chapter 8** discusses the City's operations and maintenance program.
- **Chapter 9** presents the proposed water system improvements, their estimated costs, and the schedule for implementation.
- **Chapter 10** summarizes the financial status of the water system and presents a plan for funding the water system improvements.
- The **Appendices** contain additional information and plans that supplement the main chapters of the WSP.

DEFINITION OF TERMS

The following terms are used throughout this WSP.

Capital Facilities Charge/General Facilities Charge: A one-time fee paid by a property owner when connecting to the City's water system. This fee pays for a new customer's equitable share of the cost of the existing system. This fee offsets the costs of providing water to new customers and recognizes that the existing water system was largely built and paid for by the existing customers.

Consumption: The true volume of water used by the water system's customers. The volume is measured at each customer's connection to the distribution system.

Connection Charge: A one-time fee paid by a property owner when connecting to the City's system that is made up of both the Capital Facilities Charge and the Meter Installation Charge.

Cross-Connection: A physical arrangement that connects a public water system, directly or indirectly, with facilities that could present the potential for contaminating the public water system.

Demand: The quantity of water required from a water supply source over a period of time to meet the needs of domestic, commercial, industrial, and public uses, and provide enough water to supply firefighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (MGD) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period. Flow rates pertinent to the analysis and design of water systems are as follows:

- **Average Day Demand (ADD)**: The total amount of water delivered to the system in a year divided by the number of days in the year.
- **Maximum Day Demand (MDD)**: The maximum amount of water delivered to the system during a 24-hour time period of a given year.
- **Peak Hour Demand (PHD)**: The maximum amount of water delivered to the system, excluding fire flow, during a 1-hour time period of a given year. A system's peak hour demand usually occurs during the same day as the MDD.

Distribution System Leakage (DSL): Water that is measured as going into the distribution system but not metered as going out of the system.

Equivalent Residential Units (ERUs): One ERU represents the amount of water used by one single-family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERUs by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Existing Service Area: The specific area within the retail service area where the City already provides direct service, remote service, or where service connections are currently available.

Fire Flow: The rate of flow of water required during firefighting, which is usually expressed in terms of gpm.

Future Service Area: The specific area within the retail service area where the City currently does not provide direct service, remote service, or where service connections are currently not available.

Head: A measure of pressure or force exerted by water. Head is measured in feet and can be converted to pounds per square inch (psi) by dividing feet by 2.31.

Head Loss: Pressure reduction resulting from pipeline wall friction, bends, physical restrictions, or obstructions.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressure pipeline would rise in a vertical open-end pipe.

Local Facilities Charge: A one-time fee paid by a property owner when connecting to the City's water system. The local facilities charge provides for reimbursement of a pro rata portion of the original cost of water system local distribution extensions.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-300, Table 3.

Meter Installation Charge: The installation charge or hook-up fee that is paid by a property owner to reimburse the City for the cost incurred to make the physical connection to the water system. This cost includes both direct and indirect costs for installing the service line off the system's water main up to and including the City-owned water meter and advanced metering infrastructure (AMI) equipment.

Potable: Water suitable for human consumption.

Pressure Zone: A portion of the water system that operates from sources at a common hydraulic elevation. For example, the 599 Zone refers to the City's lower pressure zone, which has a reservoir with an overflow elevation of 599 feet.

Purveyor: An agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or persons or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

Retail Service Area: The specific area where the City has a duty to serve new service connections under certain conditions.

Service Area: The largest area identified on a map where the City currently provides direct service and remote service, and the area it plans to serve.

Supply: Water that is delivered to a water system by one or more supply facilities, which may consist of supply stations, booster pump stations, springs, and wells.

Storage: Water that is "stored" in a reservoir to supplement the supply facilities of a system and provide water supply for emergency conditions. Storage is broken down into the following five components, which are defined and discussed in more detail in **Chapter 7**: operational storage; equalizing storage; standby storage; fire flow storage; and dead storage.

Wholesale Service Area: The service area of entities with whom the City has a contract to provide wholesale water service. The wholesale service area is part of the City's service area; however, the City has no duty to service the wholesale service area.

LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-3** are used throughout this WSP.

Table 1-3
Abbreviations

Abbreviation	Description
AC	asbestos cement
ADD	Average Day Demand
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
BPS	Booster Pump Station
CCR	Consumer Confidence Report
CIP	Capital Improvement Program
City	City of Snoqualmie
County	King County
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DBP	Disinfection Byproduct
DOH	Washington State Department of Health
DSL	Distribution System Leakage
Ecology	Washington State Department of Ecology
EKCCWSP	East King County Coordinated Water System Plan
EPA	U.S. Environmental Protection Agency
ERU	Equivalent Residential Unit
fps	feet per second
GMA	Growth Management Act
gpm	gallons per minute
HGL	hydraulic grade line
JOA	Joint Operating Agreement
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	milligrams per liter
North Bend	City of North Bend
OFM	Office of Financial Management
OSHA	Occupational Safety & Health Administration
PHD	Peak Hour Demand
PRV	pressure reducing valve
psi	pounds per square inch
PSRC	Puget Sound Regional Council
PSV	pressure sustaining valve
PVC	polyvinyl chloride
RCW	Revised Code of Washington
RTU	remote telemetry unit
Rumbolz	Rumbolz Sunset Water System
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SOC	Synthetic Organic Chemical
SWTR	Surface Water Treatment Rule
TDH	total dynamic head
THM	Trihalomethane
Tribe	Snoqualmie Indian Tribe - Snoqualmie Casino
UGA	Urban Growth Area
USGS	United States Geological Survey
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
Walter Walker	Walter Walker Water Works
WISHA	Washington Industrial Safety & Health Act
WRF	Water Reclamation Facility
WRECO	Weyerhaeuser Real Estate Company
WSP	Water System Plan
WUCC	Water Utility Coordinating Committee
WUE	Water Use Efficiency

2 | WATER SYSTEM DESCRIPTION

INTRODUCTION

This chapter describes the City of Snoqualmie's (City) retail water service area and water service agreements, and provides a thorough description of the water system and its individual components. The results of the evaluation and analyses of the existing water system are presented in **Chapter 7**.

WATER SERVICE AREA

History

The first sources of water supply for the City were from springs and surface streams. The springs and surface streams were supplemented by two shallow wells that are no longer in service. Two earthen reservoirs located near Interstate 90 provided storage for the system. The reservoirs each had a 250,000-gallon capacity, which eventually was reduced by approximately 50 percent due to siltation.

A study conducted in 1945 identified several springs approximately 6 miles east of the City along the North Fork of the Snoqualmie River as possible sources of supply. These possible sources of supply included two sources that are now known as Canyon Springs and Echo Lake. Canyon Springs was identified as a desirable source to develop. In 1950, the City began to utilize this source. Two collection boxes (or spring headworks) collected water from the springs. A 10-inch wooden transmission main was constructed from the springs to the existing distribution system at the intersection of Falls Avenue and River Street. All water collected from the springs in excess of the transmission main capacity was allowed to overflow at the headworks to the North Fork of the Snoqualmie River.

In 1959, 830 linear feet (LF) of wooden main on River Street from Falls Avenue to Olmstead Avenue was replaced with 10-inch asbestos cement (AC) water main. A new 12-inch cast iron (CI) transmission main was constructed from the 10-inch AC water main to a 500,000-gallon reservoir, the 599 Reservoir, in 1961.

In 1968, the Puget Sound Power and Light Company connected to the City's distribution system at the intersection of Bruce Street and Railroad Place. Service was extended about ¾ miles north of the City to serve the Snoqualmie Falls Lodge. Approximately 4,100 LF of 8-inch AC water main was constructed parallel to the railroad track extending to the southwest end of the PSE power station weir. A booster pump station (BPS) and pressure tank also were constructed in 1968 to serve the Johnson Heights hillside development southwest of the City limits.

In 1973, Well No. 1 was constructed on the Mount Si High School property near Park Street. This well was connected to the 10-inch wood transmission main supplying water from the springs. This well was constructed to provide a supplemental source of supply during high demand periods and to provide an emergency backup source of supply.

PRELIMINARY - CITY REVIEW ONLY

In 1982, Puget Western constructed a parallel 12-inch polyvinyl chloride (PVC) water main to the Snoqualmie Falls Lodge to improve fire flow. This water main began at the intersection of Fall and River Streets, and extended northerly along Falls Avenue, west to the highway, and to the Lodge along the highway right-of-way. Also in 1982, the City's water system was extended to Snoqualmie Valley Hospital at the southwest corner of the City. A booster station (384th Avenue SE BPS) and 8-inch water main were constructed to supply the hospital.

In 1984, the 10-inch wood transmission main was replaced with 6.1 miles of 12-inch PVC and ductile iron (DI) water main extending from the intersection of River Avenue and Falls Avenue to the existing Canyon Springs supply. The westerly collector at Canyon Springs was rehabilitated as part of this project. A pressure reducing valve (PRV) also was installed at River Avenue to discharge excess flow to the Snoqualmie River and control the hydraulic grade of the zone.

In 1989, the City's water system was extended to Rattlesnake Ridge to the Snoqualmie Winery site from the 384th Avenue SE BPS. This project consisted of 8-inch, 10-inch, and 12-inch distribution pipe, the Snoqualmie Point BPS, and the 0.4 Million Gallon (MG) 1172 Reservoir.

Weyerhaeuser Real Estate Company (WRECO) initiated development of Snoqualmie Ridge Phase I (SR I) in 1995. Water system facilities, including wells, a water treatment plant (WTP) for treatment of iron and manganese, booster stations, and reservoirs were constructed to provide potable water service to the SR I development. Two wells, Well Nos. 6 and 7, were drilled in 1995 and developed in 1996 at the North Wellfield. The 1040 BPS was constructed in 1996, and the 2.1 MG 1040 Reservoir No. 1 was constructed in 1997. A third well, Well No. 8, was drilled in 2001 and developed in 2002. In 2004, the 1.7 MG 1040 Reservoir No. 2 was constructed adjacent to Reservoir No. 1. Arsenic treatment was added to the WTP in 2006, and in 2008 the 1180-1260 BPS was completed to serve Snoqualmie Ridge Phase II (SR II).

In 2006, Well No. 1-R, a replacement well, was drilled to provide supply to SR I and II, and Well No. 1 was abandoned as part of the upgrades to the high school athletics field. A second well, Well No. 2, was drilled by a developer in 1995 and fully developed in 2009. Together, Well No. 1-R and Well No. 2 make up what is today referred to as the South Wellfield. A small WTP for removal of iron and manganese was constructed as well. This source is located within the 599 Zone in the historic downtown area and allows water to be pumped to the Snoqualmie Ridge area via the 705 BPS.

In 2000, the Washington State Department of Health (DOH) established Canyon Springs as a groundwater source under hydraulic influence of surface water, requiring chlorination of the source. In 2008, the City altered the operational scheme of Canyon Springs. Disinfection was installed upstream of customers and a PRV was added to control pressure in the 599 Zone. Previously, pressure had been controlled by the River Street PRV, which sent excess water into the Snoqualmie River. Excess water is now allowed to flow naturally from the springs to the river.

In 2016, the City decided to proceed with a pressure zone reconfiguration plan. The modifications proposed adding two new PRVs, one located near the intersection of SE 86th Street and 378th Avenue SE, and another near the 384th Avenue SE BPS. This created a new 670 Zone, which eliminated the need for the 709 Zone and the Johnston Heights BPS. An

additional change to the system was made along Reinig Road with the addition of a PRV/pressure sustaining valve (PSV) station; this created a new 636 Zone up to Canyon Springs. At the time of development of this Water System Plan (WSP), all the proposed PRVs had been installed, but only the 670 Zone modifications were being operated. When all modifications are complete and active, the goal is to reduce the hydraulic grade in the downtown area to 599 feet, which will allow the 599 Reservoir to operate with normal fill and draw cycles. Presently, water does not flow out of the 599 Reservoir, because the hydraulic grade of approximately 636 feet keeps the reservoir's altitude valve closed at all times. The City occasionally flushes stagnant water from the reservoir by allowing it to overflow to maintain acceptable water quality in the reservoir.

In 2018, the City constructed the 705 Reservoir No. 2, adjacent to the existing 705 Reservoir, at the 1040 BPS site. The new reservoir provides approximately 130,000 gallons of additional storage for the 705 Pressure Zone and helps moderate the 1040 BPS suction pressure.

The City commissioned a Supervisory Control and Data Acquisition (SCADA) Master Plan in 2016 that identified a 10-year plan of improvements for the City's water and wastewater SCADA systems. Before this plan was written, the SCADA system was based on 1990s technologies, with any upgrades based on the original design. The City has been working to implement this SCADA Master Plan at all of its water and wastewater facilities. The Water Reclamation Facility (WRF) and North Wellfield WTP facilities have had new controllers and SCADA computer systems installed. Remote water and wastewater facility controllers have been upgraded, and communication has moved from private UHF radio to a private government cellular system. These improvements were completed in 2019.

Existing Retail Water Service Area

The City is located in central King County adjacent to the Snoqualmie River, approximately 20 miles east of the Seattle metro area. The City limits encompass an area of approximately 7.4 square miles, as shown on **Figure 2-1**. The City's existing water distribution system extends from Canyon Springs in the east to the western City limits in the Snoqualmie Ridge area. A small portion of the distribution system extends south of Interstate 90 in the Snoqualmie Point area.

The City's existing retail water service area, which covers an area of approximately 14.6 square miles, is shown on **Figure 2-1**. The existing retail water service area includes the current City limits and some areas of unincorporated King County. Along the north-south axis of the system, the existing retail water service area is approximately 3.5 miles long. Along the east-west axis, the existing retail water service area is approximately 8.3 miles long. The City's wholesale service area, which consists of the Walter Walker Water Works (Walter Walker) system, is also shown on **Figure 2-1**.

The City's existing water rights can be used throughout the defined water service area per the 2003 Municipal Water Law.

Topography

The topography of the City's water service area varies greatly in elevation. Elevations are generally lowest near the Snoqualmie River and slope upwards significantly to the southwest.

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The lowest existing services are in the historic downtown area in the 599 Zone, at an elevation of approximately 415 feet. The highest existing services are located in the Snoqualmie Ridge area in the 1260 Zone, at an elevation of approximately 1,140 feet. While the historic downtown area is relatively flat, steep slopes are prevalent in the higher elevations of the water service area, around Snoqualmie Falls, and in some other locations.

Geology

The geology within the City limits and Urban Growth Area (UGA) is quite diverse. The City's service area is located within the foothills of the Cascade Mountains, and its geology is influenced by bedrock, folding, faulting, and deposition during continental glaciations and non-glacial periods.

Bedrock in the area consists of intrusive igneous, volcanic, and continental and marine sedimentary units. Bedrock crops out near Snoqualmie Falls, on the flanks of Rattlesnake Mountain, and as an isolated island protruding from the valley floor. Snoqualmie Falls is created by the current course of the Snoqualmie River flowing over resistant volcanic bedrock. Areas with bedrock at the surface are not susceptible to liquefaction.

Several faults (active and dormant) have been mapped within the water service area. These faults include several strands of the Rattlesnake Mountain Fault, the Lake Alice Fault, the Tokul Creek Fault, the Griffin Creek Fault, and the Snoqualmie Valley Fault. Faulting has led to the formation of the Snoqualmie Basin, which is a structural depression that has been filled with a thick sequence of younger (Quaternary Period – 2.6 million years old to present) deposits that continues to this day.

Unconsolidated sediments found at the ground surface and in the subsurface under the water service area are lumped into sediments deposited during non-glacial and glacial periods over the last 185,000 years. From youngest to oldest, those deposits include young non-glacial deposits (present to 13,000 years ago), deposits of the Vashon Stade of the Fraser Glaciation (13,000 to 15,000 years ago), deposits of the Olympia non-glacial period (15,000 to 60,000 years ago), deposits of the Possession Glaciation (60,000 to 80,000 years ago), deposits of the Whidbey non-glacial period (80,000 to 125,000 years ago), and finally deposits of the Double Bluff Glaciation (125,000 to 185,000 years ago). Unconsolidated sediments older than the Double Bluff Glaciation are not broken out due to the lack of outcrop at the surface.

The valley floor adjacent to the Snoqualmie River and its tributaries is composed of alluvium and peat sediments. The valley floor sediments have a moderate to high liquefaction susceptibility. During an earthquake, liquefaction can cause uneven settling of these sediments, which has the potential to damage water system infrastructure.

The upland areas, such as Snoqualmie Ridge, typically consist of Vashon Glacial Till, overlying Vashon Advance Outwash, overlying Olympia Beds, overlying deposits of the Possession Glaciation, which are often exposed in the ravines due to erosion. These sediments typically have a low to very low liquefaction susceptibility. Older unconsolidated units are primarily only found in the subsurface and do not crop out.

Near the end of the Vashon Stade of the Fraser Glaciation, the continental glacier was retreating back to the north, but it still blocked the flow of water out of the Strait of Juan de

Fuca. During this period a large lake, named Glacial Lake Snoqualmie, formed in the area. The far north portion of the service area to the east of the Snoqualmie River includes the Tokul Delta. The Tokul Delta is composed of a thick sequence of Vashon Recessional Outwash sediments that were deposited by recessional outwash rivers flowing along the base of the foothills adjacent to the glacial ice as they built a delta into Glacial Lake Snoqualmie.

Numerous landslide deposits have been mapped within the City's service area. Landslides often originate on the margins of the uplands, with movement oriented toward the bottom of ravines or toward the valley floor. Landslide deposits, if still active, have the potential to impact water system infrastructure.

INVENTORY OF EXISTING WATER FACILITIES

This section provides a detailed description of the existing water system and the current operation of the facilities. The analysis of the existing water facilities is presented in **Chapter 7**. Additional information on the City's existing water system facilities is included on the DOH Water Facilities Inventory (WFI) form in **Appendix A**.

Pressure Zones

The City serves customers within an elevation range of approximately 415 feet above sea level in the historic downtown area to approximately 1,140 feet above sea level on the west side of the system in the Snoqualmie Ridge area. The wide elevation range requires that the water pressure be increased or reduced to maintain pressures that are safe and sufficient to meet the flow requirements of the system. The City achieves this by dividing the water system into ten different pressure zones as shown on **Figure 2-1**. The pressure in each zone is regulated by reservoir levels, pressure reducing station settings and other control valve settings, pump settings, or a combination of these, as illustrated in the hydraulic profile (**Figure 2-2**).

599 Zone

The 599 Zone is the City's largest pressure zone by area and serves the lowest elevations in the historic downtown area. The zone primarily is supplied water from Canyon Springs on the far east side of the system. Under high demand conditions, the South Wellfield, located near Mount Si High School, also can provide supply to the 599 Zone. In emergency conditions when the sources of supply are offline or cannot keep up with demand, the zone also can be supplied water via PRVs from the 799, 705, and 670 Zones. The 599 Zone currently serves customers within an elevation range of approximately 415 feet to 525 feet.

Although referred to as the 599 Zone due to the 599-foot overflow elevation of the 599 Reservoir, the zone is currently operating at a hydraulic grade line (HGL) of approximately 636 feet due to the pressure setpoint at the Canyon Springs Transmission Main PRV. Eventually, the City intends to activate the new Reinig Road PRV/PSV, which will reduce the hydraulic grade in the downtown area to 599 feet.

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Snoqualmie Ridge Pressure Zones

The Snoqualmie Ridge area is served by the 705, 800, 890, 1040, 1180, and 1260 Pressure Zones. All water consumed in the Snoqualmie Ridge area is supplied through the 705 BPS or from the North Wellfield.

705 Zone

The 705 Zone serves customers on both sides of the Snoqualmie River, within an elevation range of approximately 420 feet to 595 feet. The 705 Zone serves the lower elevation customers in the Snoqualmie Ridge area, as well as all connections north of the State Route (SR) 202 bridge on the north side of the Snoqualmie River, including the Salish Lodge and WRF. Water from Canyon Springs and the South Wellfield can be supplied to the zone via the 705 BPS. The North Wellfield pumps water directly to the 705 Zone. The two 705 Reservoirs, located on the same site as the 1040 BPS, establish the pressure within the zone and moderate the 1040 BPS suction pressure.

800 Zone

The 800 Zone is located along the Snoqualmie Parkway, to the east of Fisher Creek Park and south of the Snoqualmie Ridge Golf Course. Water can be supplied to the zone through two PRVs from the southernmost portion of the 890 Zone, or through PRVs located in the 1040 BPS. This pressure zone supplies water to customers within an elevation range of approximately 580 feet to 695 feet.

890 Zone

The 890 Zone is comprised of three hydraulically isolated areas in the Snoqualmie Ridge area, each operating at a hydraulic grade of 890 feet.

The first area is located near the northwest corner of the 1040 Pressure Zone and is supplied water from the 1040 Zone through two PRVs. This area of the 890 Zone provides water to residences along SE Burke Street, Douglas Avenue SE, SE Cochrane Street, and Silent Creek Avenue SE. These customers are located within an elevation range of approximately 740 feet to 795 feet.

The second area of the 890 Zone is located near the northeast corner of the 1040 Zone along Whitaker Lane SE and SE Kendall Peak Street. Water supply is provided from the 1040 Zone through a single PRV station. Customers in this area are located within an elevation range of approximately 720 feet to 765 feet.

The third and largest area of the 890 Zone is located between the 1040 Zone and the 800 Zone. Customers are located within an elevation range of approximately 680 feet to 800 feet. Water can be supplied to this area of the 890 Zone through two PRVs from the 1040 Zone, or through a PRV located in the 1040 BPS.

1040 Zone

The 1040 Zone provides water to a large portion of the Snoqualmie Ridge area. It is the City's second largest pressure zone by area, and over 50 percent of the City's consumption occurs in

this zone. The two 1040 Reservoirs, with a combined storage volume of approximately 3.8 MG, are located in this zone and provide the majority of the water storage for the Snoqualmie Ridge area. The sole source of supply to the zone is the 1040 BPS, which pumps water from the 705 Zone. Customers in the 1040 Zone are located within an elevation range of approximately 730 feet to 930 feet.

1180 Zone

The 1180 Zone is a closed zone in the Snoqualmie Ridge area located to the south of the 1040 Zone. It provides water predominantly to residential customers and the Snoqualmie Valley Hospital. Service elevations range from approximately 945 feet to 1,070 feet. Water is supplied to the zone at a hydraulic grade of 1,180 feet from the 1180-1260 BPS, which pumps water from the 1040 Zone. If the 1180 pumps in the BPS are taken offline, water can be supplied to the 1180 Zone through two PRVs from the 1260 Zone.

1260 Zone

The City's highest pressure zone, the 1260 Zone, is located in the southwestern corner of the Snoqualmie Ridge area, immediately north of the Snoqualmie Valley Hospital. The 1260 Zone is a closed zone, with pressure maintained by the 1180-1260 BPS. Customers in the zone are located within an elevation range of approximately 1,015 feet to 1,140 feet. There is currently no emergency supply of water for this zone in the event that the 1260 Zone pumps in the 1180-1260 BPS are offline.

South Pressure Zones

The 670, 799, and 1172 pressure zones are located to the south of the 599 Zone. All water consumed in these zones is supplied through the 384th Avenue SE BPS.

670 Zone

The 670 Zone supplies water to the Johnston Heights development and surrounding neighborhoods. Water is supplied to the zone via a PRV from the 799 Zone. Located to the southwest of the 599 Zone, the 670 Zone currently serves customers within an elevation range of approximately 440 feet to 595 feet.

799 Zone

The 799 Zone is a small pressure zone located to the south of the 599 Zone, which is typically supplied water via a PRV from the 1172 Reservoir. The 384th Avenue SE BPS discharges into the 799 Zone, and the Snoqualmie Point BPS pumps water out of the 799 Zone to the 1172 Zone. The 799 Zone provides water to customers in an elevation range of approximately 440 feet to 620 feet.

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1172 Zone

The 1172 Zone is the City's southernmost zone, with all existing infrastructure located south of Interstate 90 (I-90) in the Snoqualmie Point Park area. The 1172 Reservoir, which is located within the zone, provides storage that can be utilized in the 1172, 799, 670, and 599 Zones. The reservoir, which is filled by the Snoqualmie Point BPS that pumps water from the 799 Zone, sets the hydraulic grade for the zone. There is currently only one service connection in the 1172 Zone: the restroom at Snoqualmie Point Park, which is located at an elevation of approximately 1,075 feet.

Supply Facilities

Water is supplied to the City's system from Canyon Springs, the North Wellfield, and the South Wellfield. A summary of the City's sources of supply is shown in **Table 2-1**. Additional information on the City's sources of supply, water treatment, and water quality monitoring is contained in **Chapter 6**.

Table 2-1

Supply Facilities Summary

Facility	Pressure Zone	Year Installed	Use	Existing Capacity (gpm)	Well Depth (feet)	Water Treatment
Canyon Springs	599 Zone	1950s	Active	898	N/A	Chlorination
North Wellfield[1]						
Well No. 6	705 Zone	1996	Active	550	589	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 7	705 Zone	1996	Active	550	541	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 8	705 Zone	2002	Active	1,250	694	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
South Wellfield[2]						
Well No. 1-R	599 Zone	2006	Active	600	557	Chlorination, Filtration (Iron and Manganese Removal)
Well No. 2	599 Zone	2009	Active	600	564	Chlorination, Filtration (Iron and Manganese Removal)

1 = Well No. 6 cannot be run simultaneously with Well No. 8, so the maximum combined capacity of the North Wellfield is approximately 1,800 gpm.
2 = The capacity of the South Wellfield is currently limited to 563 gpm by the South Wellfield WTP.

Water Supply and Treatment

All City water sources are chlorinated. The North Wellfield WTP and South Wellfield WTP remove iron and manganese from the water produced by their respective wells. The North Wellfield WTP also treats the water to remove arsenic. The City currently is planning to implement chlorination system improvements for the South Wellfield to address taste and odor issues.

Canyon Springs

The primary source of supply to the 599 Zone is Canyon Springs, located 6 miles east of the City. Canyon Springs has an existing capacity of approximately 898 gallons per minute (gpm). The spring is located in a deep canyon on the north hillside bank of the North Fork of the Snoqualmie River, approximately 60 feet above the riverbed on 20 acres owned by the City. The adjacent forestland is owned by THR LLC. Access to the springs is limited along a trail that is contained within an easement which parallels the transmission main from the springs.

Two intakes were constructed in the 1950s to collect the spring water. The first intake consists of a reinforced concrete retaining wall that acts as a dam to contain the spring water. The retaining wall was backfilled with select material to encase the 24-inch perforated concrete collection pipe and provide support for the hillside soils covering the spring source. A sloped concrete slab seals the spring source from infiltration of surface water. Water is collected in a concrete spring box that has a valved connection to the 12-inch transmission main.

The second intake is located approximately 580 feet downstream along the transmission main. The water at this location is collected by an 8-inch perforated concrete pipe placed in an interception hillside trench. The perforated pipe is encased in gravel material. The sloped surface of the hillside was covered with silty soil material to protect the spring water from surface water contamination. The collected spring water is piped to a buried reinforced concrete spring box complete with a valved supply connection to the 12-inch transmission main.

Canyon Springs water currently is treated with sodium hypochlorite generated onsite. A disinfection building is located adjacent to the PRV vault on SE 70th Street. The disinfection building houses a brine tank, 20 pounds per day (ppd) sodium hypochlorite (NaOCl) generation system, a 315-gallon hypochlorite storage tank, and chemical feed system. The sodium hypochlorite is injected into the 12-inch PVC transmission main from the springs 1,320 feet upstream of the disinfection building. This provides the required chlorine contact time of 6 milligrams-minute per liter (mg-min/L) before the first customer.

The overflow elevation of the main spring collection box is 683.9 feet. The overflow elevation of the second spring collection box is 684.8 feet. The Canyon Springs Transmission Main PRV was constructed in 2008 on SE 70th Street to regulate the pressure supplied to the 599 Zone. Currently, the hydraulic grade in the zone is approximately 636 feet. An additional PRV was installed recently along Reinig Road but is not currently active. Prior to completion of the existing PRV stations, a PRV along River Street regulated zone pressures and disposed of excess water from the springs back into the Snoqualmie River. This PRV is no longer utilized.

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North Wellfield and Water Treatment Plant

The North Wellfield consists of three wells located in the northernmost area of the City's water service area (Wells No. 6, No. 7, and No. 8) that pump water to the 705 Zone. Wells No. 6 and No. 7 were drilled in 1995 and equipped in 1996 to supply the SR I and II developments. Well No. 6 was drilled to a depth of 589 feet and has a 20-foot-deep surface seal of cement grout. Well No. 7 was drilled to a depth of 541 feet and has an 18-foot-deep surface seal of bentonite. The third well, Well No. 8, was drilled in 2001 to a depth of 694 feet and equipped in 2002 with additional upgrades. Well No. 6 has a capacity of approximately 550 gpm, Well No. 7 has a capacity of approximately 550 gpm, and Well No. 8 has a capacity of approximately 1,250 gpm. However, due to interference, Wells No. 6 and No. 8 are not operated simultaneously, so the wellfield facility has a combined capacity of approximately 1,800 gpm. Well No. 8 is equipped with a permanent on-site emergency generator. A portable generator is shared between Wells No. 6 and No. 7.



North Wellfield Water Treatment Plant

The North Wellfield sources are chlorinated and treated at the North Wellfield WTP for arsenic, iron, and manganese. A sodium hypochlorite solution is added to the raw water for oxidation, while ferric chloride is added to the raw water to coprecipitate with arsenic. The sodium hypochlorite is generated onsite and the 100 ppd system includes an electrolyzer panel, brine tank, water softener, and solution storage. Three filter trains, each consisting of eight pyrolusite pressure filter tanks, are used to remove iron, manganese, and arsenic that binds with the ferric chloride. The filter system has a rate of filtration of approximately 8 gpm/square foot of filter media, with a backwash rate of approximately 30 gpm/square foot of filter media. Filter backwash is stored in a three-cell backwash storage tank to be processed by settling and recycling the decant back to the head of the plant. Concentrated backwash waste is sent to the WRF for further treatment and handling.

Chlorine disinfection is provided to kill any bacteria from the filter media and to suppress bacteriological growth in the water storage and distribution system. This is obtained by introducing a 0.8-percent solution of sodium hypochlorite through chemical metering pumps into the water piping upstream of filtration.

The City utilizes reclaimed wastewater for municipal irrigation applications and has the ability to divert raw water from the North Wellfield prior to treatment when additional irrigation supply is needed. In case of emergency, the North Wellfield Treatment Plant is equipped with a 200 kW diesel generator to supply backup power.

South Wellfield and Water Treatment Plant

The South Wellfield, which pumps to the 599 Zone, is located on property currently occupied by Mount Si High School and consists of two wells (Well No. 1-R and No. 2). Each well has an existing capacity of approximately 600 gpm. Well No. 1-R replaced a well drilled in 1973 and was relocated in 2006 for continued use. Well No. 1-R is 557 feet deep, and the 1973 well has been decommissioned. Adjacent to Well No. 1-R is Well No. 2, which is 564 feet deep. The City owns a portable diesel generator that can be used to power the South Wellfield and treatment plant in the event of an emergency.



South Wellfield Water Treatment Plant

At the South Wellfield WTP, the raw water is chlorinated with sodium hypochlorite for oxidation and then filtered with pyrolusite media to remove iron and manganese compounds. The sodium hypochlorite is generated onsite and the system includes a 40 ppd electrolyzer panel, brine tank, water softener, and solution storage. The filter system consists of 6 filter vessels that have a rate of filtration of approximately 8 gpm/square foot of filter media, with a backwash rate of approximately 30 gpm/square foot of filter media. The treatment plant also has space for a potassium permanganate feed system should it be required in the future. The treatment plant has a total capacity of 600 gpm with a 6.2 percent backwash volume, resulting in an actual capacity of 563 gpm.

The South Wellfield has elevated raw water ammonia that can result in taste and odor issues if not properly treated through chlorination and the breakpoint reaction. Ammonia requires a high chlorine dose and extended reaction time to fully react into inert and odor-free compounds. Intermediate byproducts of the chlorine-ammonia reaction can lead to objectionable taste and odor issues. Due to these taste and odor issues, the City prioritizes use of the Canyon Springs and the North Wellfield sources ahead of the South Wellfield. The City has future plans to mitigate the South Wellfield's taste and odor issues with chlorination system improvements and the addition of a dedicated pipeline or detention tank to provide breakpoint chlorination reaction time before the water reaches customers.

The City currently is considering implementation of an Aquifer Storage and Recovery (ASR) program to address future water right shortfalls. The ASR program would involve diverting water from Canyon Springs when excess water is available from that source and recharging it through an existing well into the South Wellfield. Stored water would then be recovered during summer months through normal operation of the North and/or South Wellfields.

Pump Station Facilities

The City's water system has five booster pump station facilities. The 705 BPS, 1040 BPS, and 1180-1260 BPS provide water to pressure zones in the Snoqualmie Ridge area. The 384th Avenue SE BPS and Snoqualmie Point BPS provide water to pressure zones in the

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southern areas of the system. A summary of the pumping facilities is shown in **Table 2-2**, and a detailed description of each facility follows.

Table 2-2

Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Number of Pumps	Pump Type	Pump Motor Size (HP)	Pump Capacity	Has VFDs?	Sum of Pump Capacities (gpm)[1]	Generator
Snoqualmie Ridge Pressure Zones Booster Pump Stations										
705 BPS	599 Zone	705 Zone	1997	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	No	2,400	Kimball Creek LS Diesel Generator
			2008	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	Yes		Portable Diesel Generator
1040 BPS	705 Zone	1040 Zone	1996	4	Vertical turbine	(2) 100	(2) 625 gpm @ 385' TDH	No	2,500	Diesel Generator
						(2) 125	(2) 625 gpm @ 385' TDH	No		
1180-1260 BPS	1040 Zone	1180 Zone	2008	6	Vertical turbine	(1) 10	(1) 155 gpm @ 164' TDH	Yes	4,748	Diesel Generator
						(3) 40	(3) 531 gpm @ 215' TDH	Yes		
						(2) 125	(2) 1,500 gpm @ 210' TDH	No		
		1260 Zone		6	Vertical turbine	(1) 15	(1) 137 gpm @ 245' TDH	Yes	4,445	
						(3) 50	(3) 436 gpm @ 290' TDH	Yes		
						(2) 150	(2) 1,500 gpm @ 290' TDH	No		
South Pressure Zones Booster Pump Stations										
384th Avenue SE BPS	599 Zone	799 Zone	1982	3	Vertical turbine	(2) 20	(2) 200 gpm @ 216' TDH	No	1,600	Natural Gas Generator
					Horizontal end-suction	(1) 125	(1) 1,200 gpm @ 272' TDH	No		
Snoqualmie Point BPS	799 Zone	1172 Zone	1989	2	Submersible	(2) 25	(2) 150 gpm @ 414' TDH	No	300	None

1 = The actual total station capacity is typically less than the sum of pump capacities, due to increased head losses at higher flow rates. Total capacity may also be limited if the BPS electrical system is not designed to run all pumps concurrently.

Snoqualmie Ridge Pressure Zones Booster Pump Stations

705 BPS

The 705 BPS, which supplies water from the 599 Zone to the 705 Zone, is located along the Snoqualmie Parkway, approximately 1,000 feet west of the Parkway's intersection with Railroad Avenue/SR 202. Along with the North Wellfield, it is one of two primary sources of supply to the Snoqualmie Ridge area. The 705 BPS has a total capacity of approximately 2,400 gpm.



705 Booster Station

The BPS, which shares the same site as the Kimball Creek Lift Station, consists of two

buildings, the first of which was constructed simultaneously with the lift station in 1997. This building contains two fixed-speed 60 horsepower (hp) horizontal end-suction centrifugal pumps, each with a capacity of 600 gpm at 175 feet of total dynamic head (TDH). The City plans to retrofit these pumps with variable frequency drives (VFDs) in the future.

A second building was added in 2008 with two additional 60 hp horizontal end-suction centrifugal pumps with VFDs, each with a capacity of 600 gpm at 175 feet TDH. These pumps are tied to the South Wellfield and run to avoid over-pressurizing the historic downtown area when the South Wellfield is operating.

Back-up power for two of the pumps in the 705 BPS is provided by the Kimball Creek Lift Station's permanent diesel generator. Back-up power for the remaining two pumps is provided by a portable diesel generator. A PRV station located near the BPS allows water to be transferred from the 705 Zone to the 599 Zone.

1040 BPS

The 1040 BPS, located within Fisher Creek Park on the south side of the Snoqualmie Parkway, was constructed in 1996. The 705 Reservoirs are located immediately adjacent to the BPS.



1040 Booster Station

The pump station is currently equipped with four fixed-speed vertical turbine pumps with soft starts. Each pump has an individual capacity of 625 gpm at 385 feet TDH. Two of the pumps are equipped with 100 hp motors, and two of the pumps are equipped with 125 hp motors. Water is pumped directly from the two 705 Reservoirs to the 1040 Zone. PRVs are located inside the station that allow water to be transferred from the 1040 Zone to the 890 Zone, 800 Zone, and 705 Zone.

The 1040 BPS is equipped with a pressurized surge tank to mitigate hydraulic transients. A permanent on-site diesel generator is utilized to provide back-up power for the BPS.

1180-1260 BPS

The 1180-1260 BPS was constructed in 2008 on the same site as the 1040 Reservoirs, just south of SE Jacobia Street, between Hancock Avenue SE and SE Keller Street. The BPS was constructed to serve the SR II residential development. Both the 1180 Zone and 1260 Zone are closed zones without storage. Therefore, the BPS must remain running at all times to maintain suitable water pressure in these zones.



1180-1260 Booster Station

The 1180 Zone pumps and 1260 Zone pumps are located in separate banks of six

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pumps each on opposite sides of the building. Each zone has four smaller domestic pumps with VFDs and two larger fixed-speed fire flow pumps that draw suction from the 1040 Zone. The 1180 Zone pump array consists of one 10 hp pump with a capacity of 155 gpm at 164 feet TDH, three 40 hp pumps, each with a capacity of 531 gpm at 215 feet TDH, and two 125 hp pumps, each with a capacity of 1,500 gpm at 210 feet TDH. The 1260 Zone pump array consists of one 15 hp pump with a capacity of 137 gpm at 245 feet TDH, three 50 hp pumps, each with a capacity of 436 gpm at 290 feet TDH, and two 150 hp pumps, each with a capacity of 1,500 gpm at 290 feet TDH. All pumps are of a vertical turbine configuration.

The BPS is equipped with an emergency diesel generator for back-up power. Both the 1180 Zone and 1260 Zone discharges of the booster station are equipped with two surge tanks each to mitigate hydraulic transients. The surge tanks are located in the bottom floor of the station. The BPS also is equipped with a PRV station that allows water to be transferred from the 1260 Zone to the 1180 Zone if the 1180 Zone pumps are out of service.

A chlorine injection facility is located within the 1180-1260 BPS building. A 12.5-percent solution of sodium hypochlorite is stored onsite in a 300-gallon tank. The injection pump is connected to a recirculating pipe that feeds the 1040 Reservoirs. The facility is operated manually based on chlorine residual levels in the 1040 Reservoirs. Levels are sampled daily. The injection pump is turned on when levels drop to 0.6 parts per million (ppm) and is shut off when levels reach 0.8 ppm. Typically, this means the facility operates for 1 or 2 days per week, and only in the summer months.

South Pressure Zones Booster Pump Stations

384th Avenue SE BPS

The 384th Avenue SE BPS, which supplies water from the 599 Zone to the 799 Zone, was built in 1982 to supply the former hospital. The BPS is located at the intersection of 384th Avenue SE and SE 92nd Street. The station is equipped with two 20 hp fixed-speed vertical turbine pumps, each with a capacity of 200 gpm at 216 feet TDH, and one 125 hp fixed-speed horizontal end-suction pump with a capacity of 1,200 gpm at 272 feet TDH. The 384th Avenue SE BPS must be running when the Snoqualmie Point BPS is running.



384th Avenue SE Booster Station

PRV stations located at the BPS site allow water to be transferred from the 799 Zone to the 670 Zone and the 599 Zone. Back-up power is provided by an on-site natural gas generator. In 2011, telemetry and SCADA systems were installed at the 384th Avenue SE Booster Station, in addition to remote telemetry units (RTUs) and programmable logic controllers (PLCs).

Snoqualmie Point BPS



Snoqualmie Point Booster Station

The Snoqualmie Point BPS (also referred to as the Winery BPS) was constructed in 1989, when the City's water system was extended to Rattlesnake Ridge to the Snoqualmie Winery site. The BPS is located on the south side of I-90 in the Snoqualmie Point Park area.

The Snoqualmie Point BPS is equipped with two fixed-speed, 25 hp submersible pumps, each with a capacity of 150 gpm at 414 feet TDH. The BPS supplies water from the 799 Zone to the 1172 Zone to fill the 1172 Reservoir. Because there is no storage in the 799 Zone, the Snoqualmie Point BPS can only operate when the 384th Avenue SE BPS is operating.

The BPS currently is not equipped with back-up power. A PRV station located at the BPS site allows water to be transferred from the 1172 Zone to the 799 Zone.

Storage Facilities

The City's water system has six storage facilities that provide storage to various zones in the system. A summary of the storage facilities is shown in **Table 2-3**, and a detailed description of each facility is provided in the following sections.

PRELIMINARY - CITY REVIEW ONLY

Table 2-3
Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Overflow Elevation (feet)	Diameter (feet)	Height (feet)
599 Zone								
599 Reservoir	South of Cortland Avenue SE	599 Zone	1961	Steel	0.51	599	52	32
Snoqualmie Ridge Pressure Zones								
705 Reservoir No. 1	Fisher Creek Park	705 Zone	1996	Steel	0.03	705	15	24
705 Reservoir No. 2			2018	Steel	0.13		30	24
1040 Reservoir No. 1	South of SE Jacobia St, between Hancock Ave SE and SE Keller St	1040 Zone	1997	Concrete	2.10	1,040	122	24
1040 Reservoir No. 2			2004	Concrete	1.72		110.5	24
South Pressure Zones								
1172 Reservoir	South of Snoqualmie Point Park	1172 Zone	1989	Steel	0.40	1,172	47	31

599 Zone Storage

599 Reservoir

The 599 Reservoir, constructed in 1961, is an above-ground steel tank with a volume of approximately 0.51 MG. The reservoir is located just south of Cortland Avenue SE and provides storage for the 599 Zone. The reservoir is 52 feet in diameter, 32 feet tall, and has an overflow elevation of 599 feet. On-site valves include a 12-inch altitude valve and a 2.5-inch pressure relief valve. The tank was recently recoated.



599 Reservoir

The 599 Reservoir experiences water quality issues because the 599 Zone is typically operated at a hydraulic grade of approximately 636 feet, forcing the altitude valve to remain closed. The City occasionally flushes water from the reservoir to reduce the water age.

The Walter Walker BPS, operated by the private Walter Walker system under a service agreement, is located in a small wooden building on the tank site, immediately south of the 599 Reservoir. The Walter Walker system currently has plans to expand its BPS to include a chlorine injection system.

Snoqualmie Ridge Pressure Zones Storage

705 Reservoirs No. 1 and No. 2

The 705 Reservoirs are located within Fisher Creek Park on the south side of Snoqualmie Parkway, on the same site as the 1040 BPS. Both tanks are of steel construction. The 705 Reservoir No. 1, constructed in 1996, is 15 feet in diameter and 24 feet tall, with an overflow elevation of 705 feet. The capacity of the 705 Reservoir No. 1 is approximately 30,000 gallons. In 2018, the 30-foot-diameter 705 Reservoir No. 2 was constructed adjacent to the original reservoir. The 705 Reservoir No. 2 has a capacity of approximately 130,000 gallons.



705 Reservoir No. 1 and 2

The 705 Reservoirs provide storage for the 705 Zone and establish the hydraulic grade of the zone when the 705 BPS and North Wellfield are not operating. The two reservoirs also act as a sump for the 1040 BPS, moderating the suction pressure for the BPS.

1040 Reservoirs No. 1 and No. 2

The 1040 Reservoirs are located on the same site as the 1040 BPS, just south of SE Jacobia Street between Hancock Avenue SE and SE Keller Street. The reservoirs establish the hydraulic grade for the 1040 Zone and moderate the suction pressure for the 1180-1260 BPS.



1040 Reservoir No. 1

The 1040 Reservoir No. 1 was constructed in 1997, and the 1040 Reservoir No. 2 was constructed in 2004. Both are 24-foot-tall concrete reservoirs with an overflow elevation of 1,040 feet. The 1040 Reservoir No. 1 has a diameter of 122 feet and a capacity of approximately 2.10 MG. The 1040 Reservoir No. 2 has a diameter of 110.5 feet and a capacity of approximately 1.72 MG.



1040 Reservoir No. 2

PRELIMINARY - CITY REVIEW ONLY

The 1040 Reservoir site includes a valve vault that contains shut-off butterfly valves and check valves. Two check valves force circulation of water through Reservoir No. 2, then through Reservoir No. 1.

South Pressure Zones Storage

1172 Reservoir

The 1172 Reservoir is an above-ground steel tank located to the south of Snoqualmie Point Park. The reservoir, which was constructed in 1989, has a diameter of 47 feet and is 31 feet tall, with an overflow elevation of 1,172 feet. The volume of the tank is approximately 0.40 MG. The tank was recently recoated.



1172 Reservoir

The 384th Avenue SE BPS and Snoqualmie Point BPS operate in series to fill the tank. A vault onsite contains two check valves that provide a flow-through pattern that helps to maintain water quality. When the booster pump stations are not operating, the tank supplies water to the 1172 Zone, 799 Zone, and 670 Zone via PRVs. Water also can be transferred to the 599 Zone via a PRV.

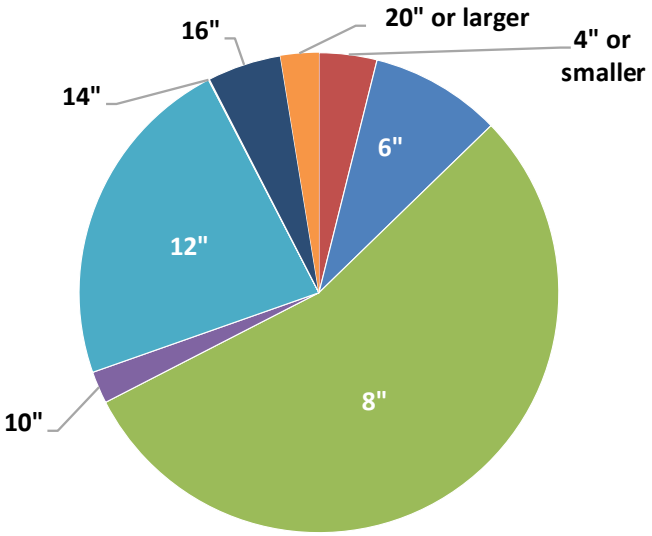
Distribution and Transmission System

The City's water system contains approximately 69 miles of water main ranging from 2 inches to 24 inches in diameter. As shown in **Table 2-4**, most of the water main (approximately 92 percent) within the system is 12 inches in diameter or less. The remaining water main (approximately 8 percent) is 14 inches in diameter or larger.

Table 2-4

Water Main Diameter Inventory

Diameter (Inches)	Length (Feet)	% of Total
4 or smaller	14,151	3.9%
6	32,069	8.8%
8	198,496	54.7%
10	7,872	2.2%
12	82,597	22.8%
14	227	0.1%
16	18,077	5.0%
20 or larger	9,338	2.6%
Total	**362,827**	**100%**

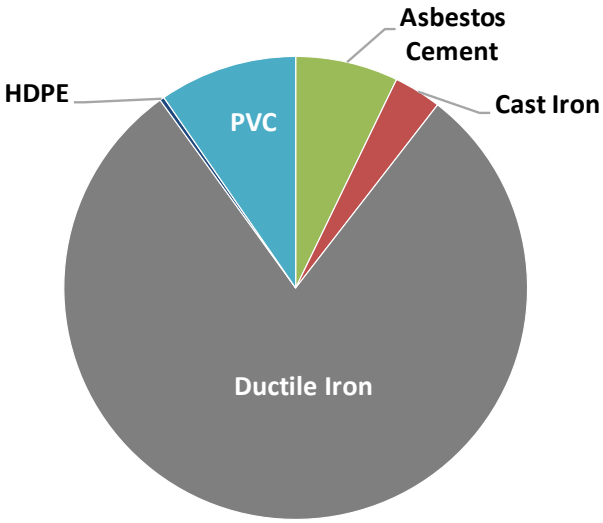


The majority of the water main in the City's system (approximately 80 percent) is constructed of DI pipe. Other water main materials present in the City's system include PVC, asbestos cement, cast iron, ductile iron, and high-density polyethylene (HDPE). **Table 2-5** shows the City's existing water main inventory by material.

Table 2-5

Water Main Material Inventory

Material	Length (Feet)	% of Total
Asbestos Cement	25,994	7.2%
Cast Iron	12,036	3.3%
Ductile Iron	288,730	79.6%
HDPE	1,134	0.3%
PVC	34,933	9.6%
Total	**362,827**	**100%**



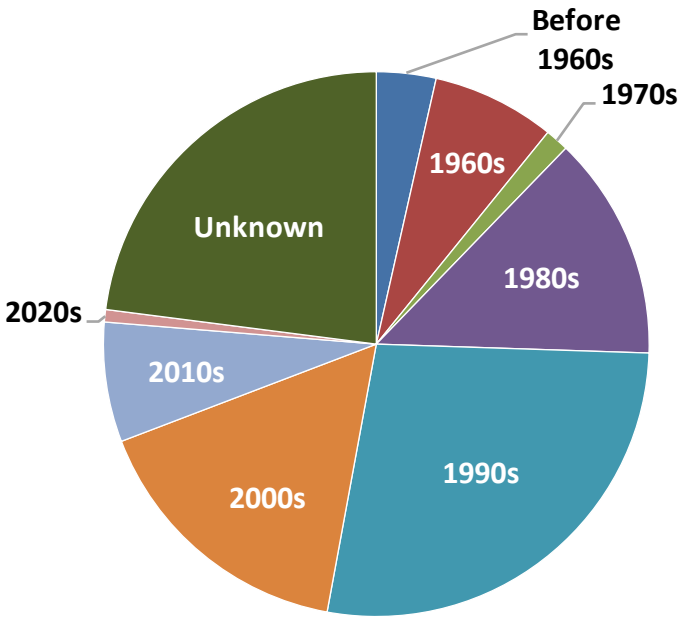
PRELIMINARY - CITY REVIEW ONLY

Per industry standard, the life expectancy of water main is generally 50 to 75 years, depending on a variety of piping, water quality, and soil conditions. Approximately 12 percent of the water main within the City's system is known to have been constructed in the 1970s or before and is reaching or has reached its projected life expectancy. Approximately 23 percent of the City's water main is of unknown age and may be reaching or has reached its projected life expectancy. The remainder of the water main in the City's water system was constructed in the 1980s or later and is generally in good condition. A detailed breakdown of the City's water main installation inventory per year is shown in **Table 2-6**.

Table 2-6

Water Main Year Inventory

Year Installed	Length (Feet)	% of Total
Before 1960s	12,796	3.5%
1960s	26,481	7.3%
1970s	5,081	1.4%
1980s	48,242	13.3%
1990s	99,289	27.4%
2000s	59,163	16.3%
2010s	25,776	7.1%
2020s	2,664	0.7%
Unknown	83,335	23.0%
Total	**362,827**	**100%**



Pressure Reducing, Pressure Sustaining, and Flow Control Stations

Pressure reducing stations are connections between adjacent pressure zones that allow water to flow from the higher pressure zone to the lower pressure zone while reducing the pressure of the water to maintain a safe range of operating pressures in the lower zone. A pressure reducing station typically consists of a below-grade vault (typically concrete) that normally contains two PRVs, sometimes a pressure relief valve, piping, and other appurtenances. The PRV hydraulically varies the flow rate through the valve (up to the flow capacity of the valve) to maintain a constant set pressure on the downstream side of the valve for water flowing into the lower pressure zone.

Pressure reducing stations can serve multiple purposes. First, they can function as an active supply facility by maintaining a continuous supply of water into a lower zone that has no other source of supply. The pressure reducing stations that serve the 800 and 890 Zones are of this type. Pressure reducing stations also can function as standby supply facilities that are normally inactive (no water flowing through them). The operation of this type of station is typically triggered by a decrease in water pressure on the downstream side of the station. A typical application of this function is a station that is needed to supply additional water to a lower zone during a fire flow situation only. The pressure setting of the control valve within the station allows it to remain closed during the normal system operation and open only during high demand conditions, like fire flows, to provide the additional supply needed.

Pressure sustaining stations are connections between adjacent pressure zones that allow water to flow from higher pressure zones to the lower pressure zone, provided the pressure in the higher zone remains above a certain threshold. Flow control stations allow water to flow from a higher pressure zone to a lower pressure zone at a regulated flow rate.

The City's water system has a total of 19 pressure reducing stations, as shown in plan view on **Figure 2-1** and in profile view on **Figure 2-2**. A list of all pressure reducing stations and related data is contained in **Table 2-7**.

PRELIMINARY - CITY REVIEW ONLY

Table 2-7

Pressure Reducing Valve Station Summary

Station Name	Upper Pressure Zone	Lower Pressure Zone	Valve Size (in)
Canyon Springs Transmission Main			
Reinig Road PRV/PSV (Inactive)	636 Zone	599 Zone	6
Canyon Springs Transmission Main PRV	Canyon Springs	636 Zone	10
Snoqualmie Ridge Pressure Zones			
705 BPS PRV/PSV	705 Zone	599 Zone	8
1040 BPS PRV - 705 Zone	800 Zone	705 Zone	8 and 3
1040 BPS PRV - 800 Zone	890 Zone	800 Zone	8 and 3
South Ironwood Park PRV	890 Zone	800 Zone	6 and 2
North Ironwood Park PRV	890 Zone	800 Zone	8 and 3
1040 BPS PRV - 890 Zone	1040 Zone	890 Zone	8 and 3
Silent Creek Avenue PRV	1040 Zone	890 Zone	6 and 2
Douglas Avenue PRV	1040 Zone	890 Zone	6 and 2
Denny Peak PRV	1040 Zone	890 Zone	6 and 2
Eagle's Nest Back Gate PRV	1040 Zone	890 Zone	6 and 2
Eagle's Nest Main Gate PRV	1040 Zone	890 Zone	6 and 2
1180-1260 BPS PRV	1260 Zone	1180 Zone	12 and 3
Satterlee Avenue PRV	1260 Zone	1180 Zone	6 and 2
South Pressure Zones			
378th Avenue PRV	670 Zone	599 Zone	6
384th Avenue BPS PRV/PSV - 599 Zone	799 Zone	599 Zone	6
384th Avenue BPS PRV - 670 Zone	799 Zone	670 Zone	6 and 2
Snoqualmie Point BPS PRV	1172 Zone	799 Zone	4 and (2) 1.25

Water System Operation and Control/Telemetry and Supervisory Control System

Successful operation of any municipal water system requires gathering and using accurate water system information. A telemetry and supervisory control system gathers information and can control a system efficiently by automatically optimizing facility operations. A telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failures, operational problems, fire, or other emergency situations.

The City's master telemetry unit (MTU) is located at the WRF, and remote telemetry units (RTUs) are located at most of the major system facilities. Modbus communication, which is a physical (wire) link, is used between the North Wellfield WTP and the WRF. A human machine interface (HMI) is located at the North Wellfield WTP control room, and PLCs are installed at most major facility locations.

The water system is controlled through a system that provides automatic and remote manual control capabilities. Information relating to control commands, equipment status, and alarms is

passed between individual processors across various communication links. The communication links utilized in the control system include cellular, fiber, and phone line communications. UHF radio links have been phased out in favor of cellular communications.

Water System Interties

Water system interties are physical connections between two adjacent water systems. Interties normally are separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main, or during firefighting situations, and is unable to provide a sufficient quantity of water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and are typically supplying water at all times.

The City's only existing intertie is with the Walter Walker system, which is located immediately south of the City's 800 Zone. The City provides wholesale water to the Walter Walker system via a Walter Walker-owned BPS located on the City's 599 Reservoir site. The Walter Walker BPS has two 70 gpm pumps that pump water through 8-inch-diameter water mains to a 40,300-gallon reservoir with an overflow elevation of approximately 890 feet. The Walter Walker system was designed to serve approximately 28 homes with fire flows of approximately 500 gpm for 1 hour or 1,000 gpm for 30 minutes. The system currently serves approximately 14 connections.

WATER SERVICE AGREEMENTS

Water Service Area Agreement

The City entered into an agreement in 1996 establishing service area boundaries as identified in the *East King County Coordinated Water System Plan* (EKCCWSP). This agreement is included in **Appendix B**. Agreements with the Lake Alice community (pertaining to water availability) and the Walter Walker water system (water system extension developer agreement) are included in **Appendix C**.

SATELLITE SYSTEM MANAGEMENT

A Satellite System Management Agency (SSMA) is defined as a person or entity that is certified by DOH to own or operate more than one public water system without the necessity for a physical connection between such systems. SSMAs were created to stop the proliferation of small water systems, many of which could not meet federal and state water quality and water system planning regulations. The goal of SSMAs is to ensure that the people of Washington State will receive safe and reliable water supplies in the future from professionally managed or properly operated water systems. SSMAs can provide three different levels of service:

1. Ownership of the satellite system;
2. Operations and management of the satellite system; or
3. Contract services only.

PRELIMINARY - CITY REVIEW ONLY

The service can be provided to new systems, existing systems that are no longer viable, or existing systems placed into receivership status by DOH.

The City currently is not a certified SSMA but is considering assuming such responsibility for the Rumbolz Sunset Water System (Rumbolz) in the future. The Rumbolz system is located to the south of the City's 1180 Zone.

ADJACENT WATER SYSTEMS

Numerous water systems are adjacent or close to the City's water service area. **Figure 2-3** shows the regional water supply setting, including the City's retail water service area and wholesale service area, and other purveyors' service areas. Eleven major adjacent purveyors are shown in **Table 2-8** and **Figure 2-3** and described as follows in additional detail.

Table 2-8

Adjacent Systems

Water System Name	Approximate Location in Relation to the City's Retail Water Service Area	Approximate Number of Service Connections	Source of Supply
City of North Bend	Southeast	2,387	1 spring, 1 well, 1 emergency intertie
Echo Glen Children's Center	West	25	2 wells (1 emergency only)
Fall City Water District	Northwest	1,118	5 wells (1 seasonal)
King County Water District 123	West	86	1 well, 1 emergency intertie
Lake Alice Water Association	West	31	1 well
Rumbolz Sunset Water System	South	40	2 wells
Snoqualmie Indian Tribe Snoqualmie Casino	Along I-90; just outside City Limits	4,400 (transient customers)	1 well
Spring Glen Association	North	71	2 wells (1 seasonal)
Tokul Creek Community	North	13	1 spring
Upper Preston Water Association	Southwest	60	1 well
Walter Walker Water Works	Inside City UGA	14	1 intertie

City of North Bend

The City of North Bend (North Bend) is located to the southeast of the City. North Bend's water system serves approximately 2,387 connections with a total residential population of approximately 5,510. The City obtains its water supply from a spring source with a capacity of 1,250 gpm and a groundwater well with a capacity of 2,500 gpm. North Bend also has an emergency intertie with the Sallal Water Association.

Echo Glen Children's Center

The Echo Glen Children's Center is located to the west of Snoqualmie's water service area. The water system provides service to approximately 25 connections, with a residential population of 340 people and a non-residential population of 90 people. Water is supplied primarily from a groundwater well with a capacity of 100 gpm. A second 100 gpm groundwater well is used in emergencies for fire suppression.

Fall City Water District

The Fall City Water District (Fall City) is located to the northwest of the City. Fall City serves approximately 1,118 connections, with a residential population of approximately 2,830 people. Water is supplied from 4 groundwater wells with a total capacity of approximately 1,630 gpm. A fifth well provides an additional seasonal capacity of approximately 314 gpm.

King County Water District 123

King County Water District 123 (WD123) is located to the west of the City. WD123 serves approximately 86 connections, with a residential population of approximately 195 and a non-residential population of approximately 47. Water is supplied to the system from a groundwater well with a capacity of 125 gpm. WD123 also has an emergency intertie with the Talking Rain Beverage Company. The emergency intertie has a capacity of 75 gpm.

Lake Alice Water Association

The Lake Alice Water Association (Lake Alice) system is located immediately to the west of the City. The Lake Alice system serves approximately 31 connections with a residential population of 90 people. Water is supplied from a single groundwater well with a capacity of 30 gpm.

Rumbolz Sunset Water System

The Rumbolz system is located to the south of the City. The system serves approximately 40 connections, with a residential population of 106 people. Water is supplied to the system from 2 groundwater wells with a total capacity of 70 gpm.

The Rumbolz system has approached the City for SSMA services. The City currently is evaluating the feasibility of providing SSMA services to the system.

PRELIMINARY - CITY REVIEW ONLY

Snoqualmie Indian Tribe – Snoqualmie Casino

In 2008, the Snoqualmie Indian Tribe completed construction of the Snoqualmie Casino, located along I-90 just outside of the City limits. The Casino system has one well, two 50,000-gallon concrete tanks, and treatment consisting of disinfection and arsenic removal. The system is designed to serve a transient population of 4,400 people and has a capacity of 125 gpm.

The Tribe owns several other properties in the area as well that have yet to be developed fully. The casino system will not serve other properties owned by the Tribe when developed.

Spring Glen Association

The Spring Glen Association, located to the north of the City, provides water to approximately 71 connections, with a residential population of 200 and a non-residential population of 45. Water is supplied to the system from a groundwater well with a capacity of 200 gpm. A second back-up groundwater well with a capacity of 200 gpm is operated seasonally.

Tokul Creek Community

The Tokul Creek Community is a Group B water system located to the north of the City, just inside the northern boundary of the City's water service area. The system has approximately 13 connections and a residential population of 23 people. Water is supplied from a groundwater spring with a capacity of 100 gpm.

Upper Preston Water Association

The Upper Preston Water User Association is located to the southwest of the City. The system provides water service to approximately 60 connections, with a residential population of 150. The source of supply is a groundwater well with a capacity of 65 gpm.

Walter Walker Water Works

The Walter Walker system is located inside the City's UGA. As discussed previously, wholesale water is supplied from the City to the Walter Walker system via a BPS located at the 599 Reservoir site. The Walter Walker system serves approximately 14 connections with a residential population of 35.

PRELIMINARY - CITY REVIEW ONLY

Figure 2-1
Existing Water System
City of Snoqualmie
Water System Plan

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(2,500 gpm)

Canyon Springs
(898 gpm)

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

890 Zone
1040 Zone
890 Zone
800 Zone
705 Zone
670 Zone
1260 Zone
1180 Zone
799 Zone
1172 Zone
599 Zone

Snoqualmie River
Alice Lake
Snoqualmie Falls
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

PRESTON-FALL CITY RD SE
332ND AVE SE
FALL CITY-SNOQUALMIE RD
TOKUL RD SE
SNOQUALMIE PKWY
SE 80TH ST
SE KINGSTON ST
RAILROAD AVE SE
SE MILLPOND RD
REINIG RD
SE PARK ST
MEADOWBROOK WAY SE
BOALCH AVE SE
BOALCH AVE NW
BENDIGO BLVD N
BENDIGO BLVD S
BALLARAT AVE N
SE 108TH ST
CEDAR FALLS WAY
WINERY RD
372ND AVE SE
376TH AVE SE
384TH AVE SE
428TH AVE SE
E SE 92ND ST

Legend

- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV
- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

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Vicinity Map



CITY OF SNOQUALMIE

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

C:\USERS\ZSCHREMPP\DESKTOP\GIS\WSP-FIG_2-1_EX_WATER_SYST.MXD BY: ZSCHREMPP PLOT DATE: JUN 12, 2020 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PRELIMINARY - CITY REVIEW ONLY

WEST ◄——► EAST

1,300'
1,200'
1,100'
1,000'
900'
800'
700'
600'
500'
400'

1260 Zone

Satterlee Avenue PRV

1180-1260 BPS PRV

1180 Zone

1180-1260 BPS
Sum of Pump Capacities:
1180 Zone: 4,748 gpm
1260 Zone: 4,445 gpm

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Diameter: 122'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Diameter: 110.5'
Height: 24'

1040 Zone

Silent Creek Avenue PRV

Douglas Avenue PRV

Denny Peak PRV

Eagle's Nest Back Gate PRV

Eagle's Nest Main Gate PRV

1040 BPS PRV- 890 Zone

890 Zone

South Ironwood Park PRV

North Ironwood Park PRV

1040 BPS PRV- 800 Zone

1040 BPS
Sum of Pump Capacities:
2,500 gpm

800 Zone

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Diameter: 30'
Height: 24'

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Diameter: 15'
Height: 24'

1040 BPS PRV- 705 Zone

705 Zone

384th Avenue BPS PRV- 670 Zone

384th Avenue BPS PRV/PSV - 599 Zone

670 Zone

378th Avenue PRV

705 BPS PRV/PSV

705 BPS
Sum of Pump Capacities:
2,400 gpm

599 Zone

Walter Walker Water Works Intertie

599 Reservoir
0.5 MG
Overflow Elev: 599'
Diameter: 52'
Height: 32'

1172 Zone

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Diameter: 47'
Height: 31'

Snoqualmie Point BPS
Sum of Pump Capacities:
300 gpm

Snoqualmie Point BPS PRV

799 Zone

384th Avenue SE BPS
Sum of Pump Capacities:
1,600 gpm

Canyon Springs (898 gpm)

Canyon Springs Transmission Main PRV

Reinig Rd PRV/PSV (Inactive)

North Wellfield Treatment Plant

North Wellfield
Well No. 6 (550 gpm)
Well No. 7 (550 gpm)
Well No. 8 (1,250 gpm)
Maximum Combined Capacity:
1,800 gpm

South Wellfield Treatment Plant

South Wellfield
Well No. 1-R (600 gpm)
Well No. 2 (600 gpm)
Maximum Combined Capacity:
563 gpm, limited by WTP capacity

Legend

- 599 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone
- Booster Pump Station
- Pressure Reducing Station
- Intertie
- Facilities at Same Site

Figure 2-2
Existing System Hydraulic Profile

City of Snoqualmie
Water System Plan

Date: MAY 6, 2020 Filename: SNQ\118-083\CAD\SNQ-HPX.DWG

PRELIMINARY - CITY REVIEW ONLY

Legend

- Snoqualmie City Limits
- Urban Growth Area
- Wholesale Water Service Area
- Retail Water Service Area

Adjacent Water Systems

- Ames Lake Water Association
- Cedar River Water and Sewer District
- City of Issaquah
- City of North Bend
- Echo Glen Children's Center
- Fall City Water District
- Four Lakes Landowner's Association
- King County Water District 123
- Lake Alice Water Association
- Mirrormont Services
- River Bend Homeowners Association
- Rumbolz Sunset Water System
- Sallal Water Association
- Sammamish Plateau Water and Sewer District
- Snoqualmie Casino
- Spring Glen Association
- Tokul Creek Community
- Upper Preston Water Association
- Walter Walker Water Works
- Wilderness Rim Association

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Vicinity Map



Figure 2-3
Adjacent Water Systems
City of Snoqualmie Water System Plan

PRELIMINARY

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

C:\DWG\WSP-FIG_2-3_ADJ_WATER_SYST.MXD BY: ZSCHREMPP PLOT DATE: APR 10, 2020

1 inch = 3,000 feet

0 1,500 3,000 6,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

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3 | LAND USE AND POPULATION

INTRODUCTION

The State of Washington Growth Management Act (GMA) requires, among other things, consistency between land use and utility plans and their implementation. This chapter demonstrates the compatibility of the City of Snoqualmie's (City) Water System Plan (WSP) with other plans, identifies the designated land uses within the existing and future service area, and presents population and employment projections within the City's planning area.

COMPATIBILITY WITH OTHER PLANS AND POLICIES

To ensure that the WSP is consistent with the land use policies that guide it and other related plans, the following planning documents were examined.

- State of Washington Growth Management Act
- Puget Sound Regional Council *VISION 2040 Part III: Multicounty Planning Policies*
- *Snoqualmie 2032 City of Snoqualmie Comprehensive Plan*
- *2012 King County Countywide Planning Policies*
- *King County Comprehensive Plan*, 2016 Update
- *East King County Coordinated Water System Plan*

Growth Management Act

The State of Washington GMA of 1990 (and its multiple amendments) defined four goals relevant to this WSP:

1. Growth should be in urban areas;
2. There should be consistency between land use and utility plans and their implementation;
3. There should be concurrency of growth with public facilities and services; and
4. Critical areas should be designated and protected.

Urban Growth Area

The GMA requires that King County (County) designate an Urban Growth Area (UGA) where most future urban growth and development will be directed. The Countywide UGA is defined in the County's *Comprehensive Plan* and encompasses the area where this urban growth and development is projected to occur over the 20-year planning period. The current King County UGA boundaries in the vicinity of the City are shown on **Figure 3-1**.

Potential Annexation Areas

A Potential Annexation Area (PAA) is an area identified by the County and a city as expected to annex into that city during the 20-year planning period. The City's PAAs, per County mapping,

are the Snoqualmie Southwest PAA (corresponding to the City's Snoqualmie Hills West and Snoqualmie Hills East planning areas), the Snoqualmie Weyerhauser West PAA (located within the City's Snoqualmie Falls planning area), the Snoqualmie Weyerhauser East PAA and Snoqualmie Mill 2 PAA (located with the City's Mill planning area), and the Snoqualmie River Alignments PAA (located within the City's Meadowbrook planning area).

Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans between jurisdictions. This means that plans and policies of the City and County must be consistent per Revised Code of Washington (RCW) 36.70A.100. Second, the GMA requires that the implementation of the WSP be consistent with comprehensive plans (RCW 36.70A.120).

The Washington State Department of Health (DOH) 2003 Municipal Water Law also requires that water system plans are consistent with local plans and regulations. The signed Consistency Statement Checklists included in **Appendix D** from the City and King County Planning Departments document the determination that this WSP is consistent with their plans and regulations.

Concurrency

Concurrency means that adequate public facilities and services be provided at the time that growth occurs. For example, growth should not occur where schools, roads, and other public facilities are overloaded. To achieve this objective, the GMA directs growth to areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, the new development should be prohibited (RCW 36.70A.110).

Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include aquifer recharge areas, wetlands, frequently flooded areas, streams, wildlife habitat, landslide hazard areas, seismic hazard areas, and steep slopes. The City has adopted development regulations identifying and protecting critical areas as required. The State Environmental Policy Act (SEPA) Checklist in **Appendix E** addresses other environmental concerns.

Puget Sound Regional Council Vision 2040 Part III: Multicounty Planning Policies

The Puget Sound Regional Council (PSRC) is designated by the governor of the State of Washington as the Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) for the central Puget Sound region, defined as King, Kitsap, Pierce, and Snohomish counties. PSRC's *VISION 2040* "is a shared strategy for moving the central Puget Sound region toward a sustainable future." PRSC's *VISION 2040 Part III: Multicounty Planning Policies* contains six major policy sections: Environment; Development Patterns; Housing; Economy; Transportation; and Public Services. Under each section, goals, policies, actions, and measures are identified. All the City's functional plans are required to be consistent with the PSRC's *VISION 2040 Part III: Multicounty Planning Policies*.

City of Snoqualmie Comprehensive Plan

The City of Snoqualmie's *Comprehensive Plan* was last adopted in 2014, with additional amendments in 2017. The plan was developed to describe the City's vision for 2032 and to provide goals and policies for achieving the vision, as well as to meet the requirements of the GMA.

The Land Use Element of the City's *Comprehensive Plan* is the City's vision of how growth and development should occur over a 20-year horizon. While the Land Use Element goals and policies set forth general standards for locating land uses, the Land Use Designations Map (Figure 2.1) indicates geographically where certain types of uses may be appropriate. The Land Use Designations Map is a blueprint for the development of an area. The City's existing land use is shown in **Figure 3-1**.

The Land Use Element considers the general location of land uses, as well as the appropriate intensity and density of land uses given the current development trends. The Transportation and Capital Facilities and Utilities Element ensures that a new development will be served adequately without compromising adopted levels of service, which is consistent with the principal of concurrency as defined in the GMA.

King County Countywide Planning Policies

The County's 2012 *Countywide Planning Policies* are a series of policies that address growth management issues in King County. The current version of the policies includes amendments ratified on June 25, 2016. For consistency with PSRC's *VISION 2040*, the *Countywide Planning Policies* also are organized into the policy sections of Environment, Development Patterns, Housing, Economy, Transportation, and Public Facilities and Services. Page 47 of the *Countywide Planning Policies* identifies specific policies related to water supply. All the City's functional plans are required to be consistent with the County's *Countywide Planning Policies.*

King County Comprehensive Plan

The current version of the King County *Comprehensive Plan* was adopted in 2016, and last amended in 2018. Chapters include the following.

- Regional Growth Management Planning
- Urban Communities
- Rural Areas and Natural Resource Lands
- Housing and Human Services
- Environment
- Shorelines
- Parks, Open Space, and Cultural Resources
- Transportation
- Services, Facilities, and Utilities
- Economic Development

- Community Service Area Subarea Planning
- Implementation, Amendments, and Evaluation

The County's plan is focused on six guiding principles, as follows.

1. Creating Sustainable Neighborhoods
2. Preserving and Maintaining Open Space and Natural Resource Lands
3. Directing Development Towards Existing Communities
4. Providing a Variety of Transportation Choices
5. Addressing Health, Equity, and Social and Environmental Justice
6. Achieving Environmental Sustainability

The County's *Comprehensive Plan* guides development and designates Land Use in unincorporated King County. County Land Use inside the City's future water service area is shown in **Figure 3-1**; the *Comprehensive Plan* can be referenced for County Land Use outside the City's future water service area.

East King County Coordinated Water System Plan

The *East King County Coordinated Water System Plan* (CWSP), originally dated October 1989, was developed under direction from the County's Water Utility Coordinating Committee (WUCC), the County, and the Seattle Water Department. The members of the WUCC represent the collective efforts of all public water systems with more than 50 service connections that provide service within the Critical Water Supply Service Area (CWSSA). The King County Council declared East King County a CWSSA on October 6, 1989.

The purpose of the CWSP is to assist the area's water utilities in establishing an effective process for planning and developing public water systems and restricting the proliferation of small public water systems. The CWSP accomplishes this by establishing future service area boundaries, minimum design standards, service review procedures, appeals procedures, long-term regional water supply strategies, and a satellite system management program. As can be seen in the following sections of this WSP, the City has established policies, design criteria, and goals that meet or exceed the requirements and goals of the CWSP.

LAND USE

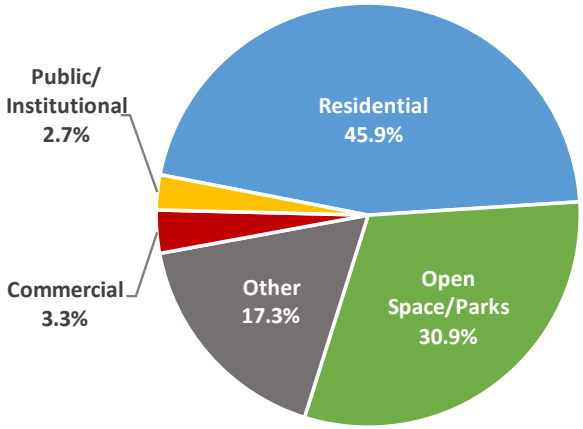
The existing retail water service area includes the current City limits and some areas of unincorporated King County, for a total of approximately 14.6 square miles. The Land Use Map for the water service area, **Figure 3-1**, guides development and can be used to forecast future demands. Land use outside the City is designated by the County, as shown on **Figure 3-1**.

Approximately 45.9 percent of the area within the current water service area is designated for residential use, as indicated in **Table 3-1**. Approximately 30.9 percent of the water service area is designated for open space/parks; approximately 3.3 percent is designated for commercial use; approximately 2.7 percent is designated for public/institutional use; and approximately 17.3 percent is designated for other land uses or is undesignated.

Table 3-1

Land Use Inside Water Service Area

Land Use Type	Acres	% of Total
Residential	4,289	45.9%
Open Space/Parks	2,881	30.9%
Other	1,611	17.3%
Commercial	307	3.3%
Public/Institutional	249	2.7%
Total	**9,336**	**100%**



POPULATION

Household Trends

The City's residential areas are largely comprised of single-family residences. The City's 2014 *Comprehensive Plan* estimated that there were approximately 3,943 housing units in the City. Of these, approximately 3,208 housing units (81.4 percent) were single-family residences, and approximately 735 housing units (18.6 percent) were one-unit attached or located in multi-unit structures. The City's average household size is estimated to be 3.0 persons in the Snoqualmie Ridge area and 2.5 persons in all other areas of the City.

Historical and Future City Population

The City has experienced rapid population growth and extensive physical development since 2000. The population of the County increased by approximately 12 percent from 2010 to 2017 based on Office of Financial Management (OFM) estimates. The population of the City increased by approximately 24 percent during the same period. A significant portion of the City's population growth is due to the continued development of the Snoqualmie Ridge on the west side of the City. **Table 3-2** illustrates the historical population growth since 1990. The historical population shown in **Table 3-2** represents the population within the City limits. The sources of the historical population numbers are the decennial census and OFM intercensal estimates.

Table 3-2

Population Trends within the City Limits

Year	Population
1990	1,546
1995	1,565
2000	1,631
2005	6,933
2010	10,670
2011	10,950
2012	11,320
2013	11,700
2014	12,130
2015	12,850
2016	13,110
2017	13,210

Projected future population growth within the City Limits, shown in **Table 3-3** and **Chart 3-1**, is based on current projections from the City's Community Development Department, Planning Division. Population growth is anticipated in the Mill Site, Snoqualmie Hills West, Snoqualmie Hills East, Snoqualmie Ridge Phases I and II, and Meadowbrook planning areas. The previously planned Salish development has been withdrawn and was not included in the population projections for the City. The City is projected to have a population of 15,499 people in 2040.

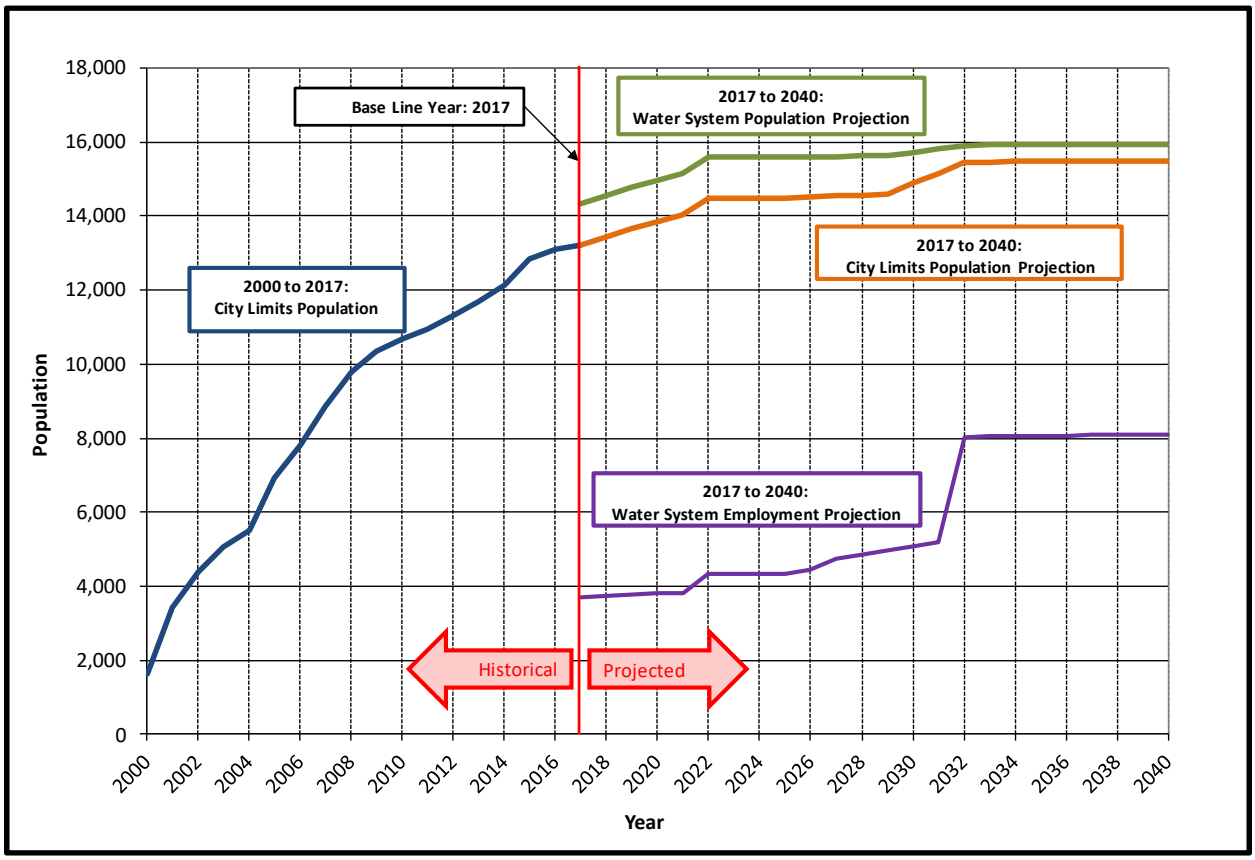
Table 3-3

Population Projections

Year	City Population	Water System Population	Water System Employment
	Existing		
2017	13,210	14,322	3,718
	Projected		
2018	13,450	14,562	3,744
2019	13,670	14,782	3,770
2020	13,859	14,971	3,796
2021	14,048	15,160	3,824
2022	14,478	15,590	4,334
2023	14,478	15,590	4,334
2024	14,478	15,590	4,333
2025	14,478	15,590	4,333
2026	14,506	15,600	4,447
2027	14,534	15,609	4,751
2028	14,562	15,618	4,865
2029	14,590	15,627	4,979
2030 (+ 10 years)	**14,877**	**15,721**	**5,093**
2031	15,164	15,815	5,207
2032	15,451	15,909	8,030
2033	15,458	15,912	8,039
2034	15,465	15,915	8,049
2035	15,471	15,918	8,059
2036	15,477	15,921	8,068
2037	15,483	15,923	8,078
2038	15,489	15,926	8,086
2039	15,494	15,928	8,095
2040 (+ 20 years)	**15,499**	**15,929**	**8,104**

Chart 3-1

Population Projections



Water System Population

The actual number of people served by the City's water system is different than the population of the City limits. It was assumed that the City currently provides water service to the entire population within the City limits. The City also provides water service to an estimated 682 people in the UGA outside the City limits. Additionally, the City provides water service to approximately 430 people outside the UGA. The water system population outside the City limits was calculated by multiplying the estimated number of connections by the average household size for unincorporated King County. As shown in **Table 3-3**, the estimated population served by the water system in 2017 was 14,322.

Water system population projections through 2040 are shown in **Table 3-3**. It was assumed that the customers in the UGA outside the City limits would all be annexed to the City by 2040. The number of water system customers outside the UGA was projected to remain constant throughout the planning period. The water system is expected to provide service to approximately 15,929 people in 2040.

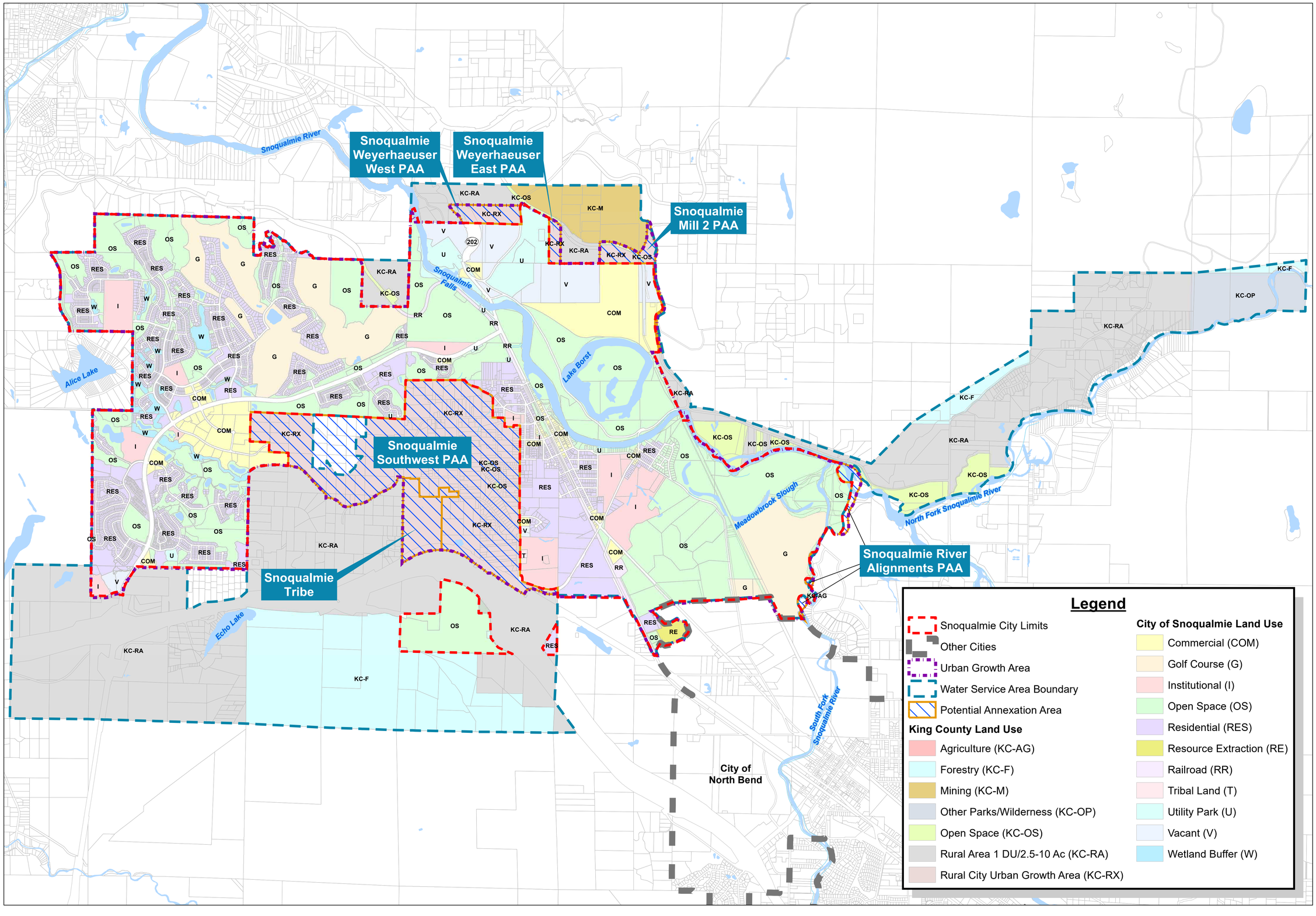
Water System Employment

The total employment for the water system, shown in **Table 3-3** and **Chart 3-1**, was calculated for use in demand projections. Existing and future employment projections within the City

limits were provided by the Community Development Department's Planning Division. During the 20-year planning period, the City expects employment growth to exceed population growth. Employment growth is anticipated in the Mill Site, Snoqualmie Hills East and West, Snoqualmie Ridge Phases I and II, and Historic/Meadowbrook planning areas. The previously planned Salish development has been withdrawn by the new property owners and was not included in the employment projections for the City. Employment at the Snoqualmie Casino is not included, as this area is not served by the water system. Employment estimates for areas of unincorporated King County served by the water system were calculated using census tract-level data available from PSRC. The percent area of the census tracts served by the water system was calculated and multiplied by the PSRC employment projections for 2015, 2020, 2025, 2030, 2035, and 2040 for those census tracts to determine the estimated employment outside the City limits. The total water system employment is expected to grow from 3,718 jobs in 2017 to 8,104 jobs in 2040.

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PRELIMINARY - CITY REVIEW ONLY



This map is a graphic representation derived from the City of Snoqualmie Geographic Information System. It was designed and intended for City of Snoqualmie staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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Vicinity Map



Figure 3-1 Land Use

City of Snoqualmie Water System Plan

PRELIMINARY

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\SNQ\118-083\GIS\WSP-FIG_3-1_LAND_USE.MXD BY: DBRIGHT PLOT DATE: JAN 31, 2020 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

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4 | WATER DEMANDS

INTRODUCTION

A detailed analysis of system demands is crucial to the planning efforts of a water supplier. A demand analysis first identifies current demands to determine if the existing system can effectively provide an adequate quantity of water to its customers under the most crucial conditions, in accordance with federal and state laws. A future demand analysis identifies projected demands to determine how much water will be needed to satisfy the water system's future growth and continue to meet federal and state laws.

The magnitude of water demands is typically based on three main factors: 1) population; 2) weather; and 3) water use classification. Population and weather have the two largest impacts on water system demands. Population growth tends to increase the annual demand, whereas high temperatures tend to increase the demand over a short period of time. Population does not solely determine demand because different user types use varying amounts of water. The use varies based on the number of users in each customer class, land use density, and irrigation practices. Water use efficiency efforts also impact demands and can be used to accommodate a portion of the system's growth without increasing a system's supply capacity.

Demands on the water system determine the size of storage reservoirs, supply facilities, water mains, and treatment facilities. Several different types of demands were analyzed and are addressed in this chapter, including average day demand, maximum day demand, peak hour demand, fire flow demand, future demands, and a demand reduction forecast based on the Water Use Efficiency program.

Certificate of Water Availability

Applicants for new water services must adhere to water availability requirements outlined in the City of Snoqualmie Municipal Code 13.12.020. Per the Municipal Water Law and Revised Code of Washington (RCW) 43.20.260, the City of Snoqualmie (City) has a duty to provide retail water service within its retail service area if: 1) Its service can be available in a timely and reasonable manner; 2) the municipal water supplier has sufficient water rights to provide the service; 3) the municipal water supplier has sufficient capacity to serve the water in a safe and reliable manner as determined by the Washington State Department of Health (DOH); and 4) it is consistent with the requirements of any comprehensive plans, development regulations, or any other applicable plan or regulation.

To fulfill the duty to serve, the City has developed a process for determining development feasibility based on water availability and priorities for water extension. As part of this process, a developer must submit an application for a Certificate of Water Availability stating proposed water usage and customer type. The City will then determine if adequate service is currently available based on source, storage, and other facility capacity, and nearest water mains and hydrants, in addition to system conditions such as pressure and flow onsite or at the nearest connection point to the system. The City may perform field testing and hydraulic modeling to

determine if available public facilities are equal to or greater than the capacity required to maintain the City's level of service standard for the impact of the development. The City has established the following levels of service for its water system:

1. Water Supply: Water rights certificates and/or permits issued by the Washington State Department of Ecology and known limitations of existing sources and aquifers.
2. Storage and System Capacity: *Water System Design Manual*, Washington State Department of Health. This includes storage and booster station capacity.

If there is sufficient water system capacity, which is further explained in **Chapter 7**, to accommodate the proposed development, a Certificate of Water Availability is issued. Once the certificate is valid, capacity in the City's water system is reserved for the applicant.

The City also maintains priorities for the extension of water service or commitment, which are as follows:

1. Service to platted lots within the existing corporate limits for uses consistent with existing land use policies.
2. Service within the existing corporate limits to new development for which a land use entitlement has been approved (e.g., preliminary plat or binding site improvement plan, Mixed Use Final Plan or Development Agreement) for uses consistent with the land use entitlement.
3. Services within the unincorporated Urban Growth Area for which a commitment to serve (Certificate of Water Availability) has been given pursuant to an approved Development Agreement for uses consistent with the Development Agreement.
4. Service within the unincorporated Urban Growth Area for existing platted lots adjacent to an existing City water main.
5. Service within the unincorporated Rural Area to existing platted lots adjacent to an existing City water main.
6. Service within the unincorporated Urban Growth Area for new subdivisions consistent with King County land use policies.
7. Service within the unincorporated Rural Area for new subdivisions consistent with King County land use policies.

CURRENT POPULATION AND SERVICE CONNECTIONS

Water Use Classifications

The City has divided all water customers into 18 different classes for billing purposes. For planning purposes, the water customers have been combined into six different groups: 1) single-family residential; 2) multi-family residential; 3) commercial; 4) irrigation; 5) public; and 6) other. The commercial group includes the Salish Lodge. The public group includes City of Snoqualmie facilities, government, schools, and the Snoqualmie Hospital. The "other" group included metered fire hydrant usage (including hydrant use by the Snoqualmie Tribe) and other connections classified as "Outside City." The demand analysis that follows will report on the water use patterns of these six user groups.

Residential and Employment Population Served

The residential population within the City limits was 13,210 in 2017, based on estimates from the Washington State Office of Financial Management (OFM). Since the City limits are contained within the Water Service Area (WSA), the actual population served by the City's water system is larger. The 2017 residential population served by the City within the water service area was estimated to be approximately 14,322 in 2017, as presented in **Chapter 3**.

EXISTING WATER DEMANDS

Water Consumption

Water consumption is the amount of water used by all customers of the system as measured by the customer's meters. **Table 4-1** shows the historical average number of connections, average annual consumption, and average daily consumption per connection of each customer class for the City from 2011 through 2017. As shown in **Table 4-1**, the City provided water service to approximately 4,911 connections in 2017. Approximately 4,503 connections (91.7 percent) were single-family residential customers, 64 connections (1.3 percent) were multi-family residential customers, 212 connections (4.3 percent) were commercial customers, 68 connections (1.4 percent) were irrigation customers, 49 connections (1.0 percent) were public customers, and 15 connections (0.3 percent) were classified as other.

Table 4-1

Average Annual Metered Consumption and Service Connections

Year	Customer Class: Single-Family Residential	Multi-Family Residential	Commercial	Irrigation	Public	Other	Totals
Average Number of Connections							
2011	3,942	51	195	53	41	12	4,294
2012	4,035	52	197	54	41	9	4,388
2013	4,144	52	199	56	44	10	4,505
2014	4,313	63	203	55	45	14	4,693
2015	4,363	64	207	55	47	9	4,745
2016	4,400	64	206	66	47	11	4,794
2017	4,503	64	212	68	49	15	4,911
Average Annual Consumption (gallons)							
2011	244,227,236	10,825,804	35,892,032	31,062,944	37,146,428	1,522,928	360,677,372
2012	262,597,368	9,734,472	37,894,428	99,409,200	49,445,792	812,328	459,893,588
2013	268,958,360	10,281,260	41,453,412	88,422,576	54,057,960	1,313,488	464,487,056
2014	276,853,500	10,415,152	42,613,560	103,505,996	57,008,820	551,276	490,948,304
2015	301,171,728	13,079,528	42,802,056	126,990,952	34,774,520	618,596	519,437,380
2016	278,712,527	13,329,360	42,149,800	108,440,552	25,817,968	2,727,956	471,178,163
2017	309,250,255	13,486,440	56,126,928	123,312,288	27,267,592	21,829,034	551,272,537
Average Daily Consumption Per Connection (gpd/conn)							
2011	170	582	504	1,606	2,482	348	230
2012	178	511	526	5,030	3,295	247	287
2013	178	542	571	4,326	3,366	360	282
2014	176	453	575	5,156	3,471	108	287
2015	189	560	567	6,326	2,027	188	300
2016	173	569	559	4,489	1,501	678	269
2017	188	577	725	4,968	1,525	3,987	308
Average	**179**	**542**	**575**	**4,557**	**2,524**	**845**	**280**

As shown in **Chart 4-1**, the single-family residential class represents approximately 91.7 percent of all connections, but only 56.1 percent of the total system consumption, as shown in **Chart 4-2**. This is due to the lower consumption per connection of single-family residential customers as compared to other customer types. As shown in **Table 4-1**, single-family residential customers use an average of approximately 179 gallons per day (gpd) per connection, compared to multi-family customers that use an average of approximately 542 gpd per connection. Multiple units are typically served by one multi-family residential connection, resulting in additional consumption per connection compared to single-family residential connections. Multi-family residential consumption per connection is similar to the consumption of commercial customers that use an average of approximately 575 gpd per connection. Irrigation and public customers use significantly more water, with an average of approximately 4,557 and 2,524 gpd per connection, respectively. The higher consumption per connection of commercial, public, and irrigation customers compared to single-family residential customers is expected since these customers include the system's highest individual water users.

Chart 4-1
2017 Water Connections by Customer Class

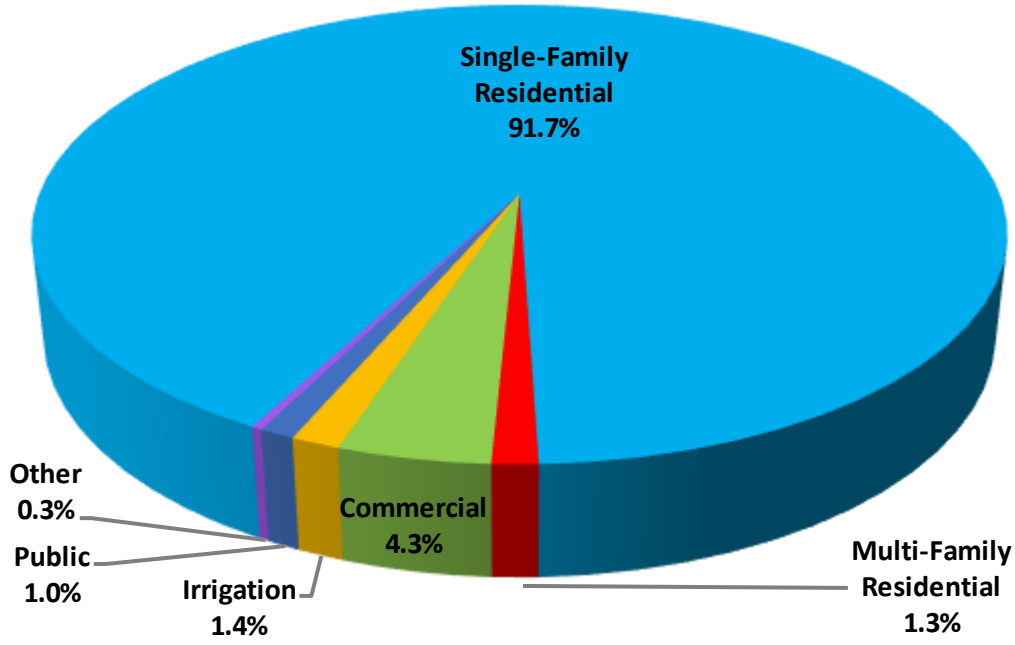


Chart 4-2
2017 Water Consumption by Customer Class

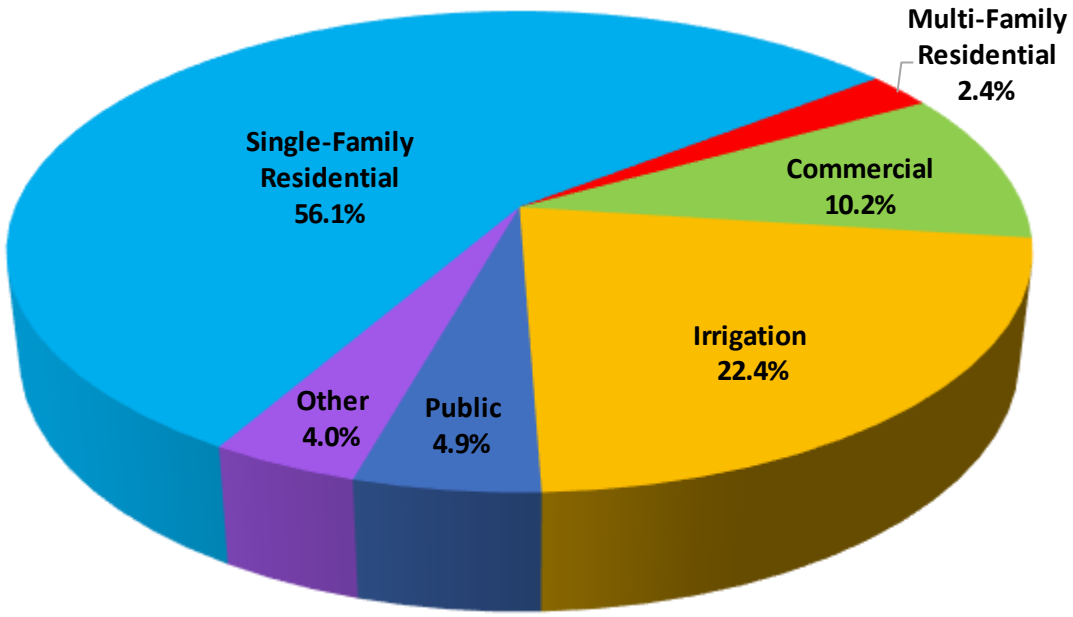


Table 4-2 shows the largest 20 water users of the system in 2017, and their total amount of metered consumption for the year. The total water consumption of these 20 water accounts represented approximately 9.3 percent of the system's total metered consumption in 2017.

Table 4-2

2017 Largest Water Users

Name	Address	Total Annual Consumption (gallons)
Salish Lodge & Spa	6501 Railroad Ave SE	7,921,320
Puget Sound Energy	35717 SE Douglas Street	7,479,252
City of Snoqualmie	38190 SE Stearns Road Hld Tank	5,888,256
City of Snoqualmie	39903 SE Park St	4,996,640
Baumann Family Investment	34935 SE Douglas Street	2,336,752
Snoqualmie Valley Hospital	9801 Frontier Avenue SE	2,093,652
City of Snoqualmie	38190 Stearns Road SE	2,087,668
Snoqualmie School District	8651 Meadowbrook Way SE	1,982,948
Snoqualmie School District	8651 Meadowbrook Way SE	1,901,416
Snoqualmie Ridge Town Center	7730 Center Blvd SE	1,806,420
Snoqualmie School District	34412 SE Swenson Street	1,796,696
Twin Star Car Wash	9002 Railroad Ave SE	1,702,448
N.W. Kidney Center	35131 SE Douglas St	1,456,356
Girard Resources & Recycling	38190 SE Stearns Rd. (Lagoons)	1,267,860
Technical Glass Products	8107 Bracken Place SE	1,128,732
Alaska Electrical Pension Fund	7713 Center Blvd SE 1st Floor	1,105,544
WA Water Service Co.	37050 SE 80th St	1,092,828
Brightstar Golf Snoqualmie, LLC	36003 SE Ridge St	1,091,332
Snoqualmie School District	FH-17-008 Timber Ridge Elem.	1,087,592
Snoqualmie Tribe	9571 Ethan Wade Way SE	986,612
Largest Water Users Total Consumption		**51,210,324**
Water System Total Metered Consumption		551,272,537
Large Water Users Percent of Total Metered Consumption		**9.3%**

The City reads customer meters monthly. Residential and irrigation demand varies throughout the year, typically peaking in the hot summer months. Other customers often peak at different times or have different peaking factors because their uses and consumption patterns differ. The demand for single-family residential customers in the City generally peaks in the summer, as shown in **Chart 4-3**. Residential and irrigation consumption have the largest peaks in the summer, as shown in **Chart 4-3** and **Chart 4-4**. Multi-family, commercial, public, and other consumption has less pronounced peaks, as shown in **Chart 4-5**, **Chart 4-6**, **Chart 4-7**, and **Chart 4-8**. Historical monthly consumption for the entire system is shown in **Chart 4-9**.

Chart 4-3

Historical Monthly Single-Family Consumption

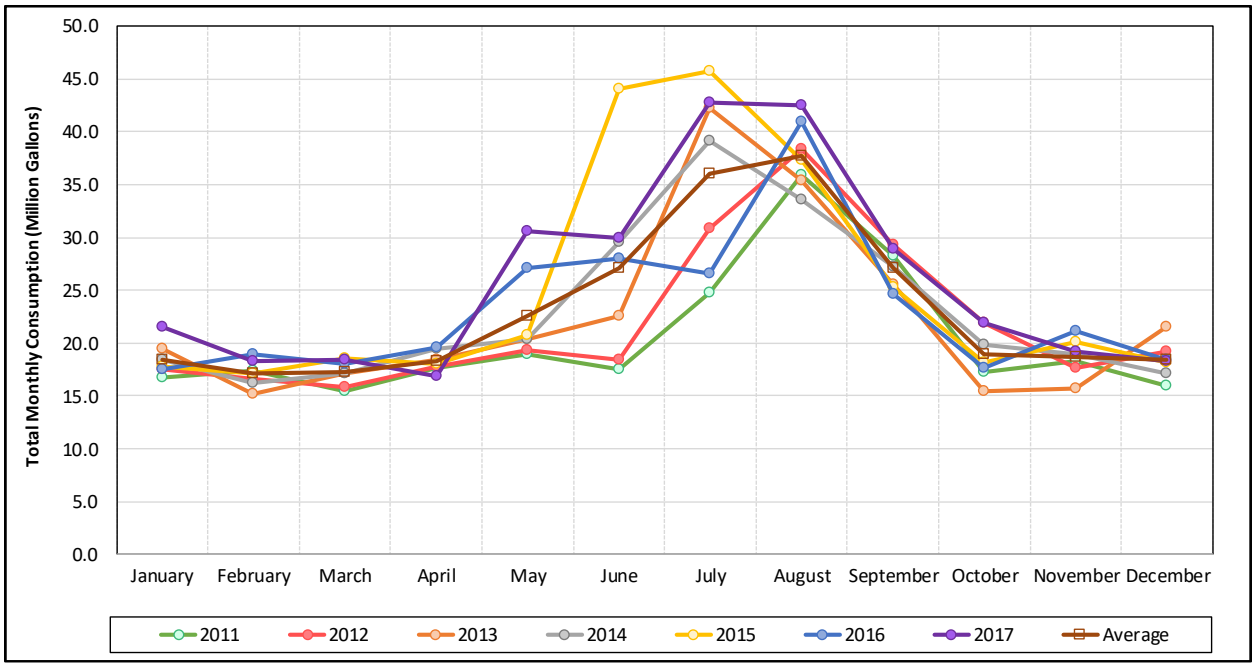


Chart 4-4

Historical Monthly Irrigation Consumption

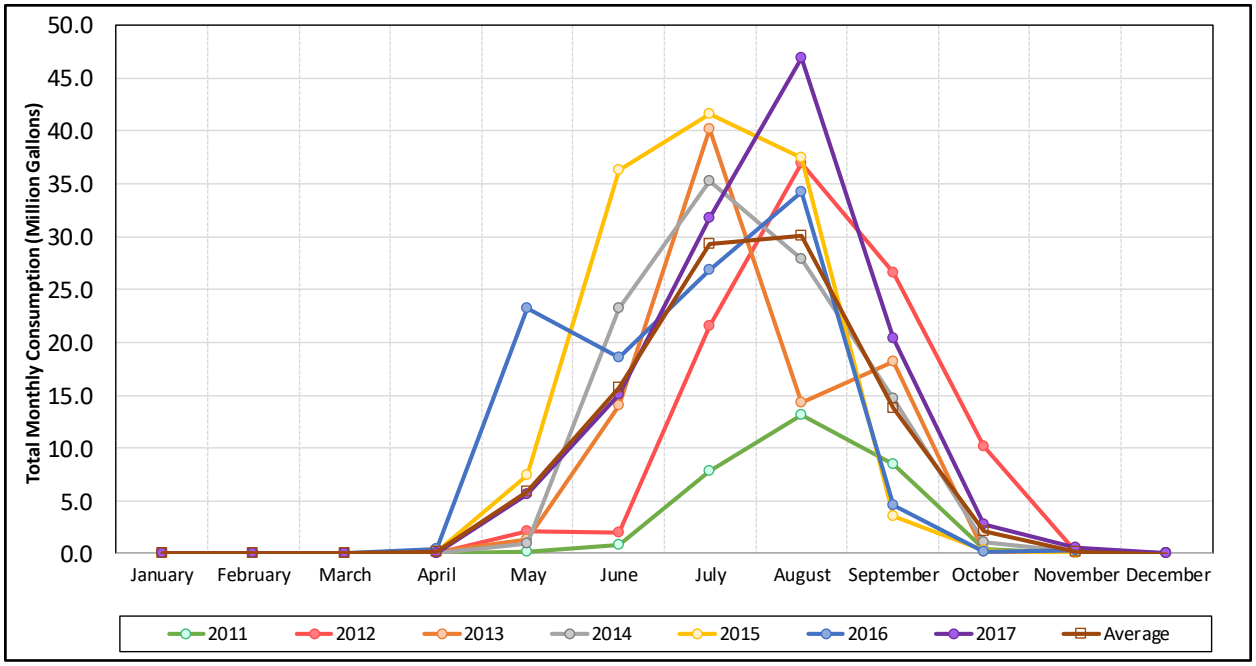


Chart 4-5

Historical Monthly Multi-Family Consumption

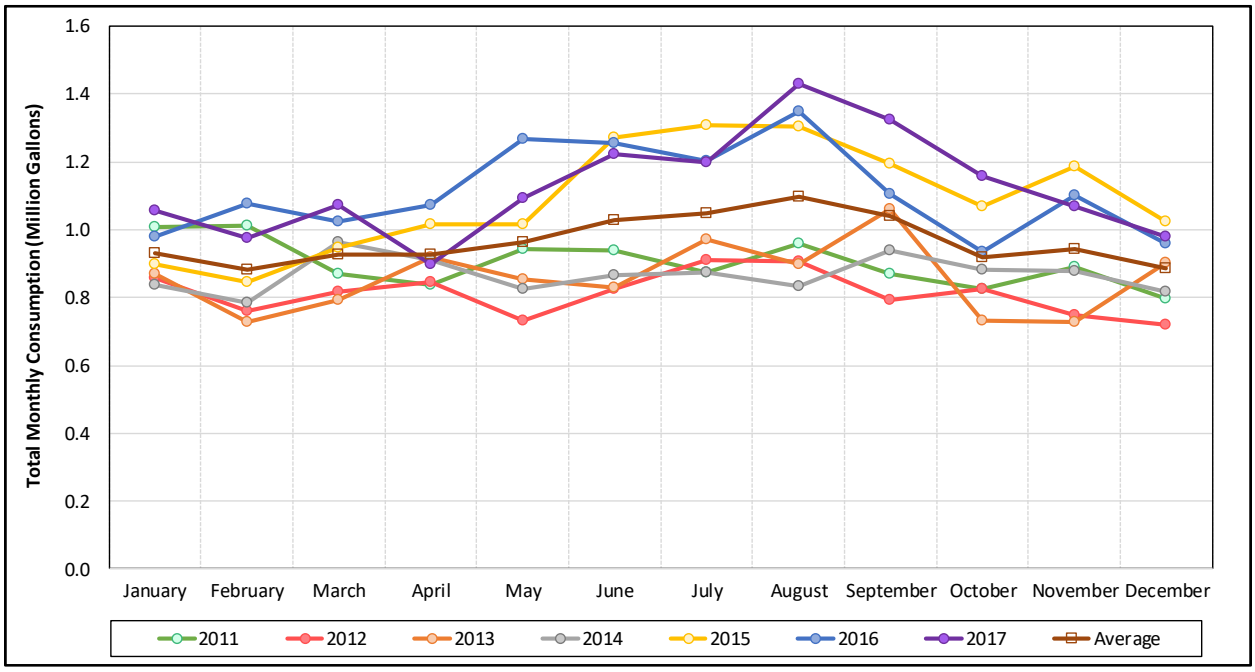
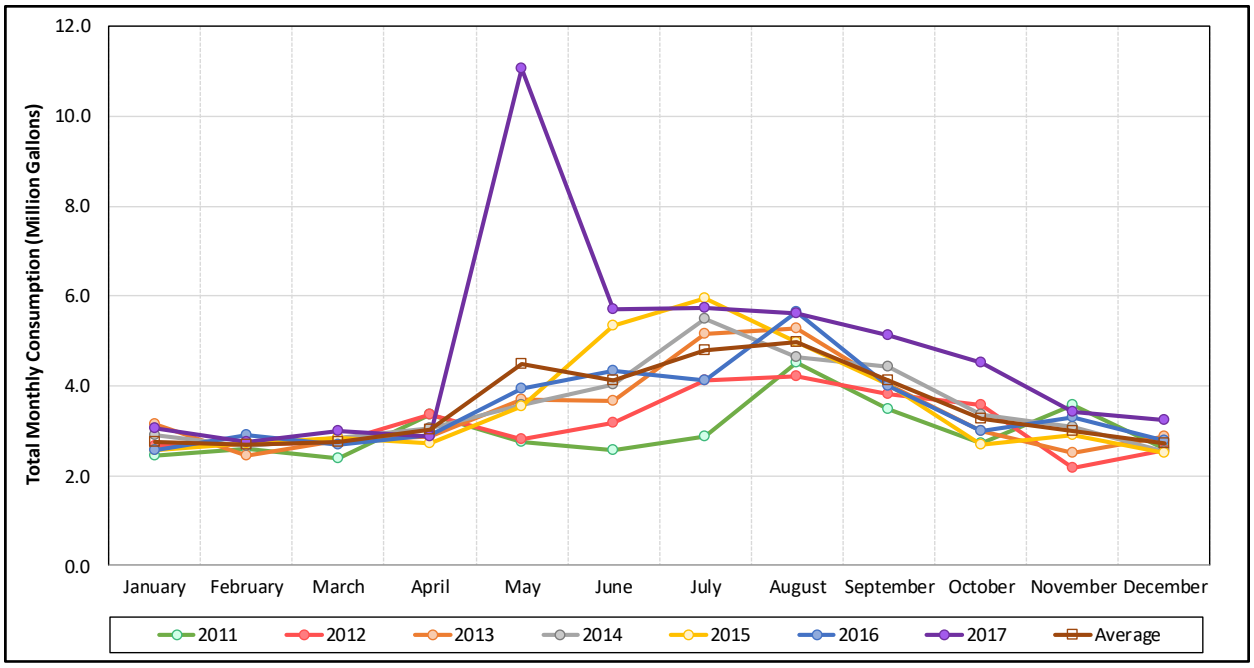


Chart 4-6

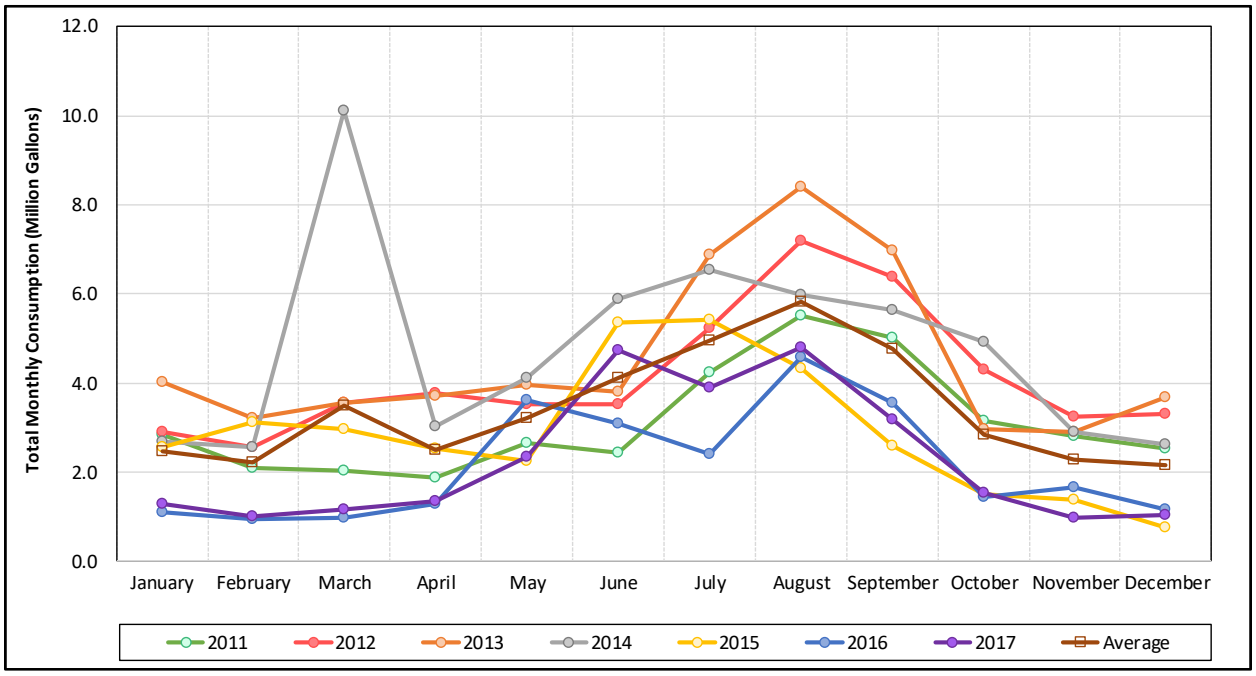
Historical Monthly Commercial Consumption



The May 2017 spike in commercial consumption, shown on **Chart 4-6**, is related to construction usage for the PSE substation at 35717 SE Douglas Street.

Chart 4-7

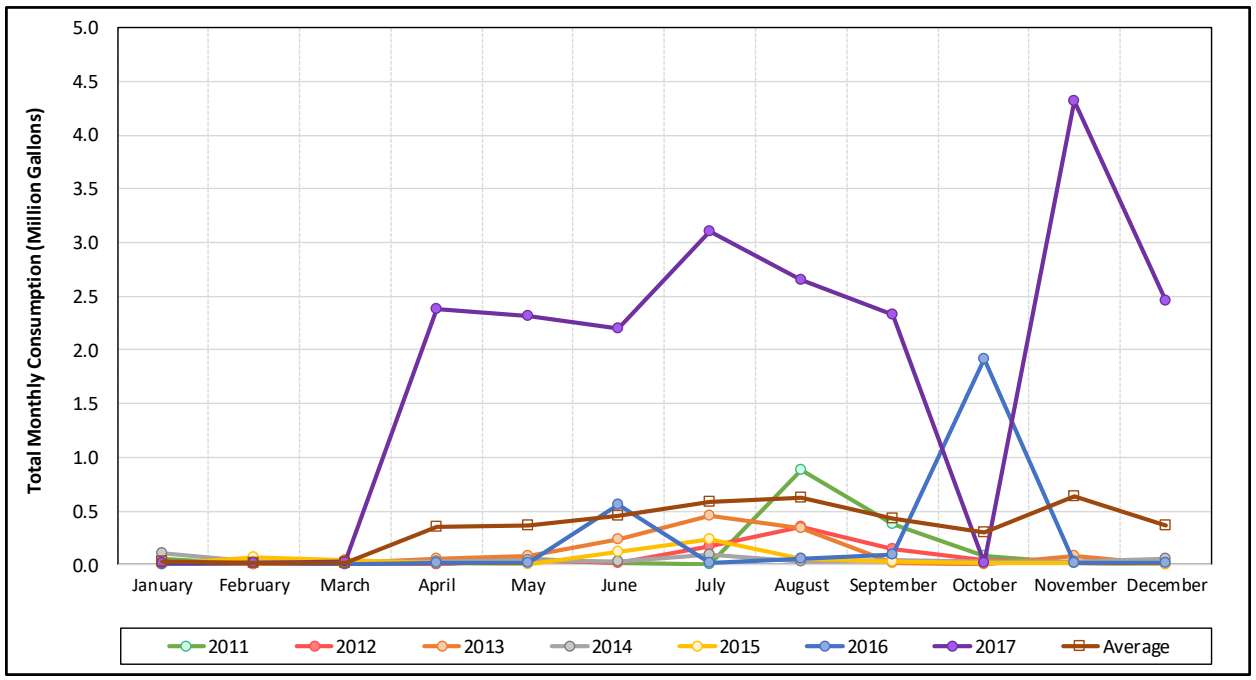
Historical Monthly Public Consumption



The March 2014 spike in public consumption, as shown on **Chart 4-7**, is due to high recorded consumption at the WRF during that month.

Chart 4-8

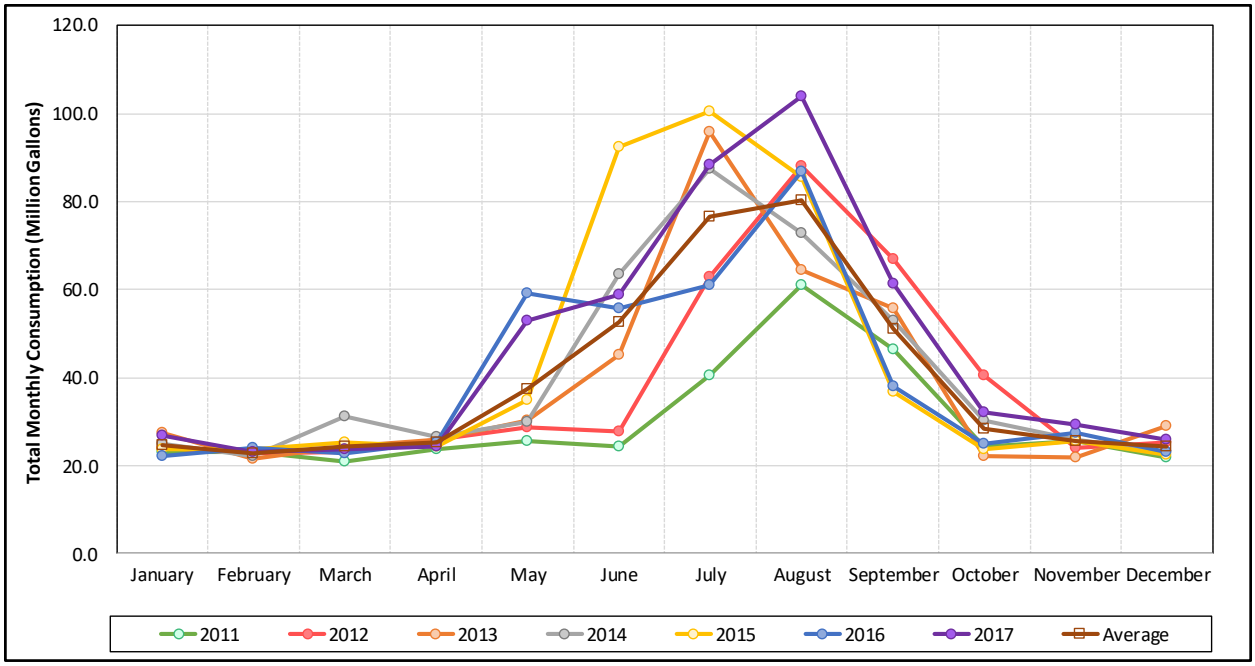
Historical Monthly Other Consumption



The October 2016 spike in other consumption, as shown on **Chart 4-8**, is related to temporary hydrant use. The higher 2017 other consumption shown on **Chart 4-8** is related to construction at the Snoqualmie Tribal Center and irrigation diversions to Eagle Lake.

Chart 4-9

Historical Monthly Consumption – Total System



Wholesale Consumption

The City provides wholesale water to the Walter Walker water system, which consists entirely of single-family residential customers. Consumption by the Walter Walker water system is included in the single-family consumption shown in **Chart 4-3**. In 2017, the Walter Walker water system was one of the City's top 20 water users; the total 2017 consumption is shown in **Table 4-2** as "WA Water Service Co." The annual consumption by the Walter Walker water system for 2011-2017 is listed in **Table 4-3**.

Table 4-3

Historical Walter Walker Water System Consumption

Year	Total Annual Consumption (gallons)
2011	1,070,388
2012	2,087,668
2013	1,237,192
2014	1,196,052
2015	1,131,724
2016	1,031,492
2017	1,092,828

Water Supply

Water supply, or production, is the total amount of water supplied to the system, as measured by the meters at source of supply facilities. Water supply is different than water consumption in that water supply is the recorded amount of water put into the system and water consumption is the recorded amount of water taken out of the system. The measured amount of water supply of any system is typically larger than the measured amount of water consumption, due to non-metered water use and water loss (i.e., distribution system leakage), which will be described more in the **Distribution System Leakage** section.

Table 4-4 and **Chart 4-10** show the annual water supply by source from 2011 to 2017. **Table 4-4** also presents the total annual supply and average day demand for 2011 through 2017. Water demands have generally been increasing since 2011. This is most likely the result of new development, which primarily consists of single-family residences in the Snoqualmie Ridge area.

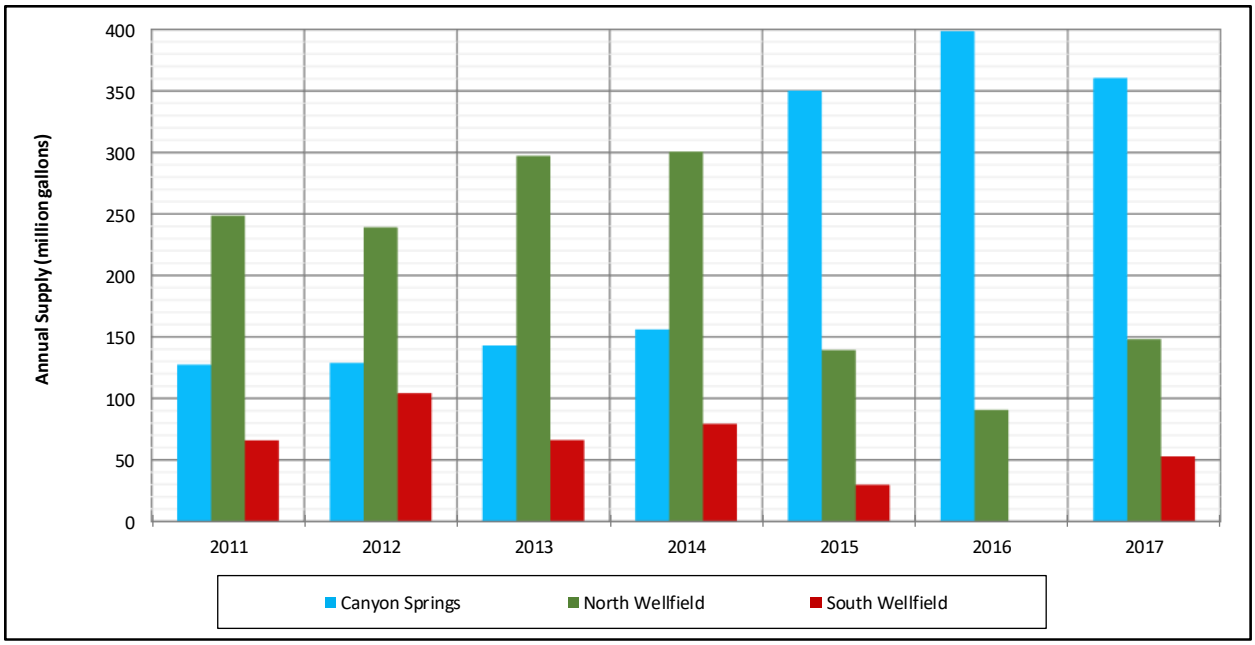
Table 4-4

Historical Water Supply

Year	Canyon Springs Supply (MG)	North Wellfield Supply (MG)	South Wellfield Supply (MG)	Total Supply (MG)	Average Day Demand (gpm)
2011	127.5	248.7	65.9	442.1	841
2012	128.8	239.1	104.2	472.2	896
2013	143.0	297.2	66.1	506.3	963
2014	156.1	300.7	79.3	536.0	1,020
2015	350.2	139.2	29.8	519.2	988
2016	398.7	90.7	0.0	489.4	929
2017	360.5	148.2	52.9	561.6	1,068

Chart 4-10

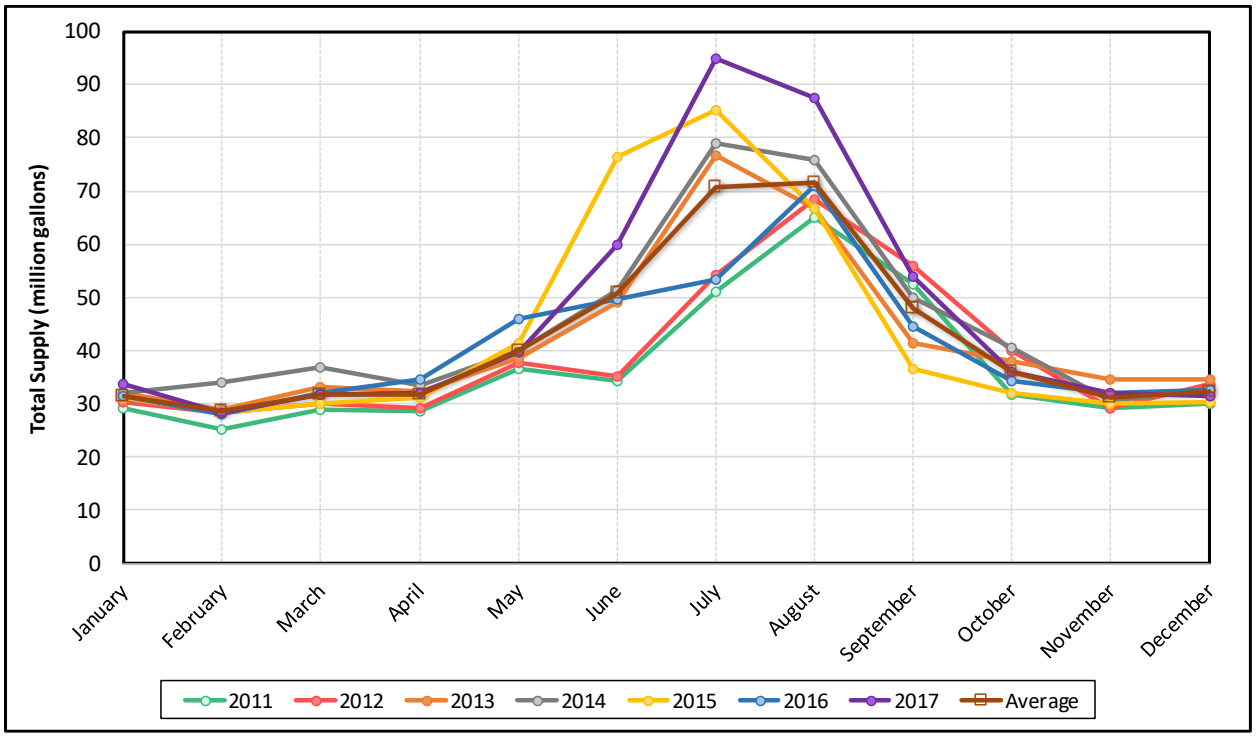
Annual Water Supply by Source



Like most other water systems, the City's water use varies seasonally. **Chart 4-11** shows the historical amount of water supplied to the City's system for each month from 2011 through 2017.

Chart 4-11

Historical Monthly Water Supply



As shown in **Chart 4-11**, water supply increases significantly during summer months, primarily due to increases in irrigation and residential usage. The City's highest water use typically occurs in July and August. On average, the amount of water supplied during these 2 months is approximately 28 percent of the total supply for the entire year.

Chart 4-12 shows the monthly water supply by source for 2017. In 2017, the majority of water was supplied by Canyon Springs, with smaller volumes throughout the year coming from the North and South Wellfield sources.

Chart 4-12

2017 Monthly Water Supply by Source

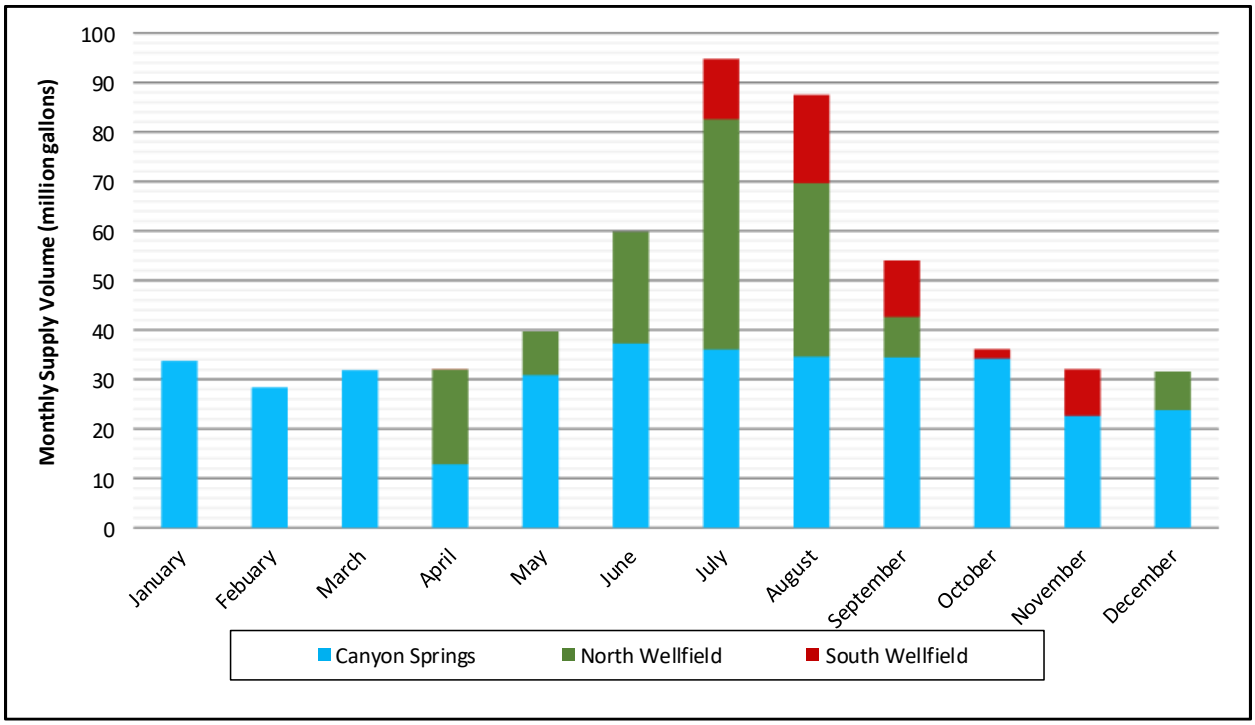


Table 4-5 shows the demand of each of the City's ten existing pressure zones. The demands are based on the City's 2017 individual customer meter data. The Snoqualmie Ridge area (specifically, the 800 Zone, 890 Zone, 1040 Zone, 1180 Zone, and 1260 Zone) accounts for approximately 73 percent of the total system demand. **Figure 2-1** in **Chapter 2** presents the City's pressure zones.

Table 4-5

2017 Demands by Pressure Zone

Pressure Zone	2017 Annual Supply (gallons)	Average Daily Demand (gpm)	Percent of Total Demand
599	72,685,835	138	12.9%
670	4,099,714	8	0.7%
705	50,342,391	96	9.0%
799	23,631,175	45	4.2%
800	11,631,626	22	2.1%
890	27,357,710	52	4.9%
1040	306,374,817	583	54.6%
1172	204,986	0	0.0%
1180	39,309,955	75	7.0%
1260	25,949,090	49	4.6%
Total	**561,587,300**	**1,068**	**100.0%**

Distribution System Leakage

The difference between the amount of water supply and the amount of authorized water consumption is the amount of distribution system leakage (DSL). There are many sources of DSL in a typical water system, including water system leaks, inaccurate supply metering, inaccurate customer metering, illegal water system connections or water use, fire hydrant usage, water main flushing, and malfunctioning telemetry and control equipment resulting in reservoir overflows. Several of these types of usages, such as water main flushing and fire hydrant usage, may be considered authorized used if they are tracked and estimated. Although real losses from the distribution system, such as reservoir over flows and leaking water mains, should be tracked for accounting purposes, these losses must be considered leakage. The Water Use Efficiency (WUE) Rule establishes a DSL standard of 10 percent or less based on a rolling 3-year average.

The amount of DSL in the City's system has been under 10 percent since 2012, as shown in **Table 4-6**. The negative DSL volume reported in 2015 is likely due to metering errors. The City will continue to record authorized water usage and improve the reporting of additional authorized water uses. The City also will implement the Water Use Efficiency (WUE) Program contained in **Appendix F**.

Table 4-6

Distribution System Leakage

	Year						
Description	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Metered Customer Use (MG)	360.7	459.9	464.5	490.9	519.4	471.2	551.3
Total Supply (MG)	442.1	472.2	506.3	536.0	519.2	489.4	561.6
Total DSL Volume (MG)	81.4	12.3	41.8	45.0	-0.2	18.2	10.3
Total DSL Percentage	18.4%	2.6%	8.3%	8.4%	0.0%	3.7%	1.8%
Rolling 3-Year Average DSL Percentage	---	---	9.8%	6.4%	5.5%	4.0%	1.8%

Per Capita Demands

Table 4-7 presents the computation of the existing residential population per capita demand based on 2017 data. As shown in the table, the residential population served by the City's water system in 2017 was approximately 14,322. This population served and the City's total residential population consumption (including connections classified as residential, schools, hydrants, outside the City (not including the Snoqualmie Casino) and associated irrigation) in 2017 were used to calculate the existing residential population's per capita consumption of 84 gpd. The existing residential population's per capita demand of 86 gpd was calculated by adding the estimated DSL associated with the residential consumption. The estimated per capita demand is used later in this chapter to forecast water demands in future years based on future residential population estimates.

Table 4-7

Existing Residential Population Per Capita Demand

Calculated 2017 Residential Population Served	14,322
2017 Total Annual Residential Population Consumption (gallons)	441,469,877
Existing Residential Population Per Capita Consumption (gpd/capita)	84
2017 Estimated Residential Population DSL (gallons)	8,260,265
2017 Total Annual Residential Population Demand (gallons)	449,730,142
Existing Residential Per Capita Demand (gpd/capita)	**86**

Table 4-8 presents the computation of the existing employment per capita demand based on 2017 data. As shown in the upper portion of the table, the employment population (i.e., number of jobs) served by the City's water system in 2017 was approximately 3,718. This population served and the City's total employment consumption (including connections classified as City, commercial, the Salish lodge, Snoqualmie Hospital, Snoqualmie Tribe, and associated irrigation) in 2017 were used to calculate the existing employment per capita consumption of 81 gpd. The existing employment per capita demand of 82 gpd was calculated by adding the estimated DSL associated with employment consumption. The estimated per capita demand is used later in this chapter to forecast water demands in future years based on future employment estimates.

Table 4-8

Existing Employment Per Capita Demand

Calculated 2017 Employment Served	3,718
2017 Total Annual Employment Consumption (gallons)	109,802,660
Existing Employment Per Capita Consumption (gpd/capita)	81
2017 Estimated Employment DSL (gallons)	2,054,498
2017 Total Annual Employment Demand (gallons)	111,857,158
Existing Employment Per Capita Demand (gpd/capita)	**82**

Peak Demands

Average Day Demand

Average day demand (ADD) is the total amount of water delivered to the system in a year divided by the number of days in the year. ADD is determined from the historical water use patterns of the system and can be used to project future demands within the system. Water production records from the City's wells and spring sources were reviewed to determine the system's ADD. The system's average day demand from 2011 through 2017 is shown in **Table 4-4**.

Maximum Day Demand

Maximum day demand (MDD) is the maximum amount of water used throughout the system during a 24-hour time period of a given year. MDD typically occurs on a hot summer day when irrigation is occurring throughout much of the system. In accordance with Washington Administrative Code (WAC) 246-290-230, the distribution system shall provide fire flow at a minimum pressure of 20 pounds per square inch (psi) during MDD (i.e., peak day demand) conditions. Supply facilities (e.g., wells, springs, pump stations, interties) typically are designed to supply water at a rate that is equal to or greater than the system's MDD.

Water production and reservoir level records available for 2015 through 2017 were retrieved from the City's supervisory control and data acquisition (SCADA) system and utilized to estimate the system's MDD, as shown in **Table 4-9**. Data from previous years was not available. The City experienced its highest MDD of 2,585 gallons per minute (gpm) on Tuesday, August 1, 2017. Historical weather records at Sea-Tac Airport show a recorded high temperature of 87 degrees Fahrenheit on this day.

Although the highest MDD was observed in 2017, the highest annual MDD/ADD peaking factor of 2.68 was observed in 2016, as shown in **Table 4-9.** This peaking factor is above the typical range of 1.2 to 2.5 observed for most Puget Sound area systems. It will be used later in this chapter in conjunction with projected ADDs, to project future MDDs of the system.

Table 4-9

Demands and Peaking Factors

Year	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Peak Hour Demand (gpm)	MDD/ADD Peaking Factor	PHD/MDD Peaking Factor
2015	988	2,241	4,214	2.27	***1.88***
2016	929	2,491	***4,495***	***2.68***	1.80
2017	1,068	***2,585***	4,284	2.42	1.66

Peak Hour Demand

Peak hour demand (PHD) is the maximum amount of water used throughout the system, excluding fire flow, during a 1-hour time period of a given year. In accordance with WAC 246-290-230, new public water systems or additions to existing systems shall be designed to provide domestic water at a minimum pressure of 30 psi during PHD conditions.

PHD, like MDD, is typically determined from the combined flow of water into the system from all supply sources and reservoirs. As with the MDD estimates, water production and reservoir level records available for 2015 through 2017 were reviewed to estimate the PHD. The City experienced its highest PHD of 4,495 gpm on Monday, August 22, 2016, from 6:00 AM to 7:00 AM, as shown in **Table 4-9**.

Although the highest PHD was observed in 2016, the highest annual PHD/MDD peaking factor of 1.88 was observed in 2015, as shown in **Table 4-9**. This peaking factor is within the typical range of 1.3 to 2.0 for most Puget Sound Area systems. It will be used later in this chapter in conjunction with projected MDDs, to project future PHDs of the system.

Existing Equivalent Residential Units

The consumption of each customer class can be expressed in terms of equivalent residential units (ERUs) for demand forecasting and planning purposes. One ERU_{ADD} is equivalent to the amount of water consumed by a single-family residence on an average day, not including DSL. One ERU_{MDD} is equivalent to the amount of water consumed by a single-family residence on the day that the water system experiences the highest demand of the year, not including DSL. The number of ERUs represented by the consumption of the other customer classes is determined from the total consumption of the customer class and the unit demand per ERU from the single-family residential demand data. The number of ERUs consumed by DSL also is calculated in this fashion.

Tables 4-10A and **4-10B** present the computed number of ERUs for each customer class on a consumption basis from 2011 through 2017, as well as the number of ERUs consumed by DSL. The consumption shown is based on the totals of each customer class shown in **Table 4-1**. The average day consumption per ERU (ERU_{ADD}) of single-family residential customers for 2011 through 2017 (7-year average) was 179 gallons. The maximum day consumption per ERU (ERU_{MDD}) of single-family residential customers for 2011 through 2017, calculated by

multiplying the ERU_{ADD} by the largest MDD/ADD peaking factor presented in **Table 4-9**, was 480 gallons.

Table 4-10A

Equivalent Residential Units – Consumption Basis

Year	Average Number of Connections	Average Annual Consumption (gallons)	Consumption per ERU_{ADD} (gpd/ERU_{ADD})	Consumption per ERU_{MDD} (gpd/ERU_{MDD})[1]	Total ERUs
Single-Family Residential (ERU Basis)					
2011	3,942	244,227,236	170	455	3,942
2012	4,035	262,597,368	178	477	4,035
2013	4,144	268,958,360	178	477	4,144
2014	4,313	276,853,500	176	472	4,313
2015	4,363	301,171,728	189	507	4,363
2016	4,400	278,712,527	173	464	4,400
2017	4,503	309,250,255	188	505	4,503
Multi-Family Residential					
2011	51	10,825,804	170	455	175
2012	52	9,734,472	178	477	150
2013	52	10,281,260	178	477	158
2014	63	10,415,152	176	472	162
2015	64	13,079,528	189	507	189
2016	64	13,329,360	173	464	210
2017	64	13,486,440	188	505	196
Commercial					
2011	195	35,892,032	170	455	579
2012	197	37,894,428	178	477	582
2013	199	41,453,412	178	477	639
2014	203	42,613,560	176	472	664
2015	207	42,802,056	189	507	620
2016	206	42,149,800	173	464	665
2017	212	56,126,928	188	505	817
Irrigation					
2011	53	31,062,944	170	455	501
2012	54	99,409,200	178	477	1,527
2013	56	88,422,576	178	477	1,362
2014	55	103,505,996	176	472	1,612
2015	55	126,990,952	189	507	1,840
2016	66	108,440,552	173	464	1,712
2017	68	123,312,288	188	505	1,796

(1) = Estimated based on maximum MDD/ADD peaking factor from **Table 4-8**.

Table 4-10B
Equivalent Residential Units – Consumption Basis

Year	Average Number of Connections	Average Annual Consumption (gallons)	Consumption per ERU_{ADD} (gpd/ERU_{ADD})	Consumption per ERU_{MDD} (gpd/ERU_{MDD})[1]	Total ERUs
Public					
2011	41	37,146,428	170	455	600
2012	41	49,445,792	178	477	760
2013	44	54,057,960	178	477	833
2014	45	57,008,820	176	472	888
2015	47	34,774,520	189	507	504
2016	47	25,817,968	173	464	408
2017	49	27,267,592	188	505	397
Other					
2011	12	1,522,928	170	455	25
2012	9	812,328	178	477	12
2013	10	1,313,488	178	477	20
2014	14	551,276	176	472	9
2015	9	618,596	189	507	9
2016	11	2,727,956	173	464	43
2017	15	21,829,034	188	505	318
Distribution System Leakage					
2011	--	81,385,893	170	455	1,314
2012	--	12,292,896	178	477	189
2013	--	41,817,111	178	477	644
2014	--	45,032,737	176	472	702
2015	--	-227,044	189	507	-3
2016	--	18,182,069	173	464	287
2017	--	10,314,763	188	505	150
System-Wide Totals					
2011	4,294	442,063,265	170	455	7,135
2012	4,388	472,186,484	178	477	7,255
2013	4,505	506,304,167	178	477	7,801
2014	4,693	535,981,041	176	472	8,350
2015	4,745	519,210,336	189	507	7,522
2016	4,794	489,360,232	173	464	7,725
2017	4,911	561,587,300	188	505	8,177
Average 2011 to 2017			**179**	**480**	

(1) = Estimated based on maximum MDD/ADD peaking factor from **Table 4-8**.

ERUs also can be calculated from a system demand standpoint, including estimated DSL in the water usage for each ERU. While this approach does not allow a direct calculation of the number of ERUs consumed by DSL, it provides a more conservative approach for forecasting future water demands by assuming that the volume of DSL will increase proportionally with future growth. Although DSL is typically low in areas of new water main construction, it is also typically increasing in aging areas of the distribution system. The oldest areas of the distribution system convey water from supply sources to the new areas of the distribution system. Including estimated DSL in the water usage for each ERU helps approximate this increasing DSL volume as the overall system ages. For these reasons, the City should use the ERU demand basis calculations to prepare Certificates of Water Availability and track water availability for new service connections and future development.

Tables 4-11A and **4-11B** present the computed number of ERUs for each customer class on a demand basis from 2011 through 2017. The demands shown are based on the consumption totals of each customer class shown in **Table 4-1**, plus a proportional percentage of the total DSL. The average day demand per ERU (ERU_{ADD}) of single-family residential customers for 2011 through 2017 (7-year average) was 191 gallons. The maximum day demand per ERU (ERU_{MDD}) of single-family residential customers for 2011 through 2017, calculated by multiplying the ERU_{ADD} by the largest MDD/ADD peaking factor presented in **Table 4-9**, was 512 gallons.

Table 4-11A
Equivalent Residential Units – Demand Basis

Year	Average Number of Connections	Average Annual Demand (gallons)	Demand per ERU_{ADD} (gpd/ERU_{ADD})	Demand per ERU_{MDD} (gpd/ERU_{MDD})[1]	Total ERUs
Single-Family Residential (ERU Basis)					
2011	3,942	299,336,464	208	558	3,942
2012	4,035	269,616,562	183	490	4,035
2013	4,144	293,172,300	194	520	4,144
2014	4,313	302,248,171	192	515	4,313
2015	4,363	301,040,087	189	507	4,363
2016	4,400	289,467,631	180	482	4,400
2017	4,503	315,036,582	192	514	4,503
Multi-Family Residential					
2011	51	13,268,618	208	558	175
2012	52	9,994,673	183	490	150
2013	52	11,206,867	194	520	158
2014	63	11,370,493	192	515	162
2015	64	13,073,811	189	507	189
2016	64	13,843,720	180	482	210
2017	64	13,738,782	192	514	196
Commercial					
2011	195	43,990,974	208	558	579
2012	197	38,907,341	183	490	582
2013	199	45,185,404	194	520	639
2014	203	46,522,333	192	515	664
2015	207	42,783,347	189	507	620
2016	206	43,776,299	180	482	665
2017	212	57,177,109	192	514	817
Irrigation					
2011	53	38,072,215	208	558	501
2012	54	102,066,395	183	490	1,527
2013	56	96,383,135	194	520	1,362
2014	55	113,000,190	192	515	1,612
2015	55	126,935,445	189	507	1,840
2016	66	112,625,113	180	482	1,712
2017	68	125,619,562	192	514	1,796

(1) = Estimated based on maximum MDD/ADD peaking factor from **Table 4-8**.

Table 4-11B

Equivalent Residential Units – Demand Basis

Year	Average Number of Connections	Average Annual Demand (gallons)	Demand per ERU_{ADD} (gpd/ERU_{ADD})	Demand per ERU_{MDD} (gpd/ERU_{MDD})[1]	Total ERUs
Public					
2011	41	45,528,421	208	558	600
2012	41	50,767,472	183	490	760
2013	44	58,924,721	194	520	833
2014	45	62,238,013	192	515	888
2015	47	34,759,320	189	507	504
2016	47	26,814,245	180	482	408
2017	49	27,777,791	192	514	397
Other					
2011	12	1,866,573	208	558	25
2012	9	834,041	183	490	12
2013	10	1,431,739	194	520	20
2014	14	601,842	192	515	9
2015	9	618,326	189	507	9
2016	11	2,833,224	180	482	43
2017	15	22,237,473	192	514	318
System-Wide Totals					
2011	4,294	442,063,265	208	558	5,822
2012	4,388	472,186,484	183	490	7,067
2013	4,505	506,304,167	194	520	7,157
2014	4,693	535,981,041	192	515	7,648
2015	4,745	519,210,336	189	507	7,525
2016	4,794	489,360,232	180	482	7,438
2017	4,911	561,587,300	192	514	8,027
Average 2011 to 2017			**191**	**512**	

(1) = Estimated based on maximum MDD/ADD peaking factor from **Table 4-8**.

The average ERU_{ADD} of 191 gpd and ERU_{MDD} of 512 gpd will be used later in this chapter to forecast ERUs in future years based on estimated future demands. This demand per ERU value also will be used to determine the capacity (in terms of ERUs) of the existing system in **Chapter 7**.

Fire Flow Demand

Fire flow demand is the amount of water required during firefighting as defined by applicable codes. Fire flow requirements are established for individual buildings and expressed in terms of flow rate (gpm) and flow duration (hours). Fighting fires imposes the greatest demand on the water system because a large volume of water must be supplied over a short period of time, requiring each component of the system to be properly sized and configured to operate at its

optimal condition. Adequate storage and supply are useless if the transmission or distribution system cannot deliver water at the required rate and pressure necessary to extinguish a fire.

General planning-level fire flow requirements were established for the City's different land use categories to provide a target level of service for planning and sizing future water facilities in areas that are not fully developed. The general planning-level fire flow requirement for each land use category or specific building type is shown in **Table 4-12**. The water system analyses presented in **Chapter 7** are based on an evaluation of the water system for providing sufficient fire flow in accordance with these general planning-level fire flow requirements. The fire flow requirements shown in **Table 4-12** do not necessarily equate to actual existing or future fire flow requirements for all buildings, since this is typically based on building size, construction type, and fire suppression system provided. Improvements to increase the available fire flow to meet the actual fire flow requirements greater than those shown in **Table 4-12** shall be the responsibility of the developer.

Table 4-12

General Planning-Level Fire Flow Requirements

Facility	Planning-Level Fire Flow Requirement (gpm)	Flow Duration (hours)
Pressure Zones 599, 670, 799, and 1172		
High School	4,000	4
Salish Lodge	3,400	3
Middle School	3,000	3
Elementary School	3,000	3
Hospital	2,000	2
Commercial (Business District)	2,000	2
Multi-Family Residential	1,500	2
Single-Family Residential	1,000	2
Pressure Zones 705, 800, 890, 1040, 1180, and 1260 (Snoqualmie Ridge)		
Commercial[1]	<2,500	2
Elementary School[1]	<2,500	2
Middle School (future)[1]	<2,500	2
Hospital[1]	<2,500	2
Multi-Family Residential[1]	<2,500	2
Single-Family Residential	1,000	2

(1) = All non-single-family residential structures have sprinkler systems that reduce required fire flow to below 2,500 gpm.

FUTURE WATER DEMANDS

Basis for Projecting Demands

Future demands were calculated from the results of the future residential and employment per capita demand computations shown in **Table 4-7** and **Table 4-8**, and the projected population data from **Chapter 3**. Future demand projections were computed with and without water savings expected from implementing WUE measures contained in the City's WUE Program in **Appendix F**.

Demand Forecasts and Water Use Efficiency

Table 4-13 presents the projected water demand forecast for the City's water system. The actual demand data from 2017 also is shown for comparison purposes. The future ADDs were projected based on population estimates for the given years from **Chapter 3** and the estimated demand per capita values. The future MDDs and PHDs shown were computed from the projected ADDs and the maximum existing system peaking factors shown in **Table 4-9**. The future MDD and PHD projections also are shown with and without estimated reductions in water use from achieving the City's WUE goal of reducing the MDD/ADD peaking factor to 2.5 by 2030.

Table 4-13

Future Water Demand Projections

	Actual	Projected													
Description	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 (+10 yrs)	2040 (+20 yrs)
Water System Residential Population Data															
Residential Population	14,322	14,562	14,782	14,971	15,160	15,590	15,590	15,590	15,590	15,600	15,609	15,618	15,627	15,721	15,929
Increase from Base Year 2017		240	460	649	838	1,268	1,268	1,268	1,268	1,277	1,286	1,296	1,305	1,399	1,607
Residential ADD (gpd/capita)[1]		86	86	86	86	86	86	86	86	86	86	86	86	86	86
Water System Area Employment Data															
Employment	3,718	3,744	3,770	3,796	3,824	4,334	4,334	4,333	4,333	4,447	4,751	4,865	4,979	5,093	8,104
Increase from Base Year 2017		26	52	78	106	616	615	615	615	729	1,033	1,147	1,261	1,375	4,386
Employment ADD (gpd/capita)[1]		82	82	82	82	82	82	82	82	82	82	82	82	82	82
Average Day Demand															
ADD (gpm)	1,068	1,084	1,099	1,112	1,125	1,179	1,179	1,179	1,179	1,186	1,204	1,212	1,219	1,231	1,415
Maximum Day Demand[2]															
MDD without WUE (gpm)	2,585	2,909	2,948	2,983	3,017	3,165	3,165	3,164	3,164	3,183	3,232	3,251	3,269	3,302	3,798
MDD with WUE (gpm)		2,894	2,918	2,936	2,954	3,081	3,065	3,048	3,032	3,033	3,062	3,063	3,064	3,077	3,539
Peak Hour Demand[3]															
PHD without WUE (gpm)	4,284	5,470	5,544	5,608	5,673	5,950	5,950	5,950	5,950	5,985	6,076	6,111	6,147	6,208	7,140
PHD with WUE (gpm)		5,441	5,485	5,520	5,554	5,794	5,762	5,731	5,700	5,703	5,757	5,759	5,760	5,785	6,653

(1) = Calculated for future population only.
(2) = MDD without WUE for 2017 based on actual telemetry data.
(3) = PHD without WUE for 2017 based on actual telemetry data.

The analysis and evaluation of the existing water system with proposed improvements, as presented in **Chapters 7** and **9**, is based on the 2040 projected demand data without WUE reductions. This ensures that the future system will be sized properly to meet all requirements, whether or not additional water use reductions are achieved. However, the City will continue to pursue reductions in water use by implementing the WUE Program contained in **Appendix F**.

Table 4-14 presents the existing and projected ERUs of the system. The ERU forecasts are based on the projected water demands from **Table 4-12** and the average ERU_{ADD} demand that was computed from actual 2011 through 2017 data. ERU forecasts based on the average ERU_{ADD} consumption are also presented for comparison purposes. The projected maximum day water demand and demand-basis ERU data from **Tables 4-13** and **4-14** are shown graphically in **Chart 4-13**. **Chart 4-13** will be used in **Chapter 7** to compare demand projections with source of supply availability.

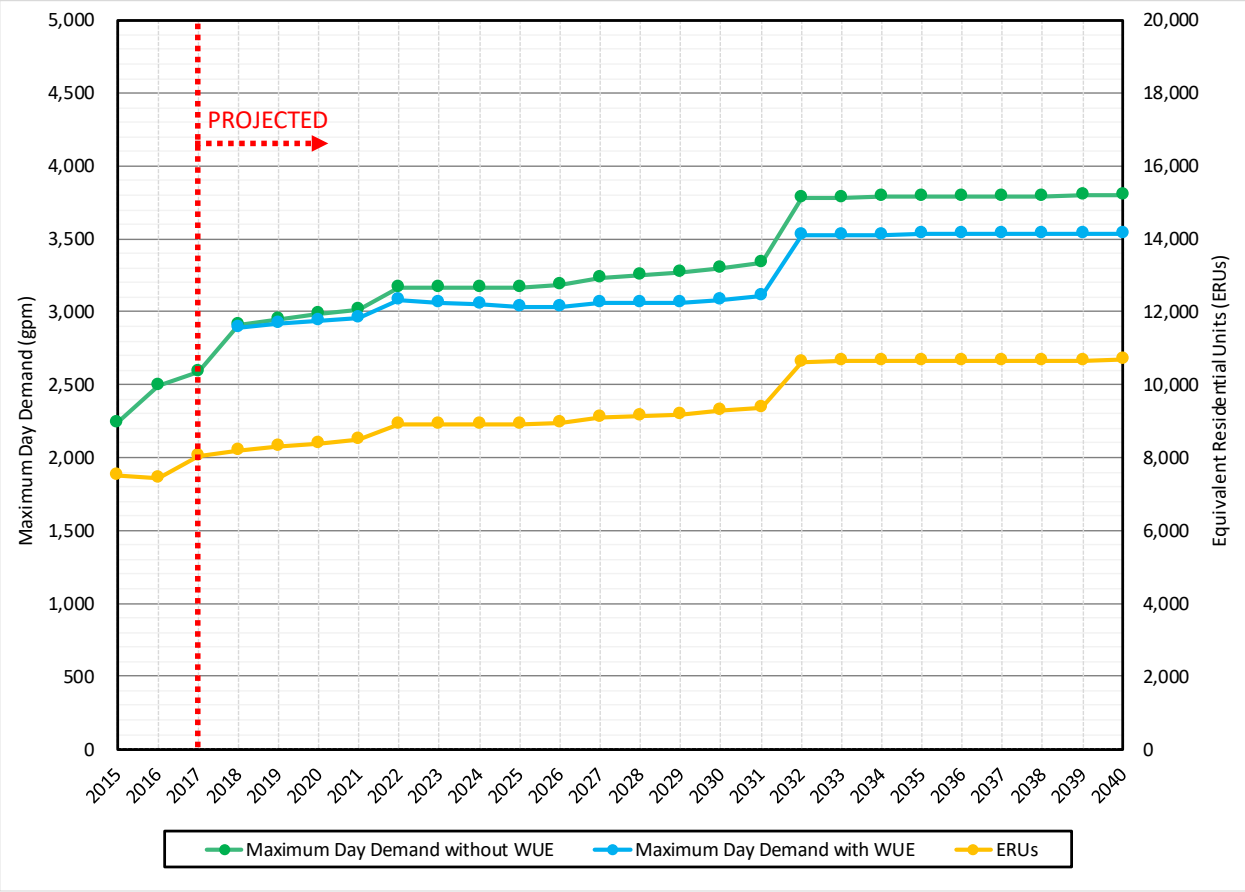
Table 4-14

Future ERU Projections

	Actual	Projected													
Description	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030 (+10 yrs)	2040 (+20 yrs)
Demand Data															
ADD (gpm)	1,068	1,084	1,099	1,112	1,125	1,179	1,179	1,179	1,179	1,186	1,204	1,212	1,219	1,231	1,415
MDD without WUE (gpm)	2,585	2,909	2,948	2,983	3,017	3,165	3,165	3,164	3,164	3,183	3,232	3,251	3,269	3,302	3,798
MDD with WUE (gpm)		2,894	2,918	2,936	2,954	3,081	3,065	3,048	3,032	3,033	3,062	3,063	3,064	3,077	3,539
Equivalent Residential Unit (ERU) Unit Demands															
ERU_{ADD} (gpd/ERU_{ADD})	192	191	191	191	191	191	191	191	191	191	191	191	191	191	191
ERU_{MDD} without WUE (gpd/ERU_{MDD})	514	512	512	512	512	512	512	512	512	512	512	512	512	512	512
ERU_{MDD} with WUE (gpd/ERU_{MDD})		510	507	504	502	499	496	494	491	488	486	483	480	477	477
ERUs - Demand Basis															
Total System ERUs	8,027	8,175	8,286	8,382	8,479	8,893	8,893	8,893	8,893	8,946	9,081	9,135	9,188	9,279	10,673
ERU Unit Consumption															
ERU_{ADD} (gpd/ERU_{ADD})	188	179	179	179	179	179	179	179	179	179	179	179	179	179	179
ERU_{MDD} without WUE (gpd/ERU_{MDD})	505	480	480	480	480	480	480	480	480	480	480	480	480	480	480
ERU_{MDD} with WUE (gpd/ERU_{MDD})		477	475	472	470	467	465	462	460	457	455	452	450	447	447
ERUs - Consumption Basis															
Total System ERUs	8,177	8,733	8,851	8,953	9,057	9,499	9,499	9,499	9,499	9,556	9,700	9,757	9,814	9,912	11,400

Chart 4-13

Maximum Day Demand and ERU Projections (Demand Basis)



5 | POLICIES AND DESIGN CRITERIA

INTRODUCTION

The City of Snoqualmie (City) operates and plans water service for City water system customers according to the design criteria, laws, and policies that originate from the seven sources listed in **Table 5-1** in descending order from those with the broadest to narrowest authority.

Table 5-1

Regulatory Agencies

Agency	Design Criteria/Laws/Policies
U.S. Department of Health & Human Services	Federal Regulations
U.S. Environmental Protection Agency	Federal Regulations
Washington State Department of Health	State Regulations
Washington State Department of Ecology	State Regulations
King County Council	County Regulations
Snoqualmie City Council	City Regulations
American Water Works Association	Design Criteria

These laws, design criteria, and policies guide the City's operation and maintenance of the water system on a daily basis, and its planning for growth and improvements. Their overall objective is to ensure that the City provides high-quality water service at a minimum cost to its customers. They also set the standards the City must meet to ensure that its water supply is adequate to meet existing and future water demands. The system's ability to meet these demands is detailed in **Chapter 7**, and the recommended improvements are identified in **Chapter 9**.

The highest three governmental entities establishing policies and laws – the U.S. Government, Washington State, and King County Council – establish requirements in statutes, regulations, or ordinances. The Snoqualmie City Council and Mayor adopt policies that cannot be less stringent or in conflict with those established by governments above them. The City's policies take the form of ordinances, memoranda, and operational procedures, many of which are summarized in this chapter or can be found in **Appendix N**.

The policies associated with the following categories are presented in this chapter.

- Supply
- Customer Service
- Facilities

- Finance
- Organization

SUPPLY POLICIES

Quality Protection

- The City will pursue steps to meet or exceed all water quality regulations and standards.
- The City will take all reasonable measures to protect its system and customers.

Cross-Connection Control

- The City has a responsibility to protect the public water system from contamination due to cross-connections. Cross-connections that can be eliminated will be eliminated. Cross-connections that cannot be eliminated must be controlled by an approved air-gap or backflow preventer that is commensurate with the assessed degree of hazard.
- The City has a cross-connection control program for eliminating cross-connections. A copy of the City's Cross-Connection Control Plan is contained in **Appendix G**.
- The City has staff that is certified for backflow prevention and testing.
- The City will comply with the backflow prevention assembly installation and testing requirements as indicated in Washington Administrative Code (WAC) 246-290-490, and as published in the most recent version of the *Cross Connection Control Manual Accepted Procedure and Practice*, Pacific Northwest Section – American Water Works Association (AWWA).

Quantity

- The City plans to fully develop its water rights to improve supply redundancy and to be better prepared for future growth.
- The City will ensure that the capacity of the system, including wells, treatment systems, pump stations, storage, and transmission mains, is sufficient to meet the maximum day demands of the system.

Fire Flow

- The City will plan to provide the minimum fire flows as outlined in **Table 4-11**. Actual fire flow requirements, as determined by the local fire marshal, may differ from those shown based on such factors as proposed use and building size. Improvements to increase the available fire flow to meet actual fire flow requirements greater than those shown shall be the responsibility of the developer.

Water Use Efficiency

- The City will promote the efficient and responsible use of water and will implement conservation measures during a water shortage.
- The City has established water use efficiency goals through a public process. Water use efficiency goals will be evaluated and reported annually and updated at least every 10 years as part of the WSP update.
- The City's Water Use Efficiency Program, which is contained in **Appendix F**, describes the City's current adopted program.

Regional Participation

- The City will continue to participate in regional supply management and planning activities to protect the environment, reduce cost of service, increase reliability, improve water quality, and secure needed quantity. The City is currently a member of the East King County Regional Water Association.

CUSTOMER SERVICE POLICIES

Duty to Serve

The City has a duty to provide service to all new connections within the retail service area when the circumstances meet the following four threshold factors:

- The City has sufficient capacity to serve water in a safe and reliable manner.
- The service request is consistent with local plans and development regulations.
- The City has sufficient water rights to provide service.
- The City can provide service in a timely and reasonable manner.

Time extensions in regard to water availability shall be granted in accordance with the associated permit requirements. When extensions are denied, the disputes are handled through the rules guiding the associated permit process. Disputes can be brought to the City Council for discussion.

The following section, **Water Service and Connection**, provides additional details regarding the City's duty to serve policies.

Water Service and Connection

- The City will strive to provide potable water service to all people within the City limits and designated retail water service area (i.e., where there are existing water mains), provided all policies related to service can be met. Requests for new water service outside the City limits, but within the Urban Growth Area (UGA) where there are no existing water mains fronting the property, will only be granted upon extension of water

service and completion of an annexation agreement (provided that the property is not already served or showing a bona fide public health emergency).

- All proposed developments within the City's water service area shall connect directly to the City's water system, unless deemed unfeasible by the City at the time of the request.
- Water system extensions required to provide water service to proposed developments shall be approved by the City and must conform to the City's adopted design criteria, and construction standards and specifications, as shown in the City's Water System Standards contained in **Appendix H**. All costs of the extension shall be borne by the developer.
- Water service cannot be extended outside of the water service area.
- A certificate of water availability shall be applied for prior to issuance of a water service installation permit to determine if water is available.
    - For water service applications within the City limits, the City will review the availability for water service at the time of the land use permit, site civil review, and building permit. During the land use permitting process, the City will determine if water is available for the site. During the site civil review, the City will address the sizing and looping of the water main. The formal water service application begins at the time of building permitting when fire flow and service sizing is evaluated.
    - Water system capacity will be evaluated based on the capacity analysis contained in **Chapter 7** of this Water System Plan (WSP) to evaluate if source of supply, storage, treatment, transmission and water rights capacity available to the applicant.
    - Water system capacity, pressure, and fire flow will be considered when confirming water availability to applicants.
    - If the City has water available in sufficient annual and instantaneous quantities to serve the property, and if the City water system is sufficiently sized, constructed and maintained so as to enable delivery of that water to the subject property, the certificate shall be issued by the City and will be valid for six months from the date of issuance, unless the applicant renews the certificate of availability prior to the expiration date.
    - A certificate of water availability may be renewed only once, for an additional six-month period, unless the applicant provides written documentation to the director's satisfaction demonstrating that the applicant has on file with the jurisdiction in which the subject property is located (King County or the City) a complete building application or complete application for a subdivision, master site plan, or other binding land use application for the underlying property, and that, through no fault of the applicant, the building permit, subdivision, master site plan or other land use application is not likely to be approved within the certificate of water availability's renewal term, in which case the Director may

grant one or more additional renewal terms as the Director determines in his/her reasonable discretion.

- When time extensions are denied, the disputes are handled through the rules guiding the permit process. Disputes can be brought to the City Council for discussion.

Annexations

- Areas annexed without existing municipal water supply will be served by the City, provided the area is within the water service area and the area is not being served by another water purveyor at the time of annexation.
- Areas annexed with existing municipal water supply must meet City water standards.
- The City will follow State guidelines in the assumption of facilities in annexation areas.

Temporary Services

- No temporary service is allowed, unless there is a bona fide health emergency.
- Temporary connections may be made to hydrants, blow-offs, or other connections approved by the City engineer or his designee only upon issuance of a permit. Conditions of use will be set forth on the permit by the City engineer or his designee.
- Meter assemblies will be provided by the City. No other meter assembly will be allowed unless approved by the City engineer or his designee prior to connection.
- The City may require the applicant to discontinue use of the connection to city water for any reason and at any time it deems necessary.

Emergency Service

- Compliance with standards may be temporarily deferred for emergency water service.
- Policy criteria may be waived for emergency service.

Planning Boundaries

- The City's retail water service area and existing and future water service areas will be designated in the current WSP and will be consistent with the *East King County Coordinated Water System Plan*.
- The City will follow State of Washington guidelines in assuming portions of adjacent water systems as a result of annexation.

Satellite System Management

- The City will consider providing satellite system management or ownership services within and adjacent to the City's existing service area.

Permit-Exempt Wells

The City lies wholly within Water Resource Inventory Area (WRIA) 7. If the City determines that water service from the City's water system is unfeasible, the property owner may submit a request for land subdivision or building permit for new construction reliant on use of a permit-exempt well (Revised Code of Washington (RCW) 90.44.050) subject to the terms and limitations identified in chapter 90.94 RCW. Such property owners shall be limited to a maximum annual average withdrawal of 950 gallons per day (gpd) per connection and no more than 5,000 gpd for domestic supply for the project. The per connection use amount may be reduced to 350 gpd for indoor use only during a declared drought (RCW 43.83B.405).

In order to subdivide property or secure building permits for connections to be served by permit-exempt wells, those property owners located within the City's corporate boundaries shall be required to pay the City a fee of $500 per connection, $350 of which is to be transmitted to the Department of Ecology. The property owner will be required to meet stormwater management requirements. The City is required to report the decision to the Department of Ecology. The City is required to record relevant water use restrictions with the property title.

The Department of Ecology is recommending that local jurisdictions located within Hirst affected basins adopt the following recording language: "Domestic water use at this property is subject to a water use limitation of a maximum annual average withdrawal of 950 gallons per day, per connection, subject to the 5,000 gallon per day limit provided in RCW 90.44.050."

The quantitative and other limitations associated with chapter 90.94 RCW, and described here, shall remain in effect until a watershed restoration and enhancement plan is approved by the Department of Ecology and/or implementing rules for this WRIA are adopted.

FACILITY POLICIES

This section describes the planning criteria and policies used to establish an acceptable hydraulic behavior level and standard of quality for the water system. Additional criteria are contained in the City's Water System Standards, a copy of which is included in **Appendix H**.

Minimum Standards

- All proposed developments within the City's existing and future service areas shall conform to the City's adopted design criteria, construction standards, and specifications, in addition to the requirements of governmental agencies.

Pressure

- The City will endeavor to maintain a minimum pressure of 40 pounds per square inch (psi) at customer meters during normal demand conditions, excluding a fire or emergency.
- The City will endeavor to maintain a maximum pressure of 100 psi in the water mains during normal demand conditions. Individual residences are responsible for reducing pressures over 80 psi.

- The City will maintain a minimum pressure of 30 psi at customer meters during all high demand conditions, excluding a fire or emergency.
- During fire or other emergency conditions, the minimum pressure at customer meters and throughout the remainder of the system is 20 psi.
- During a failure of any part of the system, the maximum pressure will not exceed 150 psi.

Velocities

- During normal demand conditions, the velocity of water in a water main should be less than 5 feet per second (fps).
- During emergency conditions such as a fire, and for design purposes, the City will endeavor to ensure the velocity of water in a water main does not exceed 8 fps.

Storage

- Storage within the distribution system must be of sufficient capacity to supplement supply when system demands are greater than the supply capacity (equalizing storage), and still maintain sufficient storage for proper pump operation (operational storage), fire suppression (fire flow storage), and other emergency conditions (standby storage).
- Equalizing storage must be provided when source pumping capacity cannot meet peak hour demands. Equalizing storage must be available at 30 psi to all service connections.
- Standby storage must be located above an elevation that yields a 20 psi service pressure to all services in the zone under peak hour demand conditions with the largest source out of service.
- The City will provide sufficient standby storage for an emergency condition in which a major supply source is out of service. The volume of storage will be sufficient to maintain uninterrupted supply equivalent to one day of maximum day demands. Standby storage will not be less than 200 gallons per equivalent residential unit.
- Fire suppression storage must be located above an elevation that yields a 20 psi service pressure to all services in the zone under maximum day demand conditions.
- The City will provide sufficient fire suppression storage for a fire condition equal to the system's maximum fire protection water demand and required duration.
- The City's Supervisory Control and Data Acquisition (SCADA)/Telemetry system will monitor high-water level and low water level conditions and will generate alarms to be received by operations and maintenance personnel and after hours standby personnel.
- A water level indicator will be maintained on the City's SCADA/Telemetry system.
- Storage facilities will be located in areas where they will satisfy the following requirements:
    1. Minimize fluctuations in system pressure during normal demands.

2. Maximize use of storage facilities during fires and maximum demands.
3. Improve the reliability of supply to the City.

Transmission and Distribution

- Where practical, transmission and distribution mains will be looped to increase reliability and fire flow capacity and decrease head losses.
- All mains will comply with the generally recognized design criteria from AWWA and Washington State Department of Health guidelines that follow.
    1. All new construction will be in accordance with the City of Snoqualmie Water System Standards, a copy of which is included in **Appendix H** of this WSP.
    2. Distribution system design assumes that adequately sized service lines will be used. All residential service lines will be ¾-inch or larger. Service lines will be the same size as the meter or larger.
    3. The minimum diameter of distribution mains will be 8 inches, unless otherwise approved by the City. All new water mains will be ductile iron pipe, unless corrosivity tests recommend an alternate material.
    4. All new distribution mains will be sized by hydraulic analysis.
    5. All new mains providing fire flow will be sized to provide the required fire flow at a minimum residual pressure of 20 psi and a maximum pipeline velocity of 8 fps during maximum day demand conditions. In general, new water mains that will carry fire flow in residential areas shall be a minimum of 8 inches in diameter and looped for multi-family residential developments. New water mains in commercial, business park, industrial, and school areas shall be a minimum of 12 inches in diameter and looped.
    6. Valve installations will satisfy the following criteria:
        a. Zone valves will be located at all pressure zone boundaries to allow future pressure zone realignment without the need for additional pipe construction.
        b. Isolation valves will be installed in the lines to allow individual pipelines to be shut down for repair or installation of water appurtenances (tee for a fire hydrant, a valve, or other appurtenances that cannot be connected by direct tap). The distance between isolation valves will not exceed 600 feet. A minimum of three valves will be provided per cross and two valves per tee.
        c. Air/vacuum release valves will be placed at all high points, or “crowns,” in all pipelines.
        d. Blow-off assemblies shall be located at main dead ends where there is not a fire hydrant. If a water main extension is expected in the future, the blow-off assembly shall have a valve the same size as the main with concrete thrust blocking.

7. Individual pressure reducing valves must be installed in all customer service lines in the City where the pressure exceeds 80 psi. Pressure reducing valves protect customers from high pressures in case a mainline pressure reducing station fails and are the property of the customer. The customer is responsible for the maintenance of individual pressure reducing valves.
8. Fire hydrant installations will satisfy the following criteria:
    a. Fire hydrants serving detached single-family or duplex dwellings on individual lots will be located not more than 500 feet on center, such that all single-family lots are within 300 feet from a fire hydrant, as measured along the path of vehicular access.
    b. Fire hydrants serving any use other than detached single-family or duplex dwellings on individual lots will be located not more than 300 feet on center and will be located so that at least one hydrant is located within 150 feet of all structures, but not closer than 50 feet, unless approved by the Snoqualmie Fire Department.
    c. A minimum of one fire hydrant shall be installed per intersection unless deemed unnecessary by both the Fire Marshal and the City.
    d. The Snoqualmie Fire Department will review all proposed fire hydrant installations to ensure the correct number and spacing of fire hydrants for each project.
    e. Fire hydrants shall be located and installed to facilitate unidirectional flushing activities.

Supply and Booster Pump Stations

- All existing and future booster pump stations will be modified/constructed to comply with the following minimum standards:
    1. All structures will be non-combustible, where practical.
    2. All buildings will have adequate heating, cooling, ventilation, insulation, lighting, and workspaces necessary for on-site operation and repair.
    3. Sites will be fenced to reduce vandalism and City liability, where appropriate.
    4. Each station will be equipped with a flow meter and all necessary instrumentation to assist personnel in operating and troubleshooting the facility.
    5. Emergency power capability will be provided to at least one booster pump station supplying each pressure zone.
- Pumps will be operated automatically, with flexibility in pump start/stop settings.
- Stations will be operated with the provision for at least two methods of control to minimize system vulnerability.
- Manual override of stations will be provided for using the City's telemetry and supervisory control system.

- Stations will be monitored with alarms for the following conditions.
    1. Pump started manually (indicator light for pump started automatically)
    2. Power phase failure
    3. Power outage/generator running
    4. Communication failure
    5. Water in structure (flood)
    6. Low suction pressure
    7. High and low discharge pressure
    8. Intrusion
    9. Pump failure
    10. Smoke detector
    11. Heat detector
- Stations will have the following indicators:
    1. Local flow indication and totalizing.
    2. Flow indication and totalizing to the City's SCADA/Telemetry system.
    3. Recording of combined supply flow to the system.
    4. Discharge pressure gauges.
    5. Motor amperage gauges.
    6. Alarm indicators for all items included under station monitoring.
    7. Appropriate hazardous material signage on exterior of buildings.
- Booster pump stations will be placed wherever necessary to fulfill the following criteria:
    1. Provide supply redundancy to a pressure zone.
    2. Improve the hydraulic characteristics of a pressure zone.
    3. Maximize storage availability and transmission capacity.
    4. Improve water quality (i.e., increase circulation) and quantity.

Pressure Reducing Stations

- All pressure reducing valves will be placed in vaults that are large enough to provide ample workspace for field inspection and valve repair.
- Vaults will drain to daylight or be equipped with sump pumps to prevent vault flooding.
- Pressure relief valves will be provided on the low pressure side of the pressure reducing valves to prevent system over pressurization in case of a pressure reducing valve failure.

Supervisory Control

- The City's supervisory control system must be capable of efficiently operating the water system's components in accordance with this WSP, and in response to reservoir levels, system pressures, abnormal system conditions, and water costs.

Maintenance

- Facility, equipment, and infrastructure breakdowns are given the highest maintenance priority. Emergency repairs will be made even if overtime labor is involved.
- Equipment will be scheduled for replacement when it becomes obsolete and as funding is available.
- Worn parts will be repaired, replaced, or rebuilt before they represent a high failure probability.
- Spare parts will be stocked for all facility, equipment, and infrastructure items whose failure will impact the ability to meet other policy standards.
- Equipment and infrastructure that is out of service will be returned to service as soon as possible.
- A preventive maintenance schedule will be established for all facilities, equipment, infrastructure, and processes.
- Tools will be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.
- Dry, heated shop space will be available for maintenance personnel to maintain facilities.
- All maintenance personnel will be trained to efficiently perform their job duties.
- Maintenance will be performed by the Water Maintenance staff and supervised by the Water Superintendent who oversees maintenance activities.
- Written records and reports showing operation and maintenance history will be maintained for each facility and item of equipment. Not all sites have a location to store records, so some records will be maintained in the maintenance office.

Reliability

- Supply to the service area will be pursued to meet maximum day demand during a reasonable worst case supply system failure.
- System planning will determine whether connections with nearby systems will be reliable or available for use in emergency situations.
- System demand planning will use historical demand data and assume all available land will be developed at saturation.

Vulnerability

- Supply vulnerability analyses will determine a reasonable worst-case failure for the water system. The analyses will consider the following conditions:
    1. Failure of the single largest source of supply.
    2. Reservoir out of service.
- Storage vulnerability analyses will determine a worst-case failure scenario for the water system. The analyses will consider:
    1. Maximum day demand with simultaneous fire; and
    2. Peak hour demand with the largest source of supply out of service.

Joint Use

- All joint-use facilities (with other public water systems) must comply with City policies and design standards.
- All joint-use facilities will be maintained by the Water Division.
- Joint-use facilities will be pursued only in those areas that improve reliability or reduce operating costs.

FINANCIAL POLICIES

General

- The City will set rates that comply with standards established by the AWWA.
- Rates and additional charges established for the City should be:
    1. Cost-based rates that recover current, historical, and future costs associated with the City's water system and services;
    2. Equitable charges to recover costs from customers commensurate with the benefits they receive; and
    3. Adequate and stable source of funds to cover the current and future cash needs of the City.
- Existing City customers will pay the direct and indirect costs of operating and maintaining the facilities through user rates. In addition, the user rates will include debt service incurred to finance the capital assets of the City.
- New customers seeking to connect to the water system will be required to pay a connection charge for an equitable share of the historical cost of the system and for the system's capital improvement program (CIP). Connection charge revenues will be used to fund the CIP in conjunction with rate revenue.
- New and existing customers will be charged for extra services through separate ancillary charges based on the costs to provide the services. Ancillary charges can increase

equitability and operating efficiency by discouraging unnecessary demand for services. The charges should be reviewed regularly and updated annually based on increases in the Consumer Price Index. Revenue from ancillary charges will be used to finance annual operations and maintenance.

- The City will maintain information systems that provide sufficient financial and statistical information to ensure conformance with rate setting policies and objectives.
- User charges must be sufficient to provide cash for the expenses of operating and maintaining the system. To ensure the fiscal and physical integrity of the utility, an amount also should be set aside each year and retained for capital expenditures.
- A Working Capital Reserve will be maintained to cover unanticipated emergencies and fluctuations in cash flow.
- Water rates will strive to equitably charge customers with different service requirements based on the cost of providing the water service. Service requirements relate to the total volume of water used, peak rates of use, and other factors.
- Water rates will be tiered to encourage the efficient use of water.
- Fees and charges are calculated based on the service provided and differ based on the location of the service inside or outside of the City Limits.

Connection Charges

- Owners of properties that have not been assessed, charged, or borne an equitable share of the cost of the water system will pay one or more of the following connection charges prior to connection to a water main.

    1. Service Installation Charges: Service installation charges include all labor and materials, but exclude road crossing, for which the customer shall pay the actual cost incurred for the connection/installation and meter tests. A property owner desiring the extension of water service to his property may be required to extend or improve the municipal water supply system as a condition thereof, and to execute a developer's agreement regarding the apportionment of the costs thereof and other appropriate conditions, including payment of the City's engineering, legal and other professional consultant fees in reviewing and processing the water service extension. Such developer's agreements may include provisions for recovery of a pro rata share of the initial construction costs of the water service extensions from additional customers desiring to connect to such extensions.
    2. Direct Facilities Charges: Direct facilities charges are collected from property owners that directly benefit from the city water system, except property owners who previously paid their fair share through an LID or ULID. The direct facilities charge is the property owner's equitable share of the established costs of the water system facilities they benefit from, regardless of whether those facilities were constructed by the City water utility or a private party.

3. Water General Facilities Charges: The general facilities charge is a charge imposed upon new customers to recover the customer's equitable share of the cost of the system and is used for funding construction of future general facilities. Funds received pursuant to the general facilities charge shall be used for capital improvement projects undertaken to construct general facilities, and payment of debt service on capital improvement projects.
4. Latecomers Fees: Latecomers fees are negotiated with developers and property owners; they provide for the reimbursement of a pro rata portion of the original cost of the water system extensions and facilities.

ORGANIZATIONAL POLICIES

Staffing

- Personnel certification will comply with State standards.
- The Water Division will promote staff training.

Relationship with Other Departments

- The Finance Department is responsible for customer billing, payment collection, project cost accounting, and fund activity reporting.
- The Utilities Division is responsible for construction and oversight of capital improvement projects.
- The Community Development Department is responsible for water system development standards and review and inspection of new infrastructure built by private developers.
- The Human Resources Department is responsible for employee records, union labor negotiations, and salary schedules.
- The Fire Department uses water utility facilities for fire protection and establishes fire flow requirements. The Fire Department also is responsible for emergency responses to hazardous events at water system facilities. Additionally, the Fire Department manages safety and risk management functions.
- The Police Department is responsible for enforcing violations of City water ordinances.
- The Water Division is responsible for fire hydrant testing.

6 | WATER SOURCE AND QUALITY

INTRODUCTION

The two basic objectives of a water system are to provide a sufficient quantity of water to meet customer usage demands and to provide high-quality water. **Chapter 7** discusses the City of Snoqualmie's (City) ability to supply a sufficient quantity of water and identifies future source requirements. This chapter discusses the City's existing water sources, water rights, water quality regulations, and water quality monitoring results.

EXISTING WATER SOURCES AND TREATMENT

Water Sources

The City's municipal water supply is provided by groundwater wells and one spring. These sources include Canyon Springs, the North Wellfield (Well Nos. 6, 7, and 8), and the South Wellfield (Well Nos. 1R and 2). Well No. 1 was decommissioned in August of 2005.

Canyon Springs

The Canyon Springs site is located at 44937 SE 70th Street above the North Fork of the Snoqualmie River. This is the oldest active source employed by the City and has a capacity of 898 gallons per minute (gpm).

North Wellfield

The North Wellfield and Treatment Plant, located at 38180 SE Mill Pond Road near Tokul Road, contains Well Nos. 6, 7, and 8. Well Nos. 6, 7, and 8 have individual pumping capacities of about 550, 550, and 1,250 gpm, respectively. However, the wells within the North Wellfield interfere with each other during operation. The combination of wells that are utilized include Well Nos. 6 and 7 at a combined pumping rate of 1,100 gpm, Well No. 8 alone at a pumping rate of 1,250 gpm, and Well Nos. 7 and 8 at a combined pumping rate of 1,650 gpm.

South Wellfield

The South Wellfield and Treatment Plant, located at 39232 SE Park Street in the downtown area, contains Well Nos. 1R and 2. Well Nos. 1R and 2 each have capacities of about 600 gpm.

Water Treatment

All three sites use chlorine to disinfect source water. A solution of 0.8-percent sodium hypochlorite is added to the water to provide an initial dose of 2.0 milligrams per liter (mg/L). The North Wellfield site stores the solution in two 3,000-gallon product tanks, while the South Wellfield and Canyon Springs sites use single product tanks of 1,000 gallons and 350 gallons, respectively. Sodium hypochlorite is generated onsite by electrolyzing a solution of water and

salt. Water from the south wells is filtered for iron and manganese. Water from the north wells is filtered for arsenic, iron and manganese. Canyon Springs is not filtered since it has naturally low levels of these contaminants. Additionally, water at the North Wellfield and Treatment Plant is treated with a 5.5 mg/L solution of ferric chloride to coprecipitate with arsenic to augment arsenic treatment. Water is not fluoridated at any of the three source sites.

WATER RIGHTS AND INTERTIES

Overview

A water right is a legal authorization to use a specified amount of public water for specific beneficial purposes. The water right amount is expressed in terms of instantaneous withdrawal rate and annual withdrawal volume. Washington State law requires users of public water to receive approval from the Washington State Department of Ecology (Ecology) prior to actual use of the water. This approval is granted in the form of a water right permit, which is developed into a certificate. However, a water right is not required for certain purposes (typically individual residences) that use 5,000 gallons per day (gpd) or less of groundwater from a well.

The process of obtaining a water right involves submitting a water right application that is reviewed by Ecology. If the request is approved, a water right is issued to allow for water use to commence. A water right permit provides permission to construct the necessary wells or diversions, pumps, and pipes to start using water. The water right permit remains in effect until the permit holder determines that its project is complete and they have used as much water as they will under the water right. At that time, the permit holder files a proof of appropriation form, which attests to the rate and volume of water used under the water right. A water right certificate is issued by Ecology following a proof of examination and determination that the amount of water put to beneficial use is consistent with the amount and conditions indicated on the water right permit.

A water right permit can only be issued by Ecology if the proposed use meets the following requirements:

- Water will be put to beneficial use.
- There will be no impairment to existing or senior rights.
- Water is physically and legally available for appropriation.
- Issuance of the requested water right will not be detrimental to the public interest.

During preparation of the report of examination, Ecology considers existing basin management plans, stream closures, minimum instream flows, hydraulic continuity (surface water interconnected to groundwater), utilization of existing water sources, water conservation, and availability of alternative water supplies, among other things. The water right decision process is increasingly becoming more complex and time consuming, due to the many competing interests for water, environmental issues, and regulatory requirements.

Existing Water Rights and Interties

The City currently holds one surface water certificate, three ground water certificates, and one ground water permit for its sources of municipal water supply. The City's water rights total 3,328 gpm and 2,372 acre-feet per year (afy).

The City currently has one intertie to provide wholesale water supply to the Walter Walker water system.

A summary of the City's water rights is presented in **Table 6-1**, and the principal water right documents are contained in **Appendix I**.

Table 6-1

Existing Water Rights

Water Right	Priority Date	Document	Source Name	Instantaneous Rate (gpm)		Annual Volume (afy)	
				Additive	Non-additive	Additive	Non-additive
GWC 91-D	1/1/1930	Superseding Certificate	North and South Wellfields	90	0	100	0
GWC 92-D	1/1/1940	Superseding Certificate	North and South Wellfields	90	0	100	0
G1-20316C	10/13/1972	Superseding Certificate	North and South Wellfields	600	0	0	500
G1-25449P	5/30/1989	Permit	North Wellfield	1,650	0	724	0
			Ground Water Subtotal	***2,430***	***0***	***924***	***500***
SWC 4553	10/18/1944	Certificate	Canyon Springs	898	0	1,448	0
			Total	**3,328**		**2,372**	

Notes:
A maximum of 2,430 gpm and 1,424 afy can be pumped from the North Wellfield.
A maximum of 600 gpm and 500 afy can be pumped from the South Wellfield.
G1-20316C annual volume is non-additive to the annual volume granted under GWC 91-D, GWC 92-D, and SWC 4553.
Instantaneous rate under SWC 4553 is equal to 2 cubic feet per second.
No annual volume specified under SWC 4553. Annual volume calculated here is equal to 898 gpm continuously, year round.
Development schedule on G1-25449P requires full beneficial use by September 30, 2020.
Maximum of all rights is 3,328 gpm and 2,372 afy.

The City's water rights are all for sources located in Water Resource Inventory Area (WRIA) 7 – Snohomish. Each water right is discussed in more detail in the following sections.

Surface Water Certificate 4553

Surface Water Certificate (SWC) 4553, with a priority date of October 18, 1944, currently authorizes the diversion of 2 cubic feet per second (cfs) (898 gpm) and 1,448 afy from Canyon Springs for municipal water supply within the City's water service area. No changes to this water right have been made since it was originally issued.

Ground Water Certificate 91-D (G1-*00059SWRIS)

Ground Water Certificate (GWC) 91-D, with a priority date of 1930, currently authorizes the withdrawal of 90 gpm and 100 afy from either the North or South Wellfields for municipal water supply within the City's water service area. The original certificate was issued on May 11, 1946 and was based on a declaration filed by the City to have a pre-ground water code water use recognized (water use initiated prior to June 6, 1945). In December 2016, the City requested to change the point of withdrawal from the original well to the North and South

Wellfields as the points of withdrawal. This change was approved on December 19, 2018. The report of examination for change indicated that all steps in the development schedule were already complete. A superseding certificate was issued by Ecology on January 2, 2020.

Ground Water Certificate 92-D (G1-*00060SWRIS)

GWC 92-D, with a priority date of 1940, currently authorizes the withdrawal of 90 gpm and 100 afy from either the North or South Wellfields for municipal water supply within the City's water service area. The original certificate was issued on May 11, 1946 and was based on a declaration filed by the City to have a pre-ground water code water use recognized. In December 2016, the City requested to change the point of withdrawal from the original well to the North and South Wellfields as the points of withdrawal. This change was approved on December 19, 2018. The report of examination for change indicated that all steps in the development schedule were already complete. A superseding certificate was issued by Ecology on January 2, 2020.

Ground Water Certificate G1-20316C

G1-20316C, with a priority date of October 13, 1972, currently authorizes the withdrawal of 600 gpm and 500 afy (non-additive) from either the North or South Wellfields for municipal water supply within the City's water service area. The original certificate was issued in April 1975 and only allowed for withdrawal from Well No. 1 in the South Wellfield. After the original certificate was issued, the City drilled Well No. 2 in the South Wellfield. In February 1997, the City filed a change application to have Well No. 2 recognized as an additional point of withdrawal under the water right. In March 2001, the City submitted a Showing of Compliance with RCW 90.44.100(3) form to Ecology to add Well No. 2 without having to go through the water right change application process. In April 2001, Ecology rejected CG1-20316C since it was no longer needed. In 2005, the City drilled Well No. 1R to replace Well No. 1. In December 2016, the City requested to add additional points of withdrawal to include the wells within the North Wellfield (Well Nos. 6, 7, and 8), as well as the current wells within the South Wellfield (Well Nos. 1R and 2) under the water right. This change application was assigned tracking number CG1-20316C@1. This change was approved on December 19, 2018. The report of examination for change indicated that all steps in the development schedule were already complete. A superseding certificate was issued by Ecology on January 2, 2020.

Ground Water Permit G1-25449P

G1-25449P, with a priority date of May 30, 1989, currently authorizes the withdrawal of 1,650 gpm and 724 afy from the North Wellfield for municipal water supply within the City's water service area. The development schedule on this permit requires full beneficial use by September 29, 2020. If the City has not made full beneficial use of this water right permit, then it will need to file an extension request before the due date and provide evidence to Ecology showing due diligence toward using the water right.

Existing Water Right Discussion

As can be seen from **Table 6-1**, all three of the ground water certificates include the wells located at both the North and South Wellfields as points of withdrawal, whereas the ground water permit only includes the wells located at the North Wellfield as points of withdrawal. For this reason, and based on a water right provision included on some of the reports of examination for change, the authorized capacity of the two wellfields is different. The maximum capacity of the North Wellfield, as authorized under the existing water rights, is 2,430 gpm and 1,424 afy. Whereas, the maximum capacity of the South Wellfield, as authorized under the existing water rights, is 600 gpm and 500 afy. However, the maximum combined ground water withdrawal rate at any time is 2,430 gpm. So, any pumping from the South Wellfield must be accompanied with an equivalent reduction in pumping from the North Wellfield to not exceed the 2,430 gpm instantaneous ground water right limit. The surface water certificate is only for water diverted from Canyon Springs and is a maximum of 898 gpm and 1,448 afy. However, since the annual volume under G1-20316C is non-additive, any ground water withdrawal (combined total of the North and South Wellfields) in excess of 924 afy needs to be debited against the volume of water that can be diverted from Canyon Springs. Meaning, that if the City chose to withdraw the maximum of 1,424 afy from ground water, the maximum volume that could be diverted from Canyon Springs would be 948 afy.

Pending Water Right Applications

The City currently has two pending new water right applications.

Ground Water Application G1-27589

Ground Water Application G1-27589, with a priority date of March 16, 1995, requests that the City be able to withdraw an additional 1,400 gpm and 2,302 afy from additional wells drilled as part of the South Wellfield. This application remains pending in Ecology's water right application processing queue.

Surface Water Application S1-28833

Surface Water Application S1-28833, with a priority date of December 21, 2016, requests that the City be able to divert an additional 3.3 cfs and 1,000 afy from Canyon Springs, beyond that allowed to be diverted under SWC 4553, which is 2 cfs and 1,448 afy. This application remains pending in Ecology's water right application processing queue.

Water Supply Evaluation

An evaluation of the City's existing water rights was performed to determine the sufficiency of the water rights to meet both existing and future water demands. **Table 6-2** compares the combined maximum instantaneous water right amounts of the sources with the maximum day demand of the system, and the combined maximum annual water right volumes of the sources with the average day demand of the system. As shown in **Table 6-2**, the City has sufficient instantaneous and annual water rights to meet existing demand.

Table 6-2
Existing Water Rights Evaluation

Description	Instantaneous Rights/ Maximum Day Demand (gpm)	Annual Rights/ Average Day Demand (afy)	(gpm)
Total Water Rights	3,328	2,372	1,471
Existing (2017) Water Demand	2,585	1,723	1,068
Surplus (or Deficient) Rights	**743**	**649**	**402**

Table 6-3 summarizes the results of the future water rights evaluation, which compares the water rights of the existing sources with the system's future 10-year and 20-year demand projections. The analyses considered future demand projections with and without water use reductions from the City's planned water use efficiency efforts, as shown in the table. The City's WUE goals are to reduce the MDD/ADD peaking factor to 2.5 by 2030 and maintain system-wide DSL at less than 6.0 percent per year based on a 3-year rolling average. The results of the future water rights evaluation indicate the City has sufficient instantaneous water rights to meet the demand through the year 2030, but insufficient instantaneous water rights to meet the demand through the year 2040. The City has sufficient annual water rights to meet demand through 2040.

Table 6-3

Future Water Rights Evaluation

Description	Instantaneous Rights/ Maximum Day Demand (gpm)	Annual Rights/ Average Day Demand (afy)	(gpm)
Year 2030 (+ 10 years) Without Water Use Efficiency			
Total Water Rights	3,328	2,372	1,471
Projected (2030) Water Demand	3,302	1,985	1,231
Surplus (or Deficient) Rights	**26**	**387**	**240**
Year 2040 (+ 20 years) Without Water Use Efficiency			
Total Water Rights	3,328	2,372	1,471
Projected (2040) Water Demand	3,798	2,283	1,415
Surplus (or Deficient) Rights	**(470)**	**89**	**55**
Year 2030 (+ 10 years) With Water Use Efficiency			
Total Water Rights	3,328	2,372	1,471
Projected (2030) Water Demand	3,077	1,985	1,231
Surplus (or Deficient) Rights	**251**	**387**	**240**
Year 2040 (+ 20 years) With Water Use Efficiency[1]			
Total Water Rights	3,328	2,372	1,471
Projected (2040) Water Demand	3,539	2,283	1,415
Surplus (or Deficient) Rights	**(211)**	**89**	**55**

1. No difference in projected average day demand anticipated based on water use efficiency.

Water Rights Planning

The City is currently developing and implementing a long-range plan for better utilizing its existing water rights and to obtain additional water rights to meet anticipated future growth.

Part of this strategy was the processing of the water right change applications that occurred between 2016 and 2018, which provided greater flexibility to the City related to the use of the North and South Wellfields.

The City also is considering implementation of an Aquifer Storage and Recovery (ASR) program to address future water right shortfalls. The proposed ASR program would involve diverting water from the City's existing source at Canyon Springs during the wet season (when excess water is available), conveying it through the drinking water distribution system, then recharging it through an existing well(s) at the City's South Wellfield. Stored water would then be recovered during summer months through normal operation of the North and/or South Wellfields.

The City currently is planning to conduct technical analyses to evaluate geochemical constraints to operating the ASR program and to quantify the volume of water that could be stored and

recovered. Because some of the recharged water will likely remain in the ground or be lost as leakage to the Snoqualmie River, there will be a streamflow benefit associated with the ASR program. This streamflow benefit from stored water is the subject of a Streamflow Restoration Grant application that was submitted to Ecology in early 2020 to cover a portion of the costs for program development.

If additional water is needed beyond what can be supplied under SWC 4553 for the ASR project, the City will need to have pending application S1-28833 processed. This water right would be subject to minimum instream flows and would not be allowed to impair any existing water rights, as discussed in the sections that follow.

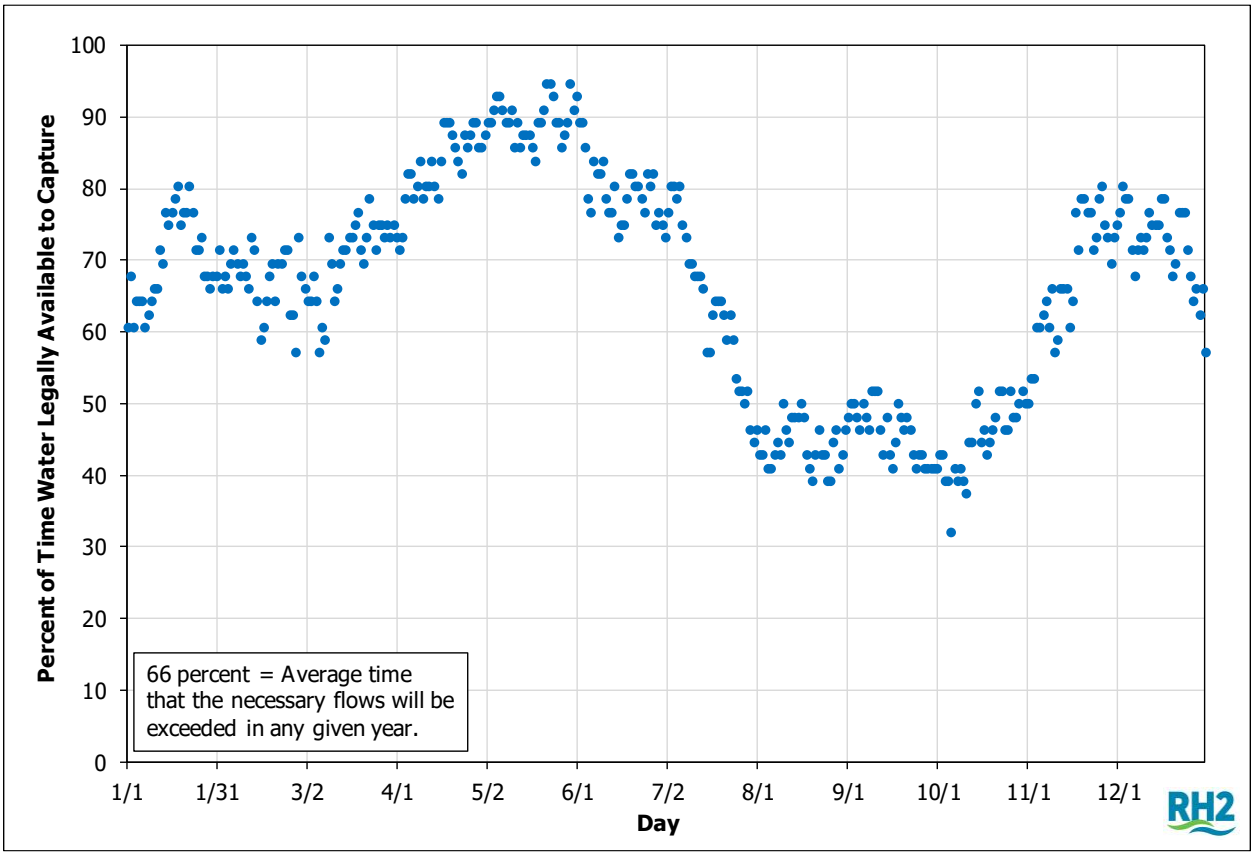
LONG-TERM WATER SUPPLY PLANNING

Feasibility of Obtaining New Water Rights

Any new water rights obtained in the vicinity of the City will be subject to minimum instream flows as specified under Chapter 173-507 Washington Administrative Code (WAC). This rule contains minimum instream flows for the Snoqualmie River at the following United States Geological Survey (USGS) control stations: 1) Snoqualmie River near Snoqualmie – 12144500; 2) Snoqualmie River near Carnation – 12149000; and 3) Snohomish River near Monroe – 12150800. This rule specifies that the actual flow in the Snoqualmie and Snohomish Rivers downstream from the site at the control stations must all be higher than the minimum instream flows identified in the rule before water can be taken under a new water right. Analysis of historic stream flows suggests that the downstream minimum instream flows are not met on average 66 percent of the days out of the year. There is a tendency for those flows not to be met during the summer, when municipal demand is the greatest (**Figure 6-1**).

Figure 6-1

Percent of Time Minimum Instream Flows are Exceeded at the Snoqualmie River near Snoqualmie, Snoqualmie River near Carnation, and Snohomish River near Monroe Gages (1964 through 2019)

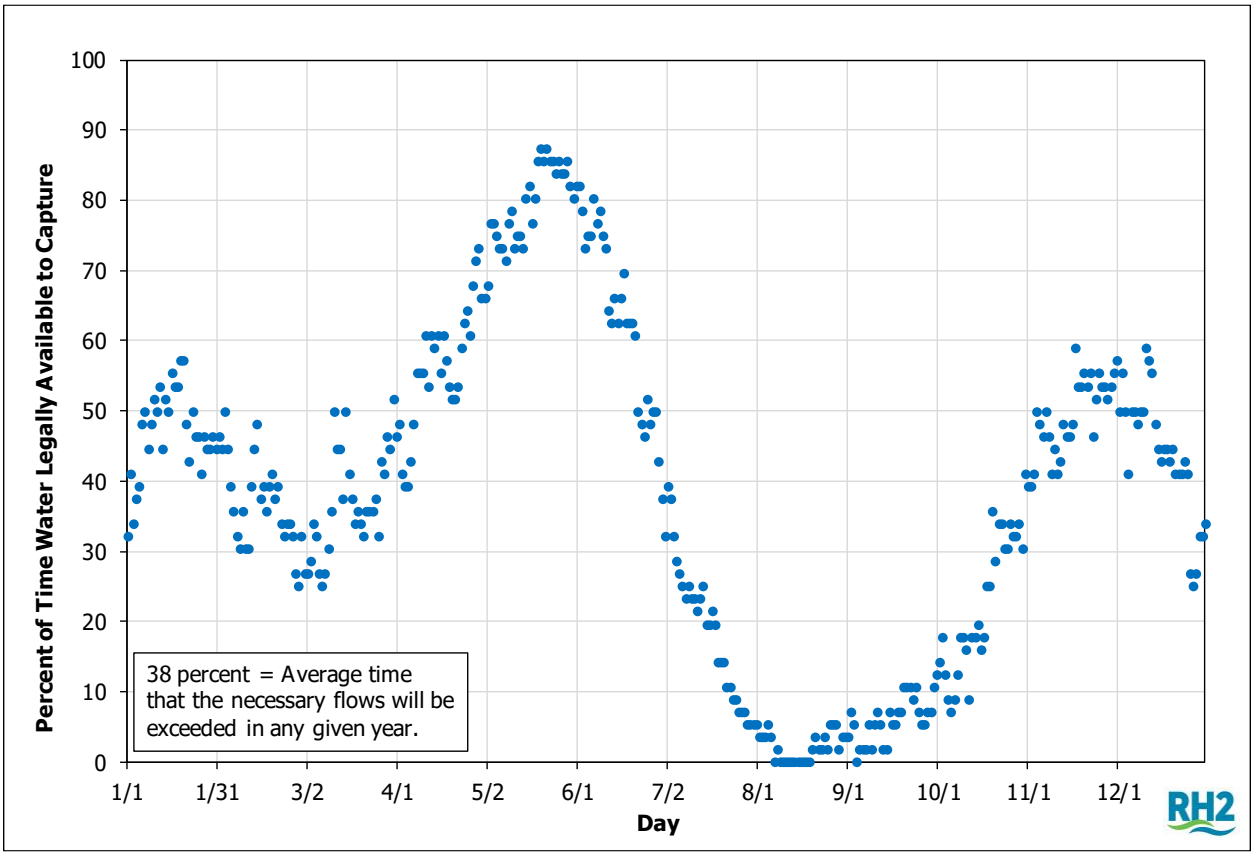


In addition, any new water right would not be allowed to impair other existing water rights, including Puget Sound Energy's water right claims for 2,500.07 cfs for hydropower production at Snoqualmie Falls under Water Right Claims S1-160814CL and S1-129397CL. **Figure 6-2** examines the combined impacts of the minimum instream flow rule and the existing Puget Sound Energy (PSE) water right claims on water availability for any new water right.

Figure 6-2

Percent of Time Minimum Instream Flows are Exceeded at the Snoqualmie River near Carnation, and Snohomish River near Monroe, and the PSE Hydropower Water Rights are met at the Snoqualmie River near Snoqualmie Gage

(1964 through 2019)



Analysis of historic stream flows suggests that the downstream minimum instream flows and PSE water rights are only met on average 38 percent of the days out of the year.

Obtaining a new, uninterruptible water right from a source near the City in WRIA 7 will be very difficult and will require that a mitigation package be presented to Ecology that specifies how impacts to the Snoqualmie River during periods when the minimum instream flow is not met or flows for existing water rights are not sufficient will be offset.

Feasibility of Transferring Existing Water Rights

The City is located very high in the Snoqualmie River Watershed. There are a limited number of water rights upstream of the City that have been maintained through beneficial use and that could be obtained and transferred to the City for municipal supply. However, if a water right that was issued prior to the adoption (September 6, 1979) of the Chapter 173-507 WAC minimum instream flow rule becomes available, and the extent and validity of the right is known with confidence, the City should pursue that water right. As with all water right acquisition, it is recommended that the City negotiate a price per acre-foot per year and only

agree to pay for the water that the City is actually able to acquire through the water right change application process.

RECLAIMED WATER

Existing Reclaimed Water Use

The City first began to produce reclaimed water in 1998.

The City owns, operates, and maintains the City of Snoqualmie Wastewater Treatment and Water Reclamation Facility (WRF) under National Pollution Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0022403. The NPDES approval was effective from May 1, 2014 through May 1, 2019. However, the City continues to operate under that permit since it is currently within the renewal process.

The NPDES permit states that, "The Permittee is authorized to produce and distribute Class A reclaimed water to various public and private locations in the vicinity of the TPC Snoqualmie Ridge Golf Course." The permit authorizes a maximum production of 1.56 million gallons per day (MGD), which is equal to 1,083 gpm and 4.79 acre-feet per day of reclaimed water.

The City's WRF is authorized to discharge water to either of two outfalls: 1) Outfall No. 001 to the Snoqualmie River; or 2) Outfall No. 002 to Eagle Lake (for reclaimed water use).

Outfall No. 001 discharges directly to the Snoqualmie River approximately 0.3 miles upstream of Snoqualmie Falls (Latitude 47.53916, Longitude -121.83222). This discharge is used when reclaimed water irrigation demand is lower than production.

Outfall No. 002 receives reclaimed water from the WRF in an approximately 2.4-mile-long transmission main to discharge into Eagle Lake at the Snoqualmie Ridge Golf Course (Latitude 47.53722, Longitude -121.86250). From Eagle Lake, the water is routed through one of two pump stations for irrigation of the golf course and/or other landscaped areas within the City.

Reclaimed water used by the City directly offsets water that would be used from the potable water system for irrigation. Since the reclaimed water system operates independent from the potable water system, a comparison of its supply and demand is not included in this Water System Plan.

DRINKING WATER REGULATIONS

Overview

The quality of drinking water in the United States is regulated by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA is allowed to delegate primary enforcement responsibility for water quality control to each state. In the State of Washington, the Department of Health (DOH) is the agency responsible for implementing and enforcing drinking water regulations. For the State of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the State must adopt

drinking water regulations that are at least as stringent as the federal regulations. In meeting these requirements, the State, in cooperation with the EPA, has published drinking water regulations that are contained in Chapter 246-290 WAC.

Existing Regulations

The Federal SDWA was enacted in 1974, as a result of public concern about water quality. The SDWA sets standards for the quality of drinking water and requires water treatment if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. The SDWA was amended again and re-authorized in August of 1996.

In response to the 1986 SDWA Amendments, EPA established six rules, known as the Phase I Rule, Phase II and IIb Rules, Phase V Rule, Surface Water Treatment Rule, Total Coliform Rule, and Lead and Copper Rule. The EPA regulates most chemical contaminants through the Phase I, II, IIb, and V Rules. The City's active sources are affected by many of these rules.

The EPA set two limits for each contaminant that is regulated under the rules. The first limit is a health goal, referred to as the Maximum Contaminant Level Goal (MCLG). The MCLG is zero for many contaminants, especially known cancer-causing agents (carcinogens). The second limit is a legal limit, referred to as the Maximum Contaminant Level (MCL). MCLs are equal to or higher than the MCLGs; however, most MCLs and MCLGs are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLGs) for carcinogens are typically zero, because they cause cancer and it is assumed that any amount of exposure may pose some risk of cancer. A summary of each rule follows.

To fully understand the discussion that follows, a brief definition of several key terms is provided below.

- Organic Chemicals – Animal or plant produced substances containing carbon and other elements such as hydrogen and oxygen.
- Synthetic Organic Chemicals (SOCs) – Man-made organic substances, including herbicides, pesticides, and various industrial chemicals and solvents.
- Volatile Organic Chemicals (VOCs) – Chemicals, as liquids, that evaporate easily into the air.
- Inorganic Chemicals (IOCs) – Chemicals of mineral origin that are naturally occurring elements. These include metals such as lead and cadmium.

Phase I Rule

The Phase I Rule, which was the EPA's first response to the 1986 Amendments, provided limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the

manufacturing of rubber, pesticides, deodorants, solvents, plastics, and other chemicals. VOCs are found in everyday items such as gasoline, paints, thinners, lighter fluid, mothballs, and glue, and typically are encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes. The City currently complies with all contaminant monitoring requirements under this rule.

Phase II and IIb Rules

The Phase II and IIb Rules update and create limits for 38 contaminants (organics and inorganics). Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals. The City currently complies with all contaminant monitoring requirements under these rules.

Phase V Rule

The Phase V Rule sets standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are IOCs (such as cyanide). The City currently complies with all contaminant monitoring requirements under this rule.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) governs surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and ground water sources under the influence of surface water (GWI). The SWTR seeks to prevent waterborne diseases caused by the microbes *Cryptosporidium, Legionella,* and *Giardia lamblia*, which are present in most surface waters. The rule requires disinfection of all surface water and GWI sources. All surface water and GWI sources also must be filtered, unless a filtration waiver is granted. A filtration waiver may be granted to systems with pristine sources that continuously meet stringent source water quality and protection requirements. The Canyon Springs source is classified as GWI; therefore, this rule is applicable. However, GWI analyses determined that Canyon Springs is in the “low risk range” for contamination. Therefore, the City is only required to provide a chlorine contact time of 6 milligram-minutes per liter. The City currently complies with all requirements of this regulation.

Interim Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR) became effective concurrent with the Stage 1 Disinfectants/Disinfection Byproducts Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water or GWI sources. The rule also requires primacy agencies (i.e., DOH in Washington State) to conduct sanitary surveys of all surface water and GWI systems, regardless of size. The rule is the first to directly regulate the protozoan *Cryptosporidium* and has set the MCLG for *Cryptosporidium* at zero. The Canyon Springs source is classified as GWI; therefore, this rule is applicable. The City currently complies with all requirements of this regulation.

Long Term 1 Enhanced Surface Water Treatment Rule

This Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) addresses water systems using surface water or GWI sources serving fewer than 10,000 people. The rule extends protections against *Cryptosporidium* for smaller water systems. The City serves a population greater than 10,000; therefore, this rule is not applicable.

Revised Total Coliform Rule

The Revised Total Coliform Rule (RTCR) sets an MCL for *Escherichia coli (E. coli)*, and specifies the frequency and timing of coliform testing based on population served, public water system type, and source water type. When total coliform is detected, a treatment technique is triggered. The water system must assess its water system facilities and operations and fix any sanitary defects. For confirmed *E. coli* incidents, known as an *E. coli* MCL violation, the water system must perform a Level 2 assessment and provide public notice within 24 hours. If a positive sample is collected on a consecutive system, the City also will need to collect source samples.

Coliform is a group of bacteria, some of which live in the digestive tract of humans and many animals and are excreted in large numbers with feces. Coliform can be found in sewage, soils, surface waters, and vegetation. The presence of any coliform in drinking water indicates a potential health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. *E. coli* is a member of the coliform group that is almost exclusively of fecal origin, and their presence can lead to increased health risks.

The City's current water quality monitoring schedule dictates that 15 routine samples be collected each month. To comply with the legal limit, systems must not find coliform in more than 5 percent of the samples taken each month. For smaller systems like the City's that take fewer than 20 samples per month, 1 sample that contains coliform would exceed the legal limit and trigger the follow-up sampling requirements. A copy of the City's Water Quality Monitoring Plan, including the coliform monitoring program and *E. coli* response plan, is contained in **Appendix J**. Within the past 6 years, the City detected the presence of coliform in its distribution system once (December 2013).

Lead and Copper Rule

The Lead and Copper Rule identifies action levels for both lead and copper. An action level is different than an MCL. An MCL is a legal limit for a contaminant, and an action level is a trigger for additional prevention or removal steps. The action level for lead is greater than 0.015 mg/L. The action level for copper is greater than 1.3 mg/L. If the 90th percentile concentration of either lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration below the action levels. The rule requires systems that exceed the lead level to educate the affected public about reducing its lead intake. Systems that continue to exceed the lead action level after implementing corrosion control and source water

treatment may be required to replace piping in the system that contains lead sources. Corrosion control is typically accomplished by increasing the pH of the water to make it less corrosive, which reduces its ability to break down water pipes and absorb lead or copper.

The EPA is in the process of implementing a lead trigger level of 10 micrograms per liter (µg/L) which would require additional monitoring and treatment requirements.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, brass, and water. Lead can pose a significant health risk if too much of it enters the body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells, and kidneys. The greatest risk is to young children and pregnant women. Lead can slow normal mental and physical development of growing bodies. The City is not aware of any lead service lines in the distribution system. Some cast iron mains are known to have leaded joints; these are gradually removed from the distribution system over time as cast iron mains are replaced with new piping constructed with modern materials.

Copper is a common, natural, and useful metal found in our environment. It is also a trace element needed in most human diets. The primary impact of elevated copper levels in water systems is stained plumbing fixtures. At certain levels (well above the action levels), copper may cause nausea, vomiting, and diarrhea. It also can lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water also could increase the risk of liver and kidney damage. The City currently complies with all contaminant monitoring and treatment requirements under this rule.

Radionuclides Rule

The Radionuclides Rule establishes an MCLG of zero for alpha, beta, and photon emitters, and radium 226/228 and MCLs of 5 picocuries per liter (pCi/L) for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 millirems per year (mrem/year) for beta particle and photon radioactivity, and 30 micrograms per liter (µg/L) for uranium. The City currently complies with all contaminant monitoring requirements under this rule.

Watershed Control Program

The Washington State mandate for watershed protection and the required elements of a watershed control program are contained in WAC 246-290-135, Source Protection. A watershed control program is a proactive and ongoing effort of a water purveyor to exercise surveillance over the conditions and activities within the watershed affecting source water quality to protect the health of its customers, as outlined in WAC 246-290-668, Watershed Control. Group A public water systems that use surface water or groundwater under the influence of surface water as their source are required to develop and implement a watershed control program. All required elements of a watershed control program must be documented and included in the purveyor's Water System Plan (applicable to the City) or Small Water System Management Program (not applicable to the City). The City's water sources are groundwater, with none

classified as being under the influence of surface water; therefore, this requirement is not applicable.

Wellhead Protection Program

The Washington State mandate for wellhead protection, and the required elements of a wellhead protection program, is contained in WAC 246-290-135, Source Protection. A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater that it supplies for drinking water. Group A public water systems that use groundwater as their source are required to develop and implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the Water System Plan (applicable to the City) or a Small Water System Management Program document (not applicable to the City). A copy of the City's Wellhead Protection Program is contained in **Appendix K**.

Consumer Confidence Report

The Consumer Confidence Report (CCR) is the centerpiece of the right-to-know provisions of the 1996 Amendments to the SDWA. The annual report must be updated and re-issued to all customers by July 1st of each year thereafter. This rule is currently being revised to possibly require delivery to customers every six months for water systems over 10,000 people. EPA will also require additional language to be included, but these final revisions are yet to be determined.

The CCR is a report on the quality of water that was delivered to the water users during the previous calendar year. The reports must contain certain specific elements, but also may contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports includes the source and type of the drinking water, type of treatment, contaminants that have been detected in the water, potential health effects of the contaminants, identification of the likely source of contamination, violations of monitoring and reporting, and variances or exemptions to the drinking water regulations. A copy of the City's most recent CCR is contained in **Appendix L**.

Stage 1 Disinfectants/Disinfection Byproducts Rule

Disinfection byproducts (DBPs) are formed when free chlorine reacts with organic substances, most of which occur naturally. These organic substances (called precursors) are a complex and variable mixture of compounds. The DBPs themselves may pose health risks.

The rule applies to the City and most other water systems, including systems serving fewer than 10,000 people that add a chemical disinfectant to the drinking water during any part of the treatment process. The rule reduced the MCL for total trihalomethanes (TTHMs), which are a composite measure of four individual THM, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule establishes MCLs and requires monitoring of three additional categories of DBPs (0.06 mg/L for five haloacetic acids (HAA5), 0.01 mg/L for bromate, and 1.0 mg/L for

chlorite). The rule establishes maximum residual disinfectant levels for chlorine (4.0 mg/L), chloramines (4.0 mg/L), and chlorine dioxide (0.8 mg/L). The rule also requires systems using surface water or groundwater directly influenced by surface water to implement enhanced coagulation or softening to remove DBP precursors, unless alternative criteria are met. The City currently complies with all contaminant monitoring requirements under this rule.

Unregulated Contaminant Monitoring Rule

The EPA established the Unregulated Contaminant Monitoring Rule (UCMR) to generate data on contaminants that are being considered for inclusion in new drinking water standards. The information collected by select public water systems will ensure that future regulations established by the EPA are based on sound science.

Three separate lists of unregulated contaminants are maintained under the UCMR: List 1; List 2; and List 3. Contaminants are organized on the tiered lists based on the availability of standard testing procedures and the known occurrence of each contaminant, with List 1 containing contaminants that have established standard testing procedures and some, but insufficient, information on their occurrence in drinking water. Monitoring for contaminants on the three lists is limited to a maximum of 30 contaminants within a 5-year monitoring cycle, and the EPA is required to publish new contaminant monitoring lists every 5 years. As new lists are published, contaminants will be moved up in the lists if adequate information is found to support additional monitoring. All public water systems serving more than 10,000 people and a randomly selected group of smaller water systems are required to monitor for contaminants. The City currently monitors for some unregulated contaminants.

Arsenic

Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The Arsenic Rule sets the MCLG of arsenic at zero and reduces the MCL from the previous standard of 0.05 mg/L to 0.01 mg/L. Arsenic's monitoring requirements are consistent with the existing requirements for other inorganic contaminants. The City has recorded sporadic exceedances of arsenic in its history of sampling. However, the last measured exceedance occurred in October of 2010, and the City is currently in compliance with contaminant monitoring requirements under this rule.

Filter Backwash Recycling Rule

Public water systems using surface water or groundwater under the direct influence of surface water that utilize filtration processes and recycling must comply with the Filter Backwash Recycling Rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration.

The rule requires filter backwash water to be returned to a location that allows complete treatment. In addition, filtration systems must provide detailed information regarding the treatment and recycling process to the state. The City's groundwater sources that utilize filtration are not under the direct influence of surface water; therefore, this rule does not apply.

Stage 2 Disinfectants/Disinfection Byproducts Rule

The EPA implemented the Stage 2 Disinfectants/Disinfection Byproducts Rule (Stage 2 D/DBPR) simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule.

Similar to the Stage 1 D/DBPR, this rule applies to most water systems that add a disinfectant to the drinking water other than ultraviolet light or those systems that deliver such water. The Stage 2 D/DBPR changes the calculation procedure requirement of the MCLs for two groups of disinfection byproducts, total THM (TTHM) and HAA5. The rule requires each sampling location to determine compliance with MCLs based on their individual annual average DBP levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also proposes new MCLGs for chloroform (0.07 mg/L), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.03 mg/L).

Additionally, the rule requires systems to document peak DBP levels and prepare an Initial Distribution System Evaluation (IDSE) to identify Stage 2 D/DBPR compliance monitoring sites. IDSEs require each water system to prepare a separate IDSE plan and report, with the exception of those systems who obtain a 40/30 Certification or a Very Small System Waiver. In order to qualify for the 40/30 Certification, all samples collected during Stage 1 monitoring must have TTHM and HAA5 levels less than or equal to 0.040 mg/L and 0.030 mg/L, respectively. The City currently complies with all contaminant monitoring requirements under this rule and has completed its IDSE plan, which is included in **Appendix J**.

Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the IESWTR, the EPA introduced the LT1ESWTR to supplement the preceding regulations. The second part of the regulations of the LT1ESWTR are mandated in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The final rule was implemented simultaneously with the Stage 2 D/DBPR described in the previous section. This rule applies to all systems that use surface water or GWI sources.

This rule establishes treatment technique requirements for filtered systems based on their risk level for contamination, calculated from the system's average *Cryptosporidium* concentration. Requirements include up to 2.5-log *Cryptosporidium* treatment, in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems that demonstrate low levels of risk will not be required to provide additional treatment. Unfiltered systems under this rule must achieve at least a 2-log inactivation of *Cryptosporidium* if the mean level in the source water remains below 0.01 oocysts/L. If an unfiltered system's mean level of *Cryptosporidium* exceeds 0.01 oocysts/L, the LT2ESWTR requires the system to provide a minimum 3-log inactivation of *Cryptosporidium*. All unfiltered systems also are required to utilize a minimum of two disinfectants in their treatment process.

The LT2ESWTR also addresses systems with unfinished water storage facilities. Under this rule, systems must either cover their storage facilities or achieve inactivation and/or removal of 4-log virus, 3-log *Giardia lamblia,* and 2-log *Cryptosporidium* on a state-approved schedule. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the proposed Stage 2 D/DBPR. The Canyon Springs source is classified as GWI;

therefore, this rule is applicable. The City currently complies with all requirements of this regulation.

Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use groundwater sources. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from groundwater systems from bacteria and viruses. The GWR applies to public water systems that use groundwater and to any system that mixes surface and ground waters if the groundwater is added directly to the distribution system and provided to consumers without treatment equivalent to surface water treatment.

The rule targets risk through an approach that relies on the following four major components:

1. Periodic sanitary surveys of groundwater systems that require the evaluation of eight critical elements and the identification of significant deficiencies (such as a well located near a leaking septic system). DOH conducted its most recent sanitary survey of the City's water system in November 2016.
2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions.
    - Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99-percent (4-log) inactivation or removal of viruses and that have a total coliform positive routine sample under the Revised Total Coliform Rule sampling in the distribution system.
    - Assessment monitoring is a complement to triggered monitoring. A state has the option to require systems to conduct source water assessment monitoring at any time to help identify high risk systems.
3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options: correct all significant deficiencies; eliminate the source of contamination; provide an alternate source of water; or provide treatment that reliably achieves 99.99-percent inactivation or removal of viruses.
4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99-percent inactivation or removal of viruses.

The City has addressed all deficiencies identified in its most recent sanitary survey and complies with all other requirements of the rule.

Future Regulations

Drinking water regulations are continuously changing in an effort to provide higher quality and safer drinking water. Modifications to the existing rules described above and implementation of new rules are planned for the near future. A summary of upcoming drinking water regulations that will most likely affect the City is presented in the following sections.

Per- and Polyfluoroalkyl Substances

In 2016, the US EPA established a health advisory level for per- and polyfluoroalkyl substances (PFAS) at 70 parts per trillion (ppt). The Washington State Department of Health proposed a regulation for PFAS in 2017, and this process will take about 2 years to complete. The primary source of PFAS contamination was historical use of PFAS-based firefighting foam used by the US military, local fire departments, and airports. It is not currently known when or what a PFAS regulation may require as adopted by the EPA or what will be the rule's implementation schedule. Since the final PFAS rule requirements are uncertain, the impact of this rule on the City is unknown at this time.

Radon

In July of 1991, the EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required the EPA to withdraw the 1991 proposal due to several concerns that were raised during the comment period. A new proposed regulation was published in the Federal Register on November 2, 1999. Comments on the proposed rule were due to the EPA by February 4, 2000. Final federal requirements for addressing radon were delayed until 2008 but have not yet been published. The rule proposes a 300 pCi/L MCL for community water systems that use groundwater or an alternative, less stringent MCL of 4,000 pCi/L for water systems where their state implements an EPA-approved program to reduce radon risks in household indoor air and tap water. It is not currently known when or what a radon regulation may require as adopted by the EPA or what the implementation schedule for the rule will be. Because the final radon rule requirements are uncertain, the impact of this rule on the City is unknown at this time.

Unregulated Contaminant Monitoring Rule Revisions

In accordance with the original UCMR and the SDWA, once every 5 years the EPA will issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. The fourth UCMR was proposed on December 11, 2015, and includes a list of 30 chemicals that will be monitored during the 2017 through 2021 monitoring cycle, and approves several new testing methods to conduct the monitoring. For this upcoming cycle, all systems serving more than 10,000 people and a larger representative sample of smaller water systems will be required to monitor for contaminants. The rule also requires additional water system data to be reported with the monitoring results, establishes a procedure for

determining minimum reporting levels, and proposes several revisions to the implementation of the monitoring program.

SOURCE WATER QUALITY

This section presents the current water quality standards for groundwater sources and the results of the City's recent source water quality monitoring efforts. A discussion of the water quality requirements and monitoring results for the City's distribution system is presented in the section that follows.

Drinking Water Standards

Drinking water quality is regulated at the federal level by the EPA and at the state level by DOH. Drinking water standards have been established to maintain high-quality drinking water by limiting the levels of specific contaminants (i.e., regulated contaminants) that can adversely affect public health and are known or likely to occur in public water systems. Non-regulated contaminants do not have established water quality standards and are generally monitored at the discretion of the water purveyor and in the interest of customers.

The regulated contaminants are grouped into two categories of standards – primary and secondary. Primary standards are drinking water standards for contaminants that could affect health. Water purveyors are required by law to monitor and comply with these standards and notify the public if water quality does not meet any one of the standards. Secondary standards are drinking water standards for contaminants that have aesthetic effects, such as unpleasant taste, odor, or color (staining). The national secondary standards are unenforceable federal guidelines or goals where federal law does not require water systems to comply with them. However, states may adopt their own enforceable regulations governing these contaminants. The State of Washington has adopted regulations that require compliance with some of the secondary standards. Water purveyors are not required to notify the public if their water quality does not meet the secondary standards.

Source Monitoring Requirements and Waivers

The City is required to perform water quality monitoring at each of its active sources for inorganic chemical and physical substances, organic chemicals, and radionuclides. The monitoring requirements that the City must comply with are specified in WAC 246-290-300. A description of the source water quality monitoring requirements and procedures for each group of substances is contained in the City's Water Quality Monitoring Plan, which is included as **Appendix J**.

DOH has developed the Susceptibility Assessment Survey Form for water purveyors to complete for use in determining a drinking water source's potential for contamination. The results of the susceptibility assessment may provide monitoring waivers that allow reduced source water quality monitoring. Based on the results of the susceptibility assessment survey for each source, DOH assigned high susceptibility ratings to Canyon Springs, the North Wellfield, and the South Wellfield.

Source Monitoring Results

The City's sources maintain a high level of water quality and have met or exceeded all drinking water standards within the last 6 years.

Canyon Springs was last monitored for IOCs in April 2011**.** The City has a waiver for IOCs through 2028, with a single sample being due in 2020. VOCs were last monitored in May 2018**,** with a waiver valid through May 2024. SOCs were last monitored in February and March 2012**,** with a waiver through March 2021. Radionuclides were last monitored in May 2015. Canyon Springs is also sampled yearly for nitrates and every 3 years for manganese.

The North Wellfield was last monitored for IOCs in April 2011. The City has a waiver for IOCs through 2028, with a single sample being due in 2020. VOCs were last monitored in May 2018**,** with a waiver valid through May 2024. SOCs were last monitored in February and March 2012**,** with a waiver through March 2021. Radionuclides were last monitored in May 2015. This source also is sampled yearly for nitrates, every 3 years for manganese, and monthly for arsenic whenever the treatment plant is in operation.

The South Wellfield was last monitored for IOCs in April 2011. The City has a waiver for IOCs through 2028, with a single sample being due in 2020. VOCs were last monitored in August 2018, with a waiver valid through May 2024. SOCs were last monitored in February and March 2012, with a waiver through March 2021. Radionuclides were last monitored in July 2015. This source also is sampled yearly for nitrates and every 3 years for manganese.

The results of inorganic chemical (including nitrate) and VOC monitoring for the City's sources indicate that all primary and secondary standards were met.

DISTRIBUTION SYSTEM WATER QUALITY

Monitoring Requirements and Results

The City is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (chlorine) residual concentration, DBPs, lead and copper, and asbestos in accordance with Chapter 246-290 WAC. A description of the distribution system water quality monitoring requirements and procedures are contained in the City's Water Quality Monitoring Plan that is included in **Appendix J**.

Coliform Monitoring

The City is required to collect a minimum of 15 coliform samples per month from different locations throughout the system. The results of coliform testing from the past 6 years were all satisfactory, with the exception a single positive total coliform sample taken in December 2013.

Disinfectant Residual Concentration Monitoring

Disinfection requirements applicable to the City are contained in WAC 246-290-310, which states that a disinfectant residual concentration shall be detectable in all active parts of the

distribution system and that the maximum residual disinfectant level shall be 4.0 mg/L for chlorine and chloramines. The City targets a free chlorine residual around 1.0 mg/L leaving its chlorination facilities to ensure a detectable residual throughout the distribution system.

Disinfectants/Disinfection Byproducts Monitoring

THM and HAA5 are DBPs that are formed when free chlorine reacts with organic substances (i.e., precursors), most of which occur naturally. Formation of THM and HAA5 are dependent on such factors as the amount and type of chlorine used, water temperature, concentration of precursors, pH, and chlorine contact time. THM have been found to cause cancer in laboratory animals and are suspected to be human carcinogens. The City must collect and report a minimum of four TTHM and four HAA5 samples on a quarterly basis. No exceedances of the TTHM or HAA5 MCL were recorded in the last 6 years.

Lead and Copper Monitoring

The Lead and Copper Rule identifies the action level for lead as being greater than 0.015 mg/L, and the action level for copper as being greater than 1.3 mg/L. Every 3 years, the City must collect and report a minimum of 30 samples. The City last sampled for lead and copper in September of 2018. All previous samples indicate the City is in compliance with these regulations.

Asbestos

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than 10 percent of asbestos cement (AC) pipe. The current MCL for asbestos is 7 million fibers per liter (MFL) and greater than 10 microns in length. Monitoring must be accomplished during the first 3-year compliance period of each 9-year compliance cycle. The water sample must be taken at a tap where asbestos contamination is most likely to occur. The last sample for asbestos was recorded in 2013, which had a concentration of 0.123 MFL. Therefore, the City is in compliance with the asbestos MCL. The City obtained a waiver through 2028 requiring no further asbestos sampling, as asbestos pipe now represents less than 10 percent of total piping.

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7 | WATER SYSTEM ANALYSIS

INTRODUCTION

This chapter presents the analysis of the City of Snoqualmie's (City) existing water system. Individual water system components were analyzed to determine their ability to meet policies and design criteria under existing and future water demand conditions. The policies and design criteria are presented in **Chapter 5**, and the water demands are presented in **Chapter 4**. A description of the water system facilities and current operation is presented in **Chapter 2**. The last section of this chapter presents the existing and projected system capacity analyses that were performed to determine the maximum number of equivalent residential units (ERUs) that can be served by the City's water system.

PRESSURE ZONES

The ideal static pressure of water supplied to customers is between 40 and 80 pounds per square inch (psi). Pressures within a water distribution system are commonly as high as 120 psi, requiring pressure reducing valves (PRVs) on individual service lines to reduce the pressure to 80 psi or less. It is difficult for the City's water system (and most others) to maintain distribution system pressures between 40 and 80 psi, primarily due to the topography of the water service area.

Table 7-1 lists each of the City's ten pressure zones, the highest and lowest elevation served in each zone, and the minimum and maximum distribution system pressures within each zone based on maximum static water conditions (full reservoirs with no demand) under existing and proposed future conditions. While this table presents the results of the pressure evaluations based on the adequacy of the pressure zones (under static conditions), the hydraulic analysis section later in this chapter presents the results of the pressure evaluation based on the adequacy of the water mains (under dynamic conditions). Planned improvements to address low and high service pressures are described later in this chapter and in **Chapter 9**.

Table 7-1

Minimum and Maximum Distribution System Static Pressures

Pressure Zone	Highest Elevation Served		Lowest Elevation Served	
	Elevation (feet)	Static Pressure (psi)	Elevation (feet)	Static Pressure (psi)
Existing System				
599 Zone				
599 Zone[1]	527	47	415	96
Snoqualmie Ridge Pressure Zones				
705 Zone	595	48	420	123
800 Zone	693	46	579	96
890 Zone	800	39	682	90
1040 Zone	929	48	730	134
1180 Zone	1069	48	947	101
1260 Zone	1140	52	1014	107
South Pressure Zones				
670 Zone	594	33	438	101
799 Zone	616	79	439	156
1172 Zone	1075	42	1075	42
Future System[2]				
599/636 Zone				
599 Zone	460	60	415	80
636 Zone	522	49	425	91
Snoqualmie Ridge Pressure Zones				
705 Zone[3]	595	48	420	123
800 Zone	693	46	579	96
890 Zone	800	39	682	90
1040 Zone[3]	929	48	730	134
1180 Zone	1069	48	947	101
1260 Zone	1140	52	1014	107
South Pressure Zones				
690 Zone	594	42	438	109
799 Zone[3]	620	78	440	156
1172 Zone	1075	42	1075	42

1 = Currently operating at an HGL of approximately 636 feet.
2 = After all CIP projects are completed.
3 = Individual or small regional PRVs will be implemented in these zones to address high service pressures.

SOURCE CAPACITY EVALUATION

This section evaluates the combined capability of the City's existing sources to determine if they have sufficient capacity to meet the overall demands of the water service area based on existing and future water demands. The section that follows will address the evaluation of the individual facilities to determine if they have sufficient capacity to meet the existing and future demands of the water system. This section also identifies facility deficiencies that are not related to the capacity of the sources.

Analysis Criteria

Supply facilities must be capable of adequately and reliably supplying high-quality water to the system. In addition, supply facilities must provide a sufficient quantity of water at pressures that meet the requirements of Washington Administrative Code (WAC) 246-290-230. The evaluation of the combined capacity of the sources in this section is based on the criteria that they provide supply to the system at a rate that is equal to or greater than the maximum day demand (MDD) of the system.

Source Capacity Analysis Results

The combined capability of the City's active sources to meet both existing and future demand requirements, based on existing pumping and treatment capacities of the individual supply facilities, is presented in **Table 7-2**. The treatment capacity of the South Wellfield is 600 gpm but is reduced to 563 gpm to account for an average backwash volume. The demands used in the evaluation for 2030 and 2040 are future demand projections without reductions from water use efficiency efforts, as shown in **Table 4-13** of **Chapter 4**. Therefore, if additional reductions in water use are achieved through water use efficiency (WUE) efforts, the total source capacity required in the future will be less than that shown in **Table 7-2**.

Table 7-2

Water Source Capacity Evaluation

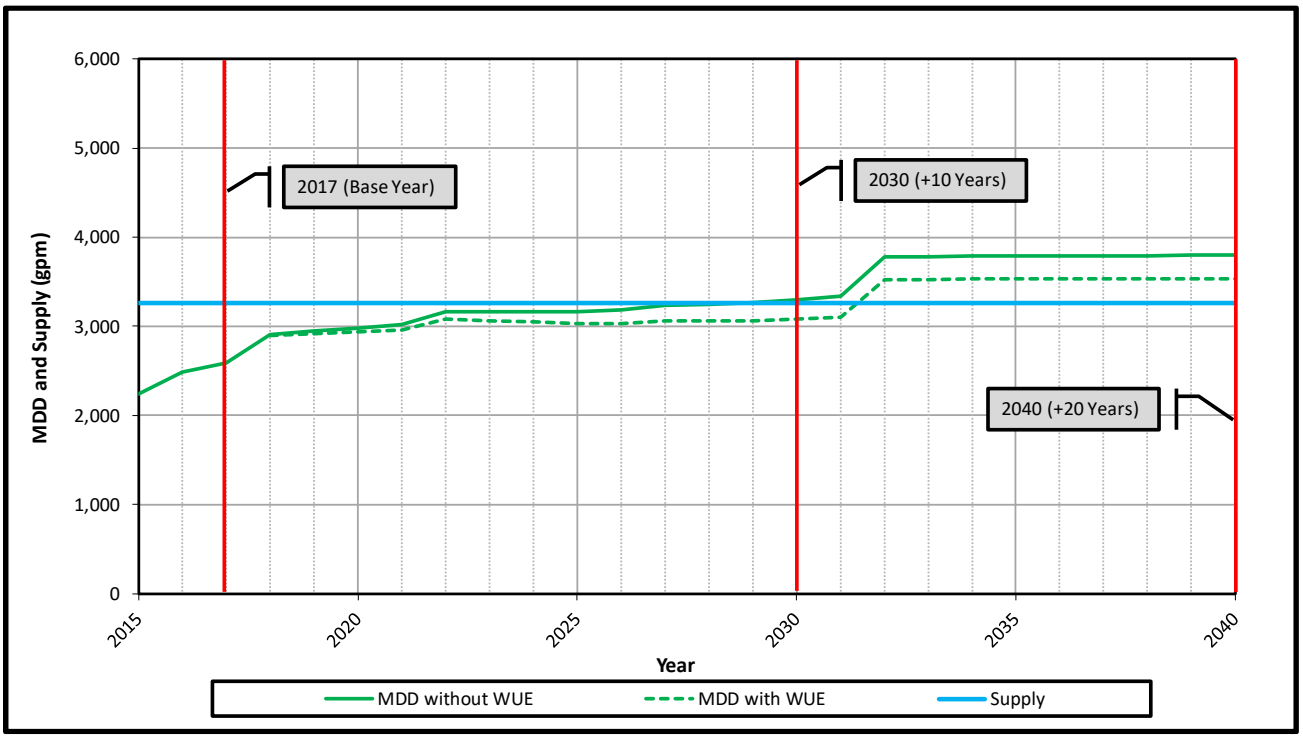
Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
Maximum Day Demand	**2,585**	**3,302**	**3,798**
Available Source Capacity (gpm)			
Canyon Springs	898	898	898
North Wellfield	1,800	1,800	1,800
South Wellfield	563	563	563
Total Source Capacity	**3,261**	**3,261**	**3,261**
Surplus or Deficient Source Capacity (gpm)			
Surplus or Deficiency	**676**	**-41**	**-537**

The results of the analysis indicate that the City has approximately 676 gallons per minute (gpm) of surplus source capacity to meet existing (year 2017) demands, but will have a source capacity deficiency of approximately 41 gpm by 2030, increasing to 537 gpm at the end of the 20-year planning period. The City is currently developing and implementing a long-range water supply plan to increase source capacity and redundancy. As part of the plan, the City is considering implementation of an Aquifer Storage and Recovery (ASR) program. Due to the uncertainty in flow rate increases from ASR or other supply improvements, the additional future source capacity from the successful implementation of any of these improvements are not reflected in **Table 7-2**.

Chart 7-1 shows the relationship between future and projected supply and demands.

Chart 7-1

Future Water Supply and Demand Projections



Facility Deficiencies

Canyon Springs

Canyon Springs needs collector box upgrades and a new access trail/road to replace the aging existing infrastructure. The City also is considering installation of a booster pump station at Canyon Springs to maximize source output. These upgrades are described in **Chapter 9** (CIP F3).

North Wellfield

Permanent backup power has been implemented for Well No. 8 and the North Wellfield Treatment Facility (NWTF). Backup power for Well No. 6 and Well No. 7 currently is provided by a portable generator. To improve reliability, the City plans to install permanent backup power with an automatic transfer switch (ATS) for Well No. 6 and Well No. 7. This upgrade is described in **Chapter 9** (CIP F7).

South Wellfield

The South Wellfield sources have elevated concentrations of iron, manganese, and ammonia in the raw water. The South Wellfield Water Treatment Plant reduces iron and manganese concentrations through filtration. The City also chlorinates at this plant for disinfection, but the duration of contact time provided downstream of chlorination to the first customer is not sufficient to fully react with ammonia. While not a health concern, byproducts of the chlorine-ammonia reaction such as di- and tri-chloramine, create taste and odor issues. Customer complaints typically increase in the

summertime when the City operates the South Wellfield to meet peak demands. As described in **Chapter 9** (CIP F4), the City plans to install additional chlorine contact time infrastructure downstream of chlorination injection to ensure that the raw ammonia has more breakpoint chlorination reaction time to minimize taste and odor impacts to customers. Improving taste and odor will increase operational flexibility of this source and improve overall source redundancy, allowing the City to operate the South Wellfield year-round.

The South Wellfield's on-site sodium hypochlorite generation (OSHG) system is aging and replacement parts are difficult to source. The City recently upgraded the OSHG systems at Canyon Springs and the NWTF. As described in **Chapter 9** (CIP F5), the City plans to upgrade the South Wellfield OSHG system to standardize on one manufacturer and allow for spare parts to be shared among its three sites.

To more efficiently manage operations of the system, the City currently operates the South Wellfield at a maximum flowrate of approximately 400 gpm, because operation of the South Wellfield impacts the production from Canyon Springs if the 705 BPS is also not operating. As described in **Chapter 9**, the City plans to complete an evaluation of the 599 Zone (CIP PZ1) and will likely implement VFDs for Well No. 1-R and Well No. 2 (CIP F2) to allow better control and more efficient operation of the South Wellfield.

Backup power at the South Wellfield is currently provided by a portable generator. As described in **Chapter 9** (CIP F6), the City plans to install permanent backup power with an ATS to improve the reliability of the source.

WATER SUPPLY FACILITIES EVALUATION

This section evaluates the existing supply facilities to determine if they have sufficient capacity to provide water supply at a rate that meets the existing and future demands of each of the zones they supply. **Figures 2-1** and **2-2** in **Chapter 2** display the pressure zones described within this section. This section also identifies deficiencies that are not related to the capacity of the supply facilities.

Analysis Criteria

The evaluation to determine if supply facilities have adequate capacity is based on one of two criteria, as follows: 1) if the pressure zone that the facility provides supply into has water storage, then the amount of supply required is equal to the MDD of the zone; or 2) if the pressure zone that the facility provides supply into does not have water storage, then the amount of supply required is equal to the peak hour demand (PHD) and maximum fire flow requirement of the zone. The higher supply requirement of the latter criteria is compensating for the lack of equalizing and fire flow storage that is typically utilized to provide short-term supply during times of peak system demands. Where fire flow is supplied by pumping, it must be assumed for the analyses that the largest pump supplying the pressure zone is out of service. Calculations were performed for each pressure zone based on these criteria, with a description of the results provided for each pressure zone in the following sections.

Supply Analysis Results

599 Zone

The City's 599 Zone contains the 599 Reservoir; therefore, it is subject to the MDD requirement. Because the 670 Zone, 799 Zone, and 1172 Zone are supplied directly from the 599 Zone, the maximum day demands of these zones also are included in the required supply. The 599 Zone is directly supplied by Canyon Springs and the South Wellfield, which have a combined capacity of approximately 1,461 gpm. As shown in **Table 7-3**, the 599 Zone is expected to have a surplus supply capacity of approximately 387 gpm at the end of the 20-year planning period.

Table 7-3

599 Zone Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
599 Zone MDD	335	498	923
South Pressure Zones MDD[1]	129	142	151
Total Required Supply	**463**	**640**	**1,074**
Available Supply Capacity (gpm)			
Canyon Springs	898	898	898
South Wellfield	563	563	563
Total Supply Capacity	**1,461**	**1,461**	**1,461**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**998**	**821**	**387**

1 = Includes 670 Zone, 799 Zone, and 1172 Zone, which are supplied from the 599 Zone.

705 Zone

The City's 705 Zone contains the 705 Reservoir No. 1 and 705 Reservoir No. 2; therefore, it is subject to the MDD requirement. Because the 800 Zone, 890 Zone, 1040 Zone, 1180 Zone, and 1260 Zone are supplied from the 705 Zone, the maximum day demands of these zones also are included in the required supply. The 705 Zone is supplied by the North Wellfield and the 705 Booster Pump Station (BPS), which have a combined capacity of approximately 4,200 gpm. As shown in **Table 7-4**, the 705 Zone is expected to have a surplus supply capacity of approximately 1,476 gpm at the end of the 20-year planning period.

Table 7-4

705 Zone Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
705 Zone MDD	232	257	257
Other Zones MDD[1]	1,890	2,405	2,467
Total Required Supply	**2,121**	**2,662**	**2,724**
Available Supply Capacity (gpm)			
North Wellfield	1,800	1,800	1,800
705 BPS	2,400	2,400	2,400
Total Supply Capacity	**4,200**	**4,200**	**4,200**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**2,079**	**1,538**	**1,476**

1 = Includes 800 Zone, 890 Zone, 1040 Zone, 1180 Zone, and 1260 Zone.

The 705 BPS currently is equipped with four pumps. Two pumps are equipped with variable frequency drives (VFDs) and two are fixed speed. As described in **Chapter 9** (CIP F8), the City plans to retrofit the two fixed-speed pumps with VFDs, allowing a higher level of control and more efficient operation.

1040 Zone

The City's 1040 Zone contains the 1040 Reservoir No. 1 and 1040 Reservoir No. 2; therefore, it is subject to the MDD requirement. Because the 800 Zone, 890 Zone, 1180 Zone, and 1260 Zone are supplied from the 1040 Zone, the maximum day demands of these zones also are included in the required supply. The 1040 Zone is supplied solely by the 1040 BPS, which pumps water from the 705 Zone.

As shown in **Table 7-5**, the 1040 BPS currently has a capacity of approximately 2,500 gpm. As described in **Chapter 9** (CIP F1), the City plans to install a fifth 625 gpm capacity pump in the 1040 BPS, which will result in a surplus supply capacity of approximately 658 gpm at the end of the 20-year planning period.

Table 7-5

1040 Zone Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
1040 Zone MDD	1,410	1,829	1,890
Other Zones MDD[1]	480	576	576
Total Required Supply	**1,890**	**2,405**	**2,467**
Available Supply Capacity (gpm)			
1040 BPS	2,500	2,500	2,500
1040 BPS 5th Pump	0	625	625
Total Supply Capacity	**2,500**	**3,125**	**3,125**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**610**	**720**	**658**

1 = Includes 800 Zone, 890 Zone, 1180 Zone, and 1260 Zone.

1180 Zone

The City's 1180 Zone is a closed zone without storage; therefore, the required supply is the PHD plus the maximum fire flow requirement. The 1180 Zone is supplied by the 1180 Zone pumps in the 1180-1260 BPS, which have a combined capacity of approximately 3,248 gpm with the largest pump out of service. As shown in **Table 7-6**, the 1180 Zone is expected to have a surplus supply capacity of approximately 329 gpm at the end of the 20-year planning period.

Table 7-6

1180 Zone Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
1180 Zone PHD	300	419	419
1180 Zone Maximum Fire Flow	2,500	2,500	2,500
Total Required Supply	**2,800**	**2,919**	**2,919**
Available Supply Capacity (gpm)			
1180 BPS	4,748	4,748	4,748
Largest Pump Out of Service	(1,500)	(1,500)	(1,500)
Total Supply Capacity	**3,248**	**3,248**	**3,248**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**448**	**329**	**329**

1260 Zone

The City's 1260 Zone is a closed zone without storage; therefore, the required supply is the PHD plus the maximum fire flow requirement. The 1260 Zone is supplied by the 1260 Zone pumps in the 1180-1260 BPS, which have a combined capacity of approximately 2,945 gpm with the largest pump out of service. As shown in **Table 7-7**, the 1260 Zone is expected to have a surplus supply capacity of approximately 154 gpm at the end of the 20-year planning period.

Table 7-7

1260 Zone Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
1260 Zone PHD	198	291	291
1260 Zone Maximum Fire Flow	2,500	2,500	2,500
Total Required Supply	**2,698**	**2,791**	**2,791**
Available Supply Capacity (gpm)			
1260 BPS	4,445	4,445	4,445
Largest Pump Out of Service	(1,500)	(1,500)	(1,500)
Total Supply Capacity	**2,945**	**2,945**	**2,945**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**247**	**154**	**154**

South Pressure Zones

The City's South Pressure Zones consist of the 670 Zone, 799 Zone, and 1172 Zone. The 1172 Reservoir provides storage to the South Pressure Zones; therefore, they are subject to the MDD requirement. Water is supplied from the 599 Zone to the 1172 Reservoir by the 384th Avenue SE BPS and Snoqualmie Point BPS, which pump in series. The 300 gpm Snoqualmie Point BPS fills the 1172 Reservoir from the 799 Zone. The 384th Avenue SE BPS, which has a capacity of approximately 1,600 gpm, normally provides suction pressure for the Snoqualmie Point BPS, but it can supply the 799 Zone and 670 Zone in a closed-zone configuration if the Snoqualmie Point BPS and/or 1172 Reservoir are out of service. As shown in **Table 7-8**, the South Pressure Zones are expected to have a surplus supply capacity of approximately 149 gpm at the end of the 20-year planning period.

Table 7-8

South Pressure Zones Supply Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Required Supply (gpm)			
670 Zone MDD	19	20	30
799 Zone MDD	109	121	121
1172 Zone MDD	1	1	1
Total Required Supply	**129**	**142**	**151**
Available Supply Capacity (gpm)			
Snoqualmie Point BPS	300	300	300
Total Supply Capacity	**300**	**300**	**300**
Surplus or Deficient Supply Capacity (gpm)			
Surplus or Deficiency	**171**	**158**	**149**

STORAGE FACILITIES

This section evaluates the City's existing water storage tanks to determine if they have sufficient capacity to meet the existing and future storage requirements of the system. This section also identifies facility deficiencies that are not related to the capacity of the water tanks.

Analysis Criteria

Water storage is typically made up of the following components: operational storage; equalizing storage; standby storage; fire flow storage; and dead storage. Each storage component serves a different purpose and will vary from system to system. A definition of each storage component and the criteria used to evaluate the capacity of the City's storage tanks is provided as follows.

Operational Storage – Volume of the reservoir used to supply the water system under normal conditions when the source or sources of supply are not delivering water to the system (i.e., sources are in the off mode). Operational storage is essentially the average amount of drawdown in the reservoir during normal operating conditions, which represents a volume of storage that will most likely not be available for equalizing storage, fire flow storage, or standby storage. The operational storage is based on the amount of storage between the fill, or pump starting setpoint level, and the overflow elevation of the tank.

Equalizing Storage – Volume of the reservoir used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. The Washington State Department of Health (DOH) requires that equalizing storage be stored above an elevation that will provide a minimum pressure of 30 psi at all service connections throughout the system under PHD conditions. Because the City's supply sources primarily operate on a "call on demand" basis to fill the reservoirs, the equalizing storage requirements are determined using the

standard DOH formula that considers the difference between the system PHD and the combined capacity of the supply sources:

$$\mathbf{ES = (PHD - Q_S)(150\ minutes)}, \text{ but in no case less than zero}$$

Where:

ES = Equalizing Storage, in gallons

PHD = Peak Hour Demand, in gpm

Q_S = Sum of all installed and active sources, except emergency supply, in gpm.

If the capacities of the sources that supply each zone are sufficient to meet the peak hour demands of their zones, the equalizing storage requirement for that supply area is zero.

Standby Storage – Volume of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service due to equipment failures, power outages, loss of supply, transmission main breaks, and any other situation that disrupts the supply source. DOH requires that standby storage be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections throughout the system. The criteria for determining the standby storage requirements for the City's system is based on the DOH recommendation that standby storage equal one day of maximum day demands. This volume may be reduced for pressure zones with multiple sources of supply that each have permanent backup power that starts automatically. The calculated volume is sufficient to supply the system for a 24-hour period when the primary supply facility is out of service and the system is experiencing maximum day demands:

$$\mathbf{SB = (1\ day)[(ERU_{MDD})(N) - (1\ day)(Q_S\text{-}Q_L)]}$$

Where:

SB = Standby Storage, in gallons

ERU_{MDD} = Maximum Day Demand per ERU, in gallons per day (gpd) per ERU

N = Number of ERUs

Q_S = Sum of all installed and continuously available sources with permanent backup power that starts automatically, except emergency supply, in gpd

Q_L = The capacity of the largest continuously available source with permanent backup power that starts automatically available to the system, in gpd.

DOH recommends that the minimum standby storage volume be no less than 200 gallons per ERU.

Fire Flow Storage – Volume of the reservoir used to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. The magnitude of the fire flow storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement established by the local fire authority. DOH requires that fire flow storage be stored above an elevation that will provide a minimum pressure of 20 psi at all points throughout the distribution system under MDD conditions.

Dead Storage – Volume of the reservoir that cannot be used because it is stored at an elevation that does not provide system pressures that meet the minimum pressure requirements established by DOH without pumping. This unusable storage occupies the lower portion of most ground-level

reservoirs. Water that is stored below an elevation that cannot provide a minimum pressure of 20 psi is considered dead storage for the analyses that follow.

Storage Analysis Results

599 Zone

As shown in **Table 7-9**, the 599 Zone has an existing maximum storage capacity of approximately 0.51 million gallons (MG) provided by the 599 Reservoir. Due to high elevation services near the 599 Reservoir, the zone has approximately 0.11 MG of dead storage. Future conversion of the services near the reservoir to the 705 Zone (CIP PZ4) will reduce the dead storage volume. Some dead storage remains due to high elevation services along the Canyon Springs transmission main. Although these services will be converted to a 636 Zone (CIP PZ1) in the future, they will still be supplied standby and fire flow storage from the 599 Reservoir through a check valve at the Reinig Road PRV/Pressure Sustaining Valve (PSV) station.

Table 7-9

599 Zone Storage Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Available/Usable Storage (MG)[1]			
Maximum Storage Capacity - Existing 599 Reservoir	0.51	0.51	0.51
Maximum Storage Capacity - Future 599 Reservoir No. 2	0.00	1.60	1.60
Dead (Non-Usable) Storage[2]	0.11	0.03	0.03
Total Available Storage	**0.40**	**2.07**	**2.07**
Required Storage (MG)			
Operational Storage[3]	0.00	0.27	0.50
Equalizing Storage	0.00	0.00	0.04
Standby Storage[4, 5]	0.48	0.28	0.52
Fire Flow Storage[5]	0.96	0.96	0.96
Total Required Storage	**1.44**	**1.51**	**2.01**
Surplus or Deficient Storage (MG)			
Surplus or Deficient Amount[1]	**(1.04)**	**0.57**	**0.06**

1 = If available, surplus storage in other pressure zones can be utilized in the 599 Zone.
2 = Assumes high elevation services near the 599 Reservoir will be connected to the 705 Zone by 2030.
3 = Future operational storage volume assumed to equal one day of average day demand.
4 = Assumes that permanent backup power that starts automatically will be implemented at the South Wellfield and Treatment Plant by 2030.
5 = Includes standby and fire flow storage for future 636 Zone, which will be supplied through the Reinig Road PRV/PSV check valve under emergency conditions.

The 599 Zone currently has no operational storage because the zone is operated at a hydraulic grade of approximately 636 feet, resulting in the 599 Reservoir remaining full at all times. When the Reinig Road PRV/PSV station is activated in the future and the hydraulic grade of the zone is reduced to 599 feet (CIP PZ1), it is assumed that the 599 Reservoir will have an operational storage component equal to one day of average day demands.

Currently, no equalizing storage is required in the 599 Zone because the source capacity exceeds the zone's peak hour demand. Approximately 0.04 MG of equalizing storage will be required by 2040, when the zone's peak hour demand will exceed the source capacity.

Required standby storage under existing conditions is equal to one day of maximum day demands, because Canyon Springs is the only source that would continue to operate automatically during a power outage. After permanent backup power with an ATS is installed at the South Wellfield and Treatment Plant, the required standby storage volume is reduced, and the recommended minimum standby storage volume of 200 gallons per ERU is utilized.

The required fire flow storage of 0.96 MG is based on the Mt. Si High School's fire flow requirement of 4,000 gpm for 4 hours.

As shown in **Table 7-9**, the 599 Zone currently has a storage deficiency of approximately 1.04 MG. As described in **Chapter 9**, the City plans to construct a new 1.6 MG 599 Reservoir No. 2 (CIP F12) to resolve the 599 Zone storage deficiency for the 20-year planning period. The 599 Zone also can utilize surplus storage available in all other zones, should the City choose to construct additional storage elsewhere in the system.

705 Zone

As shown in **Table 7-10**, the 705 Zone has an existing maximum storage capacity of approximately 0.16 MG, provided by the 705 Reservoir No. 1 and 705 Reservoir No. 2. There is no dead storage in the 705 Zone.

Table 7-10

705 Zone Storage Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Available/Usable Storage (MG)			
Maximum Storage Capacity - Existing 705 Reservoirs	0.16	0.16	0.16
Available Surplus Storage in 1040 Reservoirs[1]	0.00	0.22	0.12
Dead (Non-Usable) Storage	0.00	0.00	0.00
Total Available Storage	**0.16**	**0.38**	**0.28**
Required Storage (MG)			
Operational Storage	0.07	0.07	0.07
Equalizing Storage	0.00	0.00	0.00
Standby Storage	0.14	0.14	0.14
Fire Flow Storage[2]	0.00	0.00	0.00
Total Required Storage	**0.22**	**0.22**	**0.22**
Surplus or Deficient Storage (MG)			
Surplus or Deficient Amount	**(0.06)**	**0.16**	**0.06**

1 = Assumes that the 1040 Reservoir No. 3 will be constructed by 2030.

2 = It is assumed that the required fire flow volume for the 705 Zone (0.61 MG/3,400 gpm for 3 hours) is stored in the 1040 Reservoirs.

The operational storage component of 0.07 MG is based on the existing operational band of the 1040 BPS pumps, which lift water from the 705 Reservoirs to the 1040 Zone and are controlled by the water level in the 705 Reservoirs. No equalizing storage is required in the 705 Zone throughout the 20-year planning period because the source capacity exceeds the zone's peak hour demand. Required standby storage is based on the DOH recommended minimum standby storage volume of 200 gallons per ERU. The largest fire flow requirement in the 705 Zone is 3,400 gpm for 3 hours at the Salish Lodge, which corresponds to a required fire flow volume of 0.61 MG. It is assumed that this fire flow volume is provided from the 1040 Reservoirs via the 1040 BPS PRV.

As shown in **Table 7-10**, the 705 Zone currently has a storage deficiency of approximately 0.06 MG. As described in **Chapter 9**, the City plans to construct a new 1040 Reservoir No. 3 by 2030 to remedy storage deficiencies in the 1040 Zone operating area. Rather than constructing an additional reservoir in the 705 Zone, the 1040 Reservoir No. 3 will be constructed with a capacity of 1.8 MG to remedy the storage deficiencies in both the 1040 Zone operating area and the 705 Zone for the 20-year planning period.

1040 Zone

As shown in **Table 7-11**, the 1040 Zone has an existing maximum storage capacity of approximately 3.82 MG, provided by the 1040 Reservoir No. 1 and 1040 Reservoir No. 2. There is no dead storage in the 1040 Zone.

Table 7-11

1040 Zone Storage Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Available/Usable Storage (MG)			
Maximum Storage Capacity - Existing 1040 Reservoirs	3.82	3.82	3.82
Maximum Storage Capacity - Future 1040 Reservoir No. 3	0.00	1.80	1.80
Dead (Non-Usable) Storage	0.00	0.00	0.00
Total Available Storage	**3.82**	**5.62**	**5.62**
Required Storage (MG)			
Operational Storage	1.11	1.11	1.11
Equalizing Storage	0.09	0.21	0.23
Standby Storage	2.72	3.46	3.55
Fire Flow Storage	0.61	0.61	0.61
Total Required Storage	**4.54**	**5.40**	**5.51**
Surplus or Deficient Storage (MG)			
Surplus or Deficient Amount	**(0.72)**	**0.22**	**0.12**

The operational storage component of 1.11 MG is based on the existing operational band of the 1040 Reservoirs. An equalizing storage component is required because the PHD of the operating area supplied by the 1040 Reservoirs (800 Zone, 890 Zone, 1040 Zone, 1180 Zone, and 1260 Zone) exceeds the supply capacity of the 1040 BPS. It is assumed that a fifth pump will be added to the 1040 BPS (CIP F1) by 2030.

Required standby storage is equal to one day of maximum day demands for the 1040 Zone and associated operating area, because the 1040 BPS is the sole source of supply to the zone. The highest fire flow requirement in the zones normally supplied from the 1040 Reservoir is 2,500 gpm for 2 hours (0.3 MG), but the 1040 Reservoirs are used to store the required 705 Zone fire flow volume of 0.61 MG.

As shown in **Table 7-12**, the 1040 Zone currently has a storage deficiency of approximately 0.72 MG. As described in **Chapter 9**, the City plans to construct a new 1.8 MG 1040 Reservoir No. 3 (CIP F13) to remedy the storage deficiencies in the 1040 Zone operating area and the 705 Zone by 2030.

South Pressure Zones

As shown in **Table 7-12**, the South Pressure Zones (670 Zone, 799 Zone, and 1172 Zone) have an existing maximum storage capacity of approximately 0.40 MG, provided by the 1172 Reservoir. There is no dead storage in the South Pressure Zones.

Table 7-12

South Pressure Zones Storage Capacity Evaluation

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Available/Usable Storage (MG)			
Maximum Storage Capacity - Existing 1172 Reservoir	0.40	0.40	0.40
Maximum Storage Capacity - Future 1172/799 Reservoir No. 2	0.00	0.20	0.20
Dead (Non-usable) Storage	0.00	0.00	0.00
Total Available Storage	**0.40**	**0.60**	**0.60**
Required Storage (MG)			
Operational Storage	0.06	0.06	0.06
Equalizing Storage	0.00	0.00	0.00
Standby Storage	0.19	0.20	0.22
Fire Flow Storage	0.24	0.24	0.24
Total Required Storage	**0.48**	**0.50**	**0.52**
Surplus or Deficient Storage (MG)			
Surplus or Deficient Amount	**(0.08)**	**0.10**	**0.09**

The operational storage component of 0.06 MG is based on the existing operational band of the 1172 Reservoir. No equalizing storage is required, because the PHD of the South Pressure Zones is projected to remain below the 300 gpm capacity of the Snoqualmie Point BPS for the 20-year planning period.

Required standby storage is equal to one day of maximum day demands for the South Pressure Zones, because the 384th Avenue BPS and Snoqualmie Point BPS are the sole source of supply to the operating area. The largest fire flow requirement in the South Pressure Zones is 2,000 gpm for 2 hours, which corresponds to a required fire flow volume of 0.24 MG.

As shown in **Table 7-12**, the South Pressure Zones currently have a storage deficiency of approximately 0.08 MG. As described in **Chapter 9** (CIP F14), the City plans to construct a new 0.2 MG reservoir to remedy the storage deficiency in the South Pressure Zones through the end of the 20-year planning period. Because the 1172 Zone has only one existing service and no additional development is anticipated, the new reservoir may be constructed in either the 1172 Zone or the 799 Zone. As an alternative to constructing the new reservoir, the City will also consider upsizing the capacity of the 384th Avenue SE BPS by adding a fire flow pump to provide fire flow from the 599 Zone and thereby eliminating the need for fire flow storage in the south pressure zones.

Facility Deficiencies

The City's storage facilities are generally in good condition with few deficiencies. The valve vaults on the 1040 Reservoir No. 1 and 1040 Reservoir No. 2 site do not have a satisfactory drain system. A drain system was designed but never installed. As described in **Chapter 9**, the City plans to install a drain system or sump pump to reduce the required maintenance effort.

DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates the City's existing distribution and transmission system (i.e., water mains) to determine if they are adequately sized and looped to provide the necessary flow rates and pressures to meet the existing and future requirements of the system. This section also identifies deficiencies that are not related to the capacity of the water mains.

Analysis Criteria

Distribution and transmission mains must be capable of adequately and reliably conveying water throughout the system at acceptable flow rates and pressures. The criteria used to evaluate the City's distribution and transmission system are the state mandated requirements for Group A water systems contained in WAC 246-290-230 – Distribution Systems. The pressure analysis criteria state that the distribution system "…shall be designed with the capacity to deliver the design PHD quantity of water at 30 psi (210 kPa) under PHD flow conditions measured at all existing and proposed service water meters…" It also states that if fire flow is to be provided, "… the distribution system shall also provide MDD plus the required fire flow at a pressure of at least 20 psi (140 kPa) at all points throughout the distribution system…"

Hydraulic analyses of the existing system were performed under existing PHD conditions to evaluate its current pressure capabilities and identify existing system deficiencies. The existing system also was analyzed under existing MDD conditions to evaluate the current fire flow capabilities and identify additional existing system deficiencies. Additional hydraulic analyses were then performed with the same hydraulic model under future PHD and MDD conditions and with the proposed improvements to demonstrate that the identified improvements will eliminate the deficiencies and meet the requirements far into the future. The following is a description of the hydraulic model, the operational conditions, and facility settings used in the analyses.

Hydraulic Model

Description

A computer-based hydraulic model of the existing water system was updated to the CONNECT edition of the WaterGEMS® program (developed by Bentley Systems, Inc.). All water mains in the City's water system, including dead-end mains, were included in the model and were based on GIS water system mapping and as-built records provided by the City. Junction node elevations were assigned based on 5-foot-interval contour data obtained from King County. A hydraulic model node diagram that provides a graphical representation of the model of the water system is contained in **Appendix M**.

Demand Data

The hydraulic model of the existing system contains demands based on 2017 individual customer meter water demand data provided by the City. Demand data for each parcel was distributed to the closest representative junction node of the model based on the recorded usage, which was

then uniformly scaled to simulate the 2017 MDD and PHD. The peaking factors calculated in **Chapter 4** were used to analyze the system under PHD and MDD conditions.

The hydraulic model of the proposed system contains 10-year demand levels that are projected for the year 2030, and 20-year demand levels that are projected for the year 2040. The distribution is based on the projected future demands for each planning area.

Facilities

The hydraulic model of the existing system contains all active existing system facilities. For the proposed system analyses in the years 2030 and 2040, the hydraulic model contains all active existing system facilities and proposed system improvements identified in **Chapter 9** for the 10- and 20-year planning periods, respectively.

The facility settings for the pressure analyses corresponded to a PHD event in the water system. All sources of supply that currently are available to the system or will be available in the future for the years 2030 and 2040 analyses during a peak period were operating at their maximum pumping rates. The reservoir levels were modeled to reflect full utilization of operational and equalizing storage. The operational conditions for the pressure analyses are summarized in **Table 7-13**.

Table 7-13

Hydraulic Analyses Operational Conditions

Description	PHD Pressure Analyses			Fire Flow Analyses		
	2017	2030 (+10 years)	2040 (+20 years)	2017	2030 (+10 years)	2040 (+20 years)
Demand	2017 PHD	2030 PHD	2040 PHD	2017 MDD	2030 MDD	2040 MDD
Storage Facilities HGL (feet)						
599 Reservoir	599.0	595.8	592.5	567.0	584.1	580.9
Future 599 Reservoir No. 2	-	595.8	592.5	-	584.1	580.9
705 Reservoir No. 1	694.0	694.0	694.0	694.0	694.0	694.0
705 Reservoir No. 2	694.0	694.0	694.0	694.0	694.0	694.0
1040 Reservoir No. 1	1032.4	1034.3	1034.3	1028.6	1031.7	1031.7
1040 Reservoir No. 2	1032.4	1034.3	1034.3	1028.6	1031.7	1031.7
Future 1040 Reservoir No. 3	-	1034.3	1034.3	-	1031.7	1031.7
1172 Reservoir	1167.5	1169.0	1169.0	1149.0	1156.6	1156.6
Future 1172 Reservoir No. 2	-	1169.0	1169.0	-	1156.6	1156.6
Supply Facilities Status						
Canyon Springs	ON	ON	ON	ON	ON	ON
North Wellfield	ON	ON	ON	ON	ON	ON
South Wellfield	ON	ON	ON	ON	ON	ON
BPS Facilities Status						
705 BPS	ON	ON	ON	ON	ON	ON
1040 BPS	ON	ON	ON	ON	ON	ON
1180-1260 BPS[1]	ON	ON	ON	ON	ON	ON
384th Ave SE BPS	ON	ON	ON	ON	ON	ON
Snoqualmie Point BPS	ON	ON	ON	ON	ON	ON

1 = Largest 1180 Zone pump and largest 1260 Zone pump out of service for fire flow analyses.

Separate fire flow analyses were performed on the system to size distribution system improvements and calculate fire flow availability. The hydraulic model for the fire flow analyses contained settings that correspond to MDD events. All sources of supply that currently are available to the system during a peak period were operating at their normal pumping rates, and reservoir levels were modeled to reflect full utilization of operation, equalizing, and fire flow storage based on the maximum planning-level fire flow requirement. **Table 7-13** summarizes the operational conditions for the fire flow analyses for the existing and future planning periods.

Calibration

Hydraulic model calibration is the process of adjusting hydraulic model data so the model closely reflects actual system pressures and flows under similar demand and operating conditions. Initial Darcy-Weisbach roughness coefficients were entered into the model based on computed estimates of the coefficients from available pipe age and material data. For example, assuming that the internal surface of water pipes becomes rougher as it gets older, older water mains were assigned higher roughness coefficients than new water mains.

Hydrant flow tests were performed in 22 locations in early 2019, with hydrant flows, static pressures, and residual pressures measured during each test for use in calibrating the hydraulic model. Where available, telemetry data for the City's water system facilities was used to initialize

the settings of the facilities in the hydraulic model. Pressure transducers recording at 2-second intervals were installed throughout each pressure zone during the flow tests to verify the static and residual pressures at intermediate points in the system (between the water system facilities and the hydrant flow test locations).

The majority of the City's field fire flow results were found to be consistent with the hydraulic model results after adjusting pipe roughness coefficients within typical ranges in the hydraulic model. Some limited inconsistent testing results were found in the 599 Zone, 705 Zone, 800 Zone, 890 Zone, and 1180 Zone. These likely are due to closed or partially closed valves, incorrect water main diameters, or other differences between the modeled system configuration and field conditions. In some areas, limited telemetry data from City facilities made it challenging to determine accurate facility settings for the calibration. The City will continue to investigate discrepancies and improve the functionality of the telemetry system, which will enable the hydraulic model calibration to be improved over time.

Hydraulic Analysis Results

Hydraulic analyses were performed to determine the capability of the system to meet the pressure and flow requirements identified in **Chapter 5** and contained in WAC 246-290-230. The first analysis was performed to determine the pressure throughout the system under existing (i.e., 2017) PHD conditions. The results of this analysis were used to identify locations of low and high pressures. To satisfy the minimum pressure requirements, the pressure at all water service locations must be at least 30 psi during PHD conditions. In addition, the system should not have widespread areas with high pressures, generally considered to be more than 120 psi. A summary of the pressure deficiencies identified from the results of this analysis is shown on **Figure 7-1**.

The second set of analyses was performed to determine the capability of the existing water system to provide fire flow throughout the system under MDD conditions. A separate fire flow analysis was performed for each node in the model where fire flow is provided to determine the available fire flow at a minimum residual pressure of 20 psi at all points throughout the distribution system and a maximum allowable water main velocity of 8 feet per second (fps). Approximately 650 fire flow analyses were performed to comprehensively evaluate the water system. For each node analyzed, the resulting fire flow was compared to its general planning-level fire flow requirement, which was assigned according to its land use classification. As is typical of most water systems, the City's distribution system was constructed to meet fire flow requirements that were in place at the time of construction. Land use classification changes and/or increases in fire flow requirements over time may create deficiencies. A summary of the results of the analyses for representative system nodes is shown on **Figure 7-2**.

Figure 7-3 shows the pressure throughout the system under PHD conditions at the end of the 20-year planning period, with all improvements completed. As shown on **Figure 7-3**, all service connections will be provided a pressure of at least 30 psi under PHD conditions when all improvements are completed. **Figure 7-4** shows the available fire flow throughout the water system at the end of the 20-year planning period with all improvements completed. As shown on **Figure 7-4**, with completion of all improvements, the minimum planning-level fire flow or greater

will be available at all locations where fire flow is provided at the end of the 20-year planning period.

Deficiencies

Customer pressures less than 40 psi under PHD conditions occur in the higher elevations of the 670 Zone, and in the 599 Zone near the 599 Reservoir. Completion of Capital Improvement Program (CIP) projects described in **Chapter 9** will raise the hydraulic grade line (HGL) of the 670 Zone (CIP PRV1) and convert the high elevation 599 Zone services to the 705 Zone (CIP PZ4), resulting in customer pressures under PHD conditions of 40 psi or greater throughout the water system. Customer pressures greater than 120 psi occur in areas of the 705 Zone, 799 Zone, and 1040 Zone, and are addressed with the installation of individual PRVs.

While some areas of the system can currently provide planning-level fire flow while maintaining pressures above 20 psi and velocities below 8 fps, many areas of the system are not capable of providing planning-level fire flow within these parameters. Due to the high elevation services in the 670 Zone and 599 Zone described previously, fire flow meeting the pressure criteria cannot be provided in these zones, as shown in **Figure 7-2**. Operating the system with high water velocities can potentially damage the system due to the high surge pressures that commonly occur with high water velocities, and allowing system pressures to drop below 20 psi can lead to unacceptably low service pressures and the possibility of backflow into the distribution system. Water main and other improvements identified in **Chapter 9** have been sized to maintain system pressures above 20 psi and to prevent water velocities from exceeding 8 fps.

Some areas of the system have water mains that are more than 50 years old, which is beyond the average life expectancy of water mains. The City is planning to replace many of these in the future, as shown in the schedule of planned improvements in **Chapter 9**. All new water main installations are required to use cement mortar lined ductile iron water main in accordance with the City's Construction Standards and Specifications, which are contained in **Appendix H**.

PRESSURE REDUCING STATIONS

This section evaluates the City's existing pressure reducing stations to identify deficiencies related to their current condition and operational capability.

Evaluation and Deficiencies

The City's Reinig Road PRV/PSV has been installed but is currently inactive. **Chapter 9** describes CIP project PZ1, which will evaluate 599 Zone operation and activate the Reinig Road PRV/PSV. As described in **Chapter 9**, setpoint changes at the 384th Ave BPS - 670 Zone PRV station (CIP PRV1) are recommended to optimize customer pressures.

An additional PRVs between the 1180 Zone and 1040 Zone (CIP PRV2) is recommended to improve system redundancy, as described in **Chapter 9**. Also described in **Chapter 9** is a new PRV supplying water from the 705 Zone to the 599 Zone (CIP PZ3).

Based on the hydraulic modeling results, significant recirculation of water may be occurring through the PRV stations at the 705 BPS, 384th Avenue SE BPS, and Snoqualmie Point BPS.

Chapter 9 describes a CIP project (CIP PRV3) to evaluate this phenomenon and adjust setpoints and/or include additional functionality to booster pump stations and PRV stations to minimize wasted energy from unnecessary recirculation of water.

TELEMETRY AND SUPERVISORY CONTROL SYSTEM

This section evaluates the City's existing telemetry and supervisory control system to identify deficiencies related to its condition and current operational capability.

Evaluation and Deficiencies

The City has recently completed significant improvements to the telemetry and supervisory control system, and few deficiencies remain. As described in **Chapter 9**, the City intends to implement supervisory control and data acquisition (SCADA) at the Reinig Road PRV/PSV station (CIP PZ2).

SYSTEM CAPACITY

This section evaluates the capacity of the City's existing and future water system components (supply, storage, transmission, and water rights) to determine the maximum number of ERUs it can serve. Once established, system capacity becomes useful in determining how much capacity is available in the water system to support new customers that apply for water service through the building permit process. The system capacity information, together with the projected growth of the system expressed in ERUs, as shown in **Chart 4-13** of **Chapter 4**, also provides the City with a schedule of when additional system capacity is needed.

Analysis Criteria

The capacity of the City's system was determined from the limiting capacity of the water rights, source and treatment, transmission, and storage facilities. The annual water rights capacity evaluation was based on the existing annual water rights, as summarized in **Chapter 6**, and the system's average day consumption per ERU (ERU_{ADD}). The instantaneous water rights capacity evaluation was based on the existing instantaneous water rights, as summarized in **Chapter 6**, and the system's maximum day demand per ERU (ERU_{MDD}). The source and treatment capacity analysis was based on the limiting capacity of the source and treatment facilities and the system's ERU_{MDD}. The transmission capacity analysis was based on the total capacity of the transmission system for the supply sources and the system's ERU_{MDD}.

The storage capacity analysis was based on the storage capacity for equalizing and standby storage and the computed storage requirement per ERU. Operational and fire flow storage capacity were excluded from the storage analysis because these components are generally not directly determined by water demand or ERUs. For the analyses, a reserve amount equivalent to the operational and fire flow storage requirements were deducted from the total available storage capacity to determine the storage capacity available for equalizing and standby storage. This storage capacity available for equalizing and standby storage was divided by the existing number of ERUs presented in **Chapter 4** to determine the storage requirement per ERU.

The ERU-based demand data was derived from the average day demand of the system and demand peaking factors from **Chapter 4**.

Capacity Analysis Results

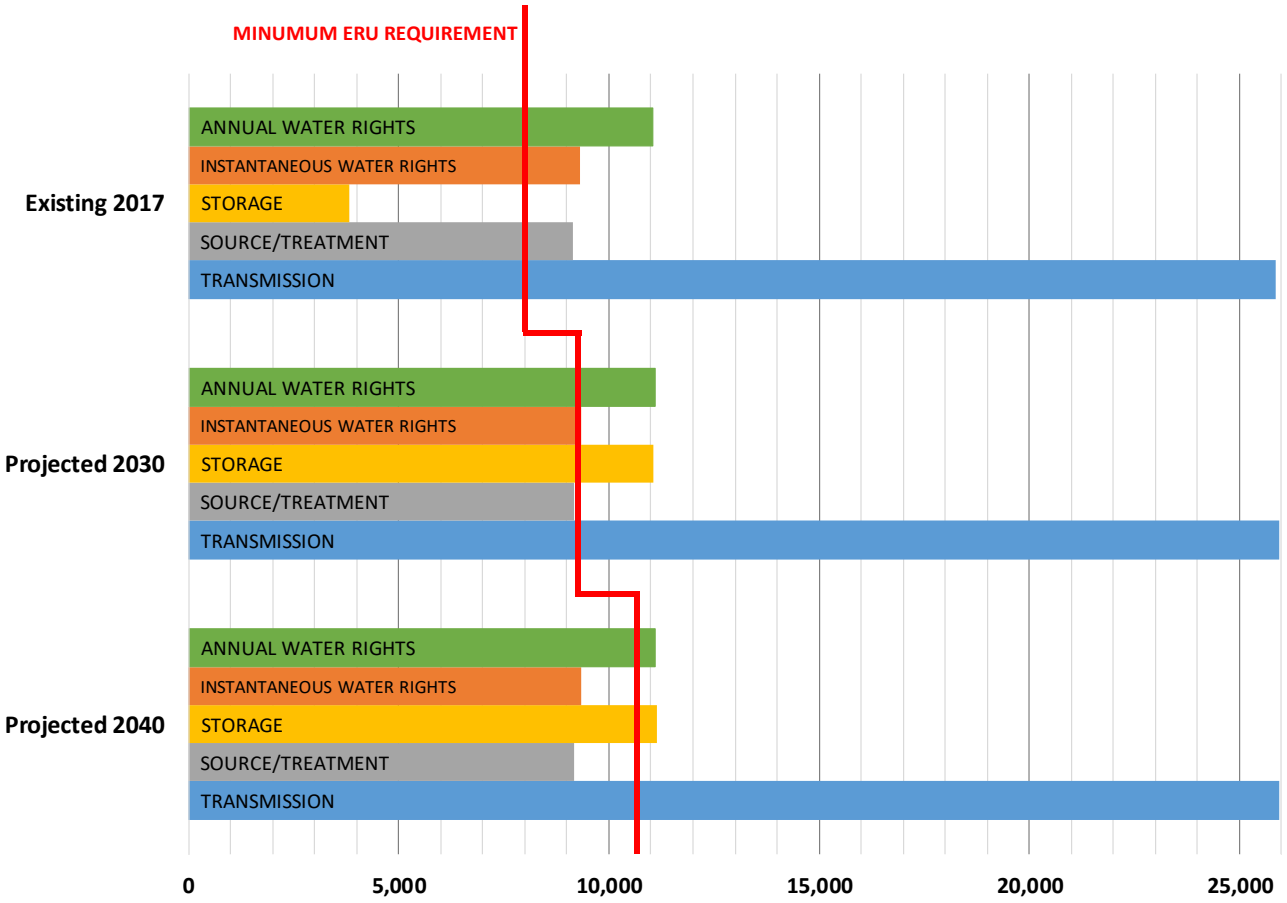
A summary of the results of the existing and projected system capacity analysis is shown in **Table 7-14** and **Chart 7-2**.

Table 7-14
System Capacity Analysis

Description	Base Year 2017	Projected 2030 (+10 years)	Projected 2040 (+20 years)
Demands Per ERU Basis			
ERU_{ADD} (gpd)[1]	192	191	191
ERU_{MDD} (gpd)[1]	514	512	512
Water Rights Capacity: Annual Average Based			
Water Rights Capacity - Annual Average Based (gpd)	2,117,582	2,117,582	2,117,582
ERU_{ADD} (gpd)[1]	192	191	191
Water Rights Annual Average Based Source Capacity (ERUs)	**11,048**	**11,088**	**11,088**
Water Rights Capacity: Instantaneous Based			
Water Rights Capacity - Instantaneous Based (gpd)	4,792,320	4,792,320	4,792,320
ERU_{MDD} (gpd)[1]	514	512	512
Water Rights Instantaneous Based Source Capacity (ERUs)	**9,319**	**9,352**	**9,352**
Source and Treatment Capacity: Maximum Day Based			
Source Capacity - Maximum Day Based (gpd)	4,695,840	4,695,840	4,695,840
ERU_{MDD} (gpd)[1]	514	512	512
Maximum Day Based Source Capacity (ERUs)	**9,131**	**9,164**	**9,164**
Storage Capacity[2]			
Maximum Equalizing & Standby Storage Capacity (gal)	1,725,625	5,132,895	4,904,758
Equalizing & Standby Storage Requirement per ERU (gal)	452	464	440
Maximum Storage Capacity (ERUs)	**3,819**	**11,072**	**11,135**
Transmission Capacity			
Transmission Capacity (gpd)	13,298,300	13,298,300	13,298,300
ERU_{MDD} (gpd)[1]	514	512	512
Maximum Transmission Capacity (ERUs)	**25,858**	**25,952**	**25,952**
Maximum System Capacity			
Maximum System Capacity (ERUs)	**3,819**	**9,164**	**9,164**
Limiting Facility	**Storage**	**Source and Treatment**	**Source and Treatment**
Unused Available System Capacity			
Maximum System Capacity (ERUs)	3,819	9,164	9,164
Projected ERUs	8,027	9,279	10,673
Unused Available System Capacity (ERUs)	**-4,208**	**-115**	**-1,508**

1 = Includes distribution system leakage.
2 = Projected storage capacity assumes storage improvements have been completed.

Chart 7-2
System Capacity Analysis



Projected storage capacity assumes storage improvements have been completed.

The results of the existing system capacity analysis indicate that the limiting capacity of the system is storage, which currently can support up to a maximum of approximately 3,819 ERUs. The existing water system has a deficit of approximately 4,208 ERUs. All other water system components have sufficient capacity to support existing water system customers. As described in **Chapter 9**, the City plans to construct additional storage by 2030 (CIP F12, F13, and F14) to address the storage deficiency.

The 10-year projected system capacity analysis, as shown in **Table 7-14** and **Chart 7-2**, includes improvements that are planned to be completed within the 10-year planning period, as described in **Chapter 9**. These improvements include supply, storage, and pressure zone improvements. The results of the 2030 system capacity analysis indicate that the proposed improvements will increase the system capacity to approximately 9,164 ERUs, based on the limiting component of the City's source and treatment capacity. The 2030 water system will have a capacity deficiency of approximately 115 ERUs.

The 20-year projected system capacity analysis, as shown in **Table 7-14** and **Chart 7-2**, includes improvements that are planned to be completed within the 20-year planning period, as described

in **Chapter 9**. The results of the 2040 system capacity analysis indicate that the system capacity will remain approximately 9,164 ERUs, based on the limiting component of the City's source and treatment capacity. The 2040 water system will have a capacity deficiency of approximately 1,508 ERUs. The City's instantaneous water rights capacity of 9,352 ERUs is also less than the projected requirement of 10,673 ERUs.

As described in **Chapter 6** and **Chapter 9**, the City plans to acquire additional water rights and expand source capacity and treatment by the end of the 20-year planning period. The Aquifer Storage and Recovery (ASR) program and other avenues are being explored, but the success of this effort is not guaranteed. If additional instantaneous water rights cannot be procured after 2030, the City will need to limit additional development until additional water rights can be procured.

PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(2,500 gpm)

Canyon Springs
(898 gpm)

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

890 Zone
1040 Zone
705 Zone
800 Zone
670 Zone
599 Zone
799 Zone
1172 Zone
1180 Zone
1260 Zone

Snoqualmie River
Alice Lake
Snoqualmie Falls
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

Legend

Low and High Pressures
- Less than 30 psi
- 30 - 40 psi
- 80 - 100 psi
- 100 - 120 psi
- Greater than 120 psi
- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV
- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

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COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

J:\DATA\SNQ\118-083\GIS\WSP-FIG_7-1_EX_PHD_PRESSURE.MXD PLOT DATE: JUL 1, 2020 BY: ZSCHREMPP

Vicinity Map

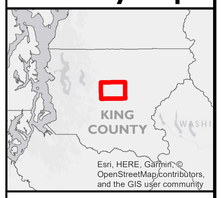


Figure 7-1
Existing Low and High Pressure Areas
City of Snoqualmie Water System Plan

PRELIMINARY

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(2,500 gpm)

Canyon Springs
(898 gpm)

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

890 Zone
1040 Zone
890 Zone
800 Zone
705 Zone
670 Zone
599 Zone
799 Zone
1172 Zone
1260 Zone
1180 Zone

Snoqualmie River
Alice Lake
Snoqualmie Falls
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

PRESTON-FALL CITY RD SE
FALL CITY-SNOQUALMIE RD
TOKUL RD SE
SNOQUALMIE PKWY
SE 80TH ST
RAILROAD AVE SE
SE MILLPOND RD
RENTON AVE SE
SE PARK ST
MEADOWBROOK WAY SE
BOALCH AVE SE
BOALCH AVE NW
BENGOCO BLVD N
BENGOCO BLVD S
BALLARAT AVE N
SE 108TH ST
CEDAR FALLS WAY
WINERY RD
428TH AVE SE
384TH AVE SE
332ND AVE SE

Legend

Available Fire Flow (% of Required)
- Less than 40%
- 40% - 70%
- 70% - 90%
- 90% - 100%
- 100% - 120%
- Greater than 120%
- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV

- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

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Vicinity Map

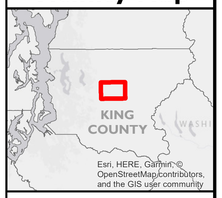


Figure 7-2
Existing Available Fire Flow
City of Snoqualmie Water System Plan

PRELIMINARY

CITY OF SNOQUALMIE

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PLOT DATE: JUL 1, 2020 BY: ZSCHREMPP J:\DATA\SNQ\118-083\GIS\WSP-FIG_7-2_EX_AVAILABLE_FF.MXD

PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(3,125 gpm)

599 Reservoir No. 2
1.6 MG
Overflow Elev: 599'
Height: 24'

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

Canyon Springs
(898 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 3
1.8 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir No. 2
0.2 MG
Overflow Elev: 1,172'
Height: 31'

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

890 Zone
1040 Zone
705 Zone
636 Zone
670 Zone
599 Zone
799 Zone
800 Zone
1172 Zone
1180 Zone
1260 Zone

Snoqualmie River
Alice Lake
Lake Borst
Snoqualmie Falls
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

Legend

Low and High Pressures
- 80 - 100 psi
- 100 - 120 psi
- Greater than 120 psi
- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV
- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 636 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

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Vicinity Map



Figure 7-3
2040 Low and High Pressure Areas with All CIP Projects

PRELIMINARY

City of Snoqualmie
Water System Plan

1 inch = 1,500 feet
0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PLOT DATE: JUL 1, 2020

BY: ZSCHREMPP

J:\DATA\SNQ\118-083\GIS\WSP-FIG_7-3_20_YEAR_PHD_PRESSURE.MXD

PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(3,125 gpm)

599 Reservoir No. 2
1.6 MG
Overflow Elev: 599'
Height: 24'

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

Canyon Springs
(898 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 3
1.8 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir No. 2
0.2 MG
Overflow Elev: 1,172'
Height: 31'

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

890 Zone
1040 Zone
800 Zone
705 Zone
636 Zone
670 Zone
599 Zone
799 Zone
1172 Zone
1180 Zone
1260 Zone

Snoqualmie River
Alice Lake
Snoqualmie Falls
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

PRESTON-FALL CITY RD SE
332ND AVE SE
FALL CITY-SNOQUALMIE RD
TOKUL RD SE
SNOQUALMIE PKWY
RAILROAD AVE SE
SE MILLPOND RD
SE 80TH ST
384TH AVE SE
376TH AVE SE
SE 92ND ST
SE PARK ST
REINIG RD
MEADOWBROOK WAY SE
WINERY RD
BOALCH AVE SE
BOALCH AVE NW
428TH AVE SE
BENDIGO BLVD N
BENDIGO BLVD S
BALLARAT AVE N
SE 108TH ST
CEDAR FALLS WAY

Legend

Available Fire Flow (% of Required)
- 100% - 120%
- Greater than 120%
- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV

- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 636 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

This map is a graphic representation derived from the City of Snoqualmie Geographic Information System. It was designed and intended for City of Snoqualmie staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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Vicinity Map



Figure 7-4 PRELIMINARY
2040 Available Fire Flow with All CIP Projects
City of Snoqualmie Water System Plan

CITY OF SNOQUALMIE

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

J:\DATA\SNQ\118-083\GIS\WSP-FIG_7-4_20_YEAR_AVAILABLE_FF.MXD BY: ZSCHREMPP PLOT DATE: JUL 1, 2020 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

8 | OPERATIONS AND MAINTENANCE

INTRODUCTION

The City of Snoqualmie's (City) water operations and maintenance (O&M) program consists of the following elements:

1. Normal operation of the water supply, treatment, and distribution system.
2. Emergency operation of the water system, with one or more of the components not available for normal use due to natural or man-made events.
3. Preventive maintenance program for ensuring that the water system is maintained in accordance with generally accepted standards.
4. Cross-connection control program, as required by state law, to ensure that there is no threat to the integrity of the water supply due to contamination from a customer's operations.

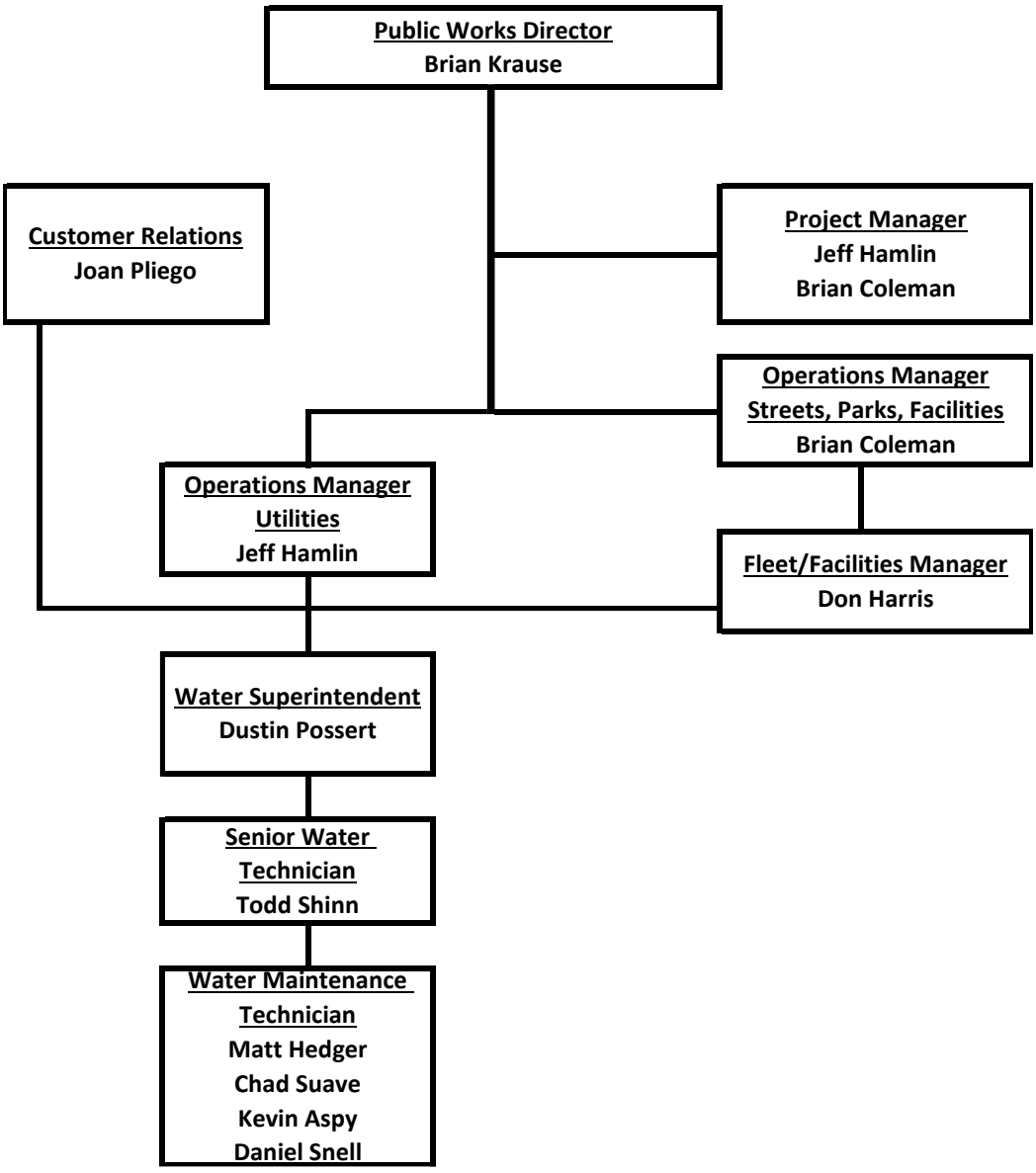
NORMAL OPERATIONS

City Personnel

The City's water system personnel are under the direction of the Public Works Director. As shown in **Figure 8-1**, the Utility Operations Manager supervises daily operations of the utility, including all water, wastewater, and stormwater operations. This position reports to the Public Works Director.

The Utility Operations staff consists of several maintenance personnel that function under the Utility Operations Manager. The water system tasks that are performed by the Utility Operations staff include inspection, testing, installation, and repair of system facilities; routine operation and preventive maintenance; recordkeeping; administrative tasks; general clerical work; and corrective or breakdown maintenance required in response to emergencies.

Figure 8-1
Organization Chart



Personnel Responsibilities

The key responsibilities of the water operations and maintenance staff are summarized as follows.

Public Works Director – Directs all activities and programs within the Public Works Department.

Project Manager – Under the direction of the Public Works Director, the Project Manager oversees assigned annual capital projects, develops project schedules and scopes of work, and facilitates selection of consultants. The Project Manager also tracks progress through the development of plans, specifications, and estimates. This position coordinates bidding and

contract execution, reviews and approves submittals, issues progress reports and pay estimates, and facilitates construction management/inspection and project closeout. The Project Manager maintains the water distribution model.

Utility Operations Manager – The Utility Operations Manager is responsible for planning, organizing, staffing, and management activities within the Utility Operation Division. For the Water Division, this position is responsible for the repair and maintenance of the water system, including transmission and distribution mains, treatment and source water facilities, storage facilities, and booster pump stations. Oversees all annual maintenance programs, including flushing, valve exercising, and source water well and reservoir inspections. The Utility Operations Manager is tasked with capital improvement program (CIP) and budget development for the utility. This position ensures that any required public notifications regarding the water system are made and may serve as the press contact.

Water Superintendent – Reports to the Utility Operations Manager and is responsible for all maintenance activities associated with water supply, distribution, pumping and storage systems, including distribution main flushing, valve exercising, and well monitoring. The Water Superintendent ensures all water quality monthly reports are complete and submitted to the proper authorities. Responsibilities include meter reading/repair, water quality monitoring and recordkeeping, and water conservation and cross-connection control programs. This position also performs preventive maintenance and checks calibration and proper monitoring of telemetry equipment.

Senior Water Maintenance Technician – Reports to the Water Superintendent and is responsible for organizing staff and work parties for day-to-day operation and maintenance of the water system. Duties include oversight of work activities, including performance of routine operations and monitoring activities, emergency repairs of water main breaks, utility locates, and other service needs.

Water Maintenance Technician – Reports to the Water Superintendent and is responsible for day-to-day operation and maintenance of the water system, including transmission, storage, pumping, and treatment facilities. Duties include performance of routine operations and monitoring activities and construction activities throughout the distribution system, including replacing or extending water mains, installing valves, installing/replacing hydrants, emergency repairs of water main breaks, and utility locates.

Customer Relations Representative – Manages customer inquiries related to Public Works, including dirty water, pressure extremes, and taste and odor issues. Tracks and coordinates all inquiries with the Operations Manager and Water Superintendent until the reported problem is resolved.

Fleet/Facility Manager – Organizes, staffs, and manages the Fleet/Facility Division. Responsibilities include preventive maintenance and repairs on vehicles and emergency generators used by Public Works.

Certification of Personnel

Chapter 246-292 Washington Administrative Code (WAC) requires that the City's water system is operated under the direct supervision of a Certified Operator. The City's water system

requires a Level 2 Water Distribution Manager. In addition, specialty certification is required for backflow device inspection and testing.

The City is in full compliance with current laws and regulations regarding staff certification and training. Several City Public Works employees possess Washington State Department of Health (DOH) certifications. **Table 8-1** shows the current certifications of the City's O&M staff that are pertinent to operation of the City's water system. It is City policy to maintain a well-qualified, technically trained staff. The City annually allocates funds for personnel training, certification, and membership in professional organizations such as the American Water Works Association (AWWA). The City believes that the time and money invested in training, certification, and professional organizations are repaid many times in improved safety, skills, and confidence.

Table 8-1

Snoqualmie Water Personnel Certification

Name	Position	Certification
Brian Krause	Director of Parks and Public Works	NA
Jeff Hamlin, PE	Utility Operations Manager	NA
Dustin Possert	Water Superintendent	WDM4, WDS, CCS, WTPO1, BAT
Todd Shin	Senior Water Maintenance Technician	WDS, WTPO1
Matthew Hedger	Water Technician II	WDS, WTPO2
Kevin Aspy	Irrigation/Water Technician II	
Daniel Snell	Irrigation/Water Technician II	
Chad Suave	Water Technician II	WDM2, WTPO1, CCS

WDM - Water Distribution Manager

WTPO - Water Treatment Plant Operator

WDS - Water Distribution Specialist

CCS - Cross-Connection Control Specialist

BAT - Backflow Assembly Tester

NA - Not Applicable

Available Chemicals and Equipment

The Public Works Department owns heavy equipment such as dump trucks, forklifts, backhoes, and loaders. If necessary, larger equipment is leased or rented on an as-needed basis from local suppliers. The City's maintenance and construction crews have personnel trained and experienced in heavy equipment operation.

Smaller commonly used tools and equipment are carried in the employee's trucks or are readily available from the stockroom. Tools and equipment such as pumps, small compressors, portable generators, pressure washers, and power tools are available from the supply room. Larger, infrequently used items are rented from various equipment rental companies located in near proximity to the City.

The Public Works Department keeps an inventory of commonly needed parts, as well as emergency supplies, at the Public Works facility. The Water Supervisor tracks the inventory and orders additional supplies as required. Critical spare equipment kept in stock includes meters,

meter boxes, various valves of all necessary sizes, pipe fittings, pipe, emergency clamps of various sizes, etc. Large non-emergency items are purchased on an as-needed basis.

Chemicals are used at several of the City's facilities. Chlorine in the form of 1-percent sodium hypochlorite is added to the Canyon Springs source for disinfection purposes. The chlorination facility at this site consists of a 20 pound per day chlorine generation system and two metering pumps that operate on a high flow/low flow demand. At flows above 300 gallons per minute (gpm), the lead pump operates. At flows below 300 gpm, the lag pump operates. DOH requires a maintained minimum free chlorine residual of 0.80 milligrams per liter (mg/L) at the first water service (chlorine generation facility). Alarms are set to notify staff when residuals drop below 0.30 mg/l, when the generator is running, and when the chemical product tank drops below a preset level. Fifty (50) pound bags of rock salt are used for chlorine generation and are hauled to and stored inside the facility by staff as needed.

The North and South Wellfield Treatment Plants use sodium hypochlorite for water disinfection. The North Wellfield Treatment Plant also uses ferric chloride for the removal of arsenic. Both treatment facilities are equipped with telemetry systems to monitor and alarm when there are failures and inconsistencies in the systems operation **Table 8-2** lists the types, storage locations, and storage quantities of chemicals used at the City's water treatment plants.

Table 8-2

Snoqualmie Water Treatment Plant Chemicals

Chemical	Storage Location	Storage Quantity
Sodium Hypochlorite (NaOCl) 1%	North Wellfield Treatment Plant	3,000 gallons
Ferric Chloride (FeCl3)	North Wellfield Treatment Plant	900 gallons
Sodium Hypochlorite (NaOCl) 1%	South Wellfield Treatment Plant	1,000 gallons
Sodium Hypochlorite (NaOCl) 1%	Canyon Springs Chlorine Generation Building	315 gallons
Sodium Hypochlorite (NaOCl) 12.5%	Jacobia Street Pump Station	350 gallons

The following representatives typically provide supplies and chemicals to the City:

- Bulk rock salt and 12.5-percent sodium hypochlorite: Northstar Chemical, (503) 625-3770.
- Bagged rock salt and ferric chloride: Cascade Columbia Distribution, (206) 282-6334.

The Public Works Department utilizes several different types of communications equipment to ensure a reliable and redundant means of communication within the department. All employees are equipped with cellular telephones, which are pre-loaded with contact information for City personnel. There is back-up radio communication available in the vehicles. Most existing vehicles and all new vehicles are equipped with a Public Works communication radio, and handheld radios also are available.

Routine Operations

Routine operations involve the analysis, formulation, and implementation of procedures to ensure that the facilities are functioning efficiently and meeting pressure requirements and other demands of the system. The utility's maintenance procedures include prompt response and repairs to ensure customers receive high-quality water service.

Continuity of Service

As a municipality, the City has the structure, stability, authority, and responsibility to ensure that water service will be continuous. For example, changes in the City Council or staff would not have a pronounced effect on the utility's customers or quality of service.

Routine Water Quality Sampling

DOH has adopted federal regulations that specify minimum monitoring requirements for water systems. The sampling requirements depend on the population served, source type, and treatment provided. The specific requirements and the minimum monthly routine coliform sampling requirements are contained in WAC 246-290-300. DOH also provided the City with an annual summary of all required water quality testing. The City currently performs all routine coliform sampling throughout the distribution system. Further discussion of the water quality monitoring program is contained in **Chapter 6** and **Appendix J**.

Cross-Connection Control

The City has adopted a cross-connection control program to comply with WAC 246-290-490 pertaining to contamination of potable water due to cross connections. The City's Cross-Connection Control Program is included in **Appendix G**. Backflow prevention devices are required at service connections where a potential for contamination exists, as outlined in the City's Municipal Code.

Recordkeeping and Reporting

DOH has enacted regulations for recordkeeping and reporting that may be found in WAC 246-290-480. The regulations identify recordkeeping and reporting procedures for operations and water quality testing.

Records are compiled and stored by each respective department that is responsible for the activity being documented. The department maintains records of capital projects, records of water quality programs and drinking water regulatory records, and records of water distribution system operation and maintenance/repair records. The department also maintains records of purchasing, bidding (non-capital projects), and other miscellaneous records. Official capital project bidding and construction documents are maintained by the City Clerk's office. Records are maintained in accordance with the Washington State records retention regulations. The City Clerk's office maintains the retention schedule of all documents Citywide. Public Works Administration assists with records retention for Public Works, including Engineering, Water

Quality, and Water Operations. The City Clerk's office and Public Works Department maintain a schedule of project files, file numbering system, and file storage location (generally capital projects only). Other records are stored locally at each department. Water operations, maintenance, and repair records are maintained electronically through the City's file system.

By computer network tracking, the City's Public Works Department has developed a filing system that breaks down the well sites, reservoirs, distribution system, water meters, and other necessary components that make up a service area. The City also involves department heads and supervisors to maintain and track their areas of responsibility. On an annual basis maintenance records are reviewed for the annual report. The Utility Operations Manager is responsible for submitting all State-required monthly forms to the appropriate agencies.

Recordkeeping

Records are kept for chlorine residual and other information as specified by DOH. DOH requires retention of critical records dealing with facilities and water quality issues summarized as follows:

- Bacteriological analysis results: 5 years.
- Chemical analysis results: for as long as the system is in operation.
- Daily source meter readings: 10 years.
- Other records of operation and analyses as may be required by DOH: 3 years.
- Documentation of actions to correct violations of primary drinking water standards: 3 years after last corrective action.
- Records of sanitary surveys: 10 years.
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility.
- Construction completion reports: life of the facility.

Reporting

1. The City must report the following to DOH:
    - Within 48 hours: A failure to comply with the primary standards or treatment technique requirements specified in Chapter 246-290 WAC.
    - Within 48 hours: A failure to comply with the monitoring requirements specified in Chapter 246-290 WAC.
    - As soon as practical, but no later than 24 hours: All Tier 1 violations, including a violation of a primary maximum contaminant level (MCL). A complete list of Tier 1 violations is located in the Code of Federal Regulations (CFR) 141.202.
    - As soon as practical, but no later than 24 hours: A backflow incident per WAC 246-290-490(8)f.

2. The City must submit to DOH all applicable reports required by Chapter 246-290 WAC. Monthly reports are due by the tenth day of the following month, unless otherwise specified.
3. Daily source meter readings must be made available to DOH on request.
4. Total annual water production records for each source must be made available to DOH upon request.
5. A water facilities inventory and report form (WFI) must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system.
6. The City must notify DOH of the presence of:
    - Coliform in a sample within 10 days of notification by the testing laboratory; and
    - Fecal coliform or *E. coli* in a sample by the end of the business day in which the City is notified by the testing laboratory.
7. When a coliform MCL violation is determined, the City must:
    - Notify DOH within 24 hours of determining acute coliform MCL violations;
    - Notify DOH before the end of the next business day when a non-acute coliform MCL is determined; and
    - Notify water customers in accordance with WAC 246-290-495.
8. If volatile organic compound (VOC) monitoring is required, a copy of the results of the monitoring and any public notice must be sent to DOH within 30 days of receipt of the test results.

Other Reports

Several other reports are required for Washington State agencies, including the Department of Revenue, Department of Labor and Industries, Department of Social and Health Services, Department of Ecology, and the Employment Security Department. All these reports are completed according to their instructions and procedural mandates.

Operations and Maintenance Records

Records include, but are not limited to, the following.

- Water quality
- MCL violations
- Water quality complaints
- Backflow prevention
- Maintenance and construction
- O&M manuals

- Personnel records
- Flushing and distribution system
- Well operation monitoring
- Surface water treatment rule disinfection monthly report
- Water treatment plant monthly report

Safety Procedures and Equipment

Safety is a primary concern and responsibility of all water O&M staff. The City has taken steps toward educating its staff and providing resources to ensure a safe working environment. The City will strive to improve its safety program on an ongoing basis. The AWWA publishes a manual entitled *Safety Practices for Water Utilities (M3)* that describes safety programs and provides guidelines for safe work practices and techniques for a variety of water utility work situations.

The following identifies procedures to be followed for O&M tasks that involve the most common potential workplace hazards in the City's water system.

Use of Chlorine or Chlorine Products

Standard Procedure – Handle with care, provide adequate ventilation, and wear safety glasses and rubber gloves. Follow material safety data sheets (MSDS) and facility standard operating procedures.

Use of Water Treatment Chemicals

Standard Procedure – Follow MSDS and facility standard operating procedures.

Working in Confined Spaces

Standard Procedure – Follow State requirements for confined space entry.

Working around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area.

Working on or around Water Reservoirs

Standard Procedure – Follow proper safety harness procedures for working on tall structures.

Working in or around Pump Stations

Standard Procedure – Obtain proper training and follow all safety procedures for working on pumps and electrical equipment.

Working on Asbestos Cement Water Main

Standard Procedure – Obtain proper training and follow all safety procedures for working with asbestos materials.

The Public Works Department follows all appropriate Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations in its day-to-day operations and complies with the following State requirements:

- WAC 296-62-145 to 14529 Part M – Entry into confined spaces.
- WAC 296-155-650 to 66411 Part N – Shoring of open ditches.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- Chapter 296-155 WAC Part C1 – Fall restraint for access to the top of the City's water reservoirs.
- *Manual on Uniform Traffic Control Devices* (MUTCD) – Traffic control for work in the public right-of-way.

Additional safety procedures are documented in the City's Accident Prevention Program.

The City's operations and maintenance staff undergo regularly scheduled safety training. The list that follows details the City's safety training programs and the intervals at which they are completed.

- Heat safety (annual training)
- Accident prevention (upon employment, as changes are made)
- Employee safety orientation (upon employment, as changes are made)
- Bloodborne policy (upon employment, annually thereafter)
- Bloodborne pathogens (upon employment, annually thereafter)
- Hepatitis "B" vaccine offer/decision (upon employment)
- Airborne pathogens (upon employment, annually thereafter)
- First Aid/CPR/Automated External Defibrillator (AED) (every 2 years First Aid and CPR, annually AED)
- Flagger certification (every 3 years)
- Hearing conservation (annually)
- Hearing protection fitting (as needed)
- Forklift (every 3 years)

- Confined space (as needed)
- Air monitor training (annually)
- Trenching/excavating (as needed)
- Defensive driving (as needed)
- Trailer transports and tie downs (annually)
- Hazardous Communication/MSDS (initially in 2014, as changes are made)
- Fire extinguishers (2013, as needed)
- Electrical safety (as needed)
- Propane safety (2011, as needed)
- Body mechanics (2014, as needed)
- Personal Protective Equipment (PPE) policy (as needed)
- Lockout/tagout policy (annually)
- Fall protection (2014, annually)
- Portable ladders (2014, as needed)
- Power hand tools (2014, annually)
- Hand tools (2014, as needed)
- Compressed air safety (2014, as needed)
- Chain saw hazards and tree removal (2012, annually)
- Machine guarding (annually)
- Aerial lifting equipment/scissors (2014, every 3 years)
- Boom trucks (2008, every 3 years)
- Mobile Crane Operator Certification (2012, every 5 years)
- Overhead cranes (2012, every 5 years)
- Rigging and signaling (2012, every 5 years)
- Portable generator training (annually)
- Cutting and welding (2014, as needed)
- High pressure washer equipment (2008, as needed)
- Railroad safety awareness (2012, as needed)
- Asbestos cement workplace practices (2012, as needed)
- Job safety analysis (as needed)
- Tailgate safety meetings (weekly)

EMERGENCY OPERATIONS

Capabilities

The City is well equipped to accommodate short-term system failures and abnormalities in accordance with WAC 246-290-420. Its capabilities are as described in the sections that follow.

Multiple Supply Capability

The City could lose the operation of one of its supply sources without adversely impacting its ability to provide emergency supply to customers.

Multiple Reservoirs

Water storage is provided by four active reservoirs that are located at three different sites and two smaller reservoirs are used for water transfer through the 1040 BPS. The pressure reducing valves (PRVs) and supply facilities interconnecting various pressure zones and reservoirs provide sufficient redundancy to prevent service disruption when one of the reservoirs is out of service for cleaning, painting, or repairs.

Distribution System

The City has attempted to loop water mains wherever possible to improve water circulation (i.e., water quality) and minimize impacts to the system if a portion of the distribution system must be taken out of service for maintenance or repairs.

Emergency Equipment

The City is equipped with the necessary tools to deal with common emergencies. If a more serious emergency should develop, the City will hire a local contractor who has a stock of spare parts necessary to make repairs to alleviate the emergency condition.

Auxiliary Power

The 1180-1280 Booster Pump Station (BPS) has three 350 kilowatt (kW) backup generators on site. The 384th Avenue SE Booster Station also has a 180 kW on-site generator, and the 705 BPS can be run off the 450 kW diesel generator at the Kimball Creek Lift Station. The City completed a generator upgrade project in 2017 to provide auxiliary power to additional facilities in the City's water system. The North Wellfield Treatment Plant was outfitted with a 200 kW diesel generator, and Well No. 8 was equipped with a 450 kW diesel generator. The Canyon Springs Chlorination Facility was equipped with a 25 kW diesel generator to ensure disinfection of water from the spring source, and a 600 kW natural gas generator with enclosure was installed at the 1040 BPS. Additionally, the City owns two trailer-mounted 250 kW portable diesel generators. These can be used at the South Wellfield Treatment Plant, the Snoqualmie Point BPS, individual well facilities, or dispatched to other Public Works facilities as needed in case of emergency.

Emergency Telephone

During the regular workday, water emergencies are routed to the appropriate department. After-hours water emergencies are routed to the standby duty person. After-hours messaging on the City phone tree (main phone lines for Public Works Administration and City Hall) instructs the caller to dial 911 and report the emergency (can be other than water emergency). Calls made to 911 are received by the City of Snoqualmie Police Department, which is in operation 24 hours a day, 7 days a week year-round. Police records personnel make direct contact with the standby duty person and relay the emergency information.

On-Call Personnel

The on-call person (standby duty person) is available 24 hours a day, 7 days a week year-round. They are equipped with a service vehicle and generally can respond to a call within 30 minutes. A list of emergency telephone numbers is provided to each on-call employee.

In the event of an after-hours emergency, the standby duty person responds, assesses the situation, and takes appropriate action to resolve the emergency situation. Appropriate action may include calling out other qualified, knowledgeable, or appropriately certified individuals. The standby duty person notifies the Utility Operation Manager about all water emergencies as they occur.

New employees are not placed on-call until they are familiar with the water system and maintenance procedures and have met the minimum standards, certification, and qualifications.

Material Readiness

Some critical repair parts, tools, and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventories are kept current and adequate for most common emergencies that reasonably can be anticipated. The City has ready access to an inventory of repair parts, including parts required for repair of each type and size of pipe within the service area.

Emergency Response Plan and Vulnerability Assessment

A Vulnerability Assessment (VA) and Emergency Response Plan (ERP) have been prepared that conform to the requirements of the Bioterrorism Act of 2002. The documents contain a vulnerability assessment of the City's water system facilities, a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency situations, and other elements. The VA and ERP also contain detailed action plans and other confidential information that is exempt from public disclosure under the provisions of Revised Code of Washington (RCW) 42.56.210. They are available for review by authorized personnel on a need-to-know basis. Contact the ERP Administrator for additional details.

Per America's Water Infrastructure Act (AWIA), which was enacted in 2018, the City is required to complete an all-hazards risk and resilience assessment (RRA) and emergency response plan (ERP). The City's deadline to complete the RRA and submit a certification letter to the EPA is

June 30, 2021. The ERP must be completed within 6 months of the RRA certification. As detailed in **Chapter 9** (CIP M3), the City plans to commence work on the RRA and ERP in 2020.

Public Notification

The Federal Safe Drinking Water Act (SDWA) and WAC 246-290-495 require purveyors to notify their customers if any of the following conditions occur:

- Failure to comply with a primary MCL described under WAC 246-290-310.
- Failure to comply with a surface water treatment technique.
- Failure to comply with monitoring requirements under Chapter 246-290 WAC.
- Failure to comply with testing requirements.
- Failure to comply with a DOH order.
- Failure to comply with a variance or exemption schedule from DOH.
- If the system is identified as a source of waterborne disease outbreak.
- If DOH issues the system a category red operating permit.
- If DOH issues an order.
- If the system is operating under a variance or exemption.

Specific notice content, distribution channels, and time limit requirements, as specified in WAC 246-290-495, must be in compliance when notification is required. The City's public notification notices for response are included in **Appendix O**.

PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed manufacturer's recommendations have been established for all critical components in the City's water system. Water quality and maintenance technicians conduct daily inspections and perform preventive/corrective maintenance on pump stations, reservoirs, PRVs, and other distribution system components. Job standards have been developed for most maintenance tasks/activities performed by these technicians and are on file with the City.

The following schedule lists key preventive maintenance tasks and the intervals at which they are performed.

Canyon Springs and Chlorine Injection Facility

Daily	Inspect site; inspect disinfection facility and function.
Weekly	Check transmission main for leaks; restock brine salt.
Quarterly	Inspect spring collection boxes and intake structures.
Annually	Drain and clean product and brine tanks.
As Needed	Rebuild control valve (PRV); clean generation cell.

South Wellfield and Treatment Plant

Daily	Inspect site (during times of operation); inspect disinfection system.
Weekly	Inspect piping and pumps for leaks.
Quarterly	Operate and inspect backwash valves and system.
Annually	Drain and clean product and brine tanks, clean and maintain chlorine analyzer.
As Needed	Rebuild control valves (PRV); clean generation cells; clean/rebuild injection pumps

North Wellfield and Treatment Plant

Daily	Inspect site; inspect chemical feeds and chemical storage levels.
Weekly	Inspect piping and pumps for leaks; inspect backwash capture valves.
Quarterly	Operate and inspect backwash system and valves; recirculate ferric chloride.
Annually	Drain and clean product tanks; clean and maintain all analyzers.
As Needed	Clean and rebuild injection pumps; wash out backwash capture tanks.

1040 Chlorine Injection Facility

Daily	Inspect site; inspect chemical feeds and chemical storage levels.
Annually	Inspect and/or rebuild injection pump.

599 Reservoir

Daily	Check reservoir level.
Weekly	Site visit; evaluate site security; Inspect hatches for tampering or damage. Inspect reservoir vaults and record the totalizer reading on the pressure relief meter at the reservoir.
Monthly	Inspect surroundings for sliding, seepage, and open pipe drains. Check catch basins and drainage pipe around reservoir. Inspect the access road to the reservoir. Exercise butterfly valves.
Annually	Inspect and service (as required) the level sensor/transmitter, high level float switch, and check valves.
As Needed	Clean/rebuild control valves.

1172 Reservoir

Weekly	Site visit; evaluate site security; check reservoir level; inspect hatches for tampering or damage. Inspect reservoir vaults and record of the totalizer reading on the pressure relief meter at the reservoir.
Monthly	Inspect the hillside behind the 1172 Reservoir for sliding, seepage, and open pipe drains. Check catch basins and drainage pipe around reservoir. Inspect the access road to the 1172 Reservoir. Exercise butterfly valves
Annually	Inspect and service (as required) the level sensor/transmitter, high level float switch, and check valves

705 Reservoir

Daily	Site visit.
Weekly	Evaluate site security; check reservoir level; inspect hatches for tampering or damage. Inspect reservoir vaults and record of the totalizer reading on the pressure relief meter at the reservoir.
Monthly	Inspect surroundings for sliding, seepage, and open pipe drains. Check catch basins and drainage pipe around reservoir. Inspect the access road to the reservoir. Exercise butterfly valves.
Annually	Inspect and service (as required) the level sensor/transmitter, high level float switch, and check valves.

1040 Reservoir

Daily	Site visit.
Weekly	Evaluate site security; check reservoir level; inspect hatches for tampering or damage. Inspect reservoir vaults and record of the totalizer reading on the pressure relief meter at the reservoir.
Monthly	Inspect surroundings for sliding, seepage, and open pipe drains. Check catch basins and drainage pipe around reservoir. Inspect the access road to the reservoir. Exercise butterfly valves.
Annually	Inspect and service (as required) the level sensor/transmitter, high level float switch, and check valves.

384th Avenue SE Booster Station

Daily	Inspect site; evaluate site security; record pump hours; check pumps for proper operation. Observe piping for visible leaks. Record suction and discharge pressures. Check and record pneumatic water tank level.
Weekly	Check upstream and downstream pressures of PRVs.
Annually	Exercise high flow pumps annually or semi-annually.
As Needed	Rebuild control valves (5-year cycle).

Snoqualmie Point Booster Station

Daily	Inspect site; evaluate site security; record pump hours; check pumps for proper operation. Observe piping for visible leaks. Record suction and discharge pressures. Check and record pneumatic water tank level.
Weekly	Check upstream and downstream pressures of PRVs.
Annually	Exercise high flow pumps annually or semi-annually.
As Needed	Rebuild control valves (5-year cycle).

705 Booster Station

Daily	Inspection site; evaluate site security; record pump hours; check pumps for proper operation. Observe piping for visible leaks. Record suction and discharge pressures. Check and record pneumatic water tank level.
Weekly	Check upstream and downstream pressures of PRVs.
Annually	Exercise high flow pumps annually or semi-annually.
As Needed	Rebuild control valves (5-year cycle).

1040 Booster Station

Daily	Inspect site; evaluate site security; record pump hours; check pumps for proper operation. Observe piping for visible leaks. Record suction and discharge pressures. Check and record pneumatic water tank level.
Weekly	Check upstream and downstream pressures of PRVs.
Annually	Exercise high flow pumps annually or semi-annually.
As Needed	Rebuild control valves (5-year cycle).

Other Components of Distribution System

Water Mains	
Bimonthly	Flush areas with water quality concerns or frequent customer concerns.
Biannual Cycle	Complete flushing of entire system.
Hydrants	
Biannual Cycle	Perform hydrant maintenance (by Snoqualmie Fire Department). Maintain vegetation surrounding hydrants; test hydrants; check accessibility and configuration of auxiliary valve. Note hydrants in need of pressure washing or painting.
As Needed	Repairs; pressure washing and painting of hydrants.
Valves	
Biannual cycle	Exercise all valves. Report malfunctioning valves and issue maintenance work orders for repair or replacement.
PRVs	
Annually	Perform testing and preventive maintenance. Check pressures; make adjustments; clean strainers; replace parts as necessary.
Source Meters	
Semi-Annually	Calibrate source meters.

Meters

Source meters are calibrated semi-annually. Customer meters are not calibrated; however, they are tested as needed based on customer or utility concerns of accuracy. The approximate installation date/age of source, reservoir, and other system meters follows.

Source Meters

Location	*Installation Date*	*Notes*
Canyon Springs	1981	Replaced in 2011
Well No. 6	1995	Replaced in 2017
Well No. 7	1995	Replaced in 2018
Well No. 8	1995	Replaced in 2018
Well Nos. 1R and Well 2	2008	

Treatment Facility Meters

Location	*Installation Date*	*Notes*
North Wellfield Treatment Plant (NWTP)	1996	Includes Well Nos. 6, 7, and 8 Calibrated February 26, 2015
South Wellfield Treatment Plant (SWTP)	2008	Includes Well Nos. 1R and 2 Calibrated February 26, 2015

Reservoir and Other Meters

Location	*Installation Date*	*Notes*
705 Pumps	1995	Replaced in 2017
599 Pumps	2008	
705 PRV Feedback	1995	Replaced in 2017
River Street PRV	2016	
Hospital Booster (799 Zone)	1980	Replaced in 2015
Winery Booster (1172 Zone)	1980	
Hospital Booster (690 Zone)	2019	
South Well Treatment Plant Backwash	2008	
North Well Treatment Plant Backwash	Unknown	
NWTP Backwash Capture to Waste	2019	
NWTP Backwash Capture Recycle	2019	

Private Meters

Location	*Installation Date*	*Notes*
Mickey Walker	Unknown	Replaced in 2017

Customer Meters

As of 2019, all but four larger customer and irrigation meters have been upgraded to Sensus Automatic Meter Reading (AMR) metering systems. At this time, all meters are read by "drive by" remote reading. City Council will determine steps to fully automate meters in the future.

STAFFING

The preventive maintenance procedures, as well as the normal and emergency operations of the utility, are described in the previous sections. The hours of labor and supervisory activity required to effectively provide this ongoing maintenance and operations schedule forms the basis for determining adequate staffing levels.

Current Staff

The current staff includes supervisory personnel, technicians, maintenance workers, and office personnel engaged in operating and maintaining the water system. There are currently 8 full-time employees supporting the water system.

Recommended Staff Level

A water system is a complex assortment of equipment and parts that require both operation and maintenance. The estimated level of effort required to provide effective operation and maintenance in this document is based on a compilation of national standards, such as those provided by the AWWA, and the pro-forma standards provided by similar water systems in the Pacific Northwest.

The available hours of a person during a year are not the total hours worked. There are many hours spent in training, non-work status, and other activities that deduct from the 2,080 hours in pay status during a year. The total available hours are typically reduced to 1,540, as shown in **Table 8-3**.

Table 8-3

Annual Available Hours per Person

Time Available Per Year Per Person	
Beginning Hours Available	2,080
Less average vacation of 3 weeks per year	-120
Less average sick leave of 2 weeks per year	-80
Less holidays of 10 days per year	-80
Less average training of 40 hours per year	-40
Less average small tasks other than above of 1 hour per day	-220
Net Total Available Hours Per Year Per Person	1,540

Preventive maintenance is the work performed to keep the water system in the condition necessary to provide the expected service. Preventive maintenance needs are based on the physical composition of the water system. Each component has a preventive maintenance need that ranges from minor to significant. **Table 8-4** provides the detail of the recommended staffing level for the water system's preventive maintenance program. As shown in **Table 8-4**, approximately 5.0 full-time employees are recommended for the preventive maintenance program.

Table 8-4

Preventive Maintenance Staff Needed

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Preventive Maintenance				
Hydrants	724	0.5	0.5	181
Isolation Valves, Hydrant Valves	1,972	0.5	0.2	197
Source Meters	6	1	2	12
Leak Survey of Water Mains	69 miles	1	4	276
Flushing Water Mains	69 miles	0.5	16	552
Booster Pump Stations	5	52	1	260
Pressure Reducing/Control Valve Stations	19	24	1	456
Water Treatment Facilities	3	260	4	3,120
Sources	6	52	4	1,248
Reservoirs	6	52	1	312
Telemetry and Control System	1	52	20	1,040
Total Hours Required				7,654
Total Full-Time Staff Required	**(based on 1,540 hours per year per person)**			**5.0**

The other component of O&M staffing is operations. Operations includes all activities other than preventive maintenance, such as water meter reading and repair of broken water mains. As a system ages, many of these activities can be expected to increase. Some operations staff demands can be reduced by replacing infrastructure with more efficient technology. Each technology or equipment upgrade should be analyzed for cost effectiveness. **Table 8-5** provides the recommended staffing level for the water system's operations program. As shown in **Table 8-5**, approximately 6.9 full-time employees are recommended for the operations program.

Table 8-5

Operations Staff Needed

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Operations				
Monitor System	20	260	0.5	2,600
False Alarm Response	1	24	2	48
Meter Reading	4,466	6	0.008	214
Groundskeeping	10	12	6	720
Inventory	1	1	40	40
Meter Repair/Replace	1	130	4	520
Main Breaks/Repair	1	24	48	1,152
Hydrant/Blowoff Repairs	1	40	8	320
Utility Locates	1	400	4	1,600
Service Connections	1	115	4	460
Main Connections	1	10	32	320
Water Quality Sampling	20	12	2	480
Administration	1	260	8	2,080
Total Hours Required				10,554
Total Full-Time Staff Required	**(based on 1,540 hours per year per person)**			**6.9**

To achieve the level of operations and maintenance shown in **Table 8-6**, approximately 11.8 full-time personnel are required for the water system alone. The City's current available staff is lacking 3.8 full-time equivalents (FTE) to meet these requirements. In addition, as the water system expands in the future, additional review of staffing needs will be required. The City plans to add staff to optimize preventive maintenance and meet the additional requirements from system expansion as the budget allows.

Table 8-6

Total Staffing Recommendation

Total Staff Recommended		
Preventive Maintenance Hours		7,654
Operations Hours		10,554
Total Hours		18,209
Total Full-Time Staff Required	**(based on 1,540 hours per year per person)**	**11.8**

ASSET MANAGEMENT

The City does not currently have an asset management program in place. The City has been in the process of evaluating computerized maintenance management system (CMMS) software over the past few years and is working towards selecting a program that will fit the City's needs.

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9 | WATER SYSTEM IMPROVEMENTS

INTRODUCTION

This chapter presents proposed improvements to the City of Snoqualmie's (City) water system that are necessary to resolve existing system deficiencies and accommodate the projected growth of water customers. The water system improvements were identified from an evaluation of the results of the water system analyses presented in **Chapter 7**. The water system improvements were sized to meet both the existing and future demand conditions of the system.

A Capital Improvement Program (CIP) number has been assigned to each proposed improvement. The CIP projects, along with their assigned numbers, are shown in plan view on **Figure 9-1**. The improvements also are illustrated in the hydraulic profile of the future water system (**Figure 9-2**). The improvements are organized and presented in this chapter according to the following categories.

- Recent Water System Improvements
- Water Main Improvements
- Pressure Zone Improvements
- PRV Improvements
- Facility Improvements
- Miscellaneous Improvements

The remainder of this chapter presents a brief description of each group of improvements, the criteria for prioritization, the basis for the cost estimates, and the schedule for implementation.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies they will resolve. Most of the improvements are necessary to resolve existing system deficiencies.

Recent Water System Improvements

The water system has undergone several changes since 2013, when the City's Water System Plan (WSP) was last updated. The City has implemented many of the recommended projects as scheduled in its previous CIP, as well as several others. **Table 9-1** lists the projects that have been completed. In addition to these major projects, the City has implemented many smaller projects, including water main replacements and extensions.

Table 9-1

Improvements Completed Since 2013 WSP

Project Description	Year Completed
Well No. 8 Backup Generator	2014
1040 BPS Generator	2015
Canyon Springs Disinfection Facility and Generator	2016
Falls Avenue/Cedar Street Water Main Replacement	2016
SCADA System Upgrades	2016 - 2019
Northern Street Infrastructure Improvements	2017
Water Rights Transfer	2017
1172 Reservoir Painting/Maintenance	2018
705 Reservoir No. 2	2018
Canyon Springs Emergency Slope Repair	2018
Canyon Springs OSHG Upgrades	2018
North Wellfield WTP Improvements and Backwash Recycle System	2018
670 Zone Conversion (384th Avenue BPS PRV - 670 Zone and 378th Avenue PRV)	2019
Greek Streets Infrastructure Improvements	2019
Reinig Road PRV/PSV Station	2019

Water Main Improvements

The following water main improvements were identified from the results of the distribution and transmission system analyses discussed in **Chapter 7**. Most of the water main improvements will replace existing distribution water main and are grouped in the "Annual Water Main Replacement Program" project (CIP WM1). The individual water main improvement projects within this group are numbered 1 through 65, as shown in **Figure 9-1**. The other water main improvements, identified as individual projects (CIP WM2 through WM12) are mostly high-priority projects, larger diameter water mains, new alignments, or other unique projects that do not entail the replacement and/or upsizing of existing water main.

CIP WM1: Annual Water Main Replacement Program

Deficiency: Most of the water main improvements shown in **Figure 9-1** are required to resolve existing system fire flow deficiencies primarily caused by older, undersized water mains installed prior to the local government adoption of fire flow requirements.

Improvements: Replace existing water main with new ductile iron water main in accordance with the City's Construction Standards and Specifications, which are contained in **Appendix H**. The individual water main improvements grouped under this project are numbered 1, 2, 3, etc., as shown in **Figure 9-1**. The selection of specific projects will be accomplished during the City's annual budget development process and will be guided by the prioritization presented later in this chapter. This provides the City with the flexibility to coordinate these projects with other projects that may occur within the same area. A variable allowance per year has been established for the annual replacement of the water mains based on the City's available budget.

CIP WM2: SR 202 Bridge Water Main Replacement Feasibility Analysis

Deficiency: In spring 2019, a joint leaked on the 12-inch-diameter ductile iron water main that crosses the Snoqualmie River on the State Route (SR) 202 bridge. The water main is nearly 40 years old and needs to be replaced. Because of bridge weight limitations, the Washington State Department of Transportation (WSDOT) has restricted the size of pipelines across the SR 202 bridge. In order to meet future growth projections, improve system reliability, and reduce risks, the City needs to install larger diameter pipelines across the Snoqualmie River.

Improvements: Complete a feasibility analysis of alternatives to install larger diameter pipelines across the Snoqualmie River. Coordinate this effort with the sanitary sewer CIP. One-third of the project cost will come from the Water Fund.

CIP WM3: SR 202 Bridge Water Main Replacement

Deficiency: In spring 2019, a joint leaked on the 12-inch-diameter ductile iron water main that crosses the Snoqualmie River on the SR 202 bridge. The water main is nearly 40 years old and needs to be replaced. Because of bridge weight limitations, WSDOT has restricted the size of pipelines across the SR 202 bridge. In order to meet future growth projections, improve system reliability, and reduce risks, the City needs to install larger diameter pipelines across the Snoqualmie River.

Improvements: Replace the 12-inch-diameter water main on the SR 202 bridge based on the recommendations of the analysis developed in CIP WM1. One-third of the project cost will come from the Water Fund.

CIP WM4: Infrastructure Improvement Program/Street Preservation Program

Deficiency: Many of the roadways slated for reconstruction under the Infrastructure Improvement Program/Street Preservation Program are severely deteriorated and sidewalks at intersections are not Americans with Disabilities Act (ADA) compliant. Aging water mains will be replaced and failing sewer piping will be replaced or repaired. Storm drain systems will be upgraded to adequately handle runoff and improve water quality. The upgrades will bring the infrastructure into consistency with the City's adopted standards.

Improvements: Replace aging water main and failing sewer piping, upgrade storm drain systems, and reconstruct roadways in accordance with the City's CIP Project IDs PUW16001CIP (Infrastructure Improvement Program) and PUW20002CIP (Street Preservation Program). Two-thirds of the project costs for the City's Infrastructure Improvement Program are provided from the Water Fund, and forty-eight (48) percent of the project costs for the Street Preservation Program are provided from the Water Fund.

CIP WM5: Investigation and Potential Replacement of Fisher Avenue Water Main

Deficiency: Field flow testing showed that there is likely a restriction in the 10- and 12-inch-diameter 800 Zone water main in Fisher Avenue SE, between SE Forest Street and SE Isley Street. Operations staff did not locate any closed or partially closed valves along the water main.

Improvements: Conduct additional investigation to locate the restriction. If necessary, replace the water main (approximately 500 linear feet (LF)).

CIP WM6: Investigation and Potential Replacement of Denny Peak Water Main

Deficiency: Field flow testing showed that there is likely a restriction in the 8-inch-diameter 890 Zone water main immediately downstream of the Denny Peak Pressure Reducing Valve (PRV). Operations staff did not locate any closed or partially closed valves along the water main.

Improvements: Conduct additional investigation to locate the restriction. If necessary, replace the water main (approximately 200 LF).

CIP WM7: SE 76th Street in Ernie's Grove

Deficiency: Currently, there is an approximately 2,400 LF, 6-inch-diameter dead-end water main in Ernie's Grove along 442nd Place SE. The water main needs to be looped to improve water quality, available fire flow, and system redundancy in the area.

Improvements: Install approximately 2,400 LF of 8-inch-diameter water main from 442nd Place SE to North Fork Road SE along SE 76th Street.

CIP WM8: Williams Addition Water System

Deficiency: The existing water mains in the Williams Addition, which are constructed with 4-inch and 6-inch-diameter asbestos cement pipe, experience approximately one or two main breaks per year.

Improvements: Replace the existing asbestos cement pipe in the Williams Addition with 8-inch-diameter ductile iron water main to eliminate aging/failing infrastructure and provide adequate fire flow.

CIP WM9: Spruce Street SE Water Main Replacement

Deficiency: Aging 6-inch-diameter asbestos cement and cast iron water mains in the vicinity of Spruce Street SE are located near a long-term stormwater CIP project. Upsizing these water mains, which are nearing the end of their useful life, will aid in bringing the available fire flow in the area closer to the planning-level requirement.

Improvements: Replace the existing 6-inch-diameter water main with 8-inch-diameter water main. Alignments include approximately 650 LF along Spruce Street SE from Meadowbrook Way SE to Mountain Avenue SE, approximately 340 LF along Mountain Avenue SE from SE Spruce Street to SE Walnut Street, approximately 270 LF along SE Spruce Street from Mountain Avenue SE to Spruce Place SE, and approximately 300 LF along Spruce Place SE from SE Spruce Street to the dead end.

CIP WM10: SE King Street Water Main Replacement

Deficiency: A short section (approximately 60 LF) of existing 6-inch-diameter asbestos cement water main along SE King Street between Maple Avenue SE and Silva Avenue SE causes a significant

fire flow availability bottleneck in the area. Upsizing this water main will aid in bringing the available fire flow in the area closer to the planning-level requirement.

Improvements: Replace approximately 60 LF of 6-inch-diameter asbestos cement water main along SE King Street, from Maple Avenue SE to 4th Avenue, with 12-inch-diameter ductile iron water main.

CIP WM11: Maple Avenue SE Water Main Replacement

Deficiency: Aging 6-inch-diameter asbestos cement water main along Maple Avenue SE from SE King Street to just north of SE River Street is nearing the end of its useful life and restricts the available fire flow in the area.

Improvements: Replace approximately 600 LF of existing 6-inch-diameter water main along Maple Avenue SE from SE King Street to just north of SE River Street with 12-inch-diameter ductile iron water main.

CIP WM12: Mill Site Water Main Loop (Developer Funded)

Deficiency: The City lacks existing water mains to supply the proposed Mill Site development. For redundancy and to improve the water system's transmission capacity, the water main constructed to supply the Mill Site will be looped on the north side of the Snoqualmie River, from the intersection of SE Reinig Road and 396th Drive SE to the intersection of Snoqualmie Parkway and SR 202. The project will include a water main bored under the river in the vicinity of the SR 202 bridge.

Improvements: Install approximately 11,800 LF of 16-inch-diameter water main from the intersection of SE Reinig Road and 396th Drive SE to the intersection of Snoqualmie Parkway and SR 202. It is anticipated that this project will be developer funded.

Pressure Zone Improvements

The following pressure zone improvements will improve various low and high pressure problems, available fire flow, and system redundancy. A brief description of the existing deficiencies and proposed improvements is provided as follows.

CIP PZ1: 599 Zone Evaluation and Reinig Road PRV/PSV Station Activation

Deficiency: The 599 Zone currently is operated at a hydraulic grade line (HGL) of 636 feet, meaning that the 599 Reservoir does not turn over and water must be flushed from the reservoir by Operations staff to maintain suitable water quality.

Improvements: Conduct a study to evaluate setpoints for the Reinig Road PRV/Pressure Sustaining Valve (PSV) station, and other valves, to adequately supply the 599 Zone and enable operation of the 599 Reservoir. As part of the study, confirm that reductions in suction pressure for the 384th Avenue SE Booster Pump Station (BPS), 705 BPS, and the Walter Walker BPS are acceptable. Activate the Reinig Road PRV/PSV station and adjust other valves as recommended in the study.

CIP PZ2: SCADA for Reinig Road PRV/PSV Station

Deficiency: The City desires to implement supervisory control and data acquisition (SCADA) at the Reinig Road PRV/PSV station to allow monitoring of flow rate and pressure at this location.

Improvements: Activate and program the required equipment at the Reinig Road PRV/PSV station to transmit telemetry to the City's SCADA system.

CIP PZ3: 705 Zone to 599 Zone Conversion

Deficiency: The Water Reclamation Facility (WRF) currently is supplied water from the 705 Zone, which results in service pressures greater than 80 pounds per square inch (psi).

Improvements: Install a new PRV, supplying water from the 705 Zone to the 599 Zone, in the vicinity of the WRF to supply the existing customers with high service pressure. Upon completion of the Mill Site Water Main Loop (CIP WM12), the PRV will provide a backup supply connection from the 705 Zone to the 599 Zone on the north side of the Snoqualmie River.

CIP PZ4: 599 Zone to 705 Zone Conversion

Deficiency: Services near the 599 Reservoir along SE 80th Street, which are connected to the 599 Zone, have low pressures and cause approximately 0.11 million gallons (MG) of the 599 Reservoir volume to be dead storage. These high elevation services also limit the available fire flow in the 599 Zone.

Improvements: Extend the nearby 705 Zone water main in Gala Court to these services and convert them from the 599 Zone to the 705 Zone.

PRV Improvements

The following PRV improvements will improve various low and high pressure problems, available fire flow, and system redundancy. A brief description of the existing deficiencies and proposed improvements is provided as follows.

CIP PRV1: 670 Zone PRV Adjustment

Deficiency: The 670 Zone currently has areas where service pressures are less than 40 psi under static conditions, including one service that is equipped with an individual BPS.

Improvement: Increase the setpoint of the 384th Avenue BPS – 670 Zone PRV. The hydraulic grade of the zone needs to be increased to approximately 687 feet to provide a minimum pressure of 40 psi to the highest elevation service under PHD conditions. Evaluate the service pressures throughout the 670 Zone and install individual PRVs at service connections that will experience pressures greater than 80 psi after the increase in hydraulic grade. All remaining asbestos cement water main in the 670 Zone should be replaced before the completion of CIP PRV1.

CIP PRV2: 1180/1040 Zone PRV at Raines Avenue SE and Water Main

Deficiency: The City desires to install a new PRV station near the intersection of Raines Avenue SE and SE Terrace Street. The PRV will supply water from the 1180 Zone to the 1040 Zone, improving

system redundancy. New water main will be constructed to connect the PRV to the 1040 Zone in the vicinity of SE Venn Street.

Improvement: Install a new 1180 Zone – 1040 Zone PRV near the intersection of Raines Avenue SE and SE Terrace Street and associated water main. Establish setpoints for the PRV to minimize recirculation of water from the 1180 Zone to the 1040 Zone under normal operating conditions.

CIP PRV3: PRV Recirculation Study and Improvements

Deficiency: Significant recirculation of water may be occurring through the PRV stations at the 705 BPS, 384th Avenue SE BPS, and Snoqualmie Point BPS.

Improvement: Evaluate this phenomenon and adjust setpoints and/or include additional functionality to booster pump stations and PRV stations to minimize wasted energy from unnecessary recirculation of water.

Facility Improvements

The following water system facility improvements were identified from the results of the water system analyses that are discussed in **Chapter 7**. The improvements are primarily necessary to resolve existing system deficiencies, but also have been sized to accommodate projected growth.

CIP F1: 1040 BPS Additional Pump

Deficiency: The supply requirements of the 1040 Zone are approaching the maximum capacity of the 1040 BPS.

Improvements: Add a fifth 625 gallons per minute (gpm) pump to the blank bay in the 1040 BPS. Complete minor piping improvements and add a new telemetry cabinet.

CIP F2: South Wellfield VFDs

Deficiency: Discharge at the South Wellfield is limited to 400 gpm due to the South Wellfield impacting Canyon Springs production.

Improvements: Install variable frequency drives (VFDs) for Well No. 1R and Well No. 2 to allow better control and more efficient operation of the South Wellfield.

CIP F3: Canyon Springs Improvements

Deficiency: Canyon Springs needs collector box upgrades and a new access trail/road to replace the aging existing infrastructure. The City also is considering installation of a booster pump station at Canyon Springs to maximize source output; this improvement is contingent on procuring additional water rights for the spring source.

Improvements: Complete a study to better define the needed improvements to Canyon Springs. Based on the results of the study, rehabilitate spring collector boxes, complete a directional bore into the hill, construct a new trail, and/or construct a BPS as recommended.

CIP F4: South Wellfield Chlorine Contact Time Improvements

Deficiency: The City limits operation of the South Wellfield due to elevated concentrations of ammonia, which can cause taste and odor issues and customer complaints. Ammonia requires a high chlorine dose and an extended contact time to react into inert nitrogen compounds; the intermediate byproducts (di- and tri-chloramines) result in taste and odor issues. The existing water conveyance infrastructure downstream of chlorine injection to the first customer is insufficient to minimize taste and odor impacts to customers.

Improvement: Install a breakpoint chlorination reaction time pipeline downstream of the chlorine feed before the first customer. From initial testing, at least 40 minutes of contact time is required to minimize taste and odor impacts. At a flow rate of 600 gpm, this results in 24,000 gallons of pipeline volume. Additional bench scale chlorination testing is recommended during predesign to confirm dose and contact time. Pipeline alignment alternatives should be evaluated during the predesign effort to determine the size, length, and location of the proposed pipeline.

CIP F5: South Wellfield On-Site Sodium Hypochlorite Generation Improvements

Deficiency: The South Wellfield's on-site sodium hypochlorite generation (OSHG) system is aging, and replacement parts are difficult to source. The on-site sodium hypochlorite generator unit should be replaced.

Improvement: Replace the existing on-site sodium hypochlorite generator unit. The capacity should match the existing unit, which provides 40 pounds per day of equivalent free-chlorine. The existing brine tank and product tanks can be reused; however, interconnecting mechanical piping would need to be modified, and the proposed OSHG unit may require additional water conditioning, such as a heater. System modifications should be evaluated during the predesign effort for the project to determine exactly what equipment can be reused, what needs to be replaced, and what should be added.

CIP F6: Permanent Backup Generator for South Wellfield and Treatment Plant

Deficiency: Backup power currently is provided to the South Wellfield and Treatment Plant with a portable generator. Installation of permanent auxiliary power with an automatic transfer switch (ATS) will allow the City to reduce the volume of standby storage required for the 599 Zone.

Improvements: Install a permanent engine generator set with an ATS to provide auxiliary power to the South Wellfield and Treatment Plant.

CIP F7: Permanent Backup Generator for Well No. 6 and Well No. 7 (North Wellfield)

Deficiency: Backup power currently is provided to Well No. 6 and Well No. 7 with a portable generator. Installation of permanent auxiliary power with an ATS will allow the City to improve the reliability of the source.

Improvements: Install a permanent engine generator set with an ATS to provide auxiliary power to Well No. 6 and Well No. 7.

CIP F8: Retrofit 705 BPS with VFDs

Deficiency: Two of the four pumps in the 705 BPS are fixed-speed, and the City has limited control over their operation.

Improvements: Retrofit the two fixed-speed pumps with VFDs to allow better control and more efficient operation of the 705 BPS.

CIP F9: 705 BPS Additional Pump

Deficiency: The City desires to add an additional pump to the 705 BPS to increase the capacity of the BPS.

Improvements: Add a fifth pump with a VFD to the 705 BPS.

CIP F10: Install Drain System for 1040 Reservoir Valve Vaults

Deficiency: The 1040 Reservoir No. 1 and 1040 Reservoir No. 2 valve vaults lack a satisfactory drain system.

Improvements: Retrofit the valve vaults with a drain system or sump pump to reduce the required maintenance effort.

CIP F11: Reservoir Siting Study

Deficiency: As described in **Chapter 7**, new reservoirs are required in the 599 Zone (CIP F12), 1040 Zone (CIP F13), and 1172 Zone/799 Zone (CIP F14) to resolve storage capacity deficiencies.

Improvements: Perform a reservoir siting study to determine suitable locations for future reservoirs. As an alternative to constructing the 1172 Zone/799 Zone Reservoir, evaluate upsizing the capacity of the 384th Avenue SE BPS by adding a fire flow pump to provide fire flow from the 599 Zone, thereby eliminating the need for fire flow storage in the south pressure zones.

CIP F12: 1.6 MG 599 Reservoir No. 2 (Partially Developer Funded)

Deficiency: The 599 Zone has insufficient storage capacity for the 20-year planning period.

Improvements: Construct a new 1.6 MG 599 Reservoir No. 2 in the 599 Zone. It is assumed that this reservoir will be constructed on the north side of the Snoqualmie River, near the Mill Site, with a base elevation of approximately 575 feet and an overflow elevation of 599 feet. It is anticipated that this project will be partially developer funded.

CIP F13: 1.8 MG Future 1040 Reservoir No. 3

Deficiency: The Snoqualmie Ridge pressure zones have insufficient storage capacity for the 20-year planning period.

Improvements: Construct a 1.8 MG 1040 Reservoir No. 3 in the 1040 Zone. It is assumed that this reservoir will be constructed adjacent to the existing 1040 Reservoir No. 1 and 1040 Reservoir No. 2, with a base elevation of 1,016 feet and an overflow elevation of 1,040 feet.

CIP F14: 0.2 MG Future 1172 Reservoir No. 2/799 Reservoir

Deficiency: The South Pressure Zones have insufficient storage capacity for the 20-year planning period.

Improvements: Based on the results of the reservoir study in CIP F11, construct either a 0.2 MG 1172 Reservoir No. 2 or 799 Reservoir in the 1172 Zone or 799 Zone, or alternatively, add additional fire flow pumping capacity to the 384th Avenue SE BPS.

Miscellaneous Improvements

The following improvements are planning efforts and program elements that are required to comply with various water regulations or are improvements that do not fit into one of the previous categories.

CIP M1: Source of Supply Improvements – Study

Deficiency: Based on the demand projections described in **Chapter 4**, the water rights analysis in **Chapter 6**, and the system capacity analyses described in **Chapter** 7, the City will experience a source of supply deficiency within the 10-year planning period.

Improvements: Conduct a study to procure an additional source(s) of water supply for the City or to increase the capacity of existing sources. The study will consider implementation of an Aquifer Storage and Recovery (ASR) program.

CIP M2: Source of Supply Improvements – Implementation

Deficiency: As described in CIP M1, the City needs to procure an additional source(s) of water supply during the 10-year planning period to accommodate projected growth.

Improvements: Implement the recommendations of the study conducted in CIP M1 to add additional source(s) of water supply for the City or to increase the capacity of existing sources.

CIP M3: Risk and Resiliency Assessment and Emergency Response Plan

Deficiency/Requirement: America's Water Infrastructure Act of 2018 requires the City to develop or update its Risk and Resilience Assessment by June 30, 2021, and its Emergency Response Plan by December 30, 2021.

Improvements: Develop or update these documents by the required deadline.

CIP M4: Water Use Efficiency Audit and Programming

Deficiency: Several water use efficiency measures must be carried out on an ongoing basis to comply with State water use efficiency requirements.

Improvements: The City will continue to implement its water use efficiency measures on an ongoing basis. The City also plans to hire a consultant to develop and implement a water/irrigation conservation program.

CIP M5: Water System Plan Update

Deficiency/Requirement: Washington Administrative Code (WAC) 246-290-100 requires that the City's WSP be updated every 10 years and submitted to the Washington State Department of Health for approval.

Improvements: Update the WSP every 10 years to meet the requirements that are in effect at the time of the update.

CIP M6: Pump Condition Evaluation

Deficiency: The City's water system relies upon many pumping facilities to operate. The equipment should be tested regularly to ensure efficient operation and reliability of the infrastructure.

Improvements: Perform pump and motor testing to assess the condition of the City's pumping infrastructure, identify any impending failures, prioritize pump overhaul or replacement, and recommend targeted improvements to increase system efficiency and reliability, and optimize annual energy costs.

ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated based on costs of similar, recently constructed water projects in the City and around the Puget Sound area and are presented in 2020 dollars. The project cost estimates include the estimated construction cost of the improvement, sales tax of 8.6 percent, and a 20-percent contingency, as well as indirect costs estimated at 35 percent of the construction cost for engineering preliminary design, final design, and construction management services, permitting, legal, and administrative services. The project cost estimates also include City staff time estimated at 15 percent of the construction cost.

Construction cost estimates for water main projects were determined from the water main unit costs (i.e., cost per foot length) shown in **Table 9-2** and the proposed diameter and approximate length of each improvement.

Table 9-2
Water Main Unit Costs

Water Main Diameter (inches)	Project Cost per Foot Length (2020 $ per LF)
Standard Piping	
8	$351
12	$388
16	$425
18	$461
21	$502
24	$545
Seismically Restrained Piping	
8	$701
12	$775
16	$849
18	$923
21	$1,003
24	$1,090

The unit costs for each water main size are based on estimates of all construction-related improvements, such as materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, asphalt surface restoration, other work necessary for a complete installation, indirect costs, contingency, and sales tax. Additional costs were added to some water main improvements to cover anticipated, increased costs related to the project location and degree of difficulty.

PRIORITIZING IMPROVEMENTS

The water system improvements were evaluated against established criteria to schedule projects that will correct the most deficiencies and meet the greatest need for improvement prior to projects correcting fewer deficiencies. A description of the criteria and method for prioritizing each category of improvements is provided in the sections that follow.

Water Main Improvements

Table 9-3 lists criteria that were established for prioritizing the water main improvements. The criteria are based on the underlying deficiencies of the existing water main that will be replaced by the proposed water main improvements. The criteria are arranged in four different categories with a weight factor assigned to each category. The criteria given the most weight are the Existing Water Main Benefit Area and Existing Water Main Material categories.

Table 9-3

Water Main Improvements Priority Ranking Criteria

Points	Category	Weight Factor	Weighted Points
	Existing Water Main Benefit Area		
3	Large Benefit Area (i.e. transmission main)	4	12
2	Medium Benefit Area	4	8
1	Small Benefit Area (i.e. localized area)	4	4
	Existing Water Main Material		
3	Asbestos Cement or Unknown	3	9
2	Cast Iron	3	6
1	Ductile Iron or PVC	3	3
	Existing Water Main Year of Installation		
3	Unknown or Before 1970	2	6
2	1970 - 1990	2	4
1	After 1990	2	2
	Existing Water Main Fire Flow Capability		
3	Available Fire Flow is 74% or Less of Required Fire Flow	1	3
2	Available Fire Flow is 75-89% of Required Fire Flow	1	2
1	Available Fire Flow is 90% or Greater of Required Fire Flow	1	1

The Existing Water Main Benefit Area category ranks the water main improvements based on the size of the area that will benefit from the replacement. The Existing Water Main Material category ranks the water main improvements based on the material of the existing water main. The Existing Water Main Year of Installation category ranks the water main improvements based on the age of the existing water mains. The Existing Water Main Fire Flow Capability category ranks the water main improvements based on the ability of the existing water mains to provide the required fire flow, as determined from the results of the hydraulic analyses in **Chapter 7**.

The water main priority ranking criteria were applied to the annual water main replacement projects, which are grouped under CIP WM1. CIP WM1 Projects 1 through 65, as shown in **Figure 9-1**, are presented in **Table 9-4** and sorted by CIP number with their priority ranking. The CIP projects that received a ranking of “high” based on the criteria shown in **Table 9-3** are presented in **Table 9-5**.

Table 9-4

Prioritized Annual Water Main Replacement Projects (Sorted by Number)

CIP	Priority		Estimated	Size		Description			
No.	Rank	Points	Cost	Length (ft)	Diam (in)	In	From	To	Notes
1	M	22	$193,000	549	8	Easement	SE 72nd St	Dead End	
2	M	22	$163,000	463	8	442nd Pl SE	SE 76th St	SE 78th St	
3	M	22	$995,000	2,837	8	434th Ave SE, SE 76th St, SE 77th St, 435th Ave SE	N Fork Rd SE	Dead End	
4	M	19	$182,000	518	8	SE Walnut St	Mountain Ave SE	Dead End	
5	M	22	$110,000	311	8	Mountain Ave SE	SE Walnut St	Dead End	
6	M	22	$42,000	118	8	SE Spruce St	Spruce Pl SE	Dead End	
7	L	16	$85,000	241	8	Spruce Pl SE	Spruce Pl SE	Dead Ends	
8	M	22	$577,000	1,487	12	Snoqualmie Elementary School	SE Park St	SE Park St	
9	L	12	$1,280,000	3,302	12	SE Park St	Snoqualmie Elementary School	Mt. Si Golf Course	
10	M	19	$42,000	108	12	Intersection of Meadowbrook Way SE and SE Spruce St/Easement	Meadowbrook Way SE	Dead End	
11	M	23	$59,000	151	12	SE Park St	NW of Meadowbrook Way SE	Meadowbrook Way SE	
12	M	23	$16,000	41	12	Falls Ave SE	SE Beta St	North of SE Beta St	
13	L	16	$787,000	1,514	12	Mt. Si High School Freshman Campus	SR 202	Easement	
14	L	12	$1,141,000	1,910	12	Stone Quarry Rd SE	SR 202	S of SR 202	
15	M	22	$584,000	497	8	Railroad Pl SE	SE Beta St	Dead End	Completion expected 2020.
				1,055	12	Railroad Pl SE, SE Beta St	SE Newton St	Dead End	
16	H	30	$321,000	288	8	Maple Ave SE	SE Newton St	Dead End	Completion expected 2020.
				626	8		SE River St	SE Newton St	Completion expected 2021.
17	M	22	$356,000	1,013	8	Doone Ave SE, SE Newton St, Reinig Pl SE	SE River St	Dead End	Completion expected 2021.
18	H	26	$119,000	305	12	SE King St	Silva Ave SE	Maple Ave SE	Completion expected 2021.
19	M	18	$114,000	294	12	SE King St	Maple Ave SE	Railroad Ave	Completion expected 2021.
20	L	14	$182,000	517	8	384th Ave SE	SE King St	SE River St	
21	H	26	$69,000	195	8	SE Newton St	384th Ave SE	Silva Ave SE	
22	H	27	$759,000	1,956	12	384th Ave SE	SE Newton St	SE Kimball Creek Dr	
23	H	27	$294,000	758	12	384th Ave SE	SE Kimball Creek Dr	384th Ave SE BPS	
24	M	22	$271,000	770	8	SE Maple St	SE Fir St	Dead End	
25	H	27	$103,000	264	12	Pine Ave SE	SE 80th St	Cedar St	Completion expected 2021.
26	L	16	$112,000	319	8	SE Fir St	SE Cedar St	Dead End	Completion expected 2021.
27	H	26	$391,000	937	8	Cedar St	10th Ave W	SE Fir St	Completion expected 2021.
				176	4	Cedar Pl SE	Cedar St	Dead End	
28	M	20	$341,000	878	12	384th Ave SE	384th Ave SE BPS	S of 384th Ave SE BPS	
29	L	14	$608,000	1,567	12	Easement	384th Ave SE	Dead End	
30	M	22	$554,000	1,577	8	384th Ave SE	384th Ave SE BPS	Dead End	
31	L	16	$335,000	955	8	381st Ave SE, SE 90th St	SE 91st St	Dead End	
32	H	26	$192,000	493	12	SE Northern St	Railroad Pl SE	Pickering Ct SE	
33	H	26	$690,000	1,967	8	378th Ave SE	SE 86th St	SE 80th St	
34	M	22	$228,000	648	8	375th Pl SE	SE 80th St	Dead End	
35	M	18	$642,000	1,512	16	SR 202	Roundabout	Salish Lodge	
36	M	22	$787,000	2,028	12	Access Road	Railroad Ave SE	Dead End	
37	M	22	$533,000	783	16	Snoqualmie Parkway	Railroad Ave SE	Vicinity of 705 BPS	
38	L	14	$429,000	1,106	12	Better Way Loop SE	SE Fury St	SE Fury St	
39	L	15	$148,000	421	8	Allman Ave SE	Snoqualmie Parkway	SE Stewart St	
40	L	11	$8,000	21	8	Easement	SE Gravenstein Ct	Dead End	
41	L	11	$6,000	17	8	Easement	SE Gravenstein Ct	Dead End	
42	L	11	$246,000	700	8	Easement Loop	SE Gravenstein Ct	SE Gravenstein Ct	
43	L	11	$93,000	264	8	SE Kendall Peak St	Denny Peak Dr SE	Dead End	
44	L	12	$225,000	578	12	Club at Snoqualmie Ridge	Club at Snoqualmie Ridge	Club at Snoqualmie Ridge	
45	L	12	$211,000	543	12	Easement	Snoqualmie Parkway	Dead End	
46	L	12	$331,000	853	12	Easement Loop	Fairway Ave SE	Loop	
47	L	11	$110,000	282	12	Easement, SE Aspen Ln	SE Kinsey St	SE Aspen Ln	
48	L	10	$618,000	1,594	12	Warren Ave SE, SE Sequoia Pl, Autumn Ave SE, Easement	SE Ridge St	SE ONeil St	
49	L	12	$192,000	495	12	Snoqualmie Valley YMCA	SE Ridge St	Dead End	
50	L	12	$86,000	221	12	Easement	SE Mayrand Ln	Dead End	

Table 9-4

Prioritized Annual Water Main Replacement Projects (Sorted by Number) (Continued)

CIP No.	Priority Rank	Priority Points	Estimated Cost	Size Length (ft)	Size Diam (in)	Description In	Description From	Description To	Notes
51	L	15	$30,000	75	12	Easement	SE Center St	Easement	
52	L	15	$18,000	46	12	Easement	Bracken Pl SE	Easement	
53	L	10	$468,000	1,206	12	Easement	Bracken Pl SE	Easement	
54	L	15	$423,000	1,089	12	Easement	SE Douglas St	SE Center St	
55	L	12	$389,000	1,002	12	Easement	SE Douglas St	Dead End	
56	L	12	$239,000	615	12	Easement	SE Douglas St	Dead End	
57	L	12	$308,000	794	12	Easement	SE Douglas St	Dead End	
58	L	16	$159,000	410	12	SE Douglas St	W of Bracken Pl SE	Dead End	
59	M	20	$190,000	490	12	SE Swenson Dr	SE Vaughan St	Snoqualmie Parkway	
60	M	19	$87,000	222	12	SE Jacobia St	SE Satterlee St	SE Graves St	
61	L	14	$73,000	188	12	Easement	SE Hearing St	SE Groshell St	
62	M	18	$256,000	658	12	Merritt Ave SE	Mitten Ave SE	Brinkley Ave SE	
63	M	19	$140,000	360	12	Hancock Ave SE, SE Jeffs St	SE Jacobia St	SE Jeffs St	
64	L	16	$377,000	972	12	Hancock Ave SE, Easement	SE Jacobia St	SE 96th St	
65	M	18	$919,000	2,370	12	Snoqualmie Valley Hospital	Frontier Ave SE	Snoqualmie Valley Hospital	
Total			**$21,036,000**						

Table 9-5

High Priority Annual Water Main Replacement Projects (Sorted by Number)

CIP No.	Priority Rank	Priority Points	Estimated Cost	Size Length (ft)	Size Diam (in)	Description In	Description From	Description To	Notes
16	H	30	$321,000	288	8	Maple Ave SE	SE Newton St	Dead End	Completion expected 2020.
				626	8		SE River St	SE Newton St	Completion expected 2021.
18	H	26	$119,000	305	12	SE King St	Silva Ave SE	Maple Ave SE	Completion expected 2021.
21	H	26	$69,000	195	8	SE Newton St	384th Ave SE	Silva Ave SE	
22	H	27	$759,000	1,956	12	384th Ave SE	SE Newton St	SE Kimball Creek Dr	
23	H	27	$294,000	758	12	384th Ave SE	SE Kimball Creek Dr	384th Ave SE BPS	
25	H	27	$103,000	264	12	Pine Ave SE	SE 80th St	Cedar St	Completion expected 2021.
27	H	26	$391,000	937	8	Cedar St	10th Ave W	SE Fir St	Completion expected 2021.
				176	4	Cedar Pl SE	Cedar St	Dead End	
32	H	26	$192,000	493	12	SE Northern St	Railroad Pl SE	Pickering Ct SE	
33	H	26	$690,000	1,967	8	378th Ave SE	SE 86th St	SE 80th St	
Total			**$2,938,000**						

Other Improvements

The additional water main, pressure zone, PRV, and facility improvements were prioritized based on existing deficiencies, safety concerns, maintenance requirements, and capacity requirements. The miscellaneous improvements were prioritized based on regulatory requirements and assessment of the water system needs. The priority order of these improvements is reflected in the schedule of improvements, which is presented in the next section.

SCHEDULE OF IMPROVEMENTS

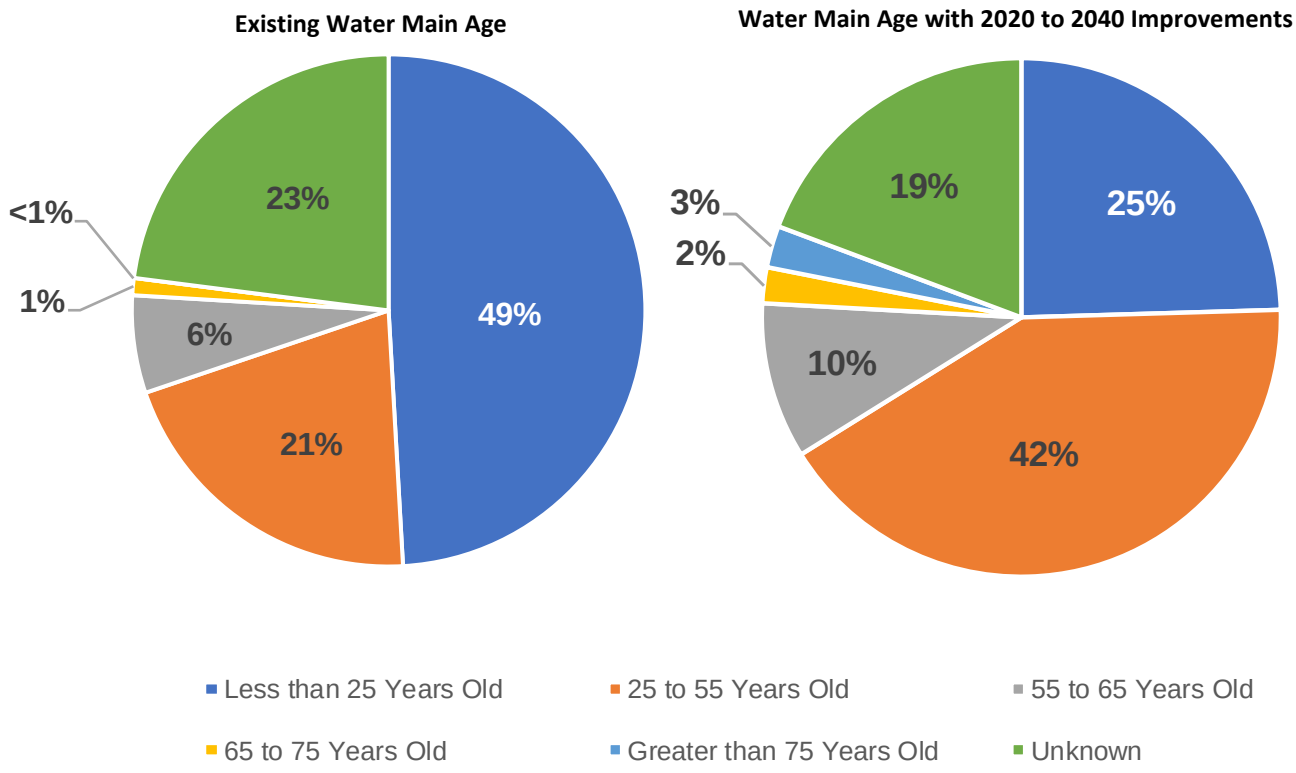
The improvement prioritization results were used to assist in establishing an implementation schedule that can be used by the City for preparing its 10-year CIP and yearly Water Department budget. The implementation schedule for the proposed improvements is shown in **Table 9-6**. A variable allowance per year has been established for the annual replacement of water mains based on the City's available budget. The City will identify and schedule the replacement of these water mains during its annual budget process. This provides the City with the flexibility to coordinate these projects with road or other projects within the same area.

As the existing infrastructure continues to age, managing and funding the water system CIP is essential to maintaining a safe and reliable water supply for the City's customers. Based on the existing level of repair and replacement identified by the City for the water system CIP, the percentage of water main in the system that is known to be greater than 65 years old, or of

unknown age, will remain approximately the same at the end of the 20-year planning period, as shown in **Chart 9-1**. If desired, the City can consider a more aggressive water main repair and replacement program or continue to develop asset management strategies to address future infrastructure needs.

Chart 9-1

Existing and Future Water Main Age



Future Project Cost Adjustments

All cost estimates shown in the tables are presented in year 2020 dollars. These cost estimates will need to be adjusted to account for the effects of inflation and changing construction market conditions to determine future costs at the actual time of project implementation. Future costs can be estimated using the Engineering News Record Construction Cost Index for the Seattle area or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

Table 9-6

Proposed Improvements Implementation Schedule

No.	Description	Estimated Cost (2020 $)	Schedule of Improvements Planned Year of Project and Estimated Cost in 2020 $										
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030-2040
	Water Main Improvements												
WM1	Annual Water Main Replacement Program[1]	$21,036,000				$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$1,500K	$10,536K
WM2	SR 202 Bridge Water Main Replacement Feasibility Analysis	$75,000	$50K	$25K									
WM3	SR 202 Bridge Water Main Replacement	$1,424,000					$475K	$949K					
WM4	Infrastructure Improvement Program/Street Preservation Program	$8,500,000	$2,500K	$1,870K	$3,570K	$560K							
WM5	Investigation and Potential Replacement of Fisher Ave Water Main	$200,000					$200K						
WM6	Investigation and Potential Replacement of Denny Peak Water Main	$80,000						$80K					
WM7	SE 76th St in Ernie's Grove	$780,000											$780K
WM8	Williams Addition Water System	$580,000	$145K	$218K	$218K								
WM9	Spruce St SE Water Main Replacement	$550,000	$138K	$206K	$206K								
WM10	SE King St Water Main Replacement	$30,000					$30K						
WM11	Maple Ave SE Water Main Replacement	$240,000					$240K						
WM12	Mill Site WM Loop (Developer Funded)	$5,770,000			$1,443K	$2,885K						$1,443K	
	Pressure Zone Improvements												
PZ1	599 Zone Evaluation and Reinig Road PRV/PSV Station Activation	$10,000	$10K										
PZ2	SCADA for Reinig Rd PRV/PSV Station	$110,000	$110K										
PZ3	705 Zone to 599 Zone Conversion	$100,000				$100K							
PZ4	599 Zone to 705 Zone Conversion[2]	$90,000				$90K							
	PRV Improvements												
PRV1	670 Zone PRV Adjustment[2]	$19,000	$19K										
PRV2	1180/1040 Zone PRV at Raines Ave SE and Water Main	$830,000											$830K
PRV3	PRV Recirculation Study and Improvements	$140,000				$140K							
	Facility Improvements												
F1	1040 BPS Additional Pump	$390,000	$390K										
F2	South Wellfield VFDs	$50,000	$50K										
F3	Canyon Springs Improvements	$5,520,000								$920K	$2,300K	$2,300K	
F4	South Wellfield Chlorine Contact Time Improvements	$800,000				$267K	$533K						
F5	South Wellfield On-Site Sodium Hypochlorite Generation Improvements	$470,000				$157K	$313K						
F6	Permanent Backup Generator for South Wellfield/South Wellfield Treatment Plant	$1,020,000				$1,020K							
F7	Permanent Backup Generator for Well No. 6 and Well No. 7 (North Wellfield)	$1,020,000										$1,020K	
F8	Retrofit 705 BPS with VFDs	$70,000					$70K						
F9	705 BPS Additional Pump	$390,000					$390K						
F10	Install Drain System for 1040 Reservoir Valve Vaults	$30,000				$30K							
F11	Reservoir Siting Study	$40,000				$40K							
F12	1.6 MG 599 Reservoir No. 2 (Partially Developer Funded)	$3,970,000					$662K	$1,654K	$1,654K				
F13	1.8 MG 1040 Reservoir No. 3	$4,470,000						$745K	$1,863K	$1,863K			
F14	0.2 MG 1172 Reservoir No. 2/799 Reservoir	$1,180,000									$393K	$787K	
	Miscellaneous Improvements												
M1	Source of Supply Improvements - Study	$200,000	$200K										
M2	Source of Supply Improvements - Implementation	$2,000,000		$1,000K	$1,000K								
M3	Risk & Resiliency Assessment and Emergency Response Plan[3]	$60,000	$30K	$30K									
M4	Water Use Efficiency Audit and Programming	$299,000	$46K	$46K	$12K	$12K	$12K	$12K	$12K	$12K	$12K	$12K	$115K
M5	Water System Plan Update	$805,000										$403K	$403K
M6	Pump Condition Evaluation	$60,000				$60K							
Total Estimated Costs of City Funded Improvements		**$55,653,000**	**$3,688K**	**$3,395K**	**$5,005K**	**$3,975K**	**$4,094K**	**$4,113K**	**$4,201K**	**$4,294K**	**$4,205K**	**$6,021K**	**$12,664K**
Total Estimated Costs of Developer Funded Improvements		**$7,755,000**			**$1,443K**	**$2,885K**	**$331K**	**$827K**	**$827K**			**$1,443K**	

1 = Annual project cost can be adjusted to meet City budget goals. Remainder of project costs can be shifted to the 2040+ horizon.

2 = Project should be completed in the short-term due to pressures below 30 psi and/or significant impact on available fire flow.

3 = America's Water Infrastructure Act of 2018 requires development or update of the Risk and Resilience Assessment by June 30, 2021, and the Emergency Response Plan by December 30, 2021.

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PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(3,125 gpm)

599 Reservoir No. 2
1.6 MG
Overflow Elev: 599'
Height: 24'

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

Canyon Springs
(898 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 3
1.8 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir No. 2
0.2 MG
Overflow Elev: 1,172'
Height: 31'

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

890 Zone
1040 Zone
800 Zone
705 Zone
670 Zone
636 Zone
599 Zone
1260 Zone
1180 Zone
799 Zone
1172 Zone

Snoqualmie River
Alice Lake
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River
Snoqualmie Falls

SNOQUALMIE PKWY
FALL CITY-SNOQUALMIE RD
PRESTON-FALL CITY RD SE
332ND AVE SE
TOKUL RD SE
RAILROAD AVE SE
SE MILLPOND RD
SE 80TH ST
376TH AVE SE
384TH AVE SE
SE 92ND ST
MEADOWBROOK WAY SE
REINIG RD
SE PARK ST
BOALCH AVE SE
428TH AVE SE
WINERY RD
BENDIGO BLVD N
BENDIGO BLVD S
BOALCH AVE NW
SE 108TH ST
BALLARAT AVE N
CEDAR FALLS WAY

Legend

Capital Improvement Projects
Canyon Springs
Well
Booster Pump Station
Water Treatment Plant
Reservoir
PRV
City Limits
Urban Growth Area
Retail Water Service Area
Wholesale Water Service Area

Pressure Zones
599 Zone
636 Zone
670 Zone
705 Zone
799 Zone
800 Zone
890 Zone
1040 Zone
1172 Zone
1180 Zone
1260 Zone

This map is a graphic representation derived from the City of Snoqualmie Geographic Information System. It was designed and intended for City of Snoqualmie staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

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Vicinity Map



Figure 9-1
Capital Improvement Projects
City of Snoqualmie Water System Plan

PRELIMINARY

CITY OF SNOQUALMIE

1 inch = 1,500 feet

0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

C:\USERS\ZSCHREMPP\DESKTOP\GIS\WSP-FIG_9-1_CIP.MXD BY: ZSCHREMPP PLOT DATE: JUN 12, 2020 COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

PRELIMINARY - CITY REVIEW ONLY

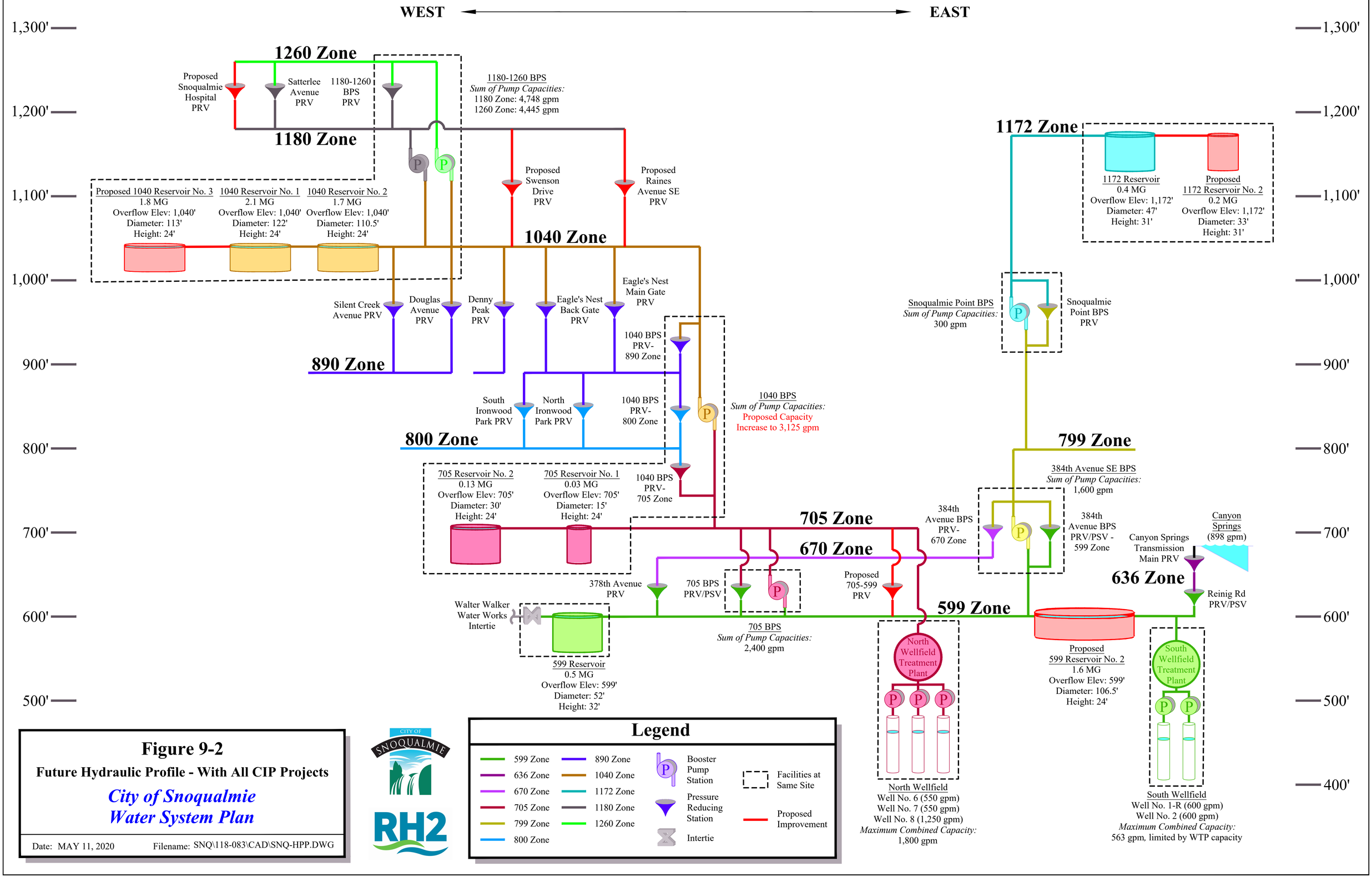


Figure 9-2

Future Hydraulic Profile - With All CIP Projects

City of Snoqualmie
Water System Plan

Date: MAY 11, 2020 Filename: SNQ\118-083\CAD\SNQ-HPP.DWG

10 | FINANCIAL PLAN

INTRODUCTION

This chapter was prepared by FCS GROUP to provide a financial program that allows the City of Snoqualmie (City) water utility to remain financially viable during the planning period. This financial viability analysis considers the historical financial condition, current and identified future financial and policy obligations, operation and maintenance (O&M) needs, and the financial impacts of the capital projects identified in this Water System Plan (WSP). Furthermore, this chapter provides a review of the water utility's current rate structure with respect to rate adequacy and customer affordability.

PAST FINANCIAL PERFORMANCE

This section includes a historical summary of financial performance as reported by the City, including fund resources and uses arising from cash transactions.

Comparative Financial Statements

The City legally owns and operates water, sewer, and stormwater utilities. The City's utilities operate on a cash basis. Therefore, annual balance sheets and income statements are not prepared. In addition, financial reporting occurs on a combined utility fund basis. Individual utility financial performance history has been isolated by reviewing the City's historical revenue and expense reports. **Table 10-1** shows a summary of water fund resources and uses arising from cash transactions for the previous 6 years (2014 through 2019). Noteworthy findings and trends for the historical performance and condition of the City's water utility are then discussed.

Table 10-1

Summary of Historical Fund Resources and Uses Arising from Cash Transactions

	2014	2015	2016	2017	2018	2019
Beginning Cash and Investments						
Reserved	$ 1,656,879	$ 1,904,505	$ 2,384,229	$ 1,672,837	$ 4,798,165	$ 7,352,319
Revenues						
Licenses and Permits	$ 9,180	$ 2,210	$ 340	$ 5,610	$ 2,863	$ 35,848
Intergovernmental Revenues	-	-	-	-	-	9,324
Charges for Goods and Services	3,227,128	3,536,862	3,685,287	3,933,093	4,158,941	4,119,775
Miscellaneous Revenues	514	7,138	23,423	5,644	61,546	96,350
Total Operating Revenues:	$ 3,236,822	$ 3,546,210	$ 3,709,050	$ 3,944,347	$ 4,223,349	$ 4,261,298
Expenditures						
Utilities	$ 2,570,368	$ 2,406,874	$ 2,448,906	$ 2,409,928	$ 2,519,777	$ 2,631,315
Total Operating Expenditures:	$ 2,570,368	$ 2,406,874	$ 2,448,906	$ 2,409,928	$ 2,519,777	$ 2,631,315
Excess (Deficiency) Revenues over Expenditures:	**$ 666,455**	**$ 1,139,337**	**$ 1,260,143**	**$ 1,534,418**	**$ 1,703,573**	**$ 1,629,983**
Other Increases in Fund Resources						
Debt Proceeds	$ -	$ 150,425	$ 31,038	$ 7,426,732	$ 12,029,856	$ -
Custodial Activities	-	26,255	-	4,292	-	-
Other Resources	42,600	237	-	-	-	15,000
Total Other Increases in Fund Resources	$ 42,600	$ 176,917	$ 31,038	$ 7,431,024	$ 12,029,856	$ 15,000
Other Decreases in Fund Resources						
Capital Expenditures	$ 824	$ 176,587	$ 1,603,562	$ 3,692,588	$ 3,955,047	$ 2,057,832
Debt Service - Principal and Interest	295,785	244,797	245,556	97,952	362,077	818,233
Debt Service - Transfers*	-	-	-	1,944,235	6,751,558	-
Transfers-Out	164,820	388,890	153,456	105,340	106,300	106,300
Custodial Activities	-	26,255	-	-	4,292	-
Total Other Decreases in Fund Resources	$ 461,429	$ 836,529	$ 2,002,574	$ 5,840,115	$ 11,179,274	$ 2,982,365
Increase (Decrease) in Cash and Investments:	**$ 247,626**	**$ 479,724**	**$ (711,393)**	**$ 3,125,328**	**$ 2,554,154**	**$ (1,337,382)**
Ending Cash and Investments						
Reserved	1,904,505	2,384,229	1,672,837	4,798,165	7,352,319	6,014,937
O&M Coverage Ratio	125.93%	147.34%	151.46%	163.67%	167.61%	161.95%
Net Operating Income as a % of Operating Revenue	20.59%	32.13%	33.97%	38.90%	40.34%	38.25%
Debt Service Coverage Ratio**	2.25	4.65	5.13	15.67	4.71	1.99

*Debt Service - Transfers includes repayment of the City's bond anticipation notes
**Does not include Debt Service - Transfers

Findings and Trends

- The City's water charges for services increased from $3.2 million (M) in 2014 to $4.1M in 2019. The average annual increase was 5.01 percent per year, with a total increase of 27.66 percent from 2014 to 2019. Operating expenditures remained fairly constant, increasing by $61,000 over the 6 years for an average annual increase of 0.47 percent. Due to the increasing revenue and flat expenditures, net operating income (revenues less expenditures) grew approximately $1.0M, from $666,000 in 2014 to $1.6M in 2019.
- The O&M coverage ratio (total operating revenues divided by total operating expenses) was 125.93 percent in 2014. Due to the increase in operating income this ratio grew to 161.95 percent in 2019. A ratio of 100 percent or greater shows that operating revenue will successfully cover operating expenses, and the utility has remained above this ratio for the past 6 years.

- Net operating income as a percentage of operating revenue was 20.59 percent in 2014. This metric has varied over the past 6 years with a high of 40.34 percent in 2018, and ended 2019 at 38.25 percent. Similar to the O&M coverage ratio, these trends help to show how successfully operating revenue actually covered operating expenses, with higher positive numbers being the best and negative numbers showing need for improvement. In addition, these trends demonstrate the ability of the utility to invest in capital, whether through direct cash transfers or the issuance and servicing of debt.
- The debt service coverage ratio measures the amount of cash flow available to meet principal and interest payments. Typically, revenue bond debt service coverage requires a minimum factor of 1.20 during the life of the loans. This ratio is calculated by dividing cash or net operating income (operating revenues less operating expenses) by annual revenue bond debt service. The debt service coverage ratio for all outstanding debt ended 2014 at 2.25, falling to 1.99 by 2019 as the City took on new debt. The fact that this ratio has sustained levels higher than the minimum target of 1.20 indicates a stable capacity for new debt and will likely result in favorable terms when entering the bond market.

FINANCIAL PLAN

The water utility is responsible for generating sufficient revenue to meet all of its costs. The primary source of funding is derived from ongoing monthly service charges, with additional revenue coming from hook-up charges, late fees, and other miscellaneous revenue. The City controls the level of user charges and, with City Council approval, can adjust user charges as needed to meet financial objectives.

The financial plan can only confirm financial feasibility if it considers the total system costs of providing water services, both operating and capital. To meet these objectives, the following elements have been completed.

1. **Capital Funding Plan.** Identifies the total Capital Improvement Plan (CIP) obligations of the planning period. The plan defines a strategy for funding the CIP, including an analysis of available resources from rate revenues, existing reserves, general facilities charges, debt financing, and any special resources that may be readily available (e.g., grants, developer contributions, etc.). The capital funding plan impacts the financial plan through the use of debt financing (resulting in annual debt service) and the assumed rate revenue made available for capital funding.
2. **Financial Forecast**. Identifies future annual non-capital costs associated with the operation, maintenance, and administration of the water system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity, along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan ultimately evaluates the sufficiency of utility revenues in meeting all obligations, including cash uses such as operating expenses, debt service, capital outlays, and reserve contributions, as well as any coverage requirements associated with long-term debt. The plan also identifies the future adjustments required to fully fund all utility obligations in the planning period.

Capital Funding Plan

To properly evaluate future capital funding needs, capital costs were escalated by 3.00 percent annually to the year of planned spending. The 2020 budget and CIP developed for this WSP identifies $48.2M in project costs over the 11-year planning horizon from 2020-2030. The 21-year period through 2040 includes $72.9M in total project costs.

A summary of the 11-year and 21-year CIPs are shown in **Table 10-2**. As shown, each year has varied capital cost obligations depending on construction schedules and infrastructure planning needs.

Table 10-2

11-Year and 21-Year CIPs

Year	Unescalated $	Escalated $
2020	$ 2,057,947	$ 2,057,947
2021	2,615,408	2,693,870
2022	1,025,000	1,087,423
2023	4,113,785	4,495,244
2024	5,839,609	6,572,531
2025	3,575,174	4,144,607
2026	4,502,158	5,375,812
2027	4,693,569	5,772,498
2028	3,982,415	5,044,804
2029	3,915,704	5,109,106
2030	4,357,056	5,855,519
11-Year Total	**$ 40,677,825**	**$ 48,209,360**
2031 - 2040	15,726,257	24,726,138
21-Year Total	**$ 56,404,082**	**$ 72,935,498**

Table 10-3 provides more detail for the 11-year CIP.

Table 10-3

11-Year CIP (Escalated $)

Project	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2020 Estimated Expenditures	2,057,947										
Water Main Replacement Program				250,000	1,250,000	1,312,500	1,378,125	1,447,031	1,519,383	1,595,352	1,675,120
Enterprise Resource Planning (ERP) System Replacement Project		120,000									
Downtown Snoqualmie Infrastructure Improvement Program		1,720,000									
SR 202 Bridge Water Main Replacement Project		51,500	26,523			550,655	1,133,156				
Pressure Zone Conversions Project					213,847						
Pressure Reducing Valve (PRV) Stations Project		143,170			157,571						
1040 Zone Booster Pump Station (BPS) Improvement Project		401,700									
705 Zone Booster Pump Station (BPS) Improvement Project						533,266					
South Wellfield Improvement Project		51,500			1,625,235	980,746					
Canyon Springs Improvement Project									1,165,428	3,000,978	3,091,008
1040 Zone Reservoir Addition Project					33,765		889,569	2,291,255	2,359,993		
599 Zone Reservoir Addition Project					45,020	767,439	1,974,962	2,034,211			
South Pressure Zones Reservoir Addition Project										512,776	1,089,392
Source of Supply Improvement Project		206,000	1,060,900	1,092,727							
Snoqualmie Mill Water Main Loop Project				3,152,517	3,247,093						
Total	**$ 2,057,947**	**$ 2,693,870**	**$ 1,087,423**	**$ 4,495,244**	**$ 6,572,531**	**$ 4,144,607**	**$ 5,375,812**	**$ 5,772,498**	**$ 5,044,804**	**$ 5,109,106**	**$ 5,855,519**

AVAILABLE FUNDING ASSISTANCE AND FINANCING RESOURCES

Feasible long-term capital funding strategies must be defined to ensure that adequate resources are available to fund the CIP identified in this WSP. In addition to the City's resources, such as accumulated cash reserves, capital revenues, and rate revenues designated for capital purposes,

capital needs can be met from outside sources, such as grants, low-interest loans, and bond financing. The following is a summary of the City's internal and external resources.

City Resources

Resources appropriate for funding capital needs include accumulated cash in the capital fund, rate revenues designated for capital spending purposes, developer contributions, and capital-related charges such as general facilities charges. The first two resources will be discussed in the **Fiscal Policies** section of the **Financial Forecast**. Capital-related charges are discussed below.

General Facilities Charges

A connection charge such as the City's general facilities charge (GFC) refers to a one-time charge imposed on new customers as a condition of connecting to the water system. The purpose of the GFC is two-fold: 1) to promote equity between new and existing customers; and 2) to provide a source of revenue to fund capital projects. Revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects.

Development of the master-planned Snoqualmie Ridge communities included the construction of water facilities, financed by the developers, that required wholesale redesign of the City's water system. Because the net benefit of the facilities to the City outweighed the value of GFC payments, it was agreed that GFCs would not be charged to future development in these communities. Development has continued to focus on building out these master-planned communities, which has resulted in no GFC revenues being collected in recent years. However, with the master-planned areas built out, all future development will be subject to the City's GFC.

Local Facilities Charges

While a connection charge is the manner in which new customers pay their share of system investment costs, local facilities charge funding is used to pay the costs of local facilities that connect each property to the system's infrastructure. Local facilities funding is often overlooked in rate forecasting because it is funded upfront by either connecting customers and developers, or through an assessment to properties, but never from rates.

A number of mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs: (a) the utility charges a connection fee based on the cost of the local facilities (under the same authority as the facilities assessment fee); (b) a developer funds an extension of the system to its development and turns those facilities over to the utility (contributed capital); or (c) a local assessment is set up called a Utility Local Improvement District (ULID/LID) or a Local Utility District (LUD), which collects tax revenue from benefited properties.

A local facilities charge (LFC) is a variation of the connection charge. It is a city-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of the main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and thus can accumulate up to 10 years of interest. It typically applies in instances when no developer-installed facilities are needed

through developer extension due to the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install on-site and sometimes off-site improvements as a condition of extending service. These are in addition to the connection charge required and must be built to City standards. Part of the agreement between the City and the developer planning to extend service might include a latecomer agreement, resulting in a latecomer charge to new connections for the developer extension.

Latecomer charges are a variation of developer extensions, whereby new customers connecting to a developer-installed improvement make a payment to the City based on their share of the developer's cost. The City passes this charge on to the developer who installed the facilities. As part of the developer extension process, this defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement cannot exceed 20 years in duration.

ULID/LID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities. Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this a relatively expensive process, and there are mechanisms by which a ULID can be rejected.

Outside Resources

This section outlines various grant, loan, and bond opportunities available to the City through federal and state agencies to fund the CIP identified in the WSP.

Grants and Low-Cost Loans

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, the benefit of low-interest loans makes the effort of applying worthwhile. Low-cost loan programs for Washington State utilities include three assistance programs for which the City may be eligible.

Public Works Board (PWB) – Cities, counties, special purpose districts, public utility districts, and quasi-municipal governments are eligible to receive loans from the PWB. Eligible projects include repair, replacement, and construction of infrastructure for domestic water, sanitary wastewater, stormwater, solid waste, road, and bridge projects that improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.

The standard PWB loan offer for the most recent funding cycle was 1.58 percent interest repaid over a 20-year term. Reduced interest rates are available for financially distressed communities. All loan terms are subject to negotiation and Board approval.

Currently, there is no funding available for construction loans. Funding cycles typically begin during the summer months, with additional funding subject to legislative appropriation.

Information regarding the application process, as well as rates and terms, is posted on the PWB website. Further detail is available at http://www.pwb.wa.gov.

Drinking Water State Revolving Fund (DWSRF) Loan Program – DWSRF funding historically targets protection of public health, compliance with drinking water regulations, and assistance for small and disadvantaged communities. The standard loan repayment term is 20 years, and in some cases partial loan forgiveness is offered. In addition to a 1.00 percent loan fee, the basic interest rate for DWSRF is 1.75 percent, though if the project is completed within 24 months of contract execution the applicant is eligible for an interest rate adjustment to 1.25 percent.

Applicants need an approved water system plan, or plan amendment, containing the DWSRF project prior to submitting an application. All public water systems that receive a DWSRF loan must undergo an environmental review, a cultural review, and an Investment Grade Efficiency Audit (IGEA). The IGEA is an effort to apply energy efficiency to water systems and may be financed as part of the DWSRF loan.

The fall 2021 application cycle will begin October 1, 2021 and conclude November 30, 2021. Further detail is available at http://www.doh.wa.gov/DWSRF.

Community Economic Revitalization Board (CERB) – CERB provides grants and loans for infrastructure improvements that encourage private business development and expansion. CERB offers loans of $3.0M maximum per project. Applicants must provide evidence that a private development or expansion is ready to occur, and that the private development is contingent upon the approval of CERB funds. Grants are available up to 25.00 percent of the total award, determined by the underwriting process and debt service coverage ratio. Applicants must provide a cash match of 20.00 percent of the total project cost. The maximum repayment term is 20 years, and interest rates vary from 1.00 percent to 3.00 percent.

The board accepts applications on an ongoing basis and meets every two months to consider projects and make funding decisions. Further detail is available at https://www.commerce.wa.gov/building-infrastructure/community-economic-revitalization-board.

Bond Financing

General Obligation Bonds – General obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions. However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by the Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

Revised Code of Washington (RCW) 39.36.020 states:

> (2)(a)(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.

> (b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein.

While bonding capacity can limit the availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A utility rate savings may be realized through two avenues: the lower interest rate and related bond costs, and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

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

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

Capital Financing Strategy

An ideal capital financing strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume revenue bond financing to meet the needs which cannot be met by available cash resources. Revenue bonds have been used as the debt funding instrument in this analysis. The capital financing strategy developed to fund the CIP identified in this WSP assumes the following funding resources:

- Accumulated cash reserves, which may include proceeds from previously issued bonds.
- Transfers of excess cash (over minimum balance targets) from the Operating Fund.
- General facilities charge revenues.
- Developer contributions.
- Interest earned on Capital Fund balances and other miscellaneous capital resources.
- Revenue bond financing.

The cash resources described above are anticipated to fund 32.33 percent of the 11-year CIP and 36.59 percent of the 21-year CIP. The remaining funding is assumed to come from developer contributions, general facilities charges, and new debt. **Table 10-4** presents the 11-year and 21-year capital financing strategy.

Table 10-4

11-Year and 21-Year Capital Financing Strategy

Year	Capital Expenditures Escalated	Funding Source				Total Financial Resources
		General Facilities Charges	Developer Contributions	Revenue Bonds	Cash Funding	
2020	**$ 2,057,947**	$ -	$ -	$ -	$ 2,057,947	**$ 2,057,947**
2021	**2,693,870**	-	46,350	-	2,647,520	**2,693,870**
2022	**1,087,423**	872,590	214,832	-	-	**1,087,423**
2023	**4,495,244**	1,583,563	2,425,308	-	486,373	**4,495,244**
2024	**6,572,531**	-	2,295,475	2,100,000	2,177,056	**6,572,531**
2025	**4,144,607**	-	438,785	-	3,705,821	**4,144,607**
2026	**5,375,812**	356,498	1,100,797	3,918,517	-	**5,375,812**
2027	**5,772,498**	927,645	1,017,106	1,581,483	2,246,264	**5,772,498**
2028	**5,044,804**	378,209	-	4,666,595	-	**5,044,804**
2029	**5,109,106**	410,058	-	2,433,405	2,265,644	**5,109,106**
2030	**5,855,519**	668,736	-	5,186,783	-	**5,855,519**
Subtotal	**$ 48,209,360**	**$ 5,197,299**	**$ 7,538,653**	**$ 19,886,783**	**$ 15,586,625**	**$ 48,209,360**
2031 - 2040	**24,726,138**	12,410,232	-	1,213,217	11,102,689	**24,726,138**
Total	**$ 72,935,498**	**$ 17,607,531**	**$ 7,538,653**	**$ 21,100,000**	**$ 26,689,314**	**$ 72,935,498**

FINANCIAL FORECAST

The financial forecast, or revenue requirement analysis, forecasts the amount of annual revenue that needs to be generated by user rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. In addition to annual operating costs, the revenue needs also include debt covenant requirements and specific fiscal policies and financial goals of the City.

For this analysis, two revenue sufficiency tests have been developed to reflect the financial goals and constraints of the City: cash needs must be met; and debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met.

Cash Test – The cash flow test identifies all known cash requirements for the City in each year of the planning period. Typically, these include O&M expenses, debt service payments, rate-funded system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the City are then compared to projected cash revenues using the current rate structure. Any projected revenue shortfalls are identified and the rate increases necessary to make up the shortfalls are established.

Coverage Test – The coverage test is based on a commitment made by the City when issuing revenue bonds and some other forms of long-term debt. For the purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City would be required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.00 coverage factor would imply that no additional

cushion is required. A 1.25 coverage factor means revenue must be sufficient to pay O&M expenses, annual revenue bond debt service payments, and an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any purpose, including funding capital projects. Targeting a higher coverage factor can help the City achieve a better credit rating and provide lower interest rates for future debt issues.

In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met, and the test with the greatest deficiency drives the level of needed rate increase in any given year.

Current Financial Structure

The City maintains a fund structure and implements financial policies that target management of a financially viable and fiscally responsible water system.

Fiscal Policies

A summary of the key financial policies employed by the City, as well as those recommended and incorporated in the financial program, are discussed below.

Operating Fund – Operating reserves are designed to provide a liquidity cushion to ensure that adequate cash working capital will be maintained to deal with significant cash balance fluctuations, such as seasonal fluctuations in billings and receipts, unanticipated cash expenses, or lower than expected revenue collections. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of O&M expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8 percent) to 120 days (33 percent) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end more appropriate for utilities with significant seasonal or consumption-based fluctuations.

This financial plan targets a minimum balance in the water utility Operating Fund equal to 90 days of O&M expenses.

Capital Fund – A utility capital contingency reserve is an amount of cash set aside in case of an emergency should a piece of equipment or a portion of the utility's infrastructure fail unexpectedly. The reserve also could be used for other unanticipated capital needs, including capital project cost overruns. Industry practices range from maintaining a balance equal to 1 to 2 percent of fixed assets, an amount equal to a 5-year rolling average of CIP costs, or an amount determined sufficient to fund equipment failure (other than catastrophic failure). The final target level should balance industry standards with the risk level of the City.

This financial plan targets a minimum balance in the water utility Capital Fund equal to 1 percent of fixed assets.

System Reinvestment – System reinvestment funding promotes system integrity through ongoing repair and replacement of system infrastructure. Ideally, a detailed asset management plan would guide the level of rate funded system reinvestment, however, in absence of this level of effort,

annual depreciation expense is commonly used as a measure of the decline in asset value associated with routine use of the system. Particularly for utilities that do not already have an explicit system reinvestment policy in place, implementing a funding level based on full depreciation expense could significantly impact rates. An alternative benchmark is annual depreciation expense net of debt principal payments on outstanding debt. This approach recognizes that customers are still paying for certain assets through the debt component of their rate and intends to avoid simultaneously charging customers for an asset and its future replacement. The specific benchmark used to set system reinvestment funding targets is a matter of policy that must balance various objectives, including managing rate impacts, keeping long-term costs down, and promoting "generational equity" (i.e., not excessively burdening current customers with paying for facilities that will serve a larger group of customers in the future).

The City does not currently have a policy in place for system reinvestment funding. No dedicated system reinvestment funding is assumed in this financial plan; however, on average, the City is able to fund approximately $1.3M annually through rates from 2020 through 2040. System reinvestment is recommended for consideration during future policy review and rate planning.

Debt Management – It is prudent to consider policies related to debt management as part of a broader utility financial policy structure. Debt management policies should be evaluated and formalized, including the level of acceptable outstanding debt, debt repayment, bond coverage, and total debt coverage targets. The City has two outstanding water revenue bonds, one of which will be fully repaid in 2027. These bonds each carry a coverage requirement of 1.20.

Because the City intends to continue using revenue bonds as a significant source of capital funding, this financial plan targets coverage between 1.5 and 2.0. Targeting a higher than required coverage factor helps the City maintain its credit rating and provides lower interest rates for future debt issues.

Financial Forecast

The financial forecast is primarily based upon the City's budget through 2022 and takes into consideration other key factors and assumptions needed to develop a complete portrait of the City's annual water utility financial obligations. The following is a list of the key revenue and expense factors and assumptions used to develop the financial forecast.

- **Growth** – Rate revenue escalation is based on the forecast of water consumption provided in **Chapter 4** of this WSP. Growth varies from no growth in many years to as high as 4.88 percent in 2022. On average, annual growth for the forecast period is 1.22 percent.
- **Revenue** – The City has two general revenue sources: 1) water service charges (rate revenue); and 2) miscellaneous (non-rate) revenue. In the event of a forecasted annual shortfall, rate revenue can be increased to meet the annual revenue requirement. For the purpose of this financial forecast, rate revenues are forecasted to increase with customer growth. Non-rate revenues are forecasted to increase with customer growth or general cost inflation depending on the nature of the revenue.
- **General Facilities Charge Revenue** – Because recent development has occurred in the developer-funded Snoqualmie Ridge communities, no GFC revenue has been included in the

forecast through 2021. The City expects GFC-eligible construction to resume in 2022, with $2.5M in GFC revenue forecasted due to the 4.88 percent growth rate assumed in that year. The growth forecast then indicates a period of no growth from 2023 through 2025, but from 2026 through 2040 this financial plan includes an average of $1.0M in GFC revenue per year. All GFC revenue collected is used to fund capital projects.

- **Expenses** – O&M expense projections are based on the City's budget through 2022 and general cost inflation increases of 3 percent, labor cost inflation increases of 5 percent, and benefit cost inflation increases of 5 percent in subsequent years. Budget figures were used for taxes through 2022. Future taxes are calculated based on forecasted revenues and prevailing tax rates.
- **Existing Debt** – The water utility has four outstanding debt issues: two revenue bonds, a G.O. bond, and a DWSRF loan. One revenue bond has annual payments of $160,000 that end after 2027, with the second bond carrying payments of $618,000 in each year of the forecast. The G.O. bond payments average $101,000 and end after 2030. The DWSRF loan is scheduled for two final payments of $35,000 in 2020 and 2021. The total annual existing debt service obligations begin 2020 at $915,000 and are reduced to $618,000 by 2040.
- **Future Debt** – The capital funding strategy developed for this WSP forecasts the need for $21.1M in new debt proceeds in five separate revenue bond issuances throughout the forecast. Annual new debt service obligations begin in 2024 at $185,000, increasing to $1.9M by 2040.
- **Transfers to Capital** – Operating fund balance above the minimum requirement is assumed to be available to fund capital projects and projected to be transferred to the Capital Fund each year. On average, the utility transfers $1.3M to the Capital Fund annually from 2020 to 2040.

Although the financial plan is completed through 2040, the rate strategy focuses on the shorter-term planning period of 2020 through 2030. It is recommended that the City revisit the proposed rates every 2 to 3 years to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 10-5, following, summarizes the annual revenue requirements based on the forecast of revenues, expenditures, fund balances, and fiscal policies.

Table 10-5

11-Year Financial Forecast

Revenue Requirement	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenues											
Rate Revenues Under Existing Rates	$ 4,313,919	$ 4,424,488	$ 4,735,842	$ 4,735,842	$ 4,735,842	$ 4,735,842	$ 4,764,260	$ 4,836,053	$ 4,864,471	$ 4,894,385	$ 4,941,748
Non-Rate Revenues	136,692	126,856	131,203	136,932	143,062	151,912	156,231	166,990	171,845	184,608	189,731
Total Revenues	**$ 4,450,611**	**$ 4,551,344**	**$ 4,867,045**	**$ 4,872,774**	**$ 4,878,904**	**$ 4,887,754**	**$ 4,920,491**	**$ 5,003,043**	**$ 5,036,316**	**$ 5,078,993**	**$ 5,131,480**
Expenses											
Cash Operating Expenses	$ 2,892,558	$ 2,933,468	$ 2,990,615	$ 3,135,864	$ 3,315,617	$ 3,363,553	$ 3,491,975	$ 3,631,300	$ 3,754,024	$ 3,892,538	$ 4,589,245
Existing Debt Service	915,524	912,533	880,294	877,761	877,865	878,150	879,286	879,504	718,141	718,305	718,337
New Debt Service	-	-	-	-	185,225	185,225	670,337	670,337	1,296,572	1,296,572	1,772,864
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-	-	-	-
Total Expenses	**$ 3,808,082**	**$ 3,846,001**	**$ 3,870,910**	**$ 4,013,625**	**$ 4,378,706**	**$ 4,426,927**	**$ 5,041,598**	**$ 5,181,140**	**$ 5,768,737**	**$ 5,907,415**	**$ 7,080,445**
Total Surplus (Deficiency)	**$ 642,529**	**$ 705,343**	**$ 996,135**	**$ 859,149**	**$ 500,198**	**$ 460,827**	**$ (121,107)**	**$ (178,097)**	**$ (732,422)**	**$ (828,421)**	**$ (1,948,966)**
Annual Rate Adjustment	**0.00%**	**0.00%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**
Cumulative Annual Rate Adjustment	**0.00%**	**0.00%**	**4.80%**	**9.83%**	**15.10%**	**20.63%**	**26.42%**	**32.49%**	**38.84%**	**45.51%**	**52.49%**
Rate Revenues After Rate Increase	$ 4,313,919	$ 4,424,488	$ 4,963,162	$ 5,201,394	$ 5,451,061	$ 5,712,712	$ 6,022,848	$ 6,407,059	$ 6,754,055	$ 7,121,777	$ 7,535,848
Additional Taxes from Rate Increase	-	-	11,432	23,413	35,968	49,127	63,294	79,006	95,027	112,016	130,457
Net Cash Flow After Rate Increase	**$ 642,529**	**$ 705,343**	**$ 1,212,024**	**$ 1,301,288**	**$ 1,179,449**	**$ 1,388,570**	**$ 1,074,186**	**$ 1,313,904**	**$ 1,062,135**	**$ 1,286,955**	**$ 514,677**
Coverage After Rate Increases	2.0	2.1	5.8	2.9	2.4	2.6	2.1	2.6	1.8	2.0	1.5

The financial forecast indicates that the water utility becomes deficient in 2026 as new debt is added to fund the capital program, and the deficiency increases without rate action. In light of the global pandemic COVID-19, and the associated financial hardship on the City's rate payers, the City Council deferred any rate action for 2021. Starting in 2022 annual rate increases of 4.80 percent are assumed to meet the operating deficiency and fund capital obligations.

City Funds and Reserves

Table 10-6 shows a summary of the projected Operating Fund and Capital Fund ending balances through 2030 based on the rate forecasts presented above. The Operating Fund is maintained at a minimum of 90 days of O&M expenses, and the Capital Fund balance fluctuates annually depending on the addition of debt proceeds and the capital projects scheduled.

Table 10-6

Ending Cash Balance Summary

Ending Fund Balances	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Fund	$ 713,233	$ 723,321	$ 737,412	$ 773,227	$ 817,549	$ 829,369	$ 861,035	$ 895,389	$ 925,650	$ 959,804	$ 1,131,595
Capital Fund	3,915,676	1,973,201	4,764,563	3,995,834	2,993,863	702,216	3,334,996	828,487	4,304,122	911,676	1,479,175
Total	**$ 4,628,910**	**$ 2,696,522**	**$ 5,501,975**	**$ 4,769,061**	**$ 3,811,413**	**$ 1,531,585**	**$ 4,196,031**	**$ 1,723,876**	**$ 5,229,772**	**$ 1,871,480**	**$ 2,610,770**

CURRENT AND PROJECTED RATES

Current Rates

The City's current rate structure consists of a fixed monthly charge based on meter size, a charge per multi-family dwelling unit, and a monthly volume charge per hundred cubic feet (cf) for all use. The fixed monthly charge is separated into two schedules, one for residential and multi-family and another for commercial and irrigation. The volume charge is likewise separated by customer class, with differing rates for residential, multi-family, and commercial and irrigation. Volume charges for residential are based on a block rate methodology, with three tiers of increasing rates. **Table 10-7** shows the existing rate schedule.

Table 10-7

Existing Schedule of Rates

Water Rates	2020 Res./MF.	2020 Comm/Irr.
Monthly Fixed		
3/4"	$ 34.36	$ 41.56
1"	43.14	52.17
1.5"	71.50	86.46
2"	119.30	144.26
3"	179.13	216.59
4"	238.81	288.76
6"	357.98	432.85
8"	477.35	577.18
MF per Unit	30.16	
Volume (per 100 cf)		
Residential		
Block 1 (0-300cf)	$2.26	
Block 2 (301-800cf)	3.80	
Block 3 (801+cf)	4.75	
Multifamily	2.70	
Commercial/Irrigation	3.49	

The City offers reduced water rates to low-income residential customers. A customer whose residence has a separate water meter is eligible for a 30 percent discount if their total household annual income meets the U.S. Department of Housing and Urban Development income limits for very low income in King County. Customers are not eligible for the discount if their annual water consumption is in excess of 100 ccf (hundred cubic feet). Applicants may appeal the criteria to the director of administrative services and must provide a convincing justification for the excess usage.

Projected Rates

The financial forecast indicates that rate increases are needed to satisfy all future financial responsibilities for the water utility. A rate strategy of 4.80 percent annual increases for the study period is recommended to satisfy this forecast deficiency. **Table 10-8** shows the projected rates with increases applied uniformly to all rate components in all classes.

Table 10-8

Proposed Schedule of Rates

Monthly Rates	Existing	Proposed									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Base Rate	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**	**per account**
Residential/Multifamily											
3/4"	$ 34.36	$ 34.36	$ 36.01	$ 37.74	$ 39.55	$ 41.45	$ 43.44	$ 45.52	$ 47.71	$ 50.00	$ 52.40
1"	43.14	43.14	45.21	47.38	49.66	52.04	54.54	57.15	59.90	62.77	65.79
1.5"	71.50	71.50	74.93	78.53	82.30	86.25	90.39	94.73	99.27	104.04	109.03
2"	119.30	119.30	125.03	131.03	137.32	143.91	150.82	158.05	165.64	173.59	181.92
3"	179.13	179.13	187.73	196.74	206.18	216.08	226.45	237.32	248.71	260.65	273.16
4"	238.81	238.81	250.27	262.29	274.88	288.07	301.90	316.39	331.57	347.49	364.17
6"	357.98	357.98	375.16	393.17	412.04	431.82	452.55	474.27	497.04	520.89	545.90
8"	477.35	477.35	500.26	524.28	549.44	575.81	603.45	632.42	662.77	694.59	727.93
MF per Unit	30.16	30.16	31.61	33.12	34.71	36.38	38.13	39.96	41.88	43.89	45.99
Commercial/Irrigation											
3/4"	$ 41.56	$ 41.56	$ 43.55	$ 45.65	$ 47.84	$ 50.13	$ 52.54	$ 55.06	$ 57.70	$ 60.47	$ 63.38
1"	52.17	52.17	54.67	57.30	60.05	62.93	65.95	69.12	72.44	75.91	79.56
1.5"	86.46	86.46	90.61	94.96	99.52	104.29	109.30	114.55	120.05	125.81	131.85
2"	144.26	144.26	151.18	158.44	166.05	174.02	182.37	191.12	200.30	209.91	219.99
3"	216.59	216.59	226.99	237.88	249.30	261.27	273.81	286.95	300.72	315.16	330.29
4"	288.76	288.76	302.62	317.15	332.37	348.32	365.04	382.56	400.93	420.17	440.34
6"	432.85	432.85	453.63	475.40	498.22	522.13	547.20	573.46	600.99	629.84	660.07
8"	577.18	577.18	604.88	633.92	664.35	696.24	729.66	764.68	801.38	839.85	880.16
Volume Charge	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**	**per 100 cf**
Residential											
Block 1 (0-300cf)	$ 2.26	$ 2.26	$ 2.37	$ 2.48	$ 2.60	$ 2.73	$ 2.86	$ 2.99	$ 3.14	$ 3.29	$ 3.45
Block 2 (301-800cf)	3.80	3.80	3.98	4.17	4.37	4.58	4.80	5.03	5.28	5.53	5.79
Block 3 (801+cf)	4.75	4.75	4.98	5.22	5.47	5.73	6.00	6.29	6.60	6.91	7.24
Multifamily	2.70	2.70	2.83	2.97	3.11	3.26	3.41	3.58	3.75	3.93	4.12
Commercial/Irrigation	3.49	3.49	3.66	3.83	4.02	4.21	4.41	4.62	4.85	5.08	5.32

Conservation Based Rates

In 2003 the Washington State Legislature passed the Municipal Water Supply Efficiency Requirements Act. The Water Use Efficiency rules went into effect on January 22, 2007 and typically apply to water system plans that each jurisdiction is required to develop every 6 to 10 years. The Revised Code of Washington (RCW) outlines the rules of this act, under RCW 70.119.180. In section 4(B), the RCW states that jurisdictions must perform an "evaluation of the feasibility of adopting and implementing water delivery rate structures that encourage water conservation."

The City currently utilizes an inverted tier structure for its residential customers, which meets the criteria of conservation-based rates. An inverted tier structure charges customers a higher rate per unit of consumption once a tier threshold is exceeded. The current structure does not include any usage in its monthly fixed charge, which emphasizes conservation. Including usage in the monthly fixed charges may provide an incentive for customers that consume on average below the included volume to use more water.

AFFORDABILITY

Based on Department of Health (DOH) updated Water System Planning Guidebook, affordability is assessed based on: a) Community affordability; and b) Consumer affordability.

Community Affordability

Community affordability is a metric for the relative financial impact water rates have on a community as a whole. U.S. Environmental Protection Agency (EPA) considers 2.50 percent of a community's median household income as the upper threshold for affordable water service. The average median household income for the City was $145,580 between 2015 and 2019 according to the U.S. Census Bureau. The 2019 value is escalated based on the 2020 increase in the Employment Cost Index Wages and Salaries index of 2.00 percent to project the median household income in future years. **Table 10-9** presents the City's average residential monthly bill projected to 2030, tested against the 2.50 percent monthly affordability threshold. The average residential bill assumes a ¾-inch water meter and 700 cf of monthly water usage.

Table 10-9

Community Affordability Test

Year	Inflation	Median HH Income	2.5% Monthly Threshold	Projected Monthly Bill	% of Median HH Income
2019		$ 145,580			
2020	2.00%	148,492	$ 309.36	$ 56.34	0.46%
2021	2.00%	151,461	315.54	56.34	0.45%
2022	2.00%	154,491	321.86	59.04	0.46%
2023	2.00%	157,580	328.29	61.88	0.47%
2024	2.00%	160,732	334.86	64.85	0.48%
2025	2.00%	163,947	341.56	67.96	0.50%
2026	2.00%	163,947	341.56	71.22	0.52%
2027	2.00%	167,226	348.39	74.64	0.54%
2028	2.00%	170,570	355.35	78.23	0.55%
2029	2.00%	173,982	362.46	81.98	0.57%
2030	2.00%	177,461	369.71	85.91	0.58%

Applying the 2.50 percent test, the City's rates are forecasted to remain within the indicated affordability range through 2030.

Consumer Affordability

Consumer affordability refers to whether the rate payers and other water system users can individually afford water service. This informs the water system of the scope of consumer affordability issues within their water system service area and whether the creation or expansion of a customer assistance program would be advantageous. While there is no universally accepted standardized metric for assessing consumer affordability, the DOH Guidebook suggests several common metrics such as frequency of water shut offs, percentage of accounts in arrears, and number of households receiving food assistance or other assistance programs. A summary of these metrics for the City is presented in **Table 10-10**. The number of households receiving food assistance was provided by the U.S. Census Bureau American Community Survey, and delinquency rates and water shut off frequency were provided by the City.

Table 10-10

Consumer Affordability Metrics

Year	30-Day Deliquency Rate	60-Day Deliquency Rate	Water Shut Off Frequency	Households w/ Food Assistance
2014	19.98%	3.10%	0.21%	245
2015	19.61%	2.65%	0.31%	238
2016	19.93%	2.53%	0.22%	217
2017	17.73%	2.11%	0.38%	199
2018	15.92%	1.81%	0.11%	100
2019	15.07%	1.87%	0.19%	104

From 2014 to 2019 the City reduced the frequency of delinquency and water shut offs, and the number of households requiring food assistance was more than halved. While these metrics may provide guidance to the City regarding the need for additional customer assistance programs, they do not directly correlate to the water utility rates' impact on affordability. In light of the economic

hardship brought upon by COVID-19 and to comply with the Governor Proclamation 20-23.7, the City has suspended the collection of late fees and are not processing shut offs for nonpayment.

CONCLUSION

The results of this analysis indicate that rates must increase to provide revenue sufficient to cover all utility financial obligations, including the addition of new debt and partial cash funding of the capital program through 2030. Beginning in 2022, annual rate increases of 4.80 percent through 2030 should provide for continued financial viability while maintaining affordable rates.

It is important to remember that the analysis performed in this chapter assumes growth rates from **Chapter 4** of this WSP. If the future growth rates change, the existing rate strategy may need to be updated and revised.

It is recommended that the City regularly review and update the key underlying assumptions that compose the multi-year financial plan to ensure that adequate revenues are collected to meet the City's total financial obligations.

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Appendix A

Water Facilities Inventory (WFI) Form

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Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

PRELIMINARY - CITY REVIEW ONLY

ONE FORM PER SYSTEM

Quarter: 1
Updated: 11/16/2018

Printed: 7/2/2020
WFI Printed For: On-Demand
Submission Reason: Treatment Update

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

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
81080 C	SNOQUALMIE WATER	KING	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

DUSTIN A. POSSERT [SUPERVISOR]
PO BOX 987
SNOQUALMIE, WA 98065

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS 38194 SE STEARNS RD
CITY SNOQUALMIE STATE WA ZIP 98065

7. OWNER NAME & MAILING ADDRESS

SNOQUALMIE, CITY OF
DANIEL MARCINKO
PO BOX 987
SNOQUALIME, WA 98065

PUBLIC WORKS DIR

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS 38194 SE STEARNS RD
CITY SNOQUALMIE STATE WA ZIP 98065

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: (425) 831-4919		Owner Daytime Phone: (425) 831-4919	
Primary Contact Mobile/Cell Phone: (425) 766-3190		Owner Mobile/Cell Phone: (425) 766-2231	
Primary Contact Evening Phone: (425) 766-3190		Owner Evening Phone: (xxx)-xxx-xxxx	
Fax: (425) 831-4798	E-mail: xxxxxxxxxxxxxxxxxxx	Fax: (425) 831-4798	E-mail: xxxxxxxxxxxxxxxxxxx

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: _____ SMA Number:

12. WATER SYSTEM CHARACTERISTICS (mark all that apply)

- [ ] Agricultural
- [x] Commercial / Business
- [x] Day Care
- [x] Food Service/Food Permit
- [ ] 1,000 or more person event for 2 or more days per year
- [x] Hospital/Clinic
- [x] Industrial
- [ ] Licensed Residential Facility
- [x] Lodging
- [ ] Recreational / RV Park
- [x] Residential
- [x] School
- [ ] Temporary Farm Worker
- [x] Other (church, fire station, etc.): _____

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [x] City / Town
- [ ] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons)

4,800,000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

WATER FACILITIES INVENTORY (WFI) FORM - Continued

PRELIMINARY - CITY REVIEW ONLY

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
81080 C	SNOQUALMIE WATER	KING	A	Comm

15	16	17	18 SOURCE CATEGORY									19 USE			20	21 TREATMENT						22	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Canyon Springs					X						X			Y		X						900	SW SE	24	24N	08E
S03	Well #6 AFJ079				X							X			Y		X	X			X	534	550	NE SE	19	24N	08E
S04	Well #7 AFJ080				X							X			Y		X	X			X	516	550	SE SE	19	24N	08E
S05	North Wellfield - Wells 6, 7, 8			X								X			Y		X	X			X	516	2200	SE SE	19	24N	08E
S06	Well #8				X							X			Y		X	X			X	710	1200	NE SE	10	24N	08E
S07	Well 1R APM025				X							X			Y		X	X				490	600	NE NW	32	24N	08E
S08	Well #2				X							X			Y		X	X				521	600	NE NW	32	24N	08E
S09	South Wellfield - Wells 1R & 2			X								X			Y		X	X				490	600	NE NW	32	24N	08E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

PRELIMINARY - FOR REVIEW ONLY

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
81080 C	SNOQUALMIE WATER	KING	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)		4887	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	4385		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	73		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	502		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	295	295	
28. TOTAL SERVICE CONNECTIONS		5182	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year? 12852

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

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	2790	2500	2790	2700	2790	2700	2790	2790	2700	2790	2700	2790
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	3100	3100	3100	3100	3100	3100	1445	1445	3100	3100	3100	3100
B. How many days per month are they present?	20	14	20	22	20	15	22	21	21	23	17	18

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	15	15	15	15	15	15	15	15	15	15	15	15

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

35. Reason for Submitting WFI:

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

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

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____ **TITLE:** _____

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PRELIMINARY - CITY REVIEW ONLY

WS ID	WS Name
81080	SNOQUALMIE WATER

Total WFI Printed: 1

PRELIMINARY - CITY REVIEW ONLY

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water Facilities Inventory (WFI)

Report Create Date:	7/2/2020		
Water System Id(s):	81080C		
Print Data on Distribution Page:	ALL		
Print Copies For:	DOH Copy		
Water System Name:	ALL		
County:	-- Any --		
Region:	ALL		
Group:	ALL		
Type:	ALL		
Permit Renewal Quarter:	ALL		
Water System Is New:	ALL		
Water System Status:	ALL		
Water Status Date From:	ALL	**To**	ALL
Water System Update Date	ALL	**To**	ALL
Owner Number:	ALL		
SMA Number:	ALL		
SMA Name:	ALL		
Active Connection Count From:	ALL	**To:**	ALL
Approved Connection Count	ALL	**To:**	ALL
Full-Time Population From:	ALL	**To:**	ALL
Water System Expanding	ALL		
Source Type:	ALL		
Source Use:	ALL		
WFI Printed For:	On-Demand		

Appendix B

Retail Water Service Area Agreements

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PRELIMINARY - CITY REVIEW ONLY

AGREEMENT
FOR ESTABLISHING WATER UTILITY SERVICE AREA BOUNDARIES AS IDENTIFIED BY THE EAST KING COUNTY COORDINATED WATER SYSTEM PLAN

PREAMBLE

The Agreement for the water utility service area boundary identifies the external boundary of the service area for which the designated water purveyor has assumed direct retail water service responsibility. The responsibilities accepted by the water purveyor are outlined in the East King County Coordinated Water System Plan (CWSP), and as defined by the adopted rules and regulations of the Department of Health (DOH). This agreement does not give new authorities or responsibilities to the water purveyor or to the County or State regulatory agencies, but rather acknowledges the geographical area for these designated service responsibilities.

The terms used within this Agreement shall be as defined in the implementing regulations of Chapter 70.116 RCW, except as identified below.

1. East King County Critical Water Supply Service Area Map shall mean the map referenced in the Agreement as Attachment A for the retail service area, except as amended in accordance with the CWSP procedures and with the concurrence of the affected water purveyors.

2. Retail Service Area shall mean the designated geographical area in which a purveyor shall supply water either by direct connection, by a satellite system, or through interim service by an adjacent utility or Satellite System Management Agency under agreement with the designated utility.

3. Wholesale Service Area shall mean the designated geographical area in which a purveyor, a group of purveyors, or another organization provides water to other water purveyors on a wholesale basis. A wholesale water supplier shall not provide water to individual customers in another purveyor's retail service area except with the concurrence of the purveyor responsible for the geographical area in question.

4. Lead Agency for administering the Agreement for Establishing Water Utility Service Area Boundaries shall be King County, unless otherwise established by amendment to the CWSP.

The authority for this Agreement is granted by the Public Water System Coordination Act of 1977, Chapter 70.116 RCW.

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WHEREAS, Such an Agreement is required in WAC 248-56-730, Service Area Agreements-Requirement of the Public Water System Coordination Act; and

WHEREAS, Designation of retail water service areas, together with the cooperation of utilities, will help assure that time, effort, and money are best used by avoiding unnecessary duplication of service; and

WHEREAS, Definite future service areas will facilitate efficient planning for, and provision of, water system improvements within East King County as growth occurs; and

WHEREAS, Definite retail and wholesale service areas will help assure that water reserved for public water supply purposes within East King County will be utilized in the future in an efficiently planned manner,

NOW, THEREFORE, the undersigned party, having entered into this Agreement by signature of its authorized representative, concurs with and will abide by the following provisions:

Section 1. Service Area Boundaries. The undersigned party acknowledges that the East King County Critical Water Supply Service Area Map, included as Attachment A to this Agreement and as may be subsequently updated, identifies the utility's future water service area. The undersigned further acknowledges that there are no service area conflicts with adjacent water utilities, or, where such conflicts exist, agrees that no new water service will be extended within disputed areas until such conflicts are resolved.

Section 2. Common Service Area Transfer. It is understood that utilities may initially continue existing water service within the boundaries of neighboring utilities, as defined in Section 1 hereof. Such common service areas, if they exist, are described in Attachment B to this agreement. Also included in Attachment B are copies of, or a list of, all resolutions, ordinances, or agreements enabling these uncontested overlays. The undersigned party agrees that any water line for retail service extending outside of the retail service area boundary, as set for in Section 1, shall be phased out and service transferred to the designated adjacent utility on an economic basis or by mutual agreement.

Economic basis considerations may include, but are now limited to:

(a) A determination by the present owner of service lines that maintenance, repair, and/or replacement costs exceed attributable income.

(b) Planned or imminent major street improvements or major

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improvements to either or both water systems which include an opportunity to transfer service. The terms of the transfer of service ares described in this Section shall be established in a separate agreement among the adjacent utilities whose boundaries are affected.

Section 3. Boundary Streets. Unless separate agreements exist with adjacent utilities concerning water services or other utility services, this party agrees that the water utility which is located to the north and/or east of boundary streets between this party and adjacent utilities will be entitled to provide future water service on both sides of those streets. Depth of service on boundary streets shall be limited to one platted lot or as otherwise agreed by the utilities. Existing services on boundary streets shall remain as connected unless transfer of service is agreed to by both parties, as per Section 2. These provisions do not disallow the placement of mains in the same street by adjacent utilities where geographic or economic constraints require such placement for the hydraulic benefit of both utilities.

Section 4. Boundary Adjustments. If, at some time in the future it is appropriate for the undersigned party to make service area boundary adjustments, such modifications must receive written concurrence (which shall not be unreasonably withheld) of all utilities that would be directly affected by such a boundary adjustment and the proper legislative authority(ies). This provision does not apply where boundary adjustments are made as a result of municipal annexations or incorporations, nor is it intended to modify the provisions of state law. These written modifications must be noted and filed with the designated King County lead agency and DOH. It is understood by the undersigned party that if, as provided by RCW 70.116.040, it is unable to provide service within its designated service area boundary it may decline to do so. But, in that case, an applicant may be referred to other adjacent utilities, to a pre-qualified Satellite System Management Agency (SSMA), or a new utility may be created and the original service area boundary will be adjusted accordingly.

Section 5. Service Extension Policies. The undersigned party agrees that in order to expand its water service area, other than by additional of retail customers to existing water mains, or to serve in the capacity of a pre-qualified SSMA, it shall have adoptd design standards and Utility Service extension policies. The design standards shall meet or exceed the East King County Minimum Design Standards.

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Municipalities further agree that if they identify a service area outside of their existing municipal corporate boundaries, the municipality will assume full responsibility for providing water service equivalent to (excluding rates and charges) the level of service provided for their inside-city customers. This will be in conformance with applicable land use policies.

The agreement by reference includes the following attachments:

Attachment A - East King County Critical Water Supply Service Area Map. (see Section 1)

Attachment B - Common Service Area Agreement - Option - Utility may attach copies or list such agreements if relevent (see Section 2)

IN WITNESS WHEREOF, the undersigned party has executed this Agreement as of 3/25/96.

City of Snoqualmie
Water Utility

Jeanne Hansen
~~Representative~~

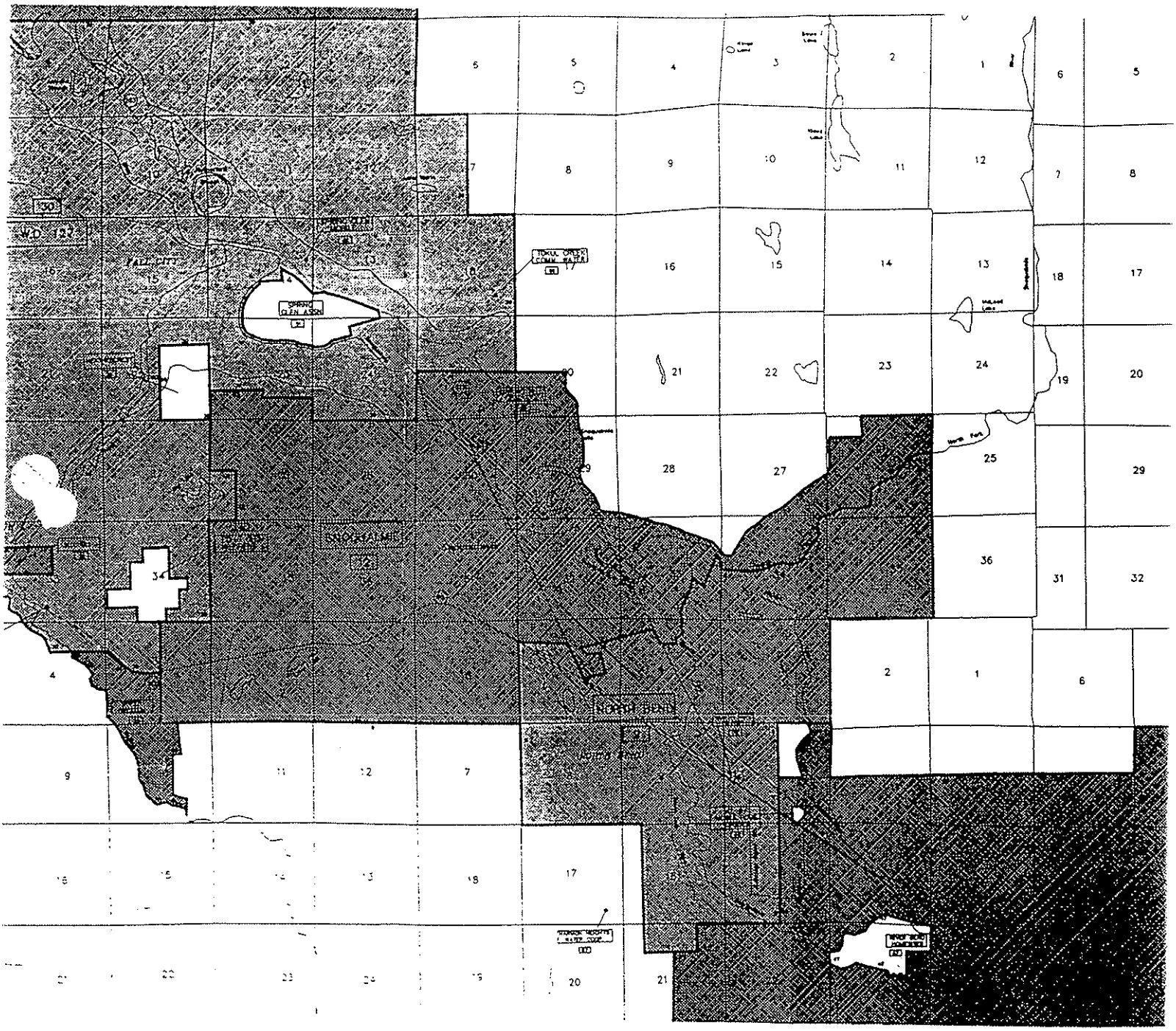
Mayor
Title

Receipt Acknowledged:

King County
Vice Chair, Upper Tolt Technical Review Committee
King Co Dept of Development + Environmental Servs
Department

April 3, 1996
Date

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Appendix C

Agreements with Other Systems

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Phone (425) 888-1555
Fax (425) 831-6041

CITY OF SNOQUALMIE
Office of the City Administrator
P.O. Box 987, Snoqualmie, Washington 98065
www.ci.snoqualmie.wa.us

May 31, 2001

Curt Kraft, President
Lake Alice Community Association
7810 Lake Alice Road S.E.
Fall City, WA 98024

RE: Snoqualmie Preservation Initiative

Dear Mr. Kraft:

This letter is to formalize the assurances given by Mayor Fletcher and City Attorney Pat Anderson in their recent meetings with you and members of your association.

The City understands and acknowledges that the Lake Alice community has raised legitimate concerns, and the Mayor has authorized me to make the following commitments on the City's behalf to address those concerns. Specifically, the City of Snoqualmie hereby commits that development approvals, if any, for the potential future development of the Weyerhaeuser Real Estate Company properties known as the Joint Planning Area and the Northwest Parcels, in the event they (or either of them) become annexed to the City of Snoqualmie, will include the following provisions:

1. Perimeter Buffers. Future buffers between development within the City of Snoqualmie and the Lake Alice community will be designed to provide a dense visual screen that will completely obscure views of development in the City from the Lake Alice community. Trails, if allowed within the buffer at all, will be located adjacent to the City edge of the buffer and not to the Lake Alice edge. The Lake Alice community will have the opportunity to participate in the formulation of the specific buffer standards, including width, planting plans and other relevant buffer features.

2. Road Connection. The current prohibition against any road connection between the City of Snoqualmie and the Lake Alice road will be maintained, provided, that after consultation with King County and the Lake Alice community, an emergency vehicle access point may be established, which will be blocked to non-emergency traffic, in the event all parties agree such a connection is in the public interest. Further, there will be no trail connection constructed between the City of Snoqualmie and the Lake Alice community.

3. Lake Alice Water Levels and Water Quality. The potential impacts of development in Snoqualmie upon Lake Alice water levels and water quality will be studied in the Environmental Impact Statement for any proposed development. Appropriate conditions, including monitoring for a period of years, will be included as determined appropriate through the EIS. The Lake Alice community will be specifically invited to participate in all phases of the EIS and development of conditions applicable to this topic.

4. Water Availability. The City of Snoqualmie will require the construction of a water main to the Snoqualmie municipal boundary adjacent to the Lake Alice Community at a point to be determined by the city. The City of Snoqualmie will incorporate into its water comprehensive plan update for approval by the Department of Ecology and the Department of Health provision for potential service to the Lake Alice community, and certify water availability for the existing platted lots adjacent to Lake Alice and properties on the opposite side of the Lake Alice Road. The impact of development in the City of Snoqualmie upon wells in the Lake Alice community will be studied in the Environmental Impact Statement for any proposed development. Appropriate conditions, including a requirement for replacement of affected wells by extension of the municipal water system, will be included as determined appropriate through the EIS. Such condition will have an appropriate duration to be determined. The Lake Alice community will be specifically invited to participate in all phases of the EIS and development of conditions applicable to this topic. The City will further permit the extension of the municipal water system, if approved by the Department of Ecology and Department of Health, by Lake Alice community members at their own expense through an LID or other financing mechanism, provided construction must be to City of Snoqualmie specifications, construction plans approved by the city and construction inspected by the city.

5. Security for Continuing WRECO Obligations. Conditions of approval will include security provisions for the performance by WRECO of any long-term obligations with respect to impacts to Lake Alice water levels or water quality or impacts to wells caused by development in the Joint Planning Area or Northwest Parcels that will survive their conveyance of the property. Such conditions may include bonding.

On behalf of Mayor Fletcher, I can assure you that the potential impacts to the Lake Alice community from development in Snoqualmie will receive our on-going attention throughout the entire process. Please contact Mayor Fletcher, Pat Anderson or myself at any time if you have questions or comments.

Very truly yours,

Gary Armstrong
City Administrator

Cc: Mayor and Council
Pat Anderson
King County Councilmember David Irons

PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE

WATER SYSTEM EXTENSION

DEVELOPER AGREEMENT

ORIGINAL

THIS AGREEMENT, by and between CITY OF SNOQUALMIE, a municipal corporation, hereinafter referred to as "City" and MICKEY WALKER, hereinafter referred to as "Developer";

WITNESSETH: That WHEREAS the City of Snoqualmie, a municipal corporation, provides water service within the corresponding City Environs; and the above named Developer is preparing to construct a water system within a proposed area located within the boundaries of the City's water service area and said development requires the City's water service and fire protection system.

WHEREFORE THE PARTIES AGREE AS FOLLOWS:

1. Developer agrees to construct a water system, complete with appurtenances, after which the City agrees to permit said system to be connected to City's water lines with both party agreements conditioned as set forth below. This system to be located within that area commonly referred to as Snoqualmie Heights, which property is described in Exhibit "A", attached hereto, and referred to hereinafter as "Premises".

2. As a condition precedent to City's obligations under this agreement, the Developer shall construct the proposed water system extension to and within the Premises so as to conform with City of Snoqualmie Standard Specifications and Details and further to conform with the City's comprehensive plan, as amended, which agreement shall include any oversizing of water lines necessitated by the comprehensive plan.

3. The Developer agrees that construction of the water system shall not commence until the following conditions have been fulfilled:

a. Deposit $1,000 with the City as a guarantee fund to complete all obligations of this agreement, which money shall be retained by the City up to the date of acceptance of the system by the City for maintenance and operation. This deposit may be used by the City to satisfy any outstanding obligations as to City expenses (including City's consulting engineer) which may remain at time of accepting said system. Developer shall be reimbursed all monies remaining after acceptance and payment of outstanding obligations. The Developer herewith agrees to make timely payments of all invoices billed on said water system extensions all as submitted by the City, and the City reserves the right to suspend any further work on the water system should such billing not be kept paid up to date.

b. The Developer shall furnish the City with four (4) sets of detailed plans of the water system prepared by a qualified engineer at the Developer's sole expense.

c. The above plans shall be approved by City's staff of consulting engineer, wherein the cost of such review shall be at the Developer's sole expense.

d. The Developer shall submit to City the Fire Marshall's Fire Flow Requirements for the proposed area of service including lines of extension to the premises based on proposed existing buildings. The City shall review said water plans to reasonably assure that fire flow requirements may be met, however the City in making such review does not guarantee said fire flow requirement nor guarantee continuous water supply for the premises.

e. Minimum requirements for all water plans submitted to the City for review are:

(1) All plans and documents shall be submitted in quadruplicate, wherein two sets are to be retained by the City;

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one set is to be returned to the applicant; and one set is to be retained by the City's consultant.

(2) A preliminary plat of the area in which water mains are to be constructed, which plat has been approved by the City or County Planning Department, whichever is applicable.

(3) A map showing the location of the plat in relation to the surrounding area.

(4) A contour map of the plat with contour intervals of twenty five feet or less.

(5) A map showing the location (and possibly depth) of all proposed utilities and any connections and/or interconnections to existing facilities or future extensions.

(6) A 1" = 100' Plan (preferably 1" = 50') plan of the water system complete with hydrants showing streets, lot lines, dimensions, and location of bench marks and monuments for the proposed plat, together with an indication of the development of the adjacent property.

(7) When applicable, a profile 1" = 50' horizontal and 1" = 5' vertical of the finished road grades with the water main and other pertinent underground utilities located with elevations noted thereon. The elevation datum shall be the same as used by the City.

(8) Full sized detail sheets shall be included as a part of the construction drawings, as required to clearly indicate the details for all of the water facilities to be constructed, consistent with City standards.

(9) Specifications as required to described the work, consistent with City standard specifications. APWA Specifications may be used provided special provisions shall be prepared to supplement the Specification document as to specifics, proposals, etc.

(10) Approvals from all regulatory agencies. Request and obtain approval from the State Department of Social & Health Services (DSHS) and all other regulatory agencies shall be provided. DSHS requests should be submitted to the DSHS District Engineer, Smith Tower, Office in Seattle.

d. Construction requirements in addition to the City's standard specifications and details for developer extensions, is as follows:

(1) All water contractors shall be licensed and registered with the State.

(2) The Developer's water system on Premises shall not be connected to City's water lines until authorized by City, and such connection shall be performed under the supervision and direction of the City.

e. Developer hereby agrees to hold the City harmless from any liability or expense, including reasonable attorney's fees incurred by City directly or as a liability to third parties and arising out of any injury or damage resulting from the construction of this water system, specifically including but not limited to any damages resulting to City's water facilities, together with expense or liability incurred by City by reason of Developer's (or Developer"s employees or contractors) breach of any covenant contained on any franchise granted by King County or State Highway Department, to the City for the purpose of enabling Developer to undertake construction within any King County or State Roads.

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Developer further agrees that in the event any official of the King County Engineering Department or State Highway Department complains to City that Developer is violating such franchise in any respect, or if Developer damages any City facilities, the City shall give the Developer such notice as is reasonable under the circumstances to make repairs or restoration. In such event that the City deems it necessary to make any repairs or restoration (emergency or otherwise) the City shall be reimbursed for the cost thereof. Notice to the Developer shall be given at the following address:

Name Walter Walker Water Works Telephone 525-7411

Address 5019-46th NE Seattle 98105

Telephone: Day-Time 525-7411 Night-Time 525-7411

4. The construction of Developer's water system on the Premises shall be supervised by the City's staff or its consultant in such manner and at such times as the form with the above mentioned plans and specificiations. The Developer herewith agrees to allow such inspections and agrees to cooperate with the City's engineer throughout construction, in addition to providing reasonable advance notice of his construction schedule during the various construction phases. Developer further agrees to reimburse City for all engineering fees and other City expenses incurred by the City for such construction supervision, which fees will be computed on an hourly charge per type of personnel involved for the time required to adequately inspect the project.

5. The Developer's water system on Premises shall not be accepted until the water lines have been fully inspected and approved by the City. Upon receipt of Developer's authorization, the City shall connect customers to the Developer's system. The City shall install the meter for all customers connecting to the Developer's system and will charge the customer for the meter installation per City ordinance. The connection requested by the fourty-sixth customer and everyone requesting a connection to the Developer's system thereafter may be accomplished by the City with the City collecting the connection charge from the Developer as set by ordinance.

6. Individual customer meters shall be read by the City and monthly water charges shall be billed to the Developer who shall be responsible for paying same. Water rates shall be set at $15.00 per customer per month and will include 400 cubic feet, or such other rate as the City Council by ordinance may require. Excess water shall be billed in accordance with the then current ordinances.

SUBMITTED this 6th day of October, 1982.

BY DEVELOPER:

H. D. Walker

CITY OF SNOQUALMIE

PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE

WATER SYSTEM EXTENSION

DEVELOPER AGREEMENT

EXHIBIT "A"

PLAT NAME SNOQUALMIE HEIGHTS

DEVELOPER W.D. WALKER

LEGAL DESCRIPTION OF PROPERTY (PREMISES) The west half of the northeast quarter and that portion of the east half of the northwest quarter described as follows:

Beginning at the northeast corner of the northeast quarter of said northwest quarter; thence west along the north line of said northwest quarter a distance of 484 feet; thence south parallel with the east line of said northwest quarter, a distance of 1800 feet, more or less, to a point on a line which is 840 feet north of and parallel to the south line of said northwest quarter; thence east along said parallel line a distance of 484 feet to the east line of said northwest quarter; thence north along said east line a distance of 1800 feet, more or less, to the Point of Beginning.

All in Section 36, Township 24 North, Range 7 East, W.M., in King County Washington.

Appendix D

Consistency Statement Checklists

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Washington State Department of Health

PRELIMINARY - CITY REVIEW ONLY

Local Government Consistency Determination Form

Water System Name: Snoqualmie Water PWS ID: 81080C

Planning/Engineering Document Title: Water System Plan Plan Date: July 2020

Local Government with Jurisdiction Conducting Review: City of Snoqualmie

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

Local Government Consistency Statement	For use by water system: Identify the page(s) in submittal	For use by local government: Yes or Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the service area.	Figure 3-1	
b) The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	Table 3-3	
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant utility service extension ordinances.	Chapter 5	
d) Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	Pages 3-1 through 3-4	
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	Pages 3-1 through 3-4	

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature — 7/13/20 Date

JEFF HAMLIN, UTILITY OPERATIONS MGR

Printed Name, Title, & Jurisdiction

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place-of-use. If no water right place-of-use expansion is requested, a consistency review is not required.

For **engineering documents,** a consistency review is required for areas where a municipal water supplier wants to expand its water right's place-of-use (water system plan amendment is required). For noncommunity water systems, a consistency review is required when requesting a place-of-use expansion. All engineering documents must be submitted with a service area map (WAC 246-290-110(4)(b)(ii)).

A) Documenting Consistency: The planning or engineering document must include the following when applicable.

a) A copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that relate to water supply planning.

b) A copy of the **growth projections** that correspond to the service area. If the local population growth projections are not used, explain in detail why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. *This applies to cities and towns only.*

d) All **service area policies** for how new water service will be provided to new customers.

e) **Other relevant elements** the Department of Health determines are related to water supply planning. See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and explain how to resolve the inconsistency.

C) Documenting a Lack of Local Review for Consistency: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for review. Please include: name of contact, date, and efforts made (letters, phone calls, and emails). To self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

PRELIMINARY - CITY REVIEW ONLY

Local Government Consistency Determination Form

Water System Name: Snoqualmie Water PWS ID: 81080C

Planning/Engineering Document Title: Water System Plan Plan Date: August 2021

Local Government with Jurisdiction Conducting Review: King County

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

	For use by water system	For use by local government
Local Government Consistency Statement	**Identify the page(s) in submittal**	**Yes or Not Applicable**
a) The water system service area is consistent with the adopted land use and zoning within the service area.	Figure 3-1	
b) The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	Table 3-3	
c) For cities and towns that provide water service: All water service area policies of the city or town described in the plan conform to all relevant utility service extension ordinances.	Chapter 5	
d) Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	Pages 3-1 through 3-4	
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	Pages 3-1 through 3-4	

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

_____ _____

Signature Date

_____

Printed Name, Title, & Jurisdiction

PRELIMINARY - CITY REVIEW ONLY

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place-of-use. If no water right place-of-use expansion is requested, a consistency review is not required.

For **engineering documents,** a consistency review is required for areas where a municipal water supplier wants to expand its water right's place-of-use (water system plan amendment is required). For noncommunity water systems, a consistency review is required when requesting a place-of-use expansion. All engineering documents must be submitted with a service area map (WAC 246-290-110(4)(b)(ii)).

A) Documenting Consistency: The planning or engineering document must include the following when applicable.

a) A copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that relate to water supply planning.

b) A copy of the **growth projections** that correspond to the service area. If the local population growth projections are not used, explain in detail why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. *This applies to cities and towns only.*

d) All **service area policies** for how new water service will be provided to new customers.

e) **Other relevant elements** the Department of Health determines are related to water supply planning. See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and explain how to resolve the inconsistency.

C) Documenting a Lack of Local Review for Consistency: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for review. Please include: name of contact, date, and efforts made (letters, phone calls, and emails). To self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Appendix E
SEPA Checklist

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SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [HELP]

1. Name of proposed project, if applicable:

   City of Snoqualmie 2020 Water System Plan (WSP)

2. Name of applicant:

City of Snoqualmie

3. Address and phone number of applicant and contact person:

Jeff Hamlin, PE
38194 SE Mill Pond Road
Snoqualmie, WA 98065
(425) 888-8023

4. Date checklist prepared:

July 7, 2020

5. Agency requesting checklist:

City of Snoqualmie

6. Proposed timing or schedule (including phasing, if applicable):

The WSP will be in effect for 10 years from date of approval (expected approval in late 2020).

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The WSP describes various planned capital improvements to the water system. These are detailed in Chapter 9.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Environmental checklists and required related studies will be prepared for individual construction projects listed in the WSP.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Unknown.

10. List any government approvals or permits that will be needed for your proposal, if known.

Department of Health, Department of Ecology, and King County.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The City's WSP proposes various improvements that are necessary to resolve existing system deficiencies, and plan for the projected growth of the water system. The WSP details the service area, existing facilities and water use, as well as the construction, operation, and maintenance requirements for the water system. The WSP was prepared in accordance with WAC 246-290-100.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Reference Figure 2-1 of the WSP for the City's Retail Water Service Area.

B. Environmental Elements [HELP]

1. *Earth* [help]

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____

Reference Chapter 2 of the WSP. Checklists for individual projects will address this on a site-specific basis.

b. What is the steepest slope on the site (approximate percent slope)?

Reference Chapter 2 of the WSP. Checklists for individual projects will address this on a site-specific basis.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Reference Chapter 2 of the WSP. Checklists for individual projects will address this on a site-specific basis.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Reference Chapter 2 of the WSP. Checklists for individual projects will address this on a site-specific basis.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Checklists for individual projects will address this on a site-specific basis.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Checklists for individual projects will address this on a site-specific basis.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Checklists for individual projects will address this on a site-specific basis.

2. Air [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Checklists for individual projects will address this on a site-specific basis.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Checklists for individual projects will address this on a site-specific basis.

3. Water [help]

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Reference Figure 2-1 of the WSP. Checklists for individual projects will address this on a site-specific basis.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Reference Figure 2-1 of the WSP. Checklists for individual projects will address this on a site-specific basis.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Checklists for individual projects will address this on a site-specific basis.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Reference Chapter 6 and Appendix I of the WSP.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Checklists for individual projects will address this on a site-specific basis.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Checklists for individual projects will address this on a site-specific basis.

b. Ground Water: [help]

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Reference Chapter 6 and Appendix I of the WSP.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Checklists for individual projects will address this on a site-specific basis.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

4. Plants [help]

a. Check the types of vegetation found on the site:

____deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
____shrubs
____grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

Checklists for individual projects will address this on a site-specific basis.

b. What kind and amount of vegetation will be removed or altered?

Checklists for individual projects will address this on a site-specific basis.

c. List threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Checklists for individual projects will address this on a site-specific basis.

e. List all noxious weeds and invasive species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

5. Animals [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

Checklists for individual projects will address this on a site-specific basis.

b. List any threatened and endangered species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

c. Is the site part of a migration route? If so, explain.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to preserve or enhance wildlife, if any:

Checklists for individual projects will address this on a site-specific basis.

e. List any invasive animal species known to be on or near the site.

Checklists for individual projects will address this on a site-specific basis.

6. Energy and Natural Resources [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Checklists for individual projects will address this on a site-specific basis.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Does not apply.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

7. Environmental Health [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

1) Describe any known or possible contamination at the site from present or past uses.

Checklists for individual projects will address this on a site-specific basis.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Checklists for individual projects will address this on a site-specific basis.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Checklists for individual projects will address this on a site-specific basis.

4) Describe special emergency services that might be required.

Checklists for individual projects will address this on a site-specific basis.

5) Proposed measures to reduce or control environmental health hazards, if any:

Checklists for individual projects will address this on a site-specific basis.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Does not apply.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Checklists for individual projects will address this on a site-specific basis.

3) Proposed measures to reduce or control noise impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

8. Land and Shoreline Use [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Checklists for individual projects will address this on a site-specific basis.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

Checklists for individual projects will address this on a site-specific basis.

c. Describe any structures on the site.

Checklists for individual projects will address this on a site-specific basis.

d. Will any structures be demolished? If so, what?

Checklists for individual projects will address this on a site-specific basis.

e. What is the current zoning classification of the site?

Reference Chapter 3 and Figure 3-1 of the WSP. Checklists for individual projects will address this on a site-specific basis.

f. What is the current comprehensive plan designation of the site?

Reference Chapter 3 and Figure 3-1 of the WSP. Checklists for individual projects will address this on a site-specific basis.

g. If applicable, what is the current shoreline master program designation of the site?

Checklists for individual projects will address this on a site-specific basis.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Checklists for individual projects will address this on a site-specific basis.

i. Approximately how many people would reside or work in the completed project?

Does not apply.

j. Approximately how many people would the completed project displace?

Does not apply.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Reference Chapter 3 of the WSP. Checklists for individual projects will address this on a site-specific basis.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Checklists for individual projects will address this on a site-specific basis.

9. Housing [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Does not apply.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

Does not apply.

c. Proposed measures to reduce or control housing impacts, if any:

Does not apply.

10. Aesthetics [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Checklists for individual projects will address this on a site-specific basis.

b. What views in the immediate vicinity would be altered or obstructed?

Checklists for individual projects will address this on a site-specific basis.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

11. Light and Glare [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Checklists for individual projects will address this on a site-specific basis.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Checklists for individual projects will address this on a site-specific basis.

c. What existing off-site sources of light or glare may affect your proposal?

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to reduce or control light and glare impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

12. Recreation [help]

a. What designated and informal recreational opportunities are in the immediate vicinity?

Checklists for individual projects will address this on a site-specific basis.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Checklists for individual projects will address this on a site-specific basis.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Checklists for individual projects will address this on a site-specific basis.

13. Historic and cultural preservation [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.

Checklists for individual projects will address this on a site-specific basis.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

Checklists for individual projects will address this on a site-specific basis.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

Checklists for individual projects will address this on a site-specific basis.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Checklists for individual projects will address this on a site-specific basis.

14. Transportation [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Reference Figure 2-1 of the WSP. Checklists for individual projects will address this on a site-specific basis.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Does not apply.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

Does not apply.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Checklists for individual projects will address this on a site-specific basis.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

Does not apply.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Checklists for individual projects will address this on a site-specific basis.

h. Proposed measures to reduce or control transportation impacts, if any:

Checklists for individual projects will address this on a site-specific basis.

15. Public Services [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Does not apply.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Does not apply.

16. Utilities [help]

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

Checklists for individual projects will address this on a site-specific basis.

d. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Checklists for individual projects will address this on a site-specific basis.

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Name of signee _____

Position and Agency/Organization _____

Date Submitted: _____

D. Supplemental sheet for nonproject actions [HELP]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or

at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Discharge to Water

During the construction of the proposed water main and facility projects, discharge of turbid water could occur. After the projects are constructed and in use, development in the City's water service area may be expanded into the new areas served by the City's water system. Without these utility improvements, development projects would be unable to occur at the housing density the City anticipates will be necessary to accommodate growth. More development and higher population will produce more wastewater to be treated and discharged. Increased impervious surfaces will increase discharge of stormwater to local water bodies which may also contribute to higher flood risks.

Emissions to Air

Temporary construction emissions expected include exhaust from machinery and vehicles, and dust. Personal vehicles belonging to the new homes built as a result of the improved and expanded water system and various heating methods (wood and pellet burning stoves) would contribute exhaust and greenhouse gas emissions to the air.

Production, Storage, and Release of Toxic or Hazardous Substances

Chemicals such as sodium hypochlorite, ferric chloride, and sulfuric acid may be used in proposed supply facilities to treat raw source water for potable uses. Chemicals will likely be stored on site. The proposed projects will generally improve existing conditions by accommodating future growth and ensuring a safe and reliable water supply.

Production of Noise

Temporary construction noise would be limited to daytime, work-day hours. Subsequent development of residential and commercial structures will also result in temporary construction noise. The production of noise created in new residential and commercial areas should be equal to current ambient noise levels within the City limits.

Proposed measures to avoid or reduce such increases are:

Reducing Discharges to Water

- *TESC plans for each construction project will minimize and protect water bodies from turbid water discharge and runoff.*
- *Construction work will comply with near-water work windows to avoid disturbing sensitive and protected fish and wildlife.*

Reducing Emissions to Air

- *Construction machinery and vehicle emissions shall be kept to a minimum by turning off equipment instead of idling during periods when equipment is not in use.*
- *Appropriate dust control measures (sweeping, watering) will be implemented as part of each project's TESC plan to keep construction generated dust to a minimum.*
- *Green technologies and equipment should be utilized within construction of the proposed projects when plausible.*

Reducing the Production, Storage, and Release of Toxic or Hazardous Substances

All drains for these chemicals will be secondary contained for safe transport to a lined waste manhole in the event of a spill. All necessary safety equipment for chemical handling will be provided.

Reducing the Projection of Noise

Limit construction work to daytime, work-day hours, Monday through Friday.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Once completed, the water main projects will be fully buried within road right-of-way. During construction, discharge of turbid water to streams may occur, which could disrupt salmonoid life history stages. Staging of excavation and fill materials and equipment on land would affect any plants in the immediate area.

The facility projects could have some localized effects on plants, animals, and fish. These projects could require clearing of existing vegetation, which could in turn affect wildlife that utilizes that vegetation for food or shelter. Clearing and grading for facilities may result in discharge of turbid water to streams, which could disrupt migration or rearing of salmonoids.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

- *TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.*
- *Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent and severe.*

- *Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.*
- *There should be no further clearing of vegetation beyond what is needed for the construction of the projects.*

3. How would the proposal be likely to deplete energy or natural resources?

Petroleum resources will be used for the construction of the proposed projects (fuel for construction machinery and vehicles) and subsequent construction of residential and commercial structures. Housing and other structures will require heating (natural gas and wood/pellet burning stoves) and electricity.

Proposed measures to protect or conserve energy and natural resources are:

Use of high efficiency pumps and motors and water main of sufficient diameter to minimize pumping losses (and associated power usage).

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The proposal should have no direct effect on parks, wilderness, wild and scenic rivers, floodplains, or prime farmlands. The project could directly affect sensitive areas such as federally-listed threatened species habitat, cultural sites and wetlands. As discussed previously, construction of these projects could potentially discharge turbid water to water bodies (including riparian wetland areas).

The proposal could have indirect effects (via expanded clearing, grading and building in the service area) on federally-listed threatened species habitat, cultural sites, wetlands and floodplains. Discharge of turbid water to adjacent water bodies could affect rearing and migrating bull trout and salmonids, critical habitat, and riparian wetlands associated with these water bodies. Excavation of structure foundations could uncover cultural sites. Impervious surfaces (buildings, parking lots, roads) result in increased stormwater runoff, which could contribute to flooding issues.

Proposed measures to protect such resources or to avoid or reduce impacts are:

- *TESC plans for each construction project will create means to protect water bodies from turbid water discharge and runoff.*
- *Working during the summer month work-window presents less of a risk for turbid discharge since rain events are less frequent and severe.*
- *Construction work will comply with near-water and migratory bird work windows to avoid disturbing federally-listed salmonoids and wildlife.*

- *Staging materials and equipment should be located on impervious surfaces or in previously cleared or impacted areas if possible.*
- *There should be no further clearing of vegetation beyond what is needed for the construction of the projects.*
- *If cultural artifacts or historic resources are uncovered during construction, project work should be suspended immediately. Appropriate authorities at the County and State levels should be notified and appropriate measures taken to protect these resources.*

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The proposed projects in the WSP would allow for an expansion of residential and commercial uses within the City's UGA. The UGA was defined specifically to accommodate population growth in the City.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Minimize clearing and grading of vegetation to that directly needed to accomplish the proposed project. Ensure projects are consistent with City planning objectives and ordinances.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The direct transportation effects of the proposed projects associated with the WSP could be temporary loss of sidewalks, on-street parking, lane closures or detours near water main installation within road right-of-way. Bus stops may also be temporarily affected by work in the right-of-way. Water service and other utility services should not be affected during construction.

Indirect effects of the proposed projects on transportation would be increased road usage and the need to build new roads for new developments and potentially expand and make more frequent repairs to existing roads. Higher population may result in increased ridership of community transit and expanded service route frequency and stops. The expansion and improvement of the water system will result in the ability to supply more water to support new residential and commercial developments.

Proposed measures to reduce or respond to such demand(s) are:

- *Construction would take place in a timely manner to minimize obstructions and alterations of local traffic flow.*
- *City-approved traffic control will be provided during construction if needed.*

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The proposed projects may conflict with environmental protection laws; however, all projects proposed will be required to obtain applicable local, state and federal permits, which are intended to encourage avoidance, minimization and mitigation for adverse environmental impacts. A preliminary list of potential permits needed for proposed water main and facility projects are listed below.

City of Snoqualmie

- *Building, Right-of-Way and Site Development Permits.*
- *Floodplain Development Permit.*
- *Critical Areas Compliance.*
- *Shoreline Conditional Use or Variance Permit (for structures within 200 feet landward of a water body).*

State

- *State Department of Ecology General Order of Approval for Diesel or Gas Emergency Electrical Generators (for back-up generators during power outages).*
- *Section 401 Water Quality Certification through State Department of Ecology (needed if Section 404 required).*

Federal

- *Federal permits for work within wetlands or waters of the State (i.e. Section 404 or Section 10 approval through the Army Corps of Engineers), including associated Endangered Species Act, Coastal Zone Management and National Historic Preservation Act compliance.*

Appendix F

Water Use Efficiency Program

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WATER USE EFFICIENCY PROGRAM

INTRODUCTION

The City of Snoqualmie (City) recognizes that water is a valuable and essential natural resource that needs to be used wisely. This Water Use Efficiency (WUE) program provides an approach to increase water use efficiency within the City's water service area.

BACKGROUND

The Water Use Efficiency Rule

In September 2003, the Washington State Legislature passed the Municipal Water Supply – Efficiency Requirements Act, also known as the Municipal Water Law. The Municipal Water Law required the state to implement the WUE Rule. The intent of this rule is to help reduce the demand that growing communities, agriculture, and industry have placed on our state's water resources, and to better manage these resources for fish and other wildlife. Municipal water suppliers are obligated under the WUE Rule to enhance the efficient use of water by the system and/or its consumers.

The WUE Rule applies to all municipal water suppliers and requires suppliers to:

- Develop WUE goals through a public process and report annually on their performance;
- Maintain distribution system leakage (DSL) at or below 10 percent of production;
- Meter all existing and new service connections;
- Collect production and consumption data, calculate DSL, and forecast demands;
- Evaluate WUE measures; and
- Implement a WUE program.

Water Use Efficiency Program Requirements

The *Water Use Efficiency Guidebook,* originally published by the Washington State Department of Health (DOH) in July 2007, and revised in January 2009, January 2011, and January 2017, identifies the water use reporting, forecasting, and efficiency program requirements for public water systems. A WUE program meeting these requirements is a necessary element of a Water System Plan as required by DOH and is necessary to obtain water right permits from the Washington State Department of Ecology (Ecology). The *Water Use Efficiency Guidebook* defines the necessary components of a WUE program as the following four fundamental elements.

1. Planning requirements that include collecting data, forecasting demand, evaluating WUE measures, calculating DSL, and implementing a WUE program to meet goals.
2. A DSL standard of 10 percent or less based on a 3-year rolling average. For systems with less than 500 connections, the DSL standard may be increased to 20 percent if a request with supporting data is provided to DOH.

3. Goal setting to provide a benchmark for achievement and to help define the success of the WUE program.
4. Annual performance reporting on progress towards meeting WUE goals.

WATER SUPPLY CHARACTERISTICS

Water in the City's system is currently only supplied by Snoqualmie-owned sources. Snoqualmie-owned sources include Canyon Springs, the South Wellfield (Well Nos. 1R and 2), and the North Wellfield (Well Nos. 6, 7, and 8). The South Wellfield has elevated raw water ammonia that can result in taste and odor issues; therefore, water is only supplied through this source when customer demand is high.

A summary of the Snoqualmie-owned sources is shown in **Table 1**, and a more detailed description of each source of supply is provided in **Chapter 2** of the City's Water System Plan (WSP).

Table 1

Supply Facilities Summary

Facility	Pressure Zone	Year Installed	Use	Existing Capacity (gpm)	Well Depth (feet)	Water Treatment
Canyon Springs	599 Zone	1950s	Active	898	N/A	Chlorination
North Wellfield[1]						
Well No. 6	705 Zone	1996	Active	550	589	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 7	705 Zone	1996	Active	550	541	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 8	705 Zone	2002	Active	1,250	694	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
South Wellfield[2]						
Well No. 1-R	599 Zone	2006	Active	600	557	Chlorination, Filtration (Iron and Manganese Removal)
Well No. 2	599 Zone	2009	Active	600	564	Chlorination, Filtration (Iron and Manganese Removal)

1 = Well No. 6 cannot be run simultaneously with Well No. 8, so the maximum combined capacity of the North Wellfield is approximately 1,800 gpm.
2 = The capacity of the South Wellfield is currently limited to 563 gpm by the South Wellfield WTP.

The City currently holds one surface water certificate, three groundwater certificates, and one ground water permit for its sources of municipal supply. A summary of these water rights is

presented in **Table 2**. Additional water rights information for each source may be found in **Chapter 6** of the WSP, and on the certificates, permits, and water rights self-assessment that are included in **Appendix I**.

Table 2

Existing Water Rights

Water Right	Priority Date	Document	Source Name	Instantaneous Rate (gpm)		Annual Volume (afy)	
				Additive	Non-additive	Additive	Non-additive
GWC 91-D	1/1/1930	Superseding Certificate	North and South Wellfield	90	0	100	0
GWC 92-D	1/1/1940	Superseding Certificate	North and South Wellfield	90	0	100	0
G1-20316C	10/13/1972	Superseding Certificate	North and South Wellfield	600	0	0	500
G1-25449P	5/30/1989	Permit	North Wellfield	1,650	0	724	0
			Ground Water Subtotal	***2,430***	***0***	***924***	***500***
SWC 4553	10/18/1944	Certificate	Canyon Springs	898	0	1,448	0
			Total	**3,328**		**2,372**	

Notes:
A maximum of 2,430 gpm and 1,424 afy can be pumped from the North Wellfield.
A maximum of 600 gpm and 500 afy can be pumped from the South Wellfield.
G1-20316C annual volume is non-additive to the annual volume granted under GWC 91-D, GWC 92-D, and SWC 4553.
Instantaneous rate under SWC 4553 is equal to 2 cubic feet per second.
No annual volume specified under SWC 4553. Annual volume calculated here is equal to 898 gpm continuously, year round.
Development Schedule on G1-25449P requires full beneficial use by September 30, 2020.
Maximum of all rights is 3,328 gpm and 2,372 afy.

WATER USE EFFICIENCY PROGRAM

As previously described, the fundamental elements of a WUE program include planning requirements and DSL standards, as well as goal setting and performance reporting. The City's water use data, demand forecasts, and other planning requirements are contained in **Chapter 4** of the WSP. The City is committed to continue collecting water use data beyond that presented in **Chapter 4** for evaluation of its WUE program and water use patterns, and for forecasting demands for future facilities. The City's WUE program that follows includes a statement of its goals and objectives, the evaluation and selection of alternative efficiency measures, the schedule and budget, and the method of program monitoring.

Water Use Efficiency Goals and the Public Process

Per Washington Administrative Code (WAC) 246-290-830, WUE goals must be set through a public process and shall be evaluated and re-established as part of a WSP update. The City formally adopted water use efficiency goals in 2004 with the adoption of its WSP that year, and last updated its WUE Program as part of its 2013 WSP. The City has established new WUE goals for this update, building on the previous goals of reducing DSL and summer water use. The new WUE goals are as follows:

- Reduce the maximum day demand/average day demand (MDD/ADD) peaking factor to 2.5 by 2030.
- Maintain system-wide DSL at less than 6.0 percent per year based on a 3-year rolling average.

The City's highest annual MDD/ADD peaking factor of 2.68 was observed in 2016, as shown in **Table 3**. This peaking factor is above the typical range of 1.2 to 2.5 observed for most Puget Sound area systems. The City has established the goal of reducing the MDD/ADD peaking factor to 2.5 by 2030. Reducing the peaking factor will help mitigate the City's need to acquire additional water rights in the future and minimize the need to increase other aspects of system capacity.

Table 3

Demands and Peaking Factors

Year	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Peak Hour Demand (gpm)	MDD/ADD Peaking Factor	PHD/MDD Peaking Factor
2015	988	2,241	4,214	2.27	***1.88***
2016	929	2,491	***4,495***	***2.68***	1.80
2017	1,068	***2,585***	4,284	2.42	1.66

As shown in **Table 4**, the system-wide DSL 3-year rolling average has been under 6 percent since 2015, well below the state DSL standard of 10 percent. The City's goal is to maintain the 3-year rolling average below 6 percent through 2030.

Table 4

Distribution System Leakage

	Year						
Description	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Metered Customer Use (MG)	360.7	459.9	464.5	490.9	519.4	471.2	551.3
Total Supply (MG)	442.1	472.2	506.3	536.0	519.2	489.4	561.6
Total DSL Volume (MG)	81.4	12.3	41.8	45.0	-0.2	18.2	10.3
Total DSL Percentage	18.4%	2.6%	8.3%	8.4%	0.0%	3.7%	1.8%
Rolling 3-Year Average DSL Percentage	---	---	9.8%	6.4%	5.5%	4.0%	1.8%

In compliance with the WUE Rule, a public hearing was held on XXX XX, 2020, at a City Council meeting to present and discuss the new goals. The City Council adopted the new goals on XXX XX, 2020.

Evaluation and Selection of Water Use Efficiency Measures

The City's evaluation of WUE measures and selected levels of implementation are presented within this section. The measures fall within three categories of implementation: 1) mandatory measures that must be implemented; 2) measures that must be evaluated; and 3) additional measures selected by the City that must be either evaluated or implemented.

The City served an average of 4,911 water service connections in 2017. Based on the number of connections, at least six WUE supplemental measures must be evaluated or implemented. Measures that are mandatory cannot be credited towards the system's WUE measures. Since the City implements the minimum number of required measures, a cost-effective evaluation is not required.

Mandatory Measures

Source Meters

The volume of water produced by the system's sources must be measured using a source meter or other meter installed upstream of the distribution system. Source meters are currently installed and operating at each of the City's sources. If any new sources are installed in the future, they will be equipped with a source meter.

Service Meters

All public water systems that supply water for municipal purposes must install individual service meters for all water users. Service meters are currently installed and operating at all connections throughout the distribution system. All future connections that are installed or activated will be equipped with a service meter.

Meter Calibration

The City must calibrate and maintain meters based on generally accepted industry standards and manufacturer information. Currently, the City evaluates and calibrates source meters every 2 years. The City began a customer meter replacement program in 1999. Customer meters are inspected regularly and replaced as necessary. Damaged or suspect meters are replaced as soon as they are discovered.

Water Loss Control Action Plan

To control leakage, systems that do not meet the state DSL standard of 10 percent must implement a Water Loss Control Action Plan (WLCAP). The City's rolling 3-year average DSL has been less than 10 percent for the past 5 years based on the information presented in **Table 4** and **Chapter 4** of the WSP. Therefore, a WLCAP is not required to be implemented.

Customer Education

Annual customer education regarding the importance of using water efficiently is a required element of all WUE programs. The City intends to provide water conservation tips along with the Consumer Confidence Report (CCR), on the City's website, and at City Hall. These materials include lawn watering and indoor conservation tips. Additional customer education and outreach measures are identified in the **Selected Supplemental Measures** section.

Measures that Must be Evaluated

Rate Structure

A rate structure that encourages WUE and provides economic incentives to conserve water must be evaluated but is not required to be implemented. The City's current utility rates are designed to discourage excessive water use. A base water rate is charged, depending on the meter size, regardless of consumption. An increasing block rate structure imposes a unit charge for water use that increases as the volume of water consumed increases.

Reclamation Opportunities

Revised Code of Washington (RCW) 90.46.010 defines reclaimed water as "water derived in any part from wastewater with a domestic wastewater component that has been adequately and reliably treated, so that it can be used for beneficial purposes." Water systems with 1,000 or more connections must evaluate reclamation opportunities (WAC 246-290-100(4)(f)(vii)), but only actual use of reclaimed water counts as a WUE measure (WAC (246-290-810(4)(d)) or multiple WUE measures if the reclaimed water is used for multiple purposes.

The City produces Class A reclaimed water at its Water Reclamation Facility (WRF). The reclaimed water is used for golf course irrigation and municipal irrigation purposes in the Snoqualmie Ridge area. The reclaimed water irrigation system is operated by a program called Maxicom, which computes the evapotranspiration rate on a daily basis and schedules irrigation in an efficient manner. This method of irrigation reduces the amount of water used for irrigation purposes.

Use of reclaimed water by the City's Irrigation and Public customer classes counts as two supplemental WUE measures.

Selected Supplemental Measures

The City has chosen to implement four different supplemental WUE measures in addition to those that are mandatory or required to be evaluated. Because several of these WUE measures affect multiple customer classes (detailed below), the City's WUE program counts as 16 WUE measures, which is greater than the requirement of 6 WUE measures based on the number of service connections.

Water Bill Showing Consumption History

The City is committed to including consumption history on all bills to its customers. The City's billing software, Springbrook, has the capability to include historic graphs on bills, and the City shows consumption history for all six of the City's customer classes. This counts as six supplemental WUE measures.

Notifying Customers about Leaks on Their Property

The City's billing department monitors customers' water bills for abnormally high water reads. When a significantly high read occurs that is outside the range of normal use, the customer is notified of a potential leak on their side of the water meter. The City provides this information to all six customer classes; thus, it counts as six supplemental WUE measures.

Snoqualmie Ridge (SR) I and II Irrigation Analysis and Water Audit

The City has conducted a thorough and exhaustive inventory and analysis of the irrigation systems within the Snoqualmie Ridge area. The City has identified all areas irrigated by either potable or reclaimed water and verified all meter data and account information to ensure all irrigated water is being properly accounted for and billed. The City now monitors monthly irrigation data for all services to help determine if additional conservation measures are needed

to curtail water use. This WUE measure applies to the City's Irrigation customer class; therefore, it counts as one supplemental WUE measure.

Purveyor Assistance

The City provides wholesale water to the Walter Walker Water Works system. The Walter Walker system includes approximately 14 homes. Conservation and efficient water use efforts made by the City intended for residential customers will be extended to the homes in the Walter Walker system as well. Because the Walter Walker system is included in the City's Residential customer class, this counts as one supplemental WUE measure.

Water Use Efficiency Program Schedule and Budget

The WUE measures described above and selected for implementation by the City are summarized in **Table 5** with their corresponding schedule and budget. The successful implementation of this program is expected to achieve the City's WUE goals.

Table 5

WUE Program Schedule and Budget

Mandatory WUE Measures		
Measure	**Schedule**	**Budget**
Source Meters Installed	Ongoing	O&M Funded
Service Meters Installed	Ongoing	O&M Funded
Meter Calibration Compliance	Ongoing	O&M Funded
Customer Education	Ongoing	O&M Funded
WUE Measures That Must Be Evaluated		
Measure	**Schedule**	**Budget**
Rate Structure	Ongoing	Not Applicable
Reclamation Opportunities	Ongoing	Not Applicable
Selected WUE Measures		
Measure	**Schedule**	**Budget**
Water Bill Showing Consumption History	Ongoing	Not Applicable
Notifying Customers About Leaks	Ongoing	O&M Funded
SR I and II Irrigation Analysis and Water Audit	Ongoing	O&M Funded
Purveyor Assistance	Ongoing	Not Applicable

O&M = Operations and Maintenance

Water Use Efficiency Program Evaluation and Reporting

The City will continue to evaluate overall demand, per capita and per equivalent residential unit water use, peaking factors, and the amount of DSL on an annual basis. The City will evaluate the performance of its WUE program and implemented measures by analyzing demand data and determining the long-term trend towards reducing water usage and meeting WUE goals. If the program monitoring shows that progress towards meeting the WUE goals is not being

accomplished, more rigorous program implementation or additional program items will be considered, along with a cost-effective evaluation of measures.

The City will provide annual WUE performance reports to its consumers in the CCR and will detail the results of water use monitoring and progress towards achieving the system's WUE goals. A copy of the City's current CCR is included in **Appendix L** of the City's WSP.

Appendix G

Cross-Connection Control Program

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CROSS-CONNECTION CONTROL PROGRAM

INTRODUCTION

A cross-connection control (CCC) program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the municipal water supply that it supplies by preventing backflow of contaminants through cross connection. A cross connection is any physical connection, actual or potential, between a water system and any source of non-potable substance. All public water systems in Washington State are required to implement a cross-connection control program. All required elements of a local CCC program must be documented and included in either the Water System Plan (applicable to the City of Snoqualmie) or Small Water System Management Program document (not applicable). The State mandate for a CCC program and the required elements of a CCC program are contained in Washington Administrative Code (WAC) 246-290-490, Cross-Connection Control, which became effective in April of 1999. The minimum required elements in a CCC program are as follows:

- An adopted local ordinance, resolution, or code that establishes the purveyor's legal authority and describes operating policies and the corrective actions of a CCC program.
- Develop and implement procedures and schedules for evaluating new and existing service connections to assess hazards.
- Develop and implement procedures and schedules that eliminate or control cross connections and ensure approved backflow preventers are properly installed.
- Ensure that personnel, including one certified Cross-Connection Control Specialist, are provided to develop and implement the CCC program.
- Develop and implement procedures to ensure approved backflow preventers are properly inspected and tested.
- Develop and implement a backflow prevention assembly testing quality control assurance program.
- Develop and implement procedures for backflow incident response.
- Include CCC program information in customer education materials.
- Develop and maintain CCC program records.
- Meet any additional CCC requirements if reclaimed water is distributed or received in the water service area.

PURPOSE AND SCOPE

This document establishes minimum standards for the City of Snoqualmie (City) to protect the public water supply from possible contamination from backflow. This document also describes minimum CCC program operating policies and provides guidelines for installation, testing, and maintenance of approved backflow devices. In addition, permitting and inspection requirements for existing and new backflow prevention devices are described, as well as various other components of the CCC program.

AUTHORITY

The Federal Safe Drinking Water Act of 1974 and the statutes of the Revised Code of Washington (RCW) Title 43 require purveyors to protect public water systems from contamination. In addition, WAC 246-290-490 establishes cross-connection control program requirements for the State. In Washington State, the Department of Health (DOH) is the lead agency for the development and administration of the State's CCC program. The City has an adopted cross-connection control ordinance in Chapter 13.13, CROSS CONNECTIONS, of the City's Municipal Code. This code establishes the City's authority in implementing a cross-connection control program and prohibits cross connections.

RESPONSIBILITY

The City is responsible for protecting its public water supply from contamination due to backflow of pollutants through water service connections. If the City determines that a backflow prevention device is necessary at a customer's premise, the City will notify the customer to install an approved backflow device. Installation of said backflow device(s) shall be a condition of continued water service from the City. Upon installation, the customer shall notify the City requesting inspection and testing of said device(s). The customer will be responsible for all applicable testing and inspection fees.

FAILURE TO COMPLY

Any person, firm, or corporation who violates any of the provisions of this document, or Chapter 13.13 of the Snoqualmie Municipal Code, may be punished in accordance with the Snoqualmie Municipal Code. Any person, firm, or corporation who violates any provisions and requirements of this document shall be subject to discontinuance of supply of City water to the premise. Discontinuance of the City's potable supply to the premise shall remain in effect until corrective action, as required by the City, is completed, tested, and approved.

CROSS-CONNECTION CONTROL PROGRAM

The City has implemented the required elements of the CCC program as listed previously. This document describes the City's current CCC program and also discusses program elements that the City needs to continue. The City is committed to protecting the public water supply from contamination by eliminating potential cross connections. The City's CCC program that follows includes a statement of its goals and objectives, the evaluation of CCC elements, and the program implementation schedule.

CCC PROGRAM GOALS AND OBJECTIVES

The goals and objectives of the City's CCC program consist of:

- Prevent contamination of the public water supply by eliminating cross connections;
- Inventory all potential cross-connection hazard areas; and
- Establish an inspection and maintenance program for all backflow prevention devices.

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The City will achieve these goals and objectives through the implementation of the CCC program that follows.

Evaluation of CCC Program Elements

The City is required to develop and implement a cross-connection control program. All required elements of a local CCC program must be documented and included in the City's Water System Plan. The evaluation of these CCC program elements and current level of implementation are presented as follows.

Cross-Connection Control Ordinance

This CCC program element requires that the purveyor "adopt a local ordinance, resolution, code, bylaw, or other written legal instrument" outlining the purveyor's program. In addition, this document must establish the purveyor's legal authority to implement a CCC program. Operating policies, technical provisions, and corrective actions of the CCC program also must be addressed in the legal document. Ordinance Number 1055 was passed by the City to authorize the CCC program described in Chapter 13.13 of the City's Municipal Code. This section establishes the City's authority to implement a cross-connection control program and prohibit cross connections.

In addition, the American Water Works Association (AWWA) published a manual entitled *Recommended Practice for Backflow Prevention and Cross-Connection Control* (AWWA M14) that outlines cross-connection control procedures that are recommended by the WAC requirements as a tool for developing a CCC program. This manual specifically lists types of backflow devices that should be used for different premises.

Evaluation of Service Connections

This CCC program element requires that the purveyor develop and implement procedures for evaluating existing and new service connections to assess the risk of connecting the consumer's premises to the purveyor's public water system. This element also requires that the purveyor notify the consumer within a reasonable timeframe of the evaluation results. New connections are required to be evaluated prior to service. Existing connections shall be inspected on a schedule acceptable to DOH.

The City has an established procedure for evaluating new service connections for potential cross connection. This risk assessment evaluation is performed during the building permit process for new water service applicants. If a backflow device is required as a result of this evaluation, the device, customer account number, property address, and other pertinent information are recorded in the City's CCC database. Inspections of existing premises are not currently being done due to budget constraints.

Cross-Connection Control and Elimination

This CCC program element requires that the purveyor eliminate existing cross connections wherever possible. If elimination is not possible, then approved backflow devices should be properly installed to eliminate the risk of contamination.

The City endeavors to eliminate potential cross connections where possible. The City does not allow any potential cross connection unless it is protected by an approved backflow device for which a permit has been issued. Backflow devices are inspected to ensure they are installed in the manner for which they were approved. Owners shall be responsible for following the provisions of

the City's CCC program. In addition, owners shall be responsible for the elimination or protection of all cross connections on their premises.

Personnel Certification

WAC 246-290-490 requires that personnel, including one certified Cross-Connection Control Specialist (CCS), are provided by the purveyor to develop and implement a CCC program. As of 2020, two City employees hold state certification as CCS. In addition, three City employees hold state certification as a Backflow Assembly Tester (BAT). The City will continue to provide properly certified personnel to implement the CCC program. The City has the properly certified staff to implement and maintain a CCC program as outlined by the State.

Backflow Device Inspection and Testing

DOH requires that all backflow devices are routinely inspected and tested by certified personnel. Inspections are required at the time of installation, annually thereafter, after a backflow incident, and/or after the assembly is repaired, reinstalled, or relocated.

The City endeavors to send out test notices annually to all owners with CCC devices. A licensed CCS must perform the testing. Testing dates and results are logged in the database. If a test fails, the owner is provided with a recommended action and timeframe for fixing the issue. The City maintains the authority to shut off water service if a customer does not comply with the CCC requirements.

Testing Quality Control Assurance Program

This program element requires development and implementation of a quality control assurance program for the testing of backflow prevention devices. Successful implementation of this program element ensures that all backflow prevention devices are tested in a similar manner and kept in optimal condition.

The City shall ensure that all testing procedures are completed in a consistent manner. Only certified individuals shall be utilized to test backflow devices. Testing shall be recorded on the proper forms and maintained at the Public Works facility. Examples of testing forms can be found in the AWWA *Recommended Practice for Backflow Prevention and Cross-Connection Control* manual. Individuals performing testing shall be trained as outlined by the State, fulfilling all necessary requirements to comply with WAC 246-290-490.

Individuals performing testing shall adhere to the following steps: 1) use only properly operating and calibrated gauge equipment; 2) follow proper field test procedures; 3) consult the manufacturer's repair and maintenance manual when disassembly is required; 4) use only original manufacturer spare parts; and 5) retest the backflow device immediately after repair or maintenance.

In addition to the above steps, the following testing procedures shall be performed by a certified individual: 1) advise the customer of an impending test/inspection so that the customer's staff may participate; 2) notify the fire department when shut down of a fire service is necessary; 3) flush residential dirt through test cocks before attaching test gauges; 4) ensure that the high and low pressure bypass hoses of the test kit are connected to the proper test cocks (open test cocks slowly when bleeding air through the bypass hoses); 5) utilize a certified testing agency to

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properly calibrate test gauges; and 6) test assemblies before the warranty expiration date. For further testing details, refer to the AWWA manual.

Incident Response

This CCC program element requires that the purveyor develop a backflow incident response plan. The following paragraph outlines the City's response to a backflow incident. Other emergency response procedures are included in the City's *Emergency Response Plan.*

Emergency Condition: Water System Contamination Due to a Backflow Incident

Impact on System: Potentially major impact. Water not suitable for potable use – loss of supply.

Emergency Response:

1. Notify the City CCS personnel of the incident.
2. Shut down the affected mains, if possible, to contain the affected contaminants.
3. Notify DOH of the backflow incident.
4. Notify all customers of the problem and instruct them to boil all water to be used for consumption and cooking or issue a no-drinking warning.
5. Flush affected water mains to remove contaminants.
6. Disinfect reservoirs and water mains, as necessary, to remove contaminated residuals.
7. Analyze water quality in other parts of the distribution system to ensure that all contaminants were contained.

This document and the City's *Emergency Response Plan* outlines procedures to be followed if an emergency arises. When a cross-connection control emergency is called into the Snoqualmie Police Department or other emergency responder during non-business hours, the responder will notify the Public Works Department on-call person. This person assesses the emergency and notifies any water division personnel as deemed necessary, depending on the severity of the emergency.

Public Education

Another CCC program requirement is that educational information of the CCC program be included in existing water system materials that are distributed to customers. Educational materials can be included in pamphlets, brochures, bill inserts, public service announcements, and consumer confidence reports (CCRs). The City currently includes cross-connection information in the CCR, which is included in **Appendix L** of the City's Water System Plan.

Recordkeeping

Purveyors also must develop and maintain records of their CCC program, as mandated by DOH. At a minimum, purveyors must maintain the following records:

- Master list of service connections and/or premises where backflow devices are protecting the public water system.
- Assessed hazard level of each backflow device.
- Inventory information on approved air gaps, including location, degree of hazard, installation date, inspection history, inspection results, and personnel conducting inspections.
- Backflow inventory information, including location, assembly description, installation date,

inspection history, test and repair history, test results, and inspecting personnel.

- Atmospheric Vacuum Breaker (AVB) inventory, including location, description, installation date, inspection history, and inspecting personnel.
- Program summary and backflow incident reports.

The City currently maintains these records at the Public Works facility to allow access by water system personnel.

Reclaimed Water Requirements

The final CCC program requirement is for systems that distribute or receive reclaimed water within their water service area. For these systems, additional cross-connection control requirements may be imposed by DOH in any permits issued in accordance with Chapter 90.46 RCW.

The City owns and operates a reclaimed water distribution system, which is used for irrigation. DOH requires that any facility that uses reclaimed water and also uses the City's water supply must install an air gap or reduced pressure backflow assembly to protect the City's water distribution system.

PROGRAM IMPLEMENTATION

The City's CCC program is an ongoing effort that requires staffing and resources to ensure its effectiveness in protecting the quality of drinking water in the distribution system. The City will continue its inspection requirements and procedures for installed approved backflow devices and document the inspections to comply with the regulatory requirements.

The City currently meets the regulatory requirement of having at least one CCS within the water division to administer its CCC program. The City will continue its active training program to comply with these requirements.

Appendix H

Water System Construction Standards

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CHAPTER 4

4.000 WATER

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CHAPTER 4

4.000 WATER

4.010 Specifications

These Technical Specifications shall be used for all water system construction in the Snoqualmie Ridge II Development.

All construction of water mains and related appurtenances shall conform to these Standards, applicable American Water Works Association (AWWA) Specifications and the current "English unit" edition of the *Standard Specifications for Road, Bridge, and Municipal Construction,* prepared by the Washington State Department of Transportation and the American Public Works Associations, Washington State Chapter, herein referred to as the "Standard Specifications." The general requirements of applicable AWWA and the Standard Specifications shall apply unless they are inconsistent with any of the provisions of this particular section. Should inconsistencies occur, these Standards shall have precedence.

References to sections in the Standard Specifications are based on the latest published edition of the Standard Specifications. If section references in future editions of the Standard Specifications are changed, these Standards will be deemed to be revised accordingly without re-issuance.

4.020 General

Design details, workmanship and materials shall be in accordance with Washington State Department of Health requirements, the City of Snoqualmie Comprehensive Water System Plan, the Snoqualmie Ridge II Water Supply, Storage, and Primary Distribution Facilities Project Report, and the Standard Specifications, except as they may be modified by this chapter.

Standard Plans need not be repeated on the plans unless required for plan clarification for the contractor, if being modified to suit a specific design, or as required by the City. However, standard plans shall be clearly referenced on the drawings.

The installation of all water system facilities shall be done in accordance with plans which have been approved by the City Engineer. Plans shall be prepared in accordance with Chapter 1.

Installation of all water main pipe and appurtenances, including placement and compaction of bedding and backfill, shall occur only when an authorized representative of the City is present to directly observe the work. All costs of such inspection shall be paid by the developer/contractor.

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The City may waive this requirement on a case by case basis if continued evidence of sound construction practice by the contractor so warrants. In any event, installations which do not meet the requirements of these standards shall be removed and replaced at the contractor's sole expense.

If, after the contractor has given the City Engineer the required 48-hour notification prior to commencing construction and after a pre-construction conference has been held with the City where the contractor has clearly defined the waterline construction schedule and if the City's inspector or representative is absent from the site during the time the contractor has scheduled construction of the waterline, then such absence shall constitute the City's waiver of the requirement that the installation of water main pipe and appurtenances shall only occur when an authorized representative of the City is present.

4.030 Easements

All water mains not in the public right-of-way shall be in easements granted to the City of Snoqualmie.

In general, all easements for water mains shall be a minimum of 15 feet wide. In special circumstances, the easement width may be reduced to 10 feet with the approval of the City Engineer.

No permanent structures are allowed to be constructed in the easement area. No additional building setback line from the edge of easements is required. Access to easements for maintenance and/or repair of the utility by the City shall not be restricted or prohibited by fences, rockeries, plantings and other improvements.

Easements shall be located within single lots rather than being split by a lot line. Easements may be located on two adjacent lots with the approval of the City Engineer.

The locations of water mains within easements shall be accurately surveyed and staked to guide the construction. Any deviation from this requirement must be approved by the City Engineer.

4.040 System Design

Water mains shall be sized to provide adequate domestic service plus fire flow at the required residual pressure. Fire flow requirements will be determined by the City of Snoqualmie Fire Marshal, however, the quantity of water required will, in no case, be less than that established by the Comprehensive Water System Plan.

The minimum water main size shall be 8 inches diameter. Larger size mains are required in specific areas outlined in the *Comprehensive Water System Plan* and as modified by the *Water System Project Report.* Water mains in cul-de-sacs or "hammerhead" tracts beyond the last hydrant may be reduced to 4-inch or 6-inch with the City Engineer's approval. Fire hydrant laterals that exceed 50' in length

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or also serve a building sprinkler system shall be 8" in diameter.

Unless otherwise required, the following guidelines shall apply for hydrant number and location.

1. Hydrant spacing shall be in accordance with the requirements listed in Table A-111-B-1, Number and Distribution of Fire Hydrants, in the 2003 International Fire Code or as otherwise approved by the Fire Marshal.

2. Where possible, hydrants shall be located at street intersections, except that in no event shall any hydrant be more than three hundred (300) feet from the center of the frontage of any lot except on dead-end cul-de-sacs with dwellings only. When the dead-end cul-de-sac exceeds three hundred (300) feet from the center of the intersection to the end of the cul-de-sac, a hydrant shall be located at the intersection and additional hydrant(s) will be required. The hydrant(s) shall be located no more than three hundred (300) feet from the center of the frontage from the last lot on the cul-de-sac, and shall comply with the maximum requirements listed above.
3. When any portion of a proposed building is in excess of 150 feet from a water supply on a public or private street on-site hydrants shall be provided when required by the Fire Chief.

The installation of all water mains and appurtenances shall be in accordance with the construction plans as approved by the City Engineer. Plans shall be prepared in accordance with Chapter 1.

All materials shall be new and undamaged. Unless otherwise approved by the City Engineer, the same manufacturer of each item shall be used throughout the work. Contractors shall furnish a water tight plug of the appropriate size which shall be installed in the end of the water main anytime work is delayed or stopped.

Minimum vertical separation of 18 inches shall be maintained between sanitary sewers and water mains in accordance with Department of Health requirements. The minimum cover for water main of 42 inches may be reduced to 24 inches, when approved by the City Engineer, to provide as much vertical separation as possible. In no case water mains shall be deeper than 60" from final grade unless approved by the City Engineer.

A minimum of 10 feet horizontal clearance shall be maintained between a water main and a sewer main and a minimum of 5 feet horizontal clearance shall be provided between a water main and a storm drain whenever possible.

The plans shall clearly indicate that the longest standard length of water pipe shall be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to encase the water pipe and/or sewer line in pipe or concrete.

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Dead ends shall be minimized by looping of all mains where practical. Where dead end mains are unavoidable, a standard 2-inch blow-off assembly is required. A fire hydrant may be used in lieu of a blow-off assembly if flow and pressure are sufficient to warrant a hydrant assembly.

All requests for witnessing of tests shall be scheduled with the City 48 hours in advance. Failure to give adequate advance notice may result in delay to the contractor.

A State of Washington Department of Health approved backflow prevention device is required for all irrigation systems.
Valves are required on all legs of tees and crosses, except tees for fire hydrants, irrigation systems and firelines (i.e. sprinkler systems) where one valve on the stub at the mainline tee shall be provided. In-line and mainline valves are required at 600 foot maximum spacing.

Plan approval by the City Engineer will not constitute approval of a backflow prevention system. A separate backflow prevention system design must be submitted and approval must be obtained prior to initiation of water service.

The following notes shall be included on each plan set:

1. All workmanship and materials shall be in accordance with the latest "English" unit edition of the *Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT/APWA). The Standard Specifications, except as they may be modified or superseded by the Snoqualmie Ridge II Development Standards and these plans, shall govern all phases of work.

2. No connection to the existing mains will be allowed except by means of an approved backflow prevention device prior to satisfactory flushing, testing, disinfection, and receipt of satisfactory bacteriological test results.

3. All connections to existing water mains shall be cut-in tees unless otherwise approved by the City Engineer. Connections to on existing mains will be made by the City at the developer's expense or by the developer pursuant to a developers agreement. Cut-in tee connections may only be made by contractors or personnel approved by the City to perform that specialized work. Installation of Cut-in tees must be observed by the City Engineer or the City's representative. Only City personnel shall operate City's water system valves.

4. All water pipe shall be bedded. Bedding material shall conform to "Bedding Material for Rigid Pipe" as specified in Section 9-03.15 of the Standard Specifications or pea gravel. Bedding shall be placed to a minimum depth of 4 inches under the barrel of the pipe and up to the springline of the pipe. As an option the contractor may use controlled

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density fill.

5. Trench backfill shall be excavated native material or Bank Run Gravel for Trench Backfill conforming to Section 9-03.19 of the Standard Specifications, depending on the suitability of the native material to compaction. Suitable native material shall be free from mud, muck, organic matter, broken pavement, rocks greater than 6-inch dimension, except in pipe zone (one foot above the crown of the pipe) where no rocks shall be greater than 2-inch dimension, and other deleterious material, and must be capable of compaction to the required density at the time of placement. If the native material cannot be readily compacted to the specified density, only Bank Run Gravel shall be utilized and any insufficiently compacted native material shall be removed and replaced with Bank Run Gravel. The native material shall only be used and remain in place if in situ compaction testing provides sufficient evidence that the specified compaction is uniformly attained.

   Backfill shall be placed in lifts not to exceed 12 inches in loose depth, and each lift shall be mechanically compacted to the following densities:

   - Along and over the pipe to a depth of one foot above the crown of the pipe – 90 percent of maximum density.
   - Above one foot above the crown of the pipe in unimproved areas – 90 percent of maximum density.
   - Above one foot above the crown of the pipe in areas to be paved (roadway and/or sidewalk) – 95 percent of maximum density.
   - Maximum density to be determined by ASTM: D-1557.

6. The owner or the owner's authorized agent shall notify the City Engineer of a person who can be contacted regarding problems during construction on a 24 hour basis.

7. Open-cut transverse crossings of roadways after final paving are not to be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, all transverse trenches shall be backfilled with controlled density fill. Transverse crossings in roadway under construction with ATB applied may be backfilled with crushed rock.

8. Call underground locate line 1-800-424-5555 a minimum 48 hours prior to any excavations.

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9. Before any construction or development activity, a preconstruction meeting must be held between the contractor, the City's inspector and other appropriate parties.

10. The City Engineer must be notified at least 48 hours prior to commencing construction. Installation of all water main pipe and appurtenances, including placement and compaction of bedding and backfill, shall occur only when an authorized representative of the City is present to directly observe the work. All costs of such inspection shall be paid by the developer/contractor. No part of the water system shall be put into use until the City has completed its normal inspections and has concluded that the work is acceptable. The City Engineer may waive this requirement on a case by case basis if continued evidence of sound construction practice by the contractor so warrants. In any event, installations which do not meet the requirements of these standards shall be removed and replaced at the contractor's sole expense.

    If, after the contractor has given the City Engineer the required 48-hour notification prior to commencing construction and after a pre-construction conference has been held with the City where the contractor has clearly defined the waterline construction schedule and if the City's inspector or representative is absent from the site during the time the contractor has scheduled construction of the waterline, then such absence shall constitute the City's waiver of the requirement that the installation of water main pipe and appurtenances shall only occur when an authorized representative of the City is present.

11. A copy of these approved plans must be on the job site whenever construction is in progress.

12. When fire flow will be interrupted to allow construction, City and of Snoqualmie Fire Department shall be given 24 hours notice of time period and locations affected.

    Phone Numbers:

Snoqualmie Public Works Department	(425) 831-4919
City of Snoqualmie Fire Department	(425) 888-1551

13. Water main pipes shall be installed with minimum of 42 inches and a maximum of 48 inches of cover to finished grade above pipe. Cover may be reduced locally to 24 inches if necessary to avoid utility conflicts with City Engineer approval.

14. Water service stub-outs shall be located by a white 2x4 stake marked "WATER" in black letters. The stake and stub-out shall extend above surface level, be visible, and directly adjacent to each other. The stub-out

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shall not be connected to the stake in any manner.

15. Hydrants are to be fitted with 4" Storz Adapter pumper ports. Hydrants shall be either Mueller or M&H. All hydrants are to be located 5 feet minimum from driveway approaches.

16. Water meters are to be located clear of driveways and sidewalks. All lot services shall be 1 inch diameter from main to house. Use Ford meter setter VBH74-18W-11-44.

17. Valve box cover plate lugs to be lined up with water main.

18. Water main pipe shall be ductile iron Class 52.

4.050 Existing Utilities

When utility services occupy the same space as the new water main, the contractor shall do all necessary excavation to fully expose such services. The contractor shall protect said services and work around them during excavating and pipe laying operations. The contractor shall be responsible for all damages to the services due to his operation and shall immediately notify the engineer and arrange for replacement of all damaged services.

In the event of conflicts the contractor shall remove and restore existing catch basin connections, inlet connections, drains, side sewers, inlets, and other sewerage and drainage facilities. All restoration shall be constructed to Snoqualmie Ridge II standards.

The contractor may encounter private water service utilities (water service lines running between the City's union at the meter and private residences) during work operations. Records of these utilities are not maintained by the City and will not be field located by the City. It shall be the contractor's responsibility to ascertain the location of and protect these private utilities from damage.
Where it is feasible and practical, as determined by the City Engineer, all abandoned pipes and appurtenances shall be removed. If it is decided by the City Engineer that the pipes can be abandoned in-place, then ends of abandoned pipes shall be plugged for a distance of 2 pipe diameters with commercial concrete.

4.060 Trench Excavation and Backfill for Water Mains

Trench excavation and backfill shall conform to the requirements of Section 7-10 of the Standard Specifications except as modified herein and by the Standard Plans.

Trench backfill shall be excavated native material or Bank Run Gravel for Trench

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Backfill conforming to Section 9-03.19 of the Standard Specifications, depending on the suitability of the native material to compaction. Suitable native material shall be free from mud, muck, organic matter, broken pavement, rocks greater than 6-inch dimension, except in pipe zone (one foot above the crown of the pipe) where no rocks shall be greater than 2-inch dimension, and other deleterious material, and must be capable of compaction to the required density at the time of placement. If the native material cannot be readily compacted to the specified density, only Bank Run Gravel shall be utilized and any insufficiently compacted native material shall be removed and replaced with Bank Run Gravel. The native material shall only be used and remain in place if in situ compaction testing provides sufficient evidence that the specified compaction is uniformly attained

Backfill shall be placed in lifts not to exceed 12 inches in loose depth, and each lift shall be mechanically compacted to the following densities:

- Along and over the pipe to a depth of one foot above the crown of the pipe – 90 percent of maximum density.

- Above one foot above the crown of the pipe in unimproved areas – 90 percent of maximum density.

- Above one foot above the crown of the pipe in areas to be paved (roadway and/or sidewalk) – 95 percent of maximum density.

Compaction of trench backfill material shall be accomplished with mechanical tampers, vibratory compactors, or other equipment suitable to the characteristics of the soils. Water settling shall not be employed. The use of compaction equipment directly over the pipe shall be controlled and limited in accordance with installation instructions and recommendations provided by the manufacturer of the pipe.

In-place density testing of compacted backfill material shall be in accordance with ASTM: D-1556 (sand cone device) or ASTM: D-2922 (nuclear density gauge). Laboratory maximum density testing of fill material shall be performed in accordance with ASTM: D-1557.

A minimum of one compaction test is required for each 200 feet of trench or as may be directed by the City Engineer. Trenches failing the required test shall have the backfill removed, replaced, and re-compacted. Compaction testing shall be done only by an approved testing laboratory at the contractors/developers expense. All test results and analysis shall be promptly given to the City Engineer. The City reserves the right to contract with an independent testing laboratory for testing of trench backfill. This testing shall also be done at the contractors/developers expense.

When, after excavating for pipes to the foundation level, the in situ material at the

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bottom of the trench is determined by the City Engineer to be unsuitable, excavation shall be continued to such additional depth as may be required by the City Engineer. Unsuitable foundation material shall be replaced with foundation gravel conforming to Section 9-03.17 of the Standard Specifications.

4.070 Trenching Transverse to Existing Roadway

Open-cut transverse crossings of roadways after final paving are not to be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, all transverse trenches shall be backfilled with controlled density fill. Transverse crossings in roadway under construction with ATB applied may be backfilled with crushed rock.

4.080 Jacking, Augering, or Tunneling

Tunneling may be required by the City Engineer under pavements, buildings, road tracks, etc. The developer/contractor shall install the pipe by jacking, augering or tunneling, or installing the pipe in a casing pipe by a combination of these methods.

When use of a casing pipe is required, the developer/contractor shall be responsible to select the gauge and size required, unless otherwise indicated on the drawings, and consistent with his jacking or augering operation, and shall be set to line and grade. During jacking or augering operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner and to the line and grade as designated. The annular space between the casing and the pipe shall be filled with controlled density fill or as otherwise approved.

The faces of the jacking pit shall be constructed by driving steel sheets, or installing timber lagging as the excavation proceeds. The sheets, or lagging, shall extend a minimum of 5 feet below the bottom of the pit except at the entrance of the utility. Prior to jacking or augering activities, shop drawings describing these activities, including dimensioning of pit length and size of underground borings and complete description of shoring, shall be submitted to the city engineer for approval.

4.090 Bedding

All water pipe shall be bedded. Bedding material shall conform to "Bedding Material for Rigid Pipe" as specified in Section 9-03.15 of the Standard Specifications or pea gravel. Bedding shall be placed to a minimum depth of 4-inches under the barrel of the pipe and up to the springline of the pipe. As an option the contractor may use controlled density fill.

4.100 Shoring

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The requirements of the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act of 1973 (WISHA) shall apply to all excavation, trenching, and ditching operations on this project. All trenches over four (4) feet in depth shall be shored, braced, and shielded in compliance with applicable Federal and/or State regulations. Shoring, bracing, or shielding shall be required in all street area excavations, including those areas where all existing pavement is being removed. Sloping to the angle of repose will be permitted only in non-critical, off-street areas.

Shoring and cribbing of excavations and trenches shall be provided in accordance with the provisions of Section 2-09 of the Standard Specifications.

The shoring system shall be a commercially available shoring system designed for the depths anticipated on the project. The shoring system shall meet all requirements of the Washington State Safety and Health Act (WISHA) and United States federal Occupational Safety and Health Act (OSHA).

Construction safety is the developer's/contractor's responsibility and all persons on site are subject to the safety direction of developer/contractor personnel. The City of Snoqualmie and its representatives do not have either control or authority on site safety issues and therefore assumes no responsibility for the safety of others.

4.110 Controlled Density Fill

Controlled Density Fill (CDF) shall be a mixture of Portland cement, fly ash, aggregates, water, and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing, and excavatable material which will result in a hardened dense, non-settling fill. Slump shall be 3 inches to 6 inches.

CDF shall be discharged from the mixer by any reasonable means into the area to be filled. The CDF shall be brought up uniformly to the elevation shown on the plans.

CDF shall not be placed on frozen ground.

CDF patching, mixing, and placing may be started if weather conditions are favorable, when the temperature is at 34 degrees F and rising. At the time of placement, CDF must have a temperature of at least 40 degrees F. Mixing and placing shall stop when temperature is 38 degrees F or less and falling. Each filling stage shall be as continuous an operation as is practicable.
Trench section to be filled with CDF shall be contained at either end of trench section by bulkhead or earth fill.

Contractor shall provide steel plates to span utility trenches and prevent traffic contact with CDF for at least 24 hours after placement or until CDF is hard enough to prevent rutting by construction equipment or traffic.

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Controlled Density Fill shall be a mixture of Portland cement, fly ash, aggregates, water, and admixtures which have been batched and mixed in accordance with Section 6-02.3 of the WSDOT/APWA Standard Specifications.

Materials

1.	Portland Cement	AASHTO M 85 or WSDOT 9-01
2.	Fly Ash	Class F
3.	Aggregates	WSDOT 9-03.1(2)B
4.	Admixtures	WSDOT 9-23.6

4.120 Sawcutting Existing Pavement and Sidewalk

The contractor shall make a vertical sawcut to the full depth of existing asphalt or concrete pavement for all crossings of the existing pavement.

Where necessary to remove existing curb, gutter, driveways and sidewalk, full panels shall be removed. Care shall be taken during removal to protect adjacent sidewalk panels, concrete curbs and existing utilities from damage. In no case shall any segment of sidewalk or curb and gutter be shorter than 5 feet in length.

4.130 Pavement Patching

This work shall consist of the reconstruction and patching of existing pavement that is scheduled to remain. The following provisions shall apply regardless of the condition or type of roadway base and pavement types encountered. Asphalt pavements shall be patched with asphalt, and concrete pavements shall be patched with concrete.

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

Before the patch is constructed, all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The patch shall be flush with the surrounding surface and shall provide a smooth riding surface for passing traffic.

Asphalt shall be Asphalt Concrete Pavement, Class B. The depth of asphalt shall be a minimum of four inches in all areas, and shall be increased as necessary to match the existing thickness. Asphalt Concrete Pavement shall be laid over four inches of crushed surfacing and shall be placed in max. 2" lifts. All faces of patch that will receive asphalt shall be clean and dry and have tack coat applied.

Cement Concrete Pavement shall be a 3-day mix conforming to the requirements of Section 5-05 of the WSDOT/APWA Standard Specifications. The thickness of concrete shall be a minimum of 6 inches, and shall be increased as necessary to match the existing thickness.

Until such time as the permanent patch placed, the contractor shall install a temporary patch over the unfinished portions of work that will affect traffic in any way. Temporary pavement patch shall be accomplished by using 3 inches of cold mix (MC 250) or 3 inches of ATB.

4.140 Pipe and Fittings for Water Mains

Water mains shall be ductile iron pipe for all sizes.

Pipe:

Ductile iron pipe shall conform to ANSI Specification A21.51-1976, or AWWA Specification C151-76, and current amendments thereto. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined in accordance with AWWA C-104 to a minimum thickness of 1/16", and the exterior shall be coated with coal tar varnish. Each length shall be plainly marked with the manufacturer's identification, year cast, thickness, class of pipe and weight. The pipe shall be furnished with mechanical joint or push-on joint, conforming to ANSI Specification A21.11 (AWWA C-111), except where otherwise noted calling for flanged joints. The ductile iron pipe shall be thickness Class 52 and shall be manufactured by Tyler, US Pipes, Griffin, or approved equal.

Fittings:

All fittings shall be short-bodied or ductile iron, Class "D", complying with applicable AWWA Specifications. Fittings shall be cement lined and either mechanical joint or flanged, as indicated on the drawings.

Provide concrete blocking at all fittings and horizontal or vertical angle points. All fittings to be blocked shall be wrapped with 8-mil polyethylene plastic. At no time will the concrete be allowed to cover joints and bolt heads or nuts.

Concrete blocking shall be properly formed with plywood or other acceptable forming materials and shall not be poured around joints. The forms shall be stripped prior to backfilling. Concrete thrust blocks must be in place at least 24 hours before beginning the pressure test to allow the concrete to set. Concrete shall be Class 3,000.

4.150 Pipe Installation for Water Mains

Cover of pipe shall be 42 inches minimum from top of pipe to finish grade. The minimum cover for water mains may be reduced to 24 inches, when approved by the City Engineer, to provide for as much vertical separation as possible. Max cover shall be 60 inches.

Adjustment in depth to avoid conflicts with other utilities shall be accomplished by either deflecting the pipe at the joints in conformance with manufacturer's recommendations or by the use of vertical bends and thrust blocking. The contractor shall lay the pipe at grades which limit high points in the waterline to

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the specific locations indicated on the construction plans. Water line shall be staked with horizontal and vertical locations outside the roadway prism.

4.160 Pipe Restraint Methods

1. All Fire Hydrants shall be restrained with 3/4" all-thread shackle rods. 90 degree elbows shall also be restrained with shackle rods and pipe clamps or mega lugs in addition to thrust blocks.

2. Shackle rods shall be connected to mechanical joints using "star" bolts (ductile iron lugs not allowed).

3. Shackle rods shall be galvanized or be stainless steel.

4. All pipe restraint systems and their application must be approved by the City Engineer.

4.170 Backflow Prevention

Backflow prevention devices shall be installed and maintained by the service customer on any service connection to the City's water supply system, where backflow prevention is necessary for protection of the City's water supply.

For irrigation, the minimum level of backflow prevention required is a double check valve assembly. Fire services shall have a double detector check valve assembly. Air gaps and reduced pressure backflow assemblies are required wherever a potential health hazard exists.

All backflow preventers shall be approved by the State of Washington. The City of Snoqualmie's backflow prevention program is based on WAC 248-54-285.

Plan approval does not constitute approval of a backflow prevention system. A separate backflow prevention system design must be submitted and approval must be obtained from the City Engineer prior to initiation of water service.

4.180 Water Main Connections

To prevent contaminated water in the new main from entering the existing distribution system, a state approved backflow prevention device shall be used on the line supplying the water. Prior to use, the device and all necessary data shall be submitted to the City Engineer for approval. During the hydrostatic pressure test, the temporary connection between the new main and the existing distribution system shall be removed.

No permanent connections to the existing system shall be made until the new water main has been tested and approved by the City Engineer. Temporary connections of the untested, unapproved new water main to the existing system shall not be made without the installation of an approved backflow prevention device between the new water main and the existing system. The contractor shall

verify the size, material, and location of the existing main at the connection point prior to installing the new connecting water main. The contractor is required to design the connection and testing configuration for connection points. These shall not be constructed without design approval by the City Engineer.

Prior to commencement of any work on a connection to an existing water main, the contractor will assemble all materials, equipment, and labor necessary to properly complete the work.

All connections to existing water mains shall be made by contractors or personnel approved by the City to perform that specialized work.

"Wet Tap" connections, if approved, to make tie-ins to the existing water mains shall consist of a tapping tee and tapping valve as approved by the City Engineer and in accordance with the Standard Plan for "Connection to Existing Main."

Where cut-in connections are approved by the City Engineer, the City will shut off water supply in the existing main. The contractor (or developer) requiring the particular connection for the proposed water main extension shall notify the City at least fifteen (15) days in advance of such required connection installation (and water main shutoff) so that the City may publish and distribute notices to the affected property owners. The water works material and labor for the connection and all other related items shall be furnished by the contractors (or developer) requiring the water main extension. The connection shall be in accordance with the Standard Plan for "Connection to Existing Main." Only the City will shut down the existing water main, and only the City will notify the owners affected by the water shutoff. The connection must be completed within the time allowed by the City in order to minimize disruption of service. All City cost and expense for the above work shall be paid for by the contractor/developer.

4.190 Hydrostatic Pressure Testing and Disinfection

The water main pipes shall be disinfected and tested before being placed in service. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the contractor. The section to be disinfected shall be thoroughly flushed at maximum flow prior to chlorination.

Testing and disinfection shall take place after all underground utilities are installed and compaction of the roadway section is complete.

Pipelines outside of roadway sections shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the contractor shall furnish and install temporary blocking.

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Water mains and appurtenances shall be pressure tested in accordance with Section 7-11.3(11) of the Standard Specifications.

Mains and appurtenances shall be disinfected when being tested. Disinfection shall be performed in accordance with 7-11.3(12) E through O of the Standard Specifications.

PRESSURE TEST PROCEDURE

GENERAL:

1. Test shall comply with Section 7-11.3(11) of the Standard Specifications.
2. Witnessed pressure test shall not be conducted until all other utility cross trenching and rough grading are completed.
3. The new line shall be separated from existing approved lines.
4. The test gauges shall be certified for accuracy.
5. The test gauges shall be graduated in 5 psi increments with a range of 0-400psi.
6. Contractor shall perform a successful pressure test before calling for the witnessed test.
7. Makeup water:
   a. Only potable water metered from the City system.
   b. Transport only in containers or trucks certified for potable water.
   c. At time of use, disinfect with chlorine at concentration of 50 mg/l.
8. Before testing, the lines shall be flushed at a minimum velocity of 2.5 ft/sec.

PROCEDURE:

1. Install a pump and test gauge at the low end of the test section.
2. Test the line and fire hydrants with all valves open and with adequate back pressure on any closed valve at the end of the test section.
3. Test each hydrant by:
   a. Closing the auxiliary valve, then opening a port cap (carefully) while observing the gauge.
   b. The closing the hydrant operating valve then opening the auxiliary valve to atmosphere while observing the gauge.

4. Test each remaining line valve by closing it, then releasing (venting) to atmosphere the pressure from behind it, then observing the test gauge.

4.200 Valves for Water Mains

All valves shall meet the standard for AWWA valves.

All valves 10-inch and smaller shall be resilient seated gate valves. All valves 12-inch and larger shall be butterfly valves.

1. Resilient-Seated Gate Valves

All valves ten (10) inches in diameter and smaller shall be resilient-seated gate valves. Valves shall be iron-body resilient-seated gate valves with non-rising stems (NRS) opening to the left and equipped with a two (2) inch square operating nut. Valves shall meet the full requirements of the AWWA C-509 and current amendments thereto. The valves shall have "O" ring stem seals which shall withstand the test pressure without leakage. Valves shall be rated at 200 P.S.I.G., working pressure, furnished with either flanged and/or mechanical joints as noted on the drawings

Valves shall be Mueller, M&H or an approved equal.

Valves shall be set with the stems vertical. The axis of the valve box shall be common with the projected axis of the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

2. Butterfly Valves

All valves twelve (12) inches in diameter and larger shall be butterfly valves rated at 150 psi, working pressure, furnished with either flanged or mechanical joints complete with extension stem and telescoping valve box. All butterfly valves shall be of the tight closing, rubber seat type. Valves shall meet the full requirements of AWWA C504, Class 150-B, and be tested in strict accordance with Section 13, thereof. Butterfly valves shall be Henry Pratt Company "Groundhog", "Dresser '450", or "Mueller Lineal III" or an approved equal. Valves shall be able to withstand test pressure.

3. General for All Valves

Valve boxes for both gate valves and butterfly valves shall be equal to the "Rich 940-B" Model, complete with a deep well base type valve box bottom section. The flared end of the valve box base shall be set below the bottom section of the 2 inch operating nut or below the stuffing box. The top section shall be 18" long "Seattle" type. Lids shall have 2" deep skirt.
The valve box shall be placed over the valve or valve operator in such a manner that the valve box does not transmit shock or stress loads to the valve. The lower casting of the unit shall be installed in such a manner as to be supported by a minimum backfill of not less than two inches in thickness. The casting shall not rest directly upon the body of the valve or upon the water main. (Use 5 inch cast iron soil pipe for extension of valve boxes.)

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Valve operating nut extensions shall be in accordance with the Standard Plan "Valve Box and Valve Operating Nut Extension."

4.210 Hydrants

New fire hydrants shall be M & H "Reliant" #929, or Mueller "Centurion". Hydrants shall be compression type, meeting AWWA Standards. Fire hydrants shall be installed at proper grade without extension sections to the barrel.

The fire hydrants shall be the break-away type, in which the valve will remain closed if the barrel is broken. Inlet connections shall be for six (6) inch pipe, and shall be mechanical joint. The hydrant and tee shall be blocked in accordance with the Standard Plan "Horizontal Blocking Details."

The gate valve shall be flanged to the mainline tee and provided with a mechanical joint for connection to the hydrant lateral pipe and shall be shackled as indicated on the Standard Plan.

The hydrants shall have a barrel diameter of not less than eight and one-half inches (8 1/2"), and the main valve opening shall be not less than five and one-quarter inches (5 1/4") in diameter. The fire hydrants shall be equipped with two (2), two and one-half inch (2 1/2") hose nozzles and one (1), four inch (4") pumper port STORZ Adaptor. Nozzle and port threads shall conform to City of Snoqualmie Standards.

After installation, all fire hydrants (regardless of factory finish) shall be wire brushed and field painted with a minimum of one coat of yellow paint per the Standard Plan.

Between the time that the hydrant is installed and the completed facility is accepted by the City and placed in operation, the hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner as approved by the City, to clearly indicate that the hydrant is not in service. Hydrants shall be installed plumb.

Before acceptance by the City, Fire Hydrants shall drain at a reasonable rate to prevent freezing as determined by the Public Works Department.

4.220 Service Connections

Connecting of services will require installation of a continuous new service line from the main to the water meter. Upon completion of the installation of the water main (before testing and disinfection) install the required services by connecting to the water main and extending the service line to the property line as indicated on the Standard Plans.

Service lines for residential property shall be 1 inch (minimum size), 200 psi.

SDR 9 poly pipe high MOL plastic manufactured by Phillips Drisco pipe.

Larger service lines shall be of the type and style as shown on the Standard Plans.

Service lines shall be perpendicular to the water main and a straight line from the main to the meter box, unless approved otherwise by City Engineer.

Corporation stops shall be "FORD" or "MUELLER" of the type and style noted on the Standard Plans. Before reconnecting the service line, the contractor shall flush the service line to remove any debris and to verify that the service line has full pressure to the meter box.

Included as a part of the service connection shall be the furnishing and installation of the meter box complete with a lid, set flush with the existing or proposed finished grade. Upon completion of each service line as indicated herein, the contractor shall flush the service line to remove debris and further verify that the service line has full pressure to the meter box. In unimproved areas, meter boxes shall be marked with a painted 2 x 4 stake.

Service lines between the main and the property line shall be placed at a trench depth sufficient to maintain a 3-foot cover over the top of service for its full length, taking into consideration the final finished grade of any storm ditches, the final grade of the street, and final grade at the property line. Tracer tape and wire wrapped around the pipe shall be installed on all service lines. No meter boxes shall be located in driveways or any traffic areas.

4.230 Air Relief Assembly

Air relief valves shall be installed at all high points in water line at locations approved by the City Engineer. Air relief valves shall conform to the details shown on the Standard Plans.

4.240 Approval of Alternate Materials

"Approved Equal" Process

The City Engineer shall be the sole judge of whether suppliers or materials qualify as "or equal" and/or "or equivalent" substitutions as may be indicated herein or on the standard plans. As a minimum, submit catalog cuts clearly showing the equivalency. The developer/contractor shall have the full burden of proof in proving equivalency. Incomplete submittals will be rejected. Allow 20 working days after receipt of all required information for the approval process.

Other Substitutions

In order to minimize the costs to the City in maintaining a spare parts inventory, to minimize the need for additional training, and to increase reliability, the City has standardized several key water system components as listed in these design and construction standards and as shown on the standard plans. The items do not include the words "or equal" and/or "or equivalent". The developer/contractor

shall only supply those specific manufacturers' items and models unless prior approval for the substitution has been granted.

Other manufacturer's equipment may be substituted for those specified, provided that the City Engineer has approved the substitute equipment prior to beginning of construction. The following procedures will be followed.

Submit the following data:

(a) Catalog Data

(b) Weight Information

(c) Certified Assembly Drawings

(d) Affidavit of Compliance with AWWA Specifications and the supplementary specifications contained herein.

(e) An actual complete, operable working unit proposed for the substitution. This sample will be returned if the equipment is not approved. If approved, it shall become the property of the City for its use in possible future replacement of the substitute unit.

Approval to substitute will be made based on a comparison of the proposed item with the City's approved standard. Substitutions which require the City to increase its inventory of spare parts, or require re-training of maintenance personnel will not be approved.

In order to alert maintenance crews as to the existence of non-standard items, the projects record drawings prepared by the developer/contractor shall clearly state: THIS INSTALLATION WAS MADE USING (item type, manufacturer, model) with a leader pointing to the item in question.

The developer/contractor shall supply two each of any special tools needed for installation, operation, repairs or maintenance at no cost to the City.

Allow sixty (60) working days to approve the requested substitution.

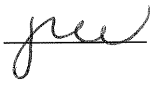
Approved: AB#04-172 11/8/04 Attest: Jodi Warren/CMC City Clerk

PRELIMINARY - CITY REVIEW ONLY

LIST OF STANDARD DRAWINGS

CHAPTER 4 – WATER

TITLE	DRAWING
Fire Hydrant	4-01
Valve Marker Post and Hydrant Bollard	4-02
1" Single Meter Service	4-03
Radio Read Conduit	4-04
1 ½" and 2" Single Meter Service	4-05
Connection to Existing Main	4-06
Valve Box and Operating Nut Extension	4-07
Valve Operating Extension Fabrication Details	4-08
2" Blow-Off Assembly	4-09
1" Combination Air Valve Assembly	4-10
2" Combination Air Valve Assembly	4-11
Standard Horizontal Blocking Details	4-12
Standard Vertical Blocking Details	4-13
Water Meter – 3", 4", 6" Meter Details	4-14
Water Meter – 3"-6" Material List	4-15
Irrigation D.C.V.A. – ¾"-1"	4-16
Irrigation D.C.V.A. – 1½"-2"	4-17
Irrigation D.C.V.A. – 2½"-3"	4-18

Approved: 

Fire Sprinkler D.C.D.A. and Vault w/F.D.C. 4-19

Fire Sprinkler D.C.D.A. and F.D.C. Material List 4-20

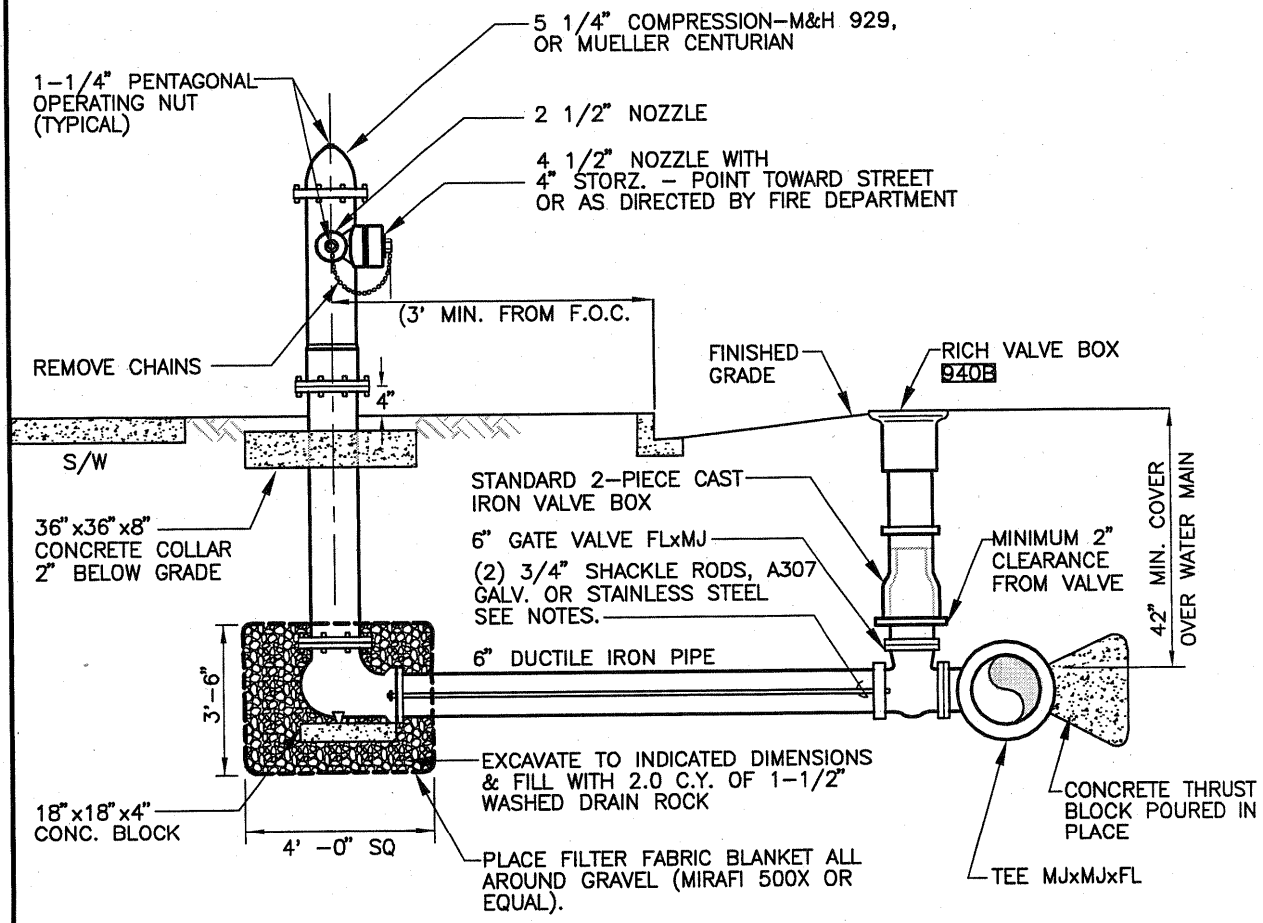
Fire Hydrant and F.D.C. Location 4-21

Flushing New Mains 4-22

since the original Pre Application Review (PAR). The original layout did not provide the degree of street connectivity between Parcels as the current proposal does. The plat design was changed to address connectivity and other layout issues during pre-application review, however, the final grading implications were still unknown at that time. Preliminary Plat 19 as proposed contains the use of retaining walls throughout the Plat. Through the course of the Preliminary Plat review process, Quadrant has revised grading and thereby lowered many of the walls that originally exceeded six-feet in height. However, a few locations remain where retaining walls exceed six-feet in height. In an effort to eliminate a sewer pump station in Parcel N-4, the City waives, with the approval of this Preliminary Plat, the six-foot wall height limitation at the following locations: at the rear lot boundaries of lots 146 -150, and 154 – 162. As result of the fixed location of the infiltration pond and the I Creek ravine, in conjunction with the Applicant's requirement to provide for a collector road right of way between the Plat and the Lake Alice Road the City also waives the 6-foot height limitation at the rear lot boundaries of lots 116-124. Lastly, The City also waives the limitation at the rear lot boundary between lots 97-101 and 102-109 and lots 28-38 and 84-93 to allow sections of wall eight feet in height. Between said lots (lots 97-101 and 102-109 and lots 28-38 and 84-93), the Applicant walls should constructed as two tiered walls not exceeding four-feet per wall with a minimum three foot separation to reduce the visual height of the wall and to allow for plantings between the two walls.

34. A 14 foot, two-tiered block retaining wall comprised of an eight-foot wall and an adjacent six-foot wall is proposed on the rear lot boundary of lots 220-224 and a portion of lot 225. An eight foot block retaining wall is proposed along the remainder of lot 225 and along the east boundary of lot 226. These are the only locations where the retaining wall is in excess of six feet and has not been reduced in height to meet the 6-foot height limitation established in Mixed Use Final Plan Condition 4.11, and has not been waived by the city based on a determination that there is no feasible lot layout, plat design or site grading with a wall . Lots 224-226 of Preliminary Plat 19 are directly adjacent to an existing home in SR I (34402 SE Carmichael Street) and Tract 7-50, a Residential Owners Association tract. Pursuant to SR II Mixed Use Final Plan Condition 4.11 the block walls proposed on the rear lot boundary of lots 220 - 226 should be reduced to not more than six feet in height. The proposed grading in this location is driven by the Applicants desired lot yield rather than compliance with the MUFP Condition. Also, as proposed, the walls in excess of six-feet at the east boundary of lots 224-226 present an adverse impact to the existing adjacent lot in SR I. Lot layout, plat design and grading and construction techniques exist that would retain the overall proposed plat design and at the same time comply with the Condition 4.11. Therefore the City cannot approve walls higher than 6 feet in this portion of the plat. Lots 220-226 should be re-configured to create 5 wider, shallower lots around the cul-de-sac as opposed to the seven lots currently proposed. In addition, the applicant should seek a grading easement from the Residential Owners Association (ROA) on the adjacent SR I ROA open space tract to the east to allow for reduction of the wall height in that area to six feet or less.

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NOTES:

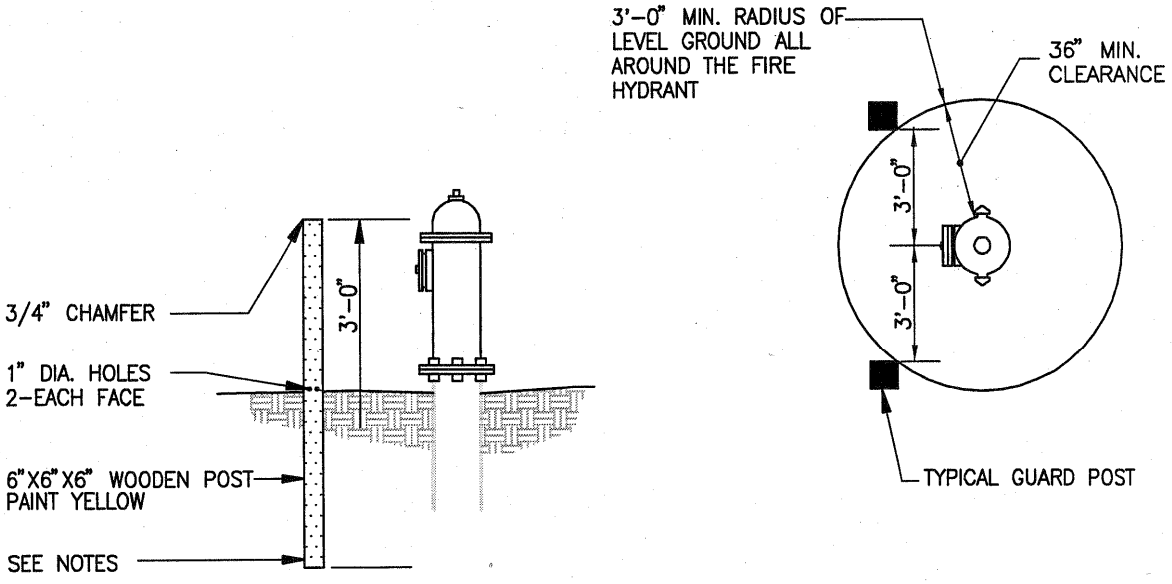
1. HYDRANT LATERALS OVER 50' SHALL BE 8" MINIMUM.
2. SHACKLE RODS SHALL BE CONNECTED TO MECHANICAL JOINTS WITH STAR BOLTS.
3. AN UNOBSTRUCTED THREE FOOT MINIMUM WORKING AREA RADIUS SHALL BE PROVIDED AROUND ALL HYDRANTS.
4. SHACKLE RODS SHALL BE CONSTRAINED AT ALL INTERMEDIATE JOINTS WITH PIPE CLAMPS.
5. FIELD PAINT HYDRANTS WITH ONE COAT SHERWIN WILLIAMS ALKYD GLOSS INDUSTRIAL ENAMEL SAFETY YELLOW NO. 554Y37.
6. PLACE FELT PAPER BETWEEN FIRE HYDRANT AND BLOCK.
7. BARREL EXTENSIONS ARE NOT PERMITTED.

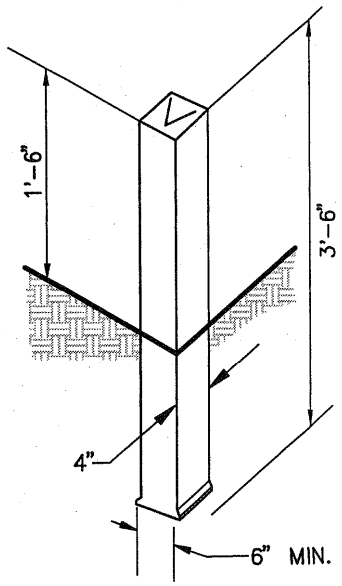
SNOQUALMIE RIDGE II			
FIRE HYDRANT			
DWN	CKD	DATE	DWG
ER		09/16/04	4–01

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NOTES:

1. GUARD POST SHALL BE 6"x6"x6" LONG DOUGLAS FIR (STRUCTURAL GRADE) TREATED WITH CHEMANITE AND DRILLED WITH 2-1" DIA. HOLES EACH WAY TO PROVIDE BREAKAWAY SAFETY FEATURE.
2. VALVE MARKER SHALL BE "VALVE MARKER", AS MANUFACTURED BY FOG TITE METER SEAL COMPANY. PAINT WITH TWO COATS OF ALKYD BASE HIGH GLOSS BLUE PAINT. PAINT DISTANCE FROM THE VALVE MARKER ON THE POST WITH BLACK ENAMEL PAINT.
3. VALVE MARKER POST TO BE USED FOR ALL MAINLINE VALVES OUTSIDE PAVED AREAS.
4. GUARD POSTS TO BE A MINIMUM 10'-0" FROM EDGE OF NEAR TRAFFIC LANE WHERE NO CURBS EXIST HYDRANTS TO BE LOCATED ACCORDINGLY.

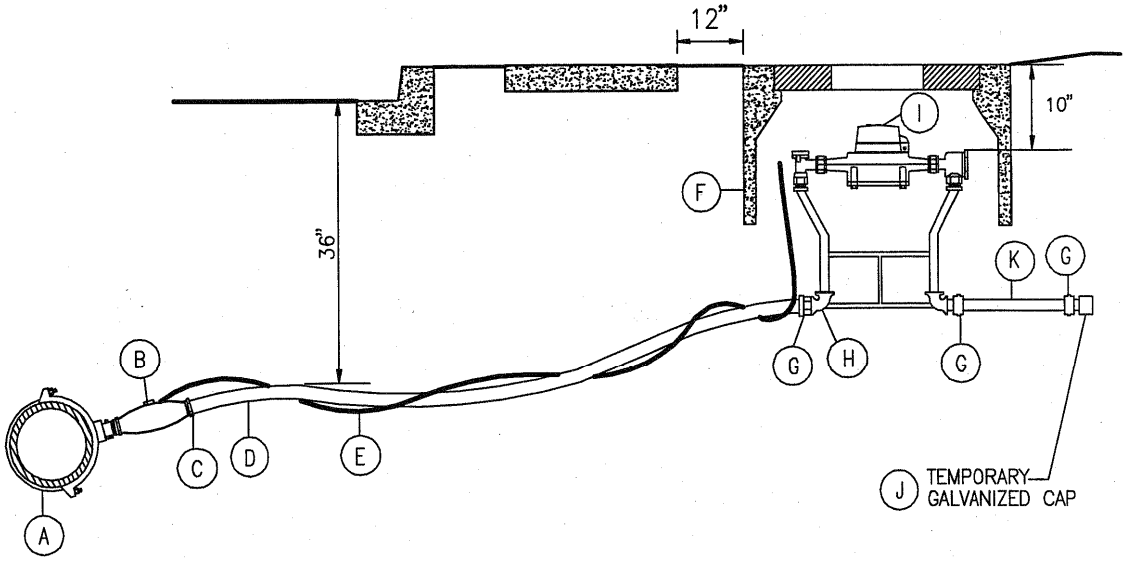
SNOQUALMIE RIDGE II

VALVE MARKER POST AND HYDRANT BOLLARD

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	ER		09/30/04	4-02

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PARTS

(A) SERVICE SADDLE, 1" FEMALE IRON PIPE THREAD (FIP) ROMAC 101 SADDLE. FOR PVC OR AC MAINS, STRAPS TO BE DOUBLE STAINLESS STEEL; SADDLE TO BE PRE FORMED FOR C-900 (PVC).

(B) CORPORATION STOP – 1" MALE IRON PIPE THREAD MIP x 1" MIP, FORD BALLCORP FB 500 OR MUELLER ORISEAL H10013.

(C) COMPRESSION ADAPTER – 1" FIP x 1" COPPER TUBE SIZE (CTS), MUELLER H15451 ONLY

(D) SERVICE PIPE – 1" CTS PHILLIPS DRISCOPIPE SDR 9-200 PSI.

(E) TRACER WIRE – SHALL BE 12 GAUGE SOLID COPPER CORE, BLUE COLORED INSULATION. WIRE ENDS TO BE STRIPPED AND TIED TO CORPORATION STOP AND TO METER SETTER. A MINIMUM OF 12 INCHES OF WIRE IS TO EXTEND INTO METER BOX AND LEFT COILED JUST UNDER THE LID. WIRE IS TO BE CONTINUOUS WITHOUT SPLICES.

(F) METER BOX – SHALL BE FOGTITE NO. B-10 METER BOX WITH CAST IRON HINGED READER LID.

(G) COMPRESSION ADAPTER – 1" CTS x 1" MIP; MUELLER H-15428 OR FORD Q-FITTINGS.

(H) METER SETTER – 1" x 18" FORD OR MUELLER WITH ANGLE VALVE AND PADLOCK WINGS, CHECK VALVE, AND DOUBLE PURPOSE NUTS; FOR A 1" METER.

(I) METER – SENSUS 1" SR-2 (CUBIC FEET) WITH RADIO READ.

(J) TEMPORARY CAP – 1" GALVANIZED.

(K) SERVICE LINE – 1" CTS PHILLIPS DRISCOPIPE SDR 9 – 200 PSI, 4 FEET LONG.

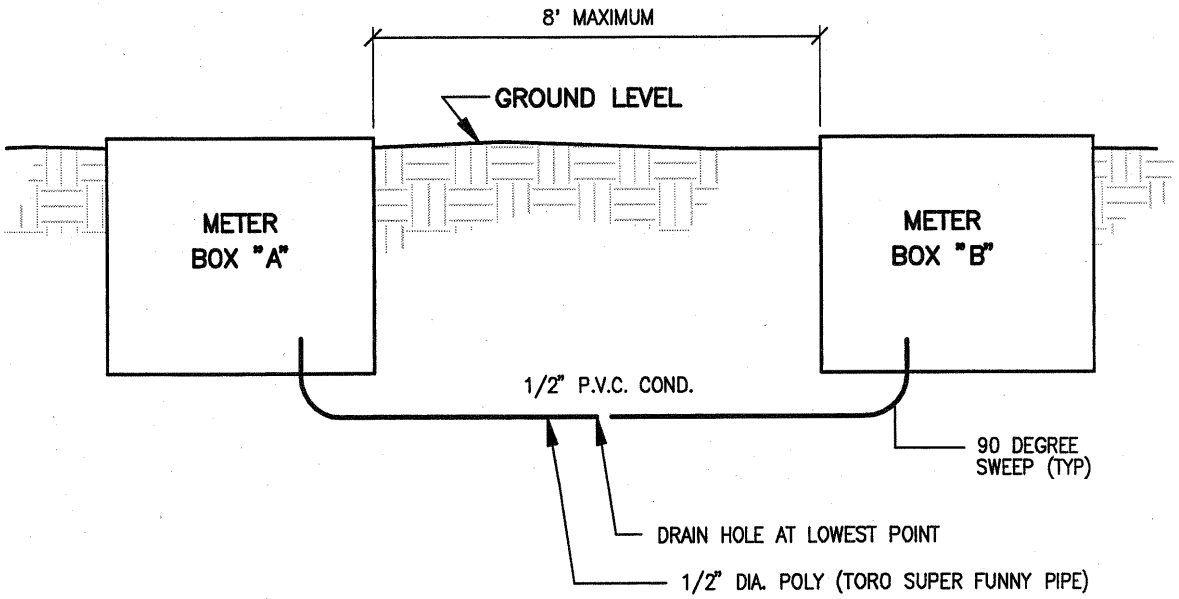
NOTES:

1. SERVICE LINE SHALL BE PERPENDICULAR TO THE WATER MAIN UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. STAINLESS STEEL INSERT STIFFENERS REQUIRED FOR ALL COMPRESSION FITTINGS.
3. ALL INCIDENTAL PIPE FITTINGS SHALL BE BRASS (NOT GALVANIZED).
4. PVC SERVICE PIPE NOT RECOMMENDED ON PRIVATE PROPERTY SIDE OF METER BOX.
5. METER BOXES SHALL BE LOCATED OUTSIDE DRIVEWAYS OR TRAFFIC AREAS OR SIDEWALKS.
6. INSTALL TEMPORARY (NONFUNCTIONAL) IDLER AT TIME OF SETTER INSTALLATION.

SNOQUALMIE RIDGE II			
1" SINGLE METER SERVICE			
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NOTE:

INSTALL WHEN TWO METERS ARE WITHIN 8 FEET OF EACH OTHER.

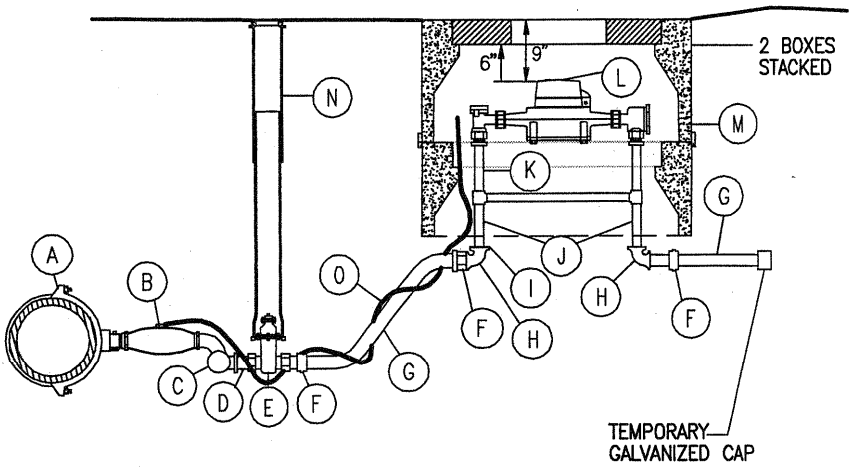
SNOQUALMIE RIDGE II			
RADIO READ CONDUIT			
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NOTES:

1. SERVICE LINE SHALL BE PERPENDICULAR TO THE WATERMAIN UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
2. STAINLESS STEEL INSERT STIFFENERS REQUIRED FOR ALL COMPRESSION FITTINGS.
3. ALL INCIDENTAL PIPE FITTINGS SHALL BE BRASS (NOT GALVANIZED).
4. PVC SERVICE PIPE NOT RECOMMENDED ON PRIVATE PROPERTY SIDE OF METER BOX.
5. BOTTOM OF VALVE BOX TO BE KEPT CLEAR OF GATE VALVE, SWING JOINT, SERVICE LINE, ETC. VALVE BASE FLANGE TO BE SET ON WELL COMPACTED SAND OR SANDY GRAVEL SO AS TO NOT SETTLE ONTO SERVICE LINE AND/OR FITTINGS.
6. CORPORATION STOP TO BE INSTALLED LEVEL AT SPRING LINE OF WATER MAIN.
7. METERS SHALL BE LOCATED OUTSIDE DRIVEWAYS OR TRAFFIC AREAS.



1-1/2" AND 2" SERVICES

(A) SERVICE SADDLE – ROMAC 202, 2" FEMALE IRON PIPE THREAD (FIP) (FOR PVC OR AC PIPE – ROMAC 202S; STRAPS TO BE PREFORMED FOR C-900 (PVC)). DOUBLE U-BOLT STRAP FOR DUCTILE IRON.

(B) CORPORATION STOP – 2" MIP x MIP, FORD BALLCORP FB 500 OR MUELLER ORISEAL H9969.

(C) SWING JOINT – TWO 2" BRASS STREET ELLS; ONE, BRASS 90° ELBOW.

(D) NIPPLE – 2" BRASS x 12" LONG.

(E) GATE VALVE – 2" RESILIENT SEAT, CAST IRON BODY, SCREWED WITH 2" SQUARE OPERATING NUT.

(F) COMPRESSION ADAPTER – 2" MALE IRON PIPE THREAD (MIP) x COPPER TUBE SIZE (CTS), MUELLER H15428 OR FORD Q-FITTING.

(G) SERVICE PIPE – 2" CTS PHILLIPS DRISCOPIPE SDR 9-200 PSI.

(H) 90° ELBOW – 2" BRASS.

(I) BRASS BUSHING – 2" x 1-1/2". NOT REQUIRED FOR 2" METER SETTER.

(J) NIPPLE – 2" BRASS OR 1-1/2" BRASS. LENGTH TO FIT.

(K) METER SETTER – WITH VERTICAL INLET, BALL VALVE WITH PADLOCK WINGS, CHECK VALVE, AND OMIT BYPASS. TO BE: FORD 1-1/2" – VBH86-12; 2" – VBH87-12 OR MUELLER 1-1/2" B2422-2 x 12; 2" B2422-2 x 12.

(L) METER – SENSUS 1-1/2" OR 2" SR (CUBIC FEET) WITH RADIO READ.

(M) METER BOX – TWO CONCRETE METER BOXES STACKED. FOGTITE NO. 2 IN NONTRAVELED AREAS AND SIDEWALK. LID TO BE CONCRETE WITH HINGED CAST IRON READER LID. METER BOXES IN TRAFFIC AREAS SHALL BE ONLY AS APPROVED BY THE CITY ENGINEER.

(N) VALVE BOX – SHALL BE RICH #940B WITH SEATTLE TYPE 18" TOP SECTION (NON-LUGGED) AND DEEP WELL BASE SECTION.

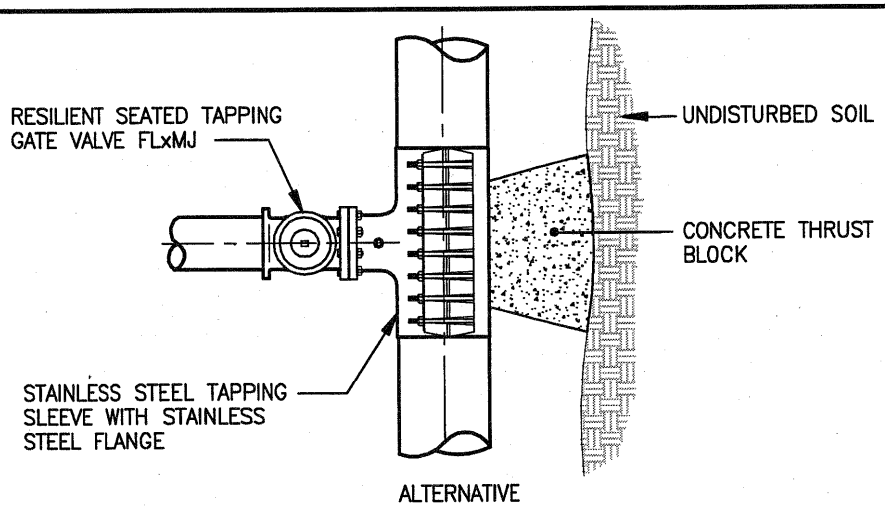
(O) TRACER WIRE – SHALL BE 12 GAUGE SOLID COPPER CORE, BLUE COLORED INSULATION. WIRE ENDS TO BE STRIPPED AND TIED TO CORPORATION STOP AND TO METER SETTER. A MINIMUM OF 12 INCHES OF WIRE IS TO EXTEND INTO METER BOX AND LEFT COILED JUST UNDER THE LID. WIRE IS TO BE CONTINUOUS WITHOUT SPLICES.

SNOQUALMIE RIDGE II

1-1/2" AND 2" SINGLE METER SERVICE

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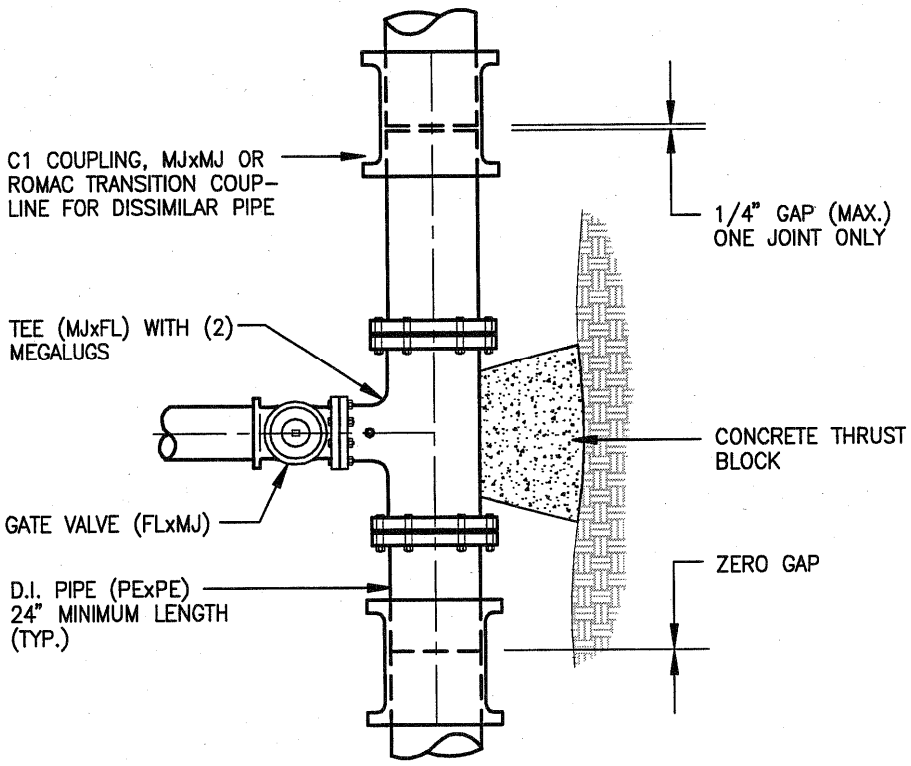
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ALTERNATIVE

WET TAP

(IF SPECIFICALLY APPROVED)



CUT-IN

NOTES:

1. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.
2. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND BACKFILL ARE POURED.

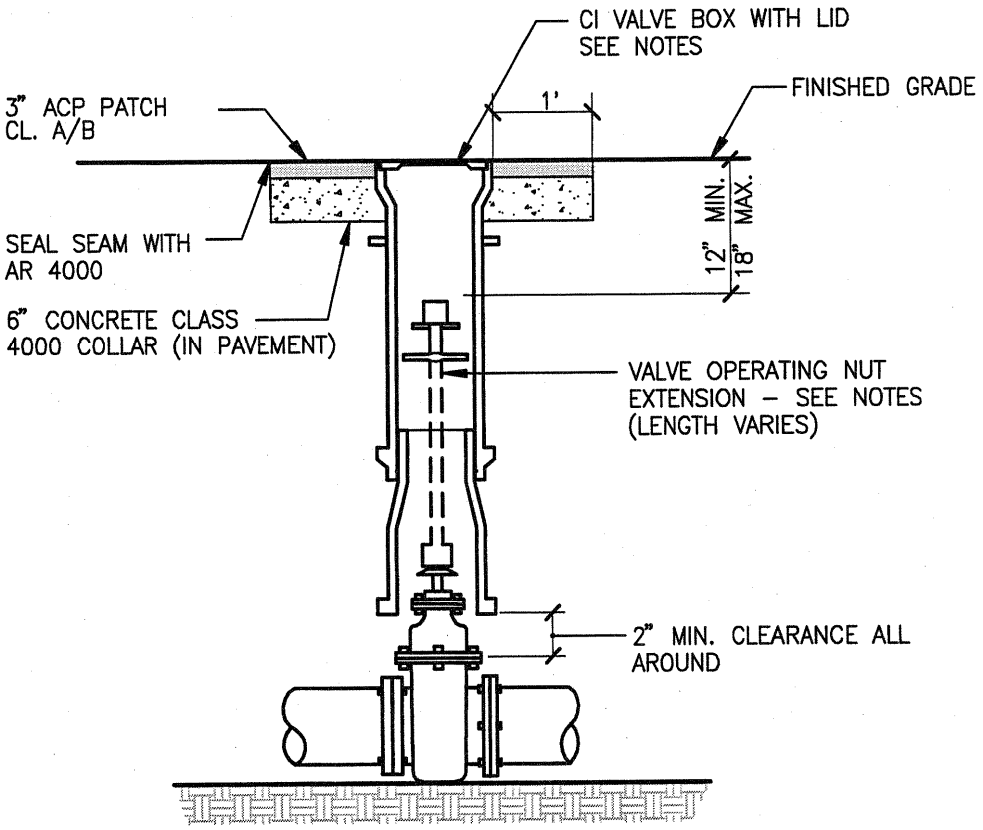
SNOQUALMIE RIDGE II

CONNECTION TO EXISTING MAIN

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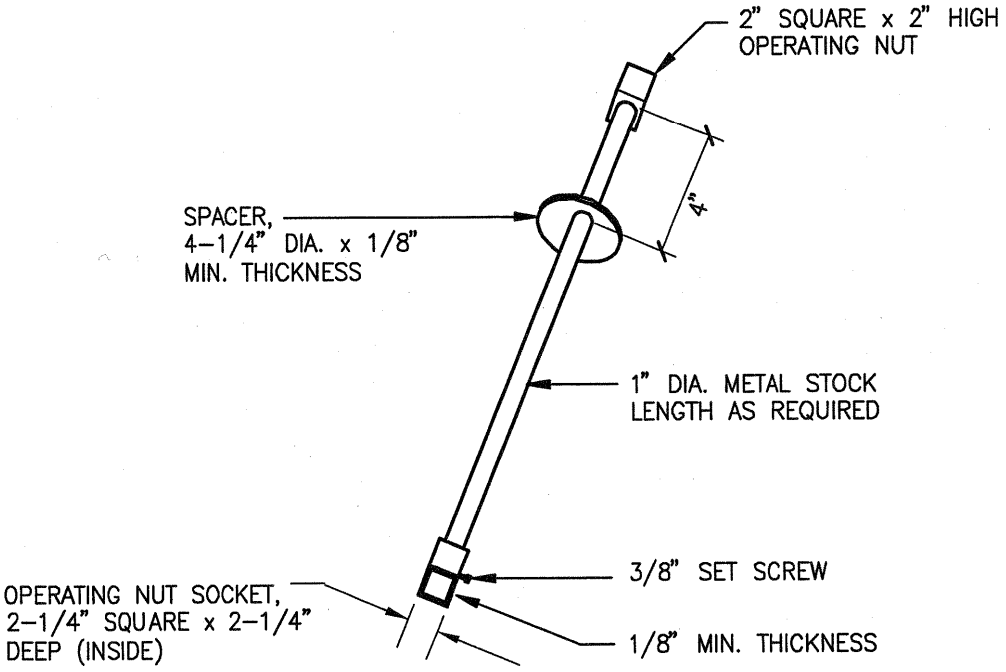
NOTES:

1. 5" DIAMETER HUBBED CAST IRON SOIL PIPE MAY BE USED FOR VALVE BOX EXTENSION.
2. ONLY ONE VALVE BOX EXTENSION TO BE USED PER VALVE.
3. ONLY ONE OPERATING NUT EXTENSION TO BE USED PER VALVE. (SEE DETAIL 4–08)
4. OPERATING NUT EXTENSION REQUIRED WHEN VALVE NUT IS OVER 4 FEET DEEP.
5. VALVE BOX SHALL BE RICH 940B WITH 18" SEATTLE STYLE TOP SECTION.
6. SET VALVE BOX LID 2 INCHES BELOW UNPAVED ROADWAY SHOULDER SURFACE.
7. VALVE LID MARKED "WATER".
8. 2" SKIRT ON LID.

SNOQUALMIE RIDGE II			
VALVE BOX AND OPERATING NUT EXTENSION			
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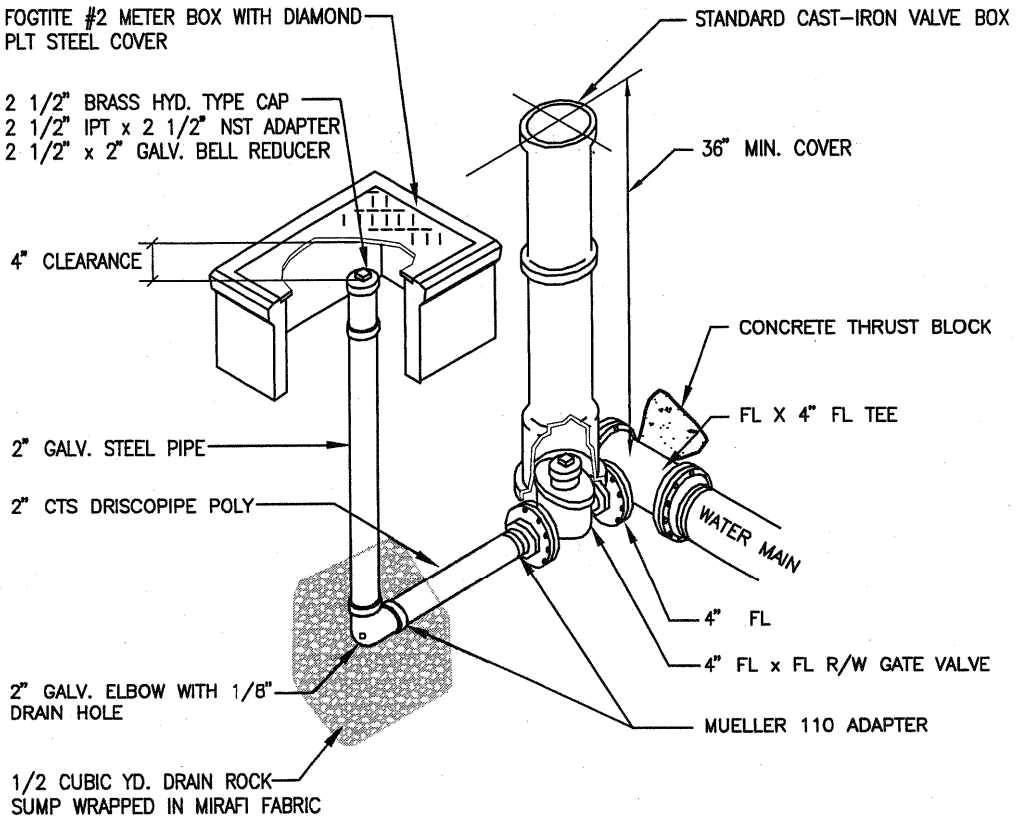
NOTES:

1. EXTENSIONS ARE TO BE A MIN. OF ONE (1) FOOT LONG WITH ONLY ONE EXTENSION TO BE USED PER VALVE.
2. FILLET WELD ALL COMPONENTS.
3. ALL EXTENSIONS ARE TO BE MADE OF STEEL SIZED AS NOTED, AND PAINTED WITH TWO COATS OF INDUSTRIAL ALKYD GLOSS PAINT. COLOR TO BE WHITE.

SNOQUALMIE RIDGE II			
VALVE OPERATING EXTENSION FABRICATION DETAILS			
K:\ENGR\LIBRARY\DETAILS\SRII\CHAPTER 4\4-08.DWG	DWN: ER	CKD: JSF	DATE: 09/16/04	DWG: 4-08

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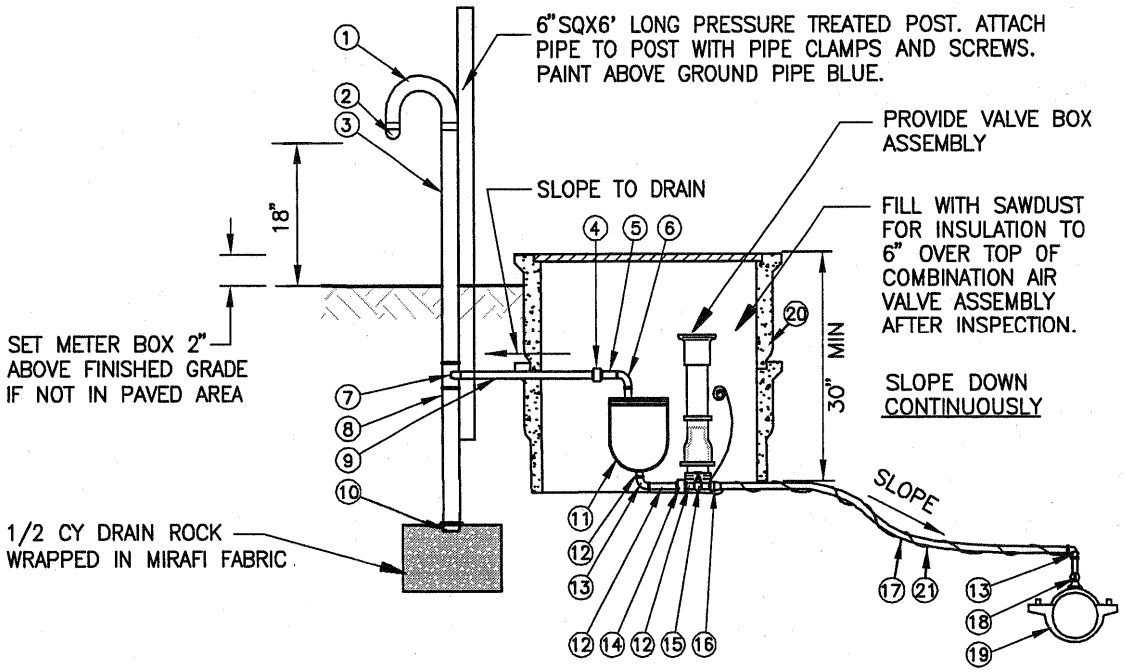
NOTES:

1. PLACE CONCRETE THRUST BLOCKS PER STANDARD DETAILS 4-12.

SNOQUALMIE RIDGE II				
2" BLOWOFF ASSEMBLY				
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NOTES

1. ALL FITTINGS TO BE BRASS OR COPPER FROM WATER MAIN TO 1" COMBINATION AIR VALVE ASSEMBLY.
2. 1" GALVANIZED PIPE ABOVE GRADE TO BE PAINTED WITH 2 COATS RUSTOLEUM HIGH GLOSS BLUE PAINT.
3. COMBINATION AIR VALVE ASSEMBLY MUST BE INSTALLED AT THE HIGHEST POINT IN THE LINE. IF THE HIGH POINT FALLS IN A LOCATION WHERE THE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL LENGTH OF LINE TO CREATE A HIGH POINT WHERE THE ASSEMBLY CAN BE INSTALLED.

1. 1" 180° OPEN PATTERN RETURN BEND
2. 1" BEEHIVE STRAINER
3. 1" GALV. IRON PIPE. LENGTH AS REQ'D
4. 1" UNION
5. 1" GALV. IRON NIPPLE
6. 1" 90° BEND
7. 1" TEE
   1" CLOSE NIPPLE
   1" 90 BEND
8. 1" GALV. IRON PIPE 18" LONG
9. 1" GALV. IRON PIPE TO FIT
10. 1" CAP WITH 1/8" HOLE FOR DRAIN
11. 1" COMBINATION AIR VALVE APCO 143C
12. 1" BRASS NIPPLE
13. 1" 90° BEND, BRASS, & 1" 90° STREET ELL, BRASS (INSTALL 90 BEND ON CORP, ALIGN PARALLEL WITH WATERMAIN. TURN SO THAT ELL IS NOT OVER CORP OPERATING NUT.)
14. 1" UNION, BRASS
15. 1" BALL CURB STOP, FORD B11-4444, OR MUELLER B20283
16. 1" CTS X 2" MIP COMPRESSION ADAPTER – MUELLER OR FORD.
17. 1" CTS PHILLIPS DRISCOPIPE SDR-9- 200 PSI
18. CORP STOP, MIP x MIP FORD BALLCORP OR MUELLER ORISEAL.
19. SERVICE SADDLE, ROMAC 202 IPT
20. FOGTITE NO. 2. CONCRETE METER BOXES STACKED WITH 3/8" STEEL TRAFFIC COVER.
21. TRACER WIRE- SHALL BE 12 GUAGE SOLID COPPER COPPER CORE, BLUE COLORED INSULATION. WIRE ENDS TO BE STRIPPED AND TIED TO CORP STOP AND TO METER SETTER. A MINIMUM OF 12 INCHES OF WIRE IS TO EXTEND INTO METER BOX AND LEFT COILED JUST UNDER THE LID. WIRE IS TO BE CONTINUOUS, WITHOUT SPLICES.

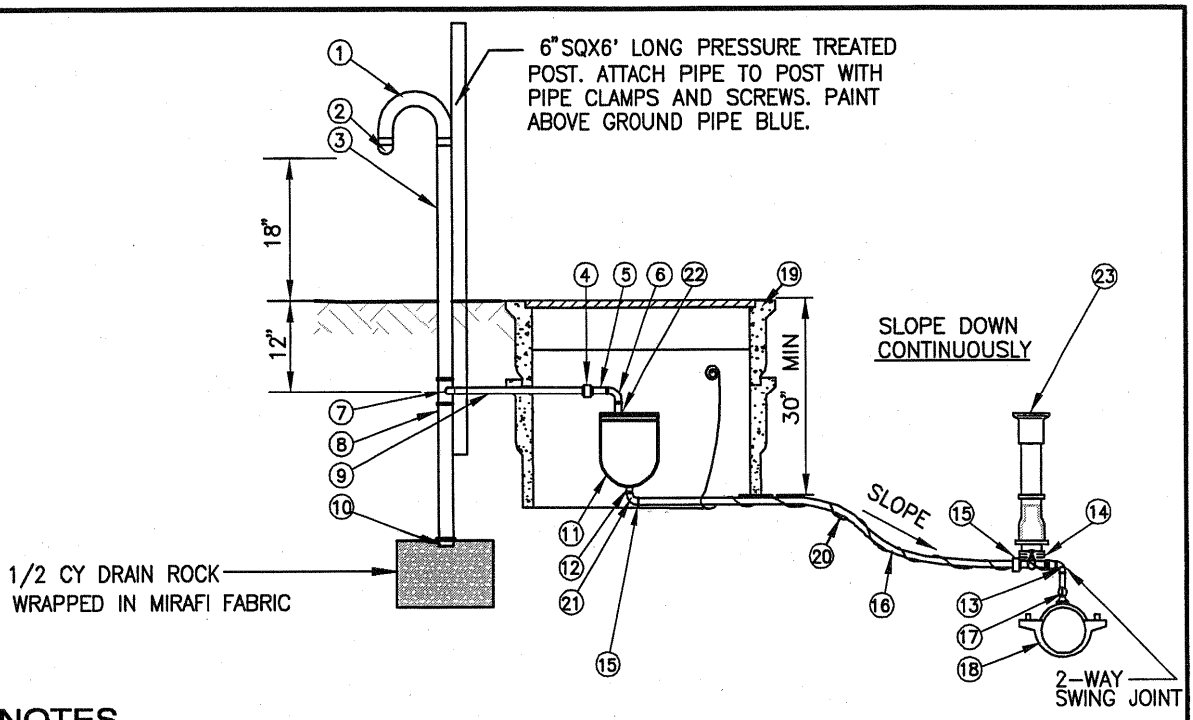
SNOQUALMIE RIDGE II

1" COMBINATION AIR VALVE ASSEMBLY

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	ER	JSF	09/16/04	4-10

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NOTES

1. ALL FITTINGS TO BE BRASS OR COPPER FROM WATER MAIN TO 1" COMBINATION AIR VALVE ASSEMBLY.
2. 1" GALVANIZED PIPE ABOVE GRADE TO BE PAINTED WITH 2 COATS RUSTOLEUM HIGH GLOSS BLUE PAINT.
3. COMBINATION AIR VALVE ASSEMBLY MUST BE INSTALLED AT THE HIGHEST POINT IN THE LINE. IF THE HIGH POINT FALLS IN A LOCATION WHERE THE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL LENGTH OF LINE TO CREATE A HIGH POINT WHERE THE ASSEMBLY CAN BE INSTALLED.

1. GALV. IRON 2" RETURN BEND.
2. 2" BEEHIVE STRAINER (BRASS)
3. 2" GALV. IRON PIPE. LENGTH AS REQ'D
4. 2" UNION
5. 2" GALV. CLOSE NIPPLE
6. 2" GALV. ELBOW
7. 2" TEE, 2" 90° STREET ELL
8. 2" GALV. IRON PIPE 8" LONG
9. 1" GALV. IRON PIPE TO FIT
10. 2" CAP WITH 1/8" HOLE FOR DRAIN
11. 2" AIR VACUUM VALVE ASSEMBLY, APCO 145C PRESSURE RATING AS APPROVED BY CITY ENGINEER.
12. 2" BRASS NIPPLE x 12" LONG
13. (2) 2" 90° BEND, BRASS SWING JOINT.
14. 2" GATE VALVE – CAST IRON BODY – RESILIENT SEAT – SCREWED – 2" SQUARE OPERATING NUT
15. 2" CTS x 2" MIP COMPRESSION ADAPTOR
16. 2" CTS PHILLIPS DRISCOPIPE SDR 9–200 PSI
17. CORP. STOP – 2" MIP x MIP – FORD BALLCORP FB 500 OR MUELLER ORISEAL H9969
18. SERVICE SADDLE, ROMAC 202 IPT
19. FOGTITE NO. 2 CONCRETE METER BOXES STACKED WITH 3/8" STEEL TRAFFIC COVER.
20. TRACER WIRE – SHALL BE 12 GAUGE SOLID COPPER CORE, BLUE COLORED INSULATION. ENDS TO BE STRIPPED AND TIED TO CORP STOP AND TO AIR UNIT. A MINIMUM OF 12" WIRE IS TO EXTEND INTO BOX AND LEFT COILED JUST UNDER THE LID. WIRE IS TO BE CONTINUOUS, WITHOUT SPLICES.
21. 2" BRASS STREET ELL
22. 2" GALV. NIPPLE, LENGTH TO FIT
23. VALVE BOX – RICH 940B WITH REGULAR BASE

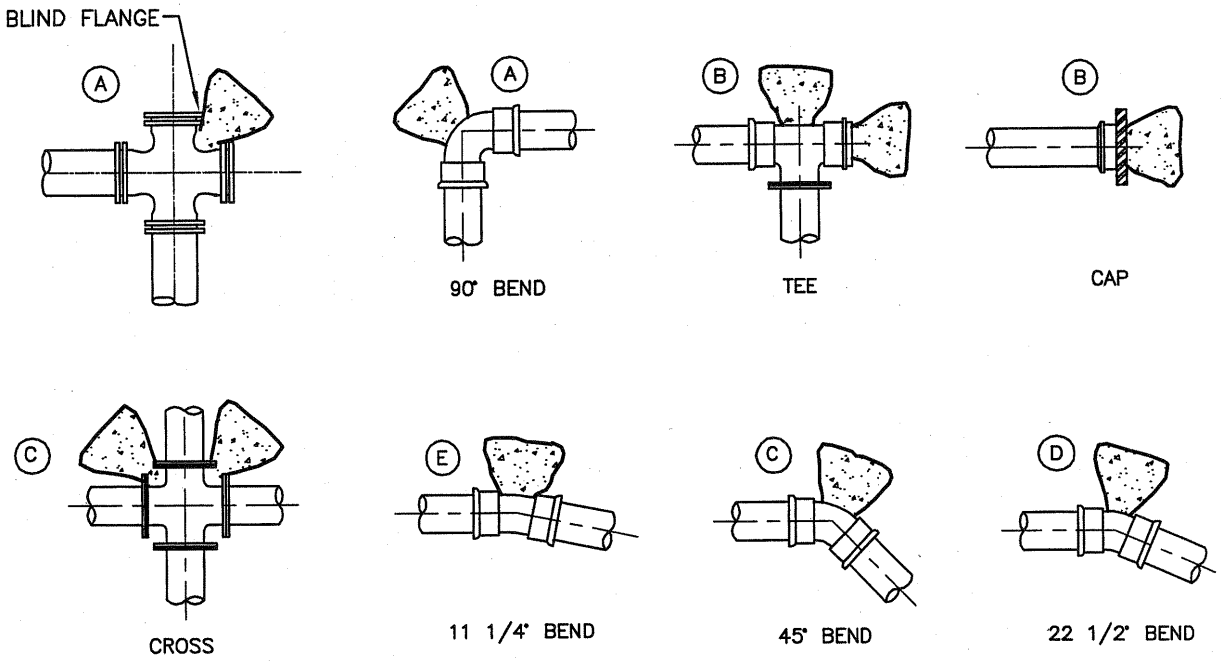
SNOQUALMIE RIDGE II

2" COMBINATION AIR VALVE ASSEMBLY

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	ER	JSF	09/16/04	4-11

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NOTES:

1. BEARING AREA OF CONCRETE THRUST-BLOCK BASED ON 200 PSI PRESSURE AND SAFE SOIL-BEARING LOAD OF 2,000 POUNDS PER SQUARE FOOT.
2. BEARING AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZES, PRESSURES, AND SOIL CONDITIONS.
3. CONCRETE BLOCKING (CLASS 3000) SHALL BE CAST IN PLACE AND HAVE A MINIMUM OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY AND SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING OF JOINT.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE UNDER ALL CONDITIONS OF SERVICE.
6. MINIMUM ROD DIAMETER SHALL BE 3/4" ASTM A-307 WITH 36KSI YIELD STRENGTH, GALV.
7. ALL BLOCKS SHALL BE FORMED WITH PLYWOOD & SHALL BE INSPECTED AND APPROVED PRIOR TO PLACING CONCRETE. FORM LUMBER SHALL BE SUBSTANTIAL IN DIMENSION (WIDTH, LENGTH, THK). FORMING SHALL BE COMPLETE AND SUFFICIENT SO AS TO KEEP THE CONCRETE FROM OVERFLOWING ONTO THE FITTINGS BEYOND THE FORMED LIMITS.
8. FITTINGS AND BOLTS SHALL BE COVERED WITH VISQUEEN PRIOR TO CONCRETE PLACEMENT.

THRUST BLOCK TABLE

MINIMUM BEARING AREA AGAINST UNDISTURBED SOIL

PIPE SIZE	(A) SQ. FT.	(B) SQ. FT.	(C) SQ. FT.	(D) SQ. FT.	(E) SQ. FT.
4"	3	1	1	1	1
6	4	4	2	1	1
8"	7	6	4	2	1
10"	11	10	6	3	2
12"	16	14	9	5	3
14"	22	19	12	6	3
16"	29	25	16	8	4
18"	36	31	20	10	5
20"	45	39	24	13	6
22"	54	47	29	15	8
24"	64	56	35	18	9
28"	87	76	48	24	12
30"	101	87	55	28	14
36"	145	125	78	40	20
42"	197	171	107	55	27
48"	257	223	140	71	36

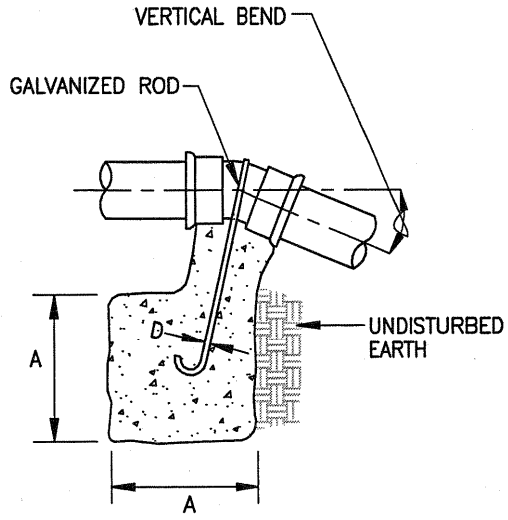
SNOQUALMIE RIDGE II

STANDARD HORIZONTAL BLOCKING DETAILS

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	ER	JSF	09/16/04	4-12

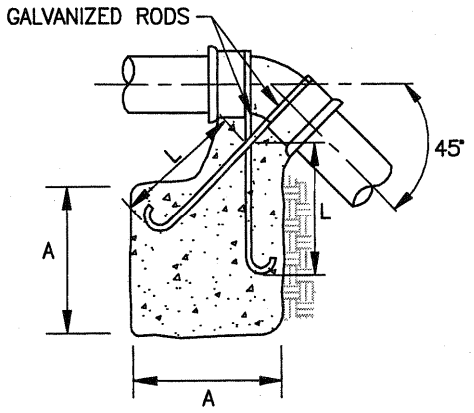
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VERTICAL BLOCKING
FOR 11–1/4°, 22 1/2° & 30° BENDS

PIPE SIZE	V B	CU. FT.	A	D	L
4"	22–1/2°	8	2.0'	3/4"	1.5'
	11–1/4°	11	2.2'		2.0'
	30°	17	2.6'		
6"	11–1/4°	11	2.2'	3/4"	2.0'
	22–1/2°	25	2.9'		
	30°	41	3.5'		
8"	11–1/4°	16	2.5'	3/4"	2.0'
	22–1/2°	47	3.6'		
	30°	70	4.1'	3/4"	2.5'
12"	11–1/4°	32	3.2'	3/4"	2.0'
	22–1/2°	88	4.5'	7/8"	3.0'
	30°	132	5.1'		
16"	11–1/4°	70	4.1'	7/8"	3.0'
	22–1/2°	184	5.7'	1–1/8"	4.0'
	30°	275	6.5'	1–1/4"	
20"	11–1/4°	91	4.5'	7/8"	3.0'
	22–1/2°	225	6.1'	1–1/4"	4.0'
	30°	330	6.9'	1–3/8"	4.5'
24"	11–1/4°	128	5.0'	1"	3.5'
	22–1/2°	320	6.8'	1–3/8"	4.5'
	30°	480	7.9'	1–5/8"	5.5'



VERTICAL BLOCKING
45° BEND

VERTICAL BLOCKING
FOR 45° BENDS

PIPE SIZE	V B	CU. FT.	A	D	L
4"	45°	30	3.1'	3/4"	2.0'
6"		68	4.1'		
8"		123	5.0'		
12"		232	6.1'	3/4"	2.5'
16"		478	7.8'	1–1/8"	4.0'
20"		560	8.2'	1–1/4"	
24"		820	9.4'	1–3/8"	4.5'

DEAD WEIGHT BLOCKING

PIPE SIZE	PIPE AREA SQ. IN.	22.5°	45°	60°	90°
		TYPE OF FITTING			
4"	12.5	0.3	0.6	0.7	1.1
6"	28.3	0.5	1.1	1.4	2.1
8"	50.3	0.9	1.9	2.5	3.8
12"	113	2.1	4.2	5.6	8.4
16"	201	3.7	7.5	9.9	15
18"	254	3.7	10	13	20
20"	314	4.9	12	16	24
24"	432	6.0	16	21	32

SIZE OF DEAD WEIGHT BLOCK C.Y. CONCRETE

NOTE:

1. CONCRETE BLOCKING BASED ON 200 PSI PRESSURE & CLASS 3000 CONCRETE.
2. FITTINGS AND BOLTS SHALL BE COVERED WITH VISQUEEN PRIOR TO CONCRETE PLACEMENT.
3. PROVIDE MIN 3" COVER OVER GALVANIZED RODS.
4. RODS SHALL BE GALV. A307 OR STAINLESS STEEL. MIN. 36 KSI YIELD STRENGTH, SIZE AS SHOWN.
5. BEARING AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZES, PRESSURES AND SOIL CONDITIONS.

SNOQUALMIE RIDGE II

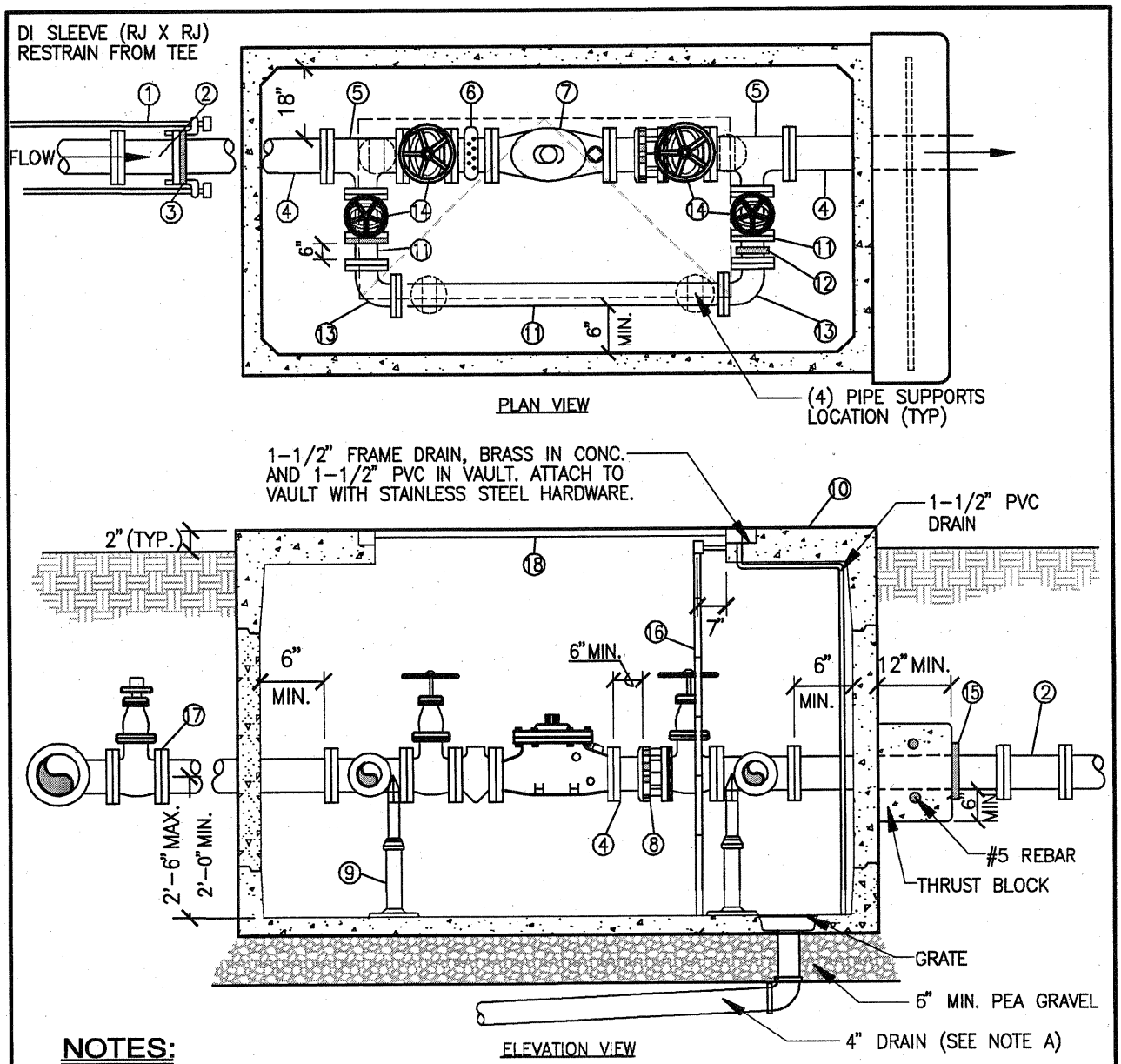
STANDARD VERTICAL BLOCKING DETAILS

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DWN	CKD	DATE	DWG
ER	JSF	09/16/04	4–13

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NOTES:

A. GRAVITY VAULT DRAIN SHALL BE CONNECTED TO STORM SEWER OR DAYLIGHT AS SHOWN ON DRAWINGS.

B. METER SHALL BE STYLE AND TYPE SPECIFIED BY WATER SUPERINTENDANT.

C. GATE VALVE (17) SHALL BE 4" SIZE FOR 3" SERVICES.

D. SEE RELATED MATERIAL LIST.

E. VAULT SHALL BE LOCATED IN PLANTER OR NON-TRAFFIC AREA UNLESS SPECIFICALLY APPROVED BY CITY ENGINEER.

F. INSTALL BLIND FLANGES ON ALL OPEN PIPES UNTIL METER IS INSTALLED.

VAULT, FITTINGS AND PIPING SIZING REQUIREMENTS

METER SIZE	BYPASS VALVES AND PIPING	BYPASS TEE (FL X FL)	MIN. INSIDE VAULT DIM.		
			LENGTH	WIDTH	HT.
3"	3"	3" x 3"	7 FT.	5.0 FT.	6 FT.
4"	4"	4" x 4"	8 FT.	5.0 FT.	6 FT.
6"	4"	6" x 4"	10.5 FT.	5.0 FT.	6 FT.

SNOQUALMIE RIDGE II

WATER METER 3", 4", 6" METER DETAILS

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	LDK	JSF	09/30/04	4-14

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3", 4", 6" METER ASSEMBLY MATERIAL LIST

1. SHACKLE RODS WITH STAR BOLTS.
2. D.I. SLEEVE (MJ X MJ)
3. MEGALUG RESTRAINT GLAND.
4. D.I. SPOOL (FL X PE)
5. TEE (FL X FL)
6. SENSUS STRAINER (FL X FL)
7. SENSUS METER AS SPECIFIED BY CITY SUPERINTENDANT FOR APPLICATION.
8. ROMAC FCA 501 FLANGE X COUPLING ADAPTER
9. ADJUSTABLE PIPE SUPPORT WITH SADDLE AND ANCHOR FLANGE.
10. UTILITY VAULT CO. CONCRETE VAULT
    - 3" ASSEMBLY– #675–LA WITH TL–2–332P COVER
    - 4" ASSEMBLY– #687–LA WITH TL–2–332P COVER
    - 6" ASSEMBLY– #5106–LA WITH TL–2–332AL COVER
11. D.I. SPOOL (FL X FL)
12. ROMAC 101 3/4" SERVICE SADDLE WITH IPT 3/4" CORP STOP TAPPED INTO BOTTOM OF SPOOL FOR FLUSH/DRAIN DOWN.
13. D.I. 90° ELBOW (FL X FL)
14. RESILIENT SEATED GATE VALVE (FL X FL) WITH HAND WHEELS.
15. MEGALUG RESTRAINT GLAND
16. LADDER PER WSDOT AND OSHA SPECIFICATIONS
17. GATE VALVE AT MAIN TEE:
    - 3" METER– USE 4" G.V. (FL X FL) WITH 4" X 3" REDUCER (FL X MJ)
    - 4" METER– USE 4" G.V. (FL X MJ)
    - 6" METER– USE 6" G.V. (FL X MJ)
18. HINGED ALUMINUM DIAMOND PLATE LOCKING HATCH COVER

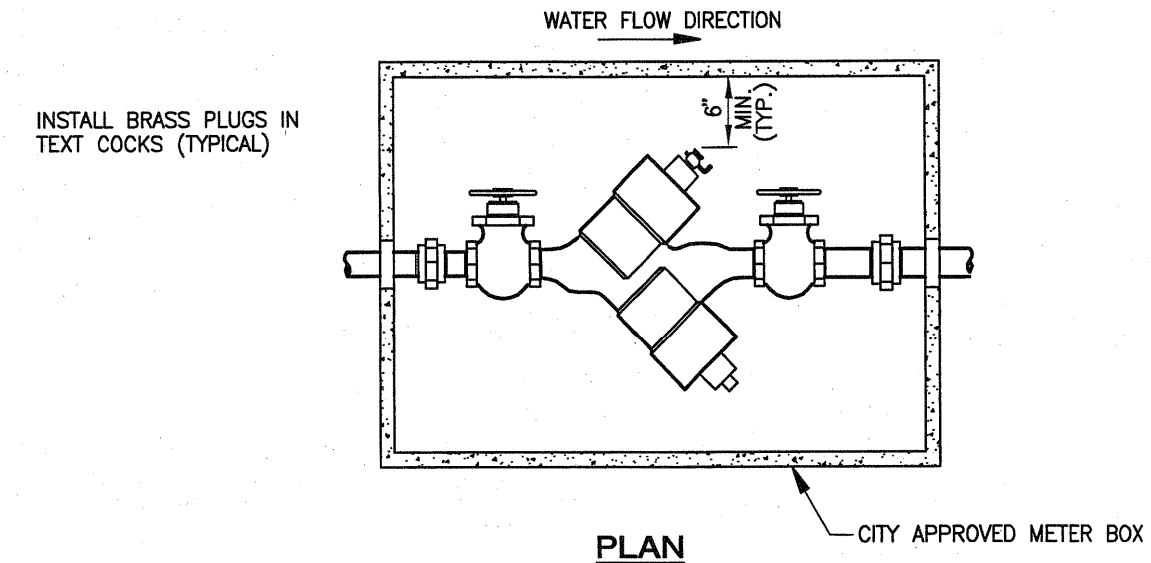
SNOQUALMIE RIDGE II

WATER METER
3"–6" MATERIAL LIST

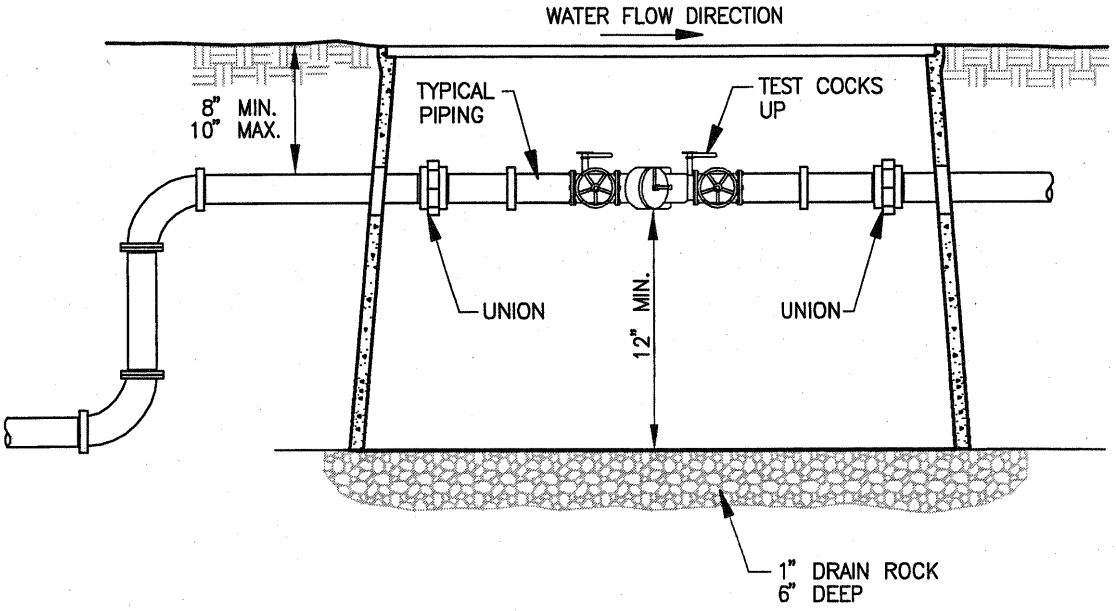
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	LDK	JSF	09/16/04	4-15

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PLAN



ELEVATION

N.T.S.

NOTES:

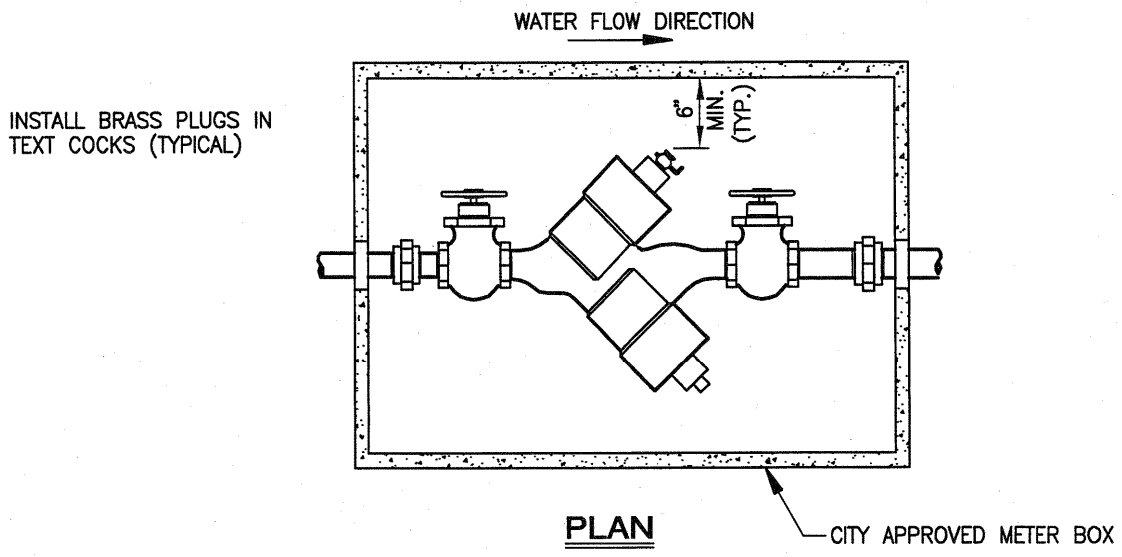
1. FOR 3/4" – 1" D.C.V.A. USE FOGTITE B–10 BOX WITH SOLID LID.
2. ASSEMBLY MUST BE TESTED BY A CERTIFIED TESTER AFTER INSTALLATION AND BEFORE USE.

SNOQUALMIE RIDGE II			
IRRIGATION D.C.V.A. 3/4" – 1"			
DWN	CKD	DATE	DWG
ER	JSF	09/16/04	4–16

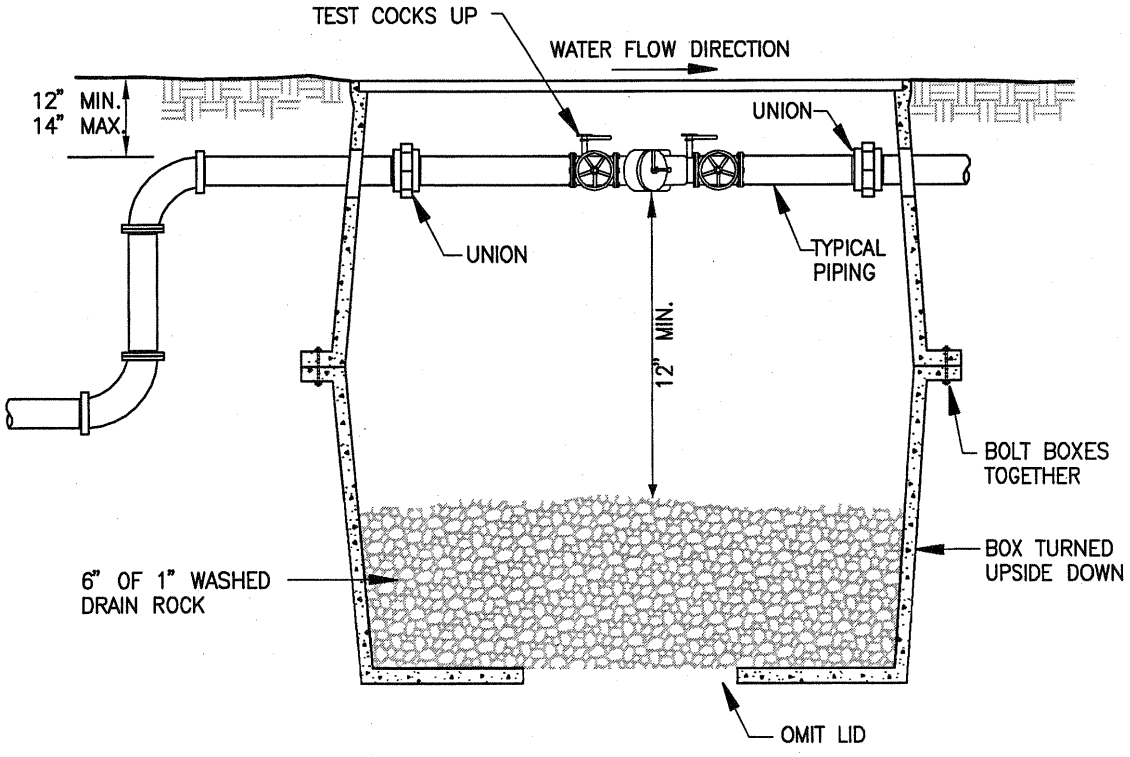
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PLAN



ELEVATION

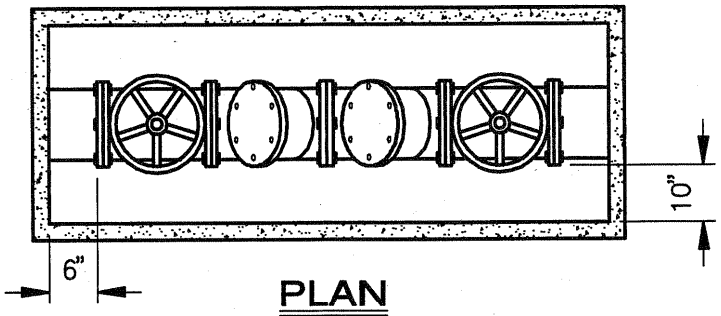
NOTES:

1. FOR 1-1/2" – 2" D.C.V.A. USE FOGTITE CONCRETE BOX #2 DOUBLE STACKED OR FOGTITE SECTIONAL VAULT – CATALOG #124.
2. ASSEMBLY MUST BE TESTED BY A CERTIFIED TESTER AFTER INSTALLATION AND BEFORE USE.

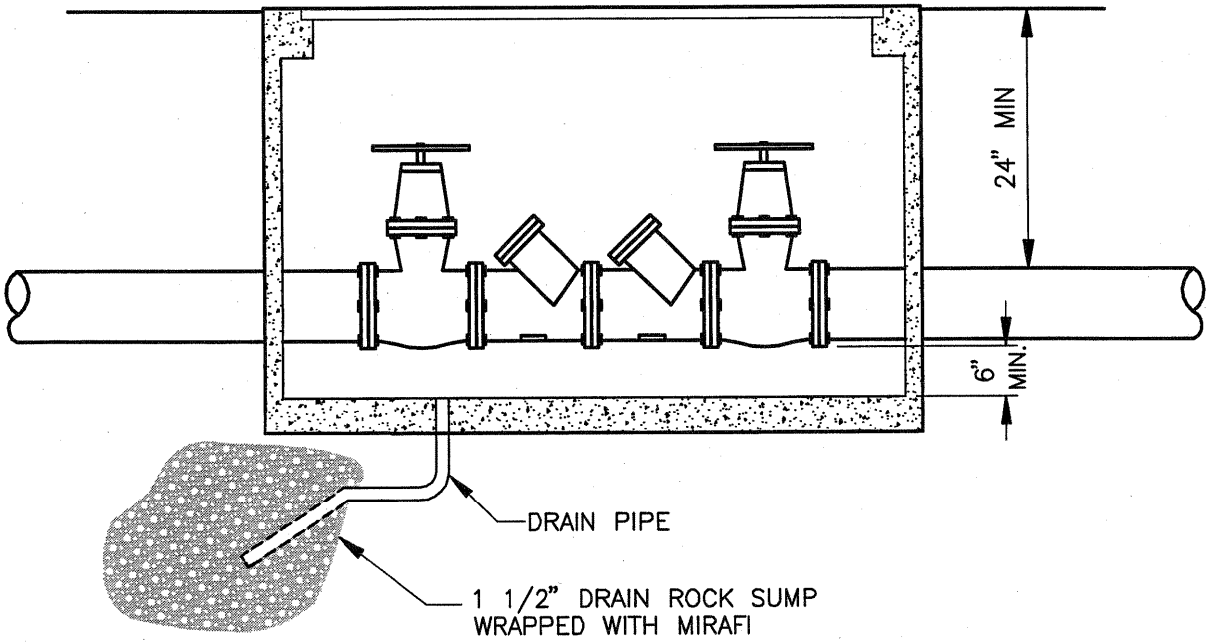
SNOQUALMIE RIDGE II			
IRRIGATION D.C.V.A. 1 1/2" – 2"			
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PLAN



PROFILE

NOTES:

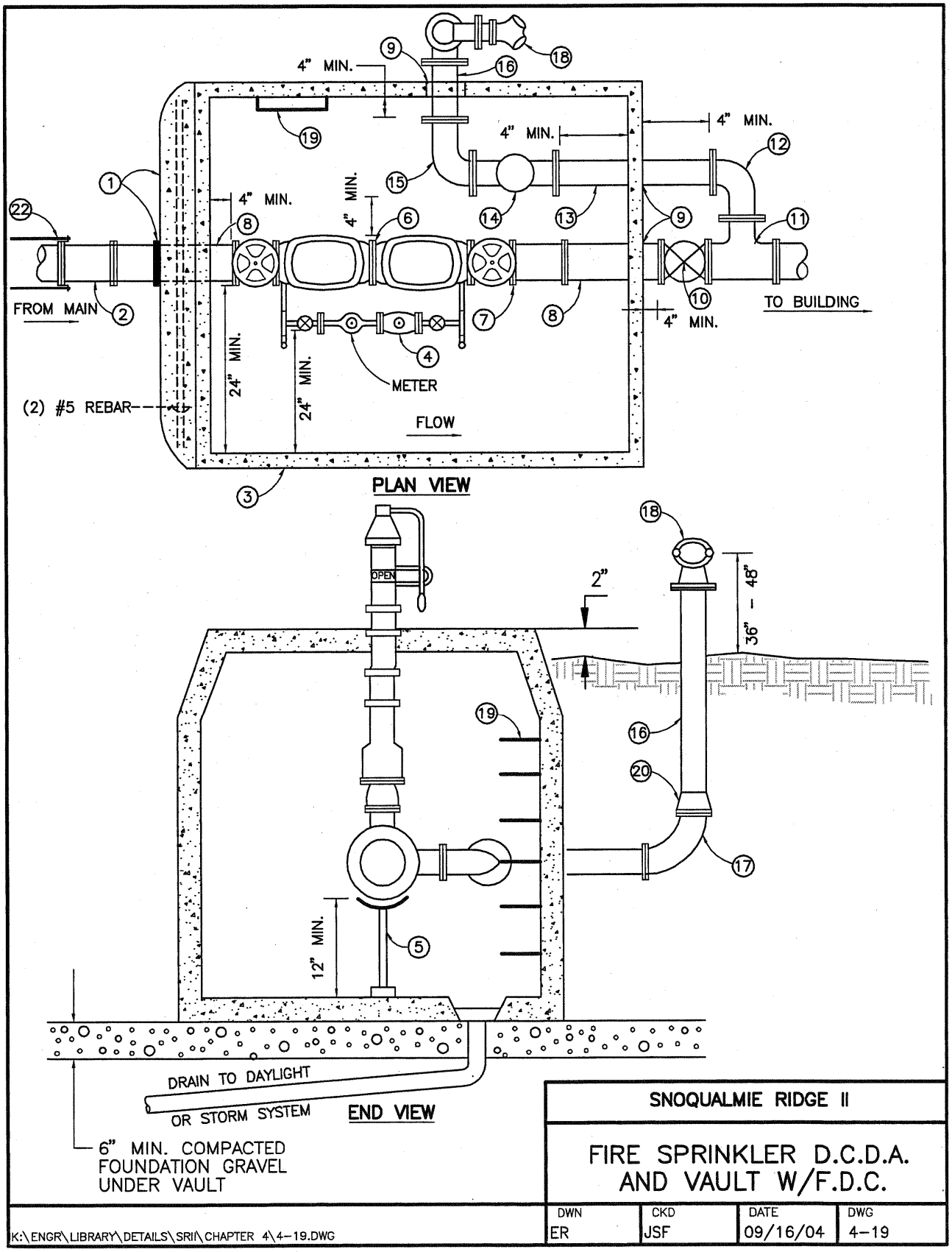
1. FOR 2-1/2" - 3" DCVA USE FOG-TITE MODEL 25T OR FOG-TITE 33-1/2"x57-1/2" SECTIONAL VAULT CATALOG #135.
2. ASSEMBLY MUST BE TESTED BY A CERTIFIED TESTER AFTER INSTALLATION AND BEFORE USE.

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SNOQUALMIE RIDGE II

IRRIGATION D.C.V.A.
2-1/2" - 3"

Approved: AB#04-172 11/8/04
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SNOQUALMIE RIDGE II

FIRE SPRINKLER D.C.D.A. AND VAULT W/F.D.C.

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	ER	JSF	09/16/04	4-19

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MATERIAL LISTING

1. CONCRETE BLOCKING (2500 PSI) AS REQUIRED WITH LOCKING MEGALUG OR EQUAL JOINT RESTRAINT. SEE DETAIL "A".
2. DUCTILE IRON SLEEVE (MJxMJ) WITH MEGALUGS.
3. PRECAST UTILITY VAULT CO. VAULT.
4. APPROVED 3/4 DCVA WITH SENSUS SR-2 METER OR AS SPECIFIED BY CITY WATER SUPT.
5. TWO ADJUSTABLE PIPE SUPPORTS.
6. D.O.H. APPROVED DCDA IN MAIN LINE.
7. FLANGE B COUPLING ADAPTOR, ROMAC STYLE FCA501.
8. D.I. PIPE (FLxPE).
9. INSTALL EPOXY NON-SHRINK GROUT, TYPICAL, ALL WALL PENETRATIONS.
10. GATE VALVE (FLxFL) WITH POST INDICATOR MUELLER OR EQUAL.
11. TEE (FLxFL)
12. LONG RADIUS 90° BEND.
13. 4" D.I. SPOOL (FLxFL)
14. 4" SWING TYPE GRAVITY OPERATED CHECK VALVE WITH AUTOMATIC DRIP FOR DRAIN DOWN.
15. 4" 90° BEND (FLxFL)
16. 4" SCHEDULE 40 GALVANIZED STEEL PIPE (IPTxIPT)
17. 4" D.I. LONG RADIUS 90° BEND (FLxFL) WITH RESTRAINED JOINTS.
18. UL LISTED FD CONNECTION AND BREAKAWAY CAPS, POWHATAN 21-133.
19. OSHA COMPLIANT LADDER BOLTED TOP AND BOTTOM. (COORDINATE WITH HATCH LID).
20. ADAPTOR (FLxIPT)
21. O.S. & Y VALVES TO BE RESILIENT SEATED W/TAMPER SWITCHES. ADD WIRING IN ACCORDANCE WITH L & I
22. 3/4 INCH SHACKLE RODS TO MAIN TEE.

DETECTOR DOUBLE CHECK AND VAULT ASSEMBLY NOTES

1. ALL VAULT LIDS SHALL BE LOCKING DOUBLE ALUMINUM HINGED COVERS.
2. ALL BACKFLOW PREVENTERS SHALL BE TESTED AFTER INSTALLATION BY A CERTIFIED TESTER.
3. ALL BENDS TO BE DUCTILE IRON CLASS 250 CEMENT LINED.
4. ALL MATERIAL TO BE MANUFACTURED IN U.S.A.
5. ALL PIPE TO BE DUCTILE IRON CLASS 52 (3" AND LARGER).
6. BYPASS METER PIPING SHALL BE BRASS.
7. 4" GALVANIZED STEEL STAND PIPE BELOW GRADE SHALL BE WRAPPED WITH POLYETHELENE 10 MIL THICKNESS.
8. CHAIN AND PADLOCKS (CITY KEYED) SHALL BE PROVIDED TO SECURE VALVES.
9. FOR HYDRAULICALLY DESIGNED SPRINKLER SYSTEMS WITH A SYSTEM DEMAND OF 1,000 GPM OR MORE A MINIMUM 6" PIPING IS REQUIRED AT THE FDC WITH A MINIMUM OF THREE 2-1/2" INLET PORTS.
10. MATERIALS SHALL BE LISTED AND LABELED AS UL AND FM APPROVED FOR INTENDED USE.
11. VAULT TYPE LAYOUT TO BE USED ONLY WHEN AN INSIDE THE BUILDING LOCATION HAS BEEN VERIFIED BY THE CITY ENGINEER AS INFEASIBLE OR NOT REQUIRED.
11. VAULT DRAIN TO BE CONNECTED TO STORM SEWER.
12. PLANS MUST BE APPROVED BY CITY ENGINEER AND FIRE DEPT.
13. SEE RELATED MATERIAL LIST.
14. LOCATE IN PLANTING AREA - NOT PAVING AREA.
15. PROVIDE SHOP DRAWINGS AND MATERIAL SUBMITTALS.
16. COMPLY WITH NFPA 24
17. INSTALL BLIND FLANGES ON ALL OPEN PIPES UNTIL METER IS INSTALLED.

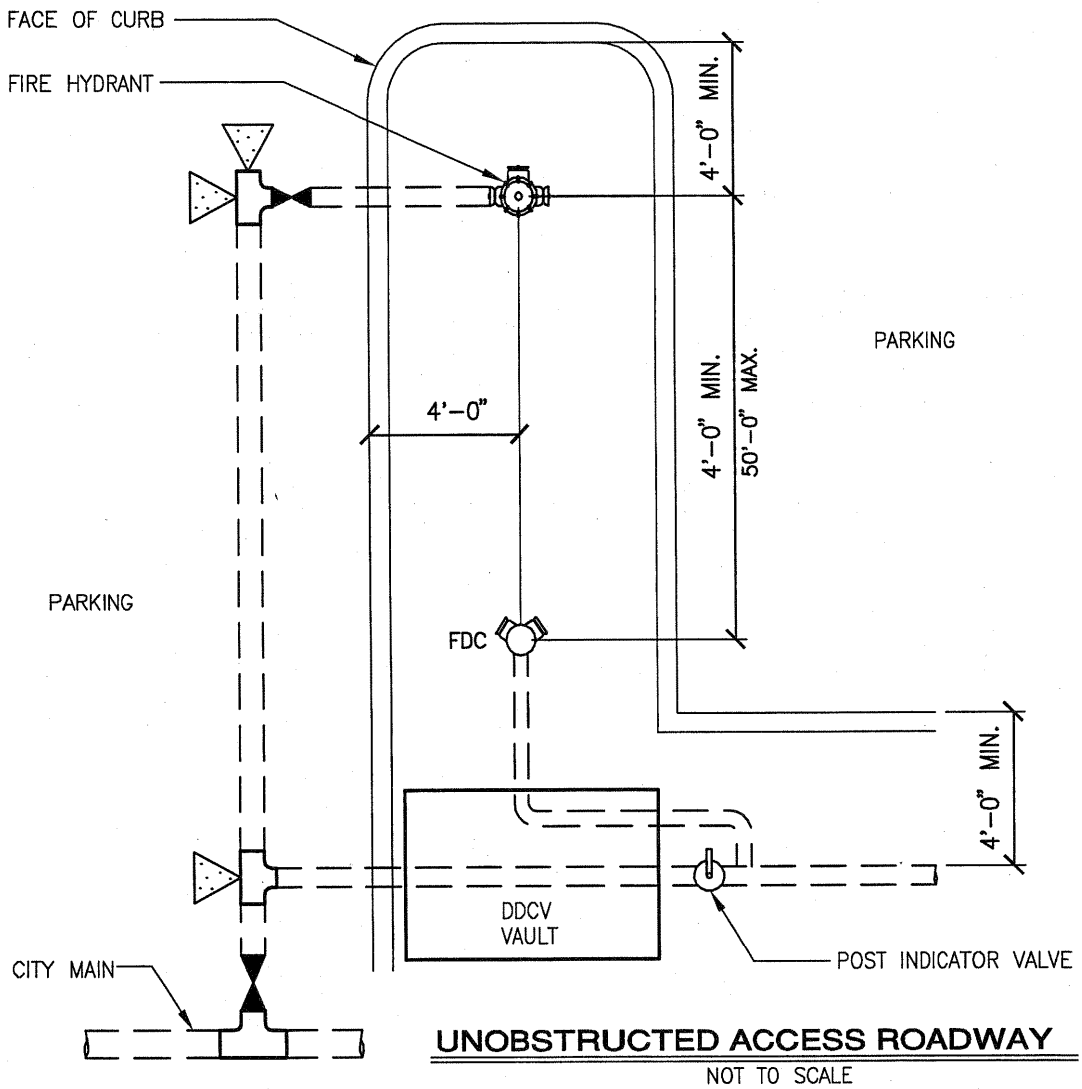
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SNOQUALMIE RIDGE II

FIRE SPRINKLER D.C.D.A. AND F.D.C. MATERIAL LIST

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UNOBSTRUCTED ACCESS ROADWAY

NOT TO SCALE

NOTES:

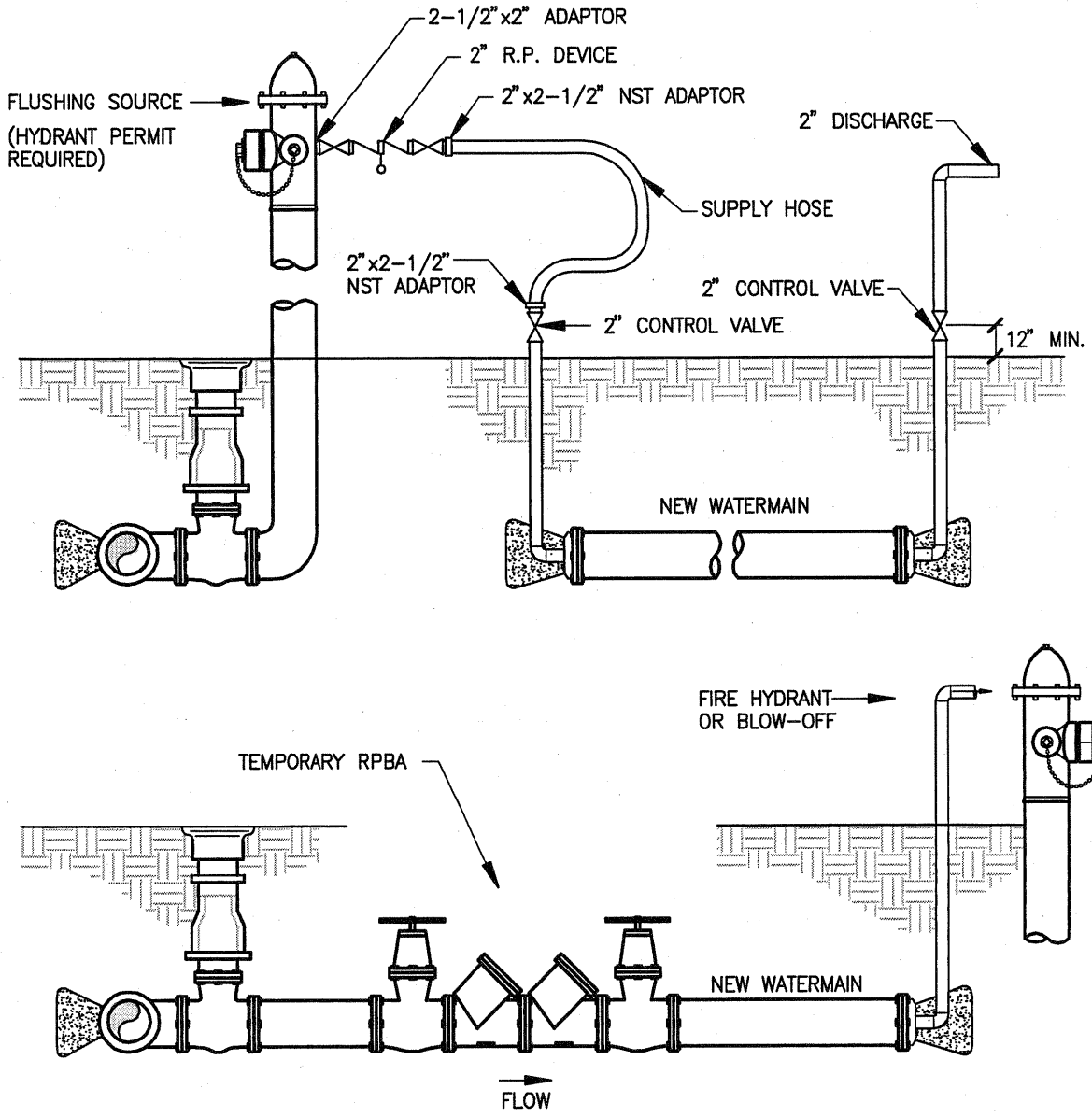
1. THIS TYPICAL LAYOUT TO BE USED ONLY WHEN AN INSIDE BUILDING INSTALLATION HAS BEEN VERIFIED BY THE CITY ENGINEER TO BE INFEASIBLE OR NOT REQUIRED.
2. SEE APPROVED PROJECT DRAWINGS AND DETAILS.
3. EASEMENTS TO BE SHOWN ON PLANS.
4. FIRE HYDRANT MAY BE LOCATED UP TO 50 FEET FROM FDC.
5. FIRE HYDRANT LATERALS (FROM CITY MAIN) EXCEEDING 50 FEET LENGTH OR ALSO SERVING SPRINKLER SYSTEMS SHALL BE 8" MIN. DIAMETER OR LARGER BASED ON FIRE FLOW CALCULATIONS.
6. PIPE FROM CITY MAIN SHALL HAVE TWO VISIBLE MEANS OF RESTRAINT, I.E. SHACKLE RODS, THRUST BLOCKS, MEGALUGS.
7. ONLY GROUND COVER LANDSCAPING SHALL BE PLANTED WITHIN 8' OF STRUCTURES.
8. SEE LOCAL FIRE CODES AND NFPA 24.

SNOQUALMIE RIDGE II			
FIRE HYDRANT AND FDC LOCATION			
DWN	CKD	DATE	DWG
LDK	JSF	09/16/04	4-21

K:\ENGR\LIBRARY\DETAILS\SRII\CHAPTER 4\4-21.DWG

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk

PRELIMINARY - CITY REVIEW ONLY



NOTES:

1. SIZE FITTINGS AS NEEDED FOR 2.5 F.P.S. FLUSHING.
2. RPBA MUST BE CERTIFIED AFTER INSTALLATION.
3. CONTRACTOR TO DISPOSE OF CHLORINE AND FLUSH WATER AS DIRECTED BY THE CITY ENGINEER.
4. AFTER FLUSHING REPLACE RPBA WITH PE END PIPE AND D.I. SLEEVES (MJ).
5. WATER USAGE MUST BE REPORTED FOR BILLING & RECORDS.
6. TEMPORARY METER MAY BE OMITTED IF USE IS TO BE ESTIMATED.
7. COORDINATE FLUSHING WITH CITY WATER SUPERINTENDENT.

SNOQUALMIE RIDGE II			
FLUSHING NEW MAINS			
K:\ENGR\LIBRARY\DETAILS\SRII\CHAPTER 4\4-22.DWG	DWN: ER	CKD: JSF	DATE: 09/16/04	DWG: 4-22

Approved: AB#04-172 11/8/04
Attest: Jodi Warren/CMC City Clerk

Appendix I
Water Rights Information

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PRELIMINARY - CITY REVIEW ONLY

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions.

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
1 SWC 4553	S01 - Canyon Springs	898 gpm	0 gpm	1,448 afy	0 afy	898 gpm	0 gpm	1,106 afy	342 afy	898 gpm	0 gpm	1,277 afy	171 afy	898 gpm	0 gpm	1,448 afy	0 afy
2 GWC 91-D	S05 & S09 - North and South Wellfields	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy
3 GWC 92-D	S05 & S09 - North and South Wellfields	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy	90 gpm	0 gpm	100 afy	0 afy
4 G1-20316C	S05 & S09 - North and South Wellfields	600 gpm	0 gpm	0 afy	500 afy	600 gpm	0 gpm	162 afy	(162 afy)	600 gpm	0 gpm	162 afy	(162 afy)	600 gpm	0 gpm	162 afy	(162 afy)
5 G1-25449P	S05 - North Wellfield	1,650 gpm	0 gpm	724 afy	0 afy	1,620 gpm	30 gpm	255 afy	469 afy	1,650 gpm	0 gpm	346 ayf	378 afy	1,650 gpm	0 gpm	473 afy	251 afy
6 Future ASR Right	NA	0 gpm	0 gpm	0 afy	0 afy	0 gpm	0 gpm	0 afy	0 afy	0 gpm	0 gpm	0 afy	0 afy	470 gpm	(470 gpm)	0 afy	0 afy
	TOTALS =	3,328 gpm		2,372 afy		3,298 gpm	30 gpm	1,720 afy	649 afy	3,328 gpm	0 gpm	1,985 afy	387 afy	3,798 gpm	(470 gpm)	2,283 afy	89 afy
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.

Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa
G1-27589	New	3/16/1995	1,400 gpm	0	2,302 afy	0 afy
S1-28833	New	12/21/2016	3.3 cfs (1,481 gpm)	0 cfs	1,000 afy	0 afy

INTERTIES: Systems receiving wholesale water complete this section. Wholesaling systems must include water sold through intertie in the current and forecasted source production columns above.

Name of Wholesaling System Providing Water	Quantities Allowed In Contract		Expiration Date of Contract	Currently Purchased Current quantity purchased through intertie				10-Year Forecasted Purchase Forecasted quantity purchased through intertie				20-Year Forecasted Purchase Forecasted quantity purchased through intertie			
	Maximum Qi Instantaneous Flow Rate	Maximum Qa Annual Volume		Maximum Qi Instantaneous Flow Rate	Current Excess or (Deficiency) Qi	Maximum Qa Annual Volume	Current Excess or (Deficiency) Qa	Maximum Qi 10-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 10-Year Forecast	Future Excess or (Deficiency) Qa	Maximum Qi 20-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 20-Year Forecast	Future Excess or (Deficiency) Qa
1 None															
TOTALS =															
Column Identifiers for Calculations:	A	B		C	=A-C	D	=B-D	E	=A-E	F	=B-F	G	=A-G	H	=B-H

INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.

Water Right #	Conditions of Interruption	Time Period of Interruption
1 None		
2		
3		

ADDITIONAL COMMENTS:

Existing year is 2017, 10-year forecast is for 2030, and 20-year forecast is for 2040. Forecasts used are w/o water use efficiency.
A maximum of 2,430 gpm and 1,424 afy can be pumped from the North Wellfield under existing water rights.
A maximum of 600 gpm and 500 afy can be pumped from the South Wellfield under existing water rights.
No annual volume specified under SWC 4553. Annual volume assigned is equal to instantaneous rate, year round.
Maximum annual volume that can be taken from ground water is 1,424 afy under existing water rights.
G1-20316C annual volume is non-additive to the annual volume granted under GWC 91-D, GWC 92-D, and SWC 4553.

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PRELIMINARY - CITY REVIEW ONLY

Certificate SWC 4553

Canyon Springs

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S. F. No. 369—3-51—75C. 27755.

PRELIMINARY - CITY REVIEW ONLY

CERTIFICATE RECORD NO. 10, PAGE NO. 4553

STATE OF WASHINGTON, COUNTY OF King

CERTIFICATE OF SURFACE WATER RIGHT

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the State Supervisor of Water Resources thereunder.)

This is to certify that TOWN OF SNOQUALMIE *of* Snoqualmie, *State of* Washington, *has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the waters of* Canyon Springs, *a tributary of* North Fork of Snoqualmie River, *with point or points of diversion within the* S½ of SE¼ of Sec. 24, Twp. 24 N., R. 8 E., W. M., *under and subject to provisions contained in* Appropriation *Permit No.* 3994 *issued by the State Supervisor of Water Resources, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Water Resources of Washington and entered of record in Volume* 10, *at Page* 4553, *on the* 26th *day of* February, 19 52 *that the priority date of the right hereby confirmed is* October 18, 1944; *that the amount of water under the right hereby confirmed, for the following purposes is limited to an amount actually beneficially used and shall not exceed*

2.0 cubic feet per second for the purpose of domestic supply.

A description of the lands under such right to which the water right is appurtenant, and the place where such water is put to beneficial use, is as follows:

Town of Snoqualmie, King County, Washington.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Water Resources affixed this 26th *day of* February, 19 52.

Chas. H. Purchase

State Supervisor of Water Resources.

NEERING DATA

MBW

S. F. No. 380—9-50—2M. 26077.

PRELIMINARY - CITY REVIEW ONLY

RECEIVED
FEB 15 1952
DEPARTMENT OF CONSERVATION & DEVELOPMENT

PROOF OF APPROPRIATION OF WATER

Application No. 6205 *Permit No.* 3994

1. *Name of applicant* Town of Snoqualmie
2. *Postoffice address* Snoqualmie, Washington
3. *Source of appropriation* Canyon Springs *tributary of* North Fork of Snoqualmie River
4. *For what purpose or purposes is water used?* Domestic Supply
5. *Give date of beginning of construction* July 17, 1950
6. *Give date of completion of construction work* November 13, 1950
7. *When was all the water completely applied to proposed use?* November 4, 1950
8. *Fill in the following carefully, according to use. If for irrigation, fill in the number of acres described in permit and the number of acres actually irrigated (Water should be applied to the full number of acres to be irrigated before certificate can issue). If for power, give location of power plant and the theoretical horsepower described in permit. If for domestic supply, municipal, manufacturing or other uses, simply give the description of place of use.*

FOR IRRIGATION

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS USED	FOR IRRIGATION FILL IN FOLLOWING	
	No. Acres Described in Permit	No. Acres Actually Irrigated

FOR POWER

LOCATION OF POWER PLANT	FOR POWER FILL IN FOLLOWING	
	H. P. Described in Permit	H. P. Actually Developed

FOR ALL OTHER USES

LEGAL DESCRIPTION OF PLACE OF USE

Town of Snoqualmie and surrounding area

9. *Does map filed with your permit show correctly the location of diverting work and area of land where water is used?* Yes *If not, state wherein such map is in error*

10. *If the dimensions of your ditch or dam do not correspond to those described in your permit and the plans and specifications now on file in the office of the State Supervisor of Hydraulics, state what changes have been made, giving dimensions of ditch or other distributing works.*

(OVER)

ok MJW

PRELIMINARY - CITY REVIEW ONLY

REMARKS:

The original Permit specified that the water appropriated should not exceed 2.0 cubic feet per second. This was later increased, and as specified in the Warranty Deed from Weyerhaeuser Timber Company, the water appropriated shall not exceed 4.0 cubic feet per second.

STATE OF WASHINGTON,
County of King } *ss.*

I, Inez Seil, *being first duly sworn, depose and say that I have read the above and foregoing proof of appropriation of water; that I know the contents thereof; and that the facts therein stated are true.*

IN WITNESS WHEREOF, I have hereunto set my hand this 14th *day of* February, *19* 57

Inez Seil
Inez Seil, Town Clerk & Treasurer

Subscribed and sworn to before me this 14th *day of* February, *19* 57

J. H. Montgomery
Notary Public.

PRELIMINARY - CITY REVIEW ONLY

Form 10. S. F. No. 370—8-44—1M. 6929.

3994

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

Permit to Appropriate Public Waters of the State of Washington

Book No. 15 of Permits, on Page 3994 Under Application No. 6205

Town of Snoqualmie

of Snoqualmie, Washington

is hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the following limitations and provisions: Permittee shall construct and maintain at his own expense a weir, or other suitable device, for measuring any water granted herein for irrigation purposes and such appropriation shall be subject to a reasonable rotation system if ordered by the State Supervisor of Hydraulics; and it is further provided that Permittee, in the use of water under this permit, shall comply with all the laws of the Departments of Fisheries and Game in accordance with Chap. 127, Laws of 1939, and all regulations and laws hereafter enacted.

Priority date of this permit is October 18, 1944

Source of the proposed appropriation is Canyon Springs,

tributary of North Fork of Snoqualmie River

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 2.0 cubic feet per second, or its equivalent in case of rotation, to be used for the following purposes: Domestic supply

as more definitely set out below.

The approximate point of diversion is located In Southeast corner of Sec. 24

being within S½ of SE¼ Sec. 24, Twp. 24 N., Rge. 8 E. W. M.,

county of King

The use, or uses, to which water is to be applied:

For Domestic Supply and Miscellaneous Uses: 2.0 cubic feet per second during entire year for Domestic supply to be used within Town of Snoqualmie Sec. , Twp. N., Rge. W. M.

For Irrigation: cubic feet per second, from to

each year, for irrigation of acres, described as follows:

PRELIMINARY - CITY REVIEW ONLY

FOR POWER: ..... cubic feet per second continuously each year. Total power to be developed ..... theoretical horse power. Total fall to be utilized ..... feet.

Nature of works by means of which power is to be developed .....

Works to be located in ..... Sec. ....., Twp. ..... N., Rge. ..... W. M.

Water to be returned to .....

Point of return ..... Sec. ....., Twp. ..... N., Rge. ..... W. M.

Use to which power is to be applied .....

FOR MUNICIPAL SUPPLY: ..... cubic feet per second during entire year to supply .....

DESCRIPTION OF DIVERSION WORKS

Height of dam (Elevation) / 645 ft.; Length on top ..... ft.; Length on bottom ..... ft.

Material to be used and character of construction Probably concrete

Description of headgate Concrete

CANAL SYSTEM

AT HEADGATE: Width on top (at water line) ..... ft.; Width on bottom ..... ft.; Depth of water ..... ft.; Grade ..... ft. fall per one thousand feet.

AT ..... MILES FROM HEADGATE: Width on top (at water line) ..... ft.; Width on bottom ..... ft.; Depth of water ..... ft.; Grade ..... feet per one thousand feet.

(Please read carefully provisions below)

Construction work shall begin on or before January 1, 1947 Extend to 1-1-49 and shall thereafter be prosecuted with reasonable diligence and completed on or before January 1, 1948

and complete application of water to proposed uses shall be made on or before January 1, 1949

Given under my hand and the seal of this office at Olympia, Washington, this 29th day of January, 194 5

Thos J. Parkhurst

State Supervisor of Hydraulics.

PRELIMINARY - CITY REVIEW ONLY

APPLICATION NO. 6205

Town of Snoqualmie

Examination made January 5, 1945

This application is for the appropriation of 2.0 c.f.s. of water from Canyon Springs, tributary of North Fork of Snoqualmie River near Snoqualmie in King County, to be used continuously for domestic supply of the town.

These springs rise out of a rock formation about 55 ft. above bed of the river and fan out on a small bench for a distance of approximately 150 feet before discharging into the river. The combined flow was estimated at 12.0 c.f.s. A Cipoletti weir had been installed on part of the flow but the water could not be properly measured as the velocity of approach was too great. This particular portion was estimated at 4.0 c.f.s. and was approximately one-third of entire flow.

The contemplated construction work will include a concrete collecting basin and a gravity flow pipe line about 10" in diameter and 5 miles in length.

This new supply is expected to take care of the future growth of the town for some time to come as well as to supplement their present inadequate system, therefore, this examiner recommends that permit be issued for 2.0 c.f.s. as applied for subject to existing rights.

Signed this 24th day of
January, 1945

M. G. Walker

M. G. Walker, Engineer
Division of Hydraulics

PRELIMINARY - CITY REVIEW ONLY

Form 10. S. F. No. 370—1-43—1M. 2886.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

RECEIVED OCT 19 1944 DIVISION OF HYDRAULICS

APPLICATION FOR A PERMIT
To Appropriate Public Waters of the State of Washington

(Read directions on last page carefully before filling out this form)

Application No. 6205 Army A. English

I, We TOWN of SNOQUALMIE (Name of applicant),

of SNOQUALMIE (Postoffice), County of KING,

State of WASHINGTON, do hereby make application for a permit to appropriate the following described public waters of the State of Washington subject to existing rights:

If the applicant is a corporation, give date and place of incorporation

MAY 18, 1903

1. The source of the proposed appropriation is CANYON SPRINGS (Name of stream)

tributary of NORTH FORK of SNOQUALMIE

2. The amount of water which the applicant intends to apply to beneficial use is 2.00 cubic feet per second.

3. The use to which the water is to be applied is Domestic Supply (Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. Time during which water will be required each year Entire Year

5. The approximate point of diversion is located SE corner Sec. ~~25~~ 24 Twp 24 NR 8 E (Give distance and bearing to section corner)

being within the S½SE¼ SE corner (Give smallest legal subdivision) of Sec. ~~25~~ 24, Tp. 24 N., R. 8 E. (E. or W.) W. M.,

in the county of King

6. The _____ (Main ditch, canal, or pipe line) to be 6 miles ft. or miles in length, terminating in the Town of Snoqualmie (Smallest legal subdivision) of Sec. _____, Tp. _____ N., R. _____ (E. or W.) W. M., the proposed location being shown on the accompanying map.

7. The name of the ditch, canal or other works is _____

8. Estimated cost of development necessary to utilize fully the appropriation herein asked for $ 40,000.00

9. Does the stream from which you wish to appropriate water flow through the tract of land on which the water is to be used? _____

10. Do you own the required right-of-way for the proposed works? No

DESCRIPTION OF WORKS

DIVERSION WORKS—

11. (a) Height of diversion dam (Elevation) 645 feet; length on top _____ feet; length at bottom _____ feet; material to be used and character of construction Probably concrete (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate concrete (Timber, concrete, etc.; number and size of openings)

When storage works are contemplated a storage permit must be filed in addition to the above. These forms can be secured, together with instructions, by addressing the State Supervisor of Hydraulics, Olympia, Washington.

PRELIMINARY - CITY REVIEW ONLY

CANAL SYSTEM—

12. *(a) Give approximate dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: Width on top (at water line)*.....*feet; width on bottom*.....*feet; depth of water*.....*feet; grade*.....*feet fall per one thousand feet.*

(b) At.....*miles from headgate: Width on top (at water line)*.....*feet; width on bottom*.....*feet; depth of water*.....*feet; grade*.....*feet fall per one thousand feet.*

SUPPLY THE FOLLOWING INFORMATION ACCORDING TO USE PROPOSED:

IRRIGATION—

13. *The land to be irrigated has a total area of*.....*acres, described as follows:*
(Give legal subdivision by section, township and range)

(If more space is required, attach separate sheet)

14. *Give the legal description of land when water is to be used for purposes other than irrigation, power and municipal supply*.....(Legal subdivisions) *Sec.*....., *Tp.*.....*N., Rge.*.....(E. or W.) *W. M.*

(a) To what stream is water returned.....

(b) Locate the point of return.....(Smallest legal subdivision) *Sec.*....., *Tp.*.....*N., Rge.*.....(E. or W.) *W. M.*

POWER—

15. *(a) Total amount of power to be developed*.....(Theoretical horsepower) *H. P.*

(b) Total fall to be utilized.....(Head) *feet.*

(c) The nature of the works by means of which the power is to be developed.....

(d) Such works to be located in.....(Legal subdivision) *of Sec.*....., *Tp.*.....*N., Rge.*.....(E. or W.) *W. M.*

(e) To what stream is the water to be returned.....

(f) Locate point of return..... *Sec.*....., *Tp.*.....*N., Rge.*.....(E. or W.) *W. M.*

(g) The use to which power is to be applied is.....

PRELIMINARY - CITY REVIEW ONLY

MUNICIPAL SUPPLY—

16. *To supply the city of* TOWN of SNOQUALMIE (Name)
KING *County, having a present population of* 775 (1940 census)
and an estimated population of 1,000 *in 19*43

(a) *Estimated present requirement*

(b) *Estimated future requirement*

17. *Construction work will begin on or before* As soon as possible

18. *Construction work will be completed on or before* " " " "

Duplicate maps of the proposed ditch or other works, prepared in accordance with the rules of the State Supervisor of Hydraulics, accompany this application.

TOWN of SNOQUALMIE
(Name of applicant)
S. R. Tharp
S. R. THARP, MAYOR

Signed in the presence of us as witnesses:

(1) D. F. Alexander (Name) Snoqualmie Wash (Address of witness)

(2) Amy F. English (Name), Snoqualmie, Wash. (Address of witness)

Remarks:

STATE OF WASHINGTON,
COUNTY OF THURSTON. } *ss.*

This is to certify that I have examined the foregoing application together with the accompanying maps and data, and return the same for correction or completion, as follows:

In order to retain its priority, this application must be returned to the State Supervisor of Hydraulics, with corrections, on or before , 19

WITNESS my hand this day of , 19

State Supervisor of Hydraulics.

PRELIMINARY - CITY REVIEW ONLY

Form 10. S. F. No. 370—1-43—1M. 2886.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

paid

APPLICATION FOR A PERMIT
To Appropriate Public Waters of the State of Washington

(Read directions on last page carefully before filling out this form)

Application No......

I, TOWN of SNOQUALMIE (Name of applicant), *of* SNOQUALMIE (Postoffice), *County of* KING, *State of* WASHINGTON, *do hereby make application for a permit to appropriate the following described public waters of the State of Washington subject to existing rights:*

If the applicant is a corporation, give date and place of incorporation MAY 18, 1903

1. *The source of the proposed appropriation is* Canyon Springs (Name of stream) *tributary of* North Fork of Snoqualmie,

2. *The amount of water which the applicant intends to apply to beneficial use is* 2.00 *cubic feet per second.*

3. *The use to which the water is to be applied is* Domestic Supply (Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. *Time during which water will be required each year* Entire Year

5. *The approximate point of diversion is located* S E corner Sec. 25 Twp 24 N R 8 E (Give distance and bearing to section corner)

being within the S E corner (Give smallest legal subdivision) *of Sec.* 25, *Tp.* 24 *N., R.* 8 E (E. or W.) *W. M., in the county of* King

6. *The* Pipe line (Main ditch, canal, or pipe line) *to be* 6 miles~~ft.~~ *or miles in length, terminating in the* Town of Snoqualmie (Smallest legal subdivision) *of Sec.*....., *Tp.*..... *N., R.*..... (E. or W.) *W. M., the proposed location being shown on the accompanying map.*

7. *The name of the ditch, canal or other works is*.....

8. *Estimated cost of development necessary to utilize fully the appropriation herein asked for* $ 40,000.00

9. *Does the stream from which you wish to appropriate water flow through the tract of land on which the water is to be used?*.....

10. *Do you own the required right-of-way for the proposed works?* N o

DESCRIPTION OF WORKS

DIVERSION WORKS—

11. *(a) Height of diversion dam* 645 (elevation) *feet; length on top*..... *feet; length at bottom*..... *feet; material to be used and character of construction* Probably concrete (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate Concrete (Timber, concrete, etc.; number and size of openings)

When storage works are contemplated a storage permit must be filed in addition to the above. These forms can be secured, together with instructions, by addressing the State Supervisor of Hydraulics, Olympia, Washington.

PRELIMINARY - CITY REVIEW ONLY

CANAL SYSTEM—

12. *(a) Give approximate dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: Width on top (at water line)*.....*feet; width on bottom*.....*feet; depth of water*.....*feet; grade*.....*feet fall per one thousand feet.*

(b) At.....*miles from headgate: Width on top (at water line)*.....*feet; width on bottom*.....*feet; depth of water*.....*feet; grade*.....*feet fall per one thousand feet.*

SUPPLY THE FOLLOWING INFORMATION ACCORDING TO USE PROPOSED:

IRRIGATION—

13. *The land to be irrigated has a total area of*.....*acres, described as follows:*.....
(Give legal subdivision by section, township and range)

(If more space is required, attach separate sheet)

14. *Give the legal description of land when water is to be used for purposes other than irrigation, power and municipal supply*.....*Sec.*....., *Tp.*.....*N., Rge.*.....*W. M.*
(Legal subdivisions) (E. or W.)

(a) To what stream is water returned.....

(b) Locate the point of return.....*Sec.*....., *Tp.*.....*N., Rge.*.....*W. M.*
(Smallest legal subdivision) (E. or W.)

POWER—

15. *(a) Total amount of power to be developed*.....*H. P.*
(Theoretical horsepower)

(b) Total fall to be utilized.....*feet.*
(Head)

(c) The nature of the works by means of which the power is to be developed.....

(d) Such works to be located in.....*of Sec.*.....,
(Legal subdivision)
Tp......*N., Rge.*.....*W. M.*
(E. or W.)

(e) To what stream is the water to be returned.....

(f) Locate point of return.....*Sec.*.....,
Tp......*N., Rge.*.....*W. M.*
(E. or W.)

(g) The use to which power is to be applied is.....

PRELIMINARY - CITY REVIEW ONLY

MUNICIPAL SUPPLY—

16. *To supply the city of* TOWN of SNOQUALMIE (Name)
KING *County, having a present population of* 775 (1940 census)
and an estimated population of 1,000 *in 19*43

(a) *Estimated present requirement*

(b) *Estimated future requirement*

17. *Construction work will begin on or before* As soon as possible

18. *Construction work will be completed on or before* " " " "

Duplicate maps of the proposed ditch or other works, prepared in accordance with the rules of the State Supervisor of Hydraulics, accompany this application.

TOWN of SNOQUALMIE (Name of applicant)
S. R. Tharp
S.R.THARP ---- Mayor

Signed in the presence of us as witnesses:

(1) W.F. Alexander (Name) Snoqualmie Wash (Address of witness)

(2) Amy F. English (Name) Snoqualmie Wash. (Address of witness)

Remarks:

STATE OF WASHINGTON,
COUNTY OF THURSTON. } *ss.*

This is to certify that I have examined the foregoing application together with the accompanying maps and data, and return the same for correction or completion, as follows:

In order to retain its priority, this application must be returned to the State Supervisor of Hydraulics, with corrections, on or before , 19

WITNESS my hand this *day of* , 19

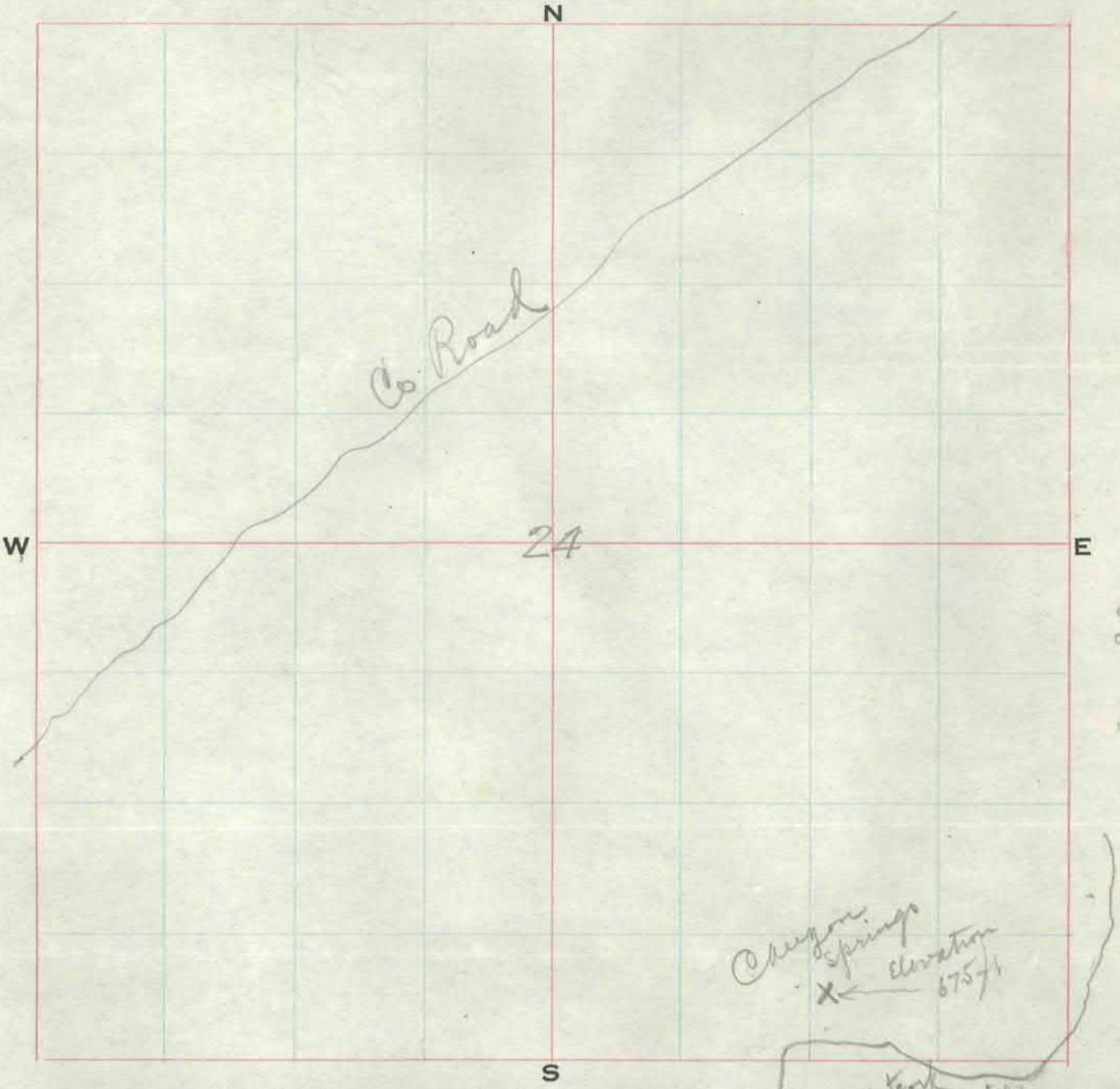
State Supervisor of Hydraulics.

S. F. No. 1854-A—1-43—3M. 2887.

SECTION PLAT

PRELIMINARY - CITY REVIEW ONLY

Sec. ~~25~~ 24 Twp. 24 N. R. 8 E



Be sure to show distance and bearing of point of diversion from nearest 40-acre corner. Also traveling directions from nearest town on main highway.

Scale: 1 inch = 800 feet.

If in Sec 25 Location is this

RECEIVED
OCT 12 1944
DIVISION OF HYDRAULICS

6205

PRELIMINARY - CITY REVIEW ONLY

1-52

PROGRESS SHEET

Name: Town of Snoqualmie
Snoqualmie, Washington

Assigned to:
Date:

APPLI. NO. 6205 PERMIT NO. 3994 CERT. NO. 4553

Appli. received 10-18-44 Initial Exam. fee received 10-18-44
Appli. returned for completion or correction _____ Received _____
Statement of add. exam. fee sent _____ Amount: _____
Additional examination fee received _____

Application amended _____
Application cancelled _____

O.K'd for publication by [illegible] Date Dec. 5, 1944.
Notice of Water Right Application sent 12-5-44
Protests filed _____
Affidavit of Publication received and checked 12-28-44 (1-22-45)

Report of Game: APPROVED BY DEPT. OF GAME 12-30-44
Report of Fisheries: APPROVED BY DEPT. OF FISHERIES 12-30-44

Temporary Permit issued _____ to _____

Examination made 1-5-45 by M. G. Walker
O.K'd for Permit 1-24-45 by "
Statement of filing and recording fee sent 1-24-45 Amount 10.00
Filing and recording fee received 1-27-45
Permit issued 1-29-45 No. 3994

Notice of Beginning of Construction sent 1-29-45
Time for " extended to 1-1-49
Fee for ext. " $5.00 to 1-1-52
Notice of " received _____

Notice of Completion of Construction sent _____
Time for " extended to _____
Notice filed 1-23-52 (letter)

Notice of Complete Application of Water sent _____
Time for " " extended to _____
Notice filed _____

Proof of Appropriation sent 1-24-52; filed 2-15-52
Statement of certificate fee sent 1-24-52 Received 2-15-52

Final Certificate of Water Right Issued 2-26-52 No. 4553

Nov. 13. 1945 - Mr Nye called and stated that surveys have been completed. [illegible]

PRELIMINARY - CITY REVIEW ONLY

Certificate GWC 91-D

North and South Wellfield

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PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

DOCUMENT TITLE: SUPERSEDING CERTIFICATE

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
Well 1R	3224089060	24N	8E	32	NE NW
Well 2	3224089060	24N	8E	32	NE NW
Well 6	1924089016	24N	8E	19	NE SE
Well 7	1924089016	24N	8E	19	SE SE
Well 8	1924089016	24N	8E	19	NE SE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS:

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

PRELIMINARY - CITY REVIEW ONLY

File NR CG1-*00059S
WR Doc ID 6799861

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

DEPARTMENT OF ECOLOGY
State of Washington

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
January 1, 1930	00059		00091

MAILING ADDRESS
City of Snoqualmie
PO Box 987
Snoqualmie, WA 98065

SITE ADDRESS (IF DIFFERENT)
Tokul Rd. SE (North Wellfield) and
Schusman Ave SE (South Wellfield)
Snoqualmie, WA 98065

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AF/YR)
90	GPM	100

GPM – gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate and annual quantity are additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

PURPOSE	WITHDRAWAL RATE ADDITIVE	WITHDRAWAL RATE NON-ADDITIVE	UNITS	ANNUAL QUANTITY (AF/YR) ADDITIVE	ANNUAL QUANTITY (AF/YR) NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	90		GPM	100		01/01 - 12/31

IRRIGATED ACRES ADDITIVE	IRRIGATED ACRES NON-ADDITIVE	PUBLIC WATER SYSTEM INFORMATION WATER SYSTEM ID	PUBLIC WATER SYSTEM INFORMATION CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Groundwater		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-1251.828

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

PRELIMINARY - CITY REVIEW ONLY

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps – either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160-291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring devices used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way

Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency

Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 2 *day of* January, *2020.*

Polly Zehm, Acting Director
Department of Ecology

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

DATA REVIEW
OK

Ria Berns, Section Manager
Northwest Regional Office
Water Resources Program

To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341

DEPARTMENT OF ECOLOGY
State of Washington

WR File NR CG1-*00059S
WR Doc ID 6799861

STATE OF WASHINGTON
FINAL
REPORT OF EXAMINATION
FOR WATER RIGHT CHANGE

Changed/added points of withdrawal

PRIORITY DATE	WATER RIGHT NUMBER
January 1, 1930	G1-*00059S (Application No. CG1-*00059S)

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
City of Snoqualmie PO Box 987 Snoqualmie, WA 98065	Tokul Rd. SE (North Wellfield) and Schusman Ave SE (South Wellfield) Snoqualmie, WA 98065

Total Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AC-FT/YR)
90	GPM	100

GPM = gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate and annual quantity are additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

	WITHDRAWAL RATE			ANNUAL QUANTITY (AC-FT/YR)		
PURPOSE	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	90		GPM	100		01/01-12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Groundwater		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWN	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Datum: NAD83/WGS84

Place of Use (See Attached Map)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Proposed Works

The City of Snoqualmie (City) has proposed to consolidate the points of withdrawal for three existing groundwater rights to include all five wells within the City's North and South Wellfields (i.e., Well Nos 6, 7, and 8, and Well Nos 1R and 2, respectively). The City has submitted Change Application Nos. CG1-20316C@1, CG1*00059S and CG1-*00060S to the Washington Department of Ecology (Ecology) for concurrent processing of the three requests for consolidation.

The subject of this report is Change Application No. CG1-*00059S, which requests to change the point of withdrawal for Certificate No. GWC 91-D from a well to all wells at the City's North and South Wellfields (Certificate No. GWC 91-D currently authorizes withdrawal at a decommissioned well owned by the City). The remaining two applications included in the City's consolidation request are intended to change the points of withdrawal for Certificate Nos. G1-20316C and GWC 92-D (file no. G1-*00060SWRIS) to all City wells at the North and South Wellfields. These applications will be addressed in separate reports; however, this report also considers the cumulative withdrawals from City wells that would result from approval of all three applications for change.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Complete	Complete	Complete

Measurement of Water Use

How often must water use be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps -- either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements
Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way
Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency
Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections
Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Findings of Facts
Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated and that the subject Certificate No. G1-*00059SWRIS (91-D) is in good standing and is eligible for change. Furthermore, I find the change of water right as recommended is from the same body of public groundwater, and will not be detrimental to existing rights or the public interest.

Therefore, I ORDER the request to change the point of withdrawal to the multiple points of withdrawal requested in Change Application No. CG1-*00059S, be approved, subject to existing rights and the provisions specified above.

Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person (see addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel RD SW Ste 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Please send a copy of your appeal to:

Ria Berns, Section Manager
Water Resources Program
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Signed at Bellevue, Washington, this 19 day of December 2018.

Ria Berns, Section Manager

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov. To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeReviser.

INVESTIGATOR'S REPORT
Water Right Control Number CG1-*00059SC@1
City of Snoqualmie
Investigator: Carl Einberger, Aspect Consulting
Reviewed by: Jay Cook

BACKGROUND

This report serves as the written findings of fact concerning Water Right Application Number CG1-*00059S.

On December 21, 2016, the City of Snoqualmie (City) filed three Applications for Change with the Washington State Department of Ecology (Ecology) to consolidate withdrawal locations to include all City wells located at the North and South Wellfield sites (i.e., Well Nos. 6, 7, and 8 and Well Nos. 1R and 2, respectively). Details of the three applications are summarized in Table 1. Future use of the existing appropriations will continue to be for municipal supply, and no changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Table 1. Change Applications Filed by the City of Snoqualmie

Change Application	Existing Source	Water Right No.	Type	Priority Date
CG1-20316C@1	South Wellfield[1]	G1-20316C	Certificate	10/13/1972
CG1-*00059S	Decommissioned Well 1	91-D	Certificate	1/01/1930
CG1-*00060S	Decommissioned Well 2	92-D	Certificate	1/01/1940

[1]Well Nos. 1R and 2

The City's water system currently serves a residential population of approximately 12,850 people with approximately 7,900 allocated equivalent residential units (ERUs; Gray & Osborne, 2016). The City's water system consists of water withdrawal, conveyance, storage, and treatment facilities. The place of use is consistent with the City's City water service area, as described in the City's 2013 Water System Plan (Gray & Osborne, 2013) and future updates.

Figure 1 (attached) shows the location of the City's wells, including the North and South Wellfields and decommissioned Wells 1 and 2. Existing and requested water right attributes for the specific water right addressed by this Report of Examination (ROE) are as follows:

EXISTING Water Right Attributes

Water Right Owner:	**City of Snoqualmie**
Priority Date:	January 1, 1930
Place of Use	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan (Original certificate stated: Town of Snoqualmie and adjacent community)

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	90	GPM	100	Year Round	

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Decommissioned Well 1	3124089041	Not Available	24N	8E	31	SW SE	47.5175	-121.8287

Datum: NAD83/WGS84

WRIA = Water Resource Inventory Area; GPM = Gallons per Minute; Ac-ft/yr = Acre-feet per year; Twp = Township; Rng = Range; Sec. = Section; QQ Q = Quarter-quarter of a section

REQUESTED Water Right Attributes

Applicant Name:	**City of Snoqualmie**
Date of Application:	December 21, 2016
Place of Use	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	90	GPM	100	Year Round	

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Datum: NAD83/WGS84

Cost Reimbursement

This application is being processed under Ecology's Cost Reimbursement Program according to the provisions of RCW 43.21A.690 and RCW 90.03.265. This report has been prepared by Aspect Consulting, LLC (Aspect) and reviewed by Ecology under contract to the applicant.

Legal Requirements for Requested Change

Public Notice

RCW 90.03.280 requires that notice of a water right application be published once a week, for two consecutive weeks, in a newspaper of general circulation in the county or counties where the water is to

be stored, diverted and used. Notice of this application was published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017. No protests were received during the 30-day statutory protest period.

Consultation with the Department of Fish and Wildlife

The Department must give notice to the Department of Fish and Wildlife (WDFW) of applications to divert, withdraw, or store water. Notice of the three change applications filed by the City was provided to WDFW on July 13, 2017. On July 18, 2017, Steve Boessow of WDFW responded in a letter to Ecology that stated:

> *Based on impacts to fish and/or wildlife and the habitat they rely on, and pursuant to Chapter 77.57.020 RCW, WDFW does not oppose the issuance of these applications. There are no changes to instantaneous or annual water quantities allowed under these proposed changes. Therefore, there are no new impacts to fish.*

State Environmental Policy Act (SEPA)

A water right application is subject to a SEPA threshold determination (i.e., an evaluation whether there are likely to be significant adverse environmental impacts) if any one of the following conditions are met:

- It is a surface water right application for more than 1 cubic foot per second, unless that project is for agricultural irrigation, in which case the threshold is increased to 50 cubic feet per second, so long as that irrigation project will not receive public subsidies;
- It is a groundwater right application for more than 2,250 gallons per minute;
- It is an application that, in combination with other water right applications for the same project, collectively exceed the amounts above;
- It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- It is part of a series of exempt actions that, together, trigger the need to do a threshold determination, as defined under WAC 197-11-305.

This project is categorically exempt from SEPA, because the three change applications associated with the project total less than 2,250 gallons per minute (gpm) in additive instantaneous quantity. The total instantaneous quantity associated with the combined change applications is 780 gpm.

Water Resources Statutes and Case Law

RCW 90.03.380(1) states that a water right that has been put to beneficial use may be changed. The point of diversion, place of use, and purpose of use may be changed if it would not result in harm or injury to other water rights. The Washington Supreme Court has held that Ecology, when processing an application for change to a water right, is required to make a tentative determination of extent and validity of the claim or right. This is necessary to establish whether the claim or right is eligible for change. *R.D. Merrill v. PCHB* and *Okanogan Wilderness League v. Town of Twisp.*

RCW 90.03.386(3) requires a municipal water supplier to apply cost-effective water conservation measures as part of its water system planning. The water supplier must also evaluate the effects of delaying the use of inchoate water rights before it may increase use of those inchoate rights. RCW 90.03.320 requires Ecology to consider the public water supplier's use of conserved water when establishing a surface or ground water right construction schedule. The City's conservation program is outlined in Chapter 5 of the current water system plan (Gray and Osborne, 2013).

RCW 90.03.386(2) states that a municipal water supplier may change its service area through the water system plan approval process. As long as the municipal water supplier is in compliance with the approved plan, the place of use for the water right is the service area of the plan.

RCW 90.44.100 allows Ecology to amend a ground water permit or certificate to: (1) allow the user to construct a replacement or additional well at a new location outside of the location of the original well, or to (2) change the manner or place of use of the water, if:

- The additional or replacement well taps the same body of public ground water as the original well. RCW 90.44.100(2)(a),
- Where a replacement well is approved, the user must discontinue use of the original well and properly decommission the original well. RCW 90.44.100(2)(b),
- Where an additional well is constructed, the user may continue to use the original well, but the combined total withdrawal from all wells shall not enlarge the right conveyed by the original permit or certificate. RCW 90.44.100(2)(c),
- Other existing rights shall not be impaired. RCW 90.44.100(2)(d).

When changing or adding points of withdrawal to groundwater rights (RCW 90.44.100), or when consolidating exempt wells with an existing permit or certificate (RCW 90.44.105), the wells must draw from the *same body of public groundwater*. Indicators that wells tap the *same body of public groundwater* include:

(a) Hydraulic connectivity.
(b) Common recharge (catchment) area.
(c) Common flow regime.
(d) Geologic materials that allow for storage and flow, with recognizable boundaries or effective barriers to flow.

INVESTIGATION

In consideration of this application, Aspect reviewed available documents pertaining to site conditions, existing well installations, and the potential effect of the proposed change on existing water right holders and established minimum instream flows. This review included information submitted by the applicant, including aquifer characterization (modeling) reports, well construction and testing reports, and pertinent Ecology records (e.g. well logs and water rights records). The review also included reports from multiple investigations characterizing the hydrogeology of the Snoqualmie basin.

A site visit was performed on July 18, 2017. Carl Einberger of Aspect met with City representatives to discuss the applications, visit existing well locations, view the area where the decommissioned wells were located, and discuss the City's current water system operations.

Using the available information in the Ecology file record, existing reports, the site visit, and communications with the City, Aspect evaluated potential effects of the proposed consolidation of withdrawal locations for the three water rights involved in the package of change applications.

Existing Water Rights Held by the City

The City's existing water rights and changes currently requested are summarized in Table 2. The subject of this report is an application to change Water Right No. G1-*00059S, however the three water right change requests are being concurrently reviewed by Ecology.

Table 2. City of Snoqualmie Water Rights (Shaded Rows Indicate Rights Requested for Change)

Water Right	Current Source	Requested Source	Priority Date	Qi gpm	Qa in ac-ft/yr	
					Additive	Non-Additive
G1-20316C	South Wellfield[1]	North & South Wellfields[1,2]	10/13/1972	600	--	500
G1-*00059SWRIS	Decommissioned Well 1		1/01/1930	90	100	--
G1*00060SWRIS	Decommissioned Well 2		1/01/1940	90	100	--
G1-25449P	North Wellfield[2]	No Change	5/30/1989	1,650	724	--
S1-*06205CWRIS	Canyon Springs	No Change	10/18/1944	898	1,448	--
Total Groundwater				**2,430**	**924**	**500**
Total Surface Water				**898**	**1,448**	**--**
Total of all Water Rights				**3,328**	**2,372**	**500**

Shaded rows indicate change applications currently being processed.
[1]Includes Well Nos. 1R and 2.
[2]Includes Well Nos. 6, 7, and 8.

The City also submitted Application No. G1-27589 on March 16, 1995 requesting appropriation of 1,400 gpm and 2,302 ac-ft/yr (annual quantity indicated as approximate), with points of withdrawal at the South Wellfield. This application is active and is not being considered as part of the City's three change applications being processed.

History of Water Use

The City was officially established in May of 1903 with water supplies initially provided by springs and surface waters. Since that time, the City has taken numerous steps to expand its water supplies to meet growing demands and provide resiliency in water supply. Key historical events in the City's water supply history includes the following (summarized from Gray & Osborne, 2013; USCB, 2017; and Ecology water right files):

- In 1930 and 1940, the City established two groundwater wells near what is now the intersection of 384th Ave SE and SE 92nd St. Water right Certificate Nos. 00091-D and 00092-D (G1-*00059SWRIS and G1-*00060SWRIS, respectively) were issued in May of 1946 to authorize use of these wells to serve the City's population of approximately 800 residents at that time.

- In 1950, the Canyon Springs source was brought online with authorization to divert up to 898 gpm and 1,448 ac-ft/yr under water right Certificate No. 04553 (S1-*06205CWRIS).

- In 1968, the Puget Sound Power and Light Company connected to the City's distribution system and service was extended to the Snoqualmie Falls Lodge.

- In 1973, Well No. 1 was constructed at the Mount Si High School property (the current location of the South Wellfield) to provide emergency supply and additional source capacity during high demand periods; withdrawals from Well No. 1 and subsequent wells in the South Wellfield (i.e., Well Nos. 1R and 2) are authorized under Certificate No. G1-23016C.

- According to a formal, signed Declaration of Gary Stevens, former Streets and Stormwater Supervisor for the City, Decommissioned Wells 1 and 2 were decommissioned in summer of 1981, given preferential use of the South Wellfield. Mr. Stevens noted the City intended to

preserve the well locations for future use through potential re-drilling or transfer to other sources.

- In 1989, the City's water system was extended to provide service to Rattlesnake Ridge and the Snoqualmie Winery site. During the same year, Well Nos. 6 and 7 were installed by Weyerhaeuser Real Estate Company to support the Snoqualmie Ridge Phase I development (the City took ownership of the wells, water right and infrastructure in 1995). A water treatment plant (for iron, manganese, and arsenic), booster stations, and reservoirs were constructed to provide potable water service to the new development.

- In 1995, Well No. 2 was installed at the South Wellfield, and aquifer testing was completed to support Application No. G1-27589 for additional appropriations from the South Wellfield (this application is still pending with Ecology).

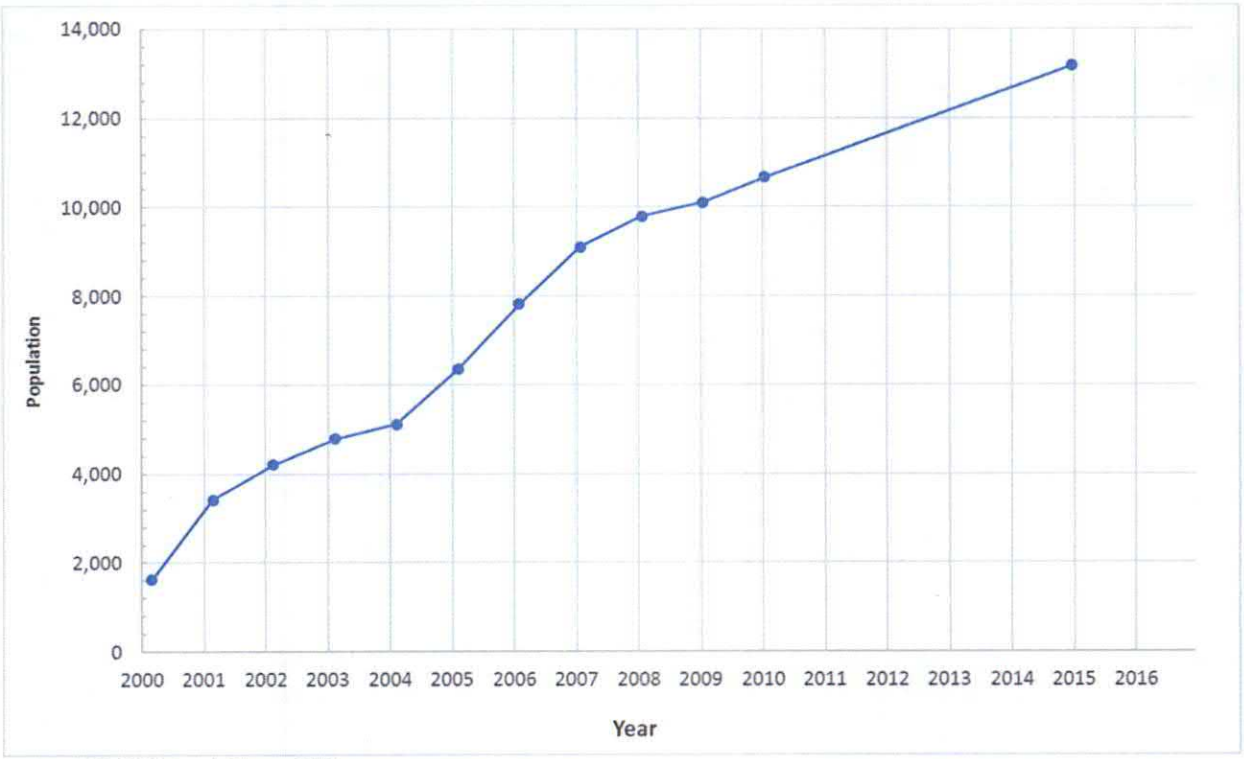
- Well No. 8 was installed at the North Wellfield in 2001 and additional reservoirs and booster stations were installed between 2004 and 2008 to supply the Snoqualmie Ridge Phase II development. Well No. 8 was the third of the three wells originally authorized by the North Wellfield water right.

- Well No. 1R was installed at the South Wellfield area in 2006 to replace Well No. 1 due to declining well yields (Well No. 1 was decommissioned). The well was installed adjacent to Well No. 2 and was added to the South Wellfield water right through a Showing of Compliance with RCW 90.44.100.

- Consistent with Mr. Stevens' declaration, the City's Water System Plans (1997, 2005 and 2013) have included the water rights evidenced by Certificate Nos. 00091-D and 00092-D (G1-*00059SWRIS and G1-*00060SWRIS, respectively). The 2005 and 2013 Water System Plans have also included an express reservation of the right for future use, stating that although the wells were no longer in service, "these rights are not subject to relinquishment for non-use and can be put to beneficial use within the City's service area through a replacement well." The 1997 Water System Plan contained similar language.

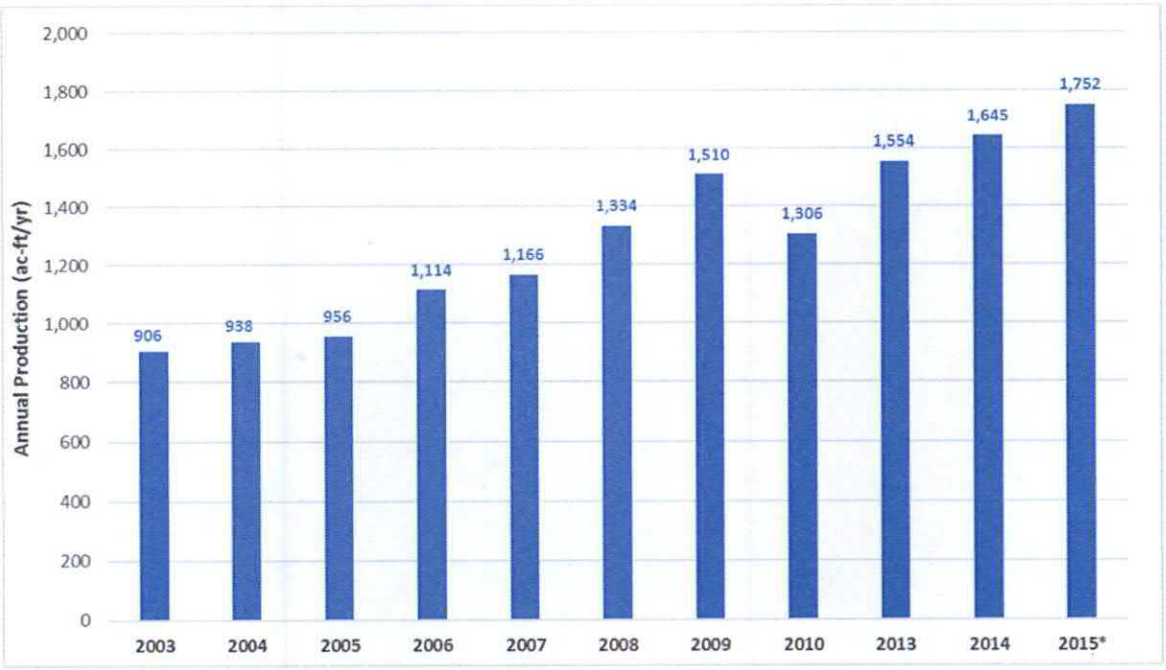
The City has experienced rapid growth in residential population and water demands since approximately 2000, as summarized in Figures 2 and 3, respectively.

Figure 2. City of Snoqualmie Population Growth



Sources: USCB, 2017; Gray & Osborne, 2013

Figure 3. City of Snoqualmie Historical Production from All Sources



*2015 production data includes 273 days (through September)

Between 2010 and 2015, the number of connections to the City's water system increased from 4,117 to 4,911. This corresponds to an overall growth rate of more than 19-percent, with residential development in the Snoqualmie Ridge accounting for the majority of new connections (Gray & Osborne, 2016). This recent growth is reflected in increased production from the South Wellfield, which has been used with increased frequency since 2008.

Annual withdrawals from the North Wellfield have increased from approximately 500 ac-ft/yr in 2004 to 900 ac-ft/yr in 2015. Withdrawals from the South Wellfield have increased from approximately 70 ac-ft/yr in 2008 to more than 240 ac-ft/yr in 2014 and recent years. The combined withdrawals from the City's wellfields is within the combined annual quantities of the subject water rights. However, the North Wellfield is operated preferentially because it: (1) is within a higher pressure zone of the City's distribution system; (2) has higher capacity; (3) supplies irrigation water to augment a Class A Reclaimed Water irrigation system as needed; and (4) can supply water to the Snoqualmie Ridge area with shortest distance of conveyance.

Projected Water Demands

The City's 2013 Water System Plan (Gray & Osborne, 2013) projects the City's population to increase at an average rate of 2-percent per year, which would result in full buildout of the City's Urban Growth Area (UGA) by approximately 2070. The City's predicted average day demands (ADD) through the year 2032 are presented in Table 3. These projections are based on observed ADD for specific areas of the UGA (i.e., the Snoqualmie Ridge Development and the Canyon Springs area) and were scaled to the proportion of developable lands in each area.

Table 3. Projected Average Day Demands

Year	Projected Qa (ac-ft/yr)[1]
2016	1,392
2017	1,472
2018	1,553
2019	1,633
2020	1,763
2021	1,844
2022	1,921
2023	1,998
2024	2,005
2025	2,012
2026	2,020
2027	2,027
2028	2,034
2029	2,041
2030	2,049
2031	2,056
2032	2,063

[1]Calculated from projections for Average Day Demand (ADD) presented in Gray & Osborne (2013).

The City has currently allocated water to four development projects: buildout of the Snoqualmie Ridge Phase 2; Kimball Creek; the Salish Lodge expansion; and the Mt. Si High School expansion. Additionally,

the Snoqualmie Ridge II applicant is engaged in long-term monitoring of the potential impact of the development of impervious surfaces in Snoqualmie Ridge II on Lake Alice Community Association ground water wells. Monitoring is scheduled to end 5 years following the completion of Snoqualmie Ridge II buildout. Although not required to do so, the City has been reserving water in an amount sufficient water service to approximately 133 connections in the event adverse effects on Lake Alice water supply are identified (Gray & Osborne, 2016). A summary of the projected annual demands from these allocations is presented in Table 4 (from Gray & Osborne, 2016).

In addition, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area. Relying on demand data from the City's 2013 Water System Plan, the applicant for the Snoqualmie Mill site projects a need for approximately 700 ERUs for its potential three-phase development.

Additionally, the City's adopted GMA Comprehensive Plan, "Snoqualmie 2032," anticipates that the eventual annexation of the City's Snoqualmie Hills West Potential Annexation Area will bring 197 new single family and 205 new multi-family residences, and 1,015 new jobs on approximately 75 acres of new commercial development. Although a detailed water demand analysis cannot be prepared until there is an actual planned development, using an estimated demand of 0.7 ERU per new multi-family unit and 5 ERU per acre for commercial development, based on estimates for Snoqualmie Ridge contained in the Water System Plan, this potential annexation could generate water demand for approximately 715 additional ERUs of water.

Thus, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area could generate water demand in excess of 1,400 ERUs.

Table 4. Allocated Future Demands

Development Project	Projected Qa (ac-ft/yr)	Projected Qi (gpm)
Snoqualmie Ridge (Phases I and II)	309.1	460
Kimball Creek	10.9	16
Salish Lodge Expansion	84.1	127
Mount Si High School	6.7	14
Lake Alice Community	38.9	58
Total Future Allocations	*450*	*675*

Source: Gray & Osborne, 2016

Proposed Use

The change proposed for Certificate No. GWC 91-D is to add the North Wellfield wells (i.e., Well Nos. 6, 7, and 8) and the South Wellfield wells (i.e., Well Nos. 1R and 2) as additional points of withdrawal to allow the authorized quantities to be used with flexibility at any of the City's active wells. The goal is to allow the City the opportunity to tailor water withdrawals to water needs throughout the City's service area.

Future use of the existing appropriations will continue to be for municipal supply, including the allocations previously described. No changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Existing Water Rights Held by Others

Ecology's Water Rights Application Tracking System (WRATS) database was queried to identify existing water rights (i.e., claims, permits, or certificates) within approximately one-half mile of the North Wellfield. This search radius was selected following an examination of Ecology's Well Log Database, which identified only seven other water supply wells completed within the local deep aquifer system (considered to be wells exceeding 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E). Water rights associated with these wells are limited to the certificates and permit presented in Table 5. The half-mile search radius was then conducted without regard to completion depth to identify additional rights tapping the nearby shallow aquifer. The results of the water right query are presented in Table 5 without any assessment of extent or validity.

Table 5. Existing Water Rights within One-half Mile of the North Wellfield[1,2]

Type	Record No.	Person or Organization	Priority Date	Qi (gpm)	Qa (ac-ft)
Claim	G1-060724CL	Stephen, Robert G	--	--	--
Claim	G1-030259CL	Sims, David M	--	--	--
Permit	G1-28625P[2]	Snoqualmie School Dist.	5/27/2009	600	500
Certificate	G1-24839CWRIS	Kenmore Per Mix Co,	6/10/1986	250	200
Certificate	G1-23440CWRIS	Gmazel, Leroy et ux.	7/18/1979	40	10

[1]Excluding Permit No. G1-25449P held by the City for the North Wellfield.
[2]The point of withdrawal for Permit no. G1-28625P is located approximately 1.7 miles south of the North Wellfield, but was included in this table because it is completed within the deep aquifer system. The purpose of use is for non-consumptive heat exchange.

Two claims to vested rights were identified within the search area. The files available for these claims do not indicate a date of first use or provide other details on well location or water use and it is uncertain if these claims are still active. Two water right Certificates were identified within the search area and were cross-referenced with Ecology's Well log database and with the Washington State Department of Health (DOH) SENTRY database to obtain additional source information. The details for these water rights are summarized in Table 6.

Table 6. Water System Details for Certificated Rights within One-half Mile of the North Wellfield[1]

Record No.	Person or Organization	DOH System ID No.	No. of Connections	Well Log ID	Source Capacity (gpm)[2]
G1-24839CWRIS	Kenmore Per Mix Co (Snoqualmie Sand & Gravel)	00919	3[5]	94089[4]	50
G1-23440CWRIS	Gmazel, Leroy et ux.	06279	2[3]	94668	40

[1]Details obtained by cross-referencing location and source information listed in water right files.
[2] Source capacity reported from DOH Water Facilities Inventory Form.
[3] Connections are residential. The system is currently approved by DOH for a total of 5 connections.
[4]Additional well logs on file in association with this property.
[5] Connections are non-residential.

Other Rights Appurtenant to the Place of Use

A review of water rights in Ecology's GWIS (Geographic Water Information System) was conducted to identify existing rights within the place of use for the subject water right (i.e., the City's water service area). Table 7 provides the water rights identified within the City's water service area. Sixty-five claims to vested rights were also identified but are not included in Table 7.

Table 7. Existing Water Rights Within the City's Water Service Area

File No.	Type	Purpose	Person or Organization	Priority Date	Qi	Qa (ac-ft/yr)
S1-24675CWRIS	Cert	IR	Colligan, Gerald	7/9/1985	0.005 cfs	0.3
S1-24723CWRIS	Cert	IR	Morton, L. William	9/4/1985	0.005 cfs	0.5
S1-25094CWRIS	Cert	DS	Benson, Julia	9/21/1987	0.01 cfs	0.5
S1-23888CWRIS	Cert	DS	Tennant, Norman Et Ux	7/23/1981	0.02 cfs	1
S1-24245CWRIS	Cert	IR	Schodde, Herman W	2/3/1983	0.01 cfs	0.5
S1-23017CWRIS	Cert	IR	Pratt Agency	12/8/1977	0.12 cfs	5
S1-22534CWRIS	Cert	DS	Solberg, Albert J	6/26/1975	0.02 cfs	1
S1-21167CWRIS	Cert	DS IR	Fitzgerald, George W	1/10/1974	0.02 cfs	3
S1-20803CWRIS	Cert	DS	Travis, C W R & N J	8/3/1973	0.01 cfs	1
S1-20806CWRIS	Cert	IR	Sletten, Arvid	8/6/1973	0.01 cfs	0.5
S1-20881CWRIS	Cert	DS	Walker, James A	9/4/1973	0.02 cfs	1
S1-00632CWRIS	Cert	DS	Costantino, Michael	6/29/1971	0.01 cfs	1
S1-00652CWRIS	Cert	FS ST	Chicklero, Albert	2/24/1971	0.01 cfs	1
S1-20103CWRIS	Cert	IR ST	Mcclain, Elvin	5/3/1972	0.01 cfs	1
S1-00515CWRIS	Cert	DS	Young, James A	10/17/1968	0.01 cfs	1
S1-00206CWRIS	Cert	DS	Blankenship, E And D	2/17/1972	0.01 cfs	1
S1-*21353CWRIS	Cert	DM	Eychaner, John	12/3/1968	0.02 cfs	2
S1-*21911CWRIS	Cert	DS	Culbertson, R W	11/18/1969	0.01 cfs	1
S1-*21918CWRIS	Cert	DS	Gebaroff, C W	11/26/1969	0.01 cfs	1
S1-*18758CWRIS	Cert	DS	Baxter, L	10/26/1964	0.01 cfs	--
S1-*16625CWRIS	Cert	DS RE	Hall, C B	4/11/1961	0.05 cfs	--
S1-*13920CWRIS	Cert	DS FS IR	Miller, H W	6/12/1956	0.3 cfs	28
S1-*09533CWRIS	Cert	DS	Margreiter, G Et Ux	4/18/1950	0.005 cfs	--
S1-*04485CWRIS	Cert	DS PO	Swanson, E M	12/15/1937	0.4 cfs	--
S1-*02428CWRIS	Cert	DM	Slade, G A	9/26/1928	0.2 cfs	--
G1-24839CWRIS	Cert	MI	Kenmore Per Mix Co	6/10/1986	250 gpm	200
G1-25200CWRIS	Cert	FR HE IR	Streissguth, Mark	3/15/1988	300 gpm	16.6
G1-23440CWRIS	Cert	DM	Gmazel, Leroy Et Ux	7/18/1979	40 gpm	10
G1-00152C	Cert	DM	Leisure Time Resorts of America	9/8/1971	40 gpm	8.5
G1-24210C	Cert	DM	Rumbolz Sunset Water Association	12/3/1982	30 gpm	5
G1-28625P	Pmt	HE	Snoqualmie Valley School Dist 410	5/27/2009	600 gpm	500

Cert = Certificate; Pmt = Permit; '—' not listed; DM = multiple domestic; DS = Domestic; FS = Fire Suppression; HE = Heat Exchange; IR = Irrigation; MI = Mining; PO = Power; ST = Stock Watering

Hydrologic Setting

The City is located within Water Resources Inventory Area (WRIA) 7, which encompasses the Snohomish River Basin. WRIA 7 and the Snohomish River basin can be further divided into 62 sub-basins, with the City being within the Lower Coal Creek sub-basin of the Snoqualmie River Valley (Snohomish County, 2005). Surface waters within the Lower Coal Creek sub-basin, including Kimball and Coal Creeks to the south of the City, and Brockway and Tokul Creeks to the north, are tributaries of the Snoqualmie River Mainstem, which flows west along the City's northern margin. The North and South Forks of the Snoqualmie River join the Middle Fork approximately 2 miles east (upstream) of the City before continuing to flow generally northwest toward the Snohomish River.

The Upper Snoqualmie River watershed, which includes the greater Snoqualmie River Basin upstream of Snoqualmie Falls (located approximately one-half mile southwest of the North Wellfield; see Figure 1) drains an area of approximately 375 miles (AESI, 1996). Precipitation in the Upper Snoqualmie River watershed ranges from more than 180 inches per year (in/yr) in the Cascade Mountains to approximately 60 inches at the City (Ecology, 2016). The average discharge in the Snoqualmie River at Snoqualmie Falls between 2000 and 2015 was approximately 3,900 and 700 cubic feet per second (cfs) in January and August, respectively (USGS, 2016).

The City and the adjacent reach of the Snoqualmie River Mainstem (Snoqualmie River) are located within a deeply incised portion of the Snoqualmie River Valley. The City is bounded to the north by the Mt Si. foothills and the Tokul Delta, and by Rattlesnake Ridge to the South, resulting in more than 400 feet of relief within the City's water service area. This relatively high relief within City limits is also associated with a wide range of geologic units deposited as valley infill.

Hydrogeologic Evaluation

A series of hydrogeologic characterizations have been completed to support several water resources projects near the City, including the City's North and South Wellfields (see AESI [1995] and [1996]), as well as large-scale studies to support groundwater management (e.g., King County, 2010; Golder, 1998; USGS, 1994, etc). These investigations were reviewed by Aspect in conjunction with geologic maps and well installation reports to support a hydrogeologic evaluation of the subject application. A geologic and hydrogeologic conceptual model is described below based on this review.

Geologic Setting

The City is located within the Snoqualmie Valley, which is a deeply incised bedrock valley filled with a series of glacial and non-glacial sediments, deposited primarily during the Pleistocene epoch (1.6 million to 10,000 years before present [ybp]). These Pleistocene-aged sediments are overlain by more recent alluvial sediments (e.g., sands and gravels) deposited by the Snoqualmie River and its tributaries (Dragovich, 2009; AESI,1994).

Bedrock of the Snoqualmie Valley near the City consists primarily of tertiary volcanic rocks (e.g., the Miocene-aged andesites exposed at Snoqualmie Falls) and older (Jurassic-aged) metasedimentary rocks (e.g., the metasandstones exposed in portions of the Tokul Creek Valley; Dragovich, 2009). The depth to bedrock at the City's wellfields, which are located generally near the center of the Snoqualmie Valley, ranges between approximately 550 and 600 feet below ground surface (feet bgs), except at Well No. 8. Andesitic bedrock was first encountered approximately 700 feet bgs at the City's Well No. 8 due to higher ground surface elevations near the Tokul Creek plateau and the proximity of Tokul Creek, which is likely associated with ancestral bedrock erosion.

A simplified geologic cross-section is presented in Figures 5 and 6 to indicate the depth to bedrock and the series of unconsolidated sediments that form the valley fill (modified from AESI, 1996). From oldest to youngest, the infill sediments have been categorized as the following stratigraphic layers (summarized from AESI, 1996 and Dragovich, 2009):

- Pre-Olympia Sediments (*Qpou*) – Pleistocene-aged undifferentiated glacial and non-glacial deposits consisting of laminated to massive silt, clay, sand and gravel. This unit has been identified immediately overlying bedrock south of the City, but is absent at the North and South Wellfields.
- Olympia Sediments (*Qo*) – Pleistocene-aged fluvial sediments deposited by the ancestral Snoqualmie River. This unit generally consists of medium to coarse sands and gravels with lenses of fine to medium sand. It has been mapped at the North and South Wellfield as being between approximately 50 to 70 feet thick, and has been identified by Golder (1996) at elevations up to 600 feet above mean sea level (amsl) near Tanner (approximately 5 miles southeast of the South Wellfield).
- Vashon Glacial Sediments (*Qva, Qvt, Qvr*) – Quaternary-aged glacial deposits of the most recent glaciation of the Puget Sound Lowlands (i.e, the Vashon Stade of the Fraser Glaciation). Sediments deposited during glacial advance (*Qva*) include glaciolacustrine clay, silt and fine sand deposited at thicknesses of approximately 100 to 200 feet. Subsequent deposits of glacial till (*Qvt*) consist of poorly sorted sand and gravel in a dense silt/clay matrix. Meltwaters that formed during the glacial retreat resulted in deposition of a prograding delta system (Qvr) in the Tokul Creek area; the local *Qvr* is noted to coarsen upwards and become generally finer-grained with distance from the ancestral delta (e.g. to the southeast).
- Recent Sediments (*Qa*) – Late-Quaternary to recent sediments deposited by the post-glacial Lake Snoqualmie and the modern Snoqualmie River. Deposition of the Tokul Creek delta system resulted in the formation of pre-historic Lake Snoqualmie, which deposited lacustrine sands, silts, and clays (*Qaf*) at thickness of up to 300 feet near the South Wellfield; these sediments are noted to become coarser-grained to the south (AESI, 1994). Recent Snoqualmie River deposits of sand and gravel (*Qag*) overly the Lake Snoqualmie sediments, and floodplain deposits of silt and clay are typically present near ground surface.

Figure 5. Geologic Cross-section Location

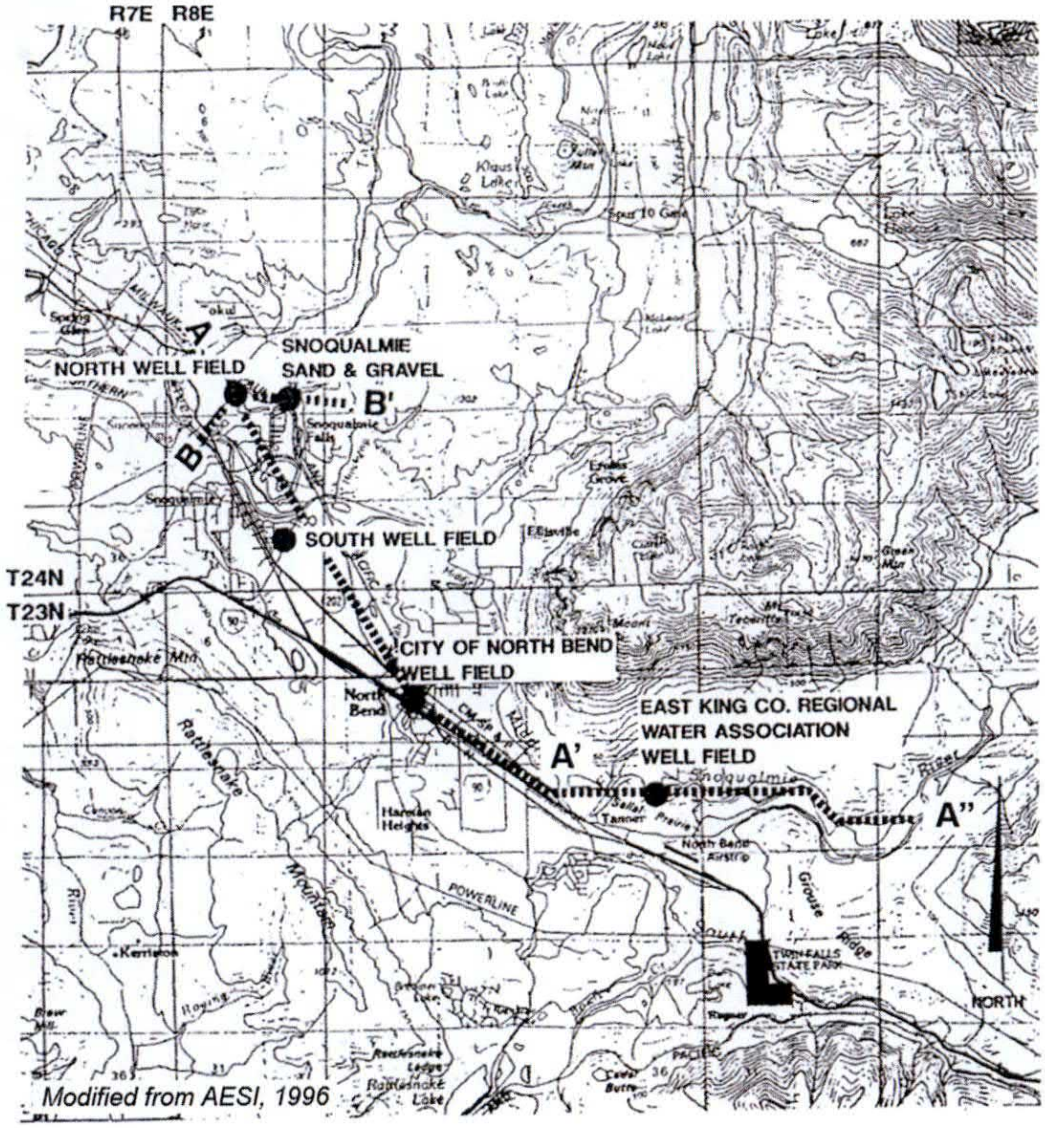
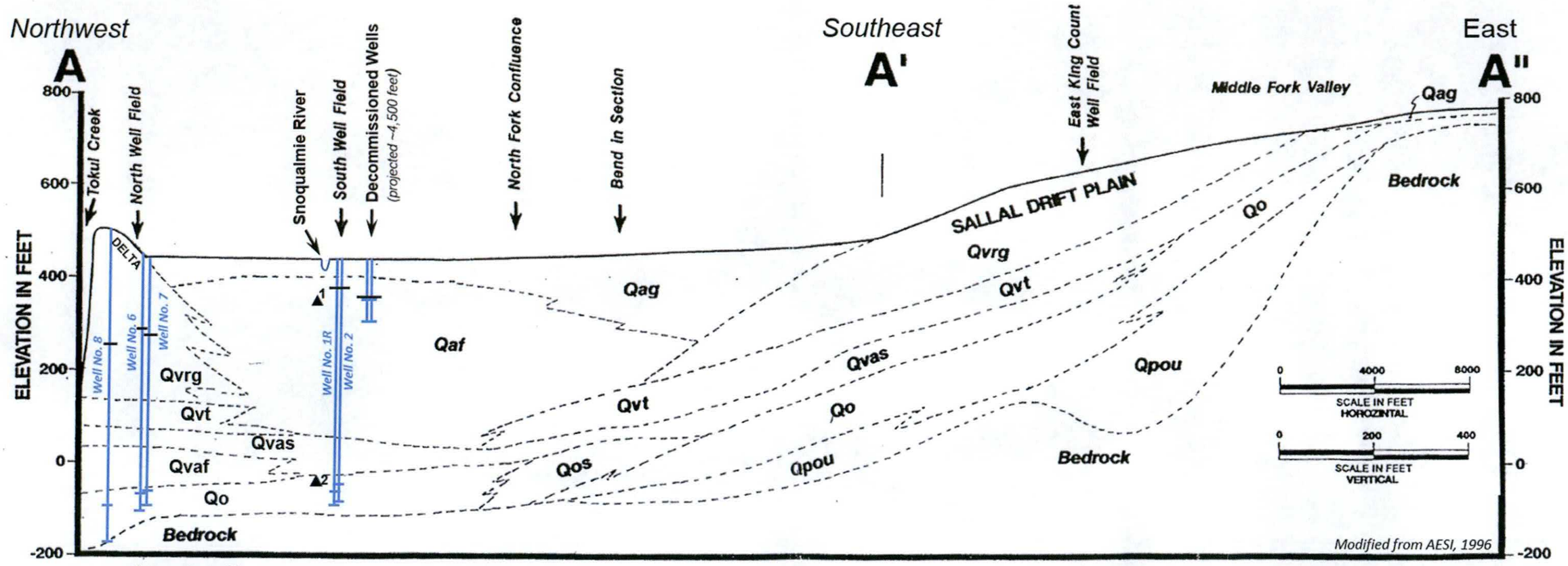


Figure 6. Geologic Cross-section



Legend

Qag	Recent river deposits consisting of gravelly sand to sandy gravel capped over bank silts
Qaf	Lake Snoqualmie deposits consisting of fine sand, silts, and clays; coarsening southward (AESI, 1994)
Qvrg	Vashon Recessional fluvial deposits consisting of cobbly sandy gravel
Qvt	Vashon till consisting of poorly sorted sand and gravel in dense silt and clay matrix
Qvas	Vashon advance fluvial deposits consisting of medium to fine sand
Qvaf	Vashon advance lacustrine deposits consisting of silts and clay
Qo	Olympia fluvial deposits consisting of cobbly sandy gravel to gravelly sand
Qos	Olympia fluvial deposits consisting of sand deposited by the historic North Fork near the confluence of the North Fork with the Middle and South Fork Snoqualmie Rivers
Qpou	Pre-Olympia undifferentiated sediments consisting of a mix of till, sand, gravel, silt, and clay
Bedrock	Tertiary- to Jurassic-aged bedrock

▲ Carbon-14 Dates
1. 5720 ybp
2. >43,000 ybp

City Well
- Approx. static water level (well log)
- Approx. screen interval

Groundwater Occurrence

There are four principal aquifers that have been identified in proximity to the City. These include, from oldest to youngest, the following aquifers (summarized from AESI, 1994, 1996 and 2002):

- Olympia Aquifer – occurring in the Olympia Sediments (*Qo*) of the ancestral Snoqualmie River, this aquifer has been locally designated as the "deep aquifer" in some reports and is tapped by all wells at the City's North and South Wellfields. The aquifer ranges in thickness from approximately 50 to 200 feet between the North Wellfield and at wells installed southeast of the City at Tanner, respectively. Beginning near the Grouse Ridge/Middle Fork Embankment area east of Tanner, the aquifer extends to an unknown distance northwest of Snoqualmie Falls. The width of the aquifer was limited by the narrow bedrock valley of the ancestral Snoqualmie River, and is estimated to be 2,000 feet near the North Wellfield.

  Aquifer testing at the City's North and South Wellfields indicated the aquifer behaves as a leaky confined system, receiving water from the overlying Vashon glacial advance sediments (*Qva*). At the North Wellfield, the Olympia Aquifer is immediately overlain by a clayey silt aquitard deposited during the glacial advance (Qvaf); however, this aquitard was not identified at the South Wellfield, suggesting relatively more recharge occurs from overlying aquifers at the South Wellfield. The transmissivity of the aquifer has been estimated to range between approximately 2,000 and 4,000 feet squared per day (ft^2/d) at the North and South Wellfields, respectively.

- Glacial (Vashon) Advance Aquifer – occurring within the sands of the glacial advance sediments (*Qvas*), this aquifer has been identified at the North and South Wellfields at thickness up to approximately 120 and 80 feet, respectively. The lateral distribution of the aquifer is similar to that for the Olympia Aquifer as a result of the ancestral topography, but sediments are generally finer and of different origin. This aquifer is considered capable of producing low yields, and modeling of leakage (recharge) rates to the underlying Olympia Aquifer indicate a transmissivity on the order of 600 ft^2/d.

- The Tokul Creek Glacial Recession Aquifer – occurring within the sand and gravel deltaic deposits of the Tokul Creek Delta (*Qvr*), this aquifer is unconfined and is bounded to the west by bedrock. The aquifer is approximately 140 feet thick at the North Wellfield, but becomes finer-grained and pinches out to the southeast. Groundwater discharges from this aquifer to Tokul Creek at an estimated rate of approximately 4 to 5 cfs near SR-202 (total baseflow in Tokul Creek was estimated at 25 cfs during the 1992 measurement period; AESI, 1996). Recharge to the aquifer includes discharge from the adjacent Snoqualmie River Aquifer, which occurs over a relatively steep gradient of about 0.3 feet per foot. Transmissivity in the aquifer ranges from about 24,000 ft^2/d near the North Wellfield to 220 ft^2/d at a well located at Snoqualmie Sand and Gravel (near the aquifer margin).

- The Snoqualmie River Aquifer – occurring within the surficial sand and gravel deposits of the recent Snoqualmie River (*Qag*), averaging approximately 50 feet thick near the City. Most groundwater within this unconfined aquifer discharges to the Snoqualmie River and to the Tokul Creek aquifer within the subsurface. Aquifer transmissivity has been estimated from slug testing to be approximately 4,000 ft^2/d; however, these results may represent an underestimate of transmissivity due to effects from delayed yield.

The generally less productive Lake Snoqualmie Unit tapped by the City's decommissioned wells likely receives recharge from the Snoqualmie River aquifer. It is considered to be unconfined to semi-confined, with discharge occurring to deeper aquifers (i.e., Qva and Qo) and ultimately to the Snoqualmie River. The Lake Snoqualmie Unit is therefore considered to be part of the Snoqualmie River aquifer system.

Groundwater Flow and Potential Changes

The current point of withdrawal for the subject water right (91-D) is Decommissioned Well No. 1 (see Figures 5 and 6), which is interpreted to have tapped shallow portions of the Lake Snoqualmie unit (*Qaf* in Figure 6). The Lake Snoqualmie unit is not known to be a prolific aquifer near the City, and likely receives recharge primarily from the overlying Snoqualmie River Aquifer and locally from Kimball Creek (located about 500 feet from the existing points of withdrawal). Kimball Creek is fish bearing and flows to Coal Creek, which discharges to the Snoqualmie River above Snoqualmie Falls. Kimball Creek is the focus of a habitat and water quality improvement project undertaken by the Snoqualmie Tribe (Baerwalde, 2011), and continued nonuse of the existing point of withdrawal for the subject right is expected to provide a flow benefit to Kimball Creek.

Based on aquifer pressures and the conceptual hydrogeologic model presented in Figure 6, groundwater within the Lake Snoqualmie Unit should discharge to the Tokul Creek Glacial Recessional Aquifer and ultimately to surface water.

All of the City's currently active production wells tap the Olympia aquifer at depths between approximately 500 and 700 feet bgs. Well Completion depths are summarized in Table 8 and depicted in cross-section as Figure 6.

Table 8. Summary of City of Snoqualmie Production Wells

Well No.	Static Water Level (feet amsl)[1]	Screen Interval (feet BGS)	Screened Elevation (feet amsl)	Wellfield	Average Wellfield Production in 2013 & 2014 (gpm)[2]
1R	374[3]	490 - 550	-70 to -130	North	570
2	--	513 – 556[4]	-100 to -143		
6	276[5]	534 – 580	-94 to -140	South	140
7	290[5]	527 - 557	-87 to -117		
8	240[3]	609 – 694	-100 to -184		
Decommissioned No. 1	355[3]	85 – 130[6]	355 - 310	--	--
Decommissioned No. 2	355[3]	85 – 130[6]	355 - 310		

[1]Reported for different water years and times of year.
[2]Production data provided by Gray and Osborne (2013 and 2016) indicates groundwater production was greatest in 2013 and 2014 for the period from 2003 through 2015.
[3]Obtained from well log on file with Ecology
[4]No well log on file with Ecology; information obtained from GeoEngineers, 1995.
[5]From AESI, 1994.
[6]Casing was perforated.

Pumping tests at the North Wellfield have resulted in a pronounced drawdown response at the South Wellfield, and vice versa. An 8-day pumping test at the North Wellfield was conducted at a rate of 1,040 gpm, resulting in approximately 50 feet of drawdown at the North Wellfield (Well TW-5) and 5 feet of drawdown at the South Wellfield (AESI, 1994). Alternatively, a similar pumping test conducted at the South Wellfield (i.e., pumping 1,130 gpm for 7 days) resulted in a comparatively lower drawdown response at the North Wellfield (i.e., approximately 2 feet; GeoEngineers, 1995). These results suggest that: (1) lateral flow boundaries likely exist to the east and west in proximity to the wellfields, resulting in the pronounced drawdown response over the approximately 2 miles separating the wellfields; and (2)

the greater drawdown response during each test at the South Wellfield to pumping at the North Wellfield may be associated with more confining conditions in the northwest portion of the aquifer (e.g., confining layers may act to limit leakage from overlying aquifers in this area, resulting in a more rapidly expanding cone of depression).

A numerical groundwater flow model was developed for the City in the 1990s using the USGS MODFLOW code to evaluate aquifer and surface water response to pumping at the North and South Wellfields (see AESI, 1994 and 1995, respectively). The steady-state model indicated that continuous pumping at either the North or South Wellfields would result in a reduction in groundwater discharge to Tokul Creek and the Snoqualmie River. This reduction is predicted to occur at both wellfields due to leakage (recharge) to the Olympia aquifer from the overlying shallow aquifers, which are in hydraulic connection with local surface waters. However, the model predicts greater local impacts will occur to the Snoqualmie River from pumping at the South Wellfield because of better hydraulic continuity with the shallow aquifers in this area.

The MODFLOW model simulated the effects of continuous pumping at the North Wellfield at a rate based on the annual limitations of existing water rights (i.e., 425 gpm, equating to approximately 700 ac-ft/year under Permit No. G1-25449P; AESI,1994). The effect of pumping at a continuous rate of 410 gpm (660 ac-ft/yr) was simulated for the South Wellfield (AESI, 1995). The results of these simulations are summarized in Table 9 (compiled from AESI, 1994 and 1995).

Table 9. Modeled Impacts to Surface Waters from Production at City Wellfields

Wellfield	Average Pumping Rate (gpm)	Tokul Creek Flow Reduction		Snoqualmie River Flow Reduction		
		Total (gpm)	*% of Baseflow*	*Total Above Falls (gpm)*[1]	*Total Below Tokul Confluence (gpm)*	*% of Baseflow*[2]
North	425	65	0.5	3[3]	70	0.02
South	410	55	0.5	240[4]	300	0.10

[1]Represents maximum total reduction in flow at Snoqualmie Falls (i.e., "return flow capture" and direct discharge to groundwater at the South Wellfield).
[2]Represents reduction in summer baseflow (est. 700 cfs) in the Snoqualmie River below the Tokul Creek Confluence (0.75 miles downstream from Snoqualmie Falls).
[3]Represents the predicted quantity of intercepted recharge to the Snoqualmie River Aquifer (see AESI, 1994)
[4]Includes an estimated 20 gpm of induced recharge from the Snoqualmie River and 220 gpm of leakage from Snoqualmie River aquifer (AESI, 1995)

The model simulations indicated that approximately 220 gpm and 3 gpm of groundwater discharge to the Snoqualmie River above Snoqualmie Falls would be intercepted by pumping at the South and North Wellfields, respectively. The model also suggested that pumping at the South Wellfield would result in an additional 20 gpm flow reduction in the Snoqualmie River, due to induced discharge from the river to the surrounding aquifer (totaling the 240 gpm seen in Table 9). The model simulated that releases from storage (replenished through recharge) and reduced outflow within the deep aquifer provide the balance of flow to the wells. The reduction in outflow from the deep aquifer system is modeled to be greater when pumping at the North Wellfield compared to the South Wellfield (commensurate with less local impact to the Snoqualmie River), but likely results in reduced baseflows to the Snoqualmie River in downstream areas. This suggests that a downstream movement of existing impacts to the Snoqualmie River may result from the proposed change, which is considered an overall benefit to the Snoqualmie River, because impacts along an upstream reach of the river associated with the water rights' existing points of withdrawal will be reduced or eliminated.

The modeled reduction in baseflow to Tokul Creek from pumping either wellfield would further decrease Snoqualmie River baseflow below the Tokul Creek confluence (approximately 0.75 miles downstream from Snoqualmie Falls). However, discharge to the Snoqualmie River from the City's wastewater treatment plant will result in an overall increase in flow in the Snoqualmie River above

Snoqualmie Falls, since the majority of this wastewater originates from the deep groundwater system that would otherwise discharge farther downstream in the Snoqualmie River.

The application for change filed by the City requested to change the point of withdrawal for Certificate No. GWC 91-D from a decommissioned well to all wells at the City's North and South wellfields. Historical impacts in the Snoqualmie River from use of the decommissioned well would likely have been experienced downstream of its confluence with Kimball Creek, but not necessarily upstream of the confluence. During evaluation of the proposed changes, Ecology expressed concerns to the City that an additional one mile reach of the Snoqualmie River would potentially be impacted by increased withdrawals at the South Wellfield. Given Ecology's concerns and the City's preferential use of the North Wellfield over the South Wellfield, the City voluntarily agreed to withdraw the request for use of this water right at the South Wellfield. For this reason, the analysis that follows focuses on anticipated increases in withdrawals at the North Wellfield.

It is recognized that the MODFLOW models for the North and South Wellfields could be updated with more recent water level and aquifer testing data, and the model output may change as a result. However, the overall results of the existing models are not expected to change the finding that less local impacts would occur to the Snoqualmie River by consolidating withdrawals at the North Wellfield site. The results in Table 9 summarize the existing model results and illustrate this finding. Importantly, the proposed consolidation is considered water balance neutral with respect to the Snoqualmie River watershed (i.e., consolidation of pumping at the North Wellfield would not increase or reduce consumptive appropriations from the basin, all of which will ultimately result in reductions of flow in the river). However, based on these results, consolidating pumping at the North Wellfield should nevertheless result in a downstream shift in potential effects from groundwater withdrawals on flow in the river, given the downstream location of the North Wellfield and greater confining conditions in this area.

Impacts to Tokul Creek resulting from consolidation of pumping at the North Wellfield (i.e., resulting from an equivalent decrease in pumping at the South Wellfield and the City's shallow decommissioned wells) were investigated by reviewing previous model simulations. Interpolating model results for pumping at both the North and South Wellfields (AESI 1994; AESI ,1995) as currently authorized (approximately 1,224 ac-ft/yr or 760 gpm continuously) results in an estimated baseflow reduction in Tokul Creek of approximately 100 gpm, which is about 1% of summer low flows in Tokul Creek (AESI, 1994). Considering the City's entire consolidation project (see Table 2), up to 880 gpm could be authorized for continuous withdrawal at the North Wellfield (i.e., 1,424 ac-ft/yr under continuous pumping). Interpolation of results from previous MODFLOW simulations at the North Wellfield (simulations included continuous pumping at rates between 100 and 3,000 gpm; AESI, 1994) indicates that continuous pumping at 880 gpm exclusively from the North Wellfield could decrease groundwater discharge to Tokul Creek by approximately 110 gpm. Thus, it is predicted that all the proposed changes combined would result in a minor increase in impacts on Tokul Creek (roughly 0.1% of summer low flow). Tokul Creek is not regulated with instream flows.

Impairment Considerations

Impairment of Minimum Instream Flow Water Rights

The term "instream flow" is used to identify a specific stream flow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the stream flows needed to protect and preserve instream

resources and values, such as fish, wildlife and recreation. Instream flows are most often described and established in a formal legal document, typically an adopted state rule.

Once established, a minimum flow constitutes an appropriation with a priority date as of the effective date of the rule establishing the minimum flow (RCW 90.03.345). Thus, a minimum flow set by rule is an existing right which may not be impaired (RCW 90.03.345; RCW 90.44.030).

Minimum instream flows were established for the Snohomish River Water Resource Inventory Area (WRIA 7) by WAC 173-507 in 1979. None of the three water rights involved with this project are junior to the instream flow rule, and as such, they are not subject to curtailment when instream flows are not met. The hydrogeological assessment suggests that, as a result of the changes, impacts in the Snoqualmie River will be reduced or eliminated along a reach of the river from shifting withdrawals downstream to the North Wellfield. Flows as measured at the gage at Snoqualmie Falls control station will not be reduced and could even see a slight increase. With the withdrawal moving a short distance downstream, flows at all other downstream control stations in the Snoqualmie/Snohomish system should see no change through this consolidation process. As noted previously, WDFW has also determined that no new impacts to fish will occur from approval of this change application.

Impairment, Qualifying Ground Water Withdrawal Facilities, and Well Interference

There are three concepts that are important when considering whether a withdrawal of water from a well would impair another existing water right. The concepts are defined as follows:

1. Impairment is an adverse impact on the physical availability of water for a beneficial use that is entitled to protection (i.e., water rights that are both senior and junior in priority to the right the applicant seeks to change).

2. Qualifying ground water withdrawal facilities are defined as those wells which in the opinion of the Department are adequately constructed. An adequately constructed well is one that (a) is constructed in compliance with well construction requirements; (b) fully penetrates the saturated thickness of an aquifer or withdraws water from a reasonable and feasible pumping lift (WAC 173-150); (c) the withdrawal facilities must be able to accommodate a reasonable variation in seasonal pumping water levels; and (d) the withdrawal facilities including pumping facilities must be properly sized to the ability of the aquifer to produce water.

3. Well interference may occur when several wells penetrate and withdraw ground water from the same aquifer. Each pumping well creates a drawdown cone. When several wells pump from the same aquifer, well density, aquifer characteristics, and pumping demand may result in individual drawdown cones that intersect and form a composite drawdown cone. At any point in an aquifer, the composite drawdown caused by pumping wells will be greatly influenced by the transmissivity (T) of the aquifer. In aquifers with high Ts, composite drawdown will generally be much less than in aquifers with similar properties but with low Ts. Transmissivity is related to hydraulic conductivity (K) and the saturated thickness (b) of an aquifer by the relationship T=Kb.

   An aquifer's hydraulic conductivity (K) is derived from the physical properties of both the fluid and geologic materials that form an aquifer. Once formed, an aquifer's saturated thickness (b) becomes important in evaluating its transmissivity. For regions of similar K in an aquifer, a large saturated thickness will result in a much higher T than a small saturated thickness. As a result, regions of similar K in an aquifer with a large saturated thickness will experience less composite drawdown or

well interference than with a small saturated thickness.

Some conditions, however, will increase or steepen composite drawdown in an aquifer. For instance, where characteristics (such as very fine, clay-rich, or poorly sorted sediments) of an unconfined aquifer cause significant drawdown relative to the saturated thickness, the composite drawdown will increase as saturated thickness is reduced and T becomes smaller. Additionally, in regions where negative or no-flow boundaries occur, such as near the edges of a valley fill aquifer where it is bounded by bedrock, composite drawdown will be steeper than in the central part (generally the greatest thickness region) of the aquifer. Consequently, it is commonly understood that the greatest composite drawdown or well interference is more likely to occur in regions of low transmissivities, thin saturated thicknesses and near negative or no-flow boundaries than in regions of high transmissivities, large saturated thicknesses, and away from negative or no-flow boundaries.

It is noted above that Tokul Creek could experience a slight increase in impacts from the proposed change. The potential increase is on the order of 0.1% of the summer low flow in Tokul Creek and will not physically impair any downstream surface water rights.

The City's proposed consolidation package requests the North Wellfield wells as additional points of withdrawal for existing rights. If the entire package were approved, withdrawals from the North Wellfield could increase from 724 to 1,424 ac-ft/yr; this amounts to an increase in the average (continuous) pumping rate from approximately 450 to 880 gpm. This increase in withdrawals at the North Wellfield would result in greater localized drawdown within the Olympia aquifer and, to a lesser degree, within overlying shallow aquifers. To estimate potential well interference to other users, the results from previous MODFLOW simulations for the North Wellfield were evaluated (see AESI, 1994).

MODFLOW simulations were previously conducted for the North Wellfield for continuous pumping rates between 100 and 3,000 gpm. Interpolation of these results was performed to estimate aquifer drawdown during pumping at 880 gpm. Results are summarized in Table 10. Figures showing the simulated drawdown in the deep aquifer from continuous pumping at the North Wellfield at 425 and 1,000 gpm are presented in Figures 7 and 8, respectively (modified from AESI, 1994).

Table 10. Simulated Drawdown Response to Pumping (MODFLOW results; AESI, 1994)

Average Annual Pumping Rate (gpm)	Deep Aquifer Drawdown (in feet)		Shallow Aquifer Drawdown (in feet)
	at 2,000 feet (Snoqualmie S & G)[1]	*at 9,000 feet (S. Wellfield and School District Wells*[2]*)*	*at 1,500 feet (adjacent domestic wells)*[3]
450	20	5	2
880[4]	30	10	4
1,000	35	12	5
2,000	75	24	9

[1] Snoqualmie Sand and Gravel Wells (G1-23849C); Ecology Well Log ID Nos. 94089 and 97733.
[2]The school district wells are include an injection and extraction well associated with Permit No. G1-28625P and are located approximately 10,000 feet from the North Wellfield.
[3]Approximate distance to Tokul Plateau Well (G1-23440C; Ecology Well Log ID 94668) and other exempt wells indicated in Table 11.
[4]Drawdown response to pumping at 880 gpm estimated by linear interpolation of existing results.

Figure 7. Simulated Drawdown in Olympia Aquifer – 425 gpm Continuous Pumping

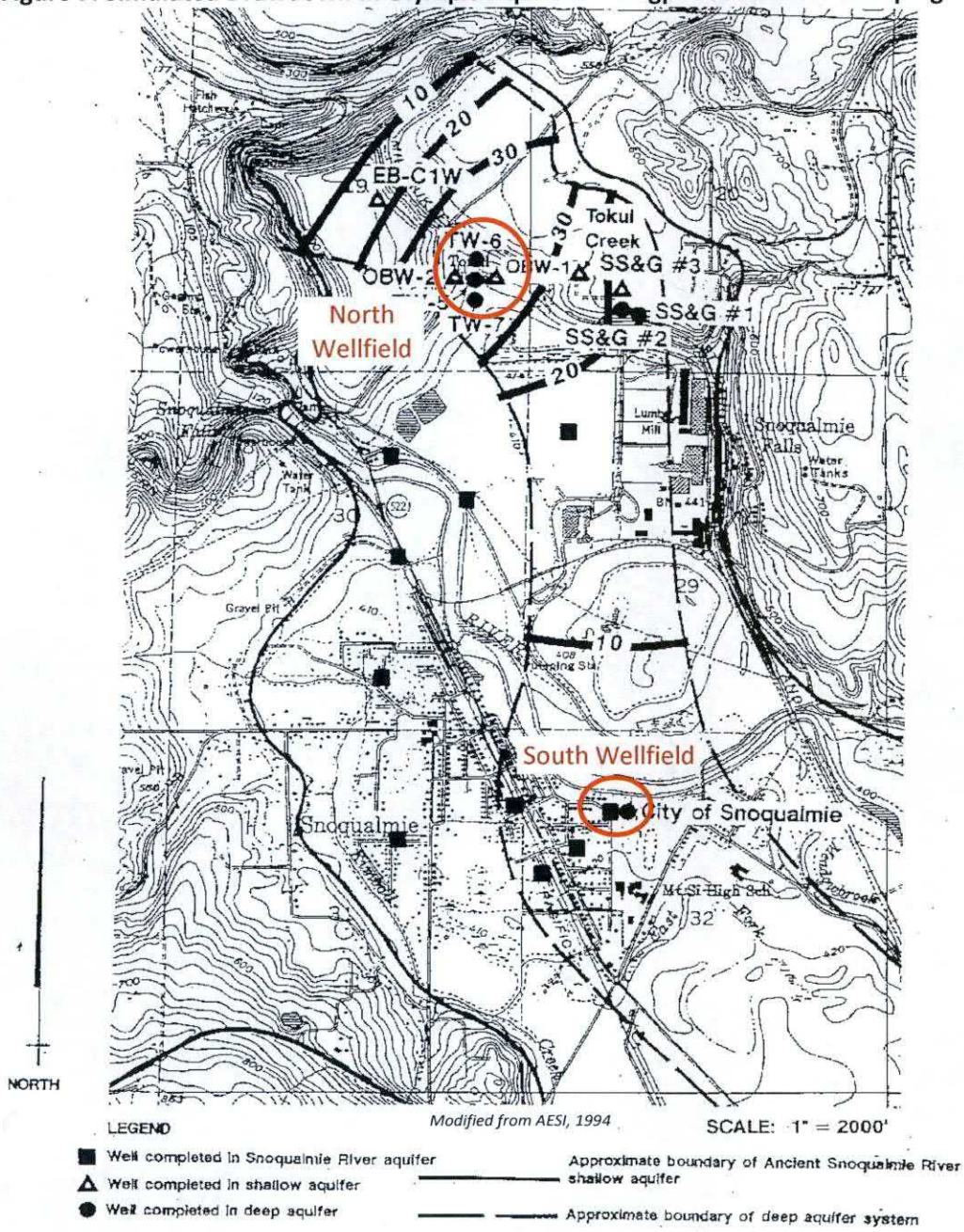
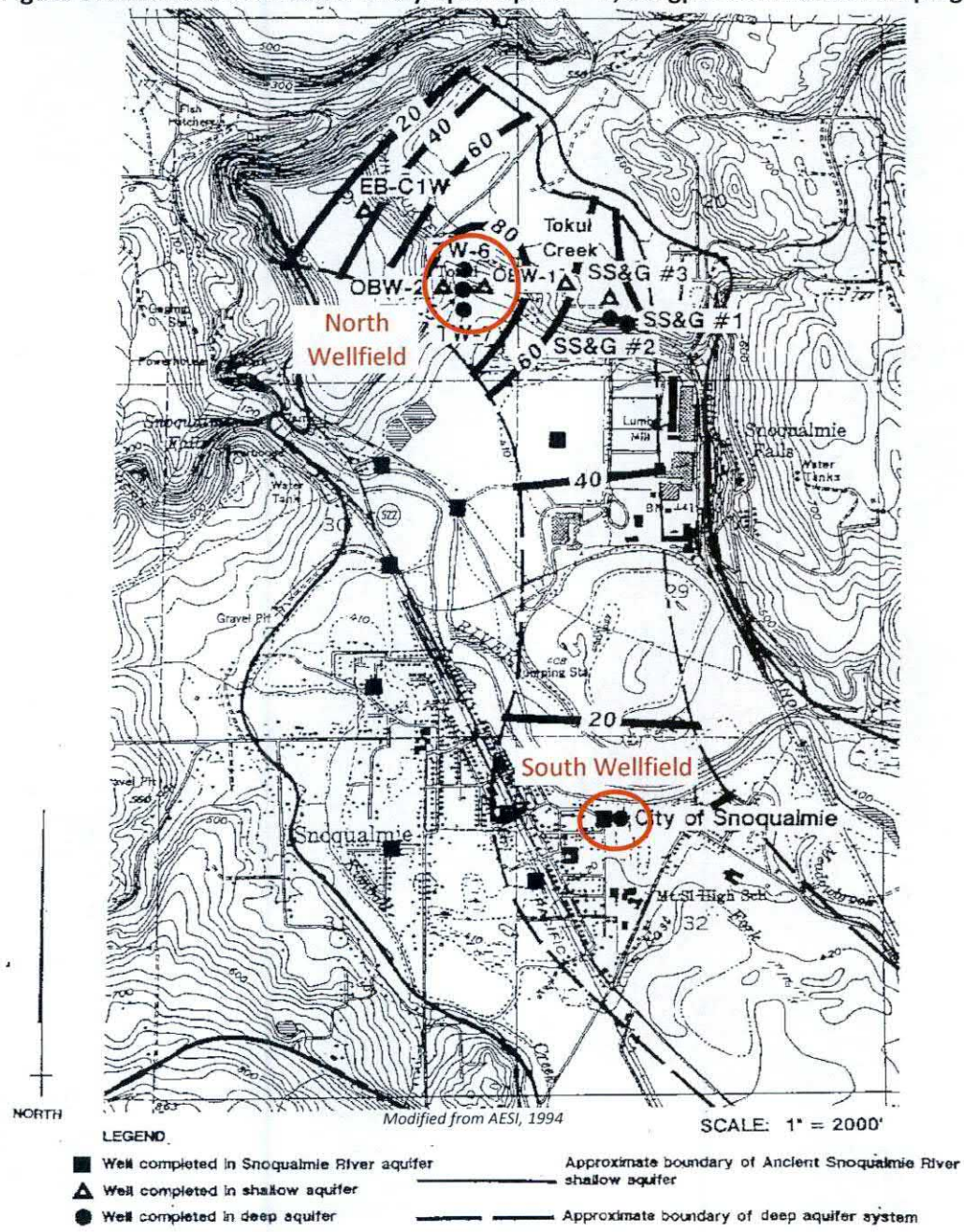


Figure 8. Simulated Drawdown in Olympia Aquifer – 1,000 gpm Continuous Pumping



Wells associated with groundwater rights identified in proximity to the North Wellfield are presented above in Table 6. According to previous reports, most of the water supply to Snoqualmie Sand and Gravel Well is provided by a well designated as Well No. 2. This well has approximately 100 feet of available drawdown, 54 feet of which is required to produce the certificated Qi of 250 gpm. This indicates there is an additional 46 feet of remaining available drawdown to accommodate potential interference drawdown from the subject application (AESI, 1994), so impacts to well yield are not anticipated to occur under the consolidation project. Snoqualmie Sand and Gravel has not reported any impacts from historical pumping at the North Wellfield, which is predicted to have resulted in more than

20 feet of interference drawdown. This suggests that the model may be over-estimating impacts, which will create a safety factor when assessing impairment.

The Tokul Plateau Well, associated with certificate no. G1-23440CWRIS and located at 5700 390th Ave SE and completed in the shallow aquifer (Table 10), was previously estimated to be able to incur approximately 4 feet of interference drawdown from the North Wellfield before well yield would be affected (AESI, 1994). This is equivalent to the predicted interference drawdown from the proposed consolidation.

Ecology's online Well Log Database was queried to identify water wells not identified in Table 6 (i.e., wells exempt from groundwater rights under RCW 90.44.050) following two approaches: (1) well logs within the local deep aquifer system, considered to be those greater than 200 feet deep and within east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E (2.25 miles south from the North Wellfield); and (2) all well logs within approximately 0.75 miles of the North Wellfield (i.e., within the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE¼ Sec 30, T24N, R8E). A radius of 0.75 miles was selected to capture any wells associated with nearby structures (identified from aerial imagery). Three wells were identified using these approaches and are presumed to be operated under "exempt" status (i.e., producing less than 5,000 gallons per day without a water right). Two of these wells are interpreted as completed in the Tokul Creek Delta / Snoqualmie River aquifer (Ecology Well Log ID Nos. 97066 and 97934), and a third well is interpreted to be completed beyond the extent of the shallow Snoqualmie River aquifer (Well Log ID 795008). Details of these wells are presented in Table 11.

Table 11. Water Well Logs near the North Wellfield ("exempt" wells)[1]

Owner Name	Address	Ecology Well Log ID No.	Static Water Level (feet BGS)[2]	Depth to Top of Screen (feet BGS)	Note
Robert Vezzoni	--[3]	97066	263	276	15 gpm with "0" drawdown
Steve Parsons	5820 390th Ave SE	97934	225	265[4]	8 gpm with "0" drawdown
Brooks Bros. Water	7001 396th Dr. SE	795008	44	221	16 gpm with 168 feet drawdown

[1] Queried area included all wells in the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE ¼ Sec 30, T24N, R08E and wells greater than 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E. No water rights were identified in association the wells indicated, and the wells are presumed to withdraw up to 5,000 gallons per day under the groundwater permit exemption.
[2]Presented as feet below ground surface (feet BGS)
[3]No address provided with well log.
[4]Well is cased to 265 feet BGS with no screen (open bottom)

Well Log ID Nos. 97066 and 97934 indicate the two exempt wells near the North Wellfield in the shallow aquifer system exhibit a high specific capacity as evidenced by zero drawdown. Both wells are reported to have more than 10 feet of available drawdown, and well yields are not expected to be reduced by the added interference drawdown resulting from the subject application (e.g., approximately 4 feet based on model simulations). Well Nos. 97066 and 97934 were installed in 1986 and 1992, respectively, and no impacts from existing authorizations have been reported. Similarly, no impacts have been reported for Well No. 795008, which is located about one mile from the North Wellfield and exhibits different hydrogeologic conditions (as evidenced by a lower specific capacity compared to City wells and others listed in Table 11).

Public Interest Considerations

No potential for detriment to the public interest was identified during the investigation of this water right change application.

Consideration of Protests and Comments

No protests were received by Ecology in response to the public notices of this change application.

Two sets of comments were received from the publication of this draft Report of Examination on Ecology's website:

- Mr. Stephen Kangas of North Bend commented to Ecology via email (on September 6, 2018) that two references to the "Tanner" area incorrectly indicated that Tanner is southwest of the City of Snoqualmie and the City's South Wellfield, rather than southeast.

  Response: This Report of Examination has been updated to correctly reference the Tanner location as southeast of the City and its South Wellfield.

- The Snoqualmie Tribe filed a comment letter (dated September 13, 2018) with Ecology stating:

  "The proposed transfer of water rights from the decommissioned wells located adjacent to Kimball Creek to the North Well Field is expected to shift impacts from Kimball Creek (on the south side of the Snoqualmie River) to Tokul Creek (on the north side of the Snoqualmie River). The proposed transfer of water rights from the South Well Field to the North Well Field is expected to result in an increase in impacts to Tokul Creek. So, as described in the draft ROEs, the proposed water rights transfers will shift impacts from non-anadromous stream reaches to an anadromous stream reach, namely, Tokul Creek...We request that if ECY approves the City of Snoqualmie's request to increase impacts to Tokul Creek, an important salmon stream, that any approval will be accompanied by requiring appropriate mitigation to help offset those expected negative impacts to anadromous fish and fish habitat."

  Response: As noted in the Investigation section of this Report of Examination, previous groundwater modeling indicated that use of the South Wellfield was predicted to have greater local impacts on the Snoqualmie River than the North Wellfield. In addition, the North Wellfield is located further downstream in the Snoqualmie River system. Given these considerations, shifting of use from the South Wellfield to the North Wellfield is expected to benefit an anadromous portion of the Snoqualmie River. Similarly, the shifting of use from the decommissioned wells located near Kimball Creek will benefit flows in both Kimball Creek and an anadromous portion of the Snoqualmie River. Transfer of all pumping from the South Wellfield and decommissioned wells is predicted to result in a very small increased impact to Tokul Creek, which is not regulated under chapter 173-507 WAC and is already impacted by the authorized water rights. The maximum new impact to stream flows in Tokul Creek as a result of all the proposed changes (i.e., if all of the water use currently authorized for the South Wellfield and Decommissioned Wells 1 and 2 shifts to the North Wellfield) is predicted based on groundwater modeling to be less than 0.15% ($1.5/1000^{th}$) of summer low flows. Nothing in state law requires mitigation for new impacts to unregulated streams; therefore, no mitigation is required.

Extent and Validity Considerations

The approved point of withdrawal for the subject right has been decommissioned, but is exempt from statutory forfeiture through nonuse under RCW 90.14.140. The City has not filed for voluntary abandonment of the right and has not demonstrated such intent. It has included Certificate GWC 91-D in recurring updates of its Water System Plan that have been reviewed by DOH and Ecology and approved by DOH, and Plan updates have included an express reservation of the right for future use, stating that although the wells were no longer in service, "these rights are not subject to relinquishment for non-use and can be put to beneficial use within the City's service area through a replacement well." (The City's most recent Water System Plan (February, 2013) includes a project (WS-1) to redevelop the decommissioned wells). The City has also included the subject right in its water right self-assessments submitted to and approved by DOH and reviewed by Ecology as part of its review of water system plan updates.

Based on the information provided by the City and upon Ecology's review, it is tentatively determined that the subject water right is in good standing and is eligible for change. This is a municipal water supply water right that is not subject to relinquishment. The full certificated instantaneous rate (90 gpm) has been perfected through beneficial use. The full annual quantity is not yet fully perfected. However, the City is a growing system, in good-standing, with a DOH green operating permit, and associated demand analyses have indicated the City can easily grow into their full annual allocation. Therefore, the full certificated annual quantity of 100 ac-ft/yr is eligible for change.

Same Source Considerations

Based on the conceptual model provided in Figure 6, the aquifer tapped by the point of withdrawal for the subject right (the Lake Snoqualmie unit) is understood to receive recharge from the overlying Snoqualmie River Aquifer, while discharging to deeper aquifer units and ultimately to the Snoqualmie River and/or Tokul Creek in downgradient areas. The requested point withdrawal is within the deeper aquifer system which shares these same points of recharge and discharge. Ecology therefore manages the various unconsolidated aquifer units in the subject area as a single groundwater system that comprises a single source.

CONCLUSIONS

Tentative determination and Potential for Enlargement

Groundwater Certificate GWC 91-D is in good standing with Ecology and is therefore eligible for change. In accordance with RCW 90.14.140(2)(d), rights for municipal supply purposes are not subject to relinquishment.

No potential for enlargement of the existing water right exists, provided the City does not withdraw more than a total of 90 gpm and 100 ac-ft/yr under this water right at the existing and proposed points of withdrawal.

Potential for Impairment of Existing Rights

The change requested will not impair existing rights.

Potential for Detriment to the Public Interest

The change requested will not be detrimental to the public interest.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend this request for change be approved in the amounts and within the limitations listed below and subject to the provisions listed above.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial:

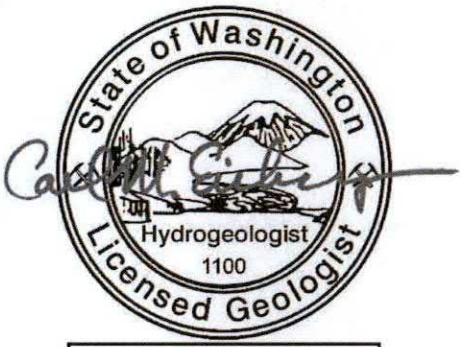
Q_i = 90 gpm
Q_a = 100 acre-feet per year
For Municipal Use

Points of Withdrawal

See Figure 1, representing the North Wellfield. The North Wellfield is located within the NE¼ SE¼, Section 19, Township 24N, Range 8E and within SE¼ SE¼ Section 19, Township 24N, Range 8E.

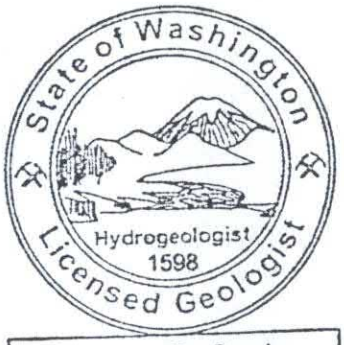
Place of Use

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.



Carl M. Einberger

Carl Einberger, LG, LHG, License #1100 *Date*



John C. Cook

12/19/2018

Jay Cook, LG, LHG, License #1598 *Date*

If you need this publication in an alternate format, please call Water Resources Program at (360) 407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Selected References

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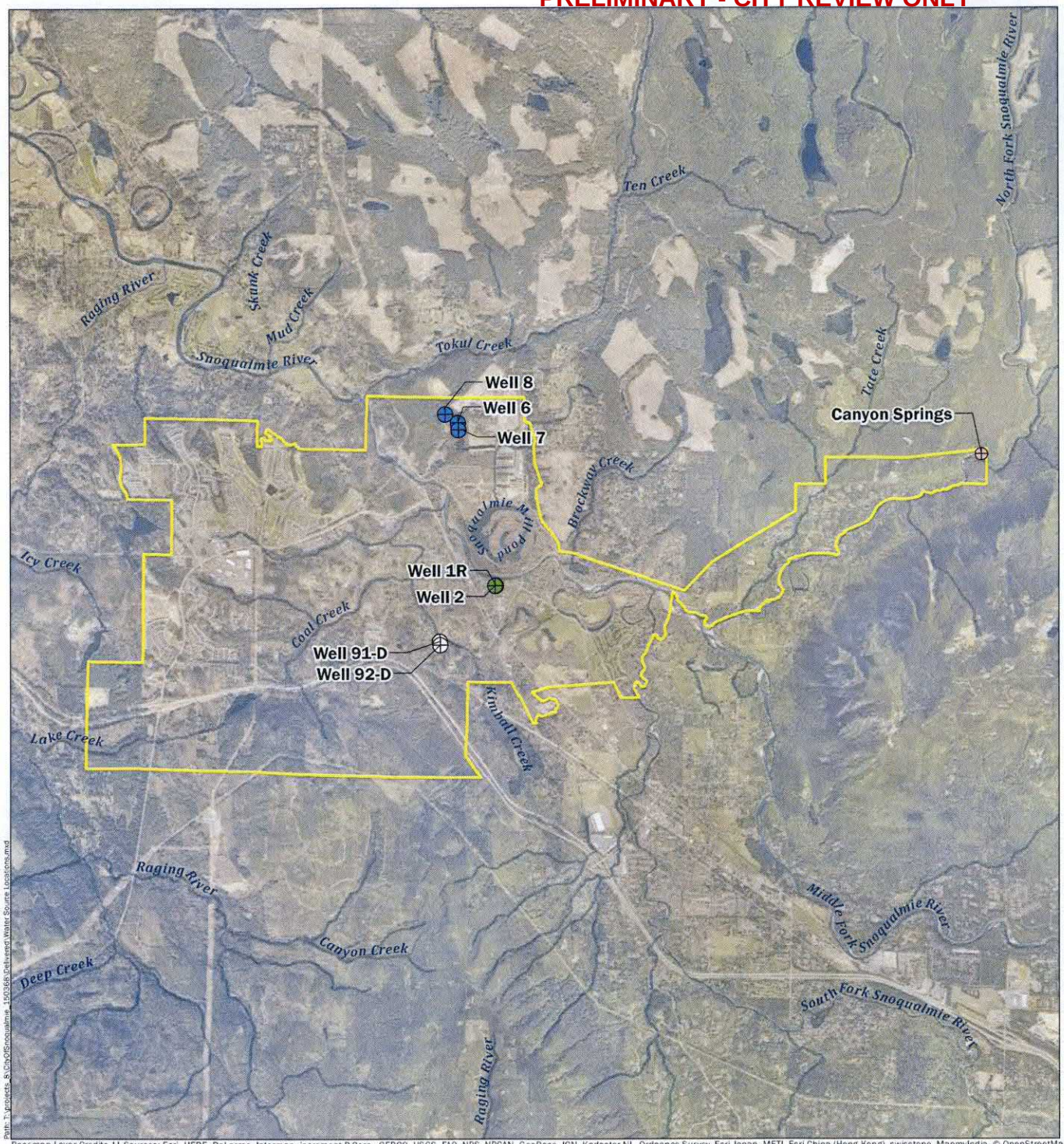
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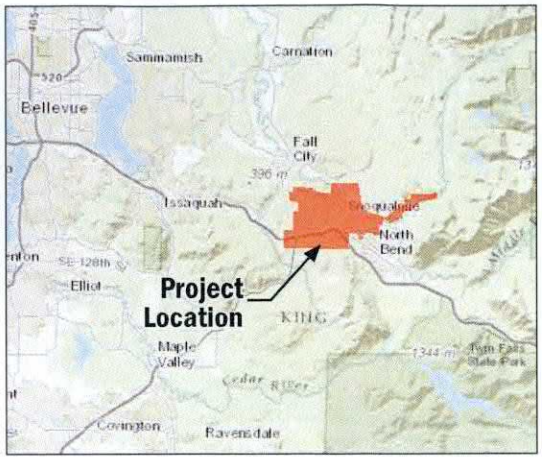
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PRELIMINARY - CITY REVIEW ONLY





- North Wellfield
- South Wellfield
- Decommissioned Well
- Canyon Springs
- City of Snoqualmie Water Service Area

N

0 7,000 14,000

Feet

Water Source Locations

City of Snoqualmie
Snoqualmie, Washington

Aspect CONSULTING	AUG-2017	FIGURE NO.
	ASPECT PROJECT NO: 150368 / FIGURE BY: ACA / RAP	1

Path: T:\projects_8\CityOfSnoqualmie_150368\Delivered\Water Source Locations.mxd

Basemap Layer Credits || Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Pictometry International Corp. 2015

PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON, COUNTY OF KING }
AFFIDAVIT OF PUBLICATION

ORIGINAL

RECEIVED
JUN 20 2017
C.O.S. - AP

* Please code and return for payment.
Thank you,
Sue

PUBLIC NOTICE

Linda M Mills, being first duly sworn on oath that she is the Legal Advertising Representative of the

Snoqualmie Valley Record

a weekly newspaper, which newspaper is a legal newspaper of general circulation and is now and has been for more than six months prior to the date of publication hereinafter referred to, published in the English language continuously as a weekly newspaper in King County, Washington. The Snoqualmie Valley Record has been approved as a Legal Newspaper by order of the Superior Court of the State of Washington for King County.

The notice in the exact form annexed was published in regular issues of the Snoqualmie Valley Record (and not in supplement form) which was regularly distributed to its subscribers during the below stated period. The annexed notice, a:

Public Notice

was published on May 31, 2017 and June 7, 2017.

The full amount of the fee charged for said foregoing publication is the sum of $265.88.

Linda Mills
Legal Advertising Representative, Snoqualmie Valley Record
Subscribed and sworn to me this 7th day of June, 2017.

Gale Gwin, Notary Public for the State of Washington, Residing in Covington, Washington

GALE GWIN
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
08-13-2019

RECEIVED
JUL 20 2017
DEPT OF ECOLOGY
NWRO - WR

PUBLIC WORKS

PUBLIC NOTICE #1883157
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
NOTICE OF APPLICATION TO CHANGE EXISTING WATER RIGHTS

TAKE NOTICE: That the CITY OF SNOQUALMIE, Washington, filed applications of change CG1-*00059S, CG1-*00060S, and CG1-20316C@1 for three ground water certificates on December 21, 2016. The applications request to change the allowable points of withdrawal. The proposed changes are to:

1. Ground Water Certificate G1-*00059SWRIS (91-D) for 90 gallons per minute (gpm) and 100 acre-feet per year (afy) for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E, W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
2. Ground Water Certificate G1-*00060SWRIS (92-D) for 90 gpm and 100 afy for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
3. Ground Water Certificate G1-20316C for 600 gpm and 500 afy for municipal supply. The existing points of withdrawal are within the NE¼ NW¼ of Section 32, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.

The request is to change the points of withdrawal for Certificates G1-*00059SWRIS and G1-*00060SWRIS and to add points of withdrawal for Certificate G1-20316C. The proposed new points of withdrawal for the three certificates are all within NE¼ SE¼ of Section 19, T24N, R8E,W.M., the SE¼ SE¼ of Section 19, T24N, R8E,W.M., and the NE¼ NW¼ of Section 32, T24N, R8E,W.M, King County, Washington.

No increase will be made to the instantaneous withdrawal rates or annual quantities, and no change to the place of use is requested.

Protests or objections to approval of this application must include a detailed statement of the basis for objections: protests must be accompanied with a fifty-dollar ($50.00) NON-REFUNDABLE recording fee (PLEASE REMIT CHECK OR MONEY ORDER ONLY) and filed with the Department of Ecology at the address shown below, within thirty (30) days from June 7, 2017.

DEPARTMENT OF ECOLOGY CASHIERING
OFFICE - NWRO-WR
PO BOX 47611
OLYMPIA WA 98504-7611

Published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017.

approved OK
DS

ACCOUNT NO. 417.13.423.594.34.41.070 AMT.

APPROVAL DATE 7/12/17

PRELIMINARY - CITY REVIEW ONLY

For Ecology Use (Date Stamp)
RECEIVED
DEC 21 2016
DEPT OF ECOLOGY
NWRO - WR

DEPARTMENT OF ECOLOGY
State of Washington

WATER RESOURCES
Application for Change/Transfer of a Water Right

You must include a $50.00 minimum filing fee with this application for: (Check all that apply.)	
☐ Change purpose(s) of use	
☐ Add purpose(s) of use	
☐ Change/transfer place of use	
☒ Change point(s) of diversion/withdrawal	
☐ Add point(s) of diversion/withdrawal	
☐ Other (i.e. consolidation, intertie, trust water)	
Explain:	

No filing fee is required for applications for:

- ☐ Drought
- ☒ Cost Reimbursement
- ☐ Water Conservancy Board

FOR OFFICIAL USE ONLY			
DATE APPLICATION RECEIVED	12/21/16		
CHECK NO.	NA	FEE $	
DATE ACCEPTED		BY	DD
CHANGE NO.	CG1-*000595		
COUNTY	King	WRIA	7
SPECIAL AREA			
SEPA: ☐ EXEMPT ☐ NOT EXEMPT			
ECY CODING: 001-002-WR10285-000011			
APP NO.		PERMIT NO.	
CERT NO.		CERT OF CHG NO.	
CG1-*000595			

☒ **I have completed a pre-application consultation with Ecology.**

1. Applicant Information

APPLICANT/BUSINESS NAME	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS: PO Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

CONTACT (IF DIFFERENT FROM ABOVE)	PHONE NO.	FAX NO.
Nancy Davidson	425-831-4919	
ADDRESS: PO Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

LEGAL LAND OWNER or PART OWNER OF PROPOSED PLACE OF USE	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS: P.O. Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

2. Water Right Information

WATER RIGHT OR CLAIM NUMBER	RECORDED NAME(S)
91-D (G1-*00059SWRIS)	Town of Snoqualmie

DO YOU OWN THE RIGHT TO BE CHANGED? ☒ YES ☐ NO

IF NO, PROVIDE OWNER(S) NAME and ADDRESS: _____

HAS THE WATER BEEN USED AS AUTHORIZED IN THE LAST FIVE (5) YEARS? ☐ YES ☒ NO

- Attach copies of any documentation that shows the historical use of water that has occurred since the right was established.
- If you have a water system plan or conservation plan, please include a copy with your application.

3. Point(s) of Diversion/Withdrawal:

A. Existing

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
Well		SW	SE	31	24N	8E	3124089041	Not Available

B. Proposed (if different from 3.A.)

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
North Wellfield	6	NE	SE	19	24N	8E	1924089016	AFJ-079
North Wellfield	7	SE	SE	19	24N	8E	1924089016	AFJ-080
North Wellfield	8	NE	SE	19	24N	8E	1924089016	AFJ-250
South Wellfield	1R	NE	NW	32	24N	8E	3224089060	APM-025
South Wellfield	2	NE	NW	32	24N	8E	3224089060	AKC-585

C. DO YOU OWN THE EXISTING AND PROPOSED POINT(S) OF DIVERSION/WITHDRAWAL?

EXISTING: ☒ YES ☐ NO PROPOSED: ☒ YES ☐ NO – IF NO, PROVIDE OWNER NAME(S): _____

- Include copies of all associated water well reports.
- If you know the distances from the nearest section corner to the above point(s) of diversion/withdrawal, please include that information in Item No. 6 (remarks) or as an attachment.

4. Purpose of Use:

A. Existing

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
Municipal	90 gpm	100	Continuous

B. Proposed (if different from 4.A.)

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
No Change Proposed			

5. Place of Use:

A. Existing

LEGAL DESCRIPTION OF LANDS WHERE WATER IS PRESENTLY USED:							
The place of use of the water right is the service area described in the most recent City of Snoqualmie Water System Plan prepared by Gray & Osborne, Inc., February 2013, approved July 18, 2012.							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE EXISTING PLACE OF USE? ☐ YES ☒ NO

IF NO, PROVIDE OWNER NAME(S): The lands in the existing place of use are owned by various public and private property owners within the City of Snoqualmie water service area as shown in the City's adopted Water System Plan.

B. Proposed (if different than 5.A.)

LEGAL DESCRIPTION OF LANDS WHERE NEW USE IS PROPOSED:							
No Change Proposed							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE PROPOSED PLACE OF USE? ☐ YES ☐ NO

IF NO, PROVIDE OWNER NAME(S):

- Attach a detailed map of your proposed change/transfer. The map should show existing and proposed point(s) of diversion/withdrawal, place of use and any other features involved with this application.
- If platted property, please include a certified copy of the plat map.

D. Are there any additional water rights or claims related to the same property as the one proposed for change/transfer?

☒ YES ☐ NO – IF YES, PROVIDE THE WATER RIGHT/CLAIM NUMBER(S): 4553 (S1-*06205CWRIS), G1-20316C, 92-D (G1-*00060SWRIS), G1-25449P

6. Remarks and Other Relevant Information:

A copy of the most recent Water System Plan has been submitted with this application.
Additional information on use of this water right will be submitted separately to support cost-reimbursement processing.

IF FOR SEASONAL OR TEMPORARY, START DATE ___/___/____ END DATE ___/___/____

Certain applications may incur a Real Estate Excise Tax liability for the seller of the water rights. The Department of Revenue has requested notification of potential taxable water right related actions and therefore may be provided with a copy of this request. For further information, contact:

Department of Revenue
Real Estate Excise Tax
PO Box 47477
Olympia, WA 98504-7477

Phone (360) 570-3265

7. Signatures:

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I hereby grant staff from the Department of Ecology or the County Conservancy Board access to the above site(s) for inspection and monitoring purposes. If assisted in preparing this above application, I understand that all responsibility for the accuracy of the information rests with me.

Matthew R Larson, Mayor **Applicant Printed Name – Title**	**Applicant Signature**	12/19/2016 **(Date: MM/DD/YYYY)**
Matthew R. Larson, Mayor **Water Right Holder Printed Name**	**Water Right Holder Signature**	12/19/2016 **(Date: MM/DD/YYYY)**
Land Owner of Existing Place of Use Printed Name	**Land Owner of Existing Place of Use Signature**	**(Date: MM/DD/YYYY)**
Land Owner of Proposed Place of Use Printed Name	**Land Owner of Proposed Place of Use Signature**	**(Date: MM/DD/YYYY)**

***Submit your application to:** DEPARTMENT OF ECOLOGY CASHIERING SECTION PO BOX 47611 OLYMPIA, WA 98504-7611	☐ Central Regional Office 1250 W. Alder Street Union Gap, WA 98903-0009 (509) 575-2490	☐ Eastern Regional Office 4601 N. Monroe Street Spokane, WA 99205-1265 (509) 329-3400
	☒ Northwest Regional Office 3190 – 160th Avenue SE Bellevue, WA 98008-5452 (425) 649-7000	☐ Southwest Regional Office PO Box 47775 Olympia, WA 98504-7775 (360) 407-6300

PRELIMINARY - CITY REVIEW ONLY

S. F. No. 7362—6-45—1M. 9327.

CERTIFICATE RECORD NO. 1 PAGE NO. 91-D UNDER DECLARATION OF CLAIM NO. 59

STATE OF WASHINGTON, COUNTY OF King

Certificate of Ground Water Right

Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and the rules and regulations of the State Supervisor of Hydraulics thereunder.

THIS IS TO CERTIFY *That* TOWN OF SNOQUALMIE

of Snoqualmie, Washington *has filed*

in the office of the State Supervisor of Hydraulics of Washington Declaration of Claim No. 59

to withdraw ground waters of the State from a pump well,

located within the SW¼ of SE¼ of Sec. 31, Twp. 24 N., Rge. 8 E.W.M.

for the purpose of municipal domestic supply.

The right to the use of said ground waters has been sustained and approved by the Supervisor of Hydraulics in accordance with Chapter 263, Laws of Washington for 1945, and is hereby entered of record in Volume 1 *of Ground Water Certificates at page* 91-D*; the right approved has a priority of* the year 1930*; the amount of water which the Declarant is entitled to withdraw for the aforesaid purpose is limited to the amount actually beneficially used and shall not exceed* 90 *gallons per minute;* 100 *acre-feet per year; and is appurtenant to the following described lands or place of use:*

The Town of Snoqualmie and the adjacent community, King County, Washington.

The right to the use of the ground water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 11th *day of* May, 19 46

RODNEY KYKER
State Supervisor of Hydraulics.

By: CHAS. J. BARTHOLET, Deputy

PRELIMINARY - CITY REVIEW ONLY

REPORT OF PROCEEDINGS OF GROUND WATER Declaration # 59

NAME TOWN OF SNOQUALMIE

Date of Examination February 20, 1946

Location: SW¼ of SE¼ of Sec. 31, Twp. 24 N., Rge.8E.W.M.

Quantity applied for 90 g.p.m. 146 acre-feet per year

Use: Municipal supply

Irrigable acreage: Present _____ Planned _____ Feasible _____

Municipal: Population 1000 as of 1945

Industrial: _____

Type of Works: Well x Infiltration trench _____ Tunnel _____

Dimensions: 4 inches by 130 feet.

Progress of Works: Completed 1930

Time Pump Will Be Operated: Daily

Other Water Rights of Applicant: _____

Proximity to existing works, springs or streams: Well # 2

125 feet south.

Estimated effect of withdrawal of water on existing water rights:

Water Bearing Zone: Sand from 85 to 130 feet.

RECOMMENDATIONS

Approved for: 90 g.p.m. 100 acre feet per year, subject to existing water rights.

Declarations #59 and #60 are approved for 100 acre-feet per year each. This water supplements the surface gravity system. If the amount were used daily it would amount to 160,000 gallons per day, which is deemed sufficient as a supplement.

Signed this 16th Day of April, 1946.

Fred B Roberts

FRED B. ROBERTS,
Ground Water Geologist
Division of Hydraulics

$2.00 recording fee should accompany each declaration.

PRELIMINARY - CITY REVIEW ONLY

S. F. No. 7349—6-45—1M. 9180.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

RECEIVED DEC 19 1945

Declaration of Ground Water Claim

(Separate claims should be filed for each well, tunnel or infiltration trench)

No. 1 59

I, TOWN of SNOQUALMIE
(Name of claimant)

of SNOQUALMIE WASHINGTON
(Complete postoffice address)

do hereby make declaration of claim of vested right to ground water by use prior to June 7, 1945, and file the same with the State Supervisor of Hydraulics, in accordance with Section 9, Chapter 263, Laws of 1945 of the State of Washington, and request a Certificate of Ground Water Right thereunder.

1. SOURCE *from which water is withdrawn is* PUMP WELLS
(Flowing well, pump well, infiltration trench, or tunnel)

2. LOCATION *is:* One-half mile south of Snoqualmie;
(Approximate distance and direction from nearest city or town)

and is more particularly described as follows:

(a) 185 feet Swly of the N.E.corner of the Sw ¼ of the SE¼ of Sec.31
(Give distance and bearing to corner of section or other legal subdivision)

being within SW ¼ of SE ¼ *of Sec.* 31, *Twp.* 24 *N., Rge.* 8 E WM
(Smallest legal subdivision) (E. or W.)

or (b) Within limits of incorporated city or town of ,

in Lot , *Block* *of*
(Name of addition or plat)

County of KING *within* *area*
(Leave blank)

(Leave blank) *sub-area* (Leave blank) *zone*

(c) The location of the well or other works is shown on the accompanying plat, or other adequate maps or drawings.

(d) The owner of property on which the works are constructed is:

TOWN of SNOQUALMIE (Name) SNOQUALMIE WASHINGTON (Post office address)

3. CONSTRUCTION WORK *was begun on* 1930 (Date); *was completed on* 1930 (Date)

and the ground water claimed was first used for the purposes set out below on 1930 (Date),

since which time the water has been used continuously
(Continuously or intermittently)

from 1930 (Date) *to* 1945 (Date)

4. QUANTITY *of water claimed and used is* 90 *gallons per minute;* 100- 146 *acre feet per year.*

5. PURPOSE OR PURPOSES *for which water is used* Municipal Domestic Supply
(Domestic, irrigation, municipal, manufacturing, industrial, etc.)

PRELIMINARY - CITY REVIEW ONLY

5. *(Continued)*

(a) FOR MUNICIPAL SUPPLY: *To supply the city, town or community of* SNOQUALMIE *in the county of* KING*, having a present population of* 1,000*, and an estimated population of* 1,000 *in 19*45.

(b) FOR IRRIGATION: *The land irrigated has a total area of* ____ *acres, and water is used each year for this purpose from* ____ (Date) *to* ____ (Date)

(c) Legal description of property on which water is used for all purposes other than municipal supply:

Water from this well is used for domestic purposes in the Town of Snoqualmie, and the adjacent community.

6. DESCRIPTION OF WORKS:

(a) WELL: *Depth* 130 *feet. Diameter* 4 *inches or feet. Dug or drilled* drilled *Flowing or pump well* pump

IF PUMP WELL: *Type and size of pump is* Pomona Centrifugal

Type and size of motor or engine is 25 H.P.

Depth from ground surface to water level before pumping 85 *feet.*

After continuous operation for at least four hours, the measured discharge of pump is 90 *g.p.m., and the drawdown of water level is* 130 *feet.*

Date of test 1940

IF FLOWING WELL: *Measured discharge* ____ *g.p.m. on* ____ (Date)

Shut-in pressure at ground surface ____ *lbs. per sq. in. on* ____ (Date)

Water is controlled by ____ (Cap, valve, etc.)

CASING: *(Give diameter, commercial specifications and depth below ground surface of each casing size.)*

4	*inch diameter*		*from* pump	*to* 85 *feet*
4	*inch diameter*	Perforated casing	*from* 85	*to* 130 *feet*
	inch diameter		*from*	*to* *feet*
	inch diameter		*from*	*to* *feet*

Describe and show depth of shoe, plug, adapter, liner or other details:

PRELIMINARY - CITY REVIEW ONLY

PERFORATED CASINGS OR SCREENS:

..... *from* ..... *to* .....
(Number per foot and size of perforations, or describe screen)

..... *from* ..... *to* .....

..... *from* ..... *to* .....

..... *from* ..... *to* .....

LOG OF WELL: *(Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)*

MATERIAL	Thickness (Feet)	Depth to Bottom (Feet)
Brown Clay	35	35
Gray semi-hardpan, with boulders	50	85
Hard silty sand, water bearing	45	130
Hardpan	30	160

(b) INFILTRATION TRENCH: *Covered or open* None

Dimensions: Length ..... *ft. Minimum depth* ..... *ft. Maximum depth* ..... *ft.*

Bottom width ..... *ft. Discharge* ..... *g.p.m. Date of test* .....

(c) TUNNEL: *Type of lining* None

Dimensions: .....
(Length, course, and cross-sectional size)

Position of water bearing stratum with reference to portal of tunnel .....

.....

Log of tunnel: (Preceding table for log of well may be used, if desired. Give footage from portal and character of materials, as pertinent.)

PRELIMINARY - CITY REVIEW ONLY

7. *Ownership of each existing well or other works for withdrawal of ground water within a radius of one-quarter mile and the distance and direction from well or other works being reported herein:*

There are no other wells anywhere around, except Well N# 2, which also Belongs to the Town of Snoqualmie, and is approximately 125 feet distant.

(Name of owner) (Direction) (Distance)

(On accompanying plat or map show location of these existing wells or works.)

8. *Remarks:*

Amy F. English
(Signature of claimant)
Clerk of Town of Snoqualmie

STATE OF WASHINGTON,
COUNTY OF KING } ss.

I, the claimant named in the foregoing claim, being first duly sworn, depose and say that I have read the above and foregoing claim to ground water right; that I know the contents thereof; and that to the best of my knowledge, information and belief, the facts therein stated are true and correct.

Subscribed and sworn to before me this ..... day of ....., 19....

Notary Public in and for the State of Washington,

Residing at .....

PRELIMINARY - CITY REVIEW ONLY

GROUND WATER

DECLARATION OF CLAIM

PROGRESS SHEET

NAME: Town of Snoqualmie
Snoqualmie, Washington

DECLARATION NO. 59 CERTIFICATE NO. 91

Declaration received 12-13-45 Initial fee received 12-13-45

Returned for completion or correction _____ Received _____

Statement of add. fee sent _____ Amount $ _____ Received _____

Same - Approved 1-7-46

Amended _____

Cancelled _____

O.K'd for publication Dec 19 by [illegible]

Notice of declaration sent 12-19-45

Protests filed _____

Affidavit of Publication received and checked 4-15-46 (Feb.28)

Time for making protests expires _____

Examination made 20 Feb 46 by FBR

O.K'd for Certificate _____ by _____

Statement of filing and recording fee sent 4-16-46 Amount $1.50

Fee received 5-10-46

Ground Water Certificate issued 5-11-46 No. D. 91

PRELIMINARY - CITY REVIEW ONLY

Certificate GWC 92-D

North and South Wellfield

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PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

DOCUMENT TITLE: SUPERSEDING CERTIFICATE

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
Well 1R	3224089060	24N	8E	32	NE NW
Well 2	3224089060	24N	8E	32	NE NW
Well 6	1924089016	24N	8E	19	NE SE
Well 7	1924089016	24N	8E	19	SE SE
Well 8	1924089016	24N	8E	19	NE SE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS:

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

PRELIMINARY - CITY REVIEW ONLY

File NR CG1-*00060S
WR Doc ID 6799860

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
January 1, 1940	00060		00092

MAILING ADDRESS
City of Snoqualmie
PO Box 987
Snoqualmie, WA 98065

SITE ADDRESS (IF DIFFERENT)
Tokul Rd. SE (North Wellfield) and
Schusman Ave SE (South Wellfield)
Snoqualmie, WA 98065

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AF/YR)
90	GPM	100

GPM = gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate and annual quantity are additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

PURPOSE	WITHDRAWAL RATE ADDITIVE	WITHDRAWAL RATE NON-ADDITIVE	UNITS	ANNUAL QUANTITY (AF/YR) ADDITIVE	ANNUAL QUANTITY (AF/YR) NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	90		GPM	100		01/01 - 12/31

IRRIGATED ACRES ADDITIVE	IRRIGATED ACRES NON-ADDITIVE	PUBLIC WATER SYSTEM INFORMATION WATER SYSTEM ID	PUBLIC WATER SYSTEM INFORMATION CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Alluvial Aquifer System		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

PRELIMINARY - CITY REVIEW ONLY

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps -- either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way

Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency

Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 2 day of January, 2020.

DEPARTMENT OF ECOLOGY
STATE OF WASHINGTON

Polly Zehm, Acting Director
Department of Ecology

DATA REVIEW
OK

Ria Berns, Section Manager
Northwest Regional Office
Water Resources Program

To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341

WR File NR CG1-*00060S
WR Doc ID 6799860

DEPARTMENT OF ECOLOGY
State of Washington

STATE OF WASHINGTON
FINAL
REPORT OF EXAMINATION
FOR WATER RIGHT CHANGE

Changed/added points of withdrawal

PRIORITY DATE	WATER RIGHT NUMBER
January 1, 1940	G1-*00060S (Application No. CG1-*00060S)

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
City of Snoqualmie PO Box 987 Snoqualmie, WA 98065	Tokul Rd. SE (North Wellfield) and Schusman Ave SE (South Wellfield) Snoqualmie, WA 98065

Total Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AC-FT/YR)
90	GPM	100

GPM = gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate and annual quantity are additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

	WITHDRAWAL RATE			ANNUAL QUANTITY (AC-FT/YR)		
PURPOSE	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	90		GPM	100		01/01-12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Alluvial Aquifer System		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWN	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Datum: NAD83/WGS84

Place of Use (See Attached Map)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Proposed Works

The City of Snoqualmie (City) has proposed to consolidate the points of withdrawal for three existing groundwater rights to include all five wells within the City's North and South Wellfields (i.e., Well Nos 6, 7, and 8, and Well Nos 1R and 2, respectively). The City has submitted Change Application Nos. CG1-20316C@1, CG1*00059S and CG1-*00060S to the Washington Department of Ecology (Ecology) for concurrent processing of the three requests for consolidation.

The subject of this report is Change Application No. CG1-*00060S, which requests to change the point of withdrawal for Certificate No. GWC 92-D from a well to all wells at the City's North and South Wellfields (Certificate No. GWC 92-D currently authorizes withdrawal at a decommissioned well owned by the City). The remaining two applications included in the City's consolidation request are intended to change the points of withdrawal for Certificate Nos. GWC 91-D (file no. G1-*00059SWRIS) and CG1-20316C@1 to all City wells at the North and South Wellfields. These applications will be addressed in separate reports; however, this report also considers the cumulative withdrawals from City wells that would result from approval of all three applications for change.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Complete	Complete	Complete

Measurement of Water Use

How often must water use be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps -- either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements
Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way
Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency
Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections
Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Findings of Facts
Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated and that the subject Certificate No. G1-*00060SWRIS (92-D) is in good standing and is eligible for change. Furthermore, I find the change of water right as recommended is from the same body of public groundwater, and will not be detrimental to existing rights or the public interest.

Therefore, I ORDER the request to change the point of withdrawal to the multiple points of withdrawal requested in Change Application No. CG1-*00060S, be approved, subject to existing rights and the provisions specified above.

Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

- You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel RD SW Ste 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Please send a copy of your appeal to:

Ria Berns, Section Manager
Water Resources Program
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Signed at Bellevue, Washington, this 19 day of December 2018.

Ria Berns, Section Manager

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov. To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeReviser.

INVESTIGATOR'S REPORT
Water Right Control Number CG1-*00060SC@1
City of Snoqualmie
Investigator: Carl Einberger, Aspect Consulting
Reviewed by: Jay Cook

BACKGROUND

This report serves as the written findings of fact concerning Water Right Application Number CG1-*00060S.

On December 21, 2016, the City of Snoqualmie (City) filed three Applications for Change with the Washington State Department of Ecology (Ecology) to consolidate withdrawal locations to include all City wells located at the North and South Wellfield sites (i.e., Well Nos. 6, 7, and 8 and Well Nos. 1R and 2, respectively). Details of the three applications are summarized in Table 1. Future use of the existing appropriations will continue to be for municipal supply, and no changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Table 1. Change Applications Filed by the City of Snoqualmie

Change Application	Existing Source	Water Right No.	Type	Priority Date
CG1-20316C@1	South Wellfield[1]	G1-20316C	Certificate	10/13/1972
CG1-*00059S	Decommissioned Well 1	91-D	Certificate	1/01/1930
CG1-*00060S	Decommissioned Well 2	92-D	Certificate	1/01/1940

[1]Well Nos. 1R and 2

The City's water system currently serves a residential population of approximately 12,850 people with approximately 7,900 allocated equivalent residential units (ERUs; Gray & Osborne, 2016). The City's water system consists of water withdrawal, conveyance, storage, and treatment facilities. The place of use is consistent with the City's City water service area, as described in the City's 2013 Water System Plan (Gray & Osborne, 2013) and future updates.

Figure 1 (attached) shows the location of the City's wells, including the North and South Wellfields and decommissioned Wells 1 and 2. Existing and requested water right attributes for the specific water right addressed by this Report of Examination (ROE) are as follows:

EXISTING Water Right Attributes

Water Right Owner:	**City of Snoqualmie**
Priority Date:	January 1, 1940
Place of Use	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan (Original certificate stated: Town of Snoqualmie and adjacent community)

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	90	GPM	100	Year Round	

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Decommissioned Well 2	3224089041	Not Available	24N	8E	31	SW SE	47.5178	-121.8286

Datum: NAD83/WGS84

WRIA = Water Resource Inventory Area; GPM = Gallons per Minute; Ac-ft/yr = Acre-feet per year; Twp = Township; Rng = Range; Sec. = Section; QQ Q = Quarter-quarter of a section

REQUESTED Water Right Attributes

Applicant Name:	**City of Snoqualmie**
Date of Application:	December 21, 2016
Place of Use	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	90	GPM	100	Year Round	

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Cost Reimbursement

This application is being processed under Ecology's Cost Reimbursement Program according to the provisions of RCW 43.21A.690 and RCW 90.03.265. This report has been prepared by Aspect Consulting, LLC (Aspect) and reviewed by Ecology under contract to the applicant.

Legal Requirements for Requested Change

Public Notice

RCW 90.03.280 requires that notice of a water right application be published once a week, for two consecutive weeks, in a newspaper of general circulation in the county or counties where the water is to

be stored, diverted and used. Notice of this application was published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017. No protests were received during the 30-day statutory protest period.

Consultation with the Department of Fish and Wildlife

The Department must give notice to the Department of Fish and Wildlife (WDFW) of applications to divert, withdraw, or store water. Notice of the three change applications filed by the City was provided to WDFW on July 13, 2017. On July 18, 2017, Steve Boessow of WDFW responded in a letter to Ecology that stated:

> *Based on impacts to fish and/or wildlife and the habitat they rely on, and pursuant to Chapter 77.57.020 RCW, WDFW does not oppose the issuance of these applications. There are no changes to instantaneous or annual water quantities allowed under these proposed changes. Therefore, there are no new impacts to fish.*

State Environmental Policy Act (SEPA)

A water right application is subject to a SEPA threshold determination (i.e., an evaluation whether there are likely to be significant adverse environmental impacts) if any one of the following conditions are met:

- It is a surface water right application for more than 1 cubic foot per second, unless that project is for agricultural irrigation, in which case the threshold is increased to 50 cubic feet per second, so long as that irrigation project will not receive public subsidies;
- It is a groundwater right application for more than 2,250 gallons per minute;
- It is an application that, in combination with other water right applications for the same project, collectively exceed the amounts above;
- It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- It is part of a series of exempt actions that, together, trigger the need to do a threshold determination, as defined under WAC 197-11-305.

This project is categorically exempt from SEPA, because the three change applications associated with the project total less than 2,250 gallons per minute (gpm) in additive instantaneous quantity. The total instantaneous quantity associated with the combined change applications is 780 gpm.

Water Resources Statutes and Case Law

RCW 90.03.380(1) states that a water right that has been put to beneficial use may be changed. The point of diversion, place of use, and purpose of use may be changed if it would not result in harm or injury to other water rights. The Washington Supreme Court has held that Ecology, when processing an application for change to a water right, is required to make a tentative determination of extent and validity of the claim or right. This is necessary to establish whether the claim or right is eligible for change. *R.D. Merrill v. PCHB* and *Okanogan Wilderness League v. Town of Twisp.*

RCW 90.03.386(3) requires a municipal water supplier to apply cost-effective water conservation measures as part of its water system planning. The water supplier must also evaluate the effects of delaying the use of inchoate water rights before it may increase use of those inchoate rights. RCW 90.03.320 requires Ecology to consider the public water supplier's use of conserved water when establishing a surface or ground water right construction schedule. The City's conservation program is outlined in Chapter 5 of the current water system plan (Gray and Osborne, 2013).

RCW 90.03.386(2) states that a municipal water supplier may change its service area through the water system plan approval process. As long as the municipal water supplier is in compliance with the approved plan, the place of use for the water right is the service area of the plan.

RCW 90.44.100 allows Ecology to amend a ground water permit or certificate to: (1) allow the user to construct a replacement or additional well at a new location outside of the location of the original well, or to (2) change the manner or place of use of the water, if:

- The additional or replacement well taps the same body of public ground water as the original well. RCW 90.44.100(2)(a),
- Where a replacement well is approved, the user must discontinue use of the original well and properly decommission the original well. RCW 90.44.100(2)(b),
- Where an additional well is constructed, the user may continue to use the original well, but the combined total withdrawal from all wells shall not enlarge the right conveyed by the original permit or certificate. RCW 90.44.100(2)(c),
- Other existing rights shall not be impaired. RCW 90.44.100(2)(d).

When changing or adding points of withdrawal to groundwater rights (RCW 90.44.100), or when consolidating exempt wells with an existing permit or certificate (RCW 90.44.105), the wells must draw from the *same body of public groundwater*. Indicators that wells tap the *same body of public groundwater* include:

(a) Hydraulic connectivity.
(b) Common recharge (catchment) area.
(c) Common flow regime.
(d) Geologic materials that allow for storage and flow, with recognizable boundaries or effective barriers to flow.

INVESTIGATION

In consideration of this application, Aspect reviewed available documents pertaining to site conditions, existing well installations, and the potential effect of the proposed change on existing water right holders and established minimum instream flows. This review included information submitted by the applicant, including aquifer characterization (modeling) reports, well construction and testing reports, and pertinent Ecology records (e.g. well logs and water rights records). The review also included reports from multiple investigations characterizing the hydrogeology of the Snoqualmie basin.

A site visit was performed on July 18, 2017. Carl Einberger of Aspect met with City representatives to discuss the applications, visit existing well locations, view the area where the decommissioned wells were located, and discuss the City's current water system operations.

Using the available information in the Ecology file record, existing reports, the site visit, and communications with the City, Aspect evaluated potential effects of the proposed consolidation of withdrawal locations for the three water rights involved in the package of change applications.

Existing Water Rights Held by the City

The City's existing water rights and changes currently requested are summarized in Table 2. The subject of this report is an application to change Water Right No. CG1-*00060S, however the three water right change requests are being concurrently reviewed by Ecology.

Table 2. City of Snoqualmie Water Rights (Shaded Rows Indicate Rights Requested for Change)

Water Right	Current Source	Requested Source	Priority Date	Qi gpm	Qa in ac-ft/yr	
					Additive	Non-Additive
G1-20316C	South Wellfield[1]	North & South Wellfields[1,2]	10/13/1972	600	--	500
G1-*00059SWRIS	Decommissioned Well 1		1/01/1930	90	100	--
G1*00060SWRIS	Decommissioned Well 2		1/01/1940	90	100	--
G1-25449P	North Wellfield[2]	No Change	5/30/1989	1,650	724	--
S1-*06205CWRIS	Canyon Springs	No Change	10/18/1944	898	1,448	--
Total Groundwater				**2,430**	**924**	**500**
Total Surface Water				**898**	**1,448**	**--**
Total of all Water Rights				**3,328**	**2,372**	**500**

Shaded rows indicate change applications currently being processed.
[1]Includes Well Nos. 1R and 2.
[2]Includes Well Nos. 6, 7, and 8.

The City also submitted Application No. G1-27589 on March 16, 1995 requesting appropriation of 1,400 gpm and 2,302 ac-ft/yr (annual quantity indicated as approximate), with points of withdrawal at the South Wellfield. This application is active and is not being considered as part of the City's three change applications being processed.

History of Water Use

The City was officially established in May of 1903 with water supplies initially provided by springs and surface waters. Since that time, the City has taken numerous steps to expand its water supplies to meet growing demands and provide resiliency in water supply. Key historical events in the City's water supply history includes the following (summarized from Gray & Osborne, 2013; USCB, 2017; and Ecology water right files):

- In 1930 and 1940, the City established two groundwater wells near what is now the intersection of 384th Ave SE and SE 92nd St. Water right Certificate Nos. 00091 and 00092 (G1-*00059SWRIS and G1-*00060SWRIS, respectively) were issued in May of 1946 to authorize use of these wells to serve the City's population of approximately 800 residents at that time.

- In 1950, the Canyon Springs source was brought online with authorization to divert up to 898 gpm and 1,448 ac-ft/yr under water right Certificate No. 04553 (S1-*06205CWRIS).

- In 1968, the Puget Sound Power and Light Company connected to the City's distribution system and service was extended to the Snoqualmie Falls Lodge.

- In 1973, Well No. 1 was constructed at the Mount Si High School property (the current location of the South Wellfield) to provide emergency supply and additional source capacity during high demand periods; withdrawals from Well No. 1 and subsequent wells in the South Wellfield (i.e., Well Nos. 1R and 2) are authorized under Certificate No. G1-23016C.

- According to a formal, signed Declaration of Gary Stevens, former Streets and Stormwater Supervisor for the City, Decommissioned Wells 1 and 2 were decommissioned in summer of 1981, given preferential use of the South Wellfield. Mr. Stevens noted the City intended to

preserve the well locations for future use through potential re-drilling or transfer to other sources.

- In 1989, the City's water system was extended to provide service to Rattlesnake Ridge and the Snoqualmie Winery site. During the same year, Well Nos. 6 and 7 were installed by Weyerhaeuser Real Estate Company to support the Snoqualmie Ridge Phase I development (the City took ownership of the wells, water right and infrastructure in 1995). A water treatment plant (for iron, manganese, and arsenic), booster stations, and reservoirs were constructed to provide potable water service to the new development.

- In 1995, Well No. 2 was installed at the South Wellfield, and aquifer testing was completed to support Application No. G1-27589 for additional appropriations from the South Wellfield (this application is still pending with Ecology).

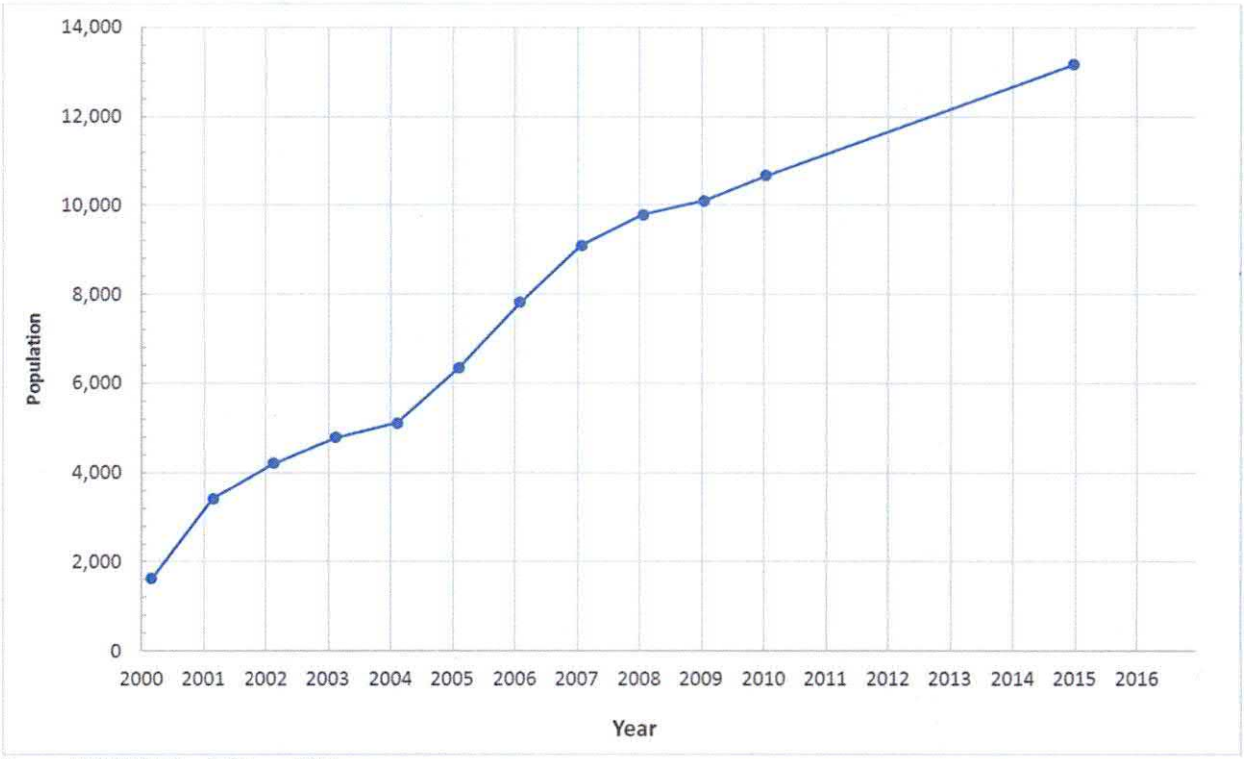
- Well No. 8 was installed at the North Wellfield in 2001 and additional reservoirs and booster stations were installed between 2004 and 2008 to supply the Snoqualmie Ridge Phase II development. Well No. 8 was the third of the three wells originally authorized by the North Wellfield water right.

- Well No. 1R was installed at the South Wellfield area in 2006 to replace Well No. 1 due to declining well yields (Well No. 1 was decommissioned). The well was installed adjacent to Well No. 2 and was added to the South Wellfield water right through a Showing of Compliance with RCW 90.44.100.

- Consistent with Mr. Stevens' declaration, the City's Water System Plans (1997, 2005 and 2013) have included the water rights evidenced by Certificate Nos. 00091-D and 00092-D (G1-*00059SWRIS and G1-*00060SWRIS, respectively). The 2005 and 2013 Water System Plans have also included an express reservation of the right for future use, stating that although the wells were no longer in service, "these rights are not subject to relinquishment for non-use and can be put to beneficial use within the City's service area through a replacement well." The 1997 Water System Plan contained similar language.

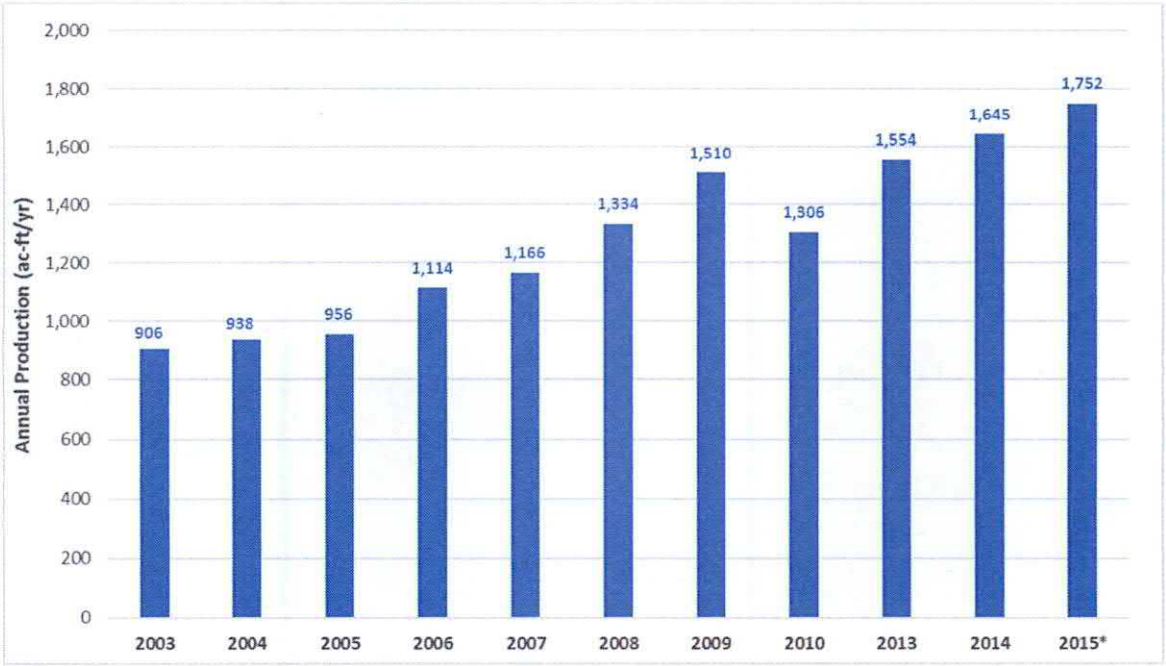
The City has experienced rapid growth in residential population and water demands since approximately 2000, as summarized in Figures 2 and 3, respectively.

Figure 2. City of Snoqualmie Population Growth



Sources: USCB, 2017; Gray & Osborne, 2013

Figure 3. City of Snoqualmie Historical Production from All Sources



*2015 production data includes 273 days (through September)

Between 2010 and 2015, the number of connections to the City's water system increased from 4,117 to 4,911. This corresponds to an overall growth rate of more than 19-percent, with residential development in the Snoqualmie Ridge accounting for the majority of new connections (Gray & Osborne, 2016). This recent growth is reflected in increased production from the South Wellfield, which has been used with increased frequency since 2008.

Annual withdrawals from the North Wellfield have increased from approximately 500 ac-ft/yr in 2004 to 900 ac-ft/yr in 2015. Withdrawals from the South Wellfield have increased from approximately 70 ac-ft/yr in 2008 to more than 240 ac-ft/yr in 2014 and recent years. The combined withdrawals from the City's wellfields is within the combined annual quantities of the subject water rights. However, the North Wellfield is operated preferentially because it: (1) is within a higher pressure zone of the City's distribution system; (2) has higher capacity; (3) supplies irrigation water to augment a Class A Reclaimed Water irrigation system as needed; and (4) can supply water to the Snoqualmie Ridge area with shortest distance of conveyance.

Projected Water Demands

The City's 2013 Water System Plan (Gray & Osborne, 2013) projects the City's population to increase at an average rate of 2-percent per year, which would result in full buildout of the City's Urban Growth Area (UGA) by approximately 2070. The City's predicted average day demands (ADD) through the year 2032 are presented in Table 3. These projections are based on observed ADD for specific areas of the UGA (i.e., the Snoqualmie Ridge Development and the Canyon Springs area) and were scaled to the proportion of developable lands in each area.

Table 3. Projected Average Day Demands

Year	Projected Qa (ac-ft/yr)[1]
2016	1,392
2017	1,472
2018	1,553
2019	1,633
2020	1,763
2021	1,844
2022	1,921
2023	1,998
2024	2,005
2025	2,012
2026	2,020
2027	2,027
2028	2,034
2029	2,041
2030	2,049
2031	2,056
2032	2,063

[1]Calculated from projections for Average Day Demand (ADD) presented in Gray & Osborne (2013).

The City has currently allocated water to four development projects: buildout of the Snoqualmie Ridge Phase 2; Kimball Creek; the Salish Lodge expansion; and the Mt. Si High School expansion. Additionally,

the Snoqualmie Ridge II applicant is engaged in long-term monitoring of the potential impact of the development of impervious surfaces in Snoqualmie Ridge II on Lake Alice Community Association ground water wells. Monitoring is scheduled to end 5 years following the completion of Snoqualmie Ridge II buildout. Although not required to do so, the City has been reserving water in an amount sufficient water service to approximately 133 connections in the event adverse effects on Lake Alice water supply are identified (Gray & Osborne, 2016). A summary of the projected annual demands from these allocations is presented in Table 4 (from Gray & Osborne, 2016).

In addition, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area. Relying on demand data from the City's 2013 Water System Plan, the applicant for the Snoqualmie Mill site projects a need for approximately 700 ERUs for its potential three-phase development.

Additionally, the City's adopted GMA Comprehensive Plan, "Snoqualmie 2032," anticipates that the eventual annexation of the City's Snoqualmie Hills West Potential Annexation Area will bring 197 new single family and 205 new multi-family residences, and 1,015 new jobs on approximately 75 acres of new commercial development. Although a detailed water demand analysis cannot be prepared until there is an actual planned development, using an estimated demand of 0.7 ERU per new multi-family unit and 5 ERU per acre for commercial development, based on estimates for Snoqualmie Ridge contained in the Water System Plan, this potential annexation could generate water demand for approximately 715 additional ERUs of water.

Thus, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area could generate water demand in excess of 1,400 ERUs.

Table 4. Allocated Future Demands

Development Project	Projected Qa (ac-ft/yr)	Projected Qi (gpm)
Snoqualmie Ridge (Phases I and II)	309.1	460
Kimball Creek	10.9	16
Salish Lodge Expansion	84.1	127
Mount Si High School	6.7	14
Lake Alice Community	38.9	58
Total Future Allocations	*450*	*675*

Source: Gray & Osborne, 2016

Proposed Use

The change proposed for Certificate No. GWC 92-D is to add the North Wellfield wells (i.e., Well Nos. 6, 7, and 8) and the South Wellfield wells (i.e., Well Nos. 1R and 2) as additional points of withdrawal to allow the authorized quantities to be used with flexibility at any of the City's active wells. The goal is to allow the City the opportunity to tailor water withdrawals to water needs throughout the City's service area.

Future use of the existing appropriations will continue to be for municipal supply, including the allocations previously described. No changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Existing Water Rights Held by Others

Ecology's Water Rights Application Tracking System (WRATS) database was queried to identify existing water rights (i.e., claims, permits, or certificates) within approximately one-half mile of the North Wellfield. This search radius was selected following an examination of Ecology's Well Log Database, which identified only seven other water supply wells completed within the local deep aquifer system (considered to be wells exceeding 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E). Water rights associated with these wells are limited to the certificates and permit presented in Table 5. The half-mile search radius was then conducted without regard to completion depth to identify additional rights tapping the nearby shallow aquifer. The results of the water right query are presented in Table 5 without any assessment of extent or validity.

Table 5. Existing Water Rights within One-half Mile of the North Wellfield[1,2]

Type	Record No.	Person or Organization	Priority Date	Qi (gpm)	Qa (ac-ft)
Claim	G1-060724CL	Stephen, Robert G	--	--	--
Claim	G1-030259CL	Sims, David M	--	--	--
Permit	G1-28625P[2]	Snoqualmie School Dist.	5/27/2009	600	500
Certificate	G1-24839CWRIS	Kenmore Per Mix Co,	6/10/1986	250	200
Certificate	G1-23440CWRIS	Gmazel, Leroy et ux.	7/18/1979	40	10

[1]Excluding Permit No. G1-25449P held by the City for the North Wellfield.
[2]The point of withdrawal for Permit No. G1-28625P is located approximately 1.7 miles south of the North Wellfield, but was included in this table because it is completed within the deep aquifer system. The purpose of use is for non-consumptive heat exchange.

Two claims to vested rights were identified within the search area. The files available for these claims do not indicate a date of first use or provide other details on well location or water use and it is uncertain if these claims are still active. Two water right Certificates were identified within the search area and were cross-referenced with Ecology's Well log database and with the Washington State Department of Health (DOH) SENTRY database to obtain additional source information. The details for these water rights are summarized in Table 6.

Table 6. Water System Details for Certificated Rights within One-half Mile of the North Wellfield[1]

Record No.	Person or Organization	DOH System ID No.	No. of Connections	Well Log ID	Source Capacity (gpm)[2]
G1-24839CWRIS	Kenmore Per Mix Co (Snoqualmie Sand & Gravel)	00919	3[5]	94089[4]	50
G1-23440CWRIS	Gmazel, Leroy et ux.	06279	2[3]	94668	40

[1]Details obtained by cross-referencing location and source information listed in water right files.
[2] Source capacity reported from DOH Water Facilities Inventory Form.
[3] Connections are residential. The system is currently approved by DOH for a total of 5 connections.
[4]Additional well logs on file in association with this property.
[5] Connections are non-residential.

Other Rights Appurtenant to the Place of Use

A review of water rights in Ecology's GWIS (Geographic Water Information System) was conducted to identify existing rights within the place of use for the subject water right (i.e., the City's water service area). Table 7 provides the water rights identified within the City's water service area. Sixty-five claims to vested rights were also identified but are not included in Table 7.

Table 7. Existing Water Rights Within the City's Water Service Area

File No.	Type	Purpose	Person or Organization	Priority Date	Qi	Qa (ac-ft/yr)
S1-24675CWRIS	Cert	IR	Colligan, Gerald	7/9/1985	0.005 cfs	0.3
S1-24723CWRIS	Cert	IR	Morton, L. William	9/4/1985	0.005 cfs	0.5
S1-25094CWRIS	Cert	DS	Benson, Julia	9/21/1987	0.01 cfs	0.5
S1-23888CWRIS	Cert	DS	Tennant, Norman Et Ux	7/23/1981	0.02 cfs	1
S1-24245CWRIS	Cert	IR	Schodde, Herman W	2/3/1983	0.01 cfs	0.5
S1-23017CWRIS	Cert	IR	Pratt Agency	12/8/1977	0.12 cfs	5
S1-22534CWRIS	Cert	DS	Solberg, Albert J	6/26/1975	0.02 cfs	1
S1-21167CWRIS	Cert	DS IR	Fitzgerald, George W	1/10/1974	0.02 cfs	3
S1-20803CWRIS	Cert	DS	Travis, C W R & N J	8/3/1973	0.01 cfs	1
S1-20806CWRIS	Cert	IR	Sletten, Arvid	8/6/1973	0.01 cfs	0.5
S1-20881CWRIS	Cert	DS	Walker, James A	9/4/1973	0.02 cfs	1
S1-00632CWRIS	Cert	DS	Costantino, Michael	6/29/1971	0.01 cfs	1
S1-00652CWRIS	Cert	FS ST	Chicklero, Albert	2/24/1971	0.01 cfs	1
S1-20103CWRIS	Cert	IR ST	Mcclain, Elvin	5/3/1972	0.01 cfs	1
S1-00515CWRIS	Cert	DS	Young, James A	10/17/1968	0.01 cfs	1
S1-00206CWRIS	Cert	DS	Blankenship, E And D	2/17/1972	0.01 cfs	1
S1-*21353CWRIS	Cert	DM	Eychaner, John	12/3/1968	0.02 cfs	2
S1-*21911CWRIS	Cert	DS	Culbertson, R W	11/18/1969	0.01 cfs	1
S1-*21918CWRIS	Cert	DS	Gebaroff, C W	11/26/1969	0.01 cfs	1
S1-*18758CWRIS	Cert	DS	Baxter, L	10/26/1964	0.01 cfs	--
S1-*16625CWRIS	Cert	DS RE	Hall, C B	4/11/1961	0.05 cfs	--
S1-*13920CWRIS	Cert	DS FS IR	Miller, H W	6/12/1956	0.3 cfs	28
S1-*09533CWRIS	Cert	DS	Margreiter, G Et Ux	4/18/1950	0.005 cfs	--
S1-*04485CWRIS	Cert	DS PO	Swanson, E M	12/15/1937	0.4 cfs	--
S1-*02428CWRIS	Cert	DM	Slade, G A	9/26/1928	0.2 cfs	--
G1-24839CWRIS	Cert	MI	Kenmore Per Mix Co	6/10/1986	250 gpm	200
G1-25200CWRIS	Cert	FR HE IR	Streissguth, Mark	3/15/1988	300 gpm	16.6
G1-23440CWRIS	Cert	DM	Gmazel, Leroy Et Ux	7/18/1979	40 gpm	10
G1-00152C	Cert	DM	Leisure Time Resorts of America	9/8/1971	40 gpm	8.5
G1-24210C	Cert	DM	Rumbolz Sunset Water Association	12/3/1982	30 gpm	5
G1-28625P	Pmt	HE	Snoqualmie Valley School Dist 410	5/27/2009	600 gpm	500

Cert = Certificate; Pmt = Permit; '—' not listed; DM = multiple domestic; DS = Domestic; FS = Fire Suppression; HE = Heat Exchange; IR = Irrigation; MI = Mining; PO = Power; ST = Stock Watering

Hydrologic Setting

The City is located within Water Resources Inventory Area (WRIA) 7, which encompasses the Snohomish River Basin. WRIA 7 and the Snohomish River basin can be further divided into 62 sub-basins, with the City being within the Lower Coal Creek sub-basin of the Snoqualmie River Valley (Snohomish County, 2005). Surface waters within the Lower Coal Creek sub-basin, including Kimball and Coal Creeks to the south of the City, and Brockway and Tokul Creeks to the north, are tributaries of the Snoqualmie River Mainstem, which flows west along the City's northern margin. The North and South Forks of the Snoqualmie River join the Middle Fork approximately 2 miles east (upstream) of the City before continuing to flow generally northwest toward the Snohomish River.

The Upper Snoqualmie River watershed, which includes the greater Snoqualmie River Basin upstream of Snoqualmie Falls (located approximately one-half mile southwest of the North Wellfield; see Figure 1) drains an area of approximately 375 miles (AESI, 1996). Precipitation in the Upper Snoqualmie River watershed ranges from more than 180 inches per year (in/yr) in the Cascade Mountains to approximately 60 inches at the City (Ecology, 2016). The average discharge in the Snoqualmie River at Snoqualmie Falls between 2000 and 2015 was approximately 3,900 and 700 cubic feet per second (cfs) in January and August, respectively (USGS, 2016).

The City and the adjacent reach of the Snoqualmie River Mainstem (Snoqualmie River) are located within a deeply incised portion of the Snoqualmie River Valley. The City is bounded to the north by the Mt Si. foothills and the Tokul Delta, and by Rattlesnake Ridge to the South, resulting in more than 400 feet of relief within the City's water service area. This relatively high relief within City limits is also associated with a wide range of geologic units deposited as valley infill.

Hydrogeologic Evaluation

A series of hydrogeologic characterizations have been completed to support several water resources projects near the City, including the City's North and South Wellfields (see AESI [1995] and [1996]), as well as large-scale studies to support groundwater management (e.g., King County, 2010; Golder, 1998; USGS, 1994, etc). These investigations were reviewed by Aspect in conjunction with geologic maps and well installation reports to support a hydrogeologic evaluation of the subject application. A geologic and hydrogeologic conceptual model is described below based on this review.

Geologic Setting

The City is located within the Snoqualmie Valley, which is a deeply incised bedrock valley filled with a series of glacial and non-glacial sediments, deposited primarily during the Pleistocene epoch (1.6 million to 10,000 years before present [ybp]). These Pleistocene-aged sediments are overlain by more recent alluvial sediments (e.g., sands and gravels) deposited by the Snoqualmie River and its tributaries (Dragovich, 2009; AESI,1994).

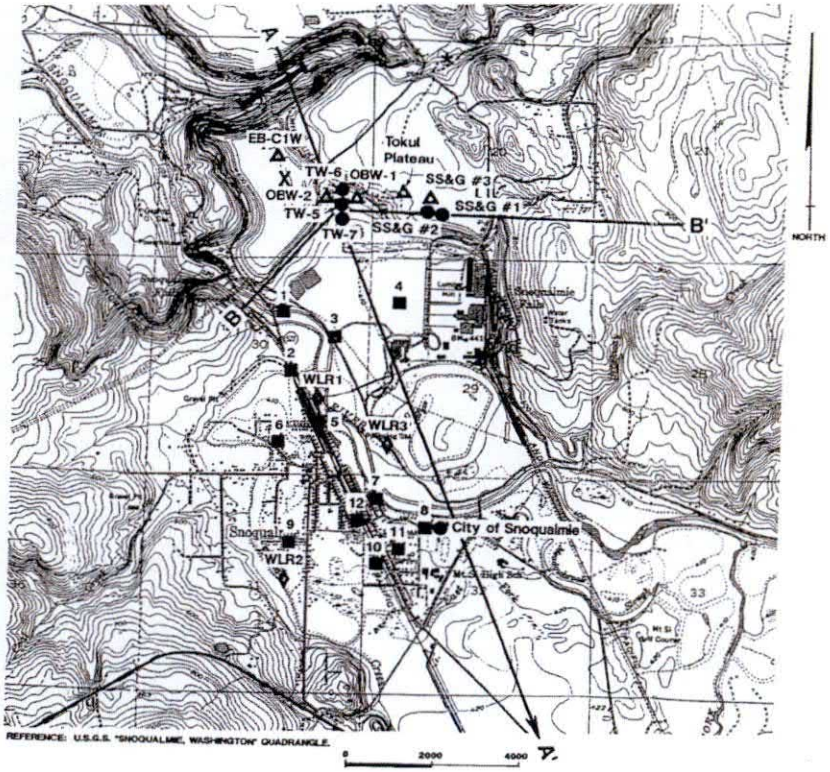
Bedrock of the Snoqualmie Valley near the City consists primarily of tertiary volcanic rocks (e.g., the Miocene-aged andesites exposed at Snoqualmie Falls) and older (Jurassic-aged) metasedimentary rocks (e.g., the metasandstones exposed in portions of the Tokul Creek Valley; Dragovich, 2009). The depth to bedrock at the City's wellfields, which are located generally near the center of the Snoqualmie Valley, ranges between approximately 550 and 600 feet below ground surface (feet bgs), except at Well No. 8. Andesitic bedrock was first encountered approximately 700 feet bgs at the City's Well No. 8 due higher

ground surface elevations near the Tokul Creek plateau and the proximity of Tokul Creek, which is likely associated with ancestral bedrock erosion.

A simplified geologic cross-section is presented in Figures 5 and 6 to indicate the depth to bedrock and the series of unconsolidated sediments that form the valley fill (modified from AESI, 1996). From oldest to youngest, the infill sediments have been categorized as the following stratigraphic layers (summarized from AESI, 1996 and Dragovich, 2009):

- Pre-Olympia Sediments (*Qpou*) – Pleistocene-aged undifferentiated glacial and non-glacial deposits consisting of laminated to massive silt, clay, sand and gravel. This unit has been identified immediately overlying bedrock south of the City, but is absent at the North and South Wellfields.
- Olympia Sediments (*Qo*) – Pleistocene-aged fluvial sediments deposited by the ancestral Snoqualmie River. This unit generally consists of medium to coarse sands and gravels with lenses of fine to medium sand. It has been mapped at the North and South Wellfield as being between approximately 50 to 70 feet thick, and has been identified by Golder (1996) at elevations up to 600 feet above mean sea level (amsl) near Tanner (approximately 5 miles southeast of the South Wellfield).
- Vashon Glacial Sediments (*Qva, Qvt, Qvr*) – Quaternary-aged glacial deposits of the most recent glaciation of the Puget Sound Lowlands (i.e, the Vashon Stade of the Fraser Glaciation). Sediments deposited during glacial advance (*Qva*) include glaciolacustrine clay, silt and fine sand deposited at thicknesses of approximately 100 to 200 feet. Subsequent deposits of glacial till (*Qvt*) consist of poorly sorted sand and gravel in a dense silt/clay matrix. Meltwaters that formed during the glacial retreat resulted in deposition of a prograding delta system (Qvr) in the Tokul Creek area; the local *Qvr* is noted to coarsen upwards and become generally finer-grained with distance from the ancestral delta (e.g. to the southeast).
- Recent Sediments (*Qa*) – Late-Quaternary to recent sediments deposited by the post-glacial Lake Snoqualmie and the modern Snoqualmie River. Deposition of the Tokul Creek delta system resulted in the formation of pre-historic Lake Snoqualmie, which deposited lacustrine sands, silts, and clays (*Qaf*) at thickness of up to 300 feet near the South Wellfield; these sediments are noted to become coarser-grained to the south (AESI, 1994). Recent Snoqualmie River deposits of sand and gravel (*Qag*) overly the Lake Snoqualmie sediments, and floodplain deposits of silt and clay are typically present near ground surface.

Figure 5. Geologic Cross-section Location

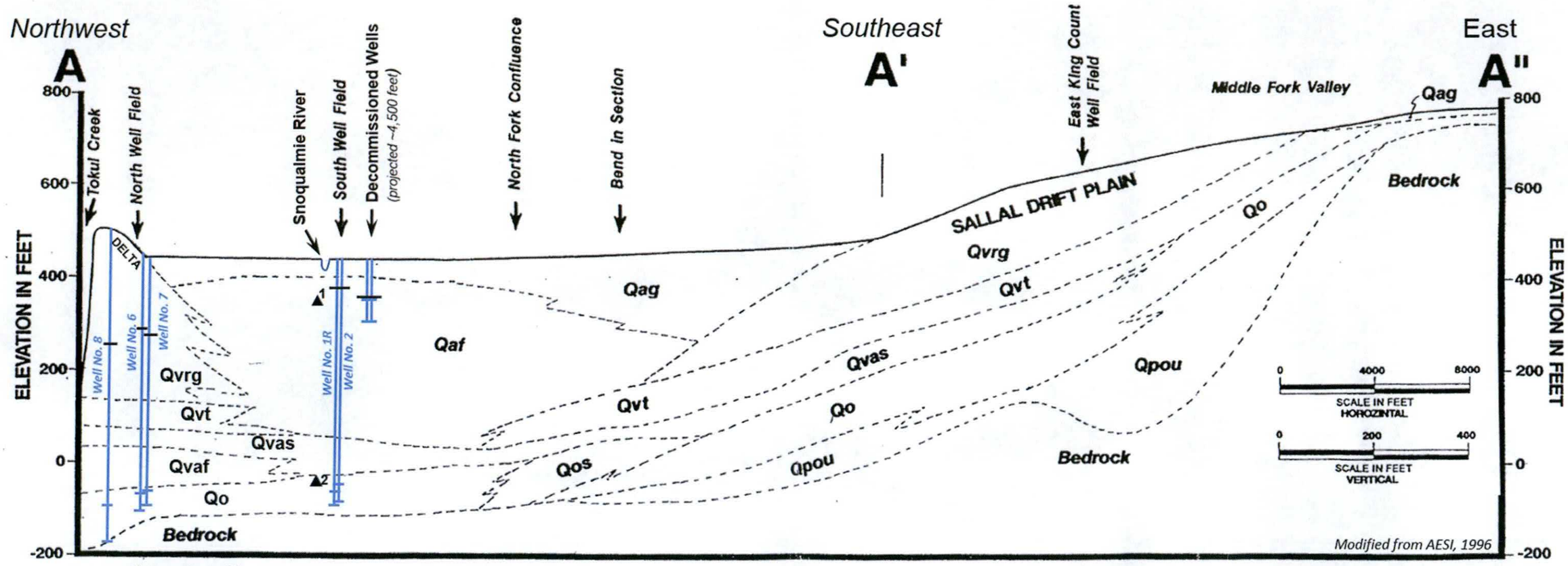


WATER WELL LOCATION MAP
Snoqualmie North Valley Well Field

PROJECT NO. W96078C
APRIL 1996
FIGURE 2

ASSOCIATED EARTH SCIENCES, INC

Figure 6. Geologic Cross-section



Legend

Qag	Recent river deposits consisting of gravelly sand to sandy gravel capped over bank silts
Qaf	Lake Snoqualmie deposits consisting of fine sand, silts, and clays; coarsening southward (AESI, 1994)
Qvrg	Vashon Recessional fluvial deposits consisting of cobbly sandy gravel
Qvt	Vashon till consisting of poorly sorted sand and gravel in dense silt and clay matrix
Qvas	Vashon advance fluvial deposits consisting of medium to fine sand
Qvaf	Vashon advance lacustrine deposits consisting of silts and clay
Qo	Olympia fluvial deposits consisting of cobbly sandy gravel to gravelly sand
Qos	Olympia fluvial deposits consisting of sand deposited by the historic North Fork near the confluence of the North Fork with the Middle and South Fork Snoqualmie Rivers
Qpou	Pre-Olympia undifferentiated sediments consisting of a mix of till, sand, gravel, silt, and clay
Bedrock	Tertiary- to Jurassic-aged bedrock

▲ Carbon-14 Dates
1. 5720 ybp
2. >43,000 ybp

City Well
- Approx. static water level (well log)
- Approx. screen interval

Groundwater Occurrence

There are four principal aquifers that have been identified in proximity to the City. These include, from oldest to youngest, the following aquifers (summarized from AESI, 1994, 1996 and 2002):

- Olympia Aquifer – occurring in the Olympia Sediments (*Qo*) of the ancestral Snoqualmie River, this aquifer has been locally designated as the "deep aquifer" in some reports and is tapped by all wells at the City's North and South Wellfields. The aquifer ranges in thickness from approximately 50 to 200 feet between the North Wellfield and at wells installed southeast of the City at Tanner, respectively. Beginning near the Grouse Ridge/Middle Fork Embankment area east of Tanner, the aquifer extends to an unknown distance northwest of Snoqualmie Falls. The width of the aquifer was limited by the narrow bedrock valley of the ancestral Snoqualmie River, and is estimated to be 2,000 feet near the North Wellfield.

  Aquifer testing at the City's North and South Wellfields indicated the aquifer behaves as a leaky confined system, receiving water from the overlying Vashon glacial advance sediments (*Qva*). At the North Wellfield, the Olympia Aquifer is immediately overlain by a clayey silt aquitard deposited during the glacial advance (Qvaf); however, this aquitard was not identified at the South Wellfield, suggesting relatively more recharge occurs from overlying aquifers at the South Wellfield. The transmissivity of the aquifer has been estimated to range between approximately 2,000 and 4,000 feet squared per day (ft^2/d) at the North and South Wellfields, respectively.

- Glacial (Vashon) Advance Aquifer – occurring within the sands of the glacial advance sediments (*Qvas*), this aquifer has been identified at the North and South Wellfields at thickness up to approximately 120 and 80 feet, respectively. The lateral distribution of the aquifer is similar to that for the Olympia Aquifer as a result of the ancestral topography, but sediments are generally finer and of different origin. This aquifer is considered capable of producing low yields, and modeling of leakage (recharge) rates to the underlying Olympia Aquifer indicate a transmissivity on the order of 600 ft^2/d.

- The Tokul Creek Glacial Recession Aquifer – occurring within the sand and gravel deltaic deposits of the Tokul Creek Delta (*Qvr*), this aquifer is unconfined and is bounded to the west by bedrock. The aquifer is approximately 140 feet thick at the North Wellfield, but becomes finer-grained and pinches out to the southeast. Groundwater discharges from this aquifer to Tokul Creek at an estimated rate of approximately 4 to 5 cfs near SR-202 (total baseflow in Tokul Creek was estimated at 25 cfs during the 1992 measurement period; AESI, 1996). Recharge to the aquifer includes discharge from the adjacent Snoqualmie River Aquifer, which occurs over a relatively steep gradient of about 0.3 feet per foot. Transmissivity in the aquifer ranges from about 24,000 ft^2/d near the North Wellfield to 220 ft^2/d at a well located at Snoqualmie Sand and Gravel (near the aquifer margin).

- The Snoqualmie River Aquifer – occurring within the surficial sand and gravel deposits of the recent Snoqualmie River (*Qag*), averaging approximately 50 feet thick near the City. Most groundwater within this unconfined aquifer discharges to the Snoqualmie River and to the Tokul Creek aquifer within the subsurface. Aquifer transmissivity has been estimated from slug testing to be approximately 4,000 ft^2/d; however, these results may represent an underestimate of transmissivity due to effects from delayed yield.

The generally less productive Lake Snoqualmie Unit tapped by the City's decommissioned wells likely receives recharge from the Snoqualmie River aquifer. It is considered to be unconfined to semi-confined, with discharge occurring to deeper aquifers (i.e., Qva and Qo) and ultimately to the Snoqualmie River. The Lake Snoqualmie Unit is therefore considered to be part of the Snoqualmie River aquifer system.

Groundwater Flow and Potential Changes

The current point of withdrawal for the subject water right (92-D) is Decommissioned Well No. 2 (see Figures 5 and 6), which is interpreted to have tapped shallow portions of the Lake Snoqualmie unit (*Qaf* in Figure 6). The Lake Snoqualmie unit is not known to be a prolific aquifer near the City, and likely receives recharge primarily from the overlying Snoqualmie River Aquifer and locally from Kimball Creek (located about 500 feet from the existing points of withdrawal). Kimball Creek is fish bearing and flows to Coal Creek, which discharges to the Snoqualmie River above Snoqualmie Falls. Kimball Creek is the focus of a habitat and water quality improvement project undertaken by the Snoqualmie Tribe (Baerwalde, 2011), and continued nonuse of the existing point of withdrawal for the subject right is expected to provide a flow benefit to Kimball Creek.

Based on aquifer pressures and the conceptual hydrogeologic model presented in Figure 6, groundwater within the Lake Snoqualmie Unit should discharge to the Tokul Creek Glacial Recessional Aquifer and ultimately to surface water.

All of the City's currently active production wells tap the Olympia aquifer at depths between approximately 500 and 700 feet bgs. Well Completion depths are summarized in Table 8 and depicted in cross-section as Figure 6.

Table 8. Summary of City of Snoqualmie Production Wells

Well No.	Static Water Level (feet amsl)[1]	Screen Interval (feet BGS)	Screened Elevation (feet amsl)	Wellfield	Average Wellfield Production in 2013 & 2014 (gpm)[2]
1R	374[3]	490 - 550	-70 to -130	North	570
2	--	513 – 556[4]	-100 to -143		
6	276[5]	534 – 580	-94 to -140	South	140
7	290[5]	527 - 557	-87 to -117		
8	240[3]	609 – 694	-100 to -184		
Decommissioned No. 1	355[3]	85 – 130[6]	355 - 310	--	--
Decommissioned No. 2	355[3]	85 – 130[6]	355 - 310		

[1]Reported for different water years and times of year.
[2]Production data provided by Gray and Osborne (2013 and 2016) indicates groundwater production was greatest in 2013 and 2014 for the period from 2003 through 2015.
[3]Obtained from well log on file with Ecology
[4]No well log on file with Ecology; information obtained from GeoEngineers, 1995.
[5]From AESI, 1994.
[6]Casing was perforated.

Pumping tests at the North Wellfield have resulted in a pronounced drawdown response at the South Wellfield, and vice versa. An 8-day pumping test at the North Wellfield was conducted at a rate of 1,040 gpm, resulting in 50 feet of drawdown at the North Wellfield (Well TW-5) and approximately 5 feet of drawdown at the South Wellfield (AESI, 1994). Alternatively, a similar pumping test conducted at the South Wellfield (i.e., pumping 1,130 gpm for 7 days) resulted in a comparatively lower drawdown response at the North Wellfield (i.e., approximately 2 feet; GeoEngineers, 1995). These results suggest that: (1) lateral flow boundaries likely exist to the east and west in proximity to the wellfields, resulting

in the pronounced drawdown response over the approximately 2 miles separating the wellfields; and (2) the greater drawdown response during each test at the South Wellfield to pumping at the North Wellfield may be associated with more confining conditions in the northwest portion of the aquifer (e.g., confining layers may act to limit leakage from overlying aquifers in this area, resulting in a more rapidly expanding cone of depression).

A numerical groundwater flow model was developed for the City in the 1990s using the USGS MODFLOW code to evaluate aquifer and surface water response to pumping at the North and South Wellfields (see AESI, 1994 and 1995, respectively). The steady-state model indicated that continuous pumping at either the North or South Wellfields would result in a reduction in groundwater discharge to Tokul Creek and the Snoqualmie River. This reduction is predicted to occur at both wellfields due to leakage (recharge) to the Olympia aquifer from the overlying shallow aquifers, which are in hydraulic connection with local surface waters. However, the model predicts greater local impacts will occur to the Snoqualmie River from pumping at the South Wellfield because of better hydraulic continuity with the shallow aquifers in this area.

The MODFLOW model simulated the effects of continuous pumping at the North Wellfield at a rate based on the annual limitations of existing water rights (i.e., 425 gpm, equating to approximately 700 ac-ft/year under Permit No. G1-25449P; AESI,1994). The effect of pumping at a continuous rate of 410 gpm (660 ac-ft/yr) was simulated for the South Wellfield (AESI, 1995). The results of these simulations are summarized in Table 9 (compiled from AESI, 1994 and 1995).

Table 9. Modeled Impacts to Surface Waters from Production at City Wellfields

Wellfield	Average Pumping Rate (gpm)	Tokul Creek Flow Reduction		Snoqualmie River Flow Reduction		
		Total (gpm)	*% of Baseflow*	*Total Above Falls (gpm)[1]*	*Total Below Tokul Confluence (gpm)*	*% of Baseflow[2]*
North	425	65	0.5	3[3]	70	0.02
South	410	55	0.5	240[4]	300	0.10

[1]Represents maximum total reduction in flow at Snoqualmie Falls (i.e., "return flow capture" and direct discharge to groundwater at the South Wellfield).
[2]Represents reduction in summer baseflow (est. 700 cfs) in the Snoqualmie River below the Tokul Creek Confluence (0.75 miles downstream from Snoqualmie Falls).
[3]Represents the predicted quantity of intercepted recharge to the Snoqualmie River Aquifer (see AESI, 1994)
[4]Includes an estimated 20 gpm of induced recharge from the Snoqualmie River and 220 gpm of leakage from Snoqualmie River aquifer (AESI, 1995)

The model simulations indicated that approximately 220 gpm and 3 gpm of groundwater discharge to the Snoqualmie River above Snoqualmie Falls would be intercepted by pumping at the South and North Wellfields, respectively. The model also suggested that pumping at the South Wellfield would result in an additional 20 gpm flow reduction in the Snoqualmie River, due to induced discharge from the river to the surrounding aquifer (totaling the 240 gpm seen in Table 9). The model simulated that releases from storage (replenished through recharge) and reduced outflow within the deep aquifer provide the balance of flow to the wells. The reduction in outflow from the deep aquifer system is modeled to be greater when pumping at the North Wellfield compared to the South Wellfield (commensurate with less local impact to the Snoqualmie River), but likely results in reduced baseflows to the Snoqualmie River in downstream areas. This suggests that a downstream movement of existing impacts to the Snoqualmie River may result from the proposed change, which is considered an overall benefit to the Snoqualmie River, because impacts along an upstream reach of the river associated with the water rights' existing points of withdrawal will be reduced or eliminated.

The modeled reduction in baseflow to Tokul Creek from pumping either wellfield would further decrease Snoqualmie River baseflow below the Tokul Creek confluence (approximately 0.75 miles downstream from Snoqualmie Falls). However, discharge to the Snoqualmie River from the City's

wastewater treatment plant will result in an overall increase in flow in the Snoqualmie River above Snoqualmie Falls, since the majority of this wastewater originates from the deep groundwater system that would otherwise discharge farther downstream in the Snoqualmie River.

The application for change filed by the City requested to change the point of withdrawal for Certificate No. GWC 91-D from a decommissioned well to all wells at the City's North and South wellfields. Historical impacts in the Snoqualmie River from use of the decommissioned well would likely have been experienced downstream of its confluence with Kimball Creek, but not necessarily upstream of the confluence. During evaluation of the proposed changes, Ecology expressed concerns to the City that an additional one mile reach of the Snoqualmie River would potentially be impacted by increased withdrawals at the South Wellfield. Given Ecology's concerns and the City's preferential use of the North Wellfield over the South Wellfield, the City voluntarily agreed to withdraw the request for use of this water right at the South Wellfield. For this reason, the analysis that follows focuses on anticipated increases in withdrawals at the North Wellfield.

It is recognized that the MODFLOW models for the North and South Wellfields could be updated with more recent water level and aquifer testing data, and the model output may change as a result. However, the overall results of the existing models are not expected to change the finding that less local impacts would occur to the Snoqualmie River by consolidating withdrawals at the North Wellfield site. The results in Table 9 summarize the existing model results and illustrate this finding. Importantly, the proposed consolidation is considered water balance neutral with respect to the Snoqualmie River watershed (i.e., consolidation of pumping at the North Wellfield would not increase or reduce consumptive appropriations from the basin, all of which will ultimately result in reductions of flow in the river). However, based on these results, consolidating pumping at the North Wellfield should nevertheless result in a downstream shift in potential effects from groundwater withdrawals on flow in the river, given the downstream location of the North Wellfield and greater confining conditions in this area.

Impacts to Tokul Creek resulting from consolidation of pumping at the North Wellfield (i.e., resulting from an equivalent decrease in pumping at the South Wellfield and the City's shallow decommissioned wells) were investigated by reviewing previous model simulations. Interpolating model results for pumping at both the North and South Wellfields (AESI 1994; AESI ,1995) as currently authorized (approximately 1,224 ac-ft/yr or 760 gpm continuously) results in an estimated baseflow reduction in Tokul Creek baseflow of approximately 100 gpm, which is about 1% of summer low flows in Tokul Creek (AESI, 1994). Considering the City's entire consolidation project (see Table 2), up to 880 gpm could be authorized for continuous withdrawal at the North Wellfield (i.e., 1,424 ac-ft/yr under continuous pumping). Interpolation of results from previous MODFLOW simulations at the North Wellfield (simulations included continuous pumping at rates between 100 and 3,000 gpm; AESI, 1994) indicates that continuous pumping at 880 gpm exclusively from the North Wellfield could decrease groundwater discharge to Tokul Creek by approximately 110 gpm. Thus, it is predicted that all the proposed changes combined would result in a minor increase in impacts on Tokul Creek (roughly 0.1% of summer low flow). Tokul Creek is not regulated with instream flows.

Impairment Considerations

Impairment of Minimum Instream Flow Water Rights

The term "instream flow" is used to identify a specific stream flow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the stream flows needed to protect and preserve instream

resources and values, such as fish, wildlife and recreation. Instream flows are most often described and established in a formal legal document, typically an adopted state rule.

Once established, a minimum flow constitutes an appropriation with a priority date as of the effective date of the rule establishing the minimum flow (RCW 90.03.345). Thus, a minimum flow set by rule is an existing right which may not be impaired (RCW 90.03.345; RCW 90.44.030).

Minimum instream flows were established for the Snohomish River Water Resource Inventory Area (WRIA 7) by WAC 173-507 in 1979. None of the three water rights involved with this project are junior to the instream flow rule, and as such, they are not subject to curtailment when instream flows are not met. The hydrogeological assessment suggests that, as a result of the changes, impacts in the Snoqualmie River will be reduced or eliminated along a reach of the river from shifting withdrawals downstream to the North Wellfield. Flows as measured at the gage at Snoqualmie Falls control station will not be reduced and could even see a slight increase. With the withdrawal moving a short distance downstream, flows at all other downstream control stations in the Snoqualmie/Snohomish system should see no change through this consolidation process. As noted previously, WDFW has also determined that no new impacts to fish will occur from approval of this change application.

Impairment, Qualifying Ground Water Withdrawal Facilities, and Well Interference

There are three concepts that are important when considering whether a withdrawal of water from a well would impair another existing water right. The concepts are defined as follows:

1. Impairment is an adverse impact on the physical availability of water for a beneficial use that is entitled to protection (i.e., water rights that are both senior and junior in priority to the right the applicant seeks to change).

2. Qualifying ground water withdrawal facilities are defined as those wells which in the opinion of the Department are adequately constructed. An adequately constructed well is one that (a) is constructed in compliance with well construction requirements; (b) fully penetrates the saturated thickness of an aquifer or withdraws water from a reasonable and feasible pumping lift (WAC 173-150); (c) the withdrawal facilities must be able to accommodate a reasonable variation in seasonal pumping water levels; and (d) the withdrawal facilities including pumping facilities must be properly sized to the ability of the aquifer to produce water.

3. Well interference may occur when several wells penetrate and withdraw ground water from the same aquifer. Each pumping well creates a drawdown cone. When several wells pump from the same aquifer, well density, aquifer characteristics, and pumping demand may result in individual drawdown cones that intersect and form a composite drawdown cone. At any point in an aquifer, the composite drawdown caused by pumping wells will be greatly influenced by the transmissivity (T) of the aquifer. In aquifers with high Ts, composite drawdown will generally be much less than in aquifers with similar properties but with low Ts. Transmissivity is related to hydraulic conductivity (K) and the saturated thickness (b) of an aquifer by the relationship T=Kb.

   An aquifer's hydraulic conductivity (K) is derived from the physical properties of both the fluid and geologic materials that form an aquifer. Once formed, an aquifer's saturated thickness (b) becomes important in evaluating its transmissivity. For regions of similar K in an aquifer, a large saturated thickness will result in a much higher T than a small saturated thickness. As a result, regions of similar K in an aquifer with a large saturated thickness will experience less composite drawdown or

well interference than with a small saturated thickness.

Some conditions, however, will increase or steepen composite drawdown in an aquifer. For instance, where characteristics (such as very fine, clay-rich, or poorly sorted sediments) of an unconfined aquifer cause significant drawdown relative to the saturated thickness, the composite drawdown will increase as saturated thickness is reduced and T becomes smaller. Additionally, in regions where negative or no-flow boundaries occur, such as near the edges of a valley fill aquifer where it is bounded by bedrock, composite drawdown will be steeper than in the central part (generally the greatest thickness region) of the aquifer. Consequently, it is commonly understood that the greatest composite drawdown or well interference is more likely to occur in regions of low transmissivities, thin saturated thicknesses and near negative or no-flow boundaries than in regions of high transmissivities, large saturated thicknesses, and away from negative or no-flow boundaries.

It is noted above that Tokul Creek could experience a slight increase in impacts from the proposed change. The potential increase is on the order of 0.1% of the summer low flow in Tokul Creek and will not physically impair any downstream surface water rights.

The City's proposed consolidation package requests the North Wellfield wells as additional points of withdrawal for existing rights. If the entire package were approved, withdrawals from the North Wellfield could increase from 724 to 1,424 ac-ft/yr; this amounts to an increase in the average (continuous) pumping rate from approximately 450 to 880 gpm. This increase in withdrawals at the North Wellfield would result in greater localized drawdown within the Olympia aquifer and, to a lesser degree, within overlying shallow aquifers. To estimate potential well interference to other users, the results from previous MODFLOW simulations for the North Wellfield were evaluated (see AESI, 1994).

MODFLOW simulations were previously conducted for the North Wellfield for continuous pumping rates between 100 and 3,000 gpm. Interpolation of these results was performed to estimate aquifer drawdown during pumping at 880 gpm. Results are summarized in Table 10. Figures showing the simulated drawdown in the deep aquifer from continuous pumping at the North Wellfield at 425 and 1,000 gpm are presented in Figures 7 and 8, respectively (modified from AESI, 1994).

Table 10. Simulated Drawdown Response to Pumping (MODFLOW results; AESI, 1994)

Average Annual Pumping Rate (gpm)	Deep Aquifer Drawdown (in feet)		Shallow Aquifer Drawdown (in feet)
	at 2,000 feet (Snoqualmie S & G)[1]	*at 9,000 feet (S. Wellfield and School District Wells*[2]*)*	*at 1,500 feet (adjacent domestic wells)*[3]
450	20	5	2
880[4]	30	10	4
1,000	35	12	5
2,000	75	24	9

[1] Snoqualmie Sand and Gravel Wells (G1-23849C); Ecology Well Log ID Nos. 94089 and 97733.
[2]The school district wells are include an injection and extraction well associated with Permit No. G1-28625P and are located approximately 10,000 feet from the North Wellfield.
[3]Approximate distance to Tokul Plateau Well (G1-23440C; Ecology Well Log ID 94668) and other exempt wells indicated in Table 11.
[4]Drawdown response to pumping at 880 gpm estimated by linear interpolation of existing results.

Figure 7. Simulated Drawdown in Olympia Aquifer – 425 gpm Continuous Pumping

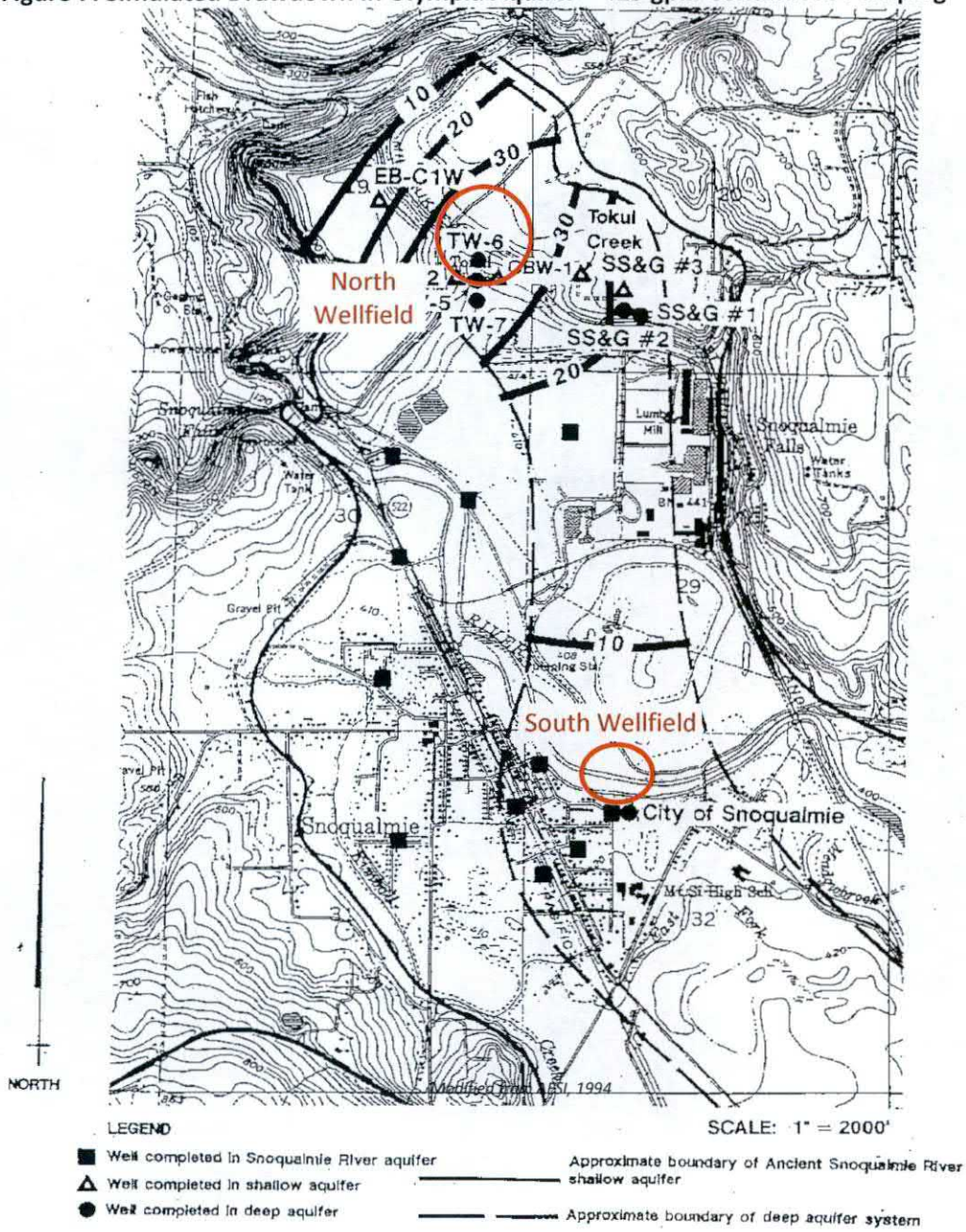
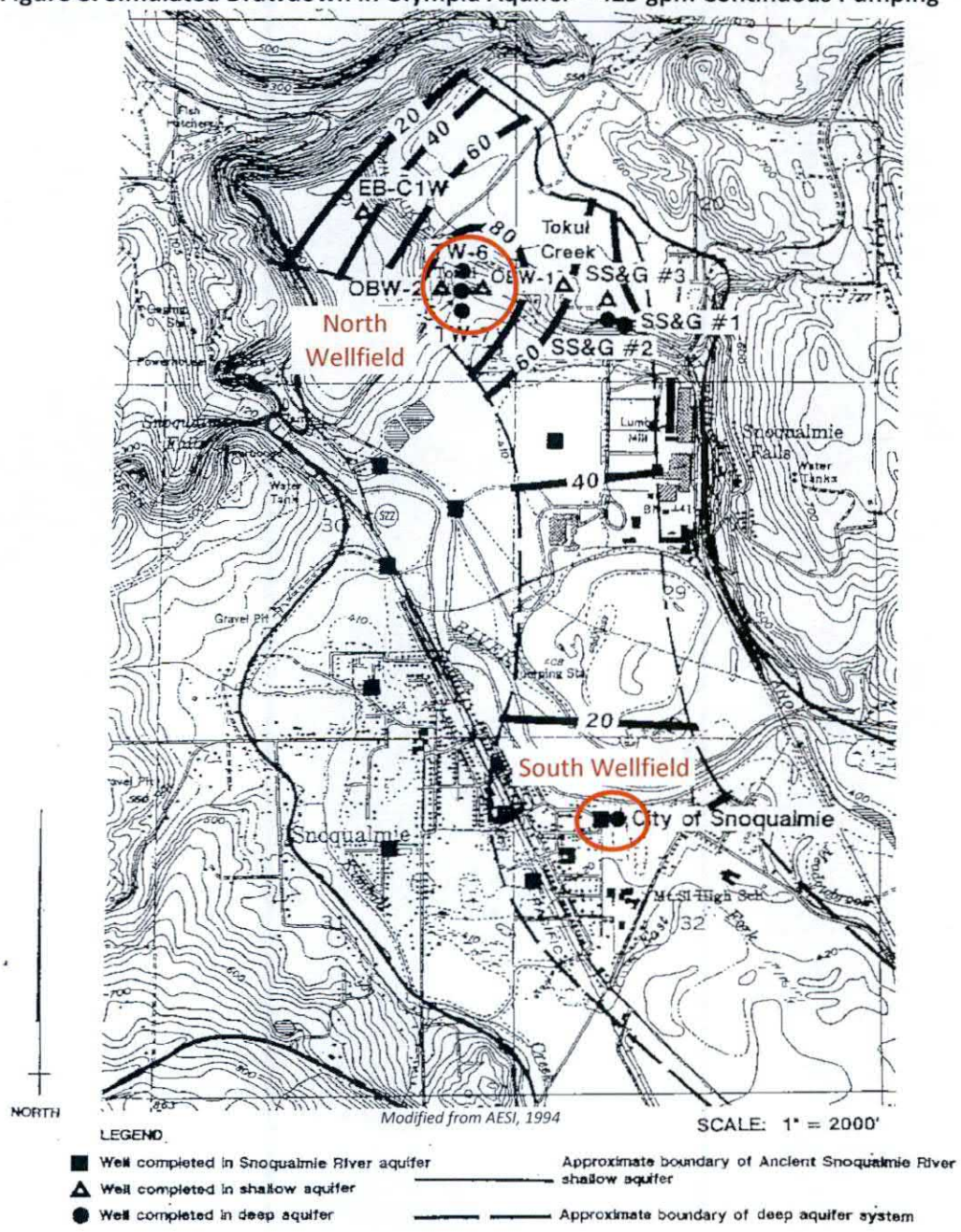


Figure 8. Simulated Drawdown in Olympia Aquifer – 425 gpm Continuous Pumping



Wells associated with groundwater rights identified in proximity to the North Wellfield are presented above in Table 6. According to previous reports, most of the water supply to Snoqualmie Sand and Gravel Well is provided by a well designated as Well No. 2. This well has approximately 100 feet of available drawdown, 54 feet of which is required to produce the certificated Qi of 250 gpm. This indicates there is an additional 46 feet of remaining available drawdown to accommodate potential interference drawdown from the subject application (AESI, 1994), so impacts to well yield are not anticipated to occur under the consolidation project. Snoqualmie Sand and Gravel has not reported any impacts from historical pumping at the North Wellfield, which is predicted to have resulted in more than

20 feet of interference drawdown. This suggests that the model may be over-estimating impacts, which will create a safety factor when assessing impairment.

The Tokul Plateau Well, associated with certificate no. G1-23440CWRIS and located at 5700 390th Ave SE and completed in the shallow aquifer (Table 10), was previously estimated to be able to incur approximately 4 feet of interference drawdown from the North Wellfield before well yield would be affected (AESI, 1994). This is equivalent to the predicted interference drawdown from the proposed consolidation.

Ecology's online Well Log Database was queried to identify water wells not identified in Table 6 (i.e., wells exempt from groundwater rights under RCW 90.44.050) following two approaches: (1) well logs within the local deep aquifer system, considered to be those greater than 200 feet deep and within east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E (2.25 miles south from the North Wellfield); and (2) all well logs within approximately 0.75 miles of the North Wellfield (i.e., within the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE¼ Sec 30, T24N, R8E). A radius of 0.75 miles was selected to capture any wells associated with nearby structures (identified from aerial imagery). Three wells were identified using these approaches and are presumed to be operated under "exempt" status (i.e., producing less than 5,000 gallons per day without a water right). Two of these wells are interpreted as completed in the Tokul Creek Delta / Snoqualmie River aquifer (Ecology Well Log ID Nos. 97066 and 97934), and a third well is interpreted to be completed beyond the extent of the shallow Snoqualmie River aquifer (Well Log ID 795008). Details of these wells are presented in Table 11.

Table 11. Water Well Logs near the North Wellfield ("exempt" wells)[1]

Owner Name	Address	Ecology Well Log ID No.	Static Water Level (feet BGS)[2]	Depth to Top of Screen (feet BGS)	Note
Robert Vezzoni	--[3]	97066	263	276	15 gpm with "0" drawdown
Steve Parsons	5820 390th Ave SE	97934	225	265[4]	8 gpm with "0" drawdown
Brooks Bros. Water	7001 396th Dr. SE	795008	44	221	16 gpm with 168 feet drawdown

[1] Queried area included all wells in the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE ¼ Sec 30, T24N, R08E and wells greater than 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E. No water rights were identified in association the wells indicated, and the wells are presumed to withdraw up to 5,000 gallons per day under the groundwater permit exemption.
[2]Presented as feet below ground surface (feet BGS)
[3]No address provided with well log.
[4]Well is cased to 265 feet BGS with no screen (open bottom)

Well Log ID Nos. 97066 and 97934 indicate the two exempt wells near the North Wellfield in the shallow aquifer system exhibit a high specific capacity as evidenced by zero drawdown. Both wells are reported to have more than 10 feet of available drawdown, and well yields are not expected to be reduced by the added interference drawdown resulting from the subject application (e.g., approximately 4 feet based on model simulations). Well Nos. 97066 and 97934 were installed in 1986 and 1992, respectively, and no impacts from existing authorizations have been reported. Similarly, no impacts have been reported for Well No. 795008, which is located about one mile from the North Wellfield and exhibits different hydrogeologic conditions (as evidenced by a lower specific capacity compared to City wells and others listed in Table 11).

Public Interest Considerations

No potential for detriment to the public interest was identified during the investigation of this water right change application.

Consideration of Protests and Comments

No protests were received by Ecology in response to the public notices of this change application.

Two sets of comments were received from the publication of this draft Report of Examination on Ecology's website:

- Mr. Stephen Kangas of North Bend commented to Ecology via email (on September 6, 2018) that two references to the "Tanner" area incorrectly indicated that Tanner is southwest of the City of Snoqualmie and the City's South Wellfield, rather than southeast.

  Response: This Report of Examination has been updated to correctly reference the Tanner location as southeast of the City and its South Wellfield.

- The Snoqualmie Tribe filed a comment letter (dated September 13, 2018) with Ecology stating:

  "The proposed transfer of water rights from the decommissioned wells located adjacent to Kimball Creek to the North Well Field is expected to shift impacts from Kimball Creek (on the south side of the Snoqualmie River) to Tokul Creek (on the north side of the Snoqualmie River). The proposed transfer of water rights from the South Well Field to the North Well Field is expected to result in an increase in impacts to Tokul Creek. So, as described in the draft ROEs, the proposed water rights transfers will shift impacts from non-anadromous stream reaches to an anadromous stream reach, namely, Tokul Creek...We request that if ECY approves the City of Snoqualmie's request to increase impacts to Tokul Creek, an important salmon stream, that any approval will be accompanied by requiring appropriate mitigation to help offset those expected negative impacts to anadromous fish and fish habitat."

  Response: As noted in the Investigation section of this Report of Examination, previous groundwater modeling indicated that use of the South Wellfield was predicted to have greater local impacts on the Snoqualmie River than the North Wellfield. In addition, the North Wellfield is located further downstream in the Snoqualmie River system. Given these considerations, shifting of use from the South Wellfield to the North Wellfield is expected to benefit an anadromous portion of the Snoqualmie River. Similarly, the shifting of use from the decommissioned wells located near Kimball Creek will benefit flows in both Kimball Creek and an anadromous portion of the Snoqualmie River. Transfer of all pumping from the South Wellfield and decommissioned wells is predicted to result in a very small increased impact to Tokul Creek, which is not regulated under chapter 173-507 WAC and is already impacted by the authorized water rights. The maximum new impact to stream flows in Tokul Creek as a result of all the proposed changes (i.e., if all of the water use currently authorized for the South Wellfield and Decommissioned Wells 1 and 2 shifts to the North Wellfield) is predicted based on groundwater modeling to be less than 0.15% (1.5/1000th) of summer low flows. Nothing in state law requires mitigation for new impacts to unregulated streams; therefore, no mitigation is required.

Extent and Validity Considerations

The approved point of withdrawal for the subject right has been decommissioned, but is exempt from statutory forfeiture through nonuse under RCW 90.14.140. The City has not filed for voluntary abandonment of the right and has not demonstrated such intent. It has included Certificate GWC 92-D in recurring updates of its Water System Plan that have been reviewed by DOH and Ecology and approved by DOH, and Plan updates have included an express reservation of the right for future use, stating that although the wells were no longer in service, "these rights are not subject to relinquishment for non-use and can be put to beneficial use within the City's service area through a replacement well." (The City's most recent Water System Plan (February, 2013) includes a project (WS-1) to redevelop the decommissioned wells). The City has also included the subject right in its water right self-assessments submitted to and approved by DOH and reviewed by Ecology as part of its review of water system plan updates.

Based on the information provided by the City and upon Ecology's review, it is tentatively determined that the subject water right is in good standing and is eligible for change. This is a municipal water supply water right that is not subject to relinquishment. The full certificated instantaneous rate (90 gpm) has been perfected through beneficial use. The full annual quantity is not yet fully perfected. However, the City is a growing system, in good-standing, with a DOH green operating permit, and associated demand analyses have indicated the City can easily grow into their full annual allocation. Therefore, the full certificated annual quantity of 100 ac-ft/yr is eligible for change.

Same Source Considerations

Based on the conceptual model provided in Figure 6, the aquifer tapped by the point of withdrawal for the subject right (the Lake Snoqualmie unit) is understood to receive recharge from the overlying Snoqualmie River Aquifer, while discharging to deeper aquifer units and ultimately to the Snoqualmie River and/or Tokul Creek in downgradient areas. The requested point withdrawal is within the deeper aquifer system which shares these same points of recharge and discharge. Ecology therefore manages the various unconsolidated aquifer units in the subject area as a single groundwater system that comprises a single source.

CONCLUSIONS

Tentative determination and Potential for Enlargement

Groundwater Certificate GWC 92-D is in good standing with Ecology and is therefore eligible for change. In accordance with RCW 90.14.140(2)(d), rights for municipal supply purposes are not subject to relinquishment.

No potential for enlargement of the existing water right exists, provided the City does not withdraw more than a total of 90 gpm and 100 ac-ft/yr under this water right at the existing and proposed points of withdrawal.

Potential for Impairment of Existing Rights

The change requested will not impair existing rights.

Potential for Detriment to the Public Interest

The change requested will not be detrimental to the public interest.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend this request for change be approved in the amounts and within the limitations listed below and subject to the provisions listed above.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial:

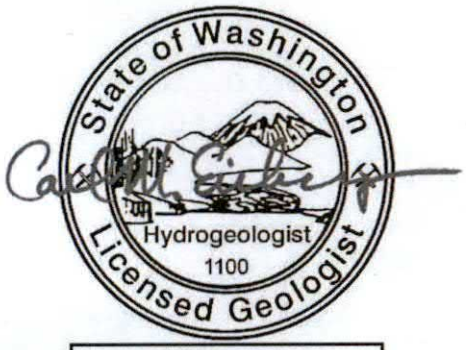
Q_i = 90 gpm
Q_a = 100 acre-feet per year
For Municipal Use

Points of Withdrawal

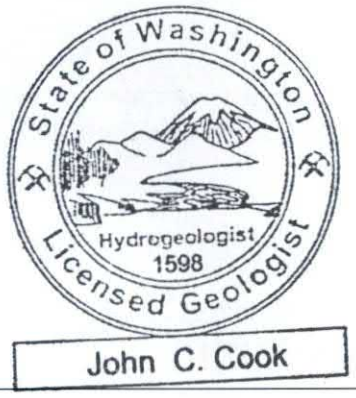
See Figure 1, representing the North Wellfield. The North Wellfield is located within the NE¼ SE¼, Section 19, Township 24N, Range 8E and within SE¼ SE¼ Section 19, Township 24N, Range 8E.

Place of Use

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.



Carl Einberger, LG, LHG, License #1100 *Date*



Jay Cook, LG, LHG, License #1598 *Date* 12/19/2018

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Selected References

Associated Earth Sciences, Inc. (AESI), 1994. Hydrogeologic Evaluation. Groundwater Application G1-25449, Snoqualmie Ridge North Valley Wellfield. Prepared for Weyerhaeuser Real Estate Company. October 1994.

Associated Earth Sciences, Inc. (AESI), 1995. MODFLOW Evaluation, Ground Water Application No. G1-27589, South Wellfield, Upper Snoqualmie Basin, Snoqualmie, WA.

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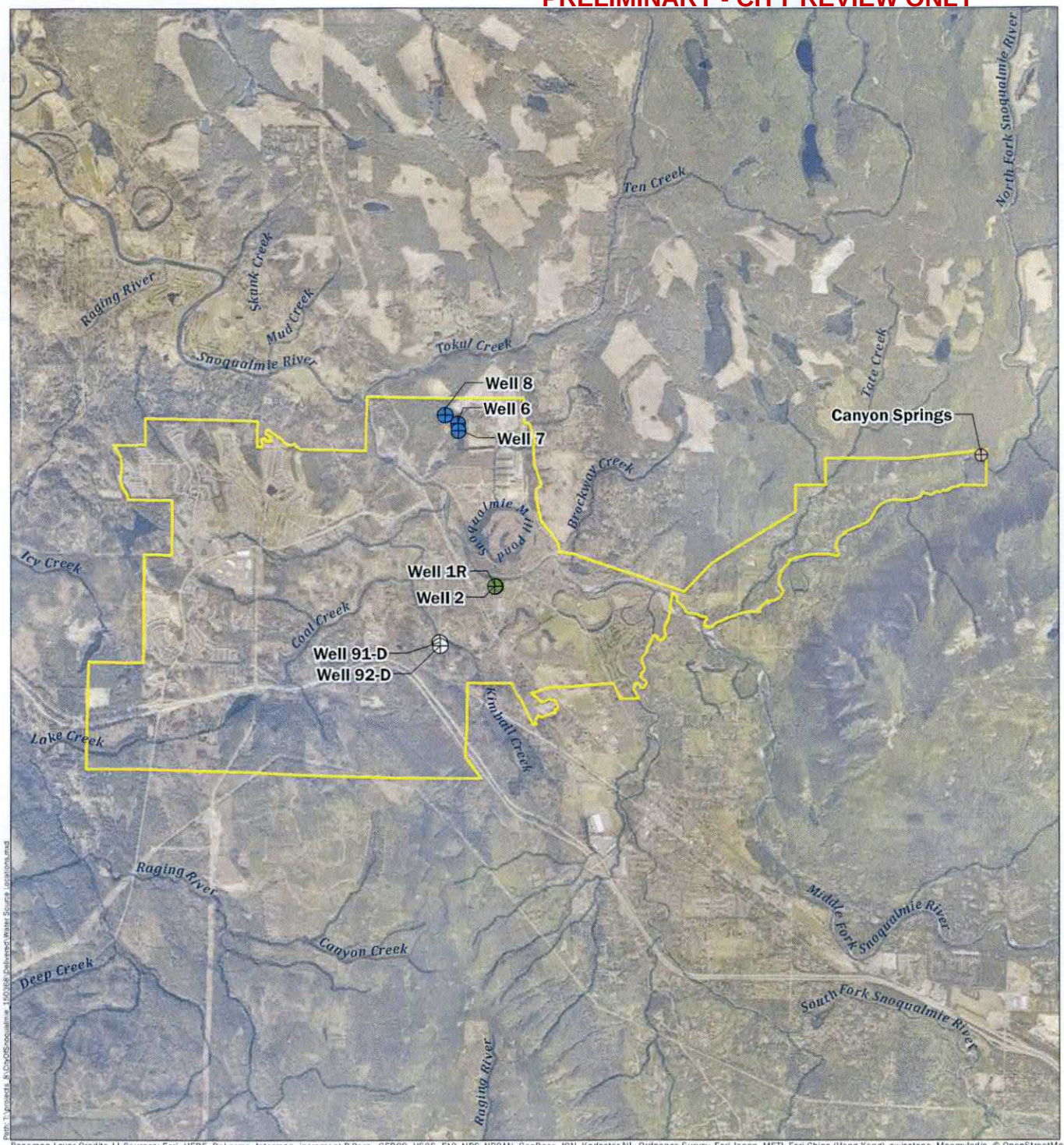
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PRELIMINARY - CITY REVIEW ONLY





- North Wellfield
- South Wellfield
- Decommissioned Well
- Canyon Springs
- City of Snoqualmie Water Service Area

N

0 7,000 14,000

Feet

Basemap Layer Credits || Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Pictometry International Corp. 2015

Path: T:\projects & Chp\05\Snoqualmie_150368\Delivered Water Source locations.mxd

Water Source Locations

City of Snoqualmie
Snoqualmie, Washington

Aspect CONSULTING	AUG-2017	FIGURE NO.
	ASPECT PROJECT NO. 150368 / FIGURE BY: ACA / RAP	1

PRELIMINARY - CITY REVIEW ONLY

PUBLIC WORKS

STATE OF WASHINGTON, COUNTY OF KING }
AFFIDAVIT OF PUBLICATION

ORIGINAL

RECEIVED
JUN 20 2017
C.O.S. - AP

* Please code and return for payment.
Thank you,
Sue

PUBLIC NOTICE

Linda M Mills, being first duly sworn on oath that she is the Legal Advertising Representative of the

Snoqualmie Valley Record

a weekly newspaper, which newspaper is a legal newspaper of general circulation and is now and has been for more than six months prior to the date of publication hereinafter referred to, published in the English language continuously as a weekly newspaper in King County, Washington. The Snoqualmie Valley Record has been approved as a Legal Newspaper by order of the Superior Court of the State of Washington for King County.

The notice in the exact form annexed was published in regular issues of the Snoqualmie Valley Record (and not in supplement form) which was regularly distributed to its subscribers during the below stated period. The annexed notice, a:

Public Notice

was published on May 31, 2017 and June 7, 2017.

The full amount of the fee charged for said foregoing publication is the sum of $265.88.

RECEIVED
JUL 20 2017
DEPT OF ECOLOGY
NWRO - WR

Linda Mills
Legal Advertising Representative, Snoqualmie Valley Record
Subscribed and sworn to me this 7th day of June, 2017.

Gale Gwin, Notary Public for the State of Washington, Residing in Covington, Washington

GALE GWIN
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
08-13-2019

PUBLIC NOTICE #1883157
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
NOTICE OF APPLICATION TO CHANGE EXISTING WATER RIGHTS

TAKE NOTICE: That the CITY OF SNOQUALMIE, Washington, filed applications of change CG1-*00059S, CG1-*00060S, and CG1-20316C@1 for three ground water certificates on December 21, 2016. The applications request to change the allowable points of withdrawal. The proposed changes are to:

1. Ground Water Certificate G1-*00059SWRIS (91-D) for 90 gallons per minute (gpm) and 100 acre-feet per year (afy) for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E, W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
2. Ground Water Certificate G1-*00060SWRIS (92-D) for 90 gpm and 100 afy for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
3. Ground Water Certificate G1-20316C for 600 gpm and 500 afy for municipal supply. The existing points of withdrawal are within the NE¼ NW¼ of Section 32, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.

The request is to change the points of withdrawal for Certificates G1-*00059SWRIS and G1-*00060SWRIS and to add points of withdrawal for Certificate G1-20316C. The proposed new points of withdrawal for the three certificates are all within NE¼ SE¼ of Section 19, T24N, R8E,W.M., the SE¼ SE¼ of Section 19, T24N, R8E,W.M., and the NE¼ NW¼ of Section 32, T24N, R8E,W.M, King County, Washington.

No increase will be made to the instantaneous withdrawal rates or annual quantities, and no change to the place of use is requested.

Protests or objections to approval of this application must include a detailed statement of the basis for objections: protests must be accompanied with a fifty-dollar ($50.00) NON-REFUNDABLE recording fee (PLEASE REMIT CHECK OR MONEY ORDER ONLY) and filed with the Department of Ecology at the address shown below, within thirty (30) days from June 7, 2017.

DEPARTMENT OF ECOLOGY CASHIERING
OFFICE - NWRO-WR
PO BOX 47611
OLYMPIA WA 98504-7611

Published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017.

offid OE
D32

ACCOUNT NO. 417.13.423.594.34.41.070 AMT.

APPROVAL DATE 7/12/17

PRELIMINARY - CITY REVIEW ONLY

RECEIVED
For Ecology Use
(Date Stamp)
DEC 21 2016
DEPT OF ECOLOGY
NWRO - WR

DEPARTMENT OF ECOLOGY
State of Washington

WATER RESOURCES
Application for Change/Transfer of a Water Right

You must include a $50.00 minimum filing fee with this application for: (Check all that apply.)	
☐ Change purpose(s) of use	
☐ Add purpose(s) of use	
☐ Change/transfer place of use	
☒ Change point(s) of diversion/withdrawal	
☐ Add point(s) of diversion/withdrawal	
☐ Other (i.e. consolidation, intertie, trust water)	
Explain:	

No filing fee is required for applications for:

- ☐ Drought
- ☒ Cost Reimbursement
- ☐ Water Conservancy Board

FOR OFFICIAL USE ONLY			
DATE APPLICATION RECEIVED	12/21/16		
CHECK NO.	NA	FEE $	
DATE ACCEPTED		BY	
CHANGE NO.			
COUNTY	King,	WRIA	7
SPECIAL AREA			
SEPA: ☐ EXEMPT ☐ NOT EXEMPT			
ECY CODING: 001-002-WR10285-000011			
APP NO.		PERMIT NO.	
CERT NO.		CERT OF CHG NO.	
CG1-000605			

☒ **I have completed a pre-application consultation with Ecology.**

1. Applicant Information

APPLICANT/BUSINESS NAME	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS: PO Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

CONTACT (IF DIFFERENT FROM ABOVE)	PHONE NO.	FAX NO.
Nancy Davidson	425-831-4919	
ADDRESS: PO Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

LEGAL LAND OWNER or PART OWNER OF PROPOSED PLACE OF USE	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS: P.O. Box 987		
CITY: Snoqualmie	STATE: WA	ZIP CODE: 98065
EMAIL ADDRESS (IF AVAILABLE): ndavidson@ci.snoqualmie.wa.us		

2. Water Right Information

WATER RIGHT OR CLAIM NUMBER	RECORDED NAME(S)
92-D (G1-*00060SWRIS)	Town of Snoqualmie

DO YOU OWN THE RIGHT TO BE CHANGED? ☒ YES ☐ NO

IF NO, PROVIDE OWNER(S) NAME and ADDRESS: _____

HAS THE WATER BEEN USED AS AUTHORIZED IN THE LAST FIVE (5) YEARS? ☐ YES ☒ NO

- Attach copies of any documentation that shows the historical use of water that has occurred since the right was established.
- If you have a water system plan or conservation plan, please include a copy with your application.

3. Point(s) of Diversion/Withdrawal:

A. Existing

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
Well		SW	SE	31	24N	8E	3124089041	Not Available

B. Proposed (if different from 3.A.)

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
North Wellfield	6	NE	SE	19	24N	8E	1924089016	AFJ-079
North Wellfield	7	SE	SE	19	24N	8E	1924089016	AFJ-080
North Wellfield	8	NE	SE	19	24N	8E	1924089016	AFJ-250
South Wellfield	1R	NE	NW	32	24N	8E	3224089060	APM-025
South Wellfield	2	NE	NW	32	24N	8E	3224089060	AKC-585

C. DO YOU OWN THE EXISTING AND PROPOSED POINT(S) OF DIVERSION/WITHDRAWAL?

EXISTING: ☒ YES ☐ NO PROPOSED: ☒ YES ☐ NO – IF NO, PROVIDE OWNER NAME(S): _____

- Include copies of all associated water well reports.
- If you know the distances from the nearest section corner to the above point(s) of diversion/withdrawal, please include that information in Item No. 6 (remarks) or as an attachment.

4. Purpose of Use:

A. Existing

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
Municipal	90 gpm	100	Continuous

B. Proposed (if different from 4.A.)

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
No Change Proposed			

5. Place of Use:

A. Existing

LEGAL DESCRIPTION OF LANDS WHERE WATER IS PRESENTLY USED:							
The place of use of the water right is the service area described in the most recent City of Snoqualmie Water System Plan prepared by Gray & Osborne, Inc., February 2013, approved July 18, 2012.							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE EXISTING PLACE OF USE? ☐ YES ☒ NO

IF NO, PROVIDE OWNER NAME(S): The lands in the existing place of use are owned by various public and private property owners within the City of Snoqualmie water service area as shown in the City's adopted Water System Plan.

B. Proposed (if different than 5.A.)

LEGAL DESCRIPTION OF LANDS WHERE NEW USE IS PROPOSED:							
No Change Proposed							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE PROPOSED PLACE OF USE? ☐ YES ☐ NO

IF NO, PROVIDE OWNER NAME(S):

- Attach a detailed map of your proposed change/transfer. The map should show existing and proposed point(s) of diversion/withdrawal, place of use and any other features involved with this application.
- If platted property, please include a certified copy of the plat map.

D. Are there any additional water rights or claims related to the same property as the one proposed for change/transfer?

☒ YES ☐ NO – IF YES, PROVIDE THE WATER RIGHT/CLAIM NUMBER(S): 4553 (S1-*06205CWRIS), G1-20316C, 91-D (G1-*00059SWRIS), G1-25449P

6. Remarks and Other Relevant Information:

A copy of the most recent Water System Plan has been submitted with this application.
Additional information on use of this water right will be submitted separately to support cost-reimbursement processing.

IF FOR SEASONAL OR TEMPORARY, START DATE ___/___/____ END DATE ___/___/____

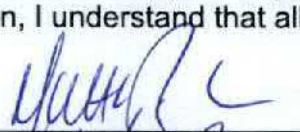
Certain applications may incur a Real Estate Excise Tax liability for the seller of the water rights. The Department of Revenue has requested notification of potential taxable water right related actions and therefore may be provided with a copy of this request. For further information, contact:

Department of Revenue
Real Estate Excise Tax
PO Box 47477
Olympia, WA 98504-7477

Phone (360) 570-3265

7. Signatures:

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I hereby grant staff from the Department of Ecology or the County Conservancy Board access to the above site(s) for inspection and monitoring purposes. If assisted in preparing this above application, I understand that all responsibility for the accuracy of the information rests with me.

Matthew R. Larson, Mayor **Applicant Printed Name – Title**	 **Applicant Signature**	12/19/2016 **(Date: MM/DD/YYYY)**
Matthew R. Larson, Mayor **Water Right Holder Printed Name**	 **Water Right Holder Signature**	**(Date: MM/DD/YYYY)**
Land Owner of Existing Place of Use Printed Name	**Land Owner of Existing Place of Use Signature**	**(Date: MM/DD/YYYY)**
Land Owner of Proposed Place of Use Printed Name	**Land Owner of Proposed Place of Use Signature**	**(Date: MM/DD/YYYY)**

***Submit your application to:** DEPARTMENT OF ECOLOGY CASHIERING SECTION PO BOX 47611 OLYMPIA, WA 98504-7611	☐ Central Regional Office 1250 W. Alder Street Union Gap, WA 98903-0009 (509) 575-2490	☐ Eastern Regional Office 4601 N. Monroe Street Spokane, WA 99205-1265 (509) 329-3400
	☒ Northwest Regional Office 3190 – 160th Avenue SE Bellevue, WA 98008-5452 (425) 649-7000	☐ Southwest Regional Office PO Box 47775 Olympia, WA 98504-7775 (360) 407-6300

PRELIMINARY - CITY REVIEW ONLY

S. F. No. 7362—6-45—1M. 9327.

CERTIFICATE RECORD NO. 1 PAGE NO. 92-D UNDER DECLARATION OF CLAIM NO. 60

STATE OF WASHINGTON, COUNTY OF King

Certificate of Ground Water Right

Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and the rules and regulations of the State Supervisor of Hydraulics thereunder.

THIS IS TO CERTIFY *That* TOWN OF SNOQUALMIE

of Snoqualmie, Washington *has filed*

in the office of the State Supervisor of Hydraulics of Washington Declaration of Claim No. 60

to withdraw ground waters of the State from a pump well,

located within the SW¼ of SE¼ of Sec. 31, Twp. 24 N., Rge. 8 E.W.M.

for the purpose of municipal domestic supply.

The right to the use of said ground waters has been sustained and approved by the Supervisor of Hydraulics in accordance with Chapter 263, Laws of Washington for 1945, and is hereby entered of record in Volume 1 *of Ground Water Certificates at page* 92-D*; the right approved has a priority of* the year 1940*; the amount of water which the Declarant is entitled to withdraw for the aforesaid purpose is limited to the amount actually beneficially used and shall not exceed* 90 *gallons per minute;* 100 *acre-feet per year; and is appurtenant to the following described lands or place of use:*

The Town of Snoqualmie and the adjacent community, King County, Washington.

The right to the use of the ground water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 11th *day of* May, *19* 46

RODNEY RYKER
State Supervisor of Hydraulics.

By: CHAS. J. BARTHOLET, Deputy

REPORT OF FINDINGS ON GROUND WATER

PRELIMINARY - CITY REVIEW ONLY

NAME TOWN OF SNOQUALMIE Declaration #60

Date of Examination February 20, 1946

Location: SW¼ of SE¼ of Sec. 31, Twp. 24 N., Rge. 8 E.W.M.

Quantity applied for 90 g.p.m. 146 acre-feet per year

Use: Municipal supply.

Irrigable acreage: Present _____ Planned _____ Feasible _____

Municipal: Population 1000 as of 1945

Industrial: _____

Type of Works: Well x Infiltration trench _____ Tunnel _____

Dimensions: 4 inches by 130 feet.

Progress of Works: Completed 1940.

Time Pump Will Be Operated: Daily

Other Water Rights of Applicant: Declaration #59

Proximity to existing works, springs or streams: Well #1 125 feet north.

Estimated effect of withdrawal of water on existing water rights:

None

Water Bearing Zone: Sand from 85 to 130 feet.

RECOMMENDATIONS

Approved for: 90 g.p.m. 100 acre feet per year, subject to existing water rights.

Declarations #59 and #60 are approved for 100 acre-feet per year each. This water supplements the surface gravity system. If the amount were used daily it would amount to 160,000 gallons per day, which is deemed sufficient as a supplement.

Signed this 16th Day of April, 1946.

Fred B Roberts

FRED B. ROBERTS,
Ground Water Geologist
Division of Hydraulics

$2.00 recording fee should accompany each declaration.

PRELIMINARY - CITY REVIEW ONLY

S. F. No. 7349—6-45—1M. 9180.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
Division of Hydraulics

RECEIVED DEC 19 1945

Declaration of Ground Water Claim

(Separate claims should be filed for each well, tunnel or infiltration trench)

No. 2 60

I, TOWN of SNOQUALMIE
(Name of claimant)

of SNOQUALMIE WASHINGTON
(Complete postoffice address)

do hereby make declaration of claim of vested right to ground water by use prior to June 7, 1945, and file the same with the State Supervisor of Hydraulics, in accordance with Section 9, Chapter 263, Laws of 1945 of the State of Washington, and request a Certificate of Ground Water Right thereunder.

1. SOURCE *from which water is withdrawn is* PUMP WELL
(Flowing well, pump well, infiltration trench, or tunnel)

2. LOCATION *is:* One-half mile south of Snoqualmie ;
(Approximate distance and direction from nearest city or town)

and is more particularly described as follows:

(a) 294 ft Swly of the NE corner of the SW¼ of the SE¼ of Sec.31
(Give distance and bearing to corner of section or other legal subdivision)

being within SW¼ of SE¼ *of Sec.* 31 , *Twp.* 24 *N., Rge.* 8 E WM
(Smallest legal subdivision) (E. or W.)

or (b) Within limits of incorporated city or town of ,

in Lot , *Block* *of*
(Name of addition or plat)

County of KING *within* *area*
(Leave blank)

(Leave blank) *sub-area* (Leave blank) *zone*

(c) The location of the well or other works is shown on the accompanying plat, or other adequate maps or drawings.

(d) The owner of property on which the works are constructed is:

TOWN of SNOQUALMIE (Name) SNOQUALMIE WASHINGTON (Post office address)

3. CONSTRUCTION WORK *was begun on* 1940 (Date) ; *was completed on* 1940 (Date)

and the ground water claimed was first used for the purposes set out below on 1940 (Date) ,

since which time the water has been used Continuously
(Continuously or intermittently)

from 1940 (Date) *to* 1945 (Date)

4. QUANTITY *of water claimed and used is* 90 *gallons per minute;* 146 *acre feet per year.*

100

5. PURPOSE OR PURPOSES *for which water is used* Municipal Domestic Supply
(Domestic, irrigation, municipal, manufacturing, industrial, etc.)

PRELIMINARY - CITY REVIEW ONLY

5. *(Continued)*

(a) FOR MUNICIPAL SUPPLY: *To supply the city, town or community of* SNOQUALMIE *in the county of* KING*, having a present population of* 1,000*, and an estimated population of* 1,000 *in 19*45

(b) FOR IRRIGATION: *The land irrigated has a total area of* ..... *acres, and water is used each year for this purpose from* ..... (Date) *to* ..... (Date)

(c) Legal description of property on which water is used for all purposes other than municipal supply:

Water from these wells is used for domestic purposes in the Town of Snoqualmie, and the adjacent community.

6. DESCRIPTION OF WORKS:

(a) WELL: *Depth* 130 *feet. Diameter* 4 *inches or feet. Dug or drilled* drilled *Flowing or pump well* pump

IF PUMP WELL: *Type and size of pump is* ~~Pomaen~~ Pomona Cnetrifugal

Type and size of motor or engine is 15 H.P.

Depth from ground surface to water level before pumping 85 *feet.*

After continuous operation for at least four hours, the measured discharge of pump is 90 *g.p.m., and the drawdown of water level is* 130 *feet.*

Date of test 1940

IF FLOWING WELL: *Measured discharge* ..... *g.p.m. on* ..... (Date)

Shut-in pressure at ground surface ..... *lbs. per sq. in. on* ..... (Date)

Water is controlled by ..... (Cap, valve, etc.)

CASING: *(Give diameter, commercial specifications and depth below ground surface of each casing size.)*

4 *inch diameter* ..... *from* pump *to* 85 *feet*

4 *inch diameter* Perforated casing *from* 85 *to* 130 *feet*

..... *inch diameter* ..... *from* ..... *to* ..... *feet*

..... *inch diameter* ..... *from* ..... *to* ..... *feet*

Describe and show depth of shoe, plug, adapter, liner or other details:

PRELIMINARY - CITY REVIEW ONLY

PERFORATED CASINGS OR SCREENS:

..... from ..... to .....
(Number per foot and size of perforations, or describe screen)

..... from ..... to .....

..... from ..... to .....

..... from ..... to .....

LOG OF WELL: *(Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)*

MATERIAL	Thickness (Feet)	Depth to Bottom (Feet)
Brown Clay	35	
Grey semi-harpan, with boulders	50	
Hard silty sand, water bearing	45	
Hardpan	30	

(b) INFILTRATION TRENCH: *Covered or open* None

Dimensions: Length ..... *ft. Minimum depth* ..... *ft. Maximum depth* ..... *ft.*

Bottom width ..... *ft. Discharge* ..... *g.p.m. Date of test* .....

(c) TUNNEL: *Type of lining* None

Dimensions: .....
(Length, course, and cross-sectional size)

Position of water bearing stratum with reference to portal of tunnel .....

Log of tunnel: (Preceding table for log of well may be used, if desired. Give footage from portal and character of materials, as pertinent.)

PRELIMINARY - CITY REVIEW ONLY

7. *Ownership of each existing well or other works for withdrawal of ground water within a radius of one-quarter mile and the distance and direction from well or other works being reported herein:*

(Name of owner)	(Direction)	(Distance)
There are no other wells anywhere around, except Well #1, which also belongs to the Town of Snoqualmie, and is approximately 125 feet distant.		

(On accompanying plat or map show location of these existing wells or works.)

8. *Remarks:*

Amy L. English
(Signature of claimant)
Clerk of Town of Snoqualmie

STATE OF WASHINGTON,
COUNTY OF KING } ss.

I, the claimant named in the foregoing claim, being first duly sworn, depose and say that I have read the above and foregoing claim to ground water right; that I know the contents thereof; and that to the best of my knowledge, information and belief, the facts therein stated are true and correct.

Subscribed and sworn to before me this ..... day of ....., 19....

Notary Public in and for the State of Washington,

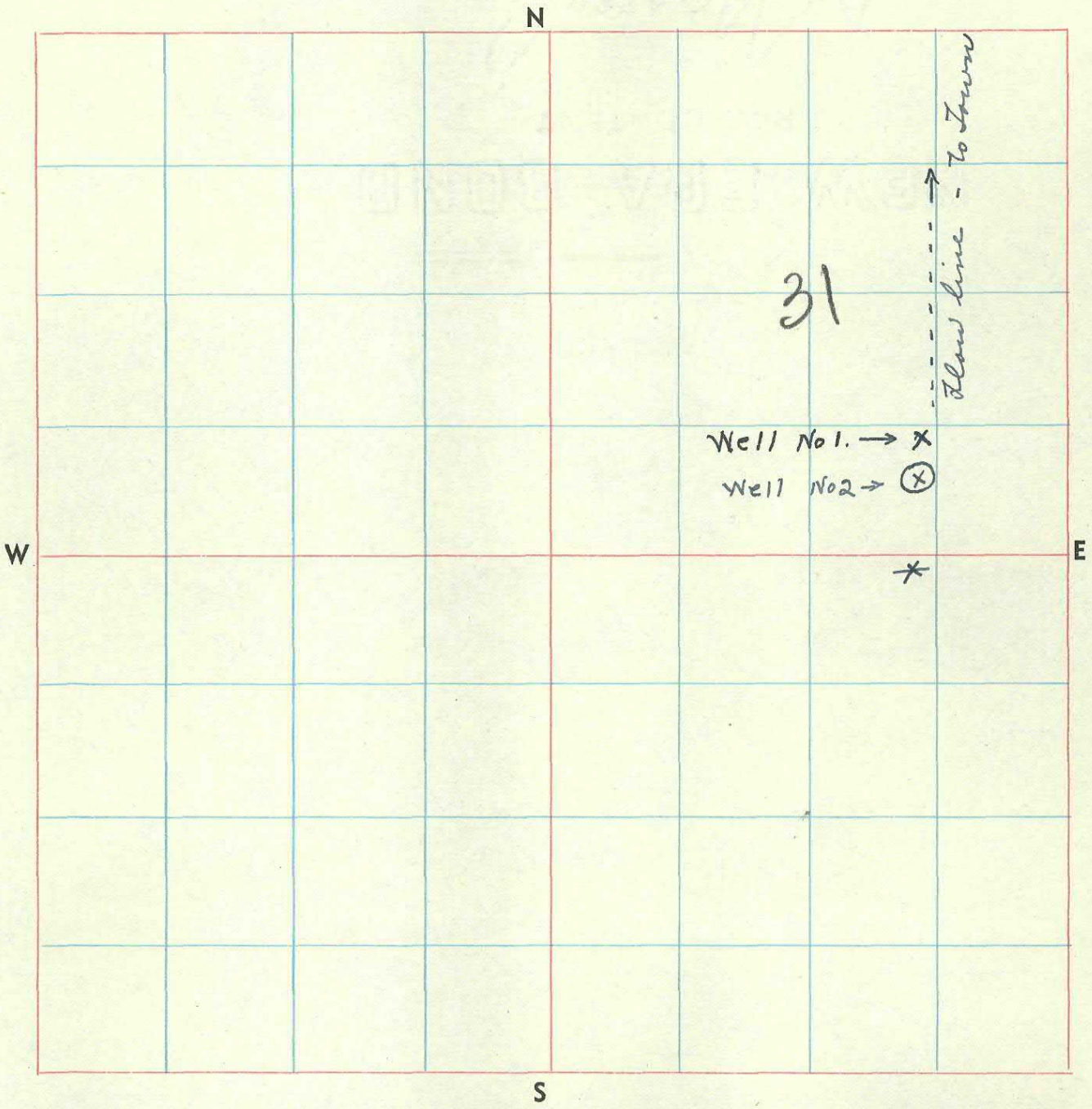
Residing at .....

S. F. No. 1854-A—6-45—3M. 9183.

SECTION PLAT

PRELIMINARY - CITY REVIEW ONLY

Sec. 31 Twp. 24 N. R. 8 E. WM



Show by a cross (X) the location of the well or other works covered by the application or declaration. Show by circle (O) the locations of other wells or works within a quarter of a mile. Also traveling directions from nearest town on main highway.

Scale: 1 inch = 800 feet.

RECEIVED
DEC 13 1945
DIVISION OF
HYDRAULICS

PRELIMINARY - CITY REVIEW ONLY

GROUND WATER

DECLARATION OF CLAIM

PROGRESS SHEET

NAME: Town of Snoqualmie
Snoqualmie, Washington

DECLARATION NO. 60 CERTIFICATE NO. 92

Declaration received 12-13-45 Initial fee received 12-13-45

Returned for completion or correction _____ Received _____

Statement of add. fee sent _____ Amount $ _____ Received _____

Same - Approval 1-7-46

Amended _____

Cancelled _____

O.K'd for publication Dec 19 by [illegible] 6 WSPS

Notice of declaration sent 12-19-45

Protests filed _____

Affidavit of Publication received and checked 4-15-46 (Feb. 28)

Time for making protests expires _____

Examination made 20 Feb '46 by JBR

O.K'd for Certificate _____ by _____

Statement of filing and recording fee sent 4-16-46 Amount $1.50

Fee received 5-10-46

Ground Water Certificate issued 5-11-46 No. D. 92

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PRELIMINARY - CITY REVIEW ONLY

Certificate G1-20316C

North and South Wellfield

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PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

DOCUMENT TITLE: SUPERSEDING CERTIFICATE

REFERENCE NUMBER:

GRANTOR
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
ECOLOGY NORTHWEST REGIONAL OFFICE (ECY NWRO)
3190 - 160TH AVE SE
BELLEVUE, WASHINGTON 98008-5452
(425) 649-7000

GRANTEE
CITY OF SNOQUALMIE
PO BOX 987
SNOQUALMIE, WA 98065

LEGAL DESCRIPTION

Source Name	Parcel	Township	Range	Sec	QQ Q
Well 1R	3224089060	24N	8E	32	NE NW
Well 2	3224089060	24N	8E	32	NE NW
Well 6	1924089016	24N	8E	19	NE SE
Well 7	1924089016	24N	8E	19	SE SE
Well 8	1924089016	24N	8E	19	NE SE

AUTHORIZED PLACE OF USE
The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

PARCELS:

ADDITIONAL LEGAL IS ON PAGE 2 OF ATTACHED DOCUMENT

PRELIMINARY - CITY REVIEW ONLY

File NR CG1-20316C@1
WR Doc ID 6799862

State of Washington
Department of Ecology

SUPERSEDING CERTIFICATE OF WATER RIGHT

DEPARTMENT OF ECOLOGY
State of Washington

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
October 13, 1973	G1-20316A	G1-20316P	G1-20316C

MAILING ADDRESS
City of Snoqualmie
PO Box 987
Snoqualmie, WA 98065

SITE ADDRESS (IF DIFFERENT)
Tokul Rd. SE (North Wellfield) and
Schusman Ave SE (South Wellfield)
Snoqualmie, WA 98065

Legal Description Continues on Page 2

Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AF/YR)
600	GPM	500

GPM = gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate is additive, and the annual quantity (500 ac-ft/yr) is non-additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

PURPOSE	WITHDRAWAL RATE ADDITIVE	WITHDRAWAL RATE NON-ADDITIVE	WITHDRAWAL RATE UNITS	ANNUAL QUANTITY (AF/YR) ADDITIVE	ANNUAL QUANTITY (AF/YR) NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	600		GPM		500	01/01 - 12/31

IRRIGATED ACRES ADDITIVE	IRRIGATED ACRES NON-ADDITIVE	PUBLIC WATER SYSTEM INFORMATION WATER SYSTEM ID	PUBLIC WATER SYSTEM INFORMATION CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Groundwater		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWP	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NE SE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SE SE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.828

Datum: NAD83/WGS84

Place of Use

PARCELS (NOT LISTED FOR SERVICE AREAS)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Measurement of Water Use

How often must water use be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

PRELIMINARY - CITY REVIEW ONLY

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps – either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160-291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements

Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way

Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency

Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections

Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Given under my hand and the seal of this office at Bellevue, Washington, this 2 *day of* January, *2020.*

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

Polly Zehm, Acting Director
Department of Ecology

DATA REVIEW
OK

Ria Berns, Section Manager
Northwest Regional Office
Water Resources Program

To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341

DEPARTMENT OF ECOLOGY
State of Washington

WR File NR CG1-20316C@1
WR Doc ID 6799862

STATE OF WASHINGTON
FINAL
REPORT OF EXAMINATION
FOR WATER RIGHT CHANGE

Changed/added points of withdrawal

PRIORITY DATE	WATER RIGHT NUMBER
October 13, 1972	G1-20316C (Application No. CG1-20316C@1)

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
City of Snoqualmie PO Box 987 Snoqualmie, WA 98065	Tokul Rd. SE (North Wellfield) and Schusman Ave SE (South Wellfield) Snoqualmie, WA 98065

Total Quantity Authorized for Withdrawal

WITHDRAWAL RATE	UNITS	ANNUAL QUANTITY (AC-FT/YR)
600	GPM	500

GPM = gallons per minute; AC-FT/YR = acre-feet per year

The withdrawal rate is additive, and the annual quantity (500 ac-ft/yr) is non-additive to all other rights held by the City of Snoqualmie.

The total annual quantity (Qa) available under all three rights involved in the City's package of change requests: CG1-20316C@1 (G1-20316C), CG1-*00059S (GWC 91-D), and CG1-*00060S (GWC 92-D) shall not exceed 700 ac-ft/yr or a maximum withdrawal rate (Qi) of 780 gpm. Total withdrawal under all groundwater rights, including G1-25449P (North Wellfield), shall not exceed 1,424 ac-ft/yr, with a maximum withdrawal rate of 2,430 gpm. These amounts may be withdrawn in full from the North Wellfield. Maximum withdrawals from the South Wellfield remain at the previously authorized amounts of 500 ac-ft/yr and 600 gpm.

Total production under all rights held by the City of Snoqualmie shall not exceed 3,328 gpm and 2,372 ac-ft/yr.

Purpose

	WITHDRAWAL RATE			ANNUAL QUANTITY (AC-FT/YR)		
PURPOSE	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	PERIOD OF USE (mm/dd)
Municipal	600		GPM		500	01/01-12/31

IRRIGATED ACRES		PUBLIC WATER SYSTEM INFORMATION	
ADDITIVE	NON-ADDITIVE	WATER SYSTEM ID	CONNECTIONS
		81080 C	

Source Location

COUNTY	WATERBODY	TRIBUTARY TO	WATER RESOURCE INVENTORY AREA
King	Groundwater		7 - Snohomish

SOURCE FACILITY/DEVICE	PARCEL	WELL TAG	TWN	RNG	SEC	QQ Q	LATITUDE	LONGITUDE
Well 1R	3224089060	APM025	24N	8E	32	NENW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NENW	47.5254	-121.8177
Well 6	1924089016	AFJ079	24N	8E	19	NESE	47.5471	-121.8255
Well 7	1924089016	AFJ080	24N	8E	19	SESE	47.5461	-121.8255
Well 8	1924089016	AFJ250	24N	8E	19	NESE	47.5482	-121.828

Datum: NAD83/WGS84

Place of Use (See Attached Map)

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

Proposed Works

The City of Snoqualmie (City) has proposed to consolidate the points of withdrawal for three existing groundwater rights to include all five wells within the City's North and South Wellfields (i.e., Well Nos. 6, 7, and 8, and Well Nos. 1R and 2, respectively). The City has submitted Change Application Nos. CG1-20316C@1, CG1*00059S and CG1-*00060S to the Washington Department of Ecology (Ecology) for concurrent processing of the three requests for consolidation.

The subject of this report is Change Application No. CG1-20316C@1, which requests to add the North Wellfield wells as additional points of withdrawal to water right Certificate No. G1-23016C, currently authorizing withdrawals only from the South Wellfield Wells. The remaining two applications included in the City's consolidation request are intended to change the points of withdrawal for Certificate Nos. GWC 91-D (file no. G1-*00059SWRIS) and GWC 92-D (file no. G1-*00060SWRIS) to all City wells at the North and South Wellfields. These two applications will be addressed in separate reports; however, this report also considers the cumulative withdrawals from City wells that would result from approval of all three applications for change.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Complete	Complete	Complete

Measurement of Water Use

How often must water use be measured?	Daily
How often must water use data be reported to Ecology?	Annually
What volume should be reported?	Total Annual Volume for each well
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm) for each well

Provisions

No Impairment of Existing Rights

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

Wells, Well Logs and Well Construction Standards

All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps -- either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

Measurements, Monitoring, Metering and Reporting

An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

Department of Health Requirements
Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

Easement and Right-of-Way
Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

Water Use Efficiency
Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

Schedule and Inspections
Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

Findings of Facts
Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated and that the subject Certificate No. G1-20316C is in good standing and is eligible for change. Furthermore, I find the change of water right as recommended is from the same body of public groundwater, and will not be detrimental to existing rights or the public interest.

Therefore, I ORDER the change to consolidate the multiple points of withdrawal requested in Change Application No. CG1-20316C, be approved, subject to existing rights and the provisions specified above.

Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person (see addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel RD SW Ste 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Please send a copy of your appeal to:

Ria Berns, Section Manager
Water Resources Program
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Signed at Bellevue, Washington, this 19 day of December 2018.

Ria Berns, Section Manager

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov. To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeReviser.

INVESTIGATOR'S REPORT
Water Right Control Number CG1-20316C@1
City of Snoqualmie
Investigator: Carl Einberger, Aspect Consulting
Reviewed by: Jay Cook

BACKGROUND

This report serves as the written findings of fact concerning Water Right Application Number CG1-20316C@1.

On December 21, 2016, the City of Snoqualmie (City) filed three Applications for Change with the Washington State Department of Ecology (Ecology) to consolidate withdrawal locations to include all City wells located at the North and South Wellfield sites (i.e., Well Nos. 6, 7, and 8 and Well Nos. 1R and 2, respectively). Details of the three applications are summarized in Table 1. Future use of the appropriations will continue to be for municipal supply, and no changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Table 1. Change Applications Filed by the City of Snoqualmie

Change Application	Existing Source	Water Right No.	Type	Priority Date
CG1-20316C@1	South Wellfield[1]	G1-20316C	Certificate	10/13/1972
CG1-*00059S	Decommissioned Well 1	91-D	Certificate	1/01/1930
CG1-*00060S	Decommissioned Well 2	92-D	Certificate	1/01/1940

[1]Well Nos. 1R and 2

The City's water system currently serves a residential population of approximately 12,850 people with approximately 7,900 allocated equivalent residential units (ERUs; Gray & Osborne, 2016). The City's water system consists of water withdrawal, conveyance, storage, and treatment facilities. The place of use is consistent with the City's water service area as described in the 2013 Water System Plan (Gray & Osborne, 2013) and future updates.

Figure 1 (attached) shows the location of the City's wells, including the North and South Wellfields and decommissioned Wells 1 and 2. Existing and requested water right attributes for the specific water right addressed by this Report of Examination (ROE) are as follows:

EXISTING Water Right Attributes

Water Right Owner:	**City of Snoqualmie**
Priority Date:	October 13, 1972
Place of Use	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan (Original certificate stated: Area served by Town of Snoqualmie)

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	600	GPM	500[1]	Year Round	

[1]Non-additive to existing rights

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
Well 2	3224089060	AKC585	24N	8E	32	NE NW	47.5254	-121.8177

WRIA = Water Resource Inventory Area; Twp = Township; Rng = Range; Sec. = Section; QQ Q = Quarter-quarter of a section; Datum: NAD83/WGS84

REQUESTED Water Right Attributes

Applicant Name:	**City of Snoqualmie**
Date of Application:	December 21, 2016
Place of Use:	City of Snoqualmie approved water service area consistent with the most recently approved Water System Plan

County	Waterbody	Tributary To	WRIA
King	Groundwater		**7 - Snohomish**

Purpose	Rate	Unit	Ac-ft/yr	Begin Season	End Season
Municipal	600	GPM	500[1]	Year Round	

[1]Non-additive to existing rights

Source Name	Parcel	Well Tag	Twp	Rng	Sec	QQ Q	Latitude	Longitude
Well 1R	3224089060	APM025	24N	8E	32	NE NW	47.5254	-121.8175
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Well 8	1924089016	AFJ250	24N	8E	19	NE SE	47.5482	-121.8280

Datum: NAD83/WGS84

Cost Reimbursement

This application is being processed under Ecology's Cost Reimbursement Program according to the provisions of RCW 43.21A.690 and RCW 90.03.265. This report has been prepared by Aspect Consulting, LLC (Aspect) and reviewed by Ecology under contract to the applicant.

Legal Requirements for Requested Change

Public Notice

RCW 90.03.280 requires that notice of a water right application be published once a week, for two consecutive weeks, in a newspaper of general circulation in the county or counties where the water is to

be stored, diverted and used. Notice of this application was published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017. No protests were received during the 30-day statutory protest period.

Consultation with the Department of Fish and Wildlife

The Department must give notice to the Department of Fish and Wildlife (WDFW) of applications to divert, withdraw, or store water. Notice of the three change applications filed by the City was provided to WDFW on July 13, 2017. On July 18, 2017, Steve Boessow of WDFW responded in a letter to Ecology that stated:

> *Based on impacts to fish and/or wildlife and the habitat they rely on, and pursuant to Chapter 77.57.020 RCW, WDFW does not oppose the issuance of these applications. There are no changes to instantaneous or annual water quantities allowed under these proposed changes. Therefore, there are no new impacts to fish.*

State Environmental Policy Act (SEPA)

A water right application is subject to a SEPA threshold determination (i.e., an evaluation whether there are likely to be significant adverse environmental impacts) if any one of the following conditions are met:

- It is a surface water right application for more than 1 cubic foot per second, unless that project is for agricultural irrigation, in which case the threshold is increased to 50 cubic feet per second, so long as that irrigation project will not receive public subsidies;
- It is a groundwater right application for more than 2,250 gallons per minute;
- It is an application that, in combination with other water right applications for the same project, collectively exceed the amounts above;
- It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- It is part of a series of exempt actions that, together, trigger the need to do a threshold determination, as defined under WAC 197-11-305.

This project is categorically exempt from SEPA, because the three change applications associated with the project total less than 2,250 gallons per minute (gpm) in additive instantaneous quantity. The total instantaneous quantity associated with the combined change applications is 780 gpm.

Water Resources Statutes and Case Law

RCW 90.03.380(1) states that a water right that has been put to beneficial use may be changed. The point of diversion, place of use, and purpose of use may be changed if it would not result in harm or injury to other water rights. The Washington Supreme Court has held that Ecology, when processing an application for change to a water right, is required to make a tentative determination of extent and validity of the claim or right. This is necessary to establish whether the claim or right (or portion thereof) is eligible for change. *R.D. Merrill v. PCHB* and *Okanogan Wilderness League v. Town of Twisp.*

RCW 90.03.386(3) requires a municipal water supplier to apply cost-effective water conservation measures as part of its water system planning. The water supplier must also evaluate the effects of delaying the use of inchoate water rights before it may increase use of those inchoate rights. RCW 90.03.320 requires Ecology to consider the public water supplier's use of conserved water when establishing a surface or ground water right construction schedule. The City's conservation program is outlined in Chapter 5 of its current water system plan (Gray and Osborne, 2013).

RCW 90.03.386(2) states that a municipal water supplier may change its service area through the water system plan approval process. As long as the municipal water supplier is in compliance with the approved plan, the place of use for the water right is the service area of the plan.

RCW 90.44.100 allows Ecology to amend a ground water permit or certificate to: (1) allow the user to construct a replacement or additional well at a new location outside of the location of the original well, or to (2) change the manner or place of use of the water, if:

- The additional or replacement well taps the same body of public ground water as the original well. RCW 90.44.100(2)(a),
- Where a replacement well is approved, the user must discontinue use of the original well and properly decommission the original well. RCW 90.44.100(2)(b),
- Where an additional well is constructed, the user may continue to use the original well, but the combined total withdrawal from all wells shall not enlarge the right conveyed by the original permit or certificate. RCW 90.44.100(2)(c),
- Other existing rights shall not be impaired. RCW 90.44.100(2)(d).

When changing or adding points of withdrawal to groundwater rights (RCW 90.44.100), or when consolidating exempt wells with an existing permit or certificate (RCW 90.44.105), as stated above the wells must draw from the *same body of public groundwater*. Indicators that wells tap the *same body of public groundwater* include:

(a) Hydraulic connectivity.
(b) Common recharge (catchment) area.
(c) Common flow regime.
(d) Geologic materials that allow for storage and flow, with recognizable boundaries or effective barriers to flow.

INVESTIGATION

In consideration of this application, Aspect reviewed available documents pertaining to site conditions, existing well installations, and the potential effect of the proposed change on existing water right holders and established minimum instream flows. This review included information submitted by the applicant, including aquifer characterization (modeling) reports, well construction and testing reports, and pertinent Ecology records (e.g. well logs and water rights records). The review also included reports from multiple investigations characterizing the hydrogeology of the Snoqualmie basin.

A site visit was performed on July 18, 2017. Carl Einberger of Aspect met with City representatives to discuss the applications, visit existing well locations, and discuss the City's current water system operations.

Using the available information in the Ecology file record, existing reports, the site visit, and communications with the City, Aspect evaluated potential effects of the proposed consolidation of withdrawal locations for the three water rights involved in the package of change applications.

Existing Water Rights Held by the City

The City's existing water rights and changes currently requested are summarized in Table 2. The subject of this report is an application to change Water Right No. G1-20316C, however the three water right change requests are being concurrently reviewed by Ecology.

Table 2. City of Snoqualmie Water Rights (Shaded Rows Indicate Rights Requested for Change)

Water Right	Current Source	Requested Source	Priority Date	Qi gpm	Qa in ac-ft/yr	
					Additive	Non-Additive
G1-20316C	South Wellfield[1]	North & South Wellfields[1,2]	10/13/1972	600	--	500
G1-*00059SWRIS	Decommissioned Well 1		1/01/1930	90	100	--
G1*00060SWRIS	Decommissioned Well 2		1/01/1940	90	100	--
G1-25449P	North Wellfield[2]	No Change	5/30/1989	1,650	724	--
S1-*06205CWRIS	Canyon Springs	No Change	10/18/1944	898	1,448	--
			Total Groundwater	**2,430**	**924**	**500**
			Total Surface Water	**898**	**1,448**	**--**
			Total of all Water Rights	**3,328**	**2,372**	**500**

Shaded rows indicate change applications currently being processed.
[1]Includes Well Nos. 1R and 2.
[2]Includes Well Nos. 6, 7, and 8.

The City also submitted Application No. G1-27589 on March 16, 1995, requesting appropriation of 1,400 gpm and 2,302 ac-ft/yr (annual quantity indicated as approximate), with points of withdrawal at the South Wellfield. This application is active but is not being considered as part of the City's three change applications being processed.

History of Water Use

The City was officially established in May of 1903 with water supplies initially provided by springs and surface waters. Since that time, the City has taken numerous steps to expand its water supplies to meet growing demands and provide resiliency in water supply. Key historical events in the City's water supply history includes the following (summarized from Gray & Osborne, 2013; USCB, 2017; and Ecology water right files):

- In 1930 and 1940, the City established two groundwater wells near what is now the intersection of 384th Ave SE and SE 92nd St. Water right Certificate Nos. 00091 and 00092 (G1-*00059SWRIS and G1-*00060SWRIS, respectively) were issued in May of 1946 to authorize use of these wells to serve the City's population of approximately 800 residents at that time.

- In 1950, the Canyon Springs source was brought online with authorization to divert up to 898 gpm and 1,448 ac-ft/yr under water right Certificate No. 04553 (S1-*06205CWRIS).

- In 1968, the Puget Sound Power and Light Company connected to the City's distribution system and service was extended to the Snoqualmie Falls Lodge.

- In 1973, Well No. 1 was constructed at the Mount Si High School property (the current location of the South Wellfield) to provide emergency supply and additional source capacity during high demand periods; withdrawals from Well No. 1 and subsequent wells in the South Wellfield (i.e., Well Nos. 1R and 2) are authorized under Certificate No. G1-23016C, which is the subject of this report.

- According to a formal, signed Declaration of Gary Stevens, former Streets and Stormwater Supervisor for the City, Decommissioned Wells 1 and 2 were decommissioned in summer of

1981, given preferential use of the South Wellfield. Mr. Stevens noted the City intended to preserve the well locations for future use through potential re-drilling or transfer to other sources.

- In 1989, the City's water system was extended to provide service to Rattlesnake Ridge and the Snoqualmie Winery site. During the same year, Well Nos. 6 and 7 were installed by Weyerhaeuser Real Estate Company to support the Snoqualmie Ridge Phase I development (the City took ownership of the wells, water right and infrastructure in 1995). A water treatment plant (for iron, manganese, and arsenic), booster stations, and reservoirs were constructed to provide potable water service to the new development.

- In 1995, Well No. 2 was installed at the South Wellfield, and aquifer testing was completed to support Application No. G1-27589 for additional appropriations from the South Wellfield (this application is still pending with Ecology).

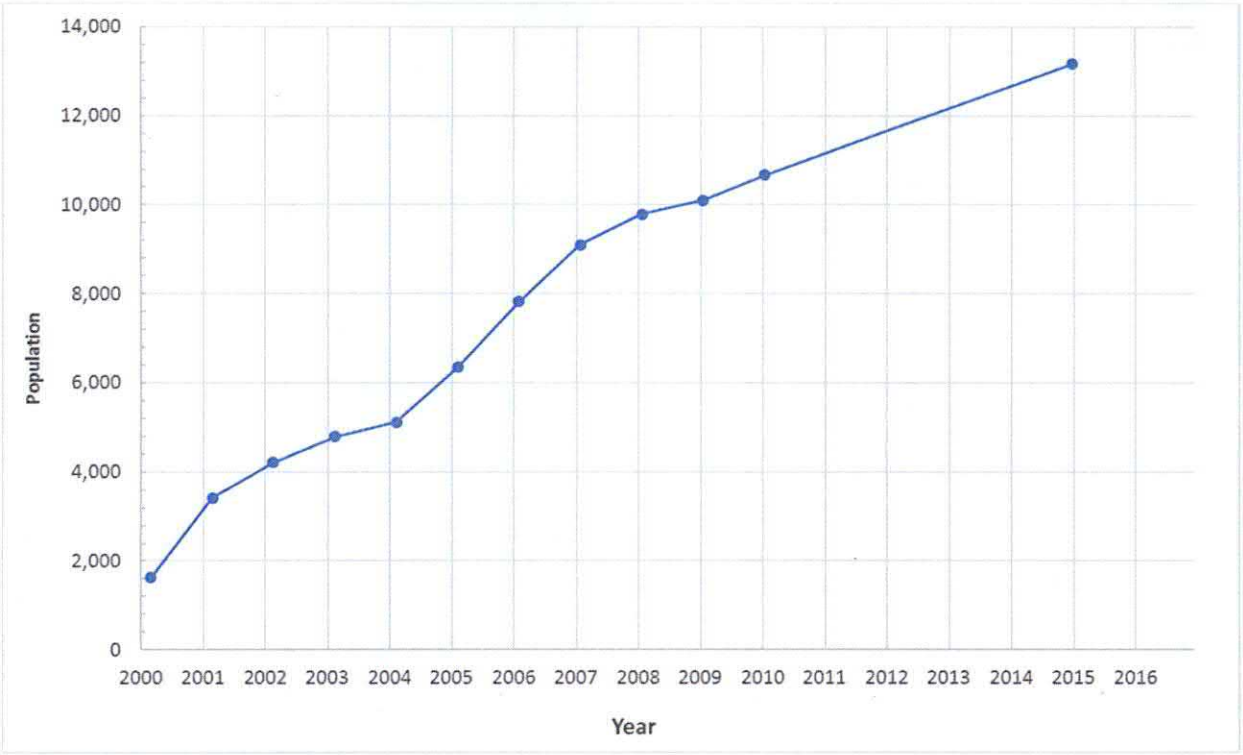
- Well No. 8 was installed at the North Wellfield in 2001 and additional reservoirs and booster stations were installed between 2004 and 2008 to supply the Snoqualmie Ridge Phase II development. Well No. 8 was the third of the three wells originally authorized by the North Wellfield water right.

- Well No. 1R was installed at the South Wellfield area in 2006 to replace Well No. 1 due to declining well yields (Well No. 1 was decommissioned). The well was installed adjacent to Well No. 2 and was added to the South Wellfield water right through a Showing of Compliance with RCW 90.44.100.

- Consistent with Mr. Stevens' declaration, the City's Water System Plans (1997, 2005 and 2013) have included the water rights evidenced by Certificate Nos. 00091-D and 00092-D (G1-*00059SWRIS and G1-*00060SWRIS, respectively). The 2005 and 2013 Water System Plans have also included an express reservation of the right for future use, stating that although the wells were no longer in service, "these rights are not subject to relinquishment for non-use and can be put to beneficial use within the City's service area through a replacement well." The 1997 Water System Plan contained similar language.

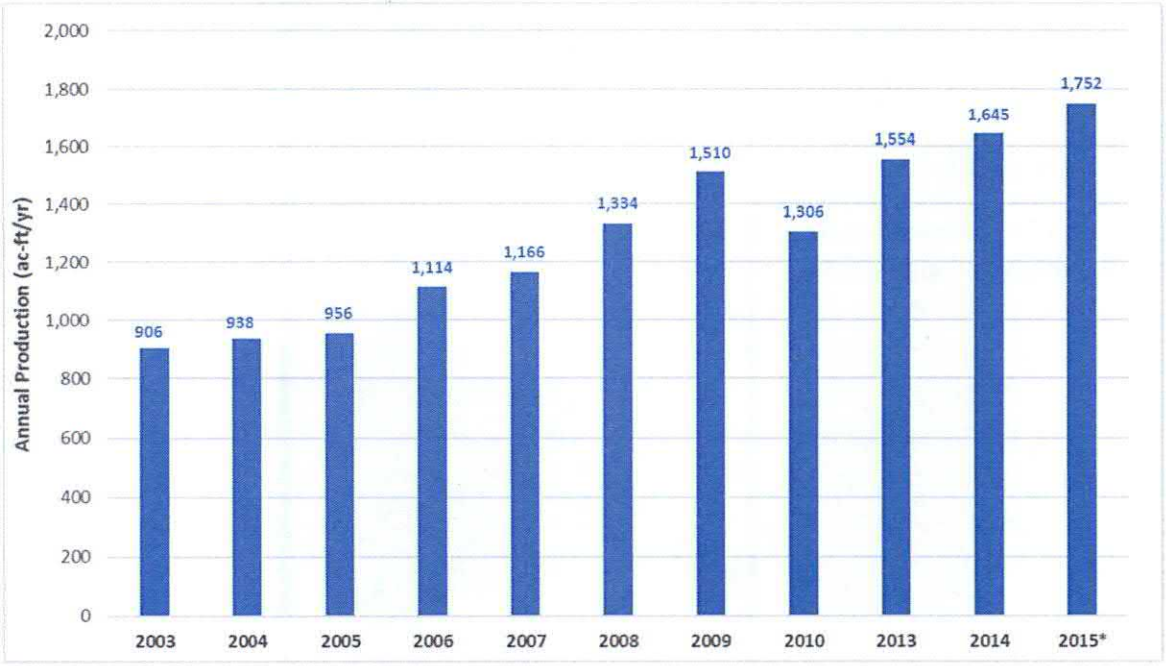
The City has experienced rapid growth in residential population and water demands since approximately 2000, as summarized in Figures 2 and 3, respectively.

Figure 2. City of Snoqualmie Population Growth



Sources: USCB, 2017; Gray & Osborne, 2013

Figure 3. City of Snoqualmie Historical Production from All Sources



*2015 production data includes 273 days (through September)

Between 2010 and 2015, the number of connections to the City's water system increased from 4,117 to 4,911. This corresponds to an overall growth rate of more than 19-percent, with residential development in Snoqualmie Ridge accounting for the majority of new connections (Gray & Osborne, 2016). This recent growth is reflected in increased production from the South Wellfield, which has been used with increased frequency since 2008.

Annual withdrawals from the North Wellfield have increased from approximately 500 ac-ft/yr in 2004 to 900 ac-ft/yr in 2015. Withdrawals from the South Wellfield have increased from approximately 70 ac-ft/yr in 2008 to more than 240 ac-ft/yr in 2014 and recent years. The combined withdrawals from the City's wellfields is within the combined annual quantities of the subject water rights. However, the North Wellfield is operated preferentially because it: (1) is within a higher pressure zone of the City's distribution system; (2) has higher capacity; (3) supplies irrigation water to augment a Class A Reclaimed Water irrigation system as needed; and (4) can supply water to the Snoqualmie Ridge area with shortest distance of conveyance.

Projected Water Demands

The City's 2013 Water System Plan (Gray & Osborne, 2013) projects the City's population to increase at an average rate of 2-percent per year, which would result in full buildout of the City's Urban Growth Area (UGA) by approximately 2070. The City's predicted average day demands (ADD) through the year 2032 are presented in Table 3. These projections are based on observed ADD for specific areas of the UGA (i.e., the Snoqualmie Ridge Development and the Canyon Springs area) and were scaled to the proportion of developable lands in each area.

Table 3. Projected Average Day Demands

Year	Projected Qa (ac-ft/yr)[1]
2016	1,392
2017	1,472
2018	1,553
2019	1,633
2020	1,763
2021	1,844
2022	1,921
2023	1,998
2024	2,005
2025	2,012
2026	2,020
2027	2,027
2028	2,034
2029	2,041
2030	2,049
2031	2,056
2032	2,063

[1]Calculated from projections for Average Day Demand (ADD) presented in Gray & Osborne (2013).

The City has currently allocated water to four development projects: buildout of the Snoqualmie Ridge Phase 2; Kimball Creek; the Salish Lodge expansion; and the Mt. Si High School expansion. Additionally, the Snoqualmie Ridge II applicant is engaged in long-term monitoring of the potential impact of the

development of impervious surfaces in Snoqualmie Ridge II on Lake Alice Community Association ground water wells. Monitoring is scheduled to end 5 years following the completion of Snoqualmie Ridge II buildout. Although not required to do so, the City has been reserving water in an amount sufficient water service to approximately 133 connections in the event adverse effects on Lake Alice water supply are identified (Gray & Osborne, 2016). A summary of the projected annual demands from these allocations is presented in Table 4 (from Gray & Osborne, 2016).

In addition, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area. Relying on demand data from the City's 2013 Water System Plan, the applicant for the Snoqualmie Mill site projects a need for approximately 700 ERUs for its potential three-phase development.

Additionally, the City's adopted GMA Comprehensive Plan, "Snoqualmie 2032," anticipates that the eventual annexation of the City's Snoqualmie Hills West Potential Annexation Area will bring 197 new single family and 205 new multi-family residences, and 1,015 new jobs on approximately 75 acres of new commercial development. Although a detailed water demand analysis cannot be prepared until there is an actual planned development, using an estimated demand of 0.7 ERU per new multi-family unit and 5 ERU per acre for commercial development, based on estimates for Snoqualmie Ridge contained in the Water System Plan, this potential annexation could generate water demand for approximately 715 additional ERUs of water.

Thus, the City anticipates additional growth from redevelopment of the former Weyerhaeuser Snoqualmie Mill site and annexation of the City's Potential Annexation Area could generate water demand in excess of 1,400 ERUs.

Table 4. Allocated Future Demands

Development Project	Projected Qa (ac-ft/yr)	Projected Qi (gpm)
Snoqualmie Ridge (Phases I and II)	309.1	460
Kimball Creek	10.9	16
Salish Lodge Expansion	84.1	127
Mount Si High School	6.7	14
Lake Alice Community	38.9	58
Total Future Allocations	*450*	*675*

Source: Gray & Osborne, 2016

Proposed Use

The change proposed for Certificate No. G1-20316C is to add the North Wellfield wells (i.e., Well Nos. 6, 7, and 8) as additional points of withdrawal to allow the authorized quantities to be used with flexibility at any of the City's active wells. The goal is to allow the City the opportunity to tailor water withdrawals to water needs throughout the City's service area.

Future use of the existing appropriations will continue to be for municipal supply, including the allocations previously described. No changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

Existing Water Rights Held by Others

Ecology's Water Rights Application Tracking System (WRATS) database was queried to identify existing water rights (i.e., claims, permits, or certificates) within approximately one-half mile of the North Wellfield. This search radius was selected following an examination of Ecology's Well Log Database, which identified only seven other water supply wells completed within the local deep aquifer system (considered to be wells exceeding 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E). Water rights associated with these wells are limited to the certificates and permits presented in Table 5. The half-mile search radius was then conducted without regard to completion depth to identify additional rights tapping the nearby shallow aquifer. The results of the water right query are presented in Table 5 without any assessment of extent or validity.

Table 5. Existing Water Rights within One-half Mile of the North Wellfield[1,2]

Type	Record No.	Person or Organization	Priority Date	Qi (gpm)	Qa (ac-ft)
Claim	G1-060724CL	Stephen, Robert G	--	--	--
Claim	G1-030259CL	Sims, David M	--	--	--
Permit	G1-28625P[2]	Snoqualmie School Dist.	5/27/2009	600	500
Certificate	G1-24839CWRIS	Kenmore Per Mix Co,	6/10/1986	250	200
Certificate	G1-23440CWRIS	Gmazel, Leroy et ux.	7/18/1979	40	10

[1]Excluding Permit No. G1-25449P held by the City for the North Wellfield.
[2]The point of withdrawal for Permit No. G1-28625P is located approximately 1.7 miles south of the North Wellfield, but was included in this table because it is completed within the deep aquifer system. The purpose of use is for non-consumptive heat exchange.

Two claims to vested rights were identified within the search area. The files available for these claims do not indicate a date of first use or provide other details on well location or water use and it is uncertain if these claims are still active. Two water right Certificates were identified within the search area and were cross-referenced with Ecology's Well log database and with the Washington State Department of Health (DOH) SENTRY database to obtain additional source information. The details for these water rights are summarized in Table 6.

Table 6. Water System Details for Certificated Rights within One-half Mile of the North Wellfield[1]

Record No.	Person or Organization	DOH System ID No.	No. of Connections	Well Log ID	Source Capacity (gpm)[2]
G1-24839CWRIS	Kenmore Per Mix Co (Snoqualmie Sand & Gravel)	00919	3[5]	94089[4]	50
G1-23440CWRIS	Gmazel, Leroy et ux.	06279	2[3]	94668	40

[1]Details obtained by cross-referencing location and source information listed in water right files.
[2] Source capacity reported from DOH Water Facilities Inventory Form.
[3] Connections are residential. The system is currently approved by DOH for a total of 5 connections.
[4]Additional well logs on file in association with this property.
[5] Connections are non-residential.

Other Rights Appurtenant to the Place of Use

A review of water rights in Ecology's GWIS (Geographic Water Information System) was conducted to identify existing rights within the place of use for the subject water right (i.e., the City's water service area). Table 7 provides the water rights identified within the City's water service area. Sixty-five claims to vested rights were also identified but are not included in Table 7.

Table 7. Existing Water Rights Within the City's Water Service Area

File No.	Type	Purpose	Person or Organization	Priority Date	Qi	Qa (ac-ft/yr)
S1-24675CWRIS	Cert	IR	Colligan, Gerald	7/9/1985	0.005 cfs	0.3
S1-24723CWRIS	Cert	IR	Morton, L. William	9/4/1985	0.005 cfs	0.5
S1-25094CWRIS	Cert	DS	Benson, Julia	9/21/1987	0.01 cfs	0.5
S1-23888CWRIS	Cert	DS	Tennant, Norman Et Ux	7/23/1981	0.02 cfs	1
S1-24245CWRIS	Cert	IR	Schodde, Herman W	2/3/1983	0.01 cfs	0.5
S1-23017CWRIS	Cert	IR	Pratt Agency	12/8/1977	0.12 cfs	5
S1-22534CWRIS	Cert	DS	Solberg, Albert J	6/26/1975	0.02 cfs	1
S1-21167CWRIS	Cert	DS IR	Fitzgerald, George W	1/10/1974	0.02 cfs	3
S1-20803CWRIS	Cert	DS	Travis, C W R & N J	8/3/1973	0.01 cfs	1
S1-20806CWRIS	Cert	IR	Sletten, Arvid	8/6/1973	0.01 cfs	0.5
S1-20881CWRIS	Cert	DS	Walker, James A	9/4/1973	0.02 cfs	1
S1-00632CWRIS	Cert	DS	Costantino, Michael	6/29/1971	0.01 cfs	1
S1-00652CWRIS	Cert	FS ST	Chicklero, Albert	2/24/1971	0.01 cfs	1
S1-20103CWRIS	Cert	IR ST	Mcclain, Elvin	5/3/1972	0.01 cfs	1
S1-00515CWRIS	Cert	DS	Young, James A	10/17/1968	0.01 cfs	1
S1-00206CWRIS	Cert	DS	Blankenship, E And D	2/17/1972	0.01 cfs	1
S1-*21353CWRIS	Cert	DM	Eychaner, John	12/3/1968	0.02 cfs	2
S1-*21911CWRIS	Cert	DS	Culbertson, R W	11/18/1969	0.01 cfs	1
S1-*21918CWRIS	Cert	DS	Gebaroff, C W	11/26/1969	0.01 cfs	1
S1-*18758CWRIS	Cert	DS	Baxter, L	10/26/1964	0.01 cfs	--
S1-*16625CWRIS	Cert	DS RE	Hall, C B	4/11/1961	0.05 cfs	--
S1-*13920CWRIS	Cert	DS FS IR	Miller, H W	6/12/1956	0.3 cfs	28
S1-*09533CWRIS	Cert	DS	Margreiter, G Et Ux	4/18/1950	0.005 cfs	--
S1-*04485CWRIS	Cert	DS PO	Swanson, E M	12/15/1937	0.4 cfs	--
S1-*02428CWRIS	Cert	DM	Slade, G A	9/26/1928	0.2 cfs	--
G1-24839CWRIS	Cert	MI	Kenmore Per Mix Co	6/10/1986	250 gpm	200
G1-25200CWRIS	Cert	FR HE IR	Streissguth, Mark	3/15/1988	300 gpm	16.6
G1-23440CWRIS	Cert	DM	Gmazel, Leroy Et Ux	7/18/1979	40 gpm	10
G1-00152C	Cert	DM	Leisure Time Resorts of America	9/8/1971	40 gpm	8.5
G1-24210C	Cert	DM	Rumbolz Sunset Water Association	12/3/1982	30 gpm	5
G1-28625P	Pmt	HE	Snoqualmie Valley School Dist 410	5/27/2009	600 gpm	500

Cert = Certificate; Pmt = Permit; '—' not listed; DM = multiple domestic; DS = Domestic; FS = Fire Suppression; HE = Heat Exchange; IR = Irrigation; MI = Mining; PO = Power; ST = Stock Watering

Hydrologic Setting

The City is located within Water Resources Inventory Area (WRIA) 7, which encompasses the Snohomish River Basin. WRIA 7 and the Snohomish River basin can be further divided into 62 sub-basins, with the City being within the Lower Coal Creek sub-basin of the Snoqualmie River Valley (Snohomish County, 2005). Surface waters within the Lower Coal Creek sub-basin, including Kimball and Coal Creeks to the south of the City, and Brockway and Tokul Creeks to the north, are tributaries of the Snoqualmie River Mainstem, which flows west along the City's northern margin. The North and South Forks of the Snoqualmie River join the Middle Fork approximately 2 miles east (upstream) of the City before continuing to flow generally northwest toward the Snohomish River.

The Upper Snoqualmie River watershed, which includes the greater Snoqualmie River Basin upstream of Snoqualmie Falls (located approximately one-half mile southwest of the North Wellfield; see Figure 1) drains an area of approximately 375 miles (AESI, 1996). Precipitation in the Upper Snoqualmie River watershed ranges from more than 180 inches per year (in/yr) in the Cascade Mountains to approximately 60 inches at the City (Ecology, 2016). The average discharge in the Snoqualmie River at Snoqualmie Falls between 2000 and 2015 was approximately 3,900 and 700 cubic feet per second (cfs) in January and August, respectively (USGS, 2016).

The City and the adjacent reach of the Snoqualmie River Mainstem (Snoqualmie River) are located within a deeply incised portion of the Snoqualmie River Valley. The City is bounded to the north by the Mt Si. foothills and the Tokul Delta, and by Rattlesnake Ridge to the South, resulting in more than 400 feet of relief within the City's water service area. This relatively high relief within City limits is also associated with a wide range of geologic units deposited as valley infill.

Hydrogeologic Evaluation

A series of hydrogeologic characterizations have been completed to support several water resources projects near the City, including the City's North and South Wellfields (see AESI [1995] and [1996]), as well as large-scale studies to support groundwater management (e.g., King County, 2010; Golder, 1998; USGS, 1994, etc). These investigations were reviewed by Aspect in conjunction with geologic maps and well installation reports to support a hydrogeologic evaluation of the subject application. A geologic and hydrogeologic conceptual model is described below based on this review.

Geologic Setting

The City is located within the Snoqualmie Valley, which is a deeply incised bedrock valley filled with a series of glacial and non-glacial sediments, deposited primarily during the Pleistocene epoch (1.6 million to 10,000 years before present [ybp]). These Pleistocene-aged sediments are overlain by more recent alluvial sediments (e.g., sands and gravels) deposited by the Snoqualmie River and its tributaries (Dragovich, 2009; AESI,1994).

Bedrock of the Snoqualmie Valley near the City consists primarily of tertiary volcanic rocks (e.g., the Miocene-aged andesites exposed at Snoqualmie Falls) and older (Jurassic-aged) metasedimentary rocks (e.g., the metasandstones exposed in portions of the Tokul Creek Valley; Dragovich, 2009). The depth to bedrock at the City's wellfields, which are located generally near the center of the Snoqualmie Valley, ranges between approximately 550 and 600 feet below ground surface (feet bgs), except at Well No. 8. Andesitic bedrock was first encountered approximately 700 feet bgs at the City's Well No. 8 due to higher ground surface elevations near the Tokul Creek plateau and the proximity of Tokul Creek, which is likely associated with ancestral bedrock erosion.

A simplified geologic cross-section is presented in Figures 5 and 6 to indicate the depth to bedrock and the series of unconsolidated sediments that form the valley fill (modified from AESI, 1996). From oldest to youngest, the infill sediments have been categorized as the following stratigraphic layers (summarized from AESI, 1996 and Dragovich, 2009):

- Pre-Olympia Sediments (*Qpou*) – Pleistocene-aged undifferentiated glacial and non-glacial deposits consisting of laminated to massive silt, clay, sand and gravel. This unit has been identified immediately overlying bedrock south of the City, but is absent at the North and South Wellfields.
- Olympia Sediments (*Qo*) – Pleistocene-aged fluvial sediments deposited by the ancestral Snoqualmie River. This unit generally consists of medium to coarse sands and gravels with lenses of fine to medium sand. It has been mapped at the North and South Wellfield as being between approximately 50 to 70 feet thick, and has been identified by Golder (1996) at elevations up to 600 feet above mean sea level (amsl) near Tanner (approximately 5 miles southeast of the South Wellfield).
- Vashon Glacial Sediments (*Qva, Qvt, Qvr*) – Quaternary-aged glacial deposits of the most recent glaciation of the Puget Sound Lowlands (i.e, the Vashon Stade of the Fraser Glaciation). Sediments deposited during glacial advance (*Qva*) include glaciolacustrine clay, silt and fine sand deposited at thicknesses of approximately 100 to 200 feet. Subsequent deposits of glacial till (*Qvt*) consist of poorly sorted sand and gravel in a dense silt/clay matrix. Meltwaters that formed during the glacial retreat resulted in deposition of a prograding delta system (Qvr) in the Tokul Creek area; the local *Qvr* is noted to coarsen upwards and become generally finer-grained with distance from the ancestral delta (e.g. to the southeast).
- Recent Sediments (*Qa*) – Late-Quaternary to recent sediments deposited by the post-glacial Lake Snoqualmie and the modern Snoqualmie River. Deposition of the Tokul Creek delta system resulted in the formation of pre-historic Lake Snoqualmie, which deposited lacustrine sands, silts, and clays (*Qaf*) at thickness of up to 300 feet near the South Wellfield; these sediments are noted to become coarser-grained to the south (AESI, 1994). Recent Snoqualmie River deposits of sand and gravel (*Qag*) overly the Lake Snoqualmie sediments, and floodplain deposits of silt and clay are typically present near ground surface.

Figure 5. Geologic Cross-section Location

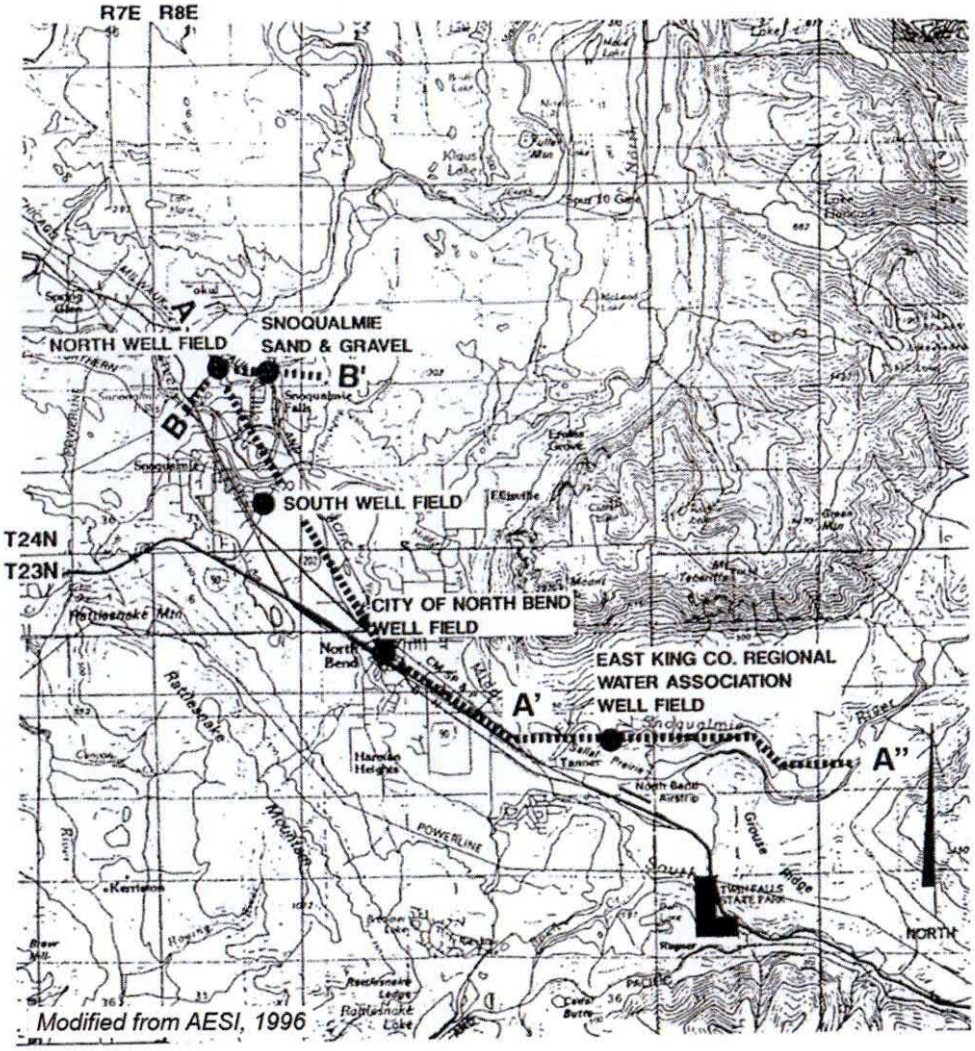
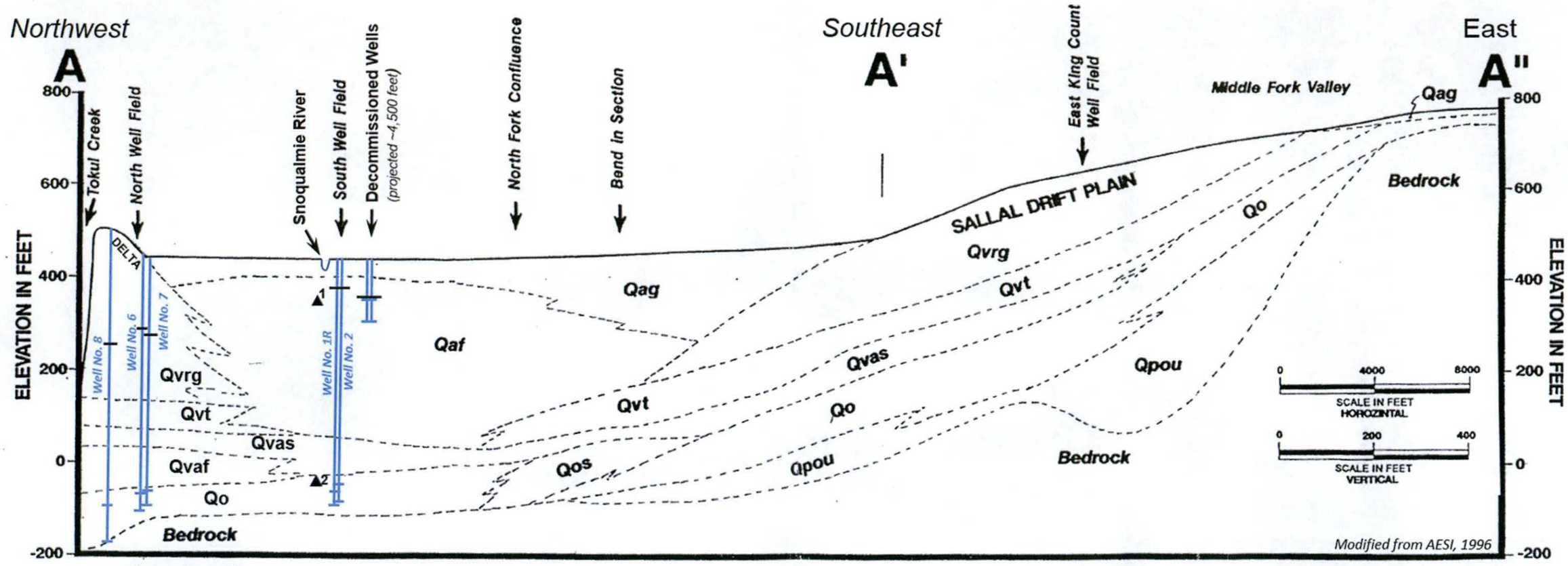


Figure 6. Geologic Cross-section



Legend

Qag	Recent river deposits consisting of gravelly sand to sandy gravel capped over bank silts
Qaf	Lake Snoqualmie deposits consisting of fine sand, silts, and clays; coarsening southward (AESI, 1994)
Qvrg	Vashon Recessional fluvial deposits consisting of cobbly sandy gravel
Qvt	Vashon till consisting of poorly sorted sand and gravel in dense silt and clay matrix
Qvas	Vashon advance fluvial deposits consisting of medium to fine sand
Qvaf	Vashon advance lacustrine deposits consisting of silts and clay
Qo	Olympia fluvial deposits consisting of cobbly sandy gravel to gravelly sand
Qos	Olympia fluvial deposits consisting of sand deposited by the historic North Fork near the confluence of the North Fork with the Middle and South Fork Snoqualmie Rivers
Qpou	Pre-Olympia undifferentiated sediments consisting of a mix of till, sand, gravel, silt, and clay
Bedrock	Tertiary- to Jurassic-aged bedrock

▲ Carbon-14 Dates
1. 5720 ybp
2. >43,000 ybp

City Well
- Approx. static water level (well log)
- Approx. screen interval

Groundwater Occurrence

There are four principal aquifers that have been identified in proximity to the City. These include, from oldest to youngest, the following aquifers (summarized from AESI, 1994, 1996 and 2002):

- Olympia Aquifer – occurring in the Olympia Sediments (*Qo*) of the ancestral Snoqualmie River, this aquifer has been locally designated as the "deep aquifer" in some reports and is tapped by all wells at the City's North and South Wellfields. The aquifer ranges in thickness from approximately 50 to 200 feet between the North Wellfield and at wells installed southeast of the City at Tanner, respectively. Beginning near the Grouse Ridge/Middle Fork Embankment area east of Tanner, the aquifer extends to an unknown distance northwest of Snoqualmie Falls. The width of the aquifer was limited by the narrow bedrock valley of the ancestral Snoqualmie River, and is estimated to be 2,000 feet near the North Wellfield.

  Aquifer testing at the City's North and South Wellfields indicated the aquifer behaves as a leaky confined system, receiving water from the overlying Vashon glacial advance sediments (*Qva*). At the North Wellfield, the Olympia Aquifer is immediately overlain by a clayey silt aquitard deposited during the glacial advance (Qvaf); however, this aquitard was not identified at the South Wellfield, suggesting relatively more recharge occurs from overlying aquifers at the South Wellfield. The transmissivity of the aquifer has been estimated to range between approximately 2,000 and 4,000 feet squared per day (ft^2/d) at the North and South Wellfields, respectively.

- Glacial (Vashon) Advance Aquifer – occurring within the sands of the glacial advance sediments (*Qvas*), this aquifer has been identified at the North and South Wellfields at thickness up to approximately 120 and 80 feet, respectively. The lateral distribution of the aquifer is similar to that for the Olympia Aquifer as a result of the ancestral topography, but sediments are generally finer and of different origin. This aquifer is considered capable of producing low yields, and modeling of leakage (recharge) rates to the underlying Olympia Aquifer indicate a transmissivity on the order of 600 ft^2/d.

- The Tokul Creek Glacial Recession Aquifer – occurring within the sand and gravel deltaic deposits of the Tokul Creek Delta (*Qvr*), this aquifer is unconfined and is bounded to the west by bedrock. The aquifer is approximately 140 feet thick at the North Wellfield, but becomes finer-grained and pinches out to the southeast. Groundwater discharges from this aquifer to Tokul Creek at an estimated rate of approximately 4 to 5 cfs near SR-202 (total baseflow in Tokul Creek was estimated at 25 cfs during the 1992 measurement period; AESI, 1996). Recharge to the aquifer includes discharge from the adjacent Snoqualmie River Aquifer, which occurs over a relatively steep gradient of about 0.3 feet per foot. Transmissivity in the aquifer ranges from about 24,000 ft^2/d near the North Wellfield to 220 ft^2/d at a well located at Snoqualmie Sand and Gravel (near the aquifer margin).

- The Snoqualmie River Aquifer – occurring within the surficial sand and gravel deposits of the recent Snoqualmie River (*Qag*), averaging approximately 50 feet thick near the City. Most groundwater within this unconfined aquifer discharges to the Snoqualmie River and to the Tokul Creek aquifer within the subsurface. Aquifer transmissivity has been estimated from slug testing to be approximately 4,000 ft^2/d; however, these results may represent an underestimate of transmissivity due to effects from delayed yield.

Groundwater Flow and Potential Changes

All of the City's currently active production wells tap the Olympia aquifer at depths between approximately 500 and 700 feet bgs. The City's two additional inactive (decommissioned) wells are interpreted to be completed in the more recent Lake Snoqualmie sediments (*Qaf*) and in hydraulic continuity with the Snoqualmie River Aquifer. Well Completion depths are summarized in Table 8 and depicted in cross-section as Figure 6.

Table 8. Summary of City of Snoqualmie Production Wells

Well No.	Static Water Level (feet amsl)[1]	Screen Interval (feet BGS)	Screened Elevation (feet amsl)	Wellfield	Average Wellfield Production in 2013 & 2014 (gpm)[2]
1R	374[3]	490 - 550	-70 to -130	North	570
2	--	513 – 556[4]	-100 to -143		
6	276[5]	534 – 580	-94 to -140	South	140
7	290[5]	527 - 557	-87 to -117		
8	240[3]	609 – 694	-100 to -184		
Decommissioned No. 1	355[3]	85 – 130[6]	355 - 310	--	--
Decommissioned No. 2	355[3]	85 – 130[6]	355 - 310		

[1]Reported for different water years and times of year.
[2]Production data provided by Gray and Osborne (2013 and 2016) indicates groundwater production was greatest in 2013 and 2014 for the period from 2003 through 2015.
[3]Obtained from well log on file with Ecology
[4]No well log on file with Ecology; information obtained from GeoEngineers, 1995.
[5]From AESI, 1994.
[6]Casing was perforated.

Pumping tests at the North Wellfield have resulted in a pronounced drawdown response at the South Wellfield, and vice versa. An 8-day pumping test at the North Wellfield was conducted at a rate of 1,040 gpm, resulting in approximately 50 feet of drawdown at the North Wellfield (Well TW-5) and 5 feet of drawdown at the South Wellfield (AESI, 1994). Alternatively, a similar pumping test conducted at the South Wellfield (i.e., pumping 1,130 gpm for 7 days) resulted in a comparatively lower drawdown response at the North Wellfield (i.e., approximately 2 feet; GeoEngineers, 1995). These results suggest that: (1) lateral flow boundaries likely exist to the east and west in proximity to the wellfields, resulting in the pronounced drawdown response during each test over the approximately 2 miles separating the wellfields; and (2) the greater drawdown response at the South Wellfield to pumping at the North Wellfield may be associated with more confining conditions in the northwest portion of the aquifer (e.g., confining layers may act to limit leakage from overlying aquifers in this area, resulting in a more rapidly expanding cone of depression).

A numerical groundwater flow model was developed for the City in the 1990s using the USGS MODFLOW code to evaluate aquifer and surface water response to pumping at the North and South Wellfields (see AESI, 1994 and 1995, respectively). The steady-state model indicated that continuous pumping at either the North or South Wellfields would result in a reduction in groundwater discharge to Tokul Creek and the Snoqualmie River. This reduction is predicted to occur at both wellfields due to leakage (recharge) to the Olympia aquifer from the overlying shallow aquifers, which are in hydraulic connection with local surface waters. However, the model predicts greater local impacts will occur to the Snoqualmie River from pumping at the South Wellfield because of better hydraulic continuity with the shallow aquifers in this area.

The MODFLOW model simulated the effects of continuous pumping at the North Wellfield at a rate based on the annual limitations of existing water rights (i.e., 425 gpm, equating to approximately 700 ac-ft/year under Permit No. G1-25449P; AESI, 1994). The effect of pumping at a continuous rate of 410 gpm (660 ac-ft/yr) was simulated for the South Wellfield (AESI, 1995). The results of these simulations are summarized in Table 9 (compiled from AESI, 1994 and 1995).

Table 9. Modeled Impacts to Surface Waters from Production at City Wellfields

Wellfield	Average Pumping Rate (gpm)	Tokul Creek Flow Reduction		Snoqualmie River Flow Reduction		
		Total (gpm)	*% of Baseflow*	*Total Above Falls (gpm)*[1]	*Total Below Tokul Confluence (gpm)*	*% of Baseflow*[2]
North	425	65	0.5	3[3]	70	0.02
South	410	55	0.5	240[4]	300	0.10

[1]Represents maximum total reduction in flow at Snoqualmie Falls (i.e., "return flow capture" and direct discharge to groundwater at the South Wellfield).
[2]Represents reduction in summer baseflow (est. 700 cfs) in the Snoqualmie River below the Tokul Creek Confluence (0.75 miles downstream from Snoqualmie Falls).
[3]Represents the predicted quantity of intercepted recharge to the Snoqualmie River Aquifer (see AESI, 1994)
[4]Includes an estimated 20 gpm of induced recharge from the Snoqualmie River and 220 gpm of leakage from Snoqualmie River aquifer (AESI, 1995)

The model simulations indicated that approximately 220 gpm and 3 gpm of groundwater discharge to the Snoqualmie River above Snoqualmie Falls would be intercepted by pumping at the South and North Wellfields, respectively. The model also suggested that pumping at the South Wellfield would result in an additional 20 gpm flow reduction in the Snoqualmie River, due to induced discharge from the river to the surrounding aquifer (totaling the 240 gpm seen in Table 9). The model simulated that releases from storage (replenished through recharge) and reduced outflow within the deep aquifer provide the balance of flow to the wells. The reduction in outflow from the deep aquifer system is modeled to be greater when pumping at the North Wellfield compared to the South Wellfield (commensurate with less local impact to the Snoqualmie River), but likely results in reduced baseflows to the Snoqualmie River in downstream areas. This suggests that a downstream movement of existing impacts to the Snoqualmie River may result from the proposed change, which is considered an overall benefit to the Snoqualmie River, because impacts along an upstream reach of the river associated with the water rights' existing points of withdrawal will be reduced or eliminated.

The modeled reduction in baseflow to Tokul Creek from pumping either wellfield would further decrease Snoqualmie River baseflow below the Tokul Creek confluence (approximately 0.75 miles downstream from Snoqualmie Falls). However, discharge to the Snoqualmie River from the City's wastewater treatment plant will result in an overall increase in flow in the Snoqualmie River above Snoqualmie Falls, since the majority of this wastewater originates from the deep groundwater system that would otherwise discharge farther downstream in the Snoqualmie River.

It is recognized that the MODFLOW models for the North and South Wellfields could be updated with more recent water level and aquifer testing data, and the model output may change as a result. However, the overall results of the existing models are not expected to change the finding that less local impact would occur to the Snoqualmie River by consolidating withdrawals at the North Wellfield site. The results in Table 9 summarize the existing model results and illustrate this finding. Importantly, the proposed consolidation is considered water balance neutral with respect to the Snoqualmie River watershed (i.e., consolidation of pumping at the North Wellfield would not increase or reduce consumptive appropriations from the basin, all of which will ultimately result in reductions of flow in the river). However, based on these results, consolidating pumping at the North Wellfield should nevertheless result in a downstream shift in potential effects from groundwater withdrawals on flow in

the river, given the downstream location of the North Wellfield and greater confining conditions in this area.

Impacts to Tokul Creek resulting from consolidation of pumping at the North Wellfield (i.e., resulting from an equivalent decrease in pumping at the South Wellfield and the City's shallow decommissioned wells) were also investigated by reviewing previous model simulations. Interpolating model results for pumping at both the North and South Wellfields (AESI 1994; AESI ,1995) as currently authorized (approximately 1,224 ac-ft/yr or 760 gpm continuously) results in an estimated baseflow reduction in Tokul Creek of approximately 100 gpm, which is about 1% of summer low flows in Tokul Creek (AESI, 1994). Considering the City's entire consolidation project (see Table 2), up to 880 gpm could be authorized for continuous withdrawal at the North Wellfield (i.e., 1,424 ac-ft/yr under continuous pumping). Interpolation of results from previous MODFLOW simulations at the North Wellfield (simulations included continuous pumping at rates between 100 and 3,000 gpm; AESI, 1994) indicates that continuous pumping at 880 gpm exclusively from the North Wellfield could decrease groundwater discharge to Tokul Creek by approximately 110 gpm. Thus, it is predicted that all the proposed changes combined would result in a minor increase in impacts on Tokul Creek (roughly 0.1% of summer low flow). Tokul Creek is not regulated with instream flows.

Impairment Considerations

Impairment of Minimum Instream Flow Water Rights

The term "instream flow" is used to identify a specific stream flow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the stream flows needed to protect and preserve instream resources and values, such as fish, wildlife and recreation. Instream flows are most often described and established in a formal legal document, typically an adopted state rule.

Once established, a minimum flow constitutes an appropriation with a priority date as of the effective date of the rule establishing the minimum flow (RCW 90.03.345). Thus, a minimum flow set by rule is an existing right which may not be impaired (RCW 90.03.345; RCW 90.44.030).

Minimum instream flows were established for the Snohomish River Water Resource Inventory Area (WRIA 7) by WAC 173-507 in 1979. None of the three water rights involved with this project are junior to the instream flow rule, and as such, they are not subject to curtailment when instream flows are not met. The hydrogeological assessment suggests that, as a result of the changes, impacts in the Snoqualmie River will be reduced or eliminated along a reach of the river from shifting withdrawals downstream to the North Wellfield. Flows as measured at the gage at Snoqualmie Falls control station will not be reduced and could even see a slight increase. With the withdrawal moving a short distance downstream, flows at all other downstream control stations in the Snoqualmie/Snohomish system should see no change through this consolidation process. As noted previously, WDFW has also determined that no new impacts to fish will occur from approval of this change application.

Impairment, Qualifying Ground Water Withdrawal Facilities, and Well Interference

There are three concepts that are important when considering whether a withdrawal of water from a well would impair another existing water right. The concepts are defined as follows:

1. Impairment is an adverse impact on the physical availability of water for a beneficial use that is entitled to protection (i.e., water rights that are both senior and junior in priority to the right the

applicant seeks to change).

2. Qualifying ground water withdrawal facilities are defined as those wells which in the opinion of the Department are adequately constructed. An adequately constructed well is one that (a) is constructed in compliance with well construction requirements; (b) fully penetrates the saturated thickness of an aquifer or withdraws water from a reasonable and feasible pumping lift (WAC 173-150); (c) the withdrawal facilities must be able to accommodate a reasonable variation in seasonal pumping water levels; and (d) the withdrawal facilities including pumping facilities must be properly sized to the ability of the aquifer to produce water.

3. Well interference may occur when several wells penetrate and withdraw ground water from the same aquifer. Each pumping well creates a drawdown cone. When several wells pump from the same aquifer, well density, aquifer characteristics, and pumping demand may result in individual drawdown cones that intersect and form a composite drawdown cone. At any point in an aquifer, the composite drawdown caused by pumping wells will be greatly influenced by the transmissivity (T) of the aquifer. In aquifers with high Ts, composite drawdown will generally be much less than in aquifers with similar properties but with low Ts. Transmissivity is related to hydraulic conductivity (K) and the saturated thickness (b) of an aquifer by the relationship T=Kb.

   An aquifer's hydraulic conductivity (K) is derived from the physical properties of both the fluid and geologic materials that form an aquifer. Once formed, an aquifer's saturated thickness (b) becomes important in evaluating its transmissivity. For regions of similar K in an aquifer, a large saturated thickness will result in a much higher T than a small saturated thickness. As a result, regions of similar K in an aquifer with a large saturated thickness will experience less composite drawdown or well interference than with a small saturated thickness.

   Some conditions, however, will increase or steepen composite drawdown in an aquifer. For instance, where characteristics (such as very fine, clay-rich, or poorly sorted sediments) of an unconfined aquifer cause significant drawdown relative to the saturated thickness, the composite drawdown will increase as saturated thickness is reduced and T becomes smaller. Additionally, in regions where negative or no-flow boundaries occur, such as near the edges of a valley fill aquifer where it is bounded by bedrock, composite drawdown will be steeper than in the central part (generally the greatest thickness region) of the aquifer. Consequently, it is commonly understood that the greatest composite drawdown or well interference is more likely to occur in regions of low transmissivities, thin saturated thicknesses and near negative or no-flow boundaries than in regions of high transmissivities, large saturated thicknesses, and away from negative or no-flow boundaries.

It is noted above that Tokul Creek could experience a slight increase in impacts from the proposed change. The potential increase is on the order of 0.1% of the summer low flow in Tokul Creek and will not physically impair any downstream surface water rights.

The City's proposed consolidation package requests the North Wellfield wells as additional points of withdrawal for existing rights. If the entire package were approved, withdrawals from the North Wellfield could increase from 724 to 1,424 ac-ft/yr; this amounts to an increase in the average (continuous) pumping rate from approximately 450 to 880 gpm. This increase in withdrawals at the North Wellfield would result in greater localized drawdown within the Olympia aquifer and, to a lesser degree, within overlying shallow aquifers. To estimate potential well interference to other users, the results from previous MODFLOW simulations for the North Wellfield were evaluated (see AESI, 1994).

MODFLOW simulations were previously conducted for the North Wellfield for continuous pumping rates between 100 and 3,000 gpm. Interpolation of these results was performed to estimate aquifer drawdown during pumping at 880 gpm. Results are summarized in Table 10. Figures showing the simulated drawdown in the deep aquifer from continuous pumping at the North Wellfield at 425 and 1,000 gpm are presented in Figures 7 and 8, respectively (modified from AESI, 1994).

Table 10. Simulated Drawdown Response to Pumping (MODFLOW results; AESI, 1994)

Average Annual Pumping Rate (gpm)	Deep Aquifer Drawdown (in feet)		Shallow Aquifer Drawdown (in feet)
	at 2,000 feet (Snoqualmie S & G)[1]	*at 9,000 feet (S. Wellfield and School District Wells*[2]*)*	*at 1,500 feet (adjacent domestic wells)*[3]
450	20	5	2
880[4]	30	10	4
1,000	35	12	5
2,000	75	24	9

[1] Snoqualmie Sand and Gravel Wells (G1-23849C); Ecology Well Log ID Nos. 94089 and 97733

[2]The school district wells are include an injection and extraction well associated with Permit No. G1-28625P and are located approximately 10,000 feet from the North Wellfield.

[3]Approximate distance to Tokul Plateau Well (G1-23440C; Ecology Well Log ID 94668) and other exempt wells indicated in Table 11.

[4]Drawdown response to pumping at 880 gpm estimated by linear interpolation of existing results.

Figure 7. Simulated Drawdown in Olympia Aquifer – 425 gpm Continuous Pumping

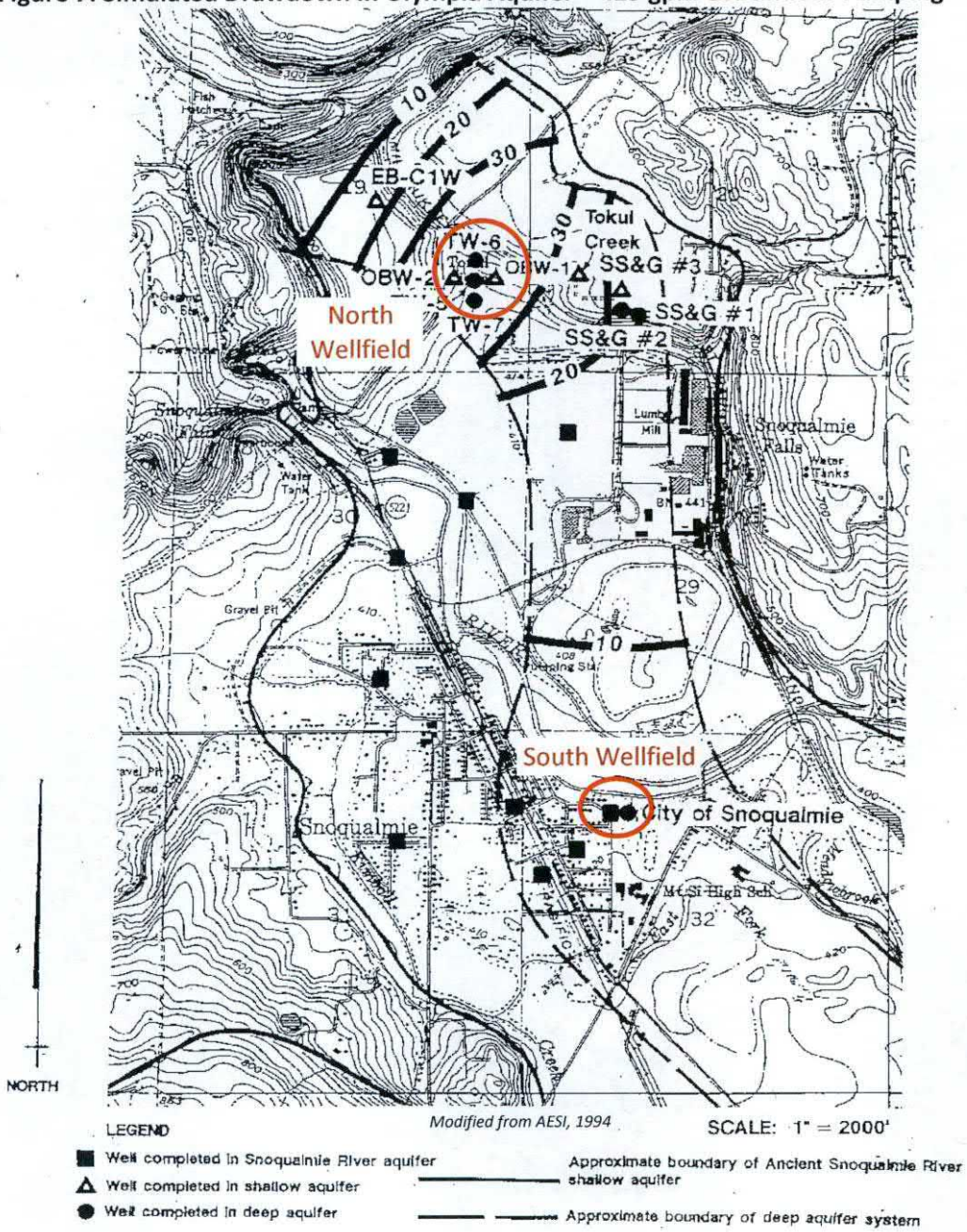
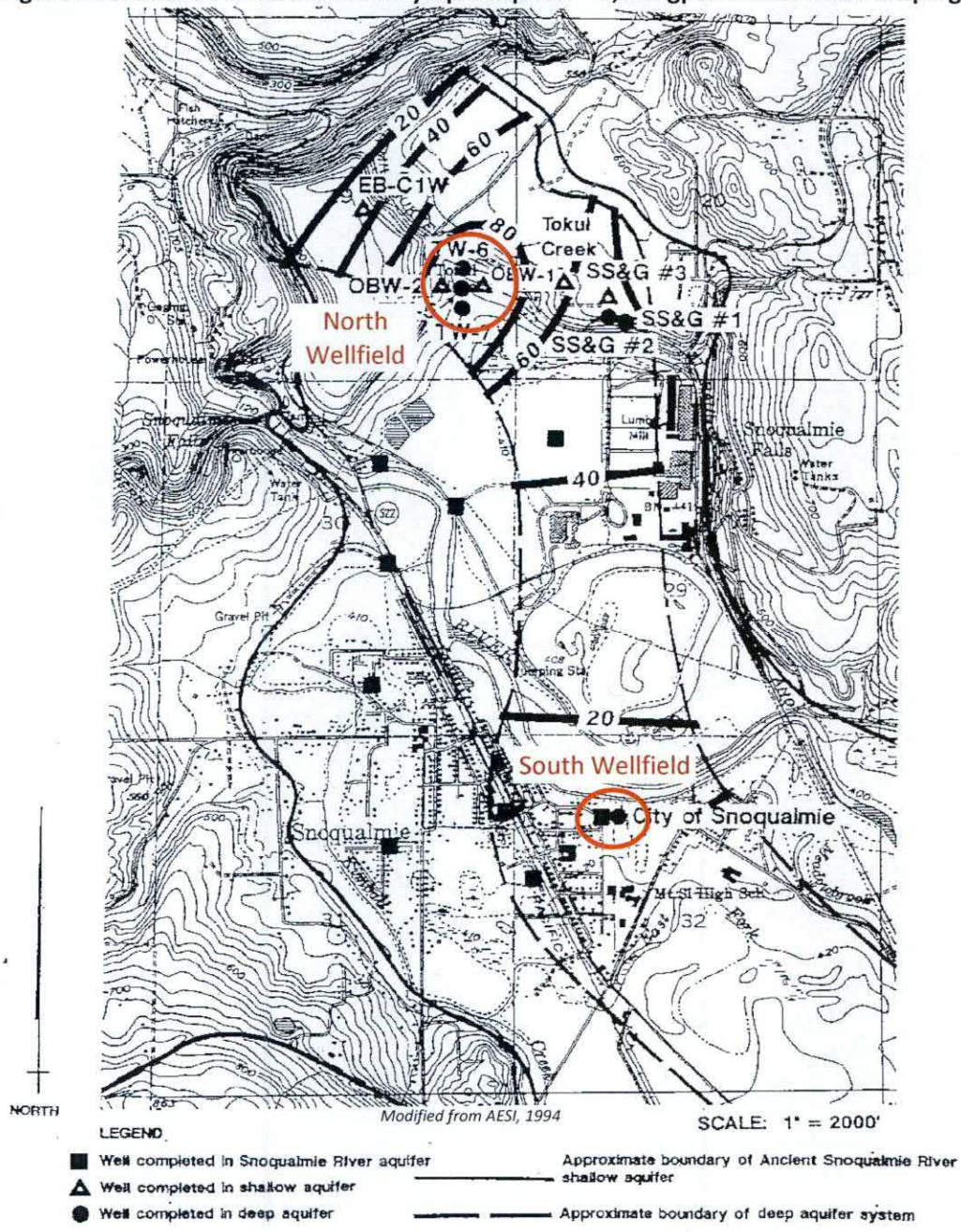


Figure 8. Simulated Drawdown in Olympia Aquifer – 1,000 gpm Continuous Pumping



Wells associated with groundwater rights identified in proximity to the North Wellfield are presented above in Table 6. According to previous reports, most of the water supply to Snoqualmie Sand and Gravel Well is provided by a well designated as Well No. 2. This well has approximately 100 feet of available drawdown, 54 feet of which is required to produce the certificated Qi of 250 gpm. This indicates there is an additional 46 feet of remaining available drawdown to accommodate potential interference drawdown from the subject application (AESI, 1994), so impacts to well yield are not anticipated to occur under the consolidation project. Snoqualmie Sand and Gravel has not reported any impacts from historical pumping at the North Wellfield, which is predicted to have resulted in more than

20 feet of interference drawdown. This suggests that the model may be over-estimating impacts, which will create a safety factor when assessing impairment.

The Tokul Plateau Well, associated with certificate number G1-23440C, located at 5700 390th Ave SE and completed in the shallow aquifer, was previously estimated to be able to incur approximately 4 feet of interference drawdown (Table 10) from the North Wellfield before well yield would be affected (AESI, 1994). This is equivalent to the predicted interference drawdown from the proposed consolidation.

Ecology's online Well Log Database was queried to identify water wells not identified in Table 6 (i.e., wells exempt from groundwater rights under RCW 90.44.050) following two approaches: (1) well logs within the local deep aquifer system, considered to be those greater than 200 feet deep and within east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E (2.25 miles south from the North Wellfield); and (2) all well logs within approximately 0.75 miles of the North Wellfield (i.e., within the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE¼ Sec 30, T24N, R8E). A radius of 0.75 miles was selected to capture any wells associated with nearby structures (identified from aerial imagery). Three wells were identified using these approaches and are presumed to be operated under "exempt" status (i.e., producing less than 5,000 gallons per day without a water right). Two of these wells are interpreted as completed in the Tokul Creek Delta / Snoqualmie River aquifer (Ecology Well Log ID Nos. 97066 and 97934), and a third well is interpreted to be completed beyond the extent of the shallow Snoqualmie River aquifer (Well Log ID 795008). Details of these wells are presented in Table 11.

Table 11. Water Well Logs near the North Wellfield ("exempt" wells)[1]

Owner Name	Address	Ecology Well Log ID No.	Static Water Level (feet BGS)[2]	Depth to Top of Screen (feet BGS)	Note
Robert Vezzoni	--[3]	97066	263	276	15 gpm with "0" drawdown
Steve Parsons	5820 390th Ave SE	97934	225	265[4]	8 gpm with "0" drawdown
Brooks Bros. Water	7001 396th Dr. SE	795008	44	221	16 gpm with 168 feet drawdown

[1] Queried area included all wells in the SE¼ Sec 19, SW¼ Sec 20, NW¼ Sec 29, and the NE ¼ Sec 30, T24N, R08E and wells greater than 200 feet deep within the east half of Sections 19, 30, and 31 and the west half of Sections 20, 29, and 32 of Township 24N, Range 8E. No water rights were identified in association the wells indicated, and the wells are presumed to withdraw up to 5,000 gallons per day under the groundwater permit exemption.
[2]Presented as feet below ground surface (feet BGS)
[3]No address provided with well log.
[4]Well is cased to 265 feet BGS with no screen (open bottom)

Well Log ID Nos. 97066 and 97934 indicate the two exempt wells near the North Wellfield in the shallow aquifer system exhibit a high specific capacity as evidenced by zero drawdown. Both wells are reported to have more than 10 feet of available drawdown, and well yields are not expected to be reduced by the added interference drawdown resulting from the subject application (e.g., approximately 4 feet based on model simulations). Well Nos. 97066 and 97934 were installed in 1986 and 1992, respectively, and no impacts from existing authorizations have been reported. Similarly, no impacts have been reported for Well No. 795008, which is located about one mile from the North Wellfield and exhibits different hydrogeologic conditions (as evidenced by a lower specific capacity compared to City wells and others listed in Table 11).

Public Interest Considerations

No potential for detriment to the public interest was identified during the investigation of this water right change application.

Consideration of Protests and Comments

No protests were received by Ecology in response to the public notices of this change application.

Two sets of comments were received from the publication of this draft Report of Examination on Ecology's website:

- Mr. Stephen Kangas of North Bend commented to Ecology via email (on September 6, 2018) that two references to the "Tanner" area incorrectly indicated that Tanner is southwest of the City of Snoqualmie and the City's South Wellfield, rather than southeast.

  Response: This Report of Examination has been updated to correctly reference the Tanner location as southeast of the City and its South Wellfield.

- The Snoqualmie Tribe filed a comment letter (dated September 13, 2018) with Ecology stating:

  "The proposed transfer of water rights from the decommissioned wells located adjacent to Kimball Creek to the North Well Field is expected to shift impacts from Kimball Creek (on the south side of the Snoqualmie River) to Tokul Creek (on the north side of the Snoqualmie River). The proposed transfer of water rights from the South Well Field to the North Well Field is expected to result in an increase in impacts to Tokul Creek. So, as described in the draft ROEs, the proposed water rights transfers will shift impacts from non-anadromous stream reaches to an anadromous stream reach, namely, Tokul Creek…We request that if ECY approves the City of Snoqualmie's request to increase impacts to Tokul Creek, an important salmon stream, that any approval will be accompanied by requiring appropriate mitigation to help offset those expected negative impacts to anadromous fish and fish habitat."

  Response: As noted in the Investigation section of this Report of Examination, previous groundwater modeling indicated that use of the South Wellfield was predicted to have greater local impacts on the Snoqualmie River than the North Wellfield. In addition, the North Wellfield is located further downstream in the Snoqualmie River system. Given these considerations, shifting of use from the South Wellfield to the North Wellfield is expected to benefit an anadromous portion of the Snoqualmie River. Similarly, the shifting of use from the decommissioned wells located near Kimball Creek will benefit flows in both Kimball Creek and an anadromous portion of the Snoqualmie River. Transfer of all pumping from the South Wellfield and decommissioned wells is predicted to result in a very small increased impact to Tokul Creek, which is not regulated under chapter 173-507 WAC and is already impacted by the authorized water rights. The maximum new impact to stream flows in Tokul Creek as a result of all the proposed changes (i.e., if all of the water use currently authorized for the South Wellfield and Decommissioned Wells 1 and 2 shifts to the North Wellfield) is predicted based on groundwater modeling to be less than 0.15% (1.5/1000th) of summer low flows. Nothing in state law requires mitigation for new impacts to unregulated streams; therefore, no mitigation is required.

Extent and Validity Considerations

Based on the information provided by the City and upon Ecology's review, it is tentatively determined that the subject water right is in good standing and is eligible for change. This is a municipal water supply water right that is not subject to relinquishment. The full certificated instantaneous rate (600 gpm) has been perfected through beneficial use. The full annual quantity is not yet fully perfected. However, the City is a growing system with boundaries that have changed over time, and it is in good-standing with a DOH green operating permit, and associated demand analysis indicates the City can easily grow into their full annual allocation. Therefore, the full certificated annual quantity of 500 ac-ft/yr is eligible for change.

Same Source Considerations

All of the existing points of withdrawal considered under this change are within the same source of water, the Olympia aquifer, as evidenced by measured interference drawdown. In addition, all City wells are within the same surface water drainage subbasin of the Snoqualmie River Basin as delineated by Snohomish County (2005).

CONCLUSIONS

Tentative determination and Potential for Enlargement

Groundwater Certificate G1-20316C is in good standing with Ecology and is therefore eligible for change. In accordance with RCW 90.14.140(2)(d), rights for municipal supply purposes are not subject to relinquishment.

No potential for enlargement of the existing water right exists, provided the City does not withdraw more than a total of 600 gpm and 500 ac-ft/yr (non-additive) under this water right at the existing and proposed points of withdrawal.

Same Source Considerations

All existing points of withdrawal considered under this change are within the same source of water.

Potential for Impairment of Existing Rights

The change requested will not impair existing rights.

Potential for Detriment to the Public Interest

The change requested will not be detrimental to the public interest.

RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend this request for change be approved in the amounts and within the limitations listed below and subject to the provisions listed above.

Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial:

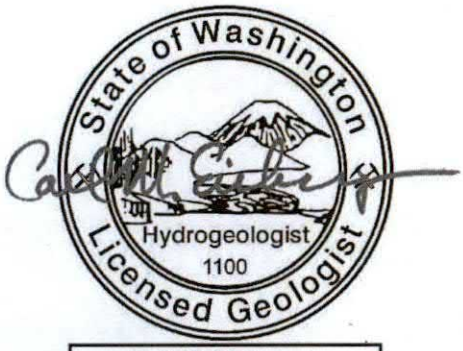
Q_i = 600 gpm
Q_a = 500 acre-feet per year (non-additive)
For Municipal Use

Points of Withdrawal

See Figure 1, representing the North and South Wellfields. The North Wellfield is located within the NE¼ SE¼, Section 19, Township 24N, Range 8E and within SE¼ SE¼ Section 19, Township 24N, Range 8E. The South Wellfield is located within the NE¼ NW¼ Section 32, Township 24N, Range 8E.

Place of Use

The place of use (POU) of this water right is the service area described in the most recent City of Snoqualmie Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.



Carl M. Einberger

Carl Einberger, LG, LHG, License #1100 *Date*



John C. Cook

12/19/2018

Jay Cook, LG, LHG, License #1598 *Date*

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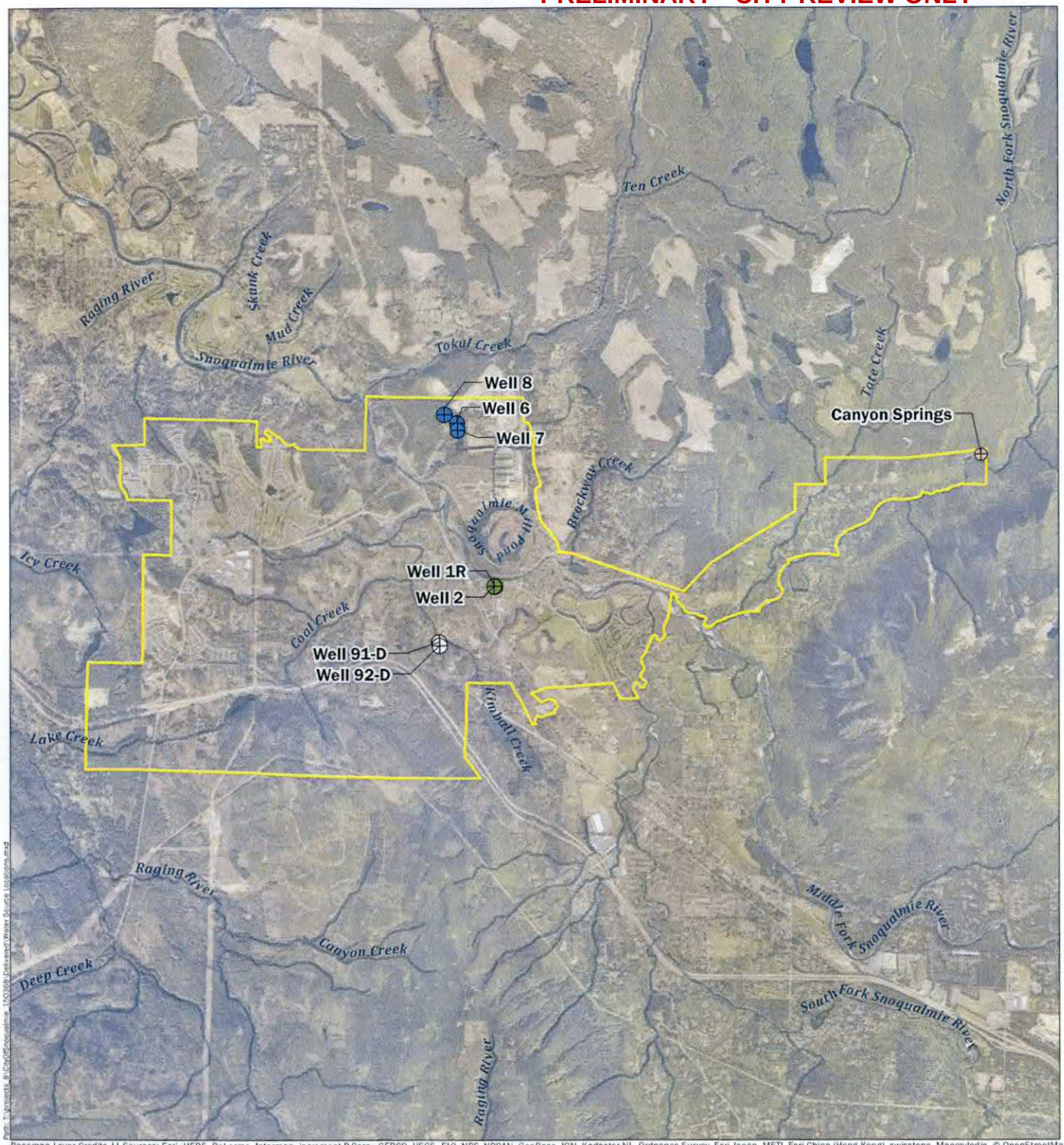
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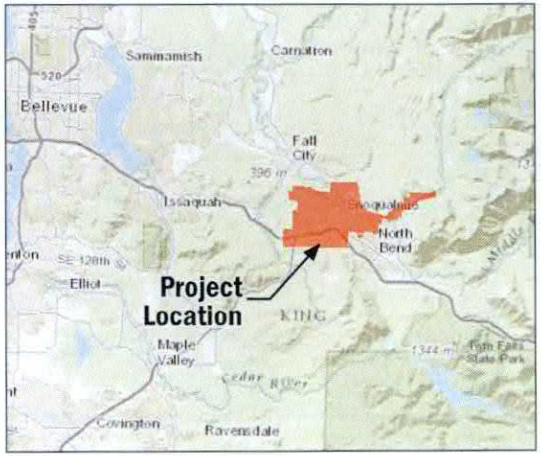
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PRELIMINARY - CITY REVIEW ONLY





- North Wellfield
- South Wellfield
- Decommissioned Well
- Canyon Springs
- City of Snoqualmie Water Service Area

N

0 7,000 14,000

Feet

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Water Source Locations

City of Snoqualmie
Snoqualmie, Washington

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The notice in the exact form annexed was published in regular issues of the Snoqualmie Valley Record (and not in supplement form) which was regularly distributed to its subscribers during the below stated period. The annexed notice, a:

Public Notice

was published on May 31, 2017 and June 7, 2017.

The full amount of the fee charged for said foregoing publication is the sum of $265.88.

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Legal Advertising Representative, Snoqualmie Valley Record
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DEPT OF ECOLOGY
NWRO - WR

GALE GWIN
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
08-13-2019

PUBLIC NOTICE #1883157
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
NOTICE OF APPLICATION TO CHANGE EXISTING WATER RIGHTS

TAKE NOTICE: That the CITY OF SNOQUALMIE, Washington, filed applications of change CG1-*00059S, CG1-*00060S, and CG1-20316C@1 for three ground water certificates on December 21, 2016. The applications request to change the allowable points of withdrawal. The proposed changes are to:

1. Ground Water Certificate G1-*00059SWRIS (91-D) for 90 gallons per minute (gpm) and 100 acre-feet per year (afy) for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E, W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
2. Ground Water Certificate G1-*00060SWRIS (92-D) for 90 gpm and 100 afy for municipal supply. The existing point of withdrawal is within the SW¼ SE¼ of Section 31, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.
3. Ground Water Certificate G1-20316C for 600 gpm and 500 afy for municipal supply. The existing points of withdrawal are within the NE¼ NW¼ of Section 32, T24N, R8E,W.M. The existing place of use is within the City of Snoqualmie Water Service Area described in the most recent Water System Plan.

The request is to change the points of withdrawal for Certificates G1-*00059SWRIS and G1-*00060SWRIS and to add points of withdrawal for Certificate G1-20316C. The proposed new points of withdrawal for the three certificates are all within NE¼ SE¼ of Section 19, T24N, R8E,W.M., the SE¼ SE¼ of Section 19, T24N, R8E,W.M., and the NE¼ NW¼ of Section 32, T24N, R8E,W.M, King County, Washington

No increase will be made to the instantaneous withdrawa rates or annual quantities, and no change to the place of use is requested.

Protests or objections to approval of this application must include a detailed statement of the basis for objections: protests must be accompanied with a fifty-dollar ($50.00) NON-REFUNDABLE recording fee (PLEASE REMIT CHECK OR MONEY ORDER ONLY) and filed with the Department of Ecology at the address shown below, within thirty (30) days from June 7, 2017.

DEPARTMENT OF ECOLOGY CASHIERING OFFICE - NWRO-WR
PO BOX 47611
OLYMPIA WA 98504-7611

Published in the Snoqualmie Valley Record on May 31, 2017 and June 7, 2017.

ACCOUNT NO. 417.13.423.594.34.41.070 AMT.

APPROVAL DATE 7/12/17

PRELIMINARY - CITY REVIEW ONLY

For Ecology Use
(Date Stamp) RECEIVED
DEC 21 2016
DEPT OF ECOLOGY
NWRO - WR

DEPARTMENT OF ECOLOGY
State of Washington

WATER RESOURCES
Application for Change/Transfer of a Water Right

You must include a $50.00 minimum filing fee with this application for:	
(Check all that apply.)	
☐ Change purpose(s) of use	
☐ Add purpose(s) of use	
☐ Change/transfer place of use	
☐ Change point(s) of diversion/withdrawal	
☒ Add point(s) of diversion/withdrawal	
☐ Other (i.e. consolidation, intertie, trust water)	
Explain:	

No filing fee is required for applications for:

- ☐ Drought
- ☒ Cost Reimbursement
- ☐ Water Conservancy Board

FOR OFFICIAL USE ONLY			
DATE APPLICATION RECEIVED			
CHECK NO.	NA	FEE $	
DATE ACCEPTED		BY	DB
CHANGE NO.	CG-20316C@1		
COUNTY	King	WRIA	7
SPECIAL AREA			
SEPA: ☑ EXEMPT ☐ NOT EXEMPT			
ECY CODING: 001-002-WR10285-000011			
APP NO.		PERMIT NO.	
CERT NO.		CERT OF CHG NO.	

☒ **I have completed a pre-application consultation with Ecology.**

1. Applicant Information

APPLICANT/BUSINESS NAME	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS		
PO Box 987		
CITY	STATE	ZIP CODE
Snoqualmie	WA	98065
EMAIL ADDRESS (IF AVAILABLE)		
ndavidson@ci.snoqualmie.wa.us		

CONTACT (IF DIFFERENT FROM ABOVE)	PHONE NO.	FAX NO.
Nancy Davidson	425-831-4919	
ADDRESS		
PO Box 987		
CITY	STATE	ZIP CODE
Snoqualmie	WA	98065
EMAIL ADDRESS (IF AVAILABLE)		
ndavidson@ci.snoqualmie.wa.us		

LEGAL LAND OWNER or PART OWNER OF PROPOSED PLACE OF USE	PHONE NO.	FAX NO.
City of Snoqualmie	425-831-4919	
ADDRESS		
P.O. Box 987		
CITY	STATE	ZIP CODE
Snoqualmie	WA	98065
EMAIL ADDRESS (IF AVAILABLE)		
ndavidson@ci.snoqualmie.wa.us		

2. Water Right Information

WATER RIGHT OR CLAIM NUMBER	RECORDED NAME(S)
G1-20316C	City of Snoqualmie

DO YOU OWN THE RIGHT TO BE CHANGED? ☒ YES ☐ NO

IF NO, PROVIDE OWNER(S) NAME and ADDRESS: _____

HAS THE WATER BEEN USED AS AUTHORIZED IN THE LAST FIVE (5) YEARS? ☐ YES ☒ NO

- Attach copies of any documentation that shows the historical use of water that has occurred since the right was established.
- If you have a water system plan or conservation plan, please include a copy with your application.

3. Point(s) of Diversion/Withdrawal:

A. Existing

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
South Wellfield	1R	NE	NW	32	24N	8E	3224089060	APM-025
South Wellfield	2	NE	NW	32	24N	8E	3224089060	AKC-585

B. Proposed (if different from 3.A.)

SOURCE	NO.	¼	¼	SEC.	TWP.	RGE.	PARCEL #	WELL TAG #
North Wellfield	6	NE	SE	19	24N	8E	1924089016	AFJ-079
North Wellfield	7	SE	SE	19	24N	8E	1924089016	AFJ-080
North Wellfield	8	NE	SE	19	24N	8E	1924089016	AFJ-250

C. DO YOU OWN THE EXISTING AND PROPOSED POINT(S) OF DIVERSION/WITHDRAWAL?

EXISTING: ☒ YES ☐ NO PROPOSED: ☒ YES ☐ NO – IF NO, PROVIDE OWNER NAME(S): _____

- Include copies of all associated water well reports.
- If you know the distances from the nearest section corner to the above point(s) of diversion/withdrawal, please include that information in Item No. 6 (remarks) or as an attachment.

4. Purpose of Use:

A. Existing

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
Municipal	600 gpm	500	Continuous

B. Proposed (if different from 4.A.)

PURPOSE OF USE	GPM or CFS	ACRE-FT/YR	PERIOD OF USE
No Change Proposed			

5. Place of Use:

A. Existing

LEGAL DESCRIPTION OF LANDS WHERE WATER IS PRESENTLY USED:							
The place of use of the water right is the service area described in the most recent City of Snoqualmie Water System Plan prepared by Gray & Osborne, Inc., February 2013, approved July 18, 2012.							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE EXISTING PLACE OF USE? ☐ YES ☒ NO

IF NO, PROVIDE OWNER NAME(S): The lands in the existing place of use are owned by various public and private property owners within the City of Snoqualmie water service area as shown in the City's adopted Water System Plan.

B. Proposed (if different than 5.A.)

LEGAL DESCRIPTION OF LANDS WHERE NEW USE IS PROPOSED:							
No Change Proposed							
¼	¼	SEC.	TWP.	RGE.	COUNTY	PARCEL #	# OF ACRES

DO YOU OWN ALL THE LANDS IN THE PROPOSED PLACE OF USE? ☐ YES ☐ NO

IF NO, PROVIDE OWNER NAME(S):

- Attach a detailed map of your proposed change/transfer. The map should show existing and proposed point(s) of diversion/withdrawal, place of use and any other features involved with this application.
- If platted property, please include a certified copy of the plat map.

D. Are there any additional water rights or claims related to the same property as the one proposed for change/transfer?

☒ YES ☐ NO – IF YES, PROVIDE THE WATER RIGHT/CLAIM NUMBER(S): 4553 (S1-*06205CWRIS), 91-D (G1-*00059SWRIS), 92-D (G1-*00060SWRIS), G1-25449P

6. Remarks and Other Relevant Information:

A copy of the most recent Water System Plan has been submitted with this application.
Additional information on use of this water right will be submitted separately to support cost-reimbursement processing.

IF FOR SEASONAL OR TEMPORARY, START DATE ___/___/____ END DATE ___/___/____

Certain applications may incur a Real Estate Excise Tax liability for the seller of the water rights. The Department of Revenue has requested notification of potential taxable water right related actions and therefore may be provided with a copy of this request. For further information, contact:

Department of Revenue
Real Estate Excise Tax
PO Box 47477
Olympia, WA 98504-7477

Phone (360) 570-3265

7. Signatures:

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I hereby grant staff from the Department of Ecology or the County Conservancy Board access to the above site(s) for inspection and monitoring purposes. If assisted in preparing this above application, I understand that all responsibility for the accuracy of the information rests with me.

Matthew R. Larson, Mayor Applicant Printed Name – Title	Applicant Signature	12/19/2016 (Date: MM/DD/YYYY)
Matthew R. Larson, Mayor Water Right Holder Printed Name	Water Right Holder Signature	12/19/2016 (Date: MM/DD/YYYY)
Land Owner of Existing Place of Use Printed Name	Land Owner of Existing Place of Use Signature	(Date: MM/DD/YYYY)
Land Owner of Proposed Place of Use Printed Name	Land Owner of Proposed Place of Use Signature	(Date: MM/DD/YYYY)

***Submit your application to:** DEPARTMENT OF ECOLOGY CASHIERING SECTION PO BOX 47611 OLYMPIA, WA 98504-7611	☐ Central Regional Office 1250 W. Alder Street Union Gap, WA 98903-0009 (509) 575-2490	☐ Eastern Regional Office 4601 N. Monroe Street Spokane, WA 99205-1265 (509) 329-3400
	☒ Northwest Regional Office 3190 – 160th Avenue SE Bellevue, WA 98008-5452 (425) 649-7000	☐ Southwest Regional Office PO Box 47775 Olympia, WA 98504-7775 (360) 407-6300

G1-20316C

PRELIMINARY - CITY REVIEW ONLY

WASHINGTON STATE DEPARTMENT OF ECOLOGY

DEPARTMENT OF ECOLOGY

RECEIVED
MAR 0 2 2001
DEPT OF ECOLOGY

Showing of Compliance with RCW 90.44.100(3)

Water Right Certificate or Permit Number: Cert. # G1-20316C Permit # G1-20316P

Parcel tax identification number: _____

Landowner(s) name: Snoqualmie Valley School District #410

Part of complying with RCW 90.44.100(3) is for the project proponent to notify the Department of Ecology (Ecology) that the statutory criteria of RCW 90.44.100(3) have been satisfied. Please attach to this document the water well report for the additional or replacement well and any additional information you have to support your affidavit.

Affidavit:

I, Kirk Holmes, do certify that I caused the well described in the attached water well report to be drilled as an additional or replacement well(s) for use under Water Right Number G1-20316P. This notice and attached documents describe and support my assertion that the replacement or additional well(s) complies with RCW 90.44.100(3) (a-g) and RCW 90.44.100(4):

a. The well is an additional or replacement well(s) that will tap the same body of public ground water as the original well;
b. If a replacement well is constructed, the use of the original well(s) shall be discontinued and the original well(s) shall be properly decommissioned;
c. The combined withdrawal of water from the additional or replacement well(s) and the original well authorized by the water right certificate does not enlarge the water right conveyed by the original water right certificate to the extent the certificate has been developed (perfected) and maintained by use of water;
d. The construction and use of the additional or replacement well(s) does not interfere with or impair water rights with an earlier priority date;
e. The additional or replacement well(s) is located no closer than the original well to a well or surface water body it might interfere with;
f. A specified manner of construction for the additional or replacement well(s) has been complied with, if required, and the new well was constructed in compliance with chapter 18.104 RCW and chapter 173-160 WAC;
g. The additional or replacement well(s) is located within the area described as the point of withdrawal in the public notice published for the original application for water right, or the most current legal description published for the right. Both the original well and the additional or replacement well(s) are located in SE1/4, NW1/4, Sec 32, T24, R8E in King County (legal description).

Therefore the well is in compliance with the requirements for a statutorily granted amendment to the water right permit or certificate.

PRELIMINARY - CITY REVIEW ONLY

I understand the acceptance of this affidavit, and any attachments, by the Department of Ecology shall not be construed as affirming the validity of any water right permit or certificate. The responsibility to comply with RCW 90.44.100(3) is with the water right permit or certificate holder asserting an amendment pursuant to RCW 90.44.100(3).

Kirk S. Hale
Name

2/28/01
Date

Acknowledgement:

State of Washington
County of King

I certify that I know or have satisfactory evidence that _____ *is the person who appeared before me, and said person acknowledged that (he/she) signed this affidavit and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the affidavit.*

Dated: 2/28/01

(Seal or Stamp)
Notary Public
State of Washington
LORAINE K. NEAL
My Appointment Expires Apr 6, 2002

Loraine K. Neal
(Signature)
Moses Lake, WA.
Residing in
Senior Account Clerk
Title
My appointment expires: April 6, 2002

If you have any questions please contact the Water Resources Section of the closest regional office. Please submit copies of new well logs and decommissioned well logs along with this completed and notarized form to the nearest regional office.

Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452
(425) 649-7000; TDD (425) 649-4259

Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775
(360) 407-6300; TDD (360) 407-6306

Eastern Regional Office
N. 4601 Monroe, Suite 202
Spokane, WA 99205-1295
(509) 456-2926; TDD (509) 458-2055

Central Regional Office
15 W. Yakima Ave., Suite 200
Yakima, WA 98902-3452
(509) 575-2597; TDD (509) 454-7673

Vancouver Field Office
2108 Grand Boulevard
Vancouver, WA 98661-4622
(360) 690-7171; TDD (360) 690-7147

Nooksack Field Office
1204 Railroad Ave., Suite 200
Bellingham, WA 98225
(360) 738-6250; TDD (425) 649-4259

G-20316C

Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

PRELIMINARY CITY REVIEW ONLY

24/8E/32F

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 24/8E-32F
Permit No G-120316F

(1) OWNER: Name TOWN of SNOQUALMIE Address TOWN Hall SNOQUALMIE WA 98065

(2) LOCATION OF WELL: County KING SE¼ NW¼ Sec. 32 T 24 N., R 8 E W.M.
Bearing and distance from section or subdivision corner S40' W & 1260'N of ¢ Sec. 32

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 544 ft. Depth of completed well 544 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 16" Diam. from 0 ft. to 98.8 ft.
Threaded ☐ 12" Diam. from 98.8 ft. to 434.7 ft.
Welded ☐ 8" Diam. from 434.7 ft. to 544 ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type Model No.
Diam. 8 Slot size 60 from 516 ft. to 527 ft.
Diam. 8 Slot size 50 from 527 ft. to 539 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ ? No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Line Shaft TURBINE
Type: GMC DIESEL H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level 46 ft. below top of well Date 5-11-73
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Story Armstrong
Yield: 600 gal./min. with 179 ft. drawdown after 11:50 hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

MATERIAL	FROM	TO
Brn clay	0	20
Blue Sand - Silt	20	50
Blue Silty Sand	50	100
Blue Silt	100	140
Blue Silty clay	140	190
Blue Silty clay	190	240
Blue silty clay	240	245
fine Silty Sand Little H2O	245	255
Stiff Blue clay	255	265
Sandy Blue clay	265	340
Silty Sandy Blue clay	340	375
Fine Silty Sand Little H2O	375	430
Silty Sand Some water	430	445
Sand & Some Gravel	445	470
Sand & Gravel W clay Binder	470	490
Coarse Gravel & Sand	490	500
Glacial Till	500	515
Sand & Gravel	515	530
Sand & Gravel	530	544

Work started 4-4, 1973. Completed 4-26, 1973

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Story Armstrong
(Person, firm, or corporation) (Type or print)

Address

[Signed]
(Well Driller)

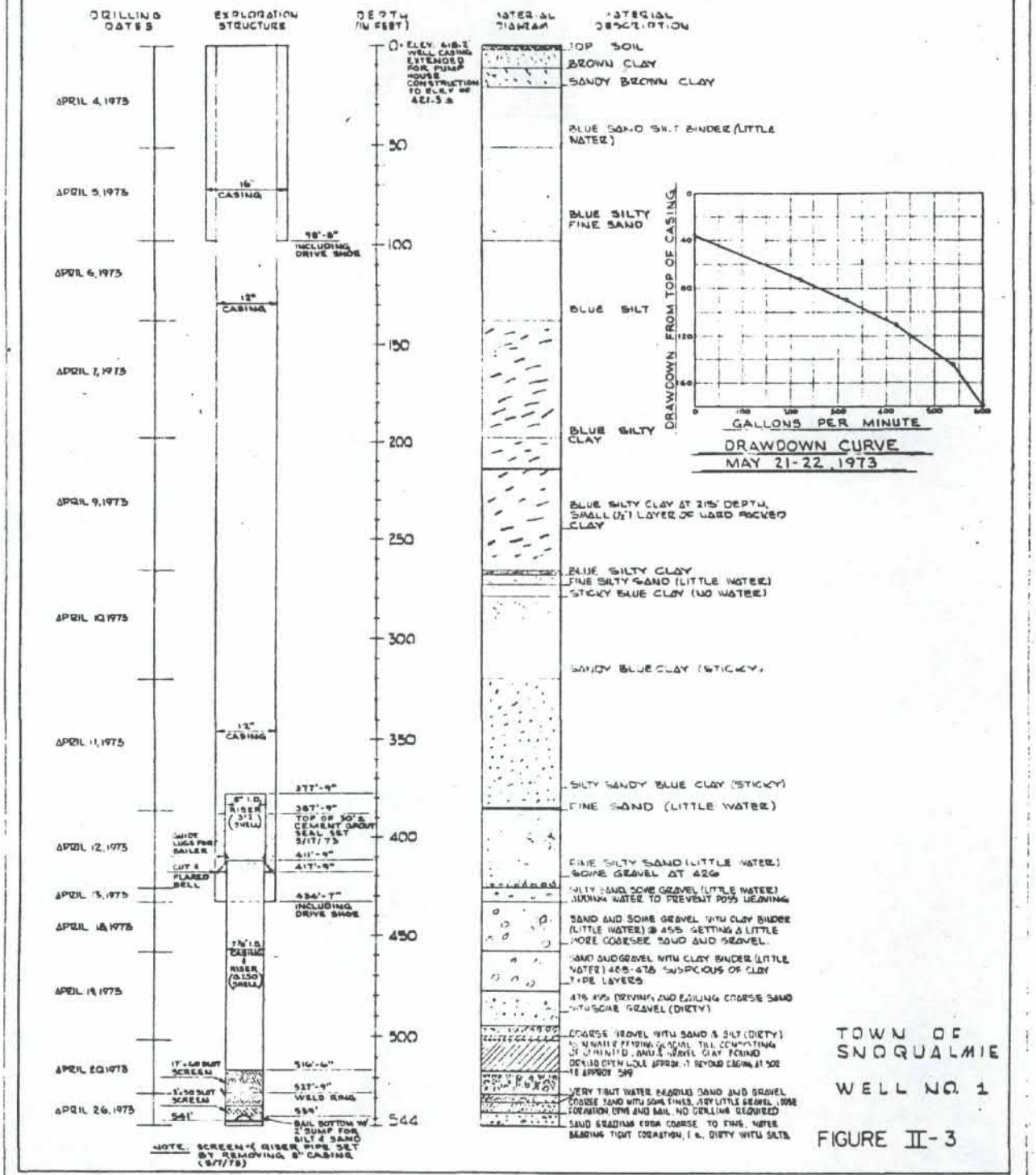
License No. Date, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

(Exhibit 1)

PRELIMINARY - CITY REVIEW ONLY

G1-28316C



TOWN OF SNOQUALMIE

WELL NO. 1

FIGURE II-3

PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

☐ *Surface Water* (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ *Ground Water* (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

CERTIFICATE NUMBER	PERMIT NUMBER	APPLICATION NUMBER	PRIORITY DATE
G1-20316C	G1-20316P	G1-20316	October 13, 1972

NAME
TOWN OF SNOQUALMIE

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
Town Hall	Snoqualmie	Washington	98065

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
A well - 12"x400'

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	600.0	500.0

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal Supply - continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
840 feet West and 1290 feet North of the center of Sec. 32

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼NW¼	32	24	8 E.	7	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY WATER TO BE USED ON

Area served by Town of Snoqualmie.

PROVISIONS

PRELIMINARY - CITY REVIEW ONLY

Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Olympia, Washington, this 30th *day of* April, *19* 75.

JOHN A. BIGGS, *Director*
Department of Ecology

by R. Jerry Bollen
R. JERRY BOLLEN, Assistant Director

ENGINEERING DATA

OK. [illegible]

FOR COUNTY USE ONLY

PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PROOF OF APPROPRIATION OF WATER

APPLICATION NUMBER: G1-20316	PERMIT NUMBER: G1-20316-P

NAME OF PERMITTEE
Town of Snoqualmie, A Municipality

POST OFFICE ADDRESS (CITY) (STATE) (ZIP CODE)
Town Hall, 210 River Street, Snoqualmie, Washington 98065

ACTUAL SOURCE OF APPROPRIATION
Ground Water Well

PURPOSE OR PURPOSES WATER IS USED FOR
Municipal Supply

DATE WATER WAS COMPLETELY APPLIED TO PERMITTED USE: August 20, 1974	IF USED FOR IRRIGATION: NUMBER OF ACRES ACTUALLY IRRIGATED: N/A
IF SOURCE IS A WELL, IS AN ACCESS PORT NOW INSTALLED: [X] YES [ ] NO	MONTHS DURING WHICH WATER IS USED: Continuous

PUMP SIZE
75 Hp Motor, Pump Capacity 550 GPM @ 360' TDH

ACTUAL AMOUNT WITHDRAWN OR DIVERTED FROM PERMANENT SYSTEM
550 [X] GPM [ ] CFS

HAVE ALL PROVISIONS AS REQUIRED BY PERMIT BEEN ACCOMPLISHED: [X] YES [ ] NO	IF NO, EXPLAIN

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS USED (USE ADDITIONAL SHEET IF NECESSARY)

Area served by Town of Snoqualmie

OK for certificate
issue as per corrected Permit (600gal/min)
PMS 4-10-75

STATE OF WASHINGTON,
County of KING } ss.

I, Ronald R. Cook, P.E., being first duly sworn, depose and say that I have read the above and foregoing proof of appropriation; that I know the contents thereof; and that the facts therein stated are true.

IN WITNESS WHEREOF, I have hereunto set my hand this 25 day of February, 1975.

Ronald R. Cook
Permittee Signature
GRAY & OSBORNE, INC., P.S.

Subscribed and sworn to before me this 25th day of February, 1975.

Bonnie M. Smith
Notary Public

ECY 070-25

P/A

PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ SURFACE WATER ☒ GROUND WATER

PERMIT NUMBER	APPLICATION NUMBER	PRIORITY DATE	
G1-20316P	G1-20316	October 13, 1972	

NAME
TOWN OF SNOQUALMIE

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
Town Hall	Snoqualmie	Washington	98065

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
A well 12"x400'

TRIBUTARY OF (IF SURFACE WATERS)

600 GPM as per well test data 4-10-75

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	~~1,000~~ gallons per minute	500.0 acre-feet per year

QUANTITY, TYPE OF USE, PERIOD OF USE
Municipal supply

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
840 feet west and 1290 feet north of the center of Sec. 32

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SE¼NW¼	32	24	8 E.	7	King

RECORDED PLATTED PROPERTY

LOT	BLOCK
OF (GIVE NAME OF PLAT OR ADDITION)	LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)

SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	COUNTY

LEGAL DESCRIPTION OF PROPERTY WATER TO BE USED ON

Area served by Town of Snoqualmie.

CONTINUE ON REVERSE SIDE

PRELIMINARY - CITY REVIEW ONLY

DESCRIPTION OF PROPOSED WORKS

DEVELOPMENT SCHEDULE

BEGINNING DATE	COMPLETION DATE	DATE COMPLETE APPLICATION OF WATER TO BE MADE
Started	November 1, 1974	November 1, 1975

PROVISIONS

The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The applicant may, for his own convenience, wish to install an airline and gage in addition to the access port.

Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Olympia, Washington, this 23rd *day of* October, *19* 73.

JOHN A. BIGGS, *Director*
Department of Ecology

ENGINEERING DATA
OK ....

by R. JERRY BOLLEN
Assistant Director

PRELIMINARY - CITY REVIEW ONLY

Report of Examination on Ground Water

Received date October 13, 1972 Date of exam. April 11, 1973 Appli. No. G1-20316

Name Town of Snoqualmie Address Town Hall, Snoqualmie, WA 98065

Type of works a well Dimensions 12"x400'

Progress of works Being drilled

Quantity applied for 1,000 g.p.m. 500 acre-feet per year

Legal sub. SE¼NW¼ Sec. 32 Twp. 24 Rge. 8 E. County King

Use Municipal Supply

Irrigation-acreage: Present Planned - Feasible

Municipal: Population 3,600 as of 2020

Industrial

Time pump will be operated Continuously

Other water rights appurtenant to this land S.W.C. 4553, G.W. Declarations 91-D and 92-D

Proximity to existing works, springs, wells, or streams None

Area Sub-area Zone

RECOMMENDATIONS

Approved for 1,000 g.p.m. 500 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

This application is approved for 1,000 gallons per minute with an annual quantity of 500 acre-feet per year and shall be supplemental to Ground Water Declarations 91-D, 92-D and Surface Water Certificate 4553.

Applicant is advised that notice of proof of appropriation of water (under which final certificate of water right issues) should not be filed until the permanent diversion facilities have been installed together with a mainline system capable of delivering the recommended quantity of water to an existing or proposed distribution system within the area to be served.

PRELIMINARY - CITY REVIEW ONLY

Use of the waters to be appropriated under this application will be for a public water supply. State Board of Health rules require every owner of a public water supply to obtain written approval from the Assistant Secretary, Division of Health prior to any new construction or alterations of a public water supply. The applicant is advised to contact the Washington State Division of Health, Public Health Building No. 4, Thurston Airdustrial Center, Olympia, with regard to the need for compliance.

It is noted that the well site and/or water transmission facilities are not wholly located upon the land owned by the applicant. Applicant is, accordingly, advised that the issuance of permit by this Department for appropriation of the waters in question does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtainment of such right is a private matter between applicant and owner of that land.

"The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The applicant may, for his own convenience, wish to install an airline and gage in addition to the access port."

Additionally, the permit when issued shall carry the following provision: "Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971."

Signed at Redmond, Washington,

this 2 day of May, 1973.

Herman H. Huggins, Jr.

HERMAN H. HUGGINS, JR.
Hydraulics Engineer
Department of Ecology

S. F. No. 370-B—OS—(Rev. 7-70).

PRELIMINARY - CITY REVIEW ONLY

$100.00 examination fee should accompany each application.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PRIORITY
Date 10/13/22
Time 10:00 AM
Accepted [illegible]

APPLICATION FOR A PERMIT

To Appropriate Public Ground Waters
OF THE STATE OF WASHINGTON

Application No. G. W. G120316

I, Town of Snoqualmie
(Name of applicant)

of Town Hall, Snoqualmie, Washington 98065
(Complete post office address)

do hereby make application for a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights. This application is made under the provisions of Chap. 263 of the Session Laws of 1945, and amendments thereto of the State of Washington and subject to the rules and regulations of the Department of Ecology.

1. *The proposed appropriation will be from* a well
(Well, tunnel, infiltration trench)

located within the Town limits of the Town of Snoqualmie
(Give approximate distance and direction from nearest city or town)

Area (Leave blank) *Sub-area* (Leave blank)

Zone (Leave blank)

Applicant's name or number of well or other works, if any Well No. 1

2. *The quantity of water which applicant intends to withdraw for beneficial use is* ~~approx~~. 1,000 *gallons per minute;* 500 *acre feet per year.*

3. *The use or uses to which water is to be applied* ~~is for~~ municipal supply
(Domestic supply, irrigation, municipal, manufacturing, industrial use, etc.)

4. *The time during which water will be required each year* continuously all twelve months

5. *Location of well or other works for withdrawal of water: In county of* King

To be verified by field examiner or dnp

(a) ~~1800' East & 1350' South of the NW Corner of Section 32~~ 840' west and 1290' north of the center of Sec. 32
(Give distance and bearing from nearest corner of section or legal subdivision)

being within the SE 1/4 NW 1/4 (Give smallest legal subdivision) *of Sec.* 32, *Twp.* 24 N., *Rge.* 8 E. (E. or W.)

or (b) *If within limits of recorded platted property, town or city: Lot* , *Block* ,

of (Give name of plat or addition) (If within town or city, give name)

(c) *Show this location on accompanying section plat. Other adequate maps or drawings will be acceptable.* Enclosed: (a) Aerial Photo with Marked Well Site
(b) Quadrangle with Marked Well Site
(c) Sketch of Well Site 1" = 200'

PRELIMINARY - CITY REVIEW ONLY

6. DESCRIPTION OF WORKS:

(a) Well will be drilled *(Dug or drilled) and have a diameter of* approx. 24 *inches and an estimated depth of* 300 *feet.*

(b) Tunnels or trenches to be described: (Attach additional sheets if needed for full description.)

(c) Distribution system to be described:

Pump discharge line from well to be approximately 10" diameter extending northerly to S.E. 2nd Street (Park Street) where discharge line will be connected to existing 10" wood stave supply main for Town.

(d) If pumps are to be used, give size and type:

Deep well turbine, size to be determined.

(e) Give capacity and type of motor or engine to be used:

Electric hollow shaft motor or a submersible motor, size to be determined

(f) If the location of the well, tunnel, or other works is less than one-fourth mile from a natural stream or stream channel, give the distance to the nearest point on each of such channels and the difference in elevation between the stream bed and the ground surface at the source of development:

Snoqualmie River (South Bank) located approximately 400 feet north of proposed well site with stream bed approximately 15 feet lower in elevation.

East fork Kimball Creek, located S 35° E approximately 1200 feet with stream bed approximately 10 feet lower in elevation.

(g) Ownership of each existing well or other works from which ground water is withdrawn within a radius of one-quarter mile and the distance and direction from well or other works being reported herein:

(Name)	(Direction)	(Distance)
None of Record		

SUPPLY THE FOLLOWING INFORMATION ACCORDING TO USE PROPOSED:

7. *For Municipal Supply: To supply the ~~xity~~, town, or ~~xxxxxxity~~ of* Snoqualmie *, in the county of* King *, having a present population of* 1,260 *, and an estimated population of* 3,600 *, in* 2020.

8. *For Irrigation: Number of acres to be irrigated* ____ *acres.*

Not applicable

PRELIMINARY - CITY REVIEW ONLY

9. *Legal Description of Property on which water is to be used for all purposes other than municipal supply:*

(Copy legal description from deed)
(If more space is required, attach separate sheet)

~~Not applicable~~
Area served by Town of Snoqualmie

(On accompanying plat show location of the existing wells or works)

10. *What interest do you have in the above described property?* Option to lease property from school
(Owner, lessee, contract buyer, etc.)

11. *Do you have any other water rights appurtenant to the above described property?* yes None
If so, from what source? Surface water Cert. 4553 (in file) and Ground Water Certs. 91-D and 92-D. 10/20/72 DKS

12. *Construction work will begin on or before* December 1, 1972

13. *Construction work will be completed on or before* March 1, 1973

14. *Water will be put to complete beneficial use on or before* July 1, 1973

Roy Anderson
(Signature of applicant)
TOWN OF SNOQUALMIE

15. *Name and address of owner of land on which well or works are located:*

Snoqualmie Valley Sch. Dist #410 (Name) P.O. Box 400 - Snoqualmie (Address)

R. M. Hoff, Chairman #410
(Signature of legal landowner)

Signed in the presence of us as witnesses:

Robert S. Jones (Name) Box N, Snoqualmie, Wn. (Address of witness)

Robert H. Akerman (Name) Rt 1 Box 204 Snoqualmie (Address of witness)

STATE OF WASHINGTON,
COUNTY OF THURSTON. } *ss.*

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for correction or completion as follows:

In order to retain its priority, this application must be returned to the Department of Ecology, with corrections, on or before ....., *19*.....

WITNESS my hand this ..... *day of* ....., *19*.....

Department of Ecology.

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PRELIMINARY - CITY REVIEW ONLY

Permit G1-25449P

North Wellfield

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PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
May 30, 1989	G1-25449	G1-25449 P	

NAME
Weyerhaeuser Real Estate Company

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
QBI	Tacoma	Washington	98447

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well Field

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	1650	724

QUANTITY, TYPE OF USE, PERIOD OF USE

Community domestic and irrigation

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION–WITHDRAWAL
TW-6: 1500 feet North and 800 feet West of SE Corner Section 19
TW-7: 970 feet North and 660 feet West of the SE corner of Section 19

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼ SE¼ and SE¼ SE¼	19	24N	8E	7	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

noqualmie Ridge and Snoqualmie Falls planning areas as defined in the City of Snoqualmie Comprehensive
/ater System Plan, with an emergency fire flow intertie for the area served by the City of Snoqualmie.

PRELIMINARY - CITY REVIEW ONLY

DESCRIPTION OF PROPOSED WORKS

North well field with three production wells and several observation wells.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	September 29, 2015	September 29, 2020

PROVISIONS

Installation and maintenance of an access port as described in Ground Water Bulletin No. 1 is required. An air line and gauge may be installed in addition to the access port.

This permit is subject to the implementation of the minimum requirements established in the Conservation Planning Requirements: Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs, March 1994.

An approved measuring device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508-64-020 through 508-64-040 (Installation, operation and maintenance requirements.) Meter readings shall be recorded monthly and this data shall be maintained and be made available to the Department of Ecology upon request.

In order to monitor the resource, static water level (SWL) shall be measured at least once each month. Measurements shall be taken after the pump has been shut off and the water level in the well has been stabilized. The data shall be maintained and made available to Ecology upon request. However, Ecology's Water Resources Section (NWRO) shall be notified if the SWL is determined to be below the level normally recorded at that time of year.

The amount of water granted is a maximum limit that shall not be exceeded. Upon perfection of the water right, a certificate will be issued only for that amount of water that is beneficially used under the terms of the permit.

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Bellevue, Washington,

this 29th day of September, 1995.

Department of Ecology

ENGINEERING DATA
OK KW

by _____
Raymond K. Hellwig, Regional Supervisor, Shorelands & Water Resources

PERMIT

PRELIMINARY - CITY REVIEW ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
May 30, 1989	G1-25449		

NAME
Weyerhaeuser Real Estate Company

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
QBI	Tacoma	Washington	98477

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well Field

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	1650	724

QUANTITY, TYPE OF USE, PERIOD OF USE
Community domestic and irrigation

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL
TW-6: 1500 feet N and 800 feet W of SE Corner Section 19
TW-7: 970 feet N and 660 feet W of the SE corner of Section 19

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼SE¼ and SE¼SE¼	19	24N	8E	7	King

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Snoqualmie Ridge and Snoqualmie Falls planning areas as defined in the City of Snoqualmie Comprehensive Water System Plan, with an emergency fire flow intertie for the area served by the City of Snoqualmie.

PRELIMINARY - CITY REVIEW ONLY

North well field with three production wells and several observation wells.

DEVELOPMENT SCHEDULE		
BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	2015	2020

REPORT

BACKGROUND

Ground Water Application G1-25449 was filed to supply the Snoqualmie Ridge development. The applicant is Weyerhaeuser Real Estate Company (WRECO), priority Date: May 30, 1989, with the proposed use being community domestic supply and irrigation.

Legal Notice: Valley Record on November 16 and 23, 1989.
Protests were received from Mr. Philip Cassady, Mr. William D Kohlschmidt, and Ms. Mary S. Kohlschmidt.

The applicant is proposing development of the well field, water distribution system and then conveying the system to the City of Snoqualmie. WRECO must demonstrate that water can be provided to serve the Snoqualmie Ridge development prior to approval of development plans by the City. Currently, WRECO and the City of Snoqualmie are negotiating the terms of a developer extension agreement. At the present time, the water application is for Snoqualmie Ridge, with plans for an emergency fire flow intertie with the City's system.

Two primary aquifers have been identified in the area, known as the deep and shallow aquifers. Due to the semi-confining leaky conditions of the aquitards, pumping in the deep aquifer will induce leakage from the secondary aquifer which will in turn induce leakage from the shallow aquifer. Thus pumping in the Snohomish River North Valley Well Field (SRNVWF) will hydraulically affect the shallow aquifer and decrease surface water discharge to Tokul Creek and the Snoqualmie River above and below Snoqualmie Falls.

In 1979 minimum instream flow requirements were enacted by the State for control points on the Snoqualmie River near Snoqualmie and Carnation. Analysis of flow records for these gages indicate that flows on the Snoqualmie River near Carnation and Snoqualmie did not meet instream flows an average of 112 and 114 days per year, respectively, based on 1979-1992 data.

Applicant's proposal includes the reintroduction of treated effluent into the River just above the Falls. The net effect of this added water will, more than likely, offset any net decrease in Snoqualmie River flows below the point of introduction. There will, however, still likely be some decrease in upstream flows as a result of decreased ground water in that area.

INVESTIGATION

Investigation consisted of:

Office research, conversations and meetings with the applicant and/or representatives of the applicant.

Approximate location of point of withdrawal:

TW-6: 1,320 feet north and 660 feet west of the SE¼ corner of Section 19, T. 24 N., R. 8 ., E.W.M., within King County. Well head is 452 feet above mean sea level (MSL)

TW-7: 970 feet north and 660 feet west of the SE¼ corner of Section 19, T. 24 N., R. 8 ., E.W.M., within King County. Well head is 436 feet above MSL.

PRELIMINARY - CITY REVIEW ONLY

Aquifer geohydrology

The target aquifer of the SRNVWF is interpreted to be an Olympian age fluvial system. This system was deposited within a deep incised bedrock valley that was subsequently filled by non-glacial and Pleistocene age glacial deposits. This buried valley or paleo-channel trends northwesterly from the SRNVWF toward Tokul Creek directly north of Snoqualmie Falls. The Olympian age non-glacial fluvial deposits directly overlie the bedrock and in turn are overlain by Vashon Advance, Vashon Subglacial, and Vashon Recessional Delta glacial deposits. The Vashon glacial units are overlain by pre-historic Lake Snoqualmie deposits which are in turn overlain by Recent Snoqualmie River deposits. However in the vicinity of the SRNVWF the upper two units are missing as the Vashon Recessional Delta deposits are very thick in this area and toward the northwest to Tokul Creek.

Two primary aquifers have been identified, known as the deep and shallow aquifers. The deep aquifer occurs within the Olympian age fluvial deposits and ranges from about 50 to 70 feet thick in the vicinity of the SRNVWF. The shallow aquifer occurs within the Vashon recessional deltaic deposits and is about 140 feet thick at the SRNVWF. These aquifers are separated by Vashon advance and Vashon subglacial deposits. A secondary aquifer was identified within Vashon advance deposits between the deep and shallow aquifers and ranges from 60 feet to over 120 feet thick at the SRNVWF. The aquifers are separated by semi-confining aquitards of varying thicknesses and permeabilities. The aquitard directly overlying the deep aquifer consists of 50 to 70 feet of clayey silt which pinches-out to the south and east. Undifferentiated Vashon subglacial deposits directly overlie the secondary aquifer and act as a semi-confining aquitard.

The shallow aquifer discharges in the vicinity of SR 202 and Tokul Creek, and contributes about 5.0 cfs to Tokul Creek instream flows based on stream measurements in 1992, a "draught year" when the stream flow was about 25 cfs. Due to the semi-confining leaky conditions of the aquitards, pumping in the deep aquifer will induce leakage from the secondary aquifer which will in turn induce leakage from the shallow aquifer. Thus pumping in the SRNVWF will hydraulically affect the shallow aquifer and decrease surface water discharge to Tokul Creek and the Snoqualmie River above and below Snoqualmie Falls.

Well characteristics:

Two of three planned wells are constructed.

TW-6 has 20 inch diameter casing set to 398 feet below surface. 16 inch casing set to 540 feet below surface. 8 inch diameter screen is set from 492 feet below surface to about 580 feet below surface. Top of casing is about elevation 422 feet above MSL. Screened from 534 to 580 feet below surface with 8 inch diameter, 30 slot screen. Static water level (SWL) 170 feet below top of casing (approximately 260 feet above MSL) on November 5, 1989.

TW-7 has 20 inch diameter casing set to 415 feet below surface. 16 inch casing set to 527 feet blow surface. 10 inch diameter screen is set from 517 feet below surface to 556. Final screened interval is 29 feet. Static water level 150.1 on May 13, 1994; 149.6 on May 26, 1994; 149.6 on June 7, 1994.

Pump test results:

A preliminary permit to pump and test (TW-6) the aquifer was issued on September 7, 1989. Another preliminary permit was issued on November 1, 1993. A memorandum to the file dated April 7, 1992 documents results of the initial pump test. Pump test results (TW-6) are documented in a report "Proposed Snoqualmie Ridge North Valley Well Field", King County Washington, Hydrogeology and Pump Test Data, Project No. 8607-14W, January 23, 1990, by Associated Earth Sciences, Inc. Highlights of the test are summarized as follows. A 44 hour test on was preformed in November of 1989 at a constant rate of 500 gallons per minute (gpm). Drawdown was 227.7 feet in TW-6 and 27.5 feet in observation well TW-5 located 144 feet to the south. Drawdown of 3.9 feet was observed in a well (the gravel pit 8 inch well) 2,500 feet to the east of TW-6. No drawdown in OBW-1, 111 feet away or OBW-2 located 18 feet away. Both of the observation wells are located in the shallower, water table aquifer.

Pump test results (TW-7) are documented in a report "Snoqualmie Ridge North Valley Well Field, Hydrogeologic Evaluation Ground Water Application G1-25449, Snoqualmie, Washington", Project No. W93199K, October 1994 by Associated Earth Sciences, Inc. Two constant rate tests and a step rate drawdown test were conducted on TW-7. Highlights of the test are summarized as follows. A 24 hour constant rate test was preformed on May 26, 1994 at a rate of 500 gpm. Drawdown was 254 feet in TW-7, TW-5's (located 275 feet northeast of TW-7) drawdown was 30.3 feet, and TW-6's (located 370 feet north of TW-7) was 22.5 feet. Observation wells located in the shallower, water table aquifer did not show measurable effects.

PRELIMINARY - CITY REVIEW ONLY

An 8 day constant rate test was conducted with TW-6 and TW-7 in June of 1994. Combined discharge was about 1040 gpm. The total discharge was nearly 12 million gallons. Monitoring wells were located in both the deep and shallow aquifers. Drawdown in the shallow aquifer ranged from 0.1 to 0.2 feet in well EB-C1W and 1.2 feet in the SS&G 3 Well.

Associated Earth Sciences, Inc. (AESI) produced an October 1994 report addressing the potential effects associated with the proposed SRNVWF withdrawal above Snoqualmie Falls. Potential impacts to instream flows due to pumping were evaluated with a ground water flow model (MODFLOW). The simulations indicated a potential reduction of 50 to 55 gpm in Tokul Creek as a result of a 425 gpm average annual rate in the SRNVWF wells. The report stated that, "No measurable impact to instream flow (presumably the Snoqualmie River) is anticipated due to pumping..." Based on the model output presented in the report's Table 6, however, it appears that additional impacts to river flows are likely. Specifically, the table suggests that of 425 gpm pumped from the deep aquifer, 210 gpm would come from increased aquifer inflow, and 160 gpm come from decreased outflow for the modeled area. A 210 gpm inflow increase would ultimately lead to a reduction in the up-gradient ground water and this, in turn, would lead to decreased Snoqualmie River flows up gradient of the modeled area. Similarly a 160 gpm outflow decrease would lead to a reduction in the down-gradient ground water, and this may also lead to decreased downstream River flows.

Mitigation

The applicant has proposed mitigation of predicted impacts to Tokul Creek flows by dedicating a portion of Water Right Certificate Record No. 1, Page 180 to instream flows through the Trust Water Rights program. An Application for Change of water has been filed. If water is not developed pursuant to this application, no change of Water Right Certificate Record No. 1, Page 180 be done. The application for change will be rejected. If water is developed pursuant to the application, the transfer of water to the instream flow program must be in place prior to water use.

Pumping from the deep aquifer may capture ground water that would otherwise enter the Snoqualmie River below Snoqualmie Falls by upwelling beyond the paleo-snoqualmie River valley passing to the north around Snoqualmie Falls. The applicant's proposal, however, includes the reintroduction of treated effluent into the River just above the Falls. The net effect of this added water will, more than likely, offset any net decrease in Snoqualmie River flows below the point of introduction.

Impairment to existing rights:

Protests

Two protests were filed. One protestant is concerned about water rights for a spring located north of Tokul Creek. The other is concerned about local wells in the upland about one mile east of the well field. The water sources for both of these protestants are from perched aquifers in glacial deposits above the shallow aquifer. There does not appear to be any hydraulic continuity between these sources. It is unlikely that they would be adversely affected by the applicant's water development.

There are several other ground water users in the area which did not file protests to the Weyerhaeuser's application. The analyses performed by AESI suggests that while these neighboring wells will experience head loss due to SRNVWF pumping, these wells have sufficient remaining head to meet their current pumping rates.

In 1979 minimum instream flow requirements were enacted by the State for control points on the Snoqualmie River near Snoqualmie and Carnation. Current, long-term flow records for these gages were analyzed in the March 1995 draft entitled, "Initial Watershed Assessment, Water Resources Inventory Area 7, Snohomish River Watershed" by Pacific Groundwater Group. This report indicates that flows on the Snoqualmie River near Carnation and Snoqualmie did not meet instream flows an average of 112 and 114 days per year, respectively, based on 1979-1992 data. The report also suggests that annual flows at both these locations may be declining, but that the methods used were inadequate to accurately quantify the rate and amount of reduction. The report included analyses of minimum daily flows for these gages, but it qualified its analyses by stating that they were done only on a simple visual basis. The report concluded that flows in the Snoqualmie River near Snoqualmie may have been lower since 1985 than in the past, but that the level of analysis was inadequate to conclude whether or not minimum flows were declining independent of natural climatic variations. With respect to flows in the Snoqualmie River near Carnation, there appeared to be no clear trend in minimum instream flows.

PRELIMINARY - CITY REVIEW ONLY

Annual allocation:

Water requirements for Snoqualmie Ridge were estimated based on land use plans and water demand forecasts in the April 1995 Snoqualmie Ridge Mixed Use Final Plan, Draft Supplemental Environmental Impact Statement. The development includes a mix of residential, office retail, business park, community center, schools, and golf course. Applicant's projected water demand without irrigation is 618,050 gallons per day.

The irrigation requirement for this area, assuming alderwood, gravelly, sandy loam soil is 25.3 inches. 25.3 inches of water over an area of 55 acres is 112 acre-feet of water. The applicant has proposed 138 acre-feet of water for irrigation.

618,050 gallons per day is 692 acre-feet of water. 692 acre-feet plus the irrigation of 112 acre-feet is 804 acre-feet. Application of a conservation goal of ten percent reduces the annual allocation to 723.6 acre-feet.

Permit fee is calculated at $ 22.00 (40 cents per acre for 55 acres of irrigation) plus $ 20.00 for community domestic equals $ 42.00.

CONCLUSION

In accordance with Chapter 90.03 Revised Code of Washington (RCW) (and Ch. 90.44 RCW), I find that there is water available for this beneficial appropriation from the source in question and that the appropriation as authorized will not impair existing rights or be detrimental to the public welfare. Therefore, a permit should be issued subject to the indicated provisions.

RECOMMENDATIONS

I recommend that a permit issue subject to the indicated provisos:

Installation and maintenance of an access port as described in Ground Water Bulletin No. 1 is required. An airline and gauge may be installed in addition to the access port.

This permit is subject to the implementation of the minimum requirements established in the Conservation Planning Requirements: Guidelines for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conservation Programs, March 1994, which are attached.

An approved measuring device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508-64-020 through WAC 508-64-040 (Installation, operation and maintenance requirements attached). Meter readings shall be recorded monthly and this data shall be maintained and be made available to the Department of Ecology upon request.

In order to protect the resource, static water level (SWL) shall be measured at least once each month. Measurements shall be taken after the pump has been shut off a reasonable time to allow water level to return to normal. Ecology's Water Resources section (NWRO) shall be notified if a below normal seasonal drop is measured in SWL, otherwise this data shall be maintained and be made available to Ecology upon request. See attached form.

The amount of water granted is a maximum limit that shall not be exceeded. Upon perfection of the water right, a certificate will be issued only for that amount of water that is beneficially used under the terms of the permit.

REPORT BY: Stephen Hirschey DATE: 8/7/95

PRELIMINARY - CITY REVIEW ONLY

Affidavit of Publication

STATE OF WASHINGTON }
ss.
COUNTY OF KING

FALLS PRINTING CO., being first duly sworn on oath, deposes and says: That it is the Publisher of the VALLEY RECORD, a weekly newspaper, which has been established, published in the English language, and circulated continuously as a weekly newspaper in the Cities of Snoqualmie and North Bend, and in said County and State, and of general circulation in said county for more than six (6) months prior to the date of the first publication of the Notice hereto attached, and that the said VALLEY RECORD was on the 1st day of July, 1941, approved as a legal newspaper by the Superior Court of said King County, and that the annexed is a true copy of

LEGAL NOTICE

LEGAL NOTICE 396-89
State of Washington
Department of Ecology
NOTICE OF APPLICATION TO APPROPRIATE PUBLIC WATERS

TAKE NOTICE:

That WEYERHAEUSER REAL ESTATE COMPANY of Tacoma, Washington, on May 30, 1989, under Application No. G1-25449 filed for permit to appropriate public waters, subject to existing rights, from North Well Field with three wells, in the amount of 1,650 gallons per minute each year, for community domestic supply/business - continuously; irrigation -- during irrigation season. The source of the proposed appropriation is located within NE1/4 SE1/4 and SE1/4 SE1/4 of Section 19, Township 24N., Range 8 E., W.M., in King County.

Protests or objections to approval of this application must include a detailed statement of the basis for objections; protests must be accompanied by a two dollar ($2.00) recording fee and filed with the Department of Ecology, at the address shown below, within thirty (30) days from November 23, 1989.

Department of Ecology
Northwest Regional Office
4350 - 150th Ave. N.E.
Redmond, Washington 98052
Publish Nov. 16 & 23, 1989.

LEGAL NOTICE 396-89 Re:
NOTICE OF APPLICATION TO APPROPRIATE PUBLIC WATERS -- Application No. G1-25449 -- WEYERHAEUSER REAL ESTATE COMPANY TACOMA, WASHINGTON

as it appeared in the regular and entire issues of said paper itself and not in a supplement thereof for a period of **TWO** consecutive weeks commencing on the **16th day of November, 1989**, and ending on the **23rd day of November, 1989**, and that said newspaper was regularly distributed to its subscribers during all of this period. That the full amount of **$40.00** has been paid in full, at the rate of $4.00 per column inch for the first insertion and $4.00 per column inch for each subsequent insertion.

Joan L. Cooper

Subscribed and sworn to before me this 23rd day of November, 1989.

Nancy L. Fish

Notary Public in and for the State of Washington, residing at Snoqualmie.

Falls Printing Co., Snoqualmie, Wash. 98065

12-8-89

RECEIVED
DEC 06 1989
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Please Detach & Return A Top Portion Of This Statement With Your Remittance

State of Washington
Department of Ecology

PRELIMINARY - CITY REVIEW ONLY

APPLICATION FOR PERMIT
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ SURFACE WATER ☒ GROUND WATER

I have examined this application as required by SEPA and find that it is ☐ not an "action". ☑ categorically exempt.

6/6/89 DATE — SIGNATURE

$10.00 MINIMUM STATUTORY EXAMINATION FEE REQUIRED WITH APPLICATION

(GRAY BOXES FOR OFFICE USE ONLY)

$1-25449

APPLICATION NO.	W.R.I.A.	COUNTY	PRIORITY DATE	TIME	ACCEPTED
G125449	7	King	5-30-89		mm

APPLICANT'S NAME — PLEASE PRINT
Weyerhaeuser Real Estate Company
Attention James A. Nyberg
Land Management Division
City of Snoqualmie 4/30/98

Bus. Tel. 924-2511
Home Tel.
Other Tel.

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
QB1	Tacoma	WA	98477

DATE & PLACE OF INCORPORATION IF APPLICANT IS A CORPORATION
December 22, 1970 in Tacoma, WA

1. SOURCE OF SUPPLY

IF SURFACE WATER	IF GROUND WATER
SOURCE (NAME OF STREAM, LAKE, SPRING, ETC.) (IF UNNAMED, SO STATE)	SOURCE (WELL, TUNNEL, INFILTRATION TRENCH, ETC.) North Well Field with three wells
TRIBUTARY	SIZE AND DEPTH 20", 16" or 12" casings, and 16" or 12" screen to approx. 550 feet depth

2. USE

USE TO WHICH WATER IS TO BE APPLIED (DOMESTIC SUPPLY, IRRIGATION, MINING, MANUFACTURING, ETC.)
Municipal water supply for Phase 1A development at Snoqualmie Ridge including golf course irrigation.

ENTER QUANTITY OF WATER REQUESTED USING UNITS OF	CUBIC FEET PER SECOND (CFS)	OR	GALLONS PER MINUTE (GPM)	ACRE FEET PER YEAR
			1650	684

Community domestic supply / Business - Continuously - Irrigation during irrig season

TIMES DURING YEAR WATER WILL BE REQUIRED Water will be required all year at average flow up to 425 gpm with peak flow up to 1,650 gpm during summertime emergency conditions.

IF IRRIGATION, NUMBER OF ACRES	IF DOMESTIC USE, NUMBER OF UNITS BY TYPE, E.G. 1-HOME, 1-MOBILE HOME, 2-CAMPSITES, ETC.	IF MUNICIPAL USE, ESTIMATED POPULATION 20 YEARS FROM TODAY
55 acres of tees, greens and fairways		1,600 people

DATE PROJECT WAS OR WILL BE STARTED	DATE PROJECT WAS OR WILL BE COMPLETED
June 1, 1989	June 1994

3. LOCATION OF POINT OF DIVERSION/WITHDRAWAL

3A. IF IN PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)	SECTION	TOWN	RANGE	ALSO, PLEASE ENCLOSE A COPY OF THE PLAT AND MARK THE POINT(S) OF WITHDRAWAL OR DIVERSION

3B. IF NOT IN PLATTED PROPERTY

ON ACCOMPANYING SECTION MAPS, ACCURATELY MARK AND IDENTIFY EACH POINT OF DIVERSION, SHOW NORTH-SOUTH AND EAST-WEST DISTANCES FROM NEAREST SECTION CORNER OR PROPERTY CORNER.

ALSO, ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.
Center of well field site is approx. 1320' north and 660' west of SE corner Section 19

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	COUNTY
NE¼ of SE¼ and SE¼ of SE¼	19	24N	8E	KING

4. DO YOU OWN THE LAND ON WHICH THIS SOURCE IS LOCATED. IF NOT, INSERT NAME & ADDRESS OF OWNER

Weyerhaeuser Company, Tacoma, WA 98477

5. LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

ATTACH A COPY OF THE LEGAL DESCRIPTION OF THE PROPERTY (ON WHICH THE WATER WILL BE USED) TAKEN FROM **A REAL ESTATE CONTRACT, PROPERTY DEED OR TITLE INSURANCE POLICY.** OR, COPY CAREFULLY IN THE SPACE BELOW.

Water from the North Well Field will be used in the City of Snoqualmie municipal water sytem which currently serves areas inside and outside the corporate limits of the City; and will serve Snoqualmie Ridge plus other future developments within the potential annexation area shown on attached Figure 1 (reference: January 1987 Final Environmental Impact Statement for City of Snoqualmie Comprehensive Plan Ammendment). The total area includes all or part of Section 1,2 & 3 in T23N, R7E; Section 4, 5 & 6 in T23N, R8E; Section 23, 24, 25, 26, 35 & 36 in T24N, R7E; and Sections 19, 20, 29, 30, 31, & 32 in T24N, R8E.

RECEIVED
MAY 30 1989
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

APPLICATION

ECY 040-1-14
Rev. 1/85

PRELIMINARY - CITY REVIEW ONLY

WHAT IS YOUR INTEREST IN THE PROPERTY ON WHICH THE WATER IS TO BE USED (PROPERTY OWNER, LESSEE, CONTRACT PURCHASER, ETC.)

Weyerhaeuser Real Estate Company is developing Snoqualmie Ridge

ARE THERE ANY EXISTING WATER RIGHTS RELATED TO THE LAND ON WHICH THE WATER IS TO BE USED (INCLUDING WATER PROVIDED BY IRRIGATION DISTRICTS OR DITCH COMPANIES.) [XX] YES [ ] NO

IF YES, FROM WHAT SOURCE (i.e. SURFACE OR GROUND WATER) AND UNDER WHAT AUTHORITY

City of Snoqualmie has water rights for Canyon Springs (Certif. No. 4553) and City of Snoqualmie Well No. 1 (Certif. No. G1-20316)

6. DESCRIPTION OF SYSTEM PROPOSED OR INSTALLED

(FOR EXAMPLE: SIZE OF PUMP, CAPACITY OF PUMP, PUMP MOTOR HORSE POWER, PIPE DIAMETER, NUMBER OF SPRINKLERS, ETC.)

The North Well Field will have three municipal wells and one observation well (Test Well 5). Each municipal well will have 12-inch through 20-inch casings, 12-inch through 16-inch screens at approximately 550 feet depth, 550 gpm pumps, about 150 HP motors, wellhouses, piping, valves and electrical power supply. Two municipal wells need to be constructed in 1989 and operable in 1991. The third well needs to be operable in 1994. Additional facilities required to supply water to Snoqualmie Ridge include 2.5 miles of transmission pipeline, two pump stations, three storage tanks and over 5 miles of distribution water mains.

REMARKS

7. Ownership of water supply, transmission, storage and distribution facilities will be transfered to the City of Snoqualmie as part of the Snoqualmie Ridge Phase 1A development. The City will operate and maintain the water system. See attached Figure 2 for well field vicinity map.

IF 10 ACRE-FEET OR MORE OF WATER IS TO BE STORED AND/OR IF THE WATER DEPTH WILL BE 10 FEET OR MORE AT THE DEEPEST POINT, A STORAGE PERMIT MUST BE FILED IN ADDITION TO THIS PERMIT. THESE FORMS CAN BE SECURED, TOGETHER WITH INSTRUCTIONS, FROM THE DEPARTMENT OF ECOLOGY.

SIGNATURES

FOR WEYERHAEUSER CO.

DON W. WILBUR
LEGAL LANDOWNERS NAME (PLEASE PRINT)

James A. Nyles
APPLICANT'S SIGNATURE

LEGAL LANDOWNER'S SIGNATURE (OWNER OF PROPERTY DESCRIBED IN ITEM NUMBER 5)

WEYERHAEUSER CO.
TACOMA WSH. 98477
LEGAL LANDOWNER'S ADDRESS

FOR OFFICE USE ONLY

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY } ss.

This is to certify that I have examined this application together with the accompanying maps and data, and am returning it for correction or completion as follows: .....

.....

.....

In order to retain its priority date, this application must be returned to the Department of Ecology, with corrections, on or before....., 19.....

Witness my hand this.....day of....., 19.....

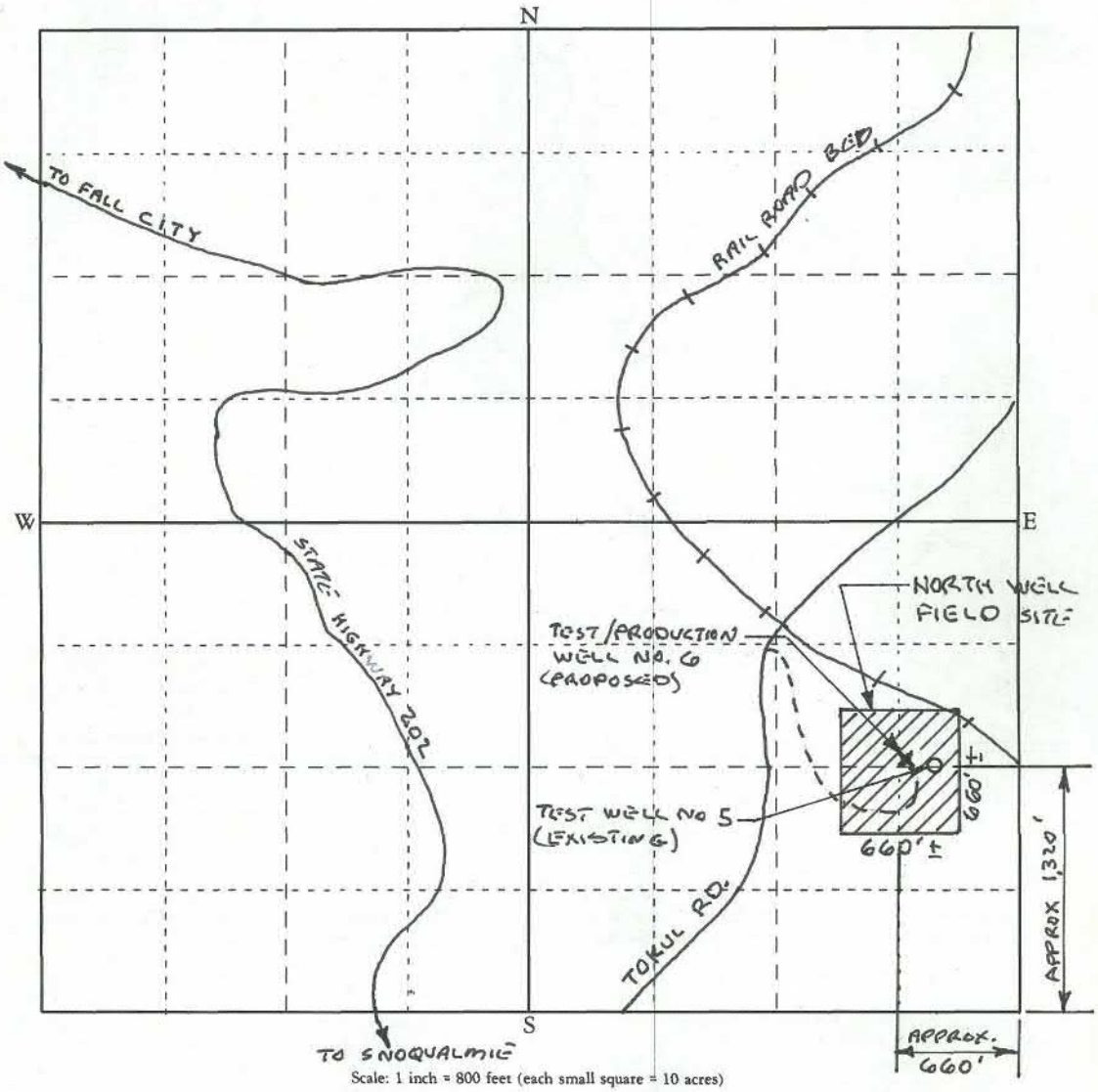
ECY 040-1-14
Rev. 1/85

.....
Department of Ecology

PRELIMINARY - CITY REVIEW ONLY

SECTION MAP

Sec. 19 Twp. 24 N. R. 8 EAST



Scale: 1 inch = 800 feet (each small square = 10 acres)

Show by a cross (X) the location of point of diversion (surface water source) or point of withdrawal (ground water source). For ground water applications, show by a circle (O) the locations of other wells or works within a quarter of a mile.

Indicate traveling directions from nearest town in space below.

Drive north 0.2 mile on State Highway 202 from City of Snoqualmie. Turn east onto SE Mill Pond Rd. at Salish Lodge. Immediately turn north onto Tokul Rd. and drive approximately 0.5 mile. Turn right onto dirt logging road at old railroad cut (existing large culvert under road) and follow logging road approximately 1,500 ft to well field site.

G1-25419

Detach here

Fold along scale

FEET 0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400 4,800 5,200

Detach this scale at the perforation, fold excess paper under or cut off excess by cutting along the scale line. This scale corresponds to the SECTION MAP above. You can read feet directly from this scale to outline property and locate points of diversion or withdrawal on the SECTION MAP. Enclose this map along with the application and $10.00 examination fee.

PRELIMINARY - CITY REVIEW ONLY

COMPLETE THIS FORM ONLY IF THIS APPLICATION INCLUDES IRRIGATION AS A USE.

In order to implement the provisions of Initiative Measure Number 59, the Family Farm Water Act which was passed by the voters on November 3, 1977, we must ask the following questions:

Does the total number of acres in which you have controlling interest in the State of Washington exceed 2000 acres for the following three categories:

1. Lands that are being irrigated under water rights acquired after December 8, 1977.

2. Lands that may be irrigated under applications now on file with the Department of Ecology.

3. Lands that may be irrigated under this application.

YES ☐

NO ☒

Please sign and return Don Wallen
(signature of landowner)

MAY 24, 1989
(date)

RECEIVED
MAY 30 1989
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

G1-25A19

ATTACHMENT TO APPLICATIONS

PRELIMINARY - CITY REVIEW ONLY

Application G1-27589A

South Wellfield

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PRELIMINARY - CITY REVIEW ONLY

FEE PAID $10.00 RG

RECEIVED
MAR 16 1995
DEPT. OF ECOLOGY

For Ecology Use
Fee Paid 10.00
Date 3-16-95

State of Washington
Application for a Water Right

Please follow the attached instructions to avoid unnecessary delays.

Section 1. APPLICANT - PERSON, ORGANIZATION, OR WATER SYSTEM

Name City of Snoqualmie Home Tel:( ) -

Mailing Address P.O. Box 987 Work Tel:(206) 888 - 5337

City Snoqualmie State WA Zip+4 98065 + FAX:(206) 831 - 6041

Section 2. CONTACT - PERSON TO CALL ABOUT THE APPLICATION

☒ Same as above

Name Bob Hanson Home Tel:( ) -

Mailing Address Work Tel:( ) -

City State Zip+4 + FAX:( ) -

Relationship to applicant City Engineer

Section 3. STATEMENT OF INTENT

The applicant requests a permit to use not more than 1,400 (☒ gallons per minute or ☐ cubic feet per second) from a ☐ surface water source or ☒ ground water source (check only one) for the purpose(s) of municipal use within area served by City of Snoqualmie. Attach a "legal" description of the place of use. (See instructions.) *NOTE: A tax parcel number or a plat number is not sufficient.*

Estimate a maximum annual quantity to be used in acre-feet per year: To be determined per Comprehensive water plan (estimated 2,302 af/y)

☐ Check if the water use is proposed for a short-term project. Indicate the period of time that the water will be needed:

From ___/___/___ to ___/___/___

Section 4. WATER SOURCE

If SURFACE WATER	If GROUNDWATER
Name the water source and indicate if stream, spring, lake, etc. If unnamed, write "unnamed spring," "unnamed stream," etc.: Number of diversions:	A permit is desired for 1 or more well(s).
Source flows into (name of body of water):	Size & depth of well(s): 550 feet depth, 12"-16" casing

LOCATION

Enter the north-south and east-west distances in feet from the point of diversion or withdrawal to the nearest section corner: Approximately 1,500 ft. south and 2,000 ft. east of the NW corner of Section 32, T24N, R8E, W.M.

¼ of	¼ of	Section	Township	Range(E/W)	County	If location of source is platted, complete below: Lot	Block	Subdivision
~~SE~~ NE¼	~~NW~~ NW¼	See Letter of	5/17/95					
~~SE~~	~~NW~~	32	24N	8E	King			

For Ecology Use Date Received: 3-16-95 Priority Date: 3-16-95

SEPA: Exempt/Not Exempt FERC License # Dept. Of Health #

Date Accepted As Complete 3-16-95 By LR Date Returned By WRIA: 7

ECY 040-1-14
Rev. 12/94 F

APPLICATION

Appl. No.: G1-27589

PRELIMINARY - CITY REVIEW ONLY

Section 5. GENERAL WATER SYSTEM INFORMATION

A. Name of system, if named: City of Snoqualmie Water System

B. Briefly describe your proposed water system. (See instructions.)
The City intends to supplement its existing municipal water system with one or more new sources of supply. A new source will be drilled in the City's South wellfield at the location shown herein. The source will consist of one or more wells 12" to 16" casing, a 75 HP pump and capacity of 600 to 800 gpm, up to a maximum of 1400 gpm. The new well(s) will be integrated into the existing distribution system. The new source and use of water is consistent with the City's Comprehensive Water Plan.

C. Do you already have any water rights or claims associated with this property or system? ☒ YES ☐ NO
PROVIDE DOCUMENTATION. Ground Water Certificate G1-20316C, 91-D, 92-D and Surface Water Certificate 4553.

Section 6. DOMESTIC / PUBLIC WATER SUPPLY SYSTEM INFORMATION
(Completed for all domestic/public supply uses.)

A. Number of "connections" requested: 4,370 Type of connection Residential, at 1,073 gpd expressed in Table 4-9, Comprehensive Water Plan
(Homes, Apartment, Recreational, etc.)

B. Are you within the area of an approved water system? ☒ YES ☐ NO
If yes, explain why you are unable to connect to the system. *Note: Regional water systems are identified by your County Health Department.* This application will increase the capacity of the existing system for growth.

Complete C. and D. only if the proposed water system will have fifteen or more connections.

C. Do you have a current water system plan approved by the Washington State Department of Health? ☒ YES ☐ NO
If yes, when was it approved? * Please attach the current approved version of your plan.
*Approval expected Spring, 1995.

D. Do you have an approved conservation plan? ☒ YES ☐ NO
If yes, when was it approved? * Please attach the current approved version of your plan.
*Incorporated into Water System Plan

Section 7. IRRIGATION/AGRICULTURAL/FARM INFORMATION
(Complete for all irrigation and agriculture uses.)

A. Total number of acres to be irrigated: _____

B. List total number of acres for other specified agricultural uses:

Use_____Acres_____
Use_____Acres_____
Use_____Acres_____

C. Total number of acres to be covered by this application: _____

D. Family Farm Act (Initiative Measure Number 59, November 3, 1977)
Add up the acreage in which you have a controlling interest, including only:
‡ Acreage irrigated under water rights acquired after December 8, 1977;
‡ Acreage proposed to be irrigated under this application;
‡ Acreage proposed to be irrigated under other pending application(s).

1. Is the combined acreage greater than 2000 acres? ☐ YES ☐ NO
2. Do you have a controlling interest in a Family Farm Development Permit? ☐ YES ☐ NO
If yes, enter permit no:_____

E. Farm uses:
Stockwater - Total # of animals _____ Animal type _____ (If dairy cattle, see below)
Dairy - # Milking _____ # Non-milking _____

PRELIMINARY - CITY REVIEW ONLY

Section 8. WATER STORAGE

Will you be using a dam, dike, or other structure to retain or store water? ☐ YES ☐ NO

NOTE: If you will be storing 10 acre-feet or more of water and/or if the water depth will be 10 feet or more at the deepest point, and some portion of the storage will be above grade, you must also apply for a reservoir permit. You can get a reservoir permit application from the Department of Ecology.

Section 9. DRIVING DIRECTIONS

Provide detailed driving instructions to the project site. East on I90 to Exit 27; left on North Bend Way, one mile; left on Meadowbrook Way, approximately one mile; left on Park Street, 800 feet. Project is due south, 500 feet.

Section 10. REQUIRED MAP

A. Attach a map of the project. (See instructions.)

Attached.

Section 11. PROPERTY OWNERSHIP

A. Does the applicant own the land on which the water will be used? ☐ YES ☒ NO
If no, explain the applicant's interest in the place of use and provide the name(s) and address(es) of the owner(s):

The place of use is the area served by the City of Snoqualmie, which is subject to change consistent with the City's Comprehensive Water Plan and East King County Coordinated Water System Plan.

B. Does the applicant own the land on which the water source is located? ☐ YES ☒ NO
If no, submit a copy of agreement:
School District No. 410 owns the property on which the well is located. Agreements will be submitted upon execution (anticipated April, 1995).

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I grant staff from the Department of Ecology access to the site for inspection and monitoring purposes. Even though I may have been assisted in the preparation of the above application by the employees of the Department of Ecology, all responsibility for the accuracy of the information rests with me.

Jeanne Hansen — March 15, 1995

Applicant (or authorized representative) Jeanne Hansen
Mayor, City of Snoqualmie — Date

Same — _____

Landowner for place of use (if same as applicant, write "same") — Date

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Application S1-28833A

Canyon Springs

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PRELIMINARY - CITY REVIEW ONLY

Phone (425) 888-1555
Fax (425) 831-6041

CITY OF SNOQUALMIE
Office of the Mayor
P.O. Box 987, Snoqualmie, Washington 98065
www.ci.snoqualmie.wa.us

RECEIVED
DEC 21 2016
DEPT OF ECOLOGY
NWRO - WR

December 19, 2016

Mr. Tom Buroker
Water Resources Section Manager
Washington State Department of Ecology - NRO
3190 160th Ave SE
Bellevue, WA 98008-5452

Re: Submittal of City of Snoqualmie Water Right Applications

Dear Mr. Buroker:

On behalf of the City of Snoqualmie, I am submitting four water right applications to the Washington State Department of Ecology (Ecology). Three of these are change applications intended to consolidate several of the City's water rights, with the goal of allowing more flexibility for use of its existing water rights and associated points of withdrawal. The fourth application seeks to increase water use at the City's existing Canyon Springs water supply source. In addition, a fifth application (G1-27589) filed by the City on March 16, 1995 to increase use at its South Wellfield is still pending processing.

The City is working with Aspect Consulting, LLC (Aspect) to support water right processing of these applications through 'front-loaded' cost-reimbursement work. City representatives and Aspect will be meeting with you on December 21, 2016 to review the applications and discuss the next steps and priorities for processing the applications.

The City currently holds the following water rights:

Summary of City of Snoqualmie Water Rights

Source	Water Right Reference	Priority Date	Qi, gallons per minute (gpm)	Qa (acre-feet/year)
Canyon Springs	4553 (S1-*06205CWRIS)	10/18/1944	898	1,448
South Wellfield	G1-20316C	10/16/1972	600	500(1)
Groundwater	91-D (G1-*00059SWRIS)	1930	90	100
Groundwater	92-D (G1-*00060SWRIS)	1940	90	100
North Wellfield	G1-25449P	5/30/1989	1,650	724
Total Permitted Water Rights			3,328	2,372(1)

(1) South Wellfield water rights are supplemental to all other rights.

PRELIMINARY - CITY REVIEW ONLY

The City's first priority is to process the three consolidation applications, which seek to allow water from water rights 91-D (G1-*00059SWRIS) and 92-D (G1-*00060SWRIS) to be withdrawn at either the South Wellfield or North Wellfield, and water from the South Wellfield (G1-20316C) to also be withdrawn from the North Wellfield. These changes will allow the City to have more flexibility in managing production from the North and South Wellfield sources.

The City's second priority will be to process the new Canyon Springs application. Canyon Springs is the City's preferred source for water supply, and increasing the use of this source will support the City's growth as evidenced by recent water demand evaluations. The City recognizes that this water right would be junior to the instream flow rule for the Snoqualmie River, and is actively reviewing mitigation options in support of this application. Further information will be provided in support of this application as work progresses.

The City's third priority will be to process the pending 1995 water right application (G1-27589) to increase use at the South Wellfield. As for the Canyon Springs application, the City recognizes that this water right would be junior to the instream flow rule for the Snoqualmie River. Further information will also be provided in support of this application as work progresses.

The City appreciates the opportunity to discuss these applications with you in person later this week and we look forward to working with Ecology to support processing of the applications. Questions regarding the City's water right applications should be directed to Nancy Davidson, Operations Manager at 425-831-4919 or ndavidson@ci.snoqualmie.wa.us or Carl Einberger at Aspect Consultants at 206-812-4748 or ceinberger@aspectconsulting.com.

Sincerely,

Matthew R. Larson
Mayor

Attachments

Cc: Dan Marcinko, Parks & Public Works Director
Bob Sterbank, City Attorney
Nancy Davidson, Operations Manager
Carl Einberger, Aspect Consultants

PRELIMINARY - CITY REVIEW ONLY

DEPARTMENT OF ECOLOGY
State of Washington

Application for a Water Right Permit

RECEIVED
(Date Stamp)
DEC 21 2016
DEPT OF ECOLOGY
NWRO - WR

A NON-REFUNDABLE MINIMUM FEE OF $50.00 MUST ACCOMPANY THIS APPLICATION FOR THE FOLLOWING:

☐ **GROUND WATER** ☒ **SURFACE WATER** ☐ **PERMANENT**
☐ **SHORT TERM** ☐ **TEMPORARY**

NO FEE REQUIRED FOR THE FOLLOWING:

☐ **DROUGHT** ☒ **COST REIMBURSEMENT**

Follow the attached instructions. Attach additional sheets as necessary.

Section 1. APPLICANT

☒ **I have participated in a pre-application conference with Ecology.**

Applicant/Business Name: City of Snoqualmie	Phone No: 425-831-4919	Other No:
Address: PO Box 987		
City: Snoqualmie	State: WA	Zip:98065
Email Address (if available): ndavidson@ci.snoqualmie.wa.us		

Contact Name (if different from above): Nancy Davidson	Phone No: 425-831-4919	Other No:
Relationship to Applicant: Public Works Operation Manager		
Address: PO Box 987		
City: Snoqualmie	State: WA	Zip: 98065
Email Address (if available): ndavidson@ci.snoqualmie.wa.us		

Legal Land Owner or Part Owner Name of the Proposed Place of Use: City of Snoqualmie	Phone No: 425-831-4919	Other No:
Address: P.O. Box 987		
City: Snoqualmie	State: WA	Zip:98065
Email Address (if available): ndavidson@ci.snoqualmie.wa.us		

For Ecology Use	APPLICATION NO: S1-28833 SEPA: Exempt/Not Exempt Fee Paid: NA Check No: ECY Coding: 001-001-WR1-0285-000011
Date Returned By	Priority Date 12/21/16 By DSH WRIA: 7
Pre-application interviewer:	

ECY 040-1-14 (Rev 03-2015) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Water Resources Program at 360-407-6872. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Section 2. STATEMENT OF INTENT

Do you own the land on which the proposed point of diversion/withdrawal is located? ☒ YES ☐ NO
If no, do you have legal authority to make this application for use of another's land? ☐ YES ☐ NO

Briefly describe the purpose of your proposed project: The City of Snoqualmie is seeking to expand the use of Canyon Springs, an existing water source that has been used by the City since the 1940's. The City recognizes that this water right would be junior to the instream flow rule for the Snoqualmie River, and is actively reviewing mitigation and storage options in support of this application. Further information will be provided in support of this application as work progresses.

Anticipated length of time to compete your project: 10 years

Water Use List all purposes for which water will be applied to a beneficial use and list quantity required for each.

Purpose(s) of Use	Rate (check one box only) ☒ Cubic Feet per Second (CFS) ☐ Gallons per Minute (GPM)	Acre-Feet per Year (AF/YR) (If known)	Period of Use (Continuously or Seasonal)
Municipal	3.3	1,000	Continuously
TOTAL:	3.3	1,000	

Short Term/Temporary Water Use

Is this a request for a short term project (less than four months and non-recurring)? ☐ YES ☒ NO

Is this request for a temporary permit? ☐ YES ☒ NO

If yes to either question above, indicate the dates that the water will be needed:

FROM: ____/____/____ TO: ____/____/____

Section 3. POINT OF DIVERSION OR WITHDRAWAL

(Complete A or B, and C below)

A.) If Surface Water Source	B.) If Ground Water Source
☒ Spring ☐ Creek ☐ River ☐ Lake ☐ Other: _____ Source Name: Canyon Springs Tributary to: Snoqualmie River Number of proposed diversion points: To be determined Do you have an existing diversion? ☒ YES ☐ NO	☐ Well(s) ☐ Other: _____ _____ Well diameter & depth: _____ Number of proposed points of withdrawal: ____ Do you have an existing well? ☐ YES ☐ NO If available, attach Water Well Report and pump test. Well Tag ID No. _____

C.) Point of Diversion/Withdrawal – Legal Description

Parcel No.	¼	¼	Section	Township	Range	County
2524089002	SW	SE	24	24N	8E	King

Lot(s)	Block(s)	Subdivision	

If known, enter the distances in feet from the point of diversion or withdrawal to the nearest section corner:

400 Feet (☒ North/☐ South) and 1750 feet (☐ East/☒ West)

from the (☐NW ☐SW ☐NE ☒SE ☐ ____) corner of Section24.

Parcel No.	¼	¼	Section	Township	Range	County

Lot(s)	Block(s)	Subdivision	

If known, enter the distances in feet from the point of diversion or withdrawal to the nearest section corner:

____feet (☐ North/☐ South) and ____feet (☐ East/☐ West)

from the (☐NW ☐SW ☐NE ☐SE ☐ ____) corner of Section____

NOTE: If more than two points of diversion/withdrawal attach additional information on a separate sheet of paper.

Section 4. PLACE OF USE

Attach a copy of the legal description of the property (on which the water will be used) taken from a real estate contract, property deed or title insurance policy, or copy it carefully in the space below.

The place of use of this water right is the service area described in the most recent City of Snoqualmie Water System Plan prepared by Gray & Osborne, Inc., February 2013, approved July 18, 2012.

¼	¼	Section	Twp.	Range	County	Parcel No.

Do you own all the lands on which the proposed place of use is located? ☐ YES ☒ NO.

If no, do you have legal authority to make this application for use of another's land? ☒ YES ☐ NO

Provide owner name(s), address, and phone number: The lands in the existing place of use are owned by various public and private property owners within the City of Snoqualmie water service area as shown in the City's adopted Water System Plan

Are there any other water rights or claims associated with this property or water system? ☒ YES ☐ NO

If yes, provide the water right and/or claim numbers: 4553 (S1-*06205CWRIS), G1-20316C, 91-D (G1-*00059SWRIS), 92-D (G1-*00060SWRIS), G1-25449P,

Attach a map of your project showing the point of diversion/withdrawal and place of use. If platted property, be sure to include a complete copy of the plat map.

Section 5. WATER SYSTEM DESCRIPTION

Describe your proposed water system (include type and size of devices used to divert or withdraw water from source): Canyon Springs is located on a hilside bank of the North Fork of the Snoqualmie River on 20 acres owned by the City. Two intakes currently exist to collect the spring water. Water is conveyed via pipeline to the City. This project will expand use of the springs, and is expected to include addition intake construction. Detailed project plans are currently in development.

Section 6. DOMESTIC WATER SUPPLY SYSTEM INFORMATION

(Complete A or B, and C below)

A.) Domestic Water Systems only	**B.) Municipal Water Systems only** *(defined under RCW 90.03.015)*
Projected number of connections to be served: _____ Type of connections: _____ *(e.g., home, recreational cabin)*	Present population to be served water: 11,710 Estimate future population to be served: 15,860 (2032). This will be revised based on new recent annexations where population estimates are still being determined. _____ (20 year projection)

C.) Water System Planning

Do you have a Water System Plan approved by the Washington State Department of Health, Drinking Water Division? ☒ YES ☐ NO

If yes, date plan was approved 7/18/2012 Water System Number: 81080

Name of water system: Snoqualmie Water

Are you within the service area of an existing water system? ☒ YES ☐ NO

If yes, explain why you are unable to connect to the system: This application is being filed as part of system expansion.

PRELIMINARY - CITY REVIEW ONLY

Section 7. IRRIGATION/STOCKWATER/OTHER FARM USES

Irrigation

Total number of acres requested to be irrigated under this application = _____ ACRES

NOTE: Outline the area to be irrigated on your attached map.

Stockwater

List number and kind of stock: _____

_____

Is the proposed project for a dairy farm? ☐ YES ☐ NO

Other Proposed Farm Uses

Describe all proposed uses: _____

_____

_____

Family Farm Water Act (RCW 90.66):

Calculate the acreage in which you have a controlling interest, including only:

- Acreage irrigated under water rights acquired after December 8, 1977,
- Acreage proposed to be irrigated under this application, and
- Acreage proposed to be irrigated under other pending application(s).

Is the combined acreage under existing rights greater than 6000 acres? ☐ YES ☐ NO

Do you have a controlling interest in a Family Farm Development Permit? ☐ YES ☐ NO

If yes, enter Permit No: _____

Section 8. OTHER WATER USES

Hydropower

Indicate total feet of head _____ and proposed capacity in kilowatts:_____

Describe works:_____

_____

_____

Indicate all uses to which power is to be applied:_____

FERC License No:_____

Mining/Industrial Use

Describe use, method of supplying and utilizing water:

Other Use

Section 9. WATER STORAGE

Will you be using a dam, dike, or other structure to retain or store water? ☐ YES ☒ NO

Are you proposing to store more than 10 acre-feet of water? ☐ YES ☒ NO

Will the water depth be 10 feet or more? ☐ YES ☒ NO

If you answered yes to any of the above questions, please describe:

NOTE: If you will be storing 10 acre-feet or more of water and/or if the water depth will be 10 feet or more at the deepest point and some portion of the storage will be above grade, you must also complete an Application for Permit to Construct a Reservoir and a Dam Construction Permit and Application.

Section 10. DRIVING DIRECTIONS

Provide detailed driving directions to the project site: The project site requires access via a trail. Parking is at the end of SE 71st Street. The City would prefer to escort Ecology personnel to the site upon request, given the nature of site access.

Site Address:

Section 11. REQUIRED SIGNATURES

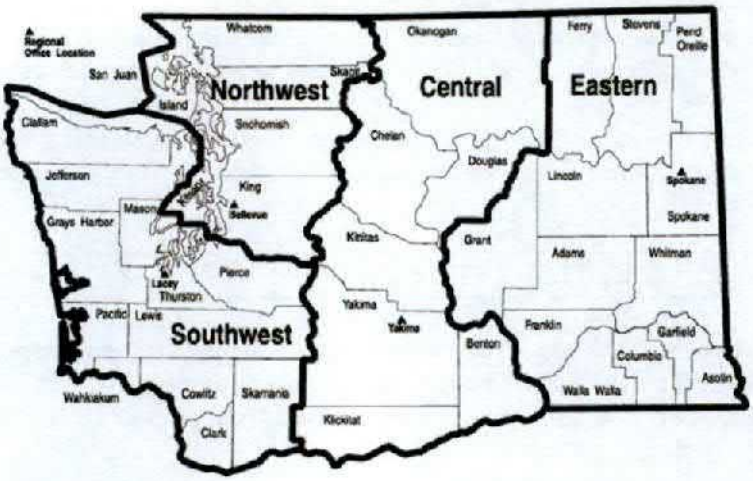
I certify that the information provided in this application is true and accurate to the best of my knowledge. I understand that in order to process my application, I grant staff from the Department of Ecology access to the site for inspection and monitoring purposes. Even though the employees of the Department of Ecology may have assisted me in the preparation of the above application, all responsibility for the accuracy of the information rests with me, the applicant.

Print Name	Signature	Date
Matthew R. Larson (Applicant or Authorized representative)		12/19/2016
 (Legal Owner or Part Owner Place of Use)		
 (Legal Owner or Part Owner Place of Use)		

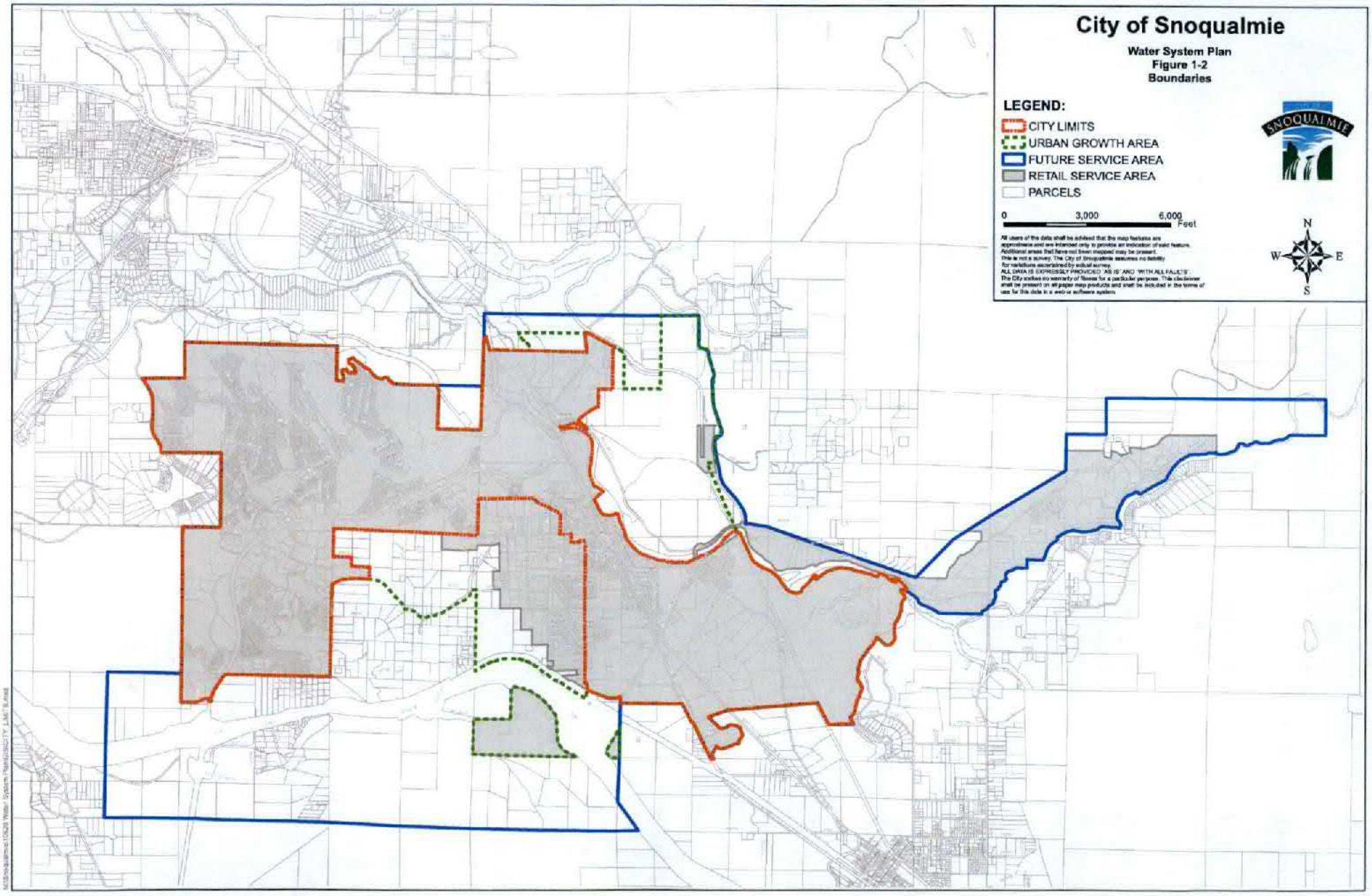
Please check the region in which the project is located:

***Submit your application to:**		
DEPARTMENT OF ECOLOGY CASHIERING SECTION PO BOX 47611 OLYMPIA, WA 98504-7611	☐ Central Regional Office 1250 W. Alder Street Union Gap, WA 98903-0009 (509) 575-2490	☐ Eastern Regional Office 4601 N. Monroe Street Spokane, WA 99205-1265 (509) 329-3400
	X Northwest Regional Office 3190 – 160th Avenue SE Bellevue, WA 98008-5452 (425) 649-7000	☐ Southwest Regional Office PO Box 47775 Olympia, WA 98504-7775 (360) 407-6300

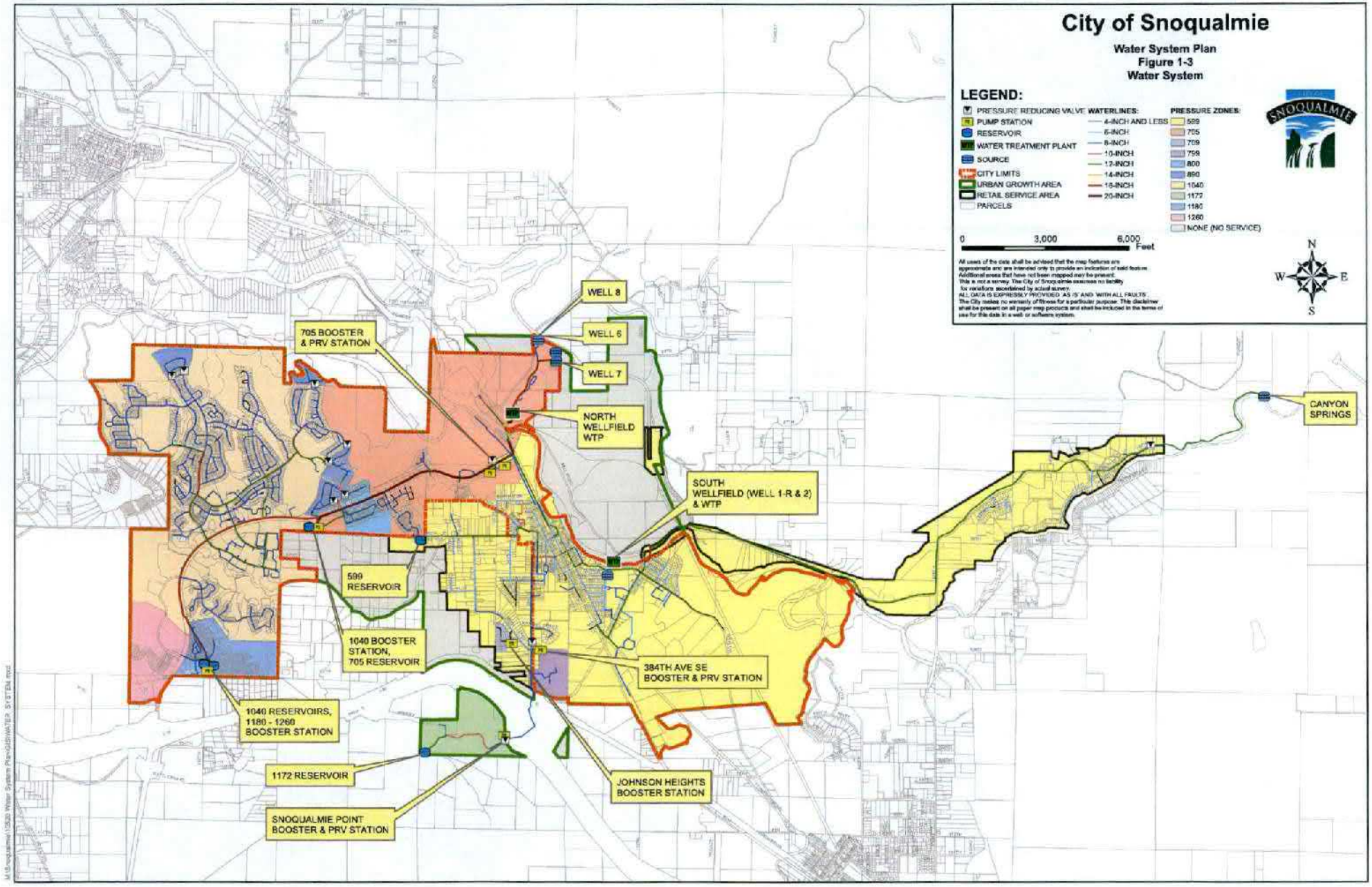
If you have questions about your application, contact the Water Resources program at the regional office in which your project is located.



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Appendix J

Water Quality Monitoring Plan

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WATER QUALITY MONITORING PLAN

INTRODUCTION

This Water Quality Monitoring Plan presents the requirements for monitoring water quality at the sources and in the distribution system in accordance with the drinking water regulations contained in Washington Administrative Code (WAC) 246-290-300. This plan also provides a summary of the existing water system facilities and operation.

EXISTING WATER SYSTEM DESCRIPTION

Water System Information

The City of Snoqualmie (City) is a municipal corporation that owns and operates a public water system that covers its corporate boundaries and some areas are outside the City's corporate boundaries. Water system data on file at the Washington State Department of Health (DOH) for the City's system is shown in **Table 1**.

Table 1

Water System Information

Information Type	Description
System Type	Group A - Community - Public Water System
System Name	Snoqualmie Water
County	King
DOH System ID Number	81080C
Address	PO Box 987 Snoqualmie, WA 98065
Contact	Jeff Hamlin, PE Project Manager/Operations Manager - Utilities
Contact Phone Number	(425) 831-4919

Water System Operation and Control

The City serves customers within an elevation range of approximately 415 feet above sea level in the historic downtown area to approximately 1,140 feet above sea level on the west side of the system in the Snoqualmie Ridge area. The wide elevation range requires that the water pressure be increased or reduced to maintain pressures that are safe and sufficient to meet the flow requirements of the system. The City achieves this by dividing the water system into ten different pressure zones.

The 599 Zone is the City's largest pressure zone by area and serves the lowest elevations in the historic downtown area. The zone primarily is supplied water from Canyon Springs on the far east side of the system. Under high demand conditions, the South Wellfield, located near Mount Si High School, also can provide supply to the 599 Zone. In emergency conditions when the sources of supply are offline or cannot keep up with demand, the zone also can be supplied water via pressure reducing valves (PRVs) from the 799, 705, and 670 Zones. The 599 Zone

currently serves customers within an elevation range of approximately 415 feet to 525 feet. Although referred to as the 599 Zone due to the 599-foot overflow elevation of the 599 Reservoir, the zone is currently operating at a hydraulic grade line (HGL) of approximately 636 feet due to the pressure setpoint at the Canyon Springs Transmission Main PRV. Eventually, the City intends to activate the new Reinig Road PRV/PSV, which will reduce the hydraulic grade in the downtown area to 599 feet.

The 670 Zone supplies water to the Johnston Heights development and surrounding neighborhoods. Water is supplied to the zone via a PRV from the 799 Zone. Located to the southwest of the 599 Zone, the 670 Zone currently serves customers within an elevation range of approximately 440 feet to 595 feet.

The 705 Zone serves customers on both sides of the Snoqualmie River, within an elevation range of approximately 420 feet to 595 feet. The 705 Zone serves the lower elevation customers in the Snoqualmie Ridge area, as well as all connections north of the State Route (SR) 202 bridge on the north side of the Snoqualmie River, including the Salish Lodge and WRF. Water from Canyon Springs and the South Wellfield can be supplied to the zone via the 705 Booster Pump Station (BPS). The North Wellfield pumps water directly to the 705 Zone. The two 705 Reservoirs, located on the same site as the 1040 BPS, establish the pressure within the zone and moderate the 1040 BPS suction pressure.

The 799 Zone is a small pressure zone located to the south of the 599 Zone, which is typically supplied water via a PRV from the 1172 Reservoir. The 384th Avenue SE BPS discharges into the 799 Zone, and the Snoqualmie Point BPS pumps water out of the 799 Zone to the 1172 Zone. The 799 Zone provides water to customers in an elevation range of approximately 440 feet to 620 feet.

The 800 Zone is located along the Snoqualmie Parkway, to the east of Fisher Creek Park and south of the Snoqualmie Ridge Golf Course. Water can be supplied to the zone through two PRVs from the southernmost portion of the 890 Zone, or through PRVs located in the 1040 BPS. This pressure zone supplies water to customers within an elevation range of approximately 580 feet to 695 feet.

The 890 Zone is comprised of three hydraulically isolated areas in the Snoqualmie Ridge area, each operating at a hydraulic grade of 890 feet.

The first area is located near the northwest corner of the 1040 Pressure Zone and is supplied water from the 1040 Zone through two PRVs. This area of the 890 Zone provides water to residences along SE Burke Street, Douglas Avenue SE, SE Cochrane Street, and Silent Creek Avenue SE. These customers are located within an elevation range of approximately 740 feet to 795 feet.

The second area of the 890 Zone is located near the northeast corner of the 1040 Zone along Whitaker Lane SE and SE Kendall Peak Street. Water supply is provided from the 1040 Zone through a single PRV station. Customers in this area are located within an elevation range of approximately 720 feet to 765 feet.

The third and largest area of the 890 Zone is located between the 1040 Zone and the 800 Zone. Customers are located within an elevation range of approximately 680 feet to 800 feet. Water can be supplied to this area of the 890 Zone through two PRVs from the 1040 Zone, or through a PRV located in the 1040 BPS.

The 1040 Zone provides water to a large portion of the Snoqualmie Ridge area. It is the City's second largest pressure zone by area, and over 50 percent of the City's consumption occurs in this zone. The two 1040 Reservoirs, with a combined storage volume of approximately 3.8 million gallons (MG), are located in this zone and provide the majority of the water storage for the Snoqualmie Ridge area. The sole source of supply to the zone is the 1040 BPS, which pumps water from the 705 Zone. Customers in the 1040 Zone are located within an elevation range of approximately 730 feet to 930 feet.

The 1172 Zone is the City's southernmost zone, with all existing infrastructure located south of Interstate 90 (I-90) in the Snoqualmie Point Park area. The 1172 Reservoir, which is located within the zone, provides storage that can be utilized in the 1172, 799, 670, and 599 Zones. The reservoir, which is filled by the Snoqualmie Point BPS that pumps water from the 799 Zone, sets the hydraulic grade for the zone. There is currently only one service connection in the 1172 Zone: the restroom at Snoqualmie Point Park, which is located at an elevation of approximately 1,075 feet.

The 1180 Zone is a closed zone in the Snoqualmie Ridge area located to the south of the 1040 Zone. It provides water predominantly to residential customers and the Snoqualmie Valley Hospital. Service elevations range from approximately 945 feet to 1,070 feet. Water is supplied to the zone at a hydraulic grade of 1,180 feet from the 1180-1260 BPS, which pumps water from the 1040 Zone. If the 1180 pumps in the BPS are taken offline, water can be supplied to the 1180 Zone through two PRVs from the 1260 Zone.

The City's highest pressure zone, the 1260 Zone, is located in the southwestern corner of the Snoqualmie Ridge area, immediately north of the Snoqualmie Valley Hospital. The 1260 Zone is a closed zone, with pressure maintained by the 1180-1260 BPS. Customers in the zone are located within an elevation range of approximately 1,015 feet to 1,140 feet. There is currently no emergency supply of water for this zone in the event that the 1260 Zone pumps in the 1180-1260 BPS are offline.

Pressure Zones

A list of the City's existing pressure zones and their respective 2017 demand is presented in **Table 2**.

Table 2
Pressure Zones

Pressure Zone	2017 Annual Supply (gallons)	Average Daily Demand (gpm)	Percent of Total Demand
599	72,685,835	138	12.9%
670	4,099,714	8	0.7%
705	50,342,391	96	9.0%
799	23,631,175	45	4.2%
800	11,631,626	22	2.1%
890	27,357,710	52	4.9%
1040	306,374,817	583	54.6%
1172	204,986	0	0.0%
1180	39,309,955	75	7.0%
1260	25,949,090	49	4.6%
Total	**561,587,300**	**1,068**	**100.0%**

Supply Facilities

A summary of the City's existing sources of supply is presented in **Table 3**.

Table 3
Supply Facilities Summary

Facility	Pressure Zone	Year Installed	Use	Existing Capacity (gpm)	Well Depth (feet)	Water Treatment
Canyon Springs	599 Zone	1950s	Active	898	N/A	Chlorination
North Wellfield[1]						
Well No. 6	705 Zone	1996	Active	550	589	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 7	705 Zone	1996	Active	550	541	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
Well No. 8	705 Zone	2002	Active	1,250	694	Chlorination, Filtration (Iron, Manganese, and Arsenic Removal)
South Wellfield[2]						
Well No. 1-R	599 Zone	2006	Active	600	557	Chlorination, Filtration (Iron and Manganese Removal)
Well No. 2	599 Zone	2009	Active	600	564	Chlorination, Filtration (Iron and Manganese Removal)

1 = Well No. 6 cannot be run simultaneously with Well No. 8, so the maximum combined capacity of the North Wellfield is approximately 1,800 gpm.
2 = The capacity of the South Wellfield is currently limited to 563 gpm by the South Wellfield WTP.

Water Storage

A summary of the City's six existing water storage facilities is presented in **Table 4**.

Table 4

Water Storage Facilities

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Overflow Elevation (feet)	Diameter (feet)	Height (feet)
599 Zone								
599 Reservoir	South of Cortland Avenue SE	599 Zone	1961	Steel	0.51	599	52	32
Snoqualmie Ridge Pressure Zones								
705 Reservoir No. 1	Fisher Creek Park	705 Zone	1996	Steel	0.03	705	15	24
705 Reservoir No. 2			2018	Steel	0.13		30	24
1040 Reservoir No. 1	South of SE Jacobia St, between Hancock Ave SE and SE Keller St	1040 Zone	1997	Concrete	2.10	1,040	122	24
1040 Reservoir No. 2			2004	Concrete	1.72		110.5	24
South Pressure Zones								
1172 Reservoir	South of Snoqualmie Point Park	1172 Zone	1989	Steel	0.40	1,172	47	31

Pump Stations

A summary of the City's existing booster pump station facilities is presented in **Table 5**.

Table 5
Booster Pump Stations

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Number of Pumps	Pump Type	Pump Motor Size (HP)	Pump Capacity	Has VFDs?	Sum of Pump Capacities (gpm)[1]	Generator
Snoqualmie Ridge Pressure Zones Booster Pump Stations										
705 BPS	599 Zone	705 Zone	1997	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	No	2,400	Kimball Creek LS Diesel Generator
			2008	2	Horizontal end-suction	(2) 60	(2) 600 gpm @ 175' TDH	Yes		Portable Diesel Generator
1040 BPS	705 Zone	1040 Zone	1996	4	Vertical turbine	(2) 100	(2) 625 gpm @ 385' TDH	No	2,500	Diesel Generator
						(2) 125	(2) 625 gpm @ 385' TDH	No		
1180-1260 BPS	1040 Zone	1180 Zone	2008	6	Vertical turbine	(1) 10	(1) 155 gpm @ 164' TDH	Yes	4,748	Diesel Generator
						(3) 40	(3) 531 gpm @ 215' TDH	Yes		
						(2) 125	(2) 1,500 gpm @ 210' TDH	No		
		1260 Zone		6	Vertical turbine	(1) 15	(1) 137 gpm @ 245' TDH	Yes	4,445	
						(3) 50	(3) 436 gpm @ 290' TDH	Yes		
						(2) 150	(2) 1,500 gpm @ 290' TDH	No		
South Pressure Zones Booster Pump Stations										
384th Avenue SE BPS	599 Zone	799 Zone	1982	3	Vertical turbine	(2) 20	(2) 200 gpm @ 216' TDH	No	1,600	Natural Gas Generator
					Horizontal end-suction	(1) 125	(1) 1,200 gpm @ 272' TDH	No		
Snoqualmie Point BPS	799 Zone	1172 Zone	1989	2	Submersible	(2) 25	(2) 150 gpm @ 414' TDH	No	300	None

1 = The actual total station capacity is typically less than the sum of pump capacities, due to increased head losses at higher flow rates. Total capacity may also be limited if the BPS electrical system is not designed to run all pumps concurrently.

Pressure Reducing, Pressure Sustaining, and Flow Control Stations

A list of the City's existing pressure reducing stations is presented in **Table 6**.

Table 6
Pressure Reducing Stations

Station Name	Upper Pressure Zone	Lower Pressure Zone	Valve Size (in)
Canyon Springs Transmission Main			
Reinig Road PRV/PSV (Inactive)	636 Zone	599 Zone	6
Canyon Springs Transmission Main PRV	Canyon Springs	636 Zone	10
Snoqualmie Ridge Pressure Zones			
705 BPS PRV/PSV	705 Zone	599 Zone	8
1040 BPS PRV - 705 Zone	800 Zone	705 Zone	8 and 3
1040 BPS PRV - 800 Zone	890 Zone	800 Zone	8 and 3
South Ironwood Park PRV	890 Zone	800 Zone	6 and 2
North Ironwood Park PRV	890 Zone	800 Zone	8 and 3
1040 BPS PRV - 890 Zone	1040 Zone	890 Zone	8 and 3
Silent Creek Avenue PRV	1040 Zone	890 Zone	6 and 2
Douglas Avenue PRV	1040 Zone	890 Zone	6 and 2
Denny Peak PRV	1040 Zone	890 Zone	6 and 2
Eagle's Nest Back Gate PRV	1040 Zone	890 Zone	6 and 2
Eagle's Nest Main Gate PRV	1040 Zone	890 Zone	6 and 2
1180-1260 BPS PRV	1260 Zone	1180 Zone	12 and 3
Satterlee Avenue PRV	1260 Zone	1180 Zone	6 and 2
South Pressure Zones			
378th Avenue PRV	670 Zone	599 Zone	6
384th Avenue BPS PRV/PSV - 599 Zone	799 Zone	599 Zone	6
384th Avenue BPS PRV - 670 Zone	799 Zone	670 Zone	6 and 2
Snoqualmie Point BPS PRV	1172 Zone	799 Zone	4 and (2) 1.25

Water Treatment

All City water sources are chlorinated. The North Wellfield sources are treated at the North Wellfield Water Treatment Plant (WTP) for arsenic, iron, and manganese. A sodium hypochlorite solution is added to the raw water for oxidation, while ferric chloride is added to the raw water to coprecipitate with arsenic. At the South Wellfield WTP, the raw water is chlorinated with sodium hypochlorite for oxidation and then filtered with pyrolusite media to remove iron and manganese compounds. The City has future plans to mitigate the South Wellfield's taste and odor issues with chlorination system improvements and the addition of a dedicated pipeline or detention tank to provide breakpoint chlorination reaction time before the water reaches customers.

SOURCE WATER QUALITY MONITORING

The City is required to perform water quality monitoring at each of its active sources for inorganic chemicals (IOC) and physical substances, organic chemicals, unregulated inorganic and organic chemicals, and radionuclides. The monitoring requirements that the City must

comply with are specified in WAC 246-290-300. The City must comply with the requirements for surface water purveyors and groundwater system monitoring. **Table 7** summarizes the source water quality monitoring requirements through 2025. The table is based on information available at the time that this document was prepared and may change in the future.

Table 7
Monitoring Schedule for 2019 through 2025

When	Monitor	Monitoring Group	Test Method	Upon Violation
		2019		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-19	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Jul-19	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-19	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
Aug-19	Canyon Springs	Manganese	IOC	Quarterly for 2 Quarters
Sep-19	North Wellfield, South Wellfield	Manganese	IOC	Quarterly for 2 Quarters
		2020		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-20	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Apr-20	All Active Sources	IOC and Physical	IOC	Quarterly for 2 Quarters
Jul-20	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-20	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
		2021		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-21	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Mar-21	All Active Sources	Herbicides	VOC - 524.2	Quarterly for 2 Quarters
May-21	Canyon Springs, North Wellfield	Radionuclides	RAD	Quarterly until less than MCL
Jul-21	South Wellfield	Radionuclides	RAD	Quarterly until less than MCL
Jul-21	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-21	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
Sep-21	30 Sites in Distribution System	Lead and Copper	LCR	(2) - 6 Mo. Periods
		2022		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-22	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Jul-22	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-22	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
Aug-22	Canyon Springs	Manganese	IOC	Quarterly for 2 Quarters
Sep-22	North Wellfield, South Wellfield	Manganese	IOC	Quarterly for 2 Quarters
		2023		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-23	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Jul-23	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-23	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
		2024		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-24	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
May-24	Canyon Springs, North Wellfield	Volatile Organic Chemicals	VOC - 524.2	Quarterly for 2 Quarters
Jul-24	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-24	South Wellfield	Volatile Organic Chemicals	VOC - 524.2	Quarterly for 2 Quarters
Aug-24	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
Sep-24	30 Sites in Distribution System	Lead and Copper	LCR	(2) - 6 Mo. Periods
		2025		
Monthly	North Wellfield	Arsenic	IOC	Quarterly for 2 Quarters
Mar-25	Canyon Springs, North Wellfield	Nitrate	NIT	Quarterly for 1 Year
Jul-25	4 Sites in Distribution System	Stage 2 DBPs	TTHM and HAA5	1 per Site per Quarter
Aug-25	South Wellfield	Nitrate	NIT	Quarterly for 1 Year
Aug-25	Canyon Springs	Manganese	IOC	Quarterly for 2 Quarters
Sep-25	North Wellfield, South Wellfield	Manganese	IOC	Quarterly for 2 Quarters

Monitoring Requirements and Procedures

Inorganic Chemical and Physical – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. If a maximum contaminant level (MCL) is exceeded, quarterly sampling is required for at least two quarters. According to the City's water quality monitoring schedule generated in 2019, the City has a waiver for a 9-year period that expires at the end of 2028 for each of its sources. Arsenic, nitrate, iron, manganese, and asbestos are included in IOC analysis, but shall be monitored as discussed as follows.

Monitoring for nitrate shall be accomplished once per year at each source. The repeat monitoring frequency shall be quarterly for at least 1 year following any one sample in which the concentration is greater than or equal to 50 percent of the MCL for nitrate or nitrite.

Monitoring for asbestos is required once every 9 years. Systems not vulnerable to asbestos contamination at the source or in the distribution system (due to asbestos cement pipe) may apply to the state for a waiver of the monitoring requirements. The City last sampled the distribution system for asbestos in July 2013. A sample must be taken at a tap served by an asbestos cement pipe where asbestos contamination is most likely to occur. If the MCL is exceeded, quarterly sampling is required for at least two quarters. Currently, the City has a waiver for asbestos which no longer requires sampling. The waiver will expire at the end of 2028.

Monitoring for arsenic is not required at the Canyon Springs and South Wellfield sources. However, one sample must be collected each month at the North Wellfield source because there is treatment specifically to remove arsenic. If the MCL is exceeded, quarterly sampling is required for at least two quarters.

Monitoring for manganese is required once every 3 years at Canyon Springs, the North Wellfield, and the South Wellfield. If the secondary MCL is exceeded, quarterly sampling is required for at least two quarters.

Monitoring for iron is not required at any of the City's sources. However, if the secondary MCL were exceeded, quarterly sampling would be required for at least two quarters.

Volatile Organic Chemicals – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Monitoring for volatile organic chemicals (VOCs) shall be accomplished once every 3 years for each compliance period. If an MCL is exceeded, quarterly sampling is required for at least two quarters. The state may then allow annual monitoring if the results are satisfactory. After three consecutive annual samples that comply with the MCLs, a waiver for reduced monitoring (once every 3-year compliance period) may be applied for again. The City's sources all currently have a 6-year VOC waiver, and the next VOC sample should be collected in May 2024 for Canyon Springs and the North Wellfield, and in August 2024 for the South Wellfield.

Synthetic Organic Chemicals – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Monitoring for synthetic organic chemicals (SOCs) shall be accomplished once every 3 years for each compliance period if a monitoring waiver is not provided by the state. If an MCL is exceeded, quarterly sampling is required for at least two quarters. The state may then allow annual monitoring if the results are satisfactory. After three consecutive annual samples that comply with the MCLs, a waiver for reduced monitoring may be applied for again. The City was granted a monitoring waiver for the

2017 through 2019 compliance periods for pesticides and soil fumigants. The next herbicides samples should be collected in March 2021 at Canyon Springs, the North Wellfield, and the South Wellfield.

Unregulated Inorganic Chemicals – Sulfate is the only unregulated inorganic chemical that must be monitored under the current State regulations. A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Monitoring is required at least once every 5 years, unless a waiver is granted by the State. The City monitors for sulfate when monitoring is performed for regulated inorganic compounds.

Unregulated Volatile Organic Chemicals – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Monitoring is required at least once every 5 years. The City monitors for unregulated volatile organic chemicals when samples for regulated volatile organic chemicals are taken.

Unregulated Synthetic Organic Chemicals – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Monitoring is required at least once every 5 years, unless a waiver is granted by the State. The City monitors for unregulated SOCs when samples for regulated SOCs are taken.

Radionuclides – A minimum of one sample shall be taken after treatment at the entry point to the distribution system for each source. Initial monitoring for gross alpha particle radioactivity, radium-226, and radium-228 required four consecutive quarterly samples. Monitoring thereafter requires four consecutive quarterly samples at least once every 48 months. The analysis for radium-226 and radium-228 may be omitted, if the results from the gross alpha particle radioactivity analysis are less than 5 picocuries per liter (pCi/L). In addition, if the results of the initial analysis are less than half of the established MCL, the required monitoring may be reduced to a single sample collected every 48 months. The initial radionuclide samples resulted in levels much less than the MCL, if detectable at all, and the City may now monitor for radionuclides once every 6 years. For Canyon Springs, the next gross alpha and radium-228 sampling is required in May 2021. For the North and South Wellfields, gross alpha and radium-228 sampling is required in July 2021.

DISTRIBUTION SYSTEM WATER QUALITY MONITORING

The City is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (chlorine) residual concentration, disinfection byproducts, lead and copper, and asbestos in accordance with Chapter 246-290 WAC.

Monitoring Requirements and Procedures

Coliform Bacteria Routine Sampling – Specific requirements are contained in WAC 246-290-300. The City has been collecting a minimum of 70 samples per month from different locations throughout the system based on estimates of the population served.

Table 8 lists the addresses and schedule of the City's routine sampling locations, including the upstream and downstream sampling locations in the event that repeat sampling is necessary. A minimum of 15 samples will be collected each month in accordance with the schedule shown in

the table. The sampling sites are rotated throughout the system to achieve a thorough sampling of all parts of the system.

Table 8

Coliform Monitoring Sampling Locations and Schedule

Site	Pressure Zone	Address	Sampling Frequency
SRX10	1260	9402 Frontier Ave SE	Monthly
SRX9	1180	34911 SE Brinkley St	Monthly
SRX3	1040	8828 Swenson Ave SE	Monthly
SRX2	1040	34723 Curtis Dr SE	Monthly
SRX7	890	34418 SE Burke St	Monthly
SRX1	1040	6211 Fairway Place SE	Monthly
SRX11	890	35708 SE Kendall Peak St	Monthly
SRX9	890	7705 Greenridge Ct SE	Monthly
SRX5	800	36332 SE Forest St	Monthly
SRX4	705	36910 SE Braeburn St	Monthly
X8	599	44937 SE 70th St	Monthly
X2	599	39025 SE Alpha St	Monthly
X9	1172	37580 SE Winery Rd	Monthly
X1	670	8716 378th Ave SE	Monthly
X4	599	8130 378th Ave SE	Monthly

Coliform Bacteria Repeat Sampling – In the event that a sample tests positive for coliform, a repeat sample shall be taken at the same location as the suspect sample and two additional samples shall be taken within five service connections upstream and downstream of the suspect sample. The repeat upstream and downstream sample locations are listed in **Table 8**. Each repeat sample also must be tested for the presence of *E. coli*. These repeat and source samples shall be taken by the end of the next business day after receiving the unsatisfactory results. The City also must conduct an assessment of its water system facilities and operations and fix any sanitary defects. If the results conclude that an *E. coli* MCL is exceeded, the City must perform a Level 2 assessment and provide public notification in accordance with WAC 246-290-495 within 24 hours. An *E. coli* Response Plan is included in the last section of this document. If a positive sample is collected on a consecutive system, the City also will need to collect source samples.

Disinfectant Residual Concentration – The City's chlorination targets are to maintain a free chlorine residual of 1.0 milligram per liter (mg/L) at the entry points to distribution at all times, as well as ensure the distribution free chlorine residual is equal to or above 0.05 mg/L in more than 95 percent of monthly samples.

Samples collected and submitted for coliform testing also shall be tested for disinfectant residual concentration to ensure the disinfectant residual meets the regulatory requirements and achieves the target levels planned by the City.

Lead and Copper – Specific requirements are contained in Title 40, Parts 141.86, 141.87, and 141.88 of the Code of Federal Regulations (CFR). Initial monitoring, beginning July 1, 1993, required 20 samples for each 6-month monitoring period for the City's population. After two consecutive 6-month monitoring periods of meeting the lead and copper action levels, ten samples taken during June, July, August, or September were required once per year. After three consecutive years of monitoring and meeting the lead and copper action levels, ten samples

taken during June, July, August, or September are required every 3 years. However, the City's population has increased such that the sampling requirement is now 30 samples every 3 years.

The City has collected samples as required. All lead and copper monitoring completed indicated lead and copper levels were below the action levels at the 90th percentile. Sample sites shall be selected based on the known existence of lead pipes, copper pipes, and copper pipes with lead solder in accordance with 40 CFR 141.86(a). All samples, except for lead service line samples, shall be "first draw tap samples" taken at a cold water tap in which water has not been drawn from the tap for at least 6 hours, but no more than 12 hours. Sample faucets shall be flushed with cold water the evening prior to collecting the sample. Lead service line samples shall be collected with one of three methods in accordance with 40 CFR 141.86(b). The locations of future sample sites shall be the same as past sample sites, unless unavoidable conditions prevent sampling at the same locations. The City has reviewed its historical records and has exposed and phsyically inspected service connections identified as being the most at risk of containing leaded service goosenecks. No records or physical inspections have indicated the presence of leaded service lines within the City's distribution system.

Fluoride Concentration – Specific requirements are contained in WAC 246-290-460 for systems that are fluoridating drinking water. The City does not currently fluoridate its water. The City samples for fluoride concentrations when they test for inorganic chemicals.

If the City decides to fluoridate its water supply in the future, the concentration of fluoride shall be maintained at 0.7 mg/L. Determinations of fluoride concentrations shall be made daily, and reports of the analyses shall be submitted to DOH within 10 days of the end of the reporting month. Monthly check samples shall be taken downstream of each fluoride injection point, at the first sample tap where adequate mixing has occurred.

Disinfection Byproducts – Specific requirements are contained in WAC 246-290-300. Under the Stage II Disinfectants and Disinfection Byproducts Rule (DBPR), the City is required to monitor for total trihalomethanes (TTHM) and five haloacetic acids (HAA5) every three months. However, the City is allowed to sample at a reduced frequency; only two TTHM and two HAA5 samples are required every year. The sample locations were established during the City's Stage II DBPR Initial Distribution System Evaluation, and sampling is performed according to the City's Stage II DBPR monitoring plan.

E. COLI RESPONSE PLAN

The following checklist includes elements that were considered by the City in developing a response plan in the event that *E. coli* is present in the source water or distribution system. The *E. coli* response plan includes operational changes or emergency procedures to reduce the effect of *E. coli* bacteria on water system customers.

Distribution System *E. coli* Response Checklist				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We inform staff members about activities within the distribution system that could affect water quality.	☒	☐	☐	☐
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	☒	☐	☐	☐
We can easily access and review documentation on water main breaks, construction & repair activities, low pressure and outage incidents.	☒	☐	☐	☐
Our Cross-Connection Control Program is up-to-date.	☒	☐	☐	☐
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	☒	☐	☐	☐
We routinely inspect all treatment facilities for proper operation	☒	☐	☐	☐
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	☒	☐	☐	☐
We can activate an emergency intertie with an adjacent water system in an emergency.	☒	☐	☐	☐
We have a map of our service area boundaries.	☒	☐	☐	☐
We have consumers who may not have access to bottled or boiled water.	☐	☒	☐	☐
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	☒	☐	☐	☐
We have identified the contact person at each day care, school, medical facility, food service, and other customers who may have difficulty responding to a Health Advisory.	☐	☐	☐	☒
We have messages prepared and translated into different languages to ensure our consumers will understand them.	☐	☐	☐	☒
We have the capacity to print and distribute the required number of notices in a short time period.	☒	☐	☐	☐
(Cont.)				

Distribution System *E. coli* Response Checklist				
Policy Direction	**Yes**	**No**	**N/A**	**To Do List**
We have discussed the issue of *E. coli*-present sample results with our policy makers.	☐	☐	☐	☒
If we find *E. coli* in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	☐	☐	☐	☒
Potential Public Notice Delivery Methods	**Yes**	**No**	**N/A**	**To Do List**
It is feasible to deliver a notice going door-to-door.	☐	☒	☐	☐
We have a list of all of our customers' addresses.	☒	☐	☐	☐
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	☒	☐	☐	☐
We have a list of customer email addresses.	☐	☒	☐	☐
We encourage our customers to remain in contact with us using social media.	☒	☐	☐	☐
We have an active website we can quickly update to include important messages.	☒	☐	☐	☐
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	☐	☒	☐	☐
We need a news release to supplement our public notification process.	☒	☐	☐	☐

***E. coli*-Present Triggered Source Response Checklist** **All Sources**				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We review our sanitary survey results and respond to any recommendations affecting the microbial quality of our water supply.	☒	☐	☐	☐
We address any significant deficiencies identified during a sanitary survey.	☒	☐	☐	☐
There are contaminant sources within our Wellhead Protection Area that could affect the microbial quality of our source water, and If yes, we can eliminate them.	☐ ☐	☒ ☐	☐ ☒	☐ ☐
We routinely inspect our well site(s).	☒	☐	☐	☐
We have a good raw water sample tap installed at each source.	☒	☐	☐	☐
After we complete work on a source, we disinfect the source, flush, and collect an investigative sample.	☒	☐	☐	☐
Public Notice	**Yes**	**No**	**N/A**	**To Do List**
We discussed the requirement for immediate public notice of an E. coli-present source sample result with our water system's governing body (board of directors or commissioners) and received direction from them on our response plan.	☐	☐	☐	☒
We discussed the requirement for immediate public notice of an E. coli-present source sample result with our wholesale customers and encouraged them to develop a response plan.	☐	☐	☐	☒
We have prepared templates and a communications plan that will help us quickly distribute our messages.	☐	☐	☐	☒

E. coli-Present Triggered Source Response Checklist

Source S01 Canyon Springs

Alternate Sources	Yes	No	N/A	To Do List
We can stop using this source and still provide reliable water service to our customers.	☒	☐	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☐	☒	☐	☐
We can provide bottled water to all or part of our distribution system for an indefinite period.	☐	☒	☐	☐
We can quickly replace our existing source of supply with a more protected new source of supply.	☐	☒	☐	☐
Temporary Treatment	**Yes**	**No**	**N/A**	**To Do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? >1.0 mg/L	☒	☐	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (operational storage) to increase the amount of time the water stays in the system before the first customer to achieve CT = 6.	☒	☐	☐	☐
We can alter the demand for drinking water (maximum day or peak hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☒	☐	☐	☐

***E. coli*-Present Triggered Source Response Checklist** **Source S05 North Wellfield**				
Alternate Sources	**Yes**	**No**	**N/A**	**To Do List**
We can stop using this source and still provide reliable water service to our customers.	☒	☐	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☐	☒	☐	☐
We can provide bottled water to all or part of my distribution system for an indefinite period.	☐	☒	☐	☐
We can quickly replace our existing source of supply with a more protected new source of supply.	☐	☒	☐	☐
Temporary Treatment	**Yes**	**No**	**N/A**	**To do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? >1.0 mg/L	☒	☐	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (Operational Storage) to increase the length of time water stays in the system before the first customer to achieve CT = 6.	☒	☐	☐	☐
We can alter the demand for drinking water (Maximum Day or Peak Hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☒	☐	☐	☐

E. coli-Present Triggered Source Response Checklist

Source S09 South Wellfield

Alternate Sources	Yes	No	N/A	To Do List
We can stop using this source and still provide reliable water service to our customers.	☒	☐	☐	☐
We have an emergency intertie with a neighboring water system that we can use until corrective action is complete (perhaps for several months).	☐	☒	☐	☐
We can provide bottled water to all or part of my distribution system for an indefinite period.	☐	☒	☐	☐
We can quickly replace our existing source of supply with a more protected new source of supply.	☐	☒	☐	☐
Temporary Treatment	**Yes**	**No**	**N/A**	**To do List**
This source is continuously chlorinated, and our existing facilities can provide 4-log virus treatment (CT = 6) before the first customer. If yes, at what concentration? >1.0 mg/L	☒	☐	☐	☐
We can quickly introduce chlorine into the water system and take advantage of the existing contact time to provide 4-log virus treatment to a large portion of the distribution system.	☒	☐	☐	☐
We can reduce the production capacity of our pumps or alter the configuration of our storage quantities (Operational Storage) to increase the length of time water stays in the system before the first customer to achieve CT = 6.	☐	☒	☐	☐
We can alter the demand for drinking water (Maximum Day or Peak Hour) through conservation messages to increase the time the water is in the system prior to the first customer in order to achieve 4-log virus treatment with chlorine.	☒	☐	☐	☐

Distribution System *E. coli* Response Plan

If we have *E. coli* in our distribution system we will immediately:

1. Call DOH.
2. Collect repeat and triggered source samples. Collect additional investigative samples as necessary.
3. Inspect our water system facilities, including treatment plants for proper operation.
4. Interview staff to determine whether anything unusual was happening in the water system service area, especially since the previous month's sample(s).
5. Review new construction activities, water main breaks, and pressure outages that may have occurred during the previous month.
6. Review Cross-Connection Control Program status.
7. Discuss with DOH whether to issue a Health Advisory based on the findings of steps 3-6. If necessary, issue the HA.
8. Increase chlorine dose at treatment plants to result in at least 1.5 mg/L at distribution entry.
9. Flush affected portions of the distribution system.
10. Prepare draft news release and website changes.
11. Contact school district & medical facilities about potential action.
12. Collect investigative samples every 10 to 12 hours until repeat results are known.
13. Respond appropriately to repeat results:
    - If repeats are all satisfactory, lift HA if one was issued.
    - If any repeat is unsatisfactory, issue HA if not already issued. Host DOH for an inspection and respond accordingly to inspection findings.

E. coli-Present Triggered Source Response Plan

Source S01 Canyon Springs

If we have *E. coli* in our source water we will immediately:

1. Call DOH.
2. Shut down source S01.
3. Distribute required notice to direct service customers. The notice will include water curtailment instructions to stop outdoor watering.
4. Increase chlorine dose to achieve at least 1.5 mg/L at the entry point to the distribution system.
5. Begin compliance monitoring at the entry point to the distribution system.
6. Begin investigative sampling from each source.
7. Ask DOH to review our Contact Time analysis and acknowledge that we provide 4-log virus treatment before the first customer.
8. Respond appropriately to repeat results:
    a. If repeats are all satisfactory, lift HA if one was issued.
    b. If any repeat is unsatisfactory, issue HA if not already issued. Host DOH for an inspection and respond accordingly to inspection findings.

E. coli-Present Triggered Source Response Plan

Source S05 North Wellfield

If we have *E. coli* in our source water we will immediately:

1. Call DOH.
2. Shut down source S05.
3. Distribute required notice to direct service customers. The notice will include water curtailment instructions to stop outdoor watering.
4. Increase chlorine dose to achieve at least 1.5 mg/L at the entry point to the distribution system.
5. Begin compliance monitoring at the entry point to the distribution system.
6. Begin investigative sampling at operating wells and treatment plant.
7. Ask DOH to review our Contact Time analysis and acknowledge that we provide 4-log virus treatment before the first customer.
8. Respond appropriately to repeat results:
    a. If repeats are all satisfactory, lift HA if one was issued.
    b. If any repeat is unsatisfactory, issue HA if not already issued. Host DOH for an inspection and respond accordingly to inspection findings.

E. coli-Present Triggered Source Response Plan

Source S09 South Wellfield

If we have *E. coli* in our source water we will immediately:

1. Call DOH.
2. Shut down source S05.
3. Distribute required notice to direct service customers. The notice will include water curtailment instructions to stop outdoor watering.
4. Increase chlorine dose to achieve at least 1.5 mg/L at the entry point to the distribution system.
5. Begin compliance monitoring at the entry point to the distribution system.
6. Begin investigative sampling at operating wells and treatment plant.
7. Ask DOH to review our Contact Time analysis and acknowledge that we provide 4-log virus treatment before the first customer.
8. Respond appropriately to repeat results:
    a. If repeats are all satisfactory, lift HA if one was issued.
    b. If any repeat is unsatisfactory, issue HA if not already issued. Host DOH for an inspection and respond accordingly to inspection findings.

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PRELIMINARY - CITY REVIEW ONLY

RTCR Level 1 and 2 Assessment Guidance Template

PRELIMINARY - CITY REVIEW ONLY

Level 1 Assessment Guidance Template

331-569, October 2017

Send your assessment to:

Northwest Region	20425 72nd Ave. South, Suite 310 Kent, WA 98032-2358	Phone: Fax: Email:	(253) 395-6750 (253) 395-6760 carol.stuckey@doh.wa.gov ingrid.salmon@doh.wa.gov
Southwest Region	PO Box 47823 Olympia WA 98504-7823	Phone: Fax: Email:	(360) 236-3030 (360) 664-8058 swro.coli@doh.wa.gov
Eastern Region	16201 Indiana Ave Suite 1500 Spokane Valley WA 99216	Phone: Fax: Email:	(509) 329-2100 (509) 329-2104 ero.waterquality@doh.wa.gov

Water System Name: City of Bonney Lake	County: Pierce	**Water System ID #**: 07650H
Assessor Name:	Email Address:	
Assessor Address, City, State, Zip:		ODW Only, Date Received:
Date(s) Assessment Completed:	**Month and Year of TTT:**	

Within 30 days of learning of the Treatment Technique Trigger (TTT), submit a completed assessment to your regional office. Keep a copy in your water system files.

Use this *Level 1 Assessment Guidance Template* as a guide for a system with only a groundwater source(s).

Part A: The Assessment

- Review the most recent sanitary survey report.
- Assess the status of the system's significant deficiencies and findings, observations, and recommendations.
- Respond to all parts of this template that are applicable to the water system.
- Use additional pages if you need more space.

Part B: The Summary and Corrective Actions

- Summarize assessment findings. For corrective actions:
  - Completed: include photos, work receipts, or reports.
  - Not yet completed: include an action plan with timetable with dates.

Part A: Assessment		**Corrective action needed?**	**Description, Comments, and Recommendations**
1. Site and Sampling Protocol			
a. Is there a written coliform monitoring plan & sampling procedure that represents the distribution system? **If yes, does the system follow the coliform monitoring plan?**	☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A	
b. Have there been changes in sampling conditions or procedures? Describe:	☐ Yes ☐ No	☐ Yes ☐ No	
c. Inspect sampling sites where unsatisfactory samples have been collected. Are the sampling taps and locations: i. Free of potential sources of contamination? ii. In good condition?	 ☐ Yes ☐ No ☐ Yes ☐ No	 ☐ Yes ☐ No ☐ Yes ☐ No	
d. Do the coliform sample results from the last 90 days suggest ongoing water quality issues?	☐ Yes ☐ No	☐ Yes ☐ No	
e. Is this assessment required due to failure to collect all repeat samples? **If yes, what were the procedures taken to ensure repeat samples will be collected in the future?**	☐ Yes ☐ No	☐ Yes ☐ No	

Part A: Assessment		Corrective action needed?	Description, Comments, and Recommendations
2. Distribution			
a. Are procedures in place to:			
i. Replace and repair system parts?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Regularly flush?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Routinely inspect vault(s)?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	
iv. Implement a cross connection control program?	☐ Yes ☐ No	☐ Yes ☐ No	
v. Maintain positive pressure?	☐ Yes ☐ No	☐ Yes ☐ No	
b. Have there been:			
i. Recent reports of low pressure (less than 20 PSI) or complete loss of pressure?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Changes in condition or operation?	☐ Yes ☐ No	☐ Yes ☐ No	
c. Inspect the distribution system. Are there any:			
i. Visible line breaks or leaks?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Observed unprotected cross connections?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Waterlogged pressure tanks?	☐ Yes ☐ No	☐ Yes ☐ No	
iv. Evidence of vandalism or other security breaches?	☐ Yes ☐ No	☐ Yes ☐ No	
v. Other:			
3. Storage Facilities - Is there a water storage tank? If no, skip to Section 4. Note: Pressure and hydropneumatic tanks are **not** storage tanks	☐ Yes ☐ No	☐ Yes ☐ No	
a. Are there:			
i. Procedures for periodic inspection and upkeep of the facility?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Any changes in storage condition or operations?	☐ Yes ☐ No	☐ Yes ☐ No	
b. Inspect each storage tank. Are there:			
i. Overflow lines constructed to prevent contaminants?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Cracks or unprotected openings in the tank walls?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Reservoir roof cracks?	☐ Yes ☐ No	☐ Yes ☐ No	
iv. Unprotected roof openings?	☐ Yes ☐ No	☐ Yes ☐ No	
v. Improperly constructed access hatch or seal?	☐ Yes ☐ No	☐ Yes ☐ No	
vi. Evidence of vandalism or other security breaches?	☐ Yes ☐ No	☐ Yes ☐ No	
c. If there is an air vent or opening for a water-level gauge, is it constructed to prevent entry of contaminants?	☐ Yes ☐ No	☐ Yes ☐ No	
d. If the overflow line discharges to a storm drain, to surface water, or directly into a sanitary sewer, is it protected by a proper air gap?	☐ Yes ☐ No	☐ Yes ☐ No	
4. Treatment - Is treatment in use for any source? If no, skip to Section 5.	☐ Yes ☐ No	☐ Yes ☐ No	
a. If treatment includes disinfection, were chlorine residuals normal during the month the TTT occurred?	☐ Yes ☐ No	☐ Yes ☐ No	

Part A: Assessment		Corrective action needed?	Description, Comments, and Recommendations
b. Inspect the treatment facility. Are there:			
i. Procedures in place for proper operation and maintenance?	☐ Yes ☐ No	☐ Yes ☐ No	
1. Is the treatment system operating properly?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Changes in equipment or process? Describe.	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Evidence of vandalism or other security breaches?	☐ Yes ☐ No	☐ Yes ☐ No	
5. Source			
a. Are there procedures in place for periodic inspection and maintenance of the source facilities?	☐ Yes ☐ No	☐ Yes ☐ No	
b. Does each source have a raw water sample tap properly located? http://www.doh.wa.gov/portals/1/Documents/pubs/331-436.pdf	☐ Yes ☐ No	☐ Yes ☐ No	
c. Inspect the source facilities. Is the:			
i. Sanitary control area free of all potential sources of contamination?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Wellhead or spring box above grade with no potential for flooding?			
iii. Well cap sealed and watertight?	☐ Yes ☐ No	☐ Yes ☐ No	
iv. Well casing free of unprotected openings?			
v. Pressure tank waterlogged?	☐ Yes ☐ No	☐ Yes ☐ No	
vi. Spring box (structure, hatch, and overflow) free of any unprotected openings?	☐ Yes ☐ No	☐ Yes ☐ No	
vii. Other:	☐ Yes ☐ No	☐ Yes ☐ No	
	☐ Yes ☐ No	☐ Yes ☐ No	
d. Have there been any changes in condition or operation?	☐ Yes ☐ No	☐ Yes ☐ No	
6. Other assessment activities. Describe:			

Part B: Assessment Summary and Corrective Action Plan with Timetable		
1. Actions Completed	**Assessor: Summarize the issues found where corrective actions have been completed.** Include photos, work receipts, or reports to depict assessment findings.	
Describe issue found	**Describe corrective action taken**	**Date Completed**
2. Actions To be Taken	**Assessor: Describe the issues found where corrective actions will be completed later.**	**Provide a timetable**
Describe issue found	**Describe planned corrective action**	**Expected Completion Date**

Assessor has discussed the Assessment findings with the Water System Owner: ☐ **Yes** ☐ **No**

If no, note the date when the discussion will occur: _____

Signature of Assessor: _____ Date: _____

Office of Drinking Water staff will review this assessment and determine if any of the issues identified are Sanitary Defects - a defect that could provide a pathway of entry for microbial contamination into the distribution system, or a defect that is indicative of a failure or imminent failure in a barrier that is already in place.

OFFICE OF DRINKING WATER USE ONLY

Regional Office Reviewer: _____ Date of Review: _____ Assessment sufficient? ☐ Yes ☐ No

Likely Cause Determined? ☐ Yes ☐ No Sanitary Defects Identified? ☐ Yes ☐ No Corrective Actions Complete? ☐ Yes ☐ No ☐ N/A

Corrective Action Plan Included? ☐ Yes ☐ No ☐ N/A Corrective Action Plan approved? ☐ Yes ☐ No ☐ N/A

Comments:

PRELIMINARY - CITY REVIEW ONLY

Level 2 Assessment Guidance Template

331-570, 2017

Send your assessment to:

Northwest Region	20425 72nd Ave. South, Suite 310 Kent, WA 98032-2358	Phone: Fax: Email:	(253) 395-6750 (253) 395-6760 carol.stuckey@doh.wa.gov ingrid.salmon@doh.wa.gov
Southwest Region	PO Box 47823 Olympia WA 98504-7823	Phone: Fax: Email:	(360) 236-3030 (360) 664-8058 swro.coli@doh.wa.gov
Eastern Region	16201 Indiana Ave Suite 1500 Spokane Valley WA 99216	Phone: Fax: Email:	(509) 329-2100 (509) 329-2104 joseph.perkins@doh.wa.gov

Water System Name: City of Bonney Lake	County: Pierce	**Water System ID #**: 07650H
Assessor Name: Click here to enter text	Email Address: Click here to enter text	
Assessor is: WDM 2, 3, or 4 ___ OR PE ___ OR LHJ ___ (check one)		ODW Only, Date Received: Click here to enter text
Assessor Address, City, State, Zip: Click here to enter text		
Date(s) Assessment Completed: Click here to enter text	**Month and Year of TTT**: Enter date	

This assessment is required due to the repeated occurrence of total coliform bacteria, or the confirmation of *E. coli* bacteria in the distribution system. Conduct a thorough assessment of the water system per this guidance and within 30 days submit the assessment to your regional office. If this is the water system's second level 2 assessment and the cause for the contamination cannot be found and fixed, the system will be required to add the barrier of continuous disinfection treatment.

Use this *Level 2 Assessment Guidance Template* for a system with only a groundwater source(s).

Part A: The Assessment

- Review the most recent sanitary survey report.
  - Assess the status of the system's significant deficiencies and findings, observations, and recommendations.
- Respond to all parts of this template that are applicable to the water system.
- Use additional pages if you need more space.

Part B: The Summary and Corrective Actions

- Summarize assessment findings. For corrective actions:
  - Completed: include photos, work receipts, or reports.
  - Not yet completed: include an action plan with dates for completion of each item.

Part A: Assessment		Corrective Action Needed?	Description, Comments, and Recommendations
1. Site and Sampling Protocol			
a. Is there a written coliform monitoring plan & sampling procedure that ensures each sample represents the distribution system?	☐ Yes ☐ No	☐ Yes ☐ No	
b. Is there a program to ensure that all sample collectors are trained before being allowed to collect compliance samples?	☐ Yes ☐ No	☐ Yes ☐ No	
c. Are routine and repeat sample sites regularly monitored to ensure that no site will contaminate the sample?	☐ Yes ☐ No	☐ Yes ☐ No	
d. Do the coliform sample results from the last 24 months suggest ongoing or reoccurring water quality issues?	☐ Yes ☐ No	☐ Yes ☐ No	
e. Relative to the Unsatisfactory samples associated with the TTT: i. Did a trained sample collector collect each sample? ii. Were the monitoring plan and sampling procedure followed? iii. Were there any changes in sampling conditions or procedures that may have contributed to the TTT?	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	

Part A: Assessment		Corrective Action Needed?	Description, Comments, and Recommendations
f. Inspect the Unsatisfactory samples' sites: i. Are the sampling locations free of potential sources of contamination? ii. Are the sampling taps in good condition? iii. Other:	☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
g. Was this TTT due to failure to collect all repeat samples? If yes, describe steps being taken to ensure all required repeat samples will be collected in the future.	☐ Yes ☐ No	☐ Yes ☐ No	
2. Distribution System			
a. Are there standard procedures for proper maintenance including: i. Pipe replacement and repair? ii. Other distribution system components replacement and repair? iii. Regular flushing? iv. Routine vault inspections? v. Maintain positive pressure throughout?	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
b. Is there a fully implemented cross connection control program?	☐ Yes ☐ No	☐ Yes ☐ No	
c. Is each air-vacuum-relief-valve vented above-grade?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
d. Following work done in distribution system or any pressure loss event, are investigative coliform samples collected?	☐ Yes ☐ No	☐ Yes ☐ No	
e. Have there been any: i. Recent reports of low pressure (less than 20 psi) or complete loss of pressure? ii. Recent repairs or new construction? iii. Pipe leaks that are not yet repaired? iv. Recent use of fire hydrants such as hydrant maintenance or flushing by utility or fire department? v. Recent reports of a cross-connection incident? vi. Off-normal events such as discolored water, odd taste, or smell? vii. Other changes in distribution conditions or operations that may have contributed to the TTT?	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
f. Inspect the distribution system. Are there any: i. Visible line breaks or leaks? ii. Observed cross connections? iii. Waterlogged pressure tanks? iv. Indications of vandalism or other security breach? v. Other:	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
3. Storage Facilities – Is there storage? If no, skip to Section 4.	☐ Yes ☐ No		
a. Are there standard procedures for periodic inspection of the exterior of each storage facility including vents, hatches, fittings for level gage/controls, and overflows?	☐ Yes ☐ No	☐ Yes ☐ No	

Part A: Assessment		Corrective Action Needed?	Description, Comments, and Recommendations
b. Are there standard procedures for periodic inspection and cleaning of the interior of each storage facility?	☐ Yes ☐ No	☐ Yes ☐ No	
If more than one tank, for each corrective action noted below, name which tank(s) the action applies to:			
c. Are all storage facilities secured from unauthorized entry and vandalism?	☐ Yes ☐ No	☐ Yes ☐ No	
d. If there is an air vent, is it constructed to prevent entry of contaminants?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
e. If there is a fitting for a level gage or level controls, is it constructed to prevent entry of contaminants?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
f. If there is an overflow line that discharges to a storm drain, surface water, or into a sanitary sewer, is it protected by a proper air gap?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
g. Has there been: i. Any recent work done at a storage facility? ii. Any other changes in storage conditions or operations?	 ☐ Yes ☐ No ☐ Yes ☐ No	 ☐ Yes ☐ No ☐ Yes ☐ No	
h. Inspect each storage tank. Are there any: i. Any floating objects in the tank? ii. Cracks or unprotected openings in tank walls? iii. Unprotected openings in the tank roof? iv. Gaps or weak areas in access hatch seals? v. Holes in the air vent screen? vi. Weak points in the attachment of the screen to the vent structure? vii. Holes in the screen on the open end of overflow line? viii. Obstructions compromising the proper air gap where the overflow line discharges into a storm drain, surface water, or sanitary sewer? ix. Indications of vandalism or other security breach? x. Other:	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	
4. Treatment – Is there treatment? If no, skip to Section 5.	☐ Yes ☐ No		
a. List every type of treatment in use:			
b. Is any source continuously treated with a disinfectant? If yes, Are there standard procedures for: i. Proper operation and maintenance of disinfection treatment facilities? ii. Monitoring disinfectant residual frequency per DOH requirement? Were: iii. Chlorine residuals 0.2 mg/L or greater in the Unsatisfactory samples? List residuals: iv. Chlorine residuals normal throughout the month the TTT occurred? v. All chlorine residual measurements from the last 90 days indicative of any on-going or recurring treatment issue?	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No	

Part A: Assessment		Corrective Action Needed?	Description, Comments, and Recommendations
c. Have there been any:			
i. Changes in treatment equipment or processes?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Recent interruptions in any treatment process?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Recent maintenance performed on any treatment component?	☐ Yes ☐ No	☐ Yes ☐ No	
d. Inspect the treatment facilities:			
i. Is the treatment system operating properly?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Is there any evidence of vandalism or other security breach?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Other:	☐ N/A	☐ Yes ☐ No	
5. Source (if more than one source, note source number as needed)			
a. Does each source comply with the Sanitary Control Area requirements (WAC 246-290-135(2)?	☐ Yes ☐ No	☐ Yes ☐ No	
b. Are all sources protected from fecal contamination by appropriate placement and construction?	☐ Yes ☐ No	☐ Yes ☐ No	
c. Are there standard procedures for periodic inspection and maintenance of the source facilities?	☐ Yes ☐ No	☐ Yes ☐ No	
d. Are the source facilities secured from unauthorized entry and vandalism?	☐ Yes ☐ No	☐ Yes ☐ No	
e. Has there been any:			
i. Recent use of an unapproved source?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Recent land use changes?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Standing water, heavy precipitation, or flooding around a source in the last month?	☐ Yes ☐ No	☐ Yes ☐ No	
iv. Recent failure of a source pump?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
v. Recent maintenance on a source pump or other source component?	☐ Yes ☐ No	☐ Yes ☐ No	
vi. Other changes in source conditions or operations?	☐ Yes ☐ No	☐ Yes ☐ No	
f. Inspect the source facilities. Is:			
i. Sanitary control area free of all potential sources of contamination?	☐ Yes ☐ No	☐ Yes ☐ No	
ii. Top of well casing or spring box at risk of submergence?	☐ Yes ☐ No	☐ Yes ☐ No	
iii. Well cap sealed and watertight?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
iv. Well casing or spring box free of unprotected openings?	☐ Yes ☐ No	☐ Yes ☐ No	
v. Pressure tank water logged or off-line?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No	
vi. There any evidence of vandalism or other security breach?	☐ Yes ☐ No	☐ Yes ☐ No	
vii. Other:	☐ N/A	☐ Yes ☐ No	
6. Other assessment activities.			
a. Is it time for the additional barrier of continuous disinfection to be installed at this system? If no, why not? Explain:	☐ Yes ☐ No		
b. Other activities:			

Part B: Assessment Summary and Corrective Action Plan with Timetable		
1. Actions Completed	**Assessor: Summarize the issues found where corrective actions have been completed.** Include photos, work receipts, and/or reports to depict assessment findings.	
Describe issue found	**Describe corrective action taken**	**Date Completed**
Click here to enter text	Click here to enter text	
Click here to enter text	Click here to enter text	
Click here to enter text	Click here to enter text	
2. Actions To be Taken	**Assessor: Describe the issues found where corrective actions will be completed later.**	**Provide a timetable**
Describe issue found	**Describe planned corrective action**	**Expected Completion Date**
Click here to enter text	Click here to enter text	
Click here to enter text	Click here to enter text	
Click here to enter text	Click here to enter text	

Assessor has discussed the Assessment findings with the Water System Owner: ☐ **Yes** ☐ **No**

If no, note the date when the discussion will occur: Click here to enter text_____

Signature of Assessor: _____ Date: Click here to enter text_____

Office of Drinking Water staff will review this assessment and determine if any of the issues identified are Sanitary Defects - a defect that could provide a pathway of entry for microbial contamination into the distribution system, or a defect that is indicative of a failure or imminent failure in a barrier that is already in place.

OFFICE OF DRINKING WATER USE ONLY

Regional Office Reviewer: Click here to enter text_____ Date of Review: Click here to enter text_____ Assessment sufficient? ☐ Yes ☐ No

Likely Cause Determined? ☐ Yes ☐ No Sanitary Defects Identified? ☐ Yes ☐ No Corrective Actions Complete? ☐ Yes ☐ No ☐ N/A

Corrective Action Plan Included? ☐ Yes ☐ No ☐ N/A Corrective Action Plan approved? ☐ Yes ☐ No ☐ N/A

Comments: Click here to enter text

PRELIMINARY - CITY REVIEW ONLY

Fact Sheet

April 2016
DOH 331-206
Revised

Revised Total Coliform Rule

Treatment technique triggers, violations, and public notification requirements

The Revised Total Coliform Rule (RTCR) continues the basic monitoring requirements and objectives of the Total Coliform Rule; however, it offers greater public health protection by adding new requirements and updating others.

The Office of Drinking Water (ODW) always required water systems with microbial contamination to find and fix any maintenance or operational defect that could allow contamination to enter a water system. RTCR formalizes this process and requires water systems to submit a water system assessment report to us any time they have unsatisfactory sample results. It also assigns violations to water systems that fail to complete these tasks.

Treatment Technique Triggers

When a treatment trigger occurs, water systems must conduct an assessment to find and fix any sanitary defects. There are two assessment levels; both evaluate the entire system from the point of sample collection to the source of supply.

Don't wait for us to notify you about the treatment technique trigger. You must complete the assessment within 30 days after the trigger occurs, and submit an assessment report to us.

A Level 1 assessment is a basic system evaluation that an owner or other knowledgeable person can do. The RTCR requires a Level 1 assessment when one of these treatment technique triggers occurs:

- A system that collects fewer than 40 routine samples during the month has more than one coliform-present sample.
- A system that collects 40 or more routine samples during the month has coliform-present results in more than 5 percent of the routine and repeat samples.
- A water system fails to collect three repeat samples for every total coliform-present sample.

A Level 2 assessment is a more complex evaluation that only a state-qualified person can do. The RTCR requires a Level 2 assessment when one of these treatment technique triggers occurs:

- A water system has an *E. coli* MCL violation (see page 2).
- A water system incurs a second treatment technique trigger in a rolling 12-month period.

3 parts of a Level 1 or Level 2 assessment

- **Evaluation:** Identify any sanitary defect that allowed coliform to enter the distribution system or failure or imminent failure of an existing barrier.
- **Discussion:** Discuss what you identified during the assessment that might allow contamination to occur and the corrective action needed to fix it.
- **Corrective action:** Record the steps you took or will take to fix the sanitary defect that allowed the contamination to occur.

Washington State Department of Health
Environmental Public Health
Office of Drinking Water

HELPING TO ENSURE SAFE AND RELIABLE DRINKING WATER

Violations

Violations under the RTCR usually indicate a failure to act. Water systems should prepare themselves to follow the rule requirements to protect the safety of their water supply.

Public Notification Requirements
Tier 1: Issued within 24 hours
Tier 2: Issued within 30 days
Tier 3: Issued within 1 year

Treatment Technique Violation

A treatment technique violation indicates the water system failed to act or respond as required. When a treatment technique violation occurs, a system must provide **Tier 2 public notification** to its customers. A coliform treatment technique violation occurs when one of the following occurs:

- A water system fails to conduct or fully complete a required Level 1 or Level 2 Assessment within 30 days of the treatment technique trigger.
- A system fails to correct any sanitary defect by taking required corrective action within the required timeframe.
- A seasonal system fails to complete an ODW-approved start-up procedure and submit a certificate of completion prior to serving water at the start of its season.

E. coli MCL Violation

If a system incurs an *E.coli* MCL violation, it must perform a **Level 2 assessment** and provide **Tier 1 public notification** to its customers. RTCR requires public notice within 24 hours after receiving confirmation of an *E. coli* MCL violation. There are four ways a system can have an *E. coli* MCL violation:

1. A total coliform-present repeat sample follows an *E. coli*-present routine sample.
2. An *E. coli*-present repeat sample follows a total coliform-present routine sample.
3. The lab fails to test a total coliform-present repeat sample for *E. coli.*
4. The system fails to take three repeat samples following an *E. coli*-present routine sample.

Monitoring Violation

A water system that incurs a monitoring violation must provide **Tier 3 public notification** to its customers. A monitoring violation occurs when:

- A system fails to collect all routine samples.
- A system fails to have each total coliform-present routine sample analyzed for *E.coli.*

Reporting Violation

A water system that incurs a reporting violation must provide **Tier 3 public notification** to its customers. A reporting violation occurs when:

- A system fails to submit a monitoring report or completed assessment form to ODW in a timely manner.
- A system fails to notify ODW of an *E. coli*-present sample in a timely manner.
- A seasonal system fails to submit to ODW a certificate of completion of an approved start-up procedure before serving water to consumers.

For more information:

Call our regional office.

Eastern Region: Spokane Valley (509) 329-2100
Northwest Region: Kent (253) 395-6750
Southwest Region: Tumwater (360) 236-3030

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PRELIMINARY - CITY REVIEW ONLY

Fact Sheet

Follow-up to an unsatisfactory routine coliform sample

April 2016
DOH 331-187
Revised

A drinking water sample is unsatisfactory whenever coliform bacteria are present. If your water system receives unsatisfactory sample results, you must collect a set of repeat samples. If your water system uses groundwater, you must also collect triggered source samples from every groundwater source that was in use when you collected the unsatisfactory routine sample. You must collect triggered source samples before treatment. If your water system has an approved triggered monitoring plan, follow your plan.

Repeat samples confirm the presence or absence of coliform bacteria in the system. If present, sample results can help you find the possible cause of contamination.

Triggered source samples indicate whether the groundwater source is contaminated with the fecal indicator *E. coli* bacteria.

You must collect repeat and triggered source samples within 24 hours after you learn about the unsatisfactory routine sample result. **Do not** shock-chlorinate the system or source before collecting any samples unless you have prior approval from us.

Review your sampling procedure

Review your sampling procedure to make sure you collect your samples correctly. For help, see *Coliform Sampling Procedure* (331-225).

Collect repeat samples

You *must* collect **THREE REPEAT** samples for every unsatisfactory ROUTINE sample. Three must come from the following locations:

1. The same tap as the original unsatisfactory routine sample.
2. An active service within 5 active connections upstream from the original unsatisfactory sample location.*
3. An active service within 5 active connections downstream from the original unsatisfactory sample location.*

You must also collect a raw water sample at each groundwater source that was in use when you collected the unsatisfactory routine sample and test it for *E. coli*.

* You may deviate from these locations if your state-approved Coliform Monitoring Plan includes one of the following:

- A standard operating procedure (SOP) for selecting alternate repeat sites.
- Defined alternate repeat site locations.

Thoroughly inspect your water system

Try to identify potential sources of contamination, such as "openings" in the system or treatment equipment failure. If you find obvious sources of contamination, call us (see below).

The month after an unsatisfactory sample

The month after an unsatisfactory routine sample, you must collect your usual number of ROUTINE samples from the distribution system.

Very small noncommunity groundwater systems not required to sample every month must collect ONE ROUTINE sample the month following an unsatisfactory sample even if they normally would not be required to collect a sample that month.

Call us if:

- You cannot sample as outlined above.
- You would like to discuss the triggered source sample requirement.
- Any repeat samples or triggered source samples are unsatisfactory.

Northwest Region: Kent	Southwest Region: Tumwater	Eastern Region: Spokane Valley
253-395-6750	360-236-3030	509-329-2100

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Appendix K

Wellhead Protection Program

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WELLHEAD PROTECTION PROGRAM

INTRODUCTION

A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater it supplies for drinking water. All federally defined Group A public water systems that use groundwater as their source are required to implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the Water System Plan (applicable to the City of Snoqualmie) or Small Water System Management Program document (not applicable). The State mandate for wellhead protection and the required elements of a wellhead protection program are contained in Washington Administrative Code (WAC) 246-290-135, Source Protection.

The City of Snoqualmie's (City) current wellhead protection program is documented in the 2013 *Water System Plan* (WSP) and has been included as **Appendix 1** for reference. This supplement to the 2013 Wellhead Protection Program provides the following:

- Updates the wellhead protection area for Canyon Springs.
- Updates the inventory of potential contaminant sources and activities.
- Identifies owners and operators of known and potential sources of water contamination, businesses, regulatory agencies, and local governments, emergency response agencies, and City customers that must be notified of the City's watershed control and wellhead protection programs.

DELINEATION OF WELLHEAD PROTECTION AREA

A wellhead protection area is the surface and subsurface area surrounding a well, wellfield, or spring through which contaminants are likely to pass and eventually be transported into the drinking water system. This is the area around the source that must be managed to protect the water supply from contamination. Establishing or delineating the boundaries of the wellhead protection area for each source is most commonly accomplished using the estimated time of travel rates of groundwater.

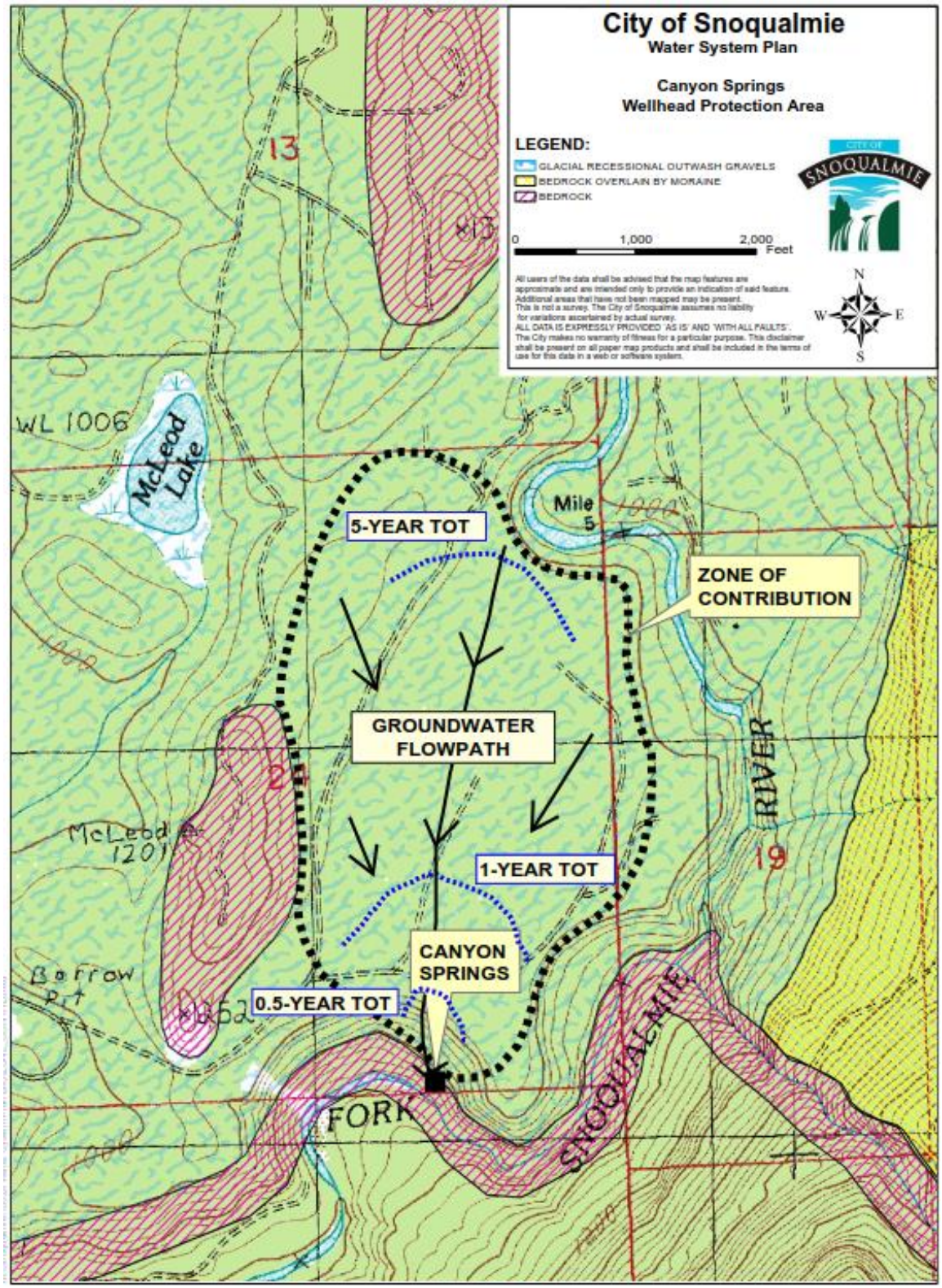
The wellhead protection and time of travel areas for the North Wellfield and the South Wellfield are identified in Figures 6-2 and 6-3 of the 2013 *Water System Plan*.

Canyon Springs

The zone of contribution for Canyon Springs was identified in Figure 6-1 of the 2013 *Water System Plan*. Approximate time of travel areas were identified from a cursory analysis of the Canyon Springs zone of contribution and are shown on **Figure 1**.

Figure 1

Canyon Springs Wellhead Protection Area



INVENTORY OF POTENTIAL CONTAMINANT SOURCES

An essential element of wellhead protection is an inventory of all potential sources of groundwater contamination throughout delineated wellhead protection areas. The purpose of the inventory is to identify past, present, and proposed activities that may pose a threat to the source of water supply (i.e. the aquifer).

The inventory of potential sources of groundwater contamination was conducted during the preparation of the City's Water System Plan. Several databases maintained by the Washington State Department of Health, the Washington State Department of Ecology (Ecology) and the US Environmental Protection Agency were searched for known and potential contaminant sources.

Inventory Findings

The inventory efforts revealed several potential point sources of contamination located within the City's wellhead protection areas. The list of potential sources of contamination is shown in **Table 1**. Due to the remote location of Canyon Springs and limited access roads to the area, no potential contaminate sources were identified within the Canyon Springs zone of contribution. Potential non-point sources of contamination are discussed in the following section.

Table 1

Potential Point Sources of Contamination

Name	Address	Material Stored/Status	WHPA Location
Weyerhaeuser Mill/Dirtfish Rally School	38800 SE Millpond Road/7001 396th Drive SE	Leaking Underground Storage Tank	North Wellfield 5-year TOT
Weyerhaeuser Mill/Dirtfish Rally School	38800 SE Millpond Road/7001 396th Drive SE	Underground Storage Tank	North Wellfield 5-year TOT
Weyerhaeuser Mill/Dirtfish Rally School	38800 SE Millpond Road/7001 396th Drive SE	Confirmed or Suspected Contaminated Sites	North Wellfield 5-year TOT
Alpine Coachworks	8352 Meadowbrook Way SE	Dangerous Waste and Materials Generators	North Wellfield 10-year TOT
Mt. Si High School	8651 Meadowbrook Way SE	Dangerous Waste and Materials Generators	North Wellfield 10-year TOT
WSDOT Snoqualmie	SR 202 and Meadowbrook Way	Leaking Underground Storage Tank	North Wellfield 10-year TOT
WSDOT Snoqualmie	SR 202 and Meadowbrook Way	Underground Storage Tank	North Wellfield 10-year TOT
Mt. Si High School	8651 Meadowbrook Way SE	Dangerous Waste and Materials Generators	South Wellfield 1-year TOT
Alpine Coachworks	8352 Meadowbrook Way SE	Dangerous Waste and Materials Generators	South Wellfield 5-year TOT
76 Station	8250 Railroad Avenue SE	Leaking Underground Storage Tank	South Wellfield 5-year TOT
76 Station	8250 Railroad Avenue SE	4x Underground Storage Tanks	South Wellfield 5-year TOT
Snoqualmie Valley School District	8001 SE Silva Avenue	Leaking Underground Storage Tank	South Wellfield 10-year TOT
Snoqualmie Valley School District	8001 SE Silva Avenue	Underground Storage Tank	South Wellfield 10-year TOT

Potential Non-Point Contaminant Sources

North Wellfield – The area around the North Wellfield is zoned as Utility Park (U), King County Mining (KC-M), and King County Rural City Urban Growth Area (KC-RX). Potential non-point sources of pollution in this area include on-site septic systems, small animal feeding operations, pesticide and fertilizer application, release/improper disposal of household products, illegal dumping, and abandoned wells.

South Wellfield – The area around the South Wellfield is zoned as Institutional (I), Open Space (OS), and Residential (RES). Potential non-point sources of pollution in this area include on-site septic systems, small animal feeding operations, pesticide and fertilizer application, release/improper disposal of household products, and abandoned wells.

NOTIFICATION OF INVENTORY FINDINGS

Owners and operators of known and potential sources of groundwater contamination will be notified of their location within the delineated wellhead protection areas. Regulatory agencies, local governments, and emergency response agencies also will be notified of the location of the wellhead protection areas, contaminant source inventory findings, contingency plans, and emergency response procedures. **Table 2** lists notification recipients.

Table 2
Notification Recipients

ID	Contact Person	Mailing Address	City, State Zip
Regulatory Agencies and Local Governments			
WA State Dept. of Health, Office of Drinking Water	Northwest Regional Manager	20435 72nd Ave S, Suite 200	Kent, WA 98032-2358
WA State Dept. of Ecology, Northwest Regional Office	Director	3190 160th Ave. SE	Bellevue, WA 98008
King County Health Department	Health Officer	14350 SE Eastgate Way	Bellevue, WA 98007
Snoqualmie Planning Department	Director	38624 SE River St	Snoqualmie, WA 98065
King County Planning Department	Director	35030 SE Douglas St #210	Snoqualmie, WA 98065
WA State Department of Transportation	Northwest Regional Director	15700 Dayton Ave. N	Seattle, WA 98133
Emergency Response Agencies			
Snoqualmie Fire Department	Fire Chief	37600 Snoqualmie Pkwy	Snoqualmie, WA 98065
Snoqualmie Police Department	Police Chief	34825 SE Douglas St	Snoqualmie, WA 98065
King County Sheriff	Sheriff	516 Third Avenue, Room W-150	Seattle, WA 98104
WA State Patrol	District 2 Captain	2803 156th Ave	Bellevue, WA 98007
City of Snoqualmie Water Customers			
All Water Customers	Varies	Varies	Snoqualmie, WA

PROGRAM IMPLEMENTATION AND RECOMMENDATIONS

The City's Wellhead Protection Program is an ongoing effort that requires staffing and resources to ensure its effectiveness in protecting the source of drinking water that is supplied to the City's customers.

The following tasks will be pursued as part of the City's ongoing Wellhead Protection Program:

- Update the detailed inventory of potential sources of groundwater contamination every 2 years.
- Confirm location, condition, and proper closure of abandoned private wells.
- Distribute the required notifications as a result of updated delineations and inventory findings. Letters should be sent to local responders, regulatory agencies, and

owners/operators of known and potential sources of groundwater contamination within the defined wellhead protection areas.

- Restrict land uses in the 1-year time of travel zones that pose a high risk to groundwater, such as gas stations, oil recycling, dry cleaners, fuel storage facilities, high-density animal keeping, high-density septic systems, and golf courses. Update the City's wellhead protection ordinance as necessary. Coordinate these efforts with King County.

Appendix 1

CHAPTER 6

SOURCE PROTECTION PROGRAM

INTRODUCTION

A comprehensive study of the groundwater characteristics and possible contaminants has been provided by the East King County Groundwater Advisory Committee. The final study was submitted to the Department of Ecology in December of 1998. This study provides a description of the area characteristics and also provides water purveyors within the East King County Groundwater Area with management strategies. The following chapter addresses the elements required of a wellhead protection plan, as stated in the WAC.

OVERVIEW

Water from underground aquifers, commonly referred to as groundwater, forms the primary source of drinking water for an estimated 65 percent of Washington State residents. The City of Snoqualmie relies on a spring water source, Canyon Springs, and two wellfields for its domestic supply.

A spring is generally classified as a point where an aquifer intersects with the ground surface. This spring source is located northeast of town on the hillside of the north slope of the North Fork of the Snoqualmie River. The North Wellfield is located to the north of the City's Public Works Shop and Wastewater Treatment Plant, and the South Wellfield is located near Mt. Si High School. To protect groundwater supplies, the Environmental Protection Agency (EPA) and the Department of Health (DOH) require public water utilities to develop a wellhead protection program as a component of their water system plans.

The purpose of a wellhead protection program is to provide local utilities with a proactive program for preventing groundwater contamination. A successful wellhead protection program consists of a number of components that must be developed before the plan can be approved or fully implemented. The major components of the plan are described below and form the basis of the following chapter.

- A *susceptibility assessment* that determines the potential for contamination.
- A *delineated wellhead protection area* that is based on all reasonably available hydrogeologic information, including the Susceptibility Assessment.
- An *inventory* within each wellhead protection area of potential sources of contamination.

- A *spill response plan* for each wellhead protection area containing documentation for coordination with local first responders.
- *Contingency plans* for providing alternate sources of drinking water in the event that contamination does occur. The contingency plan will include management recommendations to reduce the likelihood that potential contaminant sources will pollute the drinking water supply.

SUSCEPTIBILITY ASSESSMENT

Susceptibility assessments for the City's spring and wells have been submitted to the Department of Health. Copies of these susceptibility assessments are included in Appendix K. Susceptibility assessments are an important initial step in selecting appropriate delineation methods to define the wellhead protection area boundaries. Drinking water supplies vary as to their susceptibility to contaminants discharged at the surface. Wells that have been poorly constructed or have been improperly cased have an increased susceptibility. In addition, sources located in an unconfined aquifer with no confining layer (layer of low permeability) between the aquifer and surface have a much higher susceptibility. Drawing water from confined aquifers deep below the ground surface provides the best source of protection.

After review of the susceptibility assessments by DOH, Canyon Springs was given a high susceptibility rating, the North Wellfield was given a low susceptibility rating, and the South Wellfield was given a low susceptibility rating.

WELLHEAD PROTECTION AREA DELINEATION

The first step in developing a wellhead protection program is to identify the land area around each well from which groundwater may be flowing to the source. These areas are the most likely to contribute pollutants to the groundwater and are referred to as zones of contribution. Zones of contribution require proper land use management to minimize the potential of contaminants entering the groundwater system. The most commonly accepted tools for delineating wellhead protection zones are the calculated fixed radius method, analytical models, and numerical models. A discussion of these methods follows.

METHODS OF DELINEATION

Calculated Fixed Radius Method

The simplest groundwater model is the calculated fixed radius (CFR) method. In this method, zones of contribution are delineated by concentric areas around each well. In the CFR method, the delineation is calculated based on pumping data and known or assumed aquifer characteristics.

Analytical Models

The analytical model requires the incorporation of basic hydrological information and certain physical characteristics of the aquifer and source. Major assumptions and simplifications to the hydrogeologic regime occur in analytical modeling. However, the incorporation of the hydraulic gradient and hydrogeologic boundaries allows for a more realistic representation of the groundwater flow regime than in the calculated fixed radius method.

Numeric Method

The numeric method requires significantly more data. In numeric modeling, a grid is superimposed over the study area. Each square in the grid, called a cell, is characterized by physical parameters that are estimated from data collected from a variety of sources. The sources may include well logs, geologic and hydrogeologic maps, geophysical data, groundwater elevation data, stream flow discharge, and meteorological data.

The numeric method generates more accurate results than the CFR or analytical method. However, numeric models are very costly to develop. Consequently, numeric models are more commonly used by large utilities with complex aquifers that have the resources to collect the extensive model input required.

ANALYSIS

An analysis of the wellhead contribution zones for the Snoqualmie sources is presented below. A discussion of the Canyon Springs zone of contribution is presented based upon geologic information. A previous study was done on the North Wellfield in 1996 using the MODFLOW. This analysis will be used for the North Wellfield. The South Wellfield analysis uses the CFR method due to its location in the valley.

Canyon Springs

Canyon Springs is located on a steep hillside above the North Fork of the Snoqualmie River as shown on Figure 6-1. A CFR analysis is not appropriate for this source, as it receives water only from the area to the north. According to geological information, the area upland of the spring is composed of glacial recessional outwash gravels. Underneath this layer is a floor of bedrock. Canyon Springs appears to emerge at roughly the interface between the two layers. The area to the north of the spring is a large, flat plateau that is bounded to the east and north by the North Fork of the Snoqualmie River. Two bedrock knolls suggest a bedrock ridge that would form a westerly boundary of the catchment basin. An approximate boundary of the zone of contribution for the springs is shown on Figure 6-1.

The zone of contribution is an approximation of the area that would intercept rainfall. Since the area is flat, it is assumed that any precipitation that is not lost through

evapotranspiration recharges the aquifer that feeds the spring. There is no information about the depth of the aquifer, its grade, or its transmissivity. Consequently, an understanding of the travel time through the aquifer and development of 6-month, 1-year, 5-year, and 10-year zones of contribution are not possible. A cursory analysis of total precipitation over the area indicates that the rainfall contribution is only slightly higher than the expected yield. The average precipitation for the area is approximately 90 inches and 36 to 48 inches of evapotranspiration are assumed as average for second-growth conifer forest in western Washington. A net recharge of 40 to 50 inches of precipitation over the 10,000,000 square feet of the zone of contribution would yield approximately 300 million gallons per year, approximately the estimated yield of Canyon Springs.

It is possible that the aquifer receives recharge from the North Fork of the Snoqualmie River in the northern portion of the zone of contribution. At that point, the river is flowing through the outwash gravels and is at a higher elevation than the springs. It is conceivable that some of the flow could, depending upon soil saturation and groundwater levels, flow from the river into the aquifer and emerge at Canyon Spring after passing through the outwash gravels.

North Wellfield (Wells 6, 7, and 8)

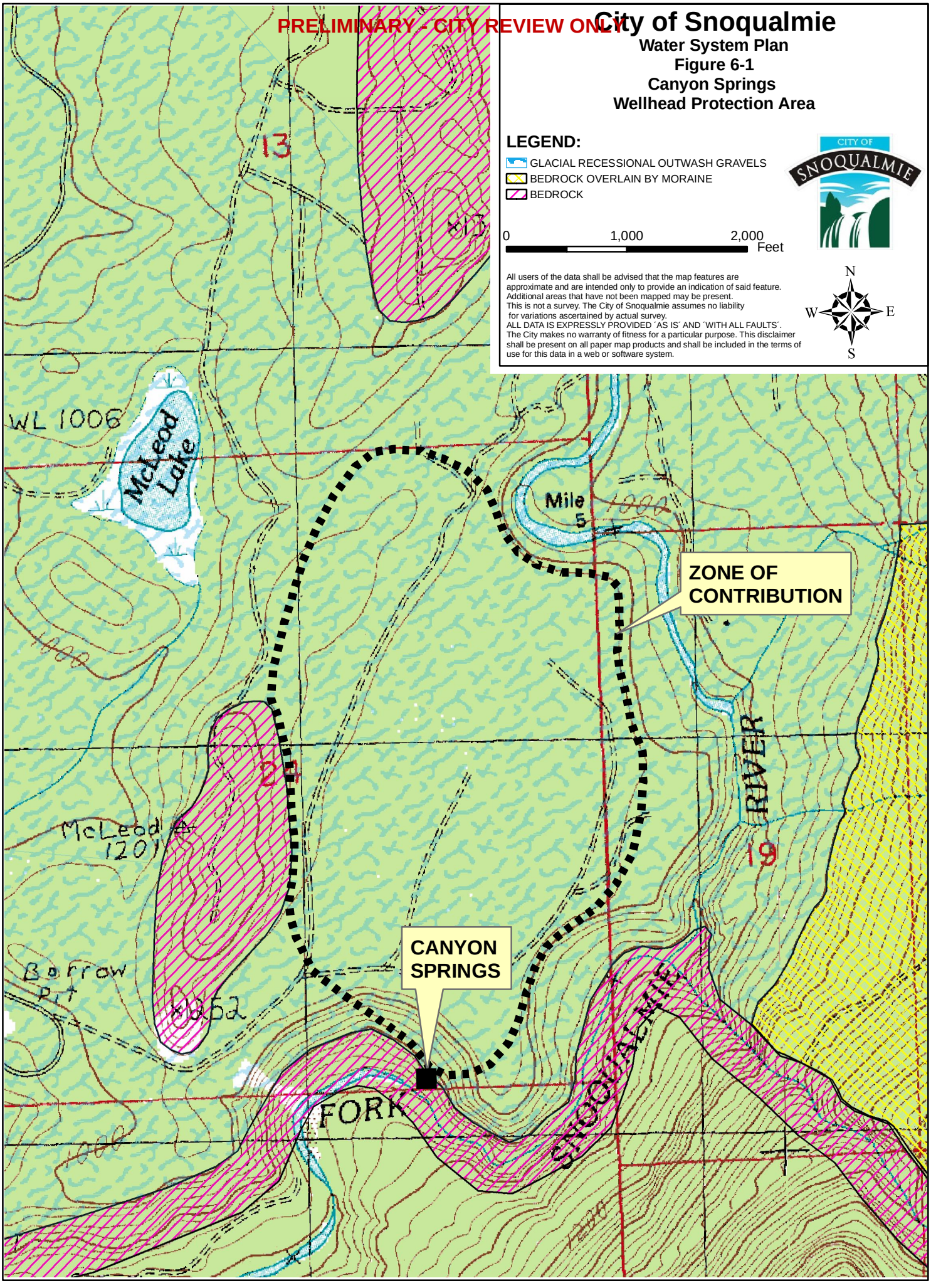
A previous study of the North Wellfield was prepared in 1996 by Associated Earth Sciences, Inc. concerning the wellhead protection area. The zones of contribution were determined by using the program MODFLOW. The analysis was conducted using a withdrawal of 450 gpm, which corresponds to the annual water right for the wellfield of 724 acre-feet per year. Since this is still the annual water right, the analysis remains current. The report can be found in Appendix K. Figure 6-2 provides the delineation of the zones of contribution for the North Wellfield. The delineation of this wellfield also provides insight to the actual path of flow water would follow for South Wellfield Well No. 1.

South Wellfield (Wells 1-R and 2)

A Wellhead Protection Plan for the South Wellfield was completed in 2010, which is included in Appendix K. The zones of contribution were determined using the CFR method. The wellfield is located in the middle of the valley and the aquifer is minimally affected by the geology of the area, making the CFR method appropriate. Figure 6-3 shows the zones of contribution for the South Wellfield.

CONTAMINANT SOURCE INVENTORY

An essential element of source protection is an inventory of all potential sources of groundwater contamination in and around the delineated protection areas. The purpose of the inventory is to identify past, present, and proposed activities that may pose a threat



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PRELIMINARY - CITY REVIEW ONLY

City of Snoqualmie

Water System Plan
Figure 6-2
North Wellfield Wellhead Protection Area

LEGEND:

- ZONE OF CONTRIBUTION
- A WEYERHAEUSER MILL SITE
- B ALPINE COACHWORKS
- C MT. SI HIGH SCHOOL
- D WSDOT FACILITY

All users of the data shall be advised that the map features are approximate and are intended only to provide an indication of said feature. This is not a survey. The City of Snoqualmie assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The City makes no warranty of fitness for a particular purpose. This disclaimer shall be present on all paper map products and shall be included in the terms of use for this data in a web or

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SCALE:1"=2,000'

NORTH WELLFIELD
WASTEWATER TREATMENT PLANT
SNOQUALMIE FALLS
SOUTH WELLFIELD
6 MO.
1 YR.
5 YR.
10 YR
SNOQUALMIE
TOKUL CREEK
RIVER
Snoqualmie
KIMBALL CREEK
PRESTON-NORTH BEND ROAD
I-90
SR 202
S.E. RENIG RD.
MIDDLE FORK
SOUTH FORK
WEYERHAEUSER MILL
Gravel Pits
Sewage Disposal Beds
Water Tanks
Stack
Mount Si Golf Course
Slough
Creek
Mile 0
Mile 1
Mile 45
T.24.N.
T.23.N.
R.7.E.
R.8.E.
19
20
21
22
24
25
27
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30
31
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36
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C
D

PRELIMINARY - CITY REVIEW ONLY

City of Snoqualmie

Water System Plan
Figure 6-3
South Wellfield Wellhead Protection Area

LEGEND:

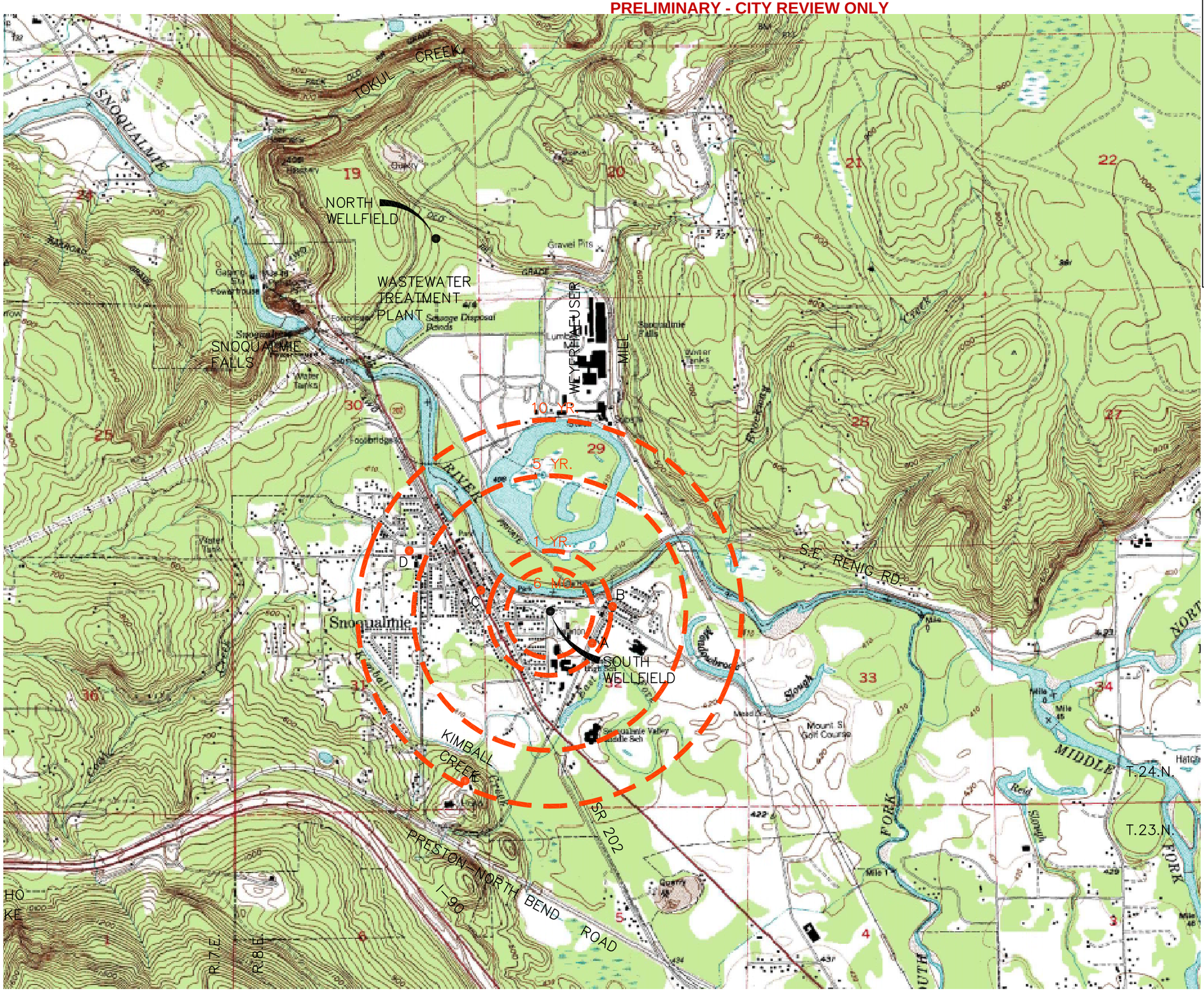
- ZONE OF CONTRIBUTION
- A MT. SI HIGH SCHOOL
- B ALPINE COACHWORKS
- C 76 STATION
- D SNOQUALMIE VALLEY SCHOOL DISTRICT

All users of the data shall be advised that the map features are approximate and are intended only to provide an indication of said feature. This is not a survey. The City of Snoqualmie assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The City makes no warranty of fitness for a particular purpose. This disclaimer shall be present on all paper map products and shall be included in the terms of use for this data in a web or software system.

CITY OF SNOQUALMIE

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SCALE:1"=2,000'



to the source or surrounding area. The inventory can also help to plan management strategies and establish a mailing list of businesses located within the source protection areas.

POTENTIAL CONTAMINANT SOURCES

Within a source protection zone, there are many diverse activities that may contaminate an aquifer, thereby impacting the water supply. A discussion of these activities, their potential effects on groundwater, and the regulatory requirements that may apply are included in the following sections.

The zone of contribution for Canyon Springs is managed forestland used for timber production. It is owned by FTGA Timberlands and managed by Hancock Forest Management. Access to the area is limited to a few roads, with only the main roads open to the public. No potential contaminant sources are thought to be located in the zone of contribution.

Locations of potential contaminant sources within the source protection area for the City's North and South Wellfields are shown in Tables 6-1 and 6-2, respectively. The names and types of the sources are listed in each table. Data sources are discussed on page 6-11. The City will attempt to notify businesses that are potential contaminant sources for the City's water. There are potential sources of contamination that fall under the following categories: Underground Storage Tank (UST), Leaking Underground Storage Tank (LUST), Dangerous Waste and Materials Generators (RCRA), or Confirmed or Suspected Contaminated Site (CSCS).

TABLE 6-1

North Wellfield Potential Contaminant Sources

Address	Potential Contaminant Source (1)	Name of Business	Figure 6-2 Identifier
6-Month Zone of Contribution			
None			
1-Year Zone of Contribution			
None			
5-Year Zone of Contribution			
38800 SE Millpond Road/ 7001 396th Drive SE	LUST	Weyerhaeuser Mill/ Dirtfish Rally School	A
38800 SE Millpond Road/ 7001 396th Drive SE	UST	Weyerhaeuser Mill/ Dirtfish Rally School	A
38800 SE Millpond Road/ 7001 396th Drive SE	CSCS	Weyerhaeuser Mill/ Dirtfish Rally School	A
10-Year Zone of Contribution			
8352 Meadowbrook Way SE	RCRA	Alpine Coachworks	B
8651 Meadowbrook Way SE	RCRA	Mt. Si High School	C
SR 202 and Meadowbrook Way	LUST	WSDOT Snoqualmie	D
SR 202 and Meadowbrook Way	UST	WSDOT Snoqualmie	D

(1) UST = Underground Storage Tank, LUST = Leaking Underground Storage Tank, RCRA = Dangerous Waste and Materials Generators which are regulated by Ecology under RCRA, and CSCS = Confirmed or Suspected Contaminated Sites.

(2) Sources: See page 6-11 of this document.

TABLE 6-2

South Wellfield Potential Contaminant Sources

Address	Potential Contaminant Source	Name of Business	Figure 6-3 Identifier
6-Month Zone of Contribution			
None			
1-Year Zone of Contribution			
8651 Meadowbrook Way SE	RCRA	Mt. Si High School	A
5-Year Zone of Contribution			
8352 Meadowbrook Way SE	RCRA	Alpine Coachworks	B
8250 Railroad Avenue SE	1 LUST	76 Station	C
8250 Railroad Avenue SE	4 USTs	76 Station	C
10-Year Zone of Contribution			
9575 Ethan Wade Way SE	4 USTs	Snoqualmie Valley Hospital	D
8001 SE Silva Avenue	LUST	Snoqualmie Valley School District	E
8001 SE Silva Avenue	UST	Snoqualmie Valley School District	E

(1) UST = Underground Storage Tank, LUST = Leaking Underground Storage Tank, RCRA = Dangerous Waste and Materials Generators which are regulated by Ecology under RCRA, and CSCS = Confirmed or Suspected Contaminated Sites.

(2) Sources: See page 6-11 of this document.

Landfills

A landfill is a disposal facility in which solid waste is permanently placed. Minimum functional standards for solid waste hauling are regulated by the Washington State Department of Ecology under WAC 173-304. These regulations set siting and closure criteria, performance standards, and operating requirements for landfills. Abandoned and improperly maintained landfills and dumpsites are often a major source of groundwater contamination. Leachate from landfills poses a threat to groundwater quality should it migrate to the water table. The Department of Ecology is responsible for mitigating dumpsite cleanup when potentially hazardous leachates are present.

There are no active landfills within the zones of contribution of the City's springs.

Commercial and Industrial Activity

Areas of commercial and industrial land use are located within most wellhead protection boundaries. Businesses that may contribute contaminants to the groundwater include dry cleaners, gas stations and other businesses with fuel storage tanks, auto repair shops,

metal plating facilities, asphalt and concrete facilities, and machine shops. Wastes generated at these businesses include substances such as petroleum products, solvents, surfactants, heavy metals, and other organic materials. These wastes can potentially enter the groundwater system through inadequate disposal practices or accidental spills. Table 6-3 presents typical commercial and industrial activities and the potentially hazardous chemicals that may be associated with them.

TABLE 6-3

Chemicals Associated with Commercial and Industrial Activities

Commercial/Industrial Activity	Contaminants
Automobile/Truck Service	Waste oils, solvents, acids, paints, soaps
Dry Cleaners	Solvents (perchloroethelyene, petroleum solvents, Freon) Spotting chemicals (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Cemeteries	Fertilizers, pesticides
Country Clubs/Golf Courses	Fertilizers, herbicides, pesticides, swimming pool chemicals, automotive wastes
Electric/Electronic Equipment Manufacturers	Nitric, hydrochloric and sulfuric acid, heavy metal sludges, ammonium persulfate, cutting oil and degreasing solvent, corrosive soldering flux, waste plating solution, cyanide, methylene chloride, perchloroetheylene, trichloroethane, acetone methanol
Furniture/Wood Manufacturing	Paints, solvents, degreasing and solvent recovery sludge
Metal Plating Shops	Sodium and hydrogen cyanide, metallic salts, alkaline solutions, acids, solvents, heavy metal-contaminated wastewater/sludge
Lawns and Gardens	Fertilizers, herbicides, pesticides
Painters, Publishers	Solvents, inks, dyes, oils, miscellaneous organics, photographic chemicals
Sand and Gravel Mining	Diesel fuel, motor oil, hydraulic fluids
Scrap, Salvage and Junkyards	Used oil, gasoline, antifreeze, PCB-contaminated oil, lead acid batteries

Various commercial and governmental activities lie along the boundaries of the 5- and 10-year zones of contribution for the City's North Wellfield. These activities include the former mill site, now a rally car driving facility, and storage and maintenance facilities for the Puget Sound Historical Railroad and WSDOT Road Maintenance facilities. Various chemical storage and industrial processes take place at these locations, which

may contribute contaminants that may enter the ground and affect the groundwater the City uses for its water supply.

RCRA Generators

The siting and operation of facilities which treat, store, or dispose of hazardous waste are subject to the requirements of the Resource Conservation and Recovery Act (RCRA), Subtitle C. In Washington State, the Department of Ecology regulates facilities which generate more than 220 pounds of hazardous waste per month under WAC 173-303, Dangerous Waste Regulations. The regulations are significant in that they establish a number of requirements for these facilities including surveillance and monitoring, recordkeeping, performance and design criteria, and siting and closure procedures. Ecology divides the facilities into three levels of hazardous waste accumulation: Level 1 facilities generate 2,200 pounds of waste per month or more; Level 2 facilities generate between 220 and 2,200 pounds per month; and Level 3 facilities generate less than 220 pounds. Level 3 generators are exempt from the regulations. All Level 1 and 2 facilities must initially file a report of their activities with Ecology and update those activities annually. A summary of those activities are published by Ecology, thereby allowing water purveyors the opportunity to determine the types of activities present within their wellhead protection area.

Two RCRA generators, Alpine Coachworks and Mt. Si High School, are found within the boundaries of the City's potential contamination zones.

Underground Storage Tanks

Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) can be a major threat to groundwater quality. Petroleum products that may contain impurities that are mobile in the groundwater system are the most commonly stored substances in USTs. The EPA estimates that 35 percent of all USTs may be leaking. The most common causes of leaks are structural failure, corrosion, improper fittings, and improper installation.

Ecology regulates underground storage tanks in Washington State under WAC 173-360. The regulations require that owners and operators of underground storage tanks comply with the following sections of the regulations:

- Notification, reporting, and recordkeeping;
- Performance standards and operating closure requirements;
- Registration and licensing; and
- Financial responsibility.

As of July 1, 1991, owners and operators of all existing nonexempt underground storage tanks must have a permit from Ecology. A valid permit is a requirement for delivery of regulated substances. The permit must be updated annually.

Underground storage tank inspections are performed by Ecology primarily through the information developed in the permitting process. Ecology maintains a file on all permitted USTs in Washington State, as required by RCRA Subtitle 1. The file provides the site name and address, tank identification number, date of installation, size, tank status, and the substance stored at the site.

The mill site has underground storage tanks located within the 5-year zone of contribution and WSDOT has an underground storage tank located within the 10-year zone of contribution of the City's North Wellfield. A gas station within the South Wellfield's 5-year zone of contribution has underground storage tanks, as does the Snoqualmie Valley School District facility, which is within the South Wellfield's 10-year zone of contribution.

Septic Systems

King County is responsible for regulating and permitting residential and small commercial on-site sewage disposal systems within the County, excluding federal facilities. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. Ammonia and nitrate nitrogen are highly soluble in water. The City will send a letter to current septic system owners within the source protection zone to notify them of the possible influence of their septic systems on the aquifer, and will also continue to monitor nitrates at the wellfields.

Improperly Sealed or Secured Wells

Improperly sealed or secured wells can act as direct conduits for contaminants to reach groundwater. A list of wells within the zones of contribution is provided in Appendix K. The City will send a letter to these well owners notifying them of the possibility of contamination to the aquifer from which their water supply originates.

Accidental Spills

Under the Model Toxics Control Act cleanup regulation, WAC 173-340, the Department of Ecology is responsible for ensuring all hazardous waste sites are properly remediated. Confirmed and suspected sites of contamination, such as accidental spills or releases of contaminants, can potentially impact groundwater supplies. Potential sources of spills and leaks can originate from underground storage tanks, accidents, and poor disposal practices. The City will notify the local fire department, Fire District 38, of the zones of contribution for the groundwater supply. The local authorities who are responsible for cleanup and containment of these spills can properly prepare for the possibility of a spill in the area.

Confirmed or Suspected Contamination Sites

Under the Model Toxics Control Act cleanup regulation, WAC 173-340, Ecology is responsible for ensuring that all hazardous waste sites are properly remediated. Confirmed and suspected sites of contamination include leaking underground storage tanks (LUSTs). A separate inventory for each LUST, including the status of cleanup efforts, is maintained by Ecology. Ecology conducts an initial site investigation within 90 days of learning of a potentially contaminated site. If this investigation shows that remediation action is required, the site will appear on the Confirmed and Suspected Contaminated Sites Report. The sites are also given a Washington Ranking Mode BIN number between 1 and 5. A rank of 1 indicates the greatest assessed risk to human health and the environment. The contaminant type and the affected media, such as groundwater, are also noted. Once the remedial action has been completed, Ecology's Toxics Cleanup Program determines if the site can be removed from the list.

There are confirmed and suspected contaminated sites within the wellhead protection area of the City's North Wellfield. These sites are located at the Snoqualmie Mill site and the Weyerhaeuser Mill along the eastern and western boundaries of the 5-year zone of contribution. Additional sites in the 10-year zone of contribution are located at the Puget Sound Railway Historical Society and the WSDOT Maintenance Facility.

INVENTORY DATA SOURCES

The above inventory of potential contaminant sources was compiled using various data sources. Agencies such as Ecology and EPA maintain contaminant databases that list businesses that handle and store potential contaminants. The following databases were used to create the inventory for the City of Snoqualmie's wellhead protection area:

- *Underground Storage Tank Report, April 2011.* This version of the Underground Storage Tanks Report was obtained from Ecology's Toxics Cleanup Program. This list was used to locate the facilities that contain underground storage tanks and verifies facilities located by field surveys in the wellhead protection areas.

- *Leaking Underground Storage Tank Report, April 2011*. This version of the Leaking Underground Storage Tank (LUST) Report was also obtained from the Ecology Toxics Cleanup Program. The LUST report lists the site name, address, age, volume, and status of sites that contain leaking underground storage tanks.

- *Dangerous Waste and Materials Generators*. The EPA's RCRA program has been taken over by Ecology within the State of Washington and is regulated under the Dangerous Waste Regulations (173-303 WAC).

- *Title III Facilities*. Title III facilities are identified as those facilities that generate, treat, store, or dispose of hazardous materials in sufficient quantity to pose a threat to the community. There are several different types of Title III facilities depending upon the quantity and the nature of the material handled. All companies that are designated as Title III facilities must report to the County on an annual basis. This reporting was a result of the 1986 Superfund Amendments and Reauthorization Act. Title III of the act was subsequently renamed to the Emergency Planning and Community Right to Know Act (EPCRA).

- *Confirmed and Suspected Contaminated Sites Report, May 2011*. Ecology maintains the Confirmed and Suspected Contamination Sites Report. The list is updated as new information becomes available. Each site is given a site status code indicating the status of the cleanup process.

SPILL/INCIDENT RESPONSE PROGRAM

Spill response planning is an important aspect of both an emergency management plan and a wellhead protection program. Specific response procedures for wellhead protection areas must be in place prior to the occurrence of a contamination incident. The information obtained as a result of the susceptibility assessment and the wellhead protection area inventory can be used to determine what types of spill response measures are necessary for the protection of drinking water sources. In order to be accepted by local emergency responders, spill response procedures for wellhead protection areas must be realistic and easy to implement.

In order for spill response procedures to be effectively executed, coordination, cooperation, and communication among the responding agencies, organizations, and individuals are imperative. In Washington State, depending on the magnitude and type of the release, any of the following organizations may be involved in a spill response for a wellhead protection area:

- *Department of Ecology (Ecology):* Ecology's Spill Response Team is responsible for determining the source and cause of the release and responsible party. If the responsible party is unknown, Ecology will investigate to determine who is responsible and ensure that containment, cleanup, and disposal proceedings begin. Ecology's 24-Hour Spill Response Team can be contacted at (360) 753-2353.

- *Department of Health (DOH):* The Department of Health, in conjunction with organizations such as Ecology's Spill Operations Section and the Association of Fire Chiefs, is developing a set of standard operating procedures that first responders can use in wellhead protection areas,

critical aquifer recharge areas, and other sensitive groundwater areas. If necessary to the cleanup effort, DOH also provides assistance through laboratory support and services.

- *Department of Transportation (DOT):* The Washington State DOT can provide spill response assistance through traffic control, equipment, and personnel for non-hazardous cleanup activities on state and interstate highways.

- *Washington State Patrol:* The state patrol is responsible for managing spills on interstate and state highways.

- *King County Fire District 38*: Initial response to a hazardous spill would most likely come from the fire department that serves the City of Snoqualmie. The Fire Department will be notified of the wellhead protection area boundaries.

CONTINGENCY PLANNING

Contingency planning is an important component of a wellhead protection program. In the event that any of the City's sources must be taken offline due to contamination, a contingency plan would provide immediate mitigation. A properly prepared and updated contingency plan helps ensure the water system and local officials are prepared to respond to emergency situations. Contingency planning also includes provision of alternative sources of drinking water. The following steps are necessary for the development of an effective contingency plan:

1. Identify maximum capacities of the existing system as to source, distribution system, and water rights restrictions. Assume loss of source and re-evaluate.

   The City has three separate sources. In the event one of these sources was contaminated, the City has the ability to transfer water throughout the entire system. Both the Canyons Springs and Snoqualmie Ridge areas also have enough water in standby storage to serve the system for multiple days.

2. Evaluate the expansion options of the existing system's capacities relative to existing water rights.

   The City currently has a surplus of water available for its use during most times of the year if one of the sources were to be contaminated. If a source were contaminated during peak months, the City would need to initiate mandatory conservation to keep maximum day and instantaneous

demands below available capacity. It is projected that demands will surpass instantaneous source capacity in 2023. The City will begin considering alternate sources of supply.

3. Identify existing or potential interties with other public water systems.

   The City currently has no emergency intertie agreements. The closest purveyor is the City of North Bend. The City is considering a potential intertie with the City of North Bend in the future as an additional source of emergency supply.

ACTIONS

The City will take the following steps to protect its existing sources from contamination.

- Notify commercial businesses, hazardous waste generators, and septic system owners of their presence within the City's wellhead protection area.

  The zone of contribution for the spring is dominated by undeveloped forestland. No businesses or residences are located within the spring area. There are various businesses, residences, and schools within the zones of contribution for both the North and South Wellfields. The City will inform these residences of their location in the wellhead protection areas. Customers will either be informed of their proximity to the wellhead protection area either through notices in their billings or in the City's newsletter.

- Monitor for nitrates annually.

  Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. With the use of on-site sewage disposal systems within the wellhead protection area, the City not only remains aware of non-compliance with MCLs for nitrates, but for trends of increased nitrate levels over a period of time. Increasing nitrate levels could be an indication of source contamination.

- Utilize management strategies provided by the *East King County Groundwater Management Plan.*

  In an effort to minimize the potential impact of materials entering the aquifer recharge area, this plan provides management policies for water purveyors, cities, and the County to follow. These policies were developed to minimize the impact of residents, businesses, and industry on

the groundwater that supplies the communities within the east King County area.

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.2

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system.
Photocopy as necessary.

PART I: System Information

Well owner/manager: City of Snoqualmie / Dan Marcinko

Water system name: City of Snoqualmie / Water Systems

County: King County

Water system number: 81080 Source number: S08

Well depth: 521 feet (From WFI form)

Source name: Well No. 2

WA well identification tag number: _____ _____ _____ - _____ _____ _____

☒ Well not tagged

Number of connections: 4,037 Population served: 10,247

Township: 24N Range: 8E

Section: 32 ¼ ¼ Section: SE 1/4, NW 1/4

Latitude/longitude (if available): 47d 1' / 120d 49' 3"

How was latitude/longitude determined?

_____Global positioning device_____survey__X__topographical map
_____other:_____

*Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 6/22/95 month/day/year

last reconstruction: ___/___/___month/day/year

❑ Information unavailable

2) Well driller: Holt Testing, Inc.

☒ Well driller unknown

3) Type of well:

X Drilled: ☐ rotary ☒ bored ☐ cable (percussion) ☐ Dug

___ other: ☐ spring(s) ☐ lateral collector (Ranney)

☐ driven ☐ jetted ☐ other:

4) Well report available ☐ Yes (attach copy to form) ☐ No

5) Average pumping rate: 600 (gallons/min)

Source of information Pump test & water right

If not documented, how was pumping rate determined?

☐ Pumping rate unknown

6) Is this source treated? yes

If so, what type of treatment:

☒ disinfection ☐ filtration ☐ carbon filter ☐ air stripper ☐ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

Iron and manganese removal

7) If source is chlorinated, is a chlorine residual maintained: ☒ Yes ☐ No

Residual level: 1 mg/L (At the point closest to the source.)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

☐ <20 ft ☐ 20-50ft ☐ 50-100ft ☐ 100-200ft ☒ >200ft

☐ information unavailable

2) Depth to ground water (static water level):

☐ <20ft ☒ 20-50ft ☐ 50-100ft ☐ >100ft

☐ flowing well/spring (artesian)

How was water level determined?

☒ well log ☐ other _____

☐ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_____ psi (pounds per square inch) **or**

_____ feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: ☐ Yes ☐ No

5) Wellhead elevation (height above mean sea level): 418 feet

How was elevation determined? ☐ topographic map ☐ Drilling/Well Log ☐ altimeter

☒ other: Site survey from Well 1-R

☐ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

X evidence of a confining layer in well log

_____ no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the **bottom** of the **lowest confining layer**? ☒ Yes ☐ No

☐ information unavailable

7) Sanitary setback:

❑ < 100ft* ☒ 100-120ft ❑ 120-200 ft ❑ >200ft

* If less than 100ft, describe the site conditions:

8) Wellhead construction:

❑ wellhead enclosed in a wellhouse

☒ controlled access (describe): Pitless unit in fenced area

❑ other uses for wellhouse (describe): _____

❑ no wellhead control

9) Surface seal:

☒ 18 ft

❑ <18 ft (no Department of Ecology approval)

❑ <18 ft (Approved by Ecology, include documentation)

❑ depth of seal unknown

❑ no surface seal

10) Annual rainfall (inches per year):

❑ <10 in/yr ❑ 10-25 in/yr ☒ >25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: 162,925,500 (gallons)

How was this determined?

☐ meter

☐ estimated: ☐ pumping rate (_____)
☐ pump capacity (_____)

☒ other: Water right maximum withdrawal

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6-month ground water travel time: 890 feet

1-year ground water travel time: 1,255 feet

5-year ground water travel time: 1,775 feet

10-year ground water travel time: 3,970 feet

Information available on length of screened/open interval?

☒ Yes ☐ No

Length of screened/open interval: 22 feet

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6-month time of travel boundary?

☒ Yes ☐ No (mark and identify on map)

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6-month time of travel boundary?

☐ Yes ☒ No (mark and identify on map)

Comments: _____

PART V: Assessment of Water Quality

1) Regional sources of risk to ground water:

Please indicate if any of the following are present within a circular area around your water source having a radius up to and including the five-year ground water travel time:

	6mo	1yr	5yr	Unknown
• likely pesticide application				
• stormwater injection wells				
• other injection wells	x			
• abandoned ground water well	x	x	x	
• landfills, dumps, disposal areas				
• known hazardous materials clean-up site				
• water system(s) with known quality problems				
• population density >1 house/acre	x	x	x	
• residences commonly have septic tanks				
• Wastewater treatment lagoons				
• sites used for land application of waste				

Mark and identify on map any of the risks listed above which are located within the 6-month time of travel boundary. (Please include a map of the wellhead and time of travel areas with this form. Please locate and mark any of the following.)

If other recorded or potential sources of ground water contamination exist within the ten-year time of travel circular zone around your water supply, please describe:

2) Source-specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions:
(Unless listed on assessment, MCLs are listed in assistance package.)

	YES
A. **Nitrate:** (Nitrate MCL = 10 mg/l)	
Results greater than MCL	
<2 mg/liter nitrate	X
2-5 mg/liter nitrate	
<5 mg/liter nitrate	
Nitrate sampling records unavailable	

	YES
B. **VOCs:** (VOC detection level 0.5 ug/l or 0.0005 mg/l)	
Results greater than MCL or SAL	
VOCs detected at least once	
VOCs never detected	X
VOC sampling records unavailable	

	YES
C. **EDB/DBCP:**	
(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)	
EDB/DBCP detected below MCL at least once	
EDB/DBCP detected above MCL at least once	
EDB/DBCP never detected	
EDB/DBCP tests required but not yet completed	
EDB/DBCP tests not required	X

	YES
D. **Other SOCs (Pesticides):**	
Other SOCs detected	
(pesticides and other synthetic organic chemicals)	
Other SOC tests performed but none detected	
(list test methods in comments)	
Other SOC tests not performed	X

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here:_____

	YES
E. **Bacterial contamination:**	
Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records)?	

Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source? _____

Source sampling records for bacteria unavailable _____

PART VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water systems which may not be accurately represented by the calculated fixed radius (CFR) method described in Part IV. For these sources, the CFR areas should be used as a preliminary delineation of the critical time of travel zones for that source. As a system develops its Wellhead Protection Plan for these sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10-year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

❑ Yes ❑ No

Describe with references to map produced in Part IV:

_____

_____

_____

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?
❑ Yes ☒ No

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?
❑ Yes ☒ No

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)
❑ Yes ☒ No

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs?

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within…

	YES	NO	unknown
<6-month travel time		X	
6 month—1 year travel time		X	
1—5 year travel time		X	
5—10 year travel time		X	

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within…

	YES	NO	unknown
<1-year travel time		X	
1—5 year travel time		X	
5—10 year travel time		X	

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

Suggestions and Comments

Did you attend one of the susceptibility workshops? ❑ Yes ❑ No

Did you find it useful? ❑ Yes ❑ No

Did you seek outside assistance to complete the assessment? ❑ Yes ❑ No

This form and instruction packet is still in the process of development. Your comments, suggestions and questions will help us upgrade and improve this assessment form. If you found particular sections confusing or problematic, please let us know. How could this susceptibility assessment be improved or made clearer? Did the instruction package help you find the information needed to complete the assessment? How much time did it take you to complete the form? Were you able to complete the assessment without additional/outside expertise? Do you feel the assessment was valuable as a learning experience? Any other comments or constructive criticisms you have would be appreciated.

PRELIMINARY - CITY REVIEW ONLY

CITY OF SNOQUALMIE

KING COUNTY WASHINGTON

SOUTH WELLFIELD WELLHEAD PROTECTION PLAN

G & O #09574
APRIL 2010

Gray & Osborne, Inc.
CONSULTING ENGINEERS

SOUTH WELLFIELD
WELLHEAD PROTECTION PLAN

INTRODUCTION

This document presents the City of Snoqualmie's Well Head Protection Plan (Plan) for the South Wellfield. A wellhead protection plan is required by the Washington State Department of Health (DOH) for all Class A water systems with wells.

This program was developed to help protect the City's sources of supply by identifying possible pollutant sources within the zones of contribution of the City's wells that may affect source water quality. Protection of the City's sources can be accomplished through monitoring, to the best extent possible, all potential contaminant sources and limiting future development within the wellhead protection area that could adversely affect the City's source of supply. Specific criteria against which the adequacy of source water protection is measured are presented in WAC 246-290-135.

WELLHEAD PROTECTION PROGRAM

The City of Snoqualmie intends to reduce the potential risk for contamination of groundwater within the identified wellhead protection area by implementing a wellhead protection program. This Plan is for the City's South Wellfield, which includes Well 1-R and Well 2. The program identifies potential contaminant sources, describes procedures for notifying the potential contaminant sources of their location within the wellhead protection area, identifies actions to protect the groundwater supply, and defines local spill response procedures for spill incidents within the wellhead protection area.

PROGRAM DEVELOPMENT AND IMPLEMENTATION

The purpose of a wellhead protection program is to provide local utilities with a program for preventing groundwater contamination. A successful wellhead protection program consists of a number of components that must be developed before the plan can be fully implemented. The major components of the plan are described below and form the basis of the chapter that follows:

- A Susceptibility Assessment determining the potential for contamination
- A Delineated Wellhead Protection Area (WHPA) based on all reasonably available hydrogeologic information, including an assessment of susceptibility to contamination.
- An Inventory of all known and identifiable potential contamination sources within each wellhead protection area.

- A Spill Response Plan for each wellhead protection area containing documentation for coordination with local first responders (police, fire, HAZMAT team, etc.).
- Contingency Plans for providing alternative sources of drinking water in the event of contamination.
- A Wellhead Protection Area Management Plan to reduce the likelihood that potential contaminant sources will pollute the drinking water supply. This includes notification to local agencies of wellhead protection area boundaries and notifying owners of potential contaminant sources within the WHPA's.

SUSCEPTIBILITY ASSESSMENT

Completion of a susceptibility assessment is an important initial step in selecting appropriate delineation methods to define wellhead protection area boundaries. Completion of the susceptibility assessment and submittal to the Department of Health (DOH) allows for a susceptibility ranking. Sources that receive low susceptibility ratings receive susceptibility waivers from DOH to reduce or waive the amount of required monitoring for volatile organic compounds (VOCs) and synthetic organic compounds (SOCs). Depending on factors such as well construction, casing, and location in a geologic setting, drinking water supplies vary in their susceptibility to contaminants discharged at the surface. Wells that have been poorly constructed or have been improperly cased have an increased susceptibility. Additionally, wells located in a geologic setting where no confining layer (aquitard/layer of low permeability) exists between the aquifer and surface have a much higher susceptibility than those drawing water from deep below the surface, with impermeable layers overlying the aquifer.

The City of Snoqualmie has completed a susceptibility assessment survey form for Well 1-R. This form is included in Appendix A. A susceptibility assessment survey has not yet been approved for Well 2. Appendix A also includes a susceptibility assessment survey form Well 2.

WELLHEAD PROTECTION AREA DELINEATION

The purpose of delineating a wellhead protection area is to estimate the area capable of contributing contaminants to a pumping well. These areas are referred to as zones of contribution and provide a basis for focusing a community's groundwater protection efforts. Multiple methods are used to delineate zones of contributions. A groundwater model simplifies the characteristics of an aquifer in order to provide mathematical estimates of actual conditions. As the groundwater model is increasingly simplified, the model becomes easier to use, but the results become less accurate. The most commonly accepted groundwater models for delineating a wellhead protection area (WHPA), or zone of contribution, are the Calculated Fixed Radius (CFR), Analytical, and Numeric models. A discussion of these methods follows.

METHODS OF DELINEATION

Calculated Fixed Radius Method

The simplest groundwater model is the CFR method. In the CFR method, the delineations are concentric areas around each well that are calculated based on pumping data and known or assumed aquifer characteristics.

Analytical Models

An Analytical model requires basic hydrogeologic information and certain physical characteristics of the aquifer and source. Major assumptions and simplifications to the hydrogeologic regime occur in analytical modeling. However, the incorporation of the hydraulic gradient and hydrogeologic boundaries allows for a more realistic representation of the groundwater flow regime than in the CFR method.

Numeric Method

The Numeric method requires significantly more data than other methods. In Numeric modeling, a grid is superimposed over the study area. Each square in the grid, called a cell, is characterized by physical parameters that are estimated from data collected from a variety of sources. The sources may include well logs, geologic and hydrogeologic maps, geophysical data, groundwater elevation data, stream flow discharge, and meteorological data. The parameters used to define the hydrogeological characteristics of each cell in the study area include identification of the vertical relationship of each aquifer and confining layer, the transmissivity of each aquifer, the thickness of the fine grained materials which separate the aquifers, the annual recharge, the connection between surface water and groundwater, the relationship between the model area and the surrounding areas (boundary conditions), and lastly, the location and pumping rate of wells.

The Numeric method generates more accurate results than the CFR or Analytical methods. However, Numeric models are relatively costly to develop. Consequently, Numeric models are more commonly used by large utilities, with complex aquifers, which have the resources to collect the extensive model input data required.

ZONES OF CONTRIBUTION

A WHPA is defined as the surface and subsurface area surrounding a groundwater source through which contamination can potentially travel and reach the source. WHPAs are based on zones of contribution (ZOCs) that are derived from the estimated time of travel required for a contaminant to move from the point of introduction into the water bearing formation to the source. The DOH Wellhead Protection Program requires a WHPA to be subdivided into five zones, which include:

- A sanitary control zone of at least a 100-foot radius, unless engineering justification supports a smaller area (WAC 246-290-135). No source of contamination may be constructed, stored, disposed of, or applied within the sanitary control zone without the permission of DOH and the water purveyor.

- Four primary zones based on 6 month, 1-year, 5-year, and 10-year time of travel boundaries. These zones are referred to as the zones of contribution of the WHPA. Within this report, these zones will be abbreviated as $ZOC_{½}$ – 6-month zone of contribution, ZOC_1 – 1-year, ZOC_5 – 5-year, and ZOC_{10} – 10-year zone of contribution.

- One buffer zone (if necessary) extending from ZOC_{10} to a groundwater divide and highlighting areas where the aquifer may be particularly susceptible or vulnerable to contamination.

The ZOC_{10} defines the boundary of the WHPA and the area to be inventoried and managed to reduce the risk of contamination.

ANALYSIS

The North Wellfield required a detailed computer analysis for ZOC's because it is located on the edge of the aquifer and groundwater flow is limited by geological features of the area. However, the South Wellfield is located in the middle of the valley and the aquifer is minimally affected by the geology of the area. Thus, the CFR Method is used to analyze the wellhead protection area ZOCs for the City's Well 1-R and Well 2. This method is the minimum acceptable method of delineation for public water systems. The following equation is applicable:

$$r = \sqrt{\frac{Qt}{\pi n H}}$$

Where:

r	=	Radius of ZOCt
Q	=	Volume of water withdrawal (cubic feet per year)
t	=	travel time (½, 1 ,5 and 10 years)
n	=	Porosity = 0.20 (default value)
H	=	well screen interval (ft) = 50 ft for Well 1-R, 22 ft for Well 2

This equation was used to calculate zone of contribution radii for the six month (1/2 year), 1 year, 5 year and 10 year time horizons for the City's South Wellfield. The value to be used for Q, the groundwater withdrawal rate, reflects the maximum annual withdrawal anticipated for each well. The water right limitations, which are detailed in

Table 1, are used as the maximum annual withdrawal anticipated for each well. The City operates Well 1-R and Well 2 one at a time. The pumping volumes used in the CFR Method are shown below in Table 1.

TABLE 1

City of Snoqualmie Maximum Annual Pumping Volumes

Source	Qa [acre-ft/year]	Qa [cubic ft/year]
Well 1-R	500	21,779,900
Well 2	500	21,779,900

Radii values calculated for the various times of travel are presented in Table 2.

TABLE 2

City of Snoqualmie Wellhead Protection Zones of Contribution (CFR Method)

Time of Travel	Well 1-R Zone of Contribution Radius (feet)[1]	Well 2 Zone of Contribution Radius (feet)[1]
6 month	890	890
1 year	1,255	1,255
5 years	2,810	2,810
10 years	3,970	3,970

(1) Radii are rounded to the nearest 5 feet.

Figure 1 shows the limits of the six-month, 1, 5, and 10-year zones of contribution for Well 1-R and Well 2. The ZOC's are merged on the map where the time of travel radii intersect for each of the wells.

CONTAMINANT SOURCE INVENTORY

An essential element of wellhead protection is an inventory of all potential sources of groundwater contamination in and around the delineated WHPA. The purpose of the inventory is to identify past, present, and proposed activities that may pose a threat to the well or surrounding area. For the inventory to be effective a full accounting of all known and potential sources of contamination within the zones must be conducted and the information accurately mapped. The inventory can also help to plan management strategies and establish a mailing list to notify businesses located within the WHPA as well as emergency response agencies.

POTENTIAL CONTAMINANT SOURCES

Within a source protection zone, there are many diverse activities that may contaminate an aquifer thereby jeopardizing the water supply. It is important that these activities are properly inventoried and, if necessary, regulated to prevent degradation of the groundwater supply. Relevant activities include land use and zoning practices, landfill, commercial and industrial operations, underground storage tanks, clandestine drug lab sites, septic systems, dry wells and catch basins, as well as known sites of contamination. A discussion of these practices, their potential effects on groundwater and the regulatory requirements that may apply are included in the following sections.

Land Use and Zoning

A portion of the City of Snoqualmie's WHPA is located within the City limits and the remaining portion is located within unincorporated King County. Areas within the service area are zoned residential, and the area within King County is zoned Rural Development District. Rural Development District is a mixed-use zoning district that allows a number of different land uses such as single family residential, resource uses and limited commercial activity.

Landfills

A landfill is a disposal facility in which solid waste is permanently placed and is not a land treatment facility. Landfills are regulated by the Washington State Department of Ecology under WAC 173-304, Minimum Functional Standards for Solid Waste Handling. These regulations set siting and closure criteria, performance standards, and operating requirements for landfills. The regulations are highly restrictive in that a proposed landfill site must meet a series of "fatal flaw" tests. A wellhead protection area would qualify as a fatal flaw, thereby prohibiting the construction of a new landfill.

Past landfill practices were not so restrictive, however. Abandoned and improperly maintained landfills and dump sites are often a major source of groundwater contamination. Leachate from landfills poses a threat to groundwater quality should it migrate to the water table. The Department of Ecology is responsible for mitigating dump site cleanup when potentially hazardous leachates are present.

There are no known active or closed landfills located within the City of Snoqualmie's WHPA.

Commercial and Industrial Activity

Areas of commercial and industrial land use are located within most wellhead protection boundaries. Businesses that may contribute contaminants to the groundwater include dry cleaners, gas stations and other businesses with fuel storage tanks, auto repair shops, metal plating facilities, asphalt and concrete facilities, and machine shops. Wastes

generated at these businesses include substances such as petroleum products, solvents, surfactants, heavy metals, and other organic materials. These wastes can potentially enter the groundwater system through inadequate disposal practices or accidental spills. Table 3 presents typical commercial and industrial activities and the potentially hazardous chemicals that may be associated with them. Appendix B contains a list of businesses within the WHPA that may potentially pose a threat to the zones of contribution of the south wellfield.

TABLE 3

Chemicals Associated with Commercial and Industrial Activities

Commercial/Industrial Activity	Potential Contaminants
Automobile/Truck Service	waste oils, solvents, acids, paints, soaps
Boat Yard/Marinas	detergents, gasoline, diesel fuels, batteries, oil, seepage from boat waste disposal areas, wood preservative and treatment chemicals, paints, waxes, varnishes, automotive wastes
Dry Cleaners	solvents (perchloroethelyene, petroleum solvents, Freon) spotting chemicals, (trichloroethane, methylchloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate)
Cemeteries	fertilizers, pesticides
Country Clubs/Golf Courses	fertilizers, herbicides, pesticides, swimming pool chemicals, automotive wastes
Electric/Electronic Equipment Manufacturers	nitric, hydrochloric and sulfuric acid, heavy metal sludges, ammonium persulfate, cutting oil and degreasing solvent, corrosive soldering flux, waste plating solution, cyanide, methylene chloride, perchloroethylene, trichloroethane, acetone methanol
Furniture/Wood Manufacturing	paints, solvents, degreasing and solvent recovery sludge
Metal Plating Shops	sodium and hydrogen cyanide, metallic salts, alkaline solutions, acids, solvents, heavy metal contaminated wastewater/sludge
Lawns and Gardens	fertilizers, herbicides, pesticides
Printers, Publishers	solvents, inks, dyes, oils, miscellaneous organics, photographic chemicals
Sand and Gravel Mining	diesel fuel, motor oil, hydraulic fluids
Scrap, Salvage and Junkyards	used oil, gasoline, antifreeze, PCB contaminated oils, lead acid batteries

PRELIMINARY - CITY REVIEW ONLY

Underground Storage Tanks

Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) are a major threat to groundwater quality. Petroleum products which may contain impurities that are mobile in the groundwater system are the most commonly stored substances in USTs. The EPA estimates that 35 percent of all USTs could be leaking. The most common causes of leaks are structural failure, corrosion, improper fittings, and improper installation. Ecology regulates underground storage tanks in Washington State under WAC 173-360, Underground Storage Tank Regulations. The regulations require that owners and operators of underground storage tanks comply with the following sections of the regulations:

- Notification, reporting, and record keeping
- Performance standards and operating closure requirements
- Registration and licensing
- Financial responsibility

The WAC allows a number of exemptions including tanks whose capacity is 110 gallons or less, farm and residential tanks with less than 1,100 gallons, heating oil less than 1,100 gallons per premises, and septic tanks.

As of July 1, 1991, owners and operators of all existing nonexempt underground tanks must have a permit from Ecology. A valid permit is a requirement for delivery of regulated substances. The permit must be updated annually. As a condition of the permit, the owner must have completed the following requirements:

- An assessment of the tank condition by an Ecology licensed tank service provider.
- Replacement of leaking tanks and site cleanup.
- Installation of leak detection devices.
- Proof of insurance to compensate a third party in the event of bodily injury or property damage resulting from a leaking tank. One million dollars insurance is required for petroleum marketing facilities.

By 1998, all existing nonexempt underground storage tanks must have provided cathodic protection and spill and overflow containment, in addition to the above requirements.

Installation and replacement of underground storage tanks must meet the specifications and performance and design standards identified in the WAC. Ecology follows the federal UST guidelines, which at this time do not require double wall vessels.

Underground storage tank inspections are performed by Ecology primarily through the information developed in the permitting process. Although routine annual inspections are not performed, Ecology inspectors do prioritize sites considered potentially hazardous. Technical assistance visits are also conducted at the request of the owner/operator. This provides another avenue in which Ecology can monitor the status of USTs.
Ecology maintains a file on all permitted USTs in Washington State, as required by RCRA, Subtitle 1. The file provides the site name and address, tank identification number, date of installation, size, tank status, and the substance stored at the site.

There are nine known operational USTs within the City of Snoqualmie's ZOC. Snoqualmie 76 has four USTs, the Snoqualmie Valley School District has four UST's, and the King County Public Hospital has one UST. Several closed in place and abandoned USTs were identified within the ZOC, but these sites do not pose a hazard to the South wellfield. Shultz Distributing, Inc. was identified as having one temporarily closed UST within the City's ZOC, but the location was not identified during a site visit. WSDOT has one UST listed in the City's right-of-way within the ZOC of the South wellfield, however, this location was not identified during a site visit.

There are two know LUST's with the City's ZOC. Snoqualmie 76 has one LUST within the ZOC_5 of the South wellfield with a cleanup started status as of April 20, 1999; a cleanup report has not yet been filed with Ecology. The Snoqualmie Valley School District 420 has one LUST site listed within the ZOC_{10} of the South wellfield with a reported cleaned up status as of June 1. 1995. Two LUSTs were listed but not identified during a site visit. These sites include the Old Snoqualmie City Hall and WSDOT.

Septic Systems

King County is responsible for regulating and permitting residential and small commercial on-site sewage disposal systems within the county, excluding federal facilities. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. Ammonia and nitrate nitrogen are highly soluble in water. The City will send a letter to current septic system owners within the source protection zone to notify them of the possible influence of their septic systems on the aquifer. Sample letters are located in Appendix C.

Drywells, Catch Basins, and Improperly Sealed or Secured Wells

Stormwater serves as a source of groundwater recharge, but it can also be a source of groundwater contamination. Runoff from streets, parking lots and other impervious surfaces can contain heavy metals, hydrocarbons, petroleum products, pesticides, and animal wastes. Dry wells may be used for stormwater, septic waste, or other wastewater disposal at commercial, industrial, and multi-family residential sites. Dry wells and catch basins may be located along major transportation corridors. Contaminants generated along transportation routes, such as highways and railroad corridors, include petroleum products, lead, hazardous chemicals and other emission products. Dry wells and catch

basins are potential sites of contamination because their intended use often discharges contaminants directly into the groundwater.

Improperly sealed or secured wells can act as direct conduits for contaminants to reach groundwater. A list of wells within the zones of contribution is provided in Appendix D. The City will send a letter to these well owners notifying them of the possibility of contamination to the aquifer from which their water supply originates.

Accidental Spills

Under the Model Toxics Control Act Cleanup, WAC 173-340, the Department of Ecology is responsible for ensuring all hazardous waste sites are properly remediated. Confirmed and suspected sites of contamination such as accidental spills or releases of contaminants can potentially impact groundwater supplies. Potential sources of spills and leaks can originate from underground storage tanks, accidents, and poor disposal practices. The City will notify the local fire department, Fire District #38, of the zones of contribution for the groundwater supply. The local authorities who are responsible for clean-up and containment of these spills can properly prepare for the possibility of a spill in the area.

Confirmed and Suspected Contamination Sites

Under WAC 173-340, Model Toxics Control Act – Cleanup, the Department of Ecology is responsible for ensuring all hazardous waste sites are properly remediated. This includes confirmed and suspected sites of contamination as well as Leaking Underground Storage Tanks (LUSTs). The LUSTs are listed above under the heading Underground Storage Tanks. A separate inventory for each, which includes the status of cleanup efforts, is maintained by Ecology. Ecology conducts an initial site investigation within 90 days of learning of a potentially contaminated site. If this investigation shows that remediation action is required, the site will appear on the Confirmed and Suspected Contaminated Sites Report. The sites are also given a Washington Ranking Mode BIN number between 1 and 5. A ranking of 1 indicates the greatest assessed risk to human health and the environment. The contaminant type and the affected media, such as groundwater, are also noted. Once the remedial action has been completed, Ecology's Toxics Cleanup Program determines if the site can be removed from the list.

There were no confirmed or suspected contamination sites found within the City's WHPA. LUSTs are listed in the section Underground Storage Tanks.

RCRA Generators

The siting and operation of facilities, which treat, store, or dispose of hazardous waste are subject to the requirements of the Resource Conservation and Recovery Act (RCRA), subtitle C. In Washington State, the Department of Ecology regulates facilities, which generate more than 220 pounds of hazardous waste per month under WAC 173-303,

Dangerous Waste Regulations. The regulations are significant in that they establish a number of requirements for these facilities including surveillance and monitoring, record keeping, performance and design criteria, and siting and closure procedures. Ecology divides the facilities into three levels of hazardous waste accumulation: Level 1 facilities generate 2,220 pounds of waste per month or more; Level 2 facilities generate between 220 and 2,200 pounds per month; and Level 3 facilities generate less than 220 pounds. Level 3 generators are exempt from the regulations. All Level 1 and 2 facilities must initially file a report of their activities with Ecology and update those activities annually. A summary of those activities are published by Ecology, thereby allowing water purveyors the opportunity to determine the types of activities present within their wellhead protection area.

Two active RCRA generators are located within the City's one and 5 year contamination zones. These include one at Mt. Si High School and one at Alpine Coachworks. See Figure 2 for exact locations.

SUMMARY OF POTENTIAL CONTAMINANT SOURCES

Table 4 summarizes the potential sources of contamination found within the six month, one, five, and ten-year zones of contribution for the City of Snoqualmie South Wellfield. Figure 2 illustrates the locations of potential contaminant sources in relation to the ZOC.

Table 4

South Wellfield Potential Contaminant Sources

Figure 2 Identifier	Location (See Figure 2)	Potential Contaminant Source	Name of Business
	Six Month Zone of Contribution		
	None		
	One Year Zone of Contribution		
A	8651 Meadowbrook Way SE	RCRA	Mt. Si High School
	Five Year Zone of Contribution		
B	8352 Meadowbrook Way SE	RCRA	Alpine Coachworks
C	8250 Railroad Ave SE	1 LUST	76 Station
C	8250 Railroad Ave SE	4 USTs	76 Station
	Ten Year Zone of Contribution		
D	9575 Ethan Wade Way SE	4 USTs	Snoqualmie Valley Hospital
E	8001 SE Silva Ave	LUST	Snoqualmie Valley School District
E	8001 SE Silva Ave	UST	Snoqualmie Valley

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			School District
Closed and Unidentified Sites			
	9040 Meadowbrook Rd NE	UST	Shultz Distributing
	38767 River St.	LUST	Old Snoqualmie City Hall
	208 Railroad Ave	UST	City of Snoqualmie
	SR202 & Meadowbrook Way	LUST	WSDOT Snoqualmie
	SR202 & Meadowbrook Way	UST	WSDOT Snoqualmie
	122 Railroad Ave	UST	Town Pump Grocery

Notes: UST = Underground Storage Tank, LUST = Leaking Underground Storage Tank
RCRA = Dangerous Waste and Materials Generators which are regulated by Ecology under RCRA.
CSCS = Confirmed or Suspected Contaminated Sites Sources

INVENTORY DATA SOURCES

The inventory of potential contaminant sources was compiled using various data sources. Agencies such as Ecology and EPA maintain contaminant databases that list businesses that handle and store potential contaminants. The following databases were used to create the inventory for the City's WHPAs:

- **Underground Storage Tank Report, (February 2010)**
  The most recent version of the Underground Storage Tanks (UST) Report was obtained from Ecology's Toxics Cleanup Program. This list was used to locate the facilities that contain underground storage tanks and verify facilities located by field surveys of the wellhead protection areas. These facilities are summarized in the inventories and located on the maps.

- **Leaking Underground Storage Tank Report, (February 2010)**
  The most recent Leaking Underground Storage Tank (LUST) Report was also obtained from Ecology's Toxics Cleanup Program. This report was used to locate the leaking underground storage tanks on the wellhead protection area maps and note the status of remedial action at the site. The LUST report lists the site name, address, age, volume, and status of sites that contain leaking underground storage tanks.

- **Dangerous Waste and Materials Generators, (February 2010)**
  This program, the EPA's RCRA program, has been taken over by Ecology within the State of Washington and is regulated under the Dangerous Waste Regulations (173-303 WAC). Information obtained from Rachel Best of Ecology's Northwest office.

- **Confirmed and Suspected Contaminated Sites Report, (February 2010)**
  Ecology maintains the Confirmed and Suspected Contamination Sites Report. The list is updated continuously as new information becomes available. Each site is given a site status code indicating the status of the cleanup process.

- **Zoning and Land Use**
  Zoning designations were obtained from the City 2005 Water System Plan.

Field surveys were conducted to verify, where practical, the potential contaminant sources indicated in the databases.

SPILL RESPONSE PLANNING

Spill response planning is an important aspect of both an emergency management plan and a wellhead protection program. The release of hazardous materials in a wellhead protection area can create further problems than the initial contamination of soil and surface water. When the release occurs in either the one, five, or ten year zones of travel, there is the possibility of the spill eventually contaminating the aquifers that supply the community's drinking water. Planning for spill response should reflect the needs and concerns of the community while maintaining the quality of the groundwater. Gaining County support in the preparation of a spill response program requires the coordination of the federal, state, and especially the local emergency response organizations.

Specific response procedures for wellhead protection areas must be determined prior to the occurrence of a contamination incident. The information obtained as a result of the susceptibility assessment and the wellhead protection area inventory can be used to determine what types of spill response measures are necessary for the protection of drinking water sources. In order to be accepted by local emergency responders, spill response procedures for wellhead protection areas should be realistic and easily implemented.

In order for spill response procedures to be effectively executed, coordination, cooperation, and communication among the responding agencies, organizations, and individuals is imperative. There are many spill response organizations at the local, state, and federal levels. Depending on the magnitude and type of the release, any of the following organizations may be involved in a spill response for a wellhead protection area in Washington State.

- *Department of Ecology (DOE):* The Spill Response Team is responsible for determining the source and cause of the release, and responsible party. If the responsible party is unknown, DOE will investigate to determine who is

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responsible and ensure that containment, clean-up, and disposal proceedings begin. The DOE's 24 Hour Spill Response can be contacted at (360) 753-2353.

- *Department of Health (DOH):* The Department of Health is developing a set of standard operating procedures, in conjunction with organizations such as DOE's Spill Operations Section and the Association of Fire Chiefs, which first responders can use in wellhead protection areas, critical aquifer recharge areas, and other sensitive groundwater areas. DOH also provides assistance through laboratory support and services if necessary to the clean-up effort.

- *Department of Transportation (DOT):* The Washington State DOT can provide spill response assistance through traffic control, equipment, and personnel for non-hazardous clean-up activities on state and interstate highways.

- *Washington State Patrol:* The state patrol is responsible for managing spills on interstate and state highways.

- *King County Fire District No. 38:* Initial response to a hazardous spill will most likely be from the local fire department that serves the City of Snoqualmie. Fire District No. 38 will be notified of the wellhead protection area boundaries.

CONTINGENCY PLANNING

Contingency planning is an important component of a wellhead protection program. In the event that any of the City's wells needs to be taken off line due to contamination, a contingency plan helps to provide mitigation. A properly prepared and updated contingency plan helps ensure the water system and local officials are prepared to respond to emergency situations. Contingency planning also includes provisions for alternate sources of drinking water. The following steps are necessary for the development of an effective contingency plan:

1. *Identify maximum capacities of the existing system as to source, distribution system, and water rights restrictions. Assume a loss of well and re-evaluate.*

   The City has two additional service areas and sources. There is the Canyon Spings service area that is supplied by the Canyon Springs in the northeast section of the City's service area. Canyon Springs contributes 900 gpm. There is also the Snoqualmie Ridge service area that is supplied by the North Wellfield located in the northwest portion of the service area. The North Wellfield contributes 1,600 gpm. In the event that one or both of the South Wellfield wells is contaminated, the City has the ability to transfer water between the additional sources. The

City's system has enough water in standby storage to serve the system for multiple days.

2. *Evaluate the expansion options of the existing system's capacities relative to existing water rights.*

   The City's current sources have a surplus of water available for the City's use if the South Wellfield is contaminated. The City could divert surplus flow from Canyon Springs or the North Wellfield to where it was needed. However, the source capacity analysis in the 2005 Water System Plan shows that this surplus does not exist past 2012. The City should begin to investigate alternative sources of supply for the future.

3. *Identify existing or potential interties with other public water systems.*

   The City currently has no emergency intertie agreements. The closest purveyor is the City of North Bend. The City may investigate a potential intertie with the city of North Bend in the future as an additional source of emergency supply.

RECOMMENDATIONS

In addition, the following items are recommended contingency planning efforts the City of Snoqualmie should consider implementing:

- Notify commercial businesses, hazardous waste generators, and septic system owners of their presence within the City's wellhead protection area. Sample letters provided in Appendix C.

- Monitor for nitrates annually. Contaminants associated with septic tank effluent include pathogenic organisms, toxic substances, and nitrogen compounds. With the use on on-site sewage disposal systems within the wellhead protection area, the City not only remains aware of non-compliance with MCLs for nitrates, but also for trends of increased levels over a period of time. Increasing nitrate levels could be an indication of source contamination.

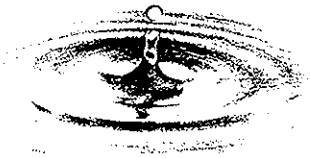
- Investigate the possibility of obtaining data from nearby monitoring wells in order to track potential contaminants in the aquifer near the wells.

- Provide public education materials regarding appropriate handling and disposal of potential groundwater contaminants.

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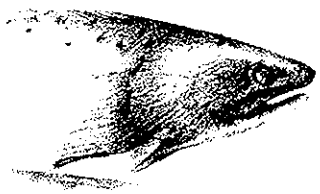
Geotechnical Engineering



Water Resources



Solid and Hazardous Waste



Ecological/Biological Sciences



Geologic Assessments

Associated Earth Sciences, Inc.

Hydrogeologic Evaluation for
Source Approval of
Group A Public Water Systems
WAC 246-290-130

SNOQUALMIE NORTH VALLEY WELL FIELD

Snoqualmie, Washington

Prepared for

Weyerhaeuser Real Estate Company

Project No. KH96078C
April 1996

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HYDROGEOLOGIC EVALUATION FOR SOURCE APPROVAL OF GROUP A PUBLIC WATER SYSTEMS WAC 246-290-130

SNOQUALMIE RIDGE NORTH VALLEY WELL FIELD

Snoqualmie, Washington

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April 1996
Project No. KH96078C

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EXECUTIVE SUMMARY

Water supply for the Snoqualmie Ridge Project will be from wells completed in a deep aquifer formed in Olympia age fluvial sand and gravel deposits. The North Well Field (NWF) is located north of the City of Snoqualmie about 3,500 feet northeast of Snoqualmie Falls. This report describes the results of a susceptibility assessment, preliminary wellhead protection area (WHPA) delineation and initial inventory of potential contamination sources as required by section 2(e) of WAC 246-290-130 for Group A public water systems.

Based on the hydrogeologic setting, the Olympia Aquifer at the NWF is interpreted to have a low susceptibility to contamination. The aquifer is deep and is separated from potential contamination sources by thick sequences of fine-grained aquitards or "protective layers". The top of the aquifer is more than 100 feet below sea level and more than 500 feet below the ground surface.

Water samples from the NWF have been analyzed for compliance with primary and secondary drinking water standards, including bacteriological analyses and testing for volatile organic compounds and radionuclides. The test results indicate the Olympia Aquifer is generally a high quality water source. Elevated levels of naturally occurring manganese were detected, but there are no indications of contamination from outside sources.

The preliminary WHPA delineation methodology recommended in WAC 246-290-130 is based on a calculated fixed radius (CFR) technique. Due to bedrock boundaries, the geometry of the aquifer system, aquifer heterogeneities and steep hydraulic gradient of the potentiometric surface, time of travel (TOT) zones determined from the CFR methodology would be highly misleading. Therefore, in order to provide a reasonable delineation of time dependent capture zones, the NWF WHPA delineation incorporated hydrogeologic mapping and numerical modeling. Ground water flow in the Upper Snoqualmie Basin was simulated by using a numerical model, MODFLOW, developed by the United States Geological Survey. The model was used to delineate the 6 month, 1, 5 and 10 year TOT zones for planned future pumping rates.

The hydrogeologic mapping and numerical modeling results indicate that the TOT zones around the well field are highly elliptical. The 10 year TOT zone extends just over 2 miles south of the well field, but only a few hundred feet to the north. The 10 year TOT zone is relatively narrow, generally in the range of 3,000 feet, and encompasses an area of over 850 acres. The shapes of the time-dependent capture zones are controlled by the hydrogeologic setting and reflect the combination of a narrow bedrock bounded aquifer with a steep hydraulic gradient.

The TOT zones determined from integrated hydrogeologic mapping and three dimensional ground water modeling were compared with TOT zones determined from the calculated fixed radius (CFR) methodology. The difference in time dependent capture zones between the two methodologies is significant. Less than one quarter of the CFR 10 year capture zone area falls within the capture zone determined from hydrogeologic mapping and modeling. This difference has significant implications for source inventory studies, delineation of management zones and determination of management options for wellhead protection planning purposes, and illustrates the importance of hydrogeologic based capture zones.

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SNOQUALMIE NORTH WELL FIELD
HYDROGEOLOGIC EVALUATION
FOR SOURCE APPROVAL OF
GROUP A PUBLIC WATER SYSTEMS WAC 256-290-130

SNOQUALMIE, WASHINGTON

April 15, 1996
Project No. W96078C

INTRODUCTION

This report presents the results of a hydrogeologic evaluation of the North Well Field (NWF), located in Snoqualmie, Washington (Figure 1). This report is designed to meet a portion of the Washington State Department of Health (WDOH) source approval requirements for Group A public water systems listed in WAC 246-290-130. The susceptibility assessment, preliminary wellhead protection area (WHPA) delineation and initial inventory of potential contamination sources outlined in section 2(e) of WAC 246-290-130 are specifically addressed in this report. The information required by WDOH under section 2(e) includes:

(i) A susceptibility assessment;

(ii) A preliminary WHPA designation using the calculated fixed radius method, with six month, one, five, and ten year time of travel criteria; and

(iii) An initial inventory of potential sources of ground water contamination located within the WHPA.

A hydrogeologic assessment and general description of the watershed as required under section 2(b) and results of initial source water quality testing as required under section 2(p) are also included. Well source development data establishing the capacity of the source per section 2(o) was described in previous reports by AESI (1990, 1994). The 1990 and 1994 reports are enclosed under separate cover.

The Washington State Department of Ecology (Ecology) approved ground water application no. G1-25449 in August 1995. The maximum average annual flow rate allowed under the water right permit is 724 acre-feet per year or about 450 gallons per minute (gpm). The peak allowable flow rate is 1650 gpm. The intended use for this new water source is community domestic, business and irrigation supply on Snoqualmie Ridge, and back-up emergency municipal supply throughout the City of Snoqualmie's water service area. Currently there are two production wells in the NWF identified as TW-6 and TW-7 (Figure 2). Deep (TW-5) and shallow (OBW-1 and OBW-2) observation wells have also been constructed in the NWF.

Hydrogeology and pump test results for the NWF were described in 1990 and 1994 reports by Associated Earth Sciences, Inc. (AESI). The 1990 report documented aquifer hydraulic characteristics in the vicinity of the well field based on a 44 hour constant rate test of TW-6. The 1994 report presented the results of an extensive aquifer testing and ground water modeling study of the NWF required by Ecology prior to finalizing their review of ground water application no. G1-25449. This information has been augmented by other studies in the Snoqualmie area including evaluations by AESI (1995a&b) and GeoEngineers (1995). AESI's 1995a report documents the results of a hydrogeologic and water quality evaluation for the proposed Snoqualmie Waste Treatment Plant Expansion. The 1995b report by AESI presents the results of a ground water modeling study of the Upper Snoqualmie Basin extending from Snoqualmie Falls to Grouse Ridge, east of Tanner (Figure 1). The 1995 report by GeoEngineers described test results for a new production well drilled at Mt. Si High School in Snoqualmie, about 1-1/2 miles southeast of the NWF. Supplemental information documenting geology, hydrogeology and aquifer characteristics in the vicinity is also contained in other reports by AESI (1986, 1987, 1988, 1993 and 1995c).

The Snoqualmie River watershed upstream of Snoqualmie Falls drains an area of about 375 square miles. Principal tributaries include the North, Middle and South Forks of the Snoqualmie River. The confluence of the tributaries is in the vicinity of North Bend, about 2 miles southeast of the City of Snoqualmie. The 59 year average discharge for the Snoqualmie River near the falls is about 2,570 cubic feet per second (U.S.G.S., 1990). Precipitation in the watershed ranges from over 180 inches per year in the Cascades to approximately 60 inches at Snoqualmie (WDOE, 1995).

GEOLOGY

The geology in the vicinity of the NWF is relatively complex, with a wide range of geologic units exposed in close proximity to the site. Two deeply incised paleovalleys have been identified in the vicinity of Snoqualmie. The oldest of these paleovalleys is located under the present day Lake Alice Plateau, south of the current Snoqualmie River. This paleovalley was subsequently abandoned and the ancient Snoqualmie River followed a new course located east and north of Snoqualmie Falls in the vicinity of the NWF. This bedrock valley was subsequently filled by a series of Pleistocene-age glacial and nonglacial units, overlain by geologically young (Recent) stream deposits (Tabor, 1993; AESI, 1990; AESI, 1994; GeoEngineers, 1995). The general character and distribution of the various units is described from oldest to youngest in the following sections. Subsurface conditions are illustrated on Figures 3 and 4.

Bedrock

Late Eocene volcanic rocks of the Mount Persis Formation are exposed at Snoqualmie Falls, located about one-half mile southwest of the NWF (Tabor, 1993). This unit consists of massive, dark green to black andesite flows, tuffs and breccia, and contains minor dacite, basalt, volcaniclastic sandstone, conglomerate and siltstone in some areas. Bedrock was encountered at depths greater than 560 feet in wells TW-5, TW-6 and TW-7 at the NWF. The lithology of cuttings obtained during drilling was consistent with Mount Persis Formation volcanics.

Pre-Olympia Deposits

Pre-Olympia undifferentiated deposits have been mapped from discontinuous exposures along north-facing slopes of the Lake Alice Plateau, and in the area east of Snoqualmie (AESI, 1987 and 1995c). Pre-Olympia deposits were encountered in test wells drilled into the paleovalley underlying the Lake Alice Plateau. These pre-Olympia sediments have not been penetrated by wells at the NWF and are interpreted to have a limited distribution. Pre-Olympia glacial and nonglacial deposits generally consist of laminated to massive silt/clay, sand, sand and gravel and clayey diamictons.

Olympia Nonglacial

The producing aquifer at the NWF is developed in Olympia nonglacial fluvial deposits. Olympia-age sediments have been mapped along the north facing slope of the Lake Alice Plateau (AESI, 1995c) and have been penetrated by several wells (AESI 1987, 1990, 1994, 1995b and GeoEngineers 1995) at the NWF and other localities near Snoqualmie. Sediments encountered in this interval at the NWF generally consist of medium to coarse sands and gravels with lenses of fine to medium sand. Vertical and lateral variations in texture are pronounced. The thickness of the unit ranges from about 50 to 70 feet in the vicinity of the NWF. Olympia deposits are interpreted to be considerably thicker in the vicinity of the Snoqualmie Sand and Gravel Pit, but total thickness has not been determined by drilling since existing wells have not penetrated the entire interval. Based on geophysical (gravity) information, the unit thickness may approach 150 feet near the gravel pit.

Olympia deposits directly overlie bedrock in the paleovalley at the NWF and in the vicinity of the City of Snoqualmie. However, as illustrated on Figure 3, Olympia sediments overlie pre-Olympian deposits upvalley from North Bend. Olympia-age fluvial deposits of the ancient Snoqualmie River have been penetrated at depths of about 540 to 590 feet (approximately 120 to 170 feet below sea level) at the NWF. Olympia-age sediments were encountered at an elevation of approximately 600 feet in a well drilled on the Middle Fork Embankment east of Tanner (Golder, 1996).

Vashon Glacial Deposits

Deposits from the most recent glaciation of the Puget Lowland have been assigned to the Vashon Stade of the Fraser Glaciation. During the advance of the Vashon ice sheet, an ice-dammed lake formed in the ancient Snoqualmie River Valley. Glaciolacustrine clay, silt and fine sand were deposited in the proglacial lake and are identified as Qvaf and Qvas on Figure 3. The clayey silt unit ranges from about 50 to 70 feet thick at the NWF. This unit is interpreted to "pinch-out" to the south and east as it was not identified in the City of Snoqualmie well or the Snoqualmie Sand and Gravel Pit wells (Figure 3). The clayey silt unit behaves as a semi-confining layer at the NWF and is overlain by Vashon advance sands which behave as a "secondary" aquifer.

The secondary Vashon-age aquifer consists of silty fine sand and ranges from about 60 to over 120 feet thick at the NWF. This secondary aquifer was also encountered in a City of Snoqualmie well

located about 1-1/2 miles to the south where it was approximately 60 to 80 feet thick. The secondary aquifer is interpreted to act as a "source zone", providing water to the deep aquifer by leakage through the semi-confining layer.

Continued southward expansion of the Vashon ice sheet ultimately resulted in the deposition of lodgement till, diamictons and silt with dropstones. Lodgement till and associated deposits have been identified in several wells, but these are discontinuous as illustrated on the cross sections. This unit ranges from about 50 to over 120 feet thick at the NWF and separates an overlying aquifer from underlying aquifers.

Following the ice maximum, a proglacial lake again formed in the ancient Snoqualmie River Valley. Meltwater from the receding ice sheet formed a prograding delta system at Tokul Creek. The Tokul Creek delta deposits are characterized by a coarsening upward sequence. Glaciolacustrine silts and fine to medium sands were deposited in prodelta environments. Foreset and topset beds associated with the delta generally consist of sands and gravels with variable percentages of cobbles and boulders. The deltaic deposits are about 350 feet thick in the vicinity of the NWF.

A shallow aquifer is developed in the Vashon recessional deltaic deposits and is about 140 feet thick at the NWF. The shallow aquifer discharges in the vicinity of SR 202 at Tokul Creek, and is interpreted to contribute about 4.0 to 5.0 cfs to Tokul Creek instream flows.

Recent Deposits

The thick Tokul Creek deltaic sequence prevented the Snoqualmie River from re-establishing its pre-ice course, resulting in the development of postglacial Lake Snoqualmie. Recent lacustrine silts and clays deposited in this lake are identified as Qaf on Figure 3. The outlet for postglacial Lake Snoqualmie was at the location of present day Snoqualmie Falls. Recent Snoqualmie River deposits overlie the lacustrine units and generally consist of gravelly sand. A very shallow aquifer is developed in this unit. These deposits are overlain by up to 10 feet of floodplain silts and clays from the modern Snoqualmie River.

AQUIFER CONDITIONS

Four aquifers have been identified in the vicinity of the NWF. From oldest to youngest these include: 1) Olympia Aquifer, 2) Vashon Advance Aquifer, 3) Tokul Creek Delta Aquifer, and 4) Snoqualmie River Aquifer. Production at the NWF will be from the Olympia Aquifer. The distribution and character of these aquifers are briefly described in this section.

Olympia Aquifer

The Olympia Aquifer is developed in Olympia age fluvial sands and gravels. The aquifer has a lenticular map pattern since it represents an ancient Snoqualmie River system confined within a narrow bedrock valley. The Olympia Aquifer extends upvalley (southeast) from the NWF to the Grouse Ridge/Middle Fork Embankment area east of Tanner. The downvalley location of the

Olympia Aquifer is unknown northwest of Snoqualmie Falls. Aquifer width is about 2000 feet in the vicinity of the NWF, and thickness ranges from about 50 to 70 feet at the NWF. The aquifer is an estimated 150 feet thick at the Snoqualmie Sand and Gravel Pit. Aquifer thickness is reported to range from about 150 to 200 feet east of Tanner (Golder, 1996).

There have been numerous pump tests from wells completed in the Olympia Aquifer to determine aquifer hydraulic characteristics at the NWF and other nearby well fields. These studies have determined that the aquifer behaves as a leaky (semi-confined) aquifer at the NWF.

Several aquifer characteristics have been determined from the various pump tests. These included the coefficient of transmissivity (T), the storage coefficient (S), horizontal hydraulic conductivity of the aquifer (K), and vertical hydraulic conductivity of the overlying aquitard (K'). Average values for these parameters are presented in Table 1. Detailed descriptions of pump test methods, analyses and results are presented in reports by AESI (1990, 1994).

TABLE 1
OLYMPIA AQUIFER PARAMETERS
FROM
PUMP TESTS AT
THE NORTH WELL FIELD

Pumping Well ID	T	S	K	K'
TW-7	1,400 ft^2/day	2×10^{-4}	28 ft/day	6.3×10^{-3} ft/day
TW-6	2,020 ft^2/day	8×10^{-4}	31 ft/day	6.4×10^{-3} ft/day

Aquifer transmissivity increases upvalley from the NWF. Pump tests indicate transmissivity is in excess of 3,600 ft^2/day at the City of Snoqualmie's South Well Field (AESI, 1994). The transmissivity of the Olympia Aquifer is estimated to exceed 20,000 ft^2/day east of Tanner (Golder, 1996).

Vashon Advance Aquifer

The Vashon Advance Aquifer is separated from the underlying Olympia Aquifer by about 50 to 70 feet of clayey silt at the NWF. This aquitard pinches out to the southeast where the Vashon Advance Aquifer is interpreted to be in direct contact with the underlying Olympia Aquifer. Although the depositional environment of the Vashon Advance Aquifer media was very different than the Olympia deposits, the distribution of the aquifer is similar. The silty fine sands of the Vashon Advance Aquifer were deposited in a proglacial lake that occupied the ancient Snoqualmie River Valley during the advance of the Vashon ice sheet. The aquifer is interpreted to extend upvalley (southeast) from the NWF to the area east of Tanner as illustrated on Figure 3, but like

the Olympia Aquifer, its width is limited by the narrow bedrock valley of the ancient Snoqualmie River.

Although the Vashon Advance Aquifer is considered capable of producing low yields, no wells are completed in this fine sand aquifer in the vicinity of the NWF. The leaky confined aquifer behavior determined from pump tests in the Olympia Aquifer suggests that the Vashon Advance Aquifer acts as a "source zone" providing water to the Olympia Aquifer by leakage through the semi-confining layer. Hydraulic properties of the Vashon Advance Aquifer have not been determined directly from pumping, but have been estimated from three dimensional ground water flow models as presented in Table 2.

TABLE 2
VASHON ADVANCE AQUIFER PARAMETERS
ESTIMATED FROM
GROUND WATER FLOW MODELING

K	S
10 ft/day	.001

Tokul Creek Delta Aquifer

The Tokul Creek Delta Aquifer has a limited distribution, but is about 140 feet thick at the NWF. This unconfined aquifer is bounded by bedrock east and west of the NWF and pinches out to the south as shown on Figure 3. The aquifer discharges at Tokul Creek in the vicinity of SR 202 at a rate of about 4.0 to 5.0 cfs, based on summertime stream gauging data (AESI, 1994).

Limited pump test information indicates that transmissivity and hydraulic conductivity are highly variable in the Tokul Creek Delta Aquifer. Relatively low values of T and K were determined from a low-rate test performed on a well located in the Snoqualmie Sand and Gravel Pit. High values of T and K were calculated from a pump test in the Tokul Creek Delta Aquifer at the NWF. Test results are presented in Table 3. The broad range of T and K values reflects significant differences in the nature of the aquifer media at the two tested localities. The aquifer material at the Snoqualmie Sand and Gravel well consisted of fine sand deposited in a low energy prodelta environment. In contrast, the aquifer media in the tested interval at the NWF consisted of clean sandy gravels and cobbles deposited at the mouth of the meltwater stream.

Average values of K and S for the Tokul Creek Delta Aquifer were estimated from the three dimensional ground water flow model. The values are reported in Table 3.

TABLE 3
TOKUL CREEK DELTA AQUIFER
PARAMETERS

	T	K	S
NWF	24,000 ft^2/day	200 ft/day	not determined
Gravel Pit	220 ft^2/day	3.6 ft/day	not determined
Ground Water Model	not determined	85 ft/day	0.25

Snoqualmie River Aquifer

The Snoqualmie River Aquifer generally consists of fine to medium sand with gravel, deposited in channel and near-channel environments of a meandering river system. The aquifer is shallow, typically less than 50 feet, and is discontinuous in map pattern (AESI, 1993). The distribution of the Snoqualmie River Aquifer is limited to the present day river valley south of the NWF. Most of the ground water in the Snoqualmie River Aquifer discharges to the Snoqualmie River and in the subsurface to the Tokul Creek Delta Aquifer. There is a steep hydraulic gradient at the interface between the two aquifers. Water levels drop in a distance of about 1-1/4 miles from average elevations of about 400 feet in the Snoqualmie River Aquifer, near the City of Snoqualmie, to approximately 200 feet where the Tokul Creek Delta Aquifer discharges at Tokul Creek.

Hydraulic testing has been performed on 8 observation wells completed in the Snoqualmie River Aquifer within and near the City of Snoqualmie (AESI, 1993). Maximum hydraulic conductivity values and the range of storage coefficients calculated from falling head slug tests are summarized in Table 4.

TABLE 4
SNOQUALMIE RIVER AQUIFER
PARAMETERS

K	S
70 ft/day	1×10^{-5} to 7×10^{-4}

The slug test results indicate that the Snoqualmie River Aquifer behaves as a confined system. However, in similar hydrogeologic settings, delayed yield behavior has been observed from pump tests. The three dimensional ground water flow modeling suggests the aquifer can act as either a confined or unconfined system depending on seasonal water levels.

SUSCEPTIBILITY ASSESSMENT

The hydrogeologic setting is the key factor influencing vulnerability to contamination in ground water sources. Shallow unconfined aquifers in humid climates are highly susceptible to contamination, while deep confined aquifers typically have a low vulnerability to contamination.

The Olympia Aquifer at the NWF is interpreted to have a low susceptibility to contamination based on the hydrogeologic conditions described in the previous sections. The aquifer is deep and is separated from potential contamination sources by thick sequences of fine-grained aquitards or "protective layers". Well depths, screened intervals, water depths and elevations for the Olympia Aquifer at the NWF are presented in Table 5.

TABLE 5
OLYMPIA AQUIFER
WATER LEVELS

Well ID	Total Depth (ft)	Screened Interval (ft)	Surface Elevation (ft)	Static Water Depth (ft) Below TOC	Static Water Elevation (ft)
TW-5	583	510-560	440	160	280
TW-6	590	534.2-580.5	436	162	276
TW-7	564	527-556.5	435	147	290

Note: TW-5 is an observation well. TW-6 and TW-7 are production wells.

Potential contamination sources are described in the Potential Contamination Source Inventory section of this report. However, one nearby potential source is discussed in this section to illustrate the low susceptibility to contamination in the Olympia Aquifer. This potential source is the sewage lagoons at the City of Snoqualmie's waste water treatment plant (WWTP), which have been in existence at their present location since the 1960's.

The WWTP is located about 2,000 feet generally upgradient (south) of the NWF. Monitoring wells have been installed at the WWTP to evaluate water quality impacts to the Tokul Creek Delta Aquifer from the existing operation (AESI, 1995a). The depth to ground water under the WWTP ranges from about 35 to 65 feet. Laboratory test results of ground water samples indicate that water quality has been relatively unaffected by seepage of effluent from the WWTP, but a minor elevated nitrate level was detected in one well in the shallow Tokul Creek Delta Aquifer (AESI, 1995a). This reported nitrate concentration of 4.1 mg/l is approximately four times higher than the nitrate levels reported from the other samples but is well below Ecology's drinking water standard of 10 mg/l. The nitrate concentration was 0.86 from well OBW-2 completed in the Tokul

Creek Delta Aquifer. The reported nitrate concentration from TW-6 completed in the Olympia Aquifer at the NWF was 0.2 (AESI, 1990).

Water samples from the NWF have been analyzed for compliance with primary and secondary drinking water standards, including bacteriological analyses and testing for volatile organic compounds and radionuclides. Laboratory test results are presented in Appendix A from water samples collected by AESI in 1994. Supplemental testing by Earth Tech has been reported separately.

The test results indicate the Olympia Aquifer is generally a high quality water source. Elevated levels of naturally occurring manganese were detected, but there are no indications of contamination from outside sources. This finding is consistent with the low susceptibility to contamination afforded by the hydrogeologic setting.

WELLHEAD PROTECTION AREA (WHPA) DELINEATION

The wellhead delineation process establishes a specific geographic area around a well or well field, and is an essential element of a wellhead protection plan (WHPP). The WHPA delineation process includes mapping the zone of contribution (ZOC) and time of travel (TOT) zones around the well. The ZOC includes the surface and subsurface areas contributing water to the well. The TOT zones identify the time required for a particle of water to reach a well and is typically expressed in years.

Washington State Wellhead Delineation Requirements

Under the 1986 amendments to the federal Safe Drinking Water Act, all states are required to develop a WHPP. The goal of the WHPP is to prevent contamination of public drinking water supplies. In Washington, the State Department of Health (DOH) is the lead agency for developing and administering the WHPP. A key element of the WHPP includes mapping the WHPA. A WHPA is the geographic area that directly contributes water in the short term to the drinking water supply. In Washington, WHPAs are primarily based on 6 month, 1, 5, and 10 year TOT zones.

There are several WHPA delineation methods. These range from simple arbitrary or calculated fixed radii, to analytical solutions and relatively complex numerical modeling programs coupled with hydrogeologic mapping. The preliminary WHPA delineation methodology recommended in WAC 246-290-130 is based on a calculated fixed radius (CFR) technique. This methodology can provide a reasonable approximation of TOT zones under a fairly limited range of hydrogeologic conditions. The CFR methodology is unsuitable for the hydrogeologic setting at the NWF. Due to bedrock boundaries, the geometry of the aquifer system, aquifer heterogeneities and steep hydraulic gradient of the potentiometric surface, TOT zones determined from the CFR methodology would be highly misleading. In order to provide a reasonable delineation of time dependent capture zones, the NWF WHPA delineation incorporated hydrogeologic mapping and numerical modeling.

Delineation Approach-Modeling

Ground water flow in the Upper Snoqualmie Basin was simulated by using a numerical model, MODFLOW, developed by the United States Geological Survey (McDonald, M.G. and Harbaugh, A.W., 1988). The primary purpose of the model developed for this study was to delineate the 6 month, 1, 5 and 10 year TOT zones for planned future pumping rates. The TOT delineation completed for this study accounted for planned future pumping from the City of Snoqualmie's South Well Field (SWF) and ongoing pumping at the Snoqualmie Sand and Gravel Pit. Average annual flow rates used in this analysis are presented in Table 6.

TABLE 6
AVERAGE ANNUAL PUMPING RATES

Well Field	Rate (GPM)
NWF	450
SWF	500
Sand & Gravel Pit	125

MODFLOW Features

Mathematical modeling simulates ground water flow indirectly by using numerical approximations for flow equations designed to represent the physical properties and processes of aquifer systems, boundary conditions and head distribution (Anderson, M.P. and Woessner, W.W., 1992). MODFLOW is a modular, three dimensional, block centered finite-difference computer program.

The finite-difference method solves a set of differential-flow equations to find the distribution of "heads" (ground water elevations or "potentiometric surface") over the aquifer flow system. This is accomplished by placing a network of grid cells over the flow system and calculating the heads at each cell node by trial and error. Additionally, at the end of a simulation, the program calculates the water budget for the entire model showing inflow and outflow rates specified for the different sources and sinks. Sources include recharge areas and rivers, and sinks may include wells or other discharge points, such as springs, to Tokul Creek.

The computer program is divided into "packages". A package is that part of the program that represents a particular hydrologic or mathematical feature. The Block Centered Flow package calculates terms in the finite-difference equation that represent flow between cells. "Stress" packages calculate terms that represent flow into or out of the aquifer due to an outside influence. The stresses include General Head, River, Drain, Recharge, and Well packages. The Solver package solves the system of finite-difference equations. The Basic package performs those tasks which belong to the model as a whole, such as specification of boundaries and initial conditions.

The printing code for model results is given in the Output Control package. Ground water flow paths were obtained from MODPATH.

The flow model used in this analysis was adapted from the ground water models developed by AESI for evaluation of water rights. Additional information documenting input parameters, calibration and sensitivity, and simulation and model results are included in the 1994 and 1995b reports by AESI.

Delineation Results

The hydrogeologic mapping and numerical modeling results indicate that the TOT zones around the well field are highly elliptical (Figure 5). The 10 year TOT zone extends just over 2 miles south of the well field, but only a few hundred feet to the north. The 10 year TOT zone is relatively narrow, generally in the range of 3,000 feet, and encompasses an area of over 850 acres. The shapes of the time-dependent capture zones are controlled by the hydrogeologic setting and reflect the combination of a narrow bedrock bounded aquifer with a steep hydraulic gradient.

The 1/2 and 1 year TOT zones also exhibit an elliptical shape, and encompass areas of about 70 to 130 acres respectively. Land use within the 1 year TOT zone is primarily undeveloped wetland and forest with some agricultural and rural residential uses. No significant potential contamination sources were identified within the 1 year TOT boundary from the preliminary source inventory completed by Earth Tech.

The 5 year TOT zone extends to "Mill Pond" located over a mile south of the well field. The most significant land use within this zone is the Weyerhaeuser lumber mill. Current operations are primarily limited to kiln drying of dimensional lumber, and processing of wood fiber into erosion control products.

Additional land uses within the 10 year TOT zone include public schools, light commercial, residential and some additional agricultural activities. An oil distributor is located just south of the 10 year TOT boundary. Other potential sources located close to but outside of the 10 year TOT zone include a gas station, a gravel mine, railroad siding and the Puget Power storage yard. The most significant transportation corridor, SR 202, is also largely outside of the 10 year TOT zone.

As described under the Susceptibility Assessment section of this report, the vulnerability to contamination is considered low in the Olympia Aquifer at the NWF due to multiple aquitards separating surface contamination sources from the aquifer. Particle tracking plots which illustrate flowpaths generated by the computer model also support this interpretation. Most of the water discharging from the well field comes directly from upgradient sources in the Olympia Aquifer, originating a few miles upvalley (southeast) of the 10 year TOT boundary. Modeling suggests only about 5 to 10 percent of the water at the well field would originate in the Tokul Creek Delta Aquifer, Snoqualmie River Aquifer, or surface water sources within the 10 year TOT zone.

Discussion

The TOT zones determined from integrated hydrogeologic mapping and three dimensional ground water modeling were compared with TOT zones determined from the calculated fixed radius (CFR) methodology. Figure 6 illustrates the dramatic difference in time dependent capture zones between the two methodologies. Less than one quarter of the CFR 10 year capture zone area falls within the capture zone determined from hydrogeologic mapping and modeling. This difference has significant implications for source inventory studies, delineation of management zones and determination of management options for WHPP purposes.

- Most of the CFR 5 and 10 year TOT zones fall outside of the actual capture zones. Source inventory studies based on the CFR methodology would expend limited resources in areas that have no influence on water quality at the NWF.

- Land uses and potential sources within the actual 5 and 10 year TOT boundaries would be excluded from a source inventory based on the CFR technique.

- The delineation of management zones within the WHPA would be seriously in error using the CFR methodology.

- Management options such as zoning restrictions could potentially be imposed on land use over a large area unrelated to the actual capture zone.

Accurately focused source inventories and delineations of management zones are dependent on a reasonable approximation of capture zones. This comparison illustrates the importance of hydrogeologic based capture zone delineations. There are some hydrogeologic settings where CFR delineation techniques would provide a reasonable approximation of capture zones, but this is not the case in the NWF. It should be emphasized that, even within the modeled capture zones, only a small portion (5 to 10 percent) of the ground water comes from overlying sources; the remainder comes from subsurface flow originating much further upstream.

POTENTIAL CONTAMINATION SOURCE INVENTORY

An initial inventory of potential contamination sources which could impact the NWF was developed in late March, 1996. The inventory is based on field observation by Earth Tech personnel of land use within, and adjacent to, the approximate 10 year TOT zone.

The NWF 10 year TOT zone is located in the Upper Snoqualmie River Valley. The central core of the City of Snoqualmie is located just west of the 10 year TOT zone. For the most part, the land within the 10 year TOT zone is relatively flat. A significant portion of the zone is within the Snoqualmie River flood plain. The NWF is located north of the City core.

Approximately sixty percent of the 10 year TOT zone is either wetland, forest, or other undeveloped land. Another ten percent is light commercial or residential. The Snoqualmie River

bisects the area. The only significant industry is the Weyerhaeuser Lumber Mill. About ten percent of the land is used for agricultural purposes.

Inventory Results

Figure 7 indicates the general land use and some point sources of potential contamination within, or adjacent to, the 10 year TOT zone.

The following tables identify the most significant point sources of potential contamination identified by initial field investigation. No attempt was made to determine specific chemicals or hazardous products which may be used by these businesses.

TABLE 7
POINT SOURCES OF POTENTIAL CONTAMINATION
WITHIN THE 10 YEAR TOT ZONE

Business	Activity
City of Snoqualmie Wastewater Treatment Plant	Treatment of municipal wastewater
Weyerhaeuser Lumber Mill	Kiln drying of dimensional lumber, processing of wood fiber into erosion control products

TABLE 8
POINT SOURCES OF POTENTIAL CONTAMINATION
ADJACENT TO 10 YEAR TOT ZONE

Business	Activity
Shultz Distributing, Inc.	Storage and distribution of heating oil
Chevron Service Station	Storage and dispensing of gasoline and diesel fuels
Puget Sound Railway Historical Association	Storage and maintenance of railroad rolling stock
Puget Power Pole Yard	Storage of utility poles and electrical utility service equipment
Lone Star/Snoqualmie Sand and Gravel	Gravel mining and concrete products

In addition to the point sources, there are some areas of agricultural use, including pasture and cultivated land. Mount Si Golf Course is located southeast of the 10 year TOT zone. Elementary,

middle and high schools are located within the southern portion of the 10 year TOT zone. These land uses may involve the application of fertilizers and other agricultural products.

No cattle feed lots or significant dairies were identified within the 10 year TOT zone.

No attempt was made to identify landfills or other solid waste disposal sites with the zone.

No research was conducted to identify underground storage tanks, except as indicated above. There are probably some underground tanks for storage of heating oil within the area. A more detailed analysis would require review of Ecology's records, and additional field investigation.

The majority of the area is served by City of Snoqualmie water and sewer systems. Some residences and farms are outside of the current City service area. No attempt was made to identify abandoned water wells. Research of City and County records would be required to identify on-site sewage disposal systems. The identification of potential contamination sources should be expanded when the City of Snoqualmie develops its WHPP.

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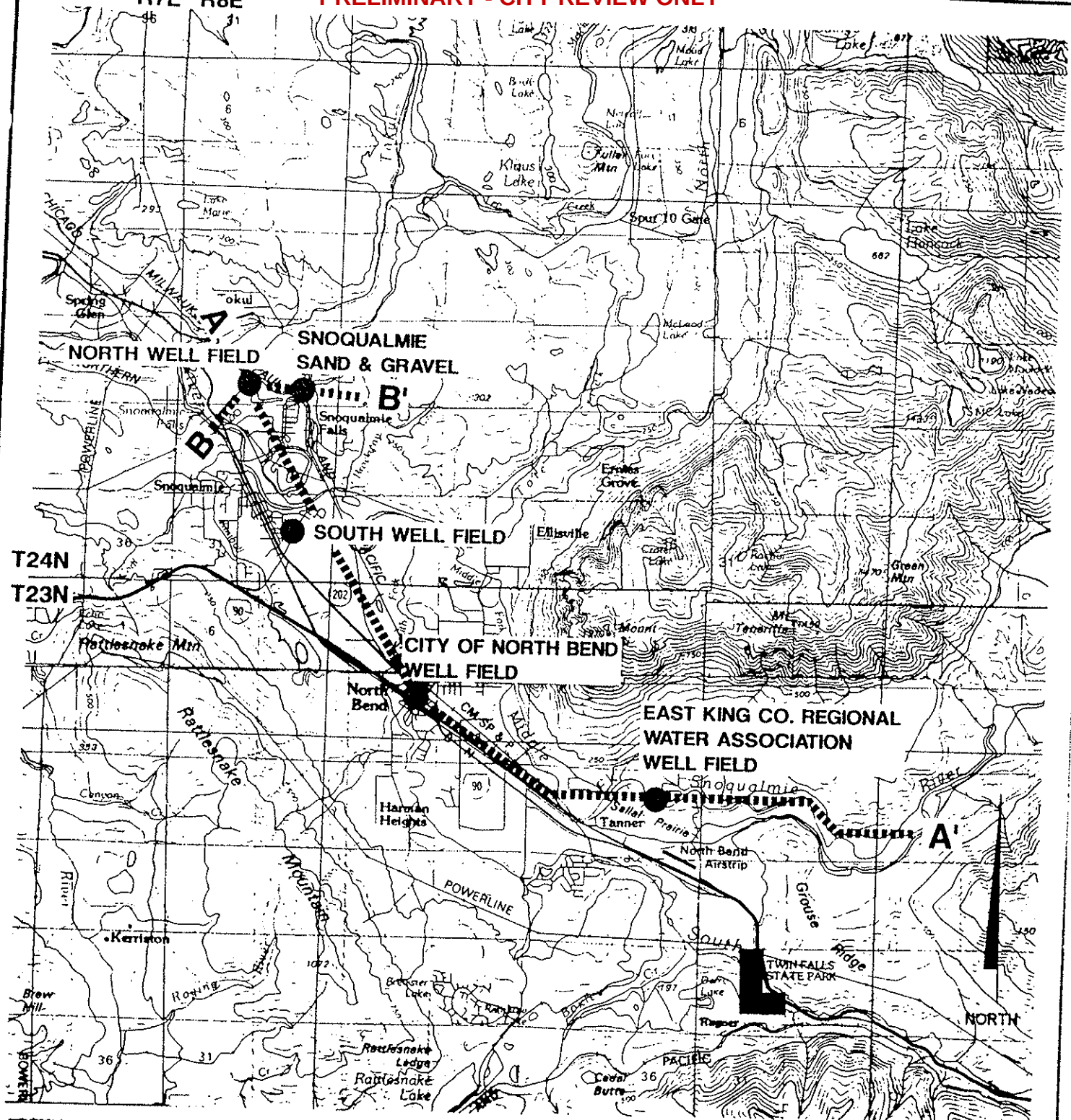
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FIGURES

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REFERENCE: U.S.G.S. 1:100,000 SCALE SERIES (TOPOGRAPHIC) MAPS "SKYKOMISH RIVER, WASHINGTON" AND "SNOQUALMIE PASS, WASHINGTON".

LEGEND

A - A' Cross section

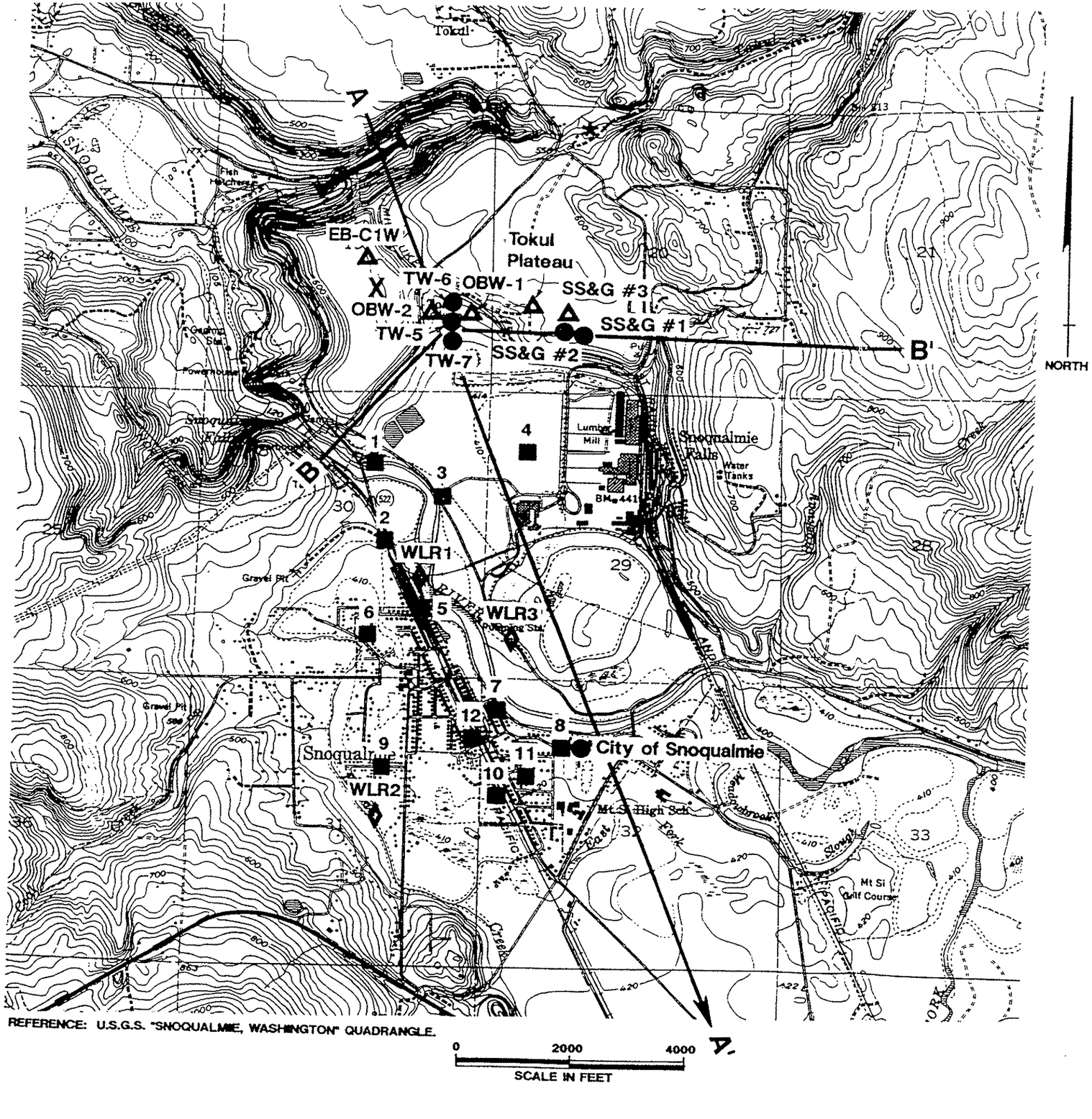
VICINITY MAP

SNOQUALMIE NORTH WELL FIELD
KING COUNTY, WASHINGTON

ASSOCIATED EARTH SCIENCES, INC

W96078C	4/96	FIGURE 1

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LEGEND

- Snoqualmie River aquifer
- Tokul Creek Delta aquifer
- Olympia aquifer
- Approximate location of staff gauge
- Approximate location of stream gauge
- Discharge zone of Tokul Creek Delta aquifer into Tokul Creek
- A - A' Cross section
- X Proposed infiltration basins

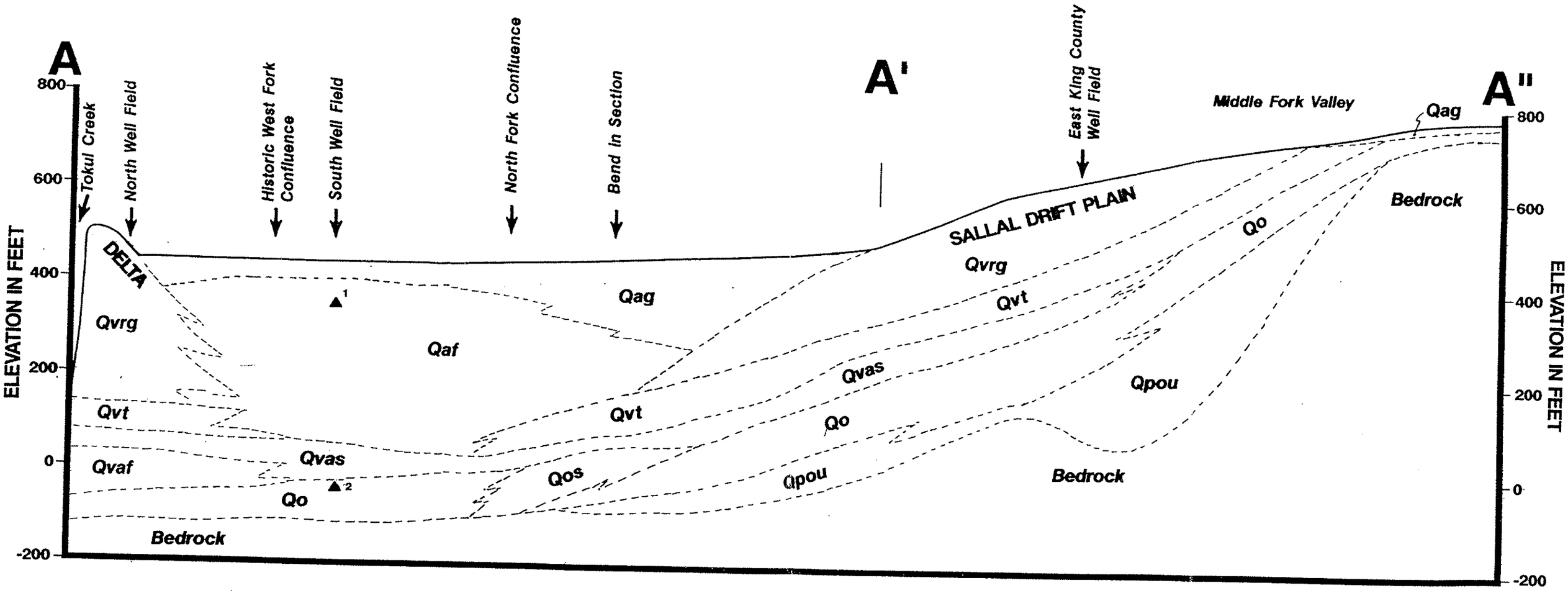
WATER WELL LOCATION MAP

Snoqualmie North Valley Well Field

PROJECT NO. W96078C
APRIL 1996
FIGURE 2

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LEGEND

Qag	Recent river deposits consisting of gravelly sand to sandy gravel capped over bank silts
Qac	Recent lacustrine deposits consisting of fine-grain silts and clays
Qvrg	Vashon recessional fluvial deposits consisting of cobbly sandy gravel
Qvt	Vashon till consisting of poorly sorted sand and gravel in a dense silt and clay matrix
Qvas	Vashon advance fluvial deposits consisting of medium to fine sand
Qvaf	Vashon advance lacustrine deposits consisting of fine-grain silts and clay
Qo	Olympia fluvial deposits consisting of cobbly sandy gravel to gravelly sand
Qos	Olympia fluvial deposits primarily consisting of sand deposited by the historic North Fork near the confluence of the North Fork with the Middle and South Forks
Qpou	Pre-Olympia undifferentiated consisting of a mixture of till, sand, gravel, silt, and clay
Br	Bedrock

▲ Carbon 14 dates
1. 5720 ybp
2. >43,000 ybp

0 4000 8000
SCALE IN FEET
HORIZONTAL

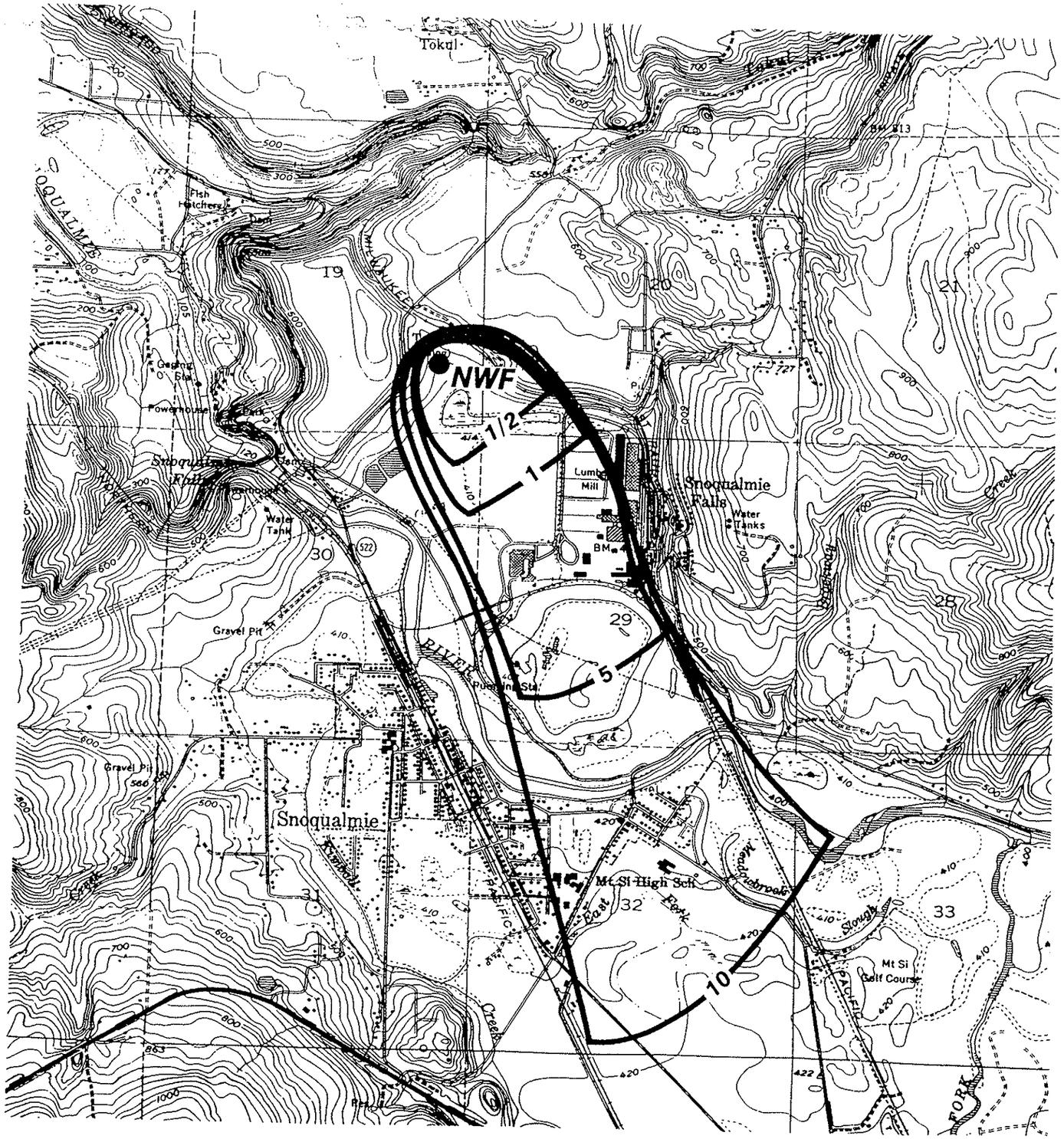
0 200 400
SCALE IN FEET
VERTICAL

FIGURE 3
GENERALIZED GEOLOGIC CROSS SECTION
UPPER SNOQUALMIE RIVER VALLEY

SNOQUALMIE NORTH WELL FIELD
KING COUNTY, WASHINGTON
PROJECT NO. W96078C
APRIL 1996

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LEGEND

10 YEAR TOT ZONE - MODFLOW

NORTH

0 2000 4000

SCALE IN FEET

FIGURE 5

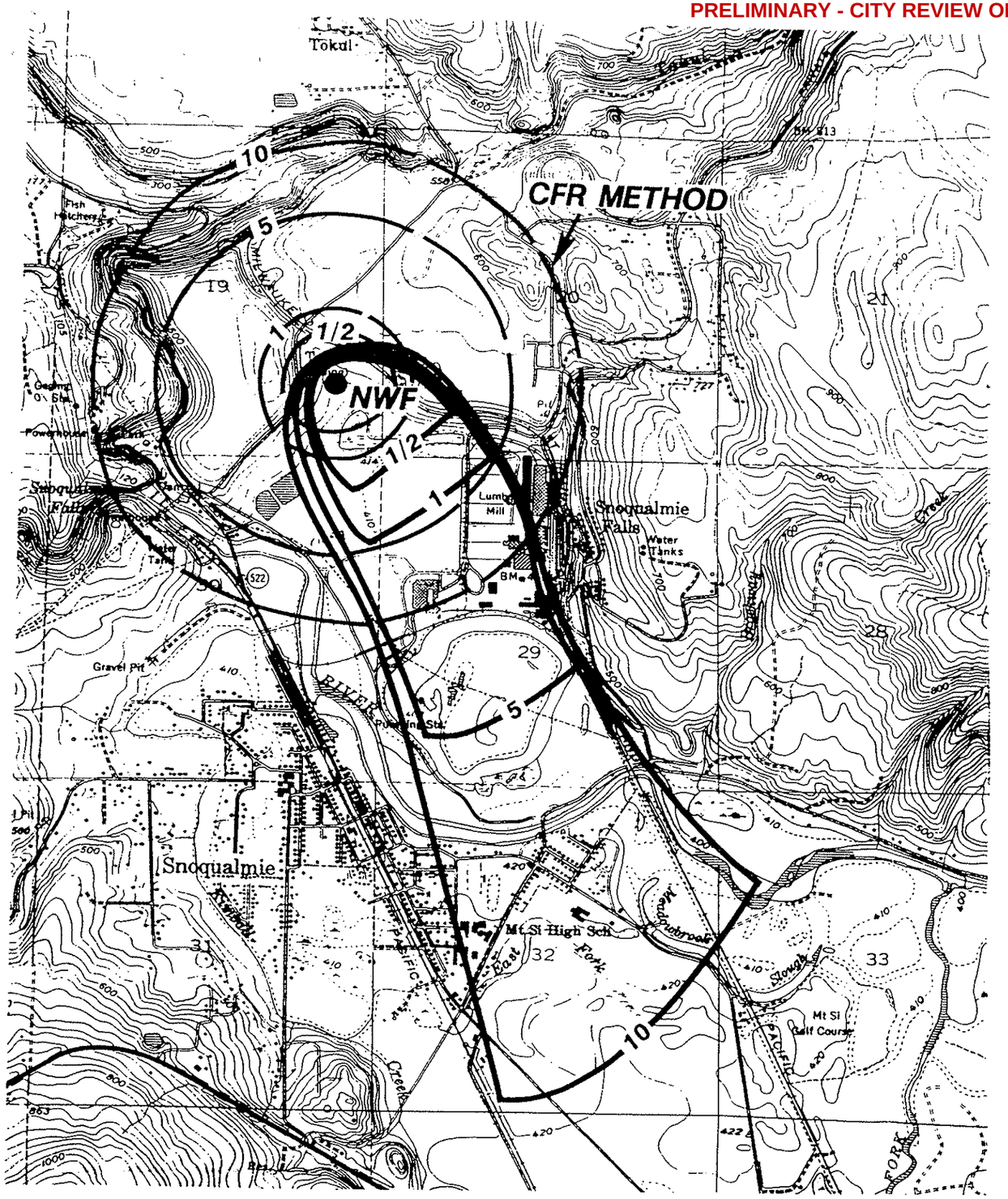
TIME OF TRAVEL MAP

1/2, 1, 5, & 10 YEAR TIME OF TRAVEL AREAS

SNOQUALMIE NORTH WELL FIELD
WELLHEAD PROTECTION
KING COUNTY, WASHINGTON
PROJECT NO. W96078C
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LEGEND

10 — 10 YEAR TOT ZONE - CFR METHOD

10 — 10 YEAR TOT ZONE - MODFLOW

Note: This map shows a comparison between TOT areas for the Calculated Fixed Radius (CFR) methodology and the hydrogeologic mapping/computer modeling techniques used in this assessment.

NORTH

0 2000 4000

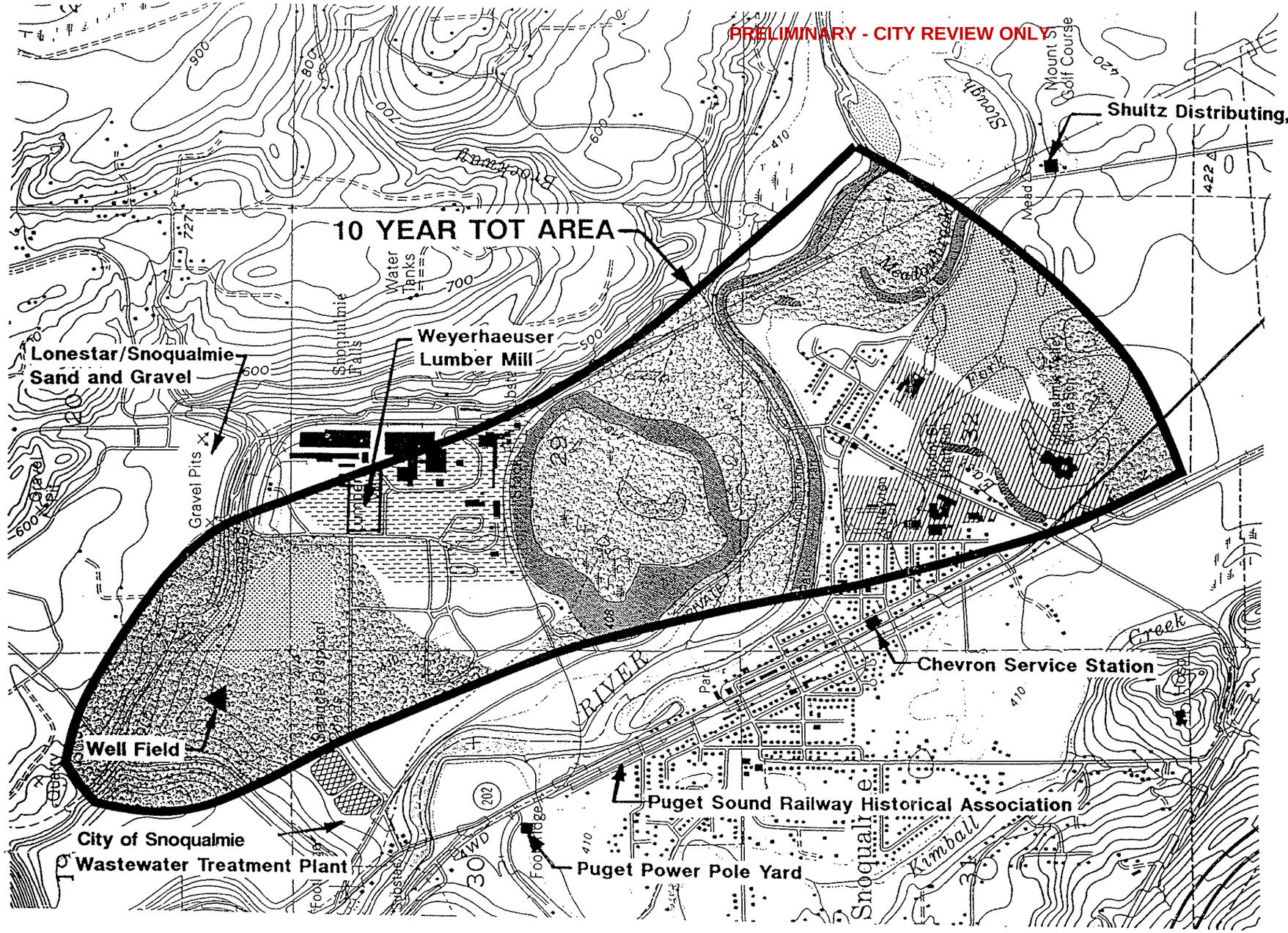
SCALE IN FEET

FIGURE 6
CFR vs. MODFLOW TIME OF TRAVEL COMPARISON MAP

SNOQUALMIE NORTH WELL FIELD
WELLHEAD PROTECTION
KING COUNTY, WASHINGTON
PROJECT NO. W96078C
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NORTH

1000 0 1000 2000 3000 FEET

Water

Wetland/Forest/Undeveloped

Agriculture/Golf Course

School

Gravel Mining/Lumber Mill

Light Commercial/Residential/Unknown

POTENTIAL CONTAMINATION SOURCES

FIGURE 7

SNOQUALMIE NORTH WELL FIELD
WELLHEAD PROTECTION
KING COUNTY, WASHINGTON
PROJECT NO. W96078C
APRIL 1996

EARTH TECH
10800 N.E. 8th Street, 7th Floor
Bellevue, WA 98004
206 455-9494 Fax 206 453-9470
Civil / Environmental Engineers

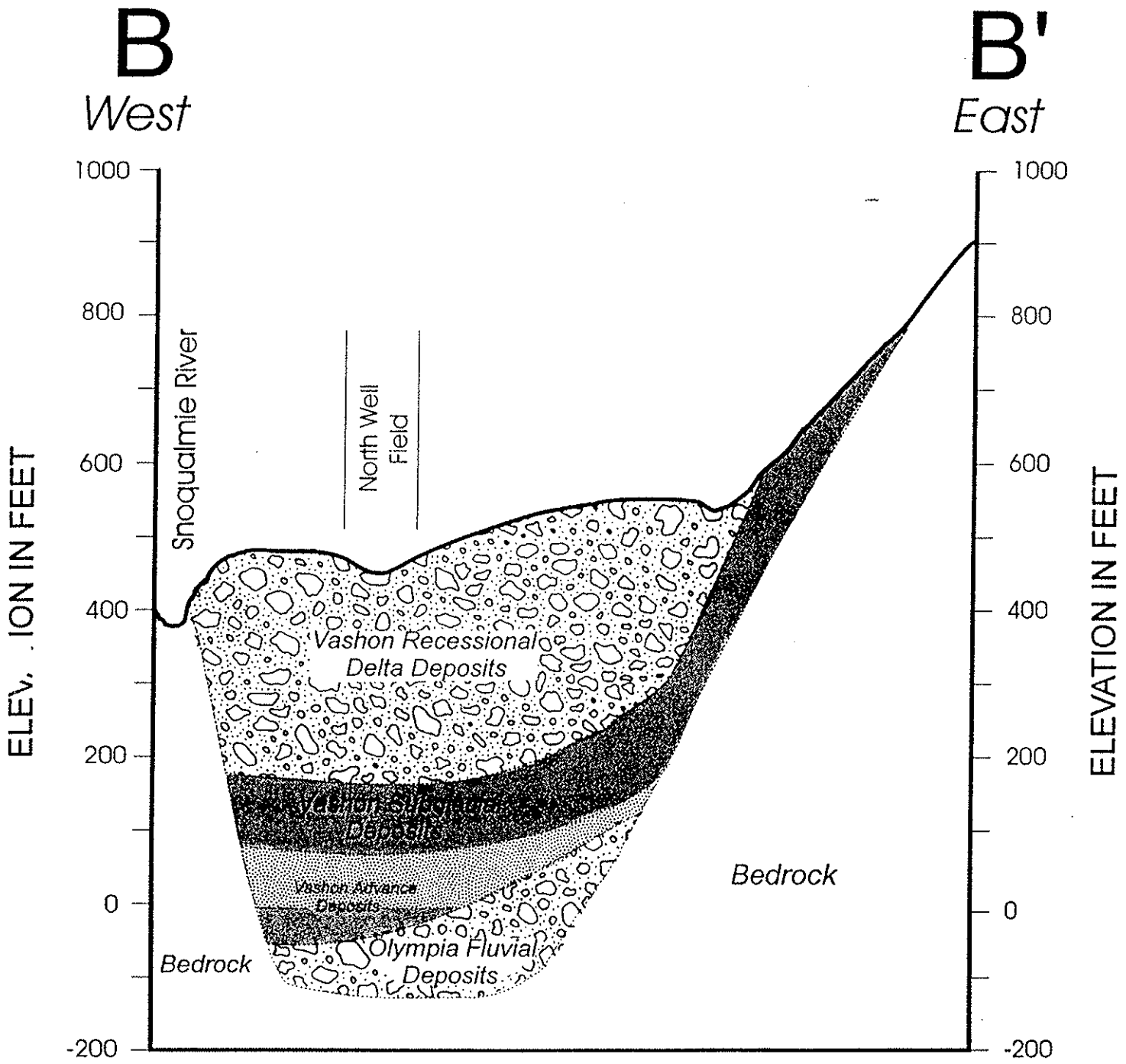


FIGURE 4

Schematic Geologic Cross Section
North Well Field
Snoqualmie, Washington

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APPENDIX A

Water Quality Test Results

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AMTEST

AmTest Inc.

Professional
Analytical
Services

14603 N.E. 87th St.
Redmond, WA
98052

Fax: 206 883 3495

Tel: 206 885 1664

ORATORY NUMBER:
6611233

E RECEIVED:
16/94

ATE COLLECTED:
6/15/94

YSTEM NAME:
93199G Snoq N W1 Fld TW6

YSTEM ID #: 4.GROUP
A

OUNTY:
ing

OURCE TYPE:
ell

AMPLE TAKEN:

OURCE NO.: 9.SOURCE NAME:

OLLECTED BY:
Curtis Koger

EPHONE:

IF TAKEN AFTER TREATMENT,

IF TAKEN FROM DISTRIBUTION,

PARTY TO PAY FOR TESTING:
S: Associated Earth Sciences
RESS: 911 5th Ave
Suite 100
Kirkland, WA 98033
EPHONE: 827-7701

TESTS		MCL	LESS THAN <	RESULTS	UNITS	COMPLIANCE	CHEMIST INITIALS
Antimony	Sb	0.006			mg/l		
Arsenic	As	0.05		0.010	mg/l	YES	VG
Barium	Ba	2.0	<	0.1	mg/l	YES	LH
Beryllium	Be	0.004			mg/l		
Cadmium	Cd	0.005	<	0.002	mg/l	YES	LH
Chromium	Cr	0.1	<	0.01	mg/l	YES	LH
Copper	Cu	1.0	<	0.02	mg/l	YES	LH
Iron	Fe	0.3		0.12	mg/l	YES	LH
Lead	Pb	0.05	<	0.002	mg/l	YES	VG
Manganese	Mn	0.05		0.12	mg/l	NO	LH
Mercury	Hg	0.002	<	0.0005	mg/l	YES	VG
Nickel	Ni	0.1			mg/l		
Selenium	Se	0.05	<	0.005	mg/l	YES	VG
Silver	Ag	0.1	<	0.01	mg/l	YES	LH
Sodium	Na			18.	mg/l		LH
Thallium	Tl	0.002			mg/l		
Zinc	Zn	5.0	<	0.05	mg/l	YES	LH
Hardness	As CaCO3			85.	mg/l		
Conductivity		700		250	umhos/cm	YES	PT
Turbidity		1.0		0.26	NTU	YES	PT
Color		15.0	<	5.0	unit	YES	PT
Chloride	Cl	250	<	20	mg/l	YES	JB
Cyanide	CN	0.2			mg/l		
Fluoride	F	2.0	<	0.5	mg/l	YES	JHS
Nitrate	as N	10.0	<	0.5	mg/l	YES	JHS
Nitrite	as N	1.0			mg/l		
Sulfate	SO4	250	<	10	mg/l	YES	VHD
TDS	TDS	500			mg/l		
Aluminum			<	5.0	mg/l		LH
pH				8.0	unit		PT
Gross Alpha			<	5	pCi/l		JB
Gross Beta			<	5	pCi/l		JB

REMARKS:

CHARGE:

LAB SUPERVISOR:
Jeff Buysedt

DATE OF REPORT:
7/12/94

is the Maximum Contaminant Level Allowed.

PRELIMINARY - CITY REVIEW ONLY

AmTest Inc.

Professional
Analytical
Services

14603 N.E. 87th St.
Redmond, WA
98052

Fax: 206 883 3495

Tel: 206 885 1664

)OI Y NUMBER:
66.1234

:E RECEIVED:
'16/94

)ATE COLLECTED:
6/15/94

:YSTEM NAME:
)93199G Snoq N Wl Fld TW7

:YSTEM ID #: 4.GROUP
A

:OUNTY:
:ing

:OURCE TYPE:
'ell

'AMPLE TAKEN:

:OURCE NO.: 9.SOURCE NAME:

COLLECTED BY:
Curtis Koger

EP' ':

I: .EN AFTER TREATMENT,

IF TAKEN FROM DISTRIBUTION,

PARTY TO PAY FOR TESTING:
E: Associated Earth Sciences
RESS: 911 5th Ave
Suite 100
Kirkland, WA 98033
EPHONE: 827-7701

TESTS		MCL	LESS THAN <	RESULTS	UNITS	COMPLIANCE	CHEMIST INITIALS
Antimony	Sb	0.006			mg/l		
Arsenic	As	0.05		0.011	mg/l	YES	VG
Barium	Ba	2.0	<	0.1	mg/l	YES	LH
Beryllium	Be	0.004			mg/l		
Cadmium	Cd	0.005	<	0.002	mg/l	YES	LH
Chromium	Cr	0.1	<	0.01	mg/l	YES	LH
Copper	Cu	1.0	<	0.02	mg/l	YES	LH
Iron	Fe	0.3		0.16	mg/l	YES	LH
Lead	Pb	0.05	<	0.002	mg/l	YES	VG
Manganese	Mn	0.05		0.17	mg/l	NO	LH
Mercury	Hg	0.002	<	0.0005	mg/l	YES	VG
Nickel	Ni	0.1			mg/l		
Selenium	Se	0.05	<	0.005	mg/l	YES	VG
Silver	Ag	0.1	<	0.01	mg/l	YES	LH
Sodium	Na			18.	mg/l		LH
Thallium	Tl	0.002			mg/l		
Zinc	Zn	5.0	<	0.05	mg/l	YES	LH
Hardness	As CaCO3			110	mg/l		
Conductivity		700		270	umhos/cm	YES	PT
Turbidity		1.0		0.26	NTU	YES	PT
Color		15.0	<	5.0	unit	YES	PT
Chloride	Cl	250	<	20	mg/l	YES	JB
Cyanide	CN	0.2			mg/l		
Fluoride	F	2.0	<	0.5	mg/l	YES	JBS
Nitrate	as N	10.0	<	0.5	mg/l	YES	JBS
Nitrite	as N	1.0			mg/l		
Sulfate	SO4	250	<	10	mg/l	YES	VHD
TDS	TDS	500			mg/l		
Aluminum			<	5.0	mg/l		LH
pH				7.9	unit		PT
Gross Alpha			<	5	pCi/l		JB
Gross Beta			<	5	pCi/l		JB

REMARKS:

CHARGE:

LAB SUPERVISOR

Jeff Buyetedt

DATE OF REPORT:
7/12/94

; is the Maximum Contaminant Level Allowed.

PRELIMINARY - CITY REVIEW ONLY

VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 524.2

Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry

AmTest Inc.
Professional Analytical Services
14603 N.E. 87th St
Redmond, WA 98052
Fax: 206 883 3495
Tel: 206 885 1664

Send Report To:
Customer : Associated Earth Sciences
Address : 911 5th Ave
: Suite 100
City : Kirkland
State ZIP : WA 98033

Bill:

COUNTY : King
SYSTEM NAME : W93199G Snoq N Wl Fld TW6
SYSTEM ID NO. :
DATE COLLECTED : 6/15/94
DATA DATE ANALYZED : 6/17/94
SOURCE NUMBER :
SOURCE TYPE : Well

LABORATORY NO. : 066-11233
DATA FILE :
ANALYST : JW
DATE OF REPORT : 7/12/94
SUPERVISOR'S INITIALS : JB

EPA Code	NAME OF COMPOUND	MCL * ug/L	AMOUNT ug/L	EPA CODE	NAME OF COMPOUND	AMOUNT ug/L
	REGULATED COMPOUNDS				UNREGULATED COMPOUNDS	
2976	VINYL CHLORIDE	2	ND	2210	CHLOROMETHANE	ND
2977	1,1,-DICHLOROETHYLENE	7	ND	2214	BROMOMETHANE	ND
2981	1,1,1-TRICHLOROETHANE	200	ND	2216	CHLOROETHANE	ND
2982	CARBON TETRACHLORIDE	5	ND	2978	1,1-DICHLOROETHANE	ND
2990	BENZENE	5	ND	2416	2,2-DICHLOROPROPANE	ND
2980	1,2-DICHLOROETHANE	5	ND	2410	1,1-DICHLOROPROPENE	ND
2984	TRICHLORETHYLENE	5	ND	2408	DIBROMOMETHANE	ND
2969	P-DICHLOROBENZENE	75	ND	2412	1,3-DICHLOROPROPANE	ND
2979	T-1,2-DICHLOROETHYLENE	100	ND	2986	1,1,1,2-TETRACHLOROETHANE	ND
2380	CIS-1,2-DICHLOROETHYLENE	70	ND	2993	BROMOBENZENE	ND
2983	1,2-DICHLOROPROPANE	5	ND	2414	1,2,3-TRICHLOROPROPANE	ND
2991	TOLUENE	1000	ND	2988	1,1,2,2-TETRACHLOROETHANE	ND
2987	TETRACHLOROETHYLENE	5	ND	2965	O-CHLOROTOLUENE	ND
2989	CHLOROBENZENE	100	ND	2966	P-CHLOROTOLUENE	ND
2992	ETHYL BENZENE	700	ND	2967	M-DICHLOROBENZENE	ND
2995	M/P-XYLENE	10000	ND	2212	DICHLORODIFLUOROMETHANE	ND
2997	O-XYLENE	10000	ND	2218	TRICHLOROFLUOROMETHANE	ND
2996	STYRENE	100	ND	2430	BROMOCHLOROMETHANE	ND
2968	O-DICHLOROBENZENE	600	ND	2994	ISOPROPYLBENZENE	ND
2964	METHYLENE CHLORIDE	5	ND	2998	N-PROPYLBENZENE	ND
2985	1,1,2-TRICHLOROETHANE	5	ND	2424	1,3,5-TRIMETHYLBENZENE	ND
2418	1,2,4-TRIMETHYLBENZENE	70	ND	2426	TERT-BUTYLBENZENE	ND
	TRIHALOMETHANES (THM)			2428	SEC-BUTYLBENZENE	ND
2941	CHLOROFORM		ND	2030	P-ISOPROPYLTOLUENE	ND
2943	BROMODICHLOROMETHANE		ND	2422	N-BUTYLBENZENE	ND
2944	CHLORODIBROMOMETHANE		ND	2378	1,2,4-TRICHLOROBENZENE	ND
2942	BROMOFORM		ND	2248	NAPHTHALENE	ND
				2246	HEXACHLOROBUTADIENE	ND
				2420	1,2,3-TRICHLOROBENZENE	ND
				2228	CIS-1,3-DICHLOROPROPENE	ND
				2224	TRANS-1,3-DICHLOROPROPENE	ND

*MCL : Maximum Contaminant Level

NOTE : An amount of ND ug/L indicates that the true concentration is less than the method detection limit of 0.5 ug/L

Reported by: Jeff Buystedt

PRELIMINARY - CITY REVIEW ONLY

VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 524.2

Measurement of Purgeable Organic Compounds in Water by Capillary Column

Gas Chromatography/Mass Spectrometry

AmTest Inc.

Professional Analytical Services

14603 N.E. 87th St.
Redmond, WA
98052

Fax: 206 883 3495

Tel: 206 885 1664

Send Report To:
Customer : Associated Earth Sciences
Address : 911 5th Ave
: Suite 100
City : Kirkland
State ZIP : WA 98033

Bill:

COUNTY : King
SYSTEM NAME : W93199G Snoq N Wl Fld TW7
SYSTEM ID NO. :
DATE COLLECTED : 6/15/94
DATA DATE ANALYZED : 6/17/94
SOURCE NUMBER :
SOURCE TYPE : Well

LABORATORY NO. : 066-11234
DATA FILE :
ANALYST : JW
DATE OF REPORT : 7/12/94
SUPERVISOR'S INITIALS : JB

EPA Code	NAME OF COMPOUND	MCL * ug/L	AMOUNT ug/L	EPA CODE	NAME OF COMPOUND	AMOUNT ug/L
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2984	TRICHLORETHYLENE	5	ND	2408	DIBROMOMETHANE	ND
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2997	O-XYLENE	10000	ND	2218	TRICHLOROFLUOROMETHANE	ND
2996	STYRENE	100	ND	2430	BROMOCHLOROMETHANE	ND
2968	O-DICHLOROBENZENE	600	ND	2994	ISOPROPYLBENZENE	ND
2964	METHYLENE CHLORIDE	5	ND	2998	N-PROPYLBENZENE	ND
2985	1,1,2-TRICHLOROETHANE	5	ND	2424	1,3,5-TRIMETHYLBENZENE	ND
2418	1,2,4-TRIMETHYLBENZENE	70	ND	2426	TERT-BUTYLBENZENE	ND
	TRIHALOMETHANES (THM)			2428	SEC-BUTYLBENZENE	ND
2941	CHLOROFORM		ND	2030	P-ISOPROPYLTOLUENE	ND
2943	BROMODICHLOROMETHANE		ND	2422	N-BUTYLBENZENE	ND
2944	CHLORODIBROMOMETHANE		ND	2378	1,2,4-TRICHLOROBENZENE	ND
2942	BROMOFORM		ND	2248	NAPHTHALENE	ND
				2246	HEXACHLOROBUTADIENE	ND
				2420	1,2,3-TRICHLOROBENZENE	ND
				2228	CIS-1,3-DICHLOROPROPENE	ND
				2224	TRANS-1,3-DICHLOROPROPENE	ND

*MCL : Maximum Contaminant Level

ND : An amount of ND ug/L indicates that the true concentration is less than the method detection limit of 0.5 ug/L

Reported by: Jeff Buysted

STATE OF WASHINGTON
DEPARTMENT OF HEALTH

WATER BACTERIOLOGICAL ANALYSIS

PRELIMINARY - CITY REVIEW ONLY

SAMPLE COLLECTION: READ INSTRUCTIONS ON BACK OF GOLDENROD COPY
If instructions are not followed, sample will be rejected.

DATE COLLECTED (MONTH / DAY / YEAR)	TIME COLLECTED	COUNTY NAME
5 / 15 / 94	1:00 ☐ AM ☒ PM	King

TYPE OF SYSTEM: ☐ PUBLIC ☐ INDIVIDUAL (Serves only 1 residence)
IF PUBLIC SYSTEM, COMPLETE: I.D. No. _____ CIRCLE GROUP A B

NAME OF SYSTEM: W93199G Snoqualmie North Well Field TW-6

SPECIFIC LOCATION WHERE SAMPLE COLLECTED: Wellhead
TELEPHONE NO. DAY ( ) 827-7701 EVENING ( )

SAMPLE COLLECTED BY: (Name) Curtis Koger
SYSTEM OWNER/MGR.: (Name)

SOURCE TYPE ☐ GROUND WATER UNDER SURFACE INFLUENCE
☐ SURFACE ☒ WELL or WELL FIELD ☐ SPRING ☐ PURCHASED or INTERTIE ☐ COMBINATION or OTHER

SEND REPORT TO: (Print Full Name, Address and Zip Code)
Associated Earth Sciences, Inc
911 5th Ave, Suite 100
Kirkland, WA 98033

TYPE OF SAMPLE (check only one in this column)
☐ ROUTINE DRINKING WATER check treatment → ☐ Chlorinated (Residual: _____ Total _____ Free) ☐ Filtered ☐ Untreated or Other _____
☐ REPEAT SAMPLE Previous coliform presence Lab # _____ Date Collected _____/_____/_____
☐ RAW SOURCE WATER Source # S ☐ NEW CONSTRUCTION or REPAIRS ☐ OTHER (Specify) ☐ Total Coliform ☐ Fecal Coliform

REMARKS:

(LAB USE ONLY) DRINKING WATER RESULTS

☐ UNSATISFACTORY, Coliforms present
REPEAT SAMPLES REQUIRED: ☐ E. Coli present ☐ E. Coli absent ☐ Fecal present ☐ Fecal absent
☒ SATISFACTORY Coliforms absent

OTHER LABORATORY RESULTS

TOTAL COLIFORM _____ / 100ml E. COLI _____ / 100ml
FECAL COLIFORM _____ / 100ml PLATE COUNT _____ / ml

ANOTHER SAMPLE REQUIRED

SAMPLE NOT TESTED BECAUSE: ☐ Sample too old ☐ Wrong container ☐ Incomplete form ☐ _____
TEST UNSUITABLE BECAUSE: ☐ Confluent growth ☐ TNTC ☐ Turbid culture ☐ Excess debris

SEE REVERSE SIDE OF GREEN COPY FOR EXPLANATION OF RESULTS

LAB NO. (7 DIGITS)	DATE, TIME RECEIVED	RECEIVED BY
6606588	6/16/94 8:30	TD

DATE REPORTED 6/20/94 LABORATORY: TD

AM TEST INC.
14603 NE 87th Street
Redmond, WA 98052

6606588

DOH 305-002 (REV 7-92)

CENTER COPY

STATE OF WASHINGTON
DEPARTMENT OF HEALTH

WATER BACTERIOLOGICAL ANALYSIS

RECEIVED JUN 23 1994

SAMPLE COLLECTION: READ INSTRUCTIONS ON BACK OF GOLDENROD COPY
If instructions are not followed, sample will be rejected.

DATE COLLECTED (MONTH / DAY / YEAR)	TIME COLLECTED	COUNTY NAME
6 / 15 / 94	1:00 ☐ AM ☒ PM	King

TYPE OF SYSTEM: ☐ PUBLIC ☐ INDIVIDUAL (Serves only 1 residence)
IF PUBLIC SYSTEM, COMPLETE: I.D. No. _____ CIRCLE GROUP A B

NAME OF SYSTEM: W93199G Snoqualmie North Well Field TW-7

SPECIFIC LOCATION WHERE SAMPLE COLLECTED: Wellhead
TELEPHONE NO. DAY ( ) 827-7701 EVENING ( )

SAMPLE COLLECTED BY: (Name) Curtis Koger
SYSTEM OWNER/MGR.: (Name)

SOURCE TYPE ☐ GROUND WATER UNDER SURFACE INFLUENCE
☐ SURFACE ☒ WELL or WELL FIELD ☐ SPRING ☐ PURCHASED or INTERTIE ☐ COMBINATION or OTHER

SEND REPORT TO: (Print Full Name, Address and Zip Code)
Associated Earth Sciences, Inc
911 5th Ave Suite 100
Kirkland WASHINGTON 98033

TYPE OF SAMPLE (check only one in this column)
☐ ROUTINE DRINKING WATER check treatment → ☐ Chlorinated (Residual: _____ Total _____ Free) ☐ Filtered ☐ Untreated or Other _____
☐ REPEAT SAMPLE Previous coliform presence Lab # _____ Date Collected _____/_____/_____
☐ RAW SOURCE WATER Source # S ☒ NEW CONSTRUCTION or REPAIRS ☐ OTHER (Specify) ☐ Total Coliform ☐ Fecal Coliform

REMARKS:

(LAB USE ONLY) DRINKING WATER RESULTS

☐ UNSATISFACTORY, Coliforms present
REPEAT SAMPLES REQUIRED: ☐ E. Coli present ☐ E. Coli absent ☐ Fecal present ☐ Fecal absent
☒ SATISFACTORY Coliforms absent

OTHER LABORATORY RESULTS

TOTAL COLIFORM _____ / 100ml E. COLI _____ / 100ml
FECAL COLIFORM _____ / 100ml PLATE COUNT _____ / ml

ANOTHER SAMPLE REQUIRED

SAMPLE NOT TESTED BECAUSE: ☐ Sample too old ☐ Wrong container ☐ Incomplete form ☐ _____
TEST UNSUITABLE BECAUSE: ☐ Confluent growth ☐ TNTC ☐ Turbid culture ☐ Excess debris

SEE REVERSE SIDE OF GREEN COPY FOR EXPLANATION OF RESULTS

LAB NO. (7 DIGITS)	DATE, TIME RECEIVED	RECEIVED BY
6606589	6/16/94 8:30	TD

DATE REPORTED 6/20/94 LABORATORY: TD

AM TEST INC.
14603 NE 87th Street
Redmond, WA 98052

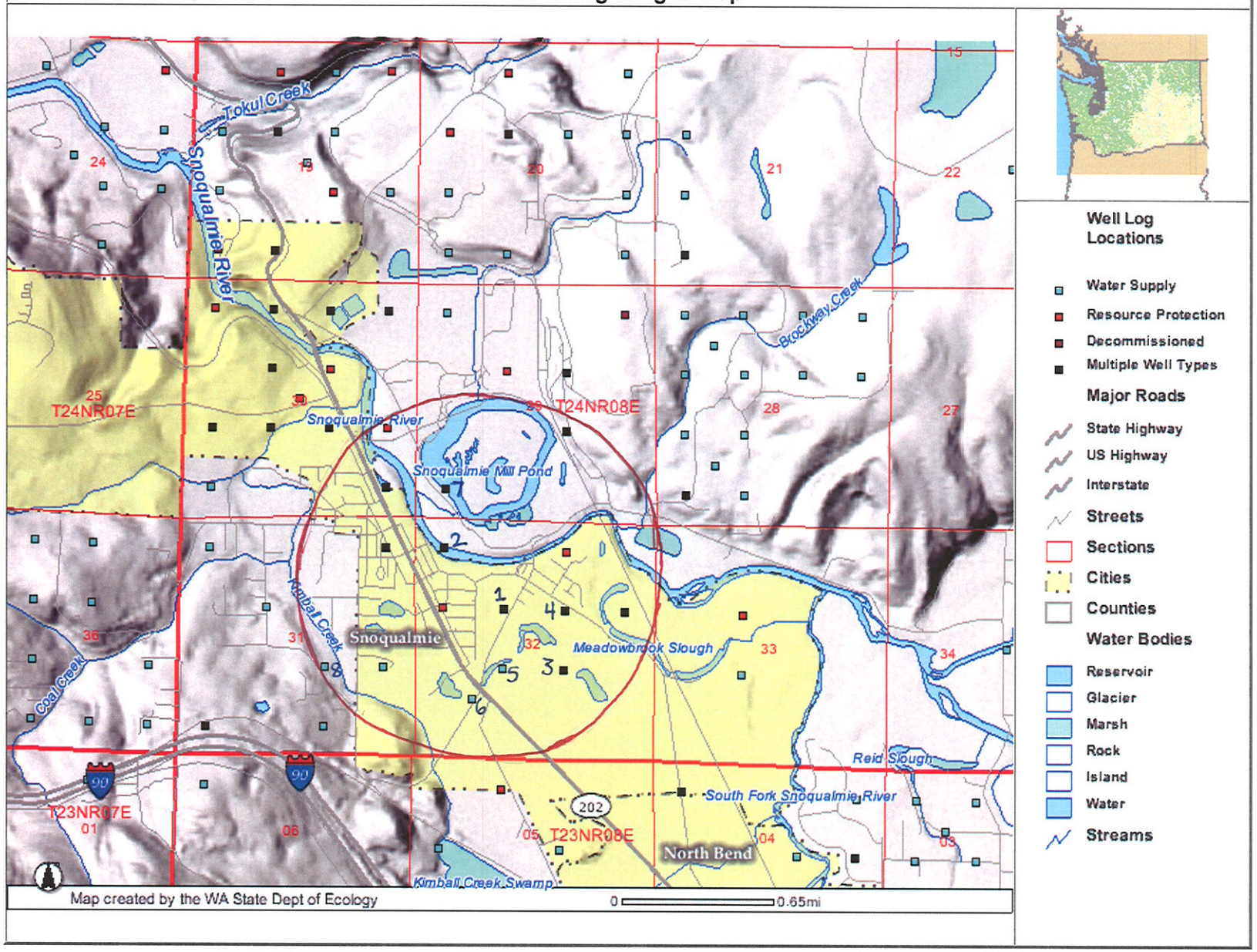
REMARKS
DOH 305-002 (REV 7-92)

6606589

DP CENTER COPY

SOUTH WELLFIELD

Well Log Images Map



PRELIMINARY - CITY REVIEW ONLY

PRELIMINARY - CITY REVIEW ONLY

City of Snoqualmie
Water System Plan
Wellhead Protection - Wells within South Wellfield Wellhead Protection Areas

1 CITY OF SNOQUALMIE
Public Land Survey: SE, NW, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: SE PARK ST AND SCHUSMAN AVE SE, SNOQUALMIE
Well Log ID: 428268, Well Tag ID: APM025, Notice of Intent Number: W166295
Well Diameter: 12 (inches), Well Depth: 557 (feet)
Well Type: Water, Well Completion Date: 5/6/2005
Well Log Received Date: 7/28/2005

2 TOWN PUMP GAS STATION
Public Land Survey: NW, NW, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: 122 RAIL RD, SNOQUALMIE
Well Log ID: 107972, Well Tag ID: (blank) , Notice of Intent Number: 018303
Well Diameter: 2 (inches), Well Depth: 20 (feet)
Well Type: Water, Well Completion Date: 9/23/1994
Well Log Received Date: 10/19/1994

3 Mt SI High School Snoqualmie Valley
Public Land Survey: NW, SE, S-32, T-24-N, R-08-E, Tax Parcel Number: 3224089082
County: KING, Well Address: 225 Meadowbrook Way SE, Snoqualmie Valley 98065
Well Log ID: 675102, Well Tag ID: BAL870, Notice of Intent Number: WE12060
Well Diameter: 12 (inches), Well Depth: 597.1 (feet)
Well Type: Water, Well Completion Date: 2/7/2010
Well Log Received Date: 9/24/2010

4 SNOQUALAMIE
Public Land Survey: SW, NE, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 107344, Well Tag ID: (blank) , Notice of Intent Number: 219101
Well Diameter: (blank) , Well Depth: 10 (feet)
Well Type: Water, Well Completion Date: 3/11/1993
Well Log Received Date: (blank)

WASH. STATE D.O.T.
Public Land Survey: SW, NE, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 108469, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: (blank) , Well Depth: 15 (feet)
Well Type: Water, Well Completion Date: 9/18/1992
Well Log Received Date: (blank)

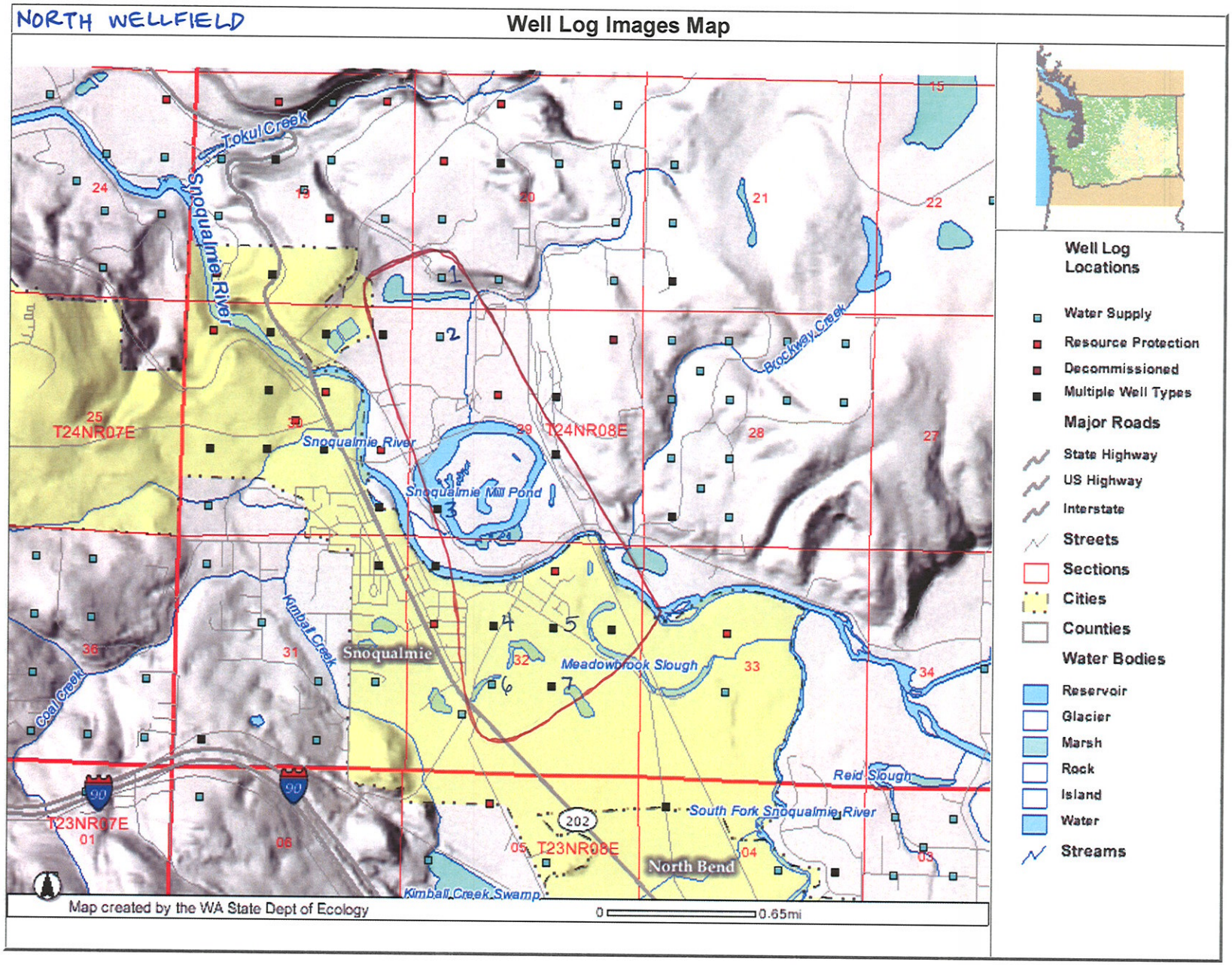
5 JOSH & CHRISTY SMART
Public Land Survey: NE, SW, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 286271, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 6 (inches), Well Depth: 31 (feet)
Well Type: Water, Well Completion Date: (blank)
Well Log Received Date: (blank)

City of Snoqualmie
Water System Plan
Wellhead Protection - Wells within South Wellfield Wellhead Protection Areas

6 A. W. PRETT, INC.
Public Land Survey: (blank), SW, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 285755, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 10 (inches), Well Depth: 37 (feet)
Well Type: Water, Well Completion Date: (blank)
Well Log Received Date: (blank)

7 SNAQUALMIE RIDGE ASSOCIATION
Public Land Survey: SW, SW, S-29, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 97732, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 6 (inches), Well Depth: 541 (feet)
Well Type: Water, Well Completion Date: 5/4/1987
Well Log Received Date: (blank)

8 JAMES WALKER
Public Land Survey: NW, SE, S-31, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 92844, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 5 (inches), Well Depth: 377 (feet)
Well Type: Water, Well Completion Date: 6/18/1981
Well Log Received Date: (blank)



PRELIMINARY - CITY REVIEW ONLY

PRELIMINARY - CITY REVIEW ONLY

City of Snoqualmie
Water System Plan
Wellhead Protection - Wells within North Wellfield Wellhead Protection Areas

1 STEVE PARSONS
Public Land Survey: SW, SW, S-20, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: 5820 390TH AVE SE, SNOQUALMIE
Well Log ID: 97934, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 6 (inches), Well Depth: 265 (feet)
Well Type: Water, Well Completion Date: 1/16/1992
Well Log Received Date: 2/6/1992

2 SNAQUALMIE SAND & GRAVEL
Public Land Survey: NW, NW, S-29, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 97733, Well Tag ID: (blank) , Notice of Intent Number: 017423
Well Diameter: 8 (inches), Well Depth: 354 (feet)
Well Type: Water, Well Completion Date: 4/7/1988
Well Log Received Date: 5/5/1988

3 SNOQUALMIE RIDGE ASSOCIATION
Public Land Survey: SW, SW, S-29, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 97732, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 6 (inches), Well Depth: 541 (feet)
Well Type: Water, Well Completion Date: 5/4/1987
Well Log Received Date: (blank)

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5 SNOQUALAMIE
Public Land Survey: SW, NE, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 107344, Well Tag ID: (blank) , Notice of Intent Number: 219101
Well Diameter: (blank) , Well Depth: 10 (feet)
Well Type: Water, Well Completion Date: 3/11/1993
Well Log Received Date: (blank)

WASH. STATE D.O.T.
Public Land Survey: SW, NE, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 108469, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: (blank) , Well Depth: 15 (feet)
Well Type: Water, Well Completion Date: 9/18/1992
Well Log Received Date: (blank)

City of Snoqualmie
Water System Plan
Wellhead Protection - Wells within North Wellfield Wellhead Protection Areas

6 JOSH & CHRISTY SMART
Public Land Survey: NE, SW, S-32, T-24-N, R-08-E, Tax Parcel Number: (blank)
County: KING, Well Address: (blank)
Well Log ID: 286271, Well Tag ID: (blank) , Notice of Intent Number: (blank)
Well Diameter: 6 (inches), Well Depth: 31 (feet)
Well Type: Water, Well Completion Date: (blank)
Well Log Received Date: (blank)

7 Mt SI High School Snoqualmie Valley
Public Land Survey: NW, SE, S-32, T-24-N, R-08-E, Tax Parcel Number: 3224089082
County: KING, Well Address: 225 Meadowbrook Way SE, Snoqualmie Valley 98065
Well Log ID: 675102, Well Tag ID: BAL870, Notice of Intent Number: WE12060
Well Diameter: 12 (inches), Well Depth: 597.1 (feet)
Well Type: Water, Well Completion Date: 2/7/2010
Well Log Received Date: 9/24/2010

Appendix L

Consumer Confidence Report

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PRELIMINARY - CITY REVIEW ONLY

Annual Water Quality Report for the Year 2019

CITY OF SNOQUALMIE

cityofsnoqualmie.org

Published May 2020

Our Commitment to You: Safe, Reliable Drinking Water

We are pleased to provide you with the City of Snoqualmie's Annual Water Quality Report for 2019, which is updated for you each year by the City's Public Works Department. Delivering quality water to you is our top priority.

This report includes details about where your water comes from, its composition, and how it meets Environmental Protection Agency and Washington State Department of Health standards. We encourage you to become informed about your drinking water to help us safeguard quality water supplies now and for future generations. This report is sent to you as required by the Federal Safe Drinking Water Act.

The City of Snoqualmie Has Three Sources of Drinking Water.

- **Canyon Springs** is located above the North Fork of the Snoqualmie River. This high-quality spring source has served the City of Snoqualmie since 1953. In 2008, the City constructed a disinfection facility to treat the water with chlorine to meet Washington State Department of Health standards. No filtration is required. No fluoride is added.

- **North Wellfield** (Wells No. 6, 7 and 8) is located near Tokul Road and was developed for the City by the Snoqualmie Ridge Phase I developers. The well water is filtered and treated with chlorine. No fluoride is added.

- **South Wellfield** (Wells No. 1 and 2) is located in downtown Snoqualmie and was developed for the City by the Snoqualmie Ridge Phase II developers. The well water is filtered and treated with chlorine. No fluoride is added.

  The water from Canyon Springs flows from the North Fork Road into Snoqualmie where it is combined with water from the South Wellfield. The mixed water flows through downtown Snoqualmie to a booster station where it is pumped into mains with the North Wellfield source that serves Snoqualmie Ridge. In the event of an emergency, flows from Snoqualmie Ridge and North Wellfield can be reversed to supply water to downtown.

Who Ensures the Water Quality in Snoqualmie?

- The U.S. Environmental Protection Agency (EPA) sets national standards for more than 100 potential drinking water contaminants under the Safe Drinking Water Act (SDWA).
- The Washington State Department of Health enforces these standards.
- State certified laboratories test the water according to these standards.
- The results are routinely reported to the Department of Health and are available to all customers.

City of Snoqualmie Water Division: Please Call Us Anytime!

As you read this report, if you have any questions or would like more information about your water utility or drinking water, please call Dustin Possert at 425-831-4919 ext. 1147 or email dpossert@ci.snoqualmie.wa.us.

PRELIMINARY - CITY REVIEW ONLY

Water Quality Monitoring Results for the Year 2019

Your water is tested for more than 100 contaminants/compounds. The table below lists the few compounds detected in 2019, along with their concentrations and possible sources. Some of the data – though representative of the water quality – is more than one year old. The state requires the City of Snoqualmie to monitor for certain contaminants less than once per year because the concentrations for these contaminants are not expected to vary significantly from year to year. The presence of these contaminants/compounds in the water does not necessarily indicate that the water poses a health risk. Detected concentrations are listed by water source.

This Is What Is In Your Tap Water:	Amount Allowed	Ideal Level (or less)	Historic Snoqualmie Source	Meets USEPA Standards	Snoqualmie Ridge Source	Meets USEPA Standards	Typical Sources of Detected Compounds
DETECTED COMPOUNDS Testing conducted in 2019	(MCL)	(MCLG)	Canyon Springs /South Wellfield	Compliance	North Wellfield	Compliance	How did it get there?
INORGANIC AND ORGANIC CONTAMINANTS							
Nitrate-N	10.	10.	CS .43 mg/L	Yes	Not Tested	Yes	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Inorganic Chemicals	0.0005 — 0.5 mg/L	0.0005 — 0.5 mg/L	Not Tested	Yes	Not Tested	Yes	Natural occurring inorganic chemicals from water source
MICROBIOLOGICAL CONTAMINANTS (Distribution Samples)							
Total Coli form	MCL: presence of coli form bacteria in ≥5% of monthly samples	0	0 out of 60 samples	Yes	0 out of 120 samples	Yes	Coli forms are bacteria which are naturally present in the environment and are used as an indicator that other, potentially-harmful bacteria may be present.
Turbidity, NTU	1.0	0	Not Tested	Yes	Not Tested	Yes	Soil runoff

RADIONUCLIDES	Lab MDA	Results	Canyon Springs* /South Wellfield	Compliance	North Wellfield**	Compliance	How did it get there?
Radium 228	0.7	Non-detectable	CS - Not Tested SW - Not Tested	Yes	Not Tested	Yes	Radionuclide is both natural and manmade radioactive material.

* See page 1 for description of Canyon Springs.

** See page 1 for description of the North Wellfield.

Definitions

Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow. More info at www.doh.wa.gov/ehp/dw.

EPA: Environmental Protection Agency

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants, such as chlorine, chloramines, and chlorine dioxide.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

mg/L (milligrams per Liter): Equivalent to ppm (parts per million)

NTU (Nephelometric Turbidity Unit): A measure of the clarity of water.

ppb (parts per billion): same as µg/L (micrograms per liter)

Turbidity: A measure of the cloudiness of the water. It is monitored because it is a good indicator of the effectiveness of the city's filtration system for Wells 6 and 7 only.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

USEPA: United States Environmental Protection Agency

PRELIMINARY - CITY REVIEW ONLY

Why Are There Contaminants in My Water?

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects may be obtained by calling the EPA's Safe Drinking Water Hotline at 1-800-426-4791 or on the EPA website at www.epa.gov.

To ensure that tap water is safe to drink, the EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Contaminants that may be present in source water before it is treated include:
Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
Organic chemical contaminants including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
Pesticides and herbicides, which may come from a variety of sources such as agricultural and residential uses.
Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
Radioactive contaminants, which are naturally occurring.
Nitrate: Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. The nitrate level in the City of Snoqualmie's water is well below the "Action Level". However, if you are caring for an infant, you should ask for more information from your health care provider.
Arsenic: Arsenic in drinking water from Canyon Springs has been reported at less than .002 ppb. The North Wellfield source is currently ranging between 0.002 ppb and 0.006 ppb. This means that your drinking water meets EPA drinking water standards for arsenic. The EPA believes that consumers should be aware of the uncertain health risks presented by very low levels of arsenic. EPA standards balance the current understanding of arsenic's health effects against the costs of removing arsenic from drinking water.

Is My Home Tap Water Monitored for Lead and Copper?

The EPA requires monitoring for the presence of lead and copper with the goal to minimize human exposure to lead and copper in drinking water. Neither lead nor copper has been detected in Snoqualmie's water sources. However, our water is naturally corrosive and may cause lead and/or copper present in your home plumbing to leach into your drinking water. Homes built with copper plumbing and lead solder before 1985 (at which time lead solder was banned) are considered "high risk." Brass fixtures, regardless of age, generally contain some lead also. The City's monitoring protocol includes sampling for lead and copper during both the first and second half of each year. According to the Department of Health, the last two sets of lead and copper testing results in Snoqualmie, collected in two consecutive six month periods, had 90th percentile values below the action levels. Based on the testing results, the water system is considered optimal.

Infants and children who drink water containing lead in excess of the action levels could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure. High risk homes can easily reduce their lead levels by letting their water run for a few seconds before using it.

Do I Need to Take Special Precautions?

Maximum Contaminant Levels – or MCLs – are set at very stringent levels. To understand the risk level of possible health effects described for many regulated contaminants, consider that a person would have to drink two liters of water every day for a lifetime at the MCL level to have a one-in-a-million chance of having the described health effect.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune- compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly persons, and infants can be at risk for infections. These people should seek advice about drinking water from their health care providers. Guidelines from the EPA and Centers for Disease Control (CDC) for appropriate means to reduce the risk of infection by cryptosporidium and other microbial contaminants are available by calling the Safe Drinking Water Hotline at 800-426-4791 and on EPA's website www.epa.gov.

PRELIMINARY - CITY REVIEW ONLY

Cross Connection Alert for Annual Backflow Assembly Testing

A connection between your drinking water pipes and a source of contamination is called a cross connection. Examples include irrigation systems; dialysis machines; nearly every hose-end applicator used for fertilizers, pesticides and herbicides; photo developing equipment; and industrial waste uses.

Cross connections are extremely dangerous because they provide opportunities for contaminating fluids to be pulled back into the water system. To help minimize the dangers, please use the following tips:

- Avoid using hose-end spray applicators for landscape chemicals.
- Install a backflow assembly if there is an existing or potential cross-connection.
- Have the backflow assembly tested by a state-certified backflow tester after installation and send a copy to the City of Snoqualmie Public Works Dept., PO Box 987, Snoqualmie, WA 98065.
- Every year, all Snoqualmie water utility customers who have backflow assemblies must have them tested and send a copy of certification to the Public Works Dept.

Please call Dustin Possert at 425-831-4919 ext. 1147 if you have questions about cross connections or testing.

Contacts

Snoqualmie Water Division
425-831-4919

To Report Water Leaks
425-831-4919

EPA – Safe Drinking Water Hotline
800-426-4791; www.epa.gov

Cross Connections Questions
425-831-4919 ext. 1147

Water Utility Billing
425-888-1555

WA State Department of Health
www.doh.wa.gov/ehp/dw

Annual Water Quality Report for the Year 2019

To: City of Snoqualmie Resident
Snoqualmie, WA 98065

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PERMIT NO. 26

cityofsnoqualmie.org
Public Works Department
38624 SE River Street
PO Box 987
Snoqualmie, WA 98065
(425) 831-4919

Appendix M

Hydraulic Model Node Diagram

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PRELIMINARY - CITY REVIEW ONLY

705 Reservoir No. 1
0.03 MG
Overflow Elev: 705'
Height: 24'

705 Reservoir No. 2
0.13 MG
Overflow Elev: 705'
Height: 24'

Well No. 8
(1,250 gpm)

Well No. 6
(550 gpm)

Well No. 7
(550 gpm)

North Wellfield WTP

705 BPS
(2,400 gpm)

1040 BPS
(2,500 gpm)

Canyon Springs
(898 gpm)

South Wellfield and WTP
(Well No. 1-R: 600 gpm)
(Well No. 2: 600 gpm)

1040 Reservoir No. 1
2.1 MG
Overflow Elev: 1,040'
Height: 24'

1040 Reservoir No. 2
1.7 MG
Overflow Elev: 1,040'
Height: 24'

599 Reservoir
0.5 MG
Overflow Elev: 599'
Height: 32'

Walter Walker BPS

384th Avenue SE BPS
(1,600 gpm)

Snoqualmie Point BPS
(300 gpm)

1180 - 1260 BPS
(1180 Zone: 4,748 gpm)
(1260 Zone: 4,445 gpm)

1172 Reservoir
0.4 MG
Overflow Elev: 1,172'
Height: 31'

890 Zone
1040 Zone
890 Zone
800 Zone
705 Zone
1260 Zone
1180 Zone
670 Zone
599 Zone
799 Zone
1172 Zone

Snoqualmie River
Alice Lake
Snoqualmie Falls
Lake Borst
Meadowbrook Slough
North Fork Snoqualmie River
South Fork Snoqualmie River

SNOQUALMIE PKWY
SE 80TH ST
SE 108TH ST
TOKUL RD SE
FALL CITY-SNOQUALMIE RD
PRESTON-FALL CITY RD SE
332ND AVE SE
RAILROAD AVE SE
SE MILLPOND RD
SE WINTERFALL WAY
SE DOWNBROOK WAY
SE PARK ST
REINIG RD
BOALCH AVE SE
BOALCH AVE NW
BENDIGO BLVD N
BENDIGO BLVD S
BALLARAT AVE N
CEDAR FALLS WAY
428TH AVE SE
376TH AVE SE
WINERY RD

Legend

- Nodes
- Canyon Springs
- Well
- Booster Pump Station
- Water Treatment Plant
- Reservoir
- PRV
- City Limits
- Urban Growth Area
- Retail Water Service Area
- Wholesale Water Service Area

Pressure Zones
- 599 Zone
- 670 Zone
- 705 Zone
- 799 Zone
- 800 Zone
- 890 Zone
- 1040 Zone
- 1172 Zone
- 1180 Zone
- 1260 Zone

This map is a graphic representation derived from the City of Snoqualmie Geographic Information System. It was designed and intended for City of Snoqualmie staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this map.

Any reproduction or sale of this map, or portions thereof, is prohibited without express written authorization by the City of Snoqualmie.

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Vicinity Map



Appendix M
Node Diagram
City of Snoqualmie
Water System Plan

COORDINATE SYSTEM: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET
PLOT DATE: JUL 2, 2020
BY: ZSCHREMPP
J:\DATA\SNQ\118-083\GIS\WSP-APP_M_NODE_DIAGRAM.MXD

CITY OF SNOQUALMIE

1 inch = 1,500 feet
0 750 1,500 3,000 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

RH2

NORTH

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Appendix N

Water Resolutions and Ordinances

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PRELIMINARY - CITY REVIEW ONLY

Chapter 13.12
WATER SERVICE REGULATIONS AND RATES[1]

Sections:

13.12.010 Rates and charges.

13.12.020 Certificate of water availability.

13.12.025 Temporary connections.

13.12.030 Water service installation permit.

13.12.035 Connection charges.

13.12.036 Service installation charges.

13.12.037 Direct facilities charges.

13.12.038 Water general facilities charges.

13.12.039 Latecomer agreements.

13.12.040 Utility payment – Due date – Delinquency – Shutoff for nonpayment – Lien.

13.12.050 Restrictions on the use of water.

13.12.060 Fire hydrants, standpipes.

13.12.070 Responsibility for maintenance.

13.12.080 Trailers and mobile homes.

13.12.090 Resale of water.

13.12.100 Additional fire protection.

13.12.110 *Repealed.*

13.12.400 Legislative findings – Computer-controlled irrigation systems.

13.12.410 Municipal irrigation system – Customers classified.

13.12.420 Eligibility for connection to municipal irrigation system.

13.12.430 Responsibility of bulk customers.

13.12.440 Responsibility of retail customers.

13.12.450 Suspension or termination of service.

PRELIMINARY - CITY REVIEW ONLY

13.12.460 Priority of source of supply of irrigation water.

13.12.470 Connection charges.

13.12.480 *Repealed.*

13.12.900 Violations.

13.12.010 Rates and charges.

The following rates and charges for all water are hereby imposed:

A. Each ratepayer shall pay for water service based on the applicable meter size. Rates for water service shall consist of a monthly base service charge based on rate classification, plus a volume charge also based on rate class.

B. Residential. This customer class includes each separately metered single-family residence, trailer or mobile home in a trailer court or mobile home park, and each separately metered residential unit in a townhome or duplex.

1. The base (minimum) service, according to meter size and location within or without the corporate limits of the city, for all residential water classifications, other than Class A reclaimed water, shall be as follows:

Base charge (Meter Size)	2017	2018	2019	2020
3/4"	$29.68	$31.17	$32.73	$34.36
1"	$37.26	$39.13	$41.08	$43.14
1-1/2"	$61.76	$64.85	$68.09	$71.50
2"	$103.06	$108.21	$113.62	$119.30
3"	$154.74	$162.48	$170.60	$179.13
4"	$206.29	$216.61	$227.44	$238.81
6"	$309.24	$324.70	$340.93	$357.98
8"	$412.36	$432.97	$454.62	$477.35

2. The following residential volume consumption rates are imposed for each 100 cubic feet (ccf) of usage for all water other than Class A reclaimed water according to location within or outside the corporate limits of the city:

Consumption Rate *(per 100 cubic feet)*	2017	2018	2019	2020
0 – 300 ccf	$1.95	$2.05	$2.15	$2.26
301 – 800 ccf	$3.29	$3.45	$3.62	$3.80

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Consumption Rate *(per 100 cubic feet)*	2017	2018	2019	2020
Over 801 ccf	$4.11	$4.31	$4.53	$4.75

3. Rates for outside city residential customers shall be one and one-half times the inside the city rates for the base charge and the consumption rates.

C. Multifamily. This customer class includes apartment, condominium, multiplex, and duplex structures that are served by a single, master water meter rather than individual unit meters.

1. The base (minimum) service for each multifamily unit connected to the single master water meter other than Class A reclaimed water shall be as follows:

Base Charge	2017	2018	2019	2020
Per unit	$26.05	$27.35	$28.72	$30.16

2. The following multifamily volume consumption rates are imposed for each 100 cubic feet (ccf) of usage for all water other than Class A reclaimed water according to location within or outside the corporate limits of the city:

Volume Rate	2017	2018	2019	2020
Per 100 ccf	$2.33	$2.45	$2.57	$2.70

3. Rates for outside city multifamily customers shall be one and one-half times the inside the city rates for the base charge and the consumption rates.

D. Commercial Water/Potable Irrigation. This customer class includes without limitation hotels, schools, hospitals, churches, lodges, intermittently used buildings, government uses, potable irrigation, and commercial or industrial uses.

1. The base (minimum) commercial water/potable irrigation service, according to meter size and location within or outside the corporate limits of the city, for all water other than Class A reclaimed water shall be as follows:

Meter Size	2017	2018	2019	2020
3/4"	$35.90	$37.70	$39.58	$41.56
1"	$45.07	$47.32	$49.69	$52.17
1-1/2"	$74.69	$78.42	$82.35	$86.46
2"	$124.61	$130.84	$137.38	$144.25
3"	$187.10	$196.46	$206.28	$216.59
4"	$249.44	$261.91	$275.01	$288.76
6"	$373.92	$392.62	$412.25	$432.86

PRELIMINARY - CITY REVIEW ONLY

Meter Size	2017	2018	2019	2020
8"	$498.59	$523.52	$549.70	$577.18

2. The following commercial water/irrigation volume rates are imposed for each 100 cubic feet of usage for all water other than Class A reclaimed water according to location within or without the corporate limits of the city:

Volume charge	2017	2018	2019	2020
Per 100 ccf	$3.01	$3.16	$3.32	$3.49

E. Rates for outside city commercial/irrigation customers shall be one and one-half times the inside the city rates for the base charge and the consumption rates.

F. Whenever two or more rate classifications are serviced by one meter, the highest of the utility rates are imposed on the customer.

G. In computing the applicable water consumption charge for all customer classes, once the threshold is exceeded for each block, the next block's rate shall be used.

H. In the event a customer is not connected to a meter service, or a meter has broken, become out-of-order or failed to accurately meter actual water usage, the customer shall be charged the base or minimum charge, together with an estimated charge for the water used at the premises, based upon the average usage for the corresponding month of the preceding year, averaged over a three-month period including the preceding and following month. In the event there is no prior history for the preceding year, the charge shall be based upon the average water usage for the month for all customers of the municipal water supply system in the same service class.

I. A "low income residential customer" means an individual:

1. Who owns or rents and resides in the residence where the discounted rate(s) are being requested;

2. Whose residence has a separate water meter;

3. Whose total household annual income meets the U.S. Department of Housing and Urban Development income limits for very low income in King County, Washington. Total household annual income shall include that of a spouse or any co-resident(s), where "annual income" is defined as adjusted gross income as indicated in the most recent federal income tax return. In the absence of a federal income tax return, the director of administrative services may consider other documentation of household annual income;

4. Who is not nor is any other adult member of the household claimed as a dependent on another federal income tax return; and

PRELIMINARY - CITY REVIEW ONLY

5. Who is named customer on the city's utility bill or can prove that he or she is the named tenant in a lease or rental agreement for that residence.

J. The director of administrative services shall create an application form and a renewal form for customers requesting a low income residential customer discount provided by subsection K of this section.

1. Applications shall be available at City Hall or mailed to any city customer upon request.

2. The low income residential customer seeking the discount must complete an application renewal form annually.

3. A notice of renewal of application will be mailed annually by the city to low income residential customers then receiving the low income discount. The completed renewal application form and required attachments must be returned to the city within 30 days or the discount will no longer apply.

4. Discounts will commence on the next subsequent billing date following application.

5. A low income residential customer who applied for and received the discount in the prior year, and whose low income residential customer discount was discontinued as a result of the customer's failure to submit the renewal form within the required 30 days, may request a one-time-only retroactive application of the low income discount for not more than two billing cycles or two months.

6. A low income residential customer is not eligible for the discount if his or her annual water consumption is in excess of 100 ccf (hundred cubic feet) per year on a calendar year basis. Applicant may appeal the criteria to the director of administrative services and must provide a convincing justification for the excess usage.

K. The water bill (including base and volume charges) of a customer whose application is determined by the director of administrative services to meet the criteria of subsections I and J of this section will be discounted by 30 percent.

L. The rate for retail customers of the municipal irrigation system for Class A reclaimed water shall be the base rate plus the volume rate specified below.

1. The base rate shall be based upon allocation of the existing total base among the current 755 Class A reclaimed water zones in the city's computer-controlled irrigation system as follows:

Customer	Zones	2017	2018	2019	2020
Per Zone Cost		*$6.92*	*$7.27*	*$7.63*	*$8.01*
City of Snoqualmie	358	$2,474.00	$2,597.00	$2,727.00	$2,864.00
Residential Owners Association	239	$1,652.00	$1,734.00	$1,821.00	$1,912.00
Business Park Owners Association	122	$843.00	$885.00	$930.00	$976.00

PRELIMINARY - CITY REVIEW ONLY

Customer	Zones	2017	2018	2019	2020
Snoqualmie Ridge Joint Committee	16	$110.00	$116.00	$122.00	$128.00
Venture Corporation	16	$110.00	$116.00	$122.00	$128.00
Bandera Murray/Franklin	4	$27.00	$29.00	$30.00	$32.00
TOTAL	755	$5,216.00	$5,477.00	$5,751.00	$6,039.00

2. There shall be added to the base rate a volume rate per 100 cubic feet as follows:

Rate	2017	2018	2019	2020
Per 100 cubic feet	$2.61	$2.75	$2.88	$3.03

M. Rates for bulk customers shall be based upon the volume of water delivered to the customer's reservoir.

1. In the case of the Eagle Lake Reservoir at the Snoqualmie Ridge Golf Course, which also serves as the reservoir for reclaimed and/or raw water for the municipal distribution system for retail customers, the rate shall be based upon the difference between the amount of water delivered to the reservoir and the amount of water supplied from the municipal pump station at Eagle Lake to retail customers.

2. The rate for bulk customers shall be a volume rate as follows:

Rate	2017	2018	2019	2020
Per 100 cubic feet	$0.77	$0.80	$0.85	$0.89

(Ord. 1187 § 21, 2017).

13.12.020 Certificate of water availability.

A. All residences and business buildings shall be separately metered and connected to the municipal water supply system, and shall have a separate shut-off; provided, there may be a single connection for multiple-dwelling units including, but not limited to, duplexes, triplexes, apartment buildings and trailer courts. A separate connection charge shall be made for each such connection.

B. A "certificate of water availability" shall be applied for prior to issuance of a water service installation permit to determine if water is available. The application shall include the applicant's name, project address, the number of anticipated ERUs, and anticipated water usage.

C. The cost for a certificate of water availability letter is $200.00. In addition, the applicant shall pay one-half of the amount of the water connection charges in effect on the date the certificate issues, for each ERU purchased. Further, the applicant shall sign an agreement committing the owner or applicant to pay any difference between the current water connection

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charges paid at the issuance of the water availability certificate and the water connection charges in effect at the time of issuance of a building permit for the subject property.

D. If the city has water available in sufficient annual and instantaneous quantities to serve the property, and if the city water system is sufficiently sized, constructed and maintained so as to enable delivery of that water to the subject property, the certificate shall be issued by the city and will be valid for six months from the date of issuance, unless the applicant renews the certificate of availability prior to the expiration date. A certificate of water availability may be renewed only once, for an additional six-month period, unless the applicant provides written documentation to the director's satisfaction demonstrating that the applicant has on file with the jurisdiction in which the subject property is located (King County or the city of Snoqualmie) a complete building application or complete application for a subdivision, master site plan, or other binding land use application for the underlying property, and that, through no fault of the applicant, the building permit, subdivision, master site plan or other land use application is not likely to be approved within the certificate of water availability's renewal term, in which case the director may grant one or more additional renewal terms as the director determines in his/her reasonable discretion.

E. Certificates are valid only for the real property referenced on the certificate. Any transfer of assignment of property ownership requires written notification of the city.

F. If a certificate has expired, the applicant will be required to pay all fees for a new certificate of water availability. (Ord. 1187 § 22, 2017).

13.12.025 Temporary connections.

A. Temporary connections may be made to hydrants, blow-offs, or other connections approved by the city engineer or his designee only upon issuance of a permit and payment of a cash deposit in such amounts as may from time to time be established by ordinance. Conditions of use will be set forth on the permit by the city engineer or his designee.

B. Meter assemblies will be provided by the city. No other meter assembly will be allowed unless approved by the city engineer or his designee prior to connection.

C. The city may require the applicant to discontinue use of the connection to city water for any reason and at any time it deems necessary. (Ord. 772 § 1, 1996).

13.12.030 Water service installation permit.

A. A service shall be installed on each separate connection to all water mains of the municipal water supply system, whether such mains are new installations or existing mains, and whether located within or without the corporate limits of the city.

B. At the time when a water service installation permit is applied for the subject property to the building department or the county, the applicant shall pay to the city the connection charge, as set forth in SMC 13.12.035 as applicable.

C. There shall be a $150.00 nonrefundable fee for the application and issuance of the permit by the city; however, if the city does not issue a permit, the connection charges, or any part

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thereof which has been paid, shall be refunded.

D. Any customer failing to permit the installation of a service required by this section shall be disconnected from the municipal water supply system, and shall not be reconnected until a service has been installed, all charges therefor have been paid, and a reconnection charge has been paid.

E. Safe and convenient access to the meter shall be permitted to the public works department at all times. (Ord. 1187 § 23, 2017; Ord. 936 § 2, 2003; Ord. 595 § 1, 1987).

13.12.035 Connection charges.

A. General.

1. The charge for installation of water service shall be the actual cost thereof, including meter, materials and labor. The public works director is hereby authorized to promulgate a uniform schedule of charges for installation of water meters, and to adjust such charges from time to time to ensure that such charges reflect the actual costs of such installation as nearly as may be at all times. The meter is and at all times remains the property of the city.

2. The city shall collect connection charges in order that each connecting property shall bear its equitable share of the cost of the public water system.

3. The connection charges collectible pursuant to this section shall be waived for water connections within the Snoqualmie Ridge 1 and 2 Planning Areas, the Snoqualmie Ridge 1 and 2 Planning Areas as shown on Figure 7.2 of the city's comprehensive plan, Snoqualmie 2032, unless the water service is requested for any of the purposes set forth in subsections (B)(2) through (4) of this section, in which case the applicable connection charges shall not be waived.

B. A new customer is:

1. Any customer requesting a new water service; and/or

2. Any customer adding to the number of units served by an existing water service in the city's service area; and/or

3. Any customer seeking to change customer classification; and/or

4. Any customer seeking a change in the size or number of water meters providing service to the customer's property.

C. Customer Class. Customer classes shall be:

1. Single-family residential, a unit served by a single water meter including manufactured (mobile) homes;

2. Duplex family residential equals one unit each side;

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3. Multifamily residential, more than two units served by one water meter, including apartments, trailer parks and RV parks; and

4. Commercial, including transient residential (e.g., motels and hotels) and schools.

D. Connection charges shall be paid:

1. Before issuing water service permit and a property is allowed to connect to the public water system; and/or

2. At the time of development/redevelopment of the property, if connection charges apply that have not yet been paid, such as charges for new facilities that directly benefit the property.

3. Connection charges that have been paid as a result of prior development activities or through participation in a LID or ULID shall not be reassessed.

4. The utility may enter into contracts with property owners of single-family homes and with the owners of development projects that meet criteria specified by the utility for payment of connection charges over time instead of as a lump sum. Such connection may be paid immediately or shall be paid as follows:

a. One-fourth at the issuance of the permit;

b. The balance in three equal annual installments on the anniversary date of the issuance of the permit;

c. The balance of the connection charge shall bear interest at 12 percent per year, and shall be a lien against the property;

d. In the event the owners fail to pay any installment when due, the entire balance shall become immediately due and payable. A penalty of 10 percent of the remaining balance shall be imposed as an administrative fee and the balance and penalty shall thereafter bear interest at 12 percent per year, and the city attorney may immediately file a lien with the King County auditor and shall, after the lien has been delinquent for four months, file a lien with the King County auditor.

E. Connection charges shall include:

1. Service installation charges as defined in SMC 13.12.036;

2. Direct facilities charges, if applicable as defined in SMC 13.12.037;

3. Water general facilities charges as defined in SMC 13.12.038;

4. Latecomer's agreements, if applicable as defined in SMC 13.12.039. (Ord. 1187 § 24, 2017).

13.12.036 Service installation charges.

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A. For each connection/installation made to the municipal water system, the following service installation charges are imposed:

1. For connections within and outside the corporate limits of the city, which charges shall include all labor and materials, but exclude road crossing, for which the customer shall pay the actual cost incurred:

Service Installation Charge		
Meter Size	Inside City	Outside City
3/4"	$4,296	$4,796
1"	$4,302	$4,802
1-1/2"	$6,764	$7,764
2"	$6,915	$8,015

B. The service installation charge established for two-inch or smaller services shall be inclusive of all materials and labor, including meters and trenching from the water main to the property for a distance not exceeding 15 feet. The service installation charge shall specifically exclude the cost of tunneling under any watercourses of any nature, tunneling under any city, state, county or other rights-of-way, and the cost of permits required by any other government agency therefor, which shall be the sole responsibility of the customer. Such tunneling under watercourses or city, state, county or other rights-of-way shall be performed by a licensed contractor, and the customer shall indemnify the city against any and all loss or liability resulting therefrom.

C. Any customer desiring to make a service connection of three inches or larger shall submit plans therefor prepared by a licensed professional engineer, which shall be subject to approval by the city prior to making such connection. After such connection has been made, the service connection shall be inspected by the city engineer. The customer shall pay all city expenses for engineering services and service and connection installation incurred in regard to such service connections.

D. The customer shall pay the actual cost incurred for meter tests, for which a deposit shall be collected according to meter size:

Meter Size	Charge
3/4"	$50.00
1"	$50.00
1-1/2"	$150.00
2"	$150.00
3"	$150.00
4"	$200.00
6"	$200.00
8"	$200.00

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E. For temporary connections to the municipal system, a permit shall be required, in addition to the applicable water rate, for which the permit fee and deposit shall be as follows, according to meter size:

Meter Size	Permit Fee
1"	$110.00 per month
3"	$170.00 per month

F. For the unauthorized flow of water as recorded on a fire system detector check meter, the charge shall be $0.25 per cubic foot.

G. A property owner desiring the extension of water service to his property may be required to extend or improve the municipal water supply system as a condition thereof, and to execute a developer's agreement regarding the apportionment of the costs thereof and other appropriate conditions, including payment of the city's engineering, legal and other professional consultant fees in reviewing and processing the water service extension. Such developer's agreements may include provisions for recovery of a pro rata share of the initial construction costs of the water service extensions from additional customers desiring to connect to such extensions. (Ord. 1187 § 25, 2017).

13.12.037 Direct facilities charges.

A. The utility shall collect direct facilities charges from property owners that directly benefit from the city water system, except property owners who previously paid their fair share through an LID or ULID.

B. The direct facilities charge is the property owner's equitable share of the established costs of the water system facilities he/she benefits from, regardless of whether those facilities were constructed by the city water utility or a private party. The equitable share shall include interest charges applied from the date of construction acceptance of the facility until the property connects, or for a period not to exceed 10 years, whichever is less, at a rate commensurate with the rate of interest applicable at the time of construction of the facility to which the property owner is seeking to connect but not to exceed 10 percent per year; provided, that the aggregate amount of interest shall not exceed the equitable share of the cost of the facility allocated to such property owner.

C. The facilities' costs shall be allocated to benefitting property owners based on the number of single-family equivalents. The director may, however, make such allocation based on front footage or other reasonably based methodology if the director determines that such alternate basis or methodology better assures equitable sharing of cost by all properties benefitting from the facilities.

D. Administrative Procedures – Adjustment of Charges. The director is authorized to adopt administrative procedures for the purpose of administering the provisions of this section, and to adjust the charges established by subsections A and B of this section from time to time to reflect the actual cost of the facilities for which the charges are made. (Ord. 1187 § 26, 2017).

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13.12.038 Water general facilities charges.

A. The general facilities charge is a charge imposed upon new customers to recover the customer's equitable share of the cost of the system and is used for funding construction of future general facilities.

B. Each new customer shall pay the general facilities charge for the customer class in effect on the date of application for service or change of service as provided herein.

C. Customers with a certificate of water availability, and that are not yet hooked up to the water system, shall pay the general facilities charge prior to hooking up and issuance of a water service installation permit.

D. A water general facilities charge ("GFC") shall be imposed in 2017 on a meter capacity equivalent ("MCE") basis, for each meter installed, using flow factors based on the American Water Works Association Principles of Water Rates, Fees and Charge M1 Manual, as follows:

2017 Water GFCs, by Meter Size		
Meter Size	MCE Factor	GFC Charge
3/4"	1.0	$7,412
1"	1.67	$12,368
1-1/2"	3.33	$24,735
2"	5.33	$39,576
3"	10.00	$74,206
4"	16.67	$123,677
6"	33.33	$247,353

E. Beginning on January 1, 2018, and on January 1st of each year thereafter, the water GFC set forth in subsection D of this section shall be increased based on the changes in the Engineering News-Record construction cost index for the Seattle area as determined in December of the preceding year.

F. Changes to Service.

1. Any customers seeking to increase the size of the water meter or service or to add an additional meter to serve the customer's property shall pay an additional general facility charge in an amount equal to the difference between the general facility charge credit for its currently sized meter previously paid to the city and the city's general facility charge at the time of the customer's initial service or meter application, plus the GFC applicable to the increased or additional water meter or service.

2. Any customer seeking to change customer classification or who does change customer classification shall pay the general facility charge for the new classification in effect on the date application for change is made; provided, that the customer will receive a credit up to the amount of general facility charge previously paid.

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G. The general facilities charge is a charge in addition to the charge for new service connections. The general facilities charge is not a charge or payment in lieu of any utility local improvement district assessment, latecomer fee, main extension cost, or local benefit charge. This charge is imposed in addition to any charge for cost of connection and charges for administration and inspection.

H. Funds received pursuant to the general facilities charge shall be used for capital improvement projects undertaken to construct general facilities, and payment of debt service on capital improvement projects. Funds received from the general facilities charge shall be accounted for in the water capital improvement fund and/or water debt service redemption funds of the city. Interest earned from the investment of such funds shall be used for capital improvements. (Ord. 1187 § 27, 2017).

13.12.039 Latecomer agreements.

A. General. The utility may enter into any contracts authorized by Chapter 35.91 RCW, the Municipal Water and Sewer Facilities Act, including contracts which provide for the reimbursement of property owners constructing public facilities, commonly known as latecomer agreements.

B. Requesting a Latecomer Agreement. A property owner may request a latecomer agreement if the owner constructs a water facility that benefits property in addition to the owner's property and it is not feasible for the owner to include such other property owner in the utility developer extension agreement. The request must be made in writing and unit costs must be provided before the utility accepts the public water facility.

C. Benefitting Properties. The utility shall determine what properties benefit from the public water facility that shall be subject to the latecomer agreement.

D. Method of Cost Allocation. The utility shall determine the method of cost allocation used.

E. Recording. The utility shall record the latecomer agreement with King County against the benefitting properties, at the expense of the property owner requesting the agreement.

F. Cost to Latecomer. As a condition of connection to the public water facility, each latecomer shall pay, at the time of connection, his/her pro rata share of the construction costs of the water facility, which are determined by the utility and specified in the latecomer agreement. Construction costs shall include but are not limited to design, installation, inspection, construction management, interest and the utility's project management costs.

G. Agreement Duration. Duration of latecomer agreements are defined in the agreement.

H. Forwarding Latecomer Payment. While the latecomer agreement is in effect, the utility will collect the latecomer payments and forward them to the property owner who paid for the facility, as specified in the agreement. (Ord. 1187 § 28, 2017).

13.12.040 Utility payment – Due date – Delinquency – Shutoff for nonpayment – Lien.

A. Meters shall be read and water consumption charged on a monthly basis. Meter readings shall be made on as close to the same cycle date as possible allowing for variation up to seven

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days because of holidays, Saturdays and Sundays, and differing lengths of calendar months. Such deviations will not be construed as a change in the normal monthly billing cycle. The city may estimate meter readings for billing purposes when city staff is unable to gain access to the premises during the regularly scheduled read, when the meter has been tampered with or is not functioning properly, or when circumstances such as snow, frost, flooding or other emergencies make reading the meter impossible or unsafe. The city may alter or reroute the meter reading and billing cycle dates when it is in the best interest of the city.

B. The city will bill for water, sewer, and storm water services (utility services) monthly. For ratepayers receiving water and sewer services, or water, storm water and sewer services, or water and storm water services, there shall be a combined bill (utility bill).

C. The city will mail, using the United States Postal Service, a utility bill to the ratepayer's address, or, at the option of the ratepayer, email a notice that the bill is available in electronic format (when available). Ratepayers are responsible for providing the city with a valid address and contact information and notifying the city of any changes in such information. Failure to receive or open a bill does not release the ratepayer from obligation of payment when due.

D. Billing for utility service will commence as of the date the water meter is installed.

E. All charges for utility service during a monthly billing period shall be due and payable upon receipt. The charges for any monthly billing remaining unpaid 15 days after the current billing due date shall be deemed delinquent. For any monthly utility service billing that is delinquent, a finance charge of one and one-half percent per month shall be assessed on the delinquent amount.

F. If any charges for utility service remain delinquent for two monthly billing cycles, and are not paid within 15 days after the second monthly billing, the city shall mail a final notice advising the customer and/or occupants of the premises that water service will be shut off on a date specified in the notice seven days after the date of noticing unless all delinquent amounts are paid within seven days. A charge of $20.00 shall be assessed for the city's costs for preparing such shutoff notice.

G. In the event of a bona fide dispute as to the amount of the total due for the utility bill, the following procedure shall be employed:

1. The customer shall first attempt to resolve the matter with the utility clerk.

2. If the dispute cannot be resolved between the customer and the utility clerk, the customer shall have the opportunity to discuss or take this to the director of administrative services whose decision shall be final.

3. Water shutoff shall be delayed during the period necessary to resolve the dispute only in the event the customer contacts the utility clerk during regular business hours more than 48 hours prior to the scheduled shutoff date and pays such portion of the disputed bill as customer acknowledges to be due. The acceptance of such payment shall not be deemed to have waived the city's right to collect the entire balance finally determined to

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be due, or to impair any right to shut off service if such additional amount is not paid immediately.

4. If the basis of the customer's dispute concerns the accuracy of his water meter, the city shall conduct a test thereof; provided, the customer shall first deposit by money order or check a sum as established by council equivalent to the actual cost of conducting the test. In the event the meter is determined to have been inaccurate so that the customer has been charged for more water than the actual quantity delivered, the customer's deposit shall be refunded and the city shall bear the cost of the test, and shall further refund to the customer for excess charges for a period not exceeding six months. If the meter is determined to be accurate or inaccurate so the customer was charged for less than the actual quantity of water delivered, the customer's deposit shall be applied to the cost of the test.

H. In the event water service is shut off for nonpayment, and the customer has not requested a determination of any disputed amount as set forth in the immediately preceding subsection and complied with the conditions thereof, water service shall not be turned on until all delinquent charges and assessments have been paid, together with the charge for turning off the service.

I. The city shall have a lien upon the premises served for all delinquent and unpaid utility charges and assessments authorized by this chapter. The utilities clerk shall prepare a notice of claim of lien and forward it to the county auditor's office for recording for all accounts remaining delinquent more than four monthly billing cycles. The lien established shall be enforceable in the manner provided by law. The city shall also assess its actual costs of recording and/or releasing liens under this section. (Ord. 1133 § 5, 2014).

13.12.050 Restrictions on the use of water.

The public works department may issue temporary restrictions on the use of water, whenever in its opinion it is necessary to do so as a result of water supplies being less than normal to assure minimum availability of water to all users or to assure water availability for public safety and fire protection. Violation of such restrictions shall subject the person or persons occupying the property on which the violation occurs to a civil penalty of $250.00. (Ord. 880 § 4, 2001; Ord. 595 § 1, 1987).

13.12.060 Fire hydrants, standpipes.

A. Fire hydrants or standpipes shall be installed outside the corporate limits only upon approval of council. As to any such application approved, the cost thereof shall be borne solely by the applicant, including the connection charge provided by SMC 13.12.020. The city may impose an additional monthly charge therefor if deemed advisable.

B. If a hydrant is required to be moved as a result of any action by the owner of the property on which it is located, or which abuts the right-of-way in which the fire hydrant is located, the cost thereof shall be borne solely by the property owner, and a deposit for the estimated amount thereof shall be made before the fire hydrant shall be moved. (Ord. 772 § 2, 1996; Ord. 595 § 1, 1987).

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13.12.070 Responsibility for maintenance.
The city shall be responsible to maintain, within its financial ability to do so, the municipal water supply system and all appurtenances thereto located within the public right-of-way, and from the public right-of-way to the meter connection. Each property owner shall be responsible to maintain all water lines and appurtenances from the meter outlet to the property owner's building or water outlet. (Ord. 595 § 1, 1987).

13.12.080 Trailers and mobile homes.
Trailers and mobile homes shall be connected to the municipal water supply system, paying the same rates applicable to single-family residences, including connection charges, unless located within a trailer park for which a connection charge has previously been paid. (Ord. 595 § 1, 1987).

13.12.090 Resale of water.
Water supplied by the municipal water supply system to its customers is intended to be used by the customer for his domestic or business consumption, and may not be resold or redelivered, except by special license granted by council upon such terms and conditions as it shall deem advisable. (Ord. 595 § 1, 1987).

13.12.100 Additional fire protection.
Customers having separately connected fire protection systems, such as sprinkler systems or auxiliary hydrants located upon their property shall be subject to standby charges. A detector-check meter shall be installed, at the sole expense of the customer, and a special rate shall be established for unauthorized or inappropriate flow of water as recorded on detector-check meters. (Ord. 595 § 1, 1987).

13.12.110 Violations.
Repealed by Ord. 857. (Ord. 772 § 3, 1996; Ord. 595 § 1, 1987).

13.12.400 Legislative findings – Computer-controlled irrigation systems.
The city council finds as follows:

A. Water is a valuable public resource. Conservation of this resource is necessary to meet current and future demand for water both for human populations and for in-stream flows for rivers and streams for fish.

B. The uncontrolled application of water for irrigation of public and private landscaping, including parks, street medians and planter strips, and landscape buffers, may result in the use of quantities in excess of those actually required for the plants, resulting in the waste of a valuable resource.

C. Computer-controlled irrigation systems exist which are capable of applying only the quantity of water required by landscaping taking into account natural precipitation, and applying such water at controlled rates readily taken up by plants. The use of such computer-controlled irrigation systems can conserve significant quantities of water and is in the public interest.

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D. The city owns and operates a wastewater treatment plant which treats wastewater to Class A standards as defined by the State Department of Ecology. Reclaimed water is suitable for land application for irrigation purposes in proximity to human populations. The city owns and operates pipes, pumps and other facilities capable of delivering reclaimed water from the wastewater treatment plant to the streets, parks, business park and neighborhood center of the Snoqualmie Ridge area. The use of reclaimed water for irrigation purposes in preference to the use of other sources is in the public interest.

E. The city owns and operates a well water supply known as the North Valley Well Field that requires treatment for use as potable water. The city further owns pipes and facilities to direct raw (untreated) well water from the North Valley Well Field into the reclaimed water sump. The use of raw water for irrigation purposes in preference to the use of potable water is in the public interest.

F. Potable water should only be used for irrigation purposes when Class A or raw water is not available for such purpose. (Ord. 857 § 2, 2000).

13.12.410 Municipal irrigation system – Customers classified.

There shall be two classes of customers of the municipal irrigation system as follows:

A. Bulk Class. The bulk customer classification is hereby established as customers maintaining a separate irrigation reservoir upon privately owned real property, owning and operating a separate computer-controlled irrigation system, and for whom the city's undertaking is the delivery of irrigation water to the customer's reservoir.

B. Retail Class. The retail customer classification is hereby established as customers, including the city, who receive irrigation water from the city's irrigation water distribution system, including the potable water distribution system when otherwise eligible for connection. Retail customers may include owners' associations or other organizations responsible for designated areas or purposes, who may provide for the irrigation of property separate ownerships when within such association's or organization's area or purpose. (Ord. 857 § 2, 2000).

13.12.420 Eligibility for connection to municipal irrigation system.

A. All connections to the municipal irrigation system shall require the prior approval of the director of public works or his designee.

B. The following requirements shall be met prior to connection to the municipal irrigation system of any retail customer, or prior to the delivery of Class A water to any bulk customer:

1. A water usage study prepared by an approved consultant setting forth the estimated demand for such connection has been reviewed and approved by the director of public works or his designee. The director of public works shall not allow the connection unless satisfied that the estimated demand is within the known capacity of the irrigation system, if to be served from a reclaimed or raw water source, or within the known capacity of the potable water system, if to be served by potable water.

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2. The customer owned portion of the computer controlled irrigation system has been installed, and such system has been tested and demonstrated to be properly communicating with the city owned portion of the system.

3. The customer has acknowledged receipt of a copy of the most recent edition of the Water Reclamation and Reuse Standards as published by the State of Washington Departments of Health and Ecology.

4. The customer has executed a customer service and use area agreement, and such agreement has been approved by the state Department of Ecology, and which agreement shall include among other things adherence to the conditions of the city's NPDES permit for Class A water and adherence to all applicable provisions of the Water Reclamation and Reuse Standards, including but not limited to construction, operation, maintenance and monitoring of Class A distribution facilities not located on any property not owned by or under the direct control of the city. (Ord. 904 § 1, 2002; Ord. 857 § 2, 2000).

13.12.430 Responsibility of bulk customers.

A. Each bulk customer shall be responsible for all costs of the acquisition, installation, maintenance, repair and replacement of his entire system, including but not limited to reservoir, distribution system, sprinkler heads and computerized irrigation controller.

B. Each bulk customer shall permit the city access to real property served upon reasonable prior notice to inspect all components of the privately owned computer-controlled irrigation system, and make available all records relating thereto, to verify proper operation of the system. (Ord. 857 § 2, 2000).

13.12.440 Responsibility of retail customers.

A. Each retail customer shall be responsible for all costs of the acquisition, installation, maintenance, repair and replacement of all irrigation system components located upon privately owned real property, including but not limited to sprinkler heads and piping to the city irrigation water supply main and controller.

B. Each retail customer shall permit the city access to real property served upon reasonable prior notice to inspect all customer-owned components to verify proper operation. (Ord. 857 § 2, 2000).

13.12.450 Suspension or termination of service.

A. The city may suspend service to any customer if it shall appear that the customer has not fulfilled the customer's responsibility hereunder. Such suspension shall continue until the cause thereof has been removed or remedied, as determined by the director of public works or his designee.

B. The city may terminate service to any customer if it shall appear the customer is unable or unwilling to remove or remedy the cause of any suspension under subsection A of this section, or has violated the state Water Reclamation and Reuse Standards. (Ord. 904 § 2, 2002; Ord. 857 § 2, 2000).

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13.12.460 Priority of source of supply of irrigation water.

A. The director of public works or his designee shall only permit the use of potable water in the municipal irrigation system when reclaimed or raw water is not available for such purpose, and shall only permit the use of raw water when reclaimed water is not available for such purpose.

B. For purposes of this section, reclaimed or raw water shall not be deemed “available” if a reclaimed water main is not within public right-of-way adjacent to the property to be served, and the extension of a reclaimed water main thereto would not be in the public interest as determined by the director of public works or his designee. (Ord. 857 § 2, 2000).

13.12.470 Connection charges.

In order to promote water conservation and the use of reclaimed water, there shall be no separate connection charge for connecting to the municipal irrigation system; provided, all connections to the municipal irrigation system shall be made by or under the supervision of the public works department, and prior to use thereof, the customer shall pay all city costs, if any, for materials, labor and set up incurred in making the connection. Such charges shall be at standard city rates for labor and at the actual cost to the city for materials or contracted services. (Ord. 857 § 2, 2000).

13.12.480 Rates and charges.

Repealed by Ord. 1133. (Ord. 1091 § 4, 2012; Ord. 1040 § 4, 2008; Ord. 857 § 2, 2000).

13.12.900 Violations.

A. The following are declared to be unlawful and punishable as misdemeanors subject to a penalty of $1,000 and/or imprisonment for 30 days. Each day of violation shall constitute a separate offense.

1. Making any connection to the municipal water supply system other than under the supervision of the public works department, or without paying the connection charge.

2. Turning on water service after the same has been shut off pursuant to SMC 13.12.040. If water service is turned on after the same has been shut off pursuant to SMC 13.12.040, there shall be a rebuttable presumption that the person in whose name the utility account was established was the person who turned on the water service.

3. Failing to permit access to a meter by the public works department for the purpose of reading, inspecting or maintaining it.

4. Endangering, threatening or intimidating any public works department employee while the employee is attempting to read, inspect or maintain a meter.

5. Making any connection to or otherwise tampering with any fire hydrant, except by permit issued pursuant to SMC 13.12.025.

B. In addition to the criminal sanctions provided, the foregoing violations shall also result in disconnection from the municipal water supply system, and the customer shall not be reconnected until a connection charge has been paid; provided, the customer may petition

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council for a review of the determination of the public works department if disconnected pursuant to this section. (Ord. 1133 § 6, 2014).

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[1]Prior legislation: Ords. 468, 470, 471, 497, 517, 541, 559, 562 and 581.

Chapter 13.13
CROSS-CONNECTIONS

Sections:

13.13.010 Title.

13.13.020 Purpose.

13.13.030 Definitions.

13.13.040 Cross-connection control program authorized.

13.13.050 Adoption by reference.

13.13.060 Compliance required.

13.13.070 Responsibility of consumer.

13.13.080 General requirements for backflow prevention assemblies.

13.13.090 Interlocal cooperation agreements.

13.13.100 Testing and repairs.

13.13.110 Access and compliance inspection.

13.13.120 Survey request.

13.13.130 Consumer's duty to notify upon backflow incident.

13.13.140 Enforcement.

13.13.150 Noncompliance with order and notice declared a civil infraction – Penalty.

13.13.160 Intentional return of used water prohibited.

13.13.170 No special duty created.

13.13.180 Severability.

13.13.010 Title.

This chapter shall be known as the city of Snoqualmie cross-connection control regulation. (Ord. 1055 § 2, 2010).

13.13.020 Purpose.

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The purpose of this chapter is to regulate cross-connections and establish a cross-connection control program to protect the public water system from contamination via cross-connections between the public water system and the consumer's water system. (Ord. 1055 § 2, 2010).

13.13.030 Definitions.

WAC 246-290-010, Definitions, is hereby adopted by reference. In addition to the definitions adopted by reference, the following words shall have the indicated meanings.

A. "Compliance inspection" is an inspection performed by the city's cross-connection control specialist to ensure that the approved backflow preventers commensurate with the degree of hazard have been installed.

B. "Consumer" means any person receiving water from a point of delivery of the public water system, regardless of whether such point of connection is located within or without the corporate limits of the city. For purposes of cross-connection control, "consumer" shall include the owner, tenant or other person in physical possession and control of a premises receiving water from point of delivery of the public water system.

C. "Degree of hazard" means the potential risk to public health depending on the type of contamination that could occur.

D. "Director" means the city's director of public works.

E. "Facility survey" means inspection of the consumer's premises by a cross-connection control specialist or a professional engineer for the purpose of evaluating and identifying potential and/or existing cross-connections, and determining by degree of hazard the required backflow protection necessary to protect the public water supply.

F. "Premises" means any real property to which water is provided, including all structures, occupied spaces, leased or tenant spaces, and any improvements made thereon and/or thereto.

G. "Purveyor" means the city of Snoqualmie, as owner and operator of the public water system.

H. "Test" means a successful test performed by a certified backflow assembly tester that verifies the assembly worked properly at the time of the test. The test is only complete when the city receives an acceptable test report form and any additional information required by the city. (Ord. 1055 § 2, 2010).

13.13.040 Cross-connection control program authorized.

The director and local administrative authority (city building official or other person authorized to administer and enforce the Uniform Plumbing Code) are hereby authorized and directed to jointly develop and administer a written cross-connection control program for the elimination and control of cross-connections. The director and the local administrative authority may each delegate their respective authority to a qualified person. (Ord. 1055 § 2, 2010).

13.13.050 Adoption by reference.

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WAC 246-290-490 is hereby adopted by reference as it now exists or may hereafter be amended from time to time. (Ord. 1055 § 2, 2010).

13.13.060 Compliance required.

A. Water consumers are hereby required to comply with all requirements of the city's cross-connection program and all directives of the director or his delegee regarding cross-connection prevention and/or control.

B. Water consumers are required to comply with the Uniform Plumbing Code as it pertains to cross-connections and to take all measures necessary to prevent the contamination of the consumer's water system or the public water system as directed by the building official.

C. Failure to comply with the requirements of the city's cross-connection control program, the directives of the director, the requirements of the Uniform Plumbing Code as it pertains to cross-connections or the directives of the building official regarding cross-connections may result in a denial of connection to the public water system or a suspension of water service until the failure of compliance has been remedied. (Ord. 1055 § 2, 2010).

13.13.070 Responsibility of consumer.

It shall be the responsibility of each consumer required by the director to provide cross-connection control to provide at his or her sole cost for the installation, testing, repair, maintenance, and proper operation of approved backflow preventers required for the control of cross-connections between his or her premises and the public water system, or within the premises as required by the local administrative authority, as the case may be. (Ord. 1055 § 2, 2010).

13.13.080 General requirements for backflow prevention assemblies.

A. Backflow prevention assemblies shall be of a type, size, and make approved by the city and the Washington State Department of Health (DOH).

B. Cross-connection control shall be in accordance with the recommendations given in the latest editions of "Cross-connection Control Manual Accepted Procedures and Practice" published by the Pacific Northwest Section, American Water Works Association or the Manual of Cross-connection published by the University of Southern California. In any event, the director or his delegee will determine the degree of hazard and protection required. (Ord. 1055 § 2, 2010).

13.13.090 Interlocal cooperation agreements.

Where service connections are located without the corporate limits of the city, the city may enter into an interlocal cooperation agreement pursuant to Chapter 39.34 RCW with the local administrative authority of such other jurisdiction for the administration, inspection and enforcement of cross-connection control, when applicable. (Ord. 1055 § 2, 2010).

13.13.100 Testing and repairs.

All backflow assemblies installed within the water service boundaries served by the city of Snoqualmie water utility shall be tested immediately upon installation and on an annual basis thereafter, and following any retrofit, relocation, reinstallation or backflow incident. Assemblies

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failing a test shall be repaired and retested until the tests pass. The city may require a more frequent testing for connections serving systems or premises that pose a high health cross-connection hazard or for assemblies that repeatedly fail. A Washington State certified backflow assembly tester shall perform the testing. Test results shall be submitted on a form acceptable to the city. (Ord. 1055 § 2, 2010).

13.13.110 Access and compliance inspection.

Authorized employees of the city with proper identification shall have the right, but not the obligation, to inspect the water supply, piping, and plumbing of the premises of any consumer for compliance with the requirements of this chapter. Said employees shall have access on reasonable prior notice and at reasonable hours of the day between 8:00 a.m. and 4:00 p.m., Monday through Friday, for the purpose of such compliance inspections. The inspection or failure to inspect shall not render the city liable for any loss, damage, or injury resulting from any defects in the piping or plumbing. Water service may be terminated or suspended to any premises for the failure to allow a compliance inspection as deemed necessary by the director or his delegee. (Ord. 1055 § 2, 2010).

13.13.120 Survey request.

A. At the time of application for service, if required by the city, the consumer shall submit plumbing plans and/or a cross-connection control survey of the premises by a city approved and Washington Department of Health certified cross-connection control specialist (CCS).

B. The survey shall assess the cross-connection hazards and list the backflow prevention provided within the premises. The results of the survey shall be submitted prior to the city turning on water service to a new customer.

C. For classes of customers other than single-family residential, when required by the city, the consumer shall submit a cross-connection control resurvey of the premises by the persons described above. The city may require the resurvey to be performed upon any change in use of the premises, in response to changes in the plumbing of the premises by the consumer, or periodically (annually or less frequently) where the consumer's plumbing system is complex or subject to frequent changes in water use, as the director or his delegee may determine. (Ord. 1055 § 2, 2010).

13.13.130 Consumer's duty to notify upon backflow incident.

In the event of a backflow incident, where the public water system or the consumer's water system has been or may have been contaminated, the consumer shall notify the cross-connection control specialist immediately. (Ord. 1055 § 2, 2010).

13.13.140 Enforcement.

A. In the event a consumer fails to comply with cross-connection control requirements, the director shall have the authority to issue to the consumer an order and notice requiring compliance with the requirements of this chapter, the city's cross-connection control program, Chapter 246-290 WAC, the Uniform Plumbing Code as it pertains to cross-connection, or the directive of any official responsible for administration thereof. The order and notice shall include:

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1. A description of the specific nature of the violation;

2. The specific corrective action to be taken;

3. The date on which water service will be discontinued unless the violation is corrected;

4. The address, telephone number, and contact person that the consumer may contact if a dispute exists as to the corrective action required;

5. Notice that the city will charge a turn-on and shut-off fee before water service is resumed following shut-off;

6. Notice that failure to comply with the order and notice shall constitute a civil infraction subject to monetary penalties not to exceed $250.00 per violation per day;

7. Notice that the local administrative authority will be notified;

8. Notice that the consumer may, within five business days, request in writing a hearing before the public works committee of the city council; and

9. Notice that service will not be shut off while a hearing is pending unless the consumer's system presents an imminent high hazard risk to the public health.

B. Consumers wishing to dispute requirements for cross-connection control may present documentation from a Washington State certified cross-connection control specialist.

C. A $45.00 administrative fee shall be charged to the consumer's water bill for each order notice issued.

D. Each time water service is turned off for noncompliance with an order, the city's standard charge for water turn-off shall apply. (Ord. 1055 § 2, 2010).

13.13.150 Noncompliance with order and notice declared a civil infraction – Penalty.

A. In addition to any other remedy or sanction available, the failure to comply with a notice and order shall constitute a civil infraction, subject to a monetary penalty of not less than $100.00 nor more than $250.00 for each violation; provided, each day of continued noncompliance, violation or repeated violation shall constitute a separate violation subject to a separate penalty.

B. The notice of infraction shall be issued upon request of the director and prosecuted by the city prosecuting attorney. (Ord. 1055 § 2, 2010).

13.13.160 Intentional return of used water prohibited.

The intentional return of used water, including but not limited to water used for heating, cooling or other purposes within the consumer's water system, to the purveyor's distribution system is prohibited. (Ord. 1055 § 2, 2010).

13.13.170 No special duty created.

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A. It is the purpose of this chapter to provide for the health, welfare and safety of the general public and not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by the terms of this chapter.

B. It is the specific intent of this chapter to place the obligation of complying with its requirements upon the permit applicant and any person owning, operating or controlling any premises, building or structure within the scope of this chapter, that no provision or term used in this chapter is intended to impose any duty whatsoever upon the city or any of its officers, agents or employees for whom the implementation or enforcement of this chapter shall be discretionary and not mandatory.

C. Nothing contained in this chapter is intended to be, nor shall be, construed to create or form the basis for any liability on the part of the city or its officers, agents and employees for any injury or damage resulting from the failure of any premises or building to comply with the provisions of this chapter or by reason or a consequence of any inspection, notice, order, certificate, permission or approval authorized or issued or done in connection with the implementation or enforcement of this chapter or by reason of any action of the city related in any manner to the enforcement of this chapter by its officers, agents or employees. (Ord. 1055 § 2, 2010).

13.13.180 Severability.

The provisions of this chapter are declared to be separate and severable. The invalidity of any clause, sentence, paragraph, subsection, section or portion of this chapter or the invalidity of the application thereof to any person or circumstances shall not affect the validity of the remainder of this chapter or the validity of its application to other persons or circumstances. (Ord. 1055 § 2, 2010).

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Appendix O

Public Notification Notices

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PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

COLIFORM MAJOR MONITORING VIOLATION

We, _____ Water System, I.D. _____, located in _____ County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During the month of _____ we did not monitor or test for coliform bacteria, and therefore cannot be sure of the quality of your drinking water during that time.

At this time:

☐ No action is required by the users.

☐ Our routine coliform sample required for the month of _____ has been collected and was found to show no presence of coliform bacteria.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, contact _____ at ( )_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on ____/____/____

Coliform Major Monitoring Public Notice Certification Form
The purpose of this form (below) is to provide documentation to the department that public notice was distributed. Please check the appropriate box and fill in the date that the notice was distributed:

☐ Notice was mailed to all water customers on ____ / ____/____.

☐ Notice was hand delivered to all water customers on ___ / ___ /___.

☐ Notice was posted (*with department approval*) at:
_____ on ___ / ___ /____.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ _____
Signature of owner or operator Position Date

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

Send copy of completed notification and certification to:

☐ Northwest Drinking Water
Department of Health
20435 72nd Ave S, Suite 200
Kent, WA 98032-2358
Phone: (253) 395-6750
Fax: (253) 395-6760

☐ Southwest Drinking Water
Department of Health
PO Box 47823
Olympia, WA 98504-7823
Phone: (360) 236-3030
Fax: (360) 664-8058

☐ Eastern Drinking Water
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

PRELIMINARY - CITY REVIEW ONLY

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

PUBLIC NOTICE CERTIFICATION FORM NITRATE MCL VIOLATION

Within 10 days of notifying your customers, you are required to send to your Regional Office of Drinking Water this completed form and a copy of each type of notice you distributed (hand-delivered notices, press releases, newspaper articles, etc.). This form certifies that you have met all the public notification requirements. If the chemical contamination remains for more than three months, you must notify your water users again and provide another Public Notice Certification Form to the Department of Health.

With this certification, you are also stating that you will meet future requirements for notifying new billing units of the violation or situation.

Water System: _____ID #: _____County:_____

Violation Date:_____ / _____ / _____ Violation Type:_____

This public water system certifies that public notice has been given to water users following state and federal requirements for delivery, content, and deadlines.

Complete the following items:

Yes No

☐ ☐ Distribution was completed on ___ / ___ /____. Check all that apply:
- ☐ Hand delivery,
- ☐ Press release (TV, radio, newspaper, etc.),
- ☐ Posting at_____ (by DOH approval only),
- ☐ Other _____ (by DOH approval only).

☐ ☐ Were the water users notified within 24 hours?

_____ _____ _____
Signature of owner or operator | Position | Date

Northwest Regional Office:
20435 72nd Ave. S., Suite 200,
Kent WA 98032
Main Office: (253) 395-6750
Fax: (253) 395-6760

Area of Coverage: Island, King, Pierce, San Juan, Skagit, Snohomish, and Whatcom Counties.

Southwest Regional Office:
243 Israel Road SE, Tumwater
PO Box 47823, Olympia WA 98504
Main Office: (360) 236-3030
Fax (360) 664-8058

Area of Coverage: Clallam, Clarks, Cowlitz, Grays Harbor, Jefferson, Kitsap, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum Counties.

Eastern Regional Office:
16201 East Indiana Ave., Suite 1500,
Spokane Valley WA 99216
Main Office: (509) 329-2100
Fax: (509) 329-2104

Area of Coverage: Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima Counties.

The Department of Health is an equal opportunity agency. For persons with disabilities, this form is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

PRELIMINARY - CITY REVIEW ONLY

IMPORTANT NOTICE ABOUT YOUR WATER SYSTEM

Coliform Maximum Contaminant Level (MCL) Exceeded: Non-acute MCL

The _____ water system, ID# _____ in _____ County routinely monitors for the presence of total coliform bacteria and in _____ this type of bacteria was detected. Although this incident was not an emergency, as our customer, you have a right to know what happened and what we did or are doing to correct the situation.

Coliforms are bacteria which are naturally present in the environment and are used as indicators that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems. The samples that showed the presence of coliform were further tested to see if other bacteria of greater concern, such as fecal coliform or *E.coli* were present. **None of these bacteria were found.**

You do not need to boil your water. People with severely compromised immune systems, infants, and some elderly may be at an increased risk. These people should seek advice from their health care provider.

What happened? What is the suspected or known source of contamination?

At this time:

- ☐ The problem is resolved. Additional samples collected were found to be free of coliform bacteria.
- ☐ We anticipate resolving the problem by ____ / ____ / ____.
- ☐ Other _____.

For more information, contact _____ at ( )____-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this notice with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Date Distributed ____ / ____ / ____.

Coliform Non-acute Public Notice Certification Form

The purpose of this form (below) is to provide documentation to the department that public notice was distributed. Please check the appropriate box and fill in the date that the notice was distributed:

- ☐ Notice was mailed to all water customers on ____ / ____/____.
- ☐ Notice was hand delivered to all water customers on ___ / ___ /___.
- ☐ Notice was posted (*with department approval*) at:
  _____ on ___ / ___ /____.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ _____
Signature of owner or operator Position Date

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

Send copy of completed notification and certification to:

☐ Northwest Drinking Water
Department of Health
20435 72nd Ave S, Suite 200
Kent, WA 98032-2358
Phone: (253) 395-6750
Fax: (253) 395-6760

☐ Southwest Drinking Water
Department of Health
PO Box 47823
Olympia, WA 98504-7823
Phone: (360) 236-3030
Fax: (360) 664-8058

☐ Eastern Drinking Water
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

PRELIMINARY - CITY REVIEW ONLY

AVISO IMPORTANTE ACERCA DEL SISTEMA DE SUMINISTRO DE AGUA

Las bacterias coliformes rebasaron el Nivel Máximo de Contaminación: NMC no agudo

El sistema de suministro de agua _____, número (ID#) _____ en el condado de _____ monitorea rutinariamente la presencia de bacterias coliformes totales. En la fecha _____, se encontró este tipo de bacteria. Aunque este incidente no es considerado una emergencia, como consumidor, Usted tiene el derecho a saber que pasó y que se ha hecho o se esta haciendo para corregir esta situación.

Las bacterias coliformes se encuentran naturalmente en el medio ambiente y se usan como indicador de la posible presencia de otras bacterias que pueden causar daño a la salud. En las muestras tomadas, las bacterias se encontraron en mayor número que el permitido y esto es una indicación de posibles problemas. Las muestras con bacterias coliformes se analizaron con más detalle en el laboratorio para ver si bacterias coliformes fecales o E. Coli pudieran también haber estado presentes. Estas bacterias causan daño a la salud de las personas. **No se encontró ninguna de estas bacterias.**

No es necesario que usted hierva el agua. Personas con un sistema inmunológico severamente comprometido, los recién nacidos y algunas personas de edad avanzada pueden tener mas riesgo de salud y deberían llamar a algún personal médico para mayor información.

¿Qué fue lo que pasó? ¿Cuál es la fuente de contaminación de la que se sabe o sospecha?

En este momento:

- ☐ El problema esta resuelto. En muestras adicionales que se colectaron no se encontraron bacterias coliformes.
- ☐ Anticipamos resolver el problema el día ____/____/____.
- ☐ Otro _____.

Para mayor información comuníquese con _____ al teléfono ( ) _____-__ _____ o con

_____	_____	_____
(dueño u operador)	(teléfono)	(dirección)

Pase esta información a todas las personas pudieran tomar agua de este suministro, especialmente aquellas personas que no hayan recibido este aviso (por ejemplo, personas que vivan en apartamentos, asilos de ancianos, escuelas y negocios.) Usted puede hacer esto colocando este aviso en un lugar público donde se pueda leer claramente o distribuyendo copias en persona o enviándolas por correo.

Este aviso es enviado a Usted por el Sistema de Suministro de Agua_____ fecha ___/___/____.

PRELIMINARY - CITY REVIEW ONLY

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

PUBLIC NOTICE CERTIFICATION
Acute Coliform MCL

Within 10 days of notifying your customers, you must send a copy of each type of notice you distribute (hand-delivered notices, press releases, newspaper articles, etc.) to our regional office. Also, complete and send this form, which certifies that you have met all the public notification requirements. If the boil water advisory remains in effect more than three months, you must notify your water users again and provide another Public Notice Certification to us. *With this certification, you are also stating that you will meet future requirements for notifying new billing units of the violation or situation.*

Water System:_____ID #_____County:_____

Violation Date:_____ / _____ / _____ Violation Type:_____

This public water system certifies that public notice has been given to water users, following state and federal requirements for delivery, content, and deadlines.

Complete the following items:

Yes No

☐ ☐ Distribution was completed on ___ / ___ /____. Check all that apply:
- ☐ Hand delivery,
- ☐ Press release (TV, radio, newspaper, etc.),
- ☐ Posting at_____ (by DOH approval only),
- ☐ Other _____ (by DOH approval only).

☐ ☐ Were the water users notified within 24 hours?

_____ _____ _____
Signature of owner or operator | Position | Date

If you need this publication in an alternate format, call (800) 525-0127 or for TTY/TDD call (877) 833-6341.

Northwest Regional Office:
20435 72nd Ave S Suite 200
Kent WA 98032
(253) 395-6775
Fax: (253) 395-6760

Southwest Regional Office:
PO Box 47823
Olympia WA 98504-7823
(360) 236-3030
Fax (360) 664-8058

Eastern Regional Office:
16201 E Indiana Ave Suite 1500
Spokane Valley WA 99216
(509) 329-2100
Fax: (509) 329-2104

DOH Form #331-264 (Updated 08/10)

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

LEAD AND COPPER INITIAL MONITORING VIOLATION

We, _____ Water System, I.D. _____, located in _____ County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. In the initial monitoring period of _____ to _____ _____, we did not meet our monitoring requirements for lead and copper, and therefore cannot be sure of the quality of your drinking water at that time. At this time:

☐ No action is required by the users.

☐ Our required lead and copper samples have currently been collected.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Lead & Copper Initial Monitoring Public Notice Certification Form
This section must be completed by Water System. Signature below indicates notice contained all required elements.

Complete the following items (check all that apply):

☐ Notice mailed to all water customers on ____ / ____/____.

☐ Notice hand delivered to all water customers on ___ / ___ /___.

☐ Notice published in newspaper (attach copy)

☐ Notice posted at _____ on ___ / ___ /____.
(***By Department Approval Only***)

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ _____
Signature of owner or operator Position Date

Send copy of completed notification and certification to:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360) 236-2252

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

ANNUAL NITRATE MONITORING VIOLATION FORM

We, _____ Water System, I.D. _____, located in _____County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During _____, we did not monitor or test for nitrate, and therefore cannot be sure of the quality of your drinking water during that time.

At this time:

- ☐ No action is required by the users.
- ☐ Our routine nitrate sample required for _____ *(current year)* has been collected.
- ☐ Samples will be collected in the future as required.
- ☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Annual Nitrate Monitoring Public Notice Certification Form

(This section must be completed by Water System. Signature below indicates notice contained all required elements.)

Complete the following items (check all that apply):

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

- ☐ Notice mailed to all water customers on ____ / ____/____.
- ☐ Notice hand delivered to all water customers on ___ / ___ /___.
- ☐ Notice published in newspaper (attach copy)
- ☐ Notice posted at _____ on ___ / ___ / ____.

(***By Department Approval Only***)

_____ _____ _____
Signature of owner or operator Position Date

Send copy of completed notification and certification to:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360) 236-2252

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

PRELIMINARY - CITY REVIEW ONLY

AVISO A LOS USUARIOS DEL SISTEMA DE AGUA

FORMULARIO DE VIOLACIÓN DEL MONITOREO ANUAL DE NITRATO

Nosotros, el sistema de agua _____, con número de identificación (ID) _____, situado en el condado de _____, estamos obligados a monitorear regularmente su agua potable por contaminantes específicos. Los resultados del monitoreo indican si su agua potable cumple o no con las normas de salud. Durante el año _____, no realizamos monitoreo ni pruebas del agua para el nitrato, y por lo tanto no podemos asegurar la calidad de su agua potable durante ese tiempo.

En este momento:

☐ No se requiere ninguna acción de los usuarios.

☐ Hemos colectado la muestra rutinaria de nitrato para el _____ (el año actual).

☐ Colectaremos las muestras en el futuro según la norma.

☐ Otra información para los usuarios:

Para más información, por favor contacte a _____ al (_____) _____ - _____ o en
.

(El dueño / operador) (El número de teléfono) (La dirección)

Por favor comparte esta información con otras personas que pudieran tomar agua de este sistema, especialmente con aquellos que no hayan recibido este aviso directamente (por ejemplo, las personas que viven en apartamentos, residencias para ancianos, escuelas y negocios). Puede hacerlo colocando este aviso en un lugar público o entregando copias en persona o por correo.

Este aviso le fue enviado por el sistema de agua _____ la fecha ____/____/____.

Formulario de certificación de la notificación al público del monitoreo anual de nitrato

(Esta sección debe ser llenada por el sistema de agua. La firma abajo indica que la notificación contiene todos los elementos requeridos.)

Complete los siguientes puntos (marque todo lo que aplica)

☐ El aviso fue enviado por correo a todos los usuarios del sistema de agua el ____/____/

☐ El aviso fue distribuido a mano a todos usuarios del sistema de agua el ____/____/

☐ El aviso fue publicado en el periódico (adjunta la copia)

☐ Se colocó el aviso en _____ el ____/____/
(**Solo con permiso del departamento**)

_____ _____ ____/____/____.
(Firma del dueño u operador) (Posición) (Fecha)

Envíe una copia de la notificación completa y la certificación a:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360) 236-2252

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

DISINFECTION BYPRODUCTS MONITORING VIOLATION

We, _____ Water System, I.D. _____, located in _____ County are required to monitor your drinking water for specific contaminants on a regular basis Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During the ☐ month(s) of _____ _____ or ☐ quarter(s) _____ in the year of _____ we did not monitor or test for ☐ Total Trihalomethanes, ☐ Haloacetic Acids, or ☐ Bromate and therefore cannot be sure of the quality of your drinking water during that time.

At this time:

☐ No action is required by the users.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, contact _____ at ( )_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on ____/____/____

Disinfection Byproducts Monitoring Public Notice Certification Form
The purpose of this form (below) is to provide documentation to the department that public notice was distributed. Please check the appropriate box and fill in the date that the notice was distributed:

☐ Notice was mailed to all water customers on ____ / ____/____.

☐ Notice was hand delivered to all water customers on ___ / ___ /___.

☐ Notice was posted (*with department approval*) at:
_____ on ___ / ___ /____.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ _____
Signature of owner or operator Position Date

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

Send copy of completed notification and certification to:

☐ Northwest Drinking Water
Department of Health
20435 72nd Ave S, Suite 200
Kent, WA 98032-2358
Phone: (253) 395-6750
Fax: (253) 395-6760

☐ Southwest Drinking Water
Department of Health
PO Box 47823
Olympia, WA 98504-7823
Phone: (360) 236-3030
Fax: (360) 664-8058

☐ Eastern Drinking Water
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

PRELIMINARY - CITY REVIEW ONLY

AVISO A LOS USUARIOS DEL SISTEMA DE AGUA

VIOLACIÓN DEL MONITOREO DE LOS SUBPRODUCTOS DE LA DESINFECCIÓN

Nosotros, el sistema del agua _____, con numero de identificación_____, situado en el condado de _____ estamos obligados a monitorear regularmente su agua potable por contaminantes específicos. Los resultados del monitoreo indican si su agua potable cumple o no con las normas de salud. Durante ☐ el(los) mes(es) de _____ o ☐ los cuartos de _____ en el año de _____ no realizamos monitoreo ni pruebas del agua para ☐ el total de los trihalometanos, ☐ los haloácidos, o ☐ bromatos y por lo tanto no podemos asegurar la calidad de su agua potable durante ese tiempo.

En este momento:

☐ No se requiere ninguna acción de los usuarios.

☐ Colectaremos las muestras en el futuro según la norma.

☐ Otra información para los usuarios:

Por más información, contacte a _____ al (____)_____o en_____.
(Dueño / operador) (Número de teléfono) (Dirección)

Por favor comparte esta información con otras personas que pudieran tomar agua de este sistema, especialmente con aquellos que no hayan recibido este aviso directamente (por ejemplo, las personas que viven en apartamentos, hospicios para ancianos, escuelas y negocios). Puede hacerlo colocando este aviso en un lugar público o entregando copias en persona o por correo.

Este aviso le fue enviado por el sistema de agua _____ el __/__/____.

Formulario de certificación de la notificación al público del monitoreo de los subproductos de la desinfección
El propósito de este formulario (abajo) es documentar para el departamento que el aviso público fue distribuido. Marque por favor la caja apropiada y complete la fecha que el aviso fue distribuido: (Esta sección debe ser llenada por el sistema de agua):

☐ El aviso fue enviado por correo a todos los usuarios del sistema de agua el ____/____/____.

☐ El aviso fue distribuido a mano a todos usuarios del sistema de agua el ____/____/____.

☐ Se colocó el aviso (solo con permiso del departamento) en:

_____ el ____/____/____.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ ____/____/____
(Firma del dueño u operador) (Posición) (Fecha)

Si usted necesita esta publicación en un formato diferente, llame al (800) 525-0127. Para TTY/TDD, llame al (800) 833-6388.

Envíe una copia de la notificación completa y la certificación a*:*

☐ Northwest Drinking Water
Department of Health
20435 72nd Ave S, Suite 200
Kent, WA 98032-2358
Phone: (253) 395-6750
Fax: (253) 395-6760

☐ Southwest Drinking Water
Department of Health
PO Box 47823
Olympia, WA 98504-7823
Phone: (360) 236-3030
Fax: (360) 664-8058

☐ Eastern Drinking Water
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

MONTHLY BROMATE MONITORING VIOLATION FORM

We, _____ Water System, I.D. _____, located in _____County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During the month(s) of _____, we did not monitor or test for the disinfection by-product bromate, and therefore cannot be sure of the quality of your drinking water during that time.

At this time:

☐ No action is required by the users.

☐ Our routine monthly bromate sample(s) have been taken for _____ *(time period)*.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Monthly Bromate Monitoring Public Notice Certification Form

(This section must be completed by Water System. Signature below indicates notice contained all required elements.)

Complete the following items (check all that apply):

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

☐ Notice mailed to all water customers on ____ / ____/____.

☐ Notice hand delivered to all water customers on ___ / ___ /___.

☐ Notice published in newspaper (attach copy)

☐ Notice posted at _____ on ___ / ___ / ____.

(***By Department Approval Only***)

_____ _____ _____
Signature of owner or operator Position Date

The Department of Health is an equal opportunity agency. For persons with disabilities, this form is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Send copy of completed notification and certification to:
Office of Drinking Water, Water System Support Section, PO Box 47822, Olympia WA 985047822 fax (360) 236-2252

DOH Form #331-394 (02/08)

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

QUARTERLY TOTAL TRIHALOMETHANE (TTHM)/HALOACETIC ACIDS (HAA5) MONITORING VIOLATION FORM

We, _____ Water System, I.D. _____, located in _____County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. During the following quarters: _____, we did not monitor or test for the disinfection by-products TTHM and HAA5, and therefore cannot be sure of the quality of your drinking water during that time.

At this time:

☐ No action is required by the users.

☐ Our routine quarterly TTHM/HAA5 samples have been taken for _____ *(time period)*.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Quarterly TTHM/HAA5 Monitoring Public Notice Certification Form

(This section must be completed by Water System. Signature below indicates notice contained all required elements.)

Complete the following items (check all that apply):

☐ Notice mailed to all water customers on ____ / ____/____.

☐ Notice hand delivered to all water customers on ___ / ___ /___.

☐ Notice published in newspaper (attach copy)

☐ Notice posted at _____ on ___ / ___ / ____.

(***By Department Approval Only***)

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

_____ _____ _____
Signature of owner or operator Position Date

The Department of Health is an equal opportunity agency. For persons with disabilities, this form is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Send copy of completed notification and certification to:
Office of Drinking Water, Water System Support Section, PO Box 47822, Olympia WA 985047822 fax (360) 236-2252

DOH Form #331-395 (02/08)

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS
QUARTERLY NITRATE MONITORING VIOLATION FORM

We, _____Water System, I.D. _____, located in _____ County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. We are required to monitor for nitrates on a quarterly basis. We have failed to meet the monitoring requirements for nitrate for the _____ quarter(s) of _____ (year). We cannot be sure of the quality of your drinking water during that time. At this time:

☐ No action is required by the users.

☐ Our current quarterly nitrate samples have been collected.

☐ Samples will be collected in the future as required.

☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Quarterly Nitrate Monitoring Public Notice Certification Form
(This section to be completed by the Water System. Signature below indicates notice contained all required elements.)

Complete the following items (check all that apply):

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

☐ Notice mailed to all water customers on ____ / ____/____

☐ Notice hand-delivered to all water customers on ___ / ___ /___

☐ Notice published in newspaper (attach copy)

☐ Notice posted at _____ on ___ / ___ /____
(***By Department Approval Only***)

_____ _____ _____
Signature of owner or operator Position Date

Send copy of completed notification and certification to:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360) 236-2252

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

PRELIMINARY - FOR REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

Reliably & Consistently Under the Maximum Contaminant Level (MCL)

ANNUAL NITRATE MONITORING VIOLATION FORM

We, _____ Water System, I.D. _____, located in _____County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. We are required to collect a nitrate sample for Source #____ each year, between the months of _____ and _____. During _____, we did not monitor or test for nitrate and therefore cannot be sure of the quality of your drinking water during that time. At this time:

- ☐ No action is required by the users.
- ☐ Our routine nitrate sample required to be collected between _____ *and* _____ *(current year)* has been collected.
- ☐ Samples will be collected in the future as required.
- ☐ Other information for customers:

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

R & C Under the MCL Annual Nitrate Monitoring Public Notice Certification Form

(This section must be completed by the Water System. A signature below indicates the notice contained all required elements.)

Complete the following items (check all that apply):

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

- ☐ Notice mailed to all water customers on ____ / ____/____
- ☐ Notice hand-delivered to all water customers on ___ / ___ /___
- ☐ Notice published in newspaper (attach copy)
- ☐ Notice posted at _____ on ___ / ___ / ____

(***By Department Approval Only***)

_____ _____ _____
Signature of owner or operator Position Date

Send a copy of completed notification and certification to:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360) 236-2252

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

PRELIMINARY - CITY REVIEW ONLY

NOTICE TO WATER SYSTEM USERS

LEAD AND COPPER MONITORING VIOLATION

We, _____ Water System, I.D. _____, located in _____ County are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not your drinking water meets health standards. In _____ we did not meet our monitoring requirements for lead and copper, and therefore cannot be sure of the quality of your drinking water at that time.

At this time:

- ☐ No action is required by the users.
- ☐ Our required lead and copper samples have been collected for this monitoring period.
- ☐ Samples will be collected in the future as required.
- ☐ Other information for customers:

For more information, please contact _____ at ( )____-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses.) You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is sent to you by _____ Water System on __/__/__

Lead & Copper Monitoring Public Notice Certification Form
This section must be completed by the water system. Signature below indicates notice contained all required elements.

Complete the following items (check all that apply):

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

- ❑ Notice mailed to all water customers on ____ / ____/____.
- ❑ Notice hand delivered to all water customers on ___ / ___ /___.
- ❑ Notice published in newspaper (attach copy)
- ❑ Notice posted at _____ on ___ / ___ /____.
  (***By Department Approval Only***)

_____ _____ _____
Signature of owner or operator Position Date

Send copy of completed notification and certification to:

Denise Garrett, Lead and Copper Program Manager
Office of Drinking Water
PO Box 47822
Olympia, WA 98504-7822
FAX (360)236-2252

DOH Form 331-461 (Updated 06/11)

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD, call (800) 833-6388.

PRELIMINARY - CITY REVIEW ONLY

AVISO PARA LOS USUARIOS DEL SISTEMA DE AGUA

VIOLACIÓN DEL MONITOREO DE PLOMO Y COBRE

Nosotros, el sistema de agua _____ , con número de identificación (I.D#) _____, ubicado en el condado de _____, regularmente debemos monitorear contaminantes específicos en el agua que usted toma. Los resultados del monitoreo son un indicador para comprobar si el agua que usted toma cumple con los estándares de salud. En _____ no cumplimos con el requisito de monitorear el plomo y el cobre, y por lo tanto no podemos estar seguros de la calidad del agua que usted tomó en esa fecha.

En este momento:

☐ Ninguna acción se requiere de parte de los usuarios.

☐ Nuestras muestras de plomo y cobre requeridas han sido tomadas para este periodo de monitoreo.

☐ Las muestras serán tomadas en el futuro como se requiere.

☐ Otra información para los usuarios:

Para mayor información comuníquese con _____ al teléfono ( ) _____-__ _____ o con

_____	_____	_____
(dueño u operador)	(teléfono)	(dirección)

Pase esta información a todas las personas que pudieran tomar agua de este suministro, especialmente aquellas personas que no hayan recibido este aviso (por ejemplo, personas que vivan en apartamentos, asilos de ancianos, escuelas y negocios.) Usted puede hacerlo colocando este aviso en un lugar público donde se pueda leer claramente o distribuyendo copias en persona o enviándolas por correo.

Este aviso es enviado a usted por el Sistema de Suministro de Agua_____ fecha ___/___/____.

Si usted necesita esta publicación en formatos alternativos llame al (800) 825-0127. Para TTY/TDD, llame al (800) 833-6388.

Appendix P

Agency Review Comments

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